3 Management Measures

In order to protect and enhance groundwater and surface water resources in the Pajaro Valley, there are management measures that can be undertaken by the PVWMA that do not involve the construction of new projects. This section presents various measures that can be used to lessen water demand, increase the yield of the groundwater basin (the predominant current water supply), maintain optimal water quality, and protect and enhance surface water resources. These include:

- Demand management options to reduce water demand;
- Pumping management options to increase the sustainable yield of the groundwater basin;
- Watershed management options to ensure groundwater recharge; and
- Well management options to maintain water quality.

The PVWMA recently undertook a significant public based process that resulted in publication of Water Conservation 2000 (WC 2000). Many of the measures and strategies discussed in the following sections are also included in WC 2000 (CH2M Hill & RBSmith, February 2000), which was received by the PVWMA Board of Directors in February 2000.

3.1 Demand Management Options

Demand management measures include options such as water conservation, land fallowing and tiered water pricing. These measures can be employed as alternatives to, or in conjunction with, new water supply projects to help solve the overdraft and seawater intrusion problem.

This section identifies and describes the potential demand management options that were evaluated as part of this Revised BMP. Also presented are the goals, implementation issues, cost estimates (as appropriate) and potential impacts associated with each option.

3.1.1 Water Conservation

PVWMA developed WC 2000 to serve as a guidance document to achieve cost-effective increases in water conservation. The WC 2000 incorporates water conservation programs from around the state that are applicable in the Pajaro Valley. Under the WC 2000, conservation would be achieved through voluntary actions without restrictions or enforced land use changes. The plan identifies cost-effective conservation opportunities of approximately 4,500 AFY of agricultural conservation and 500 AFY of urban conservation. Correcting on-farm irrigation system deficiencies, improving irrigation scheduling techniques, and conducting mobile laboratory evaluations are all methods that can be effective in increasing agricultural water conservation. The WC 2000 proposed agricultural conservation program calls for the following actions:

- Evaluate the PVWMA water metering program;
- Submit annual grower water conservation plans;
- Prepare the PVWMA annual report of water use and conservation;
- Provide records of historic pumping;
- Continue grower education and demonstration projects;
- Install CIMIS weather stations;
- Provide irrigation scheduling technology/assistance;
- Institute mobile irrigation laboratory program;
- Seek financial assistance to fund the PVWMA water conservation program;
- Seek financial assistance for irrigation system improvements; and

- Continue ongoing public education program.

Urban conservation can be achieved through water audits, a landscape water conservation ordinance, and toilet and washing machine rebate programs. The WC 2000 proposed urban conservation program calls for the following actions to conserve a projected 500 AFY:

- Conduct residential water audits;
- Conduct commercial, industrial, and institutional audits;
- Offer high efficiency washing machine rebates;
- Institute commercial toilet rebate program;
- Create and maintain demonstration gardens;
- Report previous water use on billings;
- Distribute conservation notices;
- Implement conservation pricing;
- Conduct large landscape water audits and retrofit program; and
- Draft and approve landscape water conservation ordinances.

The cumulative cost of implementing the above conservation plan to PVWMA is approximately $2,130,000 over seven years, or $3,029,000 over 10 years (CH2M Hill & RBSmith, February 2000), and does not include costs to farmers to implement such conservation measures. The present worth values shown in Table 3-1 were calculated assuming uniform annual expenditures over the seven and ten year periods. For the purposes of the Revised BMP, it was assumed that these water conservation practices would be implemented over a seven year time period. Excluded from the costs presented in Table 3-1 are the costs attributable to the farmer or owner.

Table 3-1: Conservation Present Worth Analysis

Conservation Plan	Cumulative Cost	Uniform Annual Cost	Present Worth
7-Year	$2,130,000	$304,000	$1,700,000
10-Year	$3,029,000	$303,000	$2,200,000

Notes:
1) Adapted from *Water Conservation 2000* (CH2M Hill and RBSmith Consulting, February 2000).
2) Present worth costs are based on a 30-year lifetime, 6% interest.
3) Costs presented in Table 3-1 exclude on-farm or other owner costs.

Additional water conservation program spending by the PVWMA would not necessarily result in additional voluntary conservation savings. To achieve higher levels of conservation, the PVWMA would need to implement mandatory conservation measures requiring enforced land use changes or significant capital investment by farmers. The PVWMA Board of Directors has determined that such an approach would be inconsistent with the mission, goals, and objectives of the PVWMA.

Conservation also has a number of indirect benefits, with respect to erosion control, surface runoff, and leaching of nitrates and other pollutants into the groundwater. However, irrigation improvements that significantly reduce deep percolation will also reduce recharge of the aquifers.

The PVWMA and the City of Watsonville are actively implementing water conservation measures identified in WC 2000. For additional details on conservation, refer to the *Water Conservation 2000* document (CH2M Hill and RBSmith Consulting, February 2000).

3.1.2 Water Pricing

The PVWMA currently imposes an augmentation charge for water use within PVWMA area. The augmentation charge is levied via metering of wells providing agricultural and urban water supplies within its service area. With some renovation of the metering program, alternative water pricing programs could be used to promote demand reduction in several ways. These include raising flat rates and implementing tiered water pricing.

Currently, the PVWMA augmentation charge is a flat rate of $50 per acre-foot. One option for managing water demand is to raise the augmentation charge to promote water conservation. This would encourage users not to waste water.

Another option is to implement tiered water pricing. Tiered water pricing is an incremental pricing system in which the price of water increases as the amount of water consumed exceeds certain threshold values. This management mechanism can promote conservation and/or alter water use practices. The plan would set varying levels of water pricing associated with water application rates for various crop types, which may promote conversion to crop types with lower water uses. Crops with a low water application requirement would fall into a low pricing tier, while crops with higher application rates would fall into a higher tier. Under the tiered structure, wasteful or high-use irrigators incur significantly higher water costs.

An increase in water rates or a tiered water structure would provide an incentive for conservation and would minimize wasting of water. Both methods of water pricing were considered for implementation. A recommended rate structure is discussed in Section 9.

3.1.3 Land Fallowing

The land fallowing option involves the acquisition or leasing of agricultural land and retirement of that land from production or development. Fallowing the land from production would reduce groundwater pumping by reducing water demand. Acquiring the land would stop property owners from pumping groundwater from the basin. As applied in the Pajaro Valley, the estimated capital cost to acquire agricultural land is approximately $20,000 to $30,000 per acre. This cost does not include the additional impacts of lost taxes, production, and jobs to the economy of the Valley.

Model analyses indicate that the most effective location for land fallowing from the standpoint of basin management would be within the coastal area. Eliminating coastal area pumping would allow for formation of a hydraulic groundwater barrier adjacent to the Pacific Ocean, minimizing seawater intrusion.

The cost of land fallowing would be significant. For example, fallowing 1,000 acres of land in the coastal area at a cost of $20,000 to $30,000 per acre would cost between $20 and $30 million. The removal of 1,000 acres of irrigated agriculture in the coastal area would reduce demand by approximately 2,000 AFY. Alternatively, land could be leased instead of purchased. This would allow for agricultural production during wet years when additional water supplies may be available. This option would cost approximately $1,500 per acre per year of demand reduction and associated economic impacts to the Pajaro Valley. (Note: The land lease unit cost of $1500 is assumed to be the Pajaro Valley average. However, in the coastal area the annual cost to lease land is approximately $2500 to $3000 per acre.) This makes land fallowing a costly option in the Revised BMP.

3.2 Pumping Management

The PVIGSM simulation of groundwater levels and seawater intrusion in the Pajaro Valley groundwater basin indicates that coastal groundwater pumping reductions would be more effective at preventing seawater intrusion than basin-wide pumping reductions. As discussed in Section 2.8, the elimination of coastal pumping creates a hydrostatic barrier that results in a sustainable yield of up to 48,000 AFY, doubling the sustainable yield of the basin. This assumes that 100% dependable supplemental supplies (i.e. supply from desalination or water recycling) are available to augment pumping. This pattern of pumping management optimizes the basin yield, but necessitates the construction of a distribution network to supply coastal users with the water they need. This also calls for a supplemental water supply to serve the coastal distribution system.

The sustainable basin yield is a function of the interrelationship between yield, water conservation, irrigation recharge, and reliability of water supply. These relationships become significant with alternatives that rely heavily on high levels of water conservation and on water sources with low reliability. High levels of water conservation can affect the sustainable yield because the amount of recharge to the groundwater basin is reduced. Surface water sources with low reliability can require additional groundwater pumping to meet demand during low water years. Therefore, the sustainable yield of the basin would be less than 48,000 AFY if land fallowing, high levels of conservation, or less reliable water supplies are implemented.

3.3 Summary of Demand and Demand Management

Although there are several options available to optimize the groundwater basin, they are insufficient by themselves to balance demand without providing an additional sustainable supply, as shown in Table 3-2.

Assuming 5,000 AFY of water conservation measures and an increase in basin yield of 24,000 AFY with coastal pumping restrictions, a basin wide overdraft of 16,000 AFY would still remain under current conditions. However, based on PVIGSM results, approximately 18,500 AFY of coastal pumping reductions are required to eliminate seawater intrusion. Therefore, to eliminate seawater intrusion approximately 18,500 AFY of supplemental supplies must be delivered to the coastal area. The strategy to eliminate seawater intrusion is to provide 18,500 AFY of supplemental supply to the coastal area while maintaining basin balance.

Future water use in the Pajaro Valley is projected to increase the required supplemental supply from 16,000 to 25,000 AFY (an increase of 9,000 AFY) by 2040. This overdraft will have to be met with new water supplies if a balance between demand and supply is to be achieved. Land fallowing via land leases could be used to bring about a basin balance, however, its annual unit cost of $1,500 per acre of land (plus economic impacts) precludes its use on a wide scale.

Water conservation and land fallowing are management options that reduce the amount of irrigation, which in turn reduces the amount of groundwater recharge and basin yield. Furthermore, water supplies with low reliability result in excessive groundwater pumping during dry years, which adversely affects (lowers) the sustainable yield of the groundwater basin. Model results showing this relationship can be found in *PVIGSM Technical Memoranda* (Montgomery Watson/AT Associates, May 2000). Examples of water sources with low levels of reliability would be sloughs and small streams, whereas an example of a high reliability source would be recycled water.

Table 3-2: Identification of Required Supplemental Supplies with Conservation

Optimization Option	Balancing Current Conditions (AFY)	Balancing 2040 Conditions (AFY)
Agricultural Demand	59,300	64,400
Urban Demand	12,200	16,100
Total Demand	**71,500**	**80,500**
Corralitos Filter Plant	(1,100)	(1,100)
Other Surface Water Diversions	(1,000)	(1,000)
Total Groundwater Demand[a]	**69,000 (rounded)**	**78,000 (rounded)**
Current Basin Sustainable Yield	(24,000)	(24,000)
Future Increased Yield Due to Pumping Management at Coast and Reliable Supplemental Supply Projects[b]	(24,000)	(24,000)
Water Demand without Conservation	**21,000**	**30,000**
Increased Agricultural Conservation (Achieved by 2010)[c]	(4,500)	(4,500)
Increased Urban Conservation (Achieved by 2010)[c]	(500)	(660)
Required Additional Supply[d]	**16,000**	**25,000 (rounded)**

Footnotes:

a. Values rounded to two significant figures or to the nearest thousand to represent the values significant accuracy.
b. The amount achieved if supply is 100% reliable. With less reliable supply, the amount of increased yield would be lower. The amount of increased groundwater yield of the Alternatives (except Local-Only Alternative) developed in Section 5 would be 23,000 AFY given their level reliability.
c. Conservation to be achieved over several years, but is included here to show impact on current levels of demand.
d. This value represents the supplemental supplies required to meet the overall water balance in the basin assuming 100% supply reliability. However, PVIGSM results indicate that elimination of approximately 18,500 AFY of pumping along the coast is required to eliminate seawater intrusion.

3.4 Watershed Management

In addition to the implementation of measures and projects to increase sustainable water supply for the Pajaro Valley, it is important to protect and monitor watershed conditions within the Pajaro Valley. Non-point source (NPS) pollution is likely to be the most significant threat to the water quality in the Pajaro Valley watersheds. NPS pollutants originate from a wide range of sources that are not required to have an NPDES Permit. In general, these pollutants come from sources over which water users have some level of control (e.g. fertilizer and pesticide runoff, animal waste management, paint, oil, anti-freeze poured directly into storm drains, etc.). Therefore, programs that promote and educate the public on the control of such pollutant sources can be very effective.

The SWRCB and RWQCBs are empowered by the State's Porter-Cologne Water Quality Control Act to regulate water pollution, including NPS pollution. Through cooperative efforts, the SWRCB, RWQCBs, and other organizations have developed management measures for control of NPS pollution. In 1988, the California NPS Management Plan was adopted. The plan identifies sources and potential management measures for prevention and control of NPS pollution.

Watershed management is a key aspect in protecting ground and surface water supplies, water quality, and ensuring continued beneficial use of water. A complete Watershed Management Plan is not included in the Revised BMP. However, the framework for developing key programs that would be included in a Watershed Management Plan is discussed in the following sections. Included herein are potential management measures and monitoring programs that could be implemented to protect water supplies for future beneficial use, including environmental protection and enhancement.

3.4.1 Water Resource Monitoring Program

Water resource monitoring is a key aspect in understanding and evaluating basin conditions. Data collected is often used to evaluate contaminant transport, groundwater flow, surface water recharge, and other water resources aspects. Ultimately monitoring provides the data and information for management of water resources within the basin. The Pajaro Valley consists of groundwater and surface water resources that are interconnected within the basin. This section identifies the current groundwater and surface water monitoring programs and identifies potential enhancements to the programs that may be implemented.

Groundwater Monitoring:

Groundwater monitoring programs are typically implemented to provide data for evaluation of basin conditions. In addition, monitoring programs are used to track groundwater contaminants and ultimately provide data and information that can be used to implement programs and strategies to protect groundwater supplies. This section highlights the current groundwater monitoring program and provides a general framework for development of an enhanced groundwater monitoring program.

Data collected under the current PVWMA groundwater monitoring program includes:

- Water quality data;
- Groundwater elevation data; and
- Geologic and hydrogeologic data.

These data, in conjunction with other basin features, provide the framework for understanding basin characteristics such as groundwater recharge and pollutant transport. These data also provide a mechanism for identifying water quality issues such as seawater intrusion, nitrate contamination, and contaminant movement within the groundwater system.

PVWMA's current groundwater monitoring program consists of monthly well sampling and analysis of select wells (Note: Some wells monitored under the program are sampled on a biannual or annual basis). The monitoring program covers sampling of selected production wells and monitoring wells throughout the basin. Water purveyors in the basin such as the City of Watsonville, Aromas Water District, Pajaro Sunny Mesa, and California State Water Company also provide additional well data. In all, PVWMA tracks approximately 170 wells throughout the basin and maintains a database and geographical information system (GIS) to manage, analyze, and summarize data.

Well monitoring includes measurement of groundwater levels and collection of water samples for analysis. Wells in the basin are screened at various intervals with some wells screened in multiple aquifers. Well logs provide screening data and depth for the wells within the monitoring program. The majority of the groundwater wells are screened within the Aromas aquifer, the main production aquifer in the basin.

The collected data are compiled and summarized in an annual water resources report, which is completed at the end of each calendar year. The annual report includes water quality data, evaluates the extent of the seawater intrusion, water table contours, and discusses other groundwater areas of concern. In addition, the report includes results from any hydrogeologic studies that have taken place over the water year. The extent of overdraft and seawater intrusion in the Pajaro Valley has been demonstrated in these annual reports and the need for programs and projects to improve these conditions is well documented.

Implementation of demand management and development of supplemental water supply projects will improve groundwater conditions and eliminate further seawater intrusion. It will therefore be important to monitor groundwater level and quality data to measure the effectiveness of these programs. Because of the significant future changes in overall water supply and groundwater pumping, an enhanced groundwater-monitoring program is needed. Potential enhancements to the groundwater monitoring program include:

- Monitoring Network – Expanding the monitoring network by installing new monitoring wells to provide a good basis for determining the movement of seawater intrusion;
- Water Quality Analysis – Monthly sampling and analysis of groundwater quality, investigation of aquifer screening levels, isotope analysis, water dating analysis;
- Groundwater Level Measurement – Monthly tracking of groundwater levels;
- Aquifer Transport Study – Developing an increased understanding of recharge of the aquifers and contaminant transport;
- Groundwater Modeling Updates – Continue updating of the PVIGSM, including updated land and crop use data available approximately every seven years from the Department of Water Resources, and modeling of contaminant transport;
- Database Management – Upgrading existing database. Developing tools for management and reporting of data including GIS compatibility; and
- Annual Reporting – Expanded analysis of collected data, seawater intrusion front, contaminant migration, documenting observed changes in groundwater levels and groundwater migration.

In addition to the development of an enhanced groundwater monitoring program, PVWMA is also pursuing potential funding opportunities, including state and federal grants, to help offset the cost of the enhancements to the monitoring program.

Surface Water Monitoring:

The current surface water monitoring includes sampling and analysis at approximately 25 sites within the PVWMA service area. Surface water monitoring spans the wet weather season and samples are taken on a biweekly schedule. Water quality data are managed in a database application. The USGS also maintains several gage stations within the Pajaro Valley providing flow data for select surface water in the basin.

Potential enhancements to the surface water monitoring program include:

- Water Quality Analysis – Continued monitoring of water quality of surface waters;
- Flow and Level Monitoring – Measurement of river, creek, and slough flows and measurement of lake levels;
- Modeling Updates – Continue updating of the PVIGSM and modeling of contaminant transport;
- Database Management – Maintaining and upgrading existing database. Developing tools for management and reporting of data; and
- Annual Reporting – Summarizing collected data, constituent issues, documenting observed changes in water quality levels and surface water flows.

In addition to water quality and flow monitoring, reporting, and management, the program should step up efforts to track, meter, and monitor surface water diversions. These tasks are key to protecting and managing water supplies. Surface water diversions could affect natural recharge to the groundwater basin and limit natural dilution of potential constituent concentrations of concern. In addition to the Corralitos Creek Filter Plant diversions, other surface waters are diverted for agricultural purposes. Such diversions over 10 AFY are required by the PVWMA to be metered under Ordinance 93-2 (Amended by Ordinance 96-2).

3.4.2 Recharge Area Protection Program

Groundwater resources in the Pajaro Valley result from stream recharge, percolation of rainfall, deep percolation of irrigation water, and inflow into the groundwater basin from adjoining groundwater systems. The protection of areas within the basin that serve to recharge the groundwater aquifers is critical to providing a reliable, long-term groundwater supply. Recharge areas are protected by the Counties of Santa Cruz and Monterey. For example, the Santa Cruz County General Plan and Local Coastal Plan limits or constrains development within identified recharge areas in order to protect groundwater supplies. In addition, new development must meet County policies for stormwater runoff in recharge area. PVWMA does not have a formal policy or ordinance protecting high recharge areas.

PVWMA could implement a basin-wide management measure to enhance groundwater stability through the protection of key areas of recharge. This effort could begin with a public outreach program designed to inform area residents and decision makers of the importance of protecting groundwater recharge areas.

Because clay layers inhibit deep percolation through much of the central and western portions of the Pajaro Valley, deeper aquifers rely on undeveloped areas of native vegetation or agricultural lands generally located in the eastern portions of the Valley to provide recharge through surface water infiltration and rainfall. As these or other areas in the Pajaro Valley are subject to impervious development, infiltration of precipitation would be reduced, thus reducing recharge of the underlying aquifers. Basin yield would decrease, and the negative pressure within the deep aquifers would cause the seepage of lower-quality water from above through semi-confined layers that would otherwise act as barriers.

3.4.3 Nitrate Management Program Framework

This section briefly summarizes nitrate issues and concerns in the Pajaro Valley and provides a framework for development of a nitrate management program. A complete nitrate management program is not included in the Revised BMP, as the major focal point of the document is to address seawater intrusion and the need for water supply management and projects. However, a program should be developed in the near future to address nitrate issues, as nitrates are a potential public health and agricultural concern.

As previously discussed in Section 2.9.2, groundwater nitrate contamination has been documented as a problem within the Pajaro Valley. Elevated nitrate concentrations in excess of the drinking water standard of 10 mg/L N (nitrogen) are typically observed in wells west of Highway 1, in the wells east of the City of Watsonville and in other localized areas within the PVWMA boundary. Nitrate concentrations in the basin are shown in Figure 3-1. Because agriculture is the major land use in the Pajaro Valley, elevated nitrate concentrations are likely due to fertilizer application and agricultural practices. However, other sources of nitrogen contamination include septic tank drain fields and animal facilities. In addition, nitrate concentrations occur naturally in groundwater due to biologic activity or decomposition of geologic deposits, but natural concentrations of nitrate rarely exceed the Primary Drinking Water Standard of 10 mg/L N.

The SWRCB and RWQCB, in conjunction with other stakeholders, have developed guidance for implementation of watershed management measures, including nitrate management. A "three-tiered approach" is the recommended implementation strategy for controlling pollution and protecting water supplies. The "three-tiered approach" recognizes that the most effective management is achieved through voluntary implementation of management measures. Tier 1 is therefore based on outreach and education programs that promote and encourage voluntary implementation of management measures to reduce contamination. Tiers 2 and 3 of the approach include increasing regulatory action to ensure implementation of management measures.

Currently, PVWMA is a member and participant on the Monterey County Water Resource Agency (MCWRA) Nitrates Committee, which is tasked with addressing agricultural and urban nitrate issues. The committee has coordinated and sponsored public outreach events to educate the community on nitrates management. PVWMA has co-sponsored and participated in these events. In addition, the committee has developed pocket guides for management of agriculture nitrates on which the PVWMA co-sponsored and participated. However, increased efforts are necessary to protect water resources within the Valley.

PVWMA should develop a nitrate management program promoting voluntary implementation of the management measures. Because the major sources of nitrate contamination in the Pajaro Valley are due to agricultural practices, septic tanks, and animal facilities, the nitrate management program should focus attention on promoting management measures to decrease nitrate contributions from these sources. Potential management measures for reducing nitrates contamination include:

- Crop nutrients budgeting;
- Identifying crop types, and amounts and timing of nutrients;
- Identifying hazards to site and adjacent environment;
- Water sampling and analysis to determine nitrate concentrations;
- Soil sampling and analysis to determine available nutrients;
- Plant tissue sampling and analysis;
- Calibrating nutrient equipment;
- Irrigation techniques to prevent leaching of nutrients;
- Controlling discharge from animal facilities;
- Runoff management of agricultural and urban areas; and
- Monitoring and maintaining septic tanks.

More detailed monitoring is necessary to better understand the extent and sources of nitrate contamination in the various basin aquifers. PVWMA could then detail and implement a nitrates management plan. In the interim, a public outreach program could be implemented to provide education relative to controlling nitrate leaching into the groundwater system. A cooperative education and outreach effort with the Counties of Monterey, Santa Cruz, and San Benito and other local agencies could be developed.

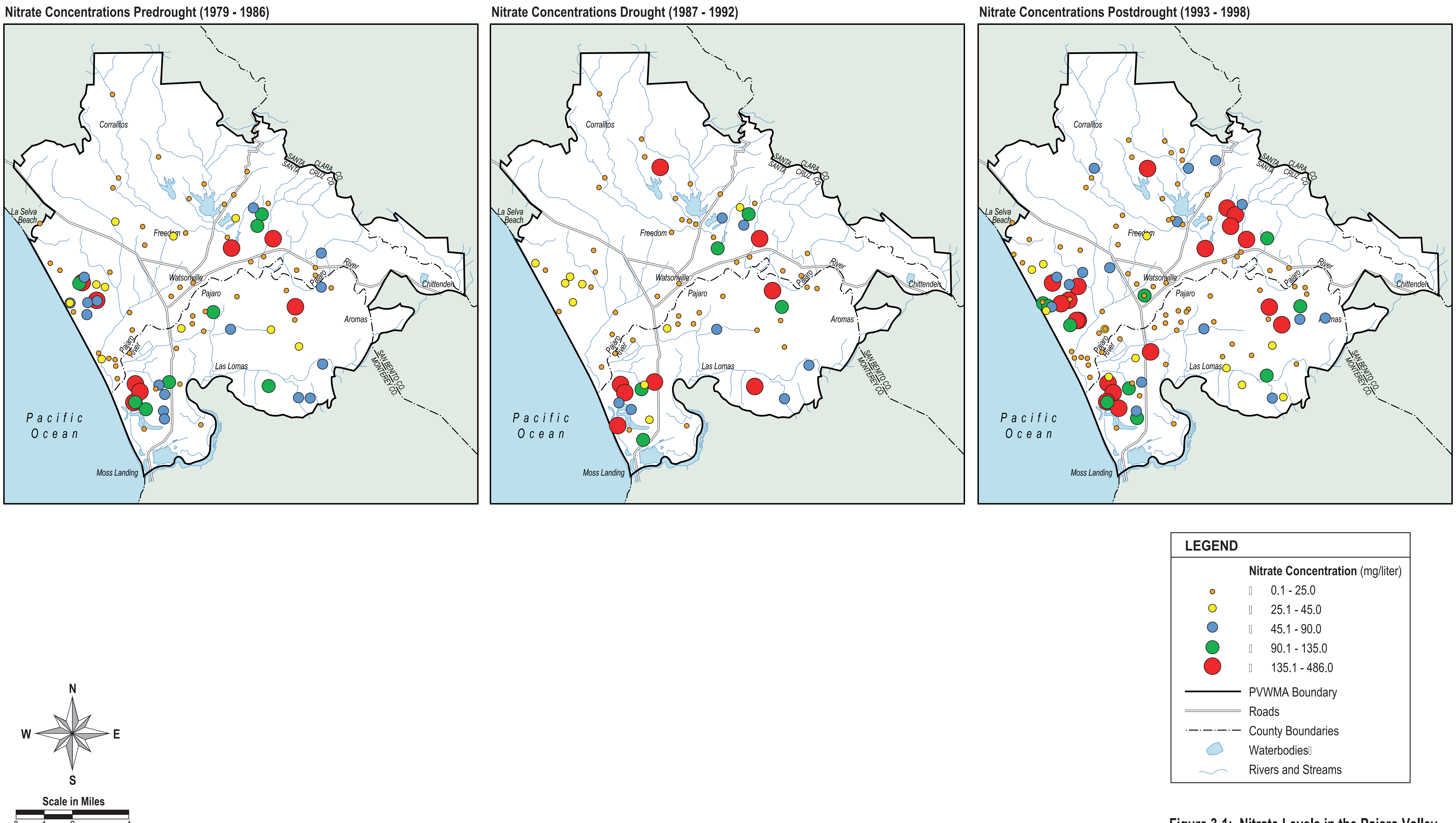

Figure 3-1: Nitrate Levels in the Pajaro Valley

3.4.4 Water Metering Program

Water use data provided by PVWMA's water metering program provide a mechanism for billing, planning, and water management. The data are especially critical for managing the Pajaro Valley groundwater basin and the funding of solutions to eliminate seawater intrusion. PVWMA's metering program includes monitoring and reading meters, maintaining and calibrating meters, and repairing or replacing meters.

In 1993, the PVMWA adopted Ordinance 93-2 requiring the installation of flow meters on all water supply facilities capable of producing over 10 AF of water annually. This included both groundwater and surface water facilities. Production facilities of less than 10 AF are approximated for billing purposes. Water use by non-metered agricultural production facilities is estimated to be about 1% of the total water use in the PVWMA service area.

The Ordinance required mandatory meter installation by the end of 1995 and most meters were installed in 1994. Turbine meters with an expected life of 5 years and propeller meters with a life of 8 years were the typical meters installed. These types of flow meters have a typical accuracy of 5% with regularly scheduled maintenance. However, since the installation of meters approximately 8 years ago, there has been limited maintenance of the meters due primarily to limited Agency resources. As a result, a significant number of broken and malfunctioning meters have not been repaired, resulting in lower than typical accuracy. PVMWA currently estimates that the water metered had an error of approximately 16% in 2001. Therefore, the PVWMA is developing an enhanced metering program to improve the accuracy of the program.

PVWMA is in the process of developing and implementing an enhanced meter program that includes the following tasks:

- Meter Readings for Billing - Biannually in June and December;
- Meter Readings for Maintenance - Biannually in the Spring and Fall;
- Maintenance and Calibration Program – Each meter to be checked, serviced and repaired at least once every two years;
- Ultrasonic Meter Accuracy Tests – Meter testing in conjunction with maintenance and calibration program;
- Turbine Meters Replacement Program – Turbine meters have become obsolete and replacement parts are no longer available. Therefore, turbine meter replacement with propeller meters is an ongoing task.
- Propeller Meter Repairs – Repair of aging propeller meters is critical for monitoring and maintaining accurate data.
- Database Tracking – PVMWA staff is in the process of developing a database to track and manage the metering program. The database shall allow for effective tracking and management of metering activities and resources.

The enhanced metering program will provide confidence in the collected data and will be a valuable tool for future planning and management of the groundwater basin. Data could be used to calibrate the PVIGSM model and validate model results. These data shall allow for evaluation of conservation efforts and accurate collection of augmentation charges for developing supplemental water supplies.

3.4.5 Well Management Program

Well management is critical to ensure maximum groundwater quality in the Pajaro Valley because wells can serve as conduits for transport of contaminated water from one aquifer to another. Therefore, the PVWMA needs to undertake a comprehensive well management program with regard to well decommissioning and well replacement. For additional information on the regulatory processes of well management, see Feeney et al, March 1999.

Well Decommissioning:

Wells are constructed in varying manners, including those with a single screened interval and those with multiple screened intervals. Wells with single screened intervals, if properly constructed with well seals between aquifers, extract groundwater from a single aquifer. Wells with multiple screened intervals can be used to extract water from more than one aquifer. Within the Pajaro Groundwater Protection Zone of the Santa Cruz County portion of the PVWMA (Zone boundaries are published on a map on file with the Environmental Health Office), new well construction is limited to wells being completed in a single aquifer only (Feeney, et al, March 1999).

When not in operation, wells with screened intervals in multiple aquifers can serve as a conduit to allow groundwater to flow from one aquifer to another. This can pose problems if one of the aquifers is intruded with seawater, or is otherwise contaminated. In particular, seawater has a higher specific gravity than fresh water. As seawater intrudes into and contaminates a fresh water aquifer, there is an increase in specific gravity that will cause the “heavier” seawater-intruded-groundwater to flow down a well and into the lower elevation aquifer, resulting in seawater contamination of the lower aquifer. This effect may be magnified by the hydrostatic pressure difference between aquifers.

It is therefore important that a consistent procedure be developed to guide decommissioning of groundwater wells that are abandoned from operation. The California Department of Water Resources has regulations that govern the construction and destruction of wells (DWR, 1974) that are applicable to all of California. The Monterey County Water Resources Agency adopted an ordinance that incorporates the requirements set by DWR, including sealing of the well casing to prevent vertical migration of contaminated water within the well. The PVWMA has a program for notifying the respective county whenever an abandoned well is discovered. PVWMA may consider an ordinance similar to that adopted by MCWRA.

Well Replacement:

Well replacement is a concern to groundwater users throughout the Pajaro Valley. Along the coast, where seawater intrusion is occurring, some wells that are seawater intruded may have to be replaced with wells that are drilled into a non-intruded aquifer. In inland areas, well deepening is used to enhance well yield or escape nitrates or other water quality problems associated with the shallow groundwater zones. These replacement wells may be needed to meet the users’ water needs on an interim basis, while the long-term water supply projects are being built.

A current Santa Cruz County regulation allows a well to be replaced only with a well that is constructed to the same depth, unless CEQA documentation prepared by the well owner demonstrates such a replacement will have no detrimental impact on groundwater resources. The purpose of this regulation is concern that replacement of wells in shallow intruded aquifers with wells in deeper, less-intruded aquifers could serve to accelerate seawater intrusion into the deeper aquifer.

Once implemented, the projects identified and evaluated in this draft Revised BMP will obviate the need for this regulation because they will eliminate over-drafting and seawater intrusion of the basin by providing an overall long-term reduction in coastal groundwater pumping.

In the inland areas of the Pajaro Valley the need for this regulation is also questioned, because replacement wells drilled to a deeper aquifer do not directly impact the advance of seawater intrusion, nor overall basin groundwater balance. The groundwater underlying the Pajaro Valley flows into the aquifers from the surrounding aquifers, infiltrates through the river and streambeds, and recharges through the soil structure. In general, the flow of groundwater in the aquifers underlying the Pajaro Valley is from the inland areas toward Monterey Bay, with the exception of the areas along the coast where groundwater levels are below sea level and seawater flows into the aquifer.