

## 9 Technical Analysis and Plan Performance

This section meets the following IRWMP Standard from the Integrated Regional Water Management Grant Program Guidelines.

**I. Technical Analysis and Plan Performance** – Include a discussion of data, technical methods, and analyses used in development of the Plan. Include a discussion of measures that will be used to evaluate Project/Plan performance, monitoring systems that will be used to gather performance data, and mechanisms to adapt project operations and Plan implementation based on performance data collected.

This section is organized by program and describes technical analysis and measurement of plan performance on a program level. Plan implementation would be affected if projects or programs were unable to meet expected performance criteria as determined through the monitoring measures described below. In such cases, changes in project sequencing or priority or substitution of alternate projects may be necessary as described previously in Section 6.

### 9.1 Conjunctive Water Supply Management Program- Analysis and Performance

The PVWMA Revised Basin Management Plan (Revised BMP), the Groundwater Management Plan Update for the San Benito County Portion of the Gilroy-Hollister Groundwater Basin (GWMP Update) and the SCVWD Integrated Water Resources Plan (IWRP) provide the technical basis for the formation of the Conjunctive Water Supply Management Program. These plans document water supply options available to PVWMA, SBCWD and SCVWD, respectively, and discuss constraints involved with the use of each of the agencies' current water supplies. Additional technical information will be developed as the other specific projects within this program progress through the planning stages.

#### 9.1.1 Data, Technical Methods and Analyses

The Revised BMP evaluated various alternatives to reliably meet water supply needs in the Pajaro Valley. Currently PVWMA relies exclusively on local waters to meet their demands. Of the 71,000 AFY of local water used, virtually all (69,000 AFY, or over 97%) is drawn from a chronically overdrafted groundwater system. The current levels and patterns of groundwater use are leading to declining groundwater levels, salt water intrusion, and the loss of coastal area wells. The Revised BMP included modeling of the groundwater basin with the Pajaro Valley Integrated Groundwater and Surface Water Model (PVIWGS). The PVIWGS was developed in 1998 to assess the behavior of the groundwater basin under current baseline conditions and to assess the merits of alternative strategies to balance the basin. It is a dynamic finite element model that simulates the balance of groundwater in the Pajaro Valley basin using geologic and hydrologic conditions, current pumping conditions, water supply and demand conditions, and other basin characteristics. The model uses numerical algorithms to solve coupled differential equations and creates a mass balance within the model grid. Model results showed that new water supply projects totaling 18,500 AFY in conjunction with conservation and coastal groundwater pumping management would increase the sustainable groundwater supply and balance the groundwater basin. Both economic and non-economic factors were considered in the evaluation of alternatives and selection of the recommended suite of projects and management activities. The PVIWGS is being updated and converted to MODFLOW. Coupled with detailed pumping information, the new model will provide a much more refined tool for evaluating and documenting water use scenarios within the basin.

The recommendations of the Revised BMP focused on the optimization of local water supplies as a first step, followed by acquisition and importation of external water supplies to meet remaining demands and balance the basin. Projects in the Conjunctive Water Supply Management program, which are related to the recommendations of the Revised BMP, are:

- Aromas Water District Wellhead Treatment
- CVP water transfers within the San Felipe Division
- Import Pipeline
- Mercy Springs
- Non-CVP water transfers and banking agreements
- PVWMA CVP Entitlement
- PVWMA Groundwater Recharge with CVP and other imported supplies

The Aromas Water District Wellhead Treatment project is an example of the optimization of local water sources. The Aromas Water District, which serves the unincorporated community of Aromas within PVWMA's jurisdiction, relies entirely on local groundwater wells. Preserving the use of these wells to meet local demand benefits the entire Pajaro Valley because the Aromas Water District will not have to rely on imported supplies. There is, however, naturally occurring manganese in the groundwater in concentrations above the Secondary Maximum Contaminant Level (SMCL) of 0.05 mg/L, and to continue use of the groundwater, the Aromas Water District is under mandate by the California Department of Health Services (DHS) to reduce the concentration of manganese. The Aromas Water District Wellhead Treatment project will construct a wellhead treatment facility to remove manganese from two of the district's wells, thereby allowing the Aromas Water District to sustain the use of its local supply.

CVP water transfers within the San Felipe Division, Import Pipeline, Mercy Springs, Non-CVP water transfers and banking agreement, PVWMA CVP Entitlement and PVWMA Groundwater Recharge with CVP and other imported supplies all relate to importing water to meet remaining demands. Importing water requires both water supplies (CVP water transfers within the San Felipe Division, Mercy Springs, Non-CVP water transfers and banking agreements and PVWMA CVP Entitlement) and infrastructure to deliver and store that water (Import Pipeline and PVWMA Groundwater Recharge with CVP and other imported supplies). The CVP water transfers within the San Felipe Division project relies on PVWMA, SBCWD and SCVWD's common rights to imported water through the San Felipe Division of the CVP system and the USBR's accelerated transfer agreements. Transfer of CPV water must be approved by USBR, which can be a process that takes months and even years. The USBR does, however, allow for accelerated transfer agreements within a hydrologic region. This is a process that SBCWD and SCVWD have taken advantage of in the past, and the same practice could be extended to include PVWMA. Of course a method for conveying the CVP water to PVWMA would have to be put in place. The San Felipe Division was originally constructed with a provision to serve CVP water to the Pajaro Valley, but no facilities were ever constructed to connect PVWMA to CVP. The Revised BMP's recommended alternative to correct this issue is the Import Pipeline. The Import Pipeline involves the construction of a 23-mile import pipeline for transport of CVP water from the Santa Clara Conduit to PVWMA. The Revised BMP initially identified Mercy Springs and PVWMA CVP Entitlement as the main sources of water for the Import Pipeline. The Non-CVP water transfers and banking agreements strategy is the corollary to the CVP water transfers within the San Felipe Division and the Import Pipeline. Recognizing that the Import Pipeline presents a major opportunity for multi-purpose and multi-benefit enhancements, the Partners have initiated discussions on other water supplies that may be transferred through the pipeline.

The GWMP Update evaluated alternatives to meet water demands in San Benito County keeping in mind the County's water quantity and quality constraints. Two issues identified in the GWMP update that can be effectively addressed through the regional conjunctive use strategy proposed in the Conjunctive Water Supply Management program are the existing imbalance of areas of high and low groundwater and the frequent reduction of long-term imported water supplies.

Projects in the Conjunctive Water Supply Management program that are supported by the analyses in the GWMP Update are:

- Hernandez Reservoir Reoperation
- Pacheco Reservoir Reoperation
- Paicines Reservoir Rehabilitation
- San Felipe Division Operations and Maintenance Improvements
- San Justo Reservoir Rehabilitation
- SBCWD Groundwater Recharge with CVP and local sources
- Groundwater Study & Biological Assessment of the Upper Pajaro River

Both Hernandez Reservoir and Pacheco Reservoir are operated to promote groundwater recharge; however, high groundwater levels exist downstream of both these reservoirs, limiting their effectiveness. Reoperation of these reservoirs is being considered to help address the imbalance in groundwater levels throughout San Benito County. Paicines Reservoir is also operated for groundwater recharge during dry seasons; however at full capacity Paicines Reservoir loses roughly 2 AF of water per acre of surface area per month. Paicines Reservoir Rehabilitation would help with the imbalance of groundwater levels by restoring the full storage capacity of Paicines Reservoir, which in turn restores the ability to control releases for recharge on San Benito River and Tres Pinos Creek. San Justo Reservoir also suffers from seepage issues; storage in this reservoir has been reduced by 3,000 AF because of seepage. San Justo Reservoir Rehabilitation would combat the issue of frequent reduction of long-term imported water supplies by maximizing the use of SBCWD's CVP water supply when the water is available. San Felipe Division Operations and Maintenance Improvements would also maximize the use of CVP water deliveries by increasing the reliability of the San Felipe Division infrastructure; the improvements would protect against shutdowns or service reductions and maintain flexibility in the timing of deliveries. SBCWD Groundwater Recharge with CVP and local sources also addresses the issue of future reductions in imported water supplies by increasing recharge during years when water is available and drawing upon those supplies in years when CVP deliveries are reduced. The completion of the Groundwater Study & Biological Assessment of the Upper Pajaro River can also assist in increasing the understanding of surface water and groundwater interactions in the Gilroy-Hollister Groundwater Basin.

The SCVWD IWRP analyzed water supply options for SCVWD including some specific South County analyses. Recommendations from the SCVWD IWRP include securing SCVWD's baseline supplies – which include existing water supplies such as groundwater basins, reservoirs, imported water supplies, water use efficiency programs and water utility infrastructure. Projects in the Conjunctive Water Supply Management program which are related to the recommendations of the SCVWD IWRP are:

- Chesbro Reservoir Reoperation
- Uvas Reservoir Reoperation
- South County Recycled Water Program
- Church Avenue Diversion
- Main Avenue and Coyote-Madrone Pipeline Repair
- SCVWD Groundwater Recharge with CVP and local sources

SCVWD wants to maximize the use of local supplies in order to decrease vulnerability to risk; Chesbro Reservoir Reoperation, Uvas Reservoir Reoperation and South County Recycled Water Program are all focused on increasing the use of locally available supplies. The reservoir reoperations projects can accomplish this by increasing the amount of water captured from the Uvas Creek and Llagas Creek watersheds. The South County Recycled Water Program maximizes the use of local water by first improving the reliability and capacity of the current recycled water system and then constructing the necessary facilities to expand the service area. Based on the recommendations of the SCVWD IWRP, SCVWD is also maximizing recharge in the Llagas Subbasin. An analysis performed comparing different water supply options for South County showed that additional recharge and conservation is the most cost effective option for meeting future water supply shortages when compared with additional recycled water (beyond that already planned) and surface water treatment. To increase understanding of the natural groundwater recharge and groundwater operational storage in South County, SCVWD recently calibrated its Llagas Groundwater Flow Model. This model supports the development of projects such as the Church Avenue Diversion, Main Avenue and Coyote-Madrone Pipeline Repair and SCVWD Groundwater Recharge with CVP and local sources, which are being considered to increase recharge in the Llagas Subbasin.

### 9.1.2 Measures and Monitoring for Program Evaluation

The performance of the Conjunctive Water Supply Management program will be evaluated based on its ability to meet the primary objectives of the program:

- Meet 100% of M&I and agriculture demands (both current and future conditions) in wet to dry years including the first year of a drought
- Meet 85% M&I and 75% agriculture demands (both current and future conditions) in second and subsequent years of a drought
- Provide a variety of water supply sources to meet demand
- Optimize and sustain use of existing import surface water entitlements from the San Felipe Division
- Optimize the use of groundwater and aquifer storage

The measures used to evaluate the program progress will include groundwater modeling, comparisons of the current water supply portfolios against corresponding water supply portfolios following implementation of the program, and comparisons of the water supply portfolios after implementation with water demand projections. Specific targets for the program are outlined in Table 9-1.

**Table 9-1: Conjunctive Water Supply Management PAEP Table**

Program Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Targets
Increase water supply reliability through increased flexibility in water management	Optimize the use of locally available supplies	Water supply portfolios	Diversification of water supply portfolios  Proportion of supplies that are imported versus local	Maintain at least 3 different water supplies in each of the Partner agencies' portfolios  Develop uses for local water sources that have not yet been captured

Program Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Targets
	Optimize storage capacity	Annual groundwater reports documenting sustainable yield	Change in groundwater sustainable yields	Maintain or increase groundwater sustainable yields
	Avoid groundwater overdraft	Annual groundwater reports documenting groundwater elevations	Change in groundwater levels	Maintain or increase groundwater elevations

The monitoring system necessary for this program is already in place since each of the Partner agencies already has a groundwater monitoring program that is used to collect groundwater level data. No other hard infrastructure/monitoring equipment is necessary to measure program performance.

## 9.2 Water Supply/Salt Management Program- Analysis and Performance

The Revised BMP and GWMP Update are the two main plans that provide the technical basis for the Water Supply/Salt Management program. These plans document water supply management challenges within the region resulting from water quality constraints.

### 9.2.1 Data, Technical Methods and Analyses

As discussed previously, development of the recommendations of the Revised BMP included modeling of the Pajaro Valley Groundwater Basin using the PVIGSM. Groundwater levels in the Pajaro Valley groundwater basin vary annually depending on weather conditions, recharge, groundwater pumping and other factors. However, the groundwater levels in the Pajaro Valley have generally been in long-term decline due to groundwater pumping in excess of the basin’s natural recharge. Pumping the groundwater in excess of the recharge has led to reduced groundwater levels near the coast which has allowed seawater to intrude. As seawater encroaches into the fresh groundwater basin, water quality is degraded and wells must be abandoned. The results of PVIGSM showed that managing coastal groundwater pumping and introducing 18,500 AFY on new water supply to the Pajaro Valley can halt seawater intrusion and bring the basin back into balance.

The projects in the Water Supply/Salt Management program which are related to the recommendations of the Revised BMP are:

- Coastal Distribution System
- Watsonville Recycled Water Treatment Facility
- Corralitos Creek Surface Fisheries Enhancement Project

The Coastal Distribution System was developed as a specific demand management recommendation in the Revised BMP; it will allow the delivery of up to 18,500 AFY of water supplies to agricultural lands in the coastal zone of PVWMA’s service area, permitting those users to stop groundwater pumping. The

location for the Coastal Distribution System was selected through a long evaluation process to minimize the total number of turnouts, pipe length and system headloss while accommodating the needs of growers. The Watsonville Recycled Water Treatment Facility is another project that was specifically recommended in the Revised BMP, and it is closely linked to the Coastal Distribution System. The Watsonville Recycled Water Treatment Facility will treat 4,000 AFY of wastewater to meet Title 22 recycled water requirements, achieve stakeholder water quality requirements by blending with 3,000 AFY of inland groundwater and surface water and establish a committed demand for 7,000 AFY of blended water to be delivered to coastal growers through the Coastal Distribution System. The Corralitos Creek Surface Fisheries Enhancement Project supports the recommendations of the Revised BMP by allowing the City of Watsonville to continue to operate its surface water intake facilities on Corralitos Creek. The City's current intake facility does not meet NOAA's current requirements for fish passage. Implementation of the Corralitos Creek Surface Fisheries Enhancement Project will ensure the City can continue to use its surface water rights instead of switching to the overtaxed groundwater basin. The Corralitos Creek Surface Fisheries Enhancement Project also includes considerations for increasing withdrawals from Corralitos Creek from 1,100 AFY to 2,100 AFY; this extra 1,000 AFY would represent a new water supply that could be credited towards the 18,500 AFY of new supplies needed for PVWMA.

A number of issues identified in the GWMP Update relate to the Water Supply/Salt Management program. On the water quantity front these include the existing and pending inability to adequately dispose of wastewater, and on the water quality side these include the increasing total dissolved solids due to the accumulation of salts in the basin, the hardness of urban supplies and the use of water softeners by end users that add additional salts to the basin. To address these issues, the GWMP Update suggested managing water resources to minimize imported salts, protecting groundwater resources from infiltration of salts and delivering M&I and agricultural water that meets the needs of the end users particularly with respect to TDS, hardness and Sodium Adsorption Ratio (SAR). Projects in the Water Supply/Salt Management program that address the issues and needs raised in the GWMP Update are:

- Cienega Valley
- Hollister Groundwater Softening
- San Juan Bautista Surface Water Treatment Plant
- SBCWD Groundwater Demineralization
- Sunnyslope Groundwater Demineralization
- Groundwater and Surface Water Blending
- North San Benito County Regional Recycled Water Project
- Sunnyslope Recycled Water Project
- Water Softener Rebate Program
- Salinity Education Program

Cienega Valley, Hollister Groundwater Softening, San Juan Bautista Surface Water Treatment Plant, SBCWD Groundwater Demineralization and Sunnyslope Groundwater Demineralization address the issue of hardness of urban supplies; each of these projects represents an alternative that satisfies M&I customers by providing water with very low TDS. Projects like Groundwater and Surface Water Blending, North San Benito County Regional Recycled Water Project and Sunnyslope Recycled Water Project take a different approach to meeting customers' desire for low TDS water; these projects produce water that meet the needs of end users but also aim to gain customer acceptance of water with higher TDS. The North San Benito County Regional Recycled Water Project and Sunnyslope Recycled Water Project also address the issue of wastewater disposal. The Water Softener Rebate Program targets the addition of foreign salts by encouraging customers to replace their water softeners with new ones that reduce salt loading to the basin. Finally, the Salinity Education Program addresses to some degree all of the salt issues raised in the GWMP Update, as this project aims to educate customers on all aspects of

salinity – from their impact on wastewater discharge requirements to how to deal appropriately with hard water.

The Pajaro River Access at WRWTF was added as an environmental enhancement to the Watsonville Recycled Water Treatment Facility. The technical feasibility of this project was assessed in conjunction with the design of the Watsonville Recycled Water Treatment Facility.

### 9.2.2 Measures and Monitoring for Program Evaluation

The performance of the Water Supply/Salt Management program will be evaluated based on its ability to meet the primary objectives of the program:

- Optimize the use of groundwater and aquifer storage
- Target recycled water use to make up 5% of total water use by 2010 and 10% of total water use by 2020
- Meet or exceed all applicable groundwater, surface water, wastewater and recycled water quality regulatory standards
- Protect or improve the quality of water supply sources
- Meet or exceed water quality targets established by stakeholders

The measures used to evaluate the program progress will include groundwater modeling, recycled water production and stakeholder feedback. Specific targets for the program are outlined in Table 9-2.

**Table 9-2: Water Supply/Salt Management PAEP Table**

Program Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Targets
Increase water supply reliability through salt management	Seawater intrusion front stays at the 2008 location	Water quality data from PVWMA monitoring wells in and near the seawater intrusion front	Percent change in chloride concentrations each year	5 or less wells in the coastal zone taken out of production between 2008 and 2012 due to adverse water quality
	Preserve the use of groundwater resources	Annual groundwater reports documenting water quality and sustainable yield	Percent change in TDS concentrations each year	Increase use of Gilroy-Hollister subbasins with high TDS  Maintain or increase groundwater sustainable yield
	Help customers to take ownership of their role in salt management	Recycled water deliveries  Customer surveys	Acre-feet of recycled water delivered  Changes in customer behavior/attitude	Recycled water use to make up 5% of total water use by 2010  Majority of customers surveyed to acknowledge importance of salt management

The main monitoring system necessary for this program is already in place since each of the Partner agencies already has a groundwater monitoring program that is used to collect groundwater level and water quality data. Additional infrastructure that should also be installed are recycled water meters for monitoring the use of recycled water. No other hard infrastructure/monitoring equipment is necessary to measure program performance. However, a method of surveying customers will be necessary to monitor changes in behavior.

## **9.3 Agricultural Water Quality Program- Analysis and Performance**

The Agriculture Water Quality program was developed to respond to the finding of the Central Coast RWQCB that agricultural activities represent one of the most significant impacts to water quality in the watershed. This conclusion is supported by a wealth of monitoring data and has been confirmed by source analysis and modeling performed during development of TMDLs established in the watershed. The RWQCB, in conjunction with federal and university sponsored research, has identified areas in which to focus efforts and have developed a number of technically sound and proven methods and practices that growers and landowners can implement to minimize their impacts on water quality. Additionally, as part of the implementation plans for the TMDLs, the RWQCB has identified parties responsible for implementing actions that will reduce pollutant loading, and agricultural and rural land users are among those facing increased regulation. Examples of the RWQCB new regulations include the Conditional Waiver for Irrigated Agriculture, the proposed Watsonville Slough Livestock Waste Discharge Prohibition and the proposed Pajaro River Watershed Land Disturbance Prohibition which would affect grazing, farm animal and livestock activities. The Agricultural Water Quality program has been developed around efforts to improve agricultural operations and to help agricultural and rural land owners meet regulations resulting from the RWQCB's TMDL implementation plans.

### **9.3.1 Data, Technical Methods and Analyses**

The RWQCB Watershed Management Initiative (WMI) and the Nitrate, Sediment and Pathogen TMDLs contain the majority of data and analyses that support the need for the Agricultural Water Quality Program. These documents also contain potential activities and projects, including those incorporated into the conditional agriculture waiver requirements, that will address the impacts of agriculture on water quality and which form the basis of the Agricultural Water Quality Program.

The WMI is a document that sets priorities and guides the near term efforts and focus of the RWQCB. It is based on a watershed approach and recognizes that non-point sources must be addressed across the watershed in coordinated fashion to meet the water quality objectives of the RWQCB Basin Plan. The Pajaro River watershed is identified as one of six targeted watersheds in the WMI. The most recent WMI update (2004) targeted the effects of agricultural on water quality as a first priority, based on a synthesis of a number of documents, including the 303(d) listings and the associated TMDLs. The projects in the Agricultural Water Quality program that address the priorities of the WMI include:

- Regional Mobile Lab
- Agricultural Water Conservation
- Farm and Rangeland Water Quality Management Program
- Nitrate Management Program
- Vegetative Buffer Strips

The Nitrate, Sediment and Pathogen TMDLs cite a number of sources for monitoring data and analysis that support the 303(d) listings for the Pajaro River, Llagas Creek and San Benito River. These include the Central Coast Ambient Monitoring Program (CCAMP), *The Establishment of Nutrient Objectives, Sources and Impacts, and Best Management Practices for the Pajaro River Llagas Creek, Pajaro River Nutrient Loading Assessment, Qualitative and Quantitative Analysis of Degradation of the San Benito River* and the *Pajaro River Watershed Water Quality Management Plan*. Land use analysis and modeling was performed during TMDL development using resources such as the Multi-Resolution Land Characteristics (MRLC) data set and EPA pollutant models to establish the link between the observed water quality data and pollutant sources identified in the watershed. This confirmed the strong correlation between agricultural and rural land use and nitrate and sediment loading and corresponding impacts on water quality. For example, the Nitrate TMDL concluded that cropland was the primary source of nutrients to the Pajaro River based on data that showed that elevated nitrate levels were found adjacent to croplands. The TMDLs also provide implementation plans that present potential actions and activities that can be considered to implement the TMDL requirements. These recommendations are guided by the earlier technical analysis and will be focused on targeting the pollutant sources, activities and locations that are determined to have the most impact on water quality. Projects in the Agriculture Water Quality Program that will substantially implement TMDLs will be:

- Regional Mobile Lab
- Farm and Rangeland Water Quality Management Program
- Nitrate Management Program
- San Benito and South Santa Clara Permit Coordination Program
- Santa Cruz Partners in Restoration Permit Coordination Program
- Vegetative Buffer Strips
- Tick Creek Riparian Enhancement.

The Agriculture Water Quality Program supports achieving the TMDLs and addressing the impacts of agriculture on water quality through a number of projects designed to assist land users and agricultural growers in voluntarily implementing best management practices or in meeting regulatory requirements. These projects have been developed in part based on research conducted by a variety of organizations that exist to support the attainment of improved water quality through improved practices. The irrigation practices and nutrient management strategies taught in the Regional Mobile Lab are based on tried and tested practices and are being constantly modified and improved from insights gained by participants during the implementation of the program over the years.

The Farm and Rangeland Water Quality Management Program is designed to help participants develop water quality plans for their operations while exposing them to proven and scientifically sound techniques. The program is well supported by technical studies conducted by organizations dedicated to the development of improved methods for managing the water quality impacts of agriculture and rural land uses. Both the NRCS and the UC Cooperative Extension (UCCE) support recommended practices presented through this program. The USDA Natural Resources Conservation Service (NRCS) provides technical expertise in areas related to soil erosion, water supply and water quality; support from the NRCS will be coordinated through the local RCDs. The UCCE Farm Advisors is a network of UC researchers that conduct agricultural research, including issues of water quality, and deliver the results directly to farmers.

The Farm and Rangeland Water Quality Management Program is developed to model the voluntary development and implementation of ranch water quality plans that were initiated in the 1990s with the SWRCB approval of the California Rangeland Water Quality Management Plan (CRWQMP). As part of the CRWQMP, the UCCE Farm Advisors and NRCS developed a Ranch Water Quality Short Course that

teaches ranchers about nonpoint source pollution associated with ranching and assists ranchers with the development of plans. The Farm and Range Water Quality Management Program addresses both agricultural impacts from cropland and rangeland. For growers, the program focuses on assistance with the requirements of the RWQCB's Conditional Agricultural Waiver program. The educational component of the waiver requirements is supported through courses that teach a wide selection of crop-specific water quality management practices designed to meet the specific needs of a particular setting. To assist in the farm water quality management plan development component of the Conditional Agricultural Waiver requirements, participants are provided with template water quality plans and learn how to complete nonpoint source site-assessments that integrate production goals with water quality, habitat conservation and soil conservation goals. Finally, for implementation of farm water quality plans, potential BMPs are taken from the NRCS Handbook of Conservation Practices which details well researched practices and describes the appropriate settings and conditions for each BMP, the advantages and disadvantages, costs and a rating of effectiveness by pollutant type. For ranchers, the program will promote voluntary implementation and preparation for potential regulations from the RWQCB.

Other water quality plans expand upon the implementation plans presented in the TMDLs. The Pajaro River Watershed Water Quality Management Plan is an endeavor by AMBAG. It includes (1) identification and assessment of the most significant NPS pollutant types and sources throughout the watershed; (2) identification of recommended strategies for minimizing NPS pollution and (3) includes a watershed-wide plan for implementation of the recommended strategies. The Lower Pajaro River Enhancement Plan is a plan for reducing the effects of sedimentation on the Lower Pajaro River. The Santa Cruz Partners in Restoration Permit Coordination Program will facilitate the implementation of this plan, and the San Benito and South Santa Clara Permit Coordination Program will build upon successful implementation of NPS pollution prevention in the lower watershed to assist the upper watershed.

### 9.3.2 Measures and Monitoring for Program Evaluation

The performance of the Agricultural program will be evaluated based on its ability to meet the primary objectives of the program:

- Implement water conservation practices for both M&I and agricultural uses consistent with the CVPIA
- Meet or exceed all applicable groundwater, surface water, wastewater, and recycled water quality regulatory standards
- Protect or improve the quality of water supply sources
- Meet or exceed water quality targets established by stakeholders
- Aid in meeting TMDLs established for the Pajaro River Watershed

The measure used to evaluate the program progress will be TMDL monitoring. The TMDL monitoring will directly evaluate performance related to surface water loading, and will provide an indirect evaluate of performance related to groundwater quality. Specific targets for the program are outlined in Table 9-3.

**Table 9-3: Agricultural Water Quality PAEP**

Program Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Targets
Aid in meeting TMDL requirements and improve water quality currently impacted by agricultural practices	Reduce agricultural non-point source pollution and achieve TMDL implementation milestones	Water quality data from stream monitoring and TMDL monitoring	Percent reductions in nitrate, sediment, coliform and pesticide levels.	Meet TMDL milestones established for the Pajaro River Watershed

As part of both the conditional agricultural waiver requirements, a water quality monitoring plan needs to be put in place to measure success. The conditional agricultural waiver allows for individual or cooperative monitoring efforts. For the purposes of evaluating this program’s progress toward achieving desired outcomes, this program will rely on cooperative monitoring efforts developed in response to the conditional agricultural waiver requirements. Tools such as the Revised Universal Soil Loss Equation, EPA developed STEPL Model and land use and pollutant load models developed with assistance from local experts at UC Santa Cruz will be used to evaluate the monitoring results.

## 9.4 Pajaro River Flood Protection Program

The Pajaro River Flood Protection Program is supported by the Pajaro River Watershed Flood Prevention Authority’s Pajaro River Watershed Study, the Pajaro River Planform Study and the Pajaro River Bench Excavation Analysis.

### 9.4.1 Data, Technical Methods and Analyses

The Pajaro River Watershed Study is a four phased evaluation. The four phases included stream flow modeling, identification and evaluation of alternatives, selection of projects, and preliminary design of projects. Phase 1 of the study included development and calibration of a hydrologic and sediment model to evaluate flood conditions, various land use scenarios, and sediment impacts. The models were also developed to facilitate evaluation of flood protection alternatives and to inform decision makers on the hydraulic aspects of alternatives. The hydrologic model developed for the watershed study was named the Pajaro River to the Ocean Flood Model (PRO-FLO). PRO-FLO is a combination of two existing models, Hydrologic Engineering Center Flood Hydrograph Package (HEC-1) and Hydrologic bay Engineering Center River Analysis System (HEC-RAS). These models were chosen for their proven track record as being appropriate tools in cases such as this study, for their general acceptance by the public, engineers and planning experts, and also because they are publicly available. The sediment model developed for the watershed study was named the Pajaro River to the Ocean Sediment Generation and Transport Model (PRO-SED). The model was designed to generate river reach profiles to determine where sediment scour and deposition occur during flooding events of various intensities. The model creates a hydrograph and, based on initial sediment data, calculates the location and magnitude of the sediment transport. PRO-SED uses MIKE11 software to model the sediment transport. MIKE11 consists of a one-dimensional, unsteady-flow hydrodynamic module coupled with a sediment transport module. The model is widely accepted, both internationally and within California, and has been approved by FEMA for use in flood studies. Phase 2 of the watershed study included development and analysis of project alternatives. Fourteen projects were identified, packaged with the USACE projects, and evaluated with respect to flood protection level, benefits, impacts, implementation issues, and costs. Of the fourteen projects, the Soap Lake Floodplain Preservation Project was identified as a key component to maintain the existing level of downstream discharge. From the Phase 2 evaluation, nine alternatives packages were identified (each

alternative package included the Soap Lake Preservation Project and a USACE's Levee Reconstruction Project with varying levels of flood protection) with potential to meet the desired 100-year flood protection. With the Soap Lake Preservation Project as a common element of all the alternatives, implementation of the preservation project was recommended. However, an overall recommended alternative could not be selected, as the overall alternative is dependent on the ultimate design that the USACE recommends for its project. Other projects in the Pajaro River Flood Protection Program that support the objective of maintaining the floodplain include Open Space Authority Acquisitions, Restoration of the Upper Pajaro River Floodplain and Trails, Spaces and Open Space Grants.

The Pajaro River Stable Planform Study – Pajaro River Channel Planform and Channel Forming Discharge Analysis was completed by USACE in 2003. This report recommended four methods, including lowering bench excavations for restoring the Lower Pajaro River Channel to its original bankfull dimensions. To further develop a bench excavation alternative, technical analysis was performed by Northwest Hydraulic Consultants (NHC) Inc. and documented in a letter report: *File #50275; RE: Pajaro River Bench Excavation Analysis; October 20, 2004*. This study analyzed sediment excavation as follows: “As requested, NHC Inc. has evaluated the sensitivity of Pajaro River water surface profiles between Highway 1 and Murphy's Crossing to channel vegetation conditions and partial excavation of benches located between the channel and levees.”... “The concept evaluated involves the excavation of benches on both sides of the river to create a new bench elevation no lower than the water surface profile of the two-year flood. The entire width of bench would not be excavated. Only bench areas extending beyond a minimum buffer width, measured from the existing levee toe, would be excavated. The purpose of the buffer is to reduce the potential of bank erosion undermining the levee toe.” The report continues with a determination that over 322,000 cubic yards of bench sediment can be removed from the system. This would result in an overall increase in conveyance capacity for the model reaches. The technical analysis includes cross section figures and the plan view map set of the excavation areas. These documents combined form the basis for the bench excavation phase of the Levee Reconstruction Project.

The Pajaro River Parkway Plan is a technical evaluation to identify public access and recreational opportunities that can be incorporated into the Levee Reconstruction Project. The plan will include an evaluation of expanding recreational opportunities within the Pajaro River levee reconstruction project area, engaging with the public, outreach and negotiation with land-owners, development of alternatives, cost estimates, benefit analysis, environmental constraints analysis, and implementation plan. The San Benito River Parkway Plan similarly studied opportunities for expanding recreational opportunities along the San Benito River, potentially in conjunction with a mine restoration project along the San Benito River. Projects in the Pajaro River Flood Protection Program that are manifestations of these plans are the Pajaro River Parkway and San Benito River Parkway projects...

## 9.4.2 Measures and Monitoring for Program Evaluation

The performance of the Pajaro River Flood Protection program will be evaluated based on its ability to meet the primary objectives of the program:

- Implement flood protection projects throughout the watershed that provide multiple benefits
- Reach consensus on the Pajaro River Flood Protection Project necessary to protect existing infrastructure and land uses from flooding and erosion from the 100-year event
- Work with stakeholders to preserve existing flood attenuation by implementing land management strategies throughout the watershed
- Develop approaches for adaptive management to minimize maintenance requirements and protect quality and availability of water while preserving ecologic and stream functions, and enhancing when appropriate

- Identify opportunities to enhance the local environment and protect, enhance, and/or restore natural resources, consistent with urban and agricultural land uses, when developing water management strategies
- Minimize adverse effects on biological and cultural resources, including riparian habitats, habitats supporting sensitive plant or animal species and archaeological/historic sites when implementing strategies and projects

The measures used to evaluate the program progress will include flow and water level monitoring, damage reports after flooding events and stakeholder feedback on enhanced recreational and habitat viewing opportunities. Specific targets for the program are outlined in Table 9-4.

**Table 9-4: Pajaro River Flood Protection PAEP**

<b>Program Goals</b>	<b>Desired Outcomes</b>	<b>Output Indicators</b>	<b>Outcome Indicators</b>	<b>Targets</b>
To minimize the risk of flooding in the Lower Pajaro River	Protect from the 100 year flood event	Acres of floodplain preserved	Reduced flood damage reports and claims	Elimination of flood damages for less than 100 yr. flood

A monitoring protocol for the Pajaro River Flood Protection would include provisions for measuring sediment deposition and erosion, vegetation growth or loss, and levee wear. Other monitoring measures would include the amount of damage claims and overtopping sightings experienced during wet weather events. A key measure of project success would involve removal of the area from the FEMA 100 year floodplain. For floodplain preservation, monitoring would include tracking the total acreage acquisition of property or development rights in the Soap Lake area.

## 9.5 Adapting Project Operations

Project operations will be modified periodically through an adaptive management process that will involve analysis of monitoring data for all measures and comparison to the proscribed targets for each of the water management programs. Project adaptation could involve:

### Conjunctive Water Supply Management Program

- Modifications to conveyance sizing for projects still in design;
- Identification of additional water banking options to improve system water supply reliability;
- Identification of additional storage, groundwater recharge, or recycled water options;
- Gathering of additional or alternative performance data.

### Water Supply/Salt Management Program

- Modification of treatment parameters such as filter and/or membrane loading, media composition, plant sizing and consideration of alternate treatment processes;
- Improvements in communications methods and avenues to urban residents, farmers and landowners; and,
- Gathering of additional or alternative performance data.

### Agricultural Water Quality Program

- Adjustments to BMP placement, sizing and design parameters;
- Improvements in communication methods and avenues to landowners and farmers;
- Identification of additional opportunities for demonstration projects and collaborative efforts; and,
- Gathering of additional or alternative performance data.

**Pajaro River Flood Protection Program**

- Development of an Adaptive Management Manual that specifies the most efficient flood channel maintenance schedule;
- Modifications of flood channel maintenance techniques for vegetation thinning, sediment removal and sandbar breaching;
- Use of improved methods for environmentally friendly sediment removal methods;
- Adjustment to patterns of land parcel acquisition in the floodplain;
- Modifications to allow improved recreational and habitat function in conjunction with flood protection projects;
- Improvements in communications methods and avenues to urban residents, landowners and recreational interests; and
- Gathering of additional or alternative performance data.