MONTEREY PENINSULA
WATER MANAGEMENT DISTRICT

2012-2013 ANNUAL REPORT
(July 1, 2012 - June 30, 2013)

for the

MPWMD MITIGATION PROGRAM

A report in compliance with the

MPWMD WATER ALLOCATION PROGRAM
FINAL ENVIRONMENTAL IMPACT REPORT
(originally certified in November 1990)

Prepared by MPWMD Staff
May 2014

2012-2013 ANNUAL REPORT
MPWMD MITIGATION PROGRAM
WATER ALLOCATION PROGRAM EIR

May 2014

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MPWMD MITIGATION PROGRAM
WATER ALLOCATION PROGRAM ENVIRONMENTAL IMPACT REPORT

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT
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I. EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND:

In April 1990, the Water Allocation Program Final Environmental Impact Report (EIR) was prepared for the Monterey Peninsula Water Management District (MPWMD or District) by J.L. Mintier and Associates. The Final EIR analyzed the effects of five levels of annual California American Water (CAW or Cal-Am) production, ranging from 16,744 acre-feet per year (AFY) to 20,500 AFY. On November 5, 1990, the MPWMD Board certified the Final EIR, adopted findings, and passed a resolution that set Option V as the new water allocation limit. Option V resulted in an annual limit of 16,744 AFY for Cal-Am production, and 3,137 AFY for non-Cal-Am production, with a total allocation of 19,881 AFY for the Monterey Peninsula Water Resource System (MPWRS).

Even though Option V was the least damaging alternative of the five options analyzed in the Water Allocation Program EIR, production at this level still resulted in significant, adverse environmental impacts that must be mitigated. Thus, the findings adopted by the Board included a "Five-Year Mitigation Program for Option V" and associated mitigation measures.

In June 1993, Ordinance No. 70 was passed, which amended the annual Cal-Am production limit from 16,744 AF to 17,619 AF, and the non-Cal-Am limit from 3,137 AF to 3,054 AF; the total production limit was increased from 19,881 AF to 20,673 AF per year due to new supply from the Paralta Well in Seaside. In April 1996, Ordinance No. 83 slightly changed the Cal-Am and non-Cal-Am annual limits to 17,621 AF and 3,046 AF, respectively, resulting in a total limit of 20,667 AFY. In February 1997, Ordinance No. 87 was adopted to provide a special water allocation for the planned expansion of the Community Hospital of the Monterey Peninsula, resulting in a new Cal-Am production limit of 17,641 AFY; the non-Cal-Am limit of 3,046 AFY was not changed. These actions did not affect the implementation of mitigation measures adopted by the Board in 1990.

The Five-Year Mitigation Program formally began in July 1991 with the new fiscal year (FY) and was slated to run until June 30, 1996. Following public hearings in May 1996 and District Board review of draft reports through September 1996, the Five-Year Evaluation Report for the 1991-1996 comprehensive program, as well as an Implementation Plan for FY 1996-1997 through FY 2000-2001, were finalized in October 1996. In its July 1995 Order WR 95-10, the

State Water Resources Control Board (SWRCB) directed Cal-Am to carry out any aspect of the Five-Year Mitigation Program that the District does not continue after June 1996. To date, as part of the annual budget approval process, the District Board has voted to continue the program. The Mitigation Program has accounted for a significant portion of the District's annual budgets in terms of revenue (derived primarily from a portion of the MPWMD user fee on the Cal-Am bill) and expenditures. It should be noted that this fee was removed from Cal-Am's bill in July 2009, resulting from actions subsequent to a California Public Utilities Commission ruling regarding a Cal-Am rate request. Cal-Am continued to pay the fee amount (8.325%) under a separate reinvestment agreement with MPWMD through June 2010. The District and Cal-Am have negotiated an annual funding agreement that funded part of the 2013 mitigation program. The Districts other revenue sources were used to fund the remainder of the program.

The California Environmental Quality Act (CEQA) (Pub. Res. Code 21081.6) requires that the MPWMD adopt a reporting or monitoring program to insure compliance with mitigation measures when implementing the Water Allocation Program. Findings Nos. 387 through 404 adopted by the Board on November 5, 1990 describe mitigation measures associated with the Water Allocation Program; many entail preparation of annual monitoring reports. This 2012-2013 Annual Report for the MPWMD Mitigation Program responds to these requirements. It covers the fiscal year period of July 1 through June 30. It should be noted that hydrologic data and well reporting data in this report are tabulated using the water year, defined as October 1 through September 30, in order to be consistent with the accounting period used by the SWRCB.

This 2012-2013 Annual Report first addresses general mitigation measures relating to water supply and demand (Sections II through XI), followed by monitoring related to compliance with production limits, drought reserve and supply augmentation (Sections XII through XV), followed by mitigations relating to specific environmental resources (Sections XVI through XIX). Section XX provides a summary of costs for the biological mitigation programs as well as related hydrologic monitoring, water augmentation and administrative costs. Section XXI presents selected references.

Table I-1 summarizes the mitigation measures described in this report. In subsequent chapters, for each topic, the mitigation measure adopted as part of the Final EIR is briefly described, followed by a summary of activities relating to the topic in FY 2012-2013 (July 1, 2012 through June 30, 2013, unless otherwise noted). Monitoring results, where applicable, are also presented. Tables and figures that support the text are found at the end of each section in the order they are mentioned in the text.

ACCOMPLISHMENTS:

Many activities are carried out as part of the MPWMD Mitigation Program to address the environmental effects that community water use has upon the Carmel River and Seaside Groundwater Basins. Highlights of the accomplishments in FY 2012-2013 for each major category are shown in **Table I-2**.

OBSERVED TRENDS, CONCLUSIONS AND/OR RECOMMENDATIONS:

The following paragraphs describe observed trends (primarily qualitative), conclusions and/or recommendations for the mitigation program. General conclusions are followed by a summary of selected Mitigation Program categories.

General Overview

In general, the Carmel River environment is in better condition today than it was in 1990 when the Allocation Program EIR was prepared. This improvement is evidenced by biological/hydrologic indicators such as consistent steelhead adult spawner counts of several hundred fish in recent years as compared to zero to five fish per year when the Mitigation Program began in 1991; improved densities of juvenile steelhead in quantities that reflect a healthy seeded stream; consistently balanced bird diversity in MPWMD restoration project areas compared to control areas; fewer miles of dry river in summer and fall than in the past; and higher water tables in the Carmel Valley alluvial aquifer at the end of each water year.

The comprehensive MPWMD Mitigation Program is an important factor responsible for this improvement. Direct actions such as fish rescues and rearing, and riparian habitat restoration literally enable species to survive and reproduce. Indirect action such as conservation programs, water augmentation, ordinances/regulations and cooperative development of Cal-Am operation strategies result in less environmental impact from human water needs than would occur otherwise. The District's comprehensive monitoring program provides a solid scientific data baseline, and enables better understanding of the relationships between weather, hydrology, human activities and the environment. Better understanding of the MPWRS enables informed decision-making that achieves the District's mission of benefiting the community and the environment.

It is acknowledged that there are other important factors responsible for this improved situation. For example, since Water Year (WY) 1991, the Carmel River has received normal or better runoff in 16 out of 22 years. Actions by federal resource agencies under the Endangered Species Act (ESA) or the SWRCB under its Order WR 95-10 and follow-up orders have provided strong incentive for Cal-Am and other local water producers to examine and amend water production practices to the degree feasible, and for the community to reduce water use. Except for one year in 1997, the community has complied with the production limits imposed on Cal-Am by the SWRCB since Order 95-10 became effective in July 1995.

Despite these improvements, challenges still remain due to human influence on the river. The steelhead and red-legged frog remain listed as threatened species under the ESA. At least several miles of the river still dry up each year, harming habitat for fish and frogs. The presence of the two existing dams, flood plain development and water diversions to meet community and local user needs continue to alter the natural dynamics of the river. Stream bank restoration projects may be significantly damaged in large winter storm events, and some people continue to illegally dump refuse into the river or alter their property without the proper permits. Thus, the

Mitigation Program (or a comprehensive effort similar to it) will be needed as long as significant quantities of water are diverted from the Carmel River and people live in close proximity to it.

Water Resources Monitoring Program

Streamflow and precipitation data continue to provide a scientific basis for management of the water resources within the District. These data continue to be useful in Carmel River Basin planning studies, reservoir management operations, water supply forecast and budgeting, and defining the baseline hydrologic conditions of the Carmel River Basin. Also, the District's streamflow monitoring program continues to produce high quality and cost-effective data.

There is limited storage of surface water by dams on the Carmel River. Los Padres Reservoir, completed in 1948, holds 1,626 AF of usable storage, based on 2008 survey data. Usable storage in San Clemente Reservoir, completed in 1921, has been essentially eliminated by order of the Department of Water Resources (DWR) due to seismic safety concerns. As an interim safety measure, which remained in effect through WY 2013, DWR has seasonally required Cal-Am to lower the water level in San Clemente Reservoir from 525 feet to 515 feet elevation, which is too low for water-supply use. Cal-Am had proposed a dam seismic strengthening program. State and federal environmental agencies urged Cal-Am to reconsider their position and support the dam removal and river reroute option. In July 2009, Cal-Am changed its position and subsequently supports the dam removal option, as memorialized in the January 2010 multi-agency collaboration statement. District staff continues to participate in technical advisory role. In 2011, Cal-Am circulated a request for bids to complete the removal of the Dam and a contractor was selected for this work in 2013. The first phase of this project began in 2013 with construction of a new access road and placement of the river diversion facilities.

Groundwater levels, and consequently groundwater storage conditions, in the Carmel Valley Alluvial Aquifer have maintained a relatively normal pattern in recent years, in contrast to the dramatic storage declines that were observed during the prolonged 1987-1991 drought period. The relatively stable storage in the Carmel Valley alluvial aquifer in recent years is attributable to a combination of a period of more favorable hydrologic conditions and the adoption of improved water management practices that have tended to preserve higher storage conditions in the aquifer. In WY 2013, Carmel Valley alluvial aquifer storage declined slightly as this year marked the second consecutive dry hydrologic year.

In contrast, storage conditions in the coastal portion of the Seaside Groundwater Basin have not been stable in recent years, in particular with respect to the deeper Santa Margarita aquifer, from which over 80 percent of the Cal-Am production in the Seaside Basin is derived. This downward trend in water levels reflects the changed production operations in the Seaside Basin stemming primarily from changed practices after SWRCB Order 95-10. The increased annual reliance on production from Cal-Am's major production wells in Seaside, along with significant increases in non-Cal-Am use, have dramatically lowered water levels in this aquifer, and seasonal recoveries have not been sufficient to reverse this trend.

To address this storage depletion trend, the District initiated efforts in the 2000-2001 timeframe to prepare a Seaside Basin Groundwater Management Plan in compliance with protocols set by

the State of California (AB 3030, as amended by SB 1938). This process was superseded by litigation filed by Cal-Am in August 2003, requesting a court adjudication of water production and storage rights in the Seaside Basin. The District participated in all litigation proceedings as an intervening "interested party". The Superior Court held hearings in December 2005 and issued a final adjudication decision in March 2006, which was amended through an additional court filing in February 2007. The final decision established a new, lower "natural safe yield" for the Basin of 3,000 AFY, and an initial Basin "operating safe yield" of 5,600 AFY. Under the decision, the operating safe yield would be reduced by 10% every three years until the operating safe yield matches the natural safe yield of the Basin in 2021. The Court also created a nine-member Watermaster Board (of which the District is a member) to implement the Court's decision. With the triennial reductions in operational yield required by the Seaside Basin Adjudication Decision, water levels have not been declining as fast as previously observed.

One of the means that could potentially mitigate this observed storage depletion trend is a program that the District has been actively pursuing since 1996 -- the Seaside Basin groundwater injection program (also known as aquifer storage and recovery, or ASR). ASR entails diverting excess water flows (typically in Winter/Spring) from the Carmel Valley Alluvial Aquifer through existing Cal-Am facilities and injecting the water into the Seaside Groundwater Basin for later recovery in dry periods.

The primary goal of the MPWMD Phase 1 and 2 ASR Projects is better management of existing water resources and production facilities to help reduce impacts to the Carmel River, especially during the dry season. The projects are viewed as being complementary to other larger, long-term water augmentation projects that are currently being pursued for the Monterey Peninsula. These projects, also known as Water Projects 1 and 2, entail a maximum diversion of 2,426 AFY, and 2,900 AFY respectively from the Carmel River for injection. The combined average yield for both projects is estimated at 2,000 AFY. The operation of the Phase 1 and 2 ASR Projects result in reduced unauthorized pumping of the Carmel River in Summer/Fall and increased storage in the Seaside Basin, which are both considered to be environmentally beneficial.

The ASR water supply efforts in 2012-2013 included: (1) continued work with regulatory and land use agencies on expansion of the Phase 1 Santa Margarita ASR site; (2) completion of the electrical facilities for the Phase 2 ASR Project at the Seaside Middle School site; (3) Completion and testing of the second ASR well at the Phase 2 ASR site; (4) diverting under water right 20808C for Phase 2 of the ASR project; (5) coordination with Cal-Am, federal, and state agencies to construct the necessary infrastructure for the ASR project; (6) coordination with Cal-Am on necessary actions and delivery system facilities to enable expanded ASR; and (7) continued implementation of a Memorandum of Understanding (MOU) with Cal-Am to operate the ASR facilities.

Groundwater quality conditions in both the Carmel Valley Alluvial Aquifer and Seaside Basin have remained acceptable in terms of potential indicators of contamination from shallow sources such as septic systems. There have been no identifiable trends indicative of seawater intrusion into the principal supply sources the coastal areas of these two aquifer systems to date.

Steelhead Fishery Program

Annual monitoring conducted by the District shows that the Carmel River steelhead population has recovered somewhat from the remnant levels of the last drought (1987 to 1991) and from past water-supply practices. Though overall fish populations have improved since the inception of the Mitigation Program in 1991, there was a period of general decline in the adult run from 2001 to 2011. Between 1992 and 2001, the spawning population recovered from a handful of fish to levels approaching 900 adults per year as counted at San Clemente Dam (SCD). Then the run experienced a six-year downward trend from 804 adults in 2001 to 222 adults in 2007, rebounding somewhat in 2008 to 412 adults. However, in 2009 and 2010, the population underwent a dramatic reduction to 95 and 157 adults respectively. In 2011 and 2012, the population rebounded again with 452 and 470 adults passing over SCD, while in 2013 the number dropped again to 249, well below the 1994-2013 average of 421, due in part to the dry year.

Previous redd surveys below SCD confirm that the spawning habitat in the lower river has improved considerably over the last 20 years and many adults are now spawning there instead of passing the SCD fish counting station. In addition, juvenile steelhead rescued by the District from the lower river that survive to adulthood are more likely to return to the lower river to spawn, rather than migrate upstream past the SCD. In 2011-2012, The District deployed a DIDSON counting station, acquired from CDFW grant funding, in the lower river to help determine whether more adults are in fact spawning downstream of the dam. Staff continued to download and review video data from the 2013 season and will be reporting the preliminary results in the 2014 Mitigation Program report.

At present, the exact reasons for this period of apparent decline in adult returns at SCD are not clear, but are likely the result of a combination of controlling and limiting factors including:

- improved spawning conditions in the lower Carmel River, encouraging fish to spawn before they reach the counter at the dam;
- spring flow variability such as low flow conditions that could dewater redds prematurely or high flows that could either deposit sediment over redds or completely wash them out;
- variable lagoon conditions, caused by artificial manipulation of the sandbar and/or naturally occurring periods of low winter flows;
- impediments to adult and smolt migration routes, such as seasonal barriers, inadequate passage facilities, and intermittent periods of low flow creating critical riffles below the Narrows during the normal winter-spring migration season;
- low densities of juvenile fish in 2004, 2007, 2009, 2010 and 2011 affecting subsequent adult populations;
- variable ocean conditions; and the

- ongoing but limited impacts of legal fishing (i.e., approximately 0.5 - 1.5% incidental mortality associated with catch-and-release fishing for adults in the winter season, and fishing for juvenile steelhead from in the upper watershed during the spring/summer trout season may slightly reduce the adult spawning stock or the number of juvenile fish that reach the ocean), as well as illegal poaching activities.

- **Juvenile Steelhead**

  Monitoring of the juvenile steelhead population at eleven sites along the mainstem Carmel River below Los Padres Dam shows that fish density continues to be quite variable both year to year and site to site from below 0.40 fish per foot [fpf] of stream to levels frequently ranging above 1.00 fpf, values that are typical of well-stocked steelhead streams. In this 2012-2013 reporting period, the average population density nearly matched the long-term average of 0.81 fpf for the Carmel River due primarily to healthy adult returns in 2011-2012 and good habitat conditions in the lower river.

  District staff believes the recovery and fluctuation of the juvenile steelhead population in the Carmel River Basin is directly related to the following factors:

  - improvements in streamflow patterns, due to favorable natural fluctuations, exemplified by relatively high base-flow conditions since 1995;

  - District and SWRCB rules to actively manage the rate and distribution of groundwater extractions and direct surface diversions within the basin, coupled with changes to CAW's operations at San Clemente and Los Padres Dams, providing increased streamflow below San Clemente Dam;

  - restoration and stabilization of the lower Carmel River's stream banks, providing improved riparian habitat (tree cover/shade along the stream and an increase in woody debris) while preventing erosion of silt/sand from filling gravel beds and pools;

  - extensive juvenile steelhead rescues by the District over the last 24 years, now totaling 375,032 fish through 2012;

  - rearing and releases of rescued fish from the MPWMD Sleepy Hollow Steelhead Rearing Facility (SHSRF) of nearly 87,300 juveniles and smolts back into the river and lagoon over the past 17 years (14 years of operation), at sizes generally larger than the river-reared fish, which in theory should enhance their ocean survival;

  - variable lagoon conditions, including highly variable water-surface elevation changes caused by mechanical breaching, chronic poor water quality (especially in the fall), and predation by birds and striped bass;

  - barriers or seasonal impediments to juvenile and smolt emigration, such as the lack of juvenile passage facilities at Los Padres Dam and intermittent periods of low flow below the Narrows during the normal spring emigration season;

- chronic, and occasionally acute, fall temperature and hydrogen sulfide levels below LPD, and the increase in suspended sediment from the SCD summer drawdown; and the

- potential for enhanced predation on smolts and young-of-the-year (YOY) migrating through the sediment fields of Los Padres and San Clemente Reservoirs.

A recent challenge that may remain for some years is the potential effects of substantive physical and operational changes to SCD required by DWR/DSOD, which has resulted in the initiation of dam removal operations. The most significant issues are the effect of released sediment from the former reservoir on downstream river habitat, proper functioning of the SHSRF, and downstream property owners (i.e., flood elevations). Major changes include:

- lowering of the reservoir water level to address seismic safety concerns on an interim basis;

- Significant changes in the Carmel River sediment regime downstream of San Clemente; and

- loss of reservoir storage, which, in the past, has helped maintain adequate river flows and cooler water in the lower Carmel River.

District staff continues to provide technical expertise and scientific data to CAW engineers and environmental consultants, DWR/DSOD, CDFG, NMFS, U.S. Fish and Wildlife Service, and others involved in addressing the resource management issues associated with removal of SCD. District staff also continues to provide technical expertise and scientific data to California Department Parks and Recreation, Monterey County Water Resources Agency, Monterey County Public Works Department, California Coastal Commission, U. S. Army Corps of Engineers, and Carmel Area Wastewater District, other regulatory agencies and stakeholders involved in the management of the Carmel River, the Carmel River Lagoon and the barrier beach.

Riparian Habitat Mitigation

The Carmel River continues to show many signs of recovery and stabilization after a combination of increased groundwater extraction, extreme drought and flood events occurred during the 1970s, 1980s and 1990s that impacted property owners, threatened species and degraded riparian habitat. In many reaches of the river, fine material (silt and sand) that entered the main stem during periods of instability has been washed out of the system leaving behind a more complex channel with improved steelhead spawning substrate, diverse habitat, and a richer riparian community. Areas with perennial or near perennial flow (upstream of Schulte Bridge) or a high groundwater table, such as downstream of Highway 1, have experienced vigorous natural recruitment in the channel bottom, which has helped to stabilize streambanks and diversify aquatic habitat.

In these areas, natural recruitment has led to vegetation encroachment that, in some areas, may constrict high flows and threaten bank stability. MPWMD continues to monitor these areas closely and to develop a management strategy to balance protection of native habitat with the need to reduce erosion potential. Environmental review of proposed projects and the process of securing permits is quite complex and requires an exhaustive review of potential impacts.

In contrast to areas with perennial flow, recovery of the streamside area between the Rancho Cañada golf courses and Quail Lodge area has been consistently impacted by groundwater extraction. In this reach, only irrigated areas are able to sustain a diversity of plant species. Plant stress in the late summer and fall is evident in non-irrigated portions of the riparian zone. In these areas, streambanks exhibit unstable characteristics during high flows, such as sudden bank collapse, because of the lack of healthy vegetation that would ordinarily provide stability.

Restoration project areas sponsored by MPWMD since 1984 continue to mature and exhibit more features of relatively undisturbed reaches, such as plant diversity and vigor, complex floodplain topography, and a variety of in-channel features such as large wood, extensive vegetative cover, pools, riffles, and cut banks. Areas that were repaired after the 1995 and 1998 floods are still developing these natural features. In part, the location and geometry of the projects constrain the rate of progress toward a fully restored stream channel (i.e., several are located in highly developed, narrow sections of the river impacted by groundwater extraction). Also, many of these projects relied heavily on the use of bank hardening (e.g., rip-rap) to stabilize banks, which can discourage plant vigor and diversity.

As cited in previous annual reports, the most significant trends continue to include the following:

- increased oversight of channel maintenance and restoration activities by Federal agencies,
- groundwater extraction downstream of Schulte Road,
- vegetation encroachment into the channel bottom,
- high avian species diversity values, and
- maturing of previous restoration projects.

Carmel River Erosion Protection and Restoration

With the exception of the channel area between the Via Mallorca Road bridge and the Rancho San Carlos Road bridge, streambanks in the river mainstem appear to be relatively stable during average water years with “frequent flow” storm events (i.e., flows with a return magnitude of less than five years). The program begun by MPWMD in 1984 (and later subsumed into the Mitigation Program) to stabilize streambanks appears to be achieving the goals that were initially set out, i.e., to reduce bank erosion during high-flow events up to a 10-year return-interval flow, restore vegetation along the streamside, and improve fisheries habitat.

Consistent with previous annual reports, it is likely that the following trends will continue:

- State and Federal agencies consider the Carmel River watershed to be a high priority area

for restoration, as evidenced by the interest in addressing water supply issues, the removal of San Clemente Dam, impacts to the Carmel Bay Area of Special Biological Significance, and management of threatened species. Stringent avoidance and mitigation requirements will continue to be placed on activities that could have negative impacts on sensitive aquatic species or their habitats.

- Activities that interrupt or curtail natural stream functions, such as lining streambanks with riprap, have come under increasing scrutiny and now require significant mitigation offsets. Approximately 35% to 40% of the streambanks downstream of Carmel Valley Village have been altered or hardened since the late 1950s. Activities that increase the amount of habitat or restore natural stream functions are more likely to be approved or funded through State and Federal grant programs.
- Additional work to add instream features (such as large logs for steelhead refuge or backwater channel areas for frogs) can restore and diversify aquatic habitat.
- Major restoration projects completed between 1992 and 1999 have had extensive and successful work to diversify plantings. However, maintenance of irrigation systems is ongoing and requires extensive work in water years classified as below normal, dry and critically dry.
- Downstream of the Robinson Canyon Road bridge, the river continues to cut into the channel bottom and form a more complex system of pools, riffles and gravel bars.

Between the mouth of the river and Robinson Canyon Road bridge, many areas of the river appear to be deeper than at any previous time since measurements have been recorded (i.e., beginning in 1978), with many reaches showing several feet of downcutting. This trend, which was identified as a concern in the 1984 Carmel River Management Program EIR, appears to have accelerated in the period from 1998 to 2013. This was a period of exceptional stability (for the Carmel River) as streambanks hardened with structural protection over the past several decades resisted erosion and the force of the river during high flows was directed into the channel bottom. This condition has resulted in the undermining of rip-rap protection and bridge infrastructure in some reaches.

Vegetation Restoration and Irrigation

To the maximum extent possible, MPWMD-sponsored river restoration projects incorporate a functional floodplain that is intended to be inundated in relatively frequent storm events (those expected every 1-2 years). For example, low benches at the Red Rock and All Saints Restoration Projects have served as natural recruitment areas and are currently being colonized by black cottonwoods, sycamores and willows. In addition, willow and cottonwood pole plantings in these areas were installed with a backhoe, which allows them to tap into the water table. These techniques have been successful and have reduced the need for supplemental irrigation.

Channel Vegetation Management

Another notable trend relating to the District's vegetation management program was the widening of the Carmel River channel after floods in 1995 and 1998. With relatively normal years following these floods, the channel has narrowed as vegetation recruits on the channel bottom and gravel bars. Current Federal regulations such as the Endangered Species Act (ESA)

"Section 4(d)" rules promulgated by NOAA Fisheries to protect steelhead significantly restrict vegetation management activities. Because of these restrictions, the District can carry out activities only on the most critical channel restrictions and erosion hazards in the lower 15 miles of the river. In the absence of high winter flows capable of scouring vegetation out of the channel bottom, encroaching vegetation may significantly restrict the channel. As vegetation in the river channel recovers from the high flows of 1995 and 1998 and matures in the channel bottom, more conflicts are likely to arise between preserving habitat and reducing the potential for property damage during high flows. MPWMD will continue to balance the need to treat erosion hazards in the river yet maintain features that contribute to aquatic habitat quality.

Permits for Channel Restoration and Vegetation Management

In 2012, MPWMD renewed its long term permits with the U.S. Army Corps of Engineers and the California Regional Water Quality Control Board for routine maintenance and restoration work. The District also filed an application with the California Department of Fish and Wildlife to renew a long-term Routine Maintenance Agreement (RMA) to conduct regular maintenance and restoration activities. Accordingly, the District hopes to operate under a new RMA by the fall of 2014.

Monitoring Program

Vegetative moisture stress fluctuates depending on the rainfall, proximate stream flow, depth to groundwater, and average daily temperatures, and tends to be much lower in above-normal rainfall years. Typical trends for a single season start with little to no vegetative moisture stress in the spring, when the soil is moist and the river is flowing. As the river begins to dry up in lower Carmel Valley (normally around June) and temperatures begin to increase, an overall increase in vegetative moisture stress occurs. For much of the riparian corridor in the lower seven miles of the Carmel River, this stress has been mitigated by supplemental irrigation, thereby preventing the die off of large areas of riparian habitat. However, many recruiting trees experience high levels of stress or mortality in areas difficult to irrigate. Riparian vegetation exposed to rapid or substantial lowering of groundwater levels (i.e., below the root zones of the plants) will continue to require monitoring and irrigation during the dry season.

With respect to riparian songbird diversity, populations dropped after major floods in 1995 and 1998 because of the loss of streamside habitat. Since 1998, species diversity recovered and now fluctuates depending on habitat conditions. Values indicate that the District mitigation program is preserving and improving riparian habitat.

Integrated Regional Water Management Plan

The IRWM program promoted by the California Department of Water Resources (DWR) encourages planning and management of water resources on a regional scale and promotes projects that incorporate multiple objectives and strategies. In addition, the IRWM process brings stakeholders together and encourages cooperation among agencies in developing mutually beneficial solutions to resource problems.

In November 2007, the District adopted the final IRWM plan for a region encompassing Monterey Peninsula areas within the District boundary, the area in the Carmel River watershed outside of the MPWMD boundary, Carmel Bay and the Southern Monterey Bay. The plan combines strategies to improve and manage potable water supply, water conservation, stormwater runoff, floodwaters, wastewater, water recycling, habitat for wildlife, and public recreation.

Subsequently, MPWMD was successful in 2011 in obtaining a $995,000 grant from the Department of Water Resources to update the IRWM Plan to Proposition 84 standards. The plan combines strategies to improve and manage potable water supply, water conservation, stormwater runoff, floodwaters, wastewater, water recycling, habitat for wildlife, and public recreation. In FY 2011-12, MPWMD entered into a grant agreement with DWR and initiated work on 10 planning projects, including an update to the 2007 plan and several planning projects to benefit local jurisdictions. During FY 2012-13, additional agreements were executed to work on all 10 planning projects. The total cost of the project, including local agency match, will be about $1.6 million and will be completed by mid-2014.

In addition, MPWMD facilitated the expansion of the Regional Water Management Group (RWMG) to include the Marina Coast Water District (MCWD) and the Resource Conservation District (RCD) of Monterey County in order to continue the development and implementation of the IRWM Plan in the Ord Community. The RWMG is comprised of representatives of the Big Sur Land Trust, City of Monterey, Monterey County Water Resources Agency, Monterey Regional Water Pollution Control Agency and MPWMD. The RWMG executed a Memorandum of Understanding concerning implementation of the IRWM Plan in 2008. The MOU was amended in 2013 to include MCWD and the RCD as part of the RWMG.

Funding from the IRWM grant program could provide the incentive to undertake a set of projects that would continue to improve the Carmel River environment and engage a larger number of organizations in helping to develop and implement a comprehensive solution to water resource problems in the planning region.

Carmel River Lagoon Habitat

The District continues to support and encourage the ongoing habitat restoration efforts in the wetlands and riparian areas surrounding the Carmel River Lagoon. These efforts are consistent with goals that were identified in the Carmel River Lagoon Enhancement Plan (Philip Williams & Associates, 1992), which was partially funded by the District. The District continues to work with various agencies and landowners to implement ongoing restoration of the Odello West property and future restoration of the Odello East property across the highway. Because of the restoration activities on the south side of the lagoon, the District has concentrated its monitoring efforts on the relatively undisturbed north side. Staff have also continue to meet and discuss with other agencies the ongoing use of an existing CDPR agricultural well and potential future use of treated water from the Carmel Area Wastewater District to augment the lagoon during periods of low water.

The District expanded its long-term monitoring around the lagoon in 1995 in an attempt to determine if the reduction in freshwater flows due to groundwater pumping upstream might change the size or ecological character of the wetlands. Demonstrable changes have not been identified. Because of the complexity of the estuarine system, a variety of parameters are monitored, including vegetative cover in transects and quadrats, water conductivity, and hydrology. It is notable that due to the number of factors affecting this system, it would be premature to attribute any observed changes solely to groundwater pumping. During the 18-year period to date, for example, there have been two Extremely Wet (1995, 1998), two Wet (2005, 2006), five Above Normal (1996, 1997, 2000, 2010, 2011), and five Normal Water Year types (1999, 2001, 2003, 2008, 2009), in terms of total annual runoff. Thus, the hydrology of the watershed has been wetter than average 50% of the time, and at least normal or better 78% of the time during that period. Other natural factors that affect the wetlands include introduction of salt water into the system as waves overtop the sandbar in autumn and winter, tidal fluctuations, and long-term global climatic change. When the District initiated the long-term lagoon monitoring component of the Mitigation Program, it was with the understanding that it would be necessary to gather data for an extended period in order to draw conclusions about well production drawdown effects on wetland dynamics. It is recommended that the current vegetation, conductivity, topographical and wildlife monitoring be continued in order to provide a robust data set for continued analysis of potential changes around the lagoon.

Lagoon bathymetric cross sectional surveys, initially conducted in 1988, have been completed annually during the dry season since 1994. These data are useful in assessing changes in the sand supply within the main body of the lagoon and are necessary to answer to questions concerning whether or not the lagoon is filling up with sand, thus losing valuable habitat. As indicated in the survey plots, the sandy bed of the lagoon can vary significantly from year to year. In general, no major trends indicating sand accumulation or depletion at the lagoon cross sections have been identified based on available data, with the exception of the upstream-most cross section, which exhibits an overall loss in sand volume over the 1994-2013 period. The observed sand loss or down-cutting is consistent with the pervasive down-cutting that has occurred along the thalweg of the Lower Carmel River (LCR) upstream of the Highway 1 Bridge for several miles. The trend of LCR streambed scour appears to have begun in Water Year 2006.

Program Costs

Mitigation Program costs for FY 2012-2013 totaled approximately $2.22 million including direct personnel expenses, operating costs, project expenditures, capital equipment, and fixed asset purchases. The annual cost of mitigation efforts varies because several mitigation measures are weather dependent. Expenditures in FY 2012-2013 were $2.37 million less than the prior fiscal year largely due to capital expenditures for Aquifer Storage Recovery (ASR) project, which are no longer captured under Mitigation Program costs. However, the overall costs have remained fairly constant (average of $3 million per year) for last five years. In the past, expenditures had trended upward due to expenditures for the ASR Project. FY 2010-2011 expenditures were $5.84 million; and FY 2011-2012 expenditures were $4.59 million.

During FY 2012-2013, revenues totaled $2.74 million including mitigation program revenues, tax revenues, investment income and miscellaneous revenues. The Mitigation Program Fund as of June 30, 2013 had a balance of $30,969.

Table I-1

SUMMARY OF COMPONENTS OF MPWMD MITIGATION PROGRAM
July 1, 2012 - June 30, 2013

WATER MANAGEMENT

- Monitor Water Resources
- Manage Water Production
- Manage Water Demand
- Monitor Water Usage
- Augment Water Supply
- Allocation of New Supply
- Determine Drought Reserve

STEELHEAD FISHERY

- Capture/Transport Emigrating Smolts in Spring
  -- Smolt rescues
  -- Build acclimation facility/tagging study
- Prevent Stranding of Fall/Winter Juvenile Migrants
  -- Juvenile rescues
  -- Build mid-Valley holding facility
- Rescue Juveniles Downstream of Robles del Rio in Summer
- Operate Sleepy Hollow holding/rearing facility
- Modify Spillway/Transport Smolts Around Los Padres Dam
- Monitoring Activities for Mitigation Plan
  -- Adult counts at San Clemente Dam
  -- Juvenile population surveys
- Other Activities not required by Mitigation Plan
  -- Spawning habitat restoration
  -- Fish planting (steelhead broodstock program)
  -- Coastal Salmon Recovery Program grant (began mid-2001)
  -- Modify critical riffles

RIPARIAN VEGETATION AND WILDLIFE

- Conservation and Water Distribution Management
- Prepare/Oversee Riparian Corridor Management Plan
- Implement Riparian Corridor Management Program
  -- Cal-Am well irrigation (4 wells)
  -- Channel clearing
  -- Vegetation monitoring
  -- Track and pursue violations
  -- River Care Guide booklet
  -- CRMP Erosion Protection Program

LAGOON VEGETATION AND WILDLIFE

- Assist with Lagoon Enhancement Plan Investigations (See Note 1)
- Expand Long-Term Lagoon Monitoring Program
  -- Water quality/quantity
  -- Vegetation/soils
- Identify Alternatives to Maintain Lagoon Volume

AESTHETICS

- Restore Riparian Vegetation (see above)

Note 1: Mitigation measures are dependent on implementation of the Lagoon Enhancement Plan by the California Department of Parks and Recreation, the land owner and CEQA lead agency. Portions of the Enhancement Plan have been implemented by CalTrans as part of a "mitigation banking" project.

Table I-2
Summary of MPWMD Mitigation Program Accomplishments in 2012-2013

MITIGATION ACTION	MAJOR ACCOMPLISHMENTS IN FY 2012-2013
Monitor Water Resources	Regularly tracked precipitation, streamflow, surface and groundwater levels and quality, and lagoon characteristics between Los Padres Dam and the Carmel River Lagoon, using real-time methods at numerous data collection stations. Maintained extensive monitoring network, and continuous streamflow recorders below San Clemente Dam and other sites.
Manage Water Production	Developed and implemented multi-agency Memorandum of Agreement and quarterly water supply strategies based on normal-year conditions; worked cooperatively with resource agencies implementing the federal Endangered Species Act. Implemented ordinances that regulate wells and water distribution systems.
Manage Water Demand	Conducted 2,178 inspections, which will save an estimated 17.116 acre-feet of water per year (AFY) through required retrofits. The Rebate Program was reinstated for fiscal year 2012-2013. From July 1, 2012, through June 30, 2013, a total of 1,546 applications for rebates were received, 1,202 applications were approved. Staff conducted multiple public outreach events for the conservation program. Implemented new ordinances related to permits, conservation, and enforcement regulations of the District.
Monitor Water Usage	Complied with SWRCB Order 95-10 for Water Year 2013.
Augment Water Supply	Long-term efforts to augment supply included: (1) Continued participation in the CPUC rate hearing process to review elements of the Monterey Peninsula Water Supply Project (MPWSP); (2) Participated in meetings intended to resolve concerns about MPWSP construction, operations, financing, management and oversight; (3) Participated on Technical Advisory Committee to the Monterey Peninsula Regional Water Authority; (4) Operated Aquifer Storage and Recovery (ASR) Phase 1 and 2 projects in WY 2013 and injected 294 AF; (5) drilled second ASR Phase 2 injection well Seaside Middle School site; (6) obtained approval from Fort Ord Reuse Authority for land use associated with ASR testing; (7) Held regular coordination meetings with Cal-Am regarding needed infrastructure upgrades to deliver water supply to the ASR project wells at full capacity; (8) Conducted additional work related to alternative desalination plant sites; (9) Provided

MITIGATION ACTION	MAJOR ACCOMPLISHMENTS IN FY 2012-2013
	technical support to the Monterey Regional Water Pollution Control Agency (MRWPCA) for the Groundwater Replenishment Project (GRP) and received presentations by MRWPCA; (10) Participated in CPUC hearing process on Cal-Am related rate requests. Near-term water supply efforts included injecting 294 AF into Seaside Basin in WY 2013 as part of ongoing ASR operations. Other ongoing activities included: (1) Served as member of both the Seaside Basin Watermaster Board and as the Technical Advisory Committee; (2) Delivered several database products to the Watermaster and its consultants under the District's contract for the required Seaside Basin Monitoring and Management Plan; (3) Continued participation on technical committee regarding removal of San Clemente Dam and associated sediment management.
Allocate New Supply	Remained within Water Allocation Program limits.
Determine Drought Reserve	Rationing was not required due to maintenance of adequate storage reserve.
Steelhead Fishery Program	River mainstem rescues were conducted by MPWMD crews over a five-month period, June 11-October 17, 2012. During this period, a total of 8,130 rescued steelhead were released to four locations, including the Sleepy Hollow Steelhead Rearing Facility. Prior to a major storm event in December 2012, the stocked fish were released back to the river. In addition, during the 2012 dry season, June through October, a total of 7,236 steelhead were rescued from four Carmel River tributaries by the Carmel River Steelhead Association (CRSA). The fish counter and video monitoring equipment at San Clemente Dam was operated continually between December 2012 and May 2013. A total of 249 fish passed over the counter, including 18 in December, 46 in January, 47 in February, 115 in March, 23 in April, and 0 in May.
Steelhead Fishery Program	During March 2013, fisheries staff completed redd surveys in three separate reaches between Los Padres Dam and the Highway 1 Bridge.

MITIGATION ACTION	MAJOR ACCOMPLISHMENTS IN FY 2012-2013
	Due to the low instream flows, the District directed Cal-Am to release an additional pulse of water from Los Padres Reservoir from April 4-5 to allow adult steelhead trapped in the lower river to continue their upstream migration. Although not as successful as the previous year, likely due to the one month later release date, the pulse helped both upstream and downstream migrants reach better habitat. The 2013 adult run of 249 fish was below the average run size of 421 fish for the 1994-2013 period where fish have been reliably counted using the District's continuous mechanical counter
Riparian Habitat Program	Continued revegetation efforts at exposed banks with little or no vegetation located between Via Mallorca and Esquiline Roads; Contracted to collect channel profile data and limited cross section data from the Carmel River for use in maintaining a long-term record and comparing to the past and future data; Made public presentations showing MPWMD-sponsored restoration work over the past 23 years; Continued long-term monitoring of physical and biological processes along the river in order to evaluate the District's river management activities; Continued the annual inspections of the Carmel River from the upstream end of the lagoon to Camp Steffani; Walked the entire river to observe and record erosion damage, conditions that could cause erosion, riparian ordinance infractions, and the overall condition of the riparian corridor; Continued enforcement actions to address serious violations of District riparian ordinances; Carried out vegetation management activities; Developed an Integrated Regional Water Management Plan; Operated under Routine Maintenance Agreement with CDFW for MPWMD vegetation maintenance activities.

MITIGATION ACTION	MAJOR ACCOMPLISHMENTS IN FY 2012-2013
Lagoon Habitat Program	Provided technical expertise and data to multi-agency sponsors of lagoon restoration program; assisted Carmel Area Wastewater District to evaluate possible Lagoon augmentation with recycled water; facilitated Carmel River Lagoon Technical Advisory Committee meetings; pursued funding for the April 2007 *Final Study Plan for the Long-Term Adaptive Management of the Carmel River State Beach and Lagoon*; continued vegetation habitat monitoring; surveyed and analyzed four bathymetric transects; participated in interagency meetings regarding management of lagoon in winter storm events (see also steelhead efforts that benefit lagoon); conducted topographic, hydrology and wildlife surveys.
Aesthetic Measures	See Riparian Habitat Program measures.

II. HYDROLOGIC MONITORING

The Water Allocation Program EIR concluded that Water Supply Option V would have less-than-significant impacts on the water resources in the Monterey Peninsula area, and that no mitigation measures were required. This conclusion was based solely on changes to the hydrologic regime and not on changes to water-dependent resources. Impacts on water-dependent resources (e.g., riparian vegetation and wildlife and steelhead fishery) due to changes in the hydrologic regime were identified as significant in the EIR. Implementation of the mitigation measures proposed for the impacts on these water-dependent resources are described in subsequent sections. It was suggested in the EIR that the District continue and expand its current monitoring programs to establish baseline conditions for assessment of long-term changes (Finding No. 381). Accordingly, the District currently maintains ongoing precipitation, streamflow, storage, water level and water quality monitoring programs. These programs and the activities to implement them for Water Year 2013 (October 1, 2012 through September 30, 2013), are summarized below.

A. Precipitation Monitoring

Description and Purpose

During the period from October 1, 2012 through September 30, 2013, the District continued to process long-term precipitation records at Los Padres and San Clemente Dams collected by California American Water (CAW). District staff also records precipitation at its Monterey office located at Ryan Ranch, and receives daily rainfall reports from the National Weather Service climate station at Monterey (maintained by R.J. Renard). In addition, real-time and historical rainfall data for the Monterey Peninsula area can be accessed via the Internet. These data support a variety of District programs, including erosion control, riparian vegetation management and identifying long-term precipitation trends and hydrologic-year conditions.

Implementation and Activities During 2012-2013

Work during this period involved continuing maintenance of the existing precipitation monitoring network. A summary of daily precipitation at San Clemente Dam (SCD) during Water Year (WY) 2013 is shown in **Figure II-1**. The average annual recorded precipitation at this site for the period from 1922 through 2013 is 21.29 inches. In WY 2013, 14.60 inches of precipitation were recorded at SCD, which is 69 percent of average.

Figure II-2 shows a comparison of WY 2013 rainfall at SCD and the average monthly rainfall at this site. As indicated in **Figure II-2,** rainfall was significantly above average for the October through December period, with a particularly wet December 2012 totaling 7.70 inches of rain. However, the following January through April period received unusually low rainfall with 3.36 inches for this four-month period (25% of the four-month average). Although beyond the WY 2013 reporting period, it should be noted

that Calendar Year (CY) 2013 was the driest CY on record at SCD since record keeping began in 1922, with 4.55 inches of rain for the 12-month period. In addition, CY 2013 is regarded as the driest CY at nearly all precipitation measuring stations in California since the mid-1800s when record keeping began. The highest daily rainfall total was 1.80 inches on December 1, 2012 as shown in **Figure II-1.** The 1.80 inches of rain represents a portion of a significant seven-day "storm series" that occurred over the November 28 through December 3, 2012 period, that totaled 5.48 inches of rain (i.e., 38% of the WY 2013 total in one week).

B. Streamflow Monitoring

Description and Purpose

Since its inception, the District has historically collected streamflow measurements at approximately 15 mainstem sites on the Carmel River and on 16 tributaries to the Carmel River. The District's current principal streamflow measuring sites within the CRB are shown on **Figure II-3**. Prior to 1991, the streamflow measurements were instantaneous measurements made by the current meter method. In 1991, a concerted effort was made to upgrade the streamflow monitoring network as staff installed continuous recorders[1] at six selected tributary sites. Since that time, the District has continued to expand its streamflow monitoring network, which currently consists of 19 continuous recording gaging stations.

Data collected at the District streamflow monitoring sites are analyzed for use in water supply planning, fishery, riparian and erosion control programs. More specific uses of streamflow data include, but are not limited, to the items listed below:

- Defining the general hydrologic conditions in the basin
- Setting flow requirements for meeting aquatic life goals
- Monitoring compliance with minimum flow requirements
- Forecasting water supply availability
- Assessing and scheduling fish rescue activities
- Assessing effectiveness of riparian mitigations
- Evaluating surface and ground water interaction
- Developing and calibrating hydrologic models
- Delineating and managing flood plains
- Evaluating and designing water supply projects
- Providing data for forecasting floods and defining flood recurrence intervals
- Assessing hydrologic impacts from water development projects
- Supporting Aquifer Storage and Recovery (ASR) operations

Implementation and Activities During 2012-2013

[1] The District utilizes both float gages and data recorders with pressure transducers to monitor stream stage.

During the 2012-2013 period, the District operated and maintained (O&M) 16 streamflow gaging stations within the Carmel River Basin/District Boundary. In addition, continuous water-level data were collected at both Los Padres and San Clemente Reservoirs, and at the Carmel River Lagoon. The District continuous recording gaging stations are listed below:

Tributary/other
Finch Creek
Cachagua Creek
Pine Creek
San Clemente Creek
Tularcitos Creek
Hitchcock Creek
Garzas Creek near Lower Garzas Canyon
Garzas Creek at Garzas Road
Potrero Creek
Robinson Canyon Creek
San Jose Creek
Arroyo del Rey at Del Rey Oaks

Mainstem
Carmel River below Los Padres Reservoir
Carmel River at Sleepy Hollow Weir
Carmel River at Don Juan Bridge
Carmel River at Highway 1 Bridge
Carmel River above Los Padres Reservoir (non-recording)

Continuous Water Level
Los Padres Reservoir
San Clemente Reservoir
Carmel River Lagoon

Streamflow gaging station O&M at each of the above sites involves obtaining monthly discharge measurements, maintaining recording equipment, obtaining staff gage readings and occasional surveying. Subsequently, river/creek stage and discharge data are processed in-house to produce mean daily streamflow records for the sites. **Table II-1** summarizes the computed annual flows in acre-feet (AF) for the District sites for the WY 1992-2013 period. In addition, **Table II-1** includes annual flow values for the two mainstem sites operated by the U.S. Geological Survey (USGS) for the 1992-2013 period.

During the 2012-2013 period, District staff continued to maintain the existing streamflow monitoring network. Streamflow within the Carmel River Basin during WY 2013 was classified as "dry", as further described below. Work within this period involved collecting numerous, routine streamflow measurements by the current meter method, in order to refine the stage/discharge relation at the gaging stations. In addition, several low-flow measurements were obtained at the sites utilizing a three-inch modified Parshall Flume.

In WY 2013, staff continued to access seven of the 19 gage sites listed above via telecommunications hardware in order to post current surface-water data on the District's website. Current streamflow data are downloaded, processed and posted to the District's web site to improve data dissemination to public agencies and private groups. These streamflow data can be accessed via the Carmel River Flows section of the District's web site and include the following Carmel River (CR) mainstem gage locations:

Carmel River below Los Padres Reservoir

Carmel River at Sleepy Hollow Weir
Carmel River at Don Juan Bridge
Carmel River at Highway 1 Bridge

In addition, the CR Lagoon Water Levels section of the District's web site now provides access to continuous Lagoon water-level data which are updated daily or weekly.

● **Summary of Streamflow Conditions --** Streamflow during WY 2013 within the CR Basin was classified as "dry". The highest peak streamflow event of the year along the CR occurred on December 2, 2012, and reached 2,980 cfs at the CR at Don Juan Bridge site. Flood frequency analysis indicates that a peak flow of this magnitude would be expected on the CR every two to three years (i.e., two to three year recurrence interval).

During WY 2013, 27,303 acre-feet (AF) of unimpaired runoff were estimated at San Clemente Dam. This total represents 40% of the average annual runoff (68,400 AF) expected at San Clemente Dam. This runoff provided streamflow to the ocean from December 3, 2012 through approximately April 9, 2013, although numerous lagoon mouth closures and breaches occurred over this period.

C. Carmel River Lagoon Water-Level Monitoring

Description and Purpose

Since 1987, the District has monitored the level of surface water in the Carmel River Lagoon. The water level is monitored with a continuous recorder located in the South Arm of the Lagoon that utilizes pressure transducer technology. The water-level data have been used, in part, to support technical studies for use by the Carmel River Steelhead Association, California Department of Parks and Recreation, California Coastal Conservancy, California Department of Fish and Wildlife, Monterey County Water Resources Agency (MCWRA), Monterey County Public Works Department (MCPWD) and MPWMD. In addition, the water-level data are monitored by the MCWRA via their ALERT system to enhance flood warning for residents located along the northern margin of the Lagoon and wetland.

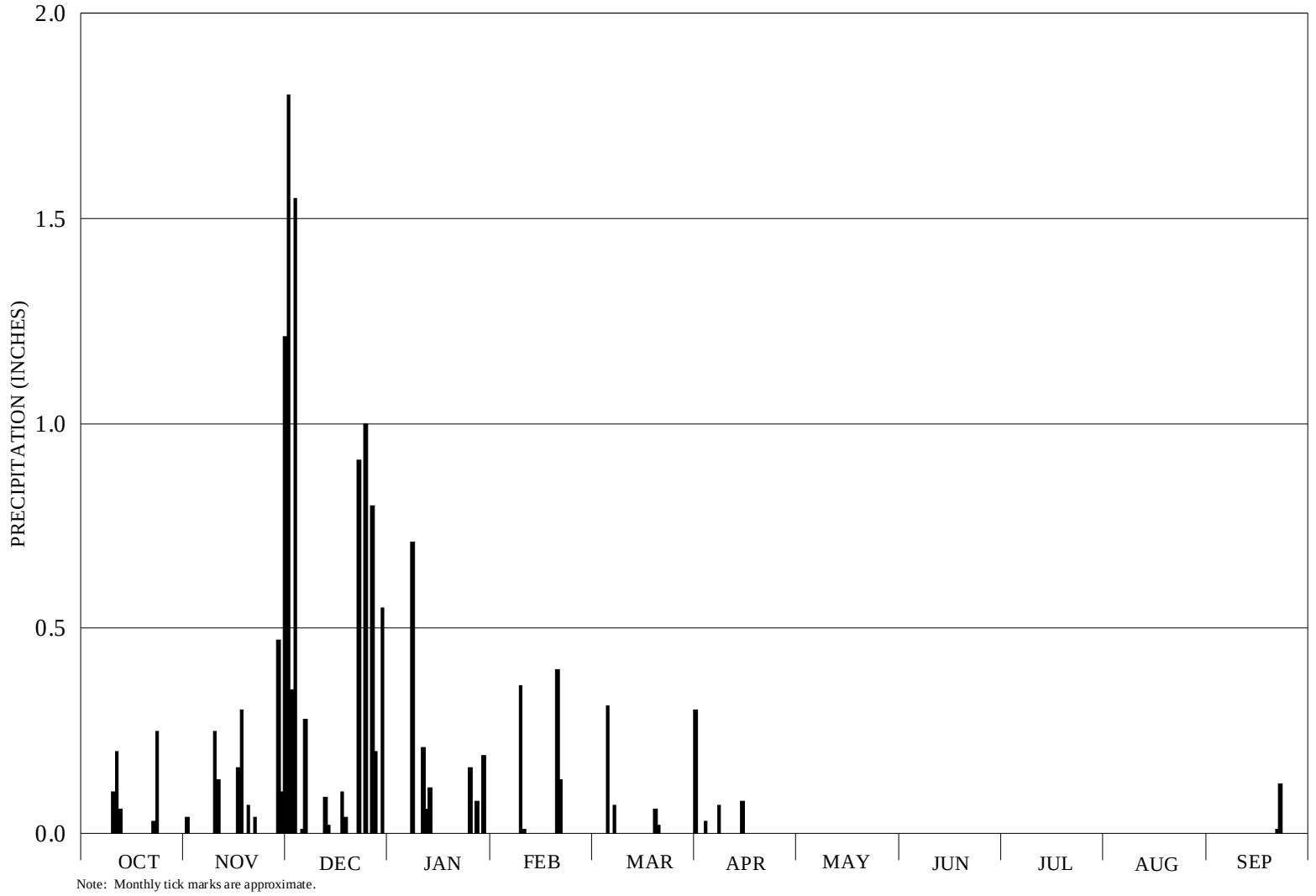
Implementation and Activities During 2012-2013

During the 2013-2013 period, District staff continued to maintain the continuous water level recorder located in the South Arm of the lagoon, and a complete record of water level readings (i.e., 15 minute intervals) was obtained. Staff continued to utilize the telecommunications capability established at the lagoon gage in September 2007 to post lagoon water-level data on to the District's website. These continuous water-level data are plotted and posted on the District website under the Carmel River Lagoon Water Levels section approximately weekly. This allows interested parties to access the data to view recent water-level trends.

The monthly plot for December 2012 shown in **Figure II-4** illustrates the first lagoon mouth opening of WY 2013. Over the week-long period from November 28, 2012 through December 3, 2012, a series of rainstorms produced 5.48 inches of rain at San Clemente Dam. On December 1, 2012, Los Padres Reservoir filled and spilled enhancing downstream river flows. Additional rainfall of approximately two inches on December 2-3, 2012 resulted in a peak streamflow of 2,140 cfs on December 2 as measured at the Carmel River near Carmel USGS Gaging Station which approximates peak lagoon inflow. This prompted the MCPWD to open the lagoon mouth to the ocean to avoid flooding of homes located along the northern margin of the lagoon and wetland. The lagoon level peaked early on December 3, 2012 at approximately 11.3 feet (NGVD 29), before rapidly draining to approximately 2.6 feet six hours later.

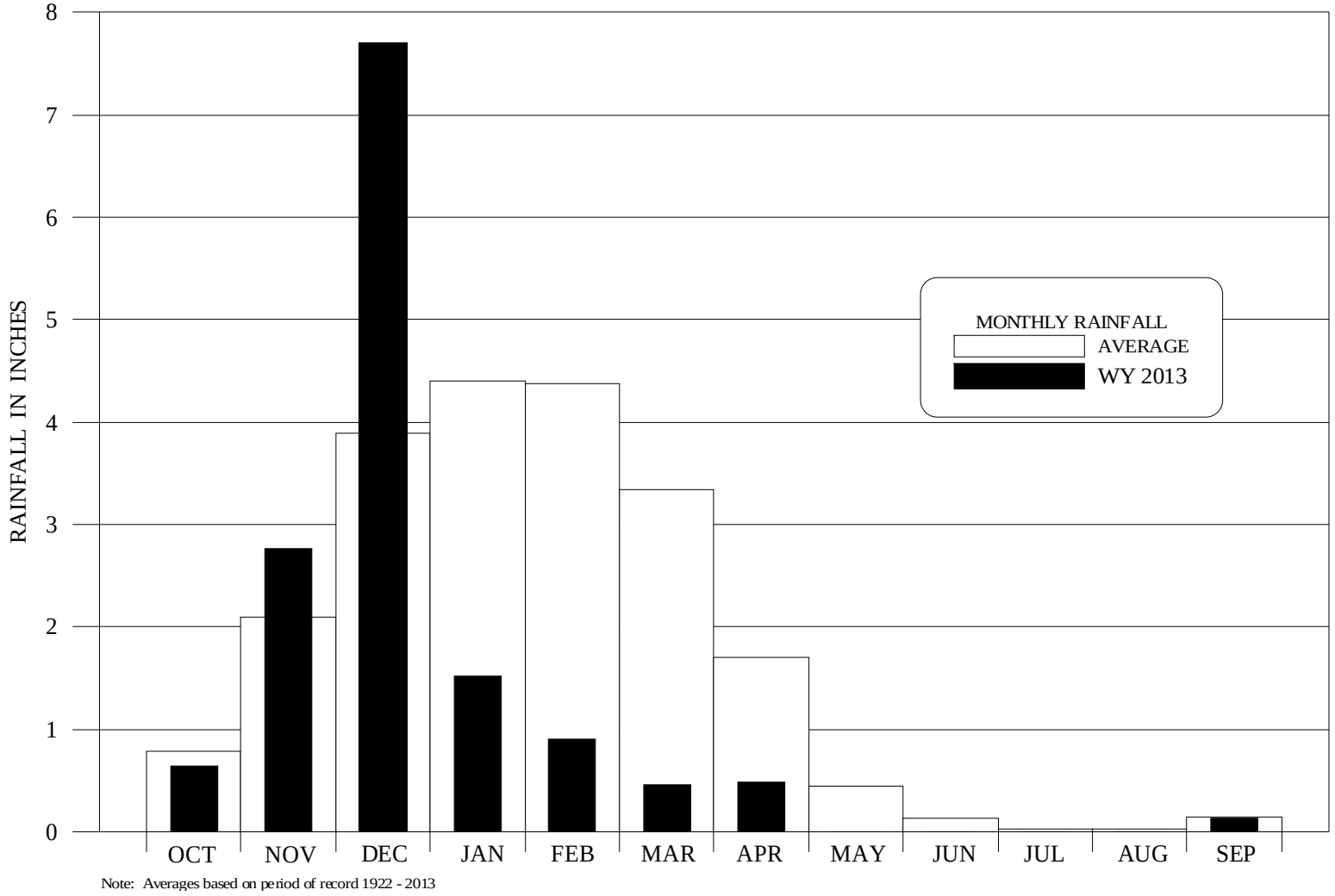
U:\mpwmd\Allocation\Annual Mit. Report RY 2013\RY 13 - Place Your Files Here\II Precipitation, Streamflow, Lagoon Water Level Monitoring\GJSection II hydrologic monitoring_JOedit.docx

Figure II-1
San Clemente Reservoir Daily Rainfall: Water Year 2013



Note: Monthly tick marks are approximate.

Figure II-2
Monthly Distribution of Rainfall at San Clemente Reservoir
Water Year 2013 Compared to 1922-2013 Long-Term Average



Note: Averages based on period of record 1922 - 2013

Figure II-3
Carmel River Basin Principal Streamflow Gaging Stations

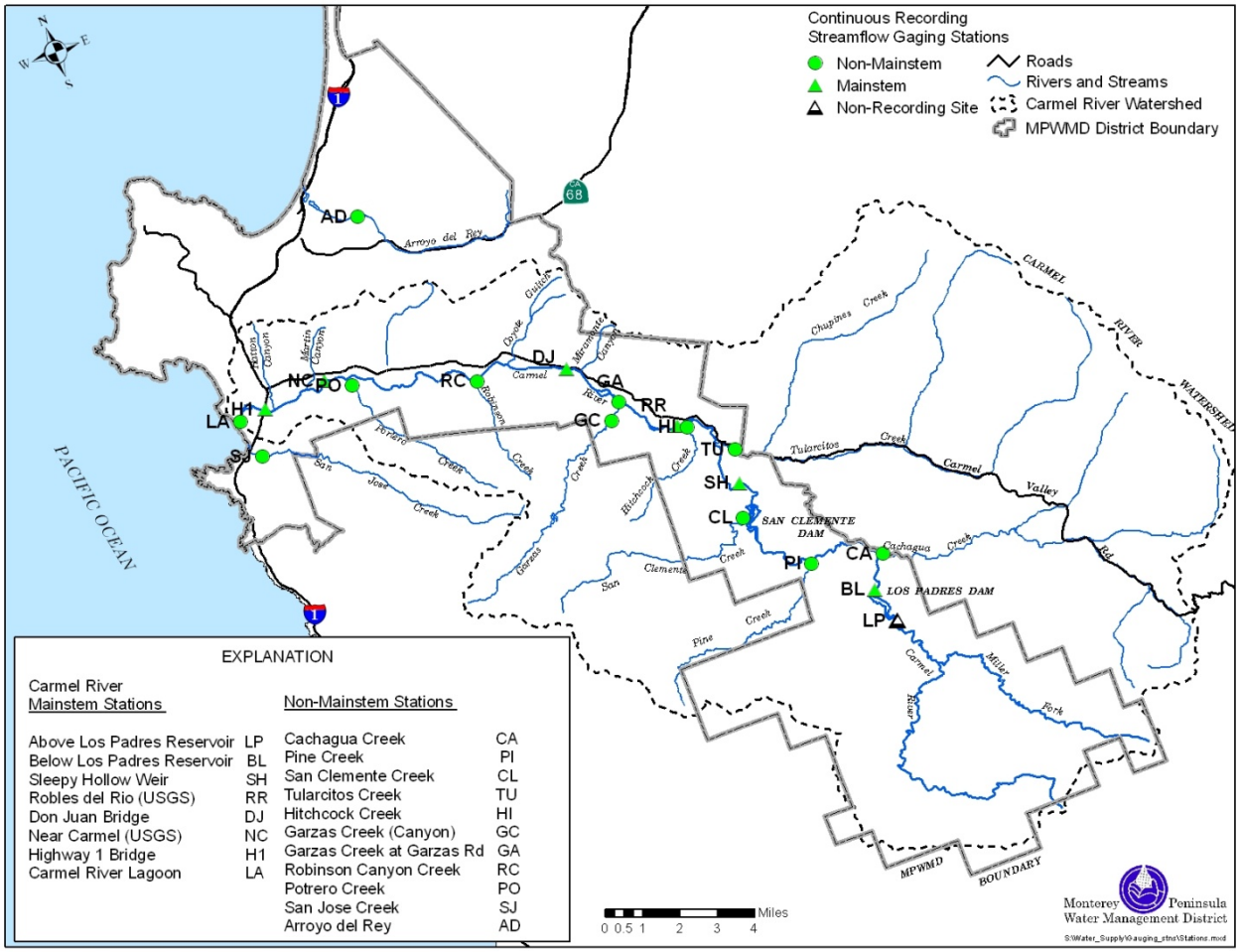


Figure II-4
Carmel River Lagoon Water Level

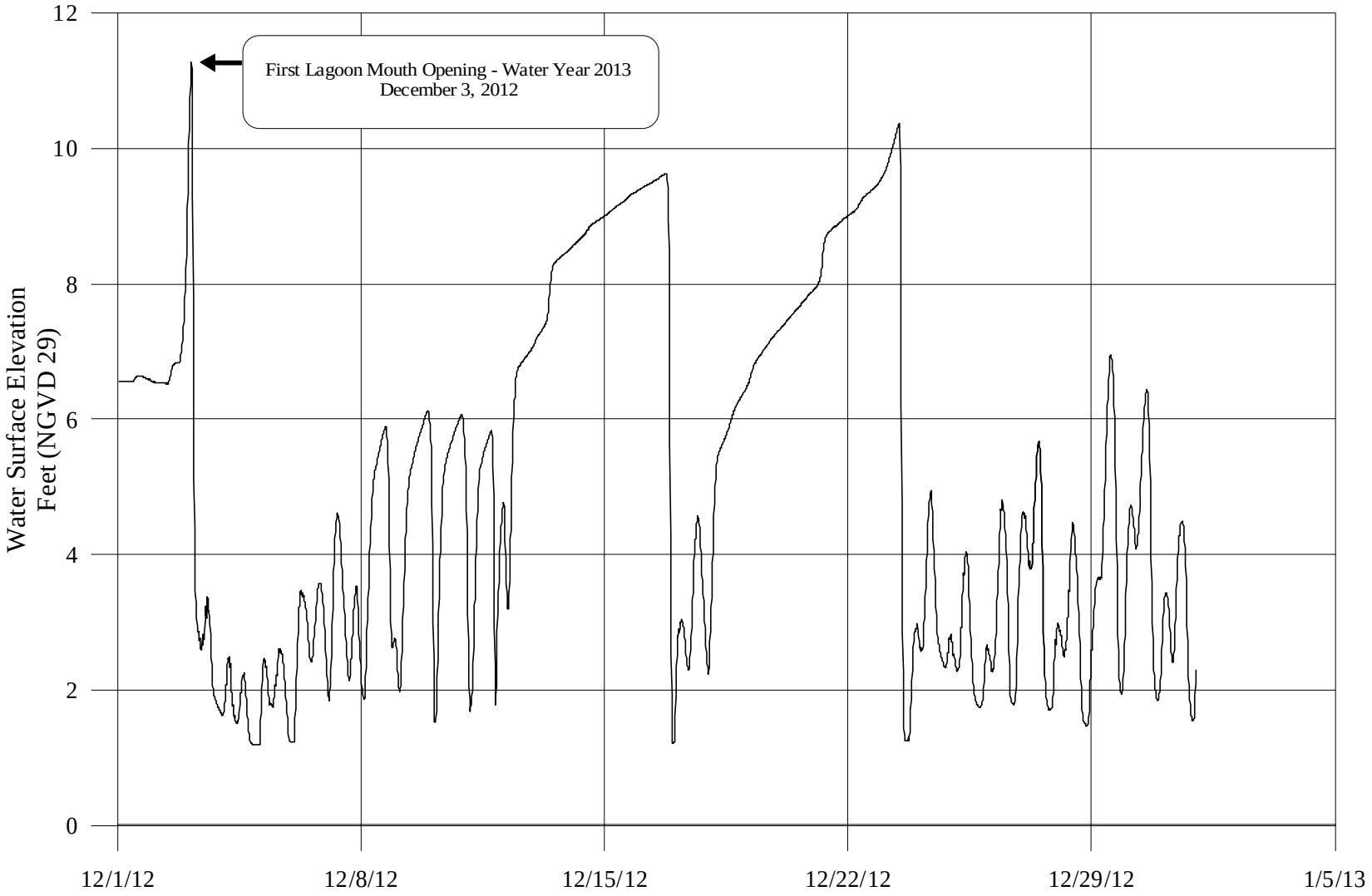


Table II-1
CARMEL RIVER BASIN - ANNUAL STREAMFLOW SUMMARY
WATER YEARS 1992 - 2013
(Values in Acre-Feet)

TRIBUTARY SITES	Drainage Area (Sq.Mi.)	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
CACHAGUA CREEK	46.3	1,780	7,340	560	16,320	3,840	4,990	23,800	2,590	1,730	1,500	245	1,270	1,250	4,340	5,210	261	2,200	*1,020*	*5,030*	*5,320*	*695*	*237*
PINE CREEK	7.8	3,750	9,800	1,230	11,110	6,550	8,300	15,610	4,540	5,300	3,270	2,300	4,250	2,350	8,910	8,020	849	3,840	2,830	6,130	6,960	1,310	1,870
SAN CLEMENTE CREEK	15.6	5,450	17,070	1,820	20,580	9,310	14,100	33,380	7,130	9,830	5,340	3,270	5,850	3,720	16,330	13,720	1,360	5,520	4,270	9,950	12,950	1,960	2,570
TULARCITOS CREEK	56.3	635	3,220	444	5,100	1,650	2,450	22,610	3,810	2,450	1,490	630	552	503	1,000	2,480	503	917	405	1,140	1,430	452	327
HITCHCOCK CREEK	4.6	*	*	52	1,820	451	716	2,970	169	482	214	18	274	234	863	691	2	383	151	549	629	6	57
GARZAS CREEK	13.2	3,700	11,170	746	12,140	4,890	8,570	24,610	5,050	4,980	3,070	1,200	2,760	1,810	8,590	7,420	381	3,010	2,500	5,720	7,620	641	1,320
ROBINSON CANYON CR.	5.4	619	2,360	89	2,230	619	1,430	6,890	545	823	433	82	448	354	1,710	1,010	25	455	451	1,120	1,150	40	153
POTRERO CREEK	5.2	*	*	30	1,790	506	1,210	5,970	855	1,020	310	43	210	164	1,470	1,050	13	308	354	983	1,170	14	50
SAN JOSE CREEK	14.2	*	*	*	*	*	*	*	6,400	6,260	2,890	1,100	1,880	1,480	7,640	6,870	862	1,740	2,330	5,220	5,760	*1,200*	*1,540*
MAINSTEM SITES																							
CR AT ROBLES DEL RIO	193	38,240	109,000	11,800	155,000	75,210	99,340	250,300	54,640	76,750	47,180	31,850	60,560	38,060	114,400	110,100	12,220	49,080	45,930	104,540	110,300	20,750	*31,970*
CR AT DON JUAN BRIDGE	216	*	122,000	12,760	173,600	83,090	111,800	252,200	53,570	73,960	49,360	31,330	60,420	38,330	121,800	118,300	12,150	52,510	*47,410*	*106,300*	*116,500*	*20,820*	*28,340*
CR NEAR CARMEL	246	35,570	123,400	8,200	177,400	74,500	104,100	261,100	55,000	76,190	47,790	28,340	55,400	35,220	119,200	119,200	7,440	43,960	43,960	105,840	115,800	17,120	*24,390*
CR AT HIGHWAY 1 BRIDGE	252	*	123,000	7,410	179,500	83,430	112,000	280,900	50,810	72,660	42,860	24,860	52,000	30,300	115,200	115,000	6,470	42,520	*39,170*	*102,700*	*111,200*	*16,410*	*24,520*

Notes: 1. Carmel River (CR) at Robles del Rio and near Carmel sites are maintained by the USGS.
2. (*) No continuous stage data collected.
3. Streamflow sites listed in downstream order.
4. San Jose Creek is outside the Carmel River Basin, but is shown for comparison.
5. WY 1992-2008 values are FINAL. WY 2009-2013 DRAFT values shown in italic.

III. Carmel River Surface-Water Quality Monitoring

Description and Purpose

This monitoring is used to help assess whether or not water-quality criteria for aquatic life are being met in various reaches of the Carmel River, and whether habitats for resources such as Carmel River steelhead (*Oncorhynchus mykiss*) and red-legged frogs (*Rana aurora draytonii*) are being sustained or impaired. Monitoring also provides District staff with a way of measuring trends over extended time periods. These data are used for recommending appropriate reservoir release schedules, determining timing of fish rescues and as an indicator of habitat quality.

Since 1991, surface-water quality data have been collected at three sampling stations along the Carmel River on a semi-monthly basis. The locations of the sampling stations are as follows: (1) below Los Padres Reservoir (BLP) at River Mile (RM) 25.4, (2) below San Clemente Reservoir at the Sleepy Hollow Weir (SHW) at RM 17.1, and (3) at the Carmel River Lagoon (CRL) at RM 0.1. River miles are measured from the mouth of the Carmel River. Monitoring at these specific stations gives District staff information on the quality of water released from each reservoir and in the surface layer of the lagoon.

District staff also monitors river temperatures continuously at six locations within the Carmel River Basin (**Figure III-1**). The objective is to document the temperature regime in different stream reaches and to determine whether water-quality criteria for maximum stream temperatures are exceeded. In addition, these data allow District staff to monitor changes in the thermal regime of the river over time.

Implementation and Activities During 2012-2013

District staff carried out a semi-monthly surface water quality sampling program for the Reporting Year (RY) 2013 (July 1, 2012 to June 30, 2013); data were collected for the following chemical and physical parameters (units in parentheses): temperature (°F), dissolved oxygen (mg/L), carbon dioxide (mg/L), pH, specific conductance (µS/cm), salinity (ppt), and turbidity (NTU). The emphasis for this suite of parameters is on the suitability for rearing juvenile steelhead. In addition, continuous recording temperature data loggers (Optic StowAway temperature data loggers from the Onset Computer Corporation) were deployed at six locations on the Carmel River (**Figure III-1**), as follows:

1.	ALP	Above Los Padres Reservoir	(RM 27.0)
2.	BLP	Below Los Padres Reservoir	(RM 25.4)
3.	ASC	Above San Clemente Reservoir	(RM 18.5)
4.	SHW	Sleepy Hollow Weir	(RM 17.1)
5.	GAR	Garland Park	(RM 10.8)
6.	SAL	South Arm Lagoon	(RM 0.1)

The District continued its vertical profiling program on the Carmel River Lagoon, on a monthly basis during RY 2013 (see plots in **Appendix III-1**). Vertical profiling helps better understand seasonal changes in the limnological cycles, such as stratification, internal mixing, community respiration, and how that relates to available habitat for steelhead. Monthly water-quality reports were distributed to the Carmel River Lagoon Technical Advisory Committee to aid in the Carmel River Lagoon management.

The following paragraphs describe the results of the semi-monthly data collection and the continuous temperature recorders at specific sampling stations.

- **Carmel River Lagoon--** The water-temperature monitoring station for the Carmel River Lagoon is located in the south arm of the lagoon on the Carmel Area Wastewater District (CAWD) effluent discharge pipe. This station had operational difficulties associated with it during RY 2013. Staff continues to apply adaptive strategies to correct these difficulties. During RY 2013, all data collected at the water-temperature station were unreliable, and therefore have not been reported. Water-quality data collected at the CRL station, which is located on the south side of the main body of the lagoon, were reliable and are listed in **Table III-1**. Maximum water temperature during water-quality sampling was 71.1°F, occurring on July 20, 2012. The minimum dissolved-oxygen measurement recorded was 6.3 mg/L, which is within the suitable criteria recommended by the Environmental Protection Agency (EPA) for steelhead (Chapman, 1986). The pH measurements ranged from 7.3 to 8.5, which is also within suitable range. Carbon dioxide measurements ranged from 10 to 20 mg/L. Variability in carbon dioxide is usually caused by an increase of marine organic debris entering the lagoon during high surf events. Carbon dioxide is a byproduct of decomposition of this material. Fish located in waters with free carbon dioxide concentrations above 20 mg/L can show signs of distress (Wedemeyer, 1996). The conductivity measurements ranged from 277 to 14,250 µS/cm. The surface salinity ranged from 0.2 to 9.8 ppt. The conductivity and salinity are highly variable at the lagoon due to tidal influences and river inflows. The turbidity measurements ranged from 0.5 to 5.8 NTU. Overall, the biggest threat to steelhead rearing continues to be the high salinity readings that occur in in the lagoon, severely reducing the amount of rearing habitat that is adequate for juvenile steelhead in the late summer and fall months, coupled with the constant sub-optimal water temperatures during this period.

- **Garland Park--** Water temperature for the Garland Park (GAR) station is shown in **Figure III-2**. The sampling period for this station was July 1, 2012 to June 30, 2013. The maximum annual water temperature was 66.9°F, occurring on June 27, 2013. The overall average water temperature during the reporting year at this station was 56.1°F. Maximum daily average water temperature was 63.6°F, occurring on June 27, 2013. Daily average water temperatures were within adequate range for steelhead rearing during the entire sampling period.

- **Sleepy Hollow Weir--** Water temperature for the Sleepy Hollow Weir (SHW) station is shown in **Figure III-3**. The data recorder malfunctioned at this site during the period of November 29, 2012 to January 15, 2013 and those data are not included in the summary statistics provided below. The sampling period that is included is July 1, 2012 to November 28, 2012 and January 16, 2013 to June 30, 2013. The maximum annual water temperature was 72.1°F, occurring on June 29, 2013. The overall average water temperature during the reporting year at this station was 57.9°F. The maximum daily average water temperature was 69.8°F, occurring on June 29, 2013. Constant water temperatures over 68°F are considered stressful for steelhead (Brungs and Jones, 1977). Average daily water temperatures over 68°F occurred 4 times, all in June 2013. This represents 1.1% of the time during the sampling period. The water-quality data collected at this station are listed in **Table III-2**. The minimum dissolved-oxygen measurement recorded was 7.0 mg/L, which is within the suitable criteria recommended by the EPA for steelhead (Chapman, 1986). Carbon-dioxide measurements ranged from 5 to 15 mg/L. The pH measurements ranged from 7.5 to 8.5. The conductivity measurements ranged from 98 to 255 µS/cm. The turbidity measurements recorded were between 0.3 to 6.0 NTU. Water-quality parameters measured were within the adequate range for steelhead rearing during the sampling period, with the exception of the June water temperatures mentioned above.

- **Above San Clemente Reservoir--** Water temperature for the Above San Clemente (ASC) station is shown in **Figure III-4**. The sampling period for this station was July 1, 2012 to June 30, 2013. The maximum annual water temperature was 72.1°F, occurring on June 28, 2013. The overall average water temperature during the reporting period at this station was 56.0°F. Maximum daily average water temperature at this station was 69.1°F, occurring on June 28, 2013. Average daily water temperatures over 68°F occurred 3 times, all in June 2013. This represents 0.8% of the time during the sampling period.

- **Below Los Padres Reservoir--** Water temperature for the Below Los Padres (BLP) station is shown in **Figure III-5**. The sampling period for this station was July 1, 2012 to June 30, 2013. The maximum annual water temperature observed was 72.4°F, occurring on September 2, 2012. The overall average water temperature observed at this station during the sampling period was 58.0°F. The maximum daily average water temperature at this station was 71.2°F, occurring on September 5, 2012. Average daily water temperatures over 68°F occurred 53 times, from August 14, 2012 to October 5, 2012. This represents 14.5% of the time during the sampling period and is directly related to reservoir water levels and releases. Water-quality data collected at this station are listed in **Table III-3**. Water quality at this station is highly influenced by reservoir water quality and release location. The minimum dissolved oxygen measurement recorded was 7.0 mg/L, which is within the suitable criteria recommended by the EPA for steelhead (Chapman, 1986). Carbon dioxide measurements ranged from 5 to 15 mg/L. The pH and conductivity measurements ranged between 7.5 to 8.0 and 72 to 257 µS/cm, respectively. Turbidity measured at this station ranged from 0.2 to 8.5

NTU. Water-quality parameters measured were within the adequate range for steelhead rearing during the reporting year, with the exception of water temperature during late Fall. During this period water released from Los Padres Reservoir was considered stressful to steelhead rearing.

- **Above Los Padres Reservoir--** Water temperature for the Above Los Padres (ALP) station is shown in **Figure III-6**. The maximum annual water temperature was 67.8°F, occurring on August 14, 2012. Average water temperature during the reporting period was 54.1°F. Maximum daily average water temperature at this station was 65.5°F, occurring on June 29, 2013. Daily average water temperatures were within the adequate range for steelhead rearing during the entire reporting year.

CONCLUSIONS AND/OR RECOMMENDATIONS:

Water-quality conditions above Los Padres Reservoir, were adequate for steelhead rearing during the entire reporting year. Water released from Los Padres Reservoir during the late summer, early fall period (Aug 14 - October 5, 2012) exhibited water temperatures that were considered stressful to steelhead rearing. This potently reduced growth rates or displaced fish to other sections of river that had more favorable conditions. At this time water-quality conditions at all other downstream sites were adequate. At the beginning of the Summer 2013 (in June), water temperatures again began to rise into stressful ranges for steelhead rearing, from above and below San Clemente Reservoir. This again potently reduced growth and displaced fish. Moving farther downstream into the Garland Park area, water temperatures were adequate for steelhead rearing the entire reporting period.

Water-quality conditions in the Carmel River Lagoon during the late summer and fall months (July through October) of most years are commonly within stressful ranges and likely decrease growth and survival rates of rearing steelhead. This is mainly caused by a lack of river inflow and variability in tidal influences. These factors can dramatically change the water-quality dynamics in the lagoon depending on their outcomes. During RY 2013, salinity readings for this period were commonly stratified and increased with depth (**Appendix III-1**). During this reporting year, this stratification into stressful conditions started in September 2012 and continued through February 2013, getting worse each passing month, as wave over-wash from the ocean entered the lagoon and no flushing flows from the river entered. By November 2012, stratification into stressful conditions occurred at approximately 0.5 meter depth. The deepest parts of the lagoon ranged up to 20 parts per thousand and above, reducing rearing habitat that is available to juvenile steelhead. Lagoon water temperature frequently was observed within sub-optimal ranges during the course of this period. Water temperatures were within stressful conditions in July 2012, then again in April through June 2013.

Figure III-1
Temperature and Semi-Monthly Water Quality Monitoring Locations in the Carmel River Basin During RY 2013

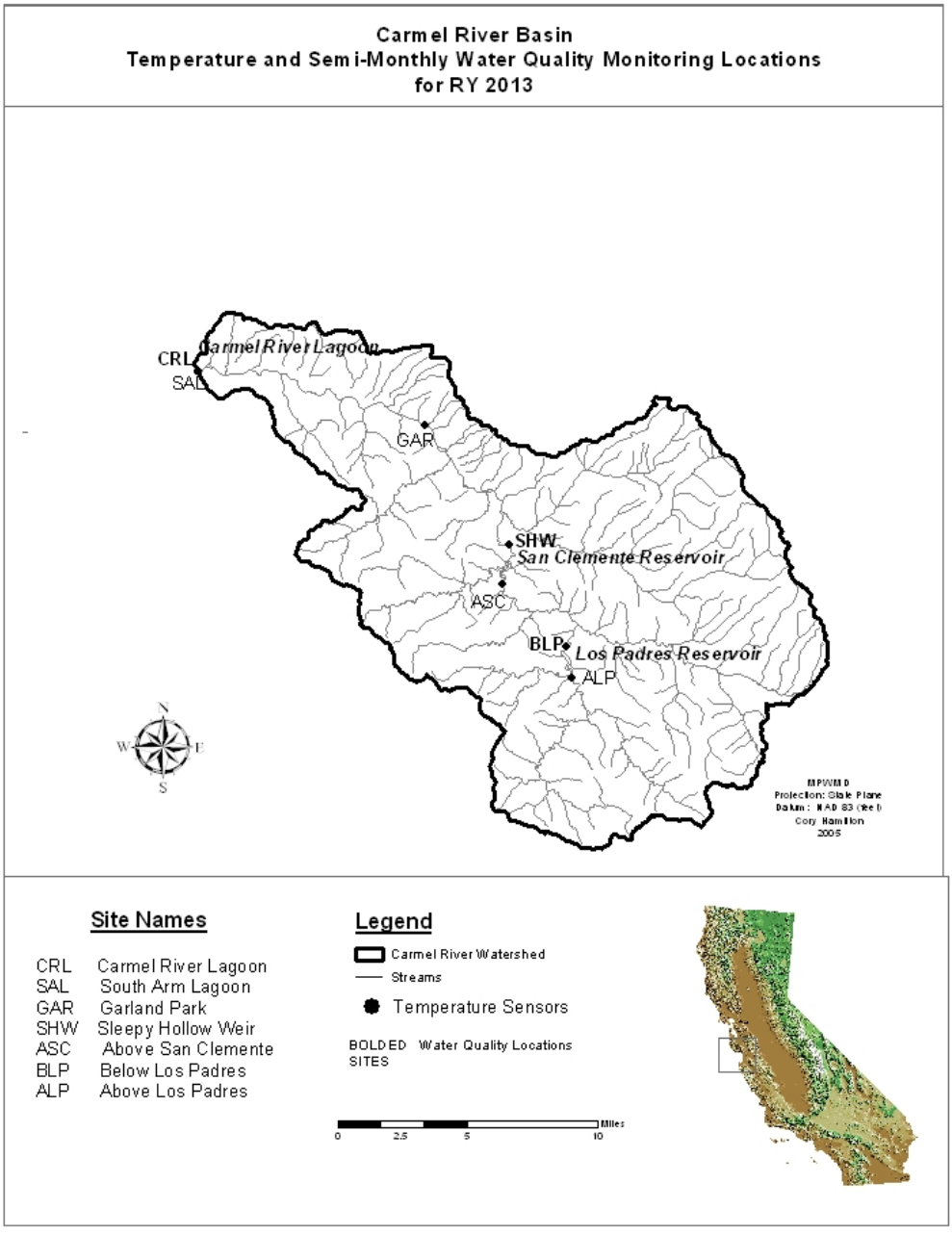


Figure III-2
Daily temperatures recorded from a continuous temperature data logger at the Garland Park (GAR) station during RY 2013

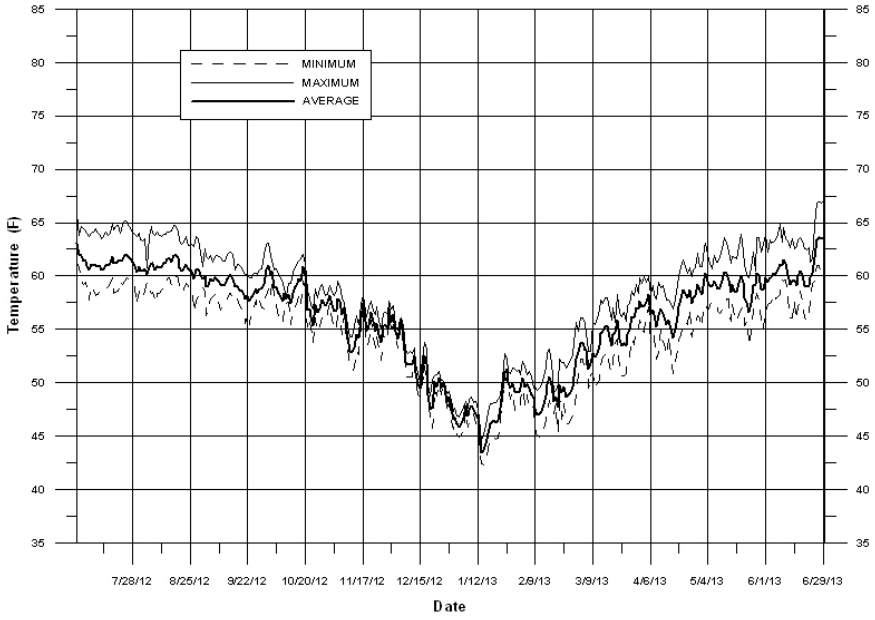


Figure III-3
Daily temperatures recorded from a continuous temperature data logger at the Sleepy Hollow Weir (SHW) station during RY 2013

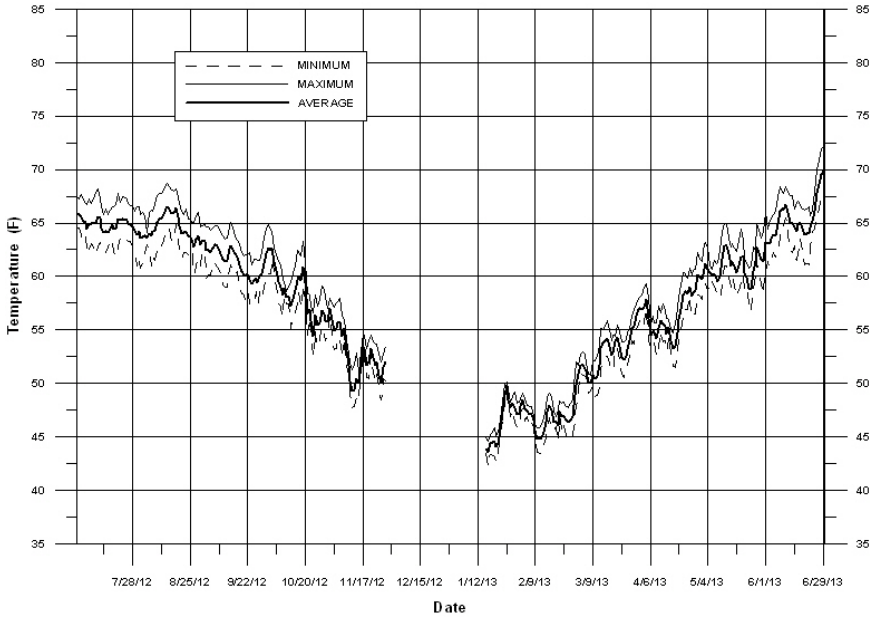


Figure III-4
Daily temperatures recorded from a continuous temperature data logger at the above San Clemente (ASC) station during RY 2013

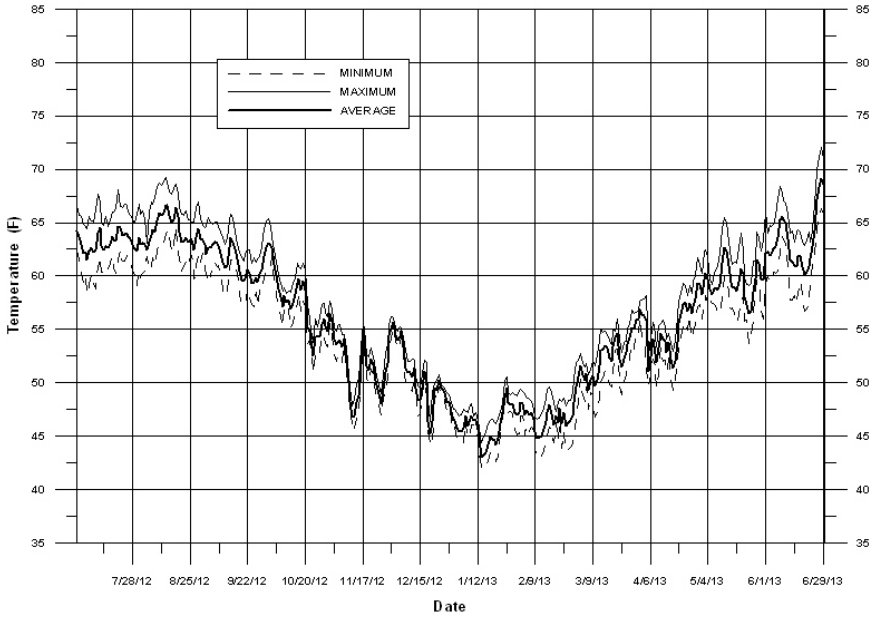


Figure III-5
Daily temperatures recorded from a continuous temperature data logger at the Below Los Padres (BLP) station during RY 2013

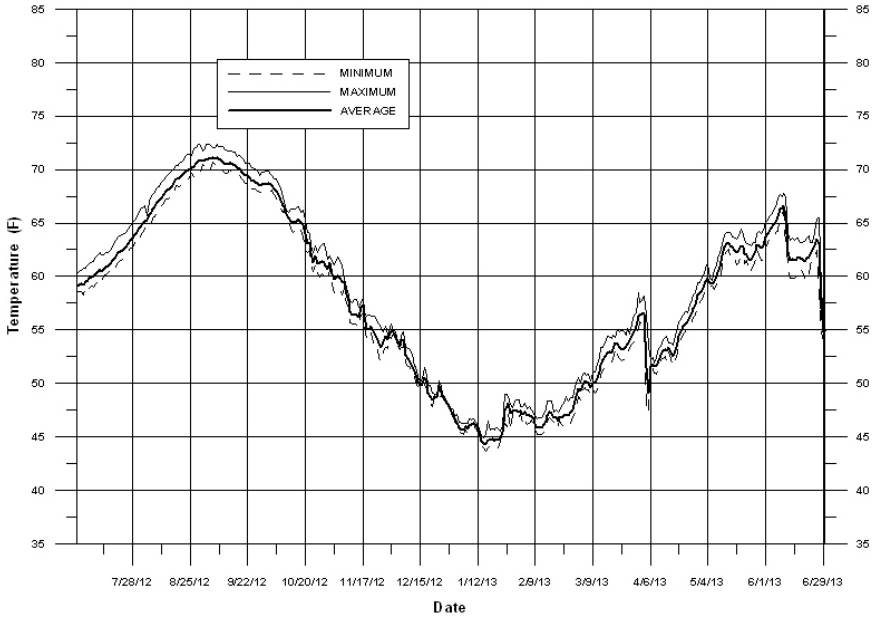


Figure III-6
Daily temperatures recorded from a continuous temperature data logger at the Above Los Padres (ALP) station during RY 2013

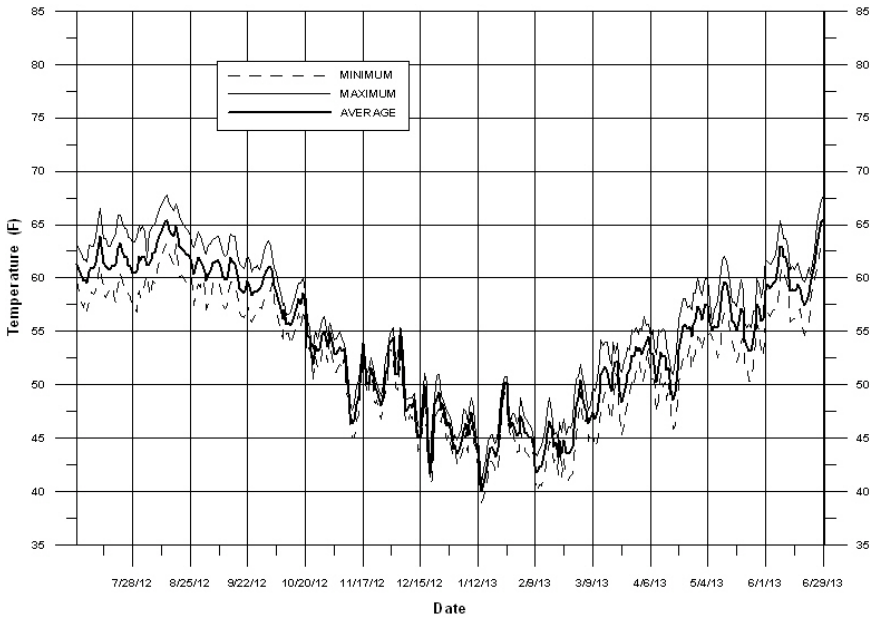


Table III-1
Water-quality data collected by MPWMD during RY 2013 at Carmel River Lagoon (CRL) site.

Date	Time 24 Hr	Temperature (F)	Dissolved Oxygen (mg/L)	Carbon Dioxide (mg/L)	pH	Conductivity (uS/cm)	Nacl (ppt)	Turbidity (NTU)	WSE (ft)
7/6/12	1255	67.8	8.4	15	7.5	850	0.5	0.8	5.75
7/20/12	1230	71.1	9.3	15	8.0	1265	0.7	1.2	4.65
8/3/12	1420	66.6	10.4	10	8.0	1585	0.9	1.2	3.9
8/24/12	1330	65.8	9.2	10	8.0	2181	1.3	1.0	3.35
9/1/12	1245	67.5	10.0	15	8.0	2303	1.3	1.7	3.39
9/14/12	1330	68.0	14.1	10	8.5	1683	0.9	1.2	3.55
9/28/12	1250	61.9	6.3	15	7.5	14250	9.8	5.8	5.3
10/9/12	1305	64.2	7.7	15	8.0	9130	6.0	3.5	4.74
10/29/12	1410	62.8	7.4	15	8.0	6350	4.1	2.3	4.86
11/16/12	1255	56.8	11.1	10	8.0	3741	4.0	1.6	4.8
12/4/12	1100	54.3	13.6	10	8.0	475	0.3	4.2	N/A
12/27/12	1230	50.5	12.8	10	7.5	1139	0.8	3.5	4.94
1/15/13	1400	46.2	14.3	10	7.5	277	0.2	0.5	2.2
2/13/13	1330	49.8	19.9	10	7.5	918	0.6	2.4	7.4
3/16/13	1515	61.0	10.0	10	7.5	829	0.7	N/A	6.4
4/15/13	1451	N/A	7.0	10	7.3	N/A	N/A	N/A	6.8
5/18/13	1256	69.3	7.8	10	7.5	1282	0.7	1.3	5.44
6/15/13	1630	68.5	13.7	20	8.0	2166	1.2	2.1	4.3
Minimum		46.2	6.3	10.0	7.3	277	0.2	0.5	2.2
Maximum		71.1	19.9	20.0	8.5	14250	9.8	5.8	7.4
Average		61.9	10.7	12.2	7.8	2966	2.0	2.1	

Table III-2
Water-quality data collected by MPWMD during RY 2013 at Sleepy Hollow Weir (SHW) station.

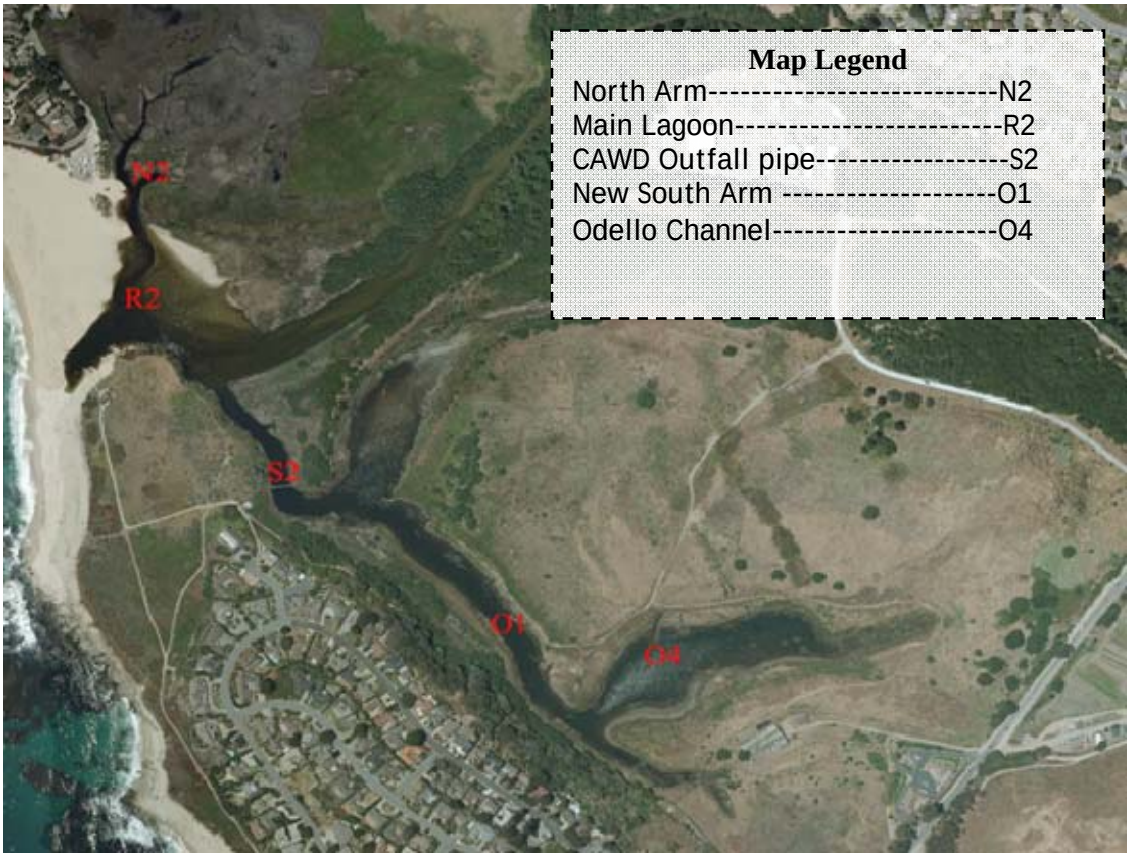
Date	Time 24 hr	Temperature (F)	Dissolved Oxygen (mg/L)	Carbon Dioxide (mg/L)	pH	Conductivity (uS/cm)	Turbidity (NTU)
7/6/2012	1130	63.9	9.2	15	8.0	223	1.8
7/20/2012	1105	63.5	9.0	10	7.5	231	3.8
8/3/2012	1330	65.3	9.9	5	8.0	228	3.5
8/24/2012	1215	64.0	7.5	10	8.0	227	4.1
9/1/2012	1200	63.5	8.6	10	8.0	230	3.7
9/14/2012	900	61.5	9.7	15	8.0	233	3.8
9/28/2012	1150	66.1	9.1	10	8.0	233	3.3
10/9/2012	1210	58.6	9.2	10	8.0	233	3.8
10/29/2012	1320	57.4	10.6	10	8.0	240	3.2
11/16/2012	1200	52.2	12.7	10	8.0	234	3.7
12/4/2012	1000	53.1	14.9	10	8.0	135	6.0
12/27/2012	1130	49.1	15.4	5	7.5	98	1.9
1/15/2013	1315	43.2	14.4	10	7.5	185	0.3
2/13/2013	1211	46.8	N/A	10	7.5	144	0.4
3/16/2013	1302	56.0	11.0	10	8.0	174	N/A
4/15/2013	1344	N/A	7.0	10	7.5	N/A	N/A
5/18/2013	1130	59.9	12.8	10	7.5	230	2.3
6/14/2013	1330	66.5	9.9	10	7.5	295	1.2
Minimum		43.2	7.0	5.0	7.5	98	0.3
Maximum		66.5	15.4	15.0	8.0	295	6.0
Average		58.3	10.6	10.0	7.8	210	2.9

Table III-3
Water-quality data collected by MPWMD during RY 2013 at Below Los Padres (BLP) station.

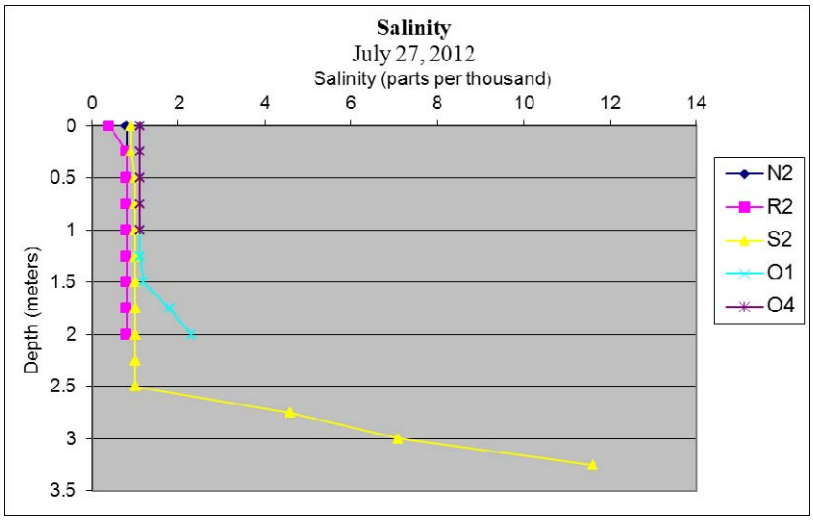
Date	Time 24 hr	Temperature (F)	Dissolved Oxygen (mg/L)	Carbon Dioxide (mg/L)	pH	Conductivity (uS/cm)	Turbidity (NTU)
7/6/2012	1020	59.5	8.8	15	7.5	174	2.96
7/20/2012	1000	61.7	8.8	10	7.5	185	2.28
8/3/2012	0945	64.9	7.9	10	7.5	202	2.4
8/24/2012	1120	70.3	7.4	15	7.5	227	3.97
9/1/2012	1030	71.1	7.0	15	7.5	234	1.57
9/14/2012	1000	70.7	8.4	10	7.5	240	2.74
9/28/2012	1030	68.7	8.1	10	7.5	247	5.35
10/9/2012	1045	67.3	8.2	10	7.5	254	6.38
10/29/2012	1210	63.0	12.2	5	8	257	6.65
11/16/2012	1030	57.6	13.4	5	8	248	6.37
12/4/2012	900	54.0	15.3	10	7.5	140	8.51
12/27/2012	1030	48.9	N/A	5	8	92	2.72
1/15/2013	1100	44.6	12.8	10	7.5	111	0.24
2/13/2013	1040	46.6	N/A	5	7.5	102	1.17
3/16/2013	1155	55.0	12.0	5	7.5	72	N/A
4/15/2013	1202	N/A	10.0	5	7.5	N/A	N/A
5/18/2013	1011	62.6	11.2	10	7.5	211	2.66
6/14/2013	1230	63.1	10.5	15	7.5	253	3.71
Minimum		44.6	7.0	5.0	7.5	72	0.2
Maximum		71.1	15.3	15.0	8.0	257	8.5
Average		60.6	10.1	9.4	7.6	191	3.7

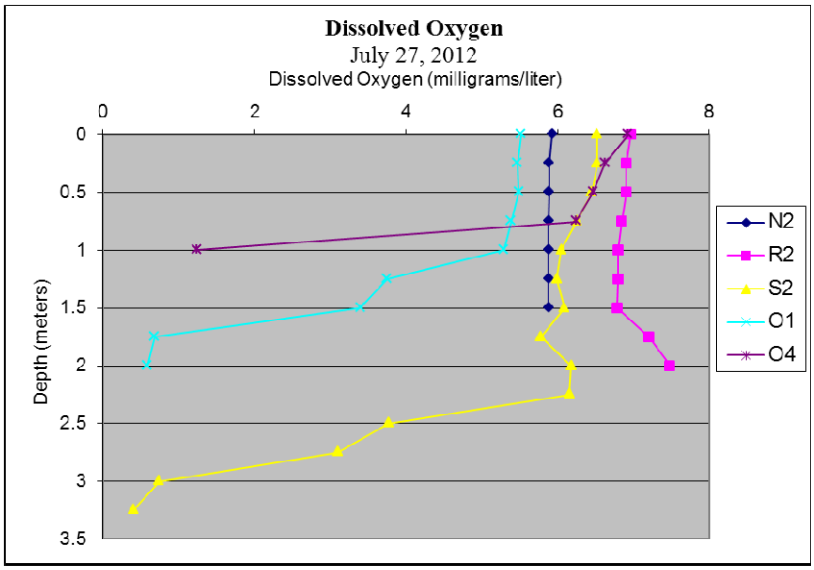
Appendix III-1

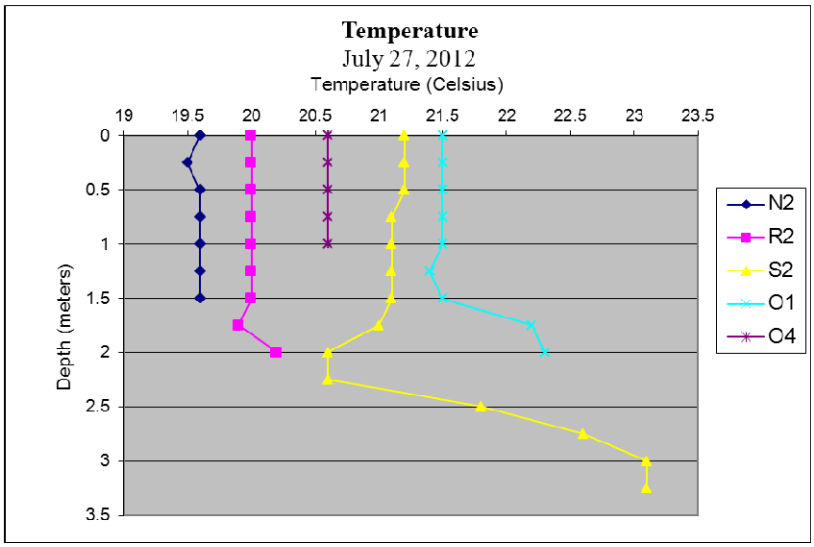
Carmel River Lagoon Profiles.
Salinity (ppt), Dissolved Oxygen (DO), Temperature (degrees C).
July 2012 – June 2013



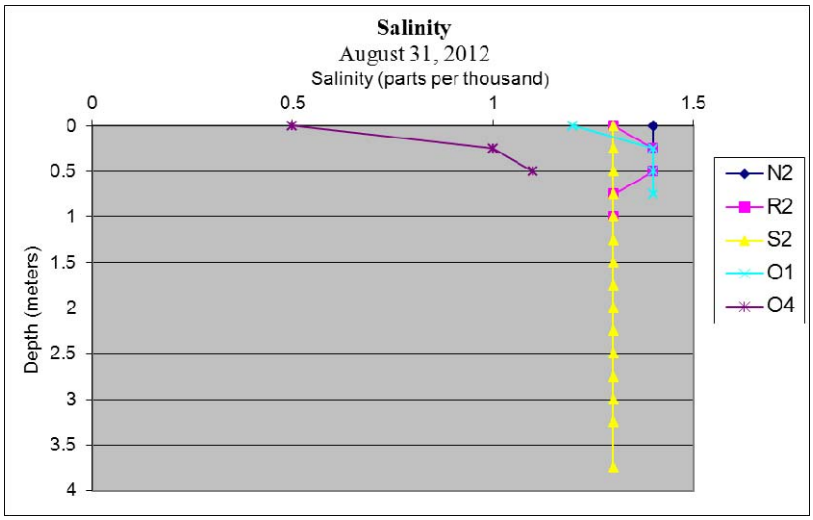
July 2012

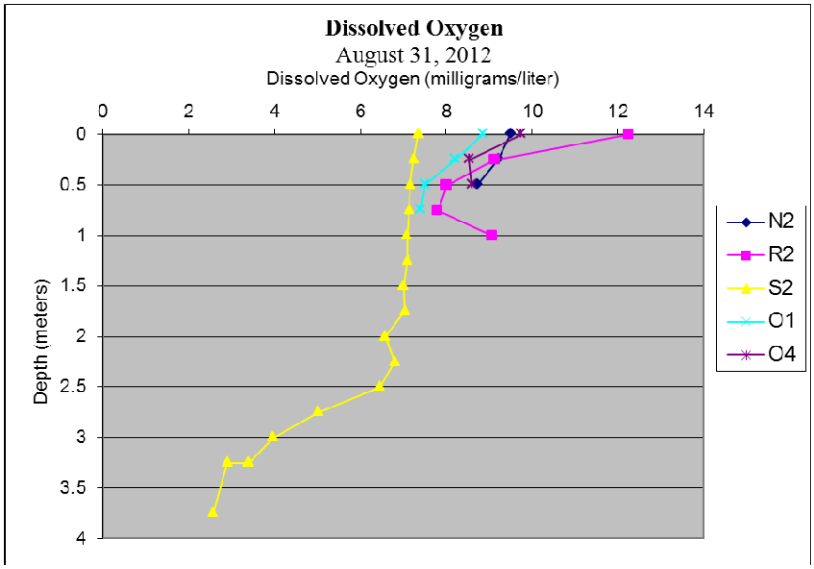

Salinity
July 27, 2012
Salinity (parts per thousand)
0
2
4
6
8
10
12
14
Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
N2
R2
S2
O1
O4

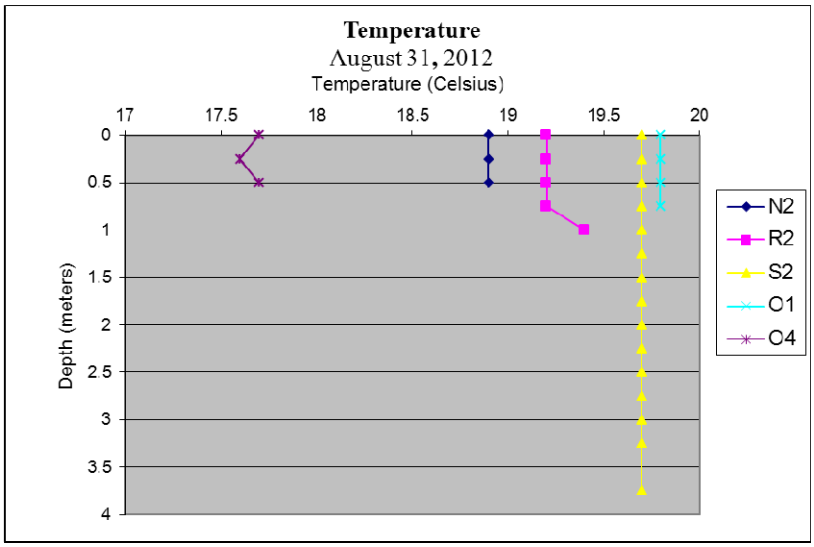

Dissolved Oxygen
July 27, 2012
Dissolved Oxygen (milligrams/liter)
0
2
4
6
8
Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
N2
R2
S2
O1
O4


Temperature
July 27, 2012
Temperature (Celsius)
19
19.5
20
20.5
21
21.5
22
22.5
23
23.5
Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
N2
R2
S2
O1
O4

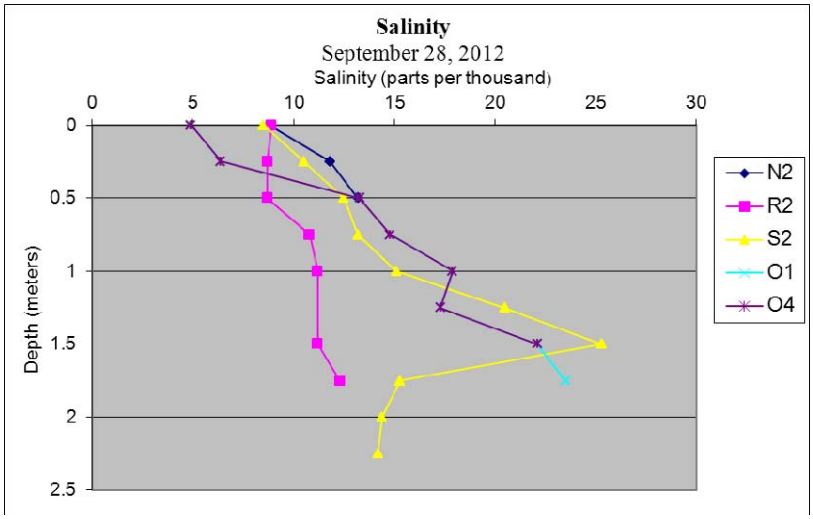
August 2012

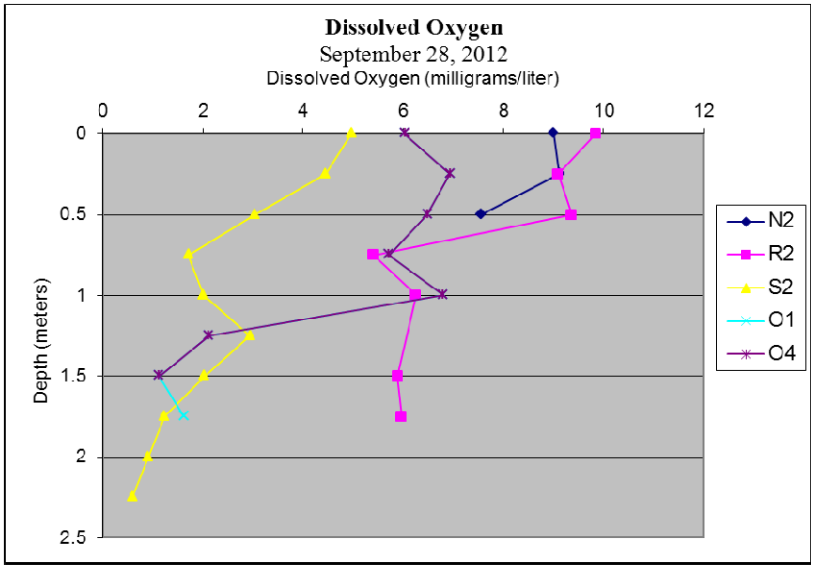

Salinity
August 31, 2012
Salinity (parts per thousand)
0
0.5
1
1.5
Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
4
N2
R2
S2
O1
O4

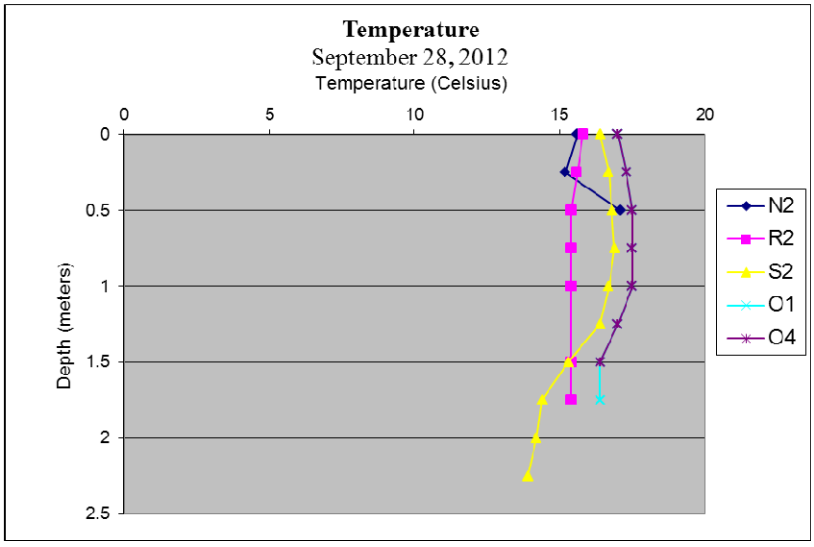

Dissolved Oxygen
August 31, 2012
Dissolved Oxygen (milligrams/liter)
0
2
4
6
8
10
12
14
Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
4
N2
R2
S2
O1
O4


Temperature
August 31, 2012
Temperature (Celsius)
17
17.5
18
18.5
19
19.5
20
Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
4
N2
R2
S2
O1
O4

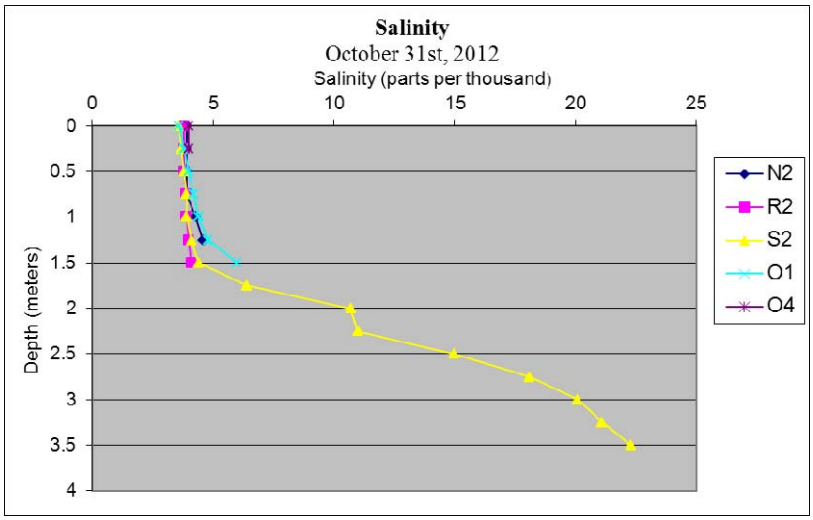
September 2012

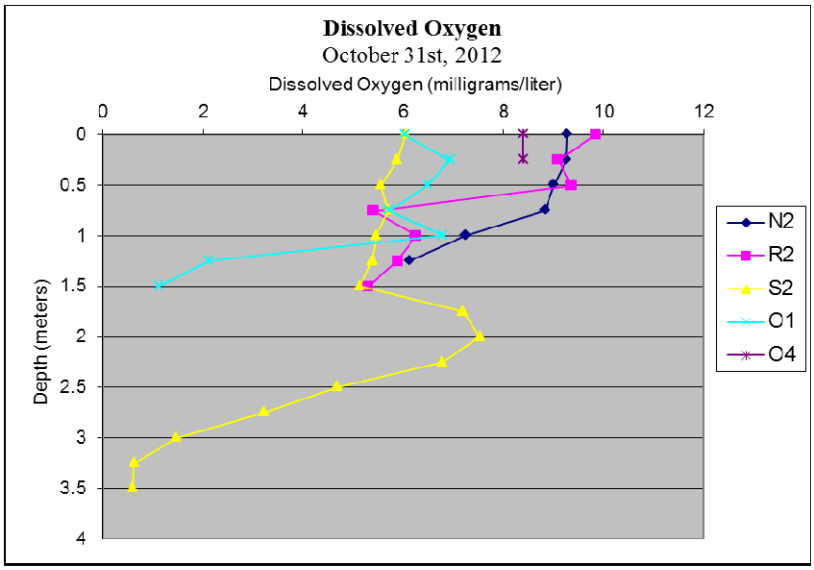


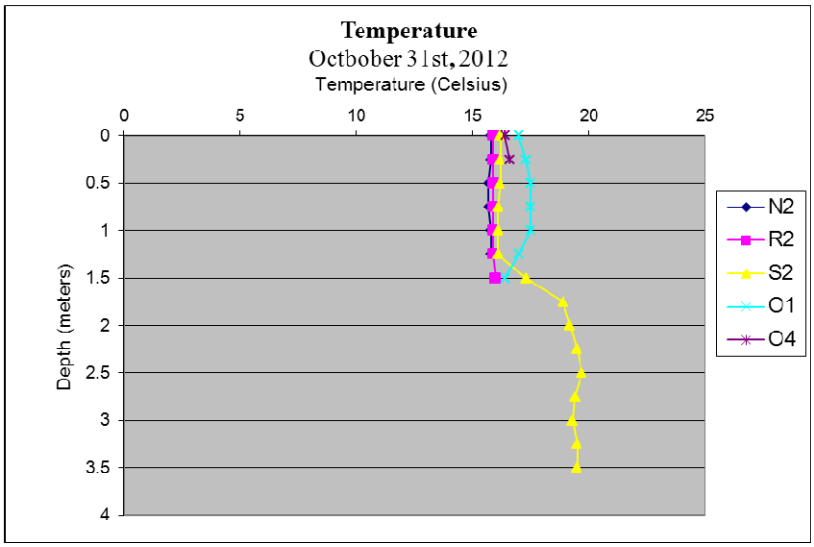




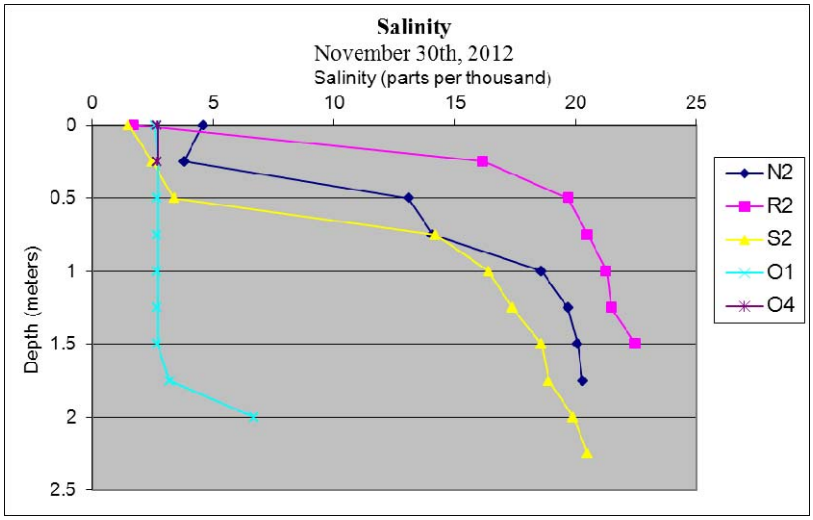
October 2012

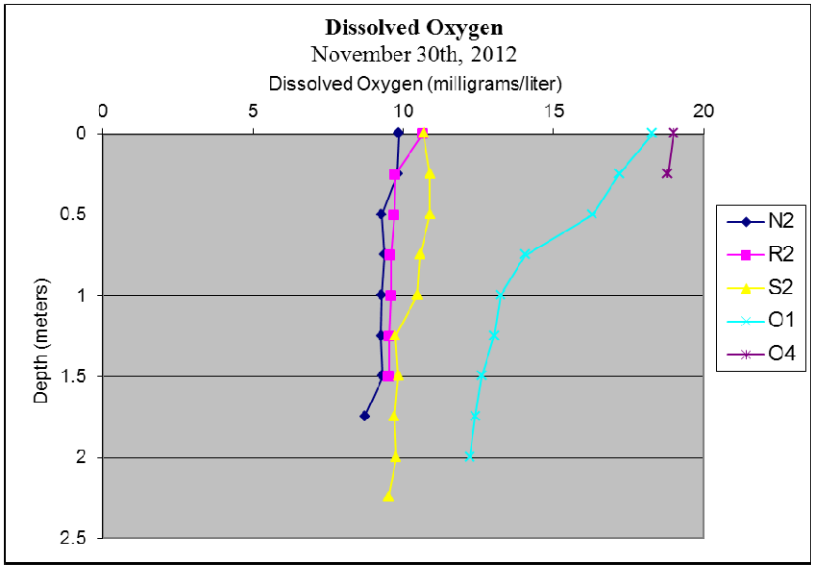


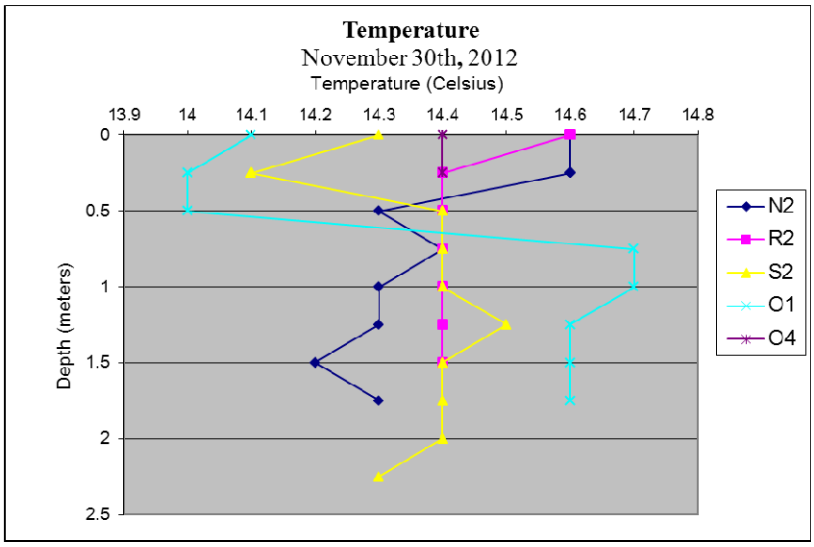




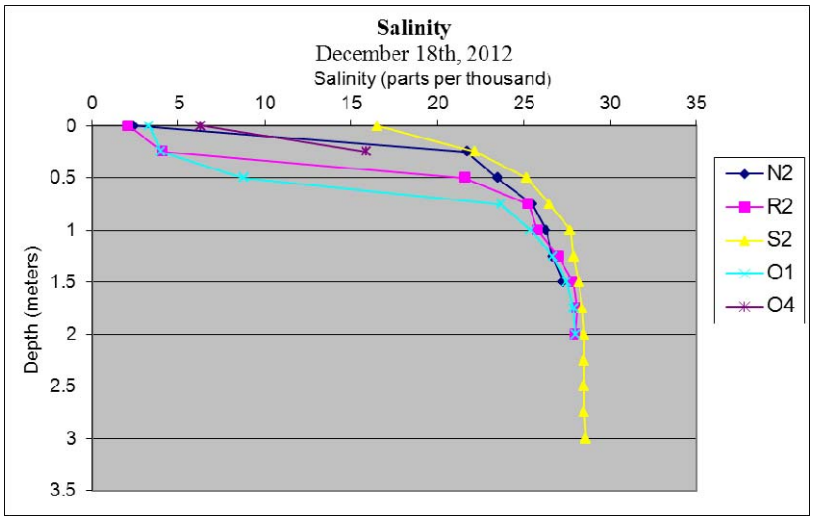
November 2012

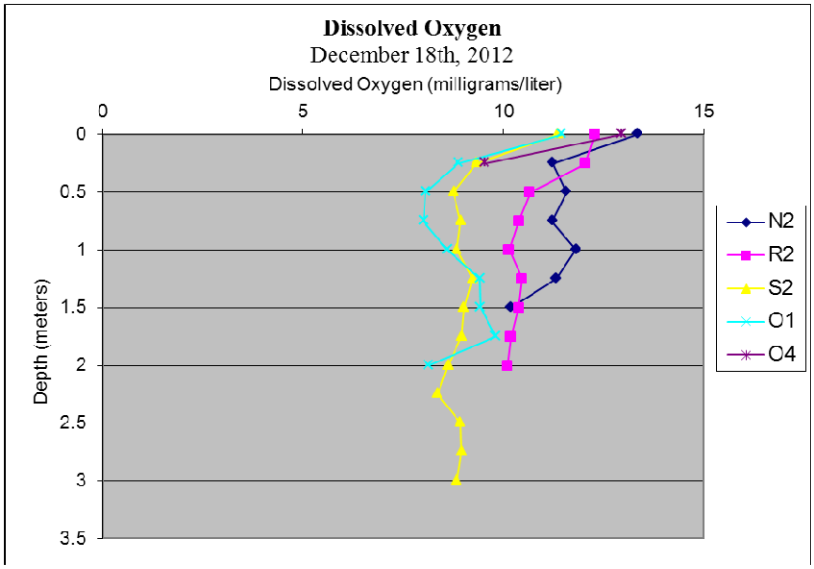


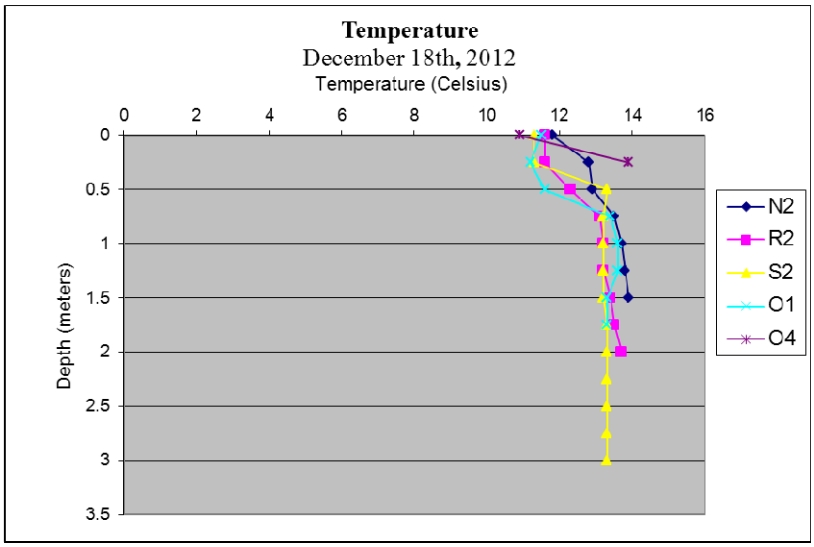




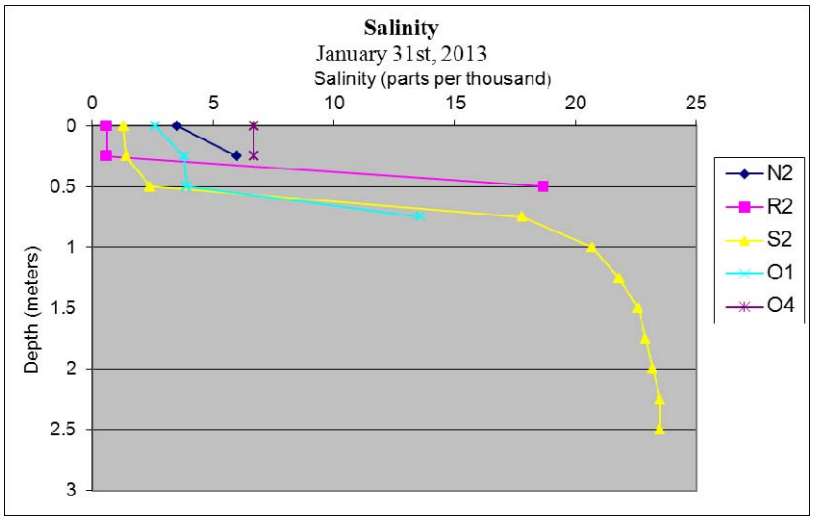
December 2012

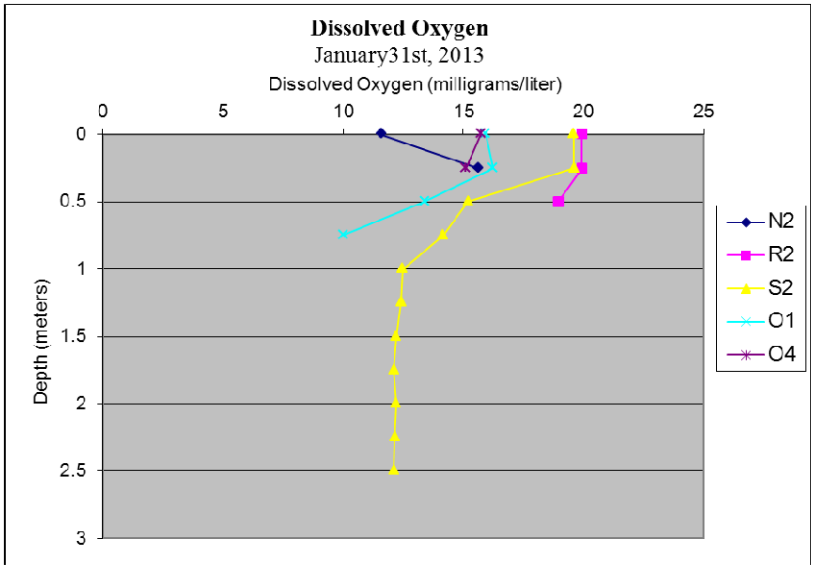


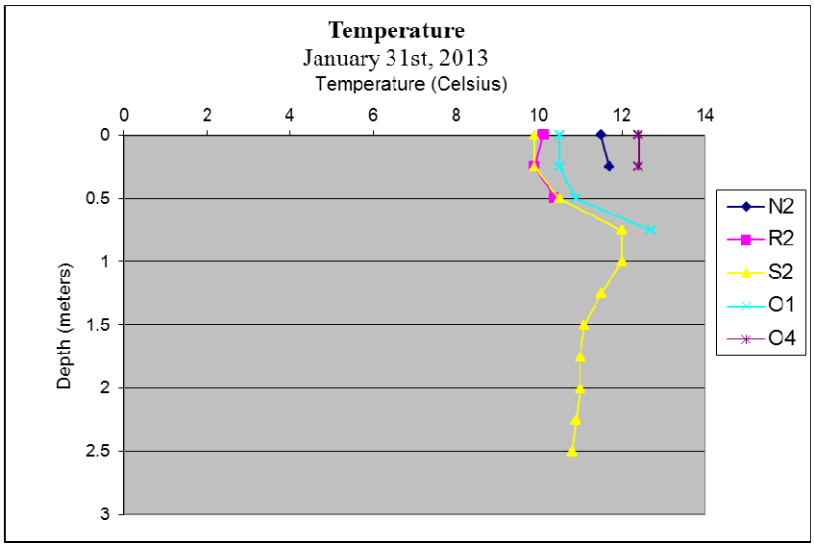




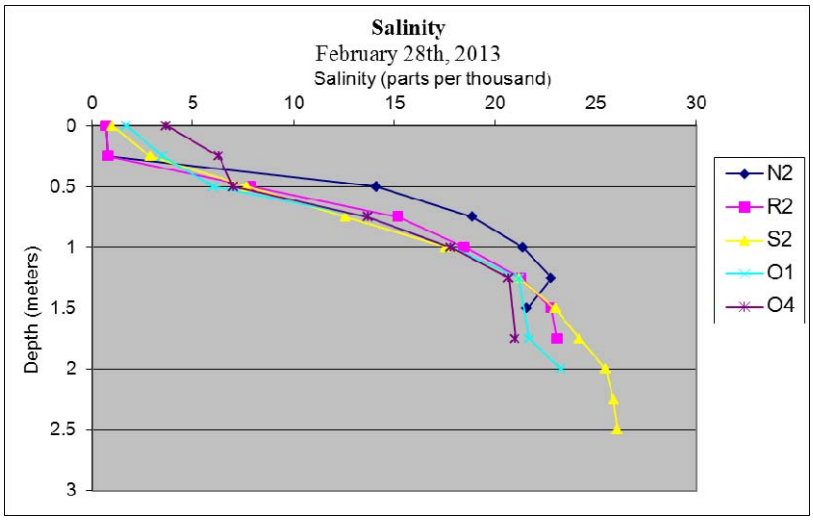
January 2013

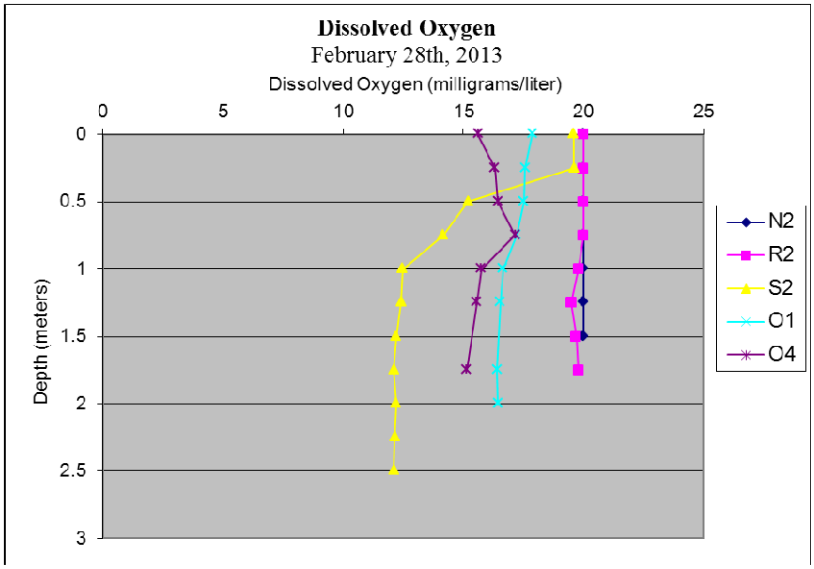


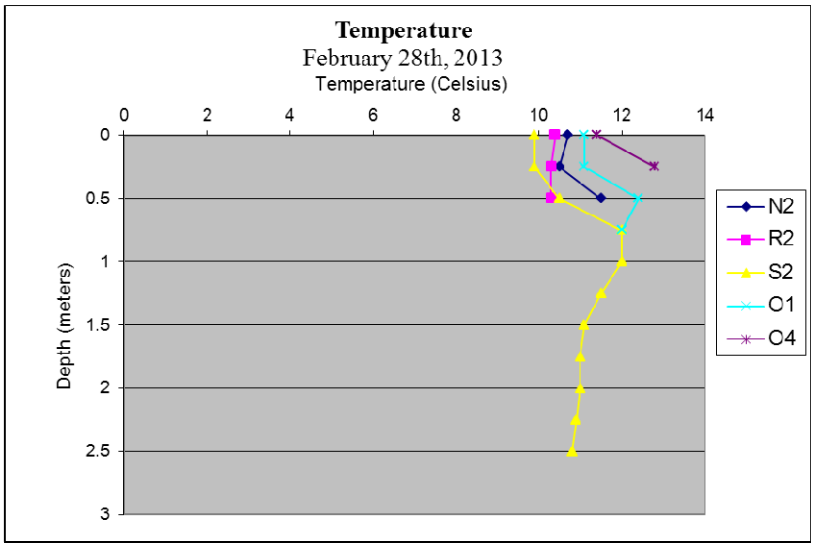




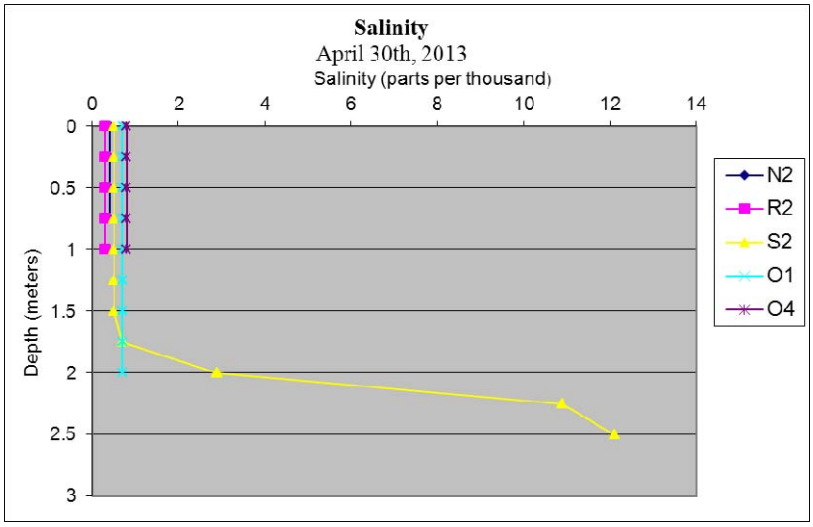
February 2013

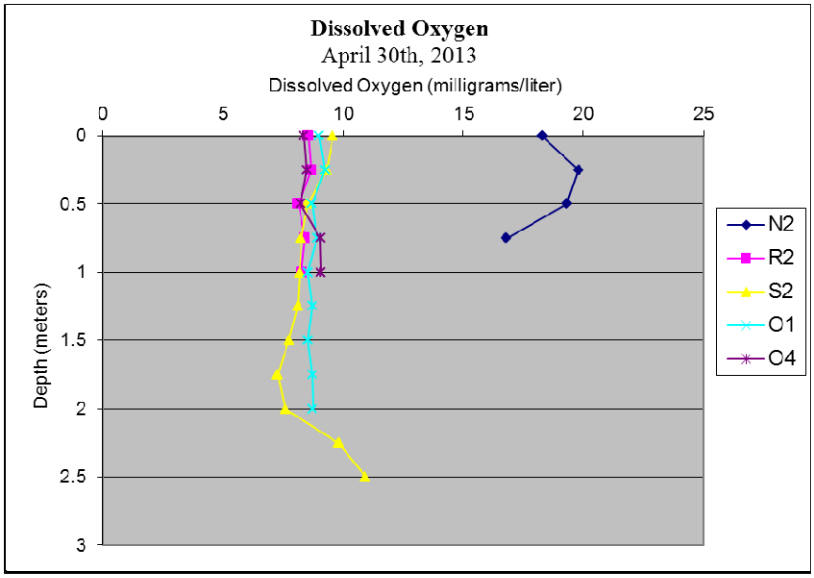


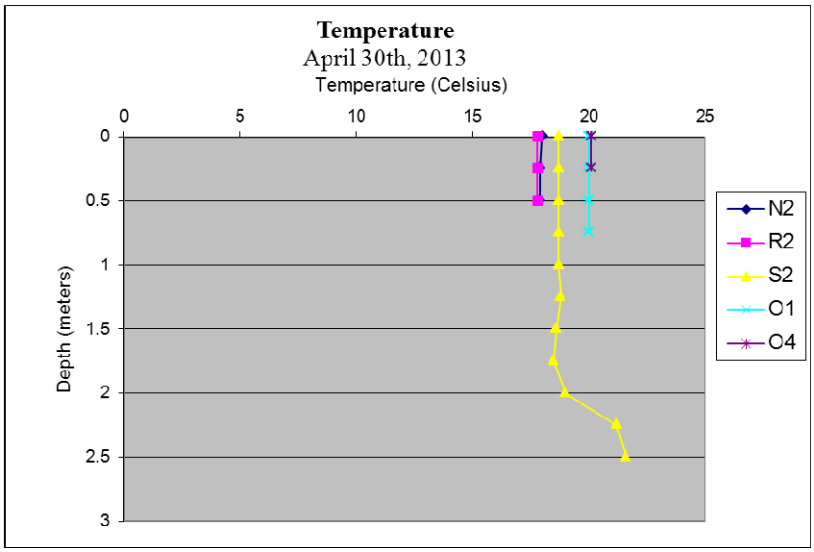




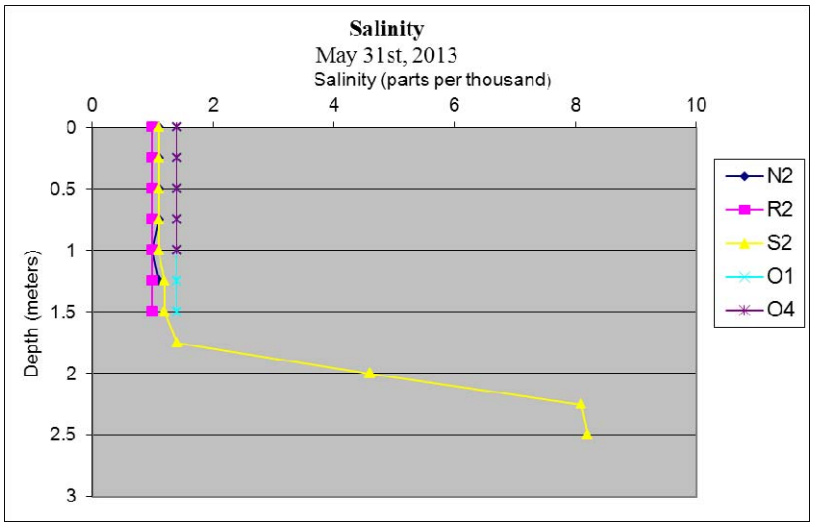
April 2013

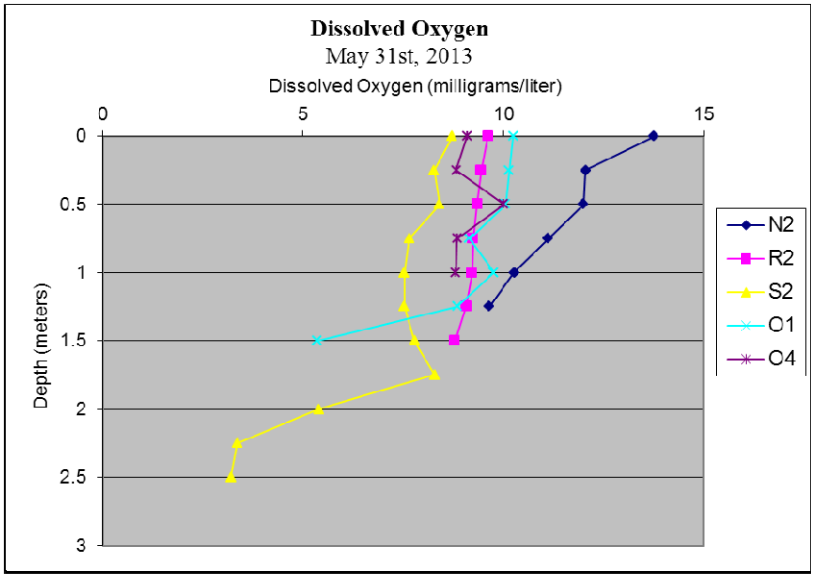

Salinity
April 30th, 2013
Salinity (parts per thousand)
0
2
4
6
8
10
12
14
Depth (meters)
0
0.5
1
1.5
2
2.5
3
N2
R2
S2
O1
O4

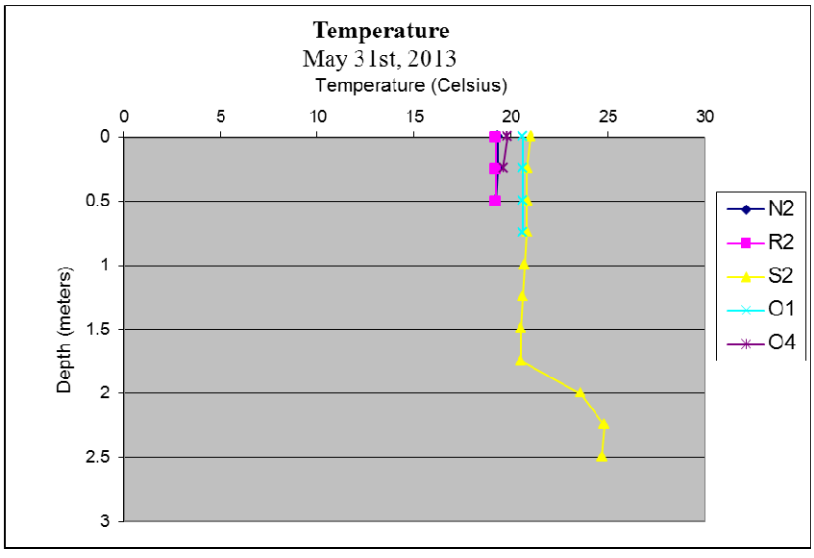

Dissolved Oxygen
April 30th, 2013
Dissolved Oxygen (milligrams/liter)
0
5
10
15
20
25
Depth (meters)
0
0.5
1
1.5
2
2.5
3
N2
R2
S2
O1
O4


Temperature
April 30th, 2013
Temperature (Celsius)
0
5
10
15
20
25
Depth (meters)
0
0.5
1
1.5
2
2.5
3
N2
R2
S2
O1
O4

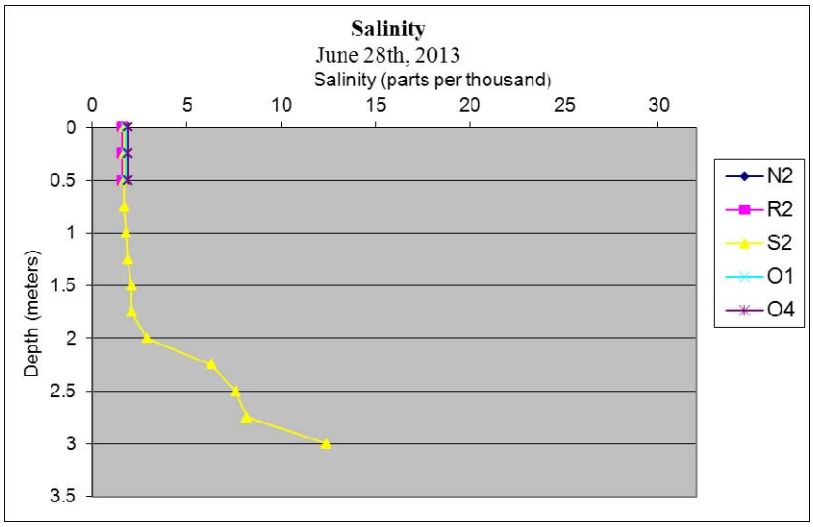
May 2013

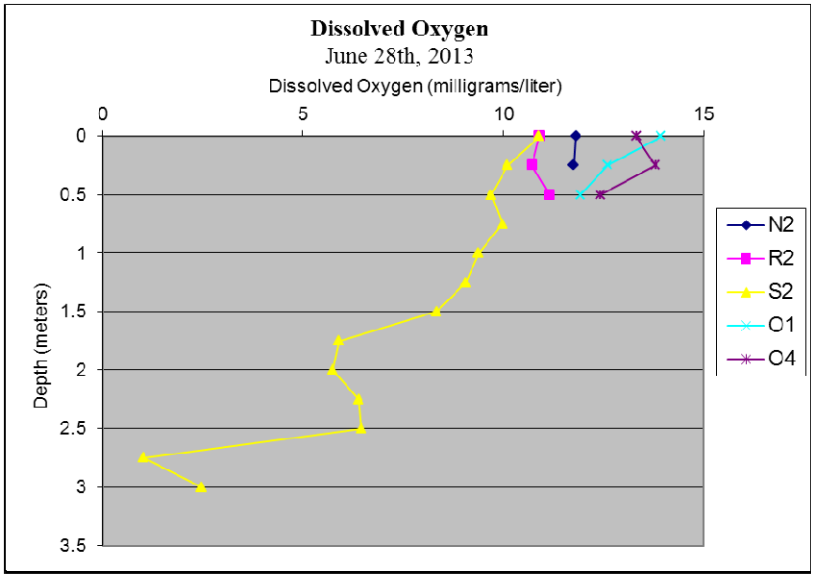

Salinity
May 31st, 2013
Salinity (parts per thousand)
0
2
4
6
8
10
0
0.5
1
1.5
2
2.5
3
Depth (meters)
N2
R2
S2
O1
O4

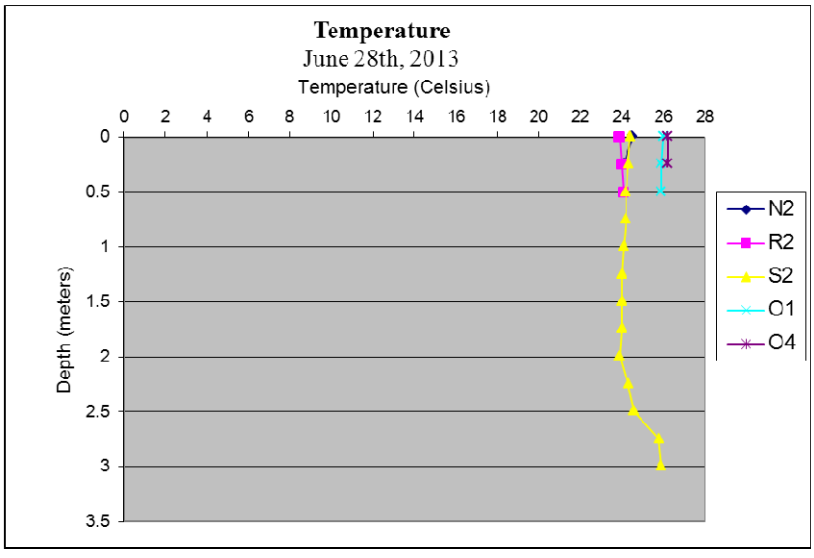

Dissolved Oxygen
May 31st, 2013
Dissolved Oxygen (milligrams/liter)
0
5
10
15
0
0.5
1
1.5
2
2.5
3
Depth (meters)
N2
R2
S2
O1
O4


Temperature
May 31st, 2013
Temperature (Celsius)
0
5
10
15
20
25
30
0
0.5
1
1.5
2
2.5
3
Depth (meters)
N2
R2
S2
O1
O4

June 2013


Salinity
June 28th, 2013
Salinity (parts per thousand)
0
5
10
15
20
25
30
Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
N2
R2
S2
O1
O4


Dissolved Oxygen
June 28th, 2013
Dissolved Oxygen (milligrams/liter)
0
5
10
15
Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
N2
R2
S2
O1
O4


Temperature
June 28th, 2013
Temperature (Celsius)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
N2
R2
S2
O1
O4

IV. GROUNDWATER MONITORING

A. Groundwater-Level Monitoring

Description and Purpose

The District maintains a groundwater-level monitoring program in the Carmel Valley Aquifer and the Seaside Groundwater Basin. The data collected as part of this program are used to support a variety of programs including: (a) storage monitoring, (b) compilation of annual and long-term well hydrographs, (c) water-table contour mapping, (d) Carmel River Management Program, (e) Seaside Basin Watermaster Program, and (f) other special projects. The monitor-well measurements are stored in a database program developed by the District to facilitate data entry, access and manipulation of the water-level data. In addition, groundwater-level measurements are collected on a regular basis by California American Water (Cal-Am) from each of their production wells, and these measurements are also utilized in the District's program.

Implementation and Activities During 2012-2013

- **Carmel Valley Aquifer --** The District's monitor well network in the Carmel Valley Aquifer consists of dedicated monitor wells and several private production wells, and currently totals approximately 50 water-level monitoring wells. During this period, the wells were measured on a monthly basis, and these measurements were used to compute end-of-month storage volume estimates for the aquifer. In addition, more frequent monitoring of selected wells was conducted during winter storm events to more closely monitor aquifer recharge.

Figure IV-1 is a typical hydrograph from the lower Carmel Valley, showing groundwater-level fluctuations at the Rancho Cañada East monitor well (River Mile 3.13) and the Rio North monitoring well (River Mile 1.65) compared with mean daily streamflow in the Carmel River at Highway 1 (River Mile 1.09). The Rancho Cañada East monitor well is located nearby the most downstream (i.e., westerly) Cal-Am production well in Carmel Valley, the Cañada well, approximately 375 feet from the river channel, and about 250 feet from the Cañada well. As shown on this figure, the groundwater elevation increased approximately three feet between the beginning of October 2012 and the end of December 2012, due to the reduced groundwater production at this time of the year, combined with the resumption of Carmel River flows. Groundwater levels declined gradually from January through September 2013 in response to receding surface flows and increased groundwater pumping. At the end of WY 2013 (i.e., September 30, 2013), the groundwater elevation in this well was about five feet lower than at the start of the WY.

The Rio North well is approximately 850 feet from the river channel. At this location, the magnitude of seasonal water-level fluctuation, approximately one foot, is less than at the Rancho Cañada East monitor well, due to its location farther from the river and major production wells in the lower Carmel Valley. Typically, the seasonal rise in water level

at the Cal-Am Rio North well lags relative to the Rancho Cañada East monitor well. The lag time is a response to the effect of distance from the river channel on the timing of groundwater recharge from river-flow events. This phenomenon is not as pronounced in **Figure IV-1**, due to the monthly water-level sampling frequency. The peak groundwater elevations recorded in both wells were observed a few days after the peak runoff in late January 2013.

During the October 2012-September 2013 period, the monitoring data indicated that overall groundwater storage in the Carmel Valley Aquifer declined slightly in WY 2013. In the river reach between San Clemente Dam and the Narrows (i.e., aquifer subunits 1 and 2), the maximum storage estimate was 94% of capacity at the end of April, declining to the lowest storage estimate at 89% of capacity at the end of September 2013. Similarly, in the river reach from the Narrows to the Carmel River Lagoon (i.e., aquifer subunits 3 and 4), the maximum storage estimate was 92% of capacity at the end of March, declining to the lowest storage estimate at 78% of capacity at the end of September 2013. In spite of the observed storage decline during WY 2013, the aquifer remained relatively full during the year due to a number of factors, including:

- Availability of adequate base flows during spring and early summer months,
- Timing and magnitude of controlled river releases from the upstream reservoirs,
- Maximized dry-season production from Cal-Am wells in the Seaside Basin,
- Water-supply management practices implemented by the District, Cal-Am, the California Department of Fish & Game and the National Marine Fisheries Service, as part of the Quarterly Water Supply Strategy and Budget process, and
- State Water Resources Control Board (SWRCB) Order No. WR 95-10 (and subsequent amendments) and the Seaside Basin adjudication decision, which constrain Cal-Am production from the Carmel River and Seaside Groundwater Basins, respectively.

● **Seaside Groundwater Basin --** In the Seaside Basin, monthly water-level measurements were collected from 20 monitor wells in the Seaside Coastal Subareas, and four were monitored in the Seaside Inland Subareas. An additional 29 wells in the Seaside Inland and Laguna Seca Subareas were monitored on a quarterly schedule during the year. These additional wells are a combination of active or inactive production wells, and dedicated monitor wells.

Figure IV-2 shows water-level data available from representative wells in the coastal Seaside Basin monitor well network. These graphs show the water-level elevations in the two principal aquifer zones, the shallower Paso Robles Formation and the deeper Santa Margarita Sandstone, at both upgradient (Site FO-07) and downgradient (Site PCA East) locations from the Paralta production well, the largest capacity Cal-Am well in the coastal area. The graphs illustrate the more dominant effect that production from the Paralta well has had on water levels in the Santa Margarita Sandstone, which is the aquifer zone from which the Paralta well obtains most of its production. The graphs also illustrate the effect of changed water-supply practices resulting from SWRCB Order WR 95-10. Under the Order, Cal-Am was directed to maximize production from its Seaside

Basin sources as a means to reduce production and associated impacts from the Carmel River system. Seasonal recoveries associated with short-term reduced wintertime production and District aquifer storage and recovery (ASR) injection operations have not been sufficient to reverse the observed long-term downward water-level trend. However, the water-level responses in the Santa Margarita Aquifer at these locations indicate a lessening of the seasonal decline during WY 2013. Additional information on the ASR program is available at the District office. Discussion of the Seaside Basin ASR Projects is included in Section XV.

B. Groundwater-Quality Monitoring

Description and Purpose

The District maintains an ongoing groundwater-quality monitoring program for the two principal groundwater sources within the District: the Carmel Valley alluvial aquifer, and the coastal subareas of the Seaside Groundwater Basin. The purpose of the program is threefold:

(1) to characterize the quality of water in the aquifers,
(2) to detect groundwater contamination from septic systems or other sources in the shallow zones of the Carmel Valley aquifer, and
(3) to monitor sea-water intrusion potential in the coastal portions of the Carmel Valley aquifer and Seaside Basin.

The District has maintained a groundwater-quality monitoring program for the Carmel Valley aquifer since 1981, and for the Seaside Basin since 1990. The District's program is in addition to the extensive water-quality monitoring that is conducted by Cal-Am at its production wells. The District manages all well construction, maintenance, and field-sampling activities associated with the program. Water samples are analyzed at Monterey Bay Analytical Services. The Monterey County Health Department, Cal-Am, and the Monterey County Water Resources Agency have also provided assistance with this program in the past. Collection of the water-quality data is intended to detect problems before they can affect the community's water supply.

Implementation and Activities During 2012-2013

The sampling schedule for Carmel Valley is normally staggered, with Upper Valley wells (i.e., upgradient of the Narrows) sampled in Spring and Lower Valley wells (i.e., downgradient of the Narrows) in Fall, to coincide with the historically higher nitrate concentrations in these respective areas. Collection of samples from the Seaside Basin monitor wells is conducted once per year in Fall, coinciding with the historically low water levels in the basin at that time of the year. Additionally, in 2012 and 2013, samples were collected quarterly from six wells closest to the coast in the Seaside Basin monitoring network by District staff under contract for the Seaside Groundwater Basin Watermaster.

● **Carmel Valley Aquifer –** Groundwater-quality data were collected from six of the network of eight monitor wells in the Carmel Valley aquifer in October 2013. One of the eight wells in lower Carmel Valley was not sampled because it was submerged under high water in the Carmel River Lagoon during the sampling period. Another well that had been sampled during this period was destroyed by flooding in March 2011 when the river scoured away the south end of the Carmel River State Beach parking lot. The locations of these sampling points are shown in **Figure IV-3** and **Figure IV-4**. The results indicated that, in general, there were only minor changes in overall water quality compared to samples collected in 2012. Staff is particularly interested in tracking indicators of potential seawater intrusion in the coastal portion of Carmel Valley. Accordingly, three clustered sets of wells were established west of Highway 1, with each set being made up of three wells completed at different depths. Review of historical data indicated that the shallower and intermediate wells in the coastal area are subject to the mixing of fresh water and saline water as high tides and surf overtop the sand berm between the lagoon and the ocean. This contributes to episodic mixing within the shallower and intermediate zones of the aquifer, but is not necessarily representative of larger-scale potential seawater intrusion into the aquifer. All three wells in the cluster closest to the ocean were destroyed by river erosion in 2011, and all three of the wells in the next closest cluster to the ocean were inaccessible due to high water during the sampling period, so during this Mitigation Report period, only the deeper well at one of the three coastal locations was sampled.

Well 16S/1W-13Lc is the deepest in the array of three wells located on State Parks property near the Carmel Area Wastewater District treatment plant at River Mile (RM) 0.65, currently the most proximate well to the ocean in Carmel Valley that is available for sampling. Specific Electrical Conductance (SEC) increased in 2013 relative to 2012, and Chloride concentration decreased in 2013 relative to 2012 (**Figure IV-5**). SEC was higher in 2013 than at any other time with the exception of anomalously high readings in Fall 2000. Additional background on historical water-quality at the coastal monitor well sites can be found in District Technical Memorandum 90-04*, Summary of Carmel Valley Groundwater-quality from Coastal Monitor Wells*, which is available at the District office. Staff will continue to track future results for trends that might indicate significant changes in concentrations of these or other constituents in the coastal area of the aquifer.

Well 16S/1E-23E4, located 6.53 miles upstream from the mouth of the Carmel River, shows a slight decline in overall water quality in 2013 relative to 2012. Degradation in water quality was noted at this site in 2007, and in 2008 staff made improvements to the wellhead at this site to reduce potential flooding along the roadside where this well is located. Attempts have been made to improve results through air-lifting and more extensive and rigorous pumping, but due to the relatively small amount of available saturation below the water table at this well, these efforts have had limited success. Staff will continue to monitor the site to ensure the wellhead is secure from surface-water sources.

Well 16S/1E-23La, located 6.72 miles upstream from the river mouth, exhibited a slight shift in water quality in 2013 relative to 2012, as shown on the graph of SEC and

Chloride that is included to track long-term trends (**Figure IV-6**). Staff will continue to track changes in all of the monitor wells in the basin to determine if they are indicative of long-term trends, or anomalous short-term events.

● **Seaside Groundwater Basin --** Eleven monitor wells in the coastal subareas of the Seaside Basin were sampled in June and July 2013. The locations of the Seaside monitor wells are shown in **Figure IV-7**. One function of the District's monitor-well network in the Seaside Basin is to serve as an early warning of potential sea-water intrusion into the two principal aquifer zones, the Paso Robles Formation and the Santa Margarita Sandstone. The water-quality results from the Seaside Basin indicate that very little water-quality changes have occurred over the period of record since monitoring began in 1990, and that there is no indication of sea-water intrusion in this area of the basin at this time. **Figure IV-8** shows SEC and Chloride concentrations in two coastal wells, one in the shallower Paso Robles Formation aquifer, and one in the deeper Santa Margarita Sandstone aquifer, for the historical period of record beginning in April 1991. Results from the District's monitoring program indicate that SEC averages approximately 350 and 825 microSiemens/centimeter (μS/cm), for the Paso Robles and Santa Margarita aquifer zones, respectively.

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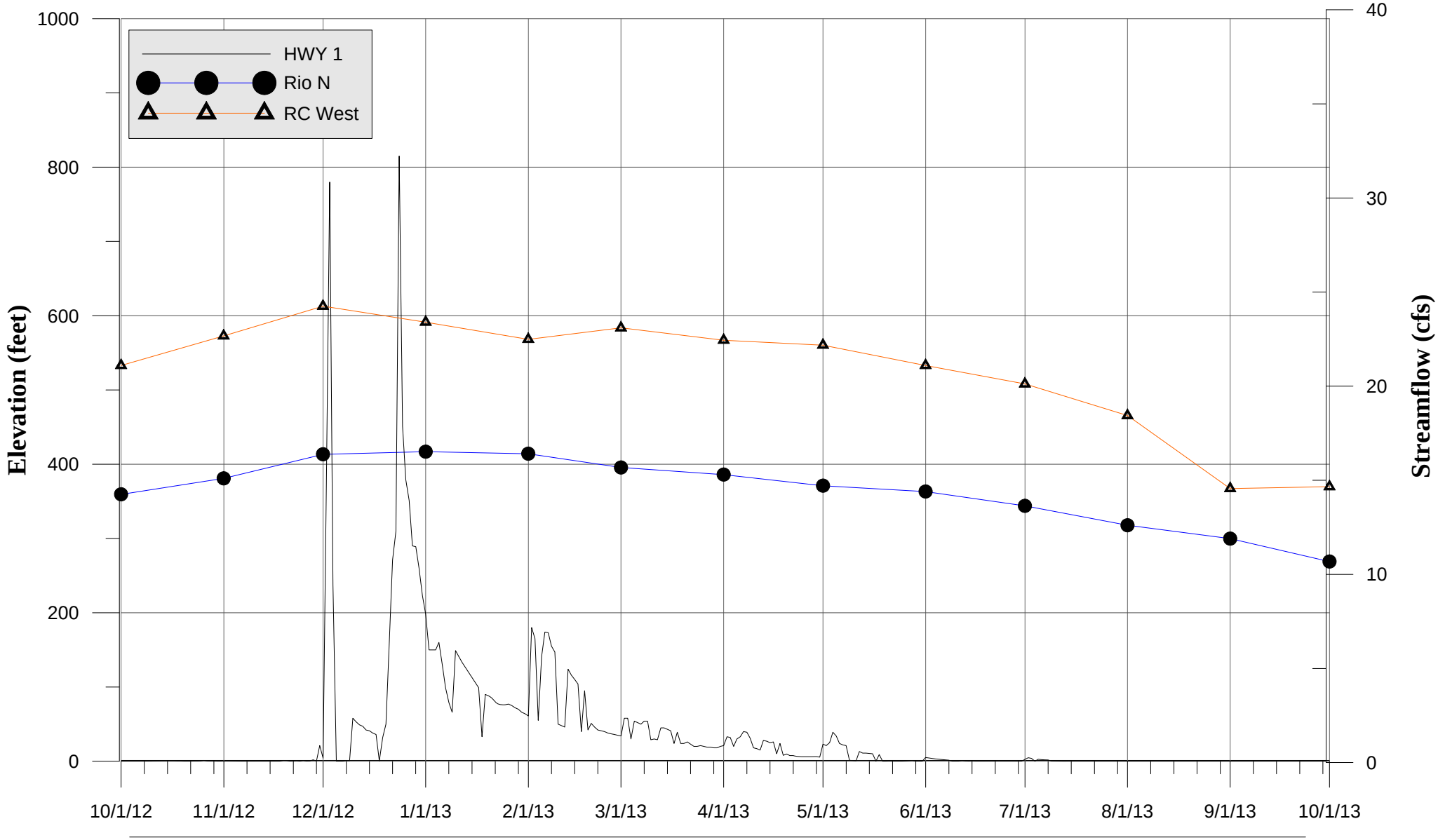
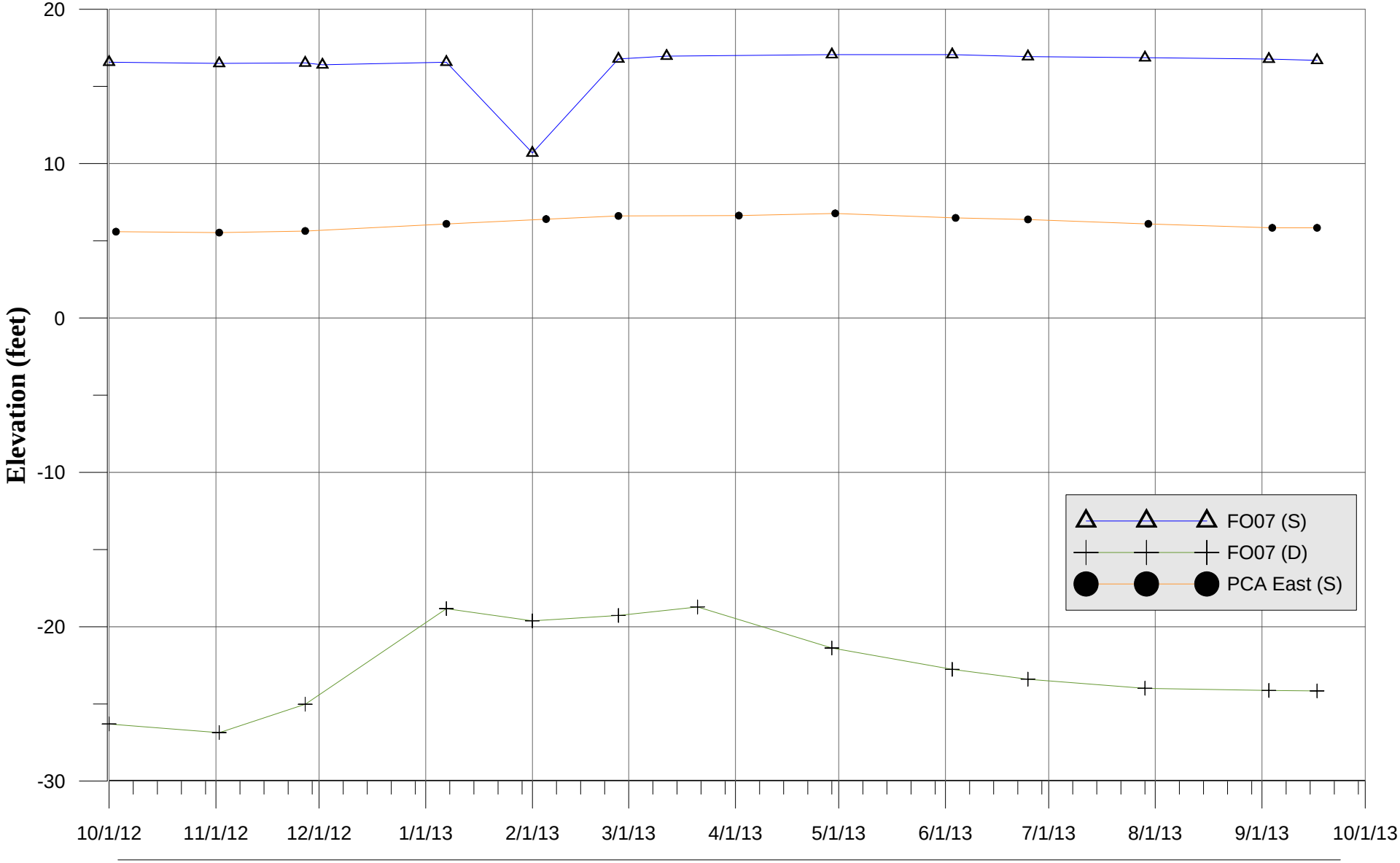


MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

Figure IV-1 Hydrographs of Monitor Well Levels and Carmel River Streamflow

Well levels measured at Rancho Canada West and Rio Road North Monitor Wells.
Carmel River Streamflow measured at Highway 1 Bridge.

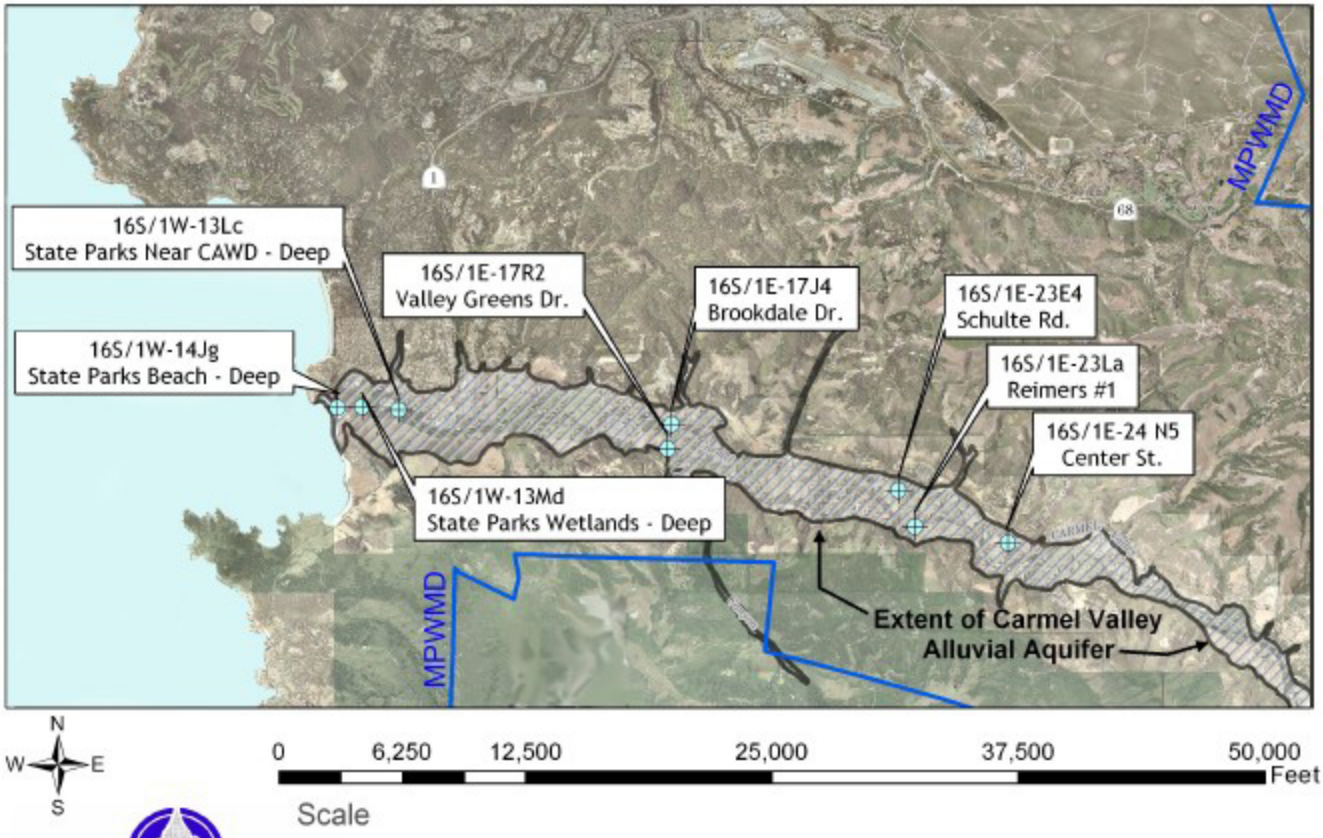


MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

Figure IV-2 Hydrographs of PCA East and FO 07 for WY 2013

Figure IV-3

LOCATION OF MPWMD LOWER CARMEL VALLEY WATER QUALITY MONITORING WELLS (River Mile 0.0 to 9.0)

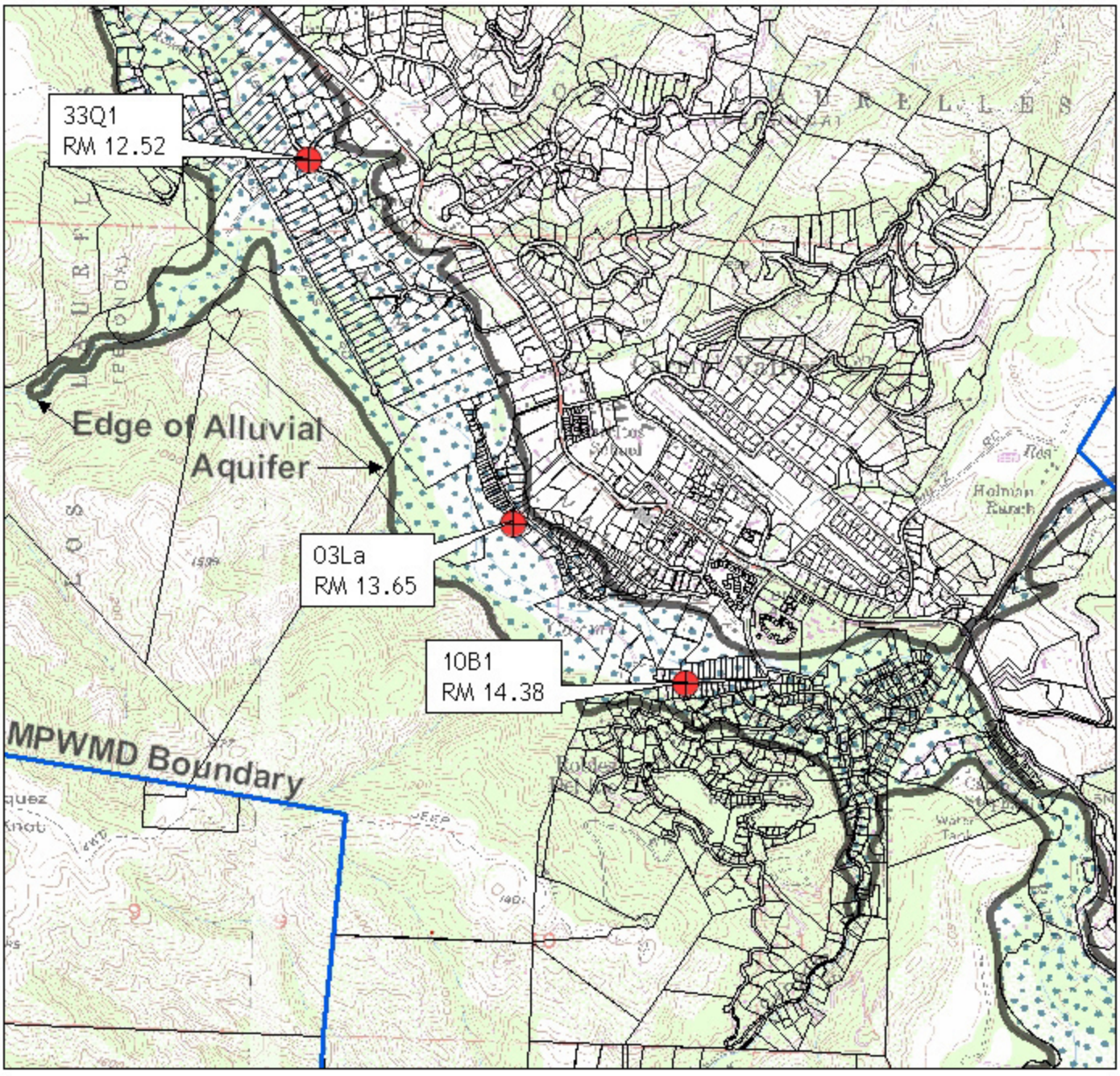


Monterey Peninsula Water Management District

u/tom/pdf12/wellmaps/lvwq.jpg

Figure IV-4

LOCATION OF MPWMD CARMEL VALLEY WATER QUALITY MONITORING WELLS
(River Mile 11.75 to 15.50)



N
W E
S

0 1,250 2,500 5,000 7,500 10,000 Feet

River Mile (RM)	Well Common Name	State Well Number
12.52	Boronda Rd.	T16S/R2E-33Q1
13.65	Little League #1	T17S/R2E-03La
14.28	De Los Helechos	T17S/R2E-10B1

Monterey Peninsula Water Management District

Figure IV-5

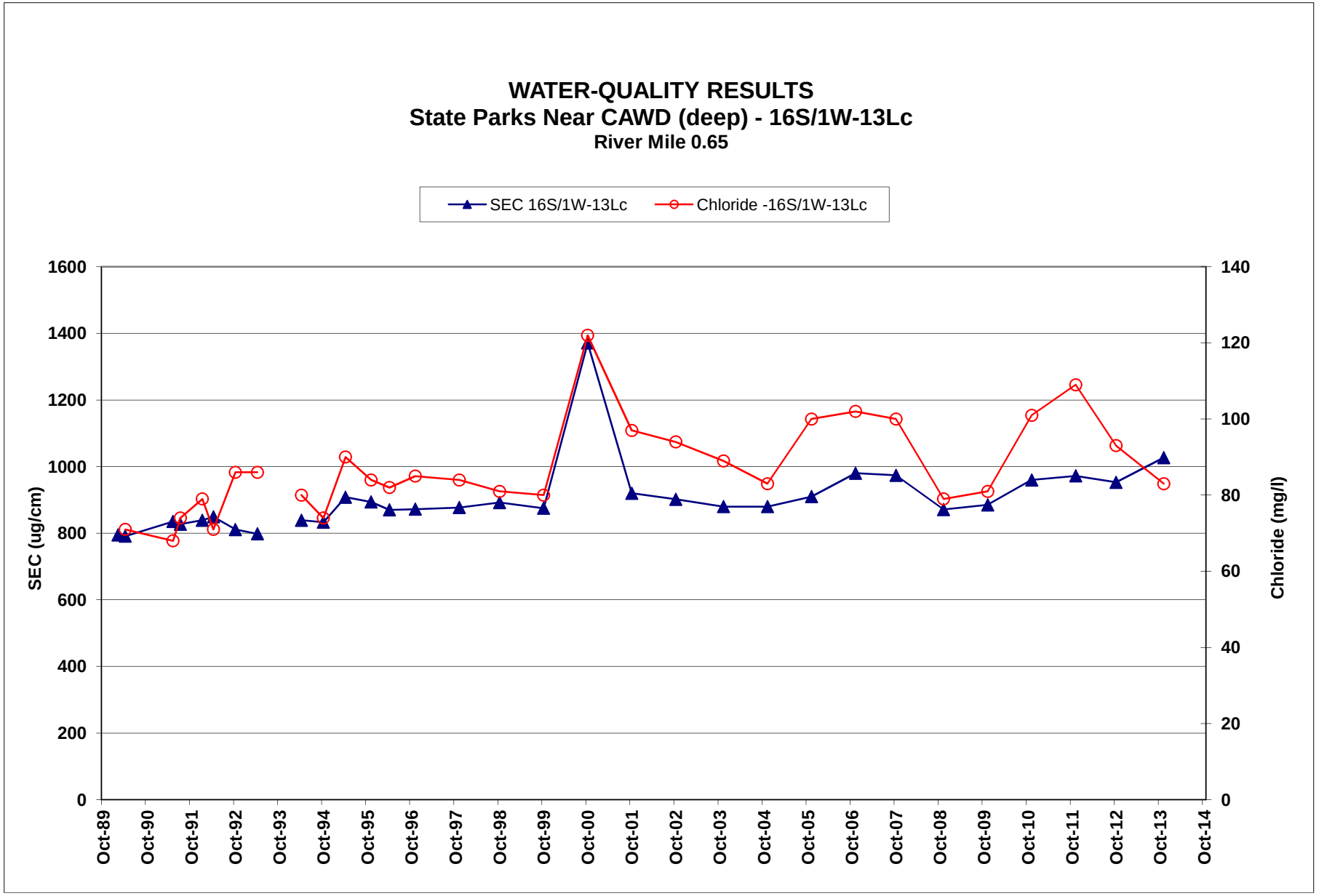


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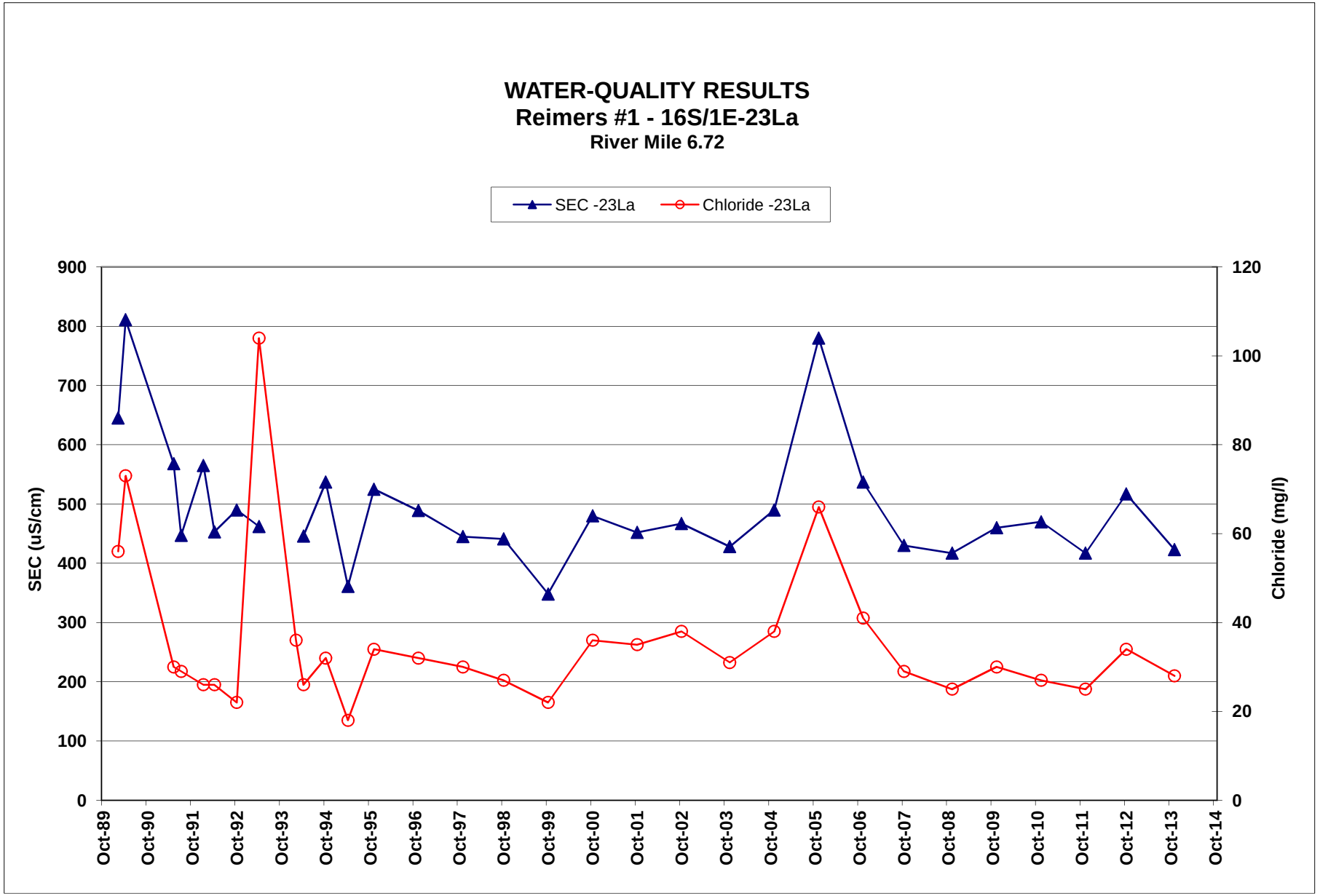
Figure IV-6


WATER-QUALITY RESULTS
Reimers #1 - 16S/1E-23La
River Mile 6.72
SEC -23La
Chloride -23La
SEC (uS/cm)
Chloride (mg/l)
900
800
700
600
500
400
300
200
100
0
120
100
80
60
40
20
0
Oct-89
Oct-90
Oct-91
Oct-92
Oct-93
Oct-94
Oct-95
Oct-96
Oct-97
Oct-98
Oct-99
Oct-00
Oct-01
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Oct-03
Oct-04
Oct-05
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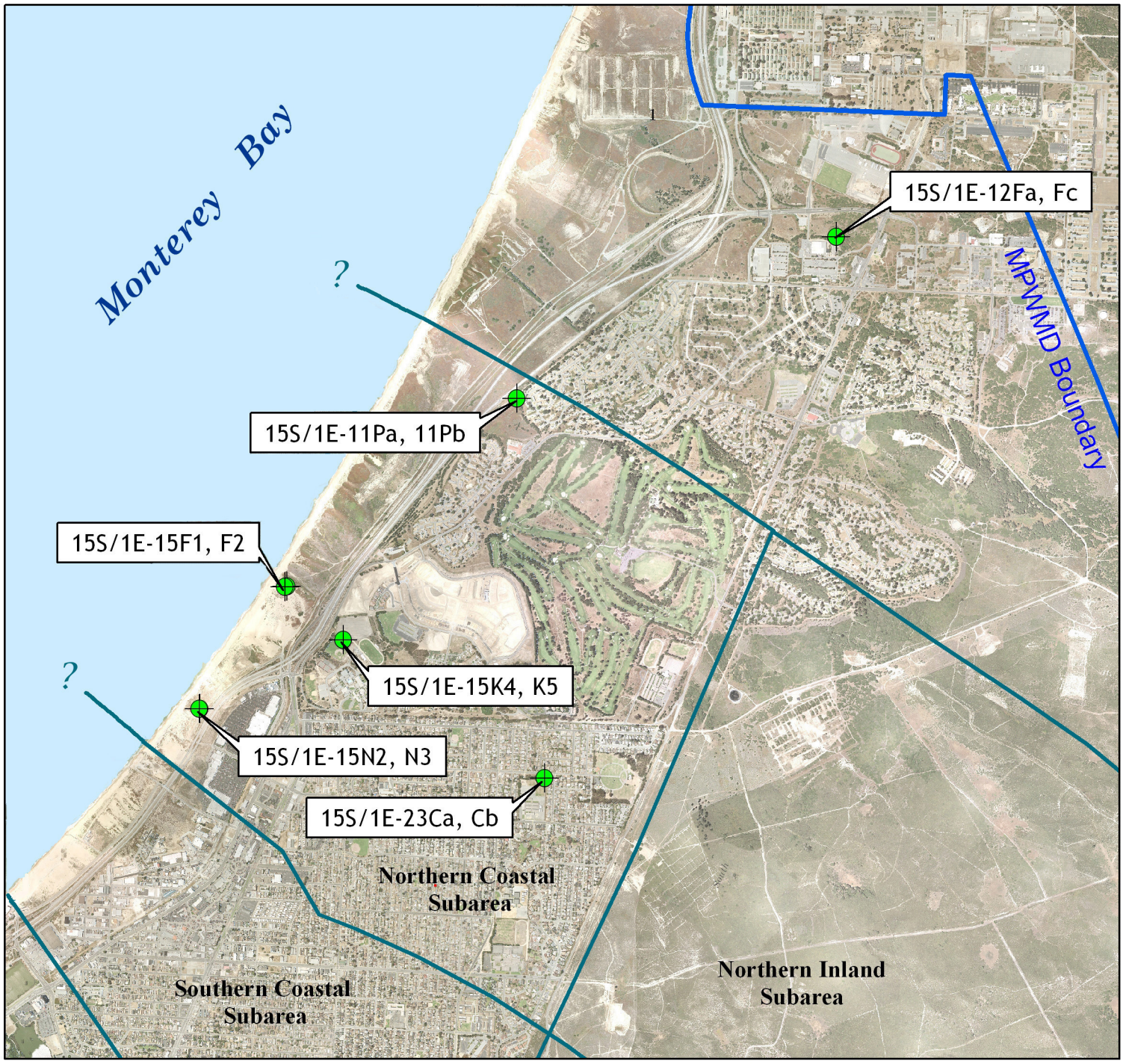
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14

Figure IV-7

SEASIDE BASIN COASTAL GROUND WATER QUALITY MONITOR WELL LOCATIONS



Monterey Peninsula Water Management District

u/tom/pdf12/wqmaps/WQseaside

V. ANNUAL LOW-FLOW MEMORANDUM OF AGREEMENT

Description and Purpose

The original Memorandum of Agreement (MOA) between the California Department of Fish and Game (now California Department of Fish and Wildlife, CDFW), Cal-Am, and the District was developed in July 1983 to balance CDFW's requirement to conserve and protect the fish and wildlife resources of the state and Cal-Am's responsibility to supply water to the citizens of the communities of the Monterey Peninsula. This MOA is modified each year to reflect specific storage conditions and inflow projections at Los Padres and San Clemente Reservoirs in the Upper Carmel River watershed. Specifically, the MOA addresses the release of water into the Carmel River from San Clemente Dam and was originally designed to maximize surface flow to the Narrows during the low-flow season. In addition to specifying minimum flow releases from San Clemente Dam, the MOA limits Cal-Am diversions from San Clemente Dam to the Carmel Valley Filter Plant (CVFP) and directs how Cal-Am pumps water from the Lower Valley Wells. Normally, the MOA is formulated in May and remains in force until the end of December. The agreement may be modified or extended by mutual consent of all the parties.

Implementation and Activities During 2012-2013

- **2012 MOA** – The 2012 MOA was developed on June 7, 2012 and approved by the District Board July 16, 2012. The final document was signed by the District and Cal-Am, but was not signed by CDFW due to the same unresolved language that was proposed in 2009 by CDFW. Based on storage conditions and expected reservoir inflows, it was agreed that Cal-Am would maintain minimum flows in the Carmel River at the Sleepy Hollow Weir of 7 cfs from June through December 2012. The 2012 MOA included terms to: (a) limit Cal-Am diversions at San Clemente Dam during low-flow periods, except during an emergency, as defined in SWRCB Order WRO 2002-0002; (b) allow production from Cal-Am's Russell Wells at a maximum rate of 0.5 cfs; (c) limit operation of Cal-Am wells in the Carmel Valley above Robinson Canyon Road Bridge during low-flow periods; and (d) require Cal-Am to make reasonable efforts to operate the lower Carmel Valley wells in sequence from the most downstream well, progressing upstream as wells are needed and available for production.

- **2013 MOA** – The 2013 MOA was developed on May 7,, 2013 and approved by the District Board on June 17, 2013. The final document was signed by the District, but was not signed by CDFW due to the same unresolved language that was proposed in 2009 by CDFW. Based on storage conditions and expected reservoir inflows, it was agreed that Cal-Am would maintain minimum flows in the Carmel River at the Sleepy Hollow Weir of 5 cfs from June through December 2013. The 2013 MOA included terms to: (a) limit Cal-Am diversions at San Clemente Dam during low-flow periods, except during an emergency, as defined in SWRCB Order WRO 2002-0002; (b) allow production from Cal-Am's Russell Wells at a maximum rate of 0.5 cfs; (c) limit operation of Cal-Am wells in the Carmel Valley above Robinson Canyon Road Bridge during low-flow periods; and (d) require Cal-Am to make reasonable efforts to operate the lower Carmel Valley wells in sequence from the most downstream well, progressing upstream as wells are needed and available for production.

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VI. QUARTERLY WATER SUPPLY STRATEGY AND BUDGET

Description and Purpose

Under Ordinance No. 19, which was adopted in December 1984, the District was required to develop an annual water-supply strategy. This strategy included estimates of projected demands and proposed production targets for the Cal-Am system. The strategy was designed to limit Cal-Am surface-water diversions from the Carmel River to no more than 35 percent of total Cal-Am production. Based on the District strategy, Cal-Am developed a water-supply budget specifying monthly production targets.

Under Ordinance No. 41, which was adopted in March 1989, development of the water-supply strategy and budget was changed from an annual to a quarterly process, and Cal-Am's annual surface-water diversions were reduced to a goal of no more than 29 percent of total production. Currently, the quarterly strategy and budget values are developed jointly by Cal-Am, the District, CDFG and NMFS, in conformance with the annual low-flow MOA. The strategy is designed to maximize the long-term production potential and protect the environmental quality of the Carmel Valley and Seaside basins. The budget includes monthly production targets for each of Cal-Am's major production sources -- San Clemente Reservoir, Upper Carmel Valley (UCV) Aquifer, Lower Carmel Valley (LCV) Aquifer, and the Coastal Subareas of the Seaside Basin -- which reflect current and expected system conditions. The quarterly strategies and budgets are normally developed in December, March, June, and September of each year.

Starting in April 2002, the Quarterly Water Supply Strategy and Budgets were fundamentally changed by the State Water Resources Control Board (SWRCB), which adopted Order WRO 2002-0002 on March 21, 2002, and by NMFS and Cal-Am, who signed a Conservation Agreement on September 18, 2001. This order and agreement changed the way that Cal-Am operates its diversions and wells upstream of Robinson Canyon Road Bridge. Specifically, Cal-Am was ordered to:

1. Immediately upon issuance of SWRCB Order WRO 2002-0002, cease withdrawal of water from the San Clemente Dam during low-flow periods except during an emergency. For the purpose of the Order, “low-flow periods” are defined as times when stream flow in the Carmel River at the Don Juan Bridge gage (RM 10.8) is less than 20 cfs for five consecutive days.

2. Reduce diversions during low-flow periods from the Scarlett No. 8 Well, Los Laureles Wells Nos. 5 and 6, Panetta Wells, Garzas Wells Nos. 3 and 4, and the Robles Well. Current diversions are 1-7 days per month at each well. Diversions at these wells shall be reduced to a maximum of two eight-hour days per month, except that those wells that currently operate only one eight-hour day per month shall continue to operate at not more than one eight-hour day per month. To the maximum degree practicable, Cal-Am shall operate these wells at night. In consultation with NMFS, USFWS, CDFG and the District, Cal-Am can operate the Scarlett 8 well incrementally to meet maximum daily demand after using all other available downstream sources at maximum capacity.

3. Install, not later than March 31, 2002, a pump that delivers water from the Begonia Zone to the Carmel Valley Village Zone. The "Begonia Zone" is defined to include water well production facilities in AQ3, AQ4 and the Seaside Groundwater Basin. The "Carmel Valley Village Zone" is defined to include all Cal-Am users upstream from the Del Monte Regulating Station.

4. The Russell Wells shall be limited to a combined total instantaneous diversion rate of not more that 0.5 cfs during low-flow periods.

5. During the low-flow periods, except for 0.5 cfs, all water diverted to Carmel Valley Village Zone shall be water that originates from the Begonia Zone (as defined in Paragraph 3 above).

In addition, the production goals for the quarterly budget process have changed over time. Beginning in 1998, the quarterly budgets were formulated with an annual production goal of 11,285 AF during each Water Year from the Carmel River Basin, in conformance with goals and requirements established by SWRCB Orders WR 95-10, WR 98-04, and subsequently in conformance with WRO 2002-0002, and CDO 2009-0060. Releases from San Clemente Reservoir were maximized throughout the year and groundwater production in the UCV was limited to periods when sufficient streamflow was available to recharge the aquifer.

Starting in March 2006, the annual limit for Cal-Am's production from its wells in the Coastal Subareas of the Seaside Groundwater Basin for customers in its main system used in the quarterly budgets was reduced from 4,000 AF per year to 3,504 AF per year based on the final judgment in the basin adjudication. Accordingly, the total annual limit for Cal-Am from the Carmel River and Seaside Groundwater Basins for its main system was set at 14,789 AF. It should be noted that the March 2006 Seaside Basin adjudication decision was amended in February 2007. The decision was amended in part to allow Cal-Am to combine its production allocation from the Coastal Subareas with its production allocation from the Laguna Seca Subarea.

On January 15, 2008, the SWRCB issued a draft Cease and Desist Order (CDO) against Cal-Am. The Draft CDO refers to the 1995 SWRCB Order 95-10, and notes that compliance with Order 95-10 had not been achieved after 12 years. The CDO institutes a series of cutbacks to Cal-Am production from the Carmel River and prohibits new or intensified connections in the Cal-Am main system. MPWMD and several other parties participated in formal hearings before the SWRCB in the summer of 2008. After several draft versions, the final SWRCB determination on the CDO was issued on October 20, 2009. The District subsequently filed a suit to challenge this ruling, and the Monterey County Superior Court issued a stay on November 3, 2009. In response to a challenge by SWRCB, the court ruled on November 23, 2009 that the stay will remain in effect until the hearing that was held in Santa Clara in April 22, 2010. At that hearing, the Court lifted the stay and the CDO was reinstated. The CDO reduced the Cal-Am annual upper limit of diversion from the Carmel River previously set by Order 95-10 at 11,285 AF to 10,429 AF in WY 2010.

In WY 2013, the CDO (Order 2009-0060) set Cal-Am Carmel River production to 10,187 AF. The Seaside adjudication decision limited Cal-Am production in the Coastal and Laguna Seca Subareas of the Seaside Basin to 2,669 AF and 147 AF, respectively. This brought the WY 2013 total production limit from all sources to 13,003 AF (not including any adjustments for supplemental supplies or carryover storage).

Implementation and Activities During 2012-2013

During 2012 and 2013, the quarterly strategies and budgets were structured to optimize production from the Coastal Subareas of the Seaside Basin and minimize impacts from production in the Upper Carmel Valley (UCV). Activities in Water Year 2013 are described below.

- **Cal-Am Main System Production in Water Year 2013**[1] – During WY 2013, Cal-Am produced 11,622 acre-feet (AF) of water for customer service from all sources in its Carmel River, Seaside Coastal and Laguna Seca Subarea systems (not including 295 AF diverted from the Carmel River Basin and injected into the Seaside Basin at the District's ASR facilities, as this was tracked separately during recovery as Seaside Basin production). This production consisted of 7,713 AF from Carmel River source wells, 2,700 AF of native water from Seaside Coastal wells, 377 AF from Laguna Seca Subarea wells, 188 AF from the Sand City desalination plant, as well as 131 AF recovered from Seaside Coastal wells from WY 2012 injection. In addition, Cal-Am produced 218 AF of recovered "pre-permanent ASR water rights" water, which is a portion of the 325 AF that had not been recovered or claimed as replenishment assessment credit during the 10-year injection testing period prior to securing permanent water rights for the ASR project. Of the system total, no water was diverted at San Clemente Dam, which represents the tenth consecutive year this has occurred since Cal-Am's record of diversions began in 1916. Currently, Cal-Am's ability to divert at this site is constrained by: (1) sediment nearly filling the reservoir and blocking the intake structure, (2) higher turbidity standards limiting the duration and period of diversion, (3) the Conservation Agreement with NMFS, and (4) SWRCB Order 2002-0002 that restricts diversions during the low-flow season.

[1] Beginning with the 2002-2003 Mitigation Report, Cal-Am production is reported on a Water Year basis, from October 1 of one Calendar Year through September 30 of the following Calendar Year. This is a change from previous annual reports in which the reporting period was July of one year through June of the following year. This change makes the mitigation report consistent with reporting requirements under SWRCB Order No. WR 95-10.

VII. WELL REGISTRATION AND REPORTING PROGRAM

Description and Purpose

All owners of wells within the District are required to register and report their annual water production. The purpose of the program is to provide annual aggregate estimates of water production from both Cal-Am and non-Cal-Am wells in the various groundwater production zones in the District. The information provided is used to make decisions regarding management of the limited water resources of the Monterey Peninsula area.

The District began its Well Registration and Reporting Program in 1980. From 1981 through 1990, well owners were allowed to report water production by one of three methods: Water Meter, Land Use, or Power Consumption Correlation. In March 1990, the District adopted Ordinance No. 48 requiring installation of water meters on all large production wells (i.e., those producing 20 or more AFY). In November 1991, District rules were further amended with the adoption of Ordinance No. 56, which extended the metering requirement to all existing medium production wells, defined as those producing between 5 and 20 AFY, and all new wells within the District. Ordinance No. 56 also eliminated the Power Consumption Correlation reporting method.

Implementation and Activities During 2012-2013

Figure VII-1 shows summaries of reported production from Cal-Am and non-Cal-Am wells in WY 2013, and **Figure VII-2** shows the WY 2012 previous year data for comparison.

Figure VII-3 compares reported production from Cal-Am and non-Cal-Am wells and surface diversions located within the Monterey Peninsula Water Resources System (MPWRS) in WY 2013 with production limits set by the District's Water Allocation Program. The MPWRS includes the Carmel River Basin, Carmel Valley Alluvial Aquifer, the coastal subareas of the Seaside Groundwater Basin, and the Laguna Seca Subarea of the Seaside Groundwater Basin. With respect to the District's Water Allocation Program limits, Cal-Am production from the MPWRS in WY 2013 was 11,434 AF, or 6,207 AF (35.2%) less than the Cal-Am production limit of 17,641 AF that was established with the adoption of Ordinance No. 87 in 1997. Preliminary calculations of available data indicate that non-Cal-Am production within the MPWRS in WY 2013 (including surface water diversions) was 3,236 AF, or 190 AF (6.3%) greater than the non Cal-Am production limit of 3,046 AF established by Ordinance No. 87. Combined production from Cal-Am and non Cal-Am sources within the MPWRS was 14,670 AF in WY 2013, which is 6,017 acre-feet (29.1%) less than the 20,687 acre-feet production limit set for the MPWRS as part of the District's Water Allocation Program. Therefore, no action is necessary at this time, although staff will continue to monitor production trends within the MPWRS and District-wide. It should be noted that this production limit set for the MPWRS did not include production from the Laguna Seca Subarea (LSS), whereas the WY 2013 production values above include the Laguna Seca Subarea. Prior to 2008, the LSS was not included in the MPWRS, but was added with the adoption of Ordinance 135 on September 22, 2008. However, the production limits in the Distict's Allocation Program did not change.

During WY 2013, District staff inspected 19 new water meter installations to ensure compliance with the District's water meter installation standards and guidelines. In addition, staff reviewed copies of eight applications for permits for construction of new wells within the District from the Monterey County Health Department. Staff also advised recipients of County well construction permits that MPWMD Water Distribution System permits were also required.

Lastly, it should be noted that 99% of the groundwater production within the District was reported by the water meter method in WY 2013. In addition, over 95% of registered well owners in the District reported annual production for their wells in WY 2013.

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MONTEREY PENINSULA WATER MANAGEMENT DISTRICT
DRAFT WATER PRODUCTION SUMMARY FOR WATER YEAR 2013

SOURCE AREAS [1, 2]	NON CAW (NON CAL-AM) WELLS						CAW (CAL-AM) WELLS		AQUIFER SUBUNIT TOTALS	
	WATER METER		LAND USE		SUB-TOTAL		WATER METER			
	NO. OF WELLS	PRODUCTION [3] (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)
AS1	8	84.6	1	0.1	9	84.7	0	0.0	9	84.7
AS2	46	165.7	36	43.0	82	208.7	4	350.3	86	559.0
AS3	133	1,090.2	48	48.1	181	1,138.4	6	[5] 5,407.2	187	6,545.5
AS4	29	974.9	7	4.2	36	979.1	1	1,955.8	37	2,934.9
SCS	6	284.6	1	1.1	7	285.8	6	3,343.7	13	3,629.4
LSS	5	510.6	2	2.7	7	513.3	5	[7] 376.6	12	889.9
CAC	12	44.9	8	13.0	20	57.9	0	0.0	20	57.9
CVU	293	667.3	45	44.6	338	711.9	0	0.0	338	711.9
MIS	115	411.4	10	6.8	125	418.2	0	0.0	125	418.2
ACTIVE	647	4,234.2	158	163.7	805	4,397.9	22	11,433.6	827	15,831.5
INACTIVE	304		33		337		11		348	
NOT REPORTING	9		5		14		0		14	
SAND CITY DESAL							0	188.3		adjusted
METHOD TOTALS:	960	4,234.2	196	163.7	1,156	4,397.9	33	11,621.9	1,189	16,019.8

NOTES:
1. Shaded areas indicate production within the Monterey Peninsula Water Resources System. The LSS was added to the Monterey Peninsula Water Resources System in Septembter 2008.

2. CAW - California American Water

3. Source areas are as follows:
   AS1 - UPPER CARMEL VALLEY - San Clemente Dam to Esquiline Bridge
   AS2 - MID CARMEL VALLEY - Esquiline Bridge to Narrows
   AS3 - LOWER CARMEL VALLEY - Narrows to Via Mallorca Bridge
   AS4 - LOWER CARMEL VALLEY - Via Mallorca Bridge to Lagoon
   SCS - SEASIDE COASTAL SUBAREAS
   LSS - LAGUNA SECA SUBAREA (Ryan Ranch Area is within LSS)
   CAC - CACHAGUA CREEK and UPPER WATERSHED AREAS
   CVU - CARMEL VALLEY UPLAND - Hillsides and Tularcitos Creek Area
   MIS - PENINSULA, CARMEL HIGHLANDS AND SAN JOSE CREEK AREAS
4. Any minor numerical discrepancies in addition are due to rounding.

5. 294.5 AF was subtracted from CAW production in AS3 to account for water provided to ASR Water Projects (ASR Wells #1, 2 and 3) in WY 2013.

6. This total includes 131.3 AF of WY 2012 ASR injection recovery; 294.5 AF of WY 2013 injection recovery; 217.9 AF from Pre-Permanent Water Rights recovery; and 2,700 AF of Native Groundwater production.

7. No water was provided to Seaside (Municipal) from CAW SCS.

DISTRICT-WIDE PRODUCTION	
SURFACE WATER DIVERSIONS:	
CAW Diversions (San Clemente Dam):	0.0
Non Cal-Am Diversions:	26.5
CAW WELLS:	
[6] SEASIDE:	3,720.3
CARMEL VALLEY:	7,713.3
Within the Water Resources System:	11,433.6
Outside the Water Resources System:	0.0
Sand City Desal	188.3
CAW TOTAL, Wells and Diversion:	11,621.9
NON CAW WELLS:	
Within the Water Resources System:	3,209.8
Outside the Water Resources System:	1,188.1
NON CAW TOTAL, Wells and Diversion:	4,424.5
GRAND TOTAL:	16,046.3

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT
DRAFT WATER PRODUCTION SUMMARY FOR WATER YEAR 2012

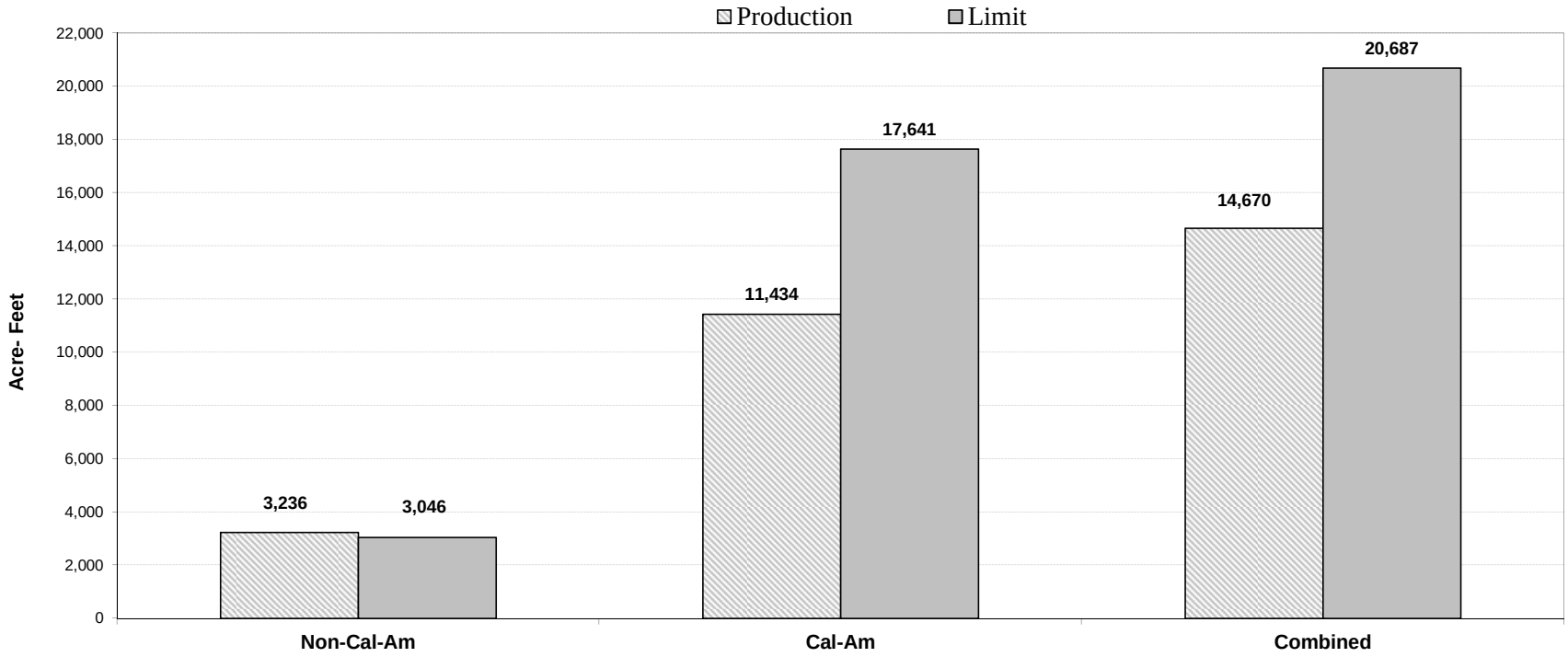
SOURCE AREAS [1, 2]	NON CAW (NON CAL-AM) WELLS						CAW (CAL-AM) WELLS		AQUIFER SUBUNIT TOTALS	
	WATER METER		LAND USE		SUB-TOTAL		WATER METER			
	NO. OF WELLS	PRODUCTION (AF) [3]	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)
AS1	7	62.2	1	0.1	8	62.3	0	0.0	8	62.3
AS2	45	136.6	36	40.1	81	176.7	3	420.7	84	597.4
AS3	126	989.5	49	52.2	175	1,041.7	6	5,464.6 [5]	181	6,506.4
AS4	30	593.0	7	2.7	37	595.8	1	1,629.1	38	2,224.9
SCS	5	263.3	1	1.1	6	264.4	5	3,925.3	11	4,189.7
LSS	7	481.5	2	2.7	9	484.2	5	369.8	14	854.0
CAC	11	104.3	7	11.6	18	115.9	0	0.0	18	115.9
CVU	288	695.3	44	44.5	332	739.8	0	0.0	332	739.8
MIS	104	434.8	10	6.8	114	441.6	0	0.0	114	441.6
ACTIVE	623	3,760.5	157	161.9	780	3,922.4	20	11,809.5	800	15,731.9
INACTIVE	342		32		374		0		374	
NOT REPORTING	16		9		25		0		25	
SAND CITY DESAL							0	242.0		adjusted
METHOD TOTALS:	981	3,760.5	198	161.9	1,179	3,922.4	20	12,051.5	1,199	15,973.9

NOTES:
1. Shaded areas indicate production within the Monterey Peninsula Water Resources System. The LSS was added to the Monterey Peninsula Water Resources System in Septembter 2008.
2. CAW - California American Water
3. Source areas are as follows:
   AS1 - UPPER CARMEL VALLEY - San Clemente Dam to Esquiline Bridge
   AS2 - MID CARMEL VALLEY - Esquiline Bridge to Narrows
   AS3 - LOWER CARMEL VALLEY - Narrows to Via Mallorca Bridge
   AS4 - LOWER CARMEL VALLEY - Via Mallorca Bridge to Lagoon
   SCS - SEASIDE COASTAL SUBAREAS
   LSS - LAGUNA SECA SUBAREA (Ryan Ranch Area is within LSS)
   CAC - CACHAGUA CREEK and UPPER WATERSHED AREAS
   CVU - CARMEL VALLEY UPLAND - Hillsides and Tularcitos Creek Area
   MIS - PENINSULA, CARMEL HIGHLANDS AND SAN JOSE CREEK AREAS
4. Any minor numerical discrepancies in addition are due to rounding.
5. 131.7 AF was subtracted from CAW production in AS3 to account for water provided to ASR Water Projects (ASR Wells #1, 2 and 3) in WY 2012.
6. This total includes 1,117 AF of WY 2011 ASR injection, 106.8 AF from Pre-Permanent Water Rights and 3,071 AF of Native Groundwater..
7. No water was provided to Seaside (Municipal) from CAW SCS.

DISTRICT-WIDE PRODUCTION	
SURFACE WATER DIVERSIONS:	
CAW Diversions (San Clemente Dam):	0.0
Non Cal-Am Diversions:	24.9
CAW WELLS:	
[6] SEASIDE:	4,295.1
CARMEL VALLEY:	7,514.4
Within the Water Resources System:	11,809.5
Outside the Water Resources System:	0.0
Sand City Desal	242.0
CAW TOTAL, Wells and Diversion:	12,051.5
NON CAW WELLS:	
Within the Water Resources System:	2,625.1
Outside the Water Resources System:	1,297.3
NON CAW TOTAL, Wells and Diversion:	3,947.2
GRAND TOTAL:	15,998.7

Figure VII-3

Comparison of Reported Production to Allocation Limits within the Monterey Peninsula Water Resources System Water Year 2013



VIII. WATER EFFICIENCY AND CONSERVATION

Description and Purpose

As a legislated function of the Monterey Peninsula Water Management District (MPWMD or District), a comprehensive water conservation program was implemented in October 1979. The Conservation Program expanded in 1983 when the District facilitated development of *The Water Conservation Plan for Monterey County*. The Conservation Plan, adopted by the MPWMD Board in 1986, included a goal to reduce demand by 15 percent of the then-estimated year 2020 demand through implementation of a number of water saving measures including retrofits, use of recycled water, education and other means. At the time the plan was adopted, 2020 demand was expected to be 24,000 AFY for the Peninsula, making the conservation goal 3,600 AF.

Ordinance No. 30, adopted in 1987, was the cornerstone conservation ordinance for the Monterey Peninsula. This ordinance required retrofit to Ultra-Low Flush 1.6 gallons per flush toilets upon resale and in new construction, remodels/additions and changes in use. The ordinance was adopted in July 1987 and codified as MPWMD Regulation XIV, Water Conservation. Regulation XIV also implemented other mandatory water saving measures and a verification process. MPWMD's Regulation XIV has been regarded as a model for other agencies.

In 2009, MPWMD undertook an extensive overhaul of Regulation XIV. Revisions incorporated new technology and best management practices and mad the regulation easier to understand. Substantial amendments to the program included significantly expanded indoor and outdoor water efficiency requirements for new construction, visitor-serving commercial uses and Non-Residential customers. For example, all Non-Residential Users that did not have 1.6 gallons-per-flush (gpf) toilets by January 1, 2010 were required to install High Efficiency Toilets (HET) by December 31, 2013. Another example is a requirement for Rain Sensors to be installed on all automatic Irrigation Systems upon Change of Ownership or Use and Expansion of Use (i.e., remodels).

Another legislated function of the MPWMD is the authority to implement and enforce water rationing. A water rationing plan developed by the Monterey Peninsula Water Management Agency (the predecessor to the MPWMD) was available when the MPWMD was established. Amendments to the plan were made in 1981 (Ordinance No. 7) and in 1988 (Ordinance Nos. 35 and 37) during drought-related rationing administered by MPWMD that continued through 1991. Water-use reductions of approximately 30 percent were achieved during the 1988-91 rationing.

In 1997, in response to SWRCB Order 95-10[1], the MPWMD Board of Directors tasked its staff with preparing a plan to address compliance with the Order (i.e., regulatory supply shortage) as well as with physical water shortages. MPWMD worked with a variety of community interests including California American Water (CAW), to conceive and develop the Expanded Water Conservation and Standby Rationing Plan (Plan), which was adopted as Ordinance No. 92 in 1998 (codified as Regulation XV). The plan consists of seven stages. The first four stages provide CAW and the District with conservation "tools" to keep community water use within

1 SWRCB Order No. WR 95-10 concluded that CAW does not have a legal right for about 10,730 AFA (about 69% of the water supplied to CAW customers) which was being diverted from the Carmel River and that diversions were having an adverse effect on the public trust resources of the river.

regulatory limits. Stages 5-7 of the Plan contain more stringent actions including per-capita rationing that would be triggered by a drought-induced water supply shortage and/or non-compliance with regulatory restrictions.

A third key element of the Conservation Program was added in 1997 when the District began issuing rebates for voluntary toilet replacements with Ultra-Low Flush (ULFT) 1.6 gallons-per-flush toilets. Initially, the District shared funding with CAW. Today, the rebate funds for CAW's customers are supported by the ratepayers through a conservation surcharge on the CAW bill, with the District administering the program.

The Rebate Program has been expanded over the years. At the end of WY 2013, the following items qualified for a rebate[2]:

Residential Indoor

- High Efficiency Toilet
- Ultra High Efficiency Toilet
- High Efficiency Residential Dishwasher
- High Efficiency Residential Clothes Washer
- Instant-Access Hot Water System
- On-demand pump or point-of source water heater as part of an Instant-Access Hot Water System

Non-Residential Indoor

- High Efficiency Toilet
- Ultra High Efficiency Toilet
- High Efficiency Urinal
- Pint Urinal
- Zero Water Consumption Urinal
- High Efficiency Residential Clothes Washer
- Commercial High Efficiency Clothes Washer
- Water Broom
- Cooling Tower Conductivity Controller
- CEE Tier II Water Efficient Ice Machine
- X-ray film processor recirculation system
- Cooling Tower pH/Conductivity Controller
- Dry Vacuum Pumps
- High Efficiency Connectionless Steamer
- Water Efficient Commercial Dishwashers
- Medical equipment steam sterilizer retrofit with a water tempering device

Outdoor Water Efficiency Rebates

- Smart (Weather-Based) Irrigation System Controller
- Soil Moisture Sensor
- Rainwater Harvesting (water storage capacity)

2 Rebates are issued when funding is available.

- Lawn removal and replacement with low water use plants or permeable surfaces
- Rotating Sprinkler Nozzles (minimum purchase and installation of ten)
- Graywater Irrigation System supplied by one Clothes Washer for irrigation and/or one or more Bathrooms that have a Bathtub/Shower connected to a Graywater Irrigation System
- Non-Residential Graywater Irrigation Systems considered on a case-by-case basis

Implementation and Activities During 2012-2013

● **Conservation Inspections** -- District staff continued an intensive inspection program to ensure compliance with the Conservation and Permit Regulations. Change of Ownership inspections make up the bulk of the District's inspection program. Most of the **1,574** properties that changed ownership in FY 2012-2013 were inspected prior to the close of escrow. **Eighty-four** percent (**84%**) of the inspected properties were found to be in compliance during the first inspection. An additional six percent (6**%**) passed during the second inspection, typically after replacing older toilets identified during the initial inspection. Subsequent enforcement is through non-compliance notice on the title of the property.

District staff inspected **660** properties for compliance with Water Permit conditions during FY 2012-2013.

A total of about **2,178** inspections were conducted in FY 2012-2013. An estimated **17.116** acre-feet (AF) of water were saved by new retrofits verified this year in these two categories.

● **Other Conservation Incentives** -- The District continued to offer incentives for property owners who agree to install water efficient appliances to offset new water fixtures as a condition of a Water Permit. Credit, in the form of water fixture units, remained available to offset new water fixtures in Remodels and Additions when an older model appliance is replaced with a High Efficiency Dishwasher (HEDW), High Efficiency Clothes Washer (HECW), High Efficiency Toilet (HET), and/or Instant-Access Hot Water (IAHW) System. This incentive program is one way to allow limited Remodeling and Additions without increasing water use.

● **Rebate Program** -- The Water Conservation Rebate Program for customers of California American Water was reinstated as of November 19, 2012, when funding became available. District staff continues to meet with local community organizations to advertise the program.

From July 1, 2012, through June 30, 2013, a total of **1,546** applications for rebates were received, **1,202** applications were approved with the use of rebate refund. **Table VIII-1** summarizes the Rebate Program for FY 2012-2013.

● **Conservation Education** -- District activities remained focused on public education and encouraging Peninsula residents and businesses to implement new water conservation and efficiency practices and to maintain existing equipment and behaviors. Individualized Water Waste education took place as necessary to remind water users not to wash sidewalks, leave hoses running or ignore leaks. Efforts again successfully kept community water use below regulatory limits. A comprehensive report on the conservation program is prepared annually and is available on the District's website.

- The District continued supporting water conservation education through the Water Awareness Committee of Monterey County (WAC). WAC is a nonprofit water-education organization serving Monterey County. The District, as a founding member, holds a seat on the WAC Board of Directors and contributes annual financial and staff support to its efforts. WAC provides books on water-efficient landscaping, Drip Irrigation, and other water related subjects to libraries in Monterey County, sponsors a school water education program and provides outreach opportunities for the public to learn about local water issues.

- District staff participated in several events during FY 2012-2013. Events included presentations at the Graniterock Contractor's Expo and at the Association of Environmental Planners Annual Conference. Outreach events included: Pebble Beach Community Services District Open House, Monterey Peninsula College Earth Day, Naval Postgraduate School Earth Day, City of Monterey's Cutting Day, City of Pacific Grove's Good Old Days, and Water Awareness Day at Del Monte Shopping Center. Staff also judged the annual Water Wise Garden Contest at the Monterey County Fair. The events provided the public with an opportunity to learn about the District's extensive activities and programs.

- District staff participated in the Monterey Business Council's Graywater Roundtable. The group was convened to establish guidelines and a process to permit and install Graywater Irrigation Systems in Monterey County. The group successfully completed the assignment and links to the County's process are provided on the District's websites.

- The District hosted two Laundry to Landscape classes. The classes were provided instruction on using graywater from the washing machine to irrigate outdoors.

- The District co-sponsored two Green Gardener courses. One course was for advanced Green Gardeners and the other focused on Graywater Irrigation System design and installation.

- District staff partnered with CAW and Water Awareness Committee to sponsor two classes exclusively for irrigation and landscape professionals on Irrigation Scheduling & Smart Controller Programming and Low Volume (Drip) Irrigation. Instruction was available in Spanish and English.

- District staff submitted comments on various development projects subject to CEQA. Projects subject to District water efficiency requirements include: September Ranch, the Cottages at Carmel, Holman Ranch and Villas de Carmelo.

- Water Demand Manager attended the leading-edge WaterSmart Innovations Conference and Exposition. The conference offered 4 sessions with choices of eight different water efficiency tracks per session.

- District staff contributed to development of a water workbook with local water-supply information for school children. The book was printed and distributed to area schools.

- The school grant program awarded grants to San Carlos School and to schools in the

Monterey Peninsula Unified School District to upgrade Irrigation System controllers and to retrofit plumbing fixtures.

- In 2012, a third CIMIS station #193 was installed in ET zone 2 at the Pacific Grove Municipal Golf Course. A second CIMIS station is located at Laguna Seca Golf Ranch. CIMIS Station #229 activated on January 1, 2011, and is located in ET zone 3. CIMIS Station #210 is located on the border of zones 3 and 6 and was activated on July 22, 2008.

- Several ordinances were approved in recent years that affect water savings.

    - Ordinance No. 144, adopted August 16, 2010, added Rebates for Cooling Tower Conductivity/pH Controllers, Dry Vacuum Pumps, High Efficiency Connectionless Food Steamers, High Efficiency Commercial Dishwashers, Graywater Irrigation Systems, retrofits of medical steam sterilizers that utilize a continuous water flow with a water tempering device, and WaterSense labeled Ultra-High Efficiency Toilets.

      The ordinance also amended the Rebate amounts for Pint Urinals (from $250 to $300), Rotating Sprinkler Nozzles (from $0.50 to $4.00 with a minimum purchase of ten), Water Efficient Ice Machines (from $450 to $500), and X-ray film processor recirculation systems (from $2,000 to $3,500), Cistern storage capacity was increased from 3,000 to 25,000 gallons with an added eligibility condition that the Site must have sufficient roof area to provide the runoff to fill the Cisterns during a normal Water Year. The ordinance also increases the maximum Lawn Rebate increases from 2,000 to 5,000 square-feet.

    - Ordinance No. 145, adopted September 20, 2010, clarified and amended rules found in the permits, conservation, and enforcement regulations of the District.

    - Ordinance No. 148, adopted April 18, 2011, amended Rule 141, Water Conservation Rebates, to implement new and additional policies related to Lawn removal Rebates adopted by the District's Board in Resolution 2011-04. The ordinance also amended portions of the Rebate Program to strengthen conditions of approval, clarified that Sites must comply with applicable District rules before Rebates are issued, and disqualified from the Rebate Program Qualifying Devices mandated by local, State or Federal water conservation programs.

Table VIII-1
Summary of Rebate Program

	Rebate Paid	Number of devices	Estimated AF	Gallons Saved
High Efficiency Toilet (HET)	57057.40	306	12.775	4,162,710
Ultra Low Flush to HET	38073.86	205	2.875	936,968
Ultra HET	3753.04	22	0.220	71,687
High Efficiency Dishwasher	31000.00	220	0.660	215,062
High Efficiency Clothes Washer	307346.14	606	10.963	3,572,245
Instant-Access Hot Water System	3777.10	19	0.000	0
On Demand Systems	800.00	8	0.000	0
Zero Use Urinals	1200.00	4	0.326	106,317
Cisterns	22152.90	76	0.000	0
Smart Controllers	240.00	2	0.000	0
Rotating Sprinkler Nozzles	0.00	0	0.000	0
Moisture Sensors	0.00	0		0
Lawn Removal & Replacement	10148.00	7	0.001	187
Ice Machines	1000.00	2	1.669	543,850
Total	**476,548.44**	**1477**	**29.489**	**9,609,026**

IX. ALLOCATION OF NEW WATER SUPPLY

The Water Allocation Program requires that each new water Connection or Expansion of Use be accounted for so that System Limits are not exceeded. Ordinance No. 70, adopted by the District Board on June 21, 1993, ended the moratorium on the issuance of new water Connections that was imposed in January 1991 as a result of the Water Allocation Program EIR. The ordinance established a consumption Allocation of water that could be used by each Jurisdiction from a total of 358 AF. This amount was based on the production capacity of the Paralta well, an interim water supply project development by the District in cooperation with California American Water (CAW) (see also **Section X**).

Of the 358 AF available from the Paralta well, a 50 AF District Reserve Allocation was established in 1993 for community benefit projects. In February 1995, Ordinance No. 73 rescinded the District Reserve and allocated the remaining water equally among the eight Jurisdictions. Of the original 50 AF, 34.72 AF remained and was distributed equally (4.34 AF each) among the Jurisdictions.

As described in Section XI of this report, specific water Entitlements associated with funding of the Pebble Beach Reclamation Project are available for areas within the Del Monte Forest pursuant to Ordinance No. 109. These Entitlements are not water "Allocations", and are tracked separately. In addition, there are several other "Entitlements" of water available to specific areas of the CAW service area.

Implementation and Activities During 2012-2013

Between August 1993 and July 2013, a total of 319.988 AF of the 342.720 AF Paralta Well Allocation had been permitted for use by Jurisdictions, leaving 22.732 AF remaining, or 6.7 percent of the Jurisdictions' Paralta well Allocations. Credits from expired or canceled Water Permits ("Pre-Paralta Credits") are tracked by Jurisdiction and may be used for Expansions of Use and New Connections similar to the Paralta Allocation. Finally, credits that were received for public retrofit projects from March 1995 to July 1998 (pursuant to Ordinance Nos. 75 and 91) and Water Use Credits that were transferred to a Jurisdiction are tracked as "Public Credits." **Table IX-1** provides the status of water Allocations for each Jurisdiction as of June 30, 2013.

Table IX-2 summarizes the Entitlements of water available to specific areas of the CAW service area.

In April 2005, the first Water Use Permits were issued to property owners in the Del Monte Forest who purchased water from the PBC. By June 30, 2013, the District had issued Water Use Permits allowing **119.39** AF to be transferred from the PBC to independent property owners in the Forest. Property owners taking advantage of this program pay PBC for the Entitlement and receive documentation of their purchase. The District processes and records a Water Use Permit

on the title of the property that provides notice of the amount of Water Entitlement available. Regular Water Permits are required when the property owner desires to use the water available from a Water Use Permit. As of June 30, 2013, **33.636** AF of Water Use Permit water had been used to permit new and expanded uses.

Ordinance No. 132. In January 2008, the Board adopted Ordinance No. 132 (adding Rule 23.6) to allow the expansion and extension of the CAW System to provide Connections to, and Potable water service for the use on and benefit of property located within Sand City. This rule enables the issuance of Sand City Water Use Permits for new and expanded water uses on Sand City sites, in a cumulative amount of no more than 206 AFA. As of June 30, 2013, **eight** Water Use Permits and Water Permits had been issued for a total of **2.419** AF.

Table IX-1

ALLOCATION REPORT
Reported in Acre-Feet
Water Year 2013

Jurisdiction	Paralta	Pre-Paralta Credits	Public	Total Water Available
Airport District	5.224	0.000	0.000	5.224
Carmel-by-the-Sea	1.397	1.081	0.842	3.320
Del Rey Oaks	0.000	0.000	0.000	0.000
Monterey	0.065	0.030	6.601	6.696
Monterey County	10.345	0.000	2.424	12.769
Pacific Grove	0.000	1.188	0.228	1.416
Sand City	0.000	0.000	23.373	23.373
Seaside	5.701	34.438	1.359	41.498
TOTALS	22.732	36.737	34.827	94.296

Allocation Holder	Total Demand from Water Permits Issued	Remaining Water Available
Quail Meadows	31.811	1.189
Water West	8.018	4.702

* Does not include 15.280 AF from the District Reserve prior to adoption of Ordinance No. 73.

Table IX-2

ENTITLEMENT REPORT
Reported in Acre-Feet
Water Year 2013

Entitlement Holder	Entitlement	Total Demand from Water Permits Issued	Remaining Entitlement/and Water Use Permits Available
Pebble Beach Co. [1]	245.610	11.473	234.137
Del Monte Forest Benefited Properties [2] **(Pursuant to Ord No. 109)**	119.390	33.636	85.754
Macomber Estates	10.000	9.595	0.405
Griffin Trust	5.000	4.809	0.191
CAWD/PBCSD Project Totals	**380.00**	**59.513**	**320.487**

Entitlement Holder	Entitlement	Total Demand from Water Permits Issued	Remaining Entitlement/and Water Use Permits Available
City of Sand City	165.00	2.419	162.581

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Increases in the Del Monte Forest Benefited Properties Entitlement will result in reductions in the Pebble Beach Co. Entitlement.

X. WATER-USE TRENDS

Description and Purpose

Based on data provided by Cal-Am, District staff tracks water use (Cal-Am metered consumption) over time to assess community water-use trends. These data are used in water-supply planning (augmentation) as well as development of conservation programs (e.g., assess the degree of conservation savings needed and the effectiveness of conservation programs).

Implementation and Activities During 2012-2013

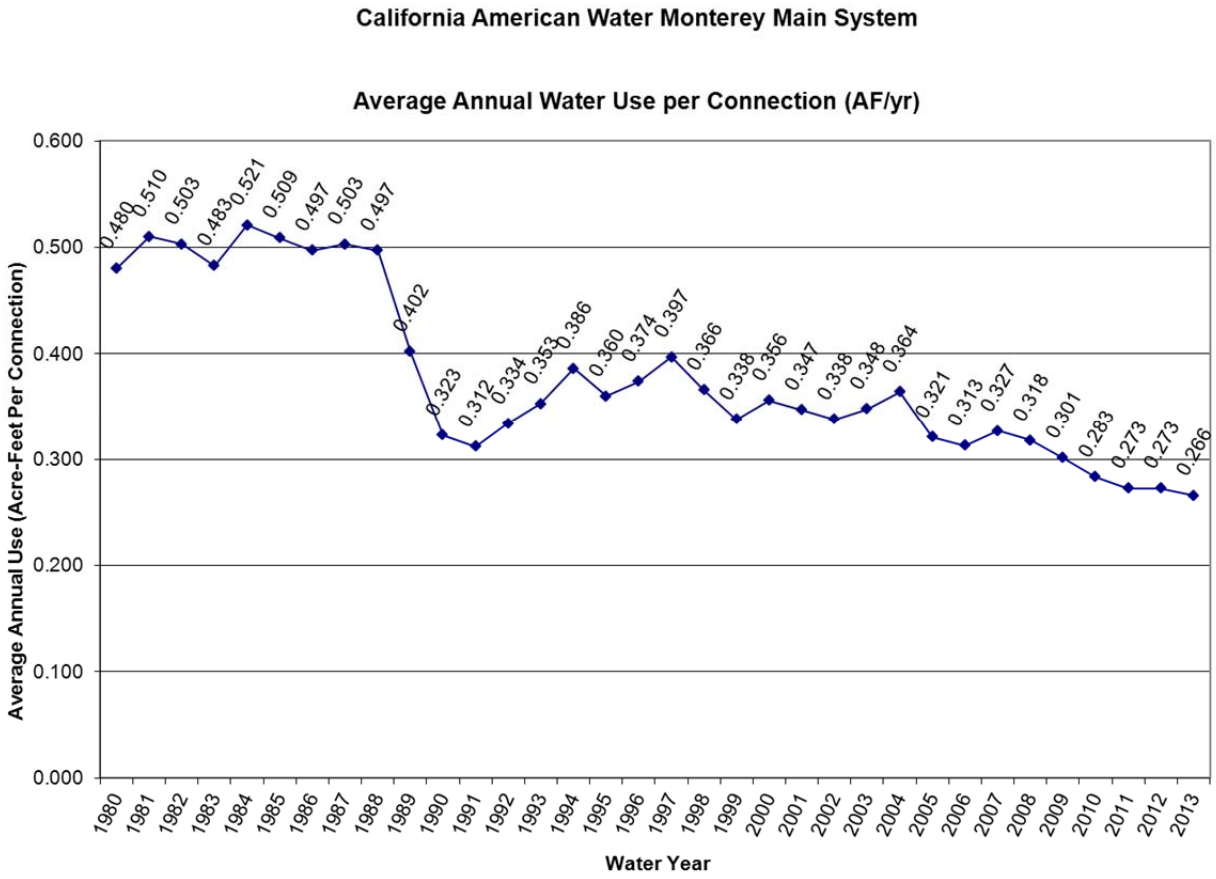
Water-use trends may be tracked by using production data at the well head, as described above, or by considering Cal-Am metered consumption information, as described below. **Figure X-1** provides water-use trends from 1980 through 2013, as represented by consumption in AF per Cal-Am connection (AF/connection) for customers[1] in the Cal-Am's Monterey Co. District (i.e., the "Main System"). This is based on Cal-Am annual "Customers & Consumption by Political Jurisdiction & Classification" reports that provide water-use information for each political jurisdiction and Cal-Am system subunits, as well as several user classifications. For WY 2013, the use per connection is based on Cal-Am's total metered consumption[2] (10,266 AF) divided by Cal-Am's total customers (38,595) and equaled 0.266 AF/connection.

Water consumption per connection in WY 2013 was the lowest rate on record during the 1980-2013 period, likely due in part to increased awareness of the need for conservation and higher water charges, and possibly depressed economic conditions. Review of **Figure X-1** indicates that water use per connection for the last 24 years (1989-2013) is significantly less than in the preceding 9 years (1980-1988). The sharp decline in WYs 1989, 1990, and 1991 is attributable to mandatory water rationing in response to the 1987-1991 drought period. From 1989-2013, annual water consumption has remained relatively stable, with a range from approximately 0.27 to 0.40 AF/connection, and average of 0.335 AF/connection, compared to the average of 0.500 AF/connection for the 1980-1988 period. Notably, water consumption in WY 2013 (0.266 AF/connection) was 53% of the pre-drought consumption in RY 1987 (0.503 AF/connection).

[1] Includes residential, multi-residential, commercial, industrial, golf course, public authority, other and non-revenue metered connections.

[2] Excludes Cal-Am satellite systems with separate well sources (i.e., Ryan Ranch, Hidden Hills, Bishop, Ralph Lane, Chualar and Ambler). Also excludes water supplied to MPWMD by Cal-Am wells to irrigate Carmel River riparian vegetation as part of the Allocation EIR Mitigation Program.

Figure X-1. California American Water Use Per Connection for Main System: 1980 – 2013



XI. WATER DISTRIBUTION SYSTEM MANAGEMENT (WATER PERMITS)

Description and Purpose

The Monterey Peninsula Water Management District (MPWMD or District) balances water supply and demand by carefully tracking the amount of allotted water used by the Jurisdictions. The Monthly Water Allocation Program Report, found in the District's regular meeting Board packet, summarizes the amount of water available to each Jurisdiction. The current Allocation system, implemented after adoption of the Water Allocation Program EIR, replaced a system based on each Jurisdiction receiving a percentage of the total available production. The current process makes only newly developed water supplies available for new and expanding uses through an Allocation by Jurisdiction system, which is tracked every time a Water Permit is issued. In mid-1993, water from the Paralta Well project resulted in an Allocation of water to the Jurisictions, ending a moratorium that was established in 1989.

In addition to Allocations for each of the eight Jurisdictions within the District, there are several separate Water Entitlements: Water West, a water company purchased by California American Water (CAW) in the early 1990's, has an independent Entitlement of water for properties within the boundaries of the former system. Properties located in the Quail Meadows subdivision, Pebble Beach Company (PBC) properties, Hester Hyde, Griffin Trust, and J. Lohr properties also have an independent Entitlement of water. Water from the PBC's Entitlement can be assigned to other properties located within the Del Monte Forest (Pebble Beach).

Implementation and Activities During 2012-2013

● **Permit Activity** -- From July 1, 2012, through June 30, 2013, a total of **828** Water Permits were issued. As shown in **Table XI-1**, **21** new residences and **357** residential Remodels/additions were permitted in the CAW system. There were **56** Non-Residential Water Permits issued for Remodels/Additions and Changes of Use in the CAW system. As of June 30, 2013, a total of **94.296 AF** of water remained available in the areas served CAW, as described in Section IX. This includes water from pre- and post-Paralta Allocations and water added to a Jurisdiction's Allocation from Water Use Credit transfers and public retrofits.

● **Reclamation** – The Carmel Area Wastewater District/Pebble Beach Community Services District (CAWD/PBSCD) Recycled Water Project began operation in 1994, producing Reclaimed Water to replace Potable water previously used to irrigate golf courses and recreational open space in the Del Monte Forest (Pebble Beach area). At the start of operation, the District released Water Entitlements to the project sponsors for their fiscal participation. The PBC received 365 AF, Macomber Estates received 10 AF, and the Griffin Trust received 5 AF. The District retains 420 AF of the project's estimated savings of 800 AFA; none of the District share has been allocated.

Ordinance No. 109. In May 2004, the Board adopted Ordinance No. 109 (amending Rule 23.5) to enable financing of upgrades to the CAWD/ PBCSD Recycled Water Project. This ordinance enabled Water Entitlements held by the PBC to be made available to properties throughout the

Del Monte Forest in order to finance the Project Expansion. Ordinance No. 109 also provided a framework for several ancillary agreements for financing, construction and operation, and sale of Recycled Water.

In April 2005, the first Water Use Permits were issued to property owners in the Del Monte Forest who purchased water from the PBC. By June 30, 2013, the District had issued Water Use Permits allowing **119.39** AF to be transferred from the PBC to independent property owners in the Forest. Property owners taking advantage of this program pay PBC for the Entitlement and receive documentation of their purchase. The District processes and records a Water Use Permit on the title of the property that provides notice of the amount of Water Entitlement available. Regular Water Permits are required when the property owner desires to use the water available from a Water Use Permit. As of June 30, 2013, **33.636** AF of Water Use Permit water had been used to permit new and expanded uses (see **Section IX**).

Ordinance No. 132. In January 2008, the Board adopted Ordinance No. 132 (adding Rule 23.6) to allow the expansion and extension of the CAW System to provide Connections to, and Potable water service for the use on and benefit of property located within Sand City. This rule enables the issuance of Sand City Water Use Permits for new and expanded water uses on Sand City sites, in a cumulative amount of no more than 206 AFA. As of June 30, 2013, **eight** Water Use Permits and Water Permits had been issued for a total of **2.419** AF.

- **Interagency Coordination** -- District staff continues extensive coordination with community development personnel from the local Jurisdictions to facilitate communication regarding the Water Permit process. Presentations on the local water-supply situation are given regularly, and meetings are held to discuss permit procedures and to answer questions about Allocation management. Through these meetings, rapport has been developed with the local agencies, making the management of water supplies more productive and accurate.

Table XI-1
Summary of Water Permits Issued

CALIFORNIA AMERICAN WATER **Main System** **(July 2012-June 2013)**			
Type of Water Permit	**No. of Permits**	**Capacity (Acre-Feet)**	**Average Use Per Permit (Acre-Feet)**
New Residential	21	0.151	0.008
• *Pebble Beach Entitlements**	8	0.555	0.070
• *Sand City Entitlement**	27	0.732	0.028
Residential Remodels/Additions	357	0.142	0.001
• *Pebble Beach Entitlements**	17	1.104	0.065
• *Sand City Entitlement**	0	0	0
New Non-Residential	4	0.046	0.012
• *Pebble Beach Entitlements**	1	0.250	0.250
• *Sand City Entitlement**	0	0	0
Non-Residential Remodels/Additions	56	1.456	0.026
• *Pebble Beach Entitlements**	0	0	0
• *Sand City Entitlement**	0	0	0

**Pebble Beach and Sand City Entitlements are tracked separately from Main California American Water System permits.*

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XII. MONITOR PRODUCTION AND COMPLIANCE WITH SWRCB ORDER WR 2009-0060

Implementation and Activities During 2012-2013

Regarding compliance with SWRCB Order WR 2009-0060, Cal-Am target production from the Carmel River Basin in WY 2013 for the SWRCB tally was based on the initial regulatory limit of 10,978 AF. This number was then reduced by the CDO reduction of 791 AF, and by the WY 2013 Sand City Desalination Project production of 188 AF, resulting in an adjusted base amount of 9,355 AF (this amount includes adjustment for 644 AF of ASR recovery that occurred in WY 2013). Actual Cal-Am Carmel River Basin diversions (after adjustments) for WY 2013 were 7,713 AF. Thus, Cal-Am reported diversions were 1,642 AF below the adjusted diversion limit from the Carmel River Basin imposed by the SWRCB. WY 2013 was the 16th straight year in which compliance with Order WR 95-10 was achieved and the fourth year for compliance with Order WR 2009-0060. A major purpose of the District's *Expanded Conservation Plan and Standby Rationing Program* is to ensure continued compliance with the SWRCB Orders. The community was in Stage 1 of the conservation program throughout the 2012-2013 reporting period.

XIII. MONITOR PRODUCTION AND COMPLIANCE WITH MPWMD ALLOCATION LIMITS

Description and Purpose

The adoption of Ordinance No. 70 in June 1993 revised the Monterey Peninsula Water Resource System (MPWRS) supply limit from an annual production limit of 19,881 acre-feet per year (AFY) to 20,673 AFY. The Cal-Am annual production limit of 16,744 AFY (Option V from Finding No. 403 of the Final Water Allocation Program EIR; Ordinance No. 53) was revised to 17,619 AFY, and the non-Cal-Am production limit of 3,137 AFY was revised to 3,054 AFY. This new water supply limit reflected the 385 AFY of new water production allocation from the Paralta Well project and minor adjustments to reflect the integration of the Water West system into the Cal-Am system, the annexation of Quail Meadows Subdivision into Cal-Am, and the refinement of the non-Cal-Am production estimate.

Ordinance No. 83, adopted in April 1996, set Cal-Am's annual production limit at 17,621 AFY and the non-Cal-Am annual production limit at 3,046 AFY, based on permanent reductions in water use by non-Cal-Am water users in exchange for water service from Cal-Am. As part of the agreement, 15% of the historical non-Cal-Am production was set aside to meet the District's long-term water conservation goal. Based on these changes, a new limit for the MPWRS as a whole was set at 20,667 AFY.

The Cal-Am production limit was again amended in February 1997, when Ordinance No. 87 was adopted as an urgency ordinance to provide a special community benefit reserve allocation of 19.6 AFY of production to the Community Hospital of the Monterey Peninsula. Ordinance No. 87 increased the total annual Cal-Am production limit to 17,641 AFY, but did not change the non-Cal-Am limit. Thus, the new limit for the MPWRS as a whole is 20,687 AFY.

In addition to District-imposed production limits as part of its Water Allocation Program, Cal-Am must also comply with limits set by the State Water Resources Control Board (SWRCB) in 1995 as part of Order WR 95-10. The Order includes a provision that Cal-Am water diversions (surface and groundwater production) from the Carmel River basin should not exceed 11,990 AF in Water Year (WY) 1996, and not exceed 11,285 AF in WY 1997 and subsequent years. In 2009, the SWRCB issued Order 2009-0060, which further modified the Cal-Am production limits and imposed a production ramp-down schedule by water year (see **Section XII**). A water year begins on October 1 and ends on September 30 the following year. The District program to monitor water use includes tracking Cal-Am compliance with the SWRCB goals.

Implementation and Activities During 2012-2013

District staff continued to manage the overall supply budget, sending periodic reports to the cities and/or county and providing updates and general information as needed. The monitoring programs initiated by Ordinance Nos. 52 and 53 continue to be implemented. Beginning with the 2001-2002 Annual Report, the District changed the reporting period for the Well Registration and Reporting Program from a Reporting Year (July 1-June 30) to a Water Year (October 1-September 30) to be consistent with the SWRCB Order reporting requirements, and other

hydrological reporting programs. The 2000-2001 Annual Mitigation Report was the last report in which groundwater production within the District was presented in a Reporting Year format. Water production tables for the current year in this report use WY 2013 data (October 1, 2012 through September 30, 2013).

As shown in **Table XIII-1**, total water produced within the Monterey Peninsula Water Resources System during WY 2013 was 14,670 AF, or about 71% of the total Water Allocation Program limit. Cal-Am's WY 2013 production of 11,434 AF is about a 3% decrease compared to WY 2012 production. Non-Cal-Am WY 2013 production of 3,236 AF (including surface diversions) is a 22% increase compared to WY 2012 production. In WY 2013, Cal-Am accounted for about 78% of total production within the MPWRS.

Regarding compliance with Cal-Am production limits imposed by MPWMD as part of the Water Allocation Program, Cal-Am water production from the MPWRS in WY 2013 was 11,434 AF, 65% of the annual limit (**Table XIII-1**).

Table XIII-1
MPWMD ALLOCATION LIMIT COMPARED TO WATER PRODUCTION[1] IN THE MONTEREY PENINSULA WATER RESOURCE SYSTEM
Data from Water Years 2012 and 2013

WATER USER	ALLOCATION LIMIT	WY 2012 PRODUCTION	% LIMIT	WY 2013 PRODUCTION	% LIMIT
Cal-Am	17,641 AF	11,810 AF	67%	11,434 AF	65%
Non-Cal-Am	3,046 AF	2,650 AF	87%	3236 AF	106%
TOTAL	**20,687 AF**	**14,460 AF**	**70%**	**14,670 AF**	**71%**

Notes:
1. MPWRS includes production from the Carmel River and underlying Carmel Valley alluvial aquifer, Coastal Subareas and Laguna Seca Subarea of the Seaside Groundwater Basin. Does not include Sand City desal plant production.
2. The Water Year (WY) runs from October 1 to September 30.
3. The non Cal-Am Production figures include non Cal-Am surface-water diversions.

Source: MPWMD production reports

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[1] Production values (table above) are based on amounts of water diverted and pumped and are, therefore, higher than the metered sales figures for water delivered to customers.

XIV. DETERMINE DROUGHT RESERVE

Description and Purpose

In conceptual terms, drought reserve can be defined as the balance between water supply and water demand that is necessary to insure a specified level of drought protection. The question that remains is how much protection is "adequate". There is no universally accepted standard for quantifying "adequate" levels of drought protection for municipal water supply systems. Moreover, drought protection can be measured in a number of ways including safe or firm yield, annual shortfalls, frequency or severity of water rationing, carryover storage, or some indicator of environmental stress.

For the MPWMD, the level of desired drought protection has been specified by the Board of Directors in terms of water rationing. Adequate drought protection exists as long as the frequency of mandatory water rationing is less than predetermined standards. The determination of whether or not mandatory water rationing would be imposed during a reoccurrence of particular drought periods is based on simulated system operations for the 1958-2002 period of record.

In more specific terms, drought reserve can be expressed as the total usable storage in the Monterey Peninsula Water Resources System that is required on May 1 to limit mandatory water rationing to the predetermined frequency. The total storage that is required includes carryover storage for use during the following water year and the storage necessary to satisfy the demand that is expected to occur during the remainder of the current water year. In August 1993, the Board adopted a drought protection goal that allows no more than 20 percent mandatory water rationing two percent of the time, or two out of 100 years, on average.

Implementation and Activities During 2012-2013

In 2013, District staff determined that approximately **24,478 acre-feet (AF)** of usable storage were required on May 1, 2013 to avoid requesting a District-wide voluntary 15 percent reduction in water demand. Similarly, approximately **19,222 AF** were required to avoid imposing mandatory 20 percent water rationing. Given that actual, usable storage on May 1 was estimated at **29,950 AF**, no demand reductions beyond existing Stage 1 restrictions were necessary for 2013 based on physical water availability. The 2013 trigger values are based on the maximum California American Water (CAW) production limit set by the State Water Resources Control Board in Order No. WR 2009-0060 (10,187 AF) for CAW's diversions from the Carmel River, the maximum production limit for CAW's diversions from the Coastal Subareas of the Seaside Groundwater Basin set by the Court as a result of the Seaside Groundwater Basin adjudication (2,669 AF), and the non CAW water production limit that was specified in the District's Water Allocation Program (3,046 AF). The 2013 trigger value for requesting voluntary 15 percent water conservation includes the water demand for the remainder of the current water year (8,550 AF) and one full year of carryover storage (15,928 AF).

XV. AUGMENT WATER SUPPLY

The Findings for Adoption of the Water Allocation Program EIR identified a set of general mitigation measures that relate to increasing the water supply. Finding No. 403-A states that the District shall pursue construction of a major, long-term water supply project to provide water for restoration of the environment and for public water supply. Finding No. 403-B states that the District should pursue a series of smaller "near-term" water supply projects to provide additional water for drought protection and some new growth until the long-term project is completed.

In 1996, District efforts related to both long-term and near-term projects were consolidated into the MPWMD Water Augmentation Plan (WAP). The first WAP report was received by the Board in December 1996, and specific goals were adopted in January 1997. Revised WAP objectives were set in January 1998, April 2000, and March 2001. Since 2001, the MPWMD Board has held Strategic Planning Workshops to set strategic planning initiatives, set goals and objectives to guide District activities, receive progress reports and provide policy guidance. Augmenting the water supply remains a major focus.

Activities for the July 2012 through June 2013 reporting period were guided by goals and objectives in the Strategic Plan adopted by the Board on April 18, 2011, as revised by a new Strategic Plan adopted on April 15, 2013. As described below, the 2011 Plan directed staff to pursue five Water Projects; the 2013 Plan clarified these goals, and added two new project categories.

To maintain consistency with the Water Allocation Program EIR, the following sections describe MPWMD efforts for long-term and near-term projects separately. In practice, District water augmentation efforts are integrated. For aquifer storage and recovery (ASR), the long-term MPWMD ASR Phase 1 and Phase 2 Projects and associated water rights will be described under Section XV-A; the annual ASR testing activities will be discussed under Section XV-B.

A. Long-Term Water Supply Project

Description and Purpose

The overarching District water supply purpose is to provide a reliable supply to meet long-term community needs while sustaining the environmental quality of the Monterey Peninsula Water Resource System (Carmel River and Seaside Basins). The following paragraphs provide a detailed setting due to the complexity of the water supply situation. This background information is followed by a review of action in July 2012 through June 2013. Additional information is provided by the General Manager at the monthly regular board meetings, available on the District website at: http://www.mpwmd.dst.ca.us/asd/board/meetings/meeting.htm (click on desired year and month).

Carmel River Basin Setting: In November 1995, the electorate did not approve the then-proposed 24,000 acre-foot (AF) New Los Padres Dam and Reservoir (NLP) Project, and did not authorize the District to issue revenue bonds for the project. Since then, the District has focused its efforts on non-dam alternatives through its Water Augmentation Plan and Strategic Planning Workshops. The District extensively participated in the 1999-2002 California Public Utilities Commission (CPUC) “Plan B” process to identify a non-dam alternative to the NLP; and the District

continues to work with California American Water (CAW or Cal-Am) and other local agencies on water supply solutions.

The State Water Resources Control Board (SWRCB) decisions on Carmel River issues in July 1995 continued to influence water augmentation efforts through June 2013. The SWRCB Order WR 95-10 identified an estimated 10,730 acre-feet per year (AFY) of historical unpermitted CAW diversions from the Carmel River that must be replaced by another water project or projects. Order 95-10 includes a "one-for-one replacement" requirement, whereby any new water that is developed must first completely offset the 10,730 AFY unlawful diversions from the Carmel River before any water can be used for new construction or remodels that intensify water use in the CAW system. Thus, near-term projects could potentially serve as a source of "supplemental water" to provide for the needs of existing legal lots of record and other future needs only when Order 95-10 requirements have been fully satisfied by a larger project or series of projects.

On January 15, 2008, the SWRCB issued a draft Cease and Desist Order (CDO) against CAW. The draft CDO asserted that compliance with Order 95-10 had not yet been achieved after 12 years, and that CAW water diversions to serve the community continue to have adverse impacts to fish, wildlife and their habitat, with particular reference to federally protected species such as the Carmel River steelhead fish and California red-legged frog. The draft CDO proposed a series of cutbacks in CAW water diversions that would result in a 50% reduction in community water use in Water Year 2015. Extensive fines could be levied against CAW, which potentially could pass them on to the community, if compliance was not achieved. Given that the Monterey Peninsula already has one of the lowest water-use rates in the state, concerns have been consistently expressed about the feasibility of the cutbacks in the draft CDO and/or health and safety, economic and quality of life impacts to the community.

CAW protested the draft CDO and was granted a formal hearing before the SWRCB. The District and several other entities testified at SWRCB hearings in June-August 2008 regarding: (1) compliance with Order 95-10 and the State Water Code; and (2) recommended content of the final CDO, and rationale for changes.

After several additional draft versions, the SWRCB Board issued the Final CDO on October 20, 2009. This would result in nearly a 50% reduction in Water Year 2017 (begins October 1, 2016). The District (and other parties) subsequently filed suit to challenge this ruling, and the Monterey County Superior Court issued a stay on November 3, 2009. In response to a challenge by SWRCB, the Court ruled on November 23, 2009 that the stay will remain in effect until a hearing outside of Monterey County was held on April 22, 2010 (pursuant to SWRCB request for change in venue). On April 22, 2010, the Santa Clara County Superior Court lifted the stay, that is, determined that the CDO is in effect and will remain in effect until litigation is resolved. District Counsel and staff, at the direction of the Board, subsequently continued to actively participate in CDO settlement and mediation efforts.

The District website includes *Answers to Frequently Asked Questions about the CDO* (FAQ), with emphasis on District permits, CAW connections, rationing, etc. This FAQ also addresses a May 2010 submittal by CAW to the CPUC requesting a moratorium on new connections in its Monterey District Main System, with certain exceptions. The most recent version of the CDO FAQ dated February 2011 is located on the District website at:

http://www.mpwmd.dst.ca.us/CDO/FAQ/CDO_FAQ_20110202_HS.pdf

The District also participated in CPUC procedures regarding CAW's moratorium request to ensure that exempted areas are clearly identified and certain text is clarified to be consistent with previous action. On January 25, 2011, a proposed decision was issued by Administrative Law Judge (ALJ) Gary Weatherford. The full Commission acted on March 24, 2011. The proposed and final decision is available on the District website at:
http://www.mpwmd.dst.ca.us/puc/CAWMoratorium_2011/InfoPage.htm

On June 4, 2013, the SWRCB held its regular business meeting in Monterey. The District, Cal-Am and the Monterey Peninsula Regional Water Authority gave presentations on compliance with the CDO. The District's presentation is provided on its website at:
http://www.mpwmd.dst.ca.us/Presentations/2013Presentations/SWRCB%20Presentation%206-4-13.pdf

The District also co-hosted a June 5, 2013 for the SWRCB to visit San Clemente Dam and the Sleepy Hollow Steelhead Rearing Facility. The General Manager held a follow-up meeting with the SWRCB Chairman Marcus on June 7, 2013 to reinforce District goals with respect to metering mixed-use projects during the moratorium, treatment of local water projects, and rationing.

Seaside Basin Setting: Though much attention is focused on the Carmel River Basin due to Order 95-10 and subsequent orders, management of the Seaside Basin also has important ramifications for long-term community water supply. SWRCB Order 95-10 directs CAW to maximize pumping in the Seaside Basin to the extent practicable in order to reduce diversions from the Carmel River. Thus, since 1995, the Seaside Basin has become an increasingly important source of water supply. Unfortunately, it has also exhibited signs of stress from over-pumping due to Order 95-10 as well as significant increases in non-CAW use. In December 2000, the MPWMD Board directed staff to begin planning activities to prepare a Seaside Basin Groundwater Management Plan (SBGMP) in compliance with protocols set by the State of California (AB 3030 as amended by SB 1938), in coordination with major well owners in the basin. In 2002, the District began evaluating two conceptual interim ordinances that would be in place until the long-term SBGMP is adopted, but this effort was terminated in 2004.

Complicating this task was litigation filed by CAW on August 14, 2003 requesting a Court adjudication of the Seaside Basin. The lawsuit involved issues such as: (a) prioritization and quantification of water rights within the basin; (b) rights to aquifer storage within the basin; (c) rights to artificially introduce non-native water into the basin through direct injection or spreading grounds; (d) a judicial determination that the basin is in overdraft; and (e) the appointment of a Watermaster to manage the basin water rights and resources. The District was recognized as an interested party and participated in all proceedings, including a non-jury trial in December 2005. District staff served as expert witnesses in the hearing and helped prepare extensive pre-trial documentation.

Judge Robert Randall rendered a Final Decision on March 27, 2006 (as amended). The Decision determined that the Seaside Basin is in overdraft; quantified water rights for parties with overlying water rights ("Alternative Producers"); and set a reduced "natural safe yield" and a near-term "operating yield" allowed to be produced by certain parties with appropriative rights ("Standard Producers") as they work toward a "physical solution" (including ASR and wastewater reclamation)

to eliminate the overdraft. A nine-member Watermaster Board was created to implement the Decision with continued oversight by the Court. The MPWMD holds one seat on the Watermaster Board with two out of 13 votes; a MPWMD Board member serves as the MPWMD representative. The Watermaster has generally held monthly meetings since its formal commencement on April 5, 2006. The Watermaster website is at: http://www.seasidebasinwatermaster.org/.

District staff sits on the Watermaster Technical Advisory Committee and contributes data and analysis for several technical reports required by the Court. MPWMD staff and consultants, along with other partners, have been retained by the Watermaster to provide contract technical services, including project management, data collection, and preparation of documents required by the Court as part of the Seaside Basin Monitoring and Management Program.

Water Supply Needs: Community water-augmentation efforts have focused on compliance with Order 95-10 and the Seaside Basin Adjudication. A special Board workshop was held on August 25, 2011 to review the ramifications of the required cutbacks in the Carmel River and Seaside Basins, along with progress on five MPWMD Water Projects. The materials on required cutbacks are provided at:
http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2011/20110825/ppt/item3_A.pdf
A revised table dated September 27, 2011 on the "water supply gap" is provided at:
http://www.mpwmd.dst.ca.us/MPWMDSupplyGapPagesRevised.pdf

Discussion continues on what the targeted water supply amount should be, which depends on various technical, legal and economic assumptions as well as stated goals. The Monterey Peninsula Regional Water Authority, through its Technical Advisory Committee, asked the District in May 2012 to evaluate the necessary water supply required by a new project or projects. The MPWMD staff memorandum provided to the Board at its May 21, 2012 meeting is available at:
http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2012/20120521/10/item10_exh10a.htm.

Participation in Regional Water Supply Project Planning and Selection: The District has adopted a leadership position in the community with respect to regional water supply planning related to the community's compliance with Order 95-10 and the Seaside Groundwater Basin adjudication. This reflects previous Board goals to have meaningful influence over the type, management and financing of the selected regional project, with emphasis on accountability to the community. Over the years since 2004, CAW has proposed regional projects known as the Coastal Water Project, the Regional Water Project, or the Regional Desalination Project. District participation in the CPUC approval process for a large CAW project has accounted for significant staff and legal effort. Since 2011, District staff has met with representatives of Monterey County, Marina Coast Water District (MCWD), and CAW to discuss governance of a regional project.

The regional project originally proposed by CAW focused solely on legalizing the existing supply; a second, expanded phase would be needed to address future needs of the jurisdictions such as legal lots of record and new subdivisions to be served by CAW. Thus, the portfolio of MPWMD water projects was viewed as either a replacement for the regional project, if it did not move forward, or as an adjunct to facilitate needed future supply. On January 17, 2012, CAW announced that it was withdrawing support for the Regional Desalination Project (formerly in partnership with Monterey County and MCWD), effectively terminating that project. The announcement came on the heels of

Judge Villareal's December 22, 2011 ruling that MCWD should have been the lead agency on the project EIR (not the CPUC).

On April 23, 2012 Cal-Am submitted a new application (A.12-04-019) to the CPUC for new water supply project, comprised of desalination, groundwater recharge and ASR. This project is currently known as the Monterey Peninsula Regional Water Project (MPRWP). In May 2012, the District Board voted to become involved in the CPUC process as a formal Party. The District's initial position statement included support, in concept, for the Groundwater Replenishment (GWR) and ASR components of the proposed project, and a desire to lend the Districts capabilities as a public agency to help the desalination component achieve the lowest cost impact on ratepayers. On June 4, 2012, the District filed its pre-hearing conference statement regarding CAW's application. This process continues to evolve as new facts emerge and the projects become refined over time.

In addition to CAW's proposed MPRWP project, two other possible regional projects exist:

1. "Deep Water Desal" -- A desalination project to be located in Moss Landing proposed by private investors that features a deep water intake to avoid harm to shallow marine organisms, and co-location with the power plant to serve a large computer "server farm" in association with the City of Salinas; and

2. "The People's Water Project" -- A desalination project to be located in Moss Landing proposed by private investors that would partner with a public agency to deliver water to the Salinas Valley and Monterey Peninsula.

Monterey Peninsula Regional Water Authority (MPRWA or Authority): In early 2012, the mayors of six peninsula cities -- Carmel-by-the-Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City and Seaside -- created a Joint Powers Authority (JPA) called the Monterey Peninsula Regional Water Authority. According to its website, the Authority's goal to find a solution to the pending Peninsula water shortage due to the SWRCB's Cease and Desist Order and the Seaside Basin Adjudication. The Authority is concerned that the community has been unable to reach a consensus on a water supply solution, and if a project is not in place by the CDO deadlines, the community will face severe rationing and an economic crisis. The Authority believes in a portfolio approach to achieve an adequate and cost-effective water supply for the Peninsula while addressing public concerns about the transparency of the project development process, and about the projected increased cost of water. The Authority website is: www.mprwa.org.

The Authority first met on February 9, 2012, and invited MPWMD General Manager Stoldt to serve on its Technical Advisory Committee (TAC). District staff attended the first Authority TAC meeting on March 15, 2012, and continues to play an important role on the TAC. The District General Manager was elected as chair of the TAC at its July 2, 2012 meeting. The Authority also retained its own consultant to provide an independent, unbiased, third-party cost assessment of the three proposed regional desalination projects, as well as an evaluation of schedules and financing.

MPWMD Board Water Supply Project Priorities for 2012-2013: On April 18, 2011, the Board adopted its Strategic Plan, which includes pursuit of the following five Water Projects:

Water Project 1 (ASR Phase 1): Inject at least 1,111 AF of water in the 2011 season (assuming adequate stream flow), with infrastructure in place to enable operation at full capacity.

Water Project 2 (ASR Phase 2): Complete project and expand production capability by at least 500 AF to meet SWRCB deadline for small water projects.

Water Project 3 (MPWMD "95-10 Desalination Project"): Assess the potential for development of local desalination facilities with the goal to establish a contingency project if the CAW desalination project is delayed; analyze options, including the Naval Postgraduate School site (priority site), and funding sources.

Water Project 4: Support the Monterey Regional Water Pollution Control Agency (MRWPCA) Groundwater Replenishment Project, as feasible, including cooperation on public outreach and a pilot project.

Water Project 5: Investigate Los Padres Reservoir Expansion, including a preparation of technical evaluation ("white paper"). Options include dredging or seasonal raising of the spillway level via a "rubber dam."

The August 25, 2011 MPWMD special meeting and workshop on water supply included an overview of pending reductions in Carmel Valley and Seaside, an overview of progress on the five MPWMD Water Projects, facts sheets on a variety of water supply options and breakout sessions to hear ideas from the public. The agenda materials are provided on the District website at: http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2011/20110825/20110825_agendaV2.htm. A detailed matrix of Water Projects 1-5 implementation was provided in January 2012 at: http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2012/20120123/11/item11_exh11b.htm

On April 15, 2013, the Board adopted its latest Strategic Plan, which includes pursuit of the following water supply projects:

Desalination: Further develop the "Ratepayer Relief Bonds" proposal for a public contribution for the CAW desalination project.

Groundwater Replenishment (GWR): Enter into a cost-sharing agreement for GWR and advance CEQA and feasibility work.

Aquifer Storage and Recovery: Complete Water Project 1 (ASR Phase 1), including an enhanced back-flush pond; redefine easement and enter into agreements with City of Seaside and FORA; complete construction.

Local Projects: Work with jurisdictions to advance planning and development of local supplies. Possible projects include: Seaside Municipal replacement supply, Pacific Grove golf course irrigation with stormwater or recycled water, Carmel irrigation with recycled water and perennial springs, or other possibilities. Consider providing seed-level matching funding to advance local planning.

Odello Property: Regulate and provide oversight to owners' proposal to de-link their water rights and transfer those rights to Cal-Am for community use, and transfer the agricultural property into open space public land.

Additional information on the 2013 Strategic Plan is provided on the District website at: http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2013/20130415/13/item13.htm.

For the purposes of this Mitigation Program Annual Report, the projects highlighted in the 2011 and 2013 Strategic Plans will be combined for discussion purposes.

Implementation and Activities During 2012-2013

The following paragraphs describe action on the Water Projects identified above in the July 2012 through June 2013 period, unless only data for a Water Year (October 2012 through September 2013) are available. A brief summary of accomplishments is provided in bold italic, followed by several paragraphs of background or explanatory information.

Aquifer Storage and Recovery Phase 1 (Santa Margarita Site): The District diverted and injected 295 AF; completed Chemical/Electrical building and installation of permanent electrical power facilities; began replacement of pumps and motors for the ASR-1 well; continued to work with FORA and the City of Seaside on property easements needed to install permanent pipelines connecting the Phase 1 and 2 sites and an expanded back-flush pit; and obtained a $2.2 million loan to fund project.

Project Construction: ASR Phase 1 (Water Project 1) is a cooperative effort with CAW which entails diverting excess water flows, if available, in the winter season (December 1 through May 31) from the Carmel Valley Alluvial Aquifer (CVAA) through existing CAW facilities and injecting the water into the Seaside Groundwater Basin via two MPWMD wells for later recovery in dry periods. The two wells drilled at the Santa Margarita site are now called "ASR-1" and "ASR-2". District and CAW staff and consultants regularly met to coordinate roles, responsibilities and tasks needed to enable operation of Water Project 1 at full capacity, as feasible.

The Final Environmental Impact Report (EIR) for Water Project 1 estimated 920 AFY as the long-term average project yield. Please refer to Section XV-B for information on ASR diversion, injection and recovery in year 2012-2013.

The District continued to work with the Fort Ord Reuse Authority (FORA) and the City of Seaside on easements for a strip of land that is needed to install permanent pipelines connecting the Phase 1 and 2 sites. This area is also needed for an expanded back-flush pit that would serve both the ASR Phase 1 and Phase 2 sites.

The City of Seaside met in April 2013 to consider expanded back-flush pit alternatives prepared by the District and recommended a configuration at the existing Santa Margarita site. Once final plans are complete, the easement's metes and bounds will be revised and draft documents for the site will be forwarded to the City of Seaside, which should allow construction at the site to proceed. This

process has taken longer than expected due to concerns expressed by the City of Seaside over a variety of issues.

Funding: On June 21, 2012, District and CAW staff met to discuss the potential for a long-term capital and operating lease for the District's Santa Margarita ASR facility. Such a lease would be modeled on the Sand City Desalination facility lease. The reason for such a lease would be to ensure recovery of some prior capital investment and creation of additional capital in order to complete the project, as well as to better define the operating relationship. This is a back-up measure to the District's new annual water supply charge to fund project completion and maintain stronger District control over the asset.

Costs for Water Project 1 have been primarily funded through a user fee that was included with the CAW water bills, until this funding mechanism was curtailed by the CPUC in 2009 (an action that is currently being litigated). The District continued to work on replacement revenue sources for Water Project 1 expenditures, including reimbursement agreements with CAW and other alternatives. An extensive effort occurred in January through June 2012 regarding a new ordinance that created a property assessment source of funding for water supply projects. Completion of Water Project 1 and 2 depends on these funds. For more information, please refer to the District website at: http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2012/20120627/0627agenda.htm.

In May 2013, the District closed on its loan with Rabobank, thereby replenishing the almost $2.2 million of reserves that were expended to pay for ASR Phase 1. The remaining loan proceeds will be used to complete the project.

Aquifer Storage and Recovery Phase 2 (Seaside Middle School Site): The District bid the building contract for facilities at the Seaside Middle School to be completed during the school summer vacation; and began construction of second ASR well at Middle School site (ASR-4).

Well Construction and Easements: ASR Phase 2 (Water Project 2), with two proposed wells at the Seaside Middle School site, is expected to produce another 1,050 AFY on average. MPWMD began Water Project 2 planning work in 2008, and completed the first phase of development with the installation of dedicated monitor wells at the Middle School site in 2009. Since then, MPWMD and Cal-Am have been working jointly to obtain Carmel River water rights for diversions to storage at the site, and for land-use approval (final site easement was issued to Cal-Am in 2011). The first of the two planned ASR wells (ASR-3) was constructed in 2010 and appurtenant facilities were installed in 2011. Injection testing was initiated at the ASR-3 well in 2012. Also in 2012, the District completed the necessary CEQA documentation (Addendum to the Phase 1 ASR Project EIR) for the permanent ASR Phase 2 site. The ASR-3 well is significant as it satisfies one of the components of SWRCB Order WR 2009-0060 (Cease and Desist Order) that requires CAW to implement one or more "small projects" by the end of 2011 that produce at least 500 AFY to reduce unlawful diversions from the Carmel River.

The Seaside Middle School site is planned to be a permanent ASR facility similar to the Santa Margarita site. Work in 2012-2013 entailed completion of the necessary engineering designs, permitting and construction of permanent facilities, including: a second full-scale ASR well (ASR-4), and permanent utility pipelines, electrical facilities, and well controls. There will be no water

treatment facilities at the Seaside Middle School ASR site; all water treatment prior to distribution into the CAW system will occur at the Santa Margarita facility. As of June 2013, a temporary pipeline delivering water from the Middle School site to the Santa Margarita site for back-flushing was still in use.

At its May 21 and June 12, 2012 meetings, the Board authorized a contract with Zim Industries to construct the ASR-4 well, including drilling a pilot borehole, installation of well casing, screen and gravel pack, development and testing of the well, provision of a pump, motor, flow control valve and temporary discharge piping. By easement restriction, the well construction was required to occur during the summer school break period to avoid disruption of school activities at the Seaside Middle School site. Additional information is on the District website at:
http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2012/20120521/02/item2.htm
http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2012/20120612/15/item15.htm

The intent was to construct and equip the ASR-4 well during summer/fall 2012 so that the well will be ready for injection testing with Carmel River basin source water as soon as all site appurtenant facilities are completed. As of June 30, 2013, the District bid the building contract for facilities at the Seaside Middle School site, which was expected to be completed during the school summer vacation, and continued construction on the ASR-4 well. All ASR Phase 2 facilities at the Seaside Middle School, including the second ASR well at that site (ASR-4 well) are expected to be operational in December 2013, with the exception of final back-flush pit construction, which will be located at an expansion of the existing back-flush pit at the Santa Margarita site.

Water Rights: ASR Phase 2 is facilitated by Amended Permit #20808C, authorized by the SWRCB on November 30, 2011, which allows MPWMD and CAW to divert an additional maximum of approximately 2,900 acre-feet per year (AFY), depending upon rainfall and operational limitations from the Carmel Valley Alluvial Aquifer for injection to the Seaside Basin, if minimum instream flow requirements in the permit are met. Full implementation of ASR Phase 2 is estimated to yield an average of 1,050 AFY, which is additive to the estimated average yield of 920 AFY currently with ASR Phase 1. Thus, successful implementation of ASR Phase 2 could result in an average reduction of up to approximately 2,000 AFY in diversions from the Alluvial Aquifer during the summer season (June 1 – November 30), as required by the Phase 1 and 2 SWRCB water rights permits for ASR.

CEQA: District staff and consultants prepared project description and hydrogeologic information for a technical addendum to the original Environmental Impact Report (EIR) on Water Project 1. Work had been conducted under a CEQA exemption for the Water Project 2 test project; additional environmental review was needed for a long-term, permanent facility. At its April 2012 meeting, the Board formally approved Water Project 2 and accepted an Addendum to the original EIR/EA for Water Project 1. The Addendum provides a description of full implementation of Water Project 2 at the Seaside Middle School site. The Addendum is intended to support any and all future discretionary approvals for installation and operation of permanent facilities at the site. For more information, consult the District website at:
http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2012/20120416/16/item16.htm.

Funding: In February 2011, the District and CAW executed a reimbursement agreement for MPWMD's expenses (not to exceed $2,750,000) associated with Water Project 2. These payments

cover the cost of the actual expenses for planning, design, and installation of the first ASR well at the site (ASR-3) and associated appurtenant facilities.

In 2012, the District and CAW completed a second reimbursement agreement for the second ASR-4 well. The agreement is an outgrowth of CPUC Decision 12-06-020 (issued on June 21, 2012) that allows CAW to create a Phase 2 project memorandum account in which to record costs associated with the ASR-4 well. Under the proposed agreement, Cal-Am would reimburse the District for the costs that the District incurs in designing, permitting, constructing, equipping, and testing the ASR-4 well, as well as its associated permanent appurtenant facilities at the Seaside Middle School site. The reimbursement agreement does not include any funding provisions for existing or planned improvements at the Santa Margarita site.

CAW Infrastructure: The capacity of the CAW distribution system to deliver injection water simultaneously to both Water Project 1 and 2 continued to be the subject of coordination meetings between MPWMD and CAW staff. CAW has indicated that the needed infrastructure upgrades to deliver injection water at full build-out capacity at both sites may not be available until CAW's "Monterey Pipeline" improvements are in place. In the meantime, pipeline construction by CAW in early 2011 in the City of Monterey helped improve the ability of CAW to deliver injected and stored water from the Seaside Basin wells to a larger area and number of customers in the CAW system.

> ***MPWMD Desalination Project (Water Project 3): The District continued to assess the potential for local desalination facilities so as to establish a contingency project if the regional project is delayed. The Naval Postgraduate School and Sand City sites did not receive land owner support.***

In fall 2009, District consultants completed hydrogeologic field work and laboratory analyses along the Fort Ord coastline. A technical report on desalination project feasibility was presented to the Board at its December 14, 2009 meeting. The report concluded that the coastal Fort Ord hydrogeology does not support its use as the source of subsurface feed water for a larger desalination project, and the District should not pursue the project. This is primarily due to the fact that there is not a continuous clay barrier to protect the lower Paso Robles and Santa Margarita aquifers from contamination by seawater extracted for the desalination project. The Board directed staff to provide a description of desalination projects investigated by MPWMD in the past in order to assess whether there are any remaining viable local desalination options within the District. This staff report was provided to the MPWMD Water Supply Planning (WSP) Committee at its March 8, 2010 meeting. The staff report is provided on the District website at: http://www.mpwmd.dst.ca.us/asd/board/committees/watersupply/2010/20100308/02/item2.htm.

The WSP committee recommended that staff proceed with investigation of the potential for desalination projects within the District boundary, with a minimum desalination project production goal of 2,000 AFY. The District Engineer continues to lead this effort. In 2011, District staff met with representatives of the Monterey Bay National Marine Sanctuary, Naval Postgraduate School, City of Sand City, Pebble Beach Company, CPUC Division of Ratepayer Advocates, City of Santa Cruz, City of Monterey, and various coastal property owners regarding the potential for desalination projects within the District boundary.

At its November 15, 2010 meeting, the Board received the District Engineer's assessment of various sites evaluated in an August 2008 consultant report titled "Monterey Peninsula Water Management District 95-10 Project Constraints Analysis." More information is available on the District website at: http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2010/20101115/15/item15.htm. The WSP Committee meeting agendas and materials are on the website at: http://www.mpwmd.dst.ca.us/asd/board/committees/watersupply/2011/2011.htm and http://www.mpwmd.dst.ca.us/asd/board/committees/watersupply/2010/2010.htm.

Beginning in April 2011, District staff met with the Naval Postgraduate School (NPS) about the possibility of developing a desalination project at the abandoned City of Monterey wastewater treatment plant site that is now owned by the Navy. The local Navy administration wished to support local water initiatives but expressed concerns about impact to the Navy's mission. Regarding development of a desalination project in Sand City, Director Pendergrass stated at the May 4, 2011 WSP Committee meeting that development of additional desalination facilities within the City boundary is infeasible due to potential impacts to the existing desalination facility.

> ***Monterey Peninsula Regional Water Project (Desalination Component): The District extensively participated in CPUC approval process, with emphasis on the "Ratepayer Relief Bonds" proposal for a public contribution for the CAW desalination project to reduce costs to the public. The District also co-hosted public workshops, advised the mayor's Water Authority and project Governance Committee, and evaluated landfill gas as a sustainable power source.***

CPUC Process for CAW Application A.12-04-019: In late 2012, the CPUC's Judge Weatherford issued a ruling that: (a) set Public Participation Hearings in January 2013; (b) provided guidance concerning a Cost and Financial Modeling Workshop in December 2012; and (c) identified the main topics to be considered at the second Prehearing Conference, also in December 2012. The workshop topics of interest to the CPUC were:

- Project costs for desalination, ASR and GWR
- Storage and Distribution Facilities Costs
- Preconstruction Project Costs such as test wells, land acquisition, permitting, etc.
- Cost impact of contingencies, such as changes in source water, facility site, plant failure or interruption, outfall use, water demand forecasts, or project delay.
- Financial modeling and project scenarios.

The main topics for discussion at the Prehearing Conference were:

- project description and any planned changes in that description;
- shifting cost recovery issues to a separate phase or application;
- status of public agency participation proposals and discussions;
- CEQA status and developments; and
- preliminary planning for the Evidentiary Hearings.

On April 25, 2013, the District and the mayor's Water Authority co-hosted a public workshop on the issues that might be considered for settlement. On April 30, 2013, the General Manager and General Counsel participated in the first of many meetings and conference calls for settlement discussions.

The CPUC administrative law judge had set June 14, 2013 as the deadline for settlement proposals not including GWR, and June 28, 2013 for proposals related to Groundwater Replenishment. The District and the Authority continued to advance the proposed Ratepayer Relief Bonds with proposed legislation. After extensive meetings and settlement discussions in late May, June and July 2013, the settlement agreement was signed on July 31, 2013.

As of June 30, 2013, CAW was encountering delays for permits from the California Coastal Commission for test extraction wells along the Marina coastline. Thus, the CPUC delayed completion of its Environmental Impact Report (EIR) on the project until December 2014. However, much upfront work on financial and other agreements is needed in order to provide a final project description in a timely manner for the EIR consultant to analyze.

Water Rights: On April 3, 2013, the State Water Resources Control Board published for public comment its "*Draft Review Of California American Water Company's Monterey Peninsula Water Supply Project*," which primarily discusses water rights for the proposed desalination facility. The document can be found at the following link:
http://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/caw_mpws/docs/calam_report040313.pdf

Renewable Power: On April 22, 2013, the MPWSP Governance Committee received a presentation from William Merry, General Manager of the Monterey Regional Waste Management District (MRWMD), on landfill gas generated electricity for possible sale to the desalination facility. In May and June 2013, staff from the District, MRWPCA, Cal-Am, the Water Authority, and MRWMD met to discuss potential terms and parameters for a Power Sales Agreement for meeting desalination facility electricity needs with power generated from renewable landfill gas at MRWMD. These discussions continue.

Design-Build: The MPRWP Governance Committee met twice in May 2013 to make recommendations about CAW's Request for Proposals (RFP) and form of contract for future design-build teams. The May 17 and June 13, 2013 meetings also covered presentations by the Cal-Poly architectural design teams for the desalination facilities.

> ***Other Regional Desalination Projects: The District investigated other regional desalination options as a back-up to the CAW regional project, with emphasis on feasibility, cost, and timing. The District determined that the Deep Water Desal concept had the most promise and met regularly the project team. The District determined it would serve as a CEQA Responsible Agency for the project's environmental review.***

In 2012, representatives from Deep Water Desalination and "The Peoples Desalination Project" made presentations and participated in the District's Water Supply Planning Committee. This led to a November 2012 comparison of various desalination alternatives, which is provided at:
http://www.mpwmd.dst.ca.us/desalination-projects/2012Reports/Report%20to%20MPRWA%20TAC%20-%202012Nov_MPWMDFinAnalysisofSPICostComparisons.pdf

A list of archived desalination documents and links are provided at:

http://www.mpwmd.dst.ca.us/desalination-projects/desalination-projects.htm

Deep Water Desal: Based on the comparative evaluation, the District determined that the Deep Water Desal (Deep Water) concept was most viable. The Deep Water representatives submitted a detailed project description to the CPUC environmental consultants on May 1, 2013 so that the project could be evaluated in the MPWSP EIR as a potential alternative project. The project description was also forwarded to State Lands Commission and to the District. In April, May and June 2013, District staff met with Deep Water representatives to review the status of legal agreements, technical progress, and financial commitments by the Deep Water team. As of June 30, 2013, District staff was confident that the project is moving forward and identified certain milestones that would allow for District participation in moving the project's CEQA process forward in a more expeditious fashion. District staff was developing a draft cost sharing agreement for the project, including a list of deliverable milestones that would affect the District's financial commitments.

CEQA Review: In May 2013, District staff also met with State Lands Commission staff, who had previously been asked by the Deep Water team to serve as Lead Agency for the CEQA work. The State Lands Commission indicated that it did not want to serve as a "Co-Lead Agency" with the District. The Water Supply Planning Committee discussed potential roles of the District in the CEQA process and determined that the District could serve as Responsible Agency.

> ***Groundwater Replenishment (Water Project 4):*** ***The District supported the MRWPCA Groundwater Replenishment Project, including extensive meetings, coordination, and a cost-sharing agreement to fund technical and environmental review studies as well as public outreach. A Notice of Preparation for an EIR was issued in June 2013.***

The MPWMD Board previously directed staff to assess the status of the Groundwater Replenishment Project (GWR) proposed by the Monterey Regional Water Pollution Control Agency. Possibilities include purified wastewater for irrigation only, and/or as potable supply through groundwater injection. In a September 2010 presentation, the MRWPCA General Manager noted that the GWR had been placed "on hold" until its role in the multi-agency Regional Water Project could be resolved. The MRWPCA presentation is available on the District website at: http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2010/20100920/ppt/7_files/frame.htm

In December 2010, based on forward progress of CAW's Regional Water Project, MRWPCA staff indicated a desire to restart work on the GWR as part of Phase 2 of the Regional Project, and requested MPWMD support. At its December 13, 2010 meeting, the MPWMD Board approved issuing a letter to MRWPCA expressing support for further investigation of the proposed GWR and related agency cooperation. The staff report and letter is provided on the District website at: http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2010/20101213/09/item9.htm and http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2010/20101213/handouts/item9.pdf.

At its March 31, 2011 Goal Setting Workshop, the District Board reiterated its intent to support reuse of recycled water, as feasible given MPWMD budget constraints. The Board directed staff to continue to work with MRWPCA to encourage wastewater recycling, including outreach and public education.

At its February 15, 2012 meeting, the District's Board directed the General Manager to develop a draft Memorandum of Understanding (MOU) between the District, MRWPCA, and CAW regarding GWR. This was presented to the MPWMD Board at its April 20, 2012 special meeting, which approved it. Details of the agreement approved by MPWMD are provided on the website at:
http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2012/20120416/15/item15.htm
http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2012/20120420/01/item1.htm

Technical Coordination and Cost Sharing: As of June 30, 2013, District and MRWPCA staff and consultants had been meeting with every other Friday in order to track project progress, including environmental and source water feasibility studies. A cost sharing agreement with MRWPCA was developed and signed, and FY2012-13 invoices for payment by the District were requested. Future work includes cost analysis, value of social benefits provided by GWR, and source water from Salinas Valley agricultural sources.

CEQA: A Notice of Preparation for an EIR was prepared, and a public scoping meeting was held on June 18, 2013.

CPUC Review: The CPUC held a June 12, 2013 workshop to discuss the Groundwater Replenishment project's role in the regional water supply solution, including criteria for inclusion of GWR in the preferred alternative. The District, MRWPCA, the Authority, and the MPWSP Governance Committee reviewed and refined a list of criteria which might be considered in evaluation of GWR.

Public Outreach: The General Manager met with Eleanor Torres, Orange County Water District's Director of Public Affairs, and Lois Humphries, consultant to MRWPCA, to discuss public outreach. Orange County has a major groundwater recharge program using wastewater as a major source.

> ***Los Padres Reservoir (Water Project 5): The District continued reviewing Los Padres Reservoir's role in maintaining a quality river environment due to summer streamflow releases and as a component in the water supply portfolio.***

Pursuant to previous direction of the Board, District staff pursued options for increasing storage at Los Padres Dam and Reservoir, which is owned by CAW. This effort stalled when CAW responded to District inquiries in an October 5, 2009 letter, which stated that CAW has "no interest" in making modifications to the dam. A written report is provided in the January 28, 2010 agenda packet at:
http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2010/20100128/03/item3.htm
CAW confirmed its position in September 2010. In a related matter, the District received a December 2011 letter from the National Marine Fisheries Service (NMFS) in response to the District's inquiry in October 2011 regarding options of either a new dam on the Carmel River or increased capacity to the existing Los Padres Dam and Reservoir. NMFS is not supportive of either proposal.

In 2012-2013, the District WSP Committee directed staff to continue to explore the concept of dredging Los Padres Reservoir to regain lost storage capacity or increasing storage in spring with a temporary "rubber dam." In light of federal agency desires to remove dams, District staff asserts

that available data show an adverse effect on the Carmel River if there were no Los Padres Dam due to the beneficial effects of summer streamflow released form storage, which offsets diversions from vineyards and other losses. As of June 30, 2013, staff was preparing a scope of work for an independent consultant to address this issue. Related issues include: quantity additional water supply possible, dam removal and steelhead recovery, fish passage, dam ownership, property owners and rights, water rights, interface with CPUC rate case, and District river work permit authority.

Local Water Projects: ***The District worked with jurisdictions to advance planning and development of local supplies, and approved a $200,000 Grant Program to assist them.***

The Cities of Pacific Grove, Carmel-By-The-Sea, and Seaside have discussed local water supply initiatives of their own; in addition, the Monterey Peninsula Airport District (MPAD) has been exploring well options. In addition to creating additional water supply, such local projects would likely provide some leverage in future discussions with the SWRCB in discussing changes to the CDO if the regional desalination project is delayed. These small projects can be expanded to meet other local non-potable demands or can be combined with each other to provide expanded benefits.

MPWMD Grant Program: On May 2, 2013, the MPWMD Water Supply Planning Committee discussed whether the District should allocate some portion of the annual Water Supply Charge to help seed such projects, such as grants or loans, and whether or not the District should ask for an allocation of any water created. The Ordinance 152 Oversight Panel's consensus was that the District should make it a priority to allocate some funds for local projects and that reimbursement from the permanent financing of such projects, if any, would be better than outright grants. The panel did not support allocating a portion of the water created to the District as a reserve.

At its June 2013 meeting, the District Board adopted a budget that included expenditure of up to $200,000 of the Water Supply Charge for development expenses for local water projects. The program requires matching by the local project sponsor. Each jurisdiction and other interested parties (potential Project Sponsors) will be solicited annually to submit an application. Applications will be due by September 1 of each year. They will be reviewed by staff and the Water Supply Planning Committee with funding recommendations brought back to the Board. The full District Board approved the Grant Program at its July 22, 2013 meeting. Next year's annual report will have more information on the grant program recipients. The Grant Program is described at: http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2013/20130722/14/item14.htm

Pacific Grove: The City of Pacific Grove has a shortage of potable water for domestic residential and commercial uses. The City currently uses approximately 100 to 125 acre-feet per year (AFY) of potable water for irrigation of the Pacific Grove Municipal Golf Links and the adjacent El Carmelo Cemetery. Additional potable water is used for public irrigation in other areas throughout the city and in nearby areas, including the Presidio of Monterey. Replacement of this irrigation demand with non-potable supplies will create a new offset of at least 100 to 125 AFY of potable water per project, for use by Cal-Am to meet its obligations to find a replacement to Carmel River water.

As of June 30, 2013, the following three Pacific Grove projects were under consideration:

- Project 1: Pacific Grove Satellite Recycled Water Treatment Project. A new satellite

recycled water treatment facility will be constructed at the former Point Piños Wastewater Treatment Plant and deliver recycled water to irrigation sites throughout the City. Raw wastewater will be captured and diverted from the City's sanitary sewer Basin 1 and conveyed to the new satellite recycled water treatment plant via 1,100 lineal feet of new 8-inch diameter sewer pipeline constructed within the golf links. Approximately 1,300 lineal feet of new 12-inch diameter recycled water pipeline will be constructed to deliver water to the golf links, cemetery, and other irrigation demands. Costs of water are estimated between $2,624 and $3,042/AF, depending on the final annual volume of water produced.

• Project 2: Pacific Grove Recycled Water Project. Recycled water will be obtained from the Pebble Beach Community Services District (PBCSD). Raw wastewater from 500 homes in the Del Monte Park area of Pacific Grove will be captured and diverted to the existing Carmel Area Wastewater District (CAWD) reclamation facility for treatment. The wastewater diversion will flow through the existing wastewater collection system owned by the PBCSD. Recycled water from CAWD will be stored in the Forest Lake Reservoir and returned to the City through existing CAWD and PBCSD recycled water systems to a delivery point near the Spanish Bay Golf Course in Pebble Beach. Approximately 10,000 to 13,500 lineal feet of new 12-inch diameter recycled water pipeline will be required to be constructed to deliver water to the golf links, cemetery and other irrigation demands. Costs of water are estimated at $2,105/AF produced.

• Project 3: Pacific Grove Storm Water Recycling Project. Storm water from the City's Congress Avenue or Greenwood Park Storm Drain Watersheds will be retained during the fall-winter wet period to be recycled to meet irrigation demands during the spring-summer season. Storm water will be diverted from the Congress Avenue or Greenwood Park storm drainage systems in a new storm water diversion structure, treated to remove trash and debris, and pumped to storage. A new 15-million gallon (MG) concrete reservoir or open storage reservoir will be constructed at the California American Water Company's David Avenue property. The storm water will be treated to meet aesthetic requirements and to comply with Title 22 Regulations for irrigation with non-potable water. Treatment will include a constructed wetland, microfiltration, ultraviolet radiation, and disinfection. Approximately 8,800 lineal feet of new 12-inch diameter recycled water pipeline will be required to deliver water to the golf links, cemetery irrigation and other irrigation demands. Costs of water are estimated at $8,977/AF, depending on the final annual volume of water produced.

Carmel: The City of Carmel has discussed perennial springs under the Harrison Memorial Library to irrigate Devendorf Park in order to free up potable water. There is also the Del Mar Avenue perennial spring. The City has also recently entered into a recycled water purchase agreement with the District for approximately 0.5 acre-feet per year of Reclamation Project water and desires to investigate additional uses up to 5 acre feet per year.

Seaside: The City of Seaside has determined that it has an approximately 110 acre-foot per year shortfall in its needs for the Seaside municipal water system as a result of the basin adjudication. City staff has approached the District for help in identifying replacement supplies.

Monterey Peninsula Airport District: MPAD has potential use of wells previously used for groundwater remediation by the U.S. Army Corps of Engineers and is also considering buying nearby property with a well. The most likely use would be non-potable irrigation supply.

> ***Odello Property: The District met with the current landowner and consultant team to provide guidance on water rights and MPWMD's role in a proposal to de-link the water rights from the parcel and transfer them to Cal-Am for community use, and transfer the agricultural property into open space public land.***

The current owner of the parcel historically known as the "Odello Artichoke Farm" is Clint Eastwood, who wishes to help ease the effect of the current Cal-Am moratorium on the community. The Odello parcel has established water rights that were previously approved by the SWRCB. District staff met with Eastwood's team to discuss the ramifications of the water rights setting, possible limitations imposed by the SWRCB Order 95-10 and CDO, the District's Water Distribution System (WDS) regulations, and possible courses of action to achieve the end goal.

B. Near-Term Water Supply Projects

Description and Purpose

Section XV-A above describes long-term water supply alternatives, including the MPWMD ASR Phase 1 and Phase 2 Projects. This section focuses on annual ASR operations. Since 1996, the District has evaluated the feasibility of ASR at greater levels of detail. As of June 2013, the District had constructed four wells in the Seaside Basin: (1) a shallower ASR pilot test well into the Paso Robles Formation (located at Mission Memorial Park in Seaside) in 1998; (2) a 720-foot deep, full-scale test well into the Santa Margarita Formation in 2001 (now ASR-1); (3) another full-scale ASR well at the Santa Margarita site (ASR-2) in 2007; and a full-scale ASR well at the Seaside Middle School site (ASR-3) in 2011. As of June 30, 2013, construction on the ASR-4 well was underway. Injection in WY 2013 occurred at both ASR sites. To comply with the SWRCB water rights permit conditions, MPWMD submits detailed annual reports to the SWRCB after each operational season.

Implementation and Activities During 2012-2013

In the 2012-2013 diversion season, a total of 295 AF were diverted and injected in the December-May season, which is roughly one-third of the estimated average amount of 920 AFY, due to limited streamflow above minimum bypass flow requirements and Cal-Am system delivery constraints. Thus, the cumulative injection total into the Seaside Basin from the program inception through May 2013 is 4,771. In Water Year 2013, a total of 644 AF were extracted (recovered) and delivered to Cal-Am system customers.

In July 2013, District staff and consultants completed the annual ASR operations reporting for WY 2012 (the previous year), which summarized operations and confirmed that diversions for the ASR projects have complied with regulatory requirements. The completion of this annual report is a requirement of the Central Coast Regional Water Quality Control Board (RWQCB) as part of their ongoing oversight of the ASR program in the Seaside Basin. The report is available at:

http://www.mpwmd.dst.ca.us/asd/board/boardpacket/2013/20130722/08/item8.htm In addition, MPWMD completed reporting of river monitoring activities associated with the ASR project diversions, per monitoring required by the CEQA process for operation of the Phase 1 ASR Project. For reference, other documents related to ASR may be found at: http://www.mpwmd.dst.ca.us/WaterProject1.html.

Other Relevant Action

The District also has taken the lead in development of an Integrated Regional Water Management Plan (IRWMP) for the Monterey Peninsula, Carmel Bay, and South Monterey Bay Area, including grant applications and extensive coordination with local agencies and groups. These efforts culminated in a comprehensive planning grant application in September 2010.

In 2011, the District received a $995,000 Planning Grant to update the IRWM Plan from the California Department of Water Resources (DWR) from Proposition 84 funds for the Integrated Regional Water Management (IRWM) Grant Program. This is about 61% of the total cost of $1,634,010. The balance of the project costs ($639,000) will be from cash and in-kind services provided from the stakeholders in the planning region. The full Work Plan, Budget, and Schedule can be viewed or downloaded at the District's IRWM web site at: http://www.mpwmd.dst.ca.us/Mbay_IRWM/Mbay_IRWM.htm

In 2012-2013, the District hosted five stakeholder meetings on July 25, 2012; October 24, 2012; February 6, 2013; and February 7, 2013 (Ord Community inter-regional focus). The materials for stakeholder meetings in 2012-2013 are provided at: http://www.mpwmd.dst.ca.us/Mbay_IRWM/2010PG/Stakeholder-info-meetings/stakeholder.htm

XVI. STEELHEAD FISHERY MITIGATION MEASURES

The Findings for Certification of the Water Allocation Program Final EIR (Findings Nos. 388-A through D) identified mitigation measures to reduce impacts to the Carmel River steelhead population, including: (a) expansion of the program to capture and transport smolts during spring, (b) prevent stranding of early fall and winter migrants, (c) rescue juveniles downstream of Robles del Rio during summer, and (d) implement an experimental smolt transport program at Los Padres Dam. Monitoring of adult returns and juvenile populations provides an indication of the overall success of the steelhead mitigation measures. The following sections briefly describe the purpose of each mitigation measure and activities during the reporting period.

A. Capture and Transport Emigrating Smolts during Spring

Description and Purpose

The goal of this program is to reduce disruption of the steelhead life cycle due to streamflow diversions. During spring months, when steelhead smolts are actively emigrating from freshwater to the ocean, the diversion of surface and groundwater from the river and alluvial aquifer often interferes, and in some cases, blocks migration into the ocean. This threatens individual fish, reduces the number of smolts that successfully reach the ocean, and indirectly affects the number of adults that eventually return to freshwater. When streamflow is too low for natural emigration, or when smolts are at risk of being stranded, the District monitors streamflow, captures emigrating smolts, and transports them to the lagoon or ocean.

Implementation and Activities During 2012-2013

The Carmel River continued to have low-flow conditions for most of the July 2012 through June 2013 period **(Figure XVI-1)**. During the primary three-month smolt migration period, March-May 2013, streamflow in the lower river was only adequate for smolt migration to the Carmel River Lagoon until early April when river levels became too low for fish to migrate over some gravel bars.

On April 19, 2013, District staff, concerned that downstream migrating smolts would become trapped in the lower river, set up the smolt box trap and weir near mid-valley. This trap was last operated in 2007 when similarly dry conditions occurred. The trap was operated for 43 days until the end of May when flows became too low to effectively catch fish and the number of smolts captured had dropped to zero. During trapping, a total of 7,107 steelhead were captured including 102 smolts and three kelts that were transported to Carmel Bay, acclimated to seawater, then released, along with 6,051 young-of-the-year (YOY)/fry, 850 juveniles, and one resident adult that were transported to permanent habitat upstream **(Figure XVI-2).** Trapping mortality was very low at 100 fish (1.4%), even with the presence of very small fry.

B. Prevent Stranding of Fall/Winter Juvenile Migrants

Description and Purpose

As in other central California streams, juvenile steelhead in the Carmel River move downstream into lower reaches of the river well ahead of the peak emigration of smolts. Depending on river conditions and diversions during the previous dry season, there is some risk that pre-smolts and other juvenile steelhead will be stranded following early fall and winter storms, which increase flows and stimulate the fish to move downstream into habitats that are subsequently dewatered after the storm peak passes. This risk occurs primarily from October through February, although during severe droughts, the risk period may extend into March. The District mitigates this problem by capturing and transporting juveniles when necessary during the high-risk period. Currently, juveniles trapped during fall/winter months are transported upstream to viable habitats above the Narrows or held at the District's Sleepy Hollow Steelhead Rearing Facility (SHSRF).

Implementation and Activities During 2012-2013

District staff monitored river conditions during the fall and winter months of 2012-2013. Flow at the District's Highway 1 Gage dropped to below 1 cfs in early July 2012 and was dry by early September. It remained functionally dry until early December when a large storm brought the flow up to nearly 800 cfs. By late December, rainfall had ceased and the average daily discharge dropped steadily from a season high of 815 cfs on December 24, to 198 on January 1, 2013, 61 cfs on February 1, and then 34 cfs on March 1 **(Figure XVI-1)**. Due to the dry conditions, there was a high risk of fish stranding and conditions were carefully monitored throughout the fall and winter but no rescues were needed.

C. Rescue Juveniles Downstream of Robles Del Rio during Summer

Description and Purpose

About 1.5 miles of habitat between Boronda Road and Robles del Rio Road and up to nine miles of habitat below the Narrows are seasonally subject to dewatering, depending on the magnitude of streamflow releases at Los Padres Dam, seasonal air temperatures, and water demand. Beginning as early as April or May of each dry season, the District rescues juvenile steelhead from the habitat in these reaches. The goal of this program is to help maintain a viable steelhead population by transplanting juveniles to permanent river habitats downstream of San Clemente Dam (if it is available), and/or rearing juvenile steelhead at the SHSRF, located just downstream of San Clemente Dam, if existing habitat is not available or is already fully saturated with juvenile steelhead.

Implementation and Activities during 2012-2013

- **MPWMD Annual Rescue Totals –** The surface flow of the Carmel River dropped to 10 cfs at the Highway 1 Bridge on June 7, 2012. In response to this decline, District staff began full-scale rescues on June 11. Rescues were conducted over a five-month period, June 11-October 17, 2012 between Highway 1 Bridge (RM 1.0) and Schulte Road Bridge (RM 6.7). An additional half-mile reach adjacent to the Carmel Valley Trail and Saddle Club in Carmel Valley Village (RM 13.0 - 13.6) was rescued later in the summer. During this period staff conducted 41

rescue operations, yielding a total of 8,159 steelhead including: 7,365 YOY, 765 yearlings (1+), and 29 mortalities (0.35%) **(Table XVI-1a)**. This total translates to 1,295 fish-per-mile (fpm) or 0.25 fish-per-lineal-foot (fpf). Since 1989, District staff has rescued 375,032 steelhead from drying reaches in the mainstem Carmel River. Compared to previous rescue seasons, rescue totals in the 2012 dry season were below the 1989-2012 average of 15,626 fish rescued **(Figure XVI-3)**.

- **2012 Dry Season, MPWMD Transplant Location –** During the 2012 dry season, a total of 8,130 juvenile steelhead rescued by MPWMD were transported and released at four different locations within the Carmel River watershed **(Table XVI-1b)**. Fish were released at the District's SHSRF (7,566), Moore's Pond (388), the Sleepy Hollow Ford (136), or in the lagoon (40).

- **CRSA Annual Rescue Totals –** During the 2012 dry season, June through October, a total of 7,236 steelhead were rescued from four Carmel River tributaries by the Carmel River Steelhead Association (CRSA), including 4,845 YOY and 2,391 yearlings, with 381 (5.3%) mortalities. The majority of the rescued fish were from Cachagua/Finch Creeks (6,219) with lesser numbers from Garzas Cr. (1,007), Hitchcock Cr. (5) and Robinson Canyon Cr. (5). It was not necessary for the CRSA to assist the District with any mainstem rescues in 2012.

- **2012 Dry Season, CRSA Transplant Location –** During the 2012 dry season, juvenile steelhead rescued in the tributaries by the CRSA were released in the mainstem at the confluence of that tributary.

- **Sleepy Hollow Steelhead Rearing Facility (SHSRF)** - The District's Water Allocation Mitigation Program includes construction and operation of a facility for rearing juvenile steelhead through the dry season. In early 1997, the District completed construction of the SHSRF, which includes: (1) a diversion and pump station, (2) two large circular tanks, (3) an 800-foot long rearing channel, (4) electrical, water, pressurized air and drainage systems, (5) an office/shop/lab building and (6) miscellaneous equipment.

Significant additional upgrades and modifications were made to the Facility between 2000 and 2003. These included: (a) a cooling tower, (b) large emergency generator, (c) upgraded impellers on the existing pumps, (d) purchases of an additional backup pump and a mobile emergency pump, and (e) installation of a centrifugal separator to reduce the buildup of coarse sediment in the cooling tower and rearing channel. In 2005 and 2006, new wooden weir boards were installed and waterproofed in the rearing channel to prevent fish movement between bays and add an additional backup mechanism. If the river pumps were to fail, the channel would hold more water longer, giving staff more time to correct the problem without fish loss. In 2007, eight, 250 gallon, insulated rearing troughs were installed. These rectangular, flow-through troughs replaced a defunct 22-foot diameter tank. These tanks are used to rear small rescued fish, for additional quarantine treatments, or for growth and survival experiments. In 2008, Tank 3, the 22-foot diameter holding tank, was outfitted with a large re-circulating pump, filtration, and UV sterilization system. This allows staff to hold fish into the winter season even during large storm events when the river's water quality is inadequate for fish survival or if the Facility's river pumps should fail.

Facility Modifications in Reporting Year 2013 – No major modifications were undertaken at the Facility during the 2012 rearing season.

Summary of 2012 SHSRF Fish Stocking and Releases - Steelhead rescues began in June 2012. Between June 11 and August 20, staff received approximately 7,566 rescued fish at the Facility. All fish brought into the facility go through a quarantine process, after which they are recounted and stocked into the rearing channel. During this process there are some numerical differences between what is brought in for quarantine from the field and what is stocked into the channel. These differences represent fish that are consumed by other fish during transport and quarantining, or numerical counting errors in the field during rescue operations. A total of 7,417 fish were stocked in the Facility after quarantine, including 6,958 YOY and 459 yearling and larger fish **(Table XVI-2)**.

The overall survival rate of fish reared at the Facility during the 2012 six-month rearing season was 72%, a 29% increase from the Facility's 17-year average of 43% **(Table XVI-2)**. This was likely due to lower stocking densities, improved disease prevention methods, and newly adaptive rearing management practices. During the 2012 rearing period, 21% (1,529) of the Facility's fish died as a result of disease, stress, or general poor health (identified mortality), and 7% (547) were unaccounted-for mortalities, potentially through intraspecific predation (cannibalism**).**

Of the total mortality, 48% (1,000) occurred in the Rearing Troughs and 52% (1076) occurred in the Rearing Channel. In the Rearing Troughs, 98% (982) were identified mortality and 2% (18) were unaccounted-for-mortalities. In the Rearing Channel 51% (547) were identified mortality and 49% (529) were unaccounted-for-mortalities. This year's identified mortality was on par with the 17-year average of 21% while the unaccounted-for-mortality saw a 29% decrease from the 17-year average of 36%. These results are likely due to new adaptive rearing management practices that target decreases in cannibalism and post rescue mortality.

Due to the "natural" rearing channel habitat (riffles and pools, cobbled bottom, boulders, logs, etc.) and suboptimal water temperatures the fish cannot be graded into different sizes once they have been stocked in the channel. Because these are wild fish, not hatchery stock, individual fish can behave quite differently from each other. The original goal of the Facility was to match the size of the fish reared in the Facility to the size of the fish reared naturally in the river.

Fish size distribution histograms comparing the June 2012 Facility fish to the October 2012 population survey results from the Sleepy Hollow and Garland Park stations **(Figure XVI-4**) clearly show that the sample of rescued fish entering the Facility are the same size range as the fish reared in the river four months later. This suggests that fish in the river are not growing during the summer months. Fish that enter the Facility are fed supplemental rations in order to sustain good health and because of this they inherently grow faster than wild fish rearing in the river.

The size distribution of Facility fish upon release in December 2012 was compared to the size distribution of fish sampled during the October 2012 population survey **(Figure XVI-5)**. This graph shows a bimodal distribution of released fish from the Facility, suggesting that one group of fish does not rapidly increase in size (50-100 mm) while a second large group more readily takes to feed and rapidly increases in size (140-224 mm). Recent studies in the Scott Creek

watershed (Santa Cruz County) support past investigations that show that ocean survival is size-dependent and that larger fish at time of ocean entry have an increased chance of returning to spawn. This study indicated that optimum size at ocean entry in Scott Creek was 150-250 mm. Of the 563 Facility fish measured during the December release, 40% (223) were in the 150-250 mm size range.

A large early December 2012 storm hit the central coast increasing flows and reconnecting the river to the lagoon. During this storm period, the Facility suffered a main pump malfunction and had to rely on operating only one pump with no backup. In order to guarantee the successful release of fish reared in the Facility, staff consulted with the National Marine Fisheries Service (NMFS) and the California Department of Fish and Wildlife (CDFW) and agreed to initiate an emergency fish release. During the emergency release, 58% of the fish were stocked in the river near Sleepy Hollow to save time and insure that most fish could be released during a short time period. Despite concern over the lack of a backup pump, once approximately 50% of the fish had been released, staff returned to the normal release protocol of transporting and releasing fish down in the lower river.

Fish from each rearing channel bay (pool) were subsampled for length and weight. The condition factor was then calculated from these data. Average lengths, weights, and condition factors for each bay are shown in **Table XVI-3**. Most fish were in excellent physical condition, and ranged in size from approximately 2.6 to 19.2 inches (66 to 488 mm). The YOY fish averaged 5-inches (128 mm), the larger YOY/smaller yearlings averaged 8.3-inches (211 mm), and the larger yearling plus (1+) fish averaged 14-inches (353 mm). A total of 5,341 fish from the rearing channel were released in the river between River Mile (RM) 3.7 and 17.3 **(Table XVI-4)**.

D. Monitoring of Steelhead Population

Description and Purpose

The District uses three primary techniques to monitor the health of the steelhead population: (1) counts of adult steelhead passing San Clemente Dam and Los Padres Dam, (2) surveys of winter steelhead redds, and (3) surveys of the juvenile steelhead population in freshwater at the end of the dry season in October.

Implementation and Activities during 2012-2013

- **Winter Steelhead Adult Run** - The fish counter and video monitoring equipment at San Clemente Dam was operated continually between December 2012 and May 2013. A total of 249 fish passed over the counter, including 18 in December, 46 in January, 47 in February, 115 in March, 23 in April, and 0 in May **(Figure XVI-6)**.

Due to the low instream flows, the District directed Cal-Am to release an additional pulse of water from Los Padres Reservoir from April 4-5 to allow adult steelhead trapped in the lower river to continue their upstream migration. Although not as successful as the previous year, likely due to the one month later release date, the pulse helped both upstream and downstream

migrants reach better habitat.

The 2013 adult run of 249 fish was below the average run size of 421 fish for the 1994-2013 period, during which fish had been reliably counted using the District's continuous mechanical counter **(Figure XVI-7)**.

The Los Padres Dam Fish Trap is operated and monitored by Cal-Am. The number of trapped adult steelhead reported during the 2013 migration season was 58, including 3 in January, 5 in February, 45 in March, and 12 in April **(Figure XVI-8)**. The 2013 run of 58 fish was only half of the average run size of 114 fish, for the 1991-2013 period **(Figure XVI-9)**.

● **Winter Steelhead Redd Surveys –** Since 1994, the District has periodically conducted winter steelhead redd (nest) surveys downstream of Los Padres Dam. Originally, these surveys were part of the District's spawning habitat restoration project to track how many adult fish actually spawned in the injected gravel between the dams and to record the downstream movement of the gravel itself. In 2001, the survey area was enlarged to include the Stonepine Resort area and several tributaries. In 2003 and 2004, complete mainstem surveys were conducted from Via Mallorca Road Bridge to Los Padres Dam. No redd surveys were conducted in the mainstem in 2005 and 2006 due to high river flows throughout much of the winter that precluded wading most river reaches and large late storms that effectively "erased" existing redds.

Due to time constraints and the existence of the adult fish counter at San Clemente Dam (SCD), staff discontinued redd surveys above SCD in 2007, and instead focused on the lower Carmel River. In each year during the spring of 2007, 2008 and 2009, one thorough survey pass was completed between the Highway 1 Bridge and San Clemente Dam. The survey goals were to: a) quantify the number of spawning redds (nests) and adult fish (including spawning pairs, singles, kelts, and carcasses) in the mainstem river below SCD, and compare those numbers to the fish passage counts at SCD in order to make a better estimate of the river's total steelhead run size; b) assess locations where adult steelhead may become stranded and need to be rescued as flows decrease; and c) assess the relative numbers of steelhead smolts that may be remaining in the river. No redd surveys were done during 2010 and 2011 due to high river flows throughout the entire migration period that precluded wading the lower river. In 2012, 58 redds were observed between Boronda Br. and the Rancho Cañada Golf Course (RCGC).

During March 2013, fisheries staff completed redd surveys in three separate reaches between Los Padres Dam and the Highway 1 Bridge: 1) Los Padres Dam (RM 24.8) to Cachagua Cr. (RM 23.2); 2) San Clemente Dam (RM 18.6) to SHSRF (RM 17.4); and 3) Scarlett Well (RM 9.1) to HW1 (RM 1.08).

River flow at the time of the 2013 surveys was low at 18 - 36 cfs at the Highway 1 gage. Early season storms allowed adults to enter the river, but by mid to late season the flows had dropped to the point where those fish were potentially unable to continue their upstream migration due to several critical riffles. There was concern about stranded adults being forced to spawn in sub-standard habitat and adult fish rescues were being discussed. Conditions were similar to those in 2007 when many adults became trapped and spawned in the lower river where many of

those redds dewatered before the fry emerged from the gravel.

As described above, on April 4, 2013, Cal-Am released additional water from Los Padres Reservoir to bring the river flow up to 42 cfs for one day at the Near Carmel Gage and allow trapped adult steelhead to continue their upstream migration past the critical riffles. By April 8th the river had returned to base flow (~18 cfs). The following week, the final 13 adults of the season were counted at the SCD ladder. This redd survey was conducted before the pulse release.

Overall, spawning habitat in the Cachagua area is fair to poor due to a lack of suitable sized spawning gravel, while in the lower river, below Scarlet Well (RM 9.1), habitat was general good with abundant clean gravel available, even to the lower end of the RCGC reach. A total of 54 redds were counted, including one in the Cachagua reach, four in the San Clemente reach, and 49 below Scarlett, including three redds downstream of Rancho San Carlo Bridge **(Table XVI-5)**. The furthest downstream redd was observed downstream of RCGC (RM 1.8).

Few fingerling-sized steelhead and no smolts were observed throughout the reach, but small groups of fry were seen downstream of SCD and in the Scarlett to Schulte reach. Twenty adults were observed, including four spawning pairs, one kelt, and four carcasses.

● **Juvenile Population Surveys** - Since Fall 1990, the District has surveyed the juvenile steelhead population in the Carmel River below Los Padres Dam. This information is crucial to assess the success of adult reproduction and to determine whether or not freshwater habitats are adequately seeded with juveniles.

In 2012 all 11 sites were sampled throughout the 17-mile reach between Red Rock in mid-Carmel Valley and Los Padres Dam. The juvenile steelhead population density at the 11 stations averaged 0.79 fpf of stream and ranged from 0.35 fpf at the Valley Greens Station (RM 13.7) to 1.31 fpf at the San Clemente Reservoir Lower Delta (RM 19.0) **(Table XVI-6).**

The overall 2012 juvenile steelhead population density was the highest it has been since 2008 and only slightly below the long-term (1990 - 2012) average density of 0.81 fpf. In addition, the downward population trend over the past ten years was reversed **(Figure XVI-10).**

● **Constraints to Cal-Am Diversions from the Lower Aquifer** - During the 1992 SWRCB hearings on complaints against Cal-Am's diversions from the Carmel River, testimony was presented that outlined the potential benefits of a modified way of managing the sequence of pumping from Cal-Am well fields in the Carmel Valley Alluvial Aquifer. Pursuant to Condition No. 5 of SWRCB Order WR 95-10, Cal-Am is required to operate its Carmel Valley production wells beginning with the most downstream well, and moving upstream to other wells as needed to meet demand. The goal of this order is to maximize the length of viable stream and aquatic habitats in the lower Carmel Valley.

During the 2012 dry season, it was estimated that this mode of operation and flow releases from Los Padres Reservoir resulted in approximately 2.0 miles of additional viable aquatic habitat. Based on estimated population density at the Lower River sites (see **Table XVI-6**), this habitat

produced approximately 6,800 additional juveniles, representing 15% of the total estimated juvenile population within the main stem of the river, downstream of San Clemente Dam **(Figure XVI-11)**.

E. Other Activities Related to the Steelhead Resource

The District carried out several activities in RY 2012 that were not specifically identified as part of the original Allocation EIR Mitigation Program, but will improve habitat conditions, help restore the steelhead resource, or provide additional key data on the steelhead resource. These include: (a) rescue and transportation of kelts, (b) spawning habitat restoration and monitoring, (c) assessment of the benthic macro-invertebrate (BMI) communities, (d) Carmel River Lagoon water quality monitoring, and (e) assessment of steelhead migration barriers.

"Kelts" are adult steelhead that have already spawned, typically from January through April, and begin to migrate back to the ocean in late spring and early summer. Under existing conditions, these fish are threatened by receding flows in most years, especially when the upstream migration of adults is delayed due to lack of early-season storms. District staff rescue and transport these fish to more stable waters, when needed.

In February 2013, the District was awarded a grant from the California Department of Fish and Wildlife (CDFW) Fisheries Restoration Grants Program (FRGP) for $170,000 of funds toward a $213,000 spawning habitat restoration project below Los Padres Dam. The final agreement was signed in late summer of 2013 followed by permitting and planning. In 2014, Staff plans to purchase and stockpile 1,500 tons of spawning gravel from the Central Valley then place it in three locations just below LPD over two years.

Implementation and Activities in 2012-2013

- **Rescue and Transportation of Kelts** – Normally, steelhead kelts migrate downstream in late spring through June. In 2013, very low flow in the lower river necessitated early trapping and rescues. Trapping results are discussed above in the Capture and Transport Emigrating Smolts section. Three kelts were trapped and released into Carmel Bay. Early 2013 spring rescues will be described in the 2013-2014 Annual Mitigation Report.

- **Spawning Habitat Restoration Project** – Los Padres Dam has been trapping native gravel behind it for approximately 65 years. During that period, suitable spawning materials below the dam have become scarce as the existing gravel continued to move downstream during high flows. In an effort to increase spawning habitat by at least 50%, the District applied for, and was granted, CDFW Fisheries Restoration Grants Program for funding to inject up to 1,500 tons of spawning gravel below the dam.

- **Steelhead Passage Barrier Assessment Grant –** In late 2011, the District was awarded a Proposition 84 grant to complete work on several important Integrated Regional Water Management Plan (IRWM) projects. Assessing steelhead migration barriers on the tributaries was identified in the 2004 Carmel River Watershed Assessment Report as a recommended task and consequently was included as one of the IRWM projects. In 2012, staff met with land owners

and started the reconnaissance and surveying of selected barriers. The final report and recommendations will be completed in 2014. Based on the findings, staff hopes to secure future grant funding for removal or modification of the worst barriers and improve steelhead access in the tributaries.

OBSERVED TRENDS, CONCLUSIONS AND/OR RECOMMENDATIONS:

- **Adult Steelhead**

Annual monitoring conducted by the District shows that the Carmel River steelhead population has recovered somewhat from the remnant levels of the last drought (1987 to 1991) and from past water-supply practices. Though overall fish populations have improved since the inception of the Mitigation Program in 1990, there was a period of general decline in the adult run from 2001 to 2011. Between 1992 and 2001, the spawning population recovered from a handful of fish to levels approaching 900 adults per year as counted at San Clemente Dam (SCD). Then the run experienced a six-year downward trend from 804 adults in 2001 to 222 adults in 2007, rebounding somewhat in 2008 to 412 adults. However, in 2009 and 2010, the population underwent a dramatic reduction to 95 and 157 adults, respectively. In 2011 and 2012, the population rebounded again with 452 and 470 adults passing over SCD, while in 2013 the number dropped again to 249, well below the 1994-2013 average of 421, likely due in part to the dry year.

Previous redd surveys below SCD confirm that the spawning habitat in the lower river has improved considerably over the last 20 years and many adults are now spawning there instead of passing the SCD fish counting station. In addition, juvenile steelhead rescued by the District from the lower river that survive to adulthood are more likely to return to the lower river to spawn, rather than migrate upstream past the SCD. In 2011-2012, The District deployed a DIDSON counting station, acquired from CDFW grant funding, in the lower river to help determine whether more adults are in fact spawning downstream of the dam. Staff continued to download and review video data from the 2013 season and will be reporting the preliminary results in 2014.

At present, the exact reasons for this period of apparent decline in adult returns at SCD are not clear, but are likely the result of a combination of controlling and limiting factors including:

- improved spawning conditions in the lower Carmel River, encouraging fish to spawn before they reach the counter at the dam;

- spring flow variability such as low-flow conditions that could dewater redds prematurely or high flows that could either deposit sediment over redds or completely wash them out;

- variable lagoon conditions, caused by artificial manipulation of the sandbar and/or naturally occurring periods of low winter flows;

- impediments to adult and smolt migration routes, such as seasonal barriers, inadequate passage facilities, and intermittent periods of low flow creating critical riffles below the Narrows during the normal winter-spring migration season;

- low densities of juvenile fish in 2004, 2007, 2009, 2010 and 2011 affecting subsequent adult populations;

- variable ocean conditions; and

- the ongoing but limited impacts of legal fishing (i.e., approximately 0.5 - 1.5% incidental mortality associated with catch-and-release fishing for adults in the winter season, and fishing for juvenile steelhead in the upper watershed during the spring/summer trout season may slightly reduce the adult spawning stock or the number of juvenile fish that reach the ocean), as well as the unquantified impacts of illegal poaching activities.

- **Juvenile Steelhead**

Monitoring of the juvenile steelhead population at eleven sites along the mainstem Carmel River below Los Padres Dam shows that fish density continues to be quite variable both year to year and site to site from below 0.40 fish per foot (fpf) of stream to levels frequently ranging above 1.00 fpf, values that are typical of well-stocked steelhead streams. In this 2012-2013 reporting period, the average population density nearly matched the long-term average of 0.81 fpf for the Carmel River due primarily to healthy adult returns in 2011-2012 and good habitat conditions in the lower river.

District staff believes the recovery and fluctuation of the juvenile steelhead population in the Carmel River Basin is directly related to the following factors:

- improvements in streamflow patterns, due to favorable natural fluctuations, exemplified by relatively high base-flow conditions since 1995;

- District and SWRCB rules to actively manage the rate and distribution of groundwater extractions and direct surface diversions within the basin, coupled with changes to CAW's operations at San Clemente and Los Padres Dams, providing increased streamflow below San Clemente Dam;

- restoration and stabilization of the lower Carmel River's stream banks, providing improved riparian habitat (tree cover/shade along the stream and an increase in woody debris) while preventing erosion of silt/sand from filling gravel beds and pools;

- extensive juvenile steelhead rescues by the District over the last 24 years, now totaling 375,032 fish through 2012;

- rearing and releases of rescued fish from the SHSRF of nearly 87,300 juveniles and smolts back into the river and lagoon over the past 17 years (14 years of operation), at sizes generally larger than the river-reared fish, which in theory should enhance their ocean survival;

- variable lagoon conditions, including highly variable water surface elevation changes caused by mechanical breaching, chronic poor water quality (especially in the fall), and predation by birds and striped bass;

- barriers or seasonal impediments to juvenile and smolt emigration, such as the lack of juvenile passage facilities at Los Padres Dam and intermittent periods of low flow below the Narrows during the normal spring emigration season;

- chronic, and occasionally acute, fall temperature and hydrogen sulfide levels below LPD, and the increase in suspended sediment from the SCD summer draw-down; and

- the potential for enhanced predation on smolts and YOY migrating through the sediment fields of LPD and SCD.

A recent challenge that may remain for some years is the potential effects of substantive physical and operational changes to San Clemente Dam required by DWR/DSOD, including the removal of the dam. The most significant issues are the effect of released sediment from the reservoir on downstream river habitat, proper functioning of MPWMD's SHSRF, and downstream property owners (flood elevations). Major changes include:

- lowering of the reservoir water level to address seismic safety concerns;

- significant changes in the sediment regime in the Carmel River downstream of San Clemente as the dam fills with sediment; and

- loss of reservoir storage, which, in the past, has helped maintain adequate river flows and cooler water in the lower Carmel River.

District staff continues to provide technical expertise and scientific data to CAW engineers and environmental consultants, DWR/DSOD, CDFW, NMFS, U.S. Fish and Wildlife Service, and others involved in addressing the resource management issues associated with seismic retrofit of San Clemente Dam. District staff also continues to provide technical expertise and scientific data to California Department Parks and Recreation, Monterey County Water Resources Agency, Monterey County Public Works Department, California Coastal Commission, U. S. Army Corps of Engineers, Carmel Area Wastewater District, and other regulatory agencies and stakeholders involved in the management of the Carmel River, the Carmel River Lagoon and the barrier beach.

Figure XVI-1

Mean daily streamflow in the Carmel River at the MPWMD Highway 1 gaging station, July 2012 through June 2013.

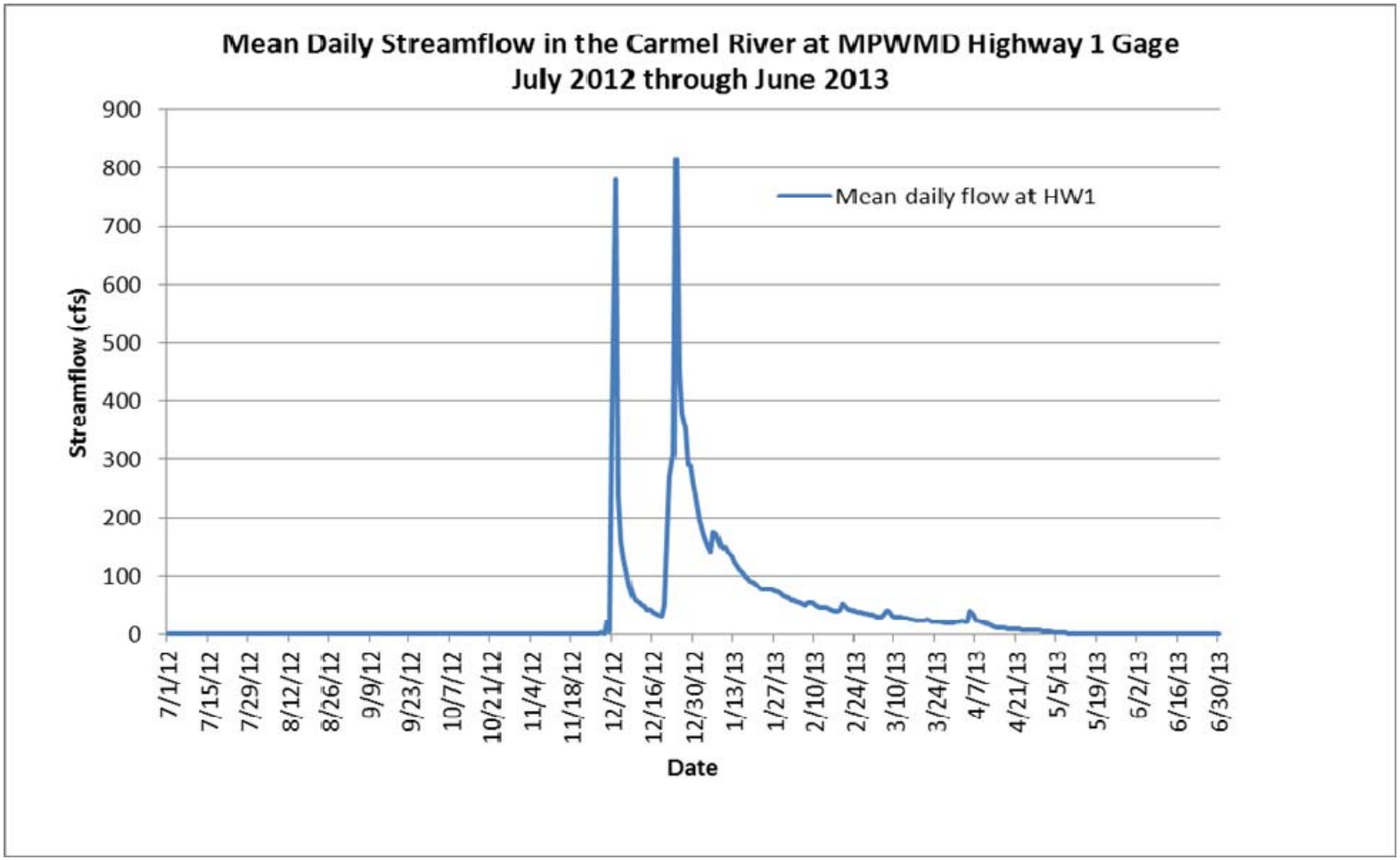


Figure XVI-2

Number of Steelhead Smolts Rescued in Carmel River Basin.

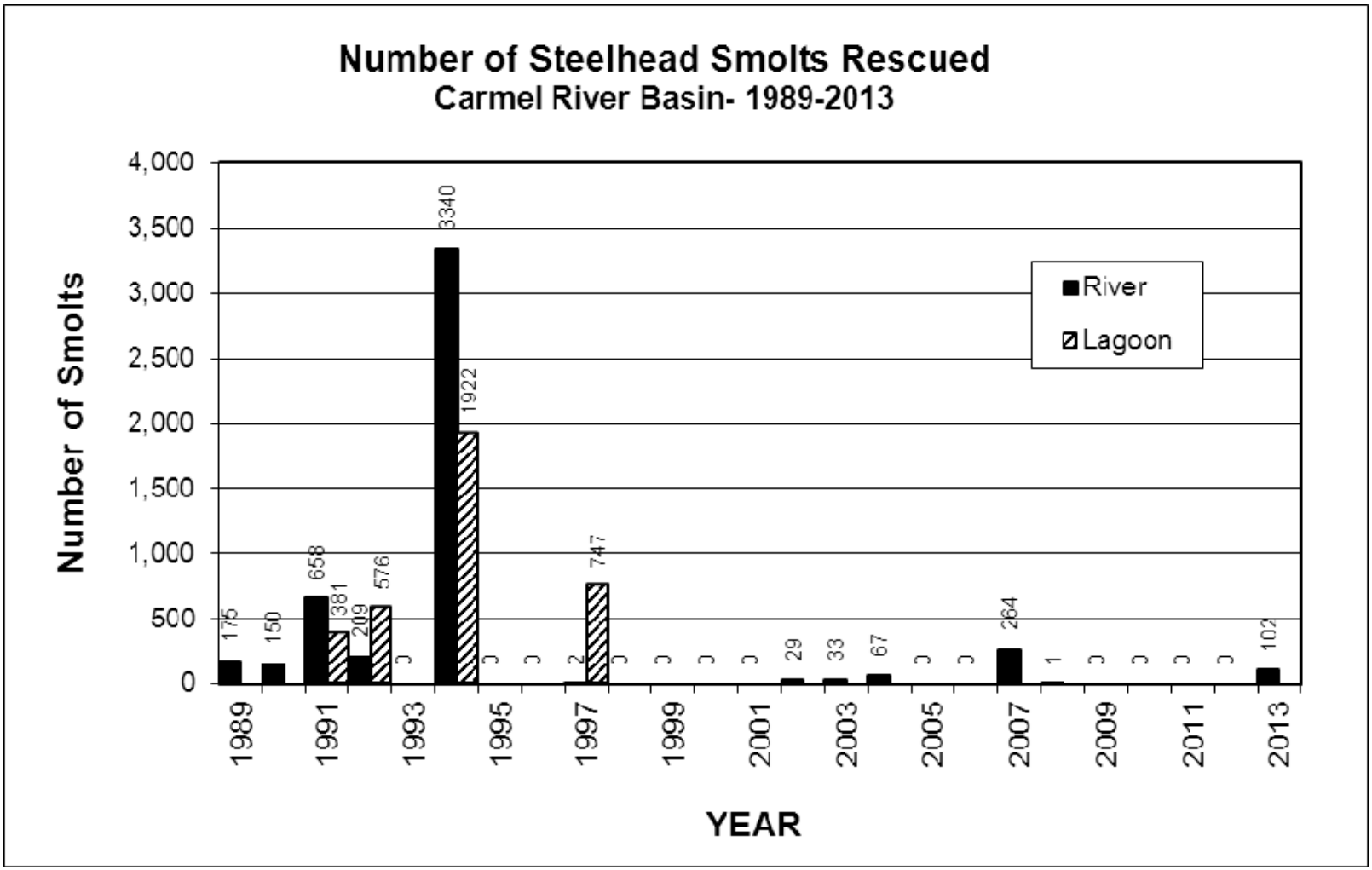


Figure XVI-3

Annual Number of Steelhead Rescued by MPWMD in the Mainstem Carmel River.

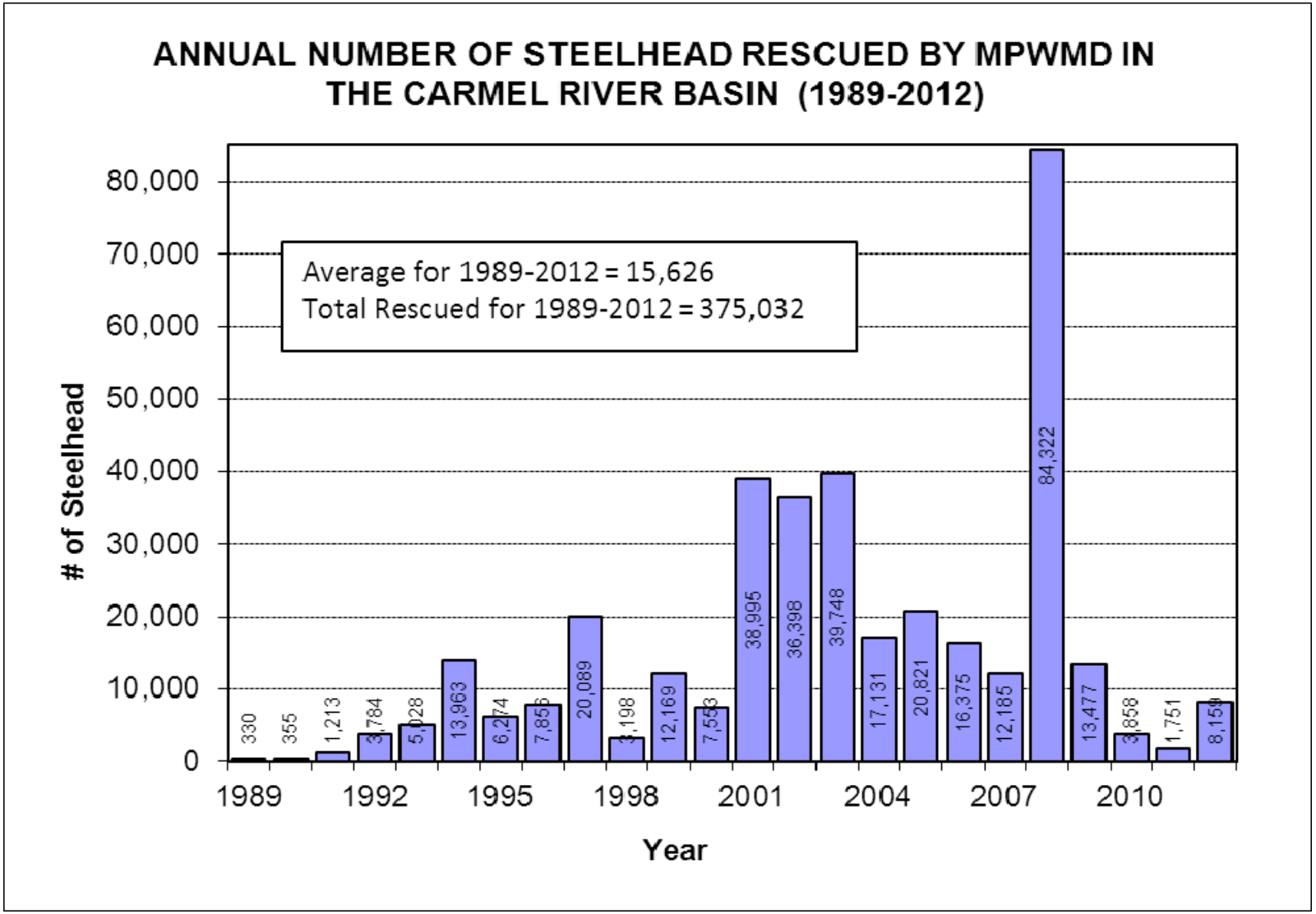


Figure XVI-4

Fish Size Distribution, Carmel River vs. Sleepy Hollow Steelhead Rearing Facility – October 2012.

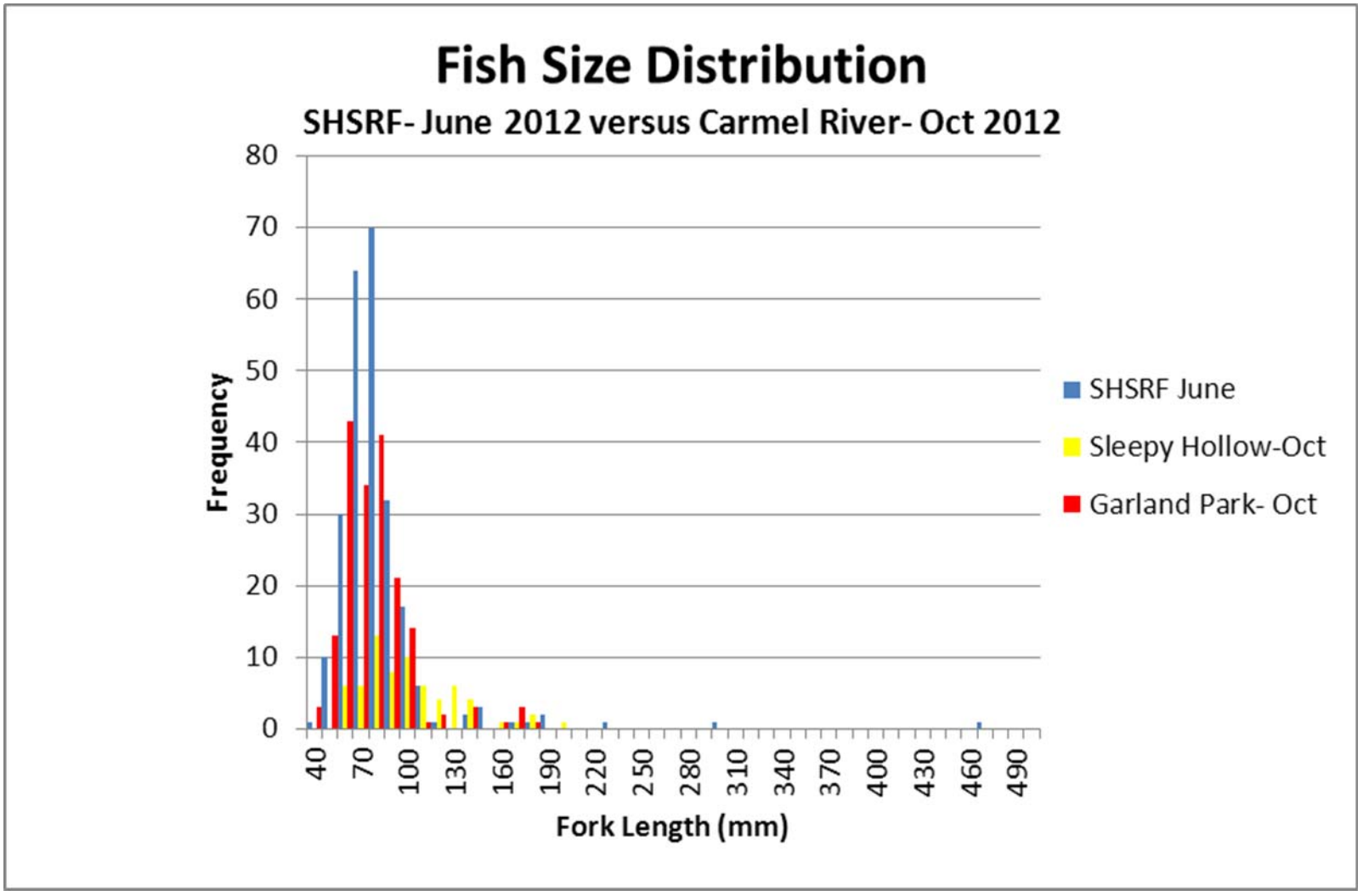


Figure XVI-5

Fish Size Distribution, Carmel River vs. Sleepy Hollow Steelhead Rearing Facility at Release – December 2012.

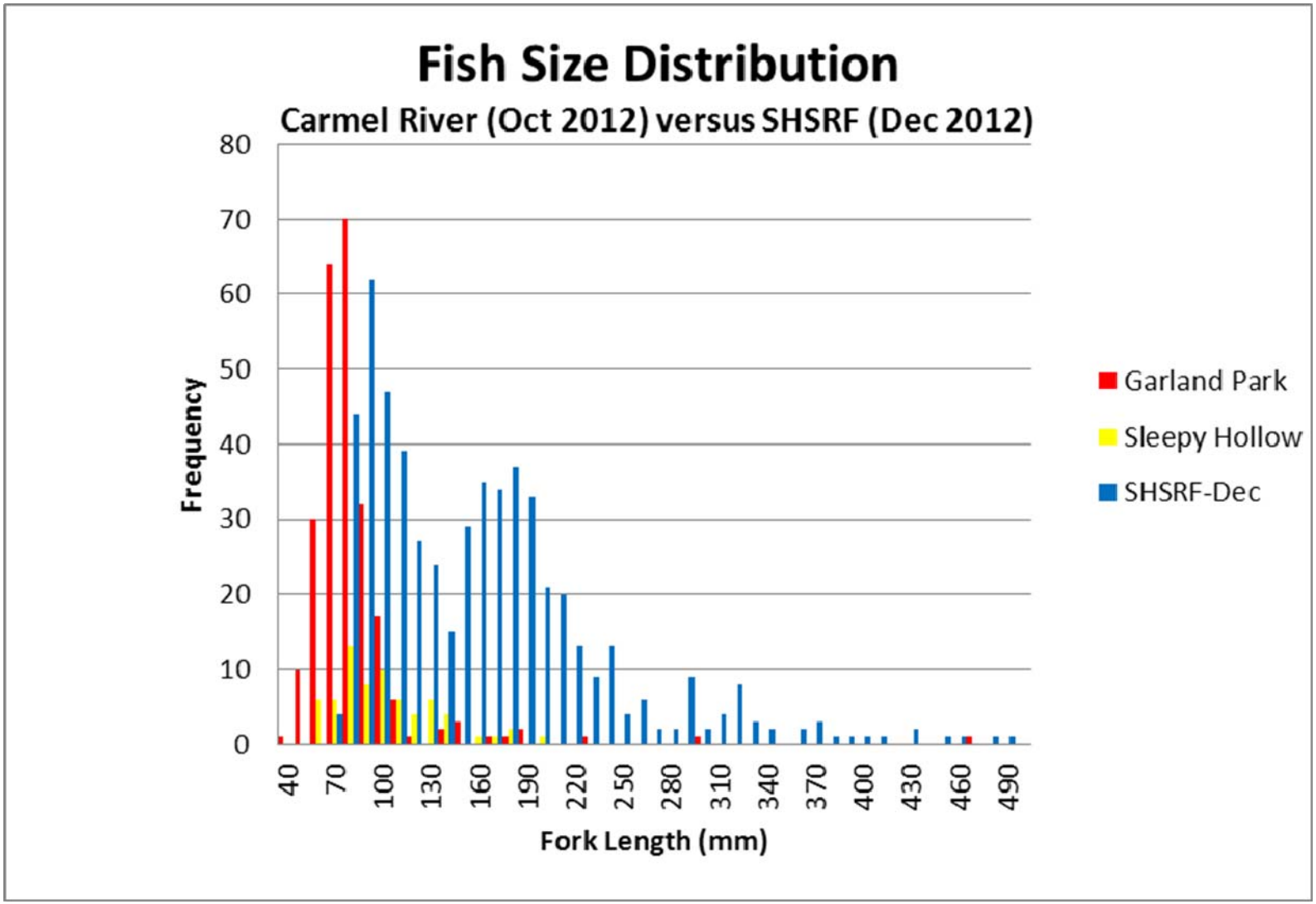
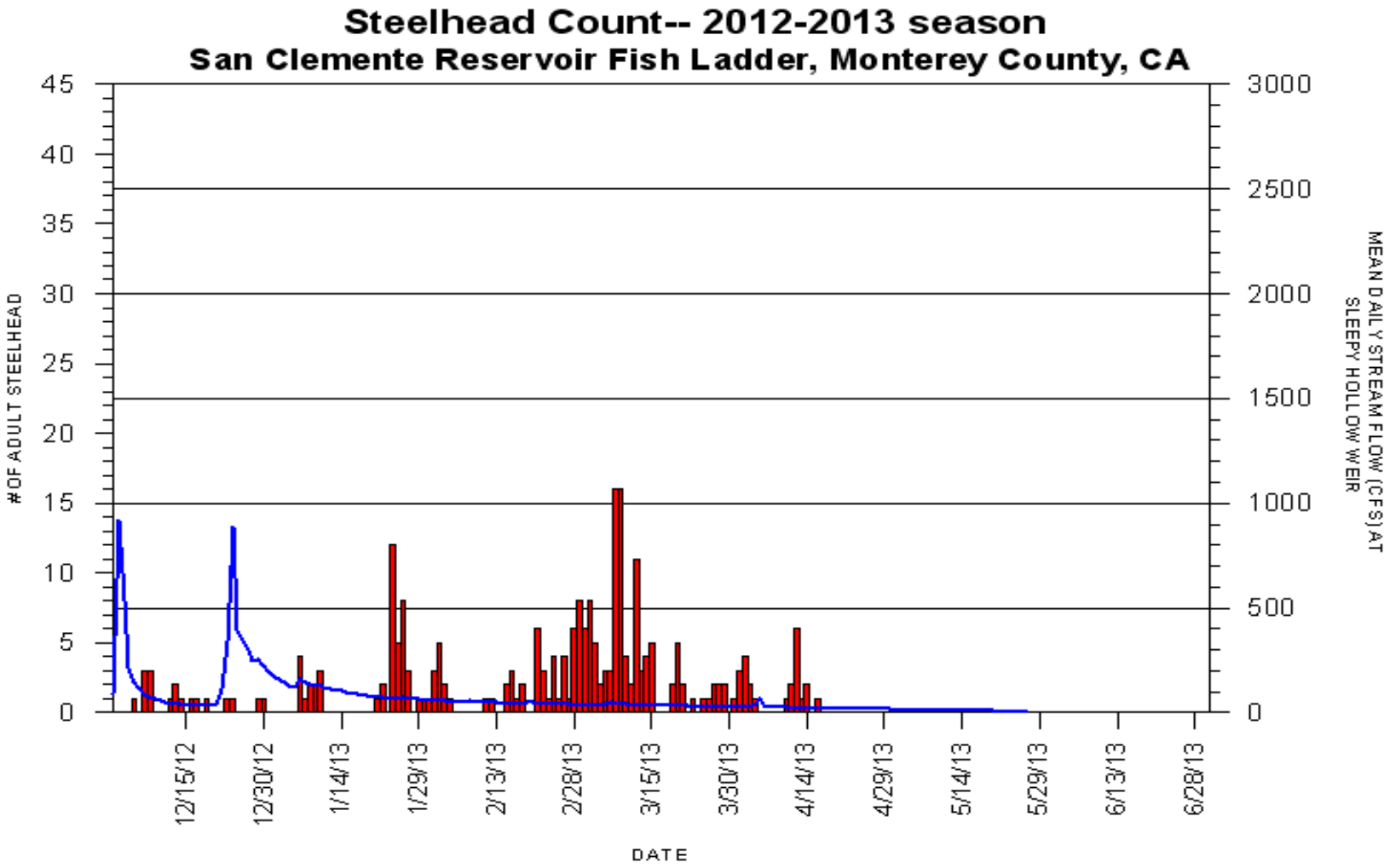


Figure XVI-6

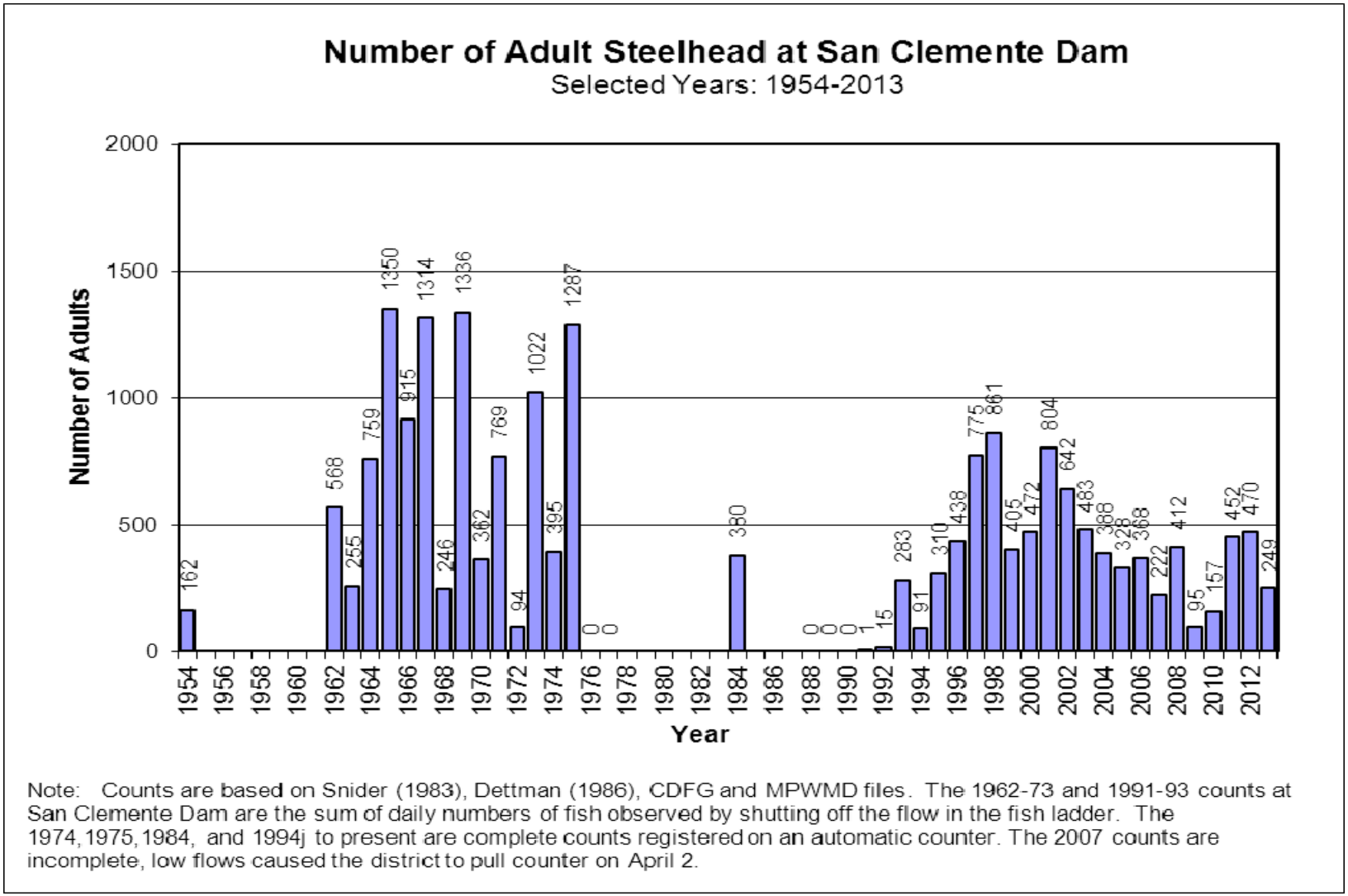


* Streamflow measured at MPWMD Sleepy Hollow Weir gaging station

**** Total Adults Counted = 249 Lagoon opened on 12/3/12**

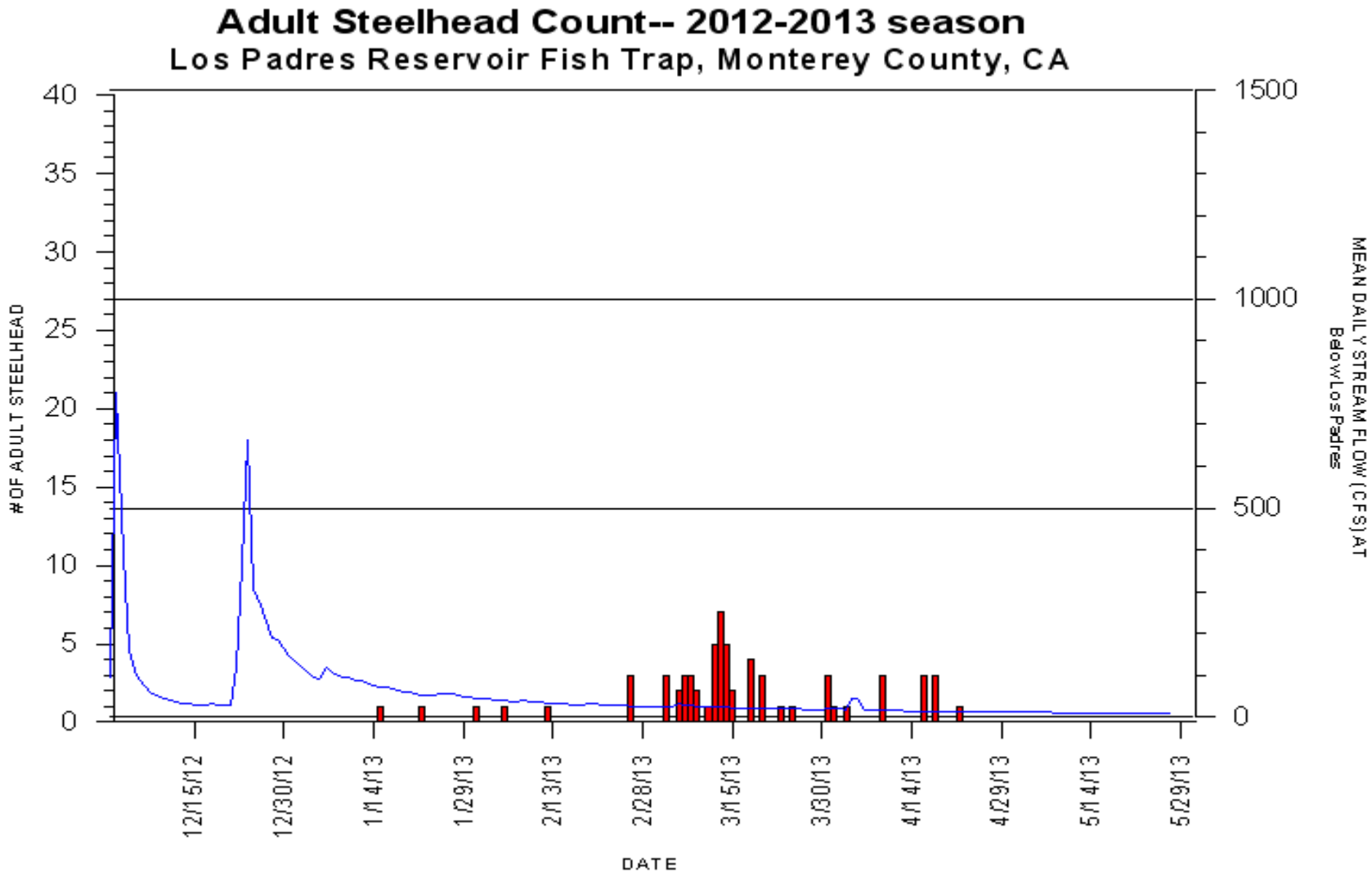
Figure XVI-7

Number of Adult Steelhead at San Clemente Dam.



Note: Counts are based on Snider (1983), Dettman (1986), CDFG and MPWMD files. The 1962-73 and 1991-93 counts at San Clemente Dam are the sum of daily numbers of fish observed by shutting off the flow in the fish ladder. The 1974, 1975, 1984, and 1994j to present are complete counts registered on an automatic counter. The 2007 counts are incomplete, low flows caused the district to pull counter on April 2.

Figure XVI-8



* Streamflow measured at MPWMD Below Los Padres gaging station

**** Total Adults Counted = 58 Lagoon opened on 12/3/12**

Figure XVI-9

Number of Adult Steelhead at Los Padres Dam.

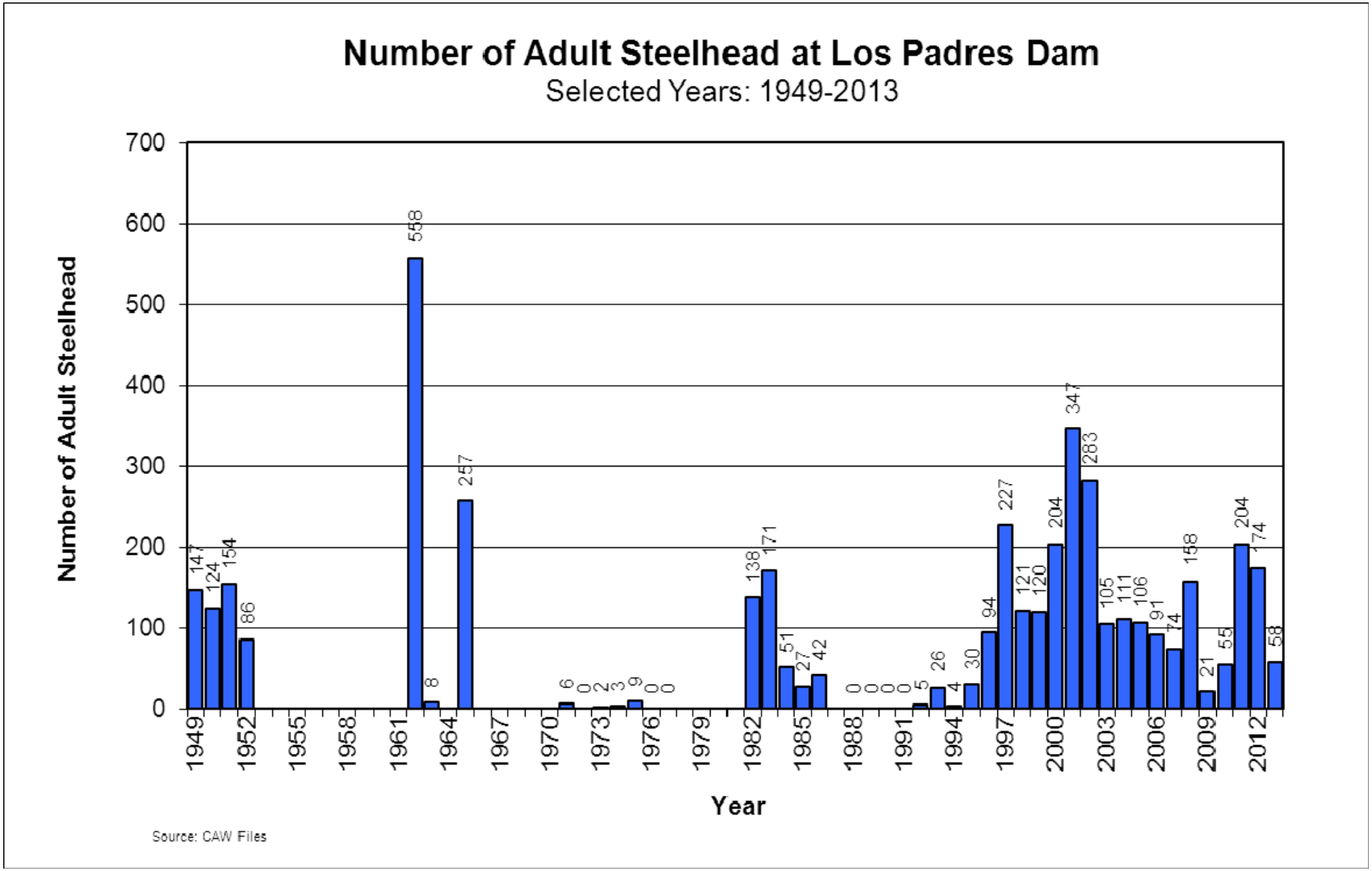


Figure XVI-10

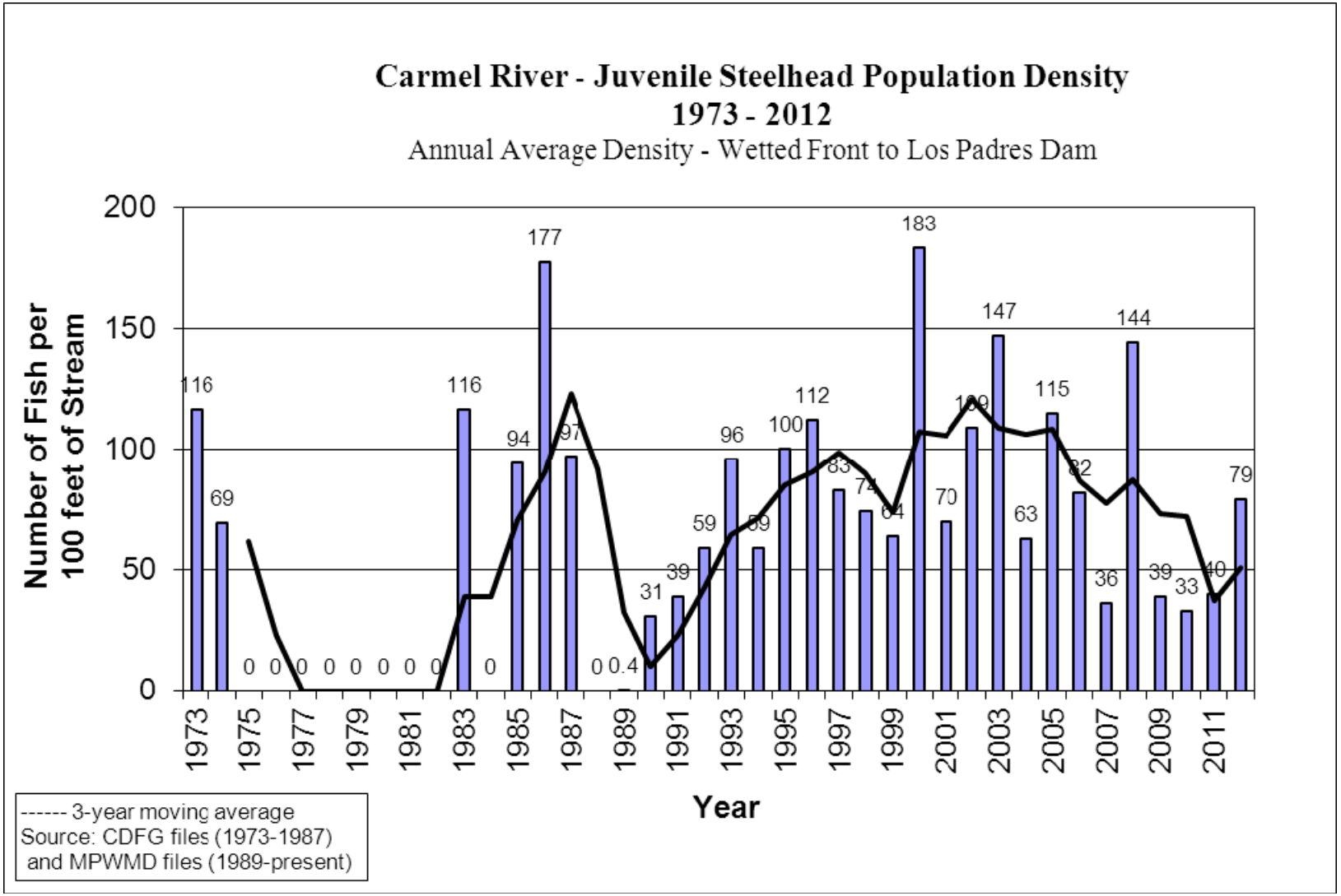


Figure XVI-11

Estimated Number of Juvenile Steelhead Reared Below San Clemente Dam (1990-2012).

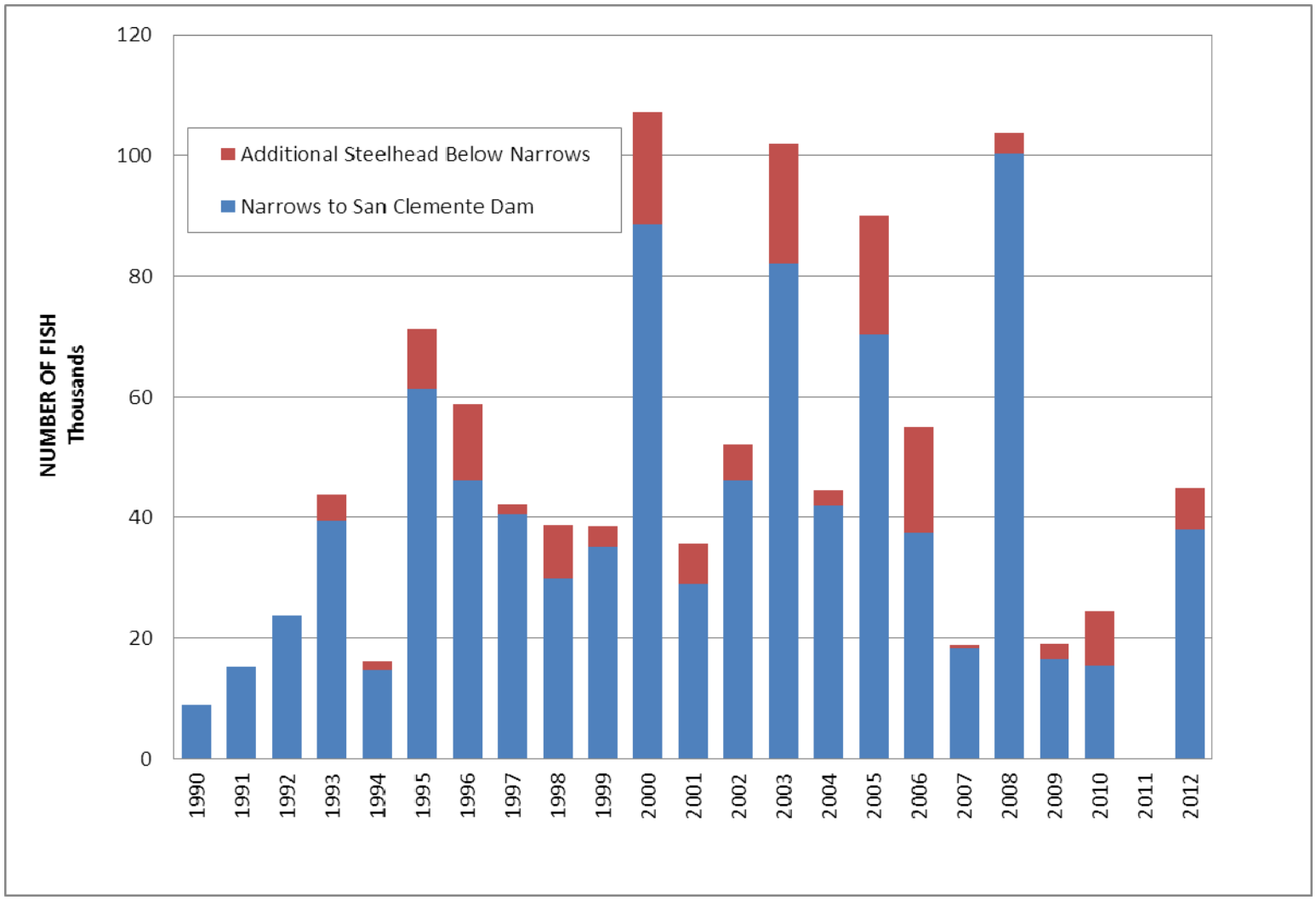


Table XVI-1a

Number of Juvenile Steelhead Rescued in the Mainstem Carmel River, by Age Group and General Location, Rescue Year 2012.

Age Group	General Location	MPWMD August 2012	CRSA 2012
Young-of-the-Year	Mainstem	7,365	0
Age 1+	Mainstem	765	0
Smolts	Lagoon and Lower River	0	0
Adults	Mainstem and Lagoon	0	0
Mortalities	Mainstem	29	0
Totals		**8,159**	0
Percentage Mortality		0.35	0

Table XVI-1b

Release Locations of Juvenile Steelhead Rescued in the Mainstem Carmel River - Rescue Year 2012.

RELEASE LOCATION	RIVERMILE	# OF FISH TRANSPLANTED
SH Ford	17.4	136
SHSRF	17.3	7,566
Moore's Pond	15.4	388
Carmel River Lagoon	0.1	40
TOTAL		**8,130**

NOTE: River miles are approximations.

Table XVI-2

SLEEPY HOLLOW STEELHEAD REARING FACILITY

Fish Rearing Summary: June 11, 2012 to December 11, 2012

Holding Location	# Fish Stocked [1]	# Morts (Disease)[2]	# Morts (Unaccounted for) [3]	Total # Released	% Survival	Mean Fork Length (mm) at release	Mean Condition Factor (K) at release	# by Release Location	Notes
Rearing Troughs 8 Troughs (smallest YOY)	1,263	992	18	253	20%	N/A	N/A	253-Steinbeck Hole	Smallest YOY, less than 70mm
Rearing Channel 7 Pools (YOY)	5,705	476	515	4,715	83%	128 (n=419)	1.07 (n=419)	628 -Quail 8 Hole 3,097 SHSRF Area 768 Redrock Area 334- RV Park	Young-of-year (YOY) fish rescued. 70 to 100mm size range
Rearing Channel 2 Pools (medium size)	419	69	14	339	81%	211 (n=116)	1.01 (n=107)	272-RSC Well 67- Quail 8 Hole	Fish in the 100 to 160mm size range
Rearing Channel 1 Pool (large size)	40	6	0	34	85%	363 (n=29)	1.22 (n=29)	34- RSC Well	Fish greater than 200mm size
Totals	7,417	1,529	547	5,341	72%			5,341 river (100%)	
		21%	7%	72%					

Notes:

1. Fish were segregated in separate RC pools by size/age at the start of the rearing season.
2. Disease was primarily bacterial infection (*Flavobacterium columnare*), but there were minor outbreaks of *Ich*. High concentration salt baths were used throughout the season to treat for infections.
3. Unaccounted-for-fish [# fish stocked - (# of morts + # released)] were likely due to predation by larger fish.

"**Morts**" refer to mortalities. "**FL**" refers to fork length - the length of the fish from snout to the fork in its tail.

"**Condition Factor**" refers to a mathematical formula for determining the physiological state of a fish, including its reproductive capacity. It is calculated by dividing fish weight by length cubed (W/L^3). The heavier a fish for a given length, the higher its condition factor (K). ($\times 10^5$)

Table XVI-3

Sleepy Hollow Steelhead Rearing Facility, Fish Rearing Summary - 2012.

Sleepy Hollow Steelhead Rearing Facility- 2012 Rearing Season						
Pool #	**Number Sampled**	**Avg Fork Length (mm)**	**Avg Weight (g)**	**Avg K Factor**	**Fish Age (at stocking)**	**Date Sampled**
1	29	353	618	1.22	Yearling +	12/11/2012
2	55	226	114	1.01	YOY/Yearling	12/10/2012
3	60	197	87	1.01	YOY/Yearling	12/7/2012
4	60	94	10	1.11	YOY	12/7/2012
8	59	152	50	1.13	YOY	12/6/2012
9	60	146	44	1.07	YOY	12/6/2012
10	60	155	53	1.14	YOY	12/5/2012
11	60	124	27	1.03	YOY	12/5/2012
12	60	117	21	1.01	YOY	12/4/2012
13	60	106	13	0.99	YOY	12/4/2012
Overall-Avg YOY (Pool 8-13)	419	128	31	1.07		
Overall- Avg YOY/Yearling (Pool 2-3)	115	211	100	1.01		
Overall-Avg Yearling (Pool 1)	29	353	618	1.22		
Total Facility	**563**	**167**	**134**	**1.07**		

Table XVI-4

Sleepy Hollow Steelhead Rearing Facility
Fish Release Location Summary - 2012.

Release Location	RM	# Released	% of Total
RSC Well	3.7	306	6
Quail 8	3.9	595	11
RV Park	5.9	334	6
Steinbeck Hole	6.8	253	5
Redrock Hole	8.1	756	14
SHSRF Area	17.3	3,097	58
Total		**5,341**	

Table XVI-5

2013 Redd Survey - Overall Observed Numbers.

HW 1 Br (RM 1.09) to Scarlett Well (RM 9.10); SHSRF (RM 17.4) to SCD (RM 18.6); and Cachagua Creek Conf. (RM 23.19) to LPD (RM 24.8).

**A total of 10.81 miles of river were surveyed once in mid-late March 2013

Redds	54
Spawning Pairs	4
Single Adults	7
Kelts	1
Carcasses	4

Smolts	0
Juveniles	2
Fry	Small groups and singles observed between the Old Carmel Dam and Schulte Br. None d/s of Schulte.
Adult Migration Barriers	Several critical riffles
Smolt Migration Barriers	Several shallow riffles

Downstream of the Narrows (HW1 to Scarlett Well):

Redds	49
Spawning Pairs	2
Single Adults	2
Kelts	0
Carcasses	3

San Clemente Dam Reach (SHSRF to SCD):

Redds	4
Spawning Pairs	2
Single Adults	4
Kelts	1
Carcasses	0

Los Padres Dam Reach (LPD to Cachagua Cr):

Redds	1
Spawning Pairs	0
Single Adults	1
Kelts	0
Carcasses	1

Table XVI-6

Carmel River Juvenile Steelhead Annual Population Survey [1]

Lineal Population Density at Survey Stations (numbers per foot of stream) [2, 3]

YEAR	Valley Greens Br. RM 4.8	Red Rock (Mid Valley) RM 7.7	Scarlett Narrows RM 8.7	Garland Park RM 10.8	Boronda RM 12.7	DeDamp Park RM 13.7	Stonepine Resort RM 15.8	Sleepy Hollow RM 17.5	SCR Lower Delta RM 19.0	SCR Upper Delta RM 19.6	Los Compadres RM 20.7	Cachagua RM 24.7	Overall Annual Average (nos./ft)	Overall Annual Average (nos./mi)
1990					ND		0.50	0.27			0.26	0.22	**0.31**	**1,650**
1991					0.12		0.74	0.39			0.09	0.62	**0.39**	**2,070**
1992				0.67	0.36		0.96	0.30			0.40	0.83	**0.59**	**3,098**
1993			0.62	0.91	0.92	0.82	0.84	0.52			1.22	1.84	**0.96**	**5,075**
1994		ND	0.44	0.23	0.43	ND	0.50	0.29			1.51	0.71	**0.59**	**3,100**
1995		0.49	0.65	1.01	1.61	ND	1.42	0.69			0.50	1.63	**1.00**	**5,281**
1996		0.24	1.52	0.82	1.05	**2.03**	1.22	0.29			0.95	1.92	**1.12**	**5,890**
1997		0.02	0.22	1.02	1.74	1.15	0.50	0.22			1.15	1.41	**0.83**	**4,359**
1998		0.19	0.30	0.67	0.34	1.50	0.27	0.60			0.54	**2.24**	**0.74**	**3,901**
1999		0.17	0.26	0.50	0.32	0.62	1.67	0.45			0.46	1.35	**0.64**	**3,403**
2000		0.91	1.03	0.64	1.38	**5.66**	1.71	1.46			1.41	**2.30**	**1.83**	**9,680**
2001		ND	0.48	0.35	0.63	0.68	1.08	0.32			0.47	1.62	**0.70**	**3,716**
2002		ND	0.68	0.85	1.67	0.83	1.07	0.50	0.33	0.68	1.52	**2.73**	**1.09**	**5,734**
2003		1.53	0.82	**2.16**	1.86	1.45	1.55	1.23	0.58	1.09	1.69	**2.16**	**1.47**	**7,738**
2004		0.25	0.46	0.78	1.21	0.43	1.24	0.55	0.21	0.41	0.45	0.89	**0.63**	**3,302**
2005		1.23	0.60	1.34	1.16	0.91	1.62	1.63	0.21	0.85	0.98	**2.10**	**1.15**	**6,062**
2006		1.13	0.64	0.86	0.87	0.47	0.37	0.95	1.65	0.28	0.82	1.00	**0.82**	**4,339**
2007		ND	0.15	0.50	0.77	0.06	0.33	0.16	0.36	0.25	0.49	0.50	**0.36**	**1,885**
2008		ND	0.90	**2.61**	**3.64**	1.11	1.19	1.38	0.17	0.71	1.13	1.56	**1.44**	**7,603**
2009		0.24	ND	0.25	ND	0.27	ND	0.48	ND	ND	ND	0.72	**0.39**	**2,070**
2010	0.19	0.06	ND	0.30	0.38	0.17	0.31	0.32	0.26	0.11	0.60	0.78	**0.33**	**1,737**
2011	0.11	0.17	ND	0.36	ND	ND	ND	1.07	ND	ND	ND	0.27	**0.40**	**2,091**
2012	ND	0.67	0.47	1.01	1.58	0.35	0.59	0.37	**1.31**	0.74	0.82	0.83	**0.79**	**4,195**
Station Ave (#/ft)	**0.15**	**0.52**	**0.60**	**0.85**	**1.10**	**1.09**	**0.94**	**0.63**	**0.56**	**0.57**	**0.83**	**1.31**	**0.81**	**4,260**
Station Ave (#/mile)	**792**	**2,753**	**3,181**	**4,485**	**5,819**	**5,749**	**4,948**	**3,315**	**2,980**	**3,004**	**4,390**	**6,940**		
Overall Station Averages:													**0.76**	**4,030**

[1] Surveys completed in October and results based on repetitive 3-pass removal method using an electrofisher.

[2] RM; indicates miles from rivermouth

[3] ND indicates stream was dry at sampling station or that site was not sampled that year. Blanks = site not added yet. 2009 - huge storm mid-Oct and river got too high to sample

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XVII. RIPARIAN HABITAT MITIGATION MEASURES

The Findings of Adoption of the 1990 Water Allocation Program Final EIR identified four mitigation measures to reduce impacts to the Carmel River riparian corridor, which includes wildlife that is dependent on streamside habitat (Finding Nos. 389-A through D, and 391). The measures are: (a) conservation and water-distribution management to retain water in the river; (b) prepare and oversee a Riparian Corridor Management Plan; (c) implement the Riparian Corridor Management Program; and (d) expand the existing monitoring program for soil moisture and vegetative stress.

Consistent with the goal of comprehensive resource management, the District is serving as the lead agency to facilitate an update and implement the Integrated Regional Water Management Plan (IRWM Plan) for a region consisting of coastal watershed areas in Carmel Bay and south Monterey Bay between Pt. Lobos on the south and the Fort Ord Dunes State Park on the north – a 38.3-mile stretch of the Pacific coast. The area encompasses the six Monterey Peninsula cities of Carmel-by-the Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City, Seaside, and extends into portions of the unincorporated area of Monterey County in the Carmel Highlands, Pebble Beach and the inland areas of Carmel Valley and the Laguna Seca area. MPWMD adopted an IRWM Plan in 2007. Subsequently, MPWMD was successful in 2011 in obtaining a $995,000 grant from the Department of Water Resources to update the IRWM Plan to Proposition 84 standards. The plan combines strategies to improve and manage potable water supply, water conservation, stormwater runoff, floodwaters, wastewater, water recycling, habitat for wildlife, and public recreation. In Fiscal Year (FY) 2012-2013, MPWMD entered into several sub-grantee and consultant agreements for the 10 planning projects, including an update to the 2007 plan and several planning projects to benefit local jurisdictions. The total cost of the project, including local agency match, will be about $1.6 million and will be completed by mid-2014.

In addition, MPWMD facilitated the expansion of the Regional Water Management Group (RWMG) to include the Marina Coast Water District (MCWD) and the Resource Conservation District (RCD) of Monterey County in order to continue the development and implementation of the IRWM Plan in the Ord Community. The RWMG is comprised of representatives of the Big Sur Land Trust, City of Monterey, Monterey County Water Resources Agency, Monterey Regional Water Pollution Control Agency and MPWMD. The RWMG executed a Memorandum of Understanding (MOU) concerning implementation of the IRWM Plan in 2008. The MOU was amended in 2013 to include MCWD and the RCD as part of the RWMG. Additional information is contained at the end of this chapter.

A. Conservation and Water Distribution Management to Retain Water in the Carmel River

The purpose of this measure is to reduce pumping impacts on riparian vegetation, particularly in the region of Aquifer Subunit 2 (Scarlett Narrows to Carmel Valley Village). Activities to further this goal during 2012-2013 are summarized above in **Section II** (Hydrologic Monitoring), **Section V** (Annual Low Flow MOA), **Section VI** (Quarterly Budget), and **Section VIII** (Water Efficiency and Conservation).

B. Oversee Riparian Corridor Management Program

Riparian habitat mitigation measures proposed in the Water Allocation Program Final EIR have formed the basis for riparian corridor management activities undertaken since the Board of Directors certified the EIR in November 1990. The Riparian Corridor Management Program (RCMP) integrates the District's many riparian mitigation and management activities into one program. Components of the RCMP include the Carmel River Erosion Protection and Restoration Program; continued irrigation around Cal-Am production wells in the lower Carmel Valley and around existing District restoration projects; in-channel vegetation management; public education; enforcement of District rules and regulations; and monitoring of wildlife, vegetation and soil.

C. Implement Riparian Corridor Management Program

The goal of the Riparian Corridor Management Program is the rehabilitation, restoration, enhancement and preservation of the streamside corridor along the Carmel River. As described below, several major sub-programs are carried out to achieve this goal.

Implementation and Activities During 2012-2013

During FY 2012-2013, MPWMD accomplished the following:

- continued revegetation efforts at exposed banks with little or no vegetation located in Aquifer Subunits 2 and 3 (Via Mallorca Rd. to Esquiline Rd.);
- applied for a Routine Maintenance Agreement with California Department of Fish and Game and operated under a Regional General Permit with the U.S. Army Corps of Engineers for maintenance activities associated with vegetation encroachment and restoration projects;
- made public presentations showing MPWMD-sponsored restoration work since 1984 and presented recent documentation of Carmel River State Beach, lagoon, and Scenic Road concerns;
- diversified restoration projects and experimented with planting techniques that allow trees to mature more quickly and depend less on irrigation;
- continued long-term monitoring of physical and biological processes along the river in order to evaluate the District's river management activities;
- continued the annual inspections of the Carmel River from the upstream end of the lagoon at River Mile (RM) 0.5 to Camp Steffani at RM 15.5 (staff members responsible for vegetation management and erosion prevention annually walk the entire river to observe and record erosion damage, conditions that could cause erosion [e.g., in-channel vegetation or debris], riparian ordinance infractions, presence of deleterious material, and the overall condition of the riparian corridor);
- carried out vegetation management activities at three sites (Rancho Cañada Golf Course Bridge No. 1, Scarlett Area, and Panetta Road Area);

The following sections describe MPWMD's work in more detail.

- **Carmel River Erosion Protection and Restoration**

Lower San Carlos Restoration Project: During the spring of 2006 and 2007, the District coordinated emergency streambank repairs to the north streambank along a portion of the Carmel River between Rancho San Carlos Road Bridge and the Via Mallorca Road Bridge. Continued channel incision has been documented in this reach and there is evidence that previous stabilization efforts are being undercut. During the spring of 2011, additional erosion of the north streambank occurred immediately downstream of the Rancho San Carlos Road Bridge. In FY 2012-2013, MPWMD staff inspected the site; however, no work to restore the bank was carried out.

Riparian Ordinance Enforcement Action: MPWMD took no new enforcement actions. However, staff did follow up on a previous enforcement action at a streambank repair site at Carmel Valley Ranch by assisting with additional plantings.

San Clemente Dam Removal and Carmel River Reroute: MPWMD engaged in efforts with state, local, and federal scientists interested in pre- and post-construction monitoring of the Carmel River.

- **Vegetation Restoration --** Various techniques for vegetation installation were employed at District restoration projects in FY 2012-2013. Planting techniques involved either rooted seedlings or cuttings sustained by irrigation, or deeper plantings set to tap summer groundwater without supplemental water applications. The District continued to diversify streambanks by planting with willows, black cottonwoods, and sycamores

The primary objectives of the District's restoration planting effort are to stabilize eroded stream banks with native vegetation and to enhance habitat values near the stream, on adjacent floodplains, and terrace areas. One of the goals of the habitat enhancement program is to diversify restoration plantings by identifying microhabitat areas and vegetating them with species typical of those riparian habitat sites. District staff provided riparian plants to several private property owners. Rooted seedlings are obtained from cuttings and seeds collected from along the Carmel River and propagated by a local nursery.

- **Irrigation Program --** Established riparian vegetation has proven to be an effective deterrent to stream erosion; the mat-like roots of most riparian species bind together loose channel banks and foliage tends to slow the velocity of high river flows. The District selectively irrigates mature streamside vegetation and newly established restoration plantings in order to maintain a healthy, vigorous riparian corridor both for erosion protection and habitat enhancement.

Table XVII-1 and **Figure XVII-1** shows water use at various restoration and riparian mitigation sites for calendar year 2013. A total of 13.56 acre-feet (AF) of water were applied in 2013. In calendar year 2012, 6.72 AF were used to irrigate riparian vegetation. This compares to the 1994 irrigation total of 51.1 AF, when drought conditions prevailed. The irrigation season typically

begins in April and continues through the end of November.

- **Vegetation Management --** Since Fall 1990, the District has carried out annual vegetation management projects along portions of the Carmel River to reduce potential obstructions to river flow and to reduce the potential for bank erosion. In the past, the District has removed in-channel debris and vegetation that could deflect high water onto adjacent stream banks, thereby inducing erosion and degrading streamside habitat.

Carmel River Inspection - Annually, staff assesses the lower 15.5 miles from the lagoon to Camp Stephani in order to determine if and where clearing should occur. At sites where debris and/or live vegetation is judged to be a potential hazard, staff balances the goals of conserving aquatic and streamside habitat with reducing the potential for erosion of private and public property and infrastructure. Only woody plant material representing a bank erosion threat is treated by notching or partially cutting through the trunk and large limbs.

During the fall of 2012, three areas with virtually 100% vegetation encroachment in the channel bottom were selected for vegetation removal:

1. Rancho Cañada Golf Course Bridge No. 1 (area approximately 225 feet^2): at approximately River Mile (RM) 2.8 a debris pile was stripped off of a bridge pier and riparian trees growing next to the pier catching the debris were cut to allow the debris to release during high flows.

2. Scarlett Area (area approximately 253 feet^2): a reach approximately 400 feet downstream of the Scarlett Well (approximately RM 8.9) was opened up. Multiple trees that recruited on a gravel bar were cut because they were catching debris. The blockage should now be able to release during high flows.

3. Panetta Road Area: a red willow with two trunks (approximate diameter 1.2 and 0.8 feet) had fallen across the Carmel River at approximately RM 12.9. This tree had the potential to catch debris and divert flow into the banks or if debris stacks on the tree it might have been ripped out of the bank (creating a weak spot). The tree was cut from than bank with large sections left in the river for large wood habitat.

A total of approximately 478 square feet of stream encompassing approximately 0.01 acres in the channel bottom was affected by the vegetation removal.

In addition to erosion hazard reduction, vegetation management objectives include removing trash and inorganic debris from the river channel. During FY 2012-2013, trash such as plastic, paper, cans, bottles and car parts were removed from the channel and disposed by the District.

In general, the health of the riparian corridor along the lower 15.5 miles of the river appeared to be good with continued development of naturally recruited species, such as black cottonwoods and sycamores, on some of the engineered floodplains as well as natural gravel bars. While most of the stream channel remained clear of major obstructions, District staff documented increases in vegetation encroachment into the channel bottom that will likely require continued monitoring and may require vegetation management activities in the future. District staff believes that

continued selective removal of encroaching vegetation will be necessary during the summer of 2014. Without such a program, it is possible that unauthorized vegetation removal by property owners along the river may increase and lead to a decline in the health and stability of the riparian corridor.

- **Public Information and Partnerships**

MPWMD continued its outreach program with presentations to freshman biology classes from Robert Louis Stevenson, 5th graders from the International School of Monterey, and graduate students at California State University Monterey Bay. Topics included information on the Monterey Peninsula Water Resource System, MPWMD's Environmental Protection Program, the Carmel River steelhead life cycle, and specific issues related to the Carmel River watershed.

D. Expand Monitoring Programs for Soil Moisture and Vegetative Stress

This mitigation measure involves implementing a soil moisture and vegetation monitoring program to better assess plant water stress and related irrigation needs in the riparian zone. Data from soil-moisture and plant water-stress tests facilitate the identification and location of impacts resulting from the prolonged depression or rapid drawdown of the water table. Soil and plant monitoring also documents the beneficial results of riparian mitigations, and provides a statistical foundation for determining trends in conditions over time.

In calendar year 2013, staff collected bi-monthly canopy ratings of individual trees at four study sites in mid and lower Carmel Valley (Rancho Cañada, San Carlos, Schulte Restoration Project, and the Valley Hills Restoration Project). Canopy ratings are used to determine the amount of defoliation that is occurring in riparian trees due to moisture stress associated with a falling water table. **Figure XVII-2** shows average canopy ratings for both willows and cottonwoods. Results showed that willows and cottonwoods were healthy and vigorous during the beginning of the monitoring season and then began exhibiting signs of moisture stress (defoliation) as the water table dropped. It should be noted, that many trees are irrigated in the vicinity of large production wells to offset impacts associated with water extraction. Monitoring results help District staff determine irrigation requirements for portions of the riparian corridor that are under the influence of groundwater extraction. In addition, soil moisture was evaluated bi-monthly with tensiometers at the same monitoring sites. Photo documentation and measurements of foliage volume occurs in other areas as well, depending on river flow conditions and depth to groundwater.

In addition to vegetation and soil moisture monitoring, avian (bird) species diversity monitoring has been carried out from 1992 to the summer of 2010. Data collected by Dr. David Mullen and the BSOL since 1992 compares habitat values at permanent monitoring stations and provides an indication of changing patterns of avian use in District restoration projects. The information collected on avian species diversity has helped document the response of populations to habitat enhancements implemented by the District. Since 1992, the avian monitoring work has shown healthy avian species diversity along river reaches where the District has implemented restoration projects, while diversity-index readings in control sites with established riparian vegetation seem to fluctuate depending on the presence of flow in the river channel, the quality

of the habitat, and off site conditions during migration. The avian monitoring program is currently on hold because of budget constraints.

OBSERVED TRENDS, CONCLUSIONS AND/OR RECOMMENDATIONS:

The Carmel River continues to show many signs of recovery and stabilization after a combination of increased groundwater extraction, extreme drought and flood events occurred during the 1970s, 1980s and 1990s that impacted property owners, threatened species and degraded riparian habitat. In many reaches of the river, fine material (silt and sand) that entered the main stem during periods of instability has been washed out of the system leaving behind a more complex channel with improved steelhead spawning substrate, diverse habitat, and a richer riparian community. Areas with perennial or near perennial flow (upstream of Schulte Bridge) or a high groundwater table, such as downstream of Highway 1, have experienced vigorous natural recruitment in the channel bottom, which has helped to stabilize streambanks and diversify aquatic habitat.

In these areas, natural recruitment has led to vegetation encroachment that, in some areas, may constrict high flows and threaten bank stability. MPWMD continues to monitor these areas closely and to develop a management strategy to balance protection of native habitat with the need to reduce erosion potential. Environmental review of proposed projects and the process of securing permits is quite complex and requires an exhaustive review of potential impacts.

In contrast to areas with perennial flow, the recovery of streamside areas subjected to annual dewatering requires monitoring. Plant stress in the late summer and fall is evident in portions of the river that go dry. In these areas, streambanks exhibit unstable characteristics during high flows, such as sudden bank collapse, because of the lack of healthy vegetation that would ordinarily provide stability. In addition, due to the presence of main stem reservoirs, there is a lack of sediment delivery from the upper watershed that continues to result in channel degradation (incision of the stream into the valley floor). Thus, pools become deeper and when combined with scour along the outside of streambanks this creates "cut" banks. Although this leads to a more complex and dynamic channel, which is a desirable condition, continued degradation can result in bank collapses and trigger an episode of erosion along the river. District staff continues to document degradation in the river bed including at the Carmel Area Wastewater District pipe across the river downstream of Highway 1 and at bridge infrastructure in the active channel.

Restoration project areas sponsored by MPWMD since 1984 continue to mature and exhibit more features of relatively undisturbed reaches, such as plant diversity and vigor, complex floodplain topography, and a variety of in-channel features such as large wood, extensive vegetative cover, pools, riffles, and cut banks.

As cited in previous reports, the most significant trends continue to include the following:

- increased encroachment of vegetation into the active channel bottom,
- effects to areas with groundwater extraction downstream of Schulte Road,

- channel scour due to a lack of sediment from upstream and from bank erosion,
- healthy avian species diversity, and
- maturing of previous restoration projects.

Carmel River Erosion Protection and Restoration

With the exception of the channel area between the Via Mallorca Road bridge and the Rancho San Carlos Road bridge, streambanks in the main stem appear to be relatively stable during average water years with "frequent flow" storm events (flows with a return magnitude of less than five years). The program begun by MPWMD in 1984 (and later subsumed into the Mitigation Program) to stabilize streambanks appears to be achieving the goals that were initially set out, i.e., to reduce bank erosion during high flow events up to a 10-year return flow, restore vegetation along the streamside, and improve fisheries habitat.

Consistent with previous reports, it is likely that the following trends will continue:

- State and Federal agencies consider the Carmel River watershed to be a high priority area for restoration, as evidenced by the interest in addressing water supply issues, the removal of San Clemente Dam, impacts to the Carmel Bay Area of Special Biological Significance, and management of threatened species. Stringent avoidance and mitigation requirements will continue to be placed on activities that could have negative impacts on sensitive aquatic species or their habitats.
- Activities that interrupt or curtail natural stream functions, such as lining streambanks with riprap, have come under increasing scrutiny and now require significant mitigation offsets. Approximately 35% to 40% of the streambanks downstream of Carmel Valley Village have been altered or hardened since the late 1950s. Activities that increase the amount of habitat or restore natural stream functions are more likely to be approved or funded through State and Federal grant programs.
- Additional work to add instream features (such as large logs for steelhead refuge or backwater channel areas for frogs) can restore and diversify aquatic habitat.
- Major restoration projects completed between 1992 and 1999 have had extensive and successful work to diversify plantings. However, maintenance of irrigation systems is ongoing and requires extensive work in water years classified as below normal, dry and critically dry.
- Downstream of the Robinson Canyon Road bridge, the river continues to cut into the channel bottom and form a more complex system of pools, riffles and gravel bars.

Between the mouth of the river and Robinson Canyon Road bridge, many areas of the river appear to be deeper than at any previous time since measurements have been recorded (i.e., beginning in 1978), with many reaches showing several feet of downcutting. This trend, which was identified as a concern in the 1984 Carmel River Management Program EIR, appears to have accelerated in the period from 1998 to 2013. This was a period of exceptional stability (for the Carmel River) as streambanks hardened with structural protection over the past several decades resisted erosion and the force of the river during high flows was directed into the channel bottom. This condition has resulted in the undermining of rip-rap protection and bridge infrastructure in some reaches.

Recently, in the spring of 2010, the Carmel Area Wastewater District's concrete-encased pipe across the bottom of the river was exposed for the first time since it was constructed in 1973. In 2012, District staff measured a maximum of 4.5 feet of scour from the top of the encasement, which is approximately five feet wide and five feet high (see **Figure XVII-3**). It is possible that high flows are passing under the pipe encasement. When the pipe encasement was installed, the top was buried two feet below the riverbed. In the spring of 2011, the river migrated into the north streambank at the Rancho San Carlos Road bridge (see **Figure XVII-4**). If no work to stabilize the streambank is carried out, it is likely that the river will continue to migrate toward homes along the north streambank.

Eventually, without corrective measures to balance the sediment load with the flow of water or to mitigate for the effect of the downcutting, streambanks will begin to collapse and the integrity of bridges and other infrastructure in the active channel of the river may be threatened.

Vegetation Restoration and Irrigation

To the maximum extent possible, MPWMD-sponsored river restoration projects incorporate a functional floodplain that is intended to be inundated in relatively frequent storm events (those expected every 1-2 years). For example, low benches at the Red Rock and All Saints Projects have served as natural recruitment areas and are currently being colonized by black cottonwoods, sycamores and willows. In addition, willow and cottonwood pole plantings in these areas were installed with a backhoe, which allows them to tap into the water table. These techniques have been successful and have reduced the need for supplemental irrigation.

Channel Vegetation Management

Another notable trend relating to the District's vegetation management program was the widening of the channel after floods in 1995 and 1998. With relatively normal years following these floods, the channel has narrowed as vegetation recruits on the channel bottom and gravel bars. Current Federal regulations such as the Endangered Species Act (ESA) "Section 4(d)" rules promulgated by NOAA Fisheries to protect steelhead significantly restrict vegetation management activities. Because of these restrictions, the District can carry out activities only on the most critical channel restrictions and erosion hazards in the lower 15 miles of the river. In the absence of high winter flows capable of scouring vegetation out of the channel bottom, encroaching vegetation may significantly restrict the channel. As vegetation in the river channel recovers from the high flows of 1995 and 1998 and matures in the channel bottom, more conflicts are likely to arise between preserving habitat and reducing the potential for property damage during high flows. MPWMD will continue to balance the need to treat erosion hazards in the river yet maintain features that contribute to aquatic habitat quality.

Permits for Channel Restoration and Vegetation Management

In 2012 MPWMD renewed its long term permits with the U.S. Army Corps of Engineers and the California Regional Water Quality Control Board for routine maintenance and restoration work. The District also filed an application with the California Department of Fish and Wildlife to renew a long-term Routine Maintenance Agreement (RMA) to conduct regular maintenance and

restoration activities. The District hopes to operate under a new RMA by the fall of 2014.

Monitoring Program

Vegetative moisture stress fluctuates depending on the rainfall, proximate stream flow, depth to groundwater, and average daily temperatures, and tends to be much lower in above-normal rainfall years. Typical trends for a single season start with little to no vegetative moisture stress in the spring, when the soil is moist and the river is flowing. As the river begins to dry up in lower Carmel Valley (normally around June) and temperatures begin to increase, an overall increase in vegetative moisture stress occurs. For much of the riparian corridor in the lower seven miles of the Carmel River, this stress has been mitigated by supplemental irrigation, thereby preventing the die off of large areas of riparian habitat. However, many recruiting trees experience high levels of stress or mortality in areas difficult to irrigate. Riparian vegetation exposed to rapid or substantial lowering of groundwater levels (i.e., below the root zones of the plants) will continue to require monitoring and irrigation during the dry season.

With respect to riparian songbird diversity, populations dropped after major floods in 1995 and 1998 because of the loss of streamside habitat. Since 1998, species diversity recovered and now fluctuates depending on habitat conditions. Values indicate that the District mitigation program is preserving and improving riparian habitat.

Strategies for the future

A comprehensive long-term solution to overall environmental degradation requires a significant increase in dry-season water flows in the lower river, a reversal of the incision process, and reestablishment of a natural meander pattern. Of these, MPWMD has made progress on increasing summer low flows and groundwater levels by aggressively pursuing a water conservation program, implementing the first and second phases of the Seaside Groundwater Basin Aquifer Storage and Recovery Project, and recommending an increase in summer releases from Los Padres Reservoir.

Reversal, or at least a slowing, of channel incision may be possible if the supply of sediment is brought into better balance with the sediment transport forces. Additional sediment from the tributary watersheds between San Clemente Dam and Los Padres Dam may pass into the lower river in the foreseeable future no matter what happens with the San Clemente Dam. However, any increase in the sediment supply may not reach the lowest portion of the river for many years.

In January 2009, CAW agreed to proceed with the removal of San Clemente Dam and reroute of the Carmel River main stem around the sediment field. MPWMD supported this dam removal and re-route project proposed by the California Coastal Conservancy. The project began in the summer of 2013 and is scheduled to be completed in 2015. In addition to a significant improvement in fish passage, removal of San Clemente Dam would likely reduce the time it takes for sand and gravel from the upper watershed to move through the river bottom and replenish the Carmel River State Beach at the mouth of the river.

Over the long term, an increase in sediment supply could help reduce streambank instability and

erosion threats to public and private infrastructure. However, reestablishing a natural supply of sediment and restoring the natural river meander pattern through the lower 15.5 miles of the Carmel Valley presents significant political, environmental, and fiscal challenges, and is not currently being considered as part of the Mitigation Program.

Integrated Regional Water Management (IRWM) Grant Program

The IRWM program promoted by the California Department of Water Resources (DWR) encourages planning and management of water resources on a regional scale and promotes projects that incorporate multiple objectives and strategies. In addition, the IRWM process brings stakeholders together and encourages cooperation among agencies in developing mutually beneficial solutions to resource problems.

In November 2007, the District adopted the final IRWM plan for a region encompassing Monterey Peninsula areas within the District boundary, the area in the Carmel River watershed outside of the MPWMD boundary, Carmel Bay and the Southern Monterey Bay. The plan combines strategies to improve and manage potable water supply, water conservation, stormwater runoff, floodwaters, wastewater, water recycling, habitat for wildlife, and public recreation.

Subsequently, MPWMD was successful in 2011 in obtaining a $995,000 grant from the Department of Water Resources to update the IRWM Plan to Proposition 84 standards. The plan combines strategies to improve and manage potable water supply, water conservation, stormwater runoff, floodwaters, wastewater, water recycling, habitat for wildlife, and public recreation. In FY 2011-2012, MPWMD entered into a grant agreement with DWR and initiated work on 10 planning projects, including an update to the 2007 plan and several planning projects to benefit local jurisdictions. During FY 2012-2013, additional agreements were signed to work on all 10 planning projects. The total cost of the project, including local agency match, will be about $1.6 million and will be completed by mid-2014.

In addition, MPWMD facilitated the expansion of the Regional Water Management Group (RWMG) to include the Marina Coast Water District (MCWD) and the Resource Conservation District (RCD) of Monterey County in order to continue the development and implementation of the IRWM Plan in the Ord Community. The RWMG is comprised of representatives of the Big Sur Land Trust, City of Monterey, Monterey County Water Resources Agency, Monterey Regional Water Pollution Control Agency and MPWMD. The RWMG executed a Memorandum of Understanding concerning implementation of the IRWM Plan in 2008. The MOU was amended in 2013 to include MCWD and the RCD as part of the RWMG.

Funding from the IRWM grant program could provide the incentive to undertake a set of projects that would continue to improve the Carmel River environment and engage a larger number of organizations in helping to develop and implement a comprehensive solution to water resource problems in the planning region.

More information about the IRWM Plan and the group of stakeholders in the planning region can be found at the following web site:

http://www.mpwmd.dst.ca.us/Mbay_IRWM/Mbay_IRWM.htm

U:\mpwmd\Allocation\Annual Mit. Report RY 2013\RY 13 - Place Your Files Here\XVII Riparian Habitat Measures\Sec_xvii_riparian_20140210-final_JOedit.docx

Table XVII-1

Monthly Irrigation Water Use During 2013
(Values in Acre-Feet)

Project Site	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Total
DeDampierre	0.000	0.005	0.004	0.006	0.020	0.026	0.017	0.031	0.018	0.026	0.006	0.001	**0.160**
Trail and Saddle	0.067	0.133	0.149	0.152	0.236	0.239	0.172	0.264	0.156	0.191	0.083	0.030	**1.872**
Begonia	0.005	0.010	0.014	0.013	0.027	0.032	0.042	0.026	0.038	0.042	0.022	0.006	**0.277**
Reimers	0.000	0.000	0.017	0.000	0.000	0.000	0.312	0.367	0.461	0.202	0.167	0.083	**1.609**
Schulte Bridge	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.021	0.000	0.000	**0.052**
All Saints	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	**0.020**
Cypress	0.000	0.000	0.028	0.099	0.088	0.209	0.662	0.797	0.510	0.539	0.329	0.389	**3.650**
San Carlos	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.718	1.077	1.008	0.884	0.332	**4.019**
San Carlos (Dow)	0.000	0.000	0.008	0.115	0.155	0.285	0.362	0.299	0.159	0.282	0.175	0.066	**1.906**
TOTAL WATER USE IN ACRE-FEET FOR DISTRICT RESTORATION PROJECTS IN 2013 =													**13.565**

Figure XVII-1

Riparian Irrigation Totals

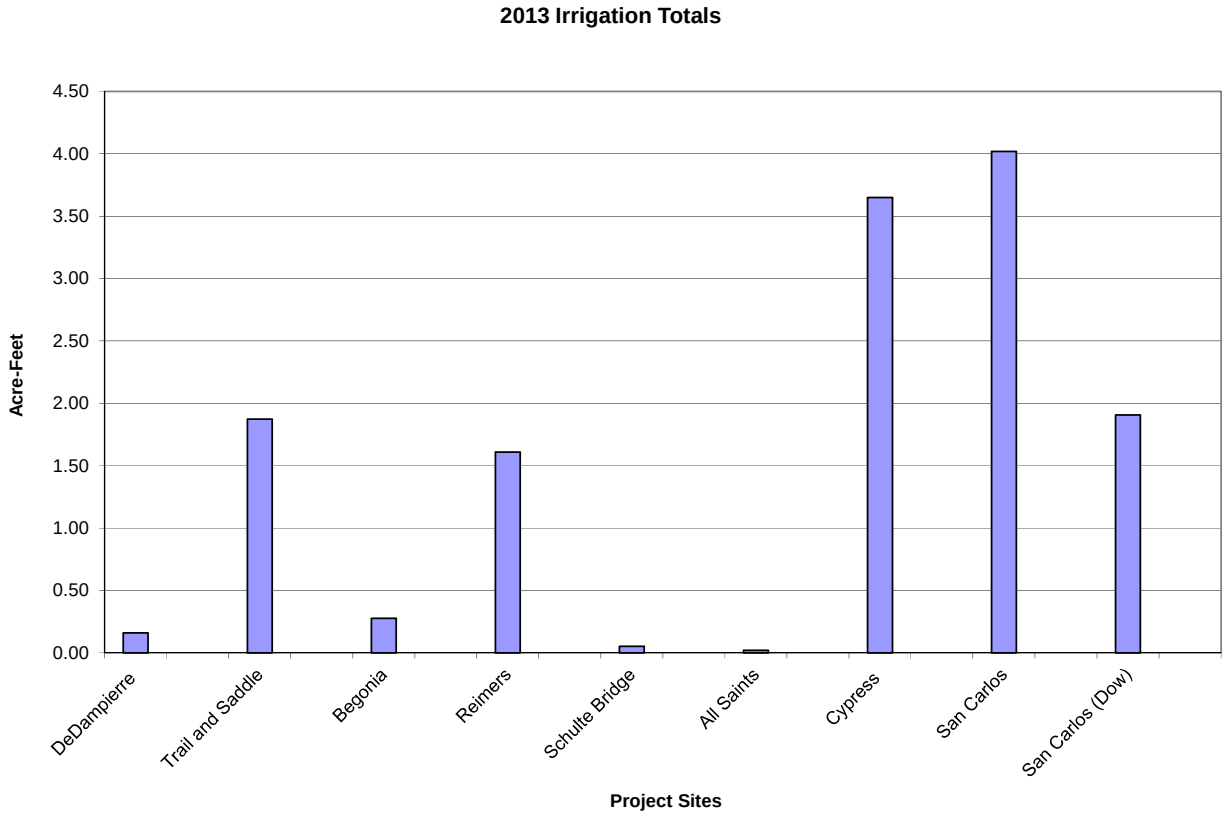
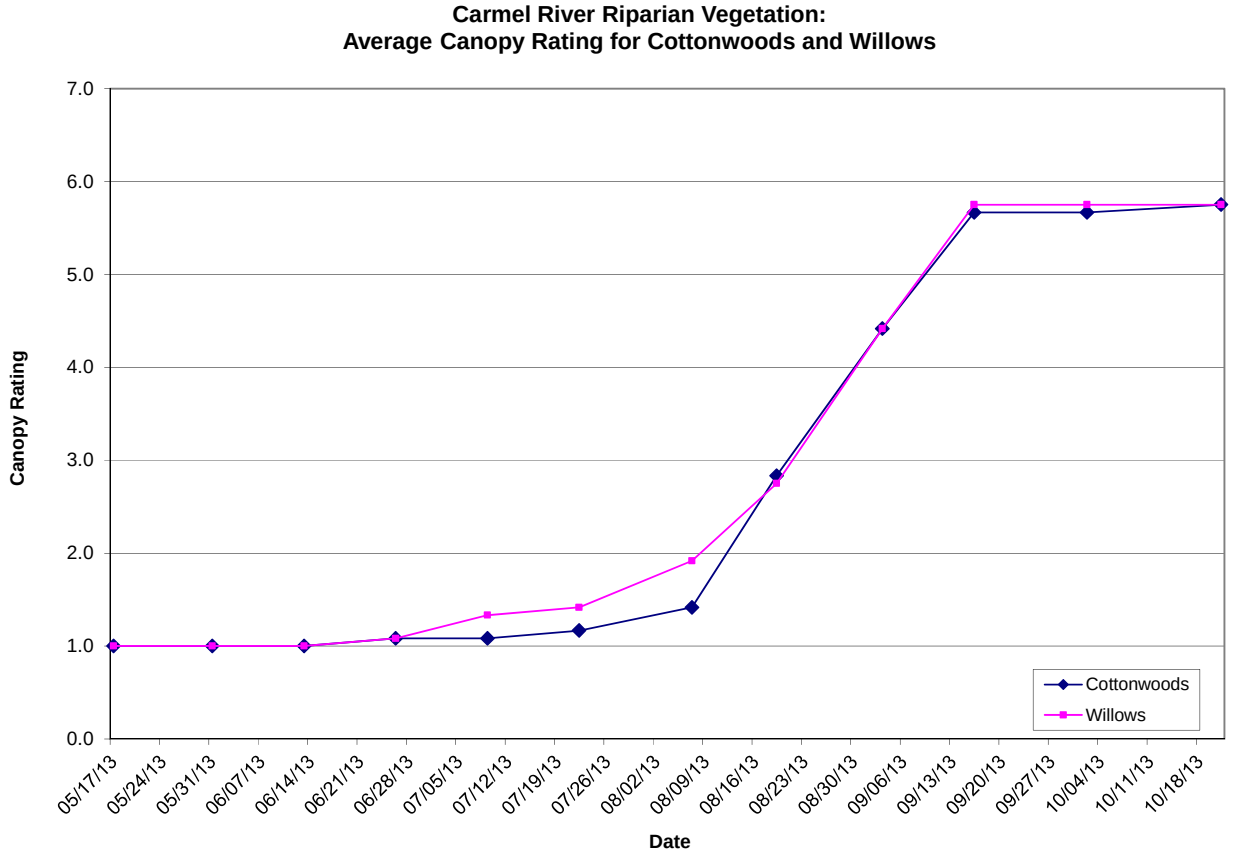


Figure XVII-2

2013 Average Canopy Rating for Cottonwoods and Willows



Canopy Rating Scale		Stress Level
1=	Green, obviously vigorous	none, no irrigation required
2=	Some visible yellowing	low, occasional irrigation required
3=	Leaves mostly yellowing	moderate, regular irrigation required
4=	< 10% Defoliated	moderate, regular irrigation required
5=	Defoliated 10% to 30%	moderate, regular irrigation required
6=	Defoliated 30% to 50%	moderate to high, additional measures required
7=	Defoliated 50% to 70%	high stress, risk of mortality or canopy dieback
8=	Defoliated 70% to 90%	high stress, risk of mortality or canopy dieback
9=	> 90% Defoliated	high stress, risk of mortality or canopy dieback
10=	Dead	consider replanting

Figure XVII-3
Carmel Area Wastewater District Pipe Encasement, Carmel River

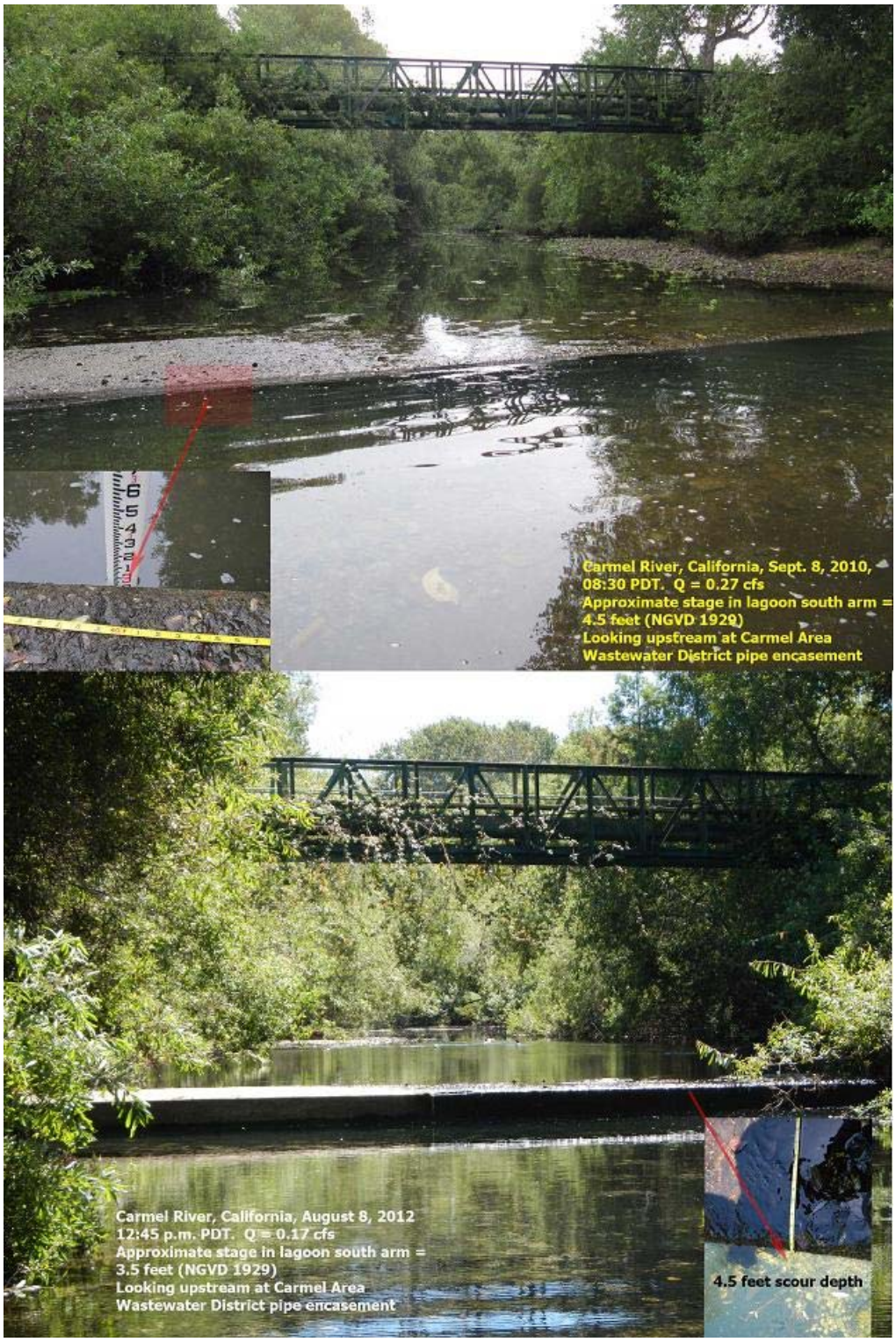


Figure XVII-4
Streambank Erosion at Rancho San Carlos Road Bridge, Carmel River

XVIII. LAGOON HABITAT MITIGATION MEASURES

The Findings for Adoption of the Water Allocation Program Final EIR identified three mitigation measures to reduce impacts to the Carmel River Lagoon, including wildlife that is dependent on it (Finding Nos. 390-A through C, and 392). They include: (a) assist with lagoon enhancement plan investigations, (b) expand long-term monitoring program, and (c) identify feasible alternatives to maintain adequate lagoon volume. This section briefly describes the purpose of these three programs and summarizes the mitigation activities from July 1, 2012 through June 30, 2013.

A. Assist with Lagoon Enhancement Plan Investigations

Description and Purpose

The District, Monterey County Water Resources Agency (MCWRA), California Department of Parks and Recreation (CDPR), and the California Coastal Conservancy (Conservancy) co-funded the Carmel River Lagoon Enhancement Plan, which was prepared by Philip Williams & Associates. A key aspect of the Lagoon Enhancement Plan was to identify alternative means to restore and enhance the lagoon environment. District staff participated on a plan review committee, which met on an as-needed basis, and contributed staff expertise for enhancement plan investigations. District staff reviewed and provided comments on the Draft Lagoon Enhancement Plan document. These comments, as well as comments from other reviewing agencies, were incorporated into the Final Plan dated December 1992.

Implementation and Activities during 2012-2013

During this period, the CDPR continued their native riparian plant re-vegetation efforts within the 100-acre portion of the "Odello West" property that is now part of the Carmel River State Beach. The re-vegetation work is ongoing, though the formal monitoring program and its reporting ended after five years in 2009.

One of the ongoing goals of the Carmel Area Wastewater District (CAWD) is to cease discharges to Carmel Bay by finding methods to recycle treated wastewater back to beneficial uses within the community. District staff provide hydrological data to the CAWD to aid them in evaluating and monitoring their efforts to augment flow to the lagoon using recycled water. No treated wastewater from the CAWD plant was released into the restoration area for percolation into the lagoon during this Reporting Year (RY). CAWD is exploring the potential to release recycled water directly to the lagoon or to wetlands for percolation as part of their discharge permit renewal from the Central Coast Regional Water Quality Control Board (CC-RWQCB). The CC-RWQCB staff required further studies to characterize the background levels of trace metal concentrations in the lagoon's receiving waters before direct discharges to surface water would be permitted. Those studies include baseline monitoring of treatment plant effluent and lagoon water quality for specific metals, which might be elevated above acceptable limits for receiving waters by releases of CAWD's recycled water. The tertiary-treated CAWD discharges continue to meet water-quality standards for surface irrigation, which would allow their release onto surrounding habitat to irrigate vegetation, but not directly into the lagoon. CAWD

completed its baseline monitoring for metals on September 6, 2011. CAWD acquired funding from CDFW to undertake these studies in 2011-2013, but there were no progress or technical reports released during the last two RYs. The contract was suspended by CDFW in May 2013, and it is unclear whether the work will resume. For now this effort to develop an alternative water source to help sustain lagoon volume during the dry season is suspended indefinitely.

District staff monitored receiving water quality and continued to provide expertise to representatives from numerous state, federal and local agencies, as well as members of the public. The lagoon water-quality data for both surface and subsurface profiles are presented in Section III. During many months in the summer and fall, there is usually no natural surface flow to the lagoon, and the lagoon has historically experienced poor water quality and low water levels that could have contributed to fish mortality. The river flowed intermittently to the lagoon in this RY. The lowest points of annual inflow were seen during intermittent periods of 0 cfs from September 11 through November 14, 2012, and again May 24 through June 30, 2013. Flows were at or below 1 cfs for 56% of the time in this RY. Thus, the lagoon experienced worse than average inflow year round for this RY.

During this RY, CAWD did not release any tertiary treated wastewater for the purpose of percolating it into the soil adjacent to the lagoon in an attempt to improve lagoon water quantity and quality. The CDPR minimally utilized what is known as its "Cal-Trans" well to provide a small amount of irrigation water for its demonstration organic farm and riparian restoration areas adjacent to the south arm of the lagoon. A significant portion of this irrigation water is normally consumed by evapotranspiration from the crops or riparian vegetation, although some water percolates into the aquifer adjacent to the lagoon. CDPR staff has opined (Dave Dixon, pers. comm.) that significant lagoon recharge from these sources is unlikely as the demonstration farm is on drip irrigation, and the restoration area is watered during the dry season only two hours a week. Specifically, CDPR produced a negligible total of 0.003 acre-feet of groundwater between June 2012 and July 2013 from their "Cal-Trans" well to serve the organic demonstration farm and irrigate the riparian restoration area. This was approximately 0.026% of the level of their use in the prior RY (2011-2012). CDPR also pumped water from their "Highway 1" well at CRSA's behest into the South arm of the Lagoon for a total of 150.11 acre-feet of water during this RY, 7,114% more than what was produced the year before.

District staff provide ongoing support to the Carmel River Lagoon Technical Advisory Committee (CRL-TAC) regarding Monterey County Resource Management Agency, Public Works (RMA-PW) management of the sandbar that forms each year between the lagoon and the ocean. The CRL-TAC remains operational in concept, but no further meetings were held during the last two RYs. Lagoon water levels can fall to less than two feet elevation (NGVD 1929, measured in the south arm) when the beach breaches in the middle. NMFS and CDFW have indicated that an elevation of from four to ten feet, depending on the time of year and life cycle needs of steelhead, would be an optimal management target to benefit steelhead rearing.

The lagoon was last connected to the ocean on a continuous basis during the last RY on May 18, 2012, when RMA-PW closed it mechanically. Lagoon elevations remained above the minimum target of four feet only through July 30, 2012. Lagoon levels never got lower than 3.0 feet throughout the summer and fall. Wave over-wash events twice raised lagoon levels on

September 24 and November 30, 2012 by approximately 2.5 and 1.5 feet, respectively. Lagoon volume then peaked at around 6.5 feet just prior to the first breach of this RY, which occurred on December 2, 2012. RMA-PW established a channel alignment at the south end of the beach and subsequent high river flows opened a channel that completely evacuated the lagoon to approximately 1.1 feet elevation. The lagoon gradually recovered to approximately 9.5 feet by December 16, 2012, when a second (non-managed) breaching occurred, which completely evacuated the lagoon a second time. A third (non-managed) and final winter breaching occurred on December 23, 2012 again completely evacuating the lagoon to approximately 1.2 feet elevation.

During the current RY, the lagoon's water volume declined rapidly in July, then stabilized August and September until the first wave over-wash event raised it approximately 2.5 feet in late September 2012. Water levels remained over 4.5 feet elevation until the second wave over-wash event in late November 2012. Mean daily river inflow ranging between 32 to 370 CFS during two separate storm cycles raised the lagoon water elevations to over 11, 9.5 and 10 feet on December 2, 16, and 23, 2012, respectively. The first breach in December 2012 was through a pre-graded outlet channel to the south constructed by RMA-PW under USACoE Nationwide Permit (File # 190890S). This permit authorizes actions to move sand on the beach without opening a channel for a 2-year period from the date of the permit (i.e., May 17, 2012). RMA-PW took no further actions until April 8, 2013. Subsequent to the final December 2012 breach, the lagoon elevation fluctuated between approximately 1.25 – 9.25 feet with the daily tidal cycle, until low flows allowed a cycle of discontinuous outflows beginning February 3, 2013. The lagoon was then closed approximately 67% of the time from February 3, 2013 until its final closure for the RY on April 9, 2013. During this period the lagoon often reached a daily minimum of approximately 1.1 feet or less, and never exceeded approximately 8.6 feet elevation, until after April 1 when it rose to 10 feet. The lagoon was closed for the season by the RMA-PW on April 9, 2013 under USACoE Nationwide Permit #27 and CDPR's CDFW 1602 Permit. In 2013, CDPR was again unable to fund the artificial closure of the lagoon to enhance habitat volume, and may not be able to do so for the foreseeable future due to the ongoing state budget crisis. The RMA-PW has assumed this effort, using its own Federal and State permits. As a result of their mechanical closure, lagoon elevations peaked at approximately 7.25 feet on April 22 2013 and began to rapidly decline thereafter in May, but leveled off a bit in June, ending the RY on June 30, 2013 just under 4 feet of elevation.

The first winter storm sufficient to keep the lagoon open occurred December 2, 2012, when flows rose to a mean daily flow of 370 cfs at the MPWMD Highway 1 Gage, and an instantaneous peak of 2,140 cfs was recorded at the USGS Near Carmel gage. After the third breaching of this RY on December 23, 2012, a series of unassisted lagoon openings and closures occurred, until the last breaching effort on April 8, 2013. This was followed by RMA-PW mechanical closure on April 9, 2013. Flows at the MPWMD Highway 1 Gage peaked with the second winter storm to the mean daily high flow for the water year of 815 cfs on December 24, 2012. Flows during this period steadily declined from the peak of 815 cfs to a low of 21 cfs at the end of the RY.

Winter ocean wave action built up the beach and closed the lagoon for more than 24 hours on approximately 17 separate occasions from December 2, 2012 through April 9, 2013. Thus the

lagoon was closed approximately 55 of 129 days during 18 consecutive weeks, or approximately 43% of the time between its first opening on December 2, 2012 and its final mechanical closure on April 9, 2013.

The District continues to seek another participating agency to take over leadership of the CRL-TAC and chair the meetings, but the District will continue to provide the same level of staff support. The CRL-TAC meets as needed concerning management of the Carmel River lagoon and beach. As described above, the CRL-TAC did not meet during the last two RYs. The District General Manager continued to work with other local agency managers and community representatives to pursue State funding to implement *Final Study Plan for the Long-Term Adaptive Management of the Carmel River State Beach and Lagoon* (April 17, 2007), but no applicable source of funding was secured during this RY.

The Monterey County Resources Management Agency (MCRMA) is the parent county agency for RMA-PW. MCRMA continues to seek the funding necessary to develop the information needed to pursue separate long-term State and Federal permit applications for lagoon breaching by RMA-PW. This is the third RY where MCRMA/RMA-PW had Federal permits for all their actions. During the 2008-2009 RY, CDPR finalized its *Mitigated Negative Declaration for the Carmel River Lagoon Water Elevation Adaptive Management*, and acquired separate State and Federal permits for the closure of the lagoon in the spring to maximize habitat volume. However, due to State budgetary constraints, CDPR was unable to implement the permitted actions these last four RYs, and notified the CRL-TAC that this will likely continue to be the case in future RYs, until the State's fiscal situation improves. CDPR recommended that another agency with appropriate jurisdiction and funding take over the lagoon closure process, and the MCRMA/RMA-PW are considering doing so.

B. Expand Long-Term Monitoring Program

Description and Purpose

Long-term monitoring of the lagoon and its associated plant communities provides data that can be used to evaluate the wetlands' response to groundwater pumping. The purpose of the monitoring is to: (1) determine if changes in hydrology or plant species distribution and coverage are occurring due to the removal of groundwater upstream, and (2) implement additional mitigations if pumping-induced changes to hydrologic characteristics or vegetation are identified. The Mitigation Program calls for extensive studies such as vegetation mapping and soil surveys to occur every five years. In practice, lagoon vegetation has been monitored annually from 1995 through 2005, and nearly every other year thereafter, except 2011 when lagoon water levels were too high in summer to do so. This monitoring resumed in 2012. Saturation-paste conductivity of soils in the vicinity of the vegetation-monitoring stations was measured annually from 1995 through 2004. Wildlife surveys have not been conducted since 2010. Bathymetric surveys continue to be conducted each year.

Implementation and Activities during 2012-2013

The District has historically conducted three types of long-term lagoon monitoring activities,

only two of which were completed this RY:

- Vegetation Surveys
- Topographic Surveys and hydrology
- Wildlife Surveys [last completed in 2010]

● **Vegetation Monitoring –** The same monitoring stations that were established in 1995 were sampled annually between 1995 and 2005, and then every other year until 2009, as the Allocation EIR only called for this monitoring to occur every two years. In July and August of 2011 the water level in the lagoon was too high to monitor the stations, except for very brief intermittent periods early in July. Therefore, vegetation monitoring did not occur in 2010 or 2011, but was resumed in July 2012 of this RY.

The report, *Biologic Assessment of the Carmel River Lagoon Wetlands*, prepared for the District by the Habitat Restoration Group in 1995, provides a detailed description of the methodology employed. Quadrats were intentionally located along transects at lower elevations of the wetlands because it is anticipated that changes in the vegetative community would first become apparent in these habitat types. The north side was emphasized because of disturbances on the south side associated with the creation of the Cal-Trans Carmel River Mitigation Bank and subsequent restoration of the former Odello artichoke field.

Dramatic changes in vegetation were not observed between the summers of 1995 and 2012. Subtle differences in vegetative cover between years may be explained by slightly different sampling dates each year, made necessary by variations in the hydrologic regime from one year to the next, rendering some low-lying quadrats inaccessible until later in the season. The timing, magnitude and direction of wave action, runoff, and breaching of the sand bar at the mouth of the lagoon affect the duration of standing water in some of the lower-lying monitoring sites.

A more detailed discussion of the results of vegetation monitoring to date is presented in the 2005 Mitigation Report. Data gathered thus far suggest that factors favoring freshwater species over salt tolerant species may be occurring. Determining whether changes are attributable to water management practices upstream as opposed to the timing of beach breaching, changes in hydrologic regime or global weather dynamics are more complex questions. Review of the available data has not identified significant changes from one single year to the next. Nor have strong relationships between species composition or distribution and water management practices been identified. Staff anticipates continued monitoring of the wetlands every other year in the future to provide evaluation of long-term trends.

● **Topographic Surveys and Hydrologic Monitoring --** During the period covered in this report, District staff surveyed four cross sections to track the movement of sediment in the lagoon, continued to maintain a water-level recorder and Automated Local Evaluation in Real Time (ALERT) station at the south arm, and measured groundwater elevations in three wetland piezometers that were installed in May 1996. There is a good correlation between surface-water elevation and water elevation in the piezometers. Staff also continues to track surface discharge into the lagoon at the Highway 1 gaging station, and water production upstream of the lagoon.

● **Wildlife Monitoring –** Birds are often used as indicators of the suitability of an area for wildlife because they tend to be easier to identify and count than other creatures. By tracking the species diversity index at a specific location over time, scientists are able to infer if changes have occurred that may affect the area's dependent wildlife. In the past, District staff contracted with the Ventana Wilderness Society and Big Sur Ornithology Lab (BSOL) to conduct avian point count surveys in the riparian corridor of the Carmel River at sites from Carmel Valley Village to a point just upstream of the lagoon (**Section XVII-C**). The District carried out this program from 1992 through 2010. However, due to budget constraints the avian point counts have not been conducted since spring 2010.

Avian monitoring specific to the lagoon was last carried out by the District at sites near the lagoon at the mouth of the Carmel River in the summer of 2004. Sampling in the vicinity of the lagoon was subsequently carried out by the California State Department of Parks and Recreation from 2005-2008, when monitoring ceased due to ongoing budget constraints.

Special Studies during 2012-2013

● **Steelhead Population Monitoring**

MPWMD applied for and acquired ESA Section 7 coverage starting in 2009 to conduct a mark-recapture study as part of its semi-annual renewal of staff Scientific Collecting Permits from CDFW. These were renewed annually through 2013. No pre-breaching population census was conducted this RY in late November due to competing high priority assignments occupying MPWMD staff. In early December 2012 the lagoon filled and was both open to the ocean and reconnected to the river. This precluded any further efforts at mark-recapture due to the lagoon being an open system from which any tagged fish could easily escape recapture.

C. Identify Feasible Alternatives to Maintain Adequate Lagoon Volume

Description and Purpose

The purpose of this mitigation measure is to determine the volume required to keep the lagoon in a stable condition that can adequately support plants and wildlife. It is envisioned that alternative means to achieve and maintain the desired volume will be compared, and the most cost-effective means selected. One alternative that may achieve these goals is the development of a water supply project that can reliably provide more water to the Monterey Peninsula and result in reduced diversions from the Carmel River; however, few other feasible alternatives have materialized in spite of extensive evaluation. MPWMD staff previously estimated that approximately 8 cfs, or about 16 acre feet per day (AFD), can percolate through the barrier beach when the outlet is closed and lagoon water levels are stable at relatively high elevations (8 – 9 feet). This seepage rate was determined utilizing continuous streamflow data from the Carmel River at Highway 1 Bridge gaging station and the 1997 lagoon stage volume relationship over the 1991-2005 period. However, in May and June 2009, following the manual lagoon mouth closure on May 18, 2009, streamflow and lagoon storage data showed that 12 cfs or 24 AFD percolated through the beach berm and into the surrounding wetlands (based on an updated 2007 lagoon storage table). It is postulated that increased infiltration capacity of the lagoon may be

due to a combination of the excavation of an outlet channel to the south, the two South Arm excavations in 2004 and 2007, and that the manual lagoon mouth closure results in a higher water surface elevation than was typical of the 1991-2005 period. A higher water surface elevation likely results in flow through the outlet channel that then percolates into the beach. This volume of water passing through the beach is significant, and is equivalent to about two-thirds of the daily Carmel River diversions historically needed to meet a portion of the municipal demand of the Monterey Peninsula during the summer. No treated water from the Carmel Area Wastewater District was added to the lagoon in this RY. There were concerns about the effects the recycled CAWD water might have on water quality in the lagoon that might affect both juvenile steelhead and red-legged frog habitat values so the action has ceased until impact evaluations have been completed (see **Section XVIII-A** above). However, a significant amount of water from an existing agricultural well (i.e., 150.11 acre-feet) was added to the lagoon in this RY. Determination of desirable lagoon volume will be conducted in conjunction with the monitoring studies noted above and the findings of the Lagoon Enhancement Plan. Development of feasible alternative means to provide adequate volume to sustain healthy lagoon habitat throughout the dry season continue to be sought by the District.

In December 2009, CAWD estimated that a total of about $2.5 million would be needed to complete a project to augment lagoon volume from CAWD treatment plant water. Approximately 300 acre-feet per year could be made available. CAWD successfully applied to the CDFW Fisheries Restoration Grant Program in early 2010 for Settlement Agreement funds to study the feasibility and potential impacts from this project. CDFW subsequently awarded a grant to CAWD and feasibility studies started in 2011, and continued through 2013. CDFW suspended the grant contract in May of 2013, and it is unclear whether the work will resume. For now this effort to develop an alternative water source to help sustain lagoon volume during the dry season is suspended indefinitely.

Implementation and Activities During 2012-2013

District staff continued the annual survey of four key lagoon cross sections (**Figure XVIII-1**) to track changes in the volume of sand in the active portion of the lagoon over time. An initial survey of the four cross sections was conducted in January 1988. Subsequent annual surveys have been conducted beginning in September 1994 through the present. Sedimentation in the lagoon is a concern because the Carmel River as a whole has taken on an increased load of sand from Tularcitos Creek and other drainages following the El Niño winter of 1998. However, it appears at this time, the majority of the sediment deposited along the Carmel River in 1998 has washed through the Carmel River system and lagoon, and has subsequently reached the ocean. These four key cross sections provide a quantitative means to evaluate whether or not lagoon volume is changing significantly over time. The dynamic nature of the lagoon substrate is evident in **Figure XVIII-2**, which shows the results of the annual surveys conducted since 1994.

In September 2013, staff completed the annual surveys of cross sections (XS) 1-4. Close inspection of the September 2013 XS surveys indicates very little net change in lagoon substrate elevation at the four cross sections from the previous year's surveys (September 2012) (**Figure XVIII-3**). This lack of substrate elevation change is consistent with what would be expected following a categorically "dry" year, as the river's hydraulic forces are relatively low.

The highest peak streamflow of WY 2013 that entered the lagoon was 2,140 cfs on December 2, 2012, recorded at the USGS Carmel River (CR) near Carmel streamflow gaging station (river mile 3.2). This is the best available approximation of peak lagoon inflow as significant lagoon backwater precluded accurate peak flow information at the CR at Highway 1 Bridge gage. This peak flow ultimately led to the first lagoon mouth breach of the WY 2013 season, as the lagoon level reached 11.3 feet (NGVD 29 datum) early on December 3, 2012, followed by near-total evacuation of lagoon water volume to approximately 2.6 feet elevation six hours later. It is postulated that major lagoon mouth breach events (such as the December 3 event described above), although greatly affect beach berm morphology, have a minimal impact on substrate elevation at the key cross sections, as supported by the annual surveys.

Review of the entire cross sectional data set (**Figure XVIII-2**) shows that the September 2013 lagoon substrate elevations for XS 1-3 are well within the range of previous surveys indicating no clear trend of either sand depletion or accumulation at the cross sections. However, XS 4 data indicate that the substrate elevation is close to the lowest ever since 1994. This is consistent with the steady loss of streambed material at the Highway 1 Bridge gaging station (and along reaches for several miles upstream) that has been occurring since 2006, suggesting a limited sand supply in the Lower Carmel River at this time. In addition, it should be noted that at elevation 10-feet the lagoon backwater zone now extends approximately one quarter mile upstream of the Highway 1 Bridge to the eastern margin of the Crossroads Shopping Center as a result of continued down-cutting of the stream channel.

OBSERVED TRENDS, CONCLUSIONS AND/OR RECOMMENDATIONS:

The District continues to support and encourage the ongoing habitat restoration efforts in the wetlands and riparian areas surrounding the Carmel River Lagoon. These efforts are consistent with goals that were identified in the Carmel River Lagoon Enhancement Plan, which was partially funded by the District. The District continues to work with various agencies and landowners to implement ongoing restoration of the Odello West property and future restoration of the Odello East property across the highway. Because of the restoration activities on the south side of the lagoon, the District has concentrated its monitoring efforts on the relatively undisturbed north side. Staff have also continue to meet and discuss with other agencies the ongoing use of an existing CDPR agricultural well and potential future use of treated water from the Carmel Area Wastewater District to augment the lagoon during periods of low water.

The District expanded its long-term monitoring around the lagoon in 1995 in an attempt to determine if the reduction in freshwater flows due to ground water pumping upstream might change the size or ecological character of the wetlands. Demonstrable changes have not been identified. Because of the complexity of the estuarine system, a variety of parameters are monitored, including vegetative cover in transects and quadrats, water conductivity, and hydrology. It is notable that due to the number of factors affecting this system, it would be premature to attribute any observed changes solely to groundwater pumping. During the 18-year period to date, for example, there have been two Extremely Wet (1995, 1998), two Wet (2005, 2006), five Above Normal (1996, 1997, 2000, 2010, 2011), and five Normal Water Year types (1999, 2001, 2003, 2008, 2009), in terms of total annual runoff. Thus, the hydrology of the

watershed has been wetter than average 50% of the time, and at least normal or better 78% of the time during that period. Other natural factors that affect the wetlands include introduction of salt water into the system as waves overtop the sandbar in autumn and winter, tidal fluctuations, and long-term global climatic change. When the District initiated the long-term lagoon monitoring component of the Mitigation Program, it was with the understanding that it would be necessary to gather data for an extended period in order to draw conclusions about well production drawdown effects on wetland dynamics. It is recommended that the current vegetation, conductivity, topographical and wildlife monitoring be continued in order to provide a robust data set for continued analysis of potential changes around the lagoon.

Lagoon bathymetric cross sectional surveys, initially conducted in 1988, have been completed annually during the dry season since 1994. These data are useful in assessing changes in the sand supply within the main body of the lagoon and are necessary to answer to questions concerning whether or not the lagoon is filling up with sand, thus losing valuable habitat. As indicated in the survey plots, the sandy bed of the lagoon can vary significantly from year to year. In general, no major trends indicating sand accumulation or depletion at the lagoon cross sections have been identified based on available data, with the exception of the upstream-most cross section number 4, which exhibits an overall loss in sand volume over the 1994-2013 period. The sand loss or down-cutting observed at cross section 4 is consistent with the pervasive down-cutting that has occurred along the thalweg of the Lower Carmel River (LCR) upstream of the Highway 1 Bridge for several miles. The trend of LCR streambed scour appears to have begun in Water Year 2006. In addition, now that annual cross sectional data have been collected in one "critically dry" year and two "dry" years (WY 2007, 2012 and 2013, respectively), it is concluded that substrate elevations at the cross sections generally do not change in these low-flow years, despite the regular occurrence of major lagoon mouth breaches in these years. Accordingly, the multi-year cross sectional data set (21 years) indicates quantity of streamflow as the primary factor that controls substrate changes at the key cross sections.

Figure XVIII-1
Map of Monitoring Transects and Stations at Carmel River Lagoon.

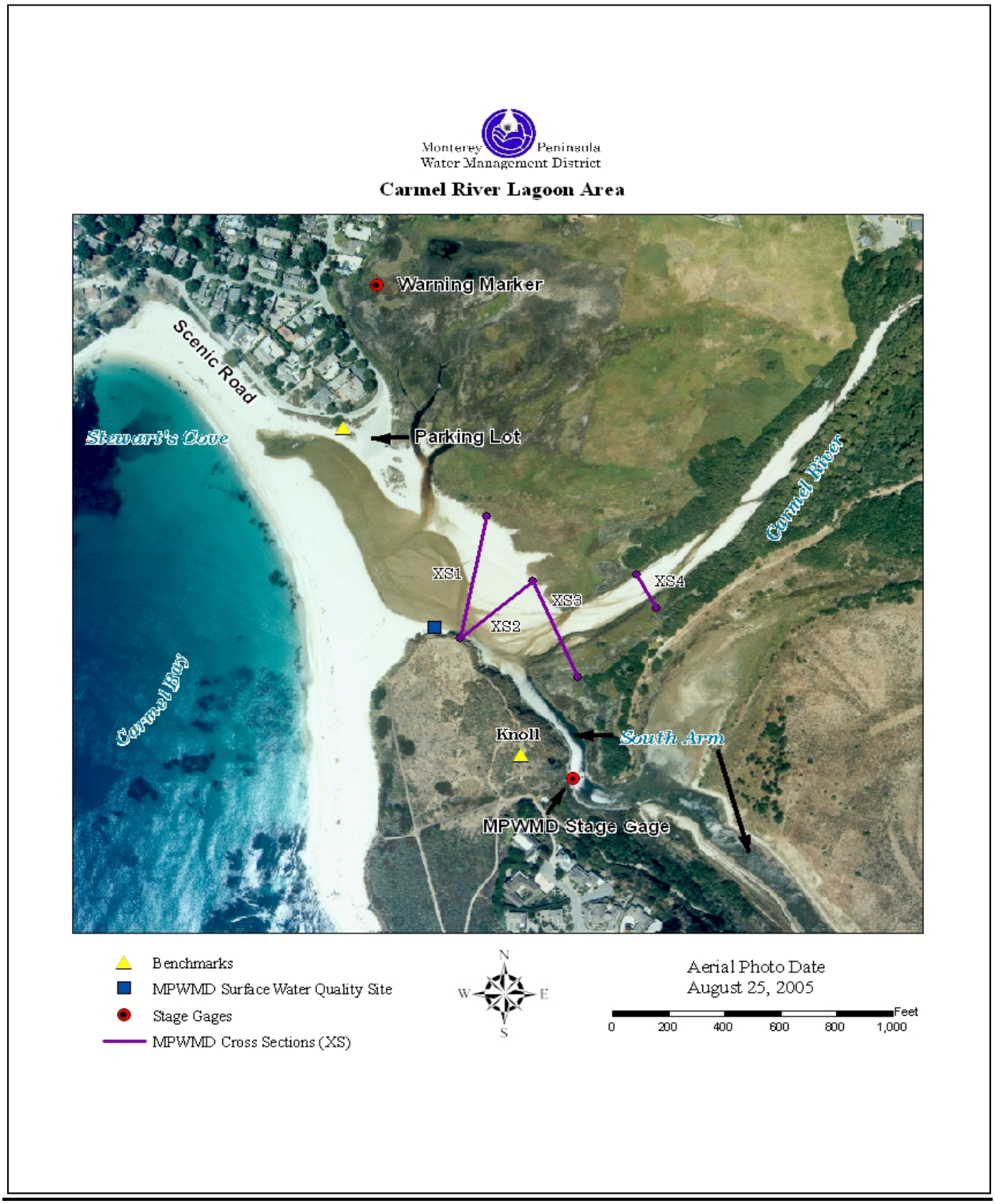


Figure XVIII-2
Carmel River Lagoon Cross Sections 1 through 4, based on Annual Surveys 1994-2013.

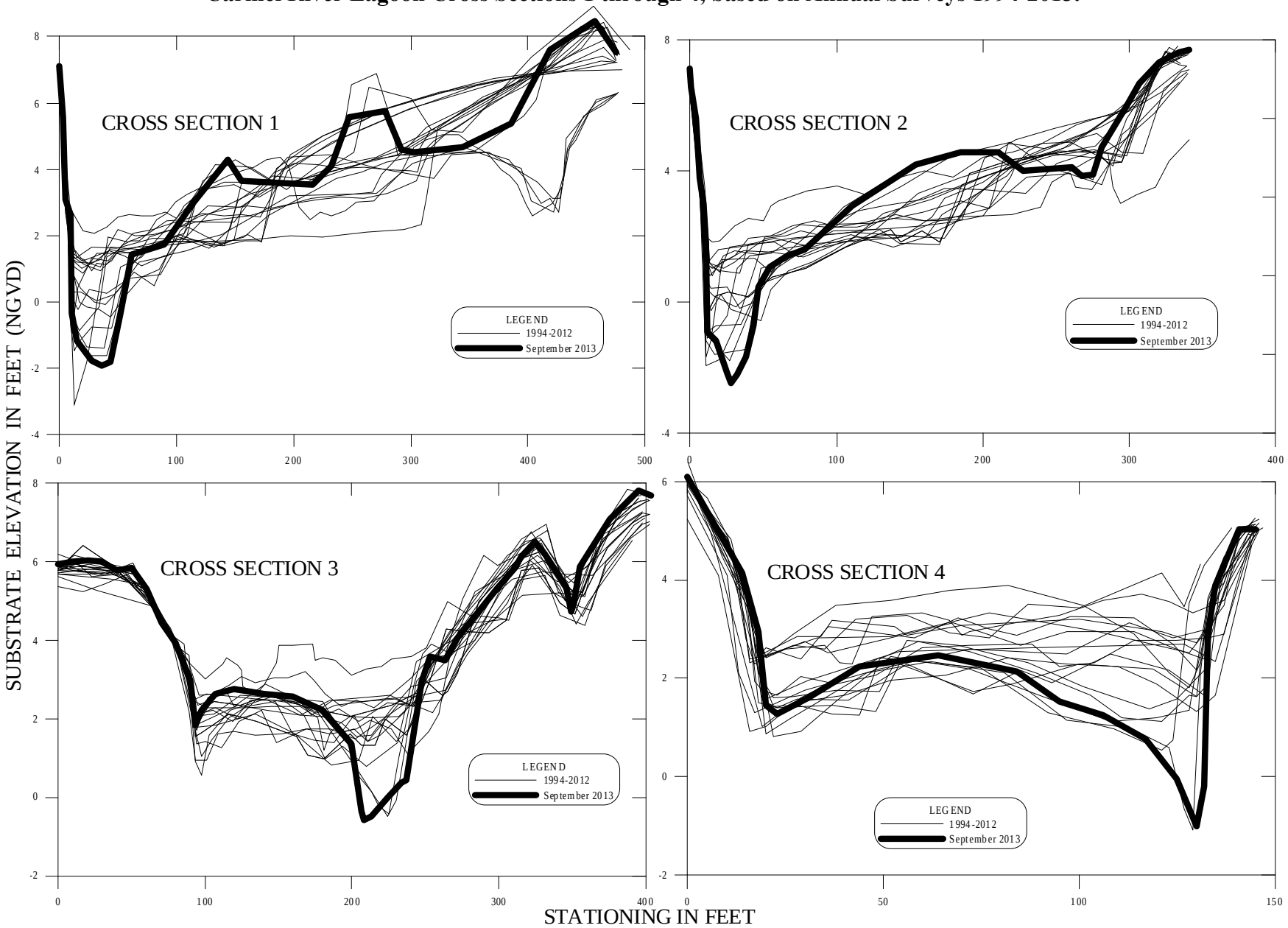
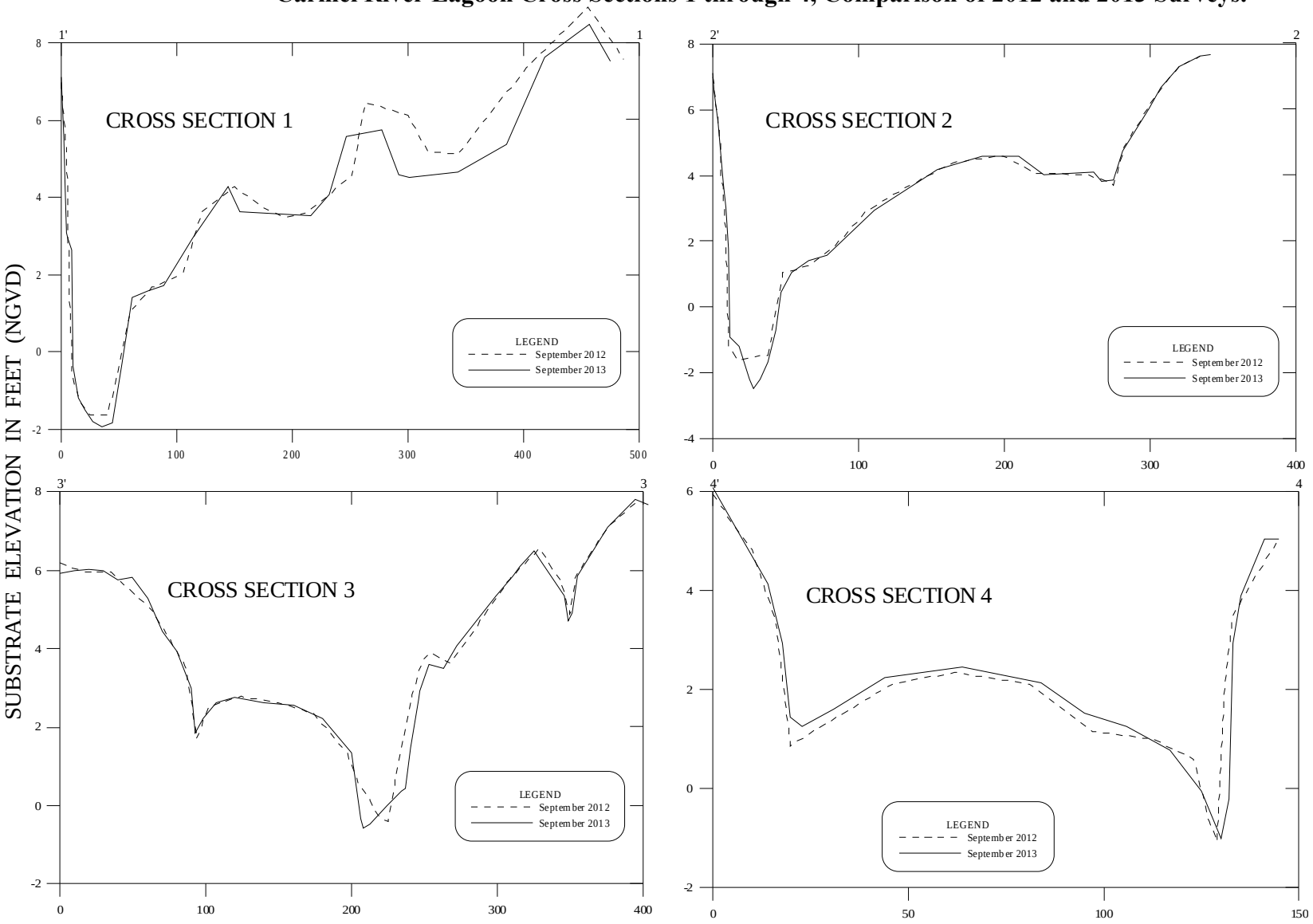


Figure XVIII-3
Carmel River Lagoon Cross Sections 1 through 4, Comparison of 2012 and 2013 Surveys.



XIX. AESTHETIC MITIGATION MEASURES

The Findings for Adoption of the Water Allocation Program Final EIR identified one mitigation measure to reduce aesthetic impacts along the Carmel River associated with riparian vegetation -- to implement the riparian habitat mitigation measures described above in Finding No. 393. Refer to **Section XVII** for information on riparian mitigation activities in the period July 2012 through June 2013.

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XX. SUMMARY OF COSTS FOR MITIGATION PROGRAM, JULY 2012 THROUGH JUNE 2013

Mitigation Program costs for FY 2012-2013 totaled approximately $2.22 million including direct personnel expenses, operating costs, project expenditures, capital equipment, and fixed asset purchases. The annual cost of mitigation efforts varies because several mitigation measures are weather dependent. Expenditures in FY 2012-2013 were $2.37 million less than the prior fiscal year largely due to capital expenditures for Aquifer Storage Recovery (ASR) project, which are no longer captured under Mitigation Program costs. However, the overall costs have remained fairly constant (average of $3 million per year) for last five years. In the past, expenditures had trended upward due to expenditures for the ASR Project. FY 2010-2011 expenditures were $5.84 million; and FY 2011-2012 expenditures were $4.59 million.

During FY 2012-2013, revenues totaled $2.74 million including mitigation program revenues, tax revenues, investment income and miscellaneous revenues. The Mitigation Program Fund as of June 30, 2013 had a balance of $30,969.

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Table XX-1

Mitigation Program Cost Breakdown for the Period July 2012 through June 2013

EXPENDITURES	Data Collection	Riparian	Fish	Lagoon	Water Supply	IRGWMP	Admin	Total
Personnel Costs	$178,063	$221,830	$327,399	$111,179	$130,846	$9,777	$523,090	$1,502,184
Operating Expenses	30,046	37,431	55,244	18,760	22,079	1,650	88,265	253,474
Project Expenses	2,842	20,596	121,152	1,524	0	281,502	11,451	439,067
Fixed Asset Acquisitions	2,747	3,423	5,052	1,715	2,019	151	8,071	23,178
TOTAL EXPENDITURES	**$213,698**	**$283,280**	**$508,847**	**$133,179**	**$154,943**	**$293,080**	**$630,877**	**$2,217,903**

REVENUES	
Permit Fees	$73,926
User Fees	1,807,685
Reimbursements	0
Tax Revenues	491,413
Grant Receipts	353,455
Investment Income	3,585
Miscellaneous	7,440
TOTAL REVENUE	**$2,737,504**
REVENUE OVER EXPENDITURES	**$519,601**

XXI. REFERENCES

The following selected references provide additional information about the subjects described in this Annual Report. References are organized by section.

Section I. Executive Summary

MPWMD, January 1992-present. *Annual Reports* for the MPWMD Mitigation Program.

MPWMD, 1996a. *Final Report, Evaluation of MPWMD Five-Year Mitigation Program, 1991-1996*. October 1996.

MPWMD, 1996b. *Final Report, Implementation Plan for MPWMD Mitigation Program, Fiscal Years 1997-2001*. October 1996.

MPWMD, 1990a. *Final Environmental Impact Report for MPWMD Water Allocation Program*. Prepared for MPWMD by Laurence Mintier & Associates, April 1990.

MPWMD, 1990b. *Certification findings adopted by MPWMD Board for Final EIR for MPWMD Water Allocation Program*. November 1990.

Philip Williams & Associates, Ltd., 1992. *Carmel River Lagoon Enhancement Plan.* Prepared for Carmel River Steelhead Association, California State Coastal Conservancy, Monterey County Water Resources Agency, Monterey Peninsula Water Management District, California Department of Parks and Recreation, June 1992.

Sections II, III and IV. Monitor Water Resources

Brungs, W. and B. Jones. 1977. *Temperature Criteria for Freshwater Fish: Protocol and Procedures*. Environmental Research Lab-Duluth, Minn. EPA/600/3-77/061.

Chapman, G., 1986. *Ambient Water Quality Criteria for Dissolved Oxygen.* Environmental Protection Agency, Washington, D.C. Office of Water Regulations and Standards. EPA/440/5-86/003.

James, Greg, 2004. *Carmel River Basin -- Surface Water Resources Data Report, Water Years 2000-2003,* Monterey Peninsula Water Management District, January 2004.

James, Greg, 1999. *Carmel River Basin -- Surface Water Resources Data Report, Water Years 1996-1999,* Monterey Peninsula Water Management District, December 1999.

James, Greg, 1996. *Carmel River Basin -- Surface Water Resources Data Report, Water Years 1992-1995,* Monterey Peninsula Water Management District, October 1996.

James, Greg, 1994. *Surface water dynamics at the Carmel River Lagoon, Water Years 1991 through 1994*. MPWMD Technical Memorandum 94-05.

James, Greg, 2005. *Surface water dynamics at the Carmel River Lagoon, Water Years 1991 through 2005*. MPWMD Technical Memorandum 05-01.

Oliver, Joe, 1996a. *Summary of Seaside Basin monitor well data, with focus on local response to production from the Paralta Well, April to December 1995.* MPWMD Technical Memorandum 96-01.

Oliver, Joe, 1996b. *Summary of Seaside Basin monitor well data, with focus on Paralta Well pumping and recovery period, December 1995 to June 1996.* MPWMD Technical Memorandum 96-02.

Piper, R. *et al*, 1982. *Fish Hatchery Management.* U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

Wedemeyer, G.A. 1996. Interactions with water quality conditions: carbon dioxide. Pages 67-69 in G.A. Wedemeyer, editor. Physiology of Fish in Intensive Culture System. Chapman and Hall, New York, New York.

Section XV. Augment Water Supply

Bell, Andrew and Henrietta Stern, 2000. *Assess Potential Feasibility of Dredging Existing Reservoirs on the Carmel River*, Preliminary Draft, MPWMD Issue Paper 2000-01, July 28, 2000.

Bookman-Edmonston/GEI, 2006. *Seawater Desalination Projects Evaluation.* Prepared for MPWMD, June 26, 2006.

California American Water and Monterey Peninsula Water Management District, 2006. *Aquifer Storage and Recovery (ASR) Management & Operations Agreement between California American Water and Monterey Peninsula Water Management District*, March 30, 2006.

California American Water/RBF Consultants, 2004. Website: www.coastalwaterproject.com

California Public Utilities Commission, 2002. *Final Report—Plan B Project Report*. Prepared by Raines, Melton & Carella, Inc. for the Water Division, July 2002.

California Public Utilities Commission, 2000. *Status Report on Plan B Components*. Prepared by Water Advisory Branch, May 18, 2001.

Camp, Dresser & McKee, Inc, 2004. *Sand City Desalination Project Feasibility Study – Final Report.* Prepared for MPWMD, April 16, 2004.

Camp, Dresser & McKee, Inc, 2003. *Monterey Peninsula Water Supply Project Alternatives - Final*

Phase 1 Technical Memorandum. Prepared for MPWMD, March 19, 2003.

EDAW, Inc., 2001. *Draft Plan B Project Report*. Prepared for California Public Utilities Commission, August 2001.

EDAW, Inc., 2000a. *Plan B Component Screening Report*. Prepared for California Public Utilities Commission, November 2000.

EDAW, Inc., 2000b. *Plan B Component Characterization Report*. Prepared for California Public Utilities Commission, April 3, 2000.

Fuerst, D.W., 2006, *Existing Water Needs of Cal-Am Customers Within MPWMD Boundaries and Non Cal-Am Producers Within the Seaside Groundwater Basin Adjusted for Weather Conditions During Water Years 1996 Through 2006*, Technical Memorandum 2006-02, October 2006

Fugro West, Inc., 1997a. *Reconnaissance-Level Feasibility Study for Seaside Basin Injection/Recovery Project*. Prepared for MPWMD, February 1997.

Fugro West, Inc., 1997b. *Hydrogeologic Assessment of Seaside Coastal groundwater Basins, Phase III Update*. Prepared for MPWMD, September 1997.

Monterey County Superior Court, Case No. M66343, *California American Water v. City of Seaside, et al.*, Final Decision, March 27, 2006.

MPWMD, 2001. *Calendar Year 2000 Update to Water Augmentation Plan*. February 13, 2001.

MPWMD, 2000. *Calendar Year Update to Water Augmentation Plan*. January 19, 2000.

MPWMD, 1998. *Update to Preliminary Water Augmentation Plan*. January 19, 1998.

MPWMD, 1996a. *Preliminary Water Augmentation Plan*. December 9, 1996.

MPWMD, 1996b. *Action Plan for Water Supply Alternatives*. February 29, 1996.

Oliver, Joe, 2000. *Assess Potential Feasibility of Reuse of Storm Water on the Monterey Peninsula.* Draft, MPWMD Issue Paper 2000-02, July 28, 2000.

Yates, G., M. Feeney and L. Rosenberg, 2002. *Laguna Seca Subarea Phase III Hydrogeologic Update*. Prepared for MPWMD, November 2002 (final report).

Yates, G., M. Feeney and L. Rosenberg, 2005. *Seaside Groundwater Basin: Update on Water Resource Conditions*. Prepared for MPWMD, April 14, 2005 (final report).

Section XVI. Steelhead Fishery Mitigation Measures

Brungs, W. and B. Jones, 1977. *Temperature Criteria for Freshwater Fish: Protocol and Procedures*. Environmental Research Lab-Duluth, Minn. EPA/600/3-77/061.

Chaney, B. (formerly Hanna, B.), 1997-2000. *Sleepy Hollow Steelhead Rearing Facility Annual Report* (reports available for years 1996 through 2000).

Chapman, G., 1986. *Ambient Water Quality Criteria for Dissolved Oxygen*. Environmental Protection Agency, Washington, D.C. Office of Water Regulations and Standards. EPA/440/5-86/003.

King, J. Thomas in association with B. Chaney and T. Lindberg, 2004. *Three-Year Summary of the Monterey Peninsula Water Management District's Bioassessment Program on the Carmel River, Fall 200-Spring 2003*. Prepared for MPWMD by BioAssessment Services, June 2004.

Piper, R. *et al*, 1982. *Fish Hatchery Management*. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

Section XVII. Riparian Habitat Mitigation Measures

Monterey Peninsula Water Management District (MPWMD), 2004. *Environmental and Biological Assessment of Portions of the Carmel River Watershed, Monterey County, California.* Prepared for the Carmel River Watershed Assessment sponsored by the Carmel River Watershed Conservancy, December 2004.

MPWMD, 1996. Pamphlet titled, "*How to Protect and Enhance Your Property Along the Carmel River*."

MPWMD, 1996. Pamphlet titled, "*Streambank Planting guidelines."*

Mullen, D.A., 1993-1996 and Big Sur Ornithology Laboratory, 1997-present. *Analysis of Avian Guild Species Diversity in the Los Padres Reservoir and Carmel River Riparian Corridor*. Annual reports to MPWMD dated 1993 to present.

Smith, D.P. and Huntington, P., 2004. *Carmel River large woody debris inventory from Stonepine to Carmel Lagoon, Fall 200.* Prepared in association with Watershed Institute, California State University Monterey Bay, Publication No. WI-2004-01, 72 pp.

Section XVIII. Lagoon Habitat Mitigation Measures

Big Sur Ornithology Laboratory, 1997-present. *Analysis of Avian Guild Species Diversity in the Los Padres Reservoir and Carmel River Riparian Corridor*. Annual reports to MPWMD dated 1997 to present (includes evaluation of lagoon species diversity index).

California State University Monterey Bay, Watershed Institute, 2001. *Winter Water Quality of the Carmel and Salinas River Lagoons, Monterey, California: 2000/2001*. Prepared for the

Monterey County Water Resources Agency.

Carmel River Lagoon Technical Advisory Committee, 2005. Draft – *Carmel River Lagoon, Proposed Short-Term Management Plan for Winter 2005-2006.* Prepared November 9, 2005.

Graham Matthews & Associates, 1997. *Carmel River Lagoon Mapping and Development of Stage-Volume and Stage-Area Relationships*. Prepared for MPWMD, November 4, 1997.

Habitat Restoration Group, 1995. *Biologic Assessment of Carmel River Lagoon Wetlands.* Prepared for MPWMD, November 1995.

Philip Williams & Associates, 1991. *Draft Carmel River Lagoon Enhancement Plan.* Prepared for Carmel River Steelhead Association, California State Coastal Conservancy, Monterey County Water Resources Agency and MPWMD, in cooperation with California Department of Parks and Recreation, December 1991.

Section XX. Summary of Costs

(Annual Audit Reports on file in District office)

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