DEENA STANLEY

PROPERTY OF AMBAG
Please Return

CLEAN WATER

Water Quality Management Plan for the Monterey Bay Region

TELEPHONE (408) 624-2117

ambag

ASSOCIATION OF MONTEREY BAY AREA GOVERNMENTS

Please return to:

Doug Catey, PE
Water Quality Engineer

at 7

MAIL ADDRESS:
P.O. BOX 190
MONTEREY, CA 93940

OFFICE ADDRESS:
23845 HOLMAN HIGHWAY
SUITE 227

WATER QUALITY MANAGEMENT PLAN FOR THE MONTEREY BAY REGION

JULY 1978

Preparation of this document has been funded by a grant from the U.S. Environmental Protection Agency under provisions of Section 208 of the Federal Water Pollution Control Act, as amended.

TABLE OF CONTENTS

	Page
Chapter I: Introduction and Summary	I-1
Chapter II: Purpose and Context of the Plan	II-1
Chapter III: Water Quality in the Monterey Bay Region	III-1
Chapter IV: Element: Septic System Pollution Control Recommendations	IV-1
Chapter V: Element: Erosion and Sediment Management	V-1
Chapter VI: Laguna Grande-Roberts Lake	VI-1
Chapter VII: Case Study on Nitrate Pollution of Groundwater: Salinas and Pajaro Valleys	VII-1
Chapter VIII: Seawater Intrusion in the Pajaro Valley	VIII-1
Chapter IX: Case Studies on Aquifer Recharge: Pajaro Valley, Carmel Valley, San Lorenzo Valley	IX-1
Chapter X: Overall Strategy for Ongoing Area-wide Water Quality Planning and Implementation	X-1
Chapter XI: Social, Economic, Environmental Assessment	XI-1

APPENDICES

A. Documentation of the Adoption Process

B. The Public Participation Process

D. Bibliography

E. Assessment and Evaluation Criteria

F. How the 16 Elements are Addressed in the Plan

G. Model Ordinances

H. Committees

I. Recommended Monitoring Program

J-1. Septic System Training Program

J-2. Proposed Demonstration Program
Sidewall Raking During Trench Excavation

J-3. San Lorenzo Valley Onsite Wastewater Disposal Zone
-- Proposed Minimum Service Arrangements

J-4. Generalized Strategy for Coordination Between Onsite Disposal Management and Facilities Planning

J-5. Coordination of Land Use and Wastewater Management Planning

K. Gloria Resource Conservation District
Third Quarter Report (w/Cover Letter to EPA)

L. Cluster Development Model Ordinance

M. Descriptions of Best Management Practices

N. Federal Regulations Re: Sole or Principal Source Aquifer Areas

INTRODUCTION

This Water Quality Management Plan for the Monterey Bay Region was prepared by the Association of Monterey Bay Area Governments in accordance with the 1972 Federal Water Pollution Control Act.

In 1975 a grant from the U.S. Environmental Protection Agency directed AMBAG to prepare a plan for controlling non-point or diffuse sources of water pollution in Monterey and Santa Cruz Counties. (Pollutant sources are "non-point" when actual pollution cannot clearly be linked to a particular waste discharger.) The plan's objective is to clean up the region's waters by 1983.

WHY SHOULD WE PREPARE AND CARRY OUT A PLAN FOR WATER QUALITY?

Why bother with this plan, and with cleaning up the water, when other plans have already been developed and money expended on wastewater treatment plants which will result in a Bay generally safe for swimming? Because there are numerous other water bodies -- lakes, coastal lagoons and estuaries, rivers and streams, underground water supplies -- which are being polluted and, in some cases, severely threatened.

Failing septic systems, excessive man-induced erosion, storm-induced runoff of polluted substances, overdrafting of coastal underground water supplies, pollution of natural water supplies by nitrates, covering of valuable groundwater recharge areas by inpenetrable pavements associated with urban development -- all of these water quality problems pose a continuing and expanding threat to a great many of this area's water resources.

HOW WAS THE PLAN PREPARED?

The first phase of planning identified the pollution problems in the region. Representative problem or case study areas were chosen for further study because they appeared to be problems common to most of the region.

These case studies were as follows:

- Septic System Failures
- Erosion and Sedimentation
- Laguna Grande/Roberts Lake (typical coastal lakes)
- Nitrate Pollution of groundwater in Pajaro and Salinas Valleys
- Pollution of Pajaro groundwater by seawater intrusion
- Recharge of groundwater aquifers -- Pajaro Valley, Carmel Valley, San Lorenzo Valley

The plan's second phase was the development of alternative techniques and improved management practices to solve the problems.

Finally, the potential solutions were evaluated for their effectiveness and their social, economic and environmental side effects. The Plan includes those recommendations which, after intensive study, appear to be the most economically and politically feasible.

Each phase of the study has been accompanied by extensive review and comment by the region's cities and counties, other public agencies, citizens and technical committees, and affected organizations and interest groups.

The following Summary of the Water Quality Management Plan contains those recommended control measures which have withstood the scrutiny of this review process.

POLLUTION CAUSED BY FAILING SEPTIC SYSTEMS

About a quarter of the people living in Monterey and Santa Cruz Counties depend on onsite septic systems, which use the soil to absorb and treat wastewater. These systems are usually reliable, but when they fail (by allowing wastewater to surface or to reach groundwater without proper treatment), there is the threat of disease, and they can contaminate water supplies, degrade wildlife habitat, and cause odors and nuisance. There are examples of all of these septic system-related problems in the region.

One solution is to provide sewer lines and treatment plants, but this approach may be prohibitively expensive in rural areas such as the San Lorenzo Valley, Carmel Valley and North Monterey County. Also, onsite disposal of wastewater in favorable locations has environmental advantages. Pollutants are not discharged into the ocean, groundwater is replenished, and uncontrolled development which may result from access to sewer lines is avoided. The federal government encourages onsite disposal, where feasible, by subsidizing onsite systems preferentially.

Rural populations in the Monterey Bay area continue to grow, and as the number of septic tanks increases, failures will become more common. Also, as systems get closer, they tend to interfere with each other, and leach fields which worked well in the past may be strained. Septic systems CAN dispose of wastewater safely and without harming the environment. It makes good economic and environmental sense to ensure that septic systems operate properly. This means that they must be located only on suitable sites, adequately designed for their location and use, properly constructed, and regularly maintained.

PLAN RECOMMENDATIONS

Experience and research now suggest further steps which can be taken to protect the environment. The AMBAG Water Quality Plan presents recommendations for keeping septic system pollution out of our waters. The recommended proposals would be implemented through new or revised ordinances or through administrative actions by concerned county agencies. With the exception of public management of septic systems in the San Lorenzo Valley, no new institutional structures are proposed. Public costs of the recommendations are modest. The price of new septic systems will rise, but the cost to homeowners will be offset by savings resulting from increased system lifespan and reliability. The benefits and costs of the septic system recommendations are summarized in Table 1 and the proposals are described further below.

One objective of the plan is to achieve the best possible site evaluation for septic systems. This will be accomplished through a training program for county staffs and others involved in septic system installation. Another goal is to keep a record at the County level of reported failures in order to identify problem areas before they become serious, and to help determine the failure causes. (An existing State-run data system called SWEEPP may be useful in evaluating septic system performance, and should be considered for this purpose.)

In order to enhance the reliability and service life of septic systems, several new design standards are recommended (most are already in effect in parts of the region). Also, because adequate operation of a septic system depends largely on how well it is cared for, a public information program is suggested. A "Homeowner's Septic Tank Guide" has already been prepared to help the homeowner maintain his sytem.

Poor construction technique is another reason for failures. AMBAG is proposing a modest demonstration program to illustrate the effects of improper installation and to provide a basis for more effective construction practice.

In areas where problems exist, public management of private onsite systems may be more cost effective than constructing a public sewer system. Also public management makes onsite systems eligible for grants for rehabilitation or expansion. Public management (through formation of an Onsite Wastewater Disposal Zone) is recommended for the San Lorenzo Valley and should be considered in several other areas.

Because home buyers are often unaware of the condition and location of their septic system, it is beneficial to ensure that the seller of a home passes this information on to a prospective buyer. A method of ensuring this is being recommended.

The way in which an area develops determines the kind (and cost) of wastewater treatment systems which can be used. The Plan recommends a program to help ensure that wastewater management is considered during early stages of land use planning to avoid future land uses which may lead to pollution from septic systems but will be too expensive to sewer.

Another problem is that northern Santa Cruz County has no convenient disposal sites for the solids which must be regularly pumped from septic tanks. The septic tank maintenance industry should be encouraged to acquire its own sites, and it is recommended that the current San Lorenzo Valley sanitation study determine the best long term solution to this problem.

In order to ensure that the results of ongoing research on onsite disposal achieve local field application, an update process is also recommended by means of which State and regional agencies will assist County departments in keeping abreast of new developments.

Two "Early Action" recommendations have already been approved by AMBAG and forwarded to local governments for consideration.

The public availability of written guidelines will help ensure that judgments are made uniformly and that new procedures become widely applied as they prove their practicality. Another "Early Action" recommendation is for a one-acre minimum lot size for new septic system installations. This standard will help protect groundwater and will ensure that neighboring systems don't interfere with each other.

Table 1

Summary of Water Quality Plan Recommendations

Problem Area: Septic System Pollution

	Management Practice	Implementing Agency	Target Implementation Date[1]	Public Cost[2] Capital[3]	Annual	Financing Source(s)	Water Quality Benefits	"No Action" Effect	Significant Secondary Impacts
A.	Develop Training Program	SWRCB State Health Dept.	May 1979	2,500	Depends on Scope of Program	SWRCB	Improved Site Evaluation	No Improvement in Site Evaluation	Public costs as noted
B.1.	Failure Mapping	Monterey County Environmental Health	December 1978	0	1,000	Monterey County	Early Documentation of potential problem areas	No Documentation until problems become severe	Public costs as noted
B.2.	Evaluation of SWEEPP and other systems	SWRCB	January 1979	1,000	0	SWRCB	Determine cost effectiveness of computerized data gathering system	No evaluation of this option	Public costs as noted
C.	Septic tank risers	Monterey and Santa Cruz Counties ; City of Scotts Valley	January 1979	0	0	---	Improved septic system design; increased system life	No design improvements; increased failures in developing areas	About $700 increase in construction costs
D.	Dual leach fields		January 1980	0	0				
E.	Leachfield Inspection risers		January 1979	0	0				
F.	Public Information	Monterey, Santa Cruz County Environmental Health; City of Scotts Valley	January 1979 - June 1979	2,750	1,630	Monterey County Santa Cruz County	Increased public awareness of maintenance needs	No reduction in failures due to inadequate maintenance	Public costs as noted
G.1.	Installation Practice Demonstration program	Santa Cruz Watershed Management	May 1979	2,050	0	SWRCB, State Health Dept., Santa Cruz County	Improved Construction practice	Continuing failures due to improper construction	Public costs as noted
G.2	Installation practice-State Guidelines	SWRCB	June 1979	3,000	0	SWRCB	Improved construction practice	Continuing failures due to improper construction	Public costs as noted
H.	Onsite Wastewater Disposal Zone	San Lorenzo Valley County Water District or Santa Cruz County	June 1979	3,500	2,400	Service Fees	Improved Septic system maintenance	No improvement in San Lorenzo River water quality	Public costs as noted
I.	Pre-Sale Inspection	Monterey County Santa Cruz County	May 1979	0	112,500	Inspection fees	Increased system life; consumer protection	Sale of homes with inadequate or inoperative septic systems	$25-50 in costs of selling home
J.1.	Coordinated Planning	Monterey County Environmental Health and Planning Departments	January 1979	0	2,000	Monterey County	Provision of most cost effective wastewater management practices in future	Possible very high public costs for future wastewater management	Public cost as noted

[1] Assumes 7/78 plan adoption

[2] 1977 dollars

[3] Included are capital construction costs and one-time costs associated with development of guidelines/regulations/plans

	Management Practice	Implementing Agency	Target Implementation Date[1]	Public Cost[2] Capital[3]	Annual	Financing Source(s)	Water Quality Benefits	"No Action" Effect	Significant Secondary Impacts
J.2.	Coordinated Groundwater Impact Assessment	201 Lead Agencies	November 1978	56-69,000	0	US EPA SWRCB 201 Lead Agencies	Determination of groundwater impacts of septic systems	Continued uncertainty regarding groundwater impacts	Public costs as noted; possible new land use controls
K.1.	Guidelines for septage disposal sites	Santa Cruz Environmental Health	May 1978	0	0	---	Encourage private disposal sites	Continuing disposal problems	Facilitate septage disposal
K.2.	Study of septage disposal	City of Santa Cruz	October 1978	1-5,000	0	Federal, State grants; 12-I/2% local share	Determine most cost effective disposal method	Continuing Disposal problems	Facilitate septage disposal
L.	Update Process	SWRCB, RWQCB, County Environmental Health agencies	June 1979	0	4,000	SWRCB	Facilitate incorporation of new data into field practice	Less effective use of new information	Public costs as noted
M.	Procedures for site evaluation	Monterey County Environmental Health	April 1978	500	0	Monterey County	Uniform site evaluation judgements; wide use of newer procedures; support other elements of 208 plan	No public availability of site evaluation procedures	None
N.	Density control	Monterey, Santa Cruz Counties	January 1979	0	0	---	Protection of groundwater; avoidance of groundwater mounds; greater dispersion of failures	Possible groundwater contamination; cumulative effects	Change in development patterns; may make some lots unbuildable
O.1.	Deep Disposal 201 Studies	201 Lead Agencies	November 1978	30,000	0	US EPA SWRCB 201 Lead Agencies	Assess impact and develop mitigations for deep disposal	Continued uncertainty regarding groundwater impacts	Public costs as noted; possible change in use of deep systems
O.2.	Deep Disposal US EPA and SWRCB Guidelines	US EPA SWRCB	June 1979	10,000	0	US EPA SWRCB	Mitigate dangers of deep disposal	Possible groundwater pollution	Same as above

[1] Assumes 7/78 plan adoption

[2] 1977 dollars

[3] Included are capital construction costs and one-time costs associated with development of guidelines/regulations/plans

POLLUTION OF LAKES AND STREAMS BY EROSION AND SEDIMENTATION

Dirt (or suspended sediment as it is referred to in respect to water quality) is a major cause of water pollution when it runs off the land into surface water bodies. Sediment from eroding land causes lakes and streams to be murky and to gradually fill in with dirt. In addition, many detrimental substances are often attached to the soil particles. These substances, such as nitrogen and phosphorus, increase the polluting effect of the erosion and sediment process.

Many of the seemingly isolated erosion and sediment problems in the Monterey Bay area are so commonplace that they have not yet been considered severe enough to warrant a serious effort at their control. However, these erosion and sediment problems have a cumulative and severe detrimental impact on water quality (and on other natural resources as well, such as land and air).

While some erosion and sediment is a natural geologic process, most of it (75% or more) is caused by man's activities which accelerate the process. This "accelerated erosion" can be controlled by the way land is used and managed. There are numerous techniques which can be used to prevent undesirable erosion and sedimentation. Examples are vegetation protection and revegetation, improved stormwater drainage systems, designation of highly erodible land areas and land adjacent to streams as permanent open space.

PLAN RECOMMENDATIONS

The program presented in the Plan (summarized in Table 2 and below) attempts to use existing agencies, departments, districts and activities to develop an overall erosion and sediment control program that will prevent new sources of "accelerated erosion" from occurring, and that will bring about the correction of existing sources of "accelerated erosion". The utilization of "existing" staffs and funds by re-directing priorities from clean-up to corrective actions is expected to limit increáses in staffing and funding. Strong erosion control ordinances, long range planning and implementation, and training of erosion control personnel are also integral parts of the program.

It is proposed that there be additional federal assistance in the form of technical assistance, education and training, low interest loans, cost-sharing, and income tax incentives. It is also proposed that the State of California establish an erosion and sediment control policy, and a program that would assist cities, counties and Resource Conservation Districts. The program would include technical assitance, cost-sharing, income tax incentives, and changes in property tax assessment procedures as incentives. The Regional Water Quality Control Board should increase enforcement of existing state water quality laws to force the correction of serious existing problems.

At the local governmental level, several actions are proposed:

- Adopt strong city and county erosion and sediment control ordinances
- Establish adequate numbers of trained personnel on city and county staffs to perform functions required by existing ordinances. Seek assistance from the U.S. Department of Agriculture Soil Conservation Service and local Resource Conservation Districts.
- Increase technical assistance to cities, counties and private land owners from the local Resource Conservation Districts, and develop long range erosion and sediment control plans to correct existing problems
- Establish a training program for local personnel who deal with the adequacy, compliance, maintenance and enforcement of erosion and sediment control measures
- Develop a certification/registration program for people training in erosion and sediment control
- Prepare plans to correct existing erosion and sediment problems in urban areas with methods for long range implementation
- Prepare plans to correct existing erosion and sediment problems within, or caused by, roads and/or road right-of-ways, with methods for long range implementation

Together, these federal, state, and local programs will result in greatly increased use of available management practices for preventing erosion and sediment problems.

TABLE 2
SUMMARY OF WATER QUALITY PLAN RECOMMENDATIONS

Problem Area: Erosion and Sediment Pollution

Management Practices[4]	Implementing Agency	Target Implementation Date[1]	Public Cost[2] Capital[3]	Annual	Financing Source(s)	Water Quality Benefits	"No Action" Effect	Significant Secondary Impacts
1. Increased federal support-								
a. staffs (tech. assist.)	USDA, SCS and AES	1983	Unknown		Federal Appropriation	Increasing technical and financial assistance to increase the use of BMP's that protect or improve water quality by preventing or reducing runoff, erosion, and sediment.	Continued increase in erosion, sediment and the resulting water quality damage	Note: In addition to improved or protected water quality, the use of BMP's can produce many desirable secondary impacts. The following are just a few: - Conservation of valuable top soil - Reduced costs for operation and/or maintenance of private and public lands, facilities, structures, etc. - Reduced fuel and energy use. --Improved air quality. -Reduced contamination of the landscape. - Improved fish and wildlife habitat.
b. loans	USDA, FMHA	1983						
c. cost-sharing	USDA, ASCS and SCS and USEPA	1980						
d. Tax Incentives	IRS (Note: all of the above will require action by the federal legislature)	1983						
2. State support -			Unknown					
a. Develop erosion and sediment control policy and program -	Dept. of Conservation	1980			State Appropriation	Establishing technical and financial assistance to increase the use of BMP's that protect or improve water quality by preventing or reducing runoff,erosion, and sediment.	"	
(1) Staff (tech)								
(2) Cost-Share								
b. Tax Incentives								
(1) Property tax	State Board of Equal.	1980						
(2) Income tax	State Franchise Tax Board	1980						
	(Note: the above will require action by the state legislatur							
3. Increase activity of RWQCB in cleanup and abatement of existing problems -	RWQCB	1980	0	$30,000	State Appropriation (or possibly fines)	Enforce the use of BMP's that improve water quality on existing problem areas	"	
a. Increased staff								

4. Adoption of erosion and sediment control ordinances.	Cities and Counties	1980	26,000	0	Cities and Counties (possibly from permit fees or from fines)	Require the use of BMP's that will protect water quality by preventing runoff, erosion and sediment from becoming problems	"	"
5. Develop adequate staffs (numbers & training) to perform functions of review, approval and enforcement of existing ordinances	Cities and Counties	1980	25,000	150,000	Cities and Counties (possibly from permit fees or from fines) Training from federal and/ or state programs, See items 7 & 8.)	Require the use of BMP's that will protect water quality by preventing runoff, erosion and sediment from becoming problems	"	"
6. a. Develop long range program of erosion and sediment control planning for land within Resource Conservation Districts			50,000	0	US EPA Section 208 (75%; districts from tax base (25%)		"	"
b. Increase technical assistance to City-County development review agencies and to Individual farm land owners preparing erosion and sediment control plans	Resource Conservation Districts (5 in the AMBAG region)	1980	0	Assist city/ counties: $20,000 assist farm owners: $60,000	Counties, from existing RCD tax base US EPA Section 208 (35%); districts from tax base (25%)	Increased technical and planning assist- to increase the use of BMP's that protect or improve water quality by preventing or reducing runoff, erosion and sediment.		

7. Develop and carry out erosion and sediment control training program for City, County, RCD or State personnel that deal with adequacy, compliance, maintenance and enforcement of erosion and sediment controls.	USDA, SCS AND AES Resource Conservation Districts CALTRANS	1981		20,000	Federal and State appropriations	Improve the adequacy, compliance, maintenance, and enforcement of BMP's that protect or improve water quality by preventing or reducing runoff, erosion, and sediment through the improved technical capability of employees	"	"
8. Develop a certification and licensing procedure for people trained in the field of erosion and sediment control.	USDA, SCS-- Univ. of CA Soil Conservation Society of America (SCSA)	1983	0	0	Individual applicants through fees and dues. No public cost.	Assure the technical capability of personnel that determine the adequacy, compliance, maintenance, and enforcement of BMP's that protect or improve water quality by preventing or reducing runoff, erosion and sediment.	"	"
9. Prepare erosion and sediment control plans to correct existing problems in urban areas and develop schedules for implementing needed BMP's.	Cities and Counties	1981-1983	250,000	0	US EPA Sect. 208 75%) cities counties (25%)	Establish a planned and systematic method of applying BMP's that will improve water quality by correcting existing runoff erosion, and sediment problems in urban areas.	"	"
10. Prepare erosion and sediment control plans to correct existing problems within, or caused by, roads and/or road right-of-ways, and develop schedules for implementing needed BMP's.	CALTRANS for State maintained roads Cities and Counties for city and county maintained roads	1981	6,000	0	US EPA Sect. 208 (75%), CALTRANS, Cities and Counties (25%)	Establish a planned and systematic method of applying BMP's that will improve water quality by correcting existing runoff, erosion and sediment problems in transportation corridors.	"	"

USDA - U.S. Dept. of Agriculture
SCS - Soil Conservation Service
FMHA- Farmers Home Administration
ASCS - Agricultural Stabilization and Conservation Service
USEPA- U.S. Environmental Protection Agency
IRS - Internal Revenue Service
AES - Agricultural Extension Service
RWQCB - Regional Water Quality Control Board
CALTRANS - California Department of Transportation

1. Assumes 7/78 plan adoption date
2. 1977 dollars
3. Included are capital construction costs and one-time costs associated with development of guidelines/regulations/plans
4. Management practices for runoff erosion and sediment control are called Best Management Practices (BMP's). BMP's are numerous and variable, and require site specific information for their use. Therefore, programs that develop systems, or methods, for utilizing BMP's are summarized rather than the individual BMP's

POLLUTION OF LAGUNA GRANDE AND ROBERTS LAKE

Laguna Grande and Roberts Lake are two coastal lakes located on the border between Seaside and Monterey. Both lakes are suffering from severe water quality and sedimentation problems that threaten their continued existence. Sediment from urban stormwater runoff and erosion of the upstream watershed are filling in Laguna Grande, which could cause the lake to be primarily a mud flat in five to ten years. Roberts Lake has practically filled in with windblown sand from nearby unstabilized dunes.

Nutrients adhering to incoming sediments have caused unsightly algae blooms in both lakes which have resulted in fish kills. Pollutants originating from urban impervious surfaces, primarily streets, have also degraded the water quality of the lakes. The impact of pollutants entering the lakes is magnified by lake shallowness which allows for little dilution and increases water temperature and sunlight penetration.

Laguna Grande and Roberts Lake can be major recreational resources in the region, but only if improved and protected. Efforts are already underway to turn Laguna Grande into a regional park; $700,000 has been spent for land acquisition, and another $1,300,000 may be spent on further land acquisition and park facilities. Roberts Lake has good potential for both recreational use and wildlife habitat. Efforts to improve the water quality of these lakes will enhance and protect present and future investments in the development of their recreational potential.

PLAN RECOMMENDATIONS

A plan has been developed to keep Laguna Grande and Roberts Lake from filling in and to improve their water quality. Included in the plan are measures to improve the existing physical condition of the lakes. Dredging is recommended to increase the depth and volume of the lakes as well as bentonite sealing, following dredging, to stop the release of nutrients from bottom sediments. Measures are also suggested that will enable the water depth of the lakes to be adjusted seasonally, and to aerate and increase the dissolved oxygen content of the lakes.

To reduce pollutants from urban stormwater runoff, it is proposed that streets within the watershed be swept with vacuum sweepers, which removes 95% of the sediment and nutrients from urban streets. The practice of disposing of street sweepings adjacent to Laguna Grande should be discontinued. It is also recommended that catchbasins with grease and silt traps should be installed on new or enlarged drainage projects, and that resloping, unsurfaced driveways in the watershed be paved to reduce sediment load to the lakes and decrease street sweeping costs.

To minimize the amount of sediment originating from upstream erosion which enters Laguna Grande, it is proposed that a sediment trap be constructed at either of two locations, at the Work Memorial Park golf driving range or at the inlet to Laguna Grande.

Land use controls are proposed to reduce pollution originating from future development in the watershed. Controls are suggested that would require onsite retention of stormwater and sediment to minimize erosion during construction. Cluster development techniques are recommended to minimize erosion from future development in the watershed, since cluster development, guided by appropriate development standards, produces less sediment and urban runoff pollution that conventional development.

Other recommended water quality control measures include: dune stabilization techniques to control the filling of Roberts Lake from sand dune erosion, water fowl control measures to lessen nutrient load to Laguna Grande from birds, and park layout and litter control programs to reduce the impact of park development on water quality.

The plan, as summarized above and in Table 3, can be carried out with minimal changes to existing government responsibilities.

The Cities of Monterey, Seaside, and Del Rey Oaks, the County of Monterey, and the Monterey Peninsula Regional Park District should form a Joint Powers Authority (JPA) to implement the recommended water quality management practices at both Laguna Grande and Roberts Lake. The member agencies of the JPA should negotiate a cost-sharing plan for the necessary water quality improvements. In doing so, the JPA draws upon member agency general funds and available State and Federal grants. If and when the City of Monterey annexes the remaining unincorporated area in the Canyon Del Rey watershed, it will probably make sense to delete the County from the JPA.

If, after six months from 208 Plan adoption, a JPA agreement including all local agencies in the watershed is not found to be practicable, preference should be given to establishing a special watershed management district.

For preventing, at both lakes, pollution originating from future urban development in the watershed, the cities of Monterey, Seaside, and Del Rey Oaks and the County of Monterey should adopt regulations related to the location and design of such development.

OTHER LAKES IN THE REGION

There are additional water basins and coastal lakes or lagoons in the region that have water quality problems similar to those of Laguna Grande/Roberts Lake, for which there are

similar solutions. Together, these basins currently provide important wildlife habitat and have high recreational potential. Increased urbanization that is taking place in the watersheds of these basins, as well as agricultural runoff, is degrading their water quality and impairing wildlife, recreational, and aesthetic values and capabilities. Comprehensive water quality management plans for these basins are recommended to be prepared and carried out by designated agencies. In addition, it is recommended that the County of Santa Cruz purchase two vacuum streetsweepers for use in the urbanizing Live Oak and Capitola areas, which drain into Corcoran Lagoon, Schwans Lagoon, Moran Lake, and Soquel Creek Lagoon.

Table 3

Summary of Water Quality Plan Recommendations

Problem Area: Pollution of Laguna Grande and Roberts Lakes

Management Practice	Implementing Agency	Target Implementation Date[1]	Public Cost[2] Capital[3]	Public Cost[2] Annual	Financing Source(s)	Water Quality Benefits	"No Action" Effect	Significant Secondary Impacts
1.a. Dredge Laguna Grande	JPA[4]	June 1980	340,000	0	EPA/JPA	Increases dilution of pollutants	Continued filling in of lake	Pollutants in bottom sediments released for short period
b. Dredge Roberts Lake	Seaside		140,000	0	EPA/Seaside			
2. Seal Laguna Grande	JPA	June 1980	13,000	0	EPA/JPA	Decreases release of nutrients from bottom sediments	Continued release of nutrients from lake bottom	None
3. Stoplog outlet, Roberts Lake	Seaside	June 1980	5,000	0	EPA/Seaside	Allows optimal adjustment of water level and volume	Decreased lake depth	None
4.a. Aerate Laguna Grande	JPA	June 1980	3,000	300	EPA/JPA	Reduces algae nuisance; protects fish	Continued algae production and low oxygen levels	None
b. Aerate Roberts Lake	Seaside		3,000	300	EPA/Seaside			
5. Vacuum sweep street	Cities/County in watershed	June 1979	20,000	15,000	EPA/Cities and County	Reduces pollution to lakes from streets in watershed	Continued filling in of lake	Less localized dust in air than with conventional sweeper
6. Install catchbasins	Cities/County	June 1980	<1000 ea.	<50 ea.	Cities/ County	Catches grease, oil, sediments in stormwater runoff	Continued filling in of lake	None
7. Pave driveways	Seaside	January 1979 (for ordinance)	4,000	3,000	Cities/ County	Eliminates a major source of sand on streets, reducing sediment load to lake and street sweeping costs	Continued filling in of lake	None
8. Install sediment trap	JPA	June 1980	< 290,000	5,000	EPA/JPA	Removes most of nutrients and sediment from runoff before entering lakes	Continued filling in of lake	None

[1] Assumes 6/78 plan adoption date

[2] 1977 dollars

[3] Included are capital construction costs and one-time costs associated with development of guidelines/regulations/plans

[4] Joint Powers Agency comprised of cities of Monterey, Seaside, Del Rey Oaks; County of Monterey; Monterey Peninsula Regional Park District

	Management Practice	Implementing Agency	Target Implementation Date[1]	Public Cost[2] Capital[3]	Public Cost[2] Annual	Financing Source(s)	Water Quality Benefits	"No Action" Effect	Significant Secondary Impacts
9.	Management plan for existing urban erosion	Cities/County in watershed	January 1979	30,000	0	Cities/County in watershed	See descriptions of benefits, No Action effect, secondary impacts under "Problem Area: Erosion/ Sediment Pollution" Table 2.		
10.	Grading/erosion sediment control ordinances	Cities/County in watershed	January 1979	4,000	25,000	Cities/County in watershed (permit fee possible)		same	
11.	Cluster development/roadway standards	Cities/County	January 1979	4,000	12,500	Cities/County in watershed	Reduces on-site erosion from development and pollutants from streets	Conventional development of watershed will increase lake pollution	Less visual and ecological disruption of landscape
12.	Sand dune stabilization	California Parks and Recreation	June 1980	13,000	1,000	EPA/State	Prevents filling in of Roberts Lake from sand dune erosion	Continued deposition of sand in Roberts Lake	None
13.	Improved bird habitat/Roberts Lake	JPA	June 1980	minimal	0	JPA	Lessen nutrient load to Laguna Grande from birds	Higher pollutant contribution to Laguna Grande	None
14.	Park litter control	JPA/ Seaside	June 1979	0	0		Decreases nutrient contribution to lakes	Increased lake pollution	None
15.	Park layout	JPA/ Seaside	June 1979	0	0	Undetermined	Good layout can prevent lake-polluting runoff and bank erosion	Increased lake pollution	None
16.	Discontinue dumping of street sweepings adjacent to lake	Seaside	June 1978	minimal		Seaside	Reduces sediment load reaching Laguna Grande	same	Undetermined public cost of transporting street wastes to new location.

[1] Assumes 6/78 plan adoption date

[2] 1977 dollars

[3] Included are capital construction costs and one-time costs associated with development of guidelines/regulations/plans

[4] Joint Powers Agency comprised of cities of Monterey, Seaside, Del Rey Oaks; County of Monterey; Monterey Peninsula Regional Park District

NITRATE POLLUTION OF SALINAS VALLEY GROUNDWATER

Nitrate and salt build-up in the Salinas Groundwater Basin is increasing and has necessitated the deepening or abandonment of 42 domestic water supply wells as they are no longer suitable for drinking water supplies. Nitrate pollution of drinking water is a public health problem, particularly when the water is ingested by infants. The result can be the development of methemoglobinemia ("blue baby disease"), having a fatality rate of 7 to 8 percent.

Relative contributions of nitrates and salts from various sources were calculated for the valley. The largest contribution of nitrates to the soil is from irrigated agriculture. There is uncertainty as to the amount of nitrate that ultimately reaches groundwater from this source. Feedlots and dairies are the next biggest apparent contributors of nitrate to groundwater. They, along with municipal-industrial percolation ponds, can cause significant localized concentrations of nitrate although they account for a relatively minor amount of nitrate on a valleywide basis. Inadequately sealed wells can also pollute deeper aquifers by poor quality surface or shallow groundwaters.

PLAN RECOMMENDATIONS

To implement the recommended programs, the emphasis has been placed on increased reliance on existing local and state agencies and their collective authority.

There is a need to better substantiate the extent and causes of the nitrate pollution problem in the Salinas Valley, and to take steps towards abatement of documented excessive nitrate sources.

More efficient irrigation and fertilizing methods could substantially reduce agriculture's contribution to nitrate pollution. It is recommended that an education (demonstration-research) program be carried out involving fertilizer and irrigation trials on several test plots for the major crops in the valley. "Best Management Practices" relating to specific fertilizer and irrigation water requirements for crops in this region could then be implemented. A research project of this type will also serve to demonstrate the difference between "Best Management Practices" and existing practices to farmers in the region, and help substantiate the identified problem.

Principal agencies involved in improving irrigation and fertilizer management practices will be the County Farm Advisor (Cooperative Extension), Hartnell Junior College and the Monterey County Flood Control and Water Conservation District.

An extensive media program is recommended to expand the agricultural community's awareness of their contribution to the nitrate problem. The availability of "Best Management Practices" can also be brought to their attention. Courses at Hartnell Junior College can be used to implement BMP's, in conjunction with Monterey County Cooperative Extension Programs.

It is recommended that the Monterey County Health Department require sealing of wells to prevent pollution of deep aquifers. It is also proposed that the South County cities consider disposal of municipal and industrial wastewater by methods other than the use of percolation ponds. Monitoring and discharge requirements relating to nitrate for all feedlots and dairies should be established by the Regional Water Quality Control Board.

It is also recommended that Monterey County develop and implement the best method for supplying: 1) each farmer with data on his water use; and 2) government with aggregated water use data.

Lastly, it is recommended that an extensive monitoring and study program to more precisely determine the extent of the nitrate and salt problem and the relative magnitude of each pollution source be conducted by the Monterey County Flood Control and Water Conservation District with assistance from the State Department of Water Resources.

TABLE 4

SUMMARY OF WATER QUALITY PLAN RECOMMENDATIONS

Problem Area: Nitrate Pollution of Groundwater in Salinas Valley

Management Practice	Implementing Agency	Target Implementation Date[1]	Public Cost[2] Capital[3] Annual	Financing Source(s)	Water Quality Benefits	"No Action" Effect	Significant Secondary Impacts
1. Improve fertilizer/ irrigation practices through education and demonstration programs	University Extension (lead agency), RWQCB, Resource Conservation Districts, County Flood Control and Water Conservation District	1979 (start of program)	State (U.C.) 100,000/3 yrs.[4] County 50,000/3 yrs.[4]	Monterey County, State (University of California)	Increased information on water fertilizer optimization; local demonstration of results	Slower improvement	None
2. Develop method to better determine water use	Monterey County	1978	Included in (1)	N/A	Water use data available to well user, public agencies; effective, individualized, technical assistance allowing better water management	Continued inadequate data on water use	None
3. Media education effort	U.C. Cooperative Extension	1979 (start of program)	Depends on Scope of Program	State (Univ. Calif) Monterey County	Increased information on water/fertilizer optimization	Same	None
4. Training in fertilizer/irrigation management	Hartnell or other College District	Long Term; Start 1979	Minimal 3,000/ Semester	1/3 State/Hartnell 2/3	Expected to result in decreased fertilizer/water application and less ground water pollution	Continued excessive use of fertilizer and water	None
5. Well sealing regulations	Monterey County	Ordinance Change: 1978	1500	N/A	Decreased opportunity for nitrate pollution via wells	Continued Nitrate pollution of groundwater via unsealed wells	None
6. Investigate alternatives to wastewater disposal by percolation ponds	South Monterey CO Cities, State Water Resources Control Board, EPA	During studies of treatment plant modifications/ enlargements	Alternative costs to be determined during studies; low incremental cost to studies	Local/State Water Resources Control Board/EPA	Alternatives could lessen impact of disposal on groundwater quality	Continuation of percolation ponds as source of groundwater nitrate	None
7. Groundwater monitoring	Monterey County Flood Control and Water Control Dist, Calif. Dept. Water Resources	Long-term; start in 1978	10,000	Monterey County/ Dept. Water Resources	Problem detection, evidence for abatement	Inadequate/ineffective solution to groundwater pollution	Abatement cost for documented pollution sources
8. Monitoring & discharge requirements for feedlots and dairies	Reg'l Water Quality Control Board	Establish requirements: 1978; ongoing monitoring	7,000	State (requirements); Feedlots & Dairies (monitoring)	Problem detection; evidence for abatement	Inadequate/ineffective solutions	Private monitoring costs; abatement cost to documented pollution sources

[1] Assumes 6/78 plan adoption date

[2] 1977 dollars

[3] Included are capital construction costs and one-time costs associated with development of guidelines/regulations/plans

[4] Includes extra labor in field help and laboratory analysis, transportation and office supplies beyond the existing Cooperative Extension resources. Possible additional equipment and machinery needs.

NITRATE POLLUTION OF PAJARO VALLEY GROUNDWATER

The water quality of the Pajaro Groundwater Basin is being degraded by pollution from nitrates and salt buildup, to the extent that the Public Health standard is being approached in many cases at which point wells will no longer be suitable for drinking water supplies. Nitrate pollution of drinking water is a public health problem, particularly when the water is ingested by infants. The results can be the development of methemoglobinemia ("blue baby disease", having a fatality rate of 7 to 8 percent). Probable causes of the pollution problems have been identified. The largest contribution of nitrates to the soil is from irrigated agriculture. There is uncertainty as to the amount of nitrate that ultimately reaches groundwater from this source.

Substantial reductions in the nitrate and salt load to groundwater could be achieved through reasonable increases in irrigation and fertilizer efficiency, physical improvements to waste disposal methods for dairies, and leachate reduction at sanitary landfills.

PLAN RECOMMENDATIONS

It is specifically recommended that the following programs be carried out to reduce groundwater pollution. Implementation of the recommendations by increased reliance on local and state agencies is emphasized.

An extensive demonstration-research program should be conducted involving fertilizer and irrigation trials on major crops in the Pajaro Valley taking into account differences in soil type, residual soil fertilizer and irrigation practices. "Best Management Practices" identified for each crop will be implementable through education programs. The trials will also allow an opportunity to further substantiate the identified problem and to demonstrate the difference between current practices and "Best Management Practices" to farmers in the region. Aggressive education, technical service and monitoring programs by the County Farm Advisors, Junior College Districts, and the Monterey and Santa Cruz Flood Control and Water Conservation Districts can accomplish increased agricultural fertilizer irrigation efficiencies.

A media program is recommended to increase awareness of the problem and bring the availability of best management practices to the agricultural community's attention. Cooperative Extension Workshops and Hartnell (or Cabrillo) Junior College courses will focus on the implementation of the best management practices.

Leachate production from the Buena Vista and Watsonville land fills should be reduced and identified problems abated by improving operations. Further sampling and monitoring is needed to determine the extent and location of the pollution problem.

It is also recommended that Santa Cruz County develop and implement the best method for supplying: 1) each farmer with data on his water use; and 2) government with aggregated water use data.

Identification of monitoring and discharge requirements relating to nitrate for all dairy operations in the valley is to be done by the Regional Water Quality Control Board.

Ongoing surveillance for abandoned wells by Santa Cruz County and Cooperative Extension field staffs and an extensive monitoring and study program to provide additional data concerning causes of the nitrate problem by the County Flood Control and Water Conservation Districts and Office of Watershed Manager will also help implement solution of the nitrate pollution problem.

Table 5

Summary of Water Quality Plan Recommendations

Problem Area: Pajaro Valley, Nitrate Pollution of Groundwater

	Management Practice	Implementing Agency	Target Implementation Date[1]	Public Cost[2] Capital[3]	Public Cost[2] Annual	Financing Sources	Water Quality Benefits	"No Action" Effect	Significant Secondary Impacts
1.	Improve Fertilizer/ Irrigation Practices through education and demonstration programs	Cooperative Extension (lead agency) S.C. Co.& Mo. Co. FC&WCD RWQCB; RCDs	Jan. 1979 (start of program)	state (UC) 15,000/3 yrs county 5,000/3 yrs[4]		Univ. CA Santa Cruz Co.	Increased info. on water, fertilizer optimization; local demonstration of results	slower improvement	none
2.	Develop method to better determine water use	Santa Cruz & Monterey Co.;	1978	included in (1)		NA	Water use data available to well user, public agencies; effective, individualized technical assistance	continued inadequate data on water use	none
3.	Media Education Effort	Cooperative Extension (U.C.)	1979	depends on program		Cooperative Extension, Santa Cruz Co.	Expanded awareness of the nitrate problem by the agricultural community; contributes to implementation of solution (BMPs)	slower improvement	none
4.	Training in fertilizer/irrigation management	Hartnell Cabrillo or other college	long term; start in 1979	3000 for one part-time instructor per semester		1/3 State 2/3 Community College Dist.	Increased recognition of the problem; means of implementing solutions(BMPs)	Less effective implementation of solutions	none
5.	Monitoring & Discharge Requirements for Dairies	RWQCB	establish requirements:1978; ongoing monitoring	500		State (requirements); dairies (monitoring)	problem detection; evidence for abatement	inadequate/ ineffective solution to pollution	private monitoring costs; abatement costs to documented pollution sources
6.	Monitoring & Operation Improvements at Landfills	Santa Cruz Co.; Watsonville	monitoring: 1978 implement changes: 1978-1983	50000 capital		Santa Cruz Co.; Watsonville	problem detection; solution to local groundwater degradation	continued local degradation	none
7.	Groundwater Monitoring Program	S.C. Co.& Mo. Co. FC&WCD, Watershed Manager's Office; State DWR	long-term start in 1978	annual cost less than 10000		Santa Cruz Co.	problem detection; evidence for abatement; public health protection	inadequate detection/ solutions to groundwater pollution	public cost of monitoring; abatement cost to documented pollution sources

1 Assumes 6/78 plan adoption

2 1977 dollars

3 Included are capital construction costs and one-time costs associated with development of guidelines/regulations/plans

4 Evaluation of applicability of Salinas Valley demonstration - research findings, additional research if needed

POLLUTION OF PAJARO VALLEY GROUNDWATER BY SEAWATER INTRUSION

The intrusion of seawater into coastal aquifers occurs when the water table is lowered to or below sea level by excessive pumping (overdrafting) of the groundwater resource. Under such conditions, a landward hydraulic gradient is established which permits seawater to move inland. Seawater intrusion can force agricultural land out of production when intruded agricultural wells are abandoned because of lowered water quality, and water supply alternatives at reasonable cost are unavailable.

Seawater intrusion has occurred along the southern half of the Pajaro Valley. Initial intrusion took place during the late 1940's, and since then has gradually advanced inland to a distance of 3 to 4 miles from the coast, covering an area of more than ten square miles. Overdrafting of the groundwater resource has been primarily responsible for seawater intrusion. Historically, withdrawals from the groundwater in the Pajaro Valley for irrigation, municipal and industrial uses have been slowly and consistently increasing, exceeding the safe yield of the groundwater during several years since 1964. This has been accompanied by a generally steady decline in groundwater levels, especially near the coast where pumping is concentrated. Seawater has advanced inland to fill the void created by this lowering of the groundwater table.

The entire Pajaro Valley has presently reached a condition of severe, continual overdraft, estimated at 17,500 acre-feet per year. Total pumpage will increase as further urban development of the valley expands water requirements. The intrusion front should continue to advance inland as long as the present patterns of pumping are maintained or intensified and no preventive steps are taken.

PLAN RECOMMENDATIONS

A method of dealing with the overdraft problem is to secure additional sources of water to supplement the overtaxed groundwater supply. To determine which additional sources are most appropriate, it is recommended that a study be conducted to weigh the relative merits of various alternatives, including imported water, development of local surface supplies, reclaimed wastewater, inter-regional transfers, and untapped deep aquifer resources. This study should be carried out under the guidance of appropriate federal, state and local agencies. It is also recommended that a stronger local interest be expressed to the Bureau of Reclamation regarding imported water supplies to the Pajaro Valley, from the San Felipe Division of the Central Valley Project. In doing so, the Bureau will be induced to provide more up-to-date information on these supplies for timely consideration by the alternative water supply study.

Water conservation techniques are recommended to reduce the level of overdraft in the Pajaro Valley by making more efficient use of pumped water. The application of efficient irrigation practices, installation of water conservation devices in new housing, use of onsite stormwater retention techniques, and educating the public of the need for and use of water conservation methods are all recommended to save water.

Another recommendation is for local governments to participate in a field study to explore the feasibility of creating a seawater intrusion barrier at the mouth of the Pajaro Valley. This barrier would be formed by taking reclaimed wastewater from the Watsonville sewage treatment plant and pumping it into the ground. This would establish an injection "ridge" at a certain elevation above sea level that would allow further extraction of groundwater landward of the barrier without further encroachment of seawater.

Finally, a periodic monitoring of well water quality along the intrusion front can thus be tracked to estimate future impacts and measure the effectiveness of the management program.

TABLE 6

Summary of Water Quality Plan Recommendations

Problem Area: Pollution of Pajaro Valley Groundwater by Seawater Intrusion

	Management Practice	Implementing Agency	Target Implementation Date[1]	Public Cost[2] Capital[3] Annual	Financing Sources	Water Quality Benefits	"No Action" Effect	Significant Secondary Impacts
1.	Study of Alternative Water Supply Sources	Monterey & Santa Cruz Cos.; Watsonville	July 1979	60,000	30,000 EPA 30,000 local	Selection of alternative water supply source to offset overdraft in Pajaro Valley	No long-range planning for water supply	Selection of imported water could have growth-inducing impacts
2.	Express Interest in San Felipe Project Water	Monterey & Santa Cruz Cos.; Watsonville	Jan 1979			Bureau of Reclamation will supply more information on San Felipe water	USBR will continue to delay on studying the Pajaro Valley portion of the San Felipe Project	none
3.	Implement BMPs for Irrigation and irrigation demonstration programs	(SEE SECTIONS ON NITRATE POLLUTION AND EROSION/SEDIMENTATION, TABLES I-5 AND I-2, RESPECTIVELY)						
4.	Require Water Saving Devices	City of Watsonville	Jan 1979	1,000 initial 5,000/yr	Watsonville	Make more efficient use of pumped water	Opportunity to save water and reduce overdraft will be lost	none
5.	Public Education Program for Water Conservation	Santa Cruz Co.; Watsonville	Jan 1979	depends on scope of program	Santa Cruz Co.; Watsonville	Make more efficient use of pumped water	Opportunity to save water and reduce overdraft will be lost	none
6.	On-site Retention of Stormwater	(SEE SECTION ON GROUNDWATER RECHARGE IN PAJARO VALLEY, TABLE 7)						
7.	Seawater Intrusion Barrier Field Study	Santa Cruz Co.; Watsonville	July 1979	150,000 200,000	131,000-175,000 EPA, State; 190,000-20,000 local	Will determine cost/feasibility of seawater intrusion barrier	Insufficient information upon which to base a decision on physical barrier	undetermined
8.	Monitor Seawater Intrusion	Flood Control Dists.; State DWR	long-term; expand existing program in 1978	(conducted as part of larger monitoring program in both counties)	Counties; State DWR	Trace advancement of intrusion	Hampers predictive capability	none

[1] Assumes 6/78 plan adoption

[2] 1977 dollars

[3] Included are capital construction costs and one-time costs associated with development of guidelines/regulations/plans

ADVERSE IMPACTS OF URBAN DEVELOPMENT ON GROUNDWATER RECHARGE IN PAJARO, CARMEL, SAN LORENZO VALLEYS

Three basins in the Monterey Bay Area were selected to study the role of urbanization in diminishing groundwater recharge: the Pajaro, Carmel, and San Lorenzo Valleys. There is very little quantitative data available on groundwater characteristics, therefore, the locations of recharge areas, calculations of recharge quantity and impacts on recharge by projected growth which have been identified for the basins are only estimates; significant research is needed to more accurately determine the full extent of existing and future impacts on our groundwater resources. Despite research needs, there is enough evidence that groundwater quantity and quality are being adversely impacted to justify taking immediate mitigative actions.

In the Pajaro Valley, the majority of recharge occurs offstream (other than in the streambeds), largely through irrigated agricultural lands. Serious groundwater quantity and quality problems are being experienced in the Pajaro Valley. The capacity of the basin is already being exceeded by existing demands. Pollution by nitrates and salts and advancing seawater intrusion are degrading the quality of the aquifer. Future urban development will create a further impact on groundwater quantity and quality. Mitigation of recharge losses alone will not solve the Valley's water quality and quantity problems, but it can play an important role in an overall basin management program.

The majority of recharge in the Carmel Valley takes place within the stream channel and adjacent lands of the Carmel River and its tributaries. The basin supplies much of the water needs of the Monterey Peninsula, and it has been estimated that the "safe yield" of the basin will be exceeded in the mid-1990's. The impact of projected development (based on increased impervious surfaces) was estimated to be a reduction in recharge of 50 to 65 acre feet per year, which could be critical when withdrawals approach the safe yield or after a succession of dry years. Groundwater quality is generally good with the exception of high iron and manganese concentrations (of natural origin). Localized existing and potential pollutant sources are urban runoff, agricultural water percolation and septic tank effluent. Seawater intrusion is also a threat, due to development pressures, increased withdrawals and sub-basin geology. Projected development could aggravate these pollution problems.

The San Lorenzo Valley is of extreme geological complexity; it is composed of three geologic units and many sub-basins, which may be fairly independent in nature. With the scanty available information, recharge categories were delineated for the basin, with 87-100% of recharge found to occur offstream. The capacity of the basin is unknown. It is most likely that the recharge function has already been significantly impacted in some areas of the basin, and will continue to worsen.

Projected development to 1995 will displace an estimated 553 acre feet per year of recharge. As the basin is comprised of many sub-basins, it is likely that localized deficits would result from sub-basin withdrawals. Further study is needed to identify "critical" recharge areas in the valley, those areas of particularly high recharge potential as well as sub-basins which are or will be used for local water supplies. There are localized groundwater quality problems in the valley including pollution from septic tank effluent, land fill seepage, and pollution of natural origins. Future development is expected to compound these problems, as well as increase urban runoff pollutants.

Plan Recommendations

It is recommended that the groundwater resources of the region be protected so that urban development does not adversely affect groundwater quantity and quality. Groundwater conditions should be maintained at pre-development levels and in some cases enhanced through modified land use planning and development practices sensitive to the region's water quantity and quality.

It is recommended that extensive research be undertaken for each of the basins to quantify the problems and allow for wise management of our groundwater resources in the future. But, even without additional data, enough is known about the impacts of urban development on groundwater recharge to warrant immediate mitigative and preventive actions, including the following.

Mitigation of impacts on groundwater recharge for each new urban development project through use of modified development practices is recommended. In some cases, existing "sound development practices" relating to grading, drainage and landscaping will provide adequate recharge protection, but where present practices do not, additional onsite measures to retain runoff and promote infiltration should be applied (such as recharge ponds, pervious pavements, vegetative management, etc.). The mitigative measures must be implemented on an area and site-specific basis. Modifications to existing subdivision ordinances to require recharge protection, and use of development review procedures for individual urban development projects should be used to ensure compliance with this recommendation.

The following planning controls which are not used solely for the purpose of recharge protection should incorporate existing recharge data into planning and implementation processes. Recharge may serve as an additional justification for these controls, which include flood plain zoning, wetlands open space, stream open space setbacks, clustered development, and the location of future development (for recharge purposes, development should be channeled towards low recharge areas).

Results of the research programs should allow quantitative performance standards for each site to be established, and overlay zoning of recharge areas for specification of allowable impacts on the recharge function. These two recharge protection measures should be implemented when the necessary data is available.

It is further recommended that the local agencies consider applying onsite mitigative measures to existing development, especially in cases where retrofitting with recharge facilities would overlap with measures taken to correct erosion or drainage problems; or in cases where recharge promotion could help reduce groundwater shortages (as in the Pajaro Valley).

To help ensure "preventative" management of the region's groundwater resources, it is recommended that the jurisdictions in each basin consider petitioning EPA for designation of their basin as a sole source aquifer.

For each of the three case study areas, it is specifically recommended that in addition to the general recommendations:

In the Pajaro Valley, groundwater recharge shall be enhanced above normal levels wherever feasible, given the severity of the existing basin overdraft. In all other cases, recharge should be at least maintained through the use of on-site measures where applicable. In addition, urban development should be confined to areas of low recharge capacity, leaving high recharge areas such as agricultural lands in open space.

In the Carmel Valley, at least existing recharge rates should be maintained. The streamways and adjacent lands should be especially protected from encroachments which would diminish instream recharge. The upper watershed area should be protected from any substantial changes in vegetation, and the coastal segment of the aquifer protected against possible seawater intrusion. Research should be conducted over the next one to five years, at which time the aquifer protection management plan should be modified as needed.

The San Lorenzo Valley should adopt the same policy of recharge loss mitigation valley-wide, with special protection of sub-basins with existing or planned well fields. Extensive research is needed to resolve some of the outstanding groundwater characteristic unknowns, and to revise the management plan to better accomplish recharge protection.

The costs of implementing this recharge protection program for the three case study basins are presented in the summary table. The total costs of applying these recommendations to the rest of the basins in the region would be $220,800 initial and $60,000 annual costs.

SUMMARY OF WATER QUALITY PLAN RECOMMENDATIONS

CASE STUDIES ON AQUIFER RECHARGE: PAJARO, CARMEL AND SAN LORENZO BASINS

Management Practice[1]	Implementing Agency[2]	Target Implementation Date	Public Cost[3] Capital	Public Cost[3] Annual	Financing Source(s)	Water Quality Benefits	"No Action" Effect	Significant Secondary Impacts
1. Subdivision ordinance modifications (revise definition of "drainage" and add soil test/report requirements)	Pajaro Valley-Santa Cruz and Monterey Counties, Watsonville Carmel Valley-Monterey County San Lorenzo Valley, Santa Cruz County, and Scotts Valley	1 to 5 years (Initiate by July, 1979; complete by July 1984)	$6,000	$0	Implementing Counties and Cities	Maintain and possibly enhance groundwater quality and quantity. May ensure adequate recharge for dilution of groundwater pollutants	Reduction in quantity and quality of groundwater where urban development adversely affects recharge	Possibly alleviate runoff and drainage problems, aesthetics (recharge ponds, etc.)
2. Apply on-site mitigation of recharge loss through modified development practices to all urban development projects	Same	Same	0	$140,000[4]	Same	Same	Same	Reduces runoff and drainage problems, add to aesthetics (ponds, grading, open space)
3. Flood plain zoning	Same	Same	0	0	---	Protect life, property and natural resources, including groundwater recharge	Flooding hazard, possible development of high recharge areas	None

4. Wetlands open space	Same	Same	2,750	0	EPA and implementing counties and cities	Will primarily protect biological processes but may also protect recharge areas	Loss of valuable biological and recharge areas	None
5. Stream open space setbacks	Same	Same	3,000	0	Same	Protect environmentally sensitive areas, water quality, prevent erosion, may protect high recharge areas as well	Possible environmental degradation, including loss of recharge areas	None
6. Direct development towards low recharge areas	Same	Same	3,500	0	Same	Protects higher recharge areas from development impacts on groundwater quantity and quality	Development of high recharge areas with adverse impacts on groundwater quantity and quality likely	None
7. Clustered development	Same	Same	3,500	0	Same	Reduce amount of impervious surfaces and direct development away from high recharge areas, protect ground water quality	Reduction in recharge quantity and quality from development of high recharge areas. Increased runoff from impervious surfaces	Less visual and ecological impact on landscape
8. Performance standards	Same	Same	Undetermined[5]		---	Maintain groundwater quanity and quality	Adverse impacts on groundwater possible	

9. Overlay zoning	Same	Same	27,000	0	Implementing counties and cities	Would ensure protection of high recharge areas, prevent groundwater quality degradation	Urban development more likely to impact groundwater with protection of zoning	None
10. Consider petitioning for sole source aquifer designation	Same	Same	1,800	0	Same	Help ensure long term protection of groundwater quality through review of all federally assisted projects	Forfeit an opportunity to protect ground water quality	If designated, review of federally assisted projects may be more extensive
11. Groundwater research and planning	Same Plus Carmel Valley Basin, Carmel, Seaside, Del Rey Oaks, Monterey, Pacific Grove San Lorenzo Valley Basin, City of Santa Cruz	Same Some aspects of the research program may need to continue beyond 1984	145,000	0	EPA Implementing counties and cities	Allow better management of groundwater resources	Will not have enough information to determine impact of urban development on groundwater or how to best manage	Provide information of value to other studies, including seawater intrusion, nitrate pollution
		TOTAL	$179,800	$140,000				

FOOTNOTES

1. The primary "management practices" are actually development practices (such as recharge ponds, pervious pavements, retention grading). There are many options, and they must be considered on a site-by-site basis. Therefore, methods of implementing these practices and other mechanisms for recharge protection are presented.

2. The implementing agencies for the non-case study basins in the region are identified on page IX-19, H. Implementing Agencies.

3. For the three case study basins, only. The summary provides costs for the whole basin, and more detail in available in Table IX-5.

4. Annual cost of staff time to ensure that mitigation measures for recharge are applied to each urban development project. Involves review and inspection of proposed mitigations.

5. Research under Recommendation #11 must be completed before costs of determining performance standards can be known.

6. Costs for recommendations #3-7 are not included in this total figure, as will be funded as part of the research program in recommendation #11.

ADDITIONAL ACTIONS TO ASSURE PLAN EFFECTIVENESS

Several actions, not explained above, are required to make sure that the Water Quality Plan fulfills it objectives.

First, the Plan contains (in Chapter X) a comprehensive set of regulatory policies related to water quality. These policies are general statements derived from the numerous and overlapping regulatory requirements described above as part of the Septic, Erosion and Sediment, Lake Protection, Groundwater Recharge, and Seawater Intrusion elements of the Water Quality Plan. It is proposed that all cities and counties adopt these general policy statements and adhere to them when developing and enforcing any specific water quality related regulatory programs. The purpose of this action is to ensure that each jurisdiction's specific water quality program is consistent with overall plan regulatory objectives and also consistent with the programs of other jurisdictions located within the same watershed or groundwater basin.

Second, actions taken by agencies responsible for implementing the plan must be reviewed annually, so as to judge the extent to which Plan requirements are being carried out. It is proposed that AMBAG, assisted by task force(s) consisting of city and county elected officials and members of the public, be responsible for this annual evaluation.

Third, the Water Quality Plan itself should be evaluated annually, so as to identify the extent to which it is capable of meeting its objectives. If actions required by the Plan are not having their desired effect of improving water quality, then the Plan must be revised. It is recommended that AMBAG also be responsible for this plan updating task.

MONTEREY BAY AREA WITH THE PLAN

With implementation of this Plan, we can expect some correction of existing water quality problems and full prevention of future pollution sources. Drinking water supplies will be protected from the polluting effects of septic systems, garbage landfills, agriculture, feedlots and dairies, intruding seawater, and urban development. Groundwater presently worthless for drinking and other water supply purposes, due to excessive nitrate or salt content, might be restored to good quality.

Surface water resources (lakes, estuaries, lagoons, streams and rivers) will be protected from damaging urban and agricultural runoff. At least several coastal lakes will be restored to a more useful state.

Septic systems, properly constructed and maintained, will continue to be used in rural areas; expensive sewering and sewage treatment facilities will be unnecessary in many areas.

MONTEREY BAY AREA WITHOUT THE PLAN

By the year 2000, we will be faced with a variety of undesirable water quality situations if this Plan is not implemented. Generally, existing problems -- some of which are already severe -- will worsen. Several coastal lakes having high recreational values will become marshes, largely as a result of man-induced pollution. Many rivers and streams, not yet polluted, will become unsafe for use by humans and wildlife. Existing surface and underground water volumes will decrease as a result of continuing erosion and sedimentation, overdrafting, and loss to urbanization of natural recharge areas. In some locations (the Pajaro Valley and perhaps the Carmel Valley) there will be insufficient drinking water sources to meet municipal demands. Vegetation dependent upon natural water resources will be endangered. Nitrate pollution of groundwater in the Pajaro and Salinas Valleys will most likely increase, to the extent that numerous wells will exceed health standards and be forced to close.

In the Pajaro Valley, and perhaps the Carmel and Salinas Valleys, seawater pollution of groundwater aquifers will also force closure of water supply wells and loss of some coastal agricultural lands. Finally, increased septic system failures will occur as rural populations and septic system densities increase, contributing to nitrate pollution of underground and surface waters and resulting in the need for expensive public sewering and wastewater treatment facilities.

Public and private costs to remedy the above problems will be high -- much higher than if corrective and preventative steps had been taken earlier.

AMBAG MEMBERS

MEMBER	REPRESENTATIVE
City of Capitola	Michael Routh
City of Carmel	Michael Brown
City of Del Ray Oaks	Robert Franco
City of Gonzales	Harry Singh, Secretary
City of Greenfield	Elias DeLeon, Jr.
City of King	Don Bates
City of Monterey	Charles Page, President
City of Salinas	Robert Wherritt
City of Santa Cruz	Louis B. Muhly
City of Scotts Valley	Jack Boone, Vice President
City of Seaside	Stephen Ross
City of Soledad	Joe Rusconi
City of Watsonville	Frank Osmer
County of Monterey	Michal Moore
County of Monterey	Sam Farr
County of Santa Cruz	Dan Forbus
County of Santa Cruz	Cecil Smith
Fort Ord (Associate)	Lt. Col. Thomas Hendricks

Special appreciation is extended to those former members of the AMBAG Board who contributed their time and effort to the 208 Plan:

City of Capitola	Tom Mason
City of Carmel	Bernard Anderson
City of King	Lonnie Silva
City of Scotts Valley	Donald Cook
City of Watsonville	Rex Clark
County of Monterey	Ed Norris
County of Santa Cruz	Phil Baldwin
	Ed Borovatz
	Dale Dawson

Preparation of this plan could not have been completed without the diligence and concerted effort of members of the AMBAG staff, technical and management consultants and project officers of State and Federal participating agencies. The effort of the following individuals and firms is very much appreciated:

AMBAG Staff:

Wilber E. Smith — Executive Director
Ernest H. Vovakis — 208 Project Directors
Lawrence H. Goldman

Technical Staff:

Michael Armstrong
Oscar Balaguer
James Barrett, USDA-SCS
Julie Brandlin
Douglas Catey
Kathleen Corsaut
Michael Di Donato
Michele Erner
Jack Liebster
George Nicolayev
Russell Rollins
Charlotte Strem
Carol Young

Secretarial Staff:

Elayne Alexander
Vera Baker
Ann St Pierre

Consultants:

Houshang-Esmaili, Associates
Planning Collaborative
Koretsky-King Associates
Earth Metrics
McDonald and Grefe
Sedway-Cooke and Associates

Central Coast Regional Water Quality Control Board
Roger Briggs
Kenneth Jones--Executive Officer

State Water Resources Control Board
Walter Bourez
Jan Stofkoper

U.S. Environmental Protection Agency

Dave Hanline
Catherine Kuhlman
Peter Uribe

CHAPTER II

PURPOSE AND CONTEXT OF THE PLAN

In 1972, the Congress enacted amendments to the Federal Water Pollution Control Act (PL92-500) that were comprehensive and far-reaching. The declared objective of the act was to "...restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To achieve this objective, the act sought to control both "point sources" or discharges emanating from a discrete source, and "non-point sources", which were more diffuse in their entry into water bodies. Point sources would be improved through a system of permits for industrial discharges and municipal sewage treatment plants. Massive grants were provided to localities to improve their sewage treatment plants. Non-point sources would be addressed primarily by regional planning programs funded under Section 208 of the Act. Working together through regional agencies, such as AMBAG, local governments would identify their major non-point source problems and develop programs to control them. It was recognized that not all the problems in a particular area could be solved in the two-year period allowed for the preparation of the initial plan. That Act emphasized, however, that an areawide planning process be established in this period to "identify, if appropriate,...non-point sources of pollution...and set forth procedures and methods (including land use requirements) to control to the extent feasible such sources."

On July 15, 1975 the State Water Resources Control Board, under authority from the Environmental Protection Agency, designated AMBAG as the official 208 planning agency for Santa Cruz and Monterey Counties.As the state-designated areawide planning organization, AMBAG applied for, and was awarded, a grant under Section 208 of the Act in the amount of $829,500. It undertook to study non-point sources of water pollution in its region, consisting of the counties of Santa Cruz and Monterey. Although the study area initially excluded the southern portion of Monterey County, a subsequent modification to AMBAG's grant contract expanded the study area to include all of both counties.

As the state-designated areawide planning organization, AMBAG applied for, and was awarded, a grant under Section 208 of the Act in the amount of $829,500. It undertook to study non-point sources of water pollution in its region, consisting of the counties of Santa Cruz and Monterey. Although the study area initially excluded the southern portion of Monterey County, a subsequent modification to AMBAG's grant contract expanded the study area to include all of both counties.

In 1975 AMBAG adopted a Wastewater Management Plan, which was subsequently incorporated into the State's Central Coast Basin Plan. The Basin Plan, discussed in the next chapter, established standards and quality objectives for the area's waters, and mandated the public and private treatment works necessary to bring point sources under control. The recommendations for control of non-point sources contained in this draft "208" Plan complement the achievements already accomplished under the Basin Plan.

In addition to its activities as a "208" planning agency, AMBAG has, since 1976, been developing regional hosuing and land use plans in a program funded under Section 701 of the U.S. Housing and Community Development Act. It has also operated as a Metropolitan Planning Organization for transportation planning. These programs, together with the "208" water quality planning program, have constituted an integrated approach to the study and solution of regional problems from a multi-jurisdictional perspective.

It should be noted that the Federal Act, referred to previously, mandated similar studies and plans throughout the nation. Several other multi-jurisdictional planning agencies, such as the Association of Bay Area Governments, the Southern California Association of Governments, and the San Diego area's Comprehensive Planning Organization, have been designated to prepare 208 plans in California. For those parts of the State outside the designated areas, the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCB) have been given the responsibility of preparing the plans. These plans are expected to be completed by June, 1979.

In the course of developing the present plan, AMBAG has actively sought the involvement and cooperation of its member cities and counties, other agencies, and the citizens of its region. The study was divided into three study phases. The first phase consisted of compiling all available data, and identifying data deficiencies in order to determine the extent and severity of the problems being studied. Representative problem areas, subsequently referred to as "case studies", were then selected for further study. These case studies were selected because it was felt that they represented problems common in the region and that the conclusions reached by studying a particular problem could be applied throughout the region. The problems selected for study were Laguna Grande and Roberts Lake as typical coastal lakes, Erosion and Sedimentation, Septic Tanks, Nitrate Pollution and Seawater Intrusion in groundwater, and Recharge of Aquifers.

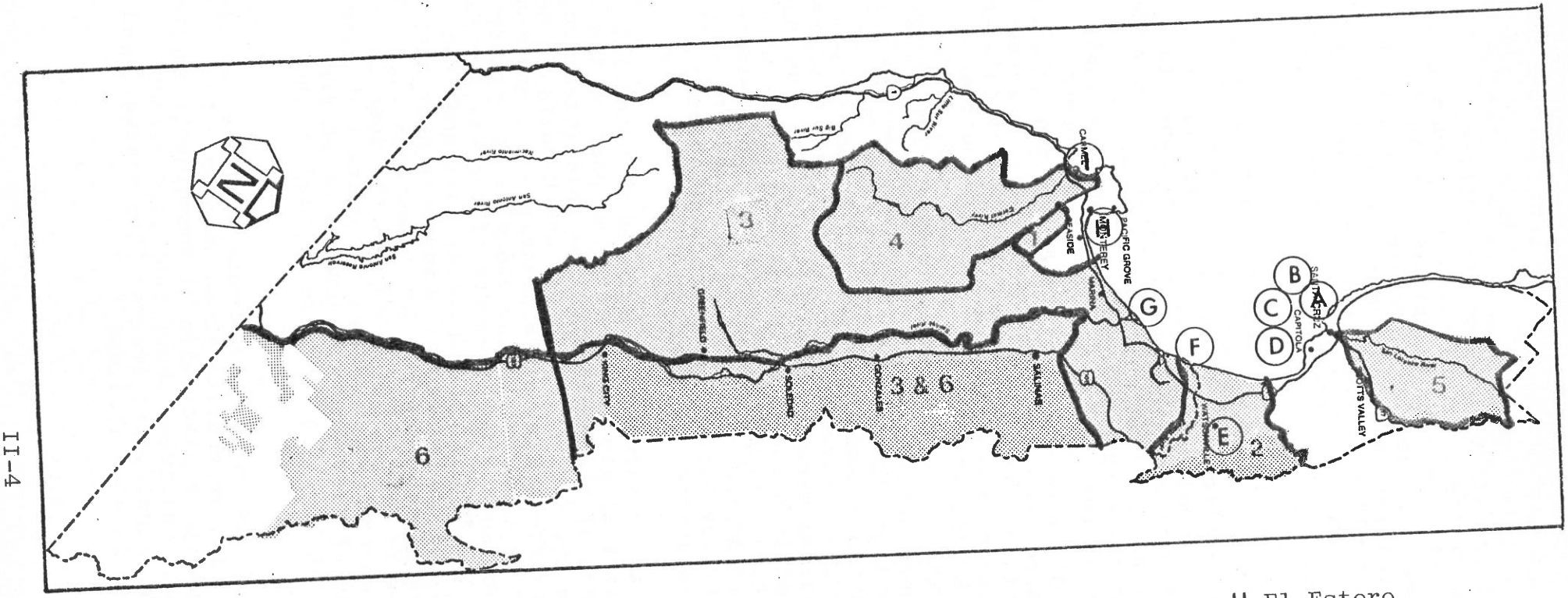
The second phase of the study included the collection of new data, an evaluation of the problems revealed by such data, and the development of alternate techniques and improved management practices to solve these problems. An institutional and funding analysis was undertaken to ascertain which agencies and monies would be appropriate for implementing proposed solutions. Land use projections were used to identify future problem areas.

In the third phase of the study, potential solutions were evaluated for their effectiveness, and their social, economic and environmental side-effects. As the most appropriate technical and institutional recommendations for specific problems emerged, they were evaluated jointly for consistency with one another. Finally, this draft Plan was formulated to include the specific case-study recommendations, and their regional application in the continuing planning process.

In developing the plan, a series of Issue Papers was prepared, each of which discussed problems then under study, together with potential solutions. These papers were then circulated for review and comment by the member cities and counties, other public agencies, and AMBAG's own advisory committees. These committees, organized specifically for the "208" program included technical personnel from interested agencies in several technical advisory committees, members of the public in five citizens' advisory committees, and an Environmental Policy Advisory Committee representing all interests. Comments received from all sources were reviewed by staff and the AMBAG Board of Directors and incorporated in the Issue Papers as appropriate. As that process was completed in each instance, the Issue Papers were adopted by the Board of Directors as Policy Papers. The Policy Papers and supporting technical reports, in turn, have guided the development of this plan.

The social, economic and environmental effects of potential plan alternatives were evaluated as an integral part of the planning process. Much of the background for this assessment was developed through the Regional Land Use and Housing Element studies conducted concurrently with 208 planning. An environmental assessment/EIR is included in the 208 plan to satisfy the procedural and substantive requirements of the California Environmental Policy Act (CEQA), the National Environmental Policy Act (NEPA) and the Environmental Assessment provisions of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA). Chapter XI of the plan includes the description of the environmental setting and a summary of overall impacts of the 208 plan. Many of the required elements of an EIR are included in the plan itself and are referenced in the Assessment document.

The specific impacts of case study recommendations are detailed in the section of the plan presenting those studies. In each case, where necessary, a discussion of unavoidable impacts, mitigation measures, alternatives, short term gain versus long term productivity, significant irreversible changes, and growth-inducing effects, is also included.



1 Coastal Lake Case Study

2 Pajaro Basin Case Study

3 Nitrate Case Study

2,4,5 Aquifer Recharge Case Studies

6 Gloria Resource Conservation District

A Schwan Lake

B Corcoran Lagoon

C Moran Lake

D Capitola Lagoon

E Pinto Lake

F Watsonville Slough

G Salinas River Lagoon

H El Estero

I Carmel River Lagoon

CHAPTER III

WATER QUALITY IN THE MONTEREY BAY REGION

Water Quality Assessment

A. Existing Quality and Monitoring

The Central Coast Regional Water Quality Control Board's (RWQCB) Basin Plan, described in the Water Quality Standards Section of this chapter, contains a summary of existing water quality in the AMBAG area. Tables 4-1 and 4-2 of the Basin Plan compare existing surface and groundwater quality with water quality planning criteria or objectives.

A number or current programs involve water quality and quantity monitoring within the AMBAG area. These programs have been summarized in "AMBAG Area Water Monitoring Efforts, and Water Quality Standards," prepared by the Regional Water Quality Control Board. Table III-1 from that report briefly describes various organizations' involvement in water monitoring.

Additional water quality data have been gathered during AMBAG's 208 planning effort. Technical reports on Laguna Grande and Roberts Lake, Nonpoint Sources of Groundwater Pollution in Santa Cruz and Monterey Counties, and Aquifer Recharge in the Carmel and San Lorenzo Valleys, have all compiled water quality data and, in some cases, generated new data.

B. Water Body Classification

To facilitate water quality evaluation, the more important surface water bodies in the state are classified by the State Water Resources Control Board (SWRCB) from information submitted by Regional Boards. The following designations are used:

1. Water Quality Limited (WQL)

   This classification is given to segments where it is known that present water quality does not provide for (1) recreation in and on subject waters, (2) protection and propagation of fish, shellfish, and wildlife, and (3) satisfaction of the July 1983 treatment levels to provide the water quality necessary to meet these goals. Water Quality Limited designations require supporting documentation. Currently, there are no Water Quality Limited segments in the AMBAG 208 area.

Table III-1

WATER MONITORING DATA: GENERATION, STORAGE, AND INDEXING

Agency	USGS	NOAA	EPA	SWRCB	DWR	DF&G
Surface Water	NAWDEX (Computer file of stations)	ENDEX (available data sources)	STORET (Repository)	Primary network & AWDN (Monitoring stations)	WDIS (Repository)	Inventory of Marine monitoring stations & some Biol. analyses for Primary network
Ground Water	"	"	"	---	"	---

Agency	State Dept. of Health	RWQCB	Monterey Co. FC & WCD	Mont. Co. Mosq. Abate. Dist.	Monterey Co. Health Dept.	Santa Cruz Co. FC & WCD
Surface Water	Monitors large supply systems, sends this data to WDIS[1]	Receiving water monitoring programs (Dischargers self-monitoring)	---	Monitors to treat, forecast, prevent mosquito emergence	Supply systems (2 to 200 connections) & Bacti in Public water contact areas[2,3]	Maintains rain gauges
Ground Water	"	"	Monitors seawater intrusion & mineral quality, sends to WDIS 200 wells	---	Bacti & chem for Supply systems (2 to 200 connections)[3]	Monitors seawater intrusion, selected data sent to WDIS. 100 wells

Agency	Santa Cruz Co. Health Dept.	Santa Cruz Co. Watershed Mgmt.
Surface Water	Ocean, River & Lagoon coliform sampling (public water contact areas)	60 stations regular monitoring of phys., chem., biol.
Ground Water	Bacti & nitrates for supply systems 5 to 200 connections	38 wells, chem. anal., 2 year program

[1] But does not send County Health data to WDIS

[2] Transmits Salinas River & Monterey Bay data to RWQCB

[3] Transmits all data to State Health, no data to WDIS

Source: "AMBAG Area Water Monitoring Efforts, and Water Quality Standards" RWQCB 1977

2. Effluent Limited I (EL I)

Three situations exist when segments can be classified as EL I:

a. Segments suspected of being water quality segments, but for which the documentation is not currently available. Segments with suspected violations or threats to water quality objectives as identified in the current Basin Plan should be given top priority (EL-I-A).

b. Segments presently in violation of standards where numerical standards and pertinent ambient water quality parameter documentation is available, but the July 1 1983 (same as the 1977 level) technology treatment levels will be sufficient to provide the water quality control necessary to meet the goals of PL 92-500 (EL-I-B).

c. Segments presently in compliance but documentation substantiates a trend toward a violation of water quality objectives identified in the Basin Plan. Segments presently in compliance but under stress, having a defined trend or expected to be in violation in the future, are areas requiring special monitoring (EL-I-C).

3. Effluent Limited II (EL II)

All remaining water bodies are classified EL II. Such a classification indicated that no violations currently exist and no evidence exists to indicate future violations.

TABLE III-2

'Effluent Limited Segments - Santa Cruz, Monterey Counties [1]

	Segment Name or Description	Regional Priority	Beneficial (1) Uses Affected	Water Quality Objectives Violated	Non-point Source	Point Source	Comments
EL-I-A	Lower Salinas River	1	G,N,P,L	Ammonia, DO, Coli., P.Toxi., TDS, Nutrients.		X	Insufficient Data
	San Lorenzo River	2	A,B,C,H,K,L, N,O,P,R,S	Turbidity, Coli, Sus. Solids.	X		Within 208 Area
	Bolsa Nueva Hydrologic Unit	3	C,N,O,P,I,J K,Q	Pesticides, Turbidity, Sus. Solids, Nutrients, Coliform.	X	X	Within 208 Area
	Pajaro River (lower)	4	B,R	TDS, Sodium, Pesticides.	X		Within 208 Area
	Carmel River	5	A,O,P,R,L	TDS, Bacteria	X		Insufficient data, ASBS & 208 Area
EL-I-B	Monterey Bay (Southern Portion)	1	F,O,P	Bacteria,	X	X	
	Coastal Segment (Aptos-Soquel)	4	J,O,P	State's Ocean Plan		X	

C. Standard Beneficial Uses - As defined by the Basin Plan

A. Municipal & Domestic Supply
B. Agriculture Supply
C. Industrial Service Supply
D. Industrial Process Supply
E. Ocean Commercial and Sport Fishing
F. Shellfish Harvesting
G. Warm Freshwater Habitat
H. Cold Freshwater Habitat
I. Preservation of Special Biological Significance
J. Marine Habitat
K. Fish Spawning
L. Fish Migration
M. Preservation of Rare and Endangered Species
N. Wildlife Habitat
O. Water Contact Recreation
P. Noncontact Water Recreation
Q. Saline Water Habitat
R. Groundwater Recharge
S. Navigation

Establishment of beneficial uses to be protected in the Central Coast Basin, AMBAG area included, was a cornerstone of the Regional Board's Basin Plan. Current beneficial uses may be broadly categorized as water supply, recreation, fish and wildlife habitat, navigation, commercial fishing, and scientific study. Table 2-1 from the Basin Plan outlined present and anticipated uses of inland surface waters. Table 2-2 outlines uses of coastal waters. Groundwaters throughout the AMBAG area are generally suitable for agricultural supply, municipal and domestic water supply, and industrial use. Specific groundwater problem areas which preclude such uses are discussed later.

The Basin Plan should be revised to include preservation of biological significance, fish spawning and saline water habitat for Elkhorn Slough.

As the preceding table of surface water classification indicates, the lower Salinas River is considered to deviate most severely from stated water quality objectives, but substantiating data are minimal. This situation could change, however, when the results of a recently conducted Department of Water Resources Lower Salinas River and Bolsa Nueva Hydrological Unit study are analyzed. Conceivably, additional data verifying water quality objectives violations could necessitate changing the lower Salinas River classification from "Effluent Limited I-A" category. However, as discussed in the Basin Plan on pages 15-37 to 39, there is substantial rationale supporting the present classification of the lower Salinas River.

The effect of changing these classifications for the lower Salinas River and Bolsa Nueva may, practically speaking, be minimal for point source discharges. The only non-agricultural discharge into the lower Salinas River is the intermittent discharge of effluent by the City of Salinas. This is scheduled to be eliminated upon completion of a regional wastewater treatment facility. Therefore, a change to "Water Quality Limited" will affect only future applications for discharge to the river, and management of

There are no "point source" discharges to Elkhorn Slough (Bolsa Nueva hydrologic unit) upstream of Pacific Gas and Electric Company and Garrapata Fisheries' discharge structures. Bolsa Nueva nutrient and bacteriological levels have been attributed to ineffective home septic tank systems and organic-laden runoff. Due to the nature of these discharges, a change in classification would primarily affect proposed discharges.

The Carmel River Basin will be studied during the Area-wide Facilities Planning Process, although the study will focus on disposal alternatives rather than river water quality.

The San Lorenzo Sub-Basin suffers from development pressures that have, through septic tank, grading practices, and urban runoff created bacteria, nutrient, and sediment water quality problems. (Santa Cruz County Health Department regularly monitors swimming areas in the Basin, and in the past nine years, one or more swimming holes have been posted as unsafe a total of five times. Year round monitoring stations indicate that bacterial concentration peaks occur during rainfall events, indicating urban runoff may be an important source of bacteria.) There is only one authorized point source discharge to the San Lorenzo River, the Santa Cruz Water Treatment Plant. With this exception only future "point source" discharges would be affected by a change in classification to "Water Quality Limited". Land use practices within the watershed, as opposed to point sources, are the more viable target for regulatory actions within the basin.

Monterey Bay water quality, particularly in the extreme southern portion, has been of concern for some time. Municipal, industrial, and non-point discharges to the bay and its tributaries have historically caused bacteria, nutrient, and alleged pesticide pollution. The process of upgrading treatment and discharging only to areas with adequate dilution capacities should help to alleviate some of these problems. This action is required by Basin Plan prohibitions and ocean discharge requirements. However, runoff from agricultural lands (e.g., near the

mouth of the Pajaro) may be a primary cause with regard to nutrients and pesticides. It should be noted that the Effluent Limited I-B segments in Monterey Bay correspond roughly to the discharge prohibition zones outlined in the Basin Plan (i.d., Northern and Southern "Pockets").

Water Quality Objectives

Once beneficial uses of surface and groundwater are recognized, compatible water quality objectives can be established as well as the level of treatment necessary to maintain the standards and ensure the continuance of the beneficial use. This approach was used in recommending water quality objectives in the Regional Board's Basin Plan. The table below summarizes these objectives.

In the case of nitrogen, the objective is also the standard for municipal supplies with more than five connections. The other consistent values are objectives rather than standards.

A. Water Quality Objectives

	Planning Criteria[a]	Constituent, mg/l TDS	Cl^-	$SO_4^=$	B	Na	N[b]
Surface and Groundwater	MUN	500/1500	250/600	250/500	---	---	10
Surface and Groundwater	AGR	700/2000	175/350	---	0.5/2.0	69	---
Surface Water Only	REC-2	---	---	---	---	---	2.0
Surface Water Only	COLD	---	---	---	---	---	1.0

[a] Values are limiting concentrations; where two values appear (e.g. a/b), the first is the threshold value, the second is the short-term value.

[b] Nitrate plus nitrite as nitrogen.

B. Water Related Policies and Laws

Many policies, plans, and laws affect water bodies and discharges within the AMBAG area. The following documents provide an overview of these water related policies:

1. State Water Plan, May 1957
2. Statement of Policy With Respect to Maintaining High Quality of Waters in California
3. State Policy for Water Quality Control
4. Porter Cologne Water Quality Control Act
5. Central Coastal Basin Plan
6. State Ocean Plan
7. Reclamation Policy
8. Thermal Plan
9. Power Plants Cooling Water Policy
10. Bays and Estuaries Policy
11. Water Pollution Control Act (PL 92-500)
12. Clean Water Act of 1977
13. Safe Drinking Water Act

Following are very general summaries of these policy positions.

1. The California Water Plan, May 1957

The State Legislature in 1947 authorized comprehensive statewide investigations and studies of water resources. This culminated in "The California Water Plan", a master plan to guide and coordinate the planning and construction by all agencies of facilities required for the control, protection, conservation, and distribution of California's water resources for the benefit of all areas of the State and for all beneficial uses.

Currently there is an effort by the State Water Resources Control Board, through its Division of Planning and Research, to examine the relation of the Water Plan with Basin Plans and to integrate the two into one Plan. This task is to be funded through statewide non-designated area planning. To be complete, this would also require integration with with other 208 plans.

A possible new source of water to the AMBAG area is the Federal Bureau of Recalamtions San Felipe Project. This project relates to the State Water Project in that its source would be a San Luis Reservoir, a joint use facility (State and Federal). This importation scheme is considered a rpime alternative for ultimate solution of groundwater overdraft problems in the Pajaro Valley. (See Chapter VIII on seawater intrusion control alternatives.)

2. Statement of Policy with Respect to Maintaining High Quality of Waters in California (Known as Nondegradation Policy)

This 1968 resolution (No. 68-16) by the State Water Resources Control Board contains general guidelines to insure that the granting of permits and licenses for unappropriate water and the disposal of wastes into the waters of the State shall be regulated to achieve highest water quality consistent with maximum benefit to the people of the State.

This nondegradation policy is a fundamental water quality objective incorporated by reference into the Water Quality Control Plan.

3. State Policy for Water Quality Control

The State Water Resources Control Board adopted this policy on July 6, 1972, stating that protection of the quality of the waters of the State for use and enjoyment by the people of the State requires implementation of water resources management programs which will conform to general principles including the following:

- Waste waters are a potential integral part of the total available fresh water resource
- Regional water and wastewater management should be promoted
- Hazardous substances should be controlled at the source
- Monitoring programs must be provided to determine the effects of discharges on all beneficial water uses

4. Porter-Cologne Water Quality Control Act

This Act provides the basis for most of the State's Water Quality activity. This Act, and subsequent amendments define the power and responsibilities of the SWRCB and the RWQCB. It also establishes basic policy concerning waste discharge requirements, basin planning, enforcement and implementation, and reclamation. Provisions are also made for compliance with the Federal Water Pollution Control Act Amendments of 1972. The State Board is empowered to formulate statewide policy for water quality control, and to coordinate and review actions of the Regional Boards. The Regional Boards are instructed to formulate, adopt, and revise water quality control plans for their regions. These plans are to be used as guidelines in adopting waste discharge requirements or specifying conditions to meet water quality objectives. The Act also grants enforcement powers to the Regional Boards which allow them to actively protect water quality.

The Porter-Cologne Act contains the Clean Water Bond Laws of 1970 and 1974. These laws provide for State participation in the Clean Water Grant process and funding equal to 12-1/2 percent of eligible project costs.

5. Water Quality Control Plan - Central Coastal Basin

This comprehensive plan was prepared in accordance with new requirements of California's Porter-Cologne Act and partially satisfies planning requirements of the Federal Water Pollution Control Act Amendments of 1972. It established a water quality control policy that provides for adequate protection of the quality objectives according to the beneficial uses established for a water body. These objectives provide a basis for establishing or revising waste discharge requirements.

The Basin Plan also describes individual watersheds within the Central Coastal Region and recommends courses of action for wastewater treatment, disposal, and reclamation. Discharge prohibitions relate to protection of drinking water supplies, fresh water contact recreation areas, and other water bodies with unique characteristics.

6. State Ocean Plan

The SWRCB adopted Resolution No. 72-45 "Water Quality Control Plan for Ocean Waters of California" on July 6, 1972. The Plan established beneficial uses of the ocean, water quality objectives, and effluent quality requirements to govern the disposal of waste into the coastal waters of California. Ocean Plan revisions were recently approved by the State Board but have not yet been approved by EPA. Revisions include technical and conceptual changes to toxic materials numerical limitations and provisions for advanced primary rather than secondary discharges. Initial dilution requirements are also being revised.

7. Policy and Action Plan for Water Reclamation in California

This Plan was adopted in January 1977 to encourage development of water reclamation facilities and to provide guidelines for protection of public health. Constituents identified as being of major importance are Bacteria, Viruses, Organic Compounds, Toxic Materials and Total Dissolved Solids. It also outlines the Regional Board's responsibility in establishing waste discharge requirements for reclaimed wastewater in order to protect water quality. Where a reclamation project won't impair existing water rights, instream beneficial uses, or water supply systems and there is an existing discharge to marine, brackish, or evaporation ponds; reclamation is encouraged to preserve and enhance instream beneficial uses and to substitute for and optimize use of better quality water.

As a result of the Reclamation Plan's recommendations, Clean Water Grant Program procedures have been revised to require thorough evaluation of reclamation possibilities during each facilities planning process. Further, Group IV, or reclamation projects will have a higher funding priority because of their added benefit of reclaiming water rather than disposing of water.

The Inland Cooling Waters Policy, Bays and Estuaries Policy, and Thermal Plan are all statewide policies which have some impact on Monterey and Santa Cruz Counties. These policies are incorporated in this 208 Plan by reference.

8. Water Pollution Control Act (PL 92-500)
Clean Water Act of 1977
Safe Drinking Water Act

Public Laws 92-500 and 95-217, the Amendments to the Federal Water Pollution Control Act, are briefly explained in Chapter II. The Safe Drinking Water Act (PL 93-523, enacted by Congress December 3, 1974, signed by the President December 17, 1974, amended by PL 95-190, November 16, 1977) requires regulation of drinking water supply quality for "Public Water Systems," defined as a system with at least fifteen connections or which regularly serves at least twenty-five people. This Law provides the basis for the Environmental Protection Agency's promulgation of maximum contaminant levels. Nitrate in a public water system must not be greater than 10mg/l as nitrogen (same as 45mg/l as nitrate).

State regulations may be more stringent than EPA regulations. California, through the Health and Safety Code, has determined a system with at least five connections constitutes a public water system. The State Department of Health delegates regulatory authority to County Health Departments for systems with between five and two hundred connections. Monterey County Health Department exercises still greater authority by also regulating systems with between two and five connections by Ordinance.

POLLUTANT LOADS

A. Non-Point Sources

The people of the Monterey Bay Region depend on groundwater for 80% of their water needs. Surface streams and reservoirs,whose watersheds are in many cases impacted by human activities, supply the rest. These surface waters are also vital for fishery, habitat and recreation values.

At the time a portion of the AMBAG region was designated as a 208 planning area, water quality problems associated with point sources were known, but the effects of diffuse, non-point sources (NPS) on the areas waters were unclear. AMBAG's strategy was to first perform an overall "initial assessment" of the cause, extent and severity of non-point source problems followed by "case studies" to develop solutions for the most significant of the problems.

Table III-3 summarizes some of the data on pollutants, their adverse effects and possible sources as collected in the initial assessment.

In addition to those presented in the table, existing or potential problems in other parts of the region had been reported, but with little substantiating data. These included landfill leachate groundwater degradation, turbidity and sedimentation from urbanization, runoff from animal operations and agriculture, and mineral and nutrient buildup in groundwater sources.

Since such problems are by their nature difficult to pinpoint and quantify, estimates of waste loads contributed by various sources were calculated. The calculations were supplemented and verified by a storm runoff sampling program conducted at five locations in the region.

Future non-point source waste loads could exacerbate existing problems. Total dissolved solids potentially added to waters by agricultural operations and septic tanks could increase 25 percent by the year 2000 if trends continue. Animal confinement facilities operations will result in an increase in TDS load of over 40 percent for the same period. Continued use of available groundwater supplies without development of supplemental water and/or change in irrigation and fertilization practices and control of animal wastes would further degrade groundwater in the Salinas and Pajaro River Valleys. Pollution of groundwater in the Carmel Valley from septic tanks and urban runoff is also a possibility. Population increases

TABLE III-3

WATER QUALITY PROBLEMS IN THE AMBAG 208 STUDY AREA

Water Body	Type of Pollution	Beneficial Uses Adversely Affected	Basin Plan W.Q. Objectives	Possible Sources of Pollution
Santa Cruz County Surface Water				
San Lorenzo River (Lower Reach)	dry weather-high coliform levels and low dissolved oxygen levels	REC-1 (swimming) COLD (cold water fishery)	30-day fecal coli-200/100 ml. minimum D.O.-7.0 mg/l	septic tanks
	wet weather-sedimentation	COLD	sediment load not to adversely affect uses	logging
Moran Lake	high nutrient levels (1.2-1.3 mg/l-NO_3 and 0.04-0.10-P)[1] sedimentation, heavy metals, oil and grease (2-4 mg/l)[1]	REC-2 (non-contact) and MAR (marine habitat)	0.5 mg/l N and 0.05-P; oil and grease not to adversely affect uses	urban runoff
Pajaro River (Lower Reach)	mineralization (1100 mg/l-TDS)[2] (255 mg/l-Na)[2] (1.2 mg/l-B)[2]	AGR (agriculture water supply)	700-2000 mg/l-TDS 69 mg/l-Na 0.5-2.0 mg/l-B	irrigation return flows
Groundwater				
Pajaro River near Watsonville	mineralization (TDS 700-2000 mg/l)[3]	AGR	See above	seepage from Pajaro River
Monterey County Surface Water				
Elkhorn Slough	high coliform counts 50-2000 MPN/100 ml[4]	SHELL (shellfish)	30 day total coli-70/100 ml	dairies and vessels and septic tanks
Salinas River (from Salinas to mouth)	mineralization, high nutrient levels (3.3 mg/l-NO_3)[5] pesticides (60 pp trillion-DDT)[6] (1600 ppt-Dieldrin)[6]	REC-2 WARM (warm water habitat)	See above	irrigation return flows and City of Salinas STP discharge
Laguna Grande and Roberts Lake	high nutrient levels (5.5 mg/l-NO_3)[5] sedimentation, heavy metals	REC-2 WARM	See above	urban runoff
Groundwater				
Salinas Basin near Salinas (180-foot aquifer)	mineralization (2000 mg/l-TDS and 150 mg/l-Na near Salinas)[1]	AGR MUN (municipal water supply)	See above	irrigation return flows and animal wastes
Near Gonzales	mineralization, high nitrates (90 mg/l-NO_3)[6]	AGR MUN	See above 45 mg/l-NO_3	irrigation return flows, animal wastes, and/or percolation ponds

[1]Santa Cruz County Watershed Program, "A Staff Report on Moran Lake," August 1976.

[2]Basin Plan

[3]Environmental Research Consultants, Inc., "Watsonville Wastewater Treatment Facility, Design Project, Environmental Impact Report," Draft, April 1976.

[4]MPNPCA Draft EIR, June 1976.

[5]Northern Salinas Valley Mosquito Abatement District Water Quality Sampling Program.

[6]City of Gonzales Sampling Program, 1976.

of about 50 percent overall are projected for the study area by 1995, with a three fold increase in developed area affecting Laguna Grande and Roberts Lake. Erosion and sedimentation associated with such new construction and new urban runoff loads could put significant additional stress on surface waters, especially coastal lagoons.

The case studies presented in this plan detail non-point sources found to be most significant. The approaches developed as solutions to these particular problems will form the basis for further work during the continuing planning process.

B. Point Sources

By necessity, AMBAG has considered some municipal and industrial point sources in water and salt balances for case study areas. A brief summary of these sources follows. A much more detailed inventory and explanation of these waste loads may be found in "Point Source Discharge Information", compiled for AMBAG by the California Regional Water Quality Control Board (RWQCB) Central Coast Region.

1. Municipal

All municipal discharges in AMBAG's area are regulated by the RWQCB. Privilege to discharge is contingent on abiding with waste discharge requirements, including monitoring programs, adopted by the Regional Board. Authority to administer EPA's National Pollutant Discharge Elimination System (NPDES Program; discharges to surface waters only) also has been delegated to the state, and therefore, the regional boards. Waste discharge requirements are based on protection of the prescribed beneficial uses of the receiving water, and public health and nuisance considerations.

2. Facilities Planning

Extensive sewerage facilities planning in the AMBAG area is either completed or underway. Most of this work is financed through the Clean Water Grant program administered by the State and authorized under Section 201 of the Federal Water Pollution Control Act Amendments. Facilities planning efforts have been described in "Point Source Discharge Information", which summarizes specific projects and alternatives. More detail may be obtained from facilities plans, which contain a wealth of information on many facets of their study areas.

Recommendations for specific facilities planning projects region-wide are contained in the Regional Board's Basin Plan. AMBAG's role in facilities planning, as representative of the interests of Monterey and Santa Cruz counties and cities, will be to review and comment on individual facilities plans as they progress, with special emphasis on secondary impacts (e.g. growth, traffic, air quality constraints). Specific water quality considerations resulting from 208 planning will be discussed later in this report. Future facilities planning projects must be consistent with the 208 Plan. Table III-3A summarizes the 208 plan recommendations related to facilities planning (201).

In the northern AMBAG area, facilities planning is just getting off the ground in the San Lorenzo Valley County Water District. This area-wide (includes Olympia, Felton, Mount Hermon, Lompico) study will examine alternatives for alleviation of excessive septic tank failures. The San Lorenzo Valley County Water District is also in the facilities planning process for treatment and disposal improvements at Bear Creek Estates.

In Scotts Valley, inadequate treatment capacity, unreliable means of disposal, and failing septic tank systems have prompted facilities planning. An alternative for disposal is reclamation, with excess flows conveyed to Santa Cruz treatment facilities.

Facilities planning for the City of Santa Cruz and surrounding areas is being carried out jointly by the City and the County of Santa Cruz. The scheme calls for consolidation of several separate discharges (East Cliff, Aptos, Rolling Woods, etc.) into one treatment/disposal/reclamation facility. Recent changes in Federal and state law have prompted facilities planners to apply for a waiver from secondary treatment requirements. This uncertainty has stalled the project to some extent.

The City of Watsonville has a primary discharge to Monterey Bay and is in the grant process to determine its treatment and disposal needs. The Las Lomas Hall Study Area and Pajaro County Sanitary District may consolidate with Watsonville.

Much of Northern Monterey County area is involved in the Monterey Peninsula Water Pollution Control Agency's plan to regionalize discharges from Pacific Grove, Monterey, Seaside, Sand City, Del Rey Oaks, Salinas, Castroville, Fort Ord, and possibly Marina and Moss Landing. Both the Prunedale/Oak Hills/Castroville

TABLE III-3a

SUMMARY OF RECOMMENDATIONS RELATING TO
WASTEWATER FACILITIES (201) PROJECTS

Chapter	Recommendation	Project Affected	Target Date
IV	D. Dual leachfields-identify areas and situations within study area in which dual fields would be cost-effective	San Lorenzo Valley, Castroville-Prunedale, Carmel Valley-Highlands	July, 1979
IV	H. On-site Wastewater Disposal Zone determine locations within study area where OWDZ should be instituted, scope of services and recommend institutional arrangements	San Lorenzo Valley	June 1979
	Consider OWDZ option for study area	Castroville-Prunedale Carmel Valley-Highlands	June 1979 (schedule undetermined)
IV	J. Coordinated planning-initiate groundwater impact assessments of septic systems in study area	San Lorenzo Valley, Castroville-Prunedale, Carmel Valley-Highlands	November, 1978
IV	K. Septage disposal-determine practicality of using City of Santa Cruz wastewater facility for septage disposal	City of Santa Cruz	October, 1978
IV	N. Density Control - (see recommendation J. regarding groundwater impact assessments)	San Lorenzo Valley Castroville-Prunedale Carmel Valley-Highlands	November, 1978
IV	O. Deep Disposal Effluent - (See recommendation J. regarding groundwater impact assessments)	San Lorenzo Valley Castroville-Prunedale Carmel Valley-Highlands	November, 1978
VII	Evaluate alternatives to percolation ponds for effluent disposal	Municipal and Industrial discharges in Salinas Valley	As systems are expanded or upgraded

area and Moss Landing are undertaking smaller scale facilities planning but options include consolidation with the regional scheme. All flows would be treated at the Northern Monterey County Regional Wastewater Treatment Plant, to be constructed just south of the Salinas River near Marina. A 7,200 foot outfall, including a 1,300 foot diffuser, will be used to dispose of treated wastewater in excess of reclaimation demands.

The Carmel Sanitary District Areawide Facilities Plan study area includes Carmel Highlands, Pebble Beach, and most of the Carmel Valley (just east of Carmel Valley Village). The District's outfall discharles into Carmel Bay, designated an Area of Special Biological Significance (ASBS) by the State Water Resources Control Board. In June, 1978, the State Board will determine Carmel's future disposal options as they relate to the ASBS designation. Based on AMBAG's initial assessment of urban runoff, findings on both the River and wastewater discharge collected over the last several years, the River has a greater potential impact on Carmel Bay than does the District's discharge. This is especially true in considering disposal alternatives involving only wet weather discharges to the Bay.

This does not mean that the District should not be concerned about the quality of its discharge. Plant upsets could cause localized water quality problems within the Bay. But the total pollutant load to the Bay should be put into perspective. Decision makers must be cognizant of relative significance of all pollutant sources in determining whether or not the present discharge to Carmel Bay should be prohibited. Cost effectiveness of proposed projects should be determined in terms of water quality improvement.

Since biological monitoring of the Bay over the last several years has indicated no detrimental effects from the discharge, it is difficult to believe a significant water quality improvement will result from eliminating this discharge. At this point in the study, a reclamation project with a wet weather discharge to the ocean seems to be a reasonable approach.

Municipal wastewater treatment and disposal facilities in communities along the Salinas River are in various stages of development. Evaporation/percolation ponds or spray disposal are common for these cities. In Federal wastewater treatment grant programs, reclamation for water conservation and removal of nutrients is encouraged. In some cases, percolation ponds may be operated in alternating wet and dry cycles to achieve significant removals of nitrogen from percolating waters (through denitrification, or conversion to nitrogen gas).

3. Ranking

The technical report previously referenced, "Point Source Discharge Information", contains a ranking of municipal discharges as required in a "208" Plan. In order to rank pollution sources in a meaningful manner, relative impact on the environment should be the primary criterion. This is easier said than done, but an attempt has been made to correlate current and projected mass emission rates of critical constituents (in conjunction with type of receiving water) with environmental impact.

Ideally, these emission rates should be ranked with other sources of constituents to gain a perspective on environmental impacts in a given area (e.g. the receiving body of water as a whole). In this way, problems may be prioritized logically. Tables 1, 2, and 3 of the referenced report (not included here) contain the municipal ranking for discharges to inland surface waters, groundwater, and the ocean, respectively. Table III-4 summarizes sludge generation and disposal practices for AMBAG municipalities. Existing and potential problems with sludge disposal are being studies in 201 Plans throughout the region. All projections are based on facilities plans or AMBAG population projections. More importantly, all sources of critical constituents (total salts and nitrogen) have been tabulated for the Salinas and Pajaro Valleys. Summaries and conclusions are presented in Chapter VII.

Regionwide facilities planning needs are reviewed periodically and prioritized for future funding considerations. The State Water Resources Control Board maintains the following project priority list, Table III-5 (only AMBAG area projects are shown here):

TABLE III-4
SLUDGE GENERATION AND DISPOSAL

Discharger	Sludge Treatment	Disposal Technique	Quantities		Sludge Heavy Metal Analysis Available to Regional Board
			Present	1995	
Salinas, Main	Anaerobic Digestion, Primary & Secondary.	Lagoons, then adjacent fields, disc.	210,500[a]	361,000[a] (1985)	Yes, High Hg
Salinas, Alisal	Anaerobic Digestion, Primary & Secondary.	Lagoons, then adjacent fields, disc.	90,000[a]		
Castroville	Anaerobic Secondary.	Plant Storage, to farms for mulch.	60[b]	To be included Regional System.	Yes, High Pb, Cu
Big Basin State Park	Anaerobic Primary.	Nursery for redwood trees.	7[b]	Unknown	No
U.S. Army, Fort Hunter Liggett	Facultative Ponds.	Facultative Ponds.	--	--	No
Salinas, Ind.	Facultative Ponds.	Facultative Ponds.	--	--	No
Gonzales	Facultative Ponds.	Facultative Ponds.	--	--	No
King City, Main	Facultative Ponds.	Facultative Ponds.	--	--	No
Soledad, City	Anaerobic Primary.	Drying Beds.	40,000[a]	100,000[a]	Yes, High Se
Soledad CTF	Anaerobic Primary & Secondary.	Farm land soil conditioner.	194,000[a]	200,000[a]	Yes, High Zn, Cu
Greenfield	Aerobic	Adjacent land, disc.	500[b]	870[b]	Yes, High Al
Salinas Utl.	Facultative Ponds.	Facultative Ponds.	--	--	No
Scotts Valley	Aerobic	Truck haul land disposal & City of Santa Cruz STP.	7,500[a]	May be included in S.C. system	Yes, High Zn, Pb, Cu
Big Sur St.Pk.	Extended Aeration.	Sludge beds.	1,000[a]	Unknown	No
Camp Roberts	Anaerobic, Primary and Secondary.	Drying beds every four months.	Unknown	Unknown	Yes, High Cr, Hg, Se
Oak Hills	Ponds.	Ponds.	--	--	No
Boulder Creek	Ponds.	Ponds.	--	--	No
Rolling Woods	None. Raw waste to T.F. to Sed. Tank.	Pumped from Sed. Tank, truck haul to Aptos.	--	--	No
Bear Creek Estates	Extended Aeration.	Septic hauler to Santa Cruz SWDS.	Highly variable	Unknown	No
Big Basin Woods	Extended Aeration.	Septic hauler to Santa Cruz City STP twice/year.	6,000[c] 500[a]	Unknown	No
U.S. Army, Fort Ord	Anaerobic	Drying Beds soil.	600[a]	Unknown	No
Northern Monterey Co. Regional Plant	Anaerobic, partial mechanical dewatering.	Dewatering by spreading in land fill borrow area, mix with soil for cover material.	None	21,200[d] 2,760,000[a]	Yes (projected from current data)
Santa Cruz City	Anaerobic Primary & Secondary.	City of Santa Cruz SWDS.	6,000[e] 180,000[a]	20,000[e] 600,000[a]	Yes, High Cr
Watsonville	Anaerobic Primary & Secondary.	Lagoons, drying beds, haul to land for soil condition.	4,000[e] 120,000[a]	20,000[e] 600,000[a]	Yes, High Ni, Cr, Al
Carmel	Anaerobic Primary & Secondary.	Dissolved air float. Haul to Marina (MPC & RDD) SWDS.	4,000[d] 150,000[a]	7,500[d] 150,000[a]	Yes
Davenport	Imhoff Tank	Haul to an East Cliff Manhole	4 truck loads per year. 600[a]	Unknown	No

[a] gallons per month.

[b] cubic yards per year (dry)

[c] gallons per year

[d] pounds per day

[e] gallons per day

TABLE III-6

BASIN	AGENCY	PROJECT NO.	STEP	EST.ELIG. COST/STEP	DESCRIPTION OF PROBLEM	CLASS & RANKING	FISCAL YEAR (AND ASSIGNED STEP) 78-79	79-80	80-81	81-82	82-83	UNSCH
	COUNTY OF MONTEREY											
3	AROMAS COUNTY WATER DISTRICT	1798-01	1-	30,000	UNSEWERED COMMUNITY	D-0338						1 2 3
		1798-10	2-	85,000								
		1798-11	3-	1,085,000								
3	BORONDA WATER DISTRICT	1649-01	1-	5,000	TREATMENT AND/OR TRANSPORT FOR UNSEWERED COMMUNITY WITH FAILING SEPTIC TANKS	D-0339	1		2	3		
		1649-10	2-	10,000								
		1649-11	3-	137,000								
3	BORONDA WATER DISTRICT	1649-20	2-	10,000	COLLECTION SYSTEM FOR UNSEWERED COMMUNITY WITH FAILING SEPTIC TANKS	L-0995					2	3
		1649-21	3-	137,000								
3	CALIFORNIA, STATE OF DEPT. OF PARKS AND RECREATION	1817-01	1-	5,000	INADEQUATE DISPOSAL SYSTEM AT PFEIFFER-BIG SUR STATE PARK	E-0638			1	2	3	
		1817-10	2-	9,000								
		1817-11	3-	86,000								
3	CARMEL SANITARY DISTRICT	1286-10	2-	200,000	DISCHARGE INTO THE CARMEL BAY ASBS	C-0243		2	3			
		1286-11	3-	4,000,000								
3	CASTROVILLE COUNTY SANITATION DISTRICT	1449-10	2-	21,000	INTERCEPTOR AND PLANT EXPANSION TO CONSOLIDATE NEARBY SEWERAGE SYSTEMS	E-0536	2	3				
		1449-11	3-	274,000								
3	CASTROVILLE COUNTY SANITATION DISTRICT	1815-01	1-	20,000	EXISTING 10-INCH TRUNK SEWER AT CAPACITY. UNABLE TO HANDLE WET WEATHER FLOWS.	L-0873			1		2	3
		1815-10	2-	46,000								
		1815-11	3-	582,000								
3	GONZALES, CITY OF	1814-01	1-	12,000	INADEQUATE TREATMENT AND DISPOSAL SYSTEM CAPACITY	E-0572		1	2	3		
		1814-10	2-	24,000								
		1814-11	3-	264,000								
3	GREENFIELD, CITY OF	1806-01	1-	12,000	INADEQUATE INTERCEPTOR CAPACITY	G-0700			1	2	3	
		1806-10	2-	24,000								
		1806-11	3-	264,000								
3	KING CITY, CITY OF	1813-01	1-	20,000	TREATMENT PLANT CAPACITY AND INTERCEPTOR TO SERVE PINE CANYON AREA	E-0573		1	2	3		
		1813-10	2-	52,000								
		1813-11	3-	648,000								
3	KING CITY, CITY OF	1813-20	2-	40,000	COLLECTION SYSTEM FOR PINE CANYON AREA	L-0896					2	3
		1813-21	3-	360,000								
3	MONTEREY COUNTY SERVICE AREA NO. 66	1318-10	2-	500,000	COLLECTION, TREATMENT AND DISPOSAL FOR UNSEWERED AREA - LAS LOMAS-HALL AREA	B-0156	2 3					
		1318-11	3-	1,685,000								
3	MONTEREY PENINSULA WATER POLLUTION CONTROL AGENCY	1066-11	3-	26,000,000	REGIONAL INTERCEPTOR AND OUTFALL	A-0132	3					
3	MONTEREY PENINSULA WATER POLLUTION CONTROL AGENCY	1066-12	3-	36,000,000	REGIONAL TREATMENT PLANT	A-0133		3				

BASIN	AGENCY	PROJECT NO.	STEP	EST.ELIG. COST/STEP	DESCRIPTION OF PROBLEM	CLASS & RANKING	FISCAL YEAR (AND ASSIGNED STEP) 78-79	79-80	80-81	81-82	82-83	UNSCH
	COUNTY OF MONTEREY											
3	MONTEREY PENINSULA WATER POLLUTION CONTROL AGENCY	1066-20 1066-21	2- 3-	2,000,000 22,000,000	TERTIARY TREATMENT AT REGIONAL TREATMENT PLANT	C-0268				2	3	
3	MONTEREY, COUNTY OF	1635-01 1635-10 1635-11	1- 2- 3-	100,000 150,000 2,810,000	TREATMENT AND/OR TRANSPORT FOR UNSEWERED COMMUNITIES- CARMEL VALLEY AND CARMEL HIGHLANDS	D-0281	1		2	3		
3	MONTEREY, COUNTY OF	1635-20 1635-21	2- 3-	270,000 5,660,000	COLLECTION SYSTEM FOR UNSEWERED AREAS OF CARMEL VALLEY AND CARMEL HIGHLANDS	L-1127					2	3
3	MONTEREY, COUNTY OF	1808-01 1808-10 1808-11	1- 2- 3-	14,000 31,000 355,000	INTERCEPTOR TO REGIONAL SYSTEM FROM TORO PARK AREA	G-0739			1		2	3
3	MOSS LANDING COUNTY SANITATION DISTRICT	1320-11	3-	2,200,000	TREATMENT AND/OR TRANSPORT AND COLLECTION SYSTEM FOR MOSS LANDING	A-0135		3				
3	SALINAS, CITY OF	1634-01 1634-10 1634-11	1- 2- 3-	4,000 8,000 90,000	INTERCEPTOR FOR UNSEWERED AREA WITH FAILING SEPTIC TANKS AND CONDEMNED WELLS IN SANTA RITA	D-0282	1		2	3		
3	SALINAS, CITY OF	1634-20 1634-21	2- 3-	12,000 135,000	COLLECTION SYSTEM FOR UNSEWERED AREA WITH FAILING SEPTIC TANKS - SANTA RITA	L-0897					2	3
3	SOLEDAD, CITY OF	1322-10 1322-11	2- 3-	75,000 4,600,000	INADEQUATE TREATMENT AND APPROACHING CAPACITY	E-0574		2 3				
	COUNTY OF SANTA CRUZ											
3	CALIFORNIA, STATE OF DEPT. OF PARKS AND RECREATION	1453-01 1453-10 1453-11	1- 2- 3-	16,000 38,000 446,000	INADEQUATE & UNRELIABLE TREATMENT FOR PRESENT DISPOSAL SITE BIG BASIN STATE PARK	E-0637	1		2			3	
3	DAVENPORT SEWER MAINTENANCE DISTRICT	1210-01 1210-10 1210-11	1- 2- 3-	12,000 26,000 289,000	NPDES TIMETABLE - UPGRADE TO SECONDARY	C-0266	1		2	3		
3	DAVENPORT SEWER MAINTENANCE DISTRICT	1796-01 1796-10 1796-11	1- 2- 3-	6,000 6,000 55,000	UNSEWERED AREA	L-0982			1		2	3
3	PASATIEMPO/ROLLING WOODS S. M. D.	1580-01	1-	50,000	FACILITIES PLANNING FOR UNSEWERED AREA	E-0663	1					

BASIN	AGENCY	PROJECT NO.	STEP	EST. ELIG. COST/STEP	DESCRIPTION OF PROBLEM	CLASS & RANKING	FISCAL YEAR (AND ASSIGNED STEP) 78-79	79-80	80-81	81-82	82-83	UNSCH
	COUNTY OF SANTA CRUZ											
3	SAN LORENZO VALLEY COUNTY WATER DISTRICT	1319-10 1319-11	2- 3-	400,000 3,600,000	TREATMENT AND/OR TRANSPORT FOR UNSEWERED COMMUNITY - FELTON TO BOULDER CREEK	D-0433			2	3		
3	SAN LORENZO VALLEY COUNTY WATER DISTRICT	1319-20 1319-21	2- 3-	184,000 3,816,000	COLLECTION SYSTEM FOR UNSEWERED COMMUNITY - FELTON TO BOULDER CREEK	L-1163						2 3
3	SAN LORENZO VALLEY COUNTY WATER DISTRICT	1325-10 1325-11	2- 3-	15,000 150,000	VIOLATIONS OF WDR. CEASE AND DESIST ORDER ISSUED. BEAR CREEK ESTATES PLANT INADEQUATE	C-0267	2	3				
3	SANTA CRUZ COUNTY SANITATION DISTRICT	1633-01 1633-10 1633-11	1- 2- 3-	22,000 58,000 720,000	TREATMENT AND/OR TRANSPORT FOR UNSEWERED COMMUNITY - LA SELVA/APTOS	D-0280	1		2		3	
3	SANTA CRUZ COUNTY SANITATION DISTRICT	1633-20 1633-21	2- 3-	45,000 665,000	COLLECTION SYSTEM FOR UNSEWERED COMMUNITY - LA SELVA/APTOS	L-0872					2	3
3	SANTA CRUZ, CITY OF	1106-10 1106-11	2- 3-	2,500,000 10,000,000	EFFLUENT DISPOSAL	C-0188	2	3				
3	SANTA CRUZ, CITY OF	1106-12	3-	20,000,000	UPGRADE TREATMENT	C-0189			3			
3	SCOTTS VALLEY, CITY OF	1329-11	3-	4,400,000	INCREASE TREATMENT AND DISPOSAL CAPACITY	A-0051	3					
3	SCOTTS VALLEY, CITY OF	1807-01 1807-10 1807-11	1- 2- 3-	14,000 31,000 355,000	INADEQUATE INTERCEPTOR CAPACITY	L-0834			1		2	3
3	WATSONVILLE, CITY OF	1128-10 1128-11	2- 3-	1,000,000 22,000,000	UPGRADE SEWAGE TREATMENT PLANT	C-0222	2	3				
3	WATSONVILLE, CITY OF	1128-20 1128-21	2- 3-	400,000 4,000,000	EXTEND OCEAN OUTFALL	C-0223	2	3				

Note: State Water Resources Control Board should revise future project priority lists to reflect the acceptability of options other than collection and treatment for the San Lorenzo Valley, Castroville-North Monterey County, and Carmel Valley-Highlands 201 projects.

4. Industry

Major industrial discharges were summarized in "Point Source Discharge Information 1977" (see Bibliography). Some industrial wastes were included in the municipal tabulation because they are collected and treated by municipalities.

For a number of reasons (relatively little industrial development in most areas, "light" industry, etc.), perhaps the only significant industrial issue for the 208 plan is the hazardous waste disposal problem in the region. Some hazardous wastes (Group I Wastes) are unacceptable for disposal in Monterey or Santa Cruz County Sanitary landfills because of safety or groundwater considerations. No Class I sites exist in the AMBAG area, although the Santa Cruz City site may accept only one specific type of Group I tannery waste. For other Group I wastes generated in the AMBAG area (pesticides, solvents, power plant metal cleaning wastes, etc.) the only option is to truck wastes either north to the San Francisco Bay Area Class I sites, or south to Casmalia (South of San Luis Obispo). The Counties' Solid Waste Management Plan does not address this issue in detail. The counties and the State Solid Waste Management Board should pursue this problem.

RECOMMENDATIONS

A. All agencies monitoring water quality should be required to submit data to the Department of Water Resources Water Data Information System (WDIS) to provide a complete water quality data bank. Associated costs and implementing agencies overlap with those recommended in Appendix I (Recommended Monitoring Program pp. 27-29). Agencies in particular are:

1. State Department of Health

2. Northern Salinas Valley Mosquite Abatement District

3. Regional Water Quality Control Board (submit self-monitoring reports of receiving waters or have dischargers enter data into WDIS)

B. Monterey and Santa Cruz Counties and the State Solid Waste Management Board should quantify current and projected Group I wastes and determine the need for a local Class I site. As of the writing of this Plan, Monterey County has completed this task.

Land Use and Population

A. Profile of Existing Land Use

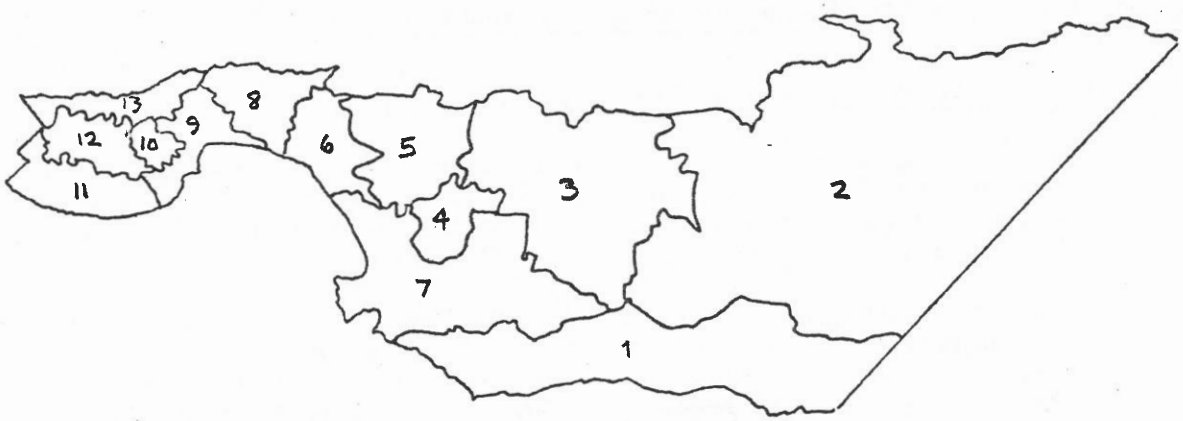
The designated area consists of one of the smallest and one of the largest counties in the state. This land of steep, rugged mountains, gentle hills and broad alluvial valleys is home to over 436,000 people.

The dominant land use in the AMBAG Region is agriculture, accounting for 70% of total land area in the region. Table III-6 portrays the land use characteristics of the region's sub-areas, called housing market areas. Figure III-1 shows the location of these sub-areas. Ninety-eight percent of agricultural use is in Monterey County, almost all in the Salinas Valley. The largest concentration of agricultural use in Santa Cruz County surrounds the City of Watsonville. Significant but much smaller concentrations are located in the Carmel Valley, Soquel Valley, and the northern coast of Santa Cruz. Actual land in agricultural use in the region exceeds estimates of prime and potential prime agricultural land available, indicating the productivity of other lands for agricultural under the region's climatic conditions, as well as the significance of agriculture in the region's economy. Agricultural use in the coastal zone of the area involves the production of crops in which the region is a dominant producer in the world, such as artichokes, Brussels sprouts, and, increasingly, strawberries. Due to the mild climate, several crops a year are possible in this part of the region.

Military lands (classified as institutional uses in Table III-6) are a significant land use in the region, chiefly in Monterey County where Fort Hunter Liggett and Fort Ord are located. Fort Ord, in particular, is a primary economic base activity in the region. The City of Monterey is also home to the Naval Postgraduate School and Defense Language Institute. The other major institutional use in the region is the University of California at Santa Cruz.

The region has a significant amount of land in open space and recreation uses in several large state parks, the Ventana Wilderness in the Los Padres National Forest, urban open spaces and recreation areas. These uses almost equal the amount of land in residential, commercial and industrial uses.

Developed uses (residential, commercial and industrial) take up about 3% of all land in the region. However, there are differences between the northern and southern areas. For Monterey County, due to its greater size, these same uses represent only 1.5% of the land area.



HOUSING MARKET AREAS

1 Big Sur
2 South Valley
3 Central Valley
4 Toro
5 Greater Salinas
6 North County
7 Peninsula
8 Watsonville Area
9 Santa Cruz
10 Scotts Valley
11 North Coast
12 San Lorenzo Valley
13 Uplands

Figure III-1

Table III-6

EXISTING LAND USE - 1976
(Acres)

HOUSING MARKET AREA	RESIDENTIAL*	COMMERCIAL	INDUSTRIAL	TRANSPORTATION and UTILITIES*	INSTITUTIONAL	OPEN SPACE & OUTDOOR RECREATION	AGRICULTURAL	VACANT	TOTAL
1	2,097	237	-	514	74,101	6,875	204,047	45,211	333,082
2	1,013	143	4,878	8,358	93,942	3,073	917,535	9,457	1,038,399
3	1,499	135	50	2,646	2,343	2,280	303,235	3,590	315,778
4	1,116	8	-	261	29	4,835	28,943	12,228	47,420
5	5,136	820	1,211	2,434	1,073	201	71,885	28,551	111,311
6	3,107	113	461	1,196	481	501	45,918	12,108	63,885
7	13,442	1,192	183	2,997	3,590	4,660	92,663	99,740	217,449
Monterey County Total	27,410	2,648	6,783	18,406	175,559	22,425	1,664,226	289,867	2,127,324
8	3,490	321	436	2,735	414	2,159	18,789	35,128	63,472
9	7,410	761	162	2,292	2,870	10,635	2,996	15,333	42,459
10	1,785	109	146	837	268	400	320	10,576	14,441
11	566	5	272	4,113	1,507	7,704	4,921	57,206	76,294
12	2,622	91	304	1,602	219	3,134	112	36,071	44,155
13	1,648	38	472	1,156	176	1,221	2,345	34,805	41,861
Santa Cruz County Total	17,521	1,325	1,792	12,735	5,454	25,253	29,483	189,119	282,682
County Undistributed	-	N/A	N/A	N/A	N/A	27,808	N/A	N/A	181,712
Santa Cruz County Total Acreage									283,167
AMBAG Region Total	44,931	3,973	8,575	31,141	281,013	47,678	1,693,709	398,986	2,410,006

*Shift made from Transportation & Utilities to Residential to obtain gross residential acreage.

Although the total land area devoted to development is a small percentage, it is highly concentrated in a small part of the region. Three-fourths of all urban land uses are located in the relatively flat coastal plain stretching from Santa Cruz to Carmel. All of the major urban centers, except Salinas, are concentrated in this part of the region, forming a crescent of urbanization around Monterey Bay, separated by significant agricultural open spaces at the mouth of the Pajaro and Salinas Rivers and the estuarine wetlands of the Elkhorn and Moro Cojo Sloughs.

The most densely developed housing market area in the region is the Santa Cruz/Capitola area; in this sub-area, over 19% of all land is already developed and much of the remaining land consists of steep uplands. The Monterey Peninsula portion of sub-area #7 is also intensely urbanized.

Over 70% of all developed land use in the region is residential, a pattern typical of most urban areas, especially those like the AMBAG Region with a relatively small amount of industrial development. Average densities range from a high of 5-6 units per gross acre in the most urban housing market areas to less than one unit per acre in the rural areas, with Monterey County densities being somewhat lower than those in Santa Cruz County. Within the cities of Monterey, Capitola, Salinas and Santa Cruz, average densities are substantially higher.

There are chiefly two types of residential land use in the region, urban residential and rural residential, although there is a tendency toward an identifiable third category in urban fringe areas which might be characterizied as suburban or semi-rural residential. Most of the housing in the region is located within the major urban centers at moderate to high densities. A much smaller part of the region's population lives in various types of rural housing, including farm housing, seasonal and retirement homes in the mountainous areas and in certain portions of the coast, and older seasonal housing which is now occupied by permanent residents employed in nearby urban centers. There is substantially more rural residential land use in the northern part of the region than in the southern part. Formerly, the Santa Cruz Mountains were a summer vacation retreat for residents of the San Francisco area. Today, there is pressure for permanent housing related to the growth of the San Jose metropolitan area, producing a trend to low density mountain development.

Commercial uses make up a very small portion of the region's land area. The majority of commercial uses are located in the urbanized areas of the region, chiefly

in the major cities--Salinas, Monterey, Santa Cruz, and Seaside. Commercial land use consists primarily of retail and service establishments catering to local populations, but there are also sizeable concentrations of facilities serving the substantial visitor trade in the region, especially in Monterey and Carmel, and to a lesser extent in Santa Cruz. These three cities together accounted for 28% of the region's taxable sales in 1976 and 61% of taxable hotel receipts. The Carmel/ Monterey complex is one of the highest ranking attractions to visitors to California arriving both by air and by automobile and the major single area of attraction outside the San Francisco and Los Angeles metropolitan areas.

Salinas and Watsonville accounted for 32% of taxable sales in the region in 1976, indicating their importance as population-serving commercial centers. Seaside, King City, Capitola and Scotts Valley are other important commercial centers, primarily serving local demand. Thus, the region's commercial development is highly concentrated in the major urban areas especially the cities, and there is relatively little scattered, commercial use along highways or in the outlying areas. This is reflected in the fact that 85% of all the region's employment (even including agricultural employment) is found within those major urban areas in which the principal cities are located and that three-fourths of the region's taxable retail sales are made in the cities.

There is little heavy industry in the region and a relatively small part of the land area of the region is devoted to industrial activity. (The largest single land use classified as industrial are the oil fields in San Ardo.) Most of the industrial land use of the region consists of food processing and distribution activities located in the Salinas and Watsonville metropolitan areas. These two areas account for about half of all industrial land use in the region (excluding the San Ardo oil field). Other major industrial activities include power generation, manufacturing and commercial fishing near Moss Landing and Castroville, the cement plant at Davenport, the light manufacturers in Santa Cruz and the warehousing and extractive industries in Sand City.

B. Forecasts of Regional Growth

Based on analyses of past studies and recent trends, AMBAG prepared a set of growth forecasts to the year 1995. These forecasts assume the adequacy of certain essential resources, primarily water, to support growth in the region. The recent drought, water quality problems in areas of major supply, uncertainty regarding safe yields

in known aquifers, and the unknown potential of water from other sources, make this an assumption of considerable importance. Under some conditions, continued growth in certain parts of the region is not likely without development of major new water resources.

C. Future Population and Employment Growth

Employment in the region is forecast to increase by almost 92,000 jobs by 1995, an increase of over 56%, for an average annual growth rate of almost 3% per year. Continuing high rates of increase in Santa Cruz County are projected with more modest rates of growth in Monterey County. However, Monterey County would account for over half of the total job gain itself and would still account for 60% of regional employment by 1995 due to its much higher initial base. Trade, services and government are expected to continue to be the primary generators of employment growth in both counties, although major gains are also expected in manufacturing, especially in Monterey County.

Based on the forecasts, virtually all of the employment growth of the region will occur in the established employment centers: Salinas, Seaside-Monterey, Watsonville, Santa Cruz, and other urban areas, such as North Monterey County, Scotts Valley, and the San Lorenzo Valley. These rapid employment growth rates are in large measure due to increases in population, resulting in increased demand for service and retail outlets.

Projections of employment for the region are generally consistent with recent trends in the growth rates of the two counties. Concentration of most employment opportunities within existing employment centers is forecast to continue. Although rapid growth rates will be experienced outside the major cities, actual numbers of jobs added in the less urbanized areas will be relatively small, accounting for only about 10% of total employment increases.

Forecasts of population for the region indicate a slower growth rate than has been experienced in the past six years. The region's population is forecast to increase by just over 50% by 1995, representing an average annual growth rate of 2.7%, much closer to the recent statewide average than the high growth rate experienced by the region in the recent past. (See Table III-7) This slower growth rate is primarily the result of a forecast decline in the growth rate of Santa Cruz County, consistent with recent declines in

III-7

TABLE III-7

POPULATION FORECAST BY HOUSING MARKET AREA

HOUSING MARKET AREA	1976 POPULATION	1995 POPULATION	CHANGE 1976-95	PERCENT INCREASE	AVERAGE ANNUAL PERCENT INCREASE	AVERAGE ANNUAL PERCENT INCREASE
1 Big Sur	1,727	1,953	226	13.1	12	0.69
2 South Valley	10,436	18,514	8,078	77.4	425	4.07
3 Central Valley	19,996	26,148	6,152	30.8	324	1.62
4 Toro	5,579	11,617	6,038	108.2	318	5.69
5 Greater Salinas	83,871	123,131	39,260	46.8	2,066	2.58
6 North County	22,406	44,523	22,117	98.7	1,164	5.19
7 Peninsula	128,080	186,480	58,400	45.6	3,074	2.4
MONTEREY COUNTY	272,095	412,366	140,271	51.6	7,383	2.75
8 Watsonville Area	38,459	58,407	19,948	51.9	1,050	2.73
9 Santa Cruz	88,550	135,797	47,247	53.4	2,487	2.81
10 Scotts Valley	10,338	18,151	7,813	75.6	411	3.98
11 North Coast	2,261	3,027	766	33.9	40	1.78
12 San Lorenzo Valley	17,003	22,226	5,223	30.7	275	1.62
13 Uplands	4,147	4,704	557	13.4	29	0.71
SANTA CRUZ COUNTY	160,758	242,312	81,554	50.7	4,292	2.7
AMBAG Region	432,853	654,678	221,825	51.2	11,750	

SOURCE: (1) For Monterey County - Monterey County Transportation Study, Socioeconomic Forecasts, 1995 (1973, revised 1976)
(2) For Santa Cruz County, Gruen, Gruen + Associates, Wastewater Facilities Plan Study, 1976; revised, 1977 for Santa Cruz County Growth Management Study

in-migration to that county. At the same time Monterey County's growth rate is forecast to increase, accounting for over 60% of the region's growth. The total population increase for the region by 1995 would be almost 225,000 people, with population levels reaching 655,000 by that time. This represents an increase of 11,750 people per year.

Housing Market Area #7 (the Monterey Peninsula and adjacent inland and coastal areas) is projected to experience the largest population increase, with the Santa Cruz, Capitola, and Greater Salinas areas accounting for most of the remaining growth. The other two major growth areas will be the Watsonville area and North Monterey County. The result is continued concentration of development in the urban crescent bordering Monterey Bay and in ate Salinas Valley with increased growth pressure in the Pajaro Valley and lower Salinas Valley. Highest growth rates are expected in the fast-developing semi-rural parts of the region, especially the Toro area, North Monterey County, Scotts Valley and San Lorenzo Valley. The population forecasts also indicate a slight reversal of the trend toward outward expansion of the centers of population, with more population growth in the major urbanized areas, a result of both economic and regulatory constraints assumed to apply to growth in the more rural areas.

While 86% of the region's employment growth is forecast to occur in the Salinas, Monterey, Watsonville and Santa Cruz/Capitola urban areas, only 74% of the region's population and household growth is projected to occur in the same areas. As a result there will be a continuation of the tendency toward outward expansion of residential settlement patterns and longer commuting distances for those who are employed. Some of the population growth in outlying areas is probably also associated with expected in-migration of retirees.

With respect to the urbanized portions of the region, forecasts suggest an increase in the employment/population ratio in the Salinas area, with increased commuting to employment in Salinas from residential areas in adjacent market areas, such as Toro, Highway 68 and the Prunedale area. The opposite relationship is indicated for the Monterey Peninsula where population growth is expected to outpace employment.

In Santa Cruz County the major urban market areas are projected to retain a reasonable degree of balance between employment and population. A discernible trend toward greater concentration of employment in the Santa Cruz and Watsonville areas with increased

commuting from the rural residential areas is indicated. Rates of employment growth in the more remote areas are high but the total share of the county's employment projected to be located in those areas is relatively small. These expectations of future growth are reflected in the forecast of land use shown in Table III-8.

These projections represent the best available consistent set of estimates of future growth for the subareas of the region. They reflect growth trends within the context of existing policies. The projected total 1995 population is very close to the sum of the State Department of Finance projections for Santa Cruz and Monterey Counties, but the distribution is different, with this projection showing greater growth in Monterey County. AMBAG will update and amend these projections as necessary. The projections adopted in this land use element will be taken as an expression of regional needs by State and Federal agencies in their decisions on the sizing of grant-funded facilities.

D. Housing and Residential Land Growth

Based on estimates of future household size, continued conversion of seasonal units to permanent occupany, and forecast population growth, at least 95,000 additional housing units are expected to be required in the region by 1995. Two-thirds of this new housing will be required in Monterey County. Most (57%) of the new housing is expected to be constructed in those housing market areas containing the major urban and employment centers of the region. Generally, household growth will occur at a rate higher than population growth due to continuing declines in average household size. Considering recent trends in development, adopted land use plans and regulations, likely constraints on development, and a continuation of existing average densities, it is calculated that new urban development will take up an additional 25,500 acres by 1995.

TABLE III-8

LAND USE FORECASTS BY HOUSING MARKET AREA - AMBAG REGION
1976-1995 CHANGE

HOUSING MARKET AREA	RESIDENTIAL	% of Region	COMMERCIAL	% of Region	INDUSTRIAL	% of Region	TRANSPORTATION and UTILITIES	INSTITUTIONAL	TOTAL DEVELOPED
1	370	1.3	131	5.8	-	0	40	11	552
2	1,639	5.9	88	3.9	29	1.0	130	151	2,037
3	1,670	6.0	98	4,4	44	1.6	139	191	2,142
4	1,293	4.6	11	0.5	-	0	87	32	1,423
5	1,722	6.2	787	35.0	979	35.4	294	229	4,011
6	5,603	20.0	196	8.7	1,015	36.7	396	448	7,658
7	6,412	23.0	339	15.1	300	10.8	700	974	8,725
Monterey County Total	18,709	67.0	1,650	73.4	2,367	85.6	1,786	2,036	26,548
8	1,532	5.5	170	7.5	288	10.4	216	201	2,635
9	3,017	10.8	366	16.3	95	3.4	301	539	4,365
10	914	3.3	22	1.0	10	0.4	78	85	1,107
11	366	1.3	6	0.3	5	0.2	30	11	417
12	1,950	7.0	32	1.4	-	0	162	57	2,201
13	1,437	5.1	3	0.1	-	0	18	6	239
Santa Cruz County Total	9,216	33.0	599	26.6	398	14.4	805	899	10,968
AMBAG Region Total	27,925		2,249		2,765		2,591	2,935	37,516

CHAPTER IV

ELEMENT: SEPTIC SYSTEM POLLUTION CONTROL RECOMMENDATIONS

INTRODUCTION

About a quarter of the people living in the AMBAG area use onsite septic systems. These systems are usually reliable, but when they fail there is the threat of disease, and they can contaminate water supplies, degrade wildlife habitat, and cause odors and nuisance. There are examples of all of these septic system-related problems in the region.

The usual solution to problems caused by failing septic systems has been the provision of central community collection systems and treatment plants. Centralized treatment has been a favored disposal choice for several reasons. First, the system effectively safeguards public health. Second, this technology is often cheaper because of economies of scale. Third, central sewerage is amenable to central (and usually public) management. This means that water quality and health regulations can be promulgated and readily enforced, and that the homeowner is relieved of responsibility. With current emphasis on environmental protection and public commitment to water quality, great strides have been made in recent years in upgrading and expanding centralized facilities.

During the early part of the federally supported effort to clean up sewage contamination, most attention was paid to large municipal polluters. As emphasis shifted to smaller, more isolated problem areas, it became clear that centralized facilities were not practical or desirable for many rural locations. This is due to the high cost of collecting waste-water where population densities are low and collector pipes must be run to each home; and to the difficulty of financing collection and treatment facilities when costs cannot be shared by a large serviced population. Experience has demonstrated that sewerage tends to be very expensive for smaller communities. The San Lorenzo Valley, the Prunedale vicinity and Carmel Valley are among the areas where centralized treatment may not be cost-effective. The difficulties have caused a renewed interest in onsite systems, both the conventional septic system and innovative methods. Regulatory and funding agencies have responded in recent years to changes in the philosophy of wastewater management. The federal government has initiated research programs, instituted an information clearinghouse, made consideration of onsite systems mandatory for wastewater planning, and has provided financial incentives for the use of onsite systems.

The State of California has also enacted legislation to facilitate onsite system management, and has launched various research, certification, and information programs to encourage the best use of onsite systems. Advantages cited for individual or neighborhood onsite systems include:

Retention of existing functional systems

Frequently, only a few systems are failing in a given problem area. Proper management may obviate the costly necessity of replacing many units which are giving good service.

Service of single homes or neighborhoods without long runs of sewer pipe

Where individual systems will work, they can be retained. Where adverse site conditions make individual systems impractical, more favorable disposal sites may exist nearby for community disposal.

More cost-effective facilities may speed up cleanup

Low-cost solutions might encourage faster solutions. Limited grant dollars could be spread further.

More National community planning is possible

Linear development along pipeline routes and other difficult to control secondary impacts of central collection are avoided.

Non-central facilities may be more ecologically sound

Wastes are disposed of over wide areas, avoiding the adverse impact of large pollution loads on receiving waters. Water is returned to the local hydrologic system rather than being wasted to sea; and energy, material and chemical costs are generally much lower than for centralized facilities. On the other hand, onsite systems can pose a threat to groundwater quality.

Septic systems in rural locations can dispose of wastewater safely and without harming the environment. Because of the expense of centralized facilities for outlying areas, it makes good economic and environmental sense to ensure that septic systems operate properly. This means that they must be:

- located only on suitable sites
- adequately designed for their location and use
- properly constructed
- regularly maintained

The worst existing problems in the AMBAG region are a result of development which occurred before these requirements were

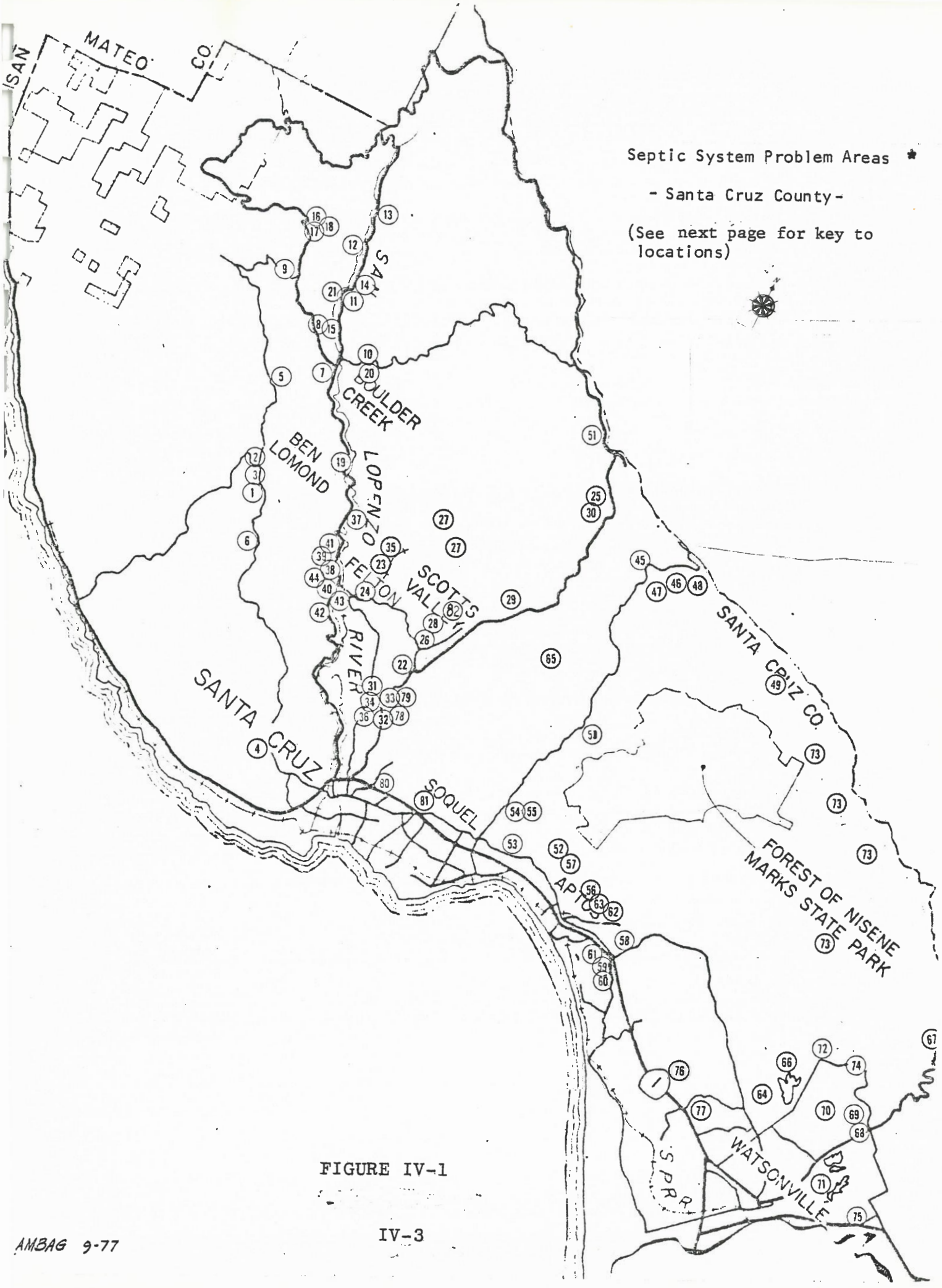


FIGURE IV-1

AMBAG 9-77

SEPTIC SYSTEM PROBLEM AREAS - SANTA CRUZ COUNTY

*1. Sunlit Lane
2. parts of Molina Drive
3. Nichols Lane (north side)
4. Highview Drive - Meter Street
5. Braemore Drive area
6. Pine Ridge
*7. Boulder Creek (downtown)
8. Bracken Brae
9. Jamison Creek area
10. Bear Creek Knolls
11. Jaunita Woods
*12. Riverside Grove
13. Ramona Woods (Quigg Way)
*14. Kings Creek
*15. Brimblecom Way
16. Lower China Grade area
17. Moon Drive (Big Basin area)
18. Rancho Dia
19. Brook Lomond
20. Creek side lower Bear Creek Road
21. Wildwood
*22. Manana Woods (lower 1/2)
*23. Olympia Circle (lower 1/2)
24. Lower Zayante
25. Mt. Charlie Ridge
26. Nelson Road/Geyer Road area
27. Lompico - Zayante
28. Lockhart Gulch
29. Canham Road
30. Upper Glenwood
31. Rolling Woods #4 area
32. Kite Hill
33. La Madrone Drive
*34. Lower Rolling Woods/Nepenthe Drive
35. Quail Hollow Circle
*36. Orchard Drive
*37. Glen Arbor
38. Felton (downtown)
*39. Lower El Solyo Heights
40. Forest Lakes
below Fern Ave,
basketball areas
41. Paradise Park
*42. Felton - Hihn, Hillside, Plateau Drive,
part of Laurel Drive
43. Felton Grove
44. Love Creek
45. Old San Jose Rd., Summit Woods
46. Miller Cut-Off Road
47. Stetson Road
48. Skyland Road
49. Highland and Summit Road areas
*50. Olive Springs Road (lower area)
51. Mt. Bache Raod, Summit area
*52. Porter Gulch Road, lower Basin
Canyon along road
53. Upper Monterey Bay Heights
54. Glen Haven Road
55. Prescott Road
56. Rio Del Mar Lodge Site Sub.
*57. Vienna Woods Subdivision
58. Wallace Avenue, Aptos
59. Loma Prieta Drive, Rio Del Mar
60. Bonita Drive, Rio Del Mar
61. Encino Drive, Rio Del Mar
62. Trout Gulch Road, Aptos
63. Cathedral Drive, Aptos
*64. Amesti Road from Phillips Road to Crow A
65. Lower Mountain View Road
66. Pioneer Road
67. Lower Hazel Dell Road
68. East Lake Avenue from fairgrounds
to Carlton
69. Hughes Road
70. Whiting Road
71. All points southeast of East Lake
Avenue
72. Wheelock Road
73. Summit Road, Highland Road, and
Eureka Canyon Road
74. Smith Road and Casserly Road
75. Riverside Road
* 76. Lower Larkin Valley Road area (near Buen
* 77. Manfre Road Vista Dr.
78. Buelah Park
79. El Rancho Drive
80. Lower Branciforte Road
81. Lower Paul Sweet Road
* 82. Scotts Valley

*Asterisk indicates areas with significant incidence of septic system failures. Other areas have adverse conditions for septic systems.

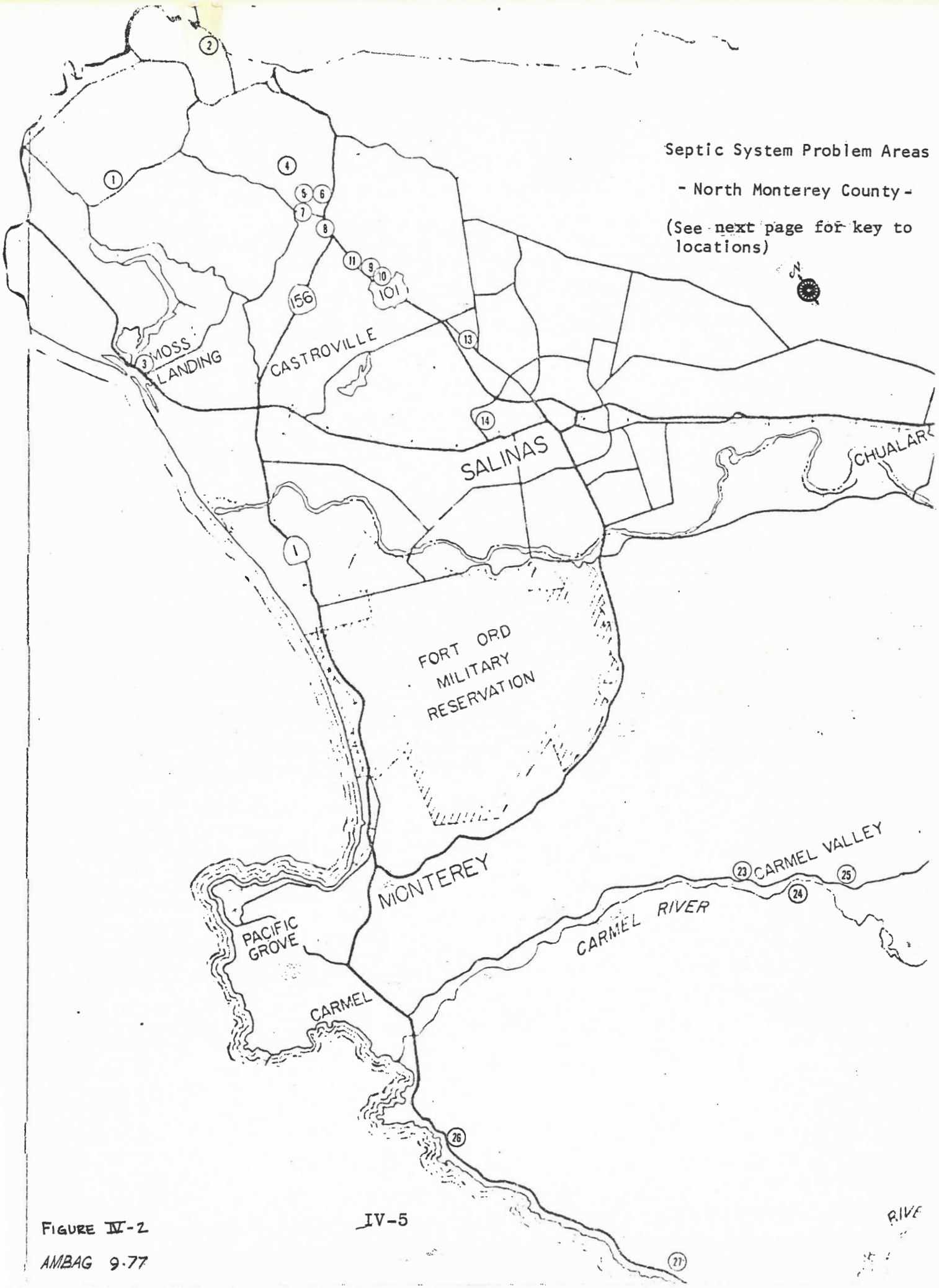


FIGURE IV-2

AMBAG 9.77

SEPTIC SYSTEM PROBLEM AREAS - MONTEREY COUNTY

1. Las Lomas
2. Aromas
3. Moss Landing
4. Echo Valley Road
5. Vale Pacifico
6. Langley Canyon
7. San Miguel-Morro Road area
8. Prunedale Road
9. Reese Circle
10. Ralph Lane
11. Pesante-Blackie Roads, Martin Lane, El Doro Drive
13. Santa Rita
14. Boronda
23. Carmel Valley Village
24. Robles del Rio
25. Los Tulares
26. Carmel Highlands
27. Coastal Canyons (Palo Colorado, Big Sur)

widely understood, and current regulations go a long way toward preventing failures.

Rural populations continue to grow. As more septic systems come into operation, the number of failures will tend to increase. Also, systems which worked well in the past may be strained because the land on which they are located is being required to accommodate greater flows from new development.

Experience and recent research now suggest further steps that can be taken to protect the environment. This chapter of the 208 Water Quality Plan presents recommendations for improving onsite disposal practice in the AMBAG region.

OBJECTIVES

The objectives of the septic system recommendations are as follows:

A. Achieve the best possible site evaluation practice.

B. Maximize the use of existing information on local septic system performance.

C. Institute the best practical design standards.

D. Institute the best practical construction practices.

E. Increase public awareness of the nature and correction of onsite disposal problems.

F. Establish the most cost effective institutional structures to manage onsite systems.

G. Prevent future wastewater disposal problems through effective planning.

H. Encourage or insure adequate system maintenance.

I. Facilitate the incorporation of new knowledge into practice.

FINDINGS

A. Training

Accurate evaluation of proposed sites for septic systems is critical for their satisfactory long-term performance. Such evaluation requires considerable skill. There is a consensus that a program to supplement existing training practices for county staffs and to speed the application of new ideas to field use would be useful.

B. Evaluation of Septic System Performance

Evaluation of the performance of septic systems in various environments within a jurisdiction has two benefits: management practices can be modified as experience shows advisable; and early indications of problems can lead to early and relatively inexpensive solutions in many cases.

Documentation on septic system failure patterns and constraints could be gathered through the reports filed by maintenance contractors and by use of information recorded during the permit process. Data could be processed manually or by local or centralized computer facilities. The State Department of Health manages a computerized program (SWEEPP), which provides information storage, manipulation and retrieval for local health agencies. The SWEEPP program might be adaptable to provide local agencies with computerized analysis of septic system siting, design, maintenance and performance data.

C. Septic Tank Risers

An important contributing factor to failure of soil absorption systems is the blockage of soil pores by solids which are washed out of the septic tank. In order to avoid excessive solids carry-over the tank must be regularly pumped out.

Since most septic tanks are buried in the ground with no indication of their whereabouts, the tank usually must be probed for and excavated before it can be pumped -- a time consuming (hence expensive) process. An "out of sight, out of mind" attitude prevails and most homeowners do not practice preventative maintenance. Tanks are cleaned only after a problem has developed. Pollution will already have occurred, and the homeowner may be faced with an expensive absorption field repair.

D. Dual Leach Fields

The most common cause of absorption system failure is a clogging mat at the infiltrative surface. The clogging mat has interacting physical, chemical and biological components, but the underlying cause is the development of permanently wet conditions within the absorption device. When the absorption system is allowed to drain and dry out, the clogging mat will break down and the system will be partially restored.

Soil clogging is most severe in loamy soils with moderate percolation rates. In sandy soils the mat is beneficial because it slows down too rapid drainage and enhances treatment of effluent; in clay soils percolation through the soil, rather than infiltration into it, may be limiting.

The most practical way of drying out the absorption system is by providing a dual system, each half of which may be alternately loaded and rested. Santa Cruz and San Mateo Counties currently require dual absorption fields, and Monterey County recommends them. If one part of a dual field does fail, an instant repair is available at no new cost to the homeowner, merely by turning the diversion valve. Emergency excavation during the wet season, when most failures occur, and when conditions are least suitable for system construction, is avoided.

The most effective configuration for a dual absorption system provides for alternation of adjacent trenches. This minimizes hydraulic interference between trenches, and maximizes evapotranspiration surface and downward percolation area.

E. Leachfield Inspection Risers

Surfacing of septic tank effluent is preceded by subsurface pooling of the wastewater in the absorption trench or pit. Monitoring the condition of the field allows warning of failure and permits early (and possibly less expensive) repair before water quality is threatened. For dual fields, monitoring indicates when alternation is required. Monitoring is made possible by inspection risers, which consist of perforated pipes extending from the ground surface into the trench or pit.

F. Public Information

Septic systems must be cared for if they are to protect water quality, but most homeowners are not aware of what must be done, or why. To help homeowners understand their systems, AMBAG and the County Enviornmental Health Agencies have produced a Homeowners Septic Tank Guide and a recommended distribution strategy (see Appendix J-7). Santa Cruz and Monterey County Health staffs have also developed slide presentations which are available for public use.

Further steps could be taken by presenting information directly to realtors associations, homeowners organizations, interested classes and other groups.

G. Installation Practice

A major cause of early failure of soil absorption systems is poor construction practice. Absorption of effluent requires maintaining open pores at the infiltrative surface, but often the pores are sealed during construction by soil smearing or compaction. The degree of damage caused by construction is directly proportional to the clay and moisture contents of the soil. These factors will vary with location, depth, and season.

A dry, friable soil will suffer little damage during construction. A somewhat wetter soil will suffer some destruction which can be mitigated by excavation techniques which leave a roughened infiltrative surface. Once a given soil is moist enough to become plastic, any mechanical stress will cause major permanent structural damage. No mitigation is possible, short of letting the soil dry out and removing the glazed or compacted material. Just as farmers never work a wet soil, construction of new absorption systems should never be attempted under such circumstances. The susceptibility of a soil to smearing and compaction can be determined by knowledgeable inspection in the field.

The most practical method of roughening the infiltrative surface during trench excavation appears to be through the use of raker teeth on the sides of the backhoe bucket. This technique is not widely applied in California.

H. Onsite Wastewater Disposal Zone

In the past only one measure was widely used to correct a group of failing septic systems or to provide maximum health and water quality protection for new development -- installation of sewers and a central treatment plant. Due to large increases in costs for new sewer systems this option is becoming less feasible. Another option, receiving increasing interest, is the establishment of a public agency to manage the rehabilitation, replacement, maintenance and monitoring of onsite systems.

Public management can provide a mechanism to improve local practice in the design, construction and maintenance of septic systems. The agency can have a broad range of functions, depending on the local situation and the reasons for instituting the program. At a minimum, onsite management would provide for inspection, maintenance, and necessary repair of septic systems. The management agency would charge a service fee to homeowners, just as a sewer district does.

State legislation (SB 430) enables the formation of an Onsite Wastewater Disposal Zone (OWDZ) within the boundaries of any public agency which has the legal authority to construct and operate sewer systems and treatment plants. An OWDZ can "...acquire, design, own, construct, install, operate, monitor, inspect and maintain on-site wastewater disposal systems..." and has the necessary fiscal and legal powers to carry out these function. An OWDZ may be formed by a resolution of the directors of the public agency, or by a petition of citizens. Formation is subject to a public hearing, and can be blocked by citizens' protest. In order for an OWDZ to be formed, the County Environmental Health Agency, and the RWQCB must determine "...the maximum number, type, volume, and location..." of onsite systems which can be used within the zone without threatening public health or water quality. This ensures that an OWDZ cannot be used to justify otherwise unacceptable development.

Federal legislation (Clean Water Act of 1977) provides that federal funds are available to subsidize 85 percent of the cost of improving individual onsite wastewater disposal systems. To qualify, these systems must protect water quality more effectively (in economic, social and environmental terms) than the construction of a sewer system, and must be under the management of a public agency (such as an OWDZ).

There are two examples of inspection/maintenance districts in the AMBAG region--the San Lorenzo Valley Inspection District, and Santa Cruz CSA 12. Other onsite management programs include a Marin Countywide District, Stinson Beach County Water District, Bolinas Community Public Utility District, Georgetown Divide Public Utilities District, Kern County CSA 40 and Olcese Water District.

In the AMBAG region the following three areas should be considered for possible inclusion in an OWDZ. Figures IV-1 and IV-2 document existing knowledge of problem locations. Current or proposed facility plans will conduct more detailed consideration of OWDZ's for these areas.

- San Lorenzo Valley -- Sensitive groundwater and surface water resources are threatened by failing septic systems on small lots. The area is under heavy development pressure. Provision of a central sewer system could prove difficult and expensive because of scattered development and rugged terrain. A study administered by the San Lorenzo Valley County Water District is underway to develop solutions to present and anticipated problems.

- North Monterey County Area -- This area is rapidly developing. Septic system failures are becoming more common and local problem areas have been documented. Provision of a sewer system would be expensive because of scattered development. A study is underway to develop solutions to present and anticipated problems.

- Carmel Valley/Highlands -- Sensitive groundwater and surface water resources could be threatened by failing septic systems, but major documented problems do not presently exist. However, Carmel Valley is under heavy development pressure, and population growth may tax the ability of the area to assimilate wastewater onsite. Sewers would be expensive because of low-density development. A study has been proposed to minimize anticipated problems.

The RWQCB's Basin Plan recommends public management of onsite systems for all areas with lots of less than one acre. Santa Cruz County's "Comprehensive Wastewater Management Program" recommends a county-wide maintenance district. The San Lorenzo Valley General Plan recommends establishment of a management district in the San Lorenzo Valley.

I. Pre-Sale Inspection

New homeowners are often ignorant of the maintenance needs and location of their septic systems, and may be unaware that they own one. This lack of knowledge discourages proper maintenance, can result in major unexpected costs to recent purchasers, and can affect the market value of a home. Some lending organizations, such as the VA, FHA and some Savings and Loan Institutions, recognize this and require certification of the adequacy of a home's septic system before issuing a mortgage loan.

Inspection at the time of home sale would assure that the system was not failing, that it was structurally sound, and that it was adequately maintained. It could also provide the new homeowner with information on the location of his system and would emphasize the need for ongoing maintenance.

No legal or administrative impediments to pre-sale inspection have been identified and the costs, both public and private, would be reasonable (see Appendix J-6 for further information on legal, administrative, and financial aspects).

J. Coordinated Land Use/Wastewater Management Planning

The AMBAG region is experiencing rapid growth. Substantial development will continue into the forseeable future, requiring new approaches to wastewater management. Existing facilities will need expansion, and areas now using onsite disposal may need to be sewered.

Development patterns dictate wastewater management options. The need for, and kind of, future sewage collection and treatment facilities will be determined by current land use planning. Since sewer systems are very expensive (especially when low-density development in remote locations must be served), coordination of land use and wastewater management planning can result in substantial financial and water quality benefits.

Coordination would essentially involve directing growth so as to permit either economical central treatment or continued onsite disposal without the threat of water quality degradation. Current state-of-the-art allows such coordination.

Santa Cruz County's Growth Management Program, the San Lorenzo Valley Sanitary Study, and Septic Tank Suitability Study will facilitate coordinated planning within the County. In Monterey County, the following current or proposed planning projects relate to land use/wastewater management questions:

Carmel Valley Master Plan Revision
Carmel Valley Highlands Wastewater Management Study (201 Facilities Planning)
Local Coastal Planning Program
North County Master Plan Revision
Castroville County Sanitation District Wastewater Management Study (201 Facilities Planning)

K. Septage Disposal

Periodic removal of solids (septage) from septic tanks is important to their proper operation. The availability of septage disposal sites influences the price, and hence the regularity, of septic tank maintenance. Monterey County has adequate septage disposal capability, primarily at the Marina landfill site, but rates for pumping in Santa Cruz County have recently increased dramatically as a result of the closing of the Santa Cruz landfill to septage.

Lack of convenient septage disposal sites threatens water quality because of the increased probability of illegal dumping by an unscrupulous operator and negligence toward repair of systems. Planned expansion of the Santa Cruz sewage treatment plant may permit septage disposal at this site in the future, however, this is uncertain.

L. Update Process

Knowledge of onsite disposal system theory and practice is expanding. Realization of the importance of proper onsite disposal to water quality has led to accelerated research at national and state levels. The State Water Resources Control Board, in coordination with other state and local agencies, has initiated research and certification programs for alternative disposal devices.

New knowledge will have little practical significance if it is not made widely available. In recognition of this, the U.S. Environmental Protection Agency is establishing a national Clearinghouse for Alternative Treatment Information, the SWRCB is developing a Public Information and Education Program for onsite practice, and the State Association of Environmental Health Officers has an onsite alternate methods committee.

Although information on onsite systems is being developed and distributed, there is no mechanism at the county or regional level to facilitate the incorporation of new knowledge into local practice.

M. Procedures for Site Evaluation (Early Action)

Site evaluation for porposed septic systems depends heavily on judgements regarding the nature of soil and parent material, surface and subsurface drainage, and possible cumulative impacts. Field sanitarians, and others involved in site evaluation, customarily make judgements regarding the adequacy of a site from the standpoint of surface drainage patterns, soil depth, soil nature and structure at different depths, groundwater elevation at different times of year, land slope and possible cumulative effects. These factors, which are subject to infinite variability, must be evaluated subjectively in the field.

The distribution of written guidelines would help ensure that judgements are made uniformly, and that new procedures become widely applied as they prove their practicality. Guidelines would support and be supported by two other elements of the proposed AMBAG water quality plan: educational tools for county staffs and management update process. The distributed procedures would recognize the need for informed interpretation as field conditions dictate. They should, however, be detailed enough to document current practice. Since no new procedures would be developed and documentation would be limited to current practice, staff time requirements for formulating the guidelines should not be great.

N. Septic System Density Control (Early Action)

Dense development using septic systems threatens water quality because the nitrates and salts in the groundwater are increased and because hydraulic interference between the systems increases the probability of poorly treated effluent either reaching the surface or percolating to the water table. A survey of ten subdivisions in coastal and foothill counties, conducted by the State Water Resources Control Board, indicates that when a development on half-acre lots reaches 25 to 30 percent buildout there are numerous failing systems. It is possible that each parcel in a subdivision of small lots could meet the criteria for septic system siting but, due to the cumulative effect, massive failure would occur when all the systems were operating. Existing septic system problems in our region (San Lorenzo Valley, Las Lomas, Moss Landing) are prime examples of what can result from development on small lots. Failures resulting from this dense development could necessitate very expensive sewer projects.

Besides controlling groundwater contanimation and hydraulic interference between systems, septic system density controls help insure that if effluent does surface, the pollution will be confined to one property where there will be ample room for a replacement absorption field.

The actual minimum lot size which would prevent hydraulic interference between adjacent systems, and which would insure groundwater protection, is a function of soil, terrain, aquifer characteristics, and weather. Where soil conditions are favorable, and where a cumulative effect from nearby systems is unlikely, a small lot might provide adequate treatment of effluent. In another area a larger lot might be inadequate. From a planning standpoint the critical issue is that once an area has developed beyond its capacity to safely absorb effluent, mitigation is difficult, expensive and sometimes impossible. It seems prudent to institute a reasonable density control at this time. SWRCB staff recommends a two-acre lot minimum where septic systems are installed over an aquifer used for drinking water. A one-acre minimum has been adopted by many jurisdictions and is recommended in the RWQCB's Basin Plan.

O. Deep Disposal of Septic Effluent

Septic tank effluent is treated by soil bacteria and other organisms in the biologically active zone of the earth's soil mantle. This active zone corresponds to the depth of penetration of plant roots. Below the biologically active zone, scarcity of bacteria and plant roots and reduced oxygen availability make removal of pollutants less complete. Many authorities, and AMBAG's groundwater consultant, have recommended the use of shallow subsurface absorption systems in order to maximize nutrient uptake by plants and oxidation of organiz pollutants by soil bacteria.

Existing local regulations limit the proximity of subsurface absorption systems to water tables, but it is probable that pollutants (especially nitrate) not subject to biological activity will eventually reach groundwater regardless of separation distance. Trench depths of eight to ten feet are common in the region. Disposal pits may be thirty feet or more deep. Deep systems are attractive to developers because they use less land and may be more convenient to construct. There is very little information available on which to base an assessment of the groundwater impacts of deep absorption systems in the Monterey Bay Region.

RECOMMENDED MANAGEMENT PRACTICES

The following measures are recommended:

A. Training

Institute a training program for professionals in onsite wastewater management. (See Appendix J-1 for proposed course syllabus.)

B. Evaluation of Septic System Performance

1. Systematically record and map septic system failures, including date and location of failure, type of problem, cause, service provided and number of people regularly using system.

2. Evaluate the feasibility of developing a computerized septic system data analysis program, using the SWEEPP program or other systems where feasible. Participation in the SWEEPP program would be voluntary for county agencies.

C. Manhole Risers

Provide manhole risers from the septic tank to ground surface on new installations to facilitate tank location and cleaning. Riser lids may be recessed a maximum of twelve inches below grade.

D. Dual Leach Fields

1. Install dual leachfields in new septic system installation on all new community or in other large commercial septic systems requiring discharge permits from the Regional Water Quality Control Board. Single absorption systems shall be required for residential units except in those areas or cases which are public health problems or which are prone to other system failures. In these cases dual absorption systems shall also be required. Each component of the dual field will provide 75 percent of the currently required infiltration area.

2. During repairs to existing absorption systems, provide for alternation between the old and new sections of the system whenever feasible.

3. Alternate adjacent trenches in dual fields whenever the field is composed of adjacent parallel trenches.

E. Public Information

1. Distribute the Homeowners Septic Tank Guide using the channels identified in Appendix J-7.

2. Develop a public information presentation, or delivery to selected audiences.

G. Installation Practice

1. Provide adequate training to county staffs and septic system installers to allow effective implementation of adequate installation standards (see Recommendation A, "Training").

2. Establish a demonstration program to establish the effects of soil smearing and the practicality of using back hoe raker teeth to roughen sidewalls during absorption system construction. Modify construction practice accordingly. (See Appendix J-2 for proposed plan for demonstration program.)

3. Practical statewide guidelines to protect soil structure during leachfield construction should be established.

H. Onsite Wastewater Disposal Zone

1. Establish an Onsite Wastewater Disposal Zone in the San Lorenzo Valley. Coordinate Onsite Wastewater Disposal Zone planning with current San Lorenzo Valley Wastewater Management study. (See Appendix J-3 for proposed OWDZ service arrangements and Appendix J-4 for proposed coordination strategy.)

2. Consider the Onsite Wastewater Disposal Zone option during current or proposed 201 Facilities planning for the Monterey North County and Carmel Valley-Highlands areas, referring to Appendix J-4 of this Plan for proposed coordination strategy.

I. Pre-Sale Inspection

Monterey and Santa Cruz Counties should enact ordinances to require pre-sale inspection of septic systems. Inspection should include elements outlined in Appendix J-6 of this Plan.

J. Coordinated Land Use/Wastewater Management Planning

Compile septic system suitability information for Monterey and Santa Cruz Counties, utilizing published studies, results of current wastewater management planning, septic system failure data and experience of Environmental Health staff to guide and coordinate land use and wastewater management planning. (See Appendix J-5 for proposed Task Outline.)

K. Septage Disposal

1. Encourage pumping contractors in Santa Cruz County to acquire adequate private disposal sites.

2. The City of Santa Cruz' expanded sewage treatment plant should be designed to accept septage, if this is technically feasible. Determination of feasibility should be undertaken as soon as possible.

   If disposal at the Santa Cruz sewage treatment plant is impractical, a study of septage disposal alternatives should be conducted, either as part of the current San Lorenzo Valley Sanitation Study, or through a new county-wide septage disposal study.

L. Update Process

1. Establish a program to transfer results of national and state research to counties and regional boards.

2. Establish a mechanism at the County and regional level to facilitate transfer of new knowledge into field practice, and to transmit the results of local field experience to research agencies.

M. Procedure for Site Evaluation (Early Action)

Make available procedures which are currently used in evaluating sites for septic systems in Monterey County.

N. Septic System Density Control (Early Action)

1. Institute a one acre lot minimum for new septic system installations in Santa Cruz and Monterey Counties.

2. Revise minimum lot size if further soil, geologic and hydrologic study shows this to be appropriate. (See study recommendations in Appendices J-4 and J-5.)

O. Deep Disposal of Septic Effluent

Further study should be undertaken to determine the effects of deep disposal systems on groundwater quality and to develop mitigations, especially for the San Lorenzo, Carmel Valley, North Monterey County, and parts of the Pajaro and Salinas aquifers.

RECOMMENDED IMPLEMENTATION PROGRAM

A. Training

State Water Resources Control Board and State Department of Health will jointly develop a proposal for a training program for county staffs and other professionals in onsite wastewater management to be presented through such forums as community colleges or special seminars. Final determinations regarding course content and length, instructors, course evaluation strategy, etc., will be made in collaboration with County Environmental Health agencies. AMBAG will provide coordination as necessary.

Note: Preliminary determination of course content has been made by affected agencies. Lead agencies will develop detailed proposal (See Appendix J-1).

B. Evaluation of Septic System Performance

1. Monterey County Environmental Health and Santa Cruz County Watershed Manager's Office will map instances of septic system failures.

2. State Water Resources Control Board, in coordination with the Department of Health and Environmental Health Officers throughout the State, will assess the feasibility of developing a septic system evaluation and planning program using SWEEPP, local computers, or other systems. Initial programming costs would be about $20,000. Subsequent costs would be nominal. Once established, the same program could be used by many jurisdictions.

C. Septic Tank Risers

Monterey County and the City of Scotts Valley should revise their Septic Tank Ordinances to ensure provision of septic tank risers. Staffs should publish construction standards to ensure reliability and safety.

Tank risers will add $100-200 to the cost of installation. This cost will be offset by less expensive pumping fees and extended absorption system life.

D. Dual Absorption Fields

1. Monterey County should ensure that dual absorption systems are installed on all new community septic systems or on larger commercial systems that require discharge permits from the Regional Water Quality Control Board.

2. Single absorption systems will be required for residential systems except in those areas or cases determined by the Director of Environmental Health as being public health problems or failure prone areas. In such areas dual absorption systems will also be required.

3. Planning procedures identified in Recommended Management Practice J should be utilized to assist the Environmental Health Officer to determine health problem areas.

4. Monterey and Santa Cruz County Environmental Health staffs require that when a dual system is composed of adjacent, parallel trenches, the effluent delivery system is designed so trenches which are next to each other are alternately loaded and rested.

E. Leachfield Inspection Risers

Monterey County and the City of Scott's Valley should ensure that absorption field inspection risers are installed on all new community systems or on other large commercial systems which require discharge permits from the Regional Water Quality Control Board.

F. Public Information

1. Montere and Santa Cruz County Environmental Health Agencies and the City of Scotts Valley shall assume lead responsibility for ongoing distribution of the Homeowners Septic Tank Guide (See Appendix J-7).

   Note: Initial printing and distribution of Guide has been accomplished. County-wide distribution has been recommended by Santa Cruz Environmental Health Director and will be considered by Santa Cruz Supervisors in August.

2. Monterey and Santa Cruz County Environmental Health Agencies should develop public information presentations.

G. Installation Practice

1. See Recommendation No. 1, Training Program.

2. Santa Cruz County, State Water Resources Control Board and State Department of Health should jointly fund demonstration project. Santa Cruz County Watershed Manager's Office will take lead responsibility for Tasks 1-3 (Appendix J-2). U.S. Soil Conservation Service, Santa Cruz Environmental Health Agency, and Regional Water Quality Control Board will provide technical expertise during initial program development. AMBAG will provide administrative support as necessary.

3. State Water Resources Control Board should include protection of soil structure in the State Guidelines being developed as part of the "Action Plan for Alternative Wastewater Systems."

H. Onsite Wastewater Disposal Zone

1. An Onsite Wastewater Disposal Zone should be formed, by either the San Lorenzo Valley County Water District or by the County through annexation to County Service Area No. 12.

   The San Lorenzo Valley Sanitation Study should determine those areas in which formation of an OWDZ would be the most cost-effective solution to wastewater disposal problems, referring to the approach outlined in Appendix J-4 of this Plan.

   Services should include, at a minimum, regular inspection and maintenance of septic systems within the OWDZ (see Appendix J-3 for proposed program to provide these services). In addition, further services, as outlined in Appendix J-4, section 4, of this Plan, should be carefully considered. In particular, rehabilitation and upgrading of existing systems using grant funds available to the OWDZ, and water conservation measures, should be thoroughly evaluated. A groundwater monitoring program and a methodology for ongoing assessment of the effectiveness of the OWDZ should also be developed as part of the 201 plan.

2. Monterey Public Works Department and future designated lead agency should respectively insure that Castroville County Sanitation District and Carmel Valley-Highlands 201 Facility Plans address OWDZ option.

I. Pre-Sale Inspection

Monterey and Santa Cruz Counties should enact ordinances to require pre-sale inspection of septic systems. Inspection should include elmeents outlined in Appendix J-6 of this Plan.

J. Coordinated Land Use/Wastewater Management Planning

1. Santa Cruz Community Resources Agency and Environmental Health staffs will continue to compile septic system suitability information as part of County Growth Management Program and Septic Tank Suitability Study.

2. Monterey County Environmental Health staff should compile septic system information as outlined in Appendix J-5 for use by Monterey County Planning Department in formulating land use plans.

3. State Water Resources Control Board and 201 lead agencies should include determination of groundwater pollution potential from septic tanks in 201 Step One studies wherever retention of septic systems is a possibility. Affected studies and local agencies are:

San Lorenzo Valley County Water District
-- San Lorenzo Valley Sanitation Study

Monterey County (Public Works) -- Castroville County Sanitation District Study

Designated Agency -- Carmel Valley-Highlands Study (proposed)

K. Septage Disposal

1. Santa Cruz County Environmental Health staff, in coordination with Regional Water Quality Control Board, will issue guidelines to assist pumping contractors in locating suitable private disposal sites.

Note: Guidelines have been made available under which two contractors have obtained private disposal sites. Other sites have been rejected as being inadequate.

2. State Water Resources Control Board, Regional Water Quality Control Board, City of Santa Cruz, and Santa Cruz County should ensure that all efforts are made to enable expanded Santa Cruz sewage treatment plant to accept septage.

If this is technically infeasible, State Water Resources Control Board, Regional Water Quality Control Board, Santa Cruz County and San Lorenzo Valley County Water District should take administrative and funding action to initiate a septage disposal study, either as part of the current San Lorenzo Valley Sanitation Study or through a new county-wide study.

L. Update Process

1. State Water Resources Control Board will establish liaison between federal and state information sources and local jurisdictions.

2. Monterey and Santa Cruz Environmental Health agencies and Regional Water Quality Control Board will work with State Water Resources Control Board to establish a mechanism for information transfer. Such a mechanism might ultimately involve academic authorities, citizens, and contractors. AMBAG will provide initial administrative support.

M. Procedures for Site Evaluation (Early Action)

Monterey County Environmental Health staff make available evaluation procedures. (Monterey County has implemented this recommendation.)

N. Septic System Density Control (Early Action)

1. Santa Cruz and Monterey Counties institute a one-acre minimum lot standard for septic systems. Variances will be supported as described below. Specific amendments to the county ordinances are suggested as follows: (Monterey County has adopted such an ordinance.)

MONTEREY COUNTY (Adopted by Monterey County May 26, 1978)

Add Subsection (4) to Section 30b of the Zoning Ordinance.

(4) Subsurface Absorption Devices:

(a) Notwithstanding any other provisions of the Zoning Ordinance, new dwellings using sewage disposal by septic tank shall not be permitted on parcels of less than one acre.

A variance to the area regulations of Section 30b(4) should be granted only if the Director of Environmental Health makes a determination that, in his judgement, no danger to health or water quality would occur as a result of the variance. This determination should be supported, in writing, by the Director's findings regarding soils and parent material, surface and subsurface drainage and possible cumulative impacts. A method for evaluating requests for variances to Section 30b(4) should be included in the written site evaluation procedures to be made available by Monterey County Environmental Health staff, as recommended above.

SANTA CRUZ COUNTY

Revise section (b) of ordinance 11.76.040 as follows:

(b) Where Prohibited. An individual sewage disposal system shall not be permitted where the property line is within 200 feet of a public sewer and connection thereto is feasible, and an individual sewage disposal system shall not be permitted on a lot of less than one acre area. The provisions of this subsection (b) shall be subject to the special provisions for mobile homes, travel trailers, apart-

ment and motels contained in Resolution 125-72 of the Board of Supervisors. A variance to the building site area requirement may be granted by the Health Officer if he determines that no danger to health or water quality would occur as a result of the variance. This determination shall be supported, in writing, by the Health Officer's findings regarding soils and parent material, surface and subsurface drainage and possible cumulative impacts. The Health Officer may require from the applicant such information as may be necessary to make his determination.

Delete sections (c) and (e) of Ordinance 11.76.040.

2. State Water Resources Control Board and 201 lead agencies should ensure that 201 Facility Plans assess impact of existing land use controls on groundwater quality in their study areas and recommend new density controls if appropriate (see Appendix J-4 for proposed strategy).

   Santa Cruz Community Resources and Environmental Health agencies, and Monterey County Planning and Environmental Health agencies should recommend new density controls in conjunction with implementation of recommendation J, "Coordinated Land Use/Wastewater Management Planning." This effort should be integrated with 201 planning whenever possible in order to reduce local costs.

O. Deep Disposal of Septic Effluent

1. The San Lorenzo Valley, Carmel Valley-Highlands, and Castroville Wastewater Facility (201) Studies should consider the impact of deep disposal systems within their study areas.

2. The State Water Resources Control Board should address the problem of deep disposal during the development of the new State Guidelines being undertaken as part of the Board's "Action Plan for Alternative Wastewater Management Systems."

3. The U.S. Environmental Protection Agency should develop guidelines concerning deep disposal systems as part of its update of the Manual of Septic Tank Practice.

TARGET IMPLEMENTATION DATES

A. Training

May 1978 - Preliminary determination of format and context of training program.

May 1979 - Complete course syllabus, choose instructor(s), determine recognition for course completion, prepare course evaluation strategy.

B. Evaluation of Septic System Performance

December 1978 - Initiate septic system failure mapping program in Monterey County

January 1979 - Complete feasibility assessment of SWEEPP program for onsite data

C. Septic Tank Risers

January 1979 - Revise Monterey County Septic Tank Ordinance. Issue construction standards

D. Dual Leach Fields

July 1979 - Identify areas and cases in which use of dual fields is indicated

January 1980 - If necessary, revise ordinances and regulations on dual fields

E. Inspection Risers

January 1979 - Revise Monterey County Ordinance

F. Public Information

June 1979 - Print and begin distribution of Homeowner's Septic Tank Guide

January 1979 - Develop public information presentation, begin presentations

G. Installation Practice

May 1979 - Complete Tasks 1-3 of demonstration program. Formualte design for field scale demonstration

December 1979 - Complete field demonstration, institute appropriate management practices

H. Onsite Wastewater Disposal Zone

June 1979 - Institute OWDZ in San Lorenzo Valley; implement proposed service arrangements

I. Pre-Sale Inspection

December 1978 - Initiate development of administrative and legal guidelines for pre-sale inspection

January 1979 - Institute pre-sale inspection mechanisms

J. Coordinated Land Use/Wastewater Management Planning

November 1978 - Initiate groundwater impact assessment, analysis of density controls

January 1979 - Initiate compilation of septic system information for use in land use planning

K. Septage Disposal

May 1978 - Issue guidelines for septage disposal sites

October 1978 - Determine practicality of using City of Santa Cruz expanded sewage treatment plant for septage disposal; initiate further studies if necessary

L. Update Process

January 1979 - Establish mechanism for information transfer

June 1979 - Information transfer process is regular operation

M. Procedure for Site Evaluation (Early Action)

April 1978 - Monterey County Environmental Health staff make evaluation procedures available (implemented as part of Early Action program)

N. Septic System Density Control (Early Action)

January 1979 - Monterey County, Santa Cruz and City of Scotts Valley amend ordinances

O. Deep Disposal of Septic Effluent

November 1978 - 201 Studies initiate investigation of deep disposal in the study area

June 1979 - SWRCB develop guidelines for deep disposal

June 1979 - U.S. Environmental Protection Agency develop guidelines for deep disposal

IMPACT ASSESSMENT

SIGNIFICANT EFFECTS: Plan proposals for training, evaluation of system performance, public information, installation practice, presale inspection, coordinated planning, onsite disposal practice update process and procedures for site evaluation would improve management and effectiveness of septic tank systems as wastewater disposal devices. In and of themselves these changes would have no direct impact on the environment.

The recommended changes in septic tank design factors (risers, dual leach fields, potential increased cost of construction and presale inspection) would add about $700 to the cost of newly constructed homes utilizing septic tanks. These investments should result in lower operating costs over the long run. The impact on housing costs, while measurable, is small; the average cost of new homes constructed in the region was over $90,000 in 1976, thus the additional investment for sewage treatment is less than one percent. Establishment of an Onsite Wastewater Disposal Zone in problem areas would reduce the incidence of septic tank failures without significant other environmental or social impacts.

These proposals would allow the continued use of septic tanks for waste disposal in certain areas of the region with a much reduced risk of failure and contamination of ground and surface waters.

MITIGATION MEASURES: These proposals themselves mitigate the impacts of continued reliance on septic tanks.

ALTERNATIVES: Potential options for improving the reliability of onsite disposal underwent two screenings in the planning process. Use of alternative soil tests was considered such as the "crust test" (a more sophisticated and accurate indication of infiltration rates); these options were rejected as too time consuming and costly. Design measures determined to be less effective than the recommended measures were: trenches as absorption area, serial distribution, dosing, sizing of gravel fill material, shallow trenches, sidewall infiltration surface, trench and pit spacing, and pressure distribution of effluent.

Management of wastewater flows to reduce effluent production and consequently decrease the changes of system failure through mandatory water rationing or modification to plumbing was rejected as inappropriate to the problem.

Alternative disposal systems were considered and recommended for further evaluation as experience with them grows.

Mandatory maintenance contracts and county inspection of private systems were determined to be less effective than an onsite wastewater disposal zone in insuring proper maintenance of septic systems.

Centralized sewer systems may be required in some presently unsewered areas as densities of homes increase. Central sewer systems also entail lower risks of groundwater and local surface water contamination if wastewaters are exported from an area for disposal. However, central treatment does improse more concentrated wastewater loads at the ultimate disposal site. Central sewers in rural areas also entail prohibitvely high costs to homeowners which is precisely why these onsite disposal measures have been investigated. If no project were begun, the low awareness of the importance of maintenance by septic tank owners would probably continue resulting in continued failures and surface and groundwater contamination.

SHORT TERM USES VERSUS LONG TERM PRODUCTIVITY: The ability to rely on independent systems for waste treatment, given proper design to allow for the assimilation of wastes, avoids costly centralized systems. Centralized systems would tend to create pressure for higher density development to reduce the per capita costs of treatment, despite the fact that many areas on septic systems are inappropriate for dense development for other reasons.

SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES: GROWTH INDUCEMENT: Providing means of effectively managing septic tanks may remove one current restraint to development of some rural lands. The provisions coordinating land use planning with wastewater planning are crucial to avoiding such adverse effects.

TABLE IV-1: SEPTIC SYSTEM RECOMMENDATION COST SUMMARY[1]

MANAGEMENT RECOMMENDATION	PUBLIC COSTS		FUNDING SOURCE	PRIVATE COSTS		COMMENTS
	INITIAL	ANNUAL		INITIAL	ANNUAL	
A. Development of Training Program	2500[2]	See Comment	SWRCB State Health Dept. Mo. Co. S. C. Co. AMBAG	0	0	Costs depend on scope of continuing training program. Funding through SWRCB and/or community colleges.
B1. Failure Mapping	0	1000	Mo. Co.	0	0	Average 1/2 man-month per year.
B2. Evaluation of SWEEPP and Other Systems	1000[2]	0	SWRCB	0	0	
C. Septic Tank Risers	0	0	----	100-200	Note 3	Savings through reduced maintenance changes.
D. Dual Leach Fields	0	0	----	500	Note 3	
E. Inspection Risers	0	0	----	50	Note 3	
F1. Public Information Homeowner's Guide	2200	130	Mo. Co. S. C. Co.	0	0	Printing and mailing costs.
F2. Public Information Staff Costs	250[2]	1500[2]	Mo. Co. S. C. Co. City of Scotts Valley	0	0	Coordinate distribution of Guide; 13 public presentations per year (3 hours each) 2 man weeks per year for other work (see Appendix J-7)
G. Installation Practice - Demonstration Project	2050[2]	0	SWRCB State Health Dept. S. C. Co.	0	0	Tasks 1-3, Appendix J-2
G2. Installation Practice - State Guidelines	3000[2]	0	SWRCB	0	0	

TABLE IV-1: SEPTIC SYSTEM RECOMMENDATION COST SUMMARY[1] (cont.)

MANAGEMENT RECOMMENDATION	PUBLIC COSTS		FUNDING SOURCE	PRIVATE COSTS		COMMENTS
	INITIAL	ANNUAL		INITIAL	ANNUAL	
H. Onsite Wastewater Disposal Zone	3500	2400	Service Fees	0	30[3]	Costs are for minimum service arrangement proposed in this plan (Appendix J-3)
I. Pre-Sale Inspection	0		Inspection Fees	25-30	Note 3	Fees with be paid either to County or private contractors, depending on mechanism chosen.
J1. Monterey County Coordinated Planning	0	2000	Mo. Co.	0	0	Average one man-month per year.
J2. Coordinated Groundwater Impact Assessment	56-69,000	0	75% Federal 12.5% State 12.5% Counties	0	0	To be included in current and proposed 201 studies.
K. Septage Disposal	1-5000	0	75% USEPA 12.5% SWRCB 12.5% City of Santa Cruz	0	0	Costs refer to City of Santa Cruz 201 septage disposal assessment.
L. Update Process	See Comment	See Comment	SWRCB USEPA	0	0	Costs depend on mechanism chosen. No new local funding anticipated.
M. Procedures for Site Evaluation (Early Action)	500[2]	0	Mo. Co.	0	0	Implemented.
N1. Density Control - One Acre Minimum (Early Action)	0	0	----	See Comment #2	Note 3	1. Implemented by Monterey County. 2. No out-of-pocket costs. Losses may be incurred through lessening of development potential.
N2. Density Control - Further Study	See Recommendation J, "Coordinated Planning"					

TABLE IV-1: SEPTIC SYSTEM RECOMMENDATION COST SUMMARY[1] (cont.)

MANAGEMENT RECOMMENDATION	PUBLIC COSTS		FUNDING SOURCE	PRIVATE COSTS		COMMENTS
	INITIAL	ANNUAL		INITIAL	ANNUAL	
01. Deep Disposal - 201 Studies	30,000	0	75% USEPA 12.5% SWRCB 12.5% 201 Lead Agencies	0	0	Cost breakdown assumes accomplishment as part of 201 studies.
02. Deep Disposal - SWRCB Guidelines	5000[2]	0	SWRCB	0	0	
03. Deep Disposal - USEPA Guidelines	5000[2]	0	USEPA	0	0	

NOTES:

1. 1977 Dollars

2. Personnel requirements fall within scope of existing agency activities. No new staffing anticipated.

3. Savings will be realized through extended system life, avoidance of inconvenience and costs involved in later repairs, and/or through avoidance of charges for community collection systems and treatment plants.

CHAPTER V

ELEMENT: EROSION AND SEDIMENT MANAGEMENT

INTRODUCTION

Soil erosion and sedimentation are pervasive problems in the Monterey Bay region, related to a variety of activities. Soil left bare by the planting of crops, particularly on hillsides, excessive grazing by cattle and construction of homes, shopping centers and highways results in erosion and sedimentation during periods of rainfall. This problem has several facets and incurs a variety of costs. Loss of valuable topsoil in agricultural areas will, if left unattended, eventually render the land unproductive. Accumulation of sediment in storm drains, culverts, and drainways requires regular maintenance by road crews and public works departments. Sediment in streams creates "muddy" or turbid water and destroys spawning areas and other wildlife habitat. Thus erosion/sedimentation is more than a water quality problem (although the focus of AMBAG's 208 program is on water quality). It is also a soil problem, a drainage problem and a maintenance problem.

What are erosion and sediment?

Briefly stated, erosion is the wearing away of the surface of the land by water (or wind), and sediment is the accumulated deposition of eroded particles that have been transported from the surface of the land. Rates of erosion and sediment are determined by runoff and land use. Runoff is that portion of precipitation (rainfall, etc.) or applied water (irrigation, etc.) that runs off the landscape, and land use is the use to which land is being put and/or designated by man. Erosion does not occur without runoff, sediment does not occur without runoff and erosion, and both runoff and erosion are influenced by the way man uses and manages the land.

Why are they a problem?

Some erosion and sediment is a natural geologic process, but man's activities, which accelerate the process, are the major causes of erosion and sediment, and of the associated water quality problem. Many detrimental substances pollute water as a direct result of erosion, sediment, runoff and land use. Oil, heavy metals, animal wastes, fertilizers, insecticides, septic tank seepage, etc., are transported in solution, in suspension, or attached to soil particles in runoff from the landscape. When these substances are mixed with, or deposited with, sediment in water, turbidity and pollution occur. Erosion also reduces the productivity of land by removing the topsoil, decreases the stability of roads and structures, and creates ugly scars on the landscape. Sediment also blocks drainageways, reduces the storage capacity of lakes and reservoirs, clogs recharge areas, and damages fish and waterfowl habitat.

Can they be controlled?

Most of the erosion and sediment that are caused by man's activities can be controlled (kept to a minimum, or even prevented) by the way land is used and managed. The technical capability of controlling erosion and sediment is available through the use of various measures called "best management practices" (BMPs). Many of these BMP's are economically beneficial, either to a land owner or to the general public (the taxpayer). However, for various reasons such as inconvenience, initial costs, or the lack of trained personnel, they have not been extensively utilized.

Has control been accomplished?

A number of agencies (federal, state and local) are presently involved in erosion and sediment control activities. In most cases, the major purposes of their various erosion and sediment control programs, laws, and/or ordinances are to conserve soil or to protect site stability, and water quality has only been a secondary objective. However, the control of erosion and sedimentation has not been accomplished, and the problems continue to increase both in frequency and in magnitude.

The U.S. Department of Agriculture can provide technical assistance, on a limited basis, to local units of government or to individual land owners. It also offers some very limited financial assistance to farmers. Their programs can be used to correct existing problems or to prevent the creation of new problems, but are completely voluntary.

The Regional Water Quality Control Board is one agency that has the authority to enforce water quality standards and to take action against existing erosion and sediment problems where they are shown to result in violations of water quality standards. Their action can require the correction of serious existing problems, but they can not prevent the problem from occuring.

The County of Santa Cruz has enacted a turbidity ordinance and a timber harvesting ordinance to address erosion and sediment problems. Other local programs, including city and county grading and subdivision ordinances, have addressed erosion and sediment control. However, they are mostly intended to prevent the creation of new problems rather than correcting existing problems.

As valuable as all of these efforts are, they have been less than successful because of budgetary restrictions, and a lack of staff or of trained personnel to carry out existing programs, laws and/or ordinances. However, even with adequate budgets, and an adequate staff of trained personnel, the existing programs, laws and/or ordinances are not strong enough to prevent the occurrence of new problems or to bring about the correction of existing and persistent problems.

Problem Identification:

During the course of study for the preparation of this 208 plan, considerable erosion and sediment control information was collected and compiled. This information is presented in detail in the Erosion and Sediment Control Technical Report, and was the basis for identifying the various problems in the AMBAG region.

In addition to identifying the major physical erosion and sediment problems, the Technical Report identified the best management practices that could be applicable to each of the problems and identified the various agencies, departments, programs, laws and/or ordinances and evaluated their ability, or inability, to adequately deal with those physical problems. These issues also are addressed in Policy Papers #9 and #12, and in Issue Papers #10 and #13.

As a result of AMBAG's contract of services with the Gloria Resource Conservation District (to be covered under"Early Action"), considerable additional information has been gathered on the existing physical problems. With this additional information and the assistance of the Soil Conservation Service, an "erosion and sediment pollution source map" was prepared. (Figures V-1a and V-1b)

The following briefly describes major existing erosion and sediment problems in the AMBAG region. Potential problems are included because they are prime examples of ongoing land use changes that are becoming problems that can be averted by the use of preventative actions. If preventative BMPs had been used in the past on potential problems such as these, many of the existing problems would not have occurred.

Existing Agricultural Problems

1. PROBLEM - VINEYARDS

   The runoff of rainfall and/or irrigation water from irrigated vineyards on sloping lands in the Gonzales-King City area is discharging sediments into water in the Salinas River.

2. PROBLEM - TRUCK CROPS

   The runoff of rainfall and/or irrigation water from irrigated truck crops on sloping land in the Salinas and Pajaro Valleys is discharging sediments into water in the Salinas and Pajaro Rivers.

3. PROBLEM - GRAINS

   The runoff of rainfall and/or irrigation water from irrigated grain on sloping land in south Monterey County is discharging sediments into water in the Salinas River.

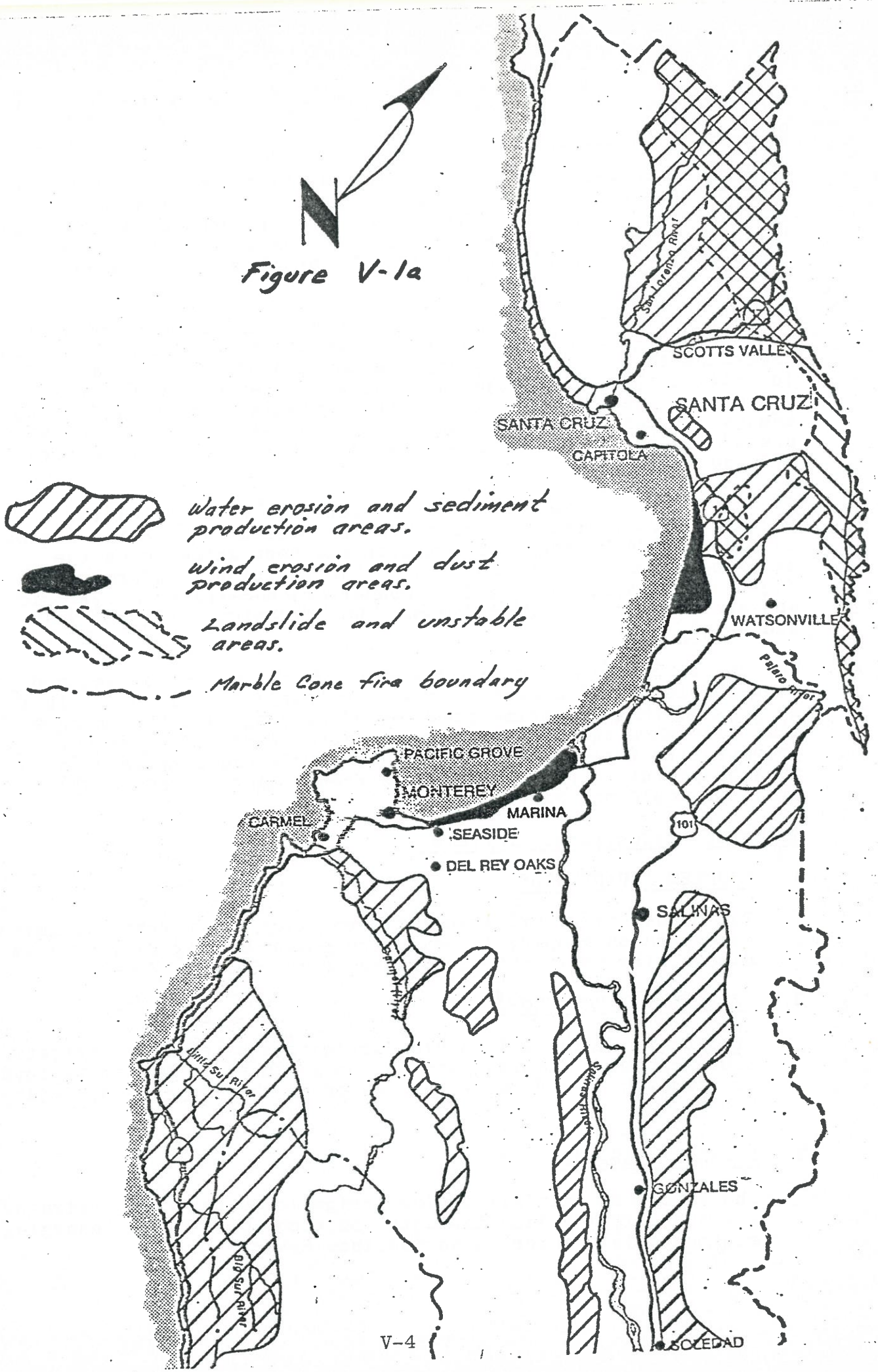

Water erosion and sediment production areas.
Wind erosion and dust production areas.
Landslide and unstable areas.
Marble Cone fire boundary
SCOTTS VALLEY
SANTA CRUZ
SANTA CRUZ
CAPITOLA
WATSONVILLE
Pajaro River
PACIFIC GROVE
MONTEREY
MARINA
CARMEL
SEASIDE
DEL REY OAKS
101
SALINAS
Arroyo Seco
Nacimiento River
San Antonio River
GONZALES
SOLEDAD

Figure V-1a

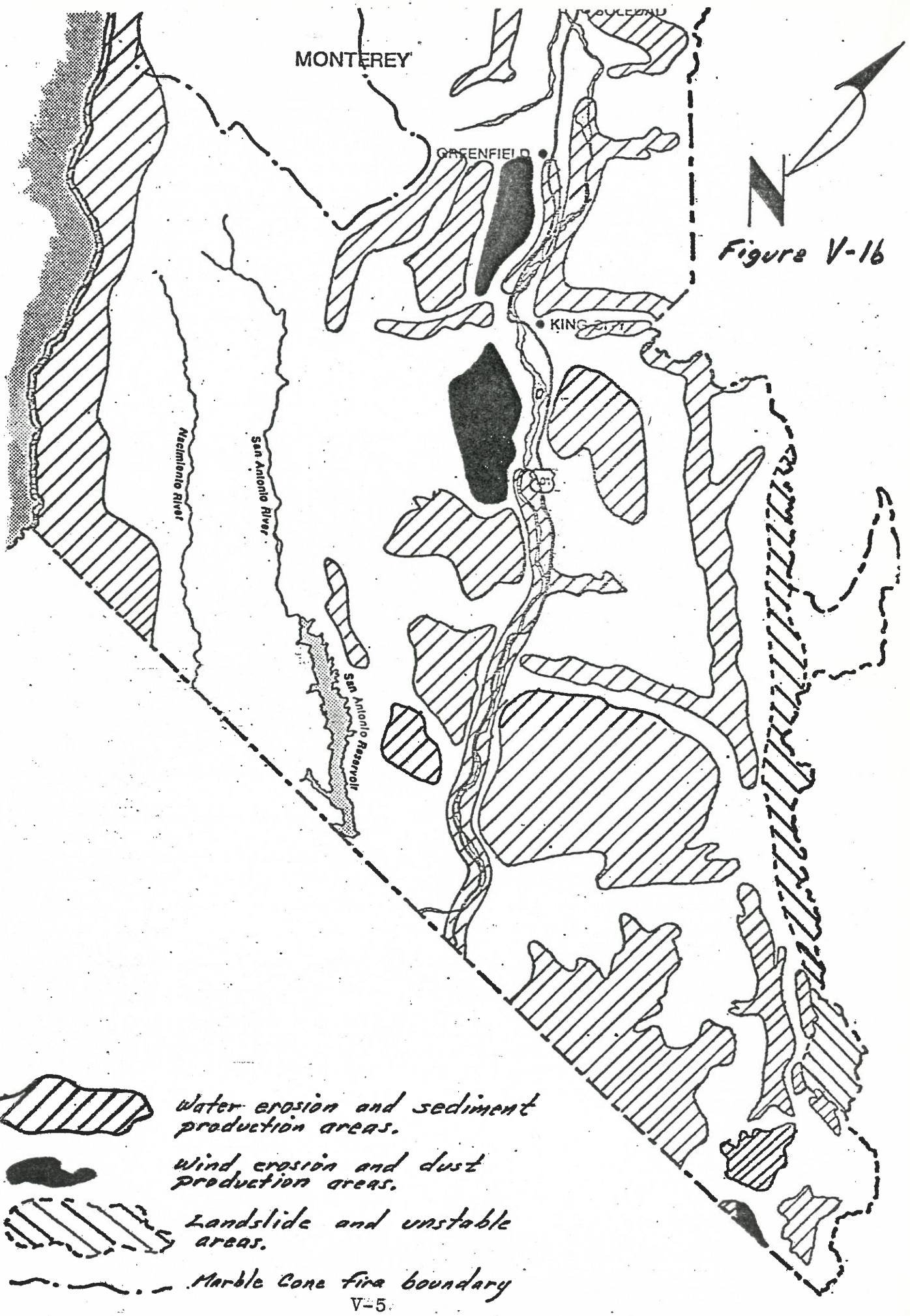

MONTEREY
GREENFIELD
KING
Nacimiento River
San Antonio River
San Antonio Reservoir
water erosion and sediment production areas.
wind erosion and dust production areas.
Landslide and unstable areas.
Marble Cone fire boundary

Figure V-16

4. PROBLEM - ORCHARDS

The runoff of rainfall from non-irrigated orchards on hilly land in eastern Santa Cruz County is discharging sediments into water in the Pajaro and other river systems.

5. PROBLEM - RANGELAND

The runoff of rainfall from overgrazed rangeland through the AMBAG area is discharging sediments into water in the area river systems. Notable sites are the southeastern hills of the Salinas Valley, Hunter Liggett, Ford Ord, and the Carmel River watershed.

6. PROBLEM - WOODLAND

The runoff of rainfall from logging activities on woodland in north Santa Cruz County is discharging sediments into water in the San Lorenzo and other rivers.

Potential Agricultural Problem

7. PROBLEM - MARGINAL LAND CONVERSION

The conversion of marginal agricultural land from grass and/or grazing to a more intensive agricultural use, especially on sloping land, without runoff and erosion controls and a management program to fit the conditions, will increase erosion and discharge of sediments into water in rivers and streams.

Existing Urban Problems

8. PROBLEM - LOW DENSITY RESIDENTIAL

The runoff of rainfall from low density residential areas on slopes and hills throughout the AMBAG area is discharging sediments into water in the river systems. Notable examples are the Santa Rita-Prunedale Elkhorn Slough drainage area, Carmel Valley, Monterey Peninsula, Corralitos, Scotts Valley, Ben Lomond, and Boulder Creek.

9. PROBLEM - HIGH DENSITY RESIDENTIAL

The runoff of rainfall from high density residential areas on slopes and hills is discharging sediments into water in river systems. Notable examples are the Carmel-Monterey-Seaside area, the Ben Lomond-Quail Hollow area, and the Aptos-Capitola-Santa Cruz area.

10. PROBLEM - OFF-SITE FLOODING

Off-site flooding and erosion caused by the runoff of rainfall from intensive residential-municipal areas on relatively flat land are discharging sediments into water in drainageways and sloughs. Examples are the north Salinas area and the Gonzales area.

11. PROBLEM - HORSES

The runoff of rainfall from small parcels (105 acres) with horses throughout the AMBAG area is discharging sediments into water inthe river systems. Notable examples are the Carmel Valley, Laguna Seca, Santa Rita, Prunedale, Scotts Valley, Soquel, Aptos, Felton, and other similar foothill-type subdivisions.

Potential Urban Problems

12. PROBLEM - EXPANSION AND INTENSIFICATION

The expansion and intensification of urban areas without consideration of the overall hydrologic capabilities of drainage characteristics and facilities will cause off-site flooding, erosion and the discharge of sediments into water in rivers and streams.

13. PROBLEM - SLOPE AND HILL DEVELOPMENT

Urban development on slopes and hills without adequate run-off and erosion control will increase erosion and the discharge of sediments into water in rivers and streams.

Other Existing Problems

14. PROBLEM - ROADS AND ROAD RIGHT-OF-WAYS

The runoff of rainfall from roads and road rights-of-way throughout the AMBAG area is discharging sediments into water in drains, creeks, rivers, and water bodies. All kinds of roads (city, county, state and private), particularly in the hills and mountains, contribute to the problem.

15. PROBLEM - STREAMBANKS

Runoff of rainfall in streams is eroding streambanks and discharging sediments into water in the river systems and water bodies throughout the AMBAG area.

16. PROBLEM - MINES AND QUARRIES

The runoff of rainfall from mines and quarries scattered throughout the AMBAG area is discharging sediments into water in river systems.

17. LANDSLIDES AND UNSTABLE AREAS

Active landslides and landslips in the watershed of Santa Cruz County (some are natural and some are man caused) are depositing soil directly into the waters of the river systems, or depositing soil on the landscape which is later discharged into the waters of the river systems as sediments by the runoff of rainfall.

OBJECTIVES

The basic objectives of an erosion and sediment control program are to correct existing man-caused erosion and sediment problems that are having a detrimental effect on water quality and other resources and to prevent the development of new or increased erosion and sediment problems due to man's activities.

Prevention

The creation of new erosion and sediment problems, or an increase in the magnitude of existing problems due to man's activities can be prevented or controlled through the adoption, implementation and enforcement of adequate erosion and sediment control ordinances. It is not unreasonable to expect the accomplishment of this part of the objective within the relatively short time frame of two years.

Correction

The correction of most existing man-caused erosion and sediment problems can be brought about through a long-term planning and implementation process that will, by planning areas, identify and precisely locate all existing problems, determine the corrective measures that are needed, and provide the necessary funding and technical assistance to assure application and maintenance. It is expected that this part of the objective can be accomplished over a period of 10 to 30 years.

FINDINGS

1. Accelerated erosion on agricultural lands degrades the productivity of the soil resource base by removing valuable topsoil. Fine soil particles and nutrients are removed causing reduced crop yields. Erosion reduces the infiltration capabilities of the soil which increases runoff and flooding. It also increases the costs for management, fertilizer, labor, equipment and fuel.

2. Erosion on non-agricultural lands such as urban areas, road right-of-ways, etc., reduces the stability of structures, roadways, and drainage facilities. In addition to the loss of nutrient rich topsoil, it increases runoff and the frequency of flooding. It also increases the costs for management, labor, equipment and fuel to maintain private property as well as public facilties.

3. Sediment produced by erosion is a pollutant and may carry soil absorbed chemicals, which are themselves pollutants. Sediment pollutes by muddying water, inhibiting photosynthesis, clogging fish gills, destroying fish spawning grounds, and increasing oxygen demands.

4. Sediment deposited in stream channels, reservoirs, estuaries, harbors, and conveyance structures such as road ditches, culverts, etc., reduces their capacity, increases the potential of flooding, and requires costly maintenance and removal programs.

5. Sediment deposited on the surface of the land damages agricultural crops and pollutes the landscape. In some cases, deposition which was once beneficial is now detrimental (productive soil being covered by less productive subsoil eroded from upland areas where the topsoil was previously eroded away). Sediment deposits on the surface of the land also cause costly maintenance and removal programs for public facilties such as roads, and for privately owned facilities.

6. More than 75 percent of all erosion, and the resulting sedimentation can be traced to man's activities and his unwitting mismanagement of the soil resources. (On-site investigation by the SCS and RCD's indicate this is as true for Salinas Valley as it is elsewhere.)

7. The technical capability is available to control most of the erosion and sediment caused by man's activities. Various measures called "best management practices" (BMP's) can be used in a cost-effective manner to prevent the development of further erosion and sediment problems, and to correct existing erosion and sediment problems.

8. The current legal capabilities of controlling erosion and sediment are not adequate to prevent erosion and sediment from becoming a problem, nor are they adequate to bring about the correction of existing erosion and sediment problems. (see AMBAG Erosion and Sediment Technical Report)

9. City and county departments with the responsibility of enforcing their various erosion and sediment control ordinances do not have adequate numbers of personnel for enforcement or compliance, nor do they have personnel on their staffs that are trained primarily in erosion and sediment control.

10. Agencies with technical expertise to address the problems of erosion and sediment control are the USDA, Soil Conservation Service, resource conservation districts, and the California Department of Transportation. However, these agencies do not have sufficient personnel.

* According to the Porter Cologne Act, deposited sediment is considered as a pollutant.

11. There are currently no specific erosion and sediment control education, training or certification programs other than the internal personnel programs of the USDA, Soil Conservation Service and the California Department of Transportation.

12. The property assessment procedures dictated by the California State Board of Equalization penalize and/or discourage the use of many best management practices. Also, the Federal and State Income Tax Laws do not provide incentives that will encourage the use of best management practices.

13. A re-direction of the efforts and programs of city and county public works and/or road departments, and of the California Department of Transporation, by emphasizing corrective-preventative actions, could result in a reduction in their overall operation and maintenance costs.

14. The State Regional Water Quality Control Board, charged with the enforcement of water quality laws, does not have enough staff to actively seek out erosion sources that are currently violating water quality laws.

15. The current erosion and sediment control programs of the federal government (through USDA), and of the local government (through the RCD's) are not adequately staffed or funded. As a result they have not been able to prevent the problems of erosion and sediment from occurring or increasing.

16. The State of California has no erosion and sediment control program. Consequently, there is no established state policy and/or guidelines to assist with the development of local erosion and sediment control programs. (A state program for erosion and sediment control is now being developed and is to be based on local input.)

RECOMMENDATIONS

It is clear that due to the diversity of the erosion and sediment problems, and of the various approaches that might be used to correct them, no one action will do the job. Therefore several recommendations are made that, if adopted, will bring about an erosion and sediment control program for the AMBAG region.

EARLY ACTIONS

During the course of this study certain things were recognized as actions that could be taken prior to the completion of the 208 plan. The following actions were proposed as "early action" items for the 208 Program, and were recommended to help move the resource conservation districts into a greater and more active role in non-point pollution control. The current results of each recommended action are included.

1. Technical Assistance: Early in the study it was recognized that the ongoing erosion control programs of the local resource conservation districts were in themselves non-point pollution controls, but they were inadequately funded and staffed. As a case study, the Gloria Resource Conservation District was funded to hire a technical employee to assist landowners within the district with the application of best management practices. The funding contract also called for the compilation of past district activities and cost information. This case study has been very successful at getting directly to the landowners and/or to some basic problems, and best management practices have been applied. The study has also developed some very interesting cost and activity information. The third quarter report of this case study is attached. (Appendix K).

The next five recommendations were included in Policy Paper #12, as "early action" items for erosion and sediment control.

2. RCD's have assessment powers under state legislation at a rate of $.02 per $100 of assessed valuation for land only. It is estimated that this rate would raise approximately $22,000 in Santa Cruz County and $70,000 in Monterey County applied on a county-wide basis. The two districts in Santa Cruz County currently levy assessments at less than the authorized amount. These two districts are presently in the process of consolidation to one county-wide district, which will also take in a large area along with coast not now within a district. AMBAG staff has been working closely with these two districts and supports the consolidation. One benefit of consolidation would be a larger financial base enabling the district to hire staff and operate a program. It is recommended that this consolidation be carried through to completion. (See Exhibit V-2 re: legal opinion that RCD's assessments are excluded from tax rate limitations under the property tax initiative.)

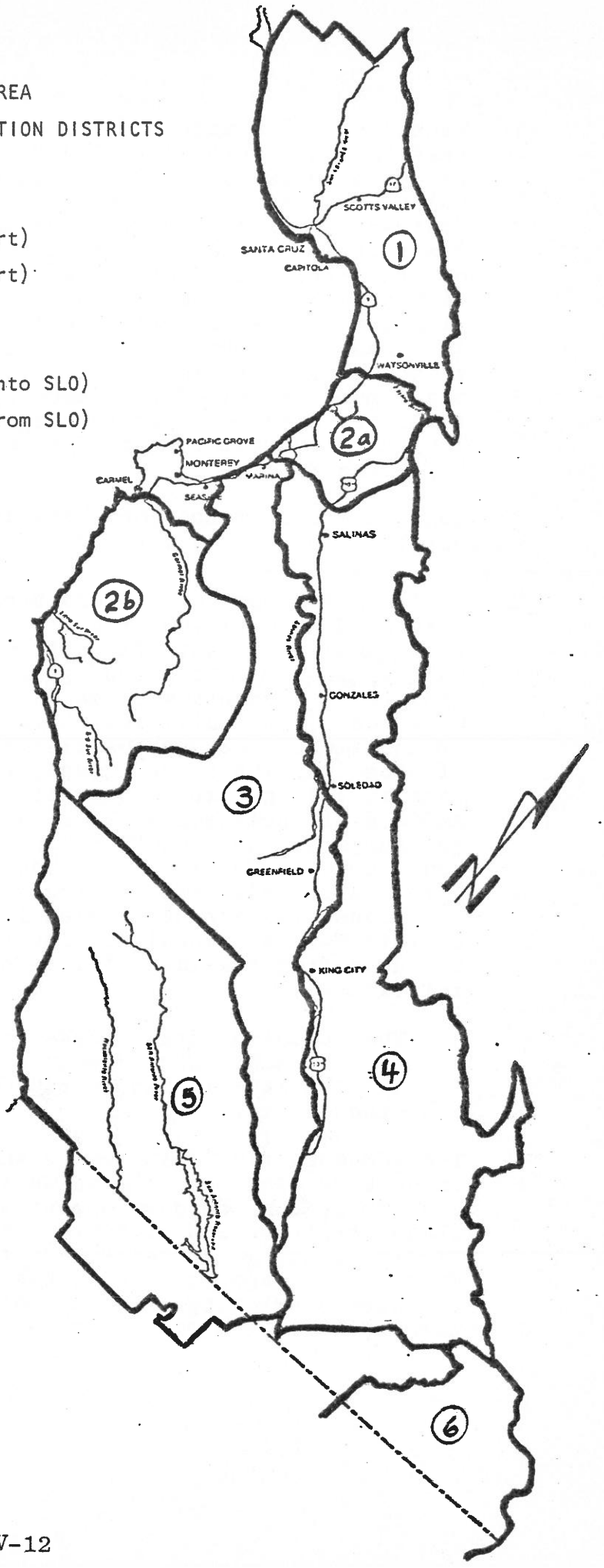
   The consolidation process is complete and as a result the new Santa Cruz Resource Conservation District includes all the land in Santa Cruz County except for the incorporated cities.

3. The RCD's in the AMBAG region should indicate their willingness through resolutions to provide technical assistance to local governments in the development and review of erosion control plans, programs and standards, and to work jointly with land owners, local governments, and the Regional Water Quality Control Board in the application of best management practices (BMP's) to correct existing erosion/sediment problems and to prevent new problems from occurring.

AMBAG AREA

RESOURCE CONSERVATION DISTRICTS

1. Santa Cruz County RCD
2a. Monterey Coast RCD (north part)
2b. Monterey Coast RCD (south part)
3. Mission Soledad RCD
4. Gloria RCD
5. Nacitone RCD (some overlap into SLO)
6. Upper Salinas RCD (overlap from SLO)



Four of the five RCD's have passed resolutions indicating their willingness to provide this assistance and to perform these duties. However, the resolutions are based on their ability to obtain the necessary funds and staff.

4. The AMBAG demonstration project with the Gloria RCD is intended to show the feasibility and acceptability of having districts hire staff and provide technical assistance to landowners. This project has already had a favorable response. It is recommended that the RCD's indicate by resolution their willingness to hire staff when funds are available to continue this program of technical assistance to landowners.

   Four of the RCD's have passed resolutions indicating their willingness to hire staff. However, the resolutions are based on their ability to obtain the necessary funds. The Santa Cruz County RCD has rented office space for the use of an SCS technician in Santa Cruz County and is considering hiring part-time clerical help and a part-time or summer student to assist with field work.

5. It is recommended that the RCD's in Monterey County consider pooling their financial resources for the purpose of maintaining a staff after the conclusion of the Gloria RCD technical assistance project.

   The Gloria RCD and Mission Soledad RCD have pooled some of their financial resources to hire part-time clerical assistance to free a technician for more field work. They are now considering the continuation of the technical employee after the conclusion of the Gloria RCD project.

   Note: The RCD's in Monterey County have been pooling their equipment and resources for a number of years.

6. The U.S. Department of Agriculture and the Environmental Protection Agency have established a Model Implementation Program to concentrate resources in a limited number of areas over a three year period to solve existing and potential problems. AMBAG has submitted an application for inclusion in this program. It is recommended that USDA and EPA act favorably in AMBAG's application.

   Although the application was pursued quite vigorously, and was quite high in the national standings, it was not selected as a project area.

MANAGEMENT PRACTICES

The recommendation of management practices, as discussed earlier, is for the adoption and use of various measures called "best management practices" (BMP's). Some seventy-five were identified in the Eriosion and Sediment Control Technical Report, and all are valid methods of either preventing or controlling erosion and/or sediment from a specific source, site or land use. However, their numbers and the possible combinations of their uses require their consolidation into some simpler form or approach.

SUB-SYSTEMS APPROACH

Sub-systems Approach to Best Management Practices for Reducing Non-Point Sediment Pollution

The intent of the water quality management planning process is to solve existing non-point source pollution problems and prevent non-point source pollution problems from occurring in the future. To this end, Best Management Practices (BMP's) are to be identified. Experience has shown that no one conservation practice best solves an existing, or prevents a potential pollution problem, especially in the area of soil erosion and sedimentation. As land use, the land user and various situations change, so does the need for conservation practices. The practices must be site specific and an on-site investigation with the land user is necessary to determine which set of practices will be most effective and acceptable.

The combination of all the inter-related conservation practices and management techniques needed to maintain or improve soil, water, plant and related resources for a primary land use is called a resource management system. Examples are Resource Management System for Cropland, Resource Management System for Pastureland, and Resource Management System for Wildlife Lane. A resource management system is composed of one or more resource management sub-systems.

For the purpose of water quality management planning in the AMBAG area, Best Management Practices (BMP's) are defined as Resource Management Sub-systems. The specific Best Management Practices are:

Erosion Control Sub-system
Pasture Management Sub-system
Range Management Sub-system
Recreation Management Sub-system
Soil Management Sub-system
Water Management Sub-system
Wildlife Management Sub-system
Woodland Management Sub-system

Each resource management sub-system includes component conservation practices needed to maintain or improve one of the resources associated with that particular land use. See Appendix M for the descriptions of the sub-systems, a tabular presentation of the relationship of BMP's and land use, a glossary of the component conservation practices, and tabular examples (by land use and problem) of the reduction of both erosion and sedimentation that is expected with the use of alternative component practices and various combinations.

Any number of the sub-systems (BMP's) may be utilized on a particular resource management system. Table V-1 shows the relationship between identified problems, and the BMP's needed to reduce erosion and sedimentation. Table V-2 shows the BMP's needed for the major types of erosion.

Sub-systems (BMP's) that will prevent non-agricultural problems from occurring in the future should be utilized for all development/construction activities (urban, transportation, etc.).

Sub-systems (BMP's) that will correct non-agricultural problems should be utilized in all non-agricultural areas (urban, transportation, industrial, etc.)

IMPLEMENTATION PROGRAM

The control and direction of Federal and State actions and programs are beyond the boundaries and influence of the AMBAG region, and AMBAG is not in a position to bring about direct changes. However, since the area is influenced by Federal and State actions and programs, recommendations of actions needed at the Federal and State levels are included.

1. The federal government should increase its support of erosion and sediment control programs by increasing its technical staffs, increasing cost-share funds, increasing the availability of low-interest loans, and by changing its income tax laws to encourage the use of best management practices for erosion and sediment control.

   Note: The Clean Water Act of 1977 (PL95-217 12/27/77) amended section 208 of the Federal Water Pollution Control Act by adding a new subsection for agricultural cost sharing. A copy of the new subsection is included as Exhibit V-1, the information needed for the implementation of this program is provided in Figures V-2a and V-2b, and in Tables V-4, V-5, and V-6.

2. The State of California should establish an erosion and sediment control program that would assist counties, cities, and resource conservation districts with the preparation and implementation of erosion and sediment control plans. A state program should also include incentives for the individual such as cost-sharing, changes in state law that would reduce property taxes for enduring erosion and sediment control practices, and incentives through the state income taxes. (These programs should be developed with local input.)

Table V-1. BEST MANAGEMENT PRACTICES NEEDED FOR SPECIFIC LAND USES AND PROBLEMS

Source of Sediment: Specific Land Use	Best Management Practices Resource Management Sub-systems
AGRICULTURAL	
1. Vineyards (irrigated)	Soil Management Sub-System Water Management Sub-system *Erosion Control Sub-system
2. Truck Crops (irrigated)	Soil Management Sub-system Water Management Sub-system *Erosion Control Sub-system
3. Grains (non-irrigated)	Soil Management Sub-system *Erosion Control Sub-system
4. Orchards (non-irrigated)	Soil Management Sub-system *Erosion Control Sub-system
5. Rangeland	Range Management Sub-system *Erosion Control Sub-system
6. Woodland	Woodland Management Sub-system *Erosion Control Sub-system
7. Marginal Land Conversion	Soil Management Sub-system Water Management Sub-system *Erosion Control Sub-system
NON-AGRICULTURAL	
8. Low Density Residential	*Erosion Control Sub-system
9. High Density Residential	*Erosion Control Sub-system
10. Off-site Flooding	*Erosion Control Sub-system
11. Horses	Pasture Management Sub-system Recreation Management Sub-system *Erosion Control Sub-system
12. Expansion and Intensification	*Erosion ControlSub-system
13. Slope and Hill Developement	*Erosion Control Sub-system
14. Roads and Road Right-of-ways	*Erosion Control Sub-system
15. Streamland	
16. Mines and Quarries	*Erosion Control Sub-system
17. Landslides and Unstable Areas	*Erosion Control Sub-system

*Needed where problems exist or are expected to occur.

TABLE V-2 BEST MANAGEMENT PRACTICES NEEDED FOR MAJOR TYPES OF EROSION

Types of Erosion	Best Management Practices							
	Erosion Control Sub-system	Pasture Management Sub-system	Range Management Sub-system	Recreation Management Sub-system	Soil Management Sub-system	Water Management Sub-system	Wildlife Management Sub-system	Woodland Management Sub-system
Sheet and Rill Erosion	E	N	N	N	N	N	N	N
Sheet and Rill Erosion due to Irrigation on Cropland	E				E	E		
Gully Erosion	E	N	N	N	N		N	N
Streambank Erosion	E	N	N	N			N	N
Landslide	E	N	N	N			N	N
Erosion from Transportation Routes	E			N		N		
Erosion from Construction Activities	E					N		

E = Essential
N = Needs evaluation on-site to determine if essential
/_/= Not needed

3. The Regional Water Quality Control Board should gear up its activities to address erosion and sediment problems as they affect water quality. (Sediment, as a carrier for fertilizers and insecticides, etc., is a major source of water pollution.

   a. The Board should develop procedural guidelines for their staff for reacting quickly to water quality problems associated with preventable erosion.

   b. The Board's staff should be prepared to pursue enforcement (Cleanup and Abatement Orders) against land owners or others who fail to institute erosion and sediment controls, and require that any cleanup and abatement actions under their direction should be in compliance with erosion and sediment control plans (Best Management Practices) prepared and/or approved by a local resource conservation district, the U.S. Soil Conservation Service, and/or someone trained in the field of erosion and sediment control. This will require closer communication between the RWQCB and the SCS and RCD's.

   c. The RWQCB staff will have to be increased to handle the increased work load if landowners or other responsible parties fail to cooperate.

4. Cities and Counties should adopt stringent erosion and sediment control ordinances and upgrade existing grading ordinances so that erosion and sediment production areas (unstable and erosive soils) are adequately protected.

   Note: Three model ordinances presented in Appendix G are summarized below

   <u>Erosion/Sedimentation Control Model Ordinance 1</u>

   This ordinance covers all development grading activities and certain agricultural activities and requires a detailed erosion and sediment control plan including: existing conditions, mitigation measures, implementation, and maintenance. It is enforced by civil fines and stop-work orders.

   <u>Erosion/Sediment Control Device Maintenance Model Ordinance 2</u>

   A serious need is to insure that once devices are installed, they are properly maintained. Under this ordinance, if maintenance is inadequate, the property owner is notified or given a certain time to make the needed corrections. Upon failure to comply, the necessary corrections are made and their costs is assessed to the property owner.

   <u>Livestock - Caused Erosion Control Model Ordinance 3</u>

   This ordinance is to prevent water quality degradation due to the keeping and grazing of livestock on small parcels of land. Standards deal with buffer zones as well as diversions, sediment basins and other devices. Permits are issued upon submission of a detailed plan.

5. City and County departments charged with the responsibility of overseeing and enforcing the ordinance procedures should develop adequate staff of personnel trained in erosion and sediment control. They should also actively seek the assistance of the U.S. Soil Conservation Service and the local resource conservation districts in the review and approval of erision and sediment control practices (BMP's).

6. Resource conservation districts should gear up their activities to provide the management and technical assistance that will be needed to address the erosion and sediment problems of the area. They should levy the full assessment allowed by law (2¢ per $100 of assessed valuation of land only) to assure financial stability and capability. They should hire and train technical employees, and where possible make use of the CETA and CCC programs. They should perform the two basic planning functions to:

    a. Develop long range programs that will identify all erosion and sediment problems within the districts, develop alternative BMP's, set work priorities, and a schedule of planning that will, within the next 30 years, develop a basic erosion and sediment control plan for each individual, land owner/cooperator.

    b. Prepare, review, and or/approve various erosion and sediment control plans for individuals and units of government. This includes the development of basic erosion and sediment control plans (for individual, land owner/cooperators) and provides a detailed analysis of the problems, alternative BMP's, and implementation schedule, and technical and financial assistance needs. This also includes the systematic review of EIR's and/or development plans (for units of government and/or developers) with comments and recommendations on the adequacy of and/or need for erosion and sediment controls (BMP's).

    Note: See legal opinion (Exhibit V-2) that RCD assessments are excluded from tax rate limitation.

7. Resource conservation districts, the U.S. Soil Conservation Service, the California Department of Transportation, and the Extension Service, in conjunction with the cities and counties, should develop and carry out an erosion and sediment control training program for all employees that will be checking the adequacy of grading, erosion and sediment control plans, and the compliance, maintenance and enforcement of grading, erosion and sediment control practices (BMP's), and laws.

8. The resource conservation districts, the U.S. Soil Conservation Service, and the University of California, should seek the assistance of the Soil Conservation Society of America (a professional society) in developing an educational and training program, and a certification and registration procedure for people trained in the field of erosion and sediment control.

9. Cities and Counties should prepare plans for the correction of existing erosion. Such plans would cover all urban and rural residential areas, identifying all existing erosion and sediment problems, and set a schedule for the systematic implementation of best management practices to correct the various erosion and sediment problems (on private as well as public land) within the next 30 years. The selection of shorter range implementation periods (such as 5 year increments) is at the discretion of the individual planning and implementing entities. They should seek the assistance of the Soil Conservation Service and the local resource conservation districts in the development, review, and scheduling of the plans and the various BMP's.

10. Following the format for Cities and Counties, (number 9 above) the California Department of Transportation (CALTRANS) and County Road Departments should prepare plans for the correction of existing erosion and sediment problems within, or caused by roads and/or road right-of-ways.

Note: The funding of the implementation phases of these parts of the 208 Plan (Nos. 9 and 10 above) is a somewhat novel approach.

It proposes to utilize existing departmental resources (funds and manpower) by redirecting certain activities from the cleaning up of sediment and the repair of erosion damage, to the prevention of their occurance. Once begun, the preventative work would slowly eliminate the major sources of sediment and the casues of erosion damage, thereby increasing the amount of funds and manpower that can be used for preventative work.

Since large parts of the budgets and manpower of City, County and State departments (Public Works, Roads, Flood Control, CALTRANS, etc.) are expended on cleaning up sediment and repairing erosion damage, and since these expenditures increase as development increases, it is reasonable to assume that eventually this approach, when coupled with stronger ordinances and enforcement that will prevent future problems, would provide a substantial reduction in operation and maintenance costs for the affected departments.

Table V-3 presents a cost summary of the recommended erosion and sediment control implementation program.

TABLE V-3 SUMMARY OF COSTS FOR EROSION AND SEDIMENT CONTROL

RECOMMENDATION	PUBLIC COSTS		FUNDING SOURCE	PRIVATE COSTS		COMMENTS
	INITIAL	ANNUAL		INITIAL	ANNUAL	
1. Increased federal support:						
a. Staffs for AES & SCS (technical assistance)	See Comment	See Comment	Federal Appropriations	0	0	Recommended federal actions will require action by the legislature. The public costs (through federal taxes) will depend on the actions taken by the legislature. The costs of the legislative processes are not considered as a part of the costs of the recommendations.
b. Loans for FMHA (low interest for erosion control measures)	See Comment	See Comment	Federal Appropriations	0	0	
c. Cost-sharing funds for ASCS, SCS, & EPA	See Comment	See Comment	Federal Appropriations	0 1/	0 1/	
d. Income Tax Incentives IRS	See Comment	See Comment	-----	0	0	
2. State support:						
a. Develop erosion and sediment control policy and program in the Dept. of Conservation (1) Staff (technical assistance) (2) Funds (cost-sharing)	See Comment	See Comment	State Appropriation	0 1/	0 1/	Recommended actions by the Department of Conservation will require administrative action. Funding for staff and cost-sharing will require action by the state legislature. The public costs will depend on State legislature actions.
b. Tax incentives (1) Property tax changest (State Board of Euqlization) (2) Income tax changes (St.Franch.Tax Bd.)	See Comment	See Comment	-----	0	0	Changes in tax laws will require action by the state legislature.

Footnotes _/ at end of Table

TABLE V-3 SUMMARY OF COSTS FOR EROSION AND SEDIMENT CONTROL

RECOMMENDATION	PUBLIC COSTS		FUNDING SOURCE	PRIVATE COSTS		COMMENTS
	INITIAL	ANNUAL		INITIAL	ANNUAL	
3. Increased cleanup and abatement activities by the RWQCB.	0	$30,000[2/]	State Appropriation (or possibly fines)	See Comment	See Comment	Only those individuals that are required to take actions (under a cleanup and abatement order) would incur any costs and those would depend on what needs to be done.
4. Adoption of stringent erosion and sediment control ordinances and upgrade grading ordinances by Cities and Counties.	$26,000[3/]	0	Cities and Counties. (possibly from permit fees or from fines)	See Comment	See Comment	The costs of the initial development would be slightly increased. However, studies show that where stricter controls are utilized, the savings of both private and public funds exceeded the increased costs.
5. Development of adequate staffs (both in number and in training) to oversee and enforce ordinance procedures by Cities and Counties	$25,000[4/]	$150,000[5/]	Ciites and Counties (possibly from permit fees or from fines)	See Comment	See Comment	Same as above. Also, the increase in staffs to assure adequate erosion and sediment control will bring about a reduction of staff (in other departments that are charged with cleanup and repair activities) that will offset the increased costs.

Footnotes _/ at end of Table

TABLE V-3 SUMMARY OF COSTS FOR EROSION AND SEDIMENT CONTROL

RECOMMENDATION	PUBLIC COSTS		FUNDING SOURCE	PRIVATE COSTS		COMMENTS
	INITIAL	ANNUAL		INITIAL	ANNUAL	
6. Increased erosion and sediment control activity by the Resource Conservation Districts (5 in the AMBAG region)						Division 9 of the Public Resources Code for the State of California is the law under which RCD's were formed, and operate. Under this law, RCD's are to: (1) develop districtwide comprehensive plans; and (2) through agreements or contracts, provide assistance to any public agency, or individual in the form of planning, plan review and/or technical assistance. This recommendation, aided by EPA funding, provides the RCD's with the opportunity to perform the functions envisioned by Division 9.
a. Long Range Programs	$50,000 6/	0	USEPA-75% RCD's-25%	0	0	
b. Prepare, review, and/or approve site specific erosion and sediment control plans --						
(1) for Cities/Counties	0	$20,000 7/	RCD funds (possibly from fees)	0 9/	0 9/	
(2) for individuals	0	$60,000 8/	USEPA-75% RCD's-25%	0 10/	0 10/	
7. Develop erosion and sediment control training program for personnel that deal with adequacy, compliance, maintenance and enforcement of erosion and sediment controls, for City and County staffs, by RCD's, SCS, CALTRANS and AES	0 11/	$20,000 11/	RCD's, SCS, CALTRANS and AES	0	0	

Footnotes _/ at end of Table

TABLE V-3 SUMMARY OF COSTS FOR EROSION AND SEDIMENT CONTROL

RECOMMENDATION	PUBLIC COSTS		FUNDING SOURCE	PRIVATE COSTS		COMMENTS
	INITIAL	ANNUAL		INITIAL	ANNUAL	
8. Development of Certification and Registration procedure for people with training in erosion and sediment control, by the Soil Conservation Society of America (a professional organization)	0	0	0	0	0	The only public costs that would apply to this is in the preparation and issuing of training certificates for Recommendations 5 and 7 above. The development of a registration procedure for erosion and sediment control specialists would be done by a professional group (SCSA) that would set the standards. Individuals would pay their own registration fees.
9. Preparation of erosion and sediment control plans to correct existing problems in urban and rural residential areas. Identify problems, needed BMP's and set implementation schedule, by Cities and Counties.	$250,000 12/	See Comment	USEPA-75% City/County -25%	0	0	The implementation phases of the various plans, by correcting existing problems, will bring about a reduction of costs now being spent on cleanup and repair activities.

Footnotes _/ at end of Table

TABLE V-3 SUMMARY OF COSTS FOR EROSION AND SEDIMENT CONTROL

RECOMMENDATION	PUBLIC COSTS		FUNDING SOURCE	PRIVATE COSTS		COMMENTS
	INITIAL	ANNUAL		INITIAL	ANNUAL	
10. Preparation of erosion and sediment control plans to correct existing problems within or caused by road right-of-ways. Identify problems, needed BMP's, and set implementation schedules. By County Road Departments for County maintained roads, and by CALTRANS for state maintained roads.	$60,000 13/	See Comment	USEPA-75% County/ CALTRANS -25%	0	0	Same as above.

Footnotes / at end of Table

TABLE V-3 Footnotes

1. Cost sharing programs can require the individual receiving the assistance to contribute up to 50% of the cost. Maintenance, or annual, costs are the individuals responsibility.

2. Represents one additional staff person per year.

3. This represents $5,000 for each County and $1,000 for each City for the development of the ordinances.

4. This $25,000 represents a committment of staff time to training programs. For appropriate staff within each City/County, it is assumed that necessary training will require 2 weeks per employee.

5. This represents 5 person years/year: 2.5 - Monterey Co.; 1- Santa Cruz Co.; 1.5-Cities. Total costs covers (annually) the time required to administer erosion and sediment control ordinances including time for development plan review, site inspection, and followup enforcement.

6. This $50,000 is apportioned as follows: Nacitone RCD - $2,000; Monterey Coast RCD-$5,000; Mission Soledad RCD - $10,000; Santa Cruz Co. RCD - $15,000; Gloria RCD - $18,000. (The apportioning was based partly on the extent of the problems within the RCD's and partly on their current capability of contributing 25% of the costs.) Long range programs, developed over a short time frame, will set the priorities for the preparation of individual, site-specific plans to be prepared over a long time frame in Recommendation 6,b (2).

7. This annual cost of $20,000 is to assist cities and counties in reviewing developer - submitted erosion and sediment control plans. It is based on assumptions that the RCD's will review 200 proposals/year and that each proposal will require 4-6 hours, or about 6 months total.

8. Total costs of developing erosion and sediment control plans (over 30 years) for all farms in the region which do not now have plans, is estimated to be $1.75 million (1977 dollars) Basis: 1974 Census and SCS 1977 records.

   Number of Farms 1,978 with 1494,141 acres.
   Number of Farms with current plans 658 with 351,907 acres.
   Number of Farms without plans 1,320 with 1,142,234 acres.
   1977 planning costs = $1.54/acre
   1,142,234 x $1.54 = $1,759,040 ÷ 30 = $58,633/year (1977 dollars)

TABLE V-3 Footnotes (Continued)

9. See comment following Recommendation No. 4.

10. Individuals following the recommendations in a precise erosion and sediment control plan could incur some initial and annual private costs. However, many of the various erosion and sediment control alternatives are cost effective (a profit instead of a cost).

11. The committment of city/county staff time to attend training programs is covered in Recommendation No. 5. The costs to the agencies that would conduct the training programs will depend on the scope of the program developed. However, since they are already involved (to various degrees) in training programs that could be expanded to include city/county personnel. It is estimated that an additional ½ person year is needed.

12. Unlike the farmland erosion and sediment control program, Recommendation 6,b,(2). These urban plans should be developed in a relatively short time with implementation over a 30 year period beginning with the highest priority problems. The $250,000 represents the cost of plan preparation for the cities, and for the urban and rural residential areas of the counties.

13. The $60,000 represents the cost of plan preparation for approximately 3,000 miles of roadway in the AMBAG area. Cost per mile is estimated to be $20.00. These plans should also be developed in a relatively short time with implementation over a long time frame beginning with the higherst priority problems.

Note: Where public costs represent a time requirement, it is not necessarily the case that new people must be hired. In fact, it is generally assumed that certain existing personnel will be trained in erosion and sediment control to enable them to carry out the plan requirements.

AGRICULTURAL COST SHARING

SEC. 35. Section 208 of the Federal Water Pollution Control Act is amended by adding at the end thereof the following new subsection:

Contracts program, establishment and administration. 33 USC 1288.

"(j)(1) The Secretary of Agriculture, with the concurrence of the Administrator, and acting through the Soil Conservation Service and such other agencies of the Department of Agriculture as the Secretary may designate, is authorized and directed to establish and administer a program to enter into contracts, subject to such amounts as are provided in advance by appropriation acts, of not less than five years nor more than ten years with owners and operators having control of rural land for the purpose of installing and maintaining measures incorporating best management practices to control nonpoint source pollution for improved water quality in those States or areas for which the Administrator has approved a plan under subsection (b) of this section where the practices to which the contracts apply are certified by the management agency designated under subsection (c)(1) of this section to be consistent with such plans and will result in improved water quality. Such contracts may be entered into during the period ending not later than September 31, 1988. Under such contracts the land owner or operator shall agree—

Contract terms.

"(i) to effectuate a plan approved by a soil conservation district, where one exists, under this section for his farm, ranch, or other land substantially in accordance with the schedule outlined therein unless any requirement thereof is waived or modified by the Secretary;

"(ii) to forfeit all rights to further payments or grants under the contract and refund to the United States all payments and grants received thereunder, with interest, upon his violation of the contract at any stage during the time he has control of the land if the Secretary, after considering the recommendations of the soil conservation district, where one exists, and the Administrator, determines that such violation is of such a nature as to warrant termination of the contract, or to make refunds or accept such payment adjustments as the Secretary may deem appropriate if he determines that the violation by the owner or operator does not warrant termination of the contract;

"(iii) upon transfer of his right and interest in the farm, ranch, or other land during the contract period to forfeit all rights to further payments or grants under the contract and refund to the United States all payments or grants received thereunder, with interest, unless the transferee of any such land agrees with the Secretary to assume all obligations of the contract;

"(iv) not to adopt any practice specified by the Secretary on the advice of the Administrator in the contract as a practice which would tend to defeat the purposes of the contract;

"(v) to such additional provisions as the Secretary determines are desirable and includes in the contract to effectuate the purposes of the program or to facilitate the practical administration of the program.

Technical and financial assistance.

"(2) In return for such agreement by the landowner or operator the Secretary shall agree to provide technical assistance and share the cost of carrying out those conservation practices and measures set forth in the contract for which he determines that cost sharing is appropriate and in the public interest and which are approved for cost shar-

Exhibit V-1

ing by the agency designated to implement the plan developed under subsection (b) of this section. The portion of such cost (including labor) to be shared shall be that part which the Secretary determines is necessary and appropriate to effectuate the installation of the water quality management practices and measures under the contract, but not to exceed 50 per centum of the total cost of the measures set forth in the contract; except the Secretary may increase the matching cost share where he determines that (1) the main benefits to be derived from the measures are related to improving offsite water quality, and (2) the matching share requirement would place a burden on the landowner which would probably prevent him from participating in the program.

Contract termination.

"(3) The Secretary may terminate any contract with a landowner or operator by mutual agreement with the owner or operator if the Secretary determines that such termination would be in the public interest, and may agree to such modification of contracts previously entered into as he may determine to be desirable to carry out the purposes of the program or facilitate the practical administration thereof or to accomplish equitable treatment with respect to other conservation, land use, or water quality programs.

"(4) In providing assistance under this subsection the Secretary will give priority to those areas and sources that have the most significant effect upon water quality. Additional investigations or plans may be made, where necessary, to supplement approved water quality management plans, in order to determine priorities.

Administration agreements reports and costs.

"(5) The Secretary shall, where practicable, enter into agreements with soil conservation districts, State soil and water conservation agencies, or State water quality agencies to administer all or part of the program established in this subsection under regulations developed by the Secretary. Such agreements shall provide for the submission of such reports as the Secretary deems necessary, and for payment by the United States of such portion of the costs incurred in the administration of the program as the Secretary may deem appropriate.

"(6) The contracts under this subsection shall be entered into only in areas where the management agency designated under subsection (c)(1) of this section assures an adequate level of participation by owners and operators having control of rural land in such areas. Within such areas the local soil conservation district, where one exists, together with the Secretary of Agriculture, will determine the priority of assistance among individual land owners and operators to assure that the most critical water quality problems are addressed.

Regulations.
Post, p. 1588.

"(7) The Secretary, in consultation with the Administrator and subject to section 304(k) of this Act, shall, not later than September 30, 1978, promulgate regulations for carrying out this subsection and for support and cooperation with other Federal and non-Federal agencies for implementation of this subsection.

"(8) This program shall not be used to authorize or finance projects that would otherwise be eligible for assistance under the terms of Public Law 83-566.

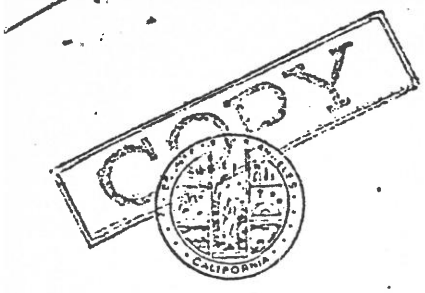
16 USC 1001 note.

Appropriation authorization.

"(9) There are hereby authorized to be appropriated to the Secretary of Agriculture $200,000,000 for fiscal year 1979 and $400,000,000 for fiscal year 1980, to carry out this subsection. The program authorized under this subsection shall be in addition to, and not in substitution of, other programs in such area authorized by this or any other public law.".

Exhibit V-1

Chapter VII
Erosion / Sediment



COUNTY OF LOS ANGELES

OFFICE OF THE COUNTY COUNSEL
648 HALL OF ADMINISTRATION
LOS ANGELES, CALIFORNIA 90012

JOHN H. LARSON, COUNTY COUNSEL
DONALD K. BYRNE, CHIEF DEPUTY

February 23, 1978

974-1857

Topanga-Las Virgenes Resource
Conservation District
Post Office Box 164
Topanga, California 90290

Re: Jarvis Tax Initiative

Gentlemen:

You ask our interpretation of several provisions of the Jarvis Tax Initiative.

1. Does the tax rate limitation imposed by the initiative apply to the charge levied by your district?

2. How are real property taxes allowed by the initiative to be allocated among the several local taxing agencies?

3. What does the term "special taxes" as used in the initiative mean?

We conclude:

1. The charge levied by your district is an ad valorem special assessment. Legal authority exists which would exclude such assessments from a tax rate limitation. We cannot anticipate whether the courts will follow such authority in the case of the Jarvis Initiative.

Exhibit V-2

2. The initiative provides that the State Legislature will determine the allocation of permissible taxes among the several local taxing agencies.

3. The term "special taxes" is undefined in the tax initiative. For this reason and because of the generality of the term, we cannot predict the construction which may eventually be placed on it.

A constitutional initiative commonly referred to as the Jarvis-Gann Tax Initiative has qualified for the June 1978 ballot. This initiative proposes the addition of Article XIII A to the State Constitution.

Section 1(a) of proposed Article XIII A provides:

> "The maximum amount of any ad valorem tax on real property shall not exceed One percent (1%) of the full cash value of such property. . . ."

Your district, in accordance with Section 9505 of the Public Resources Code, levies an annual ad valorem charge, described in the statute as an "assessment," upon land within the district.

Whether a particular charge is a tax or a special assessment is governed by the nature of the imposition and not by the statutory designation. People v. Austin (1874) 47 Cal. 353, 358.

A tax is a charge based on value levied on all taxable property, both real and personal, within a district. An ad valorem assessment, on the other hand, is a charge based on value but levied only on real property. Wells v. Union Oil Co. (1938) 25 Cal. App. 2d 165, 166; Los Angeles County Flood Control District v. Hamilton (1917) 177 Cal. 119, 128.

The characteristics of the charge levied by your district make it an ad valorem special assessment. In this regard the California Supreme Court has held that the exemptions from property taxation authorized by Section 4 of Article XIII of the State Constitution apply only to those charges which are taxes and not to those which are ad valorem special assessments.

Exhibit V-2

Cedars of Lebanon Hospital v. Los Angeles County (1950) 35 Cal. 2d 729, 746. Under general rules of constitutional construction, provisions relating to the same subject are said to be in pari materia and are to be given the same meaning. This rule would require "tax" in proposed Section 1(a) of Article XIII A be given the same meaning as "tax" in present Section 4 of Article XIII. Such construction would make the one percent tax rate limitation of the Jarvis Tax Initiative inapplicable to your district.

However, we cannot assure you that the initiative will be so construed. It is possible the courts will feel that the intention of the people in voting for the initiative was to impose a limit on all ad valorem charges, and so give a broad meaning to the word "tax."

The word "tax" has been construed with equal propriety, in two distinct senses. One inclusive and the other exclusive of special assessments. Which meaning is intended must, the court held in Chicago G. W. Ry. Co. v. Kansas N. W. Ry. (1907) Kan. 88 P. 1085, 1086, be determined by the context in which it is used.

Section 1(a) of proposed Article XIII A in part provides:

> ". . . . The one percent (1%) tax to be collected by the counties and apportioned according to law to the districts within the counties."

This provision authorizes the Legislature to provide for the method of allocation among the various local taxing agencies of those taxes permitted by the initiative.

Section 4 of proposed Article XIII A reads:

> "Cities, Counties and special districts, by a two-thirds vote of the qualified electors of such district, may impose special taxes on such district, except ad valorem taxes on real property or a transaction tax or sales tax on the sale of real property within such City, County or special district."

Exhibit V-2

The term "special taxes" is not defined in proposed Article XIII A or elsewhere in the State Constitution. In the context of proposed Article XIII A, it appears to mean all taxes other than ad valorem taxes on property. As used in Section 4 of Article XIII A, however, it is also capable of meaning all taxes other than ad valorem taxes on real property. These possible constructions make it most difficult to determine how the term "special taxes" will be read.

Very truly yours,

JOHN H. LARSON
County Counsel

By DeWitt W. Clinton
DE WITT W. CLINTON
Division Chief

DWC:mm

Exhibit V-2

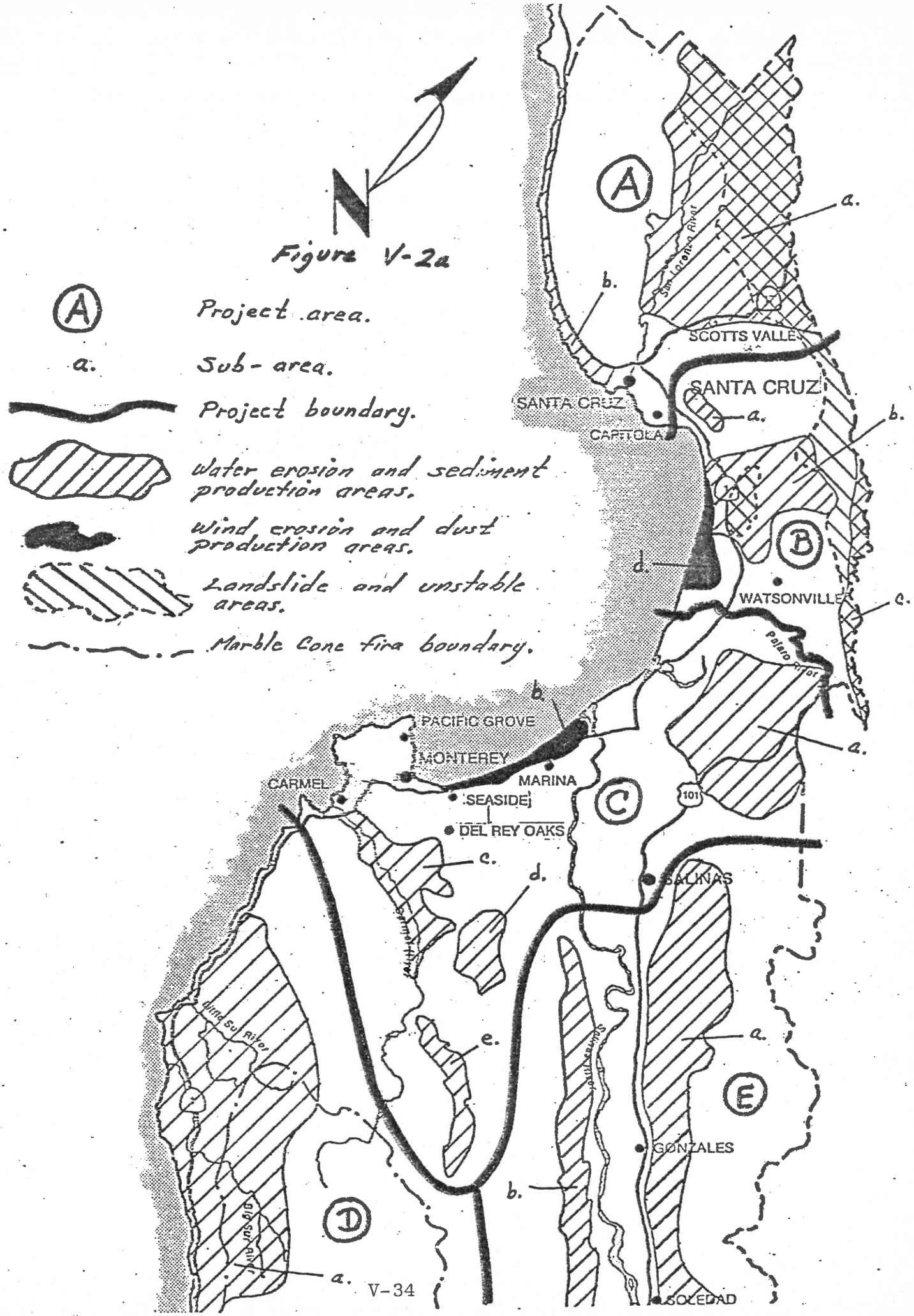

N
A
Project area.
a.
Sub-area.
Project boundary.
Water erosion and sediment production areas.
Wind erosion and dust production areas.
Landslide and unstable areas.
Marble Cone fire boundary.
SCOTTS VALLEY
SANTA CRUZ
CAPITOLA
WATSONVILLE
PACIFIC GROVE
MONTEREY
MARINA
CARMEL
SEASIDE
DEL REY OAKS
SALINAS
GONZALES
SOLEDAD
B
C
D
E
101

Figure V-2a

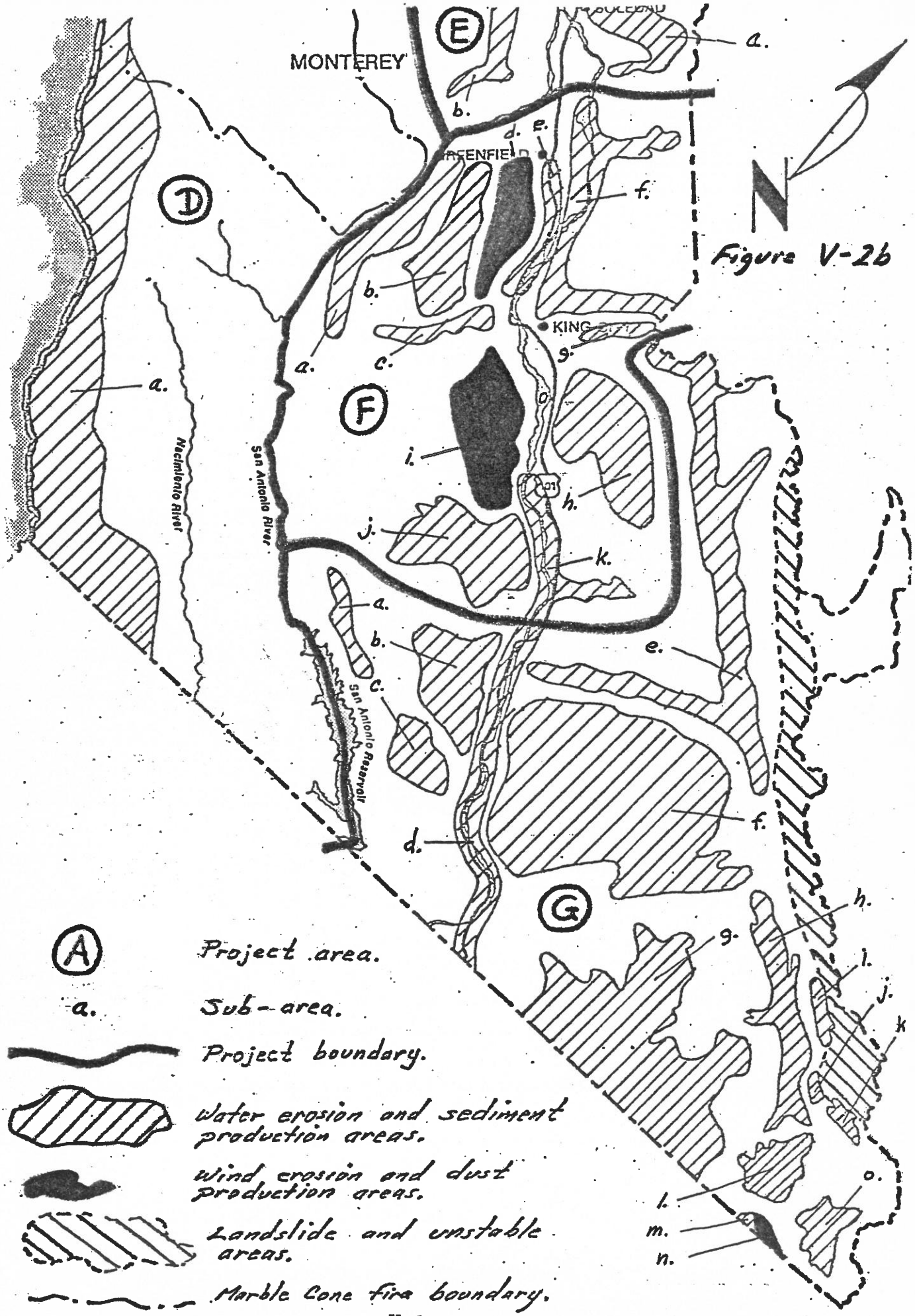

MONTEREY
GREENFIELD
KING
San Antonio River
Nacimiento River
San Antonio Reservoir
Project area.
Sub-area.
Project boundary.
Water erosion and sediment production areas.
Wind erosion and dust production areas.
Landslide and unstable areas.
Marble Cone fire boundary.

Figure V-26

TABLE V-4

PROJECT AREA	SUB-AREA	ACRES	EXISTING SUB-AREA PROBLEMS		POTENTIAL PROBLEMS
			AGRICULTURAL	OTHER	
A	a.	65,280	6	8,9,11,14,15,17	12,13
	b.	5,120		14,15	
B	a.	1,920		8,9,11,14	12,13
	b.	19,200	4	8,9,11,14,15,17	12,13
	c.	5,140		8,17	
	d.	3,070			
C	a.	28,980	2	8,9,10,11,14	7,12,13
	b.	3,830			
	c.	12,300		8,9,11,14,15	12,13
	d.	9,250		8,11,14	12,13
	e.	8,000		8,11,14	12,13
D	a.	117,200		14,15	
E	a.	46,230	1,2	10,14,15	7
	b.	22,120	1,2	8,14,15	7
F	a.	7,380		14,15	7
	b.	12,300	1,2	14,15	7
	c.	4,920		14,15	12,13
	d.	12,120	1,2	14	
	e.	2,460	2	14,15	
	f.	15,520	1,2	14,15	7
	g.	2,460	1,2	14	
	h.	19,060	1,2,3	14	7
	i.	14,880	1,2	14	7
	j.	29,920	1,2,3	14	7
	k.	4,920	1,2	14,15	
G	a.	3,700	3	14,15	
	b.	19,060	3	14,15	7
	c.	7,380	3		
	d.	7,380	2,3	14,15	7
	e.	24,000	2,3	14,15	7
	f.	70,900	3,5	14,15	
	g.	39,480	3,5	15	
	h.	9,840	3,5	15	
	i.	2,460	4,5	15	
	j.	1,230	3,5	15	
	k.	1,840	3,5	15	
	l.	4,300	3,5	15	
	m.	770	3,5	15	
	n.	1,120	3,5	15	
	o.	4,300	3,5	15	

TABLE V-5 AGRICULTURAL PROBLEMS (causes, treatment, priority) Page 1 of 5

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
1. Vineyards (irrigated)	E-a	Sheet and rill erosion.	No cover crops. No buffer areas. No erosion control facilities.	1,000 - (1) 1,000 - (2) 3,000 - (3) 3,500 - (4)	H H M L	Erosion control sub-system. Soil management sub-system.
	E-b	"	"	3,000 - (1) 1,000 - (2) 500 - (3) 500 - (4)	H H M L	"
	F-b,d	Sheet and rill, erosion. Wind erosion.	"	1,000 - (1) 1,500 - (2) 700 - (3) 2,000 - (4)	H H M L	"
	F-f,g,h	Sheet and rill erosion.	"	1,000 - (1) 1,000 - (2) 500 - (3) 4,040 - (4)	H M M L	"
	F-i	Sheet and rill erosion. Wind erosion.	"	4,400 - (1) 3,280 - (2) 2,200 - (3) 1,000 - (4)	H H M L	"
	F-j,k	Sheet and rill erosion.	"	1,000 - (1) 1,200 - (2) 500 - (3) 420 - (4)	H H M L	"

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-5 AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
2. Truck crops (irrigated)	C-a	Sheet and rill erosion. Gully erosion.	No cover crops. No buffer areas. No erosion control facilities. Over irrigation.	3,000 - (1) 1,000 - (2) 1,000 - (3) 1,000 - (4)	H H M L	Erosion control sub-system. Soil management sub-system. Water management sub-system.
	E-a	"	No cover crops. No buffer areas. No erosion control facilities. Up and down hill cultivation. Over irrigation.	10,000 - (1) 9,000 - (2) 8,600 - (3) 7,130 - (4)	H H M L	"
	E-b	"	"	6,500 - (1) 3,000 - (2) 3,000 - (3) 2,000 - (4)	H H M L	"
	F-b,d	Sheet and rill erosion. Gully erosion. Wind erosion.	"	6,000 - (1) 5,000 - (2) 4,000 - (3) 3,000 - (4)	H H M L	"

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-5 AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
2. (Continued) Truck Crops (irrigated)	F-e,f,g, h	Sheet and rill erosion. Gully erosion.	No cover crops. No buffer areas. No erosion control facilities. Up and down hill cultivation. Over irrigation.	7,000 - (1) 3,500 - (2) 3,500 - (3) 6,000 - (4)	H H M L	Erosion control sub-system. Soil management sub-system. Water management sub-system.
	F-i,j,k	Sheet and rill erosion. Gully erosion. Wind erosion.	"	3,000 - (1) 2,000 - (2) 2,000 - (3) 2,000 - (4)	H H M L	"
	G-d.e	Sheet and rill erosion. Gully erosion.	"	2,000 - (1) 1,000 - (2) 500 - (3) 500 - (4)	H H M L	"
3. Grains (non-irrigated)	F-h,j	"	No buffer areas. No erosion control facilities. No contouring, stubble mulching or minimum tillage. Summer following.	4,000 - (1) 3,000 - (2) 2,000 - (3) 1,000 - (4)	H H M L	Erosion control sub-system. Soil management sub-system.

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-5 AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
3. (continued) Grains (non-irrigated)	G-a,b,c	Sheet and rill erosion. Gully erosion.	No buffer areas. No erosion control facilities. No contouring, stubble mulching or minimum tillage. Summer following.	5,000 - (1) 4,000 - (2) 1,000 - (3) 2,000 - (4)	H H H M	Erosion control sub-system. Soil management sub-system.
	G-d,e	"	"	1,000 - (1) 500 - (2) 500 - (3) 500 - (4)	H H M L	"
	G - f thru o	"	"	4,000 - (1) 2,000 - (2) 1,000 - (3) 4,000 - (4)	H M M L	"
4. Orchards (non-irrigated)	B-b	"	No cover crops. No buffer areas. No erosion control facilities.	1,500 - (1) 500 - (2) 500 - (3) 1,000 - (4)	H M L L	"

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-5 AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
5. Rangeland	G - f thru o	Sheet and rill erosion. Gully erosion.	Overgrazing. No rotation system. Poor water location and cross fencing.	10,000 - (1) 20,000 - (2) 30,000 - (3) 45,000 - (4)	H H H M	Erosion control sub-system. Range management sub-system.
6. Woodland	A-a	Sheet and rill erosion. Gully erosion. Landslide.	No erosion control facilities. No buffer areas. Inadequate erosion control measures.	10,000 - (1) 5,000 - (2) 5,000 - (3) 10,000 - (4)	H H M M	Erosion control sub-system. Woodland management sub-system.

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-6 ESTIMATED EXTENT OF BEST MANAGEMENT PRACTICE COMPONENT CONSERVATION PRACTICES NEEDED FOR AREAS WITH HIGH TREATMENT PRIORITY, BY AGRICULTURAL PROBLEM SOURCE

AGRICULTURAL PROBLEM SOURCE	BEST MANAGEMENT PRACTICE COMPONENT CONSERVATION PRACTICES	UNIT	PROJECT AREAS			
			C	E	F	G
1. Vineyards (irrigated)	SOIL MANAGEMENT SUB-SYSTEM					
	Conservation Cropping System	Acres		6,000	13,380	
	Minimum Tillage	Acres		6,000	13,380	
	WATER MANAGEMENT SUB-SYSTEM					
	Irrigation Water Management	Acres		3,000	6,000	
	Irrigation System, Tailwater Recovery	Each		20	40	
	EROSION CONTROL SUB-SYSTEM					
	Bufferstrips	Miles		10	20	
	Cover and Green Manure Crops	Acres		6,000	13,380	
	Debris Basins	Each		30	70	
	Diversions	Miles		10	20	
	Grassed Waterways	Miles		5	10	
	Grade Stabilization Structures	Each		30	70	
	Lined Outlets or Downdrains	Each		70	150	
2. Truck Crops (irrigated)	SOIL MANAGEMENT SUB-SYSTEM					
	Conservation Cropping System	Acres	4,000	28,500	26,500	3,000
	Minimum Tillage	Acres	4,000	28,500	26,500	3,000
	WATER MANAGEMENT SUB-SYSTEM					
	Irrigation Land Leveling	Acres		6,000	5,000	
	Irrigation Pipelines	Miles	30	160	140	20
	Irrigation System, Drip	Acres	1,500	500	500	
	Irrigation System, Sprinkler & Surface	Acres	2,500	28,000	26,000	3,000
	Irrigation System, Tailwater Return	Each	30	80	70	10
	Irrigation Water Management	Acres	4,000	28,500	26,500	3,000
	EROSION CONTROL SUB-SYSTEM					
	Bufferstrips	Miles	10	50	45	5
	Contour Farming (cross-slope)	Acres		14,000	13,000	1,500
	Cover and Green Manure Crops	Acres		6,500	5,500	
	Debris Basins	Each	20	100	90	10
	Diversions	Miles		50	45	5
	Field Windbreaks	Miles		5	5	
	Grassed Waterways	Miles		30	25	
	Grade Stabilization Structures	Each	20	100	90	10
	Lined Outlets or Downdrains	Each	100	500	400	20

TABLE V-6 ESTIMATED EXTENT OF BEST MANAGEMENT PRACTICE COMPONENT CONSERVATION PRACTICES NEEDED FOR AREAS WITH HIGH TREATMENT PRIORITY, BY AGRICULTURAL PROBLEM SOURCE

AGRICULTURAL PROBLEM SOURCE	BEST MANAGEMENT PRACTICE COMPONENT CONSERVATION PRACTICES	UNIT	PROJECT AREAS			
			B	F	G	
3. Grains (non-irrigated)	SOIL MANAGEMENT SUB-SYSTEM					
	Chiseling and Subsoiling	Acres		3,000	7,000	
	Conservation Cropping System	Acres		7,000	15,500	
	Crop Residue Use	Acres		7,000	15,500	
	Minimum Tillage	Acres		7,000	15,500	
	EROSION CONTROL SUB-SYSTEM					
	Bufferstrips	Miles		50	100	
	Contour Farming (cross-slope)	Acres		5,000	10,000	
	Debris Basins	Each		35	70	
	Diversions	Miles		15	30	
	Fencing	Miles		35	70	
	Grade Stabilization Structures	Each		20	40	
	Lined Outlets or Downdrains	Each		60	140	
	Livestock Exclusion	Acres		4,000	8,000	
	Stubble Mulching	Acres		2,000	4,000	
	Stubble Seeding	Acres		6,000	14,000	
4. Orchards (non-irrigated)	SOIL MANAGEMENT SUB-SYSTEM					
	Conservation Cropping System	Acres	1,500			
	Minimum Tillage	Acres	1,500			
	EROSION CONTROL SUB-SYSTEM					
	Bufferstrips	Miles	10			
	Cover Crops	Acres	1,500			
	Debris Basins	Each	15			
	Diversions	Miles	10			
	Grade Stabilization Structures	Each	20			
	Lined Outlets or Downdrains	Each	40			

TABLE V-6 ESTIMATED EXTENT OF BEST MANAGEMENT PRACTICE COMPONENT CONSERVATION PRACTICES NEEDED FOR AREAS WITH HIGH TREATMENT PRIORITY, BY AGRICULTURAL PROBLEM SOURCE

AGRICULTURAL PROBLEM SOURCE	BEST MANAGEMENT PRACTICE COMPONENT CONSERVATION PRACTICES	UNIT	PROJECT AREAS			
			A	G		
5. Rangeland	RANGE MANAGEMENT SUB-SYSTEM					
	Deferred Grazing	Acres		30,000		
	Fencing	Miles		300		
	Fire Break (fuel break)	Miles		150		
	Planned Grazing System	Acres		60,000		
	Proper Grazing Use	Acres		60,000		
	Range Seeding	Acres		20,000		
	Stock Water Development (ponds, springs, troughs, tanks, pipelines, etc.)	Each		300		
	EROSION CONTROL SUB-SYSTEM					
	Bufferstrips	Miles		250		
	Grade Stabilization Structures	Each		100		
	Livestock Exclusion	Acres		1,000		
	Streambank Protection	Miles		250		
6. Woodland	WOODLAND MANAGEMENT SUB-SYSTEM					
	Fire Break (fuel break)	Miles	100			
	Tree Planting	Acres	1,000			
	Woodland Improved Harvesting	Acres	3,000			
	Woodland Improvement	Acres	7,000			
	Woodland Planting	Acres	1,000			
	Woodland Site Preparation	Acres	1,000			
	EROSION CONTROL SUB-SYSTEM					
	Access Roads	Miles	50			
	Bufferstrips	Miles	200			
	Critical Area Planting	Acres	2,000			
	Debris Basins	Each	50			
	Grade Stabilization Structures	Each	100			
	Lined Outlets or Downdrains	Each	200			
	Road Culvert Downdrains	Each	50			
	Road Culvert Inlets	Each	50			
	Road Culvert Outlets	Each	50			
	Streambank Protection	Miles	200			

TABLE V-7 NON-AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
8. Low Density Residential	A-a	Sheet and rill erosion. Gully erosion.	No erosion control facilities. No seeding, fertilizing and mulching. Private Roads.	5,000 - (1) 2,000 - (2) 1,000 - (3) 1,000 - (4)	H H M M	Erosion Control Sub-System
	B-a	"	"	1,000 - (1) 500 - (2)	H H	"
	B-b	"	"	1,500 - (1) 1,000 - (2) 500 - (3)	H H M	"
	B-c	"	"	500 - (1)	H	"
	C-a	"	"	3,000 - (1) 1,500 - (2) 500 - (3) 500 - (4)	H H M M	"
	C-c,d,e	"	"	1,000 - (1) 1,000 - (2) 500 - (3)	H H M	"
	E-b	"	"	500 - (1)	H	"

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-7 NON-AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
9. High Density Residential	A-a	Sheet and rill erosion. Gully erosion.	No erosion control facilities. No seeding, fertilizing and mulching. Roads.	1,000 - (1) 500 - (2) 500 - (3)	H H M	Erosion Control Sub-System.
	B-a	"	"	500 - (1)	H	"
	B-b	"	"	1,000 - (1) 500 - (2)	H H	"
	C-a	"	"	1,000 - (1) 1,000 - (2) 500 - (3)	H H M	"
	C-c	"	"	1,000 - (1) 500 - (2)	H H	"
10. Off-site flooding	C-a	Sheet and rill erosion.	Inadequate runoff control.	1,000 - (1) 500 - (2)	H H	"
	E-a	"	"	1,000 - (1) 500 - (2) 500 - (3)	H H M	"

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-7 NON-AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
11. Horses	A-a	Sheet and rill erosion	No livestock control. No erosion control facilities. No soil protection.	3,000 - (1) 1,000 - (2) 1,000 - (3) 500 - (4)	H H M M	Erosion control sub-system. Positive Management sub-system. Recreation management sub-system.
	B-a	"	"	1,000 - (1) 500 - (2)	H H	"
	B-b	"	"	2,000 - (1) 1,000 - (2) 500 - (3)	H H M	"
	C-a	"	"	3,000 - (1) 1,000 - (2) 500 - (3)	H H	"
	C-c,d,e	"	"	1,500 - (1) 500 - (2) 500 - (3)	H H M	"
14. Roads and road right-of-ways.	A-a,b	Erosion from or caused by transportation routes.	No erosion control facilities. No soil protection. Inadequate runoff controls.	(Note: Amounts expressed in miles) 150 - (1) 50 - (2) 200 - (3)	 H H M	Erosion control sub-system.

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-7 NON-AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
14. (continued) Roads and road right-of-ways.	B-a,b	Erosion from or caused by transportation routes.	No erosion control facilities. No soil protection. Inadequate run-off controls.	(Note: amounts expressed in miles) 100 - (1) 50 - (2) 50 - (3)	 H H M	Erosion control sub-system.
	C-a	"	"	100 - (1) 50 - (2) 50 - (3)	H H M	"
	C-c,d,e	"	"	100 - (1) 50 - (2)	H H	"
	D-a	"	"	150 - (1) 100 - (2)	H H	"
	E-a,b	"	"	200 - (1) 100 - (2) 50 - (3) 50 - (4)	H H M M	"
	F-all except 9	"	"	150 - (1) 100 - (2) 50 - (3)	H H M	"
	G-a,b,d, e,f	"	"	250 - (1) 150 - (2) 50 - (3)	H H M	"

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-7 NON-AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
15. Streambanks	A-a,b	Streambank erosion.	No bank protection. Excessive runoff.	(Note: amounts expressed in miles)		Erosion control sub-system. Wildlife Management sub-system.
				100 - (1)	H	
				100 - (2)	M	
				100 - (3)	L	
				100 - (4)	L	
	B-b	"	"	100 - (1)	H	"
				50 - (2)	M	
	C-c	"	"	50 - (1)	H	"
				50 - (2)	M	
	D-a	"	"	200 - (1)	H	"
				100 - (2)	M	
	E-a,b	"	"	150 - (1)	H	"
				100 - (2)	M	
				100 - (3)	L	
	F-a,b,c, e,f,g, k	"	"	200 - (1)	H	"
				50 - (2)	M	
				50 - (3)	L	
	G-All except C	"	"	250 - (1)	H	"
				100 - (2)	M	
				100 - (3)	L	
				50 - (4)	L	

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TABLE V-7 NON-AGRICULTURAL PROBLEMS (causes, treatment, priority)

PROBLEM SOURCE (from Table V-4)	LOCATION (Project area and Sub-area)	PROBLEM		ESTIMATED ACRES BY EROSION RATES 1/	TREATMENT PRIORITY H-(high) M-(medium) L-(low)	TREATMENT NEEDED (BMP's)
		DESCRIPTION	CAUSES			
17. Landslides and unstable areas.	A-a	Landslides	Natural instability. Roads and construction.	3,000 - (1) 1,500 - (2) 500 - (3) 500 - (4)	H H M M	Erosion control sub-system.
	B-b,c	"	"	1,000 - (1) 500 - (2)	H H	"

1/: (1) over 20 tons/acre; (2) 15-20 tons/acre; (3) 10-15 tons/acre; (4) below 10 tons/acre

TARGET IMPLEMENTATION DATES

As noted in the early action section, some implementation has already been started. In reality, those early actions to promote the resource conservation districts into a greater and more active role are actually increased stimuli to programs started about 40 years ago.

It will be difficult to get the federal government to implement any actions quickly. The legislative process is extremely slow, and our recommendations for increased funds and staffing must overcome trends and policies that have been moving in the opposite direction for many years. Therefore, a target implementation date of five (5) years might be overly optimistic. The passage of the agricultural cost sharing amendment (PL 95-217) took place in a relatively short time, but it has no longevity to carry on a long term program, and it only addresses a part of the overall erosion and sediment problems.

California has been inactive in the field of erosion and sediment control over the past 10 years (the State's involvement actually decreased over that time frame). However, there are new and distinct signs of movement in the direction of our recommendations which we have given a target date of 2 or 3 years.

The adoption of erosion and sediment control ordinances by cities and counties should be completed within two (2) years, and the development of trained staffs should take between two to five years to accomplish. The time it will take to prepare plans for the correction of existing erosion and sediment problems in urban areas depends on the size of the city, or the size of the county area involved, but should be completed within 3 to 5 years. Plans for correcting problems along roads and road right-of-ways should be complete within 2 or three years. The implementation of plans is a long term process.

Resource conservation districts can accomplish most of the recommendations within two or three years. However, the planning program to cover all agricultural land is a long term process.

The development of an erosion and sediment control training program for city and county employees that will be working with erosion and sediment controls should be accomplished within two or three years. However, the development of a certification and/or registration system will take three to five years.

IMPACT ASSESSMENT

SIGNIFICANT AND UNAVOIDABLE EFFECTS: Implementation of the recommended plan will reduce turbidity in the area's streams and lakes, mitigate the loss of habitat and spawning areas by sedimentation, decrease road cleanup costs, maintain the productivity of agricultural lands, and extend the life and effectiveness of flood control projects.

Costs for erosion and sediment control would normally be borne as a front end cost for urban development projects, but would be mitigated with drainage plans and construction schedules and tailored to the particular needs of developments. Total initial costs of development may be higher, but maintenance costs would be reduced.

Table V-8 summarizes some of the costs and benefits of erosion and sediment control.

ALTERNATIVES: No project would continue the damage created by sedimentation and the loss of essentially irreplaceable topsoil.

SHORT TERM USES VERSUS LONG TERM PRODUCTIVITY: The recommended practices, while more time consuming and perhaps less expedient in the short term, quickly return significant benefits in maintaining the productivity of agricultural and natural systems.

SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES: The plan proposes a number of changes in the way we manage our land. These practices are reversible; in fact, the failure to maintain diligence in applying them on erosion control projects established in the past is one of the unfortunate contributors to present problems. These proposals would slow the process of detrimental environmental change (see Table V-2)

GROWTH INDUCEMENT: The proposals would not in and of themselves stimulate or foster growth in any way, nor would they significantly slow growth; they would merely insure that growth occurs with less impact on the environment.

EROSION AND SEDIMENT PROBLEMS AND PLAN EFFECTS

TABLE - V-8

	Situation	Impact	Impact Reduction With Plan
1.	Sediment deposited in Salinas sewage treatment plant	Reduced digester capacity of 30%, cleanout costs $30,000.00.	70-90%
2.	Sediment deposits in Los Padres and San Clemonty Reservoirs	Reduced storage capacity, estimated cleanout of 580 acre feet of sediment is between $3.4 and $3.7 million	50-70%
3.	Cropland erosion in King City area (2,000 acres)	Losing over 40 tons of topsoil per acre per year. Productive use of area will end in 60-80 years. Nutrients lost with topsoil have a current market replacement value (for N-P-K) of $4.80/ton of topsoil or $384,000.00 annually. Added operation costs (cleanup sediment, gullies, etc.) are $10.00 per acre, or $20,000.00 annually	60-80%
4.	Cropland erosion in the Chular area (5,000 acres)	Losing over 20 tons of topsoil per acre per year. Nutrients lost with topsoil have a replacement value of more than $475,000.00 annually. Added operation costs amount to more than $50,000.00 annually	60-80%
5.	Road drainage (cities, counties and state)	The deposition of sediments on right-of-ways, the undercutting of road beds, clogged culverts and drains, interrupted transportation, etc. Cleanup and repair is more than $1 million annually	60-80%
6.	Utilization of strict erosion and sediment control in developing areas	Studies show investment of $1,125.00 per acre will reduce damages by more than $1,500.00 per acre (damages of downstream flooding and sediment and onsite erosion and reduced stability and costs of development)	60-80%

CHAPTER VI

LAGUNA GRANDE-ROBERTS LAKE

INTRODUCTION

Laguna Grande and Roberts Lake are two coastal lakes located on the border between Seaside and Monterey. Both lakes are suffering from severe water quality and sedimentation problems that actually threaten their continued existence. A plan for saving these lakes has been developed, along with institutional and financial means of accomplishing the plan.

OBJECTIVES

A plan has been developed to reverse the trend of water quality deterioration of Laguna Grande and Roberts Lake, by physically altering the lakes and reducing the amounts of sediments and other pollutants which enter them. In this way, existing and future investments for improving their recreational capabilities are protected.

FINDINGS

1. Sediment from urban stormwater runoff and erosion of the upstream watershed (drainage area) are filling in Laguna Grande. Erosion from future development of the upstream watershed has the potential to fill in Laguna Grande with sediment at five times the current rate. If measures are not taken to reduce substantially the sediment load to Laguna Grande, it will be primarily a mud flat in five to ten years.

2. Nutrients adhering to sediment (primarily nitrogen and phosphorus) cause algae blooms which are unsightly and have resulted in fish kills.

3. The shallowness of both these water bodies (1-3 feet in depth) increases the adverse impact of incoming pollutants. Very little dilution takes place and the low water depth results in increased water temperature and sunlight penetration which enhances algae growth.

4. Streets are the major conveyors of non-point water pollution in the Laguna Grande watershed; pollutants originating from streets include debris, organic material (nutrients) petrochemicals, and roadway sediments. During storms, streets increase runoff by covering over land which would otherwise be available for percolation and filtration. Streets can convey pollutant-carrying runoff directly to water bodies, especially if linked to a stormwater collection system.

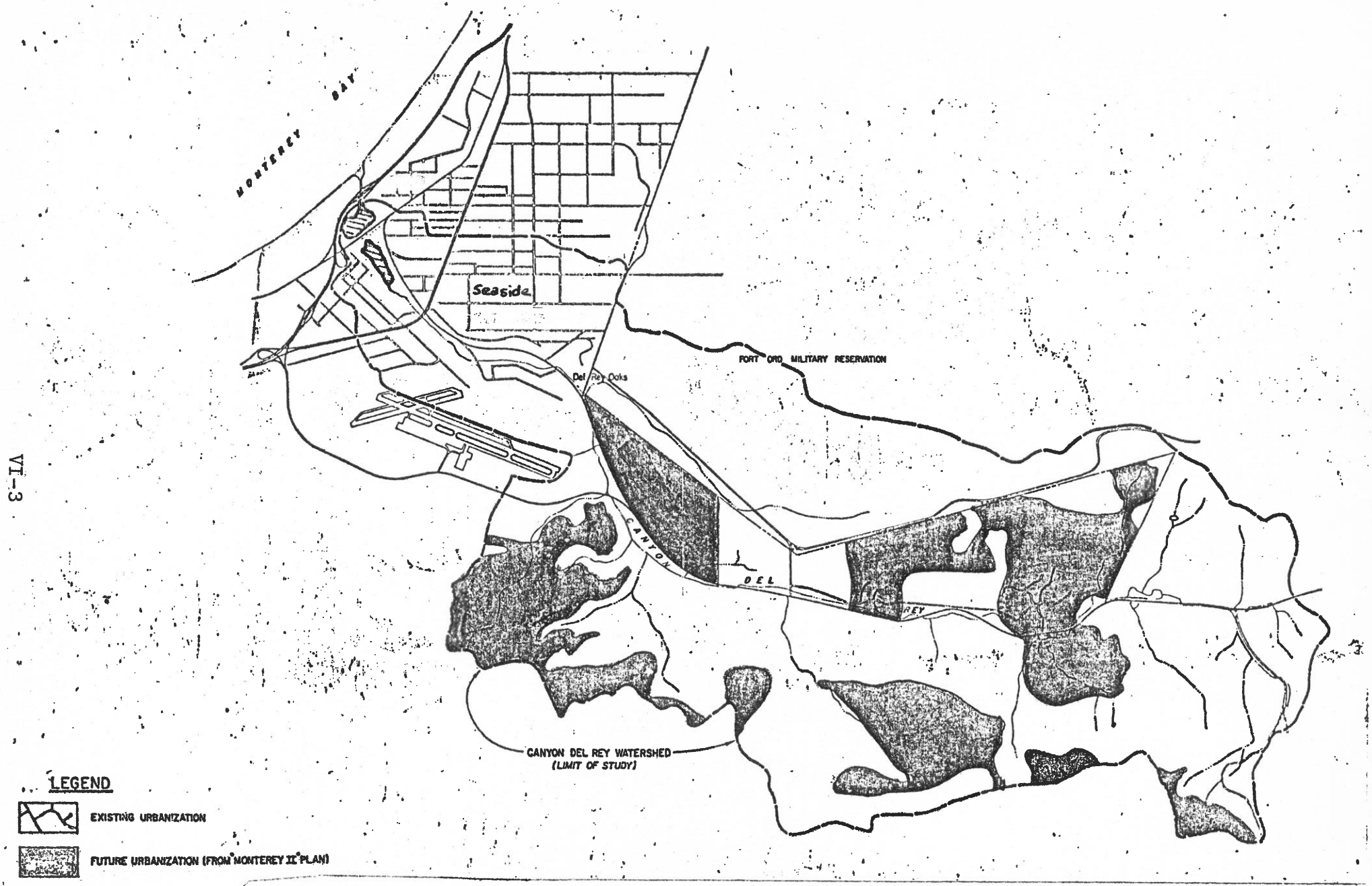
5. One method of minimizing the impact of future development on the water quality of Laguna Grande/Roberts Lake is to utilize cluster development techniques. Since clustering allows developers to shift development densities within a building site, highly erodable areas can be avoided, building patterns and street alignments can follow natural contours to avoid massive erosion from extensive cutting and grading and more open space can be made available for percolation and filtration of runoff. Also, pollutants and runoff from streets can be reduced since clustering generally requires fewer and shorter streets than conventional development. Width requirements are also less for clustered developments around cul-de-sacs where off street parking is provided.

6. Both the City of Monterey and the County of Monterey have the regulatory capability to insure that cluster (or planned unit) development is undertaken in the future in the Laguna Grande watershed (although the county lacks specific regulations or standards for its application). Hillside street standards recently proposed by the City of Monterey and proposed and adopted by the County are generally appropriate for cluster development in the Laguna Grande watershed. The City of Monterey has also developed policies and performancee standards for hillside development which can help minimize erosion if properly implemented.

7. Laguna Grande can be a major recreational source for the region, but only if it is protected and improved. Monterey, Seaside, and the Monterey Peninsula Regional Park District have spent approximately $700,000 already for purchase of Laguna Grande and adjacent land for a regional park. They plan to spend an additional $1,300,000 for further land acquisition and park facilities. With this large an investment, it is certainly desirable for the lake to the aesthetically pleasing, with water quality adequate for boating and fishing.

8. Roberts Lake has practically filled in with wind-blown sand from the nearby unstabilized dunes.

9. Roberts Lake has good potential for both recreation and wildlife habitat. But, because Roberts Lake is surrounded by roads, it has less potential than Laguna Grande. However, its importance to wildlife will increase when Laguna Grande becomes an urban park. Removal of Roberts Road would increase the water quality and recreational potential of Roberts Lake.



LAGUNA GRANDE–ROBERTS LAKE WATERSHED

RECOMMENDED MANAGEMENT PRACTICES

A plan* has been developed to keep Laguna Grande and Roberts Lake from filling in and to improve their water quality.

A. Included in the plan are measures to improve the existing physical condition of the lakes:

1. Dredge both lakes, removing four feet of material from the bottom of Laguna Grande, and two feet from Roberts Lake. This will increase both the depth and the volume of the two lakes, resulting in improved and more stable water quality.

2. After dredging, apply a bentonite (clay) seal to the bottom of Laguna Grande. This will stop the release of nutrients from the bottom sediments to the water. It is believed that the existing bottom sediments prevent significant groundwater recharge from the lake. This should be verified prior to sealing.

3. Install a stoplog outlet, to make adjustable the invert elevation of the culvert under Roberts Road. This allows maximum possible water depth and volume in dry seasons, without reducing winter flood protection capability.

4. Install lake aeration equipment to maintain necessary dissolved oxygen levels in lakes. This protects fish and reduces algae nuisance.

B. Plan measures to reduce pollutants from urban stormwater runoff include:

1. Shift to vacuum street sweepers to clean (weekly just prior to and during the wet season) streets of Monterey, Seaside, and Del Rey Oaks and Monterey County that are within the watershed except where this practice can be shown not to be effective. Vacuum street sweeping removes 95 percent of the sediment (and nutrients from urban streets. Dispose of sweeping at an appropriate site such as Marina landfill. Specifically, Seaside should discontinue its disposal at the Kolb Avenue site immediately.

2. On new or enlarged drainage projects in areas with adequate soil permeability, install catchbasins incorporating grease and silt traps. If properly maintained, traps stop some of the oil, grease and sediment carried by stormwater runoff. New designs prevent lengthy storage of water; eliminating odor and mosquito problems.

* The measures are described in greater detail in Appendix 1 of Issue Paper 10 and Water Quality Study: Laguna Grande and Roberts Lake.

3. Pave sloping, unsurfaced driveways to eliminate a major source of sand on streets, particularly in Seaside. This reduces sediment load to lakes, and reduces street sweeping costs.

C. Plan measures to reduce sediment load to Laguna Grande from existing upstream erosion:

1. Construct a sediment trap at either of two locations, at the Work Memorial Park golf driving range or at the inlet to Laguna Grande.* A trap at the driving range location would remove 75 percent of the sediment and nutrients from the upstream watershed. The construction cost of the inlet trap is 50 percent higher, and the maintenance is more difficult as it would always be submerged. The disadvantages of the driving range location are that the trap is slightly less effective at removing sediment, and it impacts the recreational value of the driving range for short periods during the rainy season. (The City of Del Rey Oaks strongly opposes the driving range location.)

2. Each jurisdiction in the watershed develop and implement a plan to solve existing serious erosion problems. (See Chapter V: Erosion and Sediment Control).

D. Plan measures to reduce pollution from future upstream development:

1. Develop controls to require onsite retention of stormwater and sediment as a means of controlling erosion during development. Under existing development controls, it is a conservative estimate that erosion during construction is twenty times the rate found several years after construction is completed and the area has stabilized. New controls that affect the timing and method of land alterations (which include building construction, roads, utilities, corporation yards, etc.) will reduce erosion during construction to twice the stabilized rate (See Chapter V: Erosion and Sediment Control). Requiring previous pavement, where soil conditions allow, will reduce runoff. Prohibiting contruction near streams will protect riparian vegetation and reduce streambank erosion.

* A third possible location for the sediment trap, on a relatively flat area south of the intersection of Highways 68 and 218, has been suggested by the City of Del Rey Oaks. This area was not selected in the initial screening of sites because it would not trap sediment generated between the intersection and Laguna Grande, and is not in public ownership. However because this location might offer some protection to the Frog Pond and Canyon del Rey Creek, cost and feasibility should be considered in detail before a final site selection is made.

2. Utilize cluster development techniques to minimize erosion from future development in the watershed. Prepare standards for cluster development so that highly erodable areas are avoided, cutting and grading is kept to a minimum, impervious surface area is minimized and open space is used for natural percolation and filtration of runoff. Streets serving cluster development in hillside areas of the watershed should follow natural contours and should be narrow as possible without unduly compromising public safety and convenience.

E. Plan measures to control the filling of Roberts Lake from sand dune erosion:

Stabilize approximately 12 acres of dunes on the bay side of Highway 1 with grasses or native vegetation.

F. Plan measures to lessen nutrient load from birds:

Birds will be discouraged from using Laguna Grande as a result of increased human activity, a steeper shoreline, and less aquatic vegetation. Compensate for the reduction in waterfowl habitat at Laguna Grande that will accompany park development and lake improvement by providing additional waterfowl habitat at Roberts Lake.

G. Measures to reduce impact on park development:

1. Embark on an intensive litter control program to improve park aesthetics and water quality.

2. Use pervious pavement, correct drainage, and vegetation with low nitrogen requirements when park is developed.

TABLE VI-1

RELATION BETWEEN LAGUNA GRANDE/ROBERTS LAKE AND OTHER CASE STUDIES

Laguna Grande	Erosion/Sedimentation	Aquifer Recharge
1) Vacuum sweep streets	Does not prevent erosion but keeps sediment from degrading lakes	
2) Catchbasins with grease and silt traps	Same	Designs with slotted walls, etc., to prevent pooling of water after storm, will allow some percolation of poor quality water. Volume is very small and soil removes most pollutants.
3) Pave driveways	Corrects major erosion problem	Slight reduction in recharge; if feasible, use of pervious pavement would offset loss
4) Sediment trap	Does not prevent erosion but keeps sediment from degrading lakes	Minor amount of recharge will occur at trap
5) Plans to correct existing erosion	Complete overlap in benefits	Depending on method of correcting could increase recharge (onsite retention of stormwater, prevention of sediment clogging of streamways) or decrease recharge (conveyance to stable outlet, etc.)
6) Onsite retention of stormwater and sediment	Reduces flood peaks, channel scour, prevents transport of sediment to creek and lakes	Retention increases recharge at site, prevents clogging of channels with sediment. Depending on location, runoff may be poor quality
7) Cluster development/roadway standards	Avoids highly erodible areas, allows less land alteration, results in less stormwater runoff	Results in less land cover with impervious surfaces, can be used to avoid development on important recharge areas
8) Park layout	Reduces transport of sediment to lake from surrounding area	Depending on layout, may result in slight changes in recharge

RECOMMENDED IMPLEMENTATION PROGRAM

Implementation responsibilities and costs are summarized in Table VI-2. Specific recommendations are that:

1. The Cities of Monterey, Seaside, and Del Rey Oaks,[1] the County of Monterey, and the Monterey Peninsula Regional Park District should form a Joint Powers Authority (JPA) to implement the recommended water quality management practices at both Laguna Grande and Roberts Lake.[2] The member agencies of the JPA should negotiate a cost-sharing plan for the necessary water quality improvements. In doing so, the JPA draws upon member agency general funds and available State and Federal grants. If and when the City of Monterey annexes the remaining unincorporated area in the Canyon Del Rey watershed, it will probably make sense to delete the County from the JPA.

   If, after six months from 208 Plan adoption, a JPA agreement including all local agencies in the watershed is not found to be practicable, preference should be given to establishing a special watershed management district.

   Dredging, sealing, aerating, and constructing a sediment trap and stoplog outlet are primarily capital projects with small operation and maintenance costs. It is hoped that U.S. Environmental Protection Agency grants (Clean Lakes Program) can be used to meet 50% of the total capital cost of $794,000. Operation and maintenance activities (costing $5,600/year) will be paid for by the JPA. Also a JPA responsibility is working with local park planners to insure that water quality projects and programs (litter control, park drainage, wildlife habitat control) related to park development and maintenance are carried out. These tasks will be assumed by park planners and maintenance personnel and the incremental cost of upgrading park projects for water quality purposes will be minimal. Another very important task for the JPA will be the development of an agreement between its member agencies (excluding the Park District) for sharing, and possible purchase of a vacuum-type street sweepter. The increased cost of purchasing a vacuum sweeper over present capital costs associated with conventional sweepers could

---

1. The City of Del Rey Oaks is opposed to participating in a JPA

2. The City of Seaside has indicated its intent to maintain responsibility for park-related development of Roberts Lake.

RECOMMENDED WATER QUALITY PLAN FOR LAGUNA GRANDE AND ROBERTS LAKE
SUMMARY OF FINANCING SOURCES

Recommended Management Practices	Public Costs[1] Initial	Public Costs[1] Annual	Financing (Public) Clean Lakes Grant (Capital Only)	JPA Capital	JPA Annual	Other Capital	Other Annual	Private Costs Capital	Private Costs Annual	Responsible Agency
1a. Dredge Laguna Grande	$340,000	$0	$170,000	$170,000				0		Water Quality Joint Powers Agency
Dredge Roberts Lake	140,000	0	70,000	70,000				0		"
1b. Seal Laguna Grande	13,000	0	6,500	6,500				0		"
1c. Stoplog Outlet, Roberts Lake	5,000	0	2,500	2,500				0		"
1d. Aerate Laguna Grande	3,000	300	1,500	1,500	300			0		"
Aerate Roberts Lake	3,000	300	1,500	1,500	300			0		"
1e. Vacuum Sweep Streets	20,000[3]	15,000[4]	1,000			10,000 (cities and County)		0		Cities and County independently (or through JPA)
Discontinue dumping of sweepings at Kolb Ave. in Seaside	0[5]	0[5]						0		Seaside
1f. Catchbasins	<1,000 ea.	<50 ea.				<1,000ea. (Cities & county)	<50ea.	<1,000ea.	<50ea.	Cities and County
1g. Pave Driveways	4,000 (for ordinance development)	3,000 (for ordinance enforcement)				4,000 (Cities & Counties)	3,000	Depends on owner's design preference		Cities and County
1h. Sediment Trap	290,000	5,000	145,000	145,000	5,000			0		JPA
1i. Management Plan for Existing Urban Erosion	30,000	0				22,500 (EPA 208) 7,500 (Cities & Counties)		Cannot be determined until plans completed.		Cities and County
1j. Grading/Erosion/ Sediment Control Ordinance	4,000 (for ordinance development)	25,000[6]				4,000 (Cities & Counties)	25,000	Undetermined		"
1k. Cluster development/ Roadway Stds. (for undeveloped area of watershed)	4,000 (for ordinance development)	12,500[6]				4,000	12,500	Undetermined		Monterey and Monterey County
1l. Sand Dune Stabilization	13,000	1,000	6,500			6,500 (State)	1,000	0		California Dept. of Parks & Recreation and CALTRANS
1m. Improved Bird Habitat/ Roberts Lake	Minimal[7]	0						0		Seaside (Parks Dept.)
1n. Park Litter Control	0	0[8]						0		Seaside (Parks Dept.) and Laguna Grande Park JPA
1o. Park Layout	0	0[8]						0		Seaside (Parks Dept.) and Laguna Grande Park JPA
TOTALS	869,000	62,100	413,500	397,000	5,600	58,500	41,500	(excluding 1f.)		

TABLE VI-2 FOOTNOTES

1. 1978 Dollars. In some cases, management practices recommended as part of this case study overlap with recommendations made as part of one or more of the other water quality case studies. Therefore, the costs identified in this table also sometimes overlap with other case study costs. For this reason, it would be misleading to aggregate costs between case studies.
2. Included under this heading are capital construction costs and one-time costs associated with the development of guidelines/regulations/plans.
3. This is the incremental cost to purchase a vacuum-type sweeper instead of a conventional sweeper; actual purchase price is $55,000.
4. $15,000 represents 0.6 of a person year the additional staff time required to sweep streets weekly.
5. Seaside will have a cost of $10-15,000/year once dumping at Kolb Avenue is discontinued. However, this cost is not included because the capacity of the Kolb Avenue landfill is nearly used up and Seaside would have to switch to another site regardless of water quality considerations.
6. Cost to enforce ordinances; these costs could be recovered by imposition of a permit fee. Also, it is expected costs of enforcing this ordinance will be offset by a reduction in public works costs associated with off-site sediment buildup.
7. Included in dredging costs.
8. Costs will generally overlap with tasks normally conducted by park personnel.

be paid for by the JPA. This cost would be $20,000, to be repeated once the vacuum sweeper wears out (6-8 years) and when the need arises in the watershed for more than one vacuum sweeper. A final function of the JPA will be to assist its member agencies in the formulation of erosion and sediment control guidelines or regulations for application to new and existing development in the Canyon Del Rey watershed.

The JPA can rely on one or more of its member agencies for staffing assistance. Staff time requirements to administer the above program are likely to be about one person-year the first year, costing the JPA approximately $25,000. Once the major construction projects are completed, the annual staffing costs for water quality purposes will be much lower. The proposed JPA is separate and distinct from the existing JPA that was formed to acquire Laguna Grande Park.

2. The City of Seaside discontinue dumping of sediment loads from city street sweepers at Kolb Avenue; and to develop and enforce a city ordinance requiring unpaved driveways in the watershed to be paved. Small public costs are associated with both of these actions.

3. The cities of Monterey, Seaside, and Del Rey Oaks and the County of Monterey adopt regulations related to the location and design of future urban development in the Canyon Del Rey watershed. The above jurisdictions will develop regulations relating to on-site retention of stormwater and sediment. These regulations will apply to all future development and re-development projects in the Canyon Del Rey watershed. Overall public costs will be decreased although initial costs borne by buyers of new homes in the drainage area may increase. Staffing requirements are approximately one person-year per year for the entire watershed, costing the four public agencies a combined total of $25,000 per year.

   In addition, the four general purpose governments should develop urban erosion control plans for their jurisdictions. These plans, to be prepared, within 2 years, will attempt to remedy erosion and sediment problems associated primarily with existing urban development, including existing public roadway projects.

   For presently unincorporated and undeveloped areas of the Canyon Del Rey watershed, the County of Monterey and the City of Monterey should jointly arrive at a single land use policy and consistent development regulations. For purposes of water quality protection, the preferred strategy is to prepare and enact a planned unit development ordinance to provide for cluster housing development, maintaining presently allowed overall density for the watershed. This ordinance should include standards and requirements for clustered development

(see Appendix L, which presents a model cluster development ordinance).

As an option to mandating clustered development in the watershed, and as a minimum requirement for purposes of protecting water quality, the county (and the city if additional watershed land is annexed) should:

(1) require land developers to submit, in the concept review stage, clustering designs in addition to other development designs.

(2) if a clustering design is not selected, require the applicant to show how water quality protection measures other than clustering will achieve the water quality objectives of this Plan; and, if a positive finding is made by the reviewing body, require the developer to install and maintain the necessary on-site erosion control and other water quality protection devices.

In addition, the recommended Lake Maintenance Joint Powers Authority could be used as a forum to assure coordinated development procedures, land use policies, and regulations that would control erosion and sedimentation in the watershed.

The county should also prepare policies and standards for hillside development similar to those developed recently by the City of Monterey, for application in the Laguna Grande watershed area. These policies and standards will similarly apply to streets serving cluster development in hillside areas of the watershed. Other recommendations for roads are that:

a. The City of Monterey and the County of Monterey should permit road designs in the Laguna Grande watershed which do not exceed or are close to the minimum widths allowable by their standards, when serving clustered development.

b. The City of Monterey and County of Monterey should grant variances under special conditions to allow for smaller road widths in the Laguna Grande watershed than their current standards permit. Subcollectors serving small, clustered residential projects with off-street parking could potentially have smaller widths than the current standards permit without unduly compromising public safety and convenience.

c. The County of Monterey should grant variances to its standard 60 foot minimum right-of-way in situations where road width, road alignment, grading, and utility placement allow a smaller right-of-way.

Public and private costs of these actions to provide for cluster housing and roadway designs with minimal surface area have not been determined. Although dependent upon site conditions, per unit construction costs are generally cheaper for a cluster arrangement than for conventional development. It is estimated that 0.5 person-years will be required to develop and enforce these new regulations by the county. If the City of Monterey successfully proceeds with its annexation plans in the watershed, then the City will be wholly responsible for enforcement of these actions. The costs to the city in such case would be minimal, since it already has or is presently developing the necessary regulatory apparatus.

4. The State of California accepts responsibility for beach sand dune erosion control on State owned property. If current plans for state purchase of beach property located directly across Highway 1 from Roberts Lake are carried out, the recommended measures for sand dune erosion control will be implemented by the State Department of Parks and Recreation. Assistance from CALTRANS is also expected. It may be possible to offset 50% of the expected capital cost of $13,000 with grants from the U.S. Environmental Protection Agency (Clean Lakes Program).

5. AMBAG accepts responsibility for ongoing tracking of plan implementation, evaluating consistency of implementing actions with the Section 208 plan. This aspect of the implementation program is more fully described in Chapter X, Overall Strategy for Water Quality Planning and Implementation.

Priority Actions

The recommended management practices are grouped into two categories (Table VI-3):

1. Practices that need to be implemented immediately to prevent further filling of the lakes with sand and sediment. These practices are of higher priority because they are necessary just to maintain the lakes in their present condition. If the lakes continue to fill in, the water quality problems will worsen considerably, and the eventual cost of dredging may double.

2. Practices that are primarily designed to improve the water quality of the lakes. These practices can be implemented as funding becomes available. They are designed to improve the water qualtiy of the lakes to an adequate level for the anticipated park uses (boating, fishing, aesthetics). In their absence, the existing water quality problems (algae blooms, fish kills, odors, etc.) would remain, but would not increase significantly.

TABLE VI-3

PRIORITY MANAGEMENT PRACTICES

FIRST PRIORITY (LAKE PRESERVATION)			SECOND PRIORITY (WATER QUALITY IMPROVEMENT)		
Measure	Cost Capital	Annual	Measure	Cost Capital	Annual
Vacuum Streetsweeping [1]	20,000	15,000	Dredge Laguna Grande	340,000	
Sediment Trap	290,000	5,000	Dredge Roberts Lake	140,000	
Management Plan for Existing Erosion	30,000		Bentonite Seal Laguna Grande	13,000	
Erosion Control Ordinances	4,000	25,000	Stoplog Outlet	5,000	
Cluster Development/ Roadway Standards	4,000	12,500	Aerate Laguna Grande	3,000	300
Sand Dune Stabilization	13,000	1,000	Aerate Roberts Lake	3,000	300
			Install Catchbasins	1,000ea	50ea
			Pave Driveways (ordinance)	4,000	3,000
			Improved Bird Habitat Roberts Lake	minimal [2]	
			Park Layout/ Litter Control		
Total	341,000	58,500	Total (excluding catchbasins)	508,000	3,600

1. See footnote on page

2. Included in dredging cost.

Target Implementation Dates

Development and implementation of ordinances and regulations should occur no later than 9 months following 208 Plan adoption. The recommended deadline date for initiating the remaining priority management practices is two years following adoption of the 208 Plan.[1]

Implementation of the remaining management practices should take place as soon as possible following 208 Plan adoption, as funds become available.

---

1 Within three months after 208 plan adoption, the three cities and county, with the assistance of AMBAG, will obtain demonstrations of vacuum streetsweepers from manufacturers or cities that use them to determine their efficiency under local conditions.

OTHER WATER BASINS

INTRODUCTION

There are additional water bodies in the AMBAG Region which have experienced water quality deterioration due mostly to human activities. Many of their problems are similar in origin to those of Laguna Grande/Roberts Lake. Management plans should be developed to prevent further degradation of these water basins and enhance their biological and aesthetic qualities.

FINDINGS

1. A number of coastal water basins have suffered adverse water quality impacts from urbanization of their watershed, much like Laguna Grande/Roberts Lake. These water basins are Lake El Estero, and Del Monte Lake in Monterey County and Schwans Lagoon, Corcoran Lagoon, Soquel Creek Lagoon, and Moran Lake in Santa Cruz County. The degree of existing urbanization of the watersheds ranges from 6% for Soquel Creek Lagoon to 83% for Schwans Lagoon (compared to 10% for Laguna Grande). Continued development of the Live Oak and Soquel areas in Santa Cruz County and expansion of the Monterey II area will place even more stress on these water bodies in the future.

2. Because these coastal water basins were developed under a climatic regime much wetter than the present, they now have reduced and seasonal flows of water, which in most cases are insufficent to provide desirable levels of flushing. Also, their shallowness (ranging from 1-1/2 feet to 3 feet in depth) inhibits dilution of incoming pollutants, and increases the impact of nutrients released from rich bottom sediments. Salinas River Lagoon (4 foot average depth), Carmel River Lagoon (one foot average depth) and Watsonville Slough (3/4 foot average depth) also have problems related to shallowness.

3. Besides urban runoff pollution, excessively large populations of hybrid Mallard/Muscovy ducks contaminate many of these water basins. Also, a few are polluted by agricultural runoff, most notably the Salinas River Lagoon and Watsonville Slough.

4. There is great potential for considerable improvement in the water quality, recreational value and biological productivity of these water bodies. Without remedial action, they will continue to degrade. If so,

it is doubtful whether they can continue to provide some of the most productive wildlife habitats in the region; in Santa Cruz County, coastal lagoon and riparian corridors represent the only significant habitats still remaining in the heavily urbanized areas. Recreational investments currently being made in some of the basins, such as in Pinto Lake, will have less value in the absence of a program for water quality improvement.

5. The similarity of water quality problems between these water basins presents opportunities to borrow from the experience gained in formulating solutions to the problem of Laguna Grande. Specifically, the dredging of shallow sediments and subsequent use of aeration equipment, and application in the watersheds of sediment traps and catch basins, onsite erosion control and stormwater retention measures, waterfowl control measures, and increased streetsweeping by vacuum sweepers, can benefit almost all of these water bodies. Increased streetsweeping can particularly be beneficial to the basins in Santa Cruz County, since the streets in the unincorporated areas (live Oaks/Soquel) are very rarely swept (there is only one mechanical sweeper for the area, which sweeps mainly in the Moran Lake watershed). Opportunities for clustering and reducing roadway widths in the Soquel Creek, El Estero and Del Monte Lagoon watersheds exist because of expected future development of large areas of undisturbed land.

RECOMMENDED MANAGEMENT PRACTICES

1. Vacuum sweepers should be used to decrease urban runoff pollution from streets in Live Oak/Soquel area, which pollutes Schwans Lagoon, Corcoran Lagoon, Soquel Creek Lagoon, and Moran Lake. Two vacuum sweepers would be needed, which would be effective on the many streets in the area that lack curbs and gutters.

2. Comprehensive water quality management plans should be developed for all of these water basins by jurisdictions in their respective watersheds. Control measures appropriate for the problems of each basin should be determined and implemented.

RECOMMENDED IMPLEMENTATION PROGRAM

1. Santa Cruz County should purchase two vacuum street sweepers for use in the Live Oak/Soquel area. The cost of these sweepers is $55,000 apiece (compared to $35,000 for mechanical sweepers). The County should explore the possibility of sharing the cost of one of the sweepers with the City of Capitola, for use in the Soquel Creek Lagoon watershed.

2. Water quality management plans should be prepared by the agencies in the Table VI-4.

TARGET IMPLEMENTATION DATES

Within three months of 208 plan adoption, Santa Cruz County and the City of Capitola with the assistance of AMBAG, will obtain demonstrations from manufacturers of vacuum sweepers or cities that use them to determine their efficiency under local conditions.

The purchase of additional vacuum street sweepers should take place within one year following 208 plan adoption. Water quality management plans for selected basins should be within one year following 208 plan adoption, and completed by July 1980.

TABLE VI-4

Water Basin	% Of Water-shed Urbanized	Water Quality Problems	Potential Solutions	Management Agencies
Schwans Lagoon	83%	High turbidity, eutrophication, dissolved oxygen fluctuation, shoreline erosion, overgrowth of vegetation	Dredging, lake bottom sealing, vegetation removal, waterfowl control, septic tank pollution mitigation, increased street-sweeping, landuse controls	Santa Cruz County
Corcoran Lagoon	37%	Eutrophication, dissolved oxygen variation, lack of mixing, urban runoff	Dredging, lake bottom sealing, aquatic plant removal, waterfowl control, settling basin installation, increased street sweeping, land use controls	Santa Cruz County
Moran Lake[1]	78%	High turbidity, algal blooms, water level fluctuation, salinity variation, lack of mixing, urban runoff pollution	Dredging, lake bottom sealing, settling basin installation, increased street sweeping, land use controls	Santa Cruz County*/City of Capitola
Soquel Creek Lagoon	6%	High coliform counts in summer, seaweed masses, urban runoff pollution	Septic tank pollution mitigation, increased street sweeping, land use controls	City of Capitola*/Santa Cruz County
Watsonville Slough	9%	Eutrophication, low dissolved oxygen, salinity variation, agricultural runoff pollution	Agricultural fertilizer, pesticide, and irrigation controls. Increased street-sweeping, land use controls	Santa Cruz County/City of Watsonville
Pinto Lake	11%	Eutrophication, high coliform levels	Septic tank pollution mitigation, aquatic plant removal, fertilizer controls, waterfowl control, land use controls	Santa Cruz County
Lake El Estero	45%	Sedimentation, aquatic plants, algal blooms, odors	Dredging, lake bottom sealing, vegetation cover restoration, settling basin installation, increased street sweeping, land use controls	City of Monterey
Salinas River Lagoon	4%	Eutrophication, high coliform and pesticide levels, agricultural runoff pollution	Septic tank pollution mitigation. Agricultural fertilizer, pesticide, and irrigation controls.	Monterey County
Carmel River Lagoon	4%	Growth of aquatic vegetation, high coliform levels, high iron concentrations	Septic tank pollution mitigation, aquatic plant removal, land use controls	Monterey County

[1] A management plan is currently being [illegible]

*Lead Agency

IMPACT ASSESSMENT

Laguna Grande and Roberts Lake are urban water bodies that are characterized primarily by the past and existing impacts of human activities. The plan is intended to relieve these impacts and restore the lakes to conditions of recreational resources. It would further manage the lakes and their environs to avoid future impacts and maintain the benefits gained by their restoration.

Short term impacts of the plan include the noise, traffic disruption, dust, increased employment, consumption of materials and energy use associated with dredging and construction of sediment traps. Dredging operations will release nutrients, oils, greases, and possibly toxics trapped in bottom sediments into the waters of the lake for a short period.

Because of nutrient buildup, algae die off and sedimentation dissolved oxygen levels in the lake periodically drop below the level required to maintain fish life. These fish kills eradicated naturally occurring fish life, so the fish that do survive in the lake are mosquito fish (Gambusia affines), planted by the mosquito abatement district, and goldfish (Carassius auratus) and perhaps other exotics (although it is less likely that they are able to survive in the lake) dumped into the lake by people who no longer want them as pets. The dredging operations could release enough sediment or toxins into the water to kill these fish over the longer term.

Measures to alter the lakes, reduce inflow of sediment, oil and grease from upstream development and surrounding urban areas will upgrade water quality in the lake and tributary streams to state objectives for recreational uses and fish and wildlife habitat.

Air Quality: Vacuum cleaning will reduce the temporary, localized dust which accompanies present streetsweeping and will reduce the loads of dust and dirt on streets which are available to contribute to particulate pollutions of the air when picked up by winds. With improved water quality, frequency of odor production at the lakes would be decreased.

Visual Amenity and Ecological Resources would be enhanced by improved lake quality and greater open space allowed by clustering development. Habitat values of the lakes for native and migratory wildfowl will be enhanced by establishment of a smaller but higher quality tule marshland, almost the rarest habitation on the Monterey Peninsula, construction of "loafing" islands and discouragement of abandoned domestic ducks. A new fishery will be established and managed.

Hazardous Land Areas and Critical Resources: Cluster development of the watershed would allow a more sensitive treatment of the landslide, and would allow for buffer zones to be established around stream corridors. Dune stabilization measures would remedy the problem of eroding sands blowing across the freeway and sedimenting Roberts Lake.

Physical Facilities such as sewerage and water service, schools, and public services would be relatively unaffected by plan proposals. Park planners estimate a 10% increase in local traffic as a result of the park itself. Operation of the street sweeping equipment and aeration facility will have an annual energy demand the equivalent of a single home typical of the region. Use of the driving range at Work Memorial Park could continue except for two to three months during the rainy season. Employment increase associated with operation and maintenance of the facilities and enforcement of development control ordinances will be minimal. Direct economic gains from improved water quality are attributable to greater flexibility of the recreational use of the park, especially for fishing. Indirect gains related to enhancement of the area will contribute to community values and the potential for building up local tax base. The cleaner streets, resulting from vacuum sweeping would also bolster community pride.

Reduced roadway widths in upstream development would require the elimination of onstreet parking to assure access for emergency vehicles. Narrower streets also reduce travel speeds; in residential areas this is a desirable affect.

Housing Costs associated with clustered development will be less than if the same units were constructed in the upstream watershed in a conventional manner. Onsite stormwater and sediment retention standards will impose higher initial costs on developers (estimated at approximately $1500 per unit average) which will be passed on to consumers. Overall, however, these costs will be recouped in lower costs for new drainage facilities and lower maintenance costs in dredging and clean out of sediment traps. Values (and subsequently assessments) of homes in the area adjacent to the park can be expected to increase (as they would with other public improvements planned for the area), yielding benefits to owners, but probably increased rents to the approximately 60% of residents that are renters. If the project is financed through a JPA in the area, taxes would not rise substantially faster than the Monterey-Seaside area as a whole. However, as units actually change hands, they will reflect the new desirability of the neighborhood and housing price rents can be thus expected to increase faster than similar areas further from the park.

Mitigation Measures that could be employed to reduce adverse impacts include requiring the use of a vacuum dredge in the lakes, which significantly reduces turbidity and mixing of trapped pollutants with the water body. Noise and expense impacts of hauling sediment to the Marina landfill could be reduced by making the sediment available to local development projects requiring fill material.

Parking bays constructed with porous pavements could be allowed to achieve the objectives of reduced roadway widths without the disadvantages of loss of parking.

Alternative[1]

Methods to Improve Water Quality: Installation of a mechanical device to divert the "first flush" runoff of a storm was considered as a method to reduce urban runoff pollution. Such a system would capture the most highly polluted portion of runoff and route it through a sanitary sewer for treatment. This alternative was found to be less effective at reducing pollution for its cost than street sweeping. The alternative of algaecide and herbicide application was screened out because it is only a temporary treatment of the eutrophication problem. Hydraulic and tidal flushing were considered, but there is no ready source of high quality fresh water available for hydraulic flushing and tidal flushing would adversely affect the lake ecology. Storm water diversion was found to be too costly. Mechanical lake filtration is still in the experimental state. The use of coagulents to remove nutrients from the water was eliminated from further consideration in the screening because it is also an experimental process, and runs the risk of toxicity to fish and other aquatic organism.

The no action alternative would result in the lakes becoming mudflats in 5 to 10 years.

Short Term Use Versus Long Term Productivity: The project would restore the productivity of a resource degraded and intruded on by other human uses.

Significant Irreversible Changes; Growth Inducement: No significant adverse effects were determined. The upgrading of lake physical and water quality would require a commitment to the proposed lake modification, streetsweeping, drainage improvement and development control program. Irreversible committments of resources are negligible; limited materials for catchbasins, the sediment trap and structures employed to minimize upstream erosion and the bentonite for lake sealing. While it is probably that the

1. Proposed Technical Alternatives for Laguna Grande and Roberts Lake, on file at AMBAG, contains discussion of these alternatives. Many alternatives were considered in plan formulation. Several were screened out early in the process for one or more of the following reasons: they were not physically possible in the given situation, they achieve only limited gains, they were inordinately expensive or they had adverse impacts.

present bottom sediments have isolated Laguna Grande from the underlying aquifer, this should be confirmed prior to bentonite sealing the lake.

Growth Inducement: These proposals would affect the design of development in the upper watershed, but would not stimulate nor facilitate that development themselves.

CHAPTER VII

CASE STUDY ON NITRATE POLLUTION OF GROUNDWATER: SALINAS AND PAJARO VALLEYS

INTRODUCTION

The water quality of the Pajaro and Salinas Groundwater Basins is worsening due to nitrate and salt build-up. The nitrate build-up has necessitated the deepening or abandonment of 42 domestic water supply wells in the Salinas Valley, and many more are approaching the Public Health Standard in both valleys. The AMBAG study of the two valleys indicated the probable causes of the pollution problems, and identified alternative solutions.

PURPOSE AND OBJECTIVES

Plans have been developed to: 1) increase the information on the extent and causes of the nitrate problems of the Pajaro and Salinas Groundwater Basins; 2) provide additional information to agriculturalists on the optimization of fertilizer and water use; and 3) provide for the abatement of documented excessive nitrate sources.

FINDINGS

A. Salinas Valley

1. For the Salinas Valley, the maximum potential net contribution of nitrate (as N) to groundwater was calculated as follows (in tons/year):

Cropland*	8,500
Feedlots	1,687
Dairies	78
Municipal/Industrial Percolation Ponds	68
Septic Tanks	61
Others	26

*After subtracting nitrate in groundwater pumped for irrigation

These values are maxima as they assume no loss of nitrogen once water has passed below the root zone. While some de-nitrification undoubtedly occurs during flow to the groundwater, it is unlikely that this mechanism accounts for appreciable nitrogen loss on a valley-wide basis.

2. The contribution of total dissolved salts (TDS) to the groundwater basins from each of the above sources was calculated. The relative contribution of salts from various sources was similar to that of nitrates. The various physical processes were taken into account, including the precipitation of salts and the solubility of weatherable minerals in the soil between the root zone and the water table.

3. Soil cores were sampled at five foot intervals to a depth of fifty feet at six locations in the valley. While six locations are not necessarily conclusive, the sampling program consistently supported the premise that once nitrate is leached below the root zone, its concentration in the soil moisture remains essentially constant (unsaturated flow conditions). In other words, except where significant impermeable strata result in saturated flow conditions, once nitrate is leached below the root zone it will eventually reach groundwater.

4. The largest contribution of nitrates to the soil is from irrigated agriculture. There is uncertainty as to the amount of nitrate that ultimately reaches groundwater from this source.

5. The category of feedlots and dairies is the next largest apparent contributor of nitrate to groundwater and is the most concentrated nitrate source. The other nitrate sources account for relatively minor amounts of nitrate on a valley-wide basis. However, feedlots, dairies, and municipal/industrial percolation ponds can cause significant, localized concentrations of nitrate in groundwater. This is due to their high nitrate concentration and/or the short travel time of nitrate through the soil to groundwater (as short as three to seven days.

6. Reasonable increases in irrigation and fertilizer efficiency, and physical improvements to waste disposal methods for feedlots, dairies, municipalities and industries, could substantially reduce the nitrate and salt load to groundwater.

7. Inadequately sealed wells can lead to pollution of deeper aquifers by poor quality surface or shallow groundwaters. Existing county standards for sealing, based on State guidelines, exempt agricultural wells from any minimum sealing depth.

8. There is need for a demonstration-research program in the Salinas Valley, to develop additional information on optimal irrigation and fertilizer application rates and cultural practices for crops in this region.

Up to this point goals for improving fertilizer and irrigation methods have been very general; detailed information on how to minimize fertilizer and irrigation water use while maximizing yield requires extensive field trials on each crop in the region where the crops are produced. Similar data has been generated for sugar beets and corn by researchers from U.C. Cooperative Extension, and has resulted in predictive fertilizer application rate procedures for these crops. The timing and quantity of application was proved to vary considerably with different crops in varying environmental conditions. There is a need for similarly detailed data for all the major crops grown in the region in order to implement "best management practices" to reduce agriculture's contribution to nitrate pollution.

There is a need to better substantiate the identification of agricultural nitrate pollution of groundwater in the Monterey Bay region. Technical analyses such as measurements of the amount of nitrogen leaching below the root zone would help demonstrate the problem as well as contribute towards the effort to minimize fertilizer and water application.

Demonstration of more efficient practices advocated by U.C. Extension is necessary to improve the receptivity of the farmers in the region to crop management changes. Comparison of existing fertilizer and water use and crop yields with best management practices would be valuable in demonstrating the economic benefits and reduced pollution that can accrue from improved efficiency. Rather than conducting the research elsewhere and reporting the results in Cooperative Extension Workshops (as is now commonly the case), demonstration projects should be carried out in this region, with maximum visibility for and involvement by local farmers.

B. Pajaro Valley

1. For the Pajaro Valley the maximum potential net contribution of nitrate to groundwater was calculated as follows (in tons/year):

Cropland	1151*
Native Vegetation	110
Spetic Tanks	47
Dairies	5
Others	2

*After subtracting nitrate in groundwater pumped for irrigation

These values are maxima as they assume no loss of nitrogen once water has passed below the root zone. While some denitrification undoubtedly occurs during flow to the groundwater, it is unlikely that this mechanism accounts for appreciable nitrogen loss on a valley-wide basis.

2. The contribution of total dissolved salts (TDS) to the groundwater basins from each of the above sources was calculated. The relative contribution of salts from the various physical processes were taken into account, including the precipitation of salts and the solubility of weatherable minerals in the soil between the root zone and the water table.

3. Soil cores were sampled at five foot intervals to a depth of fifty feet at five locations in the valley. While five locations are not necessarily conclusive, the sampling program consistently supported the premise that once nitrate is leached below the root zone, its concentration in the soil moisture remains essentially constant (under unsaturated flow conditions). In other words, except where significant impermeable strata result in saturated flow conditions, once nitrate is leached below the root zone it will eventually reach groundwater.

4. The largest contribution of nitrates to the soil is from irrigated agriculture. There is uncertainty as to the amount of nitrate that ultimately reaches groundwater from this source.

5. The other nitrate sources account for relatively minor amounts of nitrate on a valley-wide basis. However, dairies, septic tanks, and sanitary land fills (dumps) can cause significant, localized concentrations of nitrate in groundwater. This is due to their high nitrate concentration and/or the short travel time of nitrate through the soil to groundwater (as short as 3-7 days).

6. Reasonable increases in irrigation and fertilizer efficiency, physical improvements to waste disposal methods for dairies, and leachate reduction at sanitary landfills could substantially reduce the nitrate and salt load to groundwater.

7. The Buena Vista and Watsonville landfills have the potential to contaminate local surface and groundwater. The volumes of leachates presently and potentially generated at the landfills is significant but manageable.

   Both landfills are subject to high rates of rainfall infiltration, and, after they are completed, could generate substantial volumes of leachate - from 1 to 1-1/2 million gallons during the dry years and 4 to 5 million gallons during years with normal rainfall.

At the Watsonville site, leachate percolates to a locally perched water table. Springs in the vicinity of the existing landfill operations appear to be affected by leachate. Additional leachate may drain from this perched table eastward toward lower Galligan slough.

At the Buena Vista site, leachate is likely to diffuse to the alluvial aquifer, which is used for some shallow domestic wells, at the rate of 50-200 feet per year.

The reconnaissance sampling confirmed earlier observations that leachate is emerging in surface water from both landfills and that the sandy alluvial aquifer 20 feet beneath the Buena Vista site is probably contaminated.

8. Abandoned wells can lead to contamination of deeper aquifers by acting as a conveyance for polluted surface or shallow groundwaters. Monterey County has a program for identifying and eliminating abandoned wells. Santa Cruz County mandates proper destruction of such wells, but no procedure for identification of abandoned wells exists.

9. As was found to be the case in the Salinas Valley, there is need for a demonstration-research program in the Pajaro Valley (see discussion under Salinas Valley Finding #8).

RECOMMENDED MANAGEMENT PRACTICES

A. Salinas Valley

1. Make better information available to farmers on an individual basis relating to current water use and "the state of the art" in irrigation and fertilizer management.

A demonstration-research program is recommended for the Salinas Valley. A demonstration-research project involving fertilizer and irrigation trials on several test plots for the major crops and soil types in the region would provide the level of detail needed to make substantial reductions in nitrate pollution of groundwater. A similar project is planned in the Santa Maria Valley, based on work conducted by Cooperative Extension researchers under a RANN study. The results from this research should be used where applicable in the Monterey Bay region, but additional research in this area will be necessary to account for differences in soil type, residual soil fertilizer, and irrigation practices. Once identified, these "best management practices" will be implementable through an educational program.

Using the Santa Maria program as a model, the program would involve field trials in several locations three to four sites) on the major crops in the region over a three year time period. Because of the variability between the Salinas and Pajaro Valleys, it may be necessary to conduct two

separate programs. The development of BMP's for each crop should generally correspond with the approach used by Dr. Jack Hills (U.C. Extension Agronomist) in his sugar beet production study. Data collected in the field trials should include crop yields and fertility level of the soil profile. This data will be used to determine fertilizer and irrigation water requirements for each crop. The specific recommendations for each crop and soil type will be distributed through handbooks for each crop, providing guidelines for maximum production with minimum fertilizer and irrigation water applications.

An extensive research project will also serve as a demonstration program. An opportunity for the farmers of the region to be involved with field trials and see for themselves the difference between best management practices and existing practices will be provided. The farmers' awareness of the research results will be a crucial factor in determining the success of the program in changing their farming management practices.

2. A media program is recommended to expand the agricultural community's awareness of its contribution to the nitrate problem. The incentives for improving fertilizer and irrigation water management efficiency (and therefore reducing nitrate pollution) should be stressed and should include:

   a. Economics - Reductions in fertilizer and water use may save the farmer money. Avoiding the closure of water supply wells and drilling of new wells is another cost savings.

   b. Environment - The groundwater quality will be improved.

   c. Health - The threat of "blue-baby disease" will be reduced.

   d. Legal - The Federal nitrate standard is now being exceeded and actions need to be taken to meet the standard.

   Use of television, radio and newspapers to disseminate such information may be appropriate to reach those in the affected community who are unfamiliar with the problem.

   Once people are aware of the problem, the best management practices generated from the research project should be utilized to the greatest extent possible. More intensive programs such as now available from the County Cooperative Extension are recommended, emphasizing implementation of the BMP's. Workshops and mailings can be focused on precisely this issue.

3. Identification of the problem and implementation of best management practices may also be taught through college level courses. Well advertised short courses are a more promising vehicle for reaching the agricultural community than full semester courses.

4. Seal wells to an adequate depth to prevent pollution of deeper aquifers from poor quality surface or shallow groundwaters.

5. Wastewater disposal by percolation ponds should be re-evaluated. Alternative disposal methods should be investigated.

6. Implement a groundwater monitoring program such as the one suggested in Appendix I to determine more precisely the extent of the nitrate and salt problems and the relative magnitude of each pollution source. This program should be closely coordinated with the demonstration-research program.

7. Establish monitoring and discharge requirements for all feedlots and dairies.

B. Pajaro Valley

1. The information program described for the Salinas Valley may apply equally well to the Pajaro Valley.

   The transferability of the results between the two valleys will have to be evaluated by Cooperative Extension staff.

2. Institute a groundwater monitoring program for each dairy operation to determine the extent to which nitrate (and salts) from these operations degrades local groundwater supplies. If data thus obtained documents a problem, require that measures be taken to control groundwater pollution from the operations.

3. Improve the operation and monitoring of the Buena Vista and Watsonville landfills.

   a. At the Buena Vista and Watsonville landfills, reduce leachate production by:

      1. Using a cover material of low permeability.

      2. Improving surface runoff diversion (from the Buena Vista Site).

      3. Planting grasses or other suitable cover crop on the inactive portions of the landfills.

      4. Preparing and executing a management plan to minimize infiltration after landfills are completed.

b. Correct leachate flow into Gallighan Slough at the Buena Vista Site with interceptor ditches. The collected leachate should be disposed of by transmission to the treatment plant or by spray irrigation on soils with low to moderate permeability.

c. Conduct further reconnaissance sampling below both landfills to delineate the full extent of the surface and subsurface leachate plumes.

d. A regular water quality monitoring system should be instituted based on the findings of the reconnaissance study.

e. Perform annual analyses for general mineral and selected trace element chemistry on wells utilized for domestic, institutional, and food-processing supplies in the vicinity of both landfills, particularly at the labor camp and sheriff's rehabilitation center which are located on Harkins Slough Road.

4. Implement a groundwater monitoring program such as the one suggested in Appendix I to determine more precisely the extent of the nitrogen and salt problems and the relative magnitude of each pollution source. This program should be closely coordinated with the demonstration-research program. In addition, a system should be established to notify high risk families (pregnant women and infants) having wells with high nitrate levels.

RELATION BETWEEN NITRATE AND OTHER CASE STUDIES

Nitrate	Erosion/Sedimentation	Seawater Intrusion	Aquifer Recharge
Irrigation and fertilizer demonstration -research programs[1]	Improvements in irrigation efficiency should result in less runoff making tailwater easier to control	Improvements in irrigation efficiency will decrease groundwater pumping, and losses due to evaporation and buildup of perched water table	Reduction in leaching fraction will decrease mass loading of pollutants to groundwater
Water use data	Same	Same, plus better physical understanding of groundwater basin	Same
Media education effort[1]	Same	Same	Same
Training in irrigation[1] management	Increased information on both water demand and cultural practices will result in less runoff and erosion	Same	Same
Well sealing regulations	----	----	Reduction in recharge from poor quality surface or perched water
Percolation pond alternatives	----	If ponds are eliminated, may reduce recharge slightly (depends on alternative selected	Reduction in nitrate loading to groundwater
Groundwater monitoring	----	Better physical understanding of groundwater basin	----
Monitoring and discharge requirement for feedlots and dairies	----	----	Depending on findings it may be necessary to reduce pollutant loading to groundwater from this source

1. Implementation of this recommendation will also reduce the quantity or improve the quality of agricultural return flows generated in areas with tile drainage.

RECOMMENDED IMPLEMENTATION PROGRAM

A. Salinas Valley

A government structure exists which is capable of protecting groundwater in the Salinas Valley from nitrate pollution. Therefore, the recommendations presented in this section emphasize increased reliance on existing local and state agencies and their collective authority to educate, provide technical assistance, collect data, adopt regulatory programs, raise funds, and coordinate with other agencies.

It is recommended that:

1. Improvements to farm irrigation and fertilizer management practices be sought through aggressive education, technical service, and monitoring programs. Principal agencies involved in this effort will be the County Farm Advisor (University of California Cooperative Extension), Hartnell and other colleges (which can provide facilities and funding) and the Monterey County Flood Control and Water Conservation District.

    a. It is recommended that the Monterey Cooperative Extension, with the involvement of state specialists, play a lead role in both the proposed demonstration research project and media program. Both programs fit within the Extension's existing scope and responsibilities. To a great extent, the success of the demonstration-research program will be dependent upon the cooperation and assistance of agricultural, water-quality related and other entities including: The County of Monterey (to contribute some funding and staff time); the Flood Control and Water Conservation District; Regional Water Quality Control Board and Resource Conservation Districts (to provide technical and data collection assistance); and agricultural groups (to provide test plots, yield data and fertilizer trial results).

        It is further recommended that a committee composed of representatives of the above entities be formed to work out the details of a research project. The number of crops to be tested, number and location of test plots, time span, costs, and responsibilities of all the involved entities will need to be determined. The Santa Maria Plan proposal should be considered as a basis for comparison.

        It is recommended that the Cooperative Extension bear the majority of the medial program cost, with support from the county.

Cooperative Extension will most likely bear the burden of the cost for the demonstration program, as the project fits within its present scope. However, at least some support will have to be provided by the County and preferably by some of the other involved entities (especially for the monitoring aspects of the research).

b. Appropriate educational institutions such as Hartnell Junior College and California Polytechnic Institute develop and conduct courses in fertilizer and irrigation management. Courses will focus on particular topics, or types of farming. Cost will be $3,000 for one part-time instructor for one semester, one-third funded by the State and two-thirds funded by the college district.

c. Using government funds made available to them, interested farmers contract with private firms to test the nitrate concentrations in the farm's soil, irrigation water and crop foliage. This program will be administered by the Farm Advisor, supported by a State Cooperative Extension grant and/or county subsidy of at least $5,000. This would be a short-term pilot program. Farm economics and contribution of nitrates to soil and groundwater will be evaluated. It is hoped that the results of this program will lead to voluntary reliance by farmers on testing procedures prior to fertilizer and irrigation applications.

d. The above entities should jointly determine the best method for supplying: 1) each farmer with data on his water use; and 2) government with aggregated water use data.

2. The Central Coast Regional Water Quality Control Board identify all wastewater discharges from cattle feedlot and dairy operations and adopt monitoring and discharge requirements relating to nitrate. Requirements will be met by feedlot and dairy operators, including costs of such measures as installing paved manure storage areas and lining evaporation ponds where necessary. No additional RWQCB staff is required. Enforcement of regulations is a state expense.

3. The cities of Gonzales, Soledad, Greenfield, and King City should give full consideration to disposal of municipal and industrial wastewater by methods other than the current practice of allowing collected wastewater to percolate to groundwater. This analysis should be done as part of future wastewater facility studies when the cities plan on expanding or modifying their treatment facilities.

4. Monterey County Health Department modify its current well drilling ordinance to require the sealing of all wells in the Salinas Valley to the depth necessary to prevent pollution of aquifers by lower quality surface or shallow groundwater. Well owner pays for sealing; insepction and enforcement costs are paid by the county. No significant increase in enforcement costs is expected and no additional staffing is required.

5. Due to the need for additional data concerning causes of the nitrate problem, present and predicted, an extensive monitoring and study program is to be conducted over a period of several years. Funding and implementation should primarily be the responsibility of the Monterey County Flood Control and Water Conservation District, assisted by the State Department of Water Resources and Monterey County Enviornmental Health Department, which already provides chemical analysis of all domestic water supplies.

B. Pajaro Valley

A government structure exists which is capable of protecting groundwater in the Pajaro Valley from nitrate pollution. Therefore, the recommendations presented in this section emphasize increased reliance on existing local and state agencies and their collective authority to educate, provide technical assistance, collect data, adopt regulatory programs, raise funds, and coordinate wih other agencies.

It is recommended that:

1. Improvements to farm irrigation and fertilizer management practices be sought through aggressive education, technical service, and monitoring programs. Principal agencies involved in this effort will be the County Farm Advisors (University of California Cooperative Extension), Hartnell and other colleges which can provide facilities and funding, and the Monterey and Santa Cruz Flood Control and Water Conservation Districts.

   a. It is recommended that the Monterey and Santa Cruz Cooperative Extension, with the involvement of state specialists, play a lead role in both the proposed demonstration research project and media program. Both programs fit within their existing scope and responsibilities. The success of the demonstration research program will to a great extent be dependent upon the cooperation and assistance of agricultural, water quality related and other entities including:

      The Counties of Monterey and Santa Cruz (to provide some funding and staff time); the Flood Control and Water Conservation Districts, RWQCB, and RCD's (to provide technical and data collection

assistance); and agricultural groups (to provide test plots, yield data and fertilizer trial results).

It is further recommended that a committee composed of representatives of the above entities be formed to work out the details of a research project. The number of crops to be tested, number and location of test plots, time span, costs, and responsibilities of all the involved entities will need to be determined. The Santa Maria Plan proposal should be considered as a basis for comparison.

It is recommended that the Cooperative Extension bear the majority of the media program cost with support from the two counties.

Cooperative Extension will most likely bear the burden of the cost for the demonstration program, as the project fits within its present scope. However, at least some support will have to be provided by the counties and preferably by some of the other involved entities.

b. Hartnell or Cabrillo Junior College District and/or California Polytechnic Institute develop and conduct courses in fertilizer and irrigation management. Courses will focus on particular topics or types of farming. Cost will be $3,000 for one part-time instructor for one semester, one-third funded by the State and two-thirds funded by the college district.

c. Using government funds made available to them, interested farmers contract with private firms to test the nitrate concentrations in the farm's soil, irrigation water and crop foliage. This program will be administered by the Farm Advisor, supported by a State Cooperative Extension grant and/or county subsidy of at least $5,000. This would be a short-term pilot program. Farm economics and contribution of nitrates to soil and groundwater will be evaluated. It is hoped that the results of this program will lead to voluntary reliance by farmers on testing procedures prior to fertilizer and irrigation applications.

d. The above entities should jointly determine the best method for supplying: 1) each farmer with data on his water use; and 2) government with aggregated water use data.

2. The Central Coast Regional Water Quality Control Board identify all wastewater discharges from dairy operations and adopt monitoring and discharge requirements relating to nitrate. Requirements will be met by dairy operators. No additional RWQCB staff is required. Enforcement of regulations is a state expense.

3. Santa Cruz County and University of California Cooperative Extension field staffs conduct continuous surveillance for abandoned wells. Santa Cruz Environmental Health Department provide brief written guidance to staffs on recognition of abandoned wells, and establish a simple reporting procedure for such wells.

4. Due to the need for additional data concerning causes of the nitrate problem, present and predicted, an extensive monitoring and study program is to be conducted over a period of several years. Funding and implementation should be the responsibility of the County Flood Control and Water Conservation Districts and the Office of Watershed Manager.

Target Implementation Dates

Salinas Valley

Recommendation	Start-Up Date	Time Duration
1. fertilizer/irrigation trials	1979	3 years
2. media education effort	1979	3 years; appraisal after 1 year
3. college courses	1979	ongoing; appraisal annually
4. well sealing regulations	ordinance change: 1978	
5. investigate percolation pond alternatives	during planning for treatment plant modifications/ enlargements	
6. groundwater monitoring	1978	ongoing; annual appraisal for modifications
7. monitoring and discharge requirements for feedlots and dairies	establish requirements: 1978	ongoing monitoring

Pajaro Valley

1. fertilizer/irrigation trials	1979	3 years
2. media education effort	1979	3 years; appraisal after 1 year
3. college courses	1979	ongoing; appraisal annually
4. monitoring and discharge requirements for dairies	establish requirements: 1978	ongoing monitoring
5. monitoring and operation improvements at landfills	monitoring: 1978	ongoing monitoring; implement changes: 1983
6. groundwater monitoring program	1979	ongoing; annual appraisal for modifications

OTHER GROUNDWATER BASINS

Findings

1. Data on nitrate levels in groundwater throughout the region are incomplete. Problems are suspected in the San Lorenzo Valley and have been documented in some sections of the Prunedale area, Marina, Sand City, and Seaside.

2. Outside the Pajaro and Salinas Valleys, existing and previously used septic systems appear to be the main contributor to excessive nitrate levels. Around Prunedale, strawberry culture may also add nitrate to the groundwater.

3. Because septic systems are a source of nitrate in most of the region, groundwater quality will be sensitive to future population densities. The carrying capacities of the sub-basins in the region, in terms of their ability to absorb septic tank effluent without serious aquifer degradation, have not been determined.

4. Deep subsurface absorption systems may be especially prone to contribute nitrate to groundwater.

5. Inadequately sealed or improperly abandoned wells can cause groundwater pollution as described in the Pajaro and Salinas Valley case studies.

RECOMMENDED MANAGEMENT PRACTICES

1. Groundwater monitoring and geological investigations should be undertaken to determine the effects of deep subsurface absorption systems in the San Lorenzo, Carmel Valley and Prunedale area basins.

2. The capacity of the San Lorenzo Valley, Carmel Valley and Prunedale area aquifers to absorp septic system effluent without impairing groundwater quality should be calculated. Maximum unsewered carrying capacities should be determined.

RECOMMENDED IMPLEMENTATION PROGRAM

It is recommended that investigations on basin carrying capacities and the effect of deep absorption systems be conducted as part of the following 201 studies:

1. San Lorenzo Valley Sanitation Study

2. Carmel Sanitary District Areawide Facilities Plan

3. Castroville Expanded Service Area Wastewater Facilities Planning Study

Adjustments to the scheduling and funding of these studies should be made, as necessary, to incorporate the recommended tasts.

It is also recommended that:

Monterey County continue to mitigate problems caused by improperly abandoned or inadequately sealed wells (including ordinance change) as recommended for the Salinas and Pajaro valleys.

Santa Cruz County conduct ongoing surveillance for abandoned wells as recommended for the Pajaro Valley.

Environmental Impacts

The recommendations for a research and demonstration program on more efficient water use and fertilization to alleviate nitrate and runoff problems from farm operations, groundwater monitoring of feedlot and dairy operations and sealing all new wells will have only a minor impact on restoring surface and groundwater quality in and of themselves, but as an educational tool they can accelerate the voluntary adoption of best management practices by the area's farmers. If an overall reduction of ten percent of total applied fertilizer is achieved when the educational program is fully implemented, the amount of nitrate reaching groundwater could be cut by as much as one half. These proposals would have no significant adverse environmental effects.

Economic and Social Impacts

As agriculturalists are made more aware of the benefits of best management practices, employment in government commercial services offering fertilizer and irrigation management would increase. System design and sales (few of the components are manufactured locally) of drip and sprinkler irrigation and field moisture instrumentation would increase. If a ten percent savings in chemical fertilizer use were achieved, local sales would of course decrease. No fertilizers are manufactured locally, and the ten percent savings amounts to less than one half of one percent of statewide production.

The groundwater monitoring program for feedlots, dairies and percolation ponds could impose a cost of about $1,000 on operators who lack nearby wells and would have to drill an observation well to obtain samples. The cost would be significant, especially to smaller operations. If groundwater contamination were found, the costs for correcting problems could be substantial.

Mitigation Measures

Feedlot and dairy operators with less than 500 head of cattle could be exempted from the groundwater monitoring requirement at least until monitoring of larger operations and basinwide monitoring confirms there is a problem serious enough to warrant action.

Alternatives[1]

The objective of this element is to reduce nitrate buildup in groundwaters. Several alternatives which would have a beneficial impact on the environment by improving groundwater quality were evaluated during the development of the plan. The laternative of mandating reductions in fertilizer use was considered during the planning. Substantial resistance to this idea became evident through the public involvement program. Further consideration was dropped because of the site specific variability in optimal fertilizer application rates and because of the difficulties of enforcing regulatory requirements in the face of resistance to governmental intervention.

Monitoring of all private wells to determine if they suffer from nitrate pollution was considered and deleted due to lack of support of the idea by both counties' Environmental Health Departments. Allowing the use of bottled water for drinking as an alternative to the present practice of requiring abandonment or deepening of nitrate wells serving five or more connections was rejected on the grounds that the Safe Drinking Water Act requires the county to enforce drinking water standards through upgrading the water supply system. For wells having two to four connections, Monterey County Environmental Health Department opposed changing the requirements of its ordinance regulating small water systems. Santa Cruz County does not monitor nor enforce the nitrate level for such wells. The same applies to all single connection wells in both counties.

As an option to reliance on education to promote increased use of more efficient irrigation systems, tax incentives could be instituted for systems certified as water conserving, including state and federal tax credits and deductibility and exemption from local property tax assessment. (Proposition 13 does not provide for differential property tax assessments.)

"No project alternative" could result in continued infiltration of nitrate to groundwaters. Adoption of more efficient water use and fertilizer practices would likely spread (though not as fast as with the educational program) as fertilizer prices and energy costs rise and competing demands for water grow. For many of the locally produced high cash value crops, fertilizer and water costs are a relatively minor portion of total productions costs. Feedlot, dairy, and percolation pond contributions, however, would continue to degrade groundwaters.

[1]Alternatives specifically intended to improve irrigation and fertilizer efficiency are addressed in An Investigation of Non-Point Sources of Groundwater Pollution in Santa Cruz and Monterey Counties. Many of the alternatives are appropriate in site-specific situations, but their applicability is influenced by such factors as crop type, soils, climate, economics. It will continue to be the function of agencies such as University Extension, U.S. Soil Conservation Service, and Resource Conservation Districts to advise individual farmers on the use of these alternatives.

Small feedlots and dairies could be exempted from discharge requirements and monitoring programs if there were sufficient evidence (as determined by the State Water Resources Control Board) that they did not have a significant impact on water quality.

Short Term Uses Versus Long Term Productivity: The plan recommendations enhance long term productivity and health of the region's finite groundwater resources. Even with the recommended changes, however, nitrates already in the soil column will continue to enter the groundwater for many more years.

Significant Irreversible Changes: The proposed sealing of wells to the depth necessary to prevent aquifer pollution from surface or perched waters is the only irreversible change called for.

Growth Inducement: None of these proposals would stimulate or in and of themselves remove a major current constraint to population or economic growth, although they would provide for continued growth in areas that might be jeopardized by groundwater pollution if they are not implemented.

STATEMENT OF FACTS AND PRINCIPLES -- re: the Agricultural Aspects of 208 Water Quality Study

This document was preapred by the Association of Monterey Bay Area Governments staff after consultation with representatives of agriculture and agribusiness. It reflects a position paper stating the need and rationale for the inclusion of a chapter relating to nitrate pollution of ground water in the Salinas and Pajaro Valleys.

STATEMENTS OF FACT

- AMBAG is responsible for the preparation of a Water Quality Management Plan for Monterey and Santa Cruz Counties pursuant to Section 208 of the Clean Water Act of 1972.

- The U.S. Environmental Protection Agency and the California State Department of Health have developed and promulgated public health standards and regulations regarding the concentration of nitrates in drinking waters based on best available information. The Counties of Monterey and Santa Cruz Environmental Health Officers are required to enforce this regulation. The Monterey County health officer has closed more than 40 domestic water wells in the Salinas Valley.

- AMBAG was requested by the South Monterey County Cities to expand the boundaries of the 208 study to include the Southern Salinas Valley particularly as it related to the problem of "Nitrate Pollution of Groundwater."

- Many agriculturalists in the Salinas Valley and Pajaro Valley utilize good management practices using the latest available techniques and information.

- Salinas and Pajaro Valley agriculture is a dominant industry of the Monterey Bay Region and contributes to the economic and fiscal well being of the region.

- Nitrate pollution in both surface and groundwater results from municipal wastewater, industrial wastewater, natural ground salts, rain water and agricultural practices. Further study is needed in order to more accurately determine the relative contribution of various polluting sources and to propose a remedial program.

STATEMENTS OF PRINCIPLE

The AMBAG Board of Directors is charged with the responsibility of identifying the sources of significant pollution and proposing reasonable solutions. AMBAG does not have the power to nor does it seek to regulate government or industry practices.

- AMBAG, the Cities and Counties working with other public agencies and business enterprises should work cooperatively

to develop a program designed to study and propose solutions to mitigate any significant problems in the region.

- o AMBAG will make every effort to preserve the anonymity of data suppliers and to safeguard against unwarranted, irresponsible use of any data collected in studies in which it is a participant.

- o In the event changes in agricultural practices are found to be necessary AMBAG should work with existing agencies and private industry to develop effective voluntary local efforts.

PROPOSAL

- o It is proposed that the statements of fact, principle and a proposal agreed to and contained in this document reflect a joint position of the AMBAG Board of Directors and responsible representatives of the Salinas Valley and Pajaro Valley agricultural communities, and shall be inserted as a preface to the Nitrate Pollution chapter of the final 208 plan.

- o It is further proposed that AMBAG, as part of its continuing planning process and in conjunction with representatives of the agricultural community, County Agricultural Commissioner, the County Director of the Agricultural Extension Services, County Environmental Health Officers, U.S. Soil Conservation Service, the Resource Conservation Districts, and other appropriate agencies, recommend the membership of an Agricultural Study Advisory Group which would cooperate further in the investigation of possible agriculturally related environmental problems including the nitrate study. Specifically, this group's tasks would be to:

  A. Develop appropriate funding strategies to undertake these studies.

  B. Develop (with the assistance of appropriate staff and/or consultants) criteria, study limits, and data to investigate agricultural fertilizer and water use practices as related to conomic return and the ground water nitrate problem, including site selection to identify the source of nitrate pollution in underground water (deep percolation).

  C. Recommend approval of an appropriate sampling program and encourage voluntary participation in the studies and the testing work with governmental agencies to insure confidentiality and minimum interference with farming practices.

D. Make recommendations to appropriate governmental agencies responsible for planning and implementing programs.

E. Establish a method of educational persuasion to gain compliance with BMP's in the event that the studies find particular agricultural practices to be contributing to groundwater pollution or other non-judicious practices contributing to deterioration of water quality.

F. Develop a plan of action covering A through E above within a year and submit to the AMBAG Board of Directors.

G. This group is <u>not</u> to assume the powers of any official governmental entity responsible for water quality planning or program implementation; but will act in the manner specified above as an advisory body to AMBAG and EPAC.

CHAPTER VIII

SEAWATER INTRUSION IN THE PAJARO VALLEY

INTRODUCTION

The intrusion of seawater into coastal aquifers is a serious problem which results from overdrafting the groundwater resource. Under natural conditions, groundwater in coastal aquifers discharges to the sea in much the same way as do coastal streams. However, if the water table is lowered to or below sea level by over-pumping, a landward hydraulic gradient is established which permits seawater to move inland. Seawater intrusion can force coastal agriculture out of production as the quality of water pumped in affected areas is gradually lowered until well abandonment results. Since intruded seawater is not easily displaced and forced back to the ocean, it is very important to slow or half its progression at the earliest possible time.

OBJECTIVES

The objective of this chapter is to describe the causes of seawater intrusion in the Pajaro Valley, their future implications, and to propose recommendations that provide lasting solutions to the problem. The effects of seawater intrusion in the lower Salinas Valley are being investigated by the U.S. Army Corps of Engineers. When results of that study are known, they are to be incorporated in the updated 208 Plan.

FINDINGS

1. Seawater intrusion has occurred along the southern half of the Pajaro Valley. Initial intrusion took place during the late 1940's, following a period of agricultural intensification. Although the extent of the intrusion has fluctuated yearly with changes in rainfall and groundwater levels., over the long term it has gradually advanced inland to a distance of 3 to 4 miles from the coast, covering an area of more than ten square miles.

2. In the Pajaro Valley groundwater, there is no sharp division between fresh and salt water, due to intermingling. As intrusion has progressed, wells have experienced increasingly higher concentrations of salts. The most severely intruded wells in the area, long since abandoned, now contain a mixture of 20 to 30 percent seawater.

3. Since 1950, groundwater levels in the Pajaro Valley have generally undergone a steady decline. Only during exceptionally wet periods has this trend been temporarily reversed.

4. In or around the intruded area, groundwater troughs (pumping depressions) have been created by excessive pumping for irrigation or other purposes. These troughs have water levels below sea level, up to 30 feet in some cases. They have generally been accompanied by the presence of seawater intrusion since landward hydraulic gradient they create allows salt water to flow inland from the ocean.

   They have generally been accompanied by the presence of seawater intrusion since the landward hydraulic gradient they create allows salt water to flow inland from the ocean.

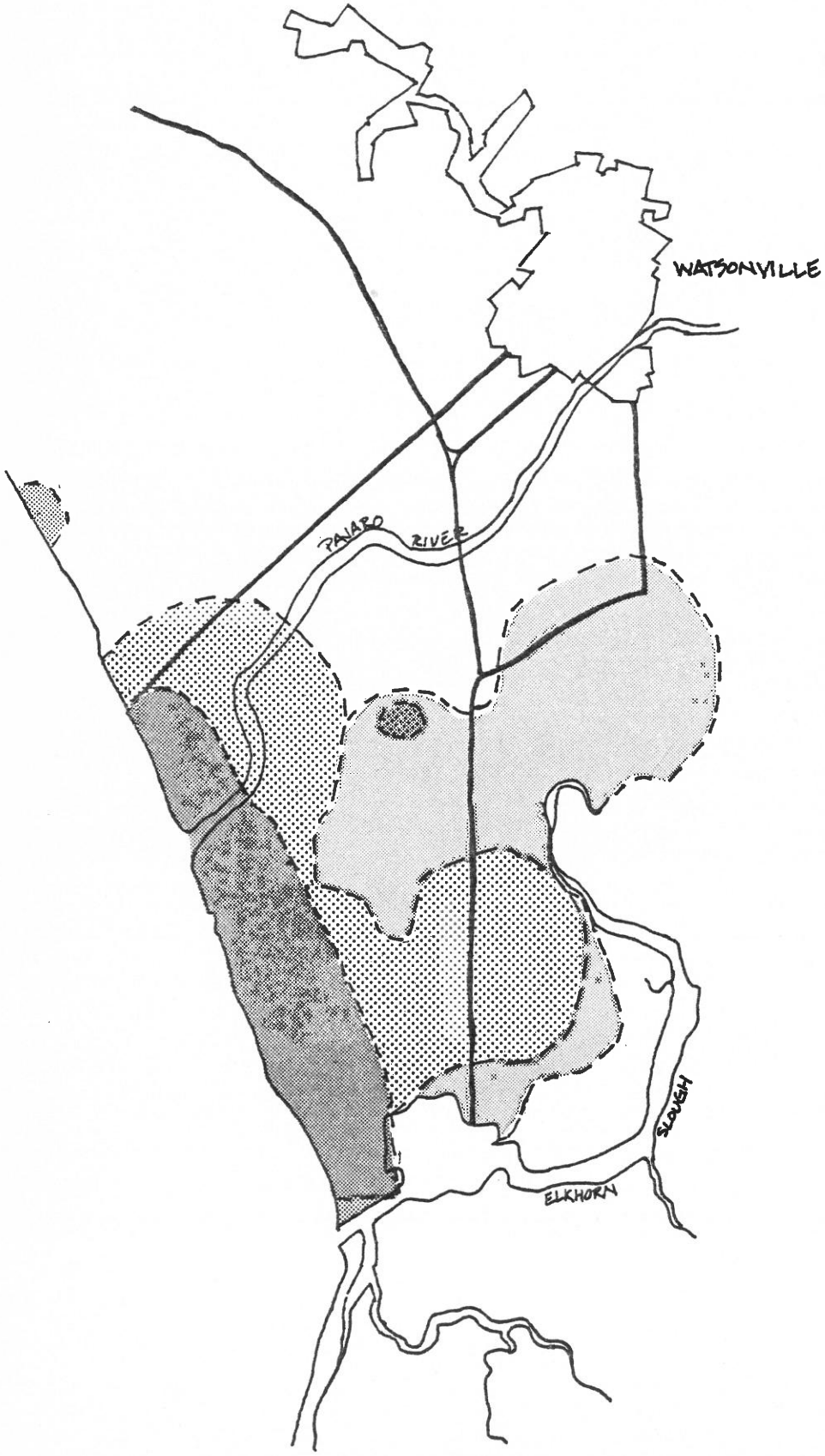
5. Historically, withdrawals from the groundwater in the Pajaro Valley for irrigation, municipal and industrial uses have been slowly and consistently increasing. Since 1964, groundwater pumpage in the Pajaro Valley has exceeded the safe yield of its groundwater during several years. The resulting net overdraft and consequent lowering of the groundwater table, especially in the trough areas near the coast where pumpage is relatively concentrated, has been primarily responsible for seawater intrusion.

6. The entire Pajaro Valley study area has presently reached a condition of severe, continual overdraft. Average annual withdrawal and outflows are exceeding average volumes of percolation and recharge by about 17,500 acre feet per year.

7. Levels of groundwater pumped for agricultural irrigation, currently accounting for about 90% of the total pumpage in the Pajaro Valley, are expected to be maintained into the future. Total pumpage will increase as further urban development of the valley expands municipal and industrial water requirements. The magnitude of overdraft will correspondingly increase in the long term, resulting in lowered groundwater tables with even less resistance to seawater intrusion. The intrusion front should continue to advance inland as long as the present patterns of pumping are maintained or intensified and no preventive steps are taken.

SEAWATER INTRUSION IN THE PAJARO VALLEY

1951-1977



*>100 MG Cl/L

+ 50-100 MG Cl/L

RECOMMENDED MANAGEMENT PRACTICES

To determine which sources of additional water supply are most appropriate for offsetting the current overdraft in the Pajaro Valley, it is recommended that:

1. Alternative water supply sources for the Pajaro Valley including imported water, development of local surface water supplies, reclaimed wastewater, intraregional transfers of local supplies, and deep aquifer resources, should be further investigated. Potential capacities, environmental and economic costs, legal obstacles, delivery dates, agricultural imports, and growth impacts should be estimated and compared.

   Work should be coordinated with ongoing studies conducted by the Federal Bureau of Reclamation in connection with the portion of the San Felipe Division of the Central Valley Project which is planned to serve the Pajaro Valley area.

   This investigation should result in a firm recommendation for which source or sources to pursue, and should detail funding sources, responsible agencies and relationship to other 208 recommendations.

To make more efficient use of water pumped from the Pajaro Valley groundwater basin for irrigation or municipal and industrial use, it is recommended that:

1. The application of best management irrigation practices proposed for erosion and nitrate problems (See Chapters V and VII) should be emphasized in the Pajaro Valley. This would ensure that agricultural activities use only as much water as is required to maintain productivity.

2. Water conserving devices such as low volume water closets and water saving shower heads and faucet aerators should be required for all new construction in the Pajaro Valley.

3. An aggressive public education program should be conducted to maintain public interest in water conservation techniques in the Pajaro Valley engendered by the recent drought. The public should be made aware of the long term nature of the groundwater overdraft which has led to seawater intrusion in the Valley.

To help recharge the overtaxed aquifers in the Pajaro Valley, it is recommended that:

1. The application of on-site stormwater retention techniques proposed for aquifer recharge problems (See Chapter IX) should be emphasized in the Pajaro Valley.

To determine the possibility of halting seawater intrusion by establishing a freshwater barrier, it is recommended that:

1. A field study should be conducted to investigate the feasibility and cost-effectiveness of taking effluent from the City of Watsonville's Waste Treatment Plant and injecting it into the ground to establish a barrier to seawater intrusion. By maintaining an injection ridge at a required elevation above sea level, continued extraction of groundwater landward of the barrier would be possible without further encroachment of seawater. This field study has been proposed by the Santa Cruz County Wastewater Facility "201" Plan.

To help keep track of the progression of seawater intrusion in order to estimate its potential future impacts and the effectiveness of the management program, it is recommended that:

1. A periodic monitoring of well water quality along the intrusion front should be conducted where monitoring is currently inadequate. (For more detailed monitoring recommendations, (See Appendix 1)

RECOMMENDED IMPLEMENTATION PROGRAM

To implement the recommended managment practices for solving seawater intrusion problem in the Pajaro Valley, it is further recommended that:

1. AMBAG should conduct a study to evaluate alternative water supply sources for the Pajaro Valley. Relevant agencies from both counties and the City of Watsonville would provide technical assistance to the study, as well as private water agencies in the study area. The State Department of Water Resources and the Federal Army Corps of Engineers, Bureau of Reclamation, Environmental Protection Agency, and Geological Survey would also be invited to participate. The estimated cost of the study is $60,000. The recommended source of financing is $25,000 from on-going Section 208 planning funds and $30,000 in cash or services from the agencies participating in the study.

2. Monterey and Santa Cruz Counties should express an interest to the Bureau of Reclamation in procuring imported water supplies from the San Felipe Division of the Central Valley Project. This is a very promising source of water. The project is authorized to provide to the Pajaro Valley area 19,000 acre feet of water annually, sufficient to offset the current level of groundwater overdraft. Because the counties in the past have indicated to the Bureau that they would not be interested in negotiating for the water for 10-15 years, the Bureau has delayed in studying rhe Pajaro Valley area and designing appropriate conveyence facilities. An immediate expression of local interest in the water would not constitute a committment. It would give the Bureau cause for restudying the area and providing updated information on water requirements and project water costs for use in the alternative water supply study. Thus, delays in the ultimate delivery of the water can be avoided, if the project water is selected as a desired alternative water supply source by the study. Local agencies should work closely with the Bureau in the generation of the information to resolve important issues, such as the application of the 160-acre limitation rule under different circumstances, and how and to what extent the water might be used to help solve the seawater intrusion problem without inducing water-consuming growth (such as using it for direct aquifer recharge in intruded agricultural areas).

3. Resource Conservation Districts, in cooperation with the Agricultural Extension Service, should prepare, review and approve site specific best management practices for irrigation management in the Pajaro Valley. More detail on this implementation program is presented in Chapter V.

4. Monterey and Santa Cruz Counties, the Agricultural Extension Service, the State Regional Water Quality Control Board and Resource Conservation Districts, should work to improve irrigation practices in the Pajaro Valley through education and demonstration programs. More detail on this implementation program is presented in Chapter VII.

5. The City of Watsonville should prepare an ordinance amending its building codes which would require water saving shower heads, faucet aerators, and low volume water closets for all new construction built within the city. The County of Santa Cruz has such an ordinance, which the city should consult for useful standards and model language. This ordinance (No. 2420) was passed by the Santa Cruz County Board of Supervisors on May 10, 1977. It amends sections 12.04.070 and 12.09.090 of the Santa Cruz County Building Code.

6. A public education program for municipal water conservation in the Pajaro Valley should be initiated by the County of Santa Cruz and the City of Watsonville. Santa Cruz County has effectively informed the public of water conservation needs and techniques during the recent drought, and should continue to apply this experience in the Pajaro Valley. The exact scope and costs of this program will be determined by these municipalities, who should cooperate in a joint public education effort.

7. Monterey and Santa Cruz Counties and the City of Watsonville should implement on-site stormwater retention in the Pajaro Valley through modified development practices. More detail on this implementation program is presented in Chapter IX.

8. The County of Santa Cruz and the City of Watsonville should actively participate in a field study to determine the feasibility and cost effectiveness of creating a seawater intrusion barrier at the mouth of the Pajaro Valley. Such a field study has been proposed by the Santa Cruz County Wastewater Facility "201" Plan at a cost of $150,000 to $200,000 (87% Federally fundable). The information produced by the study, primarily the cost of the final project and the amount of protection afforded the groundwater resource would produce useful input to the study of alternative water supply sources. This field study may have to await the final decision of EPA on Watsonville's request to waive secondary treatment requirements.

9. Additional monitoring of the movement of seawater in the Pajaro Valley groundwater resource should be implemented by the County of Monterey according to Appendix I, which calls for the monitoring of five additional wells in the Elkhorn Road area between the Los Lomas and Pajaro.

TABLE VIII-1

SUMMARY OF IMPLEMENTATION PROGRAMS FOR SEAWATER INTRUSION IN THE PAJARO VALLEY

PROGRAM	PUBLIC COSTS[1]	FUNDING SOURCES	RESPONSIBLE AGENCIES
1. Study of Alternative Water Supply Sources	$60,000	$30,000 EPA 30,000 Local/ other agencies	Monterey and Santa Cruz Counties/City of Watsonville
2. Express Interest in San Felipe Project Water to Federal Bureau of Reclamation			Monterey and Santa Cruz Counties
3. Implement Best Management Practices[2] for Irrigation	$10,000	$7,500 EPA 2,500 RCD's	Resource Conservation Districts Agricultural Extension Service
4. Improve irrigation practices[3] through education and demonstration programs	$15,000/3 yrs. - State (UC) $5,000/3 yrs. - Counties	$15,000 Univ. Ca. $5,000 Local	Agricultural Exten. Services Santa Cruz Co., State Regional Wtr. Quality Control Bd., Re-Source Conservation Dist.
5. Require Water Saving Devices for new construction	$1,000 Initial 5,000/yr.	Local	City of Watsonville
6. Initiate a Public Education Program for Water Conservation	Depends upon scope of Program	Local	County of Santa Cruz/City of Watsonville
7. Implement On-Site Stormwater Retention[4] Techniques	$1,000 Initial 40,000/yr.	Local	Monterey and Sant Cruz Co./City of Watsonville
8. Participate in a Seawater Intrusion Barrier Field Study	$150,000 - 200,000	$131,000 - 175,000 EPA 19,000 - 20,000 Local	County of Santa Cruz/City of Watsonville
9. Monitor seawater intrusion	$1,000/yr	Local	County of Monterey

TABLE VIII-1 FOOTNOTES

1. 1978 dollars. Some of the costs identified in this table overlap with other case study costs, therefore, it would be misleading to aggregate costs between case studies.

2. See Chapter V for further detail.

3. See Chapter VII for further detail.

4. See Chapter IX for further detail.

TARGET IMPLEMENTATION DATES

PROGRAM	START UP DATE	TIME DURATION
1. Study of Alternative water supply sources	July 1979	1 year
2. Express interest in San Felipe Water to Federal Bureau of Reclamation	January 1979	6 months to formulat a position, ongoing communication with Bureau
3. Implement Best Management Practices for Irrigation	July 1980	Ongoing
4. Improved irrigation practices through education and demonstration programs	January 1979	3 years
5. Require water savings Devices for New Construction	January 1979	9 months to prepare an ordinance, ongoir implementation
6. Initiate a Public Education Program for Water Conservation	January 1979	Ongoing
7. Implement On-Site Stormwater Retention Techniques	July 1979	Ongoing
8. Participate in a Seawater Intrusion Barrier Study	July 1979	1 year
9. Monitor Seawater Intrusion	January 1979	Ongoing

IMPACT ASSESSMENT

SIGNIFICANT EFFECTS: Many of the recommendations for seawater intrusion involve conducting further studies before taking action. The selection between alternative sources of new supply would include detailed environmental assessment of specific sites for storage and diversion. The overall regional affects of providing such supply to allow for continued growth in the region are evaluated in Chapter XI. However, the specific impact of water supply proposals should be more fully evaluated in the continuing planning process before commitment is made to any particular course of action. The potential impact of a wastewater injection barrier, especially with concern for health aspects, would also require a more detailed study. The recommendations for increased recharge are evaluated in Chapter IX.

ALTERNATIVES:

Measures for control of seawater intrusion that were examined fall under the following categories:

1. Provision of additional imported or local sources of water supply

2. Curtailment of pumping from the groundwater reservoir through land use and pumping restrictions or encouraging more efficient use of pumped water

3. Development of seawater intrusion barriers.

Additional water supply sources investigated included imported water, development of local surface water supplies, reclaimed wastewater and drilling to deeper aquifers. Imported supplies seem preferable because they would be relatively easy to obtain at authorized amounts and should have lower local economic and environmental costs than the other alternatives.

However, not enough information presently exists to make a concrete recommendation to obtain or develop any particular source.

Land use and pumping restrictions to curtail water use was rejected because of their potential to severely disrupt the local economy.

SHORT TERM USES VERSUS LONG TERM PRODUCTIVITY: Continuation of present practices would lead to continuing advancement of the intrusion level and degrade wells farther inland. Over the long term the continued exceedence of safe yield by withdrawals throughout the basin would penalize those users in the immediate coastline area by imposing higher costs on their ability to obtain water supply. Agricultural uses could be severely affected in the long run.

GROWTH INDUCEMENT: Alternatives providing increased water supplies would remove a potential constraint on growth and development. The forecasts for regional growth assume water supply will become available; the impacts of new growth are discussed in Chapter IX.

CHAPTER IX

CASE STUDIES ON AQUIFER RECHARGE:

PAJARO VALLEY
CARMEL VALLEY
SAN LORENZO VALLEY

INTRODUCTION

Three case study areas within the Monterey Bay Region were selected to study the role of urbanization in diminishing groundwater recharge and hence the availability of total groundwater supplies: the Pajaro, Carmel and San Lorenzo Valleys. These basins allow for considerable contrasts in hydrologic regimens, urbanization pressures and their effect on recharge.

Evaluation of these areas leads to the important conclusion that mitigation of recharge losses from present and future urban development impacts will not entirely solve the overall problems of basin supplies. For example, projected future uses of Carmel Valley groundwater resources are expected to exceed the "safe yield" of the basin in the mid 1990's (PUC 1976-77), and the Pajaro basin is already in an overdraft condition (see Chapter VIII, Seawater Intrusion).

Therefore, in the basins with existing or impending groundwater quantity deficits and pollution, basin management of withdrawals and water allocation policies are the significant water resource management issues. Nonetheless, within this management framework, mitigation of recharge losses and groundwater pollution resulting from present and future urbanization does and should play a role in the overall conservation of the region's water resources.

The findings for the three case study basins indicate that groundwater quantity and quality have been adversely impacted by past urban development and that further degradation is likely to occur as additional urban development takes place. Although estimated reductions in recharge from projected development are relatively low for the Carmel and San Lorenzo Basins, the cumulative impacts of past and future development are considerably greater. (Reductions in quantity and quality, as discussed under Findings for the case studies.) Whatever the rate and type of growth that occurs, there will be a corresponding impact on groundwater quantity and a potential for groundwater quality degradation.

Because of the variability and limits of available data, scope of study, and complexity of groundwater conditions in each of the study areas, the findings are neither uniform nor precise as to recharge impacts of future urban development.

Because of the same constraints, management guidelines likewise cannot be precise, uniform or inflexible; but the region's dependence on groundwater necessitates that actions be taken based on what we already know. Due to the complexity and variability of recharge conditions throughout the region, several types of management schemes are presented. Combinations of management practices are necessary and desirable as they deal with different facets of the land use planning and development process. As more groundwater information becomes available, these systems can be refined and individualized based on the needs of each area.

OBJECTIVES

- Protect groundwater recharge so that urban development does not adversely affect the quantity and quality of groundwater resources
- Maintain at pre-development levels and, in some cases, enhance groundwater recharge as urban development occurs
- Incorporate a new emphasis in land use planning which will bind future development to approaches and development practices sensitive to the protection and maintenance of the region's water quantity and quality

GENERAL FINDINGS AND RECOMMENDATIONS

Characteristics of the region's groundwater basins are more similar than dissimilar. The same is true for management strategies. Therefore, in order to avoid repetition between the case study recommendations, region-wide information precedes the more specific discussions for the Pajaro, Carmel, and San Lorenzo basins. Findings and recommendations applicable to all the groundwater basins in the region are first presented, followed by specific information on the case study basins.

FINDINGS

A. The case studies conducted for the three basins, as well as a survey of existing knowledge on the three other groundwater basins in the region (Santa Cruz Coastal, Aptos-Soquel and Salinas), easily allow the conclusion that there is very little quantitative groundwater resources data. It is a complex area of study that is just coming under investigation. Much more research should be conducted, as discussed under the recommendations for each basin.

B. Watershed hydrologies vary tremendously throughout the region. While the Santa Cruz Mountains, with their high annual rainfall, might be considered "water-rich", topography and limited water storage capacity can lead to water shortages in the dry season. Monterey County is considerably more arid. This variability extends to sub-basins within the same watersheds as well. Each area is unique and must be treated as such.

C. We are dependent upon our local water resources and they are not unlimited.

D. Groundwater has not been protected in the past. It has been used as needed without comprehensive consideration of the impacts that overlying land uses have on groundwater quantity and quality. Regardless of the impacts which future development will have on groundwater, significant impacts have already occurred, such as overdraft and seawater intrusion into the Pajaro and Salinas Valleys and localized septic tank pollution in the San Lorenzo Valley.

E. Aquifer recharge cannot be treated independently from water quality or other natural resource issues (for example, the recommendations for aquifer recharge protection complement and, in some cases, are identical to, the recommendations for other water quality studies. Figure IX-1 summarizes these inter-relationships.) If the costs of recharge protection are not considered justifiable in situations where groundwater supplies do not yet constrain land use, overlap with other equally important environmental concerns should be stressed. Recharge is only one part of the need for groundwater management and comprehensive natural system management and should be treated as such. The recommendations for protection of aquifer recharge are intended to be incorporated into overall environmental protection strategies.

F. The degradation of groundwater quantity and quality is not yet irreversible or critical enough to require large scale public facilities for surface water conveyance and recharge (as was the case in the Santa Clara and Ygnacio Valleys and Fresno basin). Still a comparatively rural/suburban region, there is the significant opportunity to protect groundwater resources and mitigate the cumulative displacement of aquifer recharge by urban development before severe degradation and diminished supply occurs. Because recharge displacement is not yet a serious problem, an incremental mitigation program incorporated into the land development and planning process can be used to avoid future recharge loss. This will require actions directed specifically at recharge protection.

TABLE IX-1

RELATION BETWEEN AQUIFER RECHARGE AND OTHER 208 CASE STUDIES

Aquifer Recharge Protection - Recommended Management Practices	Erosion and Sediment Management	Lake Preservation Laguna Grande - Roberts Lake	Nitrate Pollution of Groundwater: Salinas and Pajaro Valley	Seawater Intrusion Pajaro Valley	Septic System Pollution Management
1. Onsite mitigation through modified development practices (Retention grading, pervious pavement, vegetative management, recharge pond, etc.)	Best management practices (BMP's) to control erosion problems often promote recharge as well. (Grading practices, debris basins, vegetative management, etc.)	Similar measures recommended to reduce pollution from upstream development (onsite retention of stormwater with ponds, retention grading, etc., and pervious pavements) and for use around lakes (sediment traps, pervious pavements, etc.)	Improved fertilizer and irrigation methods, well sealing, improved operations of landfills will reduce groundwater pollution.	Require water conserving devices for all new construction and apply BMP's to make more efficient use of groundwater. Also help recharge by applying onsite retention techniques.	Water conservation recommended as part of the recommended Public Information program. In general, the recommendations under this case study are directed toward allowing the use of septic systems as an alternative to sewering wherever possible. This will allow the percolation of water back into the groundwater system rather than disposal to the ocean.
2. Flood plain zoning	Addressed in erosion/sedimentation Control Model Ordinance. Of benefit to erosion control and recharge.	Prohibit construction near streams to protect riparian vegetation and reduce streamback erosion.	N.A.	Increased recharge from these recommendations will help keep intrusion problem from worsening, perhaps alleviate problem.	
3. Wetlands open space			N.A.		
4. Stream open space setbacks			N.A.		
5. Direct development toward low recharge areas	N.A.	N.A.	N.A.	N.A.	Recommendation for septic system density control
6. Clustered development	Cluster development model ordinance (Appendix L) addresses both erosion control and recharge protection	Use cluster development to minimize environmental impacts (including recharge protection)	N.A.	N.A.	includes protection of groundwater quality. Coordination between land use planning and Wastewater Disposal Practices involves consideration of recharge areas and determination of groundwater impacts (Appendix J-4)
7. Groundwater Research	N.A.	N.A.	An expanded groundwater monitoring program, fertilizer and irrigation efficiency research and further study of the nitrate problem will provide information on groundwater characteristics which can be used in recharge protection	Research directed toward solving the intrusion problem will provide groundwater information which can be used for recharge protection	Recommendation for OWDZ includes monitoring; the effects of deep absorption systems on groundwater quality is recommended for evaluation. Information from both would provide information useful for aquifer recharge protection

RECOMMENDED MANAGEMENT PRACTICES

The recommendations for protection and enhancement of aquifer recharge are intended for incorporation into existing city and county planning and development review processes. Several approaches, some to be implemented now and others once additional data is gathered in each basin, are recommended for the following reasons:

- The "State of the Art" in groundwater research is in its early stages of development. Much more information on groundwater characteristics and management is needed for basins in this region before totally complete and comprehensive management programs can be designed for each basin and subbasin.

- Although sufficient data for detailed understanding and management of groundwater basins is lacking, there is enough evidence that groundwater quantity and quality are being adversely impacted to justify taking immediate action. The appropriate approach is one which mitigates problems incrementally through sound planning and development practices for new development rather than a large scale, centralized system of mitigating recharge loss (such as drainage and recharge facilities for entire watersheds as used in the Fresno Basin).

- Recharge conditions vary greatly not only between basins, but between and within subbasins. The variability extends to individual development sites. Just as there is no generalizable type of aquifer recharge, measures to protect recharge must be equally diverse.

- The development process is multi-faceted, encompassing long-range planning to construction. Protection of recharge and other natural resources is necessary at all levels and, therefore, includes more than one approach, aimed at the various phases of the process.

- A wide range of recommendations allows each jurisdiction the latitude to design the recharge protection program best suited to the characteristics of the particular groundwater basin and most easily implemented by that entity.

The following management strategies are recommended for region-wide implementation prior to additional research:

A. Onsite Mitigation Through Modified Development Practices

An "at source" mitigation (primarily through the use of structural measures) of direct development impacts at the site or project level is recommended. Such mitigation can be attained through revised site design and building practices to manage the interception, flow, infiltration and discharge of stormwater.

In many cases, existing "sound development practices" relating to grading, drainage facilities and landscaping will provide sufficient recharge mitigation, but where present practices do not, additional onsite measures to retain runoff and promote infiltration should be applied. This technique must be implemented on an area and site-specific basis, dictated by variations in basinwide management objectives, groundwater recharge conditions, the development's impact on recharge and desired quantity of recharge. For example, in some areas structural mitigation measures could be used to maintain recharge rates at pre-development levels, and in other areas to enhance natural recharge rates.

The recommended "onsite" control measures relating to development practices can be categorized as follows below. A brief description of each can be found in the management guidelines presented in Figure IX-2, on pages OX-9 - 12. In several cases there are options among individual components (i.e. dutch drains or swales).

1. Measures which promote recharge prior to concentration of runoff by intercepting rainfall and promoting direct infiltration

    a. Retention grading - (recharge protection is compatible with erosion and sedimentation control as discussed in Chapter V and Appendix G, Erosion/Sedimentation Control Model Ordinance)
    b. Pervious pavement
    c. Vegetative management

2. Measures which provide for recharge after preliminary concentration, by collecting runoff onsite and controlling its flow to recharge facilities onsite

    a. Pavement collection and recharge system
        - dutch drain
        - swale
        - seepage basin
        - stormwater leachfield
        - recharge pond

    b. Roof collection and recharge

        - storage cistern
        - seepage basin
        - stormwater leachfield
        - recharge pond

    c. Swale drainage for roadways

3. Measures which detain runoff not for the purpose of promoting onsite recharge, but to allow gradual release of runoff from principally upland areas so that uniform instream recharge can take place, or offstream recharge can result from overland flow.

- pavement and roof drainage to detention pond, basin
- detention grading

The following planning controls (B through F) affect aquifer recharge less directly than the previous recommendations and are also intended for immediate implementation. More complete descriptions of these recommendations are on pages IX-14 and 15. All are planning tools which are not used solely for the purpose of recharge protection, but recharge serves as an additional justification for these controls. Aquifer recharge protection is consistent with State goals for protecting water resources and should be implemented through the following mechanisms accordingly.*

B. Flood Plain Zoning

Should be implemented regardless of recharge values, but will provide additional benefit of recharge protection in many areas.

C. Wetlands Open Space

Recharge areas as they relate to wetlands should be examined in inventorying wetlands throughout the region. Wetlands are defined as marshlands and other areas along streamways which are of significant biological value. High recharge areas may serve as an additional justification for preserving wetlands in permanent open space.

D. Stream Open Space Setbacks

Recharge should be included as a major consideration in the establishment of stream setbacks. Setbacks should be identified for every stream and tributary in the region. Where specific setbacks are not determined, a minimum setback of 100 ft. from a streambank of a primary streamway and 25 ft. from a minor tributary are recommended. Where there is adequate information to demonstrate that setbacks need not extend to this distance, lesser setbacks are appropriate. Setbacks should be designated regardless of the type of land use occurring along streamways.

*The state legislation which requires open space zoning includes the following in its description of open space lands which should be preserved wherever possible (Section 65560): "Areas required for recharge of groundwater basins" and "areas which require special management or regulation because of hazardous or special conditions such as....flood plains, watershed, areas required for the protection of water quality and water reservoirs..."

E. Development of Impervious Areas (Direct development toward low recharge areas)

The locations of various types of recharge areas should be considered in planning the location of future development. For recharge purposes it would be preferable to situate additional urban development in locations having low recharge values, i.e. areas with relatively impermeable soils.

F. Clustered Development

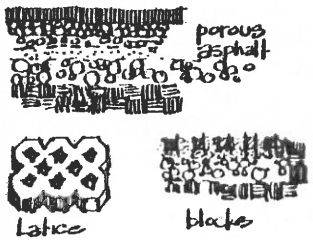
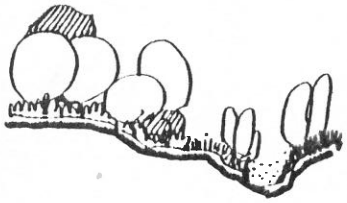
Recharge data should be considered in the designation of areas suitable for clustered development, and in locating development within a particular development project away from high recharge areas.

The cluster development model ordinance proposed in Chapter VI and Appendix L relates to aquifer recharge in the following ways:

1. Directs development away from high recharge areas by preserving land areas with unique natural features including those of hydrologic nature, among them aquifer recharge areas
2. Controls residential acreage to a percentage of the total land area
3. Requires that "stormwater runoff control measures" be identified in the development review procedure

It is intended that all six basins in the region follow these recommendations in designing aquifer recharge protection programs.

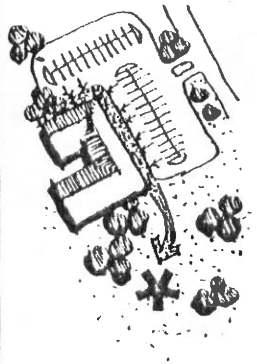
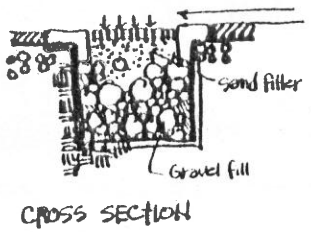
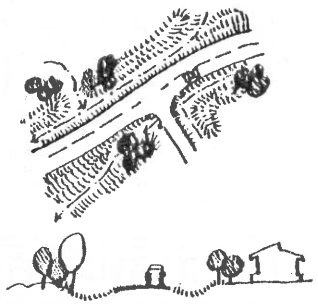
FIGURE IX-2 -- MANAGEMENT PRACTICE GUIDELINES

SYSTEM/COMPONENT		DESCRIPTION	GUIDELINES
1.10 RETENTION GRADING		Grading ordinances conventionally provide for rapid drainage of storm water from developed land, rather than allowing for natural runoff or retention of storm water on developed sites. The purpose of retention grading would be to provide shallow ponds and depressions in lawns and portions of a site to permit retention of overland flow and enhance infiltration values. Swales, terraces, diversions, and spreaders may also be used to slow runoff and increase infiltration. Increased overland flow time can reduce storm peaks and reduce downstream drainage facilities. Erosion control, slope detection, and improved water conditions for site vegetation are also benefits. Mostly applicable to large site uses or developments where porosity of soil is appropriate. If soils are poorly drained, however, mosquito nuisances and vegetation damage from waterlogged soils may result.	1) Changes to local grading ordinances should be encouraged to permit on-site retention or storm water through simple grading procedures. 2) Design criteria should be developed to relate lot size to runoff and recharge retention. 3) Grading techniques may be integrated with other measures which provide for infiltration after preliminary concentration of rainwater. 4) Retention grading standards should be designed to increase infiltration prior to concentration of runoff. Use of runoff spreaders may be included to disperse runoff where concentration has occurred and reestablish sheet flow and infiltration in undisturbed areas.
1.20 PERVIOUS PAVEMENT		Pervious pavement materials can increase at-source infiltration and reduce off-site runoff and flood peaks by reducing a percentage of the displacement associated with standard pavement. An added benefit is a reduction of skidding of vehicles on wet pavement and puddles for pedestrians, and reductions in the overall paving, curbing and storm sewer facilities. Techniques include use of porous, aggregate and asphaltic materials, porous pavers, precast concrete, lattice blocks and bricks or on-bound gravel services. Filtering properties will vary with material; some have on-proven filter value. Where water table is high, auto pollutants could infiltrate groundwater.	1) Pervious pavements may be appropriate for many roadway and pavement needs, for overflow parking areas, or for other pavement needs. Although the cost initially may be higher than conventional pavement, the added expense may be offset by reduced runoff facility investments. 2) Because porous paving is a relatively new development, few local regulations may recognize their use. Regulations may also not recognize savings in storm drain sizing.
1.30 VEGETATION MANAGEMENT		Vegetative cover affects the speed of surface water runoff and moderates the flow of water through the watershed. Vegetation management can control downstream concentration of runoff, promote upstream retention, and sustain streamflow over a longer period. Considerations include the proper management of wildland vegetation to maintain stable streamflow conditions, revegetation of areas where losses from fire or development have resulted, and restoration of special vegetation types, such as in riparian areas. Associated benefits include erosion control which reduces non-point source pollutant loads at surface waters.	1) Minimize disturbance of natural vegetation in development areas. 2) Encourage improved development standards which provide for temporary cover for erosion control during construction and permanent revegetation to stabilize developed sites.

GROUP 1.00

MEASURES TO PROMOTE RECHARGE PRIOR TO CONCENTRATION

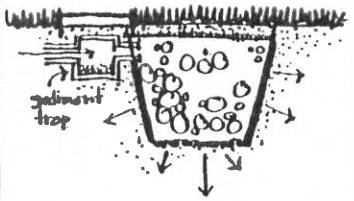
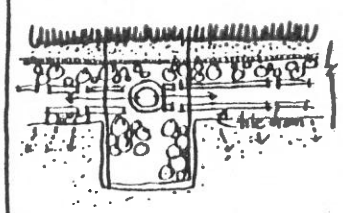
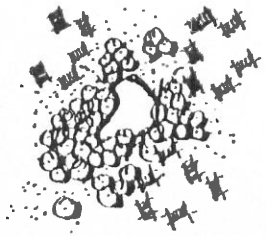
FIGURE IX-2 (continued)

SYSTEM/COMPONENT		DESCRIPTION	GUIDELINES
2.10 PAVEMENT COLLECTION AND RECHARGE SYSTEM		The system collects runoff normally displaced by impervious pavement via swales or dutch drains to one of three on-site recharge facilities: seepage pits, stormwater leachfield, or recharge ponds. The runoff is collected and allowed to infiltrate into the soil on site before reaching a significant degree of concentration. The discharge as well as the conveyance components of this system provide for infiltration and slowing and storage of storm runoff. As a result individual elements function more efficiently, each element providing for some degree of recharge; thus reducing the sizing of any individual element. Pervious pavement material may also be employed as part of the system. Seepage pits and leachfields are best to handle water with a minimum of concentration; recharge basins providing for larger, more concentrated quantities of runoff. System efficiency is generally a function of soil permiability. Consequently, these methods are not applicable in areas with standing water, poorly drained soils, flood plains, or marshes.	1) Provides for on-site infiltration of runoff and improved recharge. 2) Reduces the total volume of runoff and can reduce "peaking" effect of local floods. 3) Improve quality of vegetation on site by increasing available water in the ground. 4) Will result in a reduction in the size of storm drains required downslope of the facility. 5) System cost is considered less than conventional drainage techniques; should provide overall savings. 6) Unless "at source" seepage facilities are either designed for large storms or incorporate some method of controlled runoff release, they may not effectively reduce flood peaks during extended periods of high runoff. 7) Where soil saturation creates standing water in open ponds, mosquito nuisances can increase. 8) Applicable to all land uses having parking or paved area.
2.11 DUTCH DRAIN	 CROSS SECTION	Dutch drains provide stormwater conveyance from parking areas and buildings to recharge facility; may also collect roof runoff for roofs without gutters where runoff may fall directly onto surface of drains. Designed to receive runoff at edge or between areas of impermiable or porous pavement. Gravel-filled ditches with optional drainage pipe in base. Can be topped with: granite, brick, or concrete blocks on 4" of sand, perforated concrete slats set on "web" or lattice concrete slab with 2" of sand, grass and 6-8" coarse sand or metal grate. Generally, the individual cost of dutch drains will be more than the cost of storm sewer and runoff storage. However, there will be situations where the use of dutch drains will result in a saving. May be used on any site where premiability of soil is sufficient or where seasonally high water tables are not anticipated.	1) Provides for combination of storage, infiltration, and transfer capabilities. Because of the variety of possible covers for dutch drains, they can be easily integrated into a number of residential land uses: paved for use in driveways, covered with brick for patios, with grass to blend with landscaping, etc. 2) Size is dependent on whether drains used as the only measure or as a supplementary measure. Minimum size must insure the infiltration of at least as much precipitation as before development. Because the drains store precipitation, an increase in size allows a corresponding reduction in the size of basin leachfield or pond. Half the capacity of dutch drains may be credited against runoff storage requirements. Typical min. porosity, .12 ft./day. 3) Typical cost factors for 3' wide, 3' deep dutch drain: excavation, $2.50; materials, $5.00; paving, $7.50; total per cu. yd., $15.00.
2.12 SWALE		Swales are the man-made equivalent to natural drainage channels. The channels have open tops, natural bottoms and sloping sides generally planted with sod or other vegetation. Used along the edge of roads, driveways and other paved areas, under eaves of roofs without gutters and between areas of runoff collection and discharge. Swales allow natural processes to continue and, like natural channels, provide a means for both infiltration and transfer of water. Because of their relatively large open tops, swales are not as easily integrated into surface areas (such as patios) as are dutch drains. Their character does lend them to low profile use in areas left in a predominately natural state.	1) The swale should be run relatively flat and should not exceed about 5% slope on normal soils. Provision should be made for a good sod cover. It is critical to avoid high water velocities that erode the bottom of the swale. 2) Where water velocities will be higher than the absorption capacities of the soil, rip rap, concrete bottoms, or aprons should be used. 3) When swale channels replace curbs and gutters, gravel should be brought out 18" to 24" beyond the edge of the roadbed to stabilize the paving edge. In a well-designed swale system, the bottom of the swale should be lower than the bottom of the gravel base supporting the road so that no surcharging is possible. 4) Low initial development costs, higher maintenance costs.

GROUP 2.00

MEASURES TO PROVIDE RECHARGE AFTER PRELIMINARY CONCENTRATION

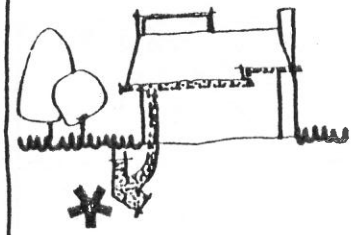
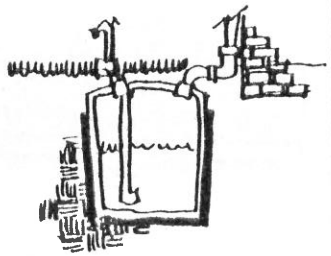
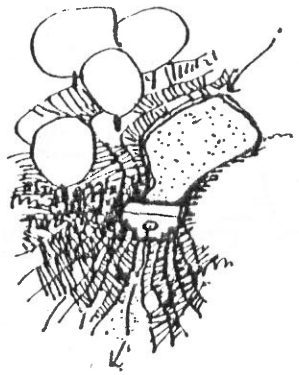
FIGURE IX-2 (continued)

SYSTEM/COMPONENT		DESCRIPTION	GUIDELINES
2.13 SEEPAGE BASIN		Seepage basins (dry well) receive runoff and store it until it percolates into the soil. Pits are usually filled with aggregate or gravel and occasionally lined. May be used on all sites where permiability of soil is sufficient (over 0.15 ft./day), and where seasonably high water tables are not anticipated. (Areas such as marshes, areas of standing water, poorly drained soil), etc.) With sufficient soil permiability, a seepage basin will provide for significant increases in infiltration. However, unless very large, it may not result in a reduction of flood peaks. Seepage pits are more liable than dutch drains to clogging by sediment as runoff has more chance to collect solids before reaching pit. Where table is in contact with basin, "non-point" source pollutants may collect and contaminate groundwater unless filter trap included in design. Under normal conditions, pollutant problem should be insignificant. May be sized for individual house (such as in roof collection) or larger system. Should not be constructed where the water table is less than 48" below the basin in all seasons. Only paved areas or roofs should drain into basins.	1) Unless the basin designed to take the total amount of runoff for a design storm, some provision for overflow must be made. In order to have maximum benefit in controlling runoff peaks and related infiltration rates, basins should, in fact, overflow during intense storms before capacity is reached. 2) The ratio of the bottom area to side area should not exceed ⅓. Should incorporate sediment trap or filter of sand. 3) Seepage pits should have a minimum percolation rate of 2' per 24 hours. 4) The minimum size of a basin should be sufficient to maintain infiltration at predevelopment levels. This depends on the porosity of the soil, and number of falls of rain per year, and the average amount per fall. The minimum size recommended is 1" of rainfall over the entire area served; the maximum size should be to take the runoff of the maximum design storm for a 24 hour period.
2.14 STORMWATER LEACHFIELD		Leachfields or seepage beds dispose of runoff by infiltration into the soil via systems of drains set in ditches of gravel. These systems only reduce speed and volume of runoff and require an overflow system. By increasing time of concentration, they may slightly reduce floodpeaks. May be used in all sites but those with periodically high water tables (marshes, flood plains, standing water) or where drainage of soil is poor. Used where percolation rate does not allow use of seepage pits. Distribute water over a wider area than seepage basin. Less clogging problems; if fields eventually clog, replacement of system is necessary. Maintenance must be frequent and increases expense. Shallow depth of beds makes them more flexible than pits; allows placement under paved areas if bearing capacity of pavement is not affected. No filtering effect of the topsoil although there will be some improvement of water quality as infiltration takes place.	1) Depth and spacing depends on the porosity of the soil. Should not be closer than 10'. Trenches should be at least 48' deep with a maximum width of 18". 2) Total storage volume is calculated by subtracting 60% for granular material from total volume. Design policy will vary, but capacity would not be less than 1" x runoff coefficent of all areas drained. 3) Prior to passing runoff into seepage ditches, water should be run through a sediment trap and distribution box. 4) System should be designed to overflow prior to capacity in order to lessen runoff peaks. 5) To increase efficiency in seepage ditch, percolation trenches may be intersected by a continuous 12" gravel bed. 6) Cost guideline (1972 estimate) for gravel beds 3' deep below parking area: excavation, $2.00/cu. yd.; gravel, $6.00/cu. yd.; tile field, $.50/sq. yd.; total, $9.35/cu. yd. storage (includes 10% for sediment trap).
2.15 RECHARGE PONDS		Relatively large, open basins with sloped sides which collect and store water until it percolates into the soil; function on a larger scale-handling runoff water from large stretches of highway or groups of residences. Used best where the aquifer is at or near the surface (i.e., high aquifer recharge areas). An effective, economically attractive method to conserve groundwater resources. Can be constructed as a borrow pit for highway or housing construction, but method loses advantage of the filtering effect of soil and, as a result, poses a risk of pollution where recharge water is of variable quality (e.g., storm runoff). Susceptible to clogging unless runoff water is fairly free of sediment and maintained frequently. Can be integrated into development project landscaping in attractive manner.	1) Sizing is based primarily on service area. 2) Prevent runoff entering basin prior to completion of construction, establishment of vegetation, etc.; could cause detrimental build-up of fine sediments on bottom of basin. 3) Maintenance problems reduced if scour at the inlet is prevented. 4) Runoff from surrounding land should be intercepted by diversions. Dense turf on side slopes prevents erosion. Basin floor should be kept clear of all vegetation.

GROUP 2.00

MEASURES TO PROVIDE RECHARGE AFTER PRELIMINARY CONCENTRATION

FIGURE IX-2 (continued)

SYSTEM/COMPONENT		DESCRIPTION	GUIDELINES
2.20 ROOF COLLECTION AND RECHARGE		System collects precipitation normally displaced by building coverage and conveys water to recharge or storage components. Traditional rain gutters are used to collect water from roof, transfer the water to a discharge area, and allow infiltration into the groundwater system. By retarding runoff at the source, water that would otherwise enter the stormdrain system can be held and allowed to recharge the groundwater system through domestic dry wells, seepage basins, storm water leach fields, etc. As in pavement collection system (see 3.10 components), and on integrated basis with pavement system or stored in cistern for summer use.	1) System takes advantage of the precipitation collection facilities already existing on most roofs and ties these facilities into on-site storage and recharge areas. 2) Reduction of storm runoff can lessen the need for curbing and storm sewers. 3) See also guidelines for system 3.10.
2.21 STORAGE CISTERN		In areas where there are limitations on groundwater recharge due to conditions of soil, topography, physiography, etc., or a need for dry season irrigation water, storm runoff can be collected and stored for later use for landscape irrigation during dry period. NOTE: See Sec. 3.30 for: 3.22 Seepage Basin (Dry Well) 3.23 Stormwater Leach Fields 3.24 Recharge Pond	1) Can help prevent uncontrolled runoff of storm precipitation and the associated problems. 2) Water detained on site for irrigation can enhance groundwater system during periods of low precipitation. 3) This component may work well within total on-site recharge system. 4) Costs of construction may be higher than costs of conventional summer irrigation water although this imbalance may be somewhat mitigated by savings in other areas.
3.00 MEASURES TO DETAIN RUNOFF		The purpose of the detention system is to hold storm water runoff for gradual release downstream at a level that protracts streamflow and infiltration in "in-stream" recharge areas. Flood peaks are also avoided. Because the recharge rate of "in-stream" zones is limited per unit of time, excessive storm water flows from upstream watersheds often exceed absorption rates. When seasonal rainfall occurs in a few heavy storms, less summer flow is likely. Hence, potential groundwater recharge is lost. Detention and controlled release in the watershed can increase the months of streamflow and maximize infiltration in the "in-stream" valley recharge zone. Although this may be provided through controlled releases from longer, "in-stream" impoundments, a more decentralized detention pond system may be developed within urbanizing lands. The latter may offset increased runoff from new development or provide additional detention below natural runoff rates. Non-point source pollution benefits may also be achieved. Detention basins are "at source" storage areas for storm water runoff. Some detention basins have a retention capacity (small permanent pool) where recreational or water supply advantages are desired. Many also provide for bacteria die-off and other water quality benefits.	1) Two types of systems may be used: 1. the collection of runoff from buildings and paved areas with conveyance to a detention structure; 2. the incorporation of swales, berms, terraces and shallowing ponding features in the grading plan to provide for some degree of site detention. 2) In both of the above, guidelines would be similar to those for storm water retention measures (3.00, 2.10), except when sited in nonporous areas or foothill areas where slope stability is a problem and detention purposes may be served. 3) Sizes may vary, however, where fewer larger structures needed, can be difficult to site in hillside areas and unslightly. Smaller structures dispersed throughout development allow for easier design. 4) Generally, ponds and basins should release runoff prior to capacity being reached. The overflow device is normally either a pipe of maximum diameter to give the discharge rate required or a spillway. Discharge from the drainage area should rise constantly until a maximum discharge (for a storm of that intensity) is reached at the time of concentration. At this point, the discharge is to remain constant until the storm ceases; discharge will then decrease at a constant rate over a period equal to the time of concentration.

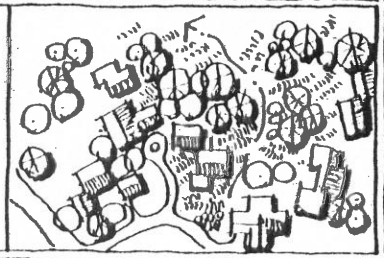
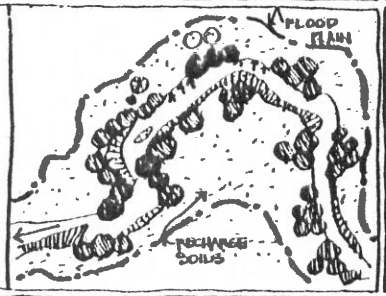
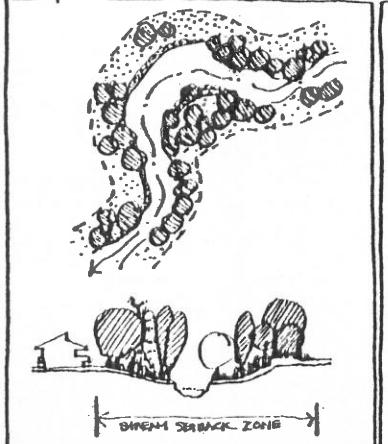
GROUP 2.00

MEASURES TO PROVIDE RECHARGE AFTER PRELIMINARY CONCENTRATION

GROUP 3.00

MEASURES TO DETAIN RUNOFF

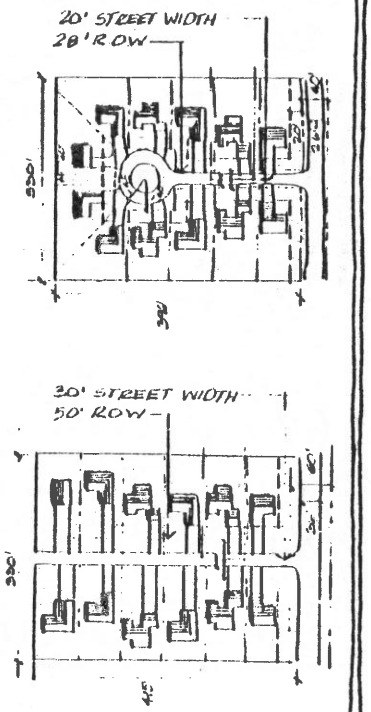
FIGURE IX-2 (continued)

SYSTEM/COMPONENT		DESCRIPTION	GUIDELINES
4.10 PLANNING CONTROLS		Various land development controls are useful to protect special, environmentally sensitive areas from development impacts including critical groundwater recharge, floodplains, etc. Ordinances may be used to prevent development, specify permitted open land type uses, or may specify performance standards. Four types of geographically specific controls are appropriate: floodplain zoning, wetlands open space protection, stream open space setbacks, and the concentration of intense development in impervious soil areas.	See individual components.
4.11 FLOOD PLAIN ZONING		Lands adjacent to many of the streamways in the region are subject to flooding and related hazards. In many cases, these same lands have a high recharge valve, particularly in the Carmel Valley where much of the land covered by the standard project flood are congruent with the "river soils" recharge zone. By protecting these zones from development high "off-stream" recharge values may be retained. The capacity of the floodplain to hold flood waters is also maintained, preventing floods from spreading into other areas previously uneffected. Other measures to minimize displacement of recharge values or to minimize flood damage to buildings in floodplains may also be utilized.	1) Where the loss in flood storage capacity or high recharge values requiring protection are present, floodplain zoning prohibiting development uses and specifing open land type uses, such as parks, farmlands, woodlands, etc., is appropriate. 2) In fringe areas of floodplains not subject to high velocity flows where back-up of flood water occurs, elevation of structures on pole foundations allows for flood flow and recharge beneath buildings.
4.12 WETLANDS OPEN SPACE		Freshwater and saltwater marshlands or similar wetlands often serve important recharge functions in addition to accommodating flood water, tidal surges, acting as traps for sediment, nutrients, contaminents, and other suspended materials along with significant wildlife habitat values. Protection of wetlands from landfill and development can thus provide many environmental benefits.	1) Wetlands should be retained in permanent open space and protected from development encroachment as a matter of regional and local planning policy.
4.13 STREAM OPEN SPACE SETBACKS		In general, significant groundwater recharge takes place within the stream channel and riparian ways. This is especially true of Carmel Valley and likely for other watersheds with similar rainfall and soil conditions. It is essential that streamways be protected from encroachments which would diminish in-stream recharge. Maintenance of natural streamway condition will provide for a more stable stream morphology, allow riparian vegetation and soils to buffer non-point source pollutant flows into surface waters and maintain healthy water quality and aquatic environment conditions. Where deep stream channels are present, side slopes may be unstable and subject to sloughing under normal streambank erosion or seismic shaking. Development setbacks from streamways and maintenance of stream corridors in open space will thus provide recharge, water quality, environmental and public safety benefits.	1) Protect stream channels from direct structural encroachments, such as channelization, diking, filling, etc., which would displace recharge surfaces, especially in less-developed areas where past development has not altered stream conditions and waterflow. 2) Develop standards appropriate to individual watersheds and stream systems which provide for appropriate setback distance of development encroachments and land use activities based on the depth of channel, extent of riparian vegetation, extent of wetted soil within the near-shore zone, the slope soil and vegetative conditions of the surrounding support zone, and the presence of any springs or adjacent wetlands. 3) Where stream-specific setback standards are not determined, a minimum setback of 100' from a streambank of a primary streamway and 25' from a minor tributary should be required.

GROUP 4.00

PLANNING MEASURES TO MAXIMIZE NATURAL RECHARGE

FIGURE IX-2 (continued)

SYSTEM/COMPONENT	DESCRIPTION	GUIDELINES
4.14 DEVELOPMENT OF IMPERVIOUS AREAS 	In both Carmel Valley and San Lorenzo Valley, much past development has occurred in areas of low recharge value. In Carmel Valley, the city of Carmel and the town of Carmel Valley and large portions of the valley in the Los Laurels road area are underlaying by soils of low recharge. In San Lorenzo Valley, established villages such as Mt. Herman, Forest Park, Wildwood, and other portions of the valley, low recharge values are present. By encouraging continued and more intensive development in these areas rather than in the high recharge value areas, displacement and loss of groundwater infiltration can be avoided. In some cases, even within areas of higher recharge capability, site-specific anomalies of impervious soil areas may be identified which offer locational opportunity for intensive land use types such as commercial, institutional or apartment developments. Soil patterns within and surrounding the city of Watsonville similarly vary according to recharge capability, providing a rationale for the direction and intensity of future development patterns.	1) Use of local general-plan policy, zoning and density control is appropriate in the Pajaro and San Lorenzo valleys to channel future development to areas of low recharge value, with low density development continued in areas of higher recharge value. 2) In the Carmel Valley, policies confining future development to areas of low recharge may be elected or reserved for future consideration. Site location criteria for intensive land uses with high percentage of land cover may be considered for local development policy. Other urbanized areas of the San Lorenzo Valley are on very high recharge areas (Zayante, Glen Arbor, Quail Hollow, Scotts Valley, Ben Lomond) which may endanger localized groundwater quality and domestic water supplies.
4.15 CLUSTERED DEVELOPMENT 	Clustered development offers an alternative to conventional grid-type subdivision which minimizes loss of infiltration and reduces contaminant and nutrient build-up on residential streets, which contributes to non-point source pollution loads. With clustered site layout, detached or semi-detached dwelling units are grouped around cul-de-sac streets, which may be reduced in width by service level. Lots may be sized to specifically fit housing types and resident needs for private yard space; the clustered plan provides for diversity of housing types, ample amounts of common open space, reduced street right-of-way, while retaining the density and single-family detached home style of conventional subdivision. Provisions for plan-unit development are present in the development ordinances of many jurisdictions throughout the region. 1) Promote use of clustered development approaches to reduce the displacement of recharge by residential development. 2) Encourage incorporation of groundwater recharge measures, i.e., recharge ponds, in common landscape areas of clustered developments where appropriate. NOTE: See comparison of clustered development to conventional development below, with respect to savings in square feet of total street per dwelling unit and total site development costs.	Refer to Appendix L "Cluster Development Model Ordinance"

GROUP 4.00

PLANNING MEASURES TO MAXIMIZE NATURAL RECHARGE

RECOMMENDED IMPLEMENTATION PROGRAM

In general, the implementation program should be comprised of the jurisdictions in each basin cooperatively designing recharge protection management programs which are consistent with one another within the same basin. An issue of potential difficulty is whether similarly situated landowners will be treated equally (such as landowners within the same groundwater basin). If some jurisdictions adopt regulatory programs while others within the same basin do not, the system may be defective, particularly if a landowner is prevented from pursuing a profitable activity which an adjacent owner in another jurisdiction is allowed. The following goals should be accomplished:

- Full mitigation of recharge losses as a result of development to at least the pre-development recharge rate, and in some cases above the natural rate.

- Protection of groundwater quality. Generally, all intensive land uses which could constitute a groundwater pollution source (including such nonpoint source as feedlots, dairies, wastewater disposal operation, landfills, etc.) should be carried out in low recharge areas only, unless adequate protection of groundwater quality can be achieved (through treatment etc.)

The following specific implementation strategies will carry out these goals. Costs of each are summarized in Figure IX-5 and the accompanying narrative.

City and county staff should review all estimates of existing recharge and the loss of recharge from the proposed development, and the adequacy of the types and sizing of mitigation measures as provided by the developer. This should be done for both subdivisions and individual projects.

A. Subdivision ordinance modifications

1. Each jurisdiction should make modifications to the "drainage" requirements of their subdivision ordinance (to include minor land divisions) to insure that specific standards relating to recharge of drainage water be imposed. Recharge of stormwater should be clearly identified as a desirable form of drainage to be used to the greatest extent feasible, and the requirement for the promotion

---

* The need for trained staff to formulate ecological zones, to administer a performance standard or permit system, calculate recharge rates and select and size appropriate onsite measures is evident for aquifer recharge. It is a highly technical area that is in its early stages of development. In the interest of consistency within basins and throughout the region it may be necessary to provide input from a regional body or state/federal agencies with special expertise, and to form inter-jurisdictional entities within each basin.

of recharge through both transmission and disposal should be specified. The structural recharge loss mitigation measures identified under management recommendation A should be required.

2. The soils report required for every subdivision under Sections 66490-66491 of the Government Code (Subdivision Map Act) should be expanded to include information on soil and subsoil properties, percolation rate, pre-development recharge rate and reduction of recharge from the proposed project. Additional soils tests beyond those now conducted will probably be needed. An engineering analysis identifying appropriate structural mitigative measures including sizing of facilities should also be required.

3. When important recharge areas will be adversely impacted despite full mitigative attempts, subdivision proposals should be denied. Two such mechanisms are:

   a. Section 66747 of the Subdivision Map Act specifies that the city or county "shall deny approval" of a final map it it finds that the design of the subdivision or proposed improvements "is likely to cause substantial environmental damage." Recharge should be considered worthy of protection in implementing this provision.

   b. A 1975 amendment to the Subdivision Map Act (under the Business and Professions Code Section 110005) requires specific plans for proposed "land projects" (defined as a subdivision with 50 or more parcels) in rural areas (less than 1500 registered voters reside within 2 miles of the property). These plans are to provide a high level of specification in location of land uses and other improvements and impacts on the environment and have direct regulatory effect which may be more restrictive than basic zoning. With its potential for protecting natural resources (including recharge), this requirement should be strictly enforced where applicable.

B. Application of structural mitigation measures to all urban development projects.

1. In general, there are three different approaches that can be used to apply the structural measures for onsite mitigation. The type of approach used is dependent upon the amount of information available.

   a. Zone-based approach: In basins with sufficient environmental data, zones with uniform characteristics can be identified, which allows the application of control measures appropriate to each zone. This has been done for the Carmel Valley (Figure IX-5). Three major management zones were delineated based on the available

technical data. Control measures were assigned to each sub-zone according to the impact that development is likely to have in each. For example, the coastal portion of the aquifer has been designated a "sea-water buffer zone" (the reasons for which are discussed under Findings for the Carmel Valley Case Study). It is potentially the most sensitive area to loss of recharge, and therefore subject to the most extensive restrictions.

b. Subarea planning approach: The lack of information and complexity of the groundwater geohydrology in most basins is too complex to designate zones, therefore assignment of appropriate mitigations may be done for subareas within basins. It may be desirable to use planning controls (such as designation of open space) in conjunction with structural measures where recharge values are high and water supply or quality problems exist. This is an appropriate approach for the Watsonville area of the Pajaro Valley based on the severity of the problem and development pressures.

c. Onsite specification approach: Selection of mitigative measures will most often need to be done on a case-by-case basis until more data allows use of a zone or subarea approach. The environmental impact report assessment, subdivision review process and building permit process can incorporate recharge protection by assessing the recharge impact of a specific project. Specific groundwater recharge conditions would be assessed, the recharge displacement by the project quantified to the greatest extent possible, and appropriate measures selected and sized.

2. For individual lots, existing soils information can be used to estimate recharge. An additional potential source of soils data is the exposure of the soil profile from septic tank installations and drilling of new wells. This source should be used wherever available.

   The development review process should be used to ensure compliance with these measures.

C. Each city and county should use the available recharge data in carrying out the secondary management recommendation (flood plain zoning, wetlands open space, stream open space setbacks, development of impervious areas, clustered development), so that protection of recharge areas will be incorporated into these planning decisions.

The next two recommendations (b. Performance Standards, c. overlay zoning) cannot be implemented until research needs in each of the basins are satisfied. The U.S.G.S's Initial Assessment of the Groundwater Resources in the Monterey Bay Region, California (August. 1977) identifies study recommendations for each of the six basins. These should be referred to in designing specific research programs, in addition to the research needs later identified for each of the case study basins studies planned by U.S.G.S. are described in Figure IX-3. In all cases, more quantitative investigations are necessary.

D. Performance Standard: This regulatory approach relies on quantitative measurements of pre-development recharge and the reduction of recharge which will result from development. The performance standard would generally be the optimum amount of recharge for a particular site, with the requirement that at least this "optimum recharge" rate be maintained.

To identify performance standards, stormwater runoff and recharge calculations are needed for each proposed development site. Standard practices and system sizing need to be developed for small projects such as single dwellings (for example, a standard sized percolation pond). For larger developments, the preferable system would be to use formulas based on specific geologic, soil, vegetative cover, evapotranspiration and precipitation values for a particular watershed. Lacking this, it may be possible to use (with modifications) standard stormwater methodologies such as the Direct Runoff Method of the SCS or infiltration models. Projections of additional runoff created by a project should be used to identify size requirements for individual facilities and the amount of mitigation that any system of components (from recommendation for structural measures) could produce.

The "state of the art" in groundwater research is such that the necessary data for identifying performance standards is not available regionwide. As an example, soils information covers only the top five feet of the soil profile. More detailed knowledge on all aspects of groundwater geo-hydrology are needed, as well as refinement of recharge calculation mechanisms.

Performance standards for sub-areas have the greatest potential for full mitigation of development impacts on recharge.

E. Overlay Zoning - More detailed recharge data for subareas within basins is needed before this recommendation can be implemented. A system of overlay natural resource protection or conservation zones would be applicable to aquifer recharge as well as other water quality and environmental processes. With this system, each area would have two sets of zoning: the traditional urbanization zoning, identifying allowable densities,

USGS RESEARCH PLANS IN MONTEREY BAY REGION

LOCATION	DESCRIPTION OF RESEARCH	DURATION OF STUDY	RESEARCH AGENCY	FUNDING
Santa Cruz County				
Pajaro Valley	1. Digital computer model to simulate groundwater flow	3 years, not yet started	USGS	1/2 USGS 1/2 Santa Cruz County*
Aptos-Soquel Basin	1. Mapping of recharge and accompanying report	Completed In preparation	USGS	1/2 USGS 1/2 Santa Cruz Co.
	2. Potential for groundwater yield of mountain area above Aptos	Almost complete, past two years	USGS	1/2 USGS 1/2 Santa Cruz Co.
	3. Potential for seawater intrusion and groundwater yields in Soquel Basin	Just beginning	USGS	1/2 USGS 1/2 Soquel Creek County Water District
Scotts Valley	1. Petitioned for designation as sole source aquifer	Not yet considered	EPA-Administrating agency USGS-Conducts geohydrological study	EPA
North Coastal	1. Mapping of recharge areas and accompanying report	Completed In preparation	USGS	1/2 USGS 1/2 Santa Cruz County
	2. Test well	Coming year	USGS	1/2 USGS 1/2 Santa Cruz Co*
Entire Santa Cruz County	1. Evaluating existing network of monitoring wells county-wide. Will make recommendations on additional needs.	Coming year	USGS	1/2 USGS 1/2 Santa Cruz Co*
	*May be affected by Proposition 13 Local Share of Funding			
Monterey County				
Salinas Valley	Salinas Valley Model	---	USGS	USGS Army Corps Engin. Monterey County
No other projects planned for Monterey County				

etc. and a "resource conservation" or "ecological capability" zoning. The most restrictive of the two zones would be applied. The natural resource zoning would be used to specify the allowable impacts on a site according to the importance of natural systems. Three categories of development impacts and their acceptable ranges could be:

Land alteration 1-35% (of the total site acreage)
Creation of Impervious Surface 1-30%
Permissible Grading 0-25%

For example, if recharge is identified as "critical" or "very high" in a particular area, land impacts could be restricted to 5%, 2% and 2%, whereas with very low recharge and the absence of other environmental constraints, impacts would reach the maximum allowable percentages.

The key to implementation of this management option is sufficiently detailed recharge data to rate the importance of natural processes and designation of allowable impacts for each natural resource category (such as High, Moderate and Low Recharge areas) and to map the basins at a much more detailed level than is now possible.

$70,000 is the estimated cost for research and preparation of recharge protection plans in the North Coast and Soquel-Aptos Basins, and $60,000 for the Salinas Valley (less money is needed as more base data have already been collected). This is intended to fund all public costs associated with the recommended implementation program.

F. Application of structural mitigation measures for groundwater recharge to existing development should be considered by local agencies as a possibility. The most likely situation where retrofitting existing development with recharge facilities would be considered feasible would be in cases where erosion or drainage problems require mitigation and recharge can be considered in the corrective actions taken. It may also be desirable to require recharge facilities for existing structures in areas where water supply shortages are constraining. The increased water supply could justify such actions.

For subdivisions, a specific financing mechanism covers necessary improvements after development has occurred.

Section 66483 of the Subdivision Map Act authorizes the imposition of fees for deferring the costs of constructing planned drainage facilities for removal of surface and stormwaters. With the broadening of the definition of "drainage" to include transfer and recharge of runoff, the costs of recharge facilities required after the initial development can be transferred directly to the subdivider.

G. The jurisdictions in each groundwater basin should consider the possibility of petitioning EPA for designation of their basin as a sole source aquifer (Section 1424e of the Safe Drinking Water Act, Public Law 93-523). To be designated, the basin must be determined to be: (1) the sole or principal source of drinking water for the area, and (2) if contaminated, the aquifer would represent a significant public health hazard. Once designated, all federally assisted projects which could contaminate the aquifer are subject to review.

As part of the designation process, USGS (under contract from EPA) provides data on geohydrologic conditions in the basin. A thorough analysis of existing data (funded by EPA) in the basins, incorporating research from all sources, would most likely produce new information on groundwater characteristics. While not intended to serve as a substitute for the proposed research programs, this analysis could enable the refinement of management programs even before more research is conducted. Water management agencies at all levels of government have studied groundwater but apparently little coordination has occurred.

Only the Fresno basin has been recommended for designation in California. The only other petition to have been received is for the Scotts Valley basin, which hasn't yet been considered. Approximately $25,000 would be allocated for the geohydrologic study.

This legislation has considerable potential as a tool for ensuring the long-term protection of the region's groundwater resources through "preventative" management. It definitely warrants full consideration by the jurisdictions in each basin. Appendix N provides further details.

Funding for the preceding recommendations will be provided through continuing 208 funds and user fees for all public costs, and all private costs will be borne by the developer (or homebuyer). Figure IX-5 and the accompanying narrative provide cost details.

H. Implementing Agencies

The jurisdictions in each basin which should carry out the preceding recommendations are: (1) Santa Cruz Coastal Basin - Santa Cruz County, (2) San Lorenzo Valley Basin - Santa Cruz County and Scotts Valley; with the City of Santa Cruz involved in all planning and development of recharge protection programs, since they depend upon the basin for their water supply. If significant annexations are made, the City may be required to implement the other recommendations as well; (3) Aptos-Soquel Basin - Santa Cruz County, with Capitola involved in planning and program development; may also be subject to development controls if they annex; (4) Pajaro Valley - Santa Cruz and Monterey County, and Watsonville; (5) Salinas Valley - Monterey County, Salinas, Gonzales, Soledad, Greenfield, King City, Marina; (6) Carmel Valley - Monterey County, Seaside and Del Rey Oaks*, with Carmel, Monterey, and Pacific Grove cooperating in planning and research. (Carmel is in a low recharge area and contains little undeveloped land, therefore, is not included as an implementing agency. This could change if significant annexations were made.)

*In the Initial Assessment of the Ground-Water Resources in in the Monterey Bay Region (U.S.G.S.), the Monterey Peninsula and Canyon Del Rey area are included as part of the Carmel basin, although there are two separate groundwater basins.

PAJARO VALLEY

The Pajaro Valley is experiencing serious groundwater quantity and quality problems. Pollution by nitrates, salts, and advancing seawater intrusion are discussed in Chapters VII and VIII, indicating the severity of the existing situation. The Pajaro is the most seriously threatened basin in the region. Further degradation of the groundwater resource can be expected from additional municipal and industrial water needs. In addition to expanding water demand, new development will also bring increases in impervious surfaces which will further reduce existing recharge levels, especially where development displaces prime agricultural lands.

FINDINGS

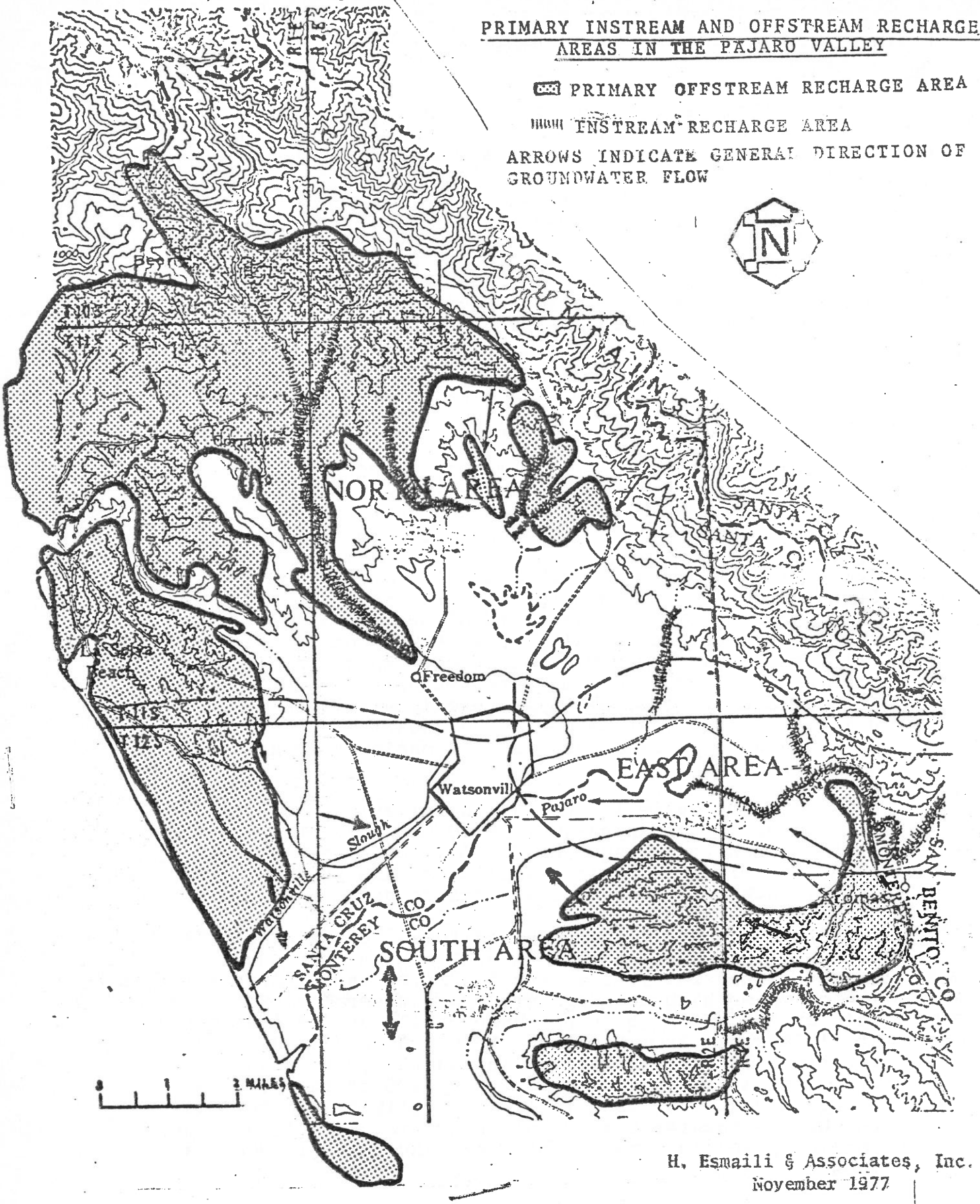
A. 90% of the water used in the Pajaro Valley is groundwater.

B. With the exception of approximately 10,000 acres in the eastern Pajaro Valley (with an impervious clay layer), surface water is directly recharged to the largely unconfined aquifer. Only 9,800 acre feet per year is contributed to recharge from outside the study area.

C. Recharge areas (see Recharge map, Figure IX-4) were identified on the basis of analysis of precipitation, soil and subsoil permeabilities, geologic discontinuities and relative formation transmissivities. Recharge has been broken down into instream (percolation to the water table through stream beds) and offstream(infiltration through soils). In contrast to most other coastal valleys in California, offstream recharge is considerably greater than instream.

D. 80% of the recharge in the Pajaro Valley occurs offstream accounting for an approximately 40,000 acre ft. per year contribution to the aquifer. 75% of this occurs over lands in irrigated agricultural uses, and the remaining 25% of recharge through non-irrigated native vegetation.

Offstream primary recharge areas total approximately 51 square miles. Permeabilities are so high that surface runoff is generally less than 5% of the annual precipitation. 70% of these high recharge areas are covered with native vegetation, but high evapotranspiration demand (estimated at 11.5 inches from November through April) results in relatively little recharge. In contrast, irrigated-agricultural lands account for only 20% of the high recharge areas, yet essentially all precipitation percolates to the groundwater because of irrigation practices. The remaining 10% is composed of urban and miscellaneous land uses.



H. Esmaili & Associates, Inc.
November 1977

Figure IX-4

E. The 20% of recharge which takes place instream contributes 10,000 acre ft. per year. About 5,000 acre feet of water percolates through the beds of the creeks draining the mountains north and northeast of Watsonville. Approximately 4,000 acre feet is contributed from the Pajaro River during a year of normal natural precipitation. Instream high recharge areas are identified on the map (Figure IX-4); instream percolation elsewhere in the study area is regarded as insignificant.

F. Recharge potentials in specific areas have been identified. Areas of exceptional recharge lie along the western edge of the Pajaro and include the vicinity of Day and Upper Pleasant Valleys, the area between Freedom Blvd. and White Road and virtually the entire area between San Andreas Road and the coast.

G. Groundwater quality varies throughout the basin, and is strongly influenced by geology, soils and land use. The primary sources of impaired water quality are irrigation percolate, recharge from the Pajaro River and intruding seawater. Localized concentrations of total dissolved solids, chlorides, nitrates, sulfate, iron and manganese are above the recommended public health limits for drinking water. Locally high concentrations of salt, boron and percent sodium partially impair the usefulness of groundwater for irrigation. Future development will have an impact on groundwater quality by increasing surface water pollutant levels with a potential for recharge and by adding to the seawater intrusion problem with increased withdrawals from the aquifer.

H. No projections of urban development were performed to enable an estimate of the potential impact of development on the recharge function. But the existing overdrafting of stored groundwater by agricultural, municipal and industrial users exceeds the recharge capability of the basin, resulting in a serious deficit. It is obvious that any further development will serve to worsen the situation.

I. As long as the area continues to use groundwater for water supplies, recharge losses as a result of impervious surface development must be mitigated as part of an overall development strategy. The problem is sufficiently documented and severe to justify taking immediate mitigative steps, without further research to prove the existence of a problem.

RECOMMENDED MANAGEMENT PRACTICES

It is recommended that:

A. Recharge losses from development be mitigated to the point where recharge is enhanced to the greatest extent possible, or at least maintained at pre-development levels.

B. Development which reduces recharge below natural levels despite full mitigation efforts, be prohibited.

C. Onsite controls for each development (basin wide Recommended Management Practices, A, page 5) be applied to mitigate recharge loss at less dense, suburban levels of development.

D. Onsite controls in conjunction with urban development policies which confine development to less important recharge areas and protect high recharge areas from development should be implemented in areas of intensive development (near the City of Watsonville).

RECOMMENDED IMPLEMENTATION PROGRAM

It is recommended that:

A. The Counties of Santa Cruz and Monterey and City of Watsonville cooperate in designing a recharge protection program which will best suit the Pajaro Basin. Specific measures including the basinwide recommendations shall be identified to protect and enhance recharge, and actions taken to implement them.

B. Monitoring of groundwater levels and quality should continue in the Pajaro Valley and further research conducted on the seawater intrusion and overall quantity problem (Chapter VIII).

C. Demonstration projects be conducted jointly by the counties and city to gather basin-specific data on the appropriate sizing and selection of mitigation measures to be used in the urban development process. This will assist the jurisdictions in identifying appropriate recharge protection measures. $10,000 of Continuing 208 funding is being sought, to be used for demonstration projects and refinement of the basic recommendations to better fit the needs of the Pajaro Valley basin.

TARGET IMPLEMENTATION DATES

Groundwater quantity and quality problems in the Pajaro Valley have been sufficiently documented to warrant implementation of the proposed mitigative measures without waiting for results of further research. The jurisdictions within the basin should design an appropriate recharge protection strategy and begin demonstrations by July, 1979.

CARMEL VALLEY

The Carmel Valley aquifer is the source of water supply for much of the Monterey Peninsula. Although no overdraft exists as in the Pajaro Valley, the Carmel Basin will have to meet future needs of projected development on the Peninsula. During normal or above average years of rainfall, the aquifer can be

fully recharged, but "drought" years as recently experienced can cause temporary shortages in the limited water supply. Past urban development may have caused localized water quality pollution. It has been estimated that projected future use of Carmel Valley's groundwater resources will exceed the "safe yield" of the basin in the mid-1990's. Proper management of this groundwater resource is necessary to mitigate the cumulative impacts of future urbanization in the valley.

FINDINGS

A. In the Carmel Valley the valley alluvium is the principle groundwater bearing formation. It has been estimated that the sustained annual "safe yield" of the basin is 10,000 to 15,000 acre feet per year. In 1976, approximately 9,000 acre feet were withdrawn from the aquifer.

B. In contrast to the Pajaro Valley, the majority of recharge occurs within the stream channel of the Carmel River and its tributaries. Instream recharge occurs principally between October and February, reaching a peak monthly in-stream recharge of approximately 1500 to 3000 acre feet per month. Recharge drops to essentially zero when stream flow ceases during the summer months. Recovery of groundwater levels in the aquifer occurs over a few months of normal rainfall (Monterey County Flood Control Dept. data).

C. Much of the alluvium is below sea level and in hydraulic continuity with the seawater entering from Carmel Bay. Maintenance of this steady outflow provides a hydraulic gradient to prevent intrusion. Lowering of the groundwater level in the coastal portion of the aquifer below sea level through increased withdrawals and/or reduced recharge would cause intrusion.

D. The steep upper watersheds of the Carmel Valley have low to moderate recharge potential but contribute significantly to tributary creeks which maintain downstream flows and instream recharge.

If not directly recharged, rainfall may seep laterally into creeks which contribute to streamflow in the Carmel River, maintaining downstream flow, and contributing to instream recharge. Any substantial changes to watershed vegetation would indirectly affect instream runoff by increasing watershed runoff rates. Increases in stream flow during the wet season, decreased duration of recharge and greater outfalls to the ocean would occur.

E. Rough approximations of instream and offstream recharge * were calculated by analyzing streamflow and well records and estimating the annual amount of water pumped from the aquifer, annual amount of return flow into the aquifer from

*The recharge map for the Carmel Valley (at a scale of 1:24,000) could not be legibly reduced for inclusion in this report because of the level of detail and size of the area. Copies at the original scale are available at AMBAG.

domestic and agricultural activities, the amount of water lost to the ocean, uptake by vegetation, evapotranspiration rates and runoff coefficients for the various land uses. Insufficient data required the use of many assumptions. There are extensive research needs before more accurate estimates of recharge can be made.

F. It was estimated that offstream recharge accounted for 12 to 39% of total recharge from 1965 to 1974, with an average of 23%. The impact of projected development (based on increased impervious surfaces) was estimated to be a reduction in recharge of 50 to 65 acre feet per year. This hypothetical decrease amounts to only 1% of total recharge. However, after a succession of three dry years, for example, the cumulative effect would be a net loss of water supply to 435 dwelling units (using 400 gallons per dwelling unit per day). When total withdrawals approach the safe yield of the basin, this reduction will be critical. The limited amount of water available and projected demands compound the problem. Further research is needed.

G. The basin appears to consist of five semi-independent subbasins. Reductions in offstream recharge could impact one or another of these subbasins, especially the coastal portion of the aquifer which accounts for 37% of the total available water in the entire aquifer.

Decreased recharge from concentrated development (and impervious surfaces), increased withdrawals from planned domestic wells and the segmented behavior of units within the basin comprise a threat of lowered groundwater levels and subsequent seawater intrusion. These factors suggest a need for a more stringent program to protect recharge in the coastal portion of the aquifer. For management purposes, the area has been designated a "Seawater Buffer Zone".

H. Much past development in the Carmel Valley has occurred in areas of low recharge value. The City of Carmel, Carmel Valley Village and large portions of the Los Laureles Road area are underlain by soils of low recharge. By encouraging continued and more intense development in those areas rather than in high recharge areas, displacement and loss of recharge can be avoided.

I. With initiation of proper on-site urban development practices, the development process could be used to <u>enhance</u> the recharge function to improve off-stream recharge. Water retained in foothill and upland watershed fractures may seep to the valley floor and percolate, serving to flatten river peaks and prolong stream flow and recharge.

J. Recharge of reclaimed wastewater in the Carmel Valley aquifer is a possibility for augmenting existing water supplies. Use of reclaimed water would reduce the demand

on the aquifer and possibly eliminate the need for developing a new water source (such as construction of a new dam). Before the desirability of recharging reclaimed water can be evaluated, the allowable impacts on water quality must be determined. The Carmel Areawide Facilities Study (201) would be most appropriate for evaluation of this possibility.

K. Existing groundwater quality in the basin is generally good, with the exception of high iron and manganese concentrations, which are of natural origin. Localized existing and potential pollutant sources are urban runoff, agricultural water percolation and septic tank effluent. Seawater intrusion is also a possible threat to groundwater quality. Results from a recent intensive survey of groundwater quality indicate that pollution from septic tanks may be occurring. Fairly high levels of ammonia, and some nitrate and phosphorous (most likely from detergents) were found in the eight wells sampled. The wells monitored were relatively shallow and located downstream from unsewered development, making them particularly vulnerable to septic tank contamination. Saturated soil conditions at the time could account for some of the results.

The major impacts of projected development will be increased urban runoff from impervious surfaces (most likely to pollute surface water, although groundwater degradation may also occur) and pollution of groundwater from septic tanks if improperly located and installed. The most significant urban runoff pollutant increases will be in iron, lead, cadmium, chromium, total solids and possibly nitrates. To predict site-specific increases in groundwater constituent levels, detailed analysis including the effects of adsorption by instream and offstream particles, dilution, uptake by soil and vegetation, etc., would be needed.

RECOMMENDED MANAGEMENT PRACTICES

It is recommended that:

A. At least the pre-development rate of recharge be protected by mitigating development (impervious surface) impacts. While water supply is not as crucial a situation as in the Pajaro Valley, encouragement of offstream recharge is recommended to extend the duration of groundwater flow to the river and maintain a live stream longer, therefore augmenting recharge beyond the normal wet season. The coastal portion of the aquifer is especially worthy of protection from the cumulative impacts of future urbanization, and the watershed and creek system must be properly managed to insure the continuation of high recharge rates, especially important during years of below normal rainfall.

B. Onsite development practices to mitigate recharge loss should be implemented on a zone basis (Figure IX-5).

C. Streamways and adjacent lands should be especially protected as instream recharge contributes the large majority of recharge. Encroachments which would diminish instream recharge should be controlled as necessary to prevent significant reductions in recharge (such as culverting and channelization of streams, filling and diking for development). Impacts on recharge should be carefully compared to the benefits of any planned streamway encroachments. Flood plain, wetlands, and stream setback zoning should be generously implemented to protect the highest recharge areas of the valley.

RECOMMENDED IMPLEMENTATION PROGRAM

It is recommended that:

A. Monterey County implement the foregoing recommendations and serve as lead agency for the necessary research to enable eventual development of a more comprehensive management program. This is especially important due to the dependence of the entire Monterey Peninsula on the Carmel Valley aquifer.

B. The following research be carried out in the next one to five years by the County with the cooperation of the Monterey Peninsula cities and assistance of appropriate state and federal agencies.

1. Further data on the capacity and "safe yield" of the aquifer, including the potential for seawater intrusion.

2. The full extent of existing and potential groundwater pollution, particularly by septic tanks.

3. Further investigation of the possibility of independent subbasins, including the capacity and quality and groundwater level fluctuations of each.

4. Rate of movement of groundwater through the aquifer. (Necessary to determine how withdrawals from segments of the basin are compensated for from water movements into these areas.)

5. Characteristics and potential of the Tularcitos aquifer.

A hydrological model of the Carmel Valley could provide much of the necessary information.

6. Additional information on the characteristics of the Seaside and Canyon Del Rey groundwater basins (considered to be part of the Carmel Basin). Very little is known at this time. Plans for extensive development and increased withdrawals necessitate groundwater quantity, quality, and geologic data.

FIGURE IX-5

GROUNDWATER RECHARGE MANAGEMENT GUIDELINES

CARMEL VALLEY

MANAGEMENT ZONES			A valley zone				B sea-water buffer zone	C watershed	
			1	2	3	4		1	2
CONTROL MEASURES			river channel	river soils	permeable valley soils	non recharge valley soils		foothills watershed	upland watershed
GROUP 1.00 MEASURES									
1.10 PLANNING CONTROLS									
.11 Flood Plain Zoning			◀	◀			◀		
.12 Wetland Open Space Protectn.			◀	◀	◀	◀	◀	◀	◀
.13 Stream Open Space Setbacks			◀	◀			◀	◀	◀
.14 Development of Impery.Areas						◀	◀		
.15 Clustered Development					◀		◀	◀	
GROUP 2.00 MEASURES									
2.10 RETENTION GRADING				◀	◀		◀		
2.20 PERVIOUS PAVEMENT MATERIAL				◀	◀		◀		
2.30 VEGETATION MANAGEMENT			◀	◀	◀		◀	◀	◀
GROUP 3.00 MEASURES									
3.10 PAVEMENT COLLECT. & RECHARGE				◀	◀		◀		
.11 Dutch Drain				◀	◀		◀		
.12 Swales				◀	◀		◀		
.13 Seepage Basin				◀	◀		◀		
.14 Stormwater Leachfields				◀	◀		◀		
.15 Recharge Ponds				◀	◀		◀		
3.20 ROOF COLLECTION & RECHARGE				◀	◀		◀		
.21 Storage Cistern for Irrigat.				◀	◀		◀		
.22 Seepage Basins				◀	◀		◀		
.23 Stormwater Leachfield				◀	◀		◀		
.24 Recharge Pond				◀	◀		◀		
3.30 SWALE DRAINAGE FOR ROADWAYS				◀	◀		◀		
GROUP 4.00 MEASURES									
4.10 PAVEMENT,ROOF DRAINAGE TO:						◀		◀	
.11 Detention Pond, Basin						◀		◀	
4.20 DETENTION GRADING						◀		◀	

$60,000 in Continuing 208 funding is the estimated cost for this research.

TARGET IMPLEMENTATION DATES

Implementation of the recommended management program should begin by July, 1979. The research program outlined above should also begin by July, 1979, continuing as long as necessary to provide the needed information (forseen to be approximately five years). As more information becomes available, the management program should be refined to better meet the aquifer protection needs of the basin.

SAN LORENZO VALLEY

The geology of groundwater bearing units in the San Lorenzo Valley is far more complex than in the Carmel Valley. Existing data is sketchy and based on many assumptions, which makes a comprehensive management program far more difficult to apply on a sub-basin geography basis. Unlike the Pajaro and Carmel Valley, the San Lorenzo Valley has many subwatersheds, variability in geography, precipitation, and soil types which complicate considerably an analysis of recharge locations and quantity. However, enough is known about existing impacts on quantity and quality to warrant immediate mitigation efforts, to be refined after further research is conducted. As in the other two valleys, the residents of the San Lorenzo Valley are dependent upon the existing surface and groundwater resources to meet their present and future water needs.

FINDINGS

A. The existing groundwater data base is totally inadequate for the wise management, both present and future, of the basin's groundwater resources. Much more quantitative data is needed. The findings are based on the present state of knowledge for the San Lorenzo Valley.

B. Three broad geologic provinces delineated by two major faults (Ben Lomond and the Zayante) make up the San Lorenzo Valley, each with different groundwater characteristics. While two of the geologic units provide only enough groundwater for localized domestic supplies, the third has a large storage capacity. Its aquifers rely heavily on a high rate of recharge to maintain groundwater volumes.

C. Four categories of recharge potential*were identified on the basis of geologic, slope and soils data (very High, High, Moderate and Low). Total annual recharge was estimated (for the Branciforte Creek subwatershed) using precipitation, area, runoff, base flow and evapotranspiration. These findings were used to estimate recharge for the entire basin. The methodology used is subject to

*The recharge map for the San Lorenzo Valley (at a scale of 1:24,000) could not be legibly reduced for inclusion in this report because of the level of detail and size of the area. Copies at the original scale are available from AMBAG.

constraints of insufficient base data for statistically reliable basin-wide recharge estimates. There are significant uncertainties in the results due to the many assumptions and generalizations which were necessary.

D. In the four recharge categories, instream recharge was estimated to range from zero to 13% of total recharge, and offstream from 87% to 100%. The four categories contribute the following to total recharge:

Very high recharge	- 6%
High	- 32.5%
Moderate	- 32%
Low	- 29.5%

Total annual recharge was estimated to be 46,700 acre feet per year. No estimate of total storage capacity was made. Again, these estimates are based on many assumptions.

That the "low" recharge category contributes 30% of total recharge is significant in that, although regarded as an insignificant groundwater province, it provides a large proportion of recharge and supports many urban settlements (covering the major portions of the mountainous areas and intervening valleys). Therefore, although these categories are useful in estimating groundwater production, they are too general to use as management guides.

E. Although difficult to quantify, it is evident that the quantity of recharge has been reduced from its natural levels by existing development. Stormwater runoff has reduced infiltration and recharge and caused extensive erosion. Higher stream flows have been observed from stormwater runoff, with more discharge to the ocean.

F. Projected development to 1995 will displace an estimated 553 acre feet per year of recharge. Although only a 1% to 5% loss, at 400 gallons per dwelling unit per day, this is enough water to support 1,235 dwelling units for a year. The displaced recharge water is equal to the loss of water available to supply one dwelling unit for every five single family units built in the valley (an "impact rate" of 5 to 1).

G. The cumulative loss of recharge from all past and future development should be considered, rather than just the relatively small decrease which will occur from projected development. Although impossible to quantify without pre-development data, it is most likely that the recharge function has already been significantly impacted in some areas of the basins, and will continue to worsen.

H. Given the complexity of groundwater sub-basins in the San Lorenzo Valley, it is likely that recharge in any confined valley area is limited to that area. Where heavy concentrations of development are present which rely on groundwater supplies it is possible that the groundwater table in these areas will be depressed as a result of new urban development.

I. The cumulative effects of recharge losses during a succession of dry years is unknown as there are insufficient data to estimate total basin storage. It is possible that serious environmental impacts could occur.

J. Existing groundwater quality problems identified by the Santa Cruz County Office of Watershed Management include the following:

- Nitrate pollution from septic tank systems in sandy soils and areas of high groundwater (the largest pollutant source)
- Domestic wastewater disposed in sandpits in the Scotts Valley area
- Disposal of domestic wastewater to streams, particularly Boulder Creek and Bear Creek
- Leachate from the Ben Lomond Solid Waste Disposal Site, located in highly permeable Santa Margarita sandstone
- Contamination from oil wells in the upper San Lorenzo Valley
- Possible impacts from timber harvesting and quarry operations, including release of sulfate, iron and heavy metals
- Mineralization of groundwater supplies in the upper San Lorenzo Valley from increased pumpage is likely

The full extent and distribution of these pollution sources is not yet known.

Potential pollution problems which have not yet been directly documented are urban runoff and domestic animal wastes.

Regardless of the impacts which future development will have on groundwater quality, there already have been significant quality reductions which must be taken into account. The existence of these significant pollution problems indicates that recharge has not been adequately considered in the past.

K. Future development will at the very least compound the groundwater pollution problem with increased urban runoff and septic tank effluent, both direct consequences of additional urbanization. It is also likely that additional impervious surfaces will reduce amounts of local recharge needed to dilute groundwater contaminants, especially septic effluent.

RECOMMENDED MANAGEMENT PRACTICES

It is recommended that:

A. Pre-development recharge rates and groundwater quality be protected from future development through a program of basinwide mitigation incorporating the previous recommendations. Enhancement of recharge may be desirable in the interest of being conservative with the basin's groundwater resources, but is less important than in the other two case study basins as annual precipitation in the San Lorenzo Valley is substantially greater.

B. The majority of recharge occurs offstream and should especially be protected. Streamflows are dependent upon discharge from groundwater, so offstream recharge will maintain and possibly prolong streamflows into the dry season.

C. Specific reaches of streams have been determined to have an instream recharge function and should be protected from culverting, channelization, filling, diking and other encroachments which could directly impact instream recharge capabilities.

D. Additional research be conducted to allow use of a zone-based system of applying mitigation techniques to new development. Research currently being conducted by the Santa Cruz County office of Watershed Management should be used and supplemented with necessary additional studies.

E. Subbasins with existing or planned well fields should be considered "critical" recharge areas and subject to special protection at least until enough data is gathered to identify those subbasins with particularly significant recharge characteristics.

RECOMMENDED IMPLEMENTATION PROGRAM

It is recommended that:

A. Santa Cruz County and the City of Scotts Valley cooperate in applying the management recommendations to the San Lorenzo Basin. As more information becomes available (including the Draft San Lorenzo Valley Watershed Management Plan planned for October, 1978), the management plan should be revised to accomplish better aquifer recharge protection.

B. Significant research be conducted within the next one to five years to resolve some of the outstanding unknowns of the San Lorenzo Valley groundwater characteristics. Specific research needs to be met are:

1. Groundwater level mapping of the entire valley showing locations of groundwater recharge and discharge. This requires stream surveys (both perennial and intermittent) and extensive well level monitoring. This information is particularly needed for septic tank management and protection of groundwater quality.

2. Identification and mitigation of groundwater quality problems.

3. Identification and further study of subbasins of "critical" recharge value (in terms of present or planned water supplies, non-point pollution occurring in high recharge areas and/or very high quantities of recharge) to include boundaries and capacity of subbasins, groundwater movement, quantity, quality and location of recharge, fluctuations in groundwater levels and relationships with the larger basin and surrounding subbasins.

   $75,000 of Continuing 208 Funding is being sought to carry out the above research and any other public costs associated with carrying out the recommended management program.

TARGET IMPLEMENTATION DATES

The proposed management program should be initiated by July, 1979. Additional research should begin by July, 1979, and is expected to continue for five years following.

Implementation Costs

Of the recommendations for mitigation of recharge losses, some will add to administrative responsibilities and costs (such as development review, planning and research), and others will impose costs directly on the developer (recharge facilities, soil tests). The public costs are identified in the accompanying table, but private costs are not. This is partially because of the many options for mitigating recharge loss, and their site specificity.

A general analysis of the cost-effectiveness of recharge mitigation development practices indicates that alternatives for recharge may serve as alternatives to traditional drainage systems with possible savings in downstream drainage facilities. Cost savings over conventional development practices may result, as is the case in the following example.

A hydrological land planning approach rather than traditional engineering was used in the development of Woodlands New Town (located 25 miles from Houston, Texas) where groundwater recharge was a primary consideration. The economic benefits of the approach were clearly demonstrated as, with conventional engineering relying heavily on storm sewer systems, construction costs were estimated at $18.7 million, while the system emphasizing retention and utilization of natural drainage and percolation resulted in costs of $4.2 million. There was a cost savings of $14.5 million.

In the accompanying table costs are identified by basins rather than jurisdictions. The need for consistency within each basin dictates that the individual jurisdictions work closely in implementing the proposed program. The financial responsibilities of each jurisdiction should be worked out within each basin.

The share of costs among basins varies between recommendations, due to each basin's characteristics. The size of the basin, uniformity and complexity of recharge areas, and available data are all factors which were considered. As more information becomes available, costs per basin may need to be re-allocated.

TABLE IX-1

MANAGEMENT RECOMMENDATIONS FOR AQUIFER RECHARGE CASE STUDY
ESTIMATED COSTS AND FINANCING

	Recommended Management Practices	Recommended Implementation Program	Public Costs[1,2] Initial	Public Costs[1,2] Annual	Funding Source[4]	Responsible Agency[4]	Costs Per Basin[3] Santa Cruz Coastal	San Lorenzo	Aptos-Soquel	Pajaro	Salinas	Carmel
1.	Onsite mitigation through modified development practices (retention grading, pervious pavement, vegetative management, recharge pond, etc.)	1a. Subdivision ordinance modifications (definition of "drainage", soil tests and report)	1a. $12,000[5]	0	Counties and cities	Counties and cities	plus	$1,000 $1,000-Santa Cruz Co. ($250/basin)	-----	$1,000 $1,000 Monterey County ($500/basin)	$6,000	$2,000
		1b. Apply structural mitigation measures to all urban development projects.	1b. 0	200,000[6]	Counties and cities (Development fees possible)	Counties and cities	$10,000/yr	$50,000/yr.	$10,000/yr	$40,000/yr	$40,000/yr	$50,000/yr
2.	Flood plain zoning	2-6. Use available recharge data when carrying out these planning tasks	2. 0[7]	0		Counties and cities	0	0	0	0	0	0
3.	Wetlands open space		3. 5,000[8]	0	EPA 3,750 (from groundwater research and planning funding) Local 1,250	"	750	1,000	750	750	750	1,000
4.	Stream open space setbacks		4. 5,000[8]	0	"	"	500	2,000	500	500	1,000	500

5.	Direct Development ~~of~~ toward ~~impervious~~ low recharge areas	5,000[8]	0	"	"	500	2,000	500	1,000	500	500
6.	Clustered development	5,000[8]	0	"	Consider recharge data in the designation of areas suitable for cluster development	500	2,000	500	500	500	1,000
7.	Performance Standards	Undetermined[9]	----	---	Counties and cities	---	---	---	---	---	---
8.	Overlay zoning	40,000[8,10]	0	Counties and cities	Counties and cities. Once additional information available from research programs, map recharge areas at level of detail similar to present	4,000	15,000	4,000	7,000	5,000	5,000
9.	Consider petitioning for sole source aquifer designation	3,600[11]	0	Counties and cities		600	600	600	600	600	600
10.	Groundwater research and planning	345,000[12]	0	258,750 EPA 86,250 Local		70,000	75,000	70,000	10,000	60,000	60,000
	TOTALS:	$400,600[13]	$200,000			$84,850	$141,850	$84,850	$58,850	$112,100	$118,100

1. Private costs to be paid for by the developer or homeowner (for structural mitigations, additional soil tests and reports) are not included here. Costs would vary for each site and type of development, therefore are not readily generalizable.

2. Estimates for public staffing costs based on $30,000 per person year for staff time, except where otherwise noted. All estimates are in 1978 dollars.

3. Estimates per basin may need to be revised as more groundwater data becomes available.

4. The implementing agencies are identified under "H," Recommended Implementation Program.

5. $1,000 for each implementing city and county. Cities of Carmel, Pacific Grove, Monterey, Capitola and Santa Cruz are excluded as they are located in relatively insignificant recharge areas. If annexations of important recharge areas occurs, implementation of recharge protection programs in their cities may be necessary.

6. $40,000 per staff person/year, with 5 staff people needed to review the adequacy of each proposed urban development's protection of recharge $40,000 is needed (rather than 30,000) due to the highly technical nature of the necessary review (training in soils, engineering, drainage and runoff control). The five staff per year were allocated to the basins as follows: Santa Cruz Coastal - ¼ (little development occurring), San Lorenzo Valley - 1¼ (large, considerable development, recharge characteristics complex), Aptos-Soquel - ½ (small area), Pajaro Valley - 1 (very important to mitigate recharge losses), Salinas Valley - 1, Carmel Valley - 1 (relatively small area but subject to development pressures and is Monterey Peninsula water source).

7. This practice is an existing requirement therefore there are no additional costs incurred for consideration of recharge information.

8. Incremental cost for considering existing recharge data; not total cost. Funded as part of the groundwater research and planning program (#10). Costs allocated between basins according to particular characteristics of each; for example, San Lorenzo Valley large; geologically and hydrologically complex so requires more planning time than other basins.

9. Costs cannot be determined until research programs conducted.

10. Staff time necessary to use detailed recharge data to prepare "recharge zone" maps for all the basins.

11. 1 week of staff time for each basin for analysis of data to make recommendation on desirability of petitioning.

12. To be spread over one to five years; includes costs for recommen-

dations 2 through 6 as are planning needs.

13. Costs for #2-6 (flood plain zoning, wetlands open space, stream open space setbacks, development of impervious areas, clustered development) are not added into total as already part of groundwater research and planning cost.

IMPACT ASSESSMENT

SIGNIFICANT EFFECTS:

Necessary measures to mitigate loss of groundwater recharge would vary from project to project depending upon conditions. Retentions grading, swales and recharge ponds would increase open space within development. All measures to maintain runoff at pre-development levels are likely to involve costs in excess of traditional subdivision development which did not provide for mitigating off-site impacts. However, most development of individual lots would not require such measures.

Many of the practices recommended have not been standard practice in the planning area. Until architects, developers, planners and decision makers become familiar with them, the development process may be slowed for the period to adapt to the recommended changes.

ALTERNATIVES:

"No project" alternative was rejected on the basis of the potential impacts of future development on groundwater resources of the region. Given the existing water supply shortages in the Pajaro Valley and dependence in the Carmel and San Lorenzo Valleys on their existing water supplies, wise management dictates mitigation of recharge losses.

Alternative of requiring retention of all runoff regardless of the pre-development recharge rate was rejected. In some cases, infiltration rates would not be sufficient for all the retained runoff to percolate. In other cases, enhancement of recharge to that extent may not be necessary, in the San Lorenzo Valley for example, where annual precipitation is high.

Alternative of centralizing recharge by the construction of large scale retention and recharge facilities by a governmental entity (such as a Drainage District) was rejected. The problem is not great enough to warrant this type of of expense. Would require development of Master Drainage Plans for each basin, provision of adequate drainage facilities into the retention facility by each developer, and large drainage facilities. Nature of problem in this region more suited to on-site, incremental and small scale mitigation measure.

Short term use vs. long term productivity: Recharge protection will enhance the long term productivity of the regions groundwater resources by protecting it from quality degradation and losses from increased impervious surfaces and runoff.

Growth Inducement

In most cases, protection of aquifer recharge will not increase the available water supply, but will allow the maintenance of pre-development groundwater levels. Enhancement of the natural recharge function may be possible under certain circumstances, but this in itself can not be termed "growth inducing." Availability of water is one of many planning considerations used in determining local development policies. The occurrence of growth should be directed by policy, not by the amount of water.

CHAPTER X

OVERALL STRATEGY FOR ONGOING AREAWIDE WATER QUALITY PLANNING AND IMPLEMENTATION

This chapter has two main objectives:

- to generally describe the plan, synthesizing the variety of implementing programs (associated with the case studies) into a cohesive framework.
- to go beyond the case study recommendations, where necessary and possible, to recommend additional plan elements (including a Continuing Planning Element) based on case study experiences.

The discussion of implementing and financing recommendations (Sections B and C below) for each of five functional water quality programs -- regulatory, facility construction and operation, waste discharge, education, monitoring and evaluation -- is preceded by a general introduction to the continuing Water Quality Management Program.

SECTION A: THE ORGANIZATIONAL FRAMEWORK FOR THE ONGOING WATER QUALITY MANAGEMENT PROGRAM

The recommended institutional and fiscal arrangements for implementing the 208 program place maximum reliance on existing authorities and capabilities of local governments in the AMBAG area. Additionally, maximum reliance is placed on the technical capabilities of existing state institutions such as the Regional Water Quality Control Board (RWQCB) and the California Department of Water Resources.

The Association of Monterey Bay Area Governments provides a regionwide and comprehensive viewpoint that is expressed primarily in the roles of coordinator and evaluator of the effectiveness of the Plan in meeting its stated water quality objectives.

1. Goal-Setting and Plan Development

The first step in the ongoing water quality planning and implementation process was that of developing the 208 Plan itself. This aspect of the total process was accomplished cooperatively by AMBAG and by the county and city governments in the region with technical input from Federal, State and local operating agencies.

2. Plan Implementation

The 208 Water Quality Management Plan is not "implemented" by means of a single decision of in a single step. The Plan contains numerous implementing strategies and

schedules for solving a variety of water quality problems.

The Plan elements are characterized by a general avoidance of major capital expenditures. Plan implementation:

- o can by and large be described as extensions of existing programs or practices that are already being carried out by general purpose governments or special districts in the AMBAG region;

- o in many cases can be associated with an equitable source of financing that is directly related to the problem.

The conclusion that the individual elements of the Water Quality Management Plan are extension of existing governmental powers and programs leads directly to the conclusion that existing established local governments should be responsible for implementing the Plan. No instances were identified where a region-wide (two-county) solution was either technically or institutionally superior.

a. Responsibility for Implementing Regulatory Requirements of Plan

A number of the key elements in the 208 Program are "regulatory" in the sense that they depend on the authority of government to regulate land use, to abate hazards to the public health, or to regulate the quantity and quality of waste discharges. The regulatory powers that would be required of any agency to implement the 208 Program were compared with the powers and technical capabilities of existing state and local governments. In every instance, the responsibility for imposing and observing whether "regulations" are in fact being complied with, and taking appropriate remedial action if they are not, is assigned to an existing local or state agency.

Each of the elements of the 208 Plan that involve a "regulatory" component is identified in the following subsection (B.1) and the responsibility and techniques for monitoring for compliance are described in detail. As a summary:

- o Responsibility for enforcement of all regulations related to land use or development standards remains with the county or the city having jurisdiction over the land area. Each local government is required to adopt appropriate ordinances, or to amend existing ordinances, that are substantially in accord with the regulatory policies of this plan or take other measures that accomplish the desired objective.

- Enforcement of management practices and procedures that can be implemented by local governments (e.g., street sweeping practices, techniques to avoid erosion problems or correct problems that have been allowed to occur previously, etc.) is the responsibility of local government.

- Enforcement of public health standards (e.g., nitrate levels in well water, adequate maintenance of septic tanks) remains with the county health agencies. Additional responsibilities could be assigned to subregional entities (e.g., the governing body of an onsite wastewater disposal zone could require the use of proper maintenance practices) but final responsibility for compliance with public health standards remains with the county health departments.

- Responsibility for monitoring quality of all liquid waste discharges from both point and non-point sources and placing conditions on such discharges remains with the Regional Water Quality Control Board.

b. Monitoring For Plan Effectiveness

The previous paragraphs dealt with the responsibility for enforcing standards and requirements included in the 208 Plan. "Monitoring for effectiveness" has a broader concern. Are the standards and requirements included in the 208 Plan adequate to the basic plan objectives of maintaining and improving water quality in the region? The 208 Water Quality Management Plan was based on a conclusion that certain actions would accomplish the water quality objectives. This conclusion must be subjected to continuous review and to a continuous monitoring program.

AMBAG will have the principal responsibility for coordinating and, in most instances, carrying out a program of evaluating to determine whether implementation of the 208 Plan is meeting Plan objectives. In most instances (e.g., monitoring groundwater pollution) the technical work is delegated to another agency. The AMBAG governing body will have the ultimate responsibility for determining whether the objectives of the 208 Plan are being met or whether the water quality management strategy should be revised. (Plan objectives are defined generally in Chapter II and specifically in each plan element or case study.)

The responsibility for monitoring for Plan effectiveness is a demanding one, including consideration of both technical and institutional factors. The recommended management practices and implementation programs appear to be efffective but that may or may not prove out in practice. As a specific example, it was concluded that regulation of the use of fertilizer as a means of

controlling nitrate penetration to the groundwater could not be implemented at the present time. Instead, a program of education in agricultural practices is to be implemented. The effectiveness of the educational program must be the subject of further observation. If, in fact, a monitoring program leads to the conclusion that the situation is not improving, then it will be necessary to make the recommendation that other measures -- such as regulatory measures -- be implemented.

As a second example, a series of model ordinances (see Appendices G and L) developed as part of the 208 effort will serve several water quality objectives. The 208 implementation strategy stops short of suggesting that these ordinances be adopted verbatim by cities and counties in the AMBAG region. Instead, the ordinances are designed to be "performance guides", relevant portions of which would be adopted in substance by jurisdictions to which the policies and requirements applied. The ordinances themselves can be modified to local circumstances and preferences.

A major aspect of the Plan's overall implementation strategy is that for a local government to be substantially in accordance with the Plan, it is necessary that the local jurisdiction's ordinance include a substantive equivalent for all applicable regulatory policies that are included in the model ordinances. For example, a jurisdiction's erosion control ordinance need not be comparable in form to the model ordinance but the applicable items must be comparable in substance. Another example: A jurisdiction's plan for remedying erosion problems associated with completed public road projects is not specified in detail as part of the Plan. The development of such a program by the local jurisdiction will be evidence of consistency with that aspect of the 208 Plan.

One of AMBAG's principal responsibilities will be to identify, annually, the extent to which the Plan, considered as a composite of all its elements, is meeting water quality objectives.

In meeting this responsibility, AMBAG will initiate, and coordinate with, a task force comprised of city and county elected officials, and public representatives. This task force will be responsible for advising the AMBAG Board of Directors as to the consistency ot local implementing actions with management requirements identified in the Plan.

SECTION B: OVERALL STRATEGY FOR IMPLEMENTING THE PLAN

As noted previously, the overall strategy for implementing the Plan was developed on the basis of insights gained during the case studies (including the Septic and Erosion region-wide "case studies"). The management practices that are recommended for adoption as a result of the case studies can be classified into five categories:

- o enacting regulatory policies and ordinances that affect water quality
- o constructing and operating public facilities
- o enacting and enforcing liquid waste discharge standards
- o conducting education programs
- o monitoring and evaluating various aspects of water quality

Certain of these actions directly affect or support attainment of water quality objectives related to more than one water quality problem area. Table X-1 shows the extent to which each of the Plan elements would help solve one or more identified water quality management problems.

Table X-2 provides details on the manner in which the organizational concepts introduced in the previous subsection (A.2) are applied to each of the elements in the recommended 208 Plan.

The following subsections discuss the regionwide institutional implications of each of the 208 Plan elements.

1. Regulatory Policies and Ordinances Related to Water Quality

Enacting and enforcing the regulatory policies contained in the model ordinances developed during the Section 208 Program is one of the key elements in the overall 208 Plan. It is the specific intent of the 208 Program that the model ordinances (see Appendix G and Appendix L) be viewed as guides. The performance requirements implied by the following regulatory policies should be substantially incorporated into the ordinance of applicable cities and counties, but:

- o maximum flexibility in form and content of the ordinance is encouraged
- o policies that are inapplicable to water quality circumstances in a particular jurisdiction should be excluded

The following policies are more procedural than the related technical recommendations found in the body of this plan, under element and case study headings. Also, they are less specific than model ordinances. The provisions, included under the four headings of Erosion and Sedimentation Control, Septic System Control, Development Standards and Controls, and Watercourse Protection, are intended to convey the major regulatory requirements and implications in a concise form.

a. Erosion and Sedimentation Control

(1) Require a review of all proposals for grading and land leveling activity for urban and agricultural purposes to ensure that they minimize

TABLE X-1: THE EFFECT OF PLAN ELEMENTS ON WATER QUALITY PROBLEMS

Action	Effect Of The Action On Case Study Water Quality Problem Areas					
	Lake Pollution	Pollution by Failing Septic Systems	Erosion and Sedimentation	Nitrate Pollution of Groundwater	Seawater Intrusion	Groundwater Recharge
REGULATORY POLICIES AND ORDINANCES RELATED TO WATER						
QUALITY CONTROL						
Erosion Control	Primary		Primary			Supporting
Development Controls & Standards	Primary		Primary			Primary
Watercourse Protection	Supporting		Primary			Primary
Septic Tank Management	Supporting	Primary		Supporting		
CONSTRUCTION AND OPERATION OF PUBLIC FACILITIES						
Sediment Traps & Comparable Facil.	Primary		Primary			Supporting
Street Sweeping	Primary		Supporting			
Repair of Erosion Damage associated with public roads	Supporting		Primary			
Landfill Operation Standards	Supporting			Primary		
Operation of munic. tmnt. facil.	Supporting			Primary		
LIQUID WASTE DISCHARGE STANDARDS						
Dairy waste standards				Primary		
Feedlot discharge standards				Primary		
EDUCATION PROGRAMS						
Agricultural Demonstration Research Project				Primary	Supporting	Supporting
Public Information on Septic Systems	Supporting	Primary		Supporting		
Training, Septic Systems	Supporting	Primary		Supporting		
Training, Erosion Control	Supporting		Primary			Supporting
Public Information on Nitrate Pollution		Supporting		Primary		
Public Information on Water Conservation		Supporting	Supporting	Supporting	Primary	Supporting
MONITORING AND EVALUATION						
Agricultural Demonstration & Res. Proj.				Primary	Supporting	Supporting
Study of Water Supply Alt., Pajaro					Primary	Supporting
Lake Maintenance Plans	Primary	Supporting	Supporting			
Recharge Protection Plans				Supporting	Supporting	Primary
Groundwater Monitoring		Supporting		Primary	Primary	Primary
Septage Disposal Site Evaluation		Primary		Supporting		
Erosion Control Plans for Urban Areas	Primary		Primary			
Erosion Control Plans for Rural Areas	Supporting		Primary	Supporting	Supporting	Supporting
Erosion Control Plans for Public Roads	Supporting		Primary			

Note: "Primary" = Primary Strategy; "Supporting" = Supporting Strategy

TABLE X-2

RESPONSIBILITY FOR IMPLEMENTING THE SECTION 208 PLAN

PLAN ELEMENT	RESPONSIBILITY FOR	
	Implementation	Compliance and Enforcement
REGULATORY POLICIES AND ORDINANCES RELATED TO WATER QUALITY CONTROL		
Erosion Control	Cities and Counties	Cities and Counties
Development Controls and Standards		
Watercourse Protection		
Septic System Regulations		
CONSTRUCTION AND OPERATION OF PUBLIC FACILITIES		
Sediment Trap and Comparable Facilities	Appropriate Local Government (e.g. City, District, JPA)	Appropriate Local Governments
Street Sweeping		
Repair of Erosion Damage Associated with Public Roads	Cities and Counties	RWQCB
Landfill Operation Standards	Cities and Counties	RWQCB
Operation of Municipal Treatment Facilities	Cities, Counties, Special Districts	RWQCB
LIQUID WASTE DISCHARGE STANDARDS		
Dairy Discharge Standards	Private Operator	RWQCB
Feedlot Discharge Standards	Private Operator	RWQCB
EDUCATION PROGRAMS		
Agricultural Demonstration & Research Proj.	Undetermined*	N/A
Public Information on Septic Systems	Counties	N/A
Training, Septic Systems	SWRCB or Community Colleges	N/A
Training, Erosion Control	SCS, RCD's Farm Advisor	N/A
Public Information on Nitrate Pollution	U.C. Cooperative Extension	N/A
Public Information on Water Conservation (Agriculture)	SCS, RCD's Farm Adv.	N/A
(Urban)	Cities, Counties or Special Districts	N/A
MONITORING AND EVALUATION		
Agricultural Demonstration & Research Proj.	Undetermined*	N/A
Study of Pajaro Water Supply Alternatives	2 County Task Force	N/A
Lake Maintenance Plans	Cities and Counties	N/A
Recharge Protection Plans	Cities and Counties	N/A
Groundwater Monitoring	Counties and/or State Dept. of Water Res.	N/A
Septage Disposal Site Evaluation	San Lorenzo Valley County Water Dist.	N/A
Erosion Control Plans for Urban Areas	Cities and Counties	N/A
Erosion Control Plans for Rural Areas	Resource Conservation Districts	N/A
Erosion Control Plans for Public Roads	Cities and Counties	N/A
Evaluating the Effectiveness of the 208 Plan	Cities, Counties and AMBAG	N/A

LEGEND:

AMBAG	Association of Monterey Bay Area Governments
JPA	Joint Powers Authority
RWQCB	Regional Water Quality Control Board
SWRCB	State Water REsources Control Board
SCS	Soil Conservation Service
RCD	Resource Conservation District

* The appropriate lead agency for this project will be determined, following 208 Plan adoption, by AMBAG as advised by an Agricultural Study Advisory Group.

the effects of modifications to the land surface which might render it susceptible to erosion or adversely affect runoff patterns.

(2) Provide for the issuance of a grading permit based in part on a Grading/Erosion/Sedimentation Control Plan, subject to administrative review and approval with appeal to the governing body.

(3) Secure the advice of the Soil Conservation Service and/or Resource Conservation Districts in matters concerning runoff, erosion and sediment control, and request their review and comment on grading proposals and on erosion and sediment control plans upon which grading permits will be based.*

(4) Require the enactment of a separate ordinance dealing with maintenance of erosion control measures, authorizing public corrective measures and corresponding property liens.

(5) Require the enactment of a new or revision of an existing ordinance dealing with the keeping of livestock on small parcels of land that are not farms or ranches, focusing on areas likely to be subject to overgrazing and accelerated erosion; and require the granting of a livestock permit before livestock may be maintained in certain circumstances.

(6) Ensure that lands are developed in reasonable increments which can be completed during a single construction season with scheduling to minimize exposure of soil. (For purposes of simplified administration, a separate grading and construction practices ordinance might be enacted, distinct from agricultural practices.)

(7) Specify the provision of temporary control measures, both vegetative and structural, to be applied concurrently with the development/construction process, after land-disturbing activity occurs.

(8) Require that personnel concerned with the review, approval and/or enforcement of any erosion and sediment control provisions or conditions of any ordinance or permit, or of any erosion and sediment control plans, be trained and experienced in the field of runoff, erosion and sediment control.

* Soil Conservation Service technical standards are accepted nationwide as the basis for erosion and sediment control work.

(9) Provide detailed grading standards which cover: construction and agricultural land grading operations, cut and fill activities, vegetative preservation, storm runoff control, and water-course protection.

(10) In all ordinances, include provisions to ensure temporary erosion control measures are applied prior to maturation of permanent vegetation, and prior to installation of permanent structural measures.

(11) Ensure that facilities requiring land disturbance are completed prior to the rainy season.

(12) Consider the adoption of the technical standards of the USDA, Soil Conservation Service as the administrative guidelines for all erosion and sediment control ordinances. (See footnote on previous page.)

b. Septic System Pollution Control Management

(1) Foster improved ability to locate previously installed septic tanks and provide greater ease of access for those engaged in inspection and/or cleaning.

(2) Provide for system "self-correction" and avoidance of serious impacts of system failures by requiring dual absorption systems on new community or other large systems or where public health concerns make them appropriate.

(3) Simplify the monitoring of septic tank absorption field condition by provision of devices which allow inspection, particularly for new community and other large systems.

(4) Consider utilizing the new legislation authorizing local government (SB430, 1978) to form onsite wastewater disposal zones.

(5) Provide for inspection of septic systems during the home sale process to ensure that the system is operating properly and to educate the home buyer as to its location and maintenance needs.

(6) Provide for maximum development densities in areas using septic systems to prevent interference between adjacent systems and to minimize the threat of groundwater pollution.

c. Development Standards and Controls

(1) Require, in areas particularly vulnerable to stormwater runoff into environmentally and hydrologically significant waterways, the clustering of previously allowable densities into an appropriately located and stable portion of the site, using traditional planned unit development procedures.

(2) Limit roadway widths and other impervious surfaces to that size which can accommodate public traffic and other public needs, but balance any increase in such limits against adverse effects associated with increased erosion, sedimentation and reduced aquifer recharge when other overriding considerations such as public safety do not preclude this.

(3) Where growth management systems are being developed by local jurisdictions, include as a criterion for the timing, sequencing and location of growth, the onsite, jurisdiction-wide, and region-wide effects on erosion and recharge, including secondary impacts resulting from roadway extensions.

(4) Amend subdivision ordinances to require a finding that no subdivision proposal be approved (under the authorization in the Subdivision Map Act that there be no finding of "substantial environmental damage") where the subdivision will be located within an area identified as a highly erodable site.

(5) Amend local guidelines under the California Environmental Quality Act for Environmental Impact Reports to ensure that secondary impacts on water quality of all developments are identified and adequate mitigation measures, structural and siting, are included.

(6) Require that subdivision ordinances mandate the provision of an adequate drainageway system and its public dedication, and broaden the definition of "drainage" and "drainageways" to include allowance for onsite retention and percolation of stormwater for purposes of protection/enhancement of aquifer recharge.

(7) In sensitive water quality impacting areas, institute provisions in local zoning ordinances which control site coverage and limitations of impervious surface.

d. Watercourse Protection

(1) Require in zoning ordinances of local jurisdictions a watercourse protection zone, whose provisions provide for review of all development within a specified distance of watercourses, for water quality as well as other environmental impacts.

(2) Ensure that all jurisdictions include in their zoning ordinances a flood-plain zone which takes into account groundwater recharge characteristics.

(3) Provide for minimum setbacks from designated waterways for wildlife habitation, open space, and visual as well as water quality considerations.

In nearly all cases, requirements of water quality-related ordinances of adjoining jurisdictions must be coordinated. Provisions related to protection of groundwater recharge areas and erosion control are conspicuous examples since a failure by one jursidiction to enact or enforce a compatible ordinance may compromise the effectiveness of the water quality ordinances in an adjoining jurisdiction. AMBAG, utilizing local task forces, will evaluate the question of compatibility of agencies within particular watersheds or groundwater basins as part of the annual plan review and revision process.

In instances where two or more local governments would gain by a cooperative effort to produce and adopt the required ordinances, AMBAG will serve as a source of information and will encourage and assist in coordinating joint effort (e.g., using intergovernmental task forces) to deal with common problems.

A jurisdiction will be in accordance with the intent of this regulatory element of the 208 Plan if it adopts a substantially complete ordinance or ordinances or modifications to existing ordinances within two years after the date of adoption of the 208 Plan. Over the longer term, a city/county/AMBAG task force(s) will comment on the way in which the ordinances are enforced in practice and the extent to which they appear to serve water quality objectives. The detailed drafting of the ordinances and the enforcement of the provisions of the ordinances are the responsibility of particular cities and counties in the region.

2. Construction and Operation of Public Facilities

Selection of the agency to construct or operate any public water quality facility is a matter for local rather than region-wide decision.

In some cases (e.g., water quality management strategies for lakes) institutional arrangements must be established. The optimal institutional arrangements -- as measured by the standard of technical efficiency and acceptability to the governments and citizens that are involved -- may vary throughout the region.

The Lake Preservation case study (see Chapter VI and Laguna Grande/Roberts Lake Technical Reprot) illustrated a number of concepts that are available for consideration, including:

- joint exercise of powers agreements between established local governments
- use of special districts that, in fact, involve little or no extension of governmental powers; since the governing body would consist of city and county officials, the responsibilities for design and operation would be met through contract with a city or county department and, in effect, the district would be used as a mechanism to allocate financial responsibility to the area that is benefitted
- use of a more autonomous special district with appropriate powers if this arrangement was more responsive to local circumstances or attitudes

In any case, there is no single institutional model for operating the public facilities that are a part of the Section 208 Plan. Existing local governments with the advice and concurrence of the appropriate Local Agency Formation Commission can establish the institutional mechanisms that are technically and fiscally appropriate and acceptable to the participants.

The following paragraphs provide additional comments on the different types of facilities or other public operations that are included in the Plan.

Sediment traps and comparable lake preservation facilities are recommended in the case studies of Laguna Grande and Roberts Lake and may be appropriate in other areas for protection of lakes, watercourses or groundwater recharge areas. Construction and operation of such facilities does not pose any particular institutional problem. One or another of the institutional alternatives considered for the Laguna Grande and Roberts Lake case studies may be applicable.

Street sweeping, using best management practices, is recommended as part of this Plan for each jurisdiction in the Laguna Grande watershed. This practice may be appropriate for other lake watersheds and can be implemented independently by the responsible local governments, although opportunities

for equipment sharing were identified during the case studies. Adequate lines of communication exist between local officials in both counties to permit the assumption that efficiencies in the purchase and use of vacuum street sweepers or other equipment will be achieved where they exist and are administratively feasible.

Correction of erosion problems associated with public roads, according to an established plan and expenditure program, is a somewaht novel element of the 208 Plan. After appropriate surveys, a classification is to be prepared by both counties and by each city, specifying existing public roadways where problems of erosion and sedimentation have become apparent. After existing erosion problems have been identified, each city and county is expected to prepare a specification and cost estimate for remedying erosion damage on roads under its control. The technical resources of the U.S. Soil Conservation Service and the local Resource Conservation Districts are available to support this effort. The cities and counties are expected to prepare a long-term expenditure program within three to five years that is fiscally realistic but that will correct the identified problems over a time period not greater than fifteen years after adoption of the 208 Plan.

Erosion control problems that are within the boundaries of a city or county but not subject to that government's jurisdiction are to be identified in the jurisdiction's erosion correction plan. The responsible governmental agency is encouraged to take corrective action within the fifteen year period.

Landfill operation standards that will prevent discharges to groundwater, to rivers or to estuaries are generally well established and understood. These statewide standards are enforced by several agencies, including the State Solid Waste Management Board, the Regional Water Quality Control Board and, at the local level, by the counties (designated by the Solid Waste Management Board as the countywide solid waste management agencies).

The 208 Plan deals with the problems of landfill operations that may affect water quality by recommending that the above agencies continue to enforce appropriate standards and that local operating agencies adopt the appropriate management practices.

No additional institutional arrangements are required.

Operation of municipal and onsite wastewater facilities includes both treatment plants and onsite disposal using septic systems. Responsibilities and authorities for these functions are well established. The local governments in the two counties have both the technical and

fiscal capacity to operate waste treatment plants where this is the appropriate approach to wastewater management. For septic system problems, the County Health Officers and the Regional Water Quality Control Board have adequate, well established authority and capability to deal with problems of public health in one case, and of water quality in the other.

3. Liquid Waste Discharge Standards

The 208 Plan depends, in part, on regulations to control wastewater discharges from feedlots and dairies that eventually reach the groundwater. The Plan also depends on regulation to solve any groundwater quality problems from municipal treatment facilities (percolation ponds).

Emerging policy of the Regional Water Quality Control Board is to make full use of existing authority to regulate sources of pollutants to groundwater that have traditionally been given lesser priority than point or non-point discharges into surface water bodies such as streams, rivers, estuaries, etc. Adequate authority and adequate policy commitment now exist within the State Water Resources Control Board and the Regional Water Quality Control Board to make such a dependence upon regulatory approaches quite realistic under the circumstances.

4. Education Programs

Several programs of continuing education are major elements of the 208 Plan.

An intensive education program for farmers evolved as the most practical interim action pending further technical studies on the relationship between nitrates in the groundwater and fertilizer practices, irrigation practices, and other agricultural practices. A range of other alternatives is discussed in the case study but there was little support -- either technical or political -- for a stringent regulatory approach in the absence of a consensus that agricultural practices were primary sources of groundwater pollution.

In the absence of a clear justification for regulatory approaches, the Plan depends on a continuation of established educational programs conducted by the Farm Advisor in each county. Specialized technical instruction may be made available by a number of sources including the U.S. Soil Conservation Service, the Resource Conservation Districts and local community colleges. Seminars may be conducted by officials from the State

Department of Water Resources or the state or regional water quality agencies. Primary responsibility for education and agricultural practices is to remain with the Farm Advisor in each county.

Technical support for improved septic tank management should be provided by means of one or a series of formal training programs held in the region. The State Water Resources Control Board is considering developing a course in septic system maintenance. In the absence of a state-supported and funded course, it would be possible to contract with the community colleges. Actual out of pocket costs for specialized courses at the community college level are very nearly covered by the state subsidy.

Resource Conservation Districts, the U.S. Soil Conservation Service, the California Department of Transportation, and the Extension Service, in conjunction with the cities and counties, should develop and carry out an erosion and sediment control training program for all employees who will be checking the adequacy of grading, erosion and sediment control plans, and the compliance, maintenance and enforcement of grading, erosion and sediment control practices (BMP's), and laws.

Also, media education efforts should be carried out by appropriate cities, counties and special districts for purposes of water conservation, particularly in the Pajaro Valley.

5. Monitoring and Evaluation

The ongoing 208 planning process includes technical studies of two separate types. First, resources available to date did not permit a complete technical evaluation of certain water quality issues. It is necessary to carry out or complete these studies as part of the ongoing program. Second, as noted earlier, a program of monitoring the effectiveness of the Plan in meeting its water quality objectives, and taking remedial action if necessary, is a major element of the Plan.

a. Urban erosion control plans are to be developed by cities and counties. Each city and county should establish a plan and expenditure program for remedying existing erosion problems.

b. Cities, counties, and CALTRANS should also develop plans for the correction of erosion problems associated with public roads (described on p. X-13).

c. Rural (farmland) erosion control plans should be developed by, or in conjunction with, the five Resource Conservation Districts in the region. These plans should be completed for each farm and are to include problem analysis, alternatives for correction, an implementation schedule and identification of technical and financial assistance needs.

d. Lake maintenance plans are to be developed by the involved local governments for those lakes that were not the subject of the case study during the initial 208 planning program. The lead agency and other involved jurisdictions for each of the lakes in the two county region is summarized in Table X-3.

TABLE X-3

RESPONSIBILITY FOR PREPARING LAKE MAINTENANCE PLANS

Lake or Estuary	Responsible Agency	Participating Jurisdictions
Schwans Lagoon	Santa Cruz County	
Corcoran Lagoon	Santa Cruz County	
Moran Lake[1]	Santa Cruz County	Capitola
Soquel Creek Lagoon	Capitola	Santa Cruz County
Watsonville Slough	Santa Cruz County	Watsonville
Pinto Lake	Santa Cruz County	"
Lake El Estero	Monterey	
Salinas River Lagoon	Monterey County	
Carmel River Lagoon	Monterey County	Carmel

[1] A management plan is currently being implemented by Santa Cruz County.

The 208 Plan requires that lake maintenance plans be initiated within one year following adoption of the 208 Plan and that implementation begin as soon thereafter as funding can be made available. It is anticipated that the lake maintenance plans will be of the same level of technical detail as the plans produced for Laguna Grande and Roberts Lake. AMBAG will serve as a coordinator and facilitator in establishing joint programs among the agencies designated in Table X-3.

e. A groundwater monitoring plan (see Appendix I) for the Region is needed to resolve the controversy about the origins and extent of nitrates in the groundwater and to determine the urgency of action to solve the problem of saltwater intrusion to the groundwater. The additional cost of the recommended program is a fairly modest $20,000 per year. The program would take advantage of the continuing efforts of the five agencies that now carry out major groundwater monitoring programs in the two counties, including:

- California Department of Water Resources
- Monterey County Flood Control and Water Conservation District
- Santa Cruz County Flood Control and Water Conservation District
- Santa Cruz County Watershed Manager's Office
- Environmental Health Departments of Monterey and Santa Cruz Counties

The counties are recommended as the lead agencies in the more extensive monitoring program, although the technical and financial support of the Department of Water Resources is also desirable.

f. In conjunction with the above groundwater monitoring plan, an Agricultural Demonstration and Research Project should be implemented. This project should seek to analyze and demonstrate the methods and cost effectiveness of applying irrigation water and fertilizers in a manner which diminishes nitrate pollution of groundwater in the Salinas and Pajaro Valleys. An Agricultural Study Advisory Group should be established and should, as a first task, determine the appropriate lead agency for implementing this Demonstration and Research Project.

g. An evaluation of water supply alternatives for the Pajaro Valley is a necessary additional study that should be carried out as part of the continuing 208 Program. The research and analysis completed to date indicates that a reasonable approach to seawater intrusion control in the Pajaro Valley is to import additional water from outside the region. Such a decision has important implications for land use and development patterns in both counties. Further, the efforts to date did not include an economic evaluation of agricultural water use from such potential sources as the San Felipe Project. This study should be done cooperatively with the Santa Cruz County Water Supply Master Plan update and the ongoing U.S. Army Corps of Engineers Water Supply Study. The following agencies should participate in this study:

- Monterey County Planning Department
- Santa Cruz County Planning Department
- Monterey County Local Agency Formation Commission
- Santa Cruz County Local Agency Formation Commission
- City of Watsonville
- Monterey County Flood Control and Water Conservation District
- Santa Cruz County Flood Control and Water Conservation District
- California Department of Water Resources
- U.S. Army Corps of Engineers
- U.S. Bureau of Reclamation
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- Association of Monterey Bay Area Governments

h. Additional research on groundwater characteristics is needed in several groundwater basins, including the three 208 case study areas -- San Lorenzo, Carmel Valley, Pajaro Valley -- and three other basins -- North Santa Cruz Coast, Aptos-Soquel, and Salinas Valley. Research requirements for each of these basins are described in Chapter IX. It is anticipated that the results of these data collection and analysis efforts will allow development of initial recharge protection plans for the North Santa Cruz Coast, Aptos-Soquel, and Salinas Valley basins and refinement of this 208 Plan's efforts on the San Lorenzo, Carmel, and Pajaro Valley basins. Development of the necessary data and recharge protection plans is the responsibility of the local jurisdictions identified in Table X-4 below. It is anticipated that much of the additional data collection and planning can be accomplished within one to five years, following adoption of this 208 Plan, with implementation beginning immediately thereafter.

TABLE X-4

RESPONSIBILITY FOR PREPARING OR
REFINING RECHARGE PROTECTION PLANS

Groundwater Basin	Responsible Agency	Participating Jurisdictions*
San Lorenzo Valley	Santa Cruz County	Scotts Valley, San Lorenzo Valley County Water District, Lompico C.W.D., Santa Cruz
Pajaro Valley	Santa Cruz County and Monterey County	Watsonville
Carmel Valley	Monterey County	Carmel, Monterey, Pacific Grove, Seaside, Carmel Sanitary District
Santa Cruz North Coast	Santa Cruz County	
Apto-Soquel	Santa Cruz County	Soquel Creek C.W.D.
Salinas	Monterey County	Salinas, Marina, Soledad, Gonzales, Greenfield, King City, Marina C.W.D.

* Local governments may wish to involve several federal and state agencies, including U.S. Geological Survey, California Department of Water Resources, California Water Resources Control Board, Central Coast Regional Water Quality Control Board.

i. Evaluating the effectiveness of the 208 Plan is a major AMBAG responsibility. This effort is intended to assure, on a continuing basis, that the 208 Plan meets its objectives. As part of the annual plan review and revision process, one of AMBAG's principal responsibilities will be to coordinate the evaluation of progress achieved in implementing the 208 Plan. An AMBAG task force(s) composed of city and county elected officials and public representatives will meet annually to review progress reports prepared by each jurisdiction in the two counties as to the consistency of their actions with responsibilities outlined in the plan. The Task Force(s) will submit its evaluation and recommendations to each jurisdiction and to the AMBAG Board of Directors for inclusion in the annual report.

AMBAG will carry out the following specific responsibilities:

1. Negotiate and update, as required, joint work plans with the Regional Water Quality Control Board, the State Department of Water Resources, the Board of Control responsible for the evaluation of water sources for seawater intrusion control in the Pajaro Valley and all local agencies carrying out further lake protection, recharge protection, and erosion control studies mandated by the 208 Plan.

   In developing these work plans (and the actual plans) AMBAG and the designated planning agencies should coordinate with other government agencies doing related planning which affects the same geographic area. It is particularly important that water quality planning be coordinated with concurrent planning for land use, housing, transportation, water supply and air quality. Formal inter-agency agreements should be utilized where appropriate.

2. Update population and land use projections and coordinate use of these projections in regional water quality, water supply, air quality, solid waste and transportation planning programs. AMBAG should rely on its existing Memoranda of Understanding with other local and state agencies doing similar long range planning.

3. Review and comment on the continued effectiveness of the Section 208 implementation strategies, including a consideration of the impact of changes in the ordinances, regulations and management practices of local agencies.

   To do this, AMBAG should establish a region-wide task force or forces (similar to the Environmental Policy Advisory Committee), composed of elected officials and members of the general public, to review and comment on the continued effectiveness of the Plan. This task force(s) will review, on a quarterly basis, implementation strategies as they are being carried out by responsible agencies. The task force(s) will also consider the annual revision of the 208 Plan as prepared by AMBAG. Findings and recommendations made by the task force(s) regarding the Plan's implementation will be forwarded to local governing agencies and to the AMBAG Board of Directors for their consideration.

It will be AMBAG's responsibility to provide technical and administrative staff support for the task force(s). The task force(s) also should obtain appropriate technical support from technical committees and local, state, and federal agencies, having expertise in subjects that are pertinent to the water quality plan. The task force(s) should, within three months of Plan adoption, establish specific guidelines for designated management agencies to follow in reporting their Plan implementation actions.

4. Prepare the annual revision of the 208 Plan.

5. Continue public participation in the 208 planning process through the following methods:

   a. Citizens Committees previously established to review and comment on the 208 Plan should be maintained to provide the same function for any future 208 Plan additions and revisions.

   b. Public information strategies should be continued including informational flyers, slide shows, news releases, and the "Citizen's Guide to Water Quality" binder kept in local libraries.

6. Serve as an initiator or coordinator of grant applications related to water quality planning and non-point source pollution management.

7. Identify water quality related measures which could mitigate any adverse air quality impacts associated with projected urban growth in the AMBAG area. AMBAG is in the process of developing a "nonattainment" air quality plan, which will contain measures for meeting state and federal ambient air quality standards by 1982, and maintaining them thereafter. In conjunction with the 208 continuing planning process, the nonattainment plan will provide for air quality analysis of new or revised sewage system service areas planned for by 201 agencies. This evaluation will examine the potential growth-inducing and consequent air quality impacts of 201 plans, based on population assumptions used and air quality control strategies proposed in the nonattainment plan. 201 plans which are inconsistent with the nonattainment plan, becuase of higher projected population levels or incompatibility with nonattainment control strategies, will not be approved unless appropriate mitigations are included.

SECTION C: FINANCING THE CONTINUING 208 PROGRAM

At this time, the amount and timing of additional federal and state funding (especially Section 208 planning funds) is not known. Where this plan identifies federal or state funds as appropriate financing sources, implementation of those activities should proceed as expeditiously as possible subject to the availability of funds.

Financing the Implementation Program

1. Regulatory Policies and Ordinances Related to Water Quality Control

Adapting the regulatory policies or model ordinances to local circumstances was assigned as an appropriate responsibility for the cities and counties in the region. In view of the fact that significant progress has already been made in developing the model ordinances, it is assumed that adaptation to local circumstances can be accomplished as part of the continuing activities of city and county planning and public works departments at low cost. The cost of enforcing ordinances could be recovered using a schedule of development or permit fees, established at the option of the local government.

An important new revenue source is available to support the additional private cost of certain management practices that may be required in order to comply with the erosion control ordinance. The 1977 amendments to Public Law 92-500 specify that the cost of agricultural best management practices are 50% grant fundable. Traditionally, on-site erosion control programs of the U.S. Soil Conservation Service were eligible for a limited number of 50% grants or loans but the recent amendments extend eligibility to irrigation improvement and other management practices (see ChapterV for more information).

Changes in ordinances related to septic tanks may cause cost increases to individual owners but these owners will be directly benefiting from improved septic tank maintenance or avoidance of health hazards. Costs of enforcement by the counties will be low.

2. Construction and Operation of Public Facilities

The majority of the "facilities oriented" implementation measures that were described previously are eligible grant programs of the U.S. Environmental Protection Agency, including the Wastewater Facilities Grant Program and the Clean Lakes Program.

Grant application and priority setting procedures for wastewater treatment facilities are now well established in California. Facilities are eligible for a state subsidy up to 12.5% in addition to the 75% federal funding. Extensive experience with the Clean Lakes Program is not yet available. A regional capital investment program for water quality should schedule implementation in direct response to availability of federal and state grant funds.

Other "facilities-oriented" water quality programs such as revisions to landfill operating practices or municipal treatment facility operations should be funded in the same manner as existing facilities are now being funded. As noted in Chapter IV, septic tank maintenance will be financed on the basis of private expense and charges to the homeowner.

3. Liquid Waste Discharge Standards

Under the 208 Plan, the Regional Water Quality Control Board is responsible for enforcement of water quality standards including those involving non-point pollution sources. To a great extent, the use of enforcement procedures depends on the relative potential for harm from different sources of pollution, considering both cost of enforcement and the damage that would result from a lack of enforcement. If current budgets are determined by the Regional Board to be inadequate, a budget augmentation can be sought as part of the annual budget process.

4. Education Programs

Inquiries made during the present project indicate that the current budget of the Farm Advisors in both counties are adequate to support an expanded educational program related to fertilizer and irrigation practices. If a local contribution totaling approximately $5,000 can be appropriated by the Boards of Supervisors for both counties it can be anticipated that the University of California Cooperative Extension will make significant technical resources available, in excess of the resources that are already available. One possible increased involvement of the University would be to support a demonstration project exploring whether more detailed use of specialists (e.g. soil scientists, irrigation specialists, plant pathologists, etc.) would allow the farmer to produce equivalent or greater yield with a lesser application either of fertilizer or irrigation water. If one or more demonstrations were successful with one or more crops, farmers would not depend permanently on the University but would take advantage of private laboratories and technical advisory services that are generally available in California (see Chapter VII for details).

Financing for a training program in septic tank maintenance may be available from one of two sources. If the State Water Resources Control Board initiates a training program, it can be anticipated that state financing would be available. (Salary and related costs of the participants would be borne by their employing organization.) In the absence of state funding the community colleges have indicated a willingness to undertake appropriate training programs. As noted previously, the incremental costs of a short course are often very nearly equal to the state subsidy.

5. Monitoring and Evaluation

All of the recommended continuing planning or monitoring functions described under B-5 above are eligible for funding under the continuing Section 208 Program. In the cases of the lake maintenance and recharge protection plans, the groundwater monitoring plan and the water supply study for the Pajaro Valley, the local share could be the subject of cost sharing arrangements between the responsible agency and the other participating jurisdictions. It is difficult at this time to estimate the total cost of preparing these plans because many of the technical inputs can be provided by public works officials, planning officials, etc., as part of their continuing responsibilities. However, Table X-5 below presents estimated costs for each of the continuing planning functions. In the case of the groundwater monitoring programs, funding can be sought from EPA, but the preferred source of financial assistance is the California Department of Water Resources. In the case of the Agricultural Research and Demonstration Project, the preferred source of funding is the University of California Cooperative Extension.

The principal source of financing for activities related to maintaining the Plan and evaluating its effectiveness should be continuing grants under the U.S. Environmental Protection Agency's Section 208 Program. The level of funding for this Program has not yet been established but a reasonable forecast indicates that funds will be available to permit AMBAG to carry out the responsibilities designated in the previous section. For planning purposes it is assumed that ongoing responsibilities within AMBAG for 208 Plan maintenance and evaluation will require 2.5 person years per year, full time equivalent and an approximate total annual cost of $100,000 per year. Staff might include individuals assigned full time to the 208 program but a preferable arrangement is to assign Section 208 responsibilities more broadly within AMBAG. Comprehensive planning considerations can be brought to bear on water quality problems by virtue of the fact that (for example) an individual with responsibility for maintaining the AMBAG Regional Land Use and Housing Elements would also be involved in the question of alternative water sources for seawater intrusion control in the Pajaro Valley.

The $25,000 local share implied by $100,000 total cost of Plan maintenance and monitoring will be treated as a "general fund" item in AMBAG's annual budget, funded by local membership contributions. It would be possible to formulate an additional schedule of charges to agencies that are not members of AMBAG, but benefit from maintenance of the 208 Plan (e.g. the waste treatment agencies) A set of "user charges" is not viable at the present time because of the fact that only a modest level of funding is required.

AMBAG will attempt to assure full participation of the region in any future demonstration projects, grant programs or other sources of funding that could be devoted to water quality objectives.

TABLE X-5: ONGOING MONITORING AND EVALUATION FUNCTIONS, ESTIMATED COSTS AND FINANCING SOURCES

Planning Function (in order of relative importance)	Cost (1978 dollars)	Financing Sources	Responsible Agency *
1. Evaluating 208 Plan Effectiveness (includes related tasks: grant seeking, work plan development, technical assistance to local agencies)	$100,000[1]	$75,000 EPA; 25,000 AMBAG	AMBAG
2. Erosion Control Plans[4]			
a. Urban area planning	250,000[5]	187,500 EPA, 62,500 cities and counties	Cities and Counties
b. Public road improvement planning	60,000[5]	45,000 EPA; 15,000 cities, counties and state	Cities, counties, state (CALTRANS)
c. Rural (farmland) area planning	1,750,000[6]	1,319,250 EPA; 430,750 Resource Conservation Districts	5 Resource Conservation Districts in AMBAG area
3. Study of Pajaro Valley water supply alternatives[2]	55,000	25,000 EPA; 30,000 Local	Two County Task Force
4. Groundwater monitoring plan	20,000[3]	15,000 EPA or California Department of Water Resources 5,000 Counties	Counties or California Department of Water Resc
5. Agricultural Demonstration Research Project	Depends on scope of program	University of California Agricultural Extension; Counties at least 5,000 each	Two County Agricultural Study Advisory Group wi determine lead agency
6. Recharge Protection Plans[7]			
a. Pajaro Valley	10,000	7,500 EPA; 2,500 local	Monterey and Santa Cruz Counties (lead)
b. San Lorenzo Valley	75,000	56,250 EPA; 18,750 local	Santa Cruz County (lead
c. Carmel Valley	60,000	45,000 EPA; 15,000 local	Monterey County (lead)
d. Salinas Valley (including Elkhorn Drainage Area)	60,000	45,000 EPA; 15,000 local	Monterey County (lead)
e. Aptos - Soquel (including Elkhorn Drainage Area)	70,000	52,500 EPA; 17,500 local	Santa Cruz County (lead
f. North Coast (Santa Cruz Co.)	70,000	52,500 EPA; 17,500 local	Santa Cruz County
7. Lake Maintenance Plans[8]			
a. Schwans Lagoon b. Corcoran Lagoon c. Watsonville Slough d. Pinto Lake	50,000	37,500 EPA; 12,500 local	Santa Cruz County (lead
e. Soquel Creek Lagoon	20,000	15,000 EPA; 5,000 Capitola	Capitola (lead)
f. Lake El Estero	15,000	11,250 EPA; 3,750 Monterey	Monterey
g. Carmel River Lagoon	15,000	11,250 EPA; 3,750 Monterey County	Monterey County (lead)

* Local agencies are generally responsible for carrying out these planning projects, utilizing U.S. Environmental Protection Agency Section 208 (P.L.92-500) Continuing Planning Funds whenever possible. AMBAG is responsible as the lead agency in securing these federal funds and for passing the money on to the designated local management agencies.

[1] FY78-79 costs; although future costs are not identified, this is intended to be a continuing function.

[2] To be completed by July 1980.

[3] $20,000 is the estimated annual cost. Several years of monitoring will probably be necessary.

[4] The three erosion control planning functions (5a,b,c) are not prioritized here. Instead, erosion control planning projects should be prioritized by problem severity. This is done by geographic sub-areas in Chapter V, Tables V-5 and V-6.

[5] This is the total cost of plans to be completed over a two year period, by July 1980.

[6] This is the total cost of plans to be completed over a thirty year period.

[7] To be initiated by July 1979. Costs shown represent total costs. The groundwater basins (6a-f) are listed in priority order.

[8] To be initiated by July 1979. Costs shown represent total costs. The lakes are not listed in order of study priority. It is intended that available lake management planning funds be provided in order of application and commitment of local matching money.

CHAPTER XI

SOCIAL ECONOMIC, ENVIRONMENTAL ASSESSMENT

INTRODUCTION

This chapter is intended to fulfill the substantive and procedural requirements of CEQA, NEPA and the FWPCA Amendments of 1977 for environmental documentation. The assessment of impacts was actually an integral part of the "208" water quality planning, in conjunction with "701" regional land use and housing planning processes. As outlined in AMBAG's Work Plan section 9300 (May 1977) criteria for evaluation were established (see Appendix E) and utilized in screening potential plan recommendations.

In accordance with the strategy of incorporating the assessment into the plan, and in line with CEQA guidelines for general plans, each individual chapter contains an assessment of the significant effects of the recommendations proposed in that chapter. Elements discussed in eachchapter include, where applicable, the mandated evaluations of:

a. The significant environmental effects of the proposed project

b. Any significant environmental effects which cannot be avoided if the proposal is implemented

c. Mitigation measures proposed to minimize the significant effects

d. Alternatives to the proposed action

e. The relationship between local short term uses of the environment and the maintenance and enhancement of long term productivity.

f. Significant irreversible environmental changes which would result from implementation of the proposed action.

g. Growth inducing impact of the proposed action

To avoid redundancy these proposal-specific assessments are not repeated here. This chapter presents the background of the environmental assessment by describing the regional environmental setting including a discussion of natural conditions and resources, service systems and air quality. Population and land use data and forecasts developed for the study are included in Chapter III. This chapter also completes the assessment by evaluating the potential secondary impacts of plan implementation.

ENVIRONMENTAL SETTING

Santa Cruz and Monterey counties constitute an enormous land area of extremely varied vegetation, geomorphology and climate, measuring over 150 miles from north to south and as narrow as ten miles from the Santa Cruz boundary to Monterey Bay in the Soquel area and as wide as 45 miles at the southerly limits of Monterey County. This area includes major portions of two important mountain ranges--the Santa Lucia Range and the Gabilan Range in Monterey County and the southern portion of the Santa Cruz Mountains in Santa Cruz County. The coastal terraces in the Santa Cruz area and the expansive flat plains surrounding Watsonville, Salinas, and smaller cities to the south are sharply defined by these ranges.

All of the study areas lie west of the San Andreas Fault. With the exception of the large alluvial valleys and the extensive areas of sand dune formations of various age, the geologic formations in hill and mountain areas are a complex jumble of sedimentary, metamorphosed, extruded and volcanic bedrock reflecting, in general, active crustal tectonics common to such areas in California. Alluvium fills numerous narrow valleys in the Santa Cruz and Santa Lucia Mountains providing well defined riparian corridors channeling surface and groundwater to the ocean. The broad expanses of agricultural soils on alluvial formations occur around Watsonville and in a unique 75+ mile valley formation along the Salinas River. To the north of Watsonville, the bedrock of the Santa Cruz Mountains is a mixture of Miocene and Pliocene formations with smaller amounts of Mezozoic granitic rocks whereas the Gabilan and Santa Lucia ranges are characterized by massive areas of the latter along with smaller amounts of PreCretaceous metamorphic granitic rocks, some of which forms the Monterey Peninsula.

The highly varied forest, foothill and farming landscape which one experiences driving through the region results from the formation of soils on these various geologic types under a widely differing set of climatic conditions. For example, there is from north to south within a ten mile band of the Bay crescent, a difference of almost fifty inches per year total precipitation. In the uplands of Santa Cruz County such as Castle Rock Ridge and Ben Lomond Mountain, precipitation exceeds 60 inches per year. As fog drip is frequently not calculated in such area, the total could be from 10 to 15 inches higher. Rainfall drops off to 30 to 25 inches along the coastal terraces in Santa Cruz County and then to 20 inches in the Watsonville area. Twenty-five inches falls in the Corralitos area north of Watsonville. South of the Watsonville area there is a sudden decrease in total annual precipitation with the Carmel Valley area receiving only 13 inches, Seaside 11 inches and the inland valley cities of Salinas and Gonzales 14 and 12 inches respectively. The upland ridges behind Monterey and Carmel Valley only receive 16 to 18 inches per year on the average.

As a result of these conditions, the uplands of Santa Cruz County and along the crest of the Santa Cruz Mountains are dominated by conifers almost as far south as the Pajaro River. These present a dramatic contrast to the vegetation of the Gabilan and Santa Lucia

mountains of the Coastal Range. Here the lower rainfall is reflected in extensive areas of chaparral, oak-grassland or savanna areas on the gentler slopes, and hardwood forests largely in the uplands. These communities are composed, to a large extent, of plants capable of surviving long periods of drought. In these areas, the narrow bands of riparian communities stand out in the landscape and are important summer carryover "wet zone" sanctuaries for the wildlife systems in the surrounding hills. Reflecting the basic climatic differences throughout the region, these bands are of greatest importance in areas of low rainfall. Thus, in general, the further south they occur, the greater are the associated resource values. In the Santa Lucia Mountains, the Monterey pine forests in the coastal-influenced westerly portions of the Monterey Peninsula provide a visual contrast. This dark green mantle on the steeply sloping coastal hills is also drought-tolerant.

At the edge of the Bay crescent, an extensive complex of dunes (ranging in geologicl age from Recent to Pleistocene) forms rolling foothills in the Fort Ord and Prunedale/Castroville areas. The Pajaro and Salinas rivers drain into the Bay at low-lying marshlands and flood plains between the older of the dune complexes. Biologists consider such coastal wetlands of great ecological importance. Elkhorn Slough has long been cited as the kind of coastal wetlands considered by biologists to be of great ecological importance.

The Santa Cruz Mountains, however, present a physiographic anomaly. The climatic, vegetational, and geologicl conditions (relevant to such critical issues as ground and surface waters quality and supply) are almost completely unique in the region and bear far more resemblance to San Mateo County than to Monterey County. The drier climate, more limited aquifer types and the zerophytic plant communities are several among many distinctly different natural conditions which occur in the Pajaro River plain and all areas to the south.

Human activities have had pronounced effects on the conditions and resources of the region. The consequences of these activities on the quality of the areas waters are the subject of this plan.

POPULATION AND LAND USE

(Please see Chapter III, Section D)

PUBLIC FACILITIES

Overview of System Capacities

Lack of capacity to provide water and sewer services to support growth and development has been a pervasive problem for the urban area over the past several years. Sewer and water moratoria have occurred (and still remain) throughout several parts of the region due to a host of system problems, including inadequate water supplies, source quality problems, inadequate water distribution systems, lack of sewage treatment capacity, lack of sewer interceptor and collection line capacity, violation of waste discharge regulations. Many

of these problems were caused by very rapid, unforeseen growth, others by changes in water quality requirements, public resistance to bonding proposals, and changes in attitudes toward growth. The presence of these problems in so many areas, the considerable uncertainty regarding long-term water supplies, and the easy access provided to large parts of the region's undeveloped area by an extensive system of interurban roads, make short-term measures of water and sewer system capacities generally irrelevant to prospects for future growth and development, except at the most generalized level.

Sewerage

Cities, special districts of various types, and private on-site disposal systems provide the areas sewerage services. About 75% of the region's population is served by some form of public sewerage system (not including private on-site disposal systems), with about 80% in Monterey County served and about 70% in Santa Cruz County served. In both counties about 60% of the served populations are provided services by municipalities, with the rest served by sanitary districts, county sanitation districts, county water districts and other special districts. Work is continuing on upgrading, expanding and in some cases consolidating sewerage treatment systems throughout the region along the lines laid out by the AMBAG Wastewater Management Plan and the Central Coast Basin Plan. Private on-site disposal systems are of two types: individual septic tanks serving a particular lot and community systems serving entire subdivisions or developments. For large subdivisions use of community on-site systems has begun to substitute for connection to traditional sewerage systems, making such development independent of established infrastructure systems, at least where overall development densities are kept relatively low.

Water

There are three basic types of public water suppliers in the region: cities, county water districts, and private water utilities operating under the regulatory authority of the Public Utilities Commission. It is estimated that about 85% of the region's population is served by one of these suppliers, the remainder of the population being on private wells or small community systems. The ability of each of these suppliers to render and extend services is dependent on its own investment decisions and service policies. The largest private water utility in the area, Cal-Am, is presently attempting to expand capacity in order to eliminate a water connection ban imposed by the Public Utilities Commission. Some of the governmental suppliers have similar capacity problems but it may be assumed that decisions regarding service policy are subject to somewhat more public control.

In certain parts of the AMBAG Region, especially Monterey County, the availability of potable water is becoming a critical determinant of the feasibility of development. Ultimately the availability of adequate water to support both urban growth and agricultural use in the Pajaro and Salinas valleys and on the Monterey Peninsula is a major source of uncertainty. Seawater intrusion in the Pajaro and Lower Salinas valleys poses a serious jeopardy to water supplies.

Although water supplies readily available to Cal-Am can support a substantial amount of growth to 1995 on the Monterey Peninsula, the actual level of potential development is dependent on withdrawals from the Carmel Valley aquifer by private landowners and the possibility of new impoundments in the watershed to be available which can support all of the growth projected for the area. Growth in the Highway 68 area is assumed to have an independent supply, though this assumption is still open to doubt.

Transportation

The private auto is by far the predominant form of transportation in the region--an average of 8,500,000 miles are traveled daily in cars, along some 400 miles of State Highways and almost 3,000 miles of city and county roads. There is almost one car for every two of the region's residents, in addition to 100,000 trucks, trailers and motorcycles. Much of the traffic in the area does come from visitors, especially in the summer season when main tourist routes like Highway 17 from San Jose to Santa Cruz and Highway 1 along the Big Sur Coast, are clogged with recreational travelers. Commerce and long distance travel between Southern California and the San Francisco Bay Area still is a substantial part of flow through the area. Within recent years, transit has expanded dramatically in the region's urban areas. Four major systems now exist, with a ridership of almost 3,500,000 people each year. In addition, several agencies provide special services for elderly, handicapped, and low income people.

HOUSING

Housing is the main use of developed land in the region, yet the supply of adequate and affordable homes for all segments of the regional community is one of the most severe of the area's problems. Of the 158,000 housing units that existed in 1976, over 10,000 were substandard, in need of major structural repair or replacement. In addition, a rapid rise in the cost of all types of housing is creating an increasing hardship for many to afford their housing costs. It is estimated that at least 29,000 lower income households are paying in excess of one quarter of their income for housing--at the price of other basic necessities.

Recent trends in housing development have been split between relatively high density apartments and condominiums and in-filling in urban areas and very low density development of rural single family homes, with little development of the traditional moderate density detached housing.

WATER QUALITY

(Please see Chapter III)

AIR QUALITY

The condition of the region's air is generally good, but during the summer and fall, national ambient air quality standards for oxidants are exceeded at some monitoring stations. Table XI -1 indicates the five year record of violation of these standards. The region has been designated as a non-attainment area and work has begun, in conjunction with this environmental assessment, on laying the basis for an air quality management plan.

The sources emitting organic gases and oxides of nitrogen have been inventoried for the base year of 1975, and are presented in Table XI-2.

ASSESSMENT OF REGIONAL IMPACTS OF GROWTH

Natural Resources and Hazards

The recommendations of this Plan are primarily intended to remedy existing nonpoint water pollution problems and develop methods and means to avoid the creation of new problems in the continued use and development of the area. Only the recommendations on new sewage facilities could be construed as facilitating or reducing growth. The evidence of recent growth trends indicates that the amount of growth in the region overall has been unaffected by sewage constraints, but that capacity limits in sewerage and water have combined with development controls to influence the location of development. The growth forecasts developed for this assessment (see Chapter III) assume that the major expansions of treatment capacity currently planned in 201 studies--which account for over 80% of the region's population--will be accomplished, that water supply will be available and that development will be controlled within the framework of existing land use plans.

This section examines the potential effects of this growth on the region's environment. It evaluates the changes forecast in population and land use against the region's critical resources and natural hazards graphically represented in Figures XI-1 and XI-2 . An environmental impact matrix (shown in Figure XI-3) was developed to score the relative potential for adverse impact related to resources and hazards within the subareas of the region given the level of growth forecast for those areas. The matrix also indexes the physiographic type of each subarea.

The areas of highest probability for impact were those where land supply was limited (for example, in narrow valleys) and where urbanization acreage projections equaled or exceeded the available land supply. The matrix chart illustrates the probability of adverse impacts or constraints of regional significance. Thus, in most of the presently urbanized areas, the scores are extremely low. It should be noted that infill urbanization within developed areas could have impacts of local or limited significance. Potential impact for each area was initially scored from 0 (no or insignificant effect) to 3 (very high impact). The final score, however,

TABLE XI-1

OXIDANT HOURLY AVERAGES EXCEEDING STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS

1976

HOURLY AVERAGE OF 0.10 PPM OR GREATER (STATE STANDARDS)

	SALINAS		GONZALES		MONTEREY		APTOS		HOLLISTER		SCOTTS VALLEY	
	Days	Hours	Days	Hours	Days	Hours	Days	Hours	Days	Hours	Days	Hours
1972	0	0	4	9	0	0	0	0	-	-	-	-
1973	5	12	5	12	6	10	1	1	5	8	-	-
1974	1	2	1	1	1	2	1	2	1	4	-	-
1975	0	0	2	2	0	0	1	4	8	16	-	-
1976	1	7	0	0	0	0	4	7	15	42	8	23
5 Year Average	1.4	4.2	2.4	4.8	1.4	2.4	1.4	2.8	-	-	-	-

HOURLY AVERAGE GREATER THAN .08 PPM (FEDERAL STANDARDS)

	SALINAS		GONZALES		MONTEREY		APTOS		HOLLISTER		SCOTTS VALLEY	
	Days	Hours	Days	Hours	Days	Hours	Days	Hours	Days	Hours	Days	Hours
1972	0	0	5	13	1	2	0	0	-	-	-	-
1973	6	20	5	14	7	19	2	2	16	28	-	-
1974	2	9	1	4	1	2	1	2	4	10	-	-
1975	0	0	3	5	0	0	1	4	13	33	-	-
1976	3	14	0	0	0	0	4	7	32	94	9	34
5 Year Average	2.2	8.6	2.8	7.2	1.8	4.6	1.6	3.0	-	-	-	-

TABLE XI-2

AVERAGE EMISSIONS OF POLLUTANTS -1975

MONTEREY AND SANTA CRUZ COUNTIES

TONS PER DAY

SOURCE CATEGORY	REACTIVE ORGANIC GASES		TOTAL ORGANIC GASES		OXIDES OF NITROGEN	
	Monterey	Santa Cruz	Monterey	Santa Cruz	Monterey	Santa C
PETROLEUM						
Production	34.5		64.2			
Refining						
Marketing	3.3	1.4	3.4	1.5		
Subtotal	37.8	1.4	67.6	1.5		
ORGANIC SOLVENTS						
Surface Coating	2.3	1.3	2.6	1.4		
Dry Cleaning			0.9	0.5		
Degreasing	0.3		1.8	1.0		
Other	5.8	0.4	7.9	0.5		
Subtotal	8.4	1.7	13.2	3.4		
METALLURGICAL						
MINERAL						
FOOD AND AG PROCESSING						
PESTICIDES	3.0	1.2	3.0	1.2		
COMBUSTION OF FUELS						
Power Plants	0.3		0.6		27.6	
Other Industrial	0.1		0.3	0.1	14.0	4.7
Domestic and Commercial	0.1	0.1	0.3	0.2	1.8	0.8
Subtotal	0.5	0.1	1.2	0.3	43.4	5.5
WASTE BURNING						
Agricultural Debris	0.6	0.2	1.0	0.4		
Forest Management						
Range Improvement	0.4		0.7			
Disposal Sites						
Incinerators						
Other						
Subtotal	1.0	0.2	1.7	0.4		

Average Emissions of Pollutants - 1975 continued

Monterey and Santa Cruz Counties

Tons Per Day

SOURCE CATEGORY	REACTIVE ORGANIC GASES		TOTAL ORGANIC GASES		OXIDES OF NITROGEN	
	Monterey	Santa Cruz	Monterey	Santa Cruz	Monterey	Santa Cruz
MISC. AREA SOURCES						
Wild Fires	0.2	0.1	0.3	0.1		
Structural Fires	0.4	0.2	0.7	0.4		
Farming Operations						
Construction and Demolition						
Unpaved Roads						
Utility Equip.; Mowers, etc.	0.4	0.2	0.5	0.2		
Subtotal	1.0	0.5	1.5	0.7		
TOTAL, STATIONARY SOURCES						
MOBILE SOURCES						
Motor Vehicles - On Road						
Light Duty Passenger	14.1	9.3	15.3	10.1	11.1	7.3
Light Duty Gas Trucks	3.0	2.1	3.3	2.4	2.2	1.6
Medium Duty Gas Trucks	0.5	0.4	0.5	0.4	0.4	0.3
Heavy Duty Gas Trucks	2.4	1.8	2.6	1.9	1.8	1.3
Heavy Duty Diesil Trucks	0.3	0.2	0.3	0.2	4.1	3.0
Motorcycles	0.4	0.2	0.4	0.3		
Subtotal	20.7	14.8	22.4	15.3	19.6	13.5
JET AIRCRAFT	0.2		0.2		0.2	
PISTON AIRCRAFT	0.4	0.2	0.5	0.2	0.9	
RAILROAD	0.8		0.8		2.9	
SHIPS						
OTHER OFF ROAD VEHICLES	2.7	1.1	3.0	1.2	4.9	1.7
TOTAL, MOBILE SOURCES	24.9	15.3	27.0	16.7	28.5	15.2
TOTAL ALL SOURCES	76.6	20.4	115.2	24.2	71.9	20.7

accounts for the degree these impacts can be mitigated. Where impacts are readily mitigated, the score is not increased. Where mitigation is possible only with ecological or economic penalty the score is multiplied by 2. Where mitigation is not possible, the score is weighted by a factor of 4.

Non-mitigable conflicts involve prime agricultural soils and the biologically rich marsh and wetlands. In these areas, urban uses would physically displace these resources. For example, continued use of prime soils for agricultural activities or the basic ecological functions in the wetlands would be essentially terminated by the change in use.

Development of riparian channels, timber and mineral resource areas, involves partially mitigable impacts. Mitigation (that is a compromise between urban and resource function or uses) is conceivable, however, difficult in these cases. Commercial timber operations, as an example, have, under controlled management, taken place in relative proximity to suburban uses in the Santa Cruz Mountains in San Mateo County. The need for strong management or extraction controls, however, reduces the margin of profit to private resource developers and may result in higher costs for the consumer.

In the case of some resource conditions (groundwater, flooding, erosion, sedimentation, slope stability, and fire hazard) development control and mitigating practices are possible. All are mitigations which in effect allow a compromise between the protection of natural resource functions and urban development, if handled properly. In the case of groundwater erosion and sedimentation such measures are recommended by this plan.

The evaluation[1] indicates the areas most vulnerable to impacts are the Coastal Wetlands of which Elkhorn Slough and the mouth of the Salinas River are prime examples. Next in importance are the Rural Agricultural Plain areas surrounding the Agricultural Plain Cities because of the presence of prime soils. The scores for rural agricultural plains and wetlands are high because of the non-mitigatable impact of urbanization on resources. Confined Valley Rural areas (even though some prime soils are involved, for example, in Carmel Valley) are rated less vulnerable than agricultural areas because the potential impacts on ground and surface waters are mitigatable as outlined in this Plan.

---

[1]Remember that in some areas development pressure (that is, primarily residential use of a density of one unit per two acres or more) is projected to be limited in geographic extent. The summary score is consequently low. This should not be read to mean that these areas have high capability to accept urbanization with limited environmental impact penalties. The low scores for the Castle Rock Ridge and Highway 17 Crest Skyland Areas for example reflect a limited projection of urbanization (of the density described) within the next twenty years.

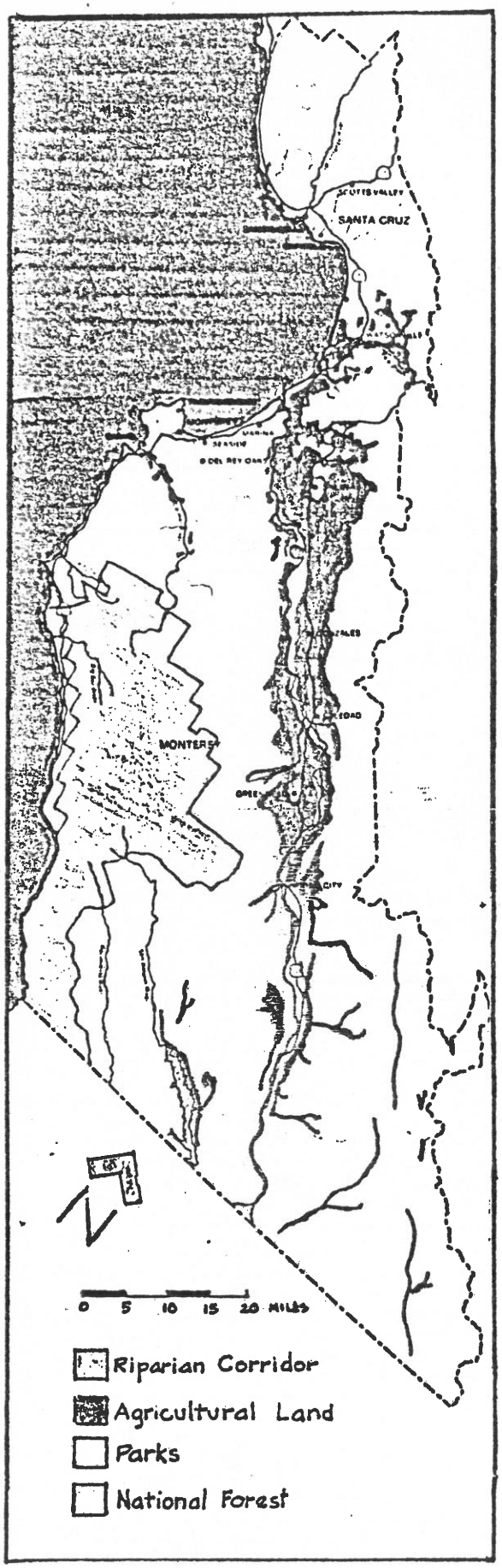


FIGURE XI-1
Regional Resources

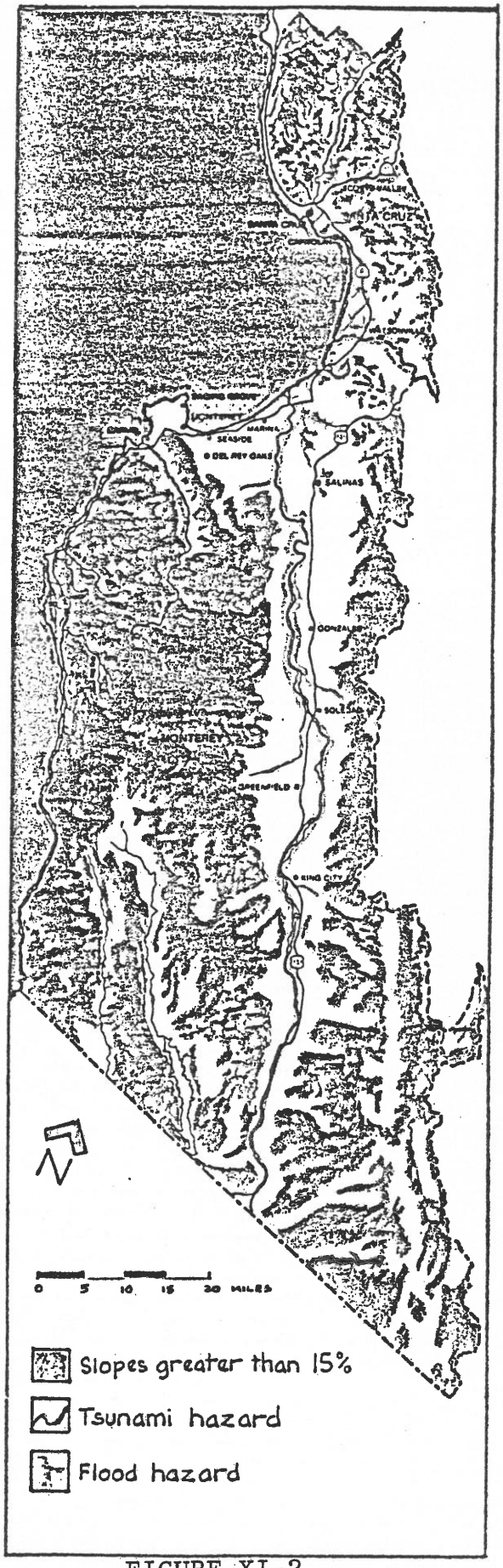


FIGURE XI-2
Natural Hazard Areas

Groundwater Quality and Quantity
Surface Water Quality
Wildlife Habitat
Riparian Habitat
Scenic Agricultural Lands
Historic Resources
Natural Resources
Fire Hazard
Flood Zone
Earthquake Faults
Erosion / Sedimentation
Slope / Visual Stability
Gain Size
Kinds (Tri)
Kinds (Tri) (peripheral)
Greenfield (peripheral)
Soledad
Soledad (peripheral)
Gonzales
Gonzales (peripheral)
Iron Creek
Iron Creek (Urban)
Iron Creek (Creek Vicinity Hills)
Salinas / Santa Rita
Salinas / Santa Rita (peripheral)
Carmel / Creek (Urban)
Carmel Valley (urban)
Carmel Valley (unincorporated)
Carmel Valley (Lodge) Village
Monterey
Pacific Grove
Pacific Grove (peripheral)
Del Rey Oaks
Del Rey Oaks (peripheral)
Monterey
Monterey (Peripheral)
Spreckels
Spreckels River Mouth Area
Watsonville / Freedom
Watsonville / Freedom (peripheral)
Elkhorn - Sunset Beach
La Selva Beach
Aptos - Rio Del Mar
Capitola
Santa Cruz
UCSC Area
Pleasant Valley
Corralitos / Creek
Eureka Valley (unincorporated)
Eureka Valley (urban)
Bonnie Creek
Bonnie Creek (Oil ridges)
Main - Davenport Landing
East Creek
Scott Creek (Oil ridges)
Boonie Boonie
Ben Lomond / Felton - Ben Lomond / Felton - Rock - Bear
San Lorenzo Valley (urban)
San Lorenzo Valley (Oil ridges)
Davenport - Bonny Doon
Davenport - Bonny Doon - Rock Slope - Steep Hillside - Tree Removal - Grading

FIGURE XI-3

Inland and Coastal Foothills and Inland and Coastal Mountains would respond relatively similarly to development since steep slopes and highly erodible soils and failure-prone slopes are problems common throughout the region. In general, the watersheds found in the Inland and Coastal Mountains are of sufficient scale to support substantial riparian areas with either perennial or annual stream flow. From a biological support standpoint these become relatively more important in the southern part of the region where total annual rainfall is lower. An important example of "coastal foothills" is in the complex of poorly consolidated ancient dunes and other sedimentary materials found between Highway 101 and the Elkhorn Slough areas. These are presently experiencing intense development pressure, as in the Oak Hills area.

Because prime soils and wetlands are not involved in the sloping areas (either in areas of Inland or Coastal Foothills or Mountains) these scores are considerably lower than the non-urbanized lowlands and valleys which they surround. While there are basic climatic differences between Santa Cruz and Monterey County, the conflicts with timber resources in the former are "balanced" by increased fire hazards in much of the mountainous terrain in Monterey County.

The cities of Carmel, Monterey, Pacific Grove and Seaside are essentially built out with little vacant infill land. Such coastal areas as Aptos and Rio del Mar and portions of Capitola score in the twenties--these areas are either surrounded by and/or have infill land which is developable by present standards. This includes terrace lands and steeply sloping canyon walls which are formed on erodible sedimentary formations and are in some cases subject to flooding, fire hazard and tsunami.

The areas of lowest impact are the Agricultural Plain Cities, particularly in Monterey County where the existing levels of urbanization are assumed to have precluded protection of most resource values and where infilling is likely to have little effect of regional significance.

Air Quality

1995 air quality conditions were projected by applying the linear rollback technique to the 1975 emission inventory, 1976 air quality data, the forecast of population and ARB growth factors emission sources. The projection of emissions for each source category are shown in table XI-3. The ambient air quality conditions resulting from these emissions are summarized in Table XI-4. While the maximum oxidant concentration is reduced from an hourly average of 16.0 parts per million (ppm) to 0.12 ppm, the Federal and State ambient standards both are still exceeded. Conversely, while oxides of nitrogen increase, they remain below violation levels.

Plans to Mitigate Growth Impacts

In concert with the 208 planning effort and its environmental assessment, AMBAG has developed draft regional plan elements for land use and housing. The regional land use plan specifically seeks to minimize the environmental impacts of regional growth identified in this assessment.

The proposed land use policies would maintain the maximum amount of prime agricultural lands, timber and mineral resources in production, ensure the quantity and quality of water sources and protect natural habitat, open space, recreation and scenic resources. They provide for accommodating projected growth and needed housing in a manner consistent with resource protection, giving priority to absorbing new growth first in existing urban areas, then establishing new growth areas in locations with the least conflicts with resources or hazards.

In view of the projected failure to meet air quality standards, AMBAG and the Monterey Bay Unified Air Pollution Control District have jointly sought to initiate air quality maintenance planning in the region. The first steps of that planning, emission inventory and air quality forecast, were integrated with the 208 environmental assessment. Subsequent work will develop control measures and seek their implementation.

TABLE XI-3

Average Emissions of Pollutants - 1995
Monterey and Santa Cruz Counties
Tons Per Day

	Reactive Organic Gases		Total Organic Gases		Oxides of Nitrogen	
	Mont. -	S.C.	Mont. -	S.C.	Mont.-	S.C
STATIONARY SOURCES						
PETROLEUM	2.1		4.0			
PRODUCTION						
REFINING						
MARKETING	2.6	1.4	2.7	1.4		
SUBTOTAL	4.7	1.4	6.7	1.4		
ORGANIC SOLVENT USERS						
SURFACE COATING	4.5	3.0	4.9	3.3		
DRY CLEANING			1.4	0.9		
DEGREASING	0.6		3.4	2.0		
OTHER	8.8	0.6	12.0	0.9		
SUBTOTAL	13.8	3.6	21.8	7.3		
CHEMICAL						
METALLURGICAL						
MINERAL						
FOOD AND AG PROCESSING						
PESTICIDES	3.3	1.9	3.3	1.9		
WOOD PROCESSING						
COMBUSTION OF FUELS						
POWER PLANTS	0.5		1.2		53.3	
OTHER INDUSTRIAL	0.4	0.1	1.0	0.2	35.0	3.3
DOMESTIC AND COMMERCIAL	0.2	0.1	0.5	0.3	2.3	1.4
ORCHARD HEATERS						
SUBTOTAL		0.2	2.7	0.6	90.6	4.7
WASTE BURNING						
AGRICULTURAL DEBRIS	0.2	0.2	0.4	0.5		
FOREST MANAGEMENT						
RANGE IMPROVEMENT			0.6			
DUMPS						
CONICAL BURNERS						
INCINERATORS						
OTHER	5.0	3.2	9.0	6.1		
SUBTOTAL	5.7	3.4	11.0	6.5		

	Reactive Organic Gases Mont.	S. C.	Total Organic Gases Mont.	S.C.	Oxides of Nitrogen Mont.	S.C.
MISCELLANEOUS AREA SOURCES						
WILD FIRES	0.2	0.1	0.3	0.1		
STRUCTURAL FIRES	0.6	0.4	1.1	0.7		
FARMING OPERATIONS						
CONST. AND DEMOL.						
UNPAVED ROADS						
UTILITY EQUIP: MOWERS,ETC	0.7	0.3	0.8	0.3		
SUBTOTAL	1.4	0.7	2.1	1.1		
TOTAL STATIONARY	29.9		47.6	10.9	91	4.7
MOBILE SOURCES						
MOTOR VEHICLES-ON ROAD	3.0	2.3	3.3	2.5	3.7	2.8
LIGHT-DUTY PASSENGER	1.0	0.7	1.0	0.8	1.3	1.0
LIGHT-DUTY GAS TRUCKS	0.2	0.2	0.2	0.1	0.2	0.1
MEDIUM-DUTY GAS TRUCKS	0.4	0.4	0.5	0.3	5.8	4.4
HEAVY-DUTY GAS TRUCKS	0.2	0.2	0.3	0.2		
MOTORCYCLES	5.2	4.2	5.8	4.3	13.4	10.1
SUBTOTAL	0.3		0.3		0.3	
JET AIRCRAFT	0.3		0.3		0.3	
PISTON AIRCRAFT	0.7	0.3	0.8		1.4	
RAILROADS	1.2		1.2		4.3	
SHIPS						
OTHER OFF-ROAD VEH	4.0	1.7	4.4	1.9	7.2	2.8
TOTAL MOBILE SOURCES	11.3	6.2	12.5	6.6	26.5	12.9
TOTAL ALL SOURCES	41.2	17.5	60.1	25.5	117.5	17.5

PROJECTED EMISSIONS OF AIR POLLUTANTS AND POLLUTANT CONCENTRATIONS FOR MONTEREY AND SANTA CRUZ COUNTIES

Year	Reactive Organic gases Emission TPD	Projected Photochemical Oxidant Concentration ppm	Oxides of nitrogen emissions TPD	Projected Nitrogen Dioxide Concentration
1975	46.1	0.16 ppm*	71.9	0.016 ppm Annual Average
1995	41.2	0.14 ppm	117.5	0.026

*Second highest one hour concentration

Table XI-4

APPENDIX A

DOCUMENTATION OF THE ADOPTION PROCESS

This appendix summarizes the procedures developed for adoption of the 208 Water Quality Plan. The basis for this process is spelled out in AMBAG Policy Paper #4 "Procedure for Review and Adoption of Water Quality, Land Use and Housing Plans", which was developed by the AMBAG staff, reviewed by numerous committees as well as local agencies, and adopted by the AMBAG Board on May 11, 1977. The concepts and procedures specified in Policy Paper #4 have remained an integral part of the 208 planning process throughout. However, many of the specifics, such as, the number and titles of Issue Papers have been modified as the process itself evolved.*

An understanding of how the approval process has worked will help to clarify other key relationships contained within the planning requirements, namely:

1. The relationship of adoption procedures and schedule to the public education and participation element;

2. The relationship of adoption to responsibilities for implementation;

3. Specification as to how the continuing planning process relates to amendment and revision of the 208 plan.

As specified in Policy Paper #4, the AMBAG Board of Directors, the Environmental Policy Advisory Committee (EPAC), various technical and citizens advisory committees, as well as affected Federal, State, and local agencies were to have the opportunity to review and comment on each of 19 Issue Papers‡ which, along with various technological reports provide a basis for the contents of the plan. In addition, the Board and appropriate affected local agencies were to approve and endorse, respectively, the following Policy Papers as elements of the areawide plan:

Policy Paper	#2	Selection of Priority Water Problems
" "	#3	Population Projections
" "	#4	Procedure for Review and Adoption of Water Quality, Land Use and Housing Plans
" "	#12	Early Action Program for Water Quality
" "	#13	Water Quality Case Study Management Plans
" "	#15	Final Water Quality Plan

*A policy paper refers to an issue paper which has completed the review sequence and does not constitute adopted policy per se'.

‡ Subsequently reduced to 15 Issue Papers, 12 of which comprise the 208 Plan

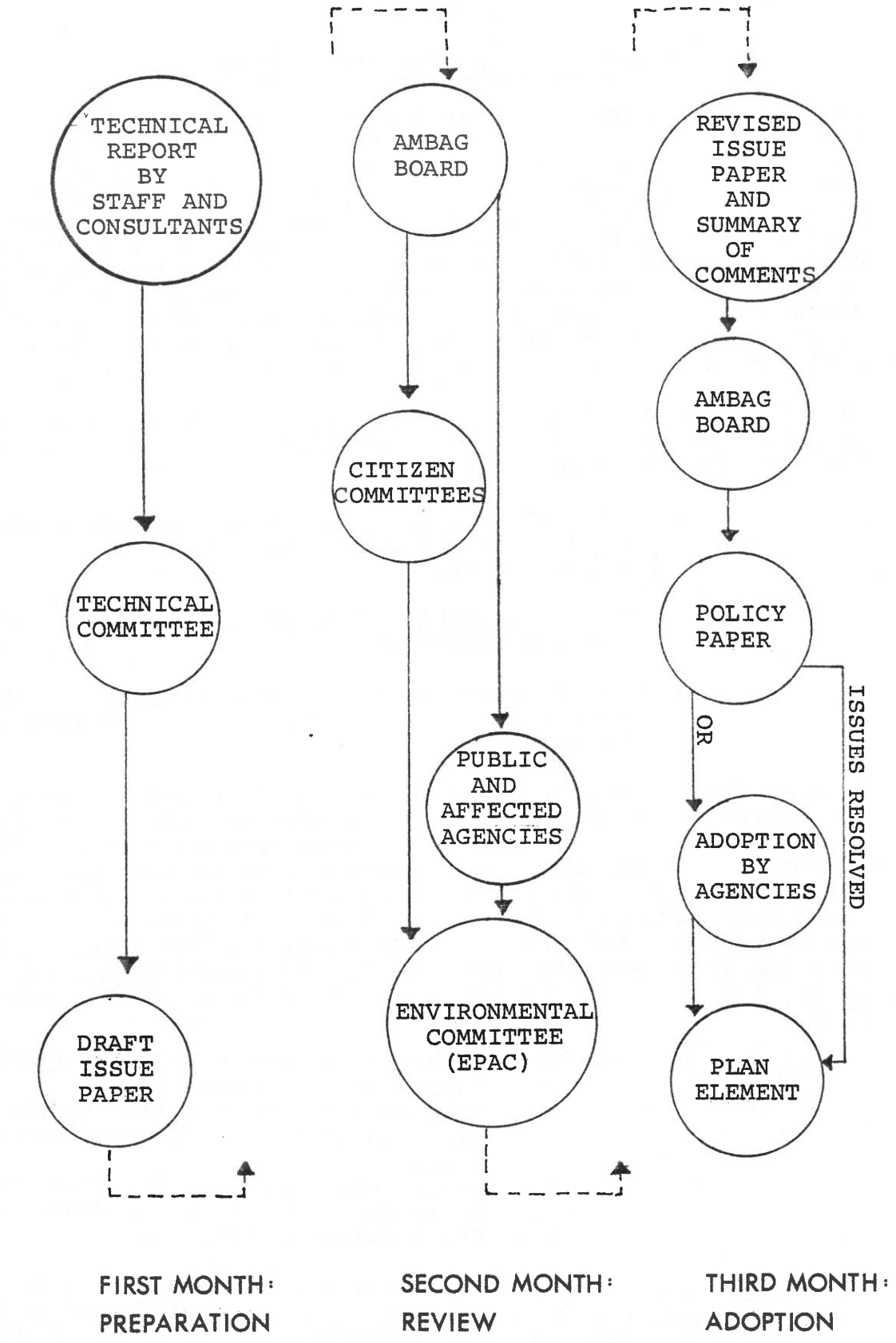


FIGURE A. PLAN REVIEW AND ADOPTION PROCEDURE

This approach was to accomplish the following:

1. The Board of Directors would provide specific guidance to staff and consultants at critical study points for "go-or-no-go" decisions, thus minimizing the potential for surprise recommendations contained in a single plan at the end of the planning period, and "all or nothing" plan adoption.

2. Local governing bodies, technical staffs and affected public or private interests would be brought into the decision-making process early, maximizing their participation and facilitating final adoption of the plan.

3. Establish a basis by which local agencies and appropriate affected groups could satisfactorily resolve differences or disagreements with specific recommendations or measures presented to the Board by staff and/or consultants for interim or final approval.

4. Establish the AMBAG Board of Directors as the final decision-making authority for recommendations contained within the plan.

Each Issue Paper was subjected to the sequence indicated in Figure A as part of a three month adoption cycle. Although the review process was followed as closely as possible, local governmental entities were not able to participate as actively as initially expected due to the unavoidable tight time frames and required technical and policy review requirements.

APPENDIX B

THE PUBLIC PARTICIPATION PROCESS

INTRODUCTION

AMBAG's public information/participation program for the 208 study was formulated early in the planning process to insure that public perceptions and concerns were reflected at every stage of the study.

Every effort was made to inform the public, elected officials and special interest groups of the direction the study was taking. Armed with enough solid information on the study, the well-informed constituency could then effectively participate in plan formulation.

Public information and citizen involvement go hand in hand, and AMBAG developed a strategy for eliciting active public interest and participation in water quality in the Monterey Bay region.

PUBLIC INFORMATION PROGRAM

AMBAG's public information program was aided early in the study by the hiring of a Public Affairs Coordinator. Public information activities were carried out continuously throughout the planning period and included the following:

Media Relations: News releases on the status of the 208 study were issued on a regular basis and were sent to over 60 media in the region. Followups were made on these releases through live radio and television news broadcasts. The T.V. news frequently contained photo coverage of areas identified in the study as water quality problems.

Public service announcements on the need for citizen concern about water pollution in the region were released in conjunction with public meetings on the study.

The media were invited to attend all public meetings, committee meetings and public participation activities. They also received copies of all publications.

Publications

AMBAG's quarterly newsletter, "AMBAG Update", includes a section entitled "Up to Date with 208". Articles in this section dealt with the status of the study, background information, and news on the various public meetings dealing with 208. The newsletter is distributed to more than 900 citizens and organizations throughout the region.

"208 Newsbriefs", containing more technical and detailed information on the study, were distributed to elected officials, technical staff and interested citizens.

A brochure describing AMBAG and its functions included a section on the 208 program.

Numerous Environmental Protection Agency publications on 208 were also distributed by AMBAG as part of its 208 public information program.

The Summary of the 208 Draft Plan, Chapter 1 in this document, will be prepared as a newspaper supplement. It will be published and circulated by the region's four major daily newspapers a week prior to public workshops on the Plan. The summary will also be mailed to all 208 committees, local elected officials, and agency staffs.

Information Depositories

A three-ring binder, "A Citizens Guide to Water Quality", was distributed to all the city halls, county office buildings, and public libraries in the region. These binders contain all AMBAG publications relating to 208, as well as meeting notices and minutes, issue papers, and a return postcard requesting further information. (An update service to the binders will continue until final plan adoption.) These binders will remain permanently on file as reference documents on the 208 plan.

Public Information Booths

Public information booths were set up at the region's two county fairs, an environmental fair in Santa Cruz, a community fair at Monterey Peninsula College, and a local senior citizens conference. These booths provided publications on the 208 program, a slide show on the 208 case studies, and a questionnaire on citizens' perceptions of environmental issues. This proved to be a very effective method of getting 208 information into the hands of the general public.

Four QuizMatic(R) Water Quality Exhibits were purchased and placed in libraries. The literature rack on the QuizMatic held meeting notices for the 208 citizens committees.

Presentations

Once the initial assessment of water quality problems in the region had been completed, 208 staff began meeting with special interest groups, technical staffs, and elected bodies to discuss the progress of the 208 plan. These presentations were made not only to inform but to generate interest and

participation in the study. Issue papers, brochures, newsletters (and technical reports when appropriate) were distributed at these presentations. A slide show covering the case study areas was also shown at many of these meetings.

PUBLIC PARTICIPATION PROGRAM

AMBAG's 208 public participation program was designed to involve as many people as possible in the planning process. Public information was disseminated as a method for stimulating interest in 208 which would in turn lead to active citizen participation. The Draft Plan reflects the success of the public involvement process--recommendations were discussed, amended, and in some cases deleted, by the public through various participation methods.

The range and flexibility of AMBAG's public involvement strategy is illustrated by the many approaches used to elicit public review and comment.

Environmental Policy Advisory Committee

The Environmental Policy Advisory Committee (EPAC) was established by the AMBAG Board of Directors early in the study to provide policy guidance to the Board. This committee, composed both of elected officials and citizens, met monthly to review the progress and direction of the study. The meetings were well publicized and were open to the public.

Recommendations on Issue Papers from the technical and citizens committees were reviewed by EPAC, and forwarded to the Board for adoption. As citizens committees were formed, their chairmen were appointed by the Board as voting members of EPAC, thus insuring citizen committee opinion at the policy guidance level.

Citizens Advisory Committees

Five citizens advisory committees (CAC's) were established throughout the region to review and comment on the 208 plan as it was prepared. The committees met monthly in Monterey, Salinas, King City, Watsonville, and Santa Cruz to review each issue paper and forward recommended changes to the EPAC.

Unlike many CAC's, these committees were not appointed by the Board. Instead, membership was open to anyone interested enough to join. Invitations to join the committees were issued to over 100 organizations throughout the region as well as to the general public through news releases and public service announcements. Nor was membership limited to a certain numer; as each issue paper was ready for review, news releases announced the committees' meeting dates and the subject to be discussed. In this way citizens could participate when subjects of particular interest arose.

The committees' comments were recorded, summarized, and forwarded to EPAC and the Board for their consideration in reviewing the issue papers.

Citizen committee members were kept informed of the study's progress and were asked to report back to organizations they might represent.

Attempts were made to contact special interest groups who might have a particular concern with only one portion of the study, i.e. septic tank companies and agricultural groups. Response from these groups was excellent, due in part to the specialized effort to contact them when appropriate.

It is expected that citizen committee members will actively support implementation of the Plan, since it is not only AMBAG's plan but theirs as well.

Case Study Tours

Further involvement by Board members, other elected officials, committee members, staff and media was gained through two bus tours of the 208 case study areas.

Case study areas in each county were covered by separate all-day tours. Commentary by AMBAG and county staff provided attendees with expert analysis of the problems, their causes and possible solutions. Tour packets included maps, technical documents, and general 208 information. Both tours were well reported by the media.

Public Workshops

Three public workshops were held after the initial assessment was completed. Held in Santa Cruz, Salinas and Monterey, the workshops were widely publicized and provided an opportunity to present the 208 planning process to the public and to elicit public comment on the plan's proposed case studies.

Public workshops will be held on the Draft Plan in conjunction with the citizen committee meetings. The workshops will be announced in a newspaper supplement containing the Draft Plan Summary.

Comments from these public workshops were and will be forwarded to the EPAC and the Board. It is hoped that elected officials will also attend these workshops to discuss the Plan with their constituents. Holding the public workshops in conjunction with the CAC's will allow the CAC chairmen and members to discuss the Plan with a larger public.

Case Study Interviews

Prior to and during the formulation of case study recommendations, interviews were conducted with over 50 community and business leaders, elected officials and selected staff to obtain their views on the financial/institutional and technical recommendations. These interviews were conducted by AMBAG staff and were well received by those interviewed.

Comments from those interviewed were incorporated into the issue papers, and in some instances a second interview was conducted to obtain a second reaction to the plan recommendations.

This interview process was substituted for a public perception survey which was found to be too expensive.

The results of the interviews were very valuable in the financial/institutional recommendations where political considerations become very important.

Public Participation in the Continuing Planning Process

To guarantee public involvement in implementation of the 208 Plan, and any further 208 planning which may be undertaken, AMBAG will maintain the public information/participation activities already established. These can be expanded and/or altered to fit the particular water quality problems being studied.

Public awareness of water quality problems and the planning/implementation necessary to solve these problems is crucial to the success of any 208 study. AMBAG will continue to pursue active public involvement through every possible avenue.

PUBLIC PARTICIPATION SUMMARY

AMBAG's 208 public participation/information methods have been described and the Draft Plan reflects public opinion obtained through these methods. While it is true that no method can guarantee public acceptance, the Draft Plan stands a much better chance of being implemented than if no public opinion had been considered.

How Public Participation Affected Each Plan Element

As stated above, public participation in the drafting of the 208 Plan was very important in selecting the case study recommendations. The EPAC, the citizens and technical committees, and special interest groups all played a vital role in this selection process. Alternative recommendations were presented to these groups and then refined based on the public's reactions.

Following is a summary of the groups and agencies which participated in the drafting of each Plan element.

Chapter IV - Septic System Pollution Management

EPAC
Citizens Committees
Septic tank installers
Septic tank maintenance companies
County Environmental Health and Planning Departments
Santa Cruz County Watershed Management
City of Scotts Valley
Regional Water Quality Control Board
Salinas Chamber of Commerce

Chapter V - Erosion and Sediment Management

EPAC
Citizens Committees
U.S. Soil Conservation Service
Resource Conservation Districts (5)
County Agricultural Commissioners
UC Extension (Farm Advisors)
Farmers/Ranchers
Growers/Shippers Association
Farm Bureau
Chambers of Commerce
Regional Water Quality Control Board
Central Coast Resource Conservation & Development Assn.
Santa Cruz County Watershed Management

Chapter VI - Case Study on Lake Preservation: Laguna Grande-Roberts Lake

EPAC
Citizens Committees
Laguna Grande Joint Powers Agency
Cities of Monterey, Seaside, Del Rey Oaks
Monterey Peninsula Regional Park District
County of Monterey
Audubon Society
California Department of Fish & Game
Mosquito Abatement District
Central Coast Regional Coastal Commission
League of Women Voters
Del Monte Grove Citizens Committee

Chapter VII - Cast Study on Nitrate Pollution of Groundwater: Salinas and Pajaro Valley

EPAC
Citizens Committees
County Environmental Health Departments
Farmers/Ranchers
US Soil Conservation Service
County Agricultural Commissioners
UC Extension (local, Davis and Riverside)
Growers/Shippers Association
Farm Bureau
Chambers of Commerce (Salinas and Watsonville)
Regional Water Quality Control Board
Central Coast Resource Conservation & Development Assn.
Santa Cruz County Watershed Management
State Health Department
Department of Water Resources
Monterey County Flood Control

Chapter VIII - Case Study on Seawater Intrusion of Groundwater: Pajaro Valley

EPAC
Citizens Committees
County Flood Control Districts
Santa Cruz County Watershed Management
US Department of Interior Bureau of Reclamation
County Public Works Departments
Brown & Caldwell (Santa Cruz 201 Consultants)

Chapter IX - Case Studies on Aquifer Recharge: Pajaro Valley, Carmel Valley, San Lorenzo Valley

EPAC
Citizens Committees
Santa Cruz County Watershed Management
Regional Water Quality Control Board
County Flood Control Districts
City of Watsonville Planning Departments
US Geological Survey
Carmel Valley Master Plan Committee

APPENDIX D

BIBLIOGRAPHY

I. AMBAG TECHNICAL REPORTS AND POLICY PAPERS

AMBAG Policy Paper #1: "Water Quality" 1977

AMBAG Policy Paper #2: "Selection of Water Quality Problems" 1977

AMBAG Policy Paper #3: "Population Projections" 1977

AMBAG Policy Paper #4: "Procedure for Review and Adoption of Water Quality, Land Use, and Housing Plans" 1977

AMBAG Policy Paper #5: "Existing Institutional System for Water Quality Management" 1977

AMBAG Technical Report: "Inventory of Government Agencies Affecting Water Quality in Monterey and Santa Cruz Counties" 1977

AMBAG Policy Paper #8: "Septic System Pollution Control Alternatives" 1977

AMBAG Technical Report: "Septic System Pollution Control Alternatives" 1977

AMBAG Policy Paper #9: "Erosion and Sediment Control Alternatives" 1977

AMBAG Technical Report: "Erosion and Sediment Control Alternatives" 1977

AMBAG Issue Paper #10: "Water Quality Case Studies, Non-Point Source Pollution Control Alternatives" 1977

AMBAG Technical Report: "Laguna Grande-Roberts Lake"

"An Investigation of Non-Point Sources of Groundwater Pollution in Santa Cruz and Monterey Counties" H. Esmaili and Associates

AMBAG Issue Paper #10A: "Water Quality Case Studies: Pollution Control Alternatives" 1977

AMBAG Issue Paper #11: "Draft Land Use and Housing Element" 1977

AMBAG Issue Paper #13: "Water Quality Management Recommendations" 1978

Initial Assessment of Non-Point Source Pollution in the AMBAG 208 Area, Water Resources Engineers, Inc. 1977

Initial Assessment of the Groundwater Resources in the Monterey Bay Region, California, U.S. Geological Survey/ AMBAG 1977

Earthmetrics, Aquifer Recharge Case Study Technical Report, 1977

Regional Land Use Study, The Planning Collaborative, Inc., John M. Sanger and Associated Consultants 1978

AMBAG "Erosion and Sediment Information Sources: Appendix A to Technical Report" 1978

II. STATE AND FEDERAL POLICIES AND LEGISLATION

Regional Water Quality Control Board:

Water Quality Control Plan for the Central Coast Basin (Basin Plan) 1975

State Agencies with Water Quality Impact on AMBAG Area 1977

Point Source Discharge Information 1977

Areawide "208" Water Quality Management Planning Work Plan for the California (RWQCB), Central Coast Region 1977

AMBAG Area Water Monitoring Efforts and Water Quality Standards, Action Program for Water Quality 1978

Technical Report: "Institutional and Financial Alternatives and Recommendations for the Section 208 Program" McDonald and Grefe, Inc., in Association with Sedway/Cooke 1978

State Water Resources Control Board

Statement of Policy with Respect to Maintaining High Quality of Water in California 1968

State Policy for Water Quality Control 1972

State Ocean Plan 1972 Revised 1978

Water Quality Control Policy for the Enclosed Bays and Estuaries of California 1974

Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California 1975

Policy and Action Plan for Water Reclamation in California 1977

Priority List for Fiscal Year 1978-1979

Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling

The California Water Plan, State of California Legislature 1957

Porter-Cologne Water Quality Control Act, California State Legislature July 1976

Amendments to the Federal Water Pollution Control Act (PL92-500, 95-217) U.S. Congress 1977

Safe Drinking Water Act (PL95-190) U.S. Congress 1977

III. ADDITIONAL SOURCES

Chapter V, Technical Appendix C, Water Quality Impacts, December 15, 1977, Robert Aston, Water Quality Chemist

Hydrologic Analysis of Flood Potential and Stormwater Water Quality for Live Oak General Plan Environmental Analysis, Santa Cruz County Office of Watershed Management, Robert Aston, October 1977

Investigation of Porous Pavements for Urban Runoff Control, Franklin Institute Research for Environmental Protection Agency, March 1972

Monterey Bay Area: Natural History and Cultural Imprints, Burton L. Gordon, Department of Geography, San Francisco State University 1974

Laguna Grande Regional Park Master Plan and Final Environmental Impact Report, Manachek, et al. 1977

Environmental Report - Growth Management Program, Santa Cruz County, Community Resources Agency, December 1977

Management Techniques for Aquifer Recharge Study, The Planning Collaborative

APPENDIX E

ASSESSMENT AND EVALUATION CRITERIA

Adopted by EPAC August 29, 1977

AMBAG is preparing plans to deal with the Monterey Bay area's water quality, housing, transportation and land use problems and opportunities. Actions proposed in those plans are likely to have effects beyond the immediate problem areas. Under the National Environmental Policy Act and the California Environmental Quality Act, such impacts, if they are significant, must be described, documented, and evaluated in a public review process.

Typically this review, through an Environmental Impact Statement or Report, has been done after the fact--after the design of a plan or project has been substantially settled. It is our intent to identify the important social, economic and environmental factors related to our possible actions, so that they may be taken into account in the process of planning itself, rather than in a desultory report prepared in hindsight. As potential plan proposals are conceived and formulated, they will be evaluated against the issues listed below. These judgements will play a part in selecting the alternatives to be studied further. The significant impacts of potential actions or activities will be documented in an environmental, social and economic assessment to give technical planners, elected representatives and the public a firm basis from which to select the alternatives to be adopted as policy when we reach that phase of planning.

Water Quality

The restoration and protection of the beneficial uses of the area's surface and ground waters is the prime objective of our "208" water quality plan. The assessment will evaluate the impact of plan proposals on these beneficial uses where they apply, as set out in the adopted Water Quality Control Plan Report for the Central Coast Basin:

1. Domestic, agricultural and industrial supply

2. Groundwater recharge

3. Commercial and sport fishing

4. Recreation on and in the water

5. Fish and wildlife habitat and areas of special biological significance

Air Quality

The Congress and state legislature have set standards for the maximum allowable concentrations of pollutants in the air we breathe. The assessment will describe the level of air pollutant emissions associated with plan proposals in relation to these standards.

Visual Amenity

Several local governments have adopted policies for the protection of the visual environment in both the location and design of new developments. The assessment will identify any changes plan proposals would cause in (1) scenic views, (2) the region's open and natural areas, and (3) the appearance of the urban landscape.

Ecological Resources

1. The impacts on desirable, unusual, rare or endangered species, as defined by the State Department of Fish and Game and the U.S. Fish and Wildlife Service will be assessed.

2. The effects on land habitat areas which provide cover and food for important wildlife species will be described.

Hazardous Land Areas

The assessment will describe the relationship of plan proposals to (1) fault zones, (2) lands with landslide, liquefaction and engineering problems, (3) flood and tsunami prone areas, and (4) fire hazard areas.

Critical Land Resources

The assessment will investigate the effect on the supply and use of (1) prime agriculture lands, (2) specialty crop lands, (3) other agricultural land, (4) timber and forested land, (5) lands for mineral production, (6) stream corridors, lakes, and wetlands, and (7) parks, open space and other public lands.

Physical Facilities

The effect of plan proposals and the existing and required capacity of the following facilities will be evaluated: (1) major roads and highways, (2) sewage interceptors and treatment plants, (3) water service, (4) schools and public services, and (5) energy demand.

Employment

The direct and secondary impact of plan proposals on the number of employed and their wage levels will be described.

Investments and Expenditures

The assessment will identify the impact of proposals on (1) industrial, commercial, agricultural, and service activities, (2) prices and consumption of goods and services, and (3) capital investments for new and replacement facilities.

Fiscal and Taxes

1. The assessment will identify direct costs to local governments of implementation including (a) capital and replacement costs, (b) operating and maintenance costs, (c) administrative costs, and (d) costs of regulation, inspection, and enforcement.

2. Fiscal effects on local government will be assessed: (a) impact on bonds and bonding capacity, (b) impact on property tax base and rates, (c) impact on sales taxes, fees, licenses, user charges, connection and standby charges, and (d) impacts on grant eligibility.

Housing Cost and Supply

1. The effects on existing housing will be described as follows: (a) impact on purchase cost and rent, (b) impact on cost of rehabilitation and maintenance, and (c) impact on removal or conversion.

2. The effects on new housing will be described as follows: (a) cost of land, site preparation, and construction, and (b) supply and location of new housing, proximity to employment and services.

Equity

The differential impact of plan proposals on the aged, youth, minorities, low income and other special groups will be addressed as they relate to plan proposals.

Community Values

The effects on community character and community stability will be assessed.

Institutional and Political

The assessment will describe:

1. The impact on intergovernmental responsibility and coordination.

2. The implementability of proposals in terms of (a) public acceptability, (b) organizational and political feasibility, (c) legal capability, and (d) impact on existing plans, regulations and policies.

3. The flexibility and reversability of actions.

APPENDIX F

HOW THE 16 ELEMENTS ARE ADDRESSED IN THE PLAN

The EPA regulations on preparation of water quality management plans[1] identify sixteen management planning elements whose inclusion is required in all 208 plans. The following table is included to aid federal and state agencies in reviewing the AMBAG 208 plan for adequacy in addressing these elements.

Management Planning Element	Location in AMBAG Plan
1. Planning Boundaries	Chapters 1,3
2. Water Quality Assessment and Segment Classification	Chapter 3[2]
3. Inventories and Projections	Chapter 3
4. Nonpoint Source Assessment	Chapters 1, 3-9
5. Water Quality Standards	Chapter 3
6. Total Maximum Daily Loads	Chapter 3
7. Point Source Load Allocations	Chapter 3
8. Municipal Waste Treatment Systems Needs	Chapter 3
9. Industrial Waste Treatment Systems Needs	Chapter 3
10. Nonpoint Source Control Needs	Chapters 1, 4-9
11. Residual Waste Control Needs; Land Disposal Needs	Chapters 3, 4
12. Urban and Industrial Stormwater Needs	Chapters 6, 9
13. Target Abatement Dates	Chapters 1, 4-10
14. Regulatory Programs	Chapters 1, 4-10
15. Management Agencies	Chapters 1, 4-10
16. Environmental, Social, Economic Impacts	Chapters 1, 4-9, 11

[1] 40 CRF 131; 40 FR 55343, November 28, 1975

[2] There are no water quality limited segments in the AMBAG region

APPENDIX G

MODEL ORDINANCES

INTRODUCTION AND SUMMARY

BACKGROUND

The purpose of this report is to provide the AMBAG 208 Program with model ordinances for the control of erosion and sedimentation. The experience of existing programs to date has been one of limited success at preventing the occurrence or acceleration of erosion and sedimentation. Prior to presenting the model ordinances, a brief discussion of the erosion and sedimentation process, the adverse effects of the process and the specific areas of concern in the AMBAG 208 area is offered as background material.

Erosion and Sedimentation

Erosion is the process of wearing away the surface of the land by water, wind, ice, or other geologic agents. The following terms are used to describe the different types of water erosion:

- raindrop or splash--force of raindrops causes soil to splatter;
- sheet--water removes uniform layer of soil off the surface without gully formation;
- rill--water concentrates, forming small channels and eroding land several inches in depth;
- gully--water concentrates in narrow channels, eroding land as much as 100 feet in depth;
- streambank--water removes soil from banks and, to some extent, from stream bottoms;
- natural (or geologic)--water and other natural agents wear away earth's surface under natural environmental conditions of climate, vegetation, etc., undisturbed by man;
- normal--gradual erosion of land used by man which does not greatly exceed natural erosion; and
- accelerated--erosion much more rapid than natural or normal erosion, primarily as a result of land disturbing activities by man.

Man's activities, especially construction, have accelerated the process of erosion and its damaging effects substantially. For example, soil erosion of a square mile of land can increase from 2 ton/acre/year on agricultural lands to more than 40 tons/acre/year as the land is converted to suburban uses. Basically, the erosion is influenced by soil characteristics, land use, slope, ground cover, and rainfall characteristics.

Sedimentation is the accumulation of soil as a result of erosion. Over eons, natural sedimentation has completely changed rivers and coastal areas, formed valleys, and floodplains, etc., which have changed both plant and animal life. At the same time, it is necessary for maintaining the normal regimen of river systems and coastal areas which support complex biota, over a shorter time frame. However, urbanization has accelerated this phenomenon and led to undesirable impacts on the environment. Sediment is generally acknowledged to be the greatest contributor, by volume, to water pollution in the world. The Agricultural Research Service of the U.S. Department of Agriculture estimates 4 billion tons of soil material are washed into tributary streams each year. Of this total, about 50% originates from agricultural crop lands; 30% stems from geologic erosion; approximately 5-10% comes from forest and associated rangelands; and the remaining 10-15% derives from streambank erosion, surface mines, roadbanks, and urban, industrial, and highway construction. The amount of soil loss is related to storm magnitudes and on the amount of land disturbing activities in a watershed. In developing areas soil loss can be as much as 1,000-10,000 tons/square mile/year.

Adverse Effects of Erosion and Sedimentation

Given the high erosion rates and sediment yields from land disturbing activities, it is not surprising that a number of adverse impacts have resulted. Erosion is aesthetically displeasing; accounts for many dollars in loss of valuable topsoil, in increased agricultural costs, and in increased road and drainage maintenance costs; and induces increased rates of erosion and sedimentation. It is through the deposition of eroded soils that erosion imposes the greatest damage. The adverse effects of sediment include covering and ruining croplands, lawns, roads, and recreation areas; reducing hydraulic capacity in ditches, drains, and culverts; filling streams, lakes, and man-made water impoundments which reduces their storage capacity and increases flood potential; reducing the aesthetic and recreation value of water; and increasing the cost of filtering operations for municipal water supply reservoirs. Furthermore, sediment acts as a transport medium for other pollutants, especially nutrients, pesticides, and heavy metals, which adsorb to the eroded soil particles.

Erosion and Sediment Problems in the AMBAG Region

AMBAG's "Erosion and Sediment Control, Technical Report" (June, 1977) identified major erosion and sediment pollution problems in the AMBAG area. The report also presented a list of erosion and sediment control measures and identified existing control program. The major problems for the region are summarized below.

Existing Agricultural Problems:

- Vineyards--Sediments, in the runoff of rainfall and irrigation water from irrigated vineyards on sloping lands in the Gonzales-King City area, are polluting water in the Salinas River.

- Truck crops--Sediments, in the runoff of rainfall and irrigation water from irrigated truck crops on sloping land in the Salinas and Pajaro Valleys, are polluting water in the Salinas and Pajaro Rivers.

- Grains--Sediments, in the runoff of rainfall and irrigation water from irrigated and non-irrigated grain on sloping land in south Monterey County, are polluting water in the Salinas River.

- Orchards--Sediments, in the runoff of rainfall from non-irrigated orchards on hilly land in eastern Santa Cruz County, are polluting water in the Pajaro and other river systems.

- Rangeland--Sediments, in the runoff of rainfall from overgrazed rangeland throughout the AMBAG area, are polluting water in the area river systems. Notable sites are southeastern hills of the Salinas Valley, Hunter Liggett, Fort Ord, and the Carmel River Watershed.

- Woodland--Sediments, in the runoff of rainfall from logging activities on woodland in north Santa Cruz County, are polluting water in the San Lorenzo and other rivers.

Potential Agricultural Problem:

- Marginal land conversion--The conversion of marginal agricultural land from grass and/or grazing to a more intensive agricultural use, especially on sloping land, without runoff and erosion controls and a management program to fit the conditions, will increase erosion and sediment, and increase water pollution.

Existing Urban Problems:

- Moderate and extensive residential--Sediments in the runoff of rainfall from moderate and extensive residential areas on slopes and hills throughout the AMBAG area, are polluting water in the river systems. Notable examples are the Santa Rita-Prunedale area, Carmel Valley, Monterey Peninsula, Carralitos, Scotts Valley, Ben Lomond, and Boulder Creek.

- Intensive residential-municipal--Sediments, in the runoff of rainfall from intensive residential-municipal areas on slopes and hills, are polluting water in river systems. Notable examples are the Carmel-Monterey-Seaside area and the Aptos-Capitola-Santa Cruz area.

- Off-site flooding--Sediments, from off-site flooding and erosion caused by the runoff of rainfall from intensive residential-municipal areas on relatively flat land, are polluting water in drainageways and sloughs. Examples are the north Salinas area, and the Gonzales area.

- Horses--Sediments, in the runoff of rainfall from small parcels (1-5 acres) with horses throughout the AMBAG area, are polluting water in the river systems. Notable examples are the Carmel Valley, Laguna Seca, Santa Rita, Prunedale, Scotts Valley, Soquel, Aptos, Felton, and other similar foothill-type subdivisions.

Potential Urban Problems:

- Expansion and intensification--The expansion and intensification of urban areas without consideration of the overall hydrologic capabilities of drainage characteristics and facilities will cause off-site flooding, erosion and sediment that will pollute water.

- Slope and hill development--Urban development on slopes adn hills without adequate runoff and erosion control will cause sediment that will pollute water.

Other Existing Problems:

- Roads and road right-of-ways--Sediments, in the runoff of rainfall from roads and road right-of-ways throughout the AMBAG area, are polluting water in drains, creeks, rivers, and water bodies. All kinds of roads (city, county, state and private), particularly in the hills and mountains, contribute to the problem.

- Streambanks--Runoff of rainfall in streams is eroding stream banks and causing sediments that pollute water in the river systems and water bodies throughout the AMBAG area.

- Mines and quarries--Sediments, in the runoff of rainfall from mines and quarries scattered throughout AMBAG area, are polluting water in river systems.

  Landslides--Sediments from landslides and landslips in the Santa Cruz County watersheds (some natural and some caused by man) are polluting the water in the river systems.

APPROACHES TO CONTROL

Existing Efforts

Most of the erosion and sedimentation problems created by man's activities can be controlled. In general there are two approaches to controlling the adverse effects of soil detachment, transport, and deposition. First, there are corrective measures which are designed to minimize the impact of the pollutant after it has already been generated. Alternatively, there is the preventive approach which stresses preservation of a watershed's drainage characteristics and protection of soil surfaces from erosive forces. This latter approch is predicated on man's ability to use and manage land in a proper manner. The various control measures which embody this preventive approach are called "best management practices" (BMPs). In addition, because BMPs stress prevention and are often nonstructural, they tend to be more cost effective than corrective measures.

To date erosion and sediment control in the AMBAG region have been accomplished on a voluntary basis or through development laws and ordinances. However, both corrective and preventive approaches have been ineffective at preventing the occurrence or acceleration of erosion and sedimentation. The lack of coordination among various governmental programs, laws, and ordinances and the absence of trained staffs that understand erosion and sedimentation control have major stumbling blocks.

Proposed Model Ordinances

In response to the need for a comprehensive program, this report presents three model ordinances dealing with erosion and sedimentation problems. The basic approach of these ordinances is preventive and requires implementation of many of the BMPs identified in AMBAG's "Erosion and Sediment Control, Technical Report" (June, 1977). The key ordinance is the Grading/Erosion/Sedimentaiton Control Model Ordinance, whose purpose is to regulate land activities and require the application of BMPs in order to preserve and protect the natural environment and the public safety from the adverse impacts of erosion and sedimentation. Separate ordinances have been set up for maintaining erosion control measures, and the keeping of livestock. The ordinances have been designed to give local jurisdictions considerable discretion in implementing the ordinances. Basically, they are based on a system of permits which regulate land activities and are administered by an appropriate city of county department. The standards section for the Grading/Erosion/Sedimentation Control Model Ordinance has purposefully been made lengthy to permit flexibility in choosing appropriate standards for any given jurisdiction. Only the standards and basic procedures for the other model ordinances have been provided as it is expected most jurisdictions would integrate them into existing ordinances.

SUMMARY

In this report, three model ordinance are presented. They are designed to conserve soil and water resources and prevent and control accelerated soil erosion and sediment damage to land, water, and other resources in the AMBAG 208 region. They cover the following areas:

- Grading/Erosion/Sedimentation Control
- Maintenance of Erosion/Sediment Control Devices
- Keeping of Livestock

The need for improving existing governmental and legislative efforts in erosion and sedimentation control provides the impetus for the ordinances. As man's activities on the land become increasingly disruptive, the impacts associated with erosion and sedimentation become more and more detrimental. The approach adopted in the ordinances is to prevent such adverse effects through the application of best management practices.

In drafting these ordinances, a primary consideration is to provide local entities with the maximum amount of flexibility in adapting them to existing ordinances. In order to accomplish this flexibility, sections such as performance bonds, abatement procedures, and appeals are left relatively vague so that local jurisdictions can reference existing codes that cover those subjects. The section on standards is exceptionally lengthy in order to allow any given jurisdiction the flexibility to select appropriate standards. Furthermore, the definitions of terms such as "grading" and "watercourse protection zone" are broad so that references to these items within the body of the ordinances are all inclusive and can be modified readily.

Where ordinances call for development of adequate and effective erosion and sedimentation control measures, persons shall observe the standards provided within the ordinances and for additional technical guidance refer to the Soil Conservation Service's Technical Standards and Technical Guide, which were designed to provide a basis for evaluating the adequacy of technical assistance, a source of technical information, and a useful training tool in both planning and application.

Grading/Erosion/Sedimentation Control

The purpose of the Grading/Erosion/Sedimentation Control Ordinance is to establish comprehensive standards and procedures for the conduct of grading operations that will mitigate the impact of such operations on surface water quality. Existing grading regulations are primarily concerned with structural stability and do not address erosion and sedimentation control. The key feature of the ordinance is a requirement that all applicants for a grading permit must submit a Grading and Erosion/Sediment Control Plan concurrently. The ordinance specifies the plan contents which include descriptions of existing and modified physical characteristics of the site, proposed mitigative measures, an implementation schedule, and maintenance provisions. The ordinance also details standards which will govern the issuance of all grading permits and approval of all Grading and Erosion/Sediment Control Plans. The standards are comprehensive but are generally concerned with cut and fill operations, vegetation preservation, storm runoff control, and watercourse protection. Violations of the provisions within this ordinance, as determined by the Director is punishable by civil fines and stop work orders.

Maintenance or Erosion/Sediment Control Devices

The intent of this ordinance is to insure that once erosion and sedimentation control measures are implemented, they are properly maintained. If the Director determines that maintenance is inadequate, the property owner is notified and informed of the necessary corrective measures and a time schedule in which to make the appropriate remedies. Upon failure to comply, the Director can make the necessary corrections and assess the cost to the property owner as a lien on his property.

Keeping Livestock

Provisions within the Livestock Ordinance seek to protect water quality from the keeping of livestock. Standards detailed in the ordinance provide for the establishment of buffer zones and the use of vegetative buffer strips, diversions, dissipators, sediment basins and other erosion and sedimentation control measures. Furthermore, the keeping of livestock including horses, cattle, goats, sheep, or hogs within defined areas is permissible only where property owners have first obtained a permit from the (Director). Application for such a permit must be accompanied by a detailed plot plan whose contents are described in the ordinance.

EROSION/SEDIMENTATION CONTROL MODEL ORDINANCE 1

#_____Purposes. The purpose of this ordinance is to control and prevent the adverse effects of erosion and sedimentation in (_____) which include, but are not limited to, loss of valuable topsoil; increased agricultural costs; increased road and drainage maintenance costs; destruction of crops, lawns, roads, and recreation areas; filling of ditches, drains, culverts, streams, lakes, and man-made impoundments; increased flood hazards; and transport of other pollutants. The control and prevention of such detrimental impacts; and in general and preservation and protection of the natural environment, and the public health, safety, and general welfare can be accomplished by: regulating the alteration of land and topography; regulating the removal of vegetation; specigying standards for drainage system construction; requiring erosion and sedimentation control; assuring the continued, efficient operation of the drainage system; and protecting streams and floodplains from substantial alteration of their natural functions.

#_____Construction. The provisions of this ordinance shall be liberally construed to accomplish its purpose and objectives.

#_____Severability. If any provision of this ordinance in the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions or applications of this ordinance which can be given effect without the invalid provisions or application and to this end the provisions of this division are severable.

#_____Nuisance Abatement. No provision of this ordinance is a limitation on any of the following:

_____. On the right of any person to maintain an appropriate action for relief against a private nuisance or for any other private relief.

_____. On the power of any city or county to declare, prohibit and abate nuisances.

Effect on Other Laws. No provision of this ordinance is intended to repeal, abregate, annul, impair or interfere with any rules, regulations, ordinances or permits previously adopted, promulgated, or issued pursuant to law. However, wherever this ordinance imposes greater restrictions, the provisions of this ordinance shall govern.

Section Definitions

"Aggrieved person" means any person who, in person or through a representative, appeared or otherwise communicated with the (Director) and informed the (Director) of his concerns prior to the determination of the (Director).

"Agricultural Land" is the land used for the production of food and fiber, including but not limited to, general farming, livestock and poultry enterprises, grazing, nurseries, horticulture, viticulture, truck farming, forestry, sod production, berry production and wild crop harvesting and includes lands used for on-site structures necessary to carry out such activities.

"Agricultural Land Grading" is the initial act of shaping the surface of agricultural land, to a planned grade, to facilitate the most efficient and effective movement of irrigation water over the surface of the land. Also called land leveling, or land shaping. Does not include annual practices of grading, shaping or plaining used to prepare for, produce, and/or harvest crops.

"Agricultural Land Use Change" is a change in the use of agricultural land, from one agricultural use to another, which may increase the number and frequency of cultural operations, or which may result in the permanent removal of ground cover, and which may increase runoff and/or soil erosion. For example: The conversion of sloping land that has historically been used for grazing, hay or grain production, to other uses such as irrigated vineyards, berries or truck crops.

"Best Management Practices" means preventive control measures, either structural, vegetative, or some combination thereof, determined to be most effective in terms of minimizing cost and controlling water pollutants; and for the prevention and/or control of accelerated erosion and sediment damage, Best Management Practices may include, but are not limited to, guidelines on management.

"Erosion" means the process by which the surface of the land is worn away by the action of water, wind, gravity, or a combination thereof.

(a) "geologic erosion" means the wearing away of the earth's surface by water, ice, or other natural agents under natural conditions of climate, vegetation, etc., undisturbed by man.

(b) "normal erosion" means the gradual erosion of land used by man which does not greatly exceed geologic erosion, where all reasonable soil and water conservation practices have been applied.

(c) "accelerated" means erosion much more rapid than normal erosion or geologic erosion primarily as a result of the activities of man.

"Excavating" is any act by which soil materials are cut into, dug, quarried, uncovered, removed, displaced or relocated.

"Farm or Ranch" is any parcel of land more than 20 acres in size, or, any parcel less than 20 acres from which the gross sale of agricultural products is $2,000, or more, annually.

"Filling" is the depositing by man or soil materials to raise the level of the ground.

"Grading"is altering the elevation of the land surface by stripping, filling, stockpiling of soil materials, as well as stripping or wholesale disruption, or any combination thereof, including clearing, filling, excavation or similar disturbance of vegetative cover.

"Grazing" is the act of allowing livestock to have access to any land for the purpose of obtaining browse or forage whether planted for that purpose or growing naturally.

"Intensive Agricultural Land Use" is the use of agricultural land for the production of crops that require many and frequent cultural operations which may result in the permanent removal of ground cover. This would include but is not limited to such crops as vineyards and vegetables.

"Land Use Change" is the change of land use from one purpose to another which may result in soil erosion. Including but not limited to removal of ground cover, grading, excavating, and filling of land.

"Parcel" means all contiguous lands under ownership or control of a person.

"Person" means any individual, organization, partnership, or other business association or corporation, including any utility, governmental entity or agency thereof to the extent permissable by law.

"Sediment" means the solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice, and has come to rest on the earth's surface.

"Sedimentation" is the process or action of depositing sediment and can cause the degradation of water quality by the presence of suspended solid particles, derived from soils by erosion or discharged into surface waters from other sources; or the deposition of water-borne sediments in stream channels, lakes, reservoirs, or on flood plains.

"Structural Measures" are works of improvement for land stabilization to prevent erosion, sediment or flood damage which includes, but are not limited to, gully control structures, grass waterways, riprap, sediment basins, flood retention dams, diversions, lining channels with rock, concrete or other materials.

"Unintensive Agricultural Land Use" is the use of agricultural land for the production of crops that require few and infrequent cultural operations which may result in the temporary removal of ground cover. This would include but is not limited to such crops as hay, pasture and grain.

"Watercourse Protection Zone" means any intermittent or perennial stream, river, drainage course, drainage channel or swale and includes its channel and banks, and a backshore zone consisting of any contiguous lands along the top edge of the channel or bank, or the high water mark where there is no defined channel or bank, of greater than ___% slope up to a maximum distance of ___ft. from the top edge of the channel or bank or the high water mark where there is no defined channel or bank, but in no event shall the backshore zone be less than ___ft. Where any such watercourse protection zones have been mapped and adopted by the (Board), the map shall define the boundary of such watercourse protection zone.

Erosion-Sedimentation

#_____Permits. Any person wishing to perform or undertake any grading shall obtain a grading permit from the Director or the (Board) on appeal except as provided herin.

#_____Exemptions. Notwithstanding any provision of this article to the contrary, no grading permit shall be required pursuant to this article for the following:

(a) Grading for agricultural purposes except where:

#_____i. Agricultural land grading activity affecting over _____acres, or _____acres if the (average) slope exceeds _____%, or if any portion of the slope exceeds _____%, or if the activity involves the movement of more than _____cu. yards of material or takes place within _____ft. of a watercourse protection zone.

#_____ii. Agricultural land use changes that will cause or intensify cultural activities such as plowing, discing, or other similar disturbance of the natural vegetation if the area affected is greater than_____acres, or_____acres if the (average) slope exceeds _____%, or takes place within _____ft. of a watercourse protection zone

(b) Notwithstanding the provisions of a(i) and a(ii) above, activities dealth with in such provisions done under a land conservation plan approved by the Director or when it is determined by the Director that such use will not cause excess erosion or sedimentation.

(c) Grading involving the disturbance of an area less than _____sq.ft., or less than _____cu.yds. in volume unless located within _____ft. of any water-course protection zone.

(d) Emergency work necessary to preserve life or property; provided, however, that when emergency work is per-formed under this section, the person performing it

shall report the pertinent facts relating to the work to the Director within _____days after commencement of the work and shall thereafter obtain a permit pursuant to Section _____ and perform such work as may be determined by the Director to be reasonably necessary to correct any erosion or condition with a potential to cause erosion that was caused by the emergency work.

#_____Procedures. The (Board) shall adopt procedures for the submission, review, and appeal of grading permit application including the Erosion and Sedimentation Control Plans. Such procedures shall include but are not limited to:

(a) Application and appeal forms

(b) Application and appeal fee schedules providing for reasonable fees for the reimbursement of expenses for the processing of any application of appeal under this ordinance.

(c) Guidelines for the interpretation of the standards contained herin which may be amended from time to time as additional experience and information warrants.

(d) Notification of the public.

(e) Performance bonds to insure the completion of erosion and sediment controls.

#_____Exemptions. Upon application, the Director may exempt such grading from the provisions of this ordinance if he determines, and supports by written findings, that such grading is minor in nature, possesses no potential for causing or aggravating erosion, and is consistent with the intent of this ordinance.

#_____Amendments to Permits. Any person wishing to amend a permit shall apply for such amendment in the same manner as provided for a permit in Section _____.

#_____Minor Amendments. If the Director determines that an amendment is monor in nature, would not result in any hazard to life or limb, hazard to property, adverse effects on the safety, use or stability of a public way or any drainage channel or watercourse, any erosion of sedimentation, or adverse impact on the natural environment, and supports such determination with written findings, such amendments may be authorized by the Director.

#____Appeals. Any aggrieved person may appeal the decision of the Director to the (Board) except as provided herin. The appeal must be filed within ____days on an appeal form established by the (Board) or the decision of the Director shall become final.

#____Non-Appealable Decisions. The decision of the (Director) shall be final with respect to the following:

(a) Determinations as to exemptions because of the minor nature of the work.

(b) Determinations as to the material or non-material nature of amendments to permits.

(c) Determinations as to extensions of time.

(d) Determinations as to emergency permits.

#____DeNovo Appeals. The (Board) shall hear all valid appeals in de novo public hearing and its determination shall be final.

#____Performance Bonds. No grading permit shall become effective unless and until performance bonds or similar security in favor of the (jurisdiction) are provided sufficient in amount to cover the cost of constructing all erosion control devices and establishing such vegetation as required by the grading permit. The sufficiency of such security shall be determined by the Director and shall be released upon satisfaction of the terms and provisions of the permit.

#____Certification of Completion. Upon commencement of any grading work under a grading permit, no additional grading, building, accupancy, or special use permits or similar entitlements for use shall become effective until the Director certifies that the erosion and sediment control provisions of the grading permit have been satisfactorily completed. The terms of the grading permit may specify a schedule of activities permitting partial satisfaction of permit conditions to allow partial certificates of completion to be filed where, in the discretion of the Director such incremental procedures will not cause or increase the risk of excess erosion or sedimentation.

#____Compliance with Standards. No permit shall be issued unless the Grading and Erosion/Sediment Control Plan complies with the standards contained herein and the intent of this ordinance. The Director or the (Board) on appeal shall impose such conditions on the permit as are necessary to insure compliance with the intent of this ordinance.

#_____ Work Conforming to Permit. All grading shall be undertaken in conformity with the terms and conditions of the approved Grading and Erosion/Sediment Control Plan and grading permit.

#_____ Violation. Any person who violates any provision of this ordinance shall be subject to a civil fine of not less than $____ nor more than $_____ for each day in which such violation occurs.

#_____ Exemplary Damages. Where a person has intentionally and willfully violated any provision of this ordinance, the (Board) may maintain an action, in addition to that provided in Section _____, for exemplary damages and may recover an award, the size of which is left to the discretion of the court. In exercising its discretion, the court shall consider the amount of liability to deter further violations.

#_____ Additional Remedies. The remedies provided by this ordinance shall be in addition to any other remedies available at law including injuctive relief to restrain any violation of the provisions contained herin.

#_____ Inspection. The Director shall have the authority, when in the performance of his duty, to enter upon any premises where grading authorized by a grading permit is being undertaken, with such tools and equipment as may be necessary or convenient, solely for the purpose of inspecting such work to determine compliance with terms and conditions of such permits.

#_____ Stop Work Orders. When the Director determines that a violation of this ordinance is taking place, he shall issue a stop work order to the person responsible for such violation. Such order shall have the effect of suspending any permit issued pursuant to this ordinance until such violation has been corrected to the satisfaction of the Director or the (Board) on appeal.

#_____ Submission of Plans. The filing of an application for a grading permit shall be accompanied by a Grading and Erosion/Sediment Control Plan. Such plans shall be prepared and certified as being in conformance with these provisions by a (_____) qualified in erosion control matters and acceptable to the (Director).

#_____ Plan Contents. The Grading and Erosion/Sediment Control Plan shall include the following:

(a) A map showing the topography of the parcel at _____ft. contour intervals in areas of cross-slope of less than 5%, at _____ft. contour intervals in areas of 6% through 10% cross-slope, and at _____ft. contour intervals in areas exceeding 10% cross slope. The

map shall show the condition of the land in its existing condition, and the surrounding areas shall be indicated. A second map, or an overlay to the first, shall show the condition of the land in its proposed condition and the surrounding areas at a level of detail identical to the first map.

(b) Soils characteristics including the nature, distribution, erosion hazard, and strength of existing soils, based on USDA, Soil Conservation Service soil maps, and soil descriptions and classifications.

(c) Geologic characteristics of the site including any evidence of landslides, slumps, or faults.

(d) Hydrologic characteristics of the site and the hydrologic subsystem on which the site is located including the location, capacities and condition of all watercourses, based on USDA, Soil Conservation Service methods.

(e) Description of the vegetation on the site both as existing and proposed.

(f) Location of any existing buildings or structures on the property where the work is to be performed, the location of any existing buildings or structures on land of adjacent owners which are within 100 feet of the property or which may be affected by the proposed grading operations, and proposed or approximate locations of structures relative to adjoining topography.

(g) The direction of drainage flow and approximate grade of all streets.

(h) Limiting dimensions, elevations, or finish contours to be achieved by the grading, including all cut and fill slopes, proposed drainage channels, and related construction.

(i) Detailed plans and locations of all structural and nonstructural erosion and sedimentation control devices, including temporary and permanent surface and subsurface drainage devices, walls, dams, sediment basins, storage reservoirs, and other protective devices to be constructed with, or as a part of, the proposed work, together with a map showing drainage area, a complete drainage network, including outfall lines and natural drainageways which may be affected by the proposed development, and estimated runoff of the area served by the drains.

(j) A description of methods to be employed in disposing of soil and other material that is removed from the grading site, including the location of the disposal site.

(k) A schedule showing when each stage of the project will be completed, including the total area of soil surface which is to be disturbed during each stage, and estimated starting and completion dates, the schedule shall be drawn up to limit to the shortest possible period the time that soil is exposed and unprotected.

(l) Maintenance provisions for insuring the continued usefulness of all erosion control measures.

(m) Such other information as the Director determines is necessary to determine the effect of the grading and compliance with the intent of this ordinance.

Standards. The following standards shall govern the issuance of all grading permits and approval of all Grading and Erosion/Sediment Control Plans pursuant to this ordinance.

(a) Plans for development and construction shall minimize cut and fill operations.

(b) During development and/or construction, adequate protective measures, temporary and permanent, shall be provided to minimize damage from surface water to the cut face of excavations or the sloping surfaces of fills.

(c) Fills shall not encroach upon natural watercourses, their floodplains, or constructed channels in a manner so as to adversely affect other properties.

(d) Land shall be developed in increments of workable size which can be completed during a single construction season. Erosion and sediment control measures shall be coordinated with the sequence of grading, development, and construction operations. Control measures such as seeding, fertilizing, mulching, berms, interceptor ditches, terraces, and sediment traps shall be put into effect prior to the commencement of each increment of the development/construction process.

(e) Sediment basins (debris basins, desilting basins, or silt traps) shall be installed in conjunction with the initial grading operations and in no

event later than _____, and maintained through the development process to remove sediment from runoff waters draining from land undergoing development.

(f) Alteration of land in existing developed areas shall be conducted in such a manner than changes in patterns of natural drainage shall not adversely affect other landowners, any natural or public drainageway; and no restrictions or barriers, including fences, may be placed in these drainageways or floodplains except as provided herein.

(g) No construction materials or construction by-products shall be discarded in any drainageway or stream.

(h) Fill areas shall be prepared by removing organic material, such as vegetation and rubbish, and other material detrimental to proper compaction or otherwise not conducive to stability; no rock or similar irreducible material with a maximum density greater than _____ inches shall be used as fill material in fills that are intended to provide structural strength.

(i) All retaining walls or facings with a total vertical projection in excess of _____ feet and associated with cut or fill surfaces shall be designed as structural members keyed into stable foundations and capable of sustaining the design loads.

(j) Fills shall be compacted to at least 95% of maximum density.

(k) Natural or constructed slopes in excess of _____% shall not be subjected to development.

(l) Cut slopes shall be no steeper than _____ horizontal to _____ vertical; subsurface drainage shall be provided as necessary for stability.

(m) Fill slopes shall be no steeper than _____ horizontal to _____ vertical; fill slopes shall not be located on natural slopes _____ or steeper, or where fill slope toes out within _____ feet horizontally of the top of an existing or planned cut slope.

(n) Tops and toes of cut and fill slopes shall be set back from property boundaries a distance of _____ feet plus _____ of the height of the cut or fill, but need not exceed a horizontal distance of _____ feet; tops and toes of cut and fill slopes shall be set back from structures a distance of _____ feet plus _____ the height of the cut or fill, but not exceeding _____ feet.

(o) Borrowing for fill shall be prohibited unless the material is obtained from a cut permitted under an approved grading plan obtained for some purpose other than to produce fill material, or imported from outside the jurisdiction.

(p) All slopes which are stabilized by mechanical or chemical restraints shall be adapted to conform to the surrounding terrain and shall maintain a natural appearance.

(q) Existing vegetation of the deep-rooted perennial variety shall be preserved to the greatest extent possible in the location of roads, structures, and other land-soil disturbing activities. Road alignment should follow natural terrain and no unnecessary cuts or fills shall be allowed in order to create additional lots or building sites.

(r) Vegetation shall be removed only when absolutely necessary, e.g., for buildings, filled areas, roads.

(s) Every effort shall be made to conserve topsoil which is removed during construction for later use on areas requiring vegetation or landscaping, e.g., cut and fill slopes.

(t) Temporary vegetation sufficient to stabilize the soil while permanent vegetative cover is maturing shall be established on all disturbed areas as each stage of grading is completed. Areas not contained within lot boundaries shall be protected with adapted, fire-resistent species of perennial vegetal cover after all construction is completed.

(u) New plantings shall be protected by measures such as seeding, fertilizing, and mulching.

(v) All disturbed soil surfaces shall be stabilized or covered within a total of _____days and in any event should be completed before the rainy season running from _____ to _____. If the planned impervious surfaces (e.g. roads, driveways, etc.) cannot be established prior to October 15, a temporary treatment adequate to prevent erosion shall be installed on those surfaces.

(w) Construction shall be scheduled to minimize soil disturbance between _(date)_ and _(date)_ . (the normal rainy season of the area)

(x) The applicant shall be fully responsible for any destruction of existing vegetation proposed for retention. He shall carry the responsibility both for his own employees and for all subcontractors from the first day of construction until the notice of completion is filed. The applicant shall be responsible for replacing such destroyed vegetation.

(y) The use of qualified personnel experienced and knowledgeable in the practice of revegetation shall be required.

(z) No paving with concrete, asphalt, or other impervious material within the tree crown zone of trees to be preserved shall be allowed.

(aa) Soil and other materials shall not be temporarily or permanently stored in locations which would cause suffocation of root systems of trees to be preserved or would cause acceleration of the erosion process.

(bb) The permanent vegetation shall be installed on the construction site as soon as utilities are in place and final grades are achieved.

(cc) The paving of streets, parking lots, and other areas shall be completed in conjunction with final grading for these areas. Final grading and removal of vegetation shall not occur more than 30 days prior to scheduled paving.

(dd) Seeding, fertilizing and mulching shall be carried out on all bare, graded, and/or disturbed areas including areas to be landscaped with trees, shrubs or other slow growing permanent vegetation within a total of 30 days and in any event no later than the start of the rainy season.

(ee) A drainage and runoff control system shall be completed and made operational at the earliest possible time during the initial grading and/or construction activities, and in any event prior to the start of the rainy season running from _____ to _____.

(ff) The Drainage and runoff control system and its component facilities, shall be non-erosive in design, and shall conduct runoff to stable outlets (natural or constructed).

(gg) The drainage and runoff control system and its component facilities will be designed to fit the hydrology of the area under fully developed conditions, and to handle runoff from a storm of 100 year frequency, 24 hour duration.

(hh) A combination of storage and controlled release of storm water runoff shall be required for all development and construction.

(ii) The release rate of storm water from all developments shall not exceed the storm water runoff from the area in its natural undeveloped state for all intensities and durations of rainfall. The carrying capacity of the channels immediately downstream must be considered in determining the amount of the release. The release rate shall not be greater than that calculated from a storm of _____ year frequency with a runoff rate coefficient of _____, _____ and _____ for land with an average slope of up to _____%, _____ to _____%, and over _____% respectively.

(jj) The drainage system being developed shall have adequate capacity to bypass through the development the flow from all upstream areas for a storm of _____ year design frequency for the land upstream under projected development. The bypass flow rate shall be not less than the _____ year flow rate of record or computed using a runoff coefficient of not less than _____.

(kk) The retention storage to be provided shall be calculated on the basis of the 100-year frequency rainfall for the affected area. The retention volume required shall be that necessary to handle the runoff of a 100-year rainfall, for any and all durations, from the proposed development less that volume discharged during the same duration at the approved release rate as specified above.

All free-flowing storm drainage systems shall be designed to accommodate the runoff generated by a 100-year design storm without creating static head at the entrance and to accommodate the runoff generated by a 100-year design storm utilizing the available head at the entrance.

(ll) When the (Board) determines that development and construction projects are too small, or engineering, aesthetic, and economic factors make combined retention or other drainage facilities more practical for construction by the (_____), the (_____) shall require a fee or equivalent dedication of land which the county shall use to construct these facilities. The (_____) may permit several developers to construct joint facilities. The Director shall approve or disapprove the waiver of on-site drainage or retention facilities on the basis of the engineering feasibility of a combined facility. The Director shall not accept a fee or dedication of land less than the proportionate share for that piece of property in its developed state and the present costs of construction such drainage or retention facilities.

(mm) Retention facilities and drainage structures shall, where possible use natural topography and existing vegetation for protection and landscaping. If the existing vegetation can not be used, or is not adequate, climatically adapted species of trees, shrubs and permanent ground cover will be used, provided however, that they are not the type that will reduce the strength of any structure or impair the operation and maintenance of the facilities. (e.g. roots may cause seepage and failure of earthen dams; vegetation can reduce the flow capacity of channels, etc.). All on-site facilities shall be properly maintained by the owner such that they do not become nuisances. Nuisance conditions shall include: improper storage resulting in uncontrolled runoff and overflow; stagnant water with concomitant algae growth, insect breeding, and odors; discarded debris; and safety hazards created by the facility's operation. Provisions shall be made for the maintenance of all common and public retention ponds and facilities.

All runoff control structures located on private property whether dedicated to the (_____)or not shall be accessible at reasonable times for inspection. Where runoff control structures have been accepted by the (_____) for maintenance, access easements shall be provided.

(nn) No grading shall take place within any watercourse protection zone except that which is absolutely necessary, and then only with such mitigation measures as are necessary to insure that no excess erosion or sedimentation is cause, and only for the following purposes.

i. Drainage and erosion control devices
ii. Utilities
iii. Roads, streets and bridges
iv. Recreation facilities

(oo) During construction, all disturbed areas (cuts, fills, graded and/or bare areas) shall be sprinkled with water to prevent dust and/or wind erosion.

#_____Waiver. Upon a conclusive demonstration by the applicant that any of the standards contained herein are not necessary in the proposed development and that the omission of such requirements would not result in hazard to life or limb, hazard to property, adverse effects on the safety, use or stability of a public way or any drainage channel or watercourse, any erosion or sedimentation, or adverse impact on the natural environment, the Director or the (Board) on appeal may waive those particular requirements.

EROSION/SEDIMENT CONTROL DEVICE MAINTENANCE MODEL ORDINANCE 2

Maintenance by Owners. Owners of property that has been graded under a grading permit issued pursuant to _____ shall maintain all such erosion and sediment control devices and vegetation required by such permits.

Inspection. Upon a determination by the Director that a condition exists in violation of Section ___, the person designated by the Director pursuant to Section ____ shall have the authority, when in the performance of his duty and upon first presenting his credentials and identifying himself to the person apparently in control of the premises, if available, to enter upon any such premises between the hours of 8:00 am and 6:00 pm with such tools and equipment as may be necessary or convenient solely for the purpose of inspection and investigation to determine the cause or condition violating the provisions of _____ and determination of the best practicable method for eliminating such violations.

Notification of Violation. The Director shall notify any person he has reason to believe has not maintained such erosion and sediment control devises and vegetation in the manner provided in _____ in writing and such notification shall specify the defects in such maintenance, the methods of correcting such defects, and the time within which such defects must be corrected.

Abatement. If such defects described in Section ____ are not corrected within such time period, the Director may (abate such conditions as provided in _____) cause such corrective measures to be completed after ____days of notifying the owner of such determination, and the cost of such measures shall constitute a lien on the property as provided in _____.

Finality of Decisions. The decision of the (Director) shall be final unless an appeal is filed with the (Board) within _____ days as provided in Section _____.

LIVESTOCK-CAUSED EROSION CONTROL MODEL ORDINANCE 3

Livestock Permit. No person may keep livestock including horses, cattle, goats, sheep or hogs within (urban or non farm/ non ranch areas) without having first obtained a livestock permit from the (Director) or the (Board) upon appeal.

Permit Application. The Board shall adopt procedures for the submission, review, and appeal of livestock permit applications. Such procedures shall include but are not limited to:

(a) Application and appeal forms

(b) Application and appeal fee schedules providing for reasonable fees for the reimbursement of expenses for the processing of any application or appeal under this article.

(c) Guidelines for the interpretation of the standards contained herein which may be amended from time to time as additional experience and information warrants.

(d) Notification of the public.

(e) Performance bonds to insure completion of erosion and sediment controls.

Exemption. Upon application, the (Director) may exempt such keeping of livestock from the provisions of this article if he determines, and supports by written findings, that such use is minor in nature, possesses no potential for causing or aggravating erosion, adversely affecting water quality of any watercourse, and is consistent with the intent of this article.

Permit Submittals. The filing of an application for a livestock permit shall be accompanied by a detailed plot plan, including the following:

(a) The location of all dwellings and other structures, fences, and corrals.

(b) A map showing the topography of the parcel at _____ ft. contour intervals in areas of cross-slope of less than ____% and at _- ft. contour intervals in areas exceeding ____% cross-slope.

(c) All wells, streams, swales, and watercourses on or within ____ ft. of the property

(d) All erosion control devices including buffers, diversions, and sediment basins and shall include methods of establishing and maintaining such devices.

(e) Such other information as the (Director) determines is necessary to determine the effect of the keeping of livestock and compliance with the intent of this article.

#_____ Standards. The following standards shall apply to the keeping of livestock:

(a) No livestock shall be permitted within the buffer zone to be established along all watercourses and drainage ways. The buffer zone shall be established by the (Director) on the basis of the vegetation, slope and composition of the soils surrounding the drainageway but in no event shall such buffer be less than _____ nor more than _____ft. in depth.

(b) "Vegetated buffer strips shall be established on all downhill sides of areas where livestock is kept. The width of the buffer strip shall be determined by the following: Width in feet _____x average % slope. The buffer strips shall be climatically adapted grasses with fibrous root systems or material with similar properties. The buffer strip will be protected from grazing by a fence on the uphill side (between the buffer strip and the livestock) if along a property line the width of the buffer strip and the setback of the fence will be measured uphill from the property line."

(c) Where necesary to ensure that water quality is not affected by the keeping of livestock, such devices as diversions, dissipators and sediment basins will be required to control runoff.

APPENDIX H

COMMITTEES

The development of AMBAG's 208 plan was subject to close review and comment by a number of committees at the technical, citizens, and policy levels. These committees are described below.

Citizens Committees

AMBAG established citizens committees in five locations to review draft issue papers following their release by the AMBAG Board. The committees submitted their comments to the Environmental Policy Advisory Committee. One member of each citizen committee was also a member of the EPAC. Citizen committees were located in Santa Cruz, Watsonville, Monterey, Salinas, and King City. The committees met regularly during the plan development process.

Technical Committees

A number of technical committees assisted the AMBAG staff in the development of technical reports and issue papers by providing critical scrutiny of and suggestions on the material. These committees were composed of technical staff from local governments and other agencies and met on an as needed basis. The technical committees were as follows:

(1) Agricultural Advisory Committee

This committee consisted of the farm advisors and agricultural commissions of the two counties and local staff of the U.S. Soil Conservation Service. The committee met periodically to review and comment on findings in the agricultural case studies.

(2) Planning Directors Advisory Committee

The planning directors (or their alternates) of AMBAG's member agencies comprised this committee. The group met regularly and reviewed components of the 208 plan related to general planning matters. These included primarily land use issues related to water quality protection.

(3) Laguna Grande Technical Advisory Committee

Agencies with an interest in the water quality of the Laguna Grande watershed were represented on this committee. They included staff of the cities of Monterey and Seaside, Monterey County, the State Department of Fish and Game, the North Salinas Valley Mosquito Abatement District, the Coastal Commission, the Monterey Peninsula Regional Park District, and the Laguna Grande Joint Powers Agency.

(4) Aquifer Recharge Technical Advisory Committee

Representative of the two county flood control and water conservation districts, the Santa Cruz County watershed manager, participated on this committee to review the findings of the aquifer recharge studies.

Policy Committee

The Environmental Policy Advisory Committee was established by the AMBAG Board of Directors on December 10, 1976, to serve as the principal policy review and advisory committee to the Board of Directors. The EPAC was designed to be broadly representative of local governments, the public, and various interest groups. The committee reviewed comments made by technical and citizens committees and provided recommendations to the Board of Directors. The EPAC met monthly.

AMBAG 208 Citizens Committees

Toni Brucia, Mty.
Mike J. Galien, Crml.
Ann Howell, Mty.
David Erickson, Mty.
Helen B. McCaig, P.B.
Mel Vercoe, P.G.
Dan Weiss, Crml. Vly.
W.B. Parham, Jr., Crml. Vly.
Dorris Hammond, Crml.
Clifford J. Hunt, P.B.
Janice Baker, Crml.
William G. Doolittle, Crml.
Douglass Wilhoit, Crml.
Dan E. Hale, Ft. Ord
Mike Ricketts, Crml. Vly.
Edward A. Muniz, Mty.
Peter Thomas, Sde.
Donnie Kane, Sde.
Charlotte Hurst, Crml.
Earl Moser, Crml.
Glen Chang, Crml.
Phyllis Sanderson, Big Sur
Gene Takigawa, Mty.
Richard Harris, Crml.
Arthur Strasburger, Jr.,Carml.
Rex White, Crml. Vly.
Doris Fee, Big Sur
Janice K. Ward, P.G.
Carl von Saltza, Mty.
Andrew J. Johnson, Sde.
Bob Gibbs, S.C.
Elizabeth Snyder-Ellison, S.C.
Katie Burdick, Aptos
Griff Nelson, S.C.
Anne Gulliver, Boulder Crk.
Ree Burnap, Aptos
John Callahan, S.C.
Marfa Levine, Aptos
Pat Liberty, Scotts Vly.

Chris Wilson, Ben Lomond
Ronald A. Rollins, Scotts Vly.
Emery Smith, S.C.
Bonnie Gee, Goulder Crk.
Robert Hall, S.C.
Nancy Carlson, Boulder Crk.
Fred McPherson, Boulder Crk.
John Clark Hanna, S.C.
Max Hartstein, Boulder Crk.
Maxine Keating, Scotts Vly.
Brad Bogard, S.C.
Anne Garni, S.C.
Bill Quealy, Ben Lomond
Michael & Polly Doyle, Ben Lomond
William G. Rummel, Aptos
Dick Ludeman, S.C.
Michael Ponza, Soquel
Dick Lepke, S.C.
Wash Kostinko, S.C.
Bernard H. Golden, S.C.
Bonnie Edsberg, Watsonvl.
O.B. Conrads, Watsonvl.
Rich Nelson, Watsonvl.
Pete Herrlich, Aromas
Vincent Catalano, Watsonvl.
Don Chapin, Watsonvl.
Judy Deqhvee, Watsonvl.
Harold A. Johnson, Jr., Watsonvl.
Jim Perry, Watsonvl.
Carla Olander, Watsonvl.
Jose Ruiz, Watsonvl.
Bill Marquiss, Watsonvl.
Pat McGrath, Watsonvl.
Omer Shriver, Watsonvl.
Eleanor Taylor, Aromas
Roy & D.E. Clasassen, Watsonvl.
Marino Cursi, Castrovl.
Casey Nesbit, Soledad

Harold Widemann, Gonz.
Mike Trescony, San Lucas
Gene Kelley, K.C.
Jim & Betty Barrington,K.C
Lawrence Porter, K.C.
George Newson, Coalinga
Andrew Foskett, K.C.
Tom Updike, K.C.
Sarah J. Palmer, Slns.
C. Raye Morris, Slns.
Judi Moncrief, Slns.
Lynne Penrose, Slns.
Joe Cochran, Slns.
David Swinehart, Slns.
Peter Larson, Slns.
Gail Bennington, Slns.
Bill Woods, Slns.
Sam Moore, Slns.
John Grider, Slns.
Kathleen Anderson, Slns.
Gerald Whisenand, Slns.

EPAC Members, Past & Present

Ed Angstadt, Veg. Growers/Shippers Assn.
Bernard Anderson, Councilman, City of Carmel
Ruth Andresen, Coastal Comm.
Phil Baldwin, Sup., S.C.Cty.
Walter Bourez, SWRCB
John Carlson, City of Seaside
Betty L. Davis, Sierra Club
Paul Davis, City of Marina
*Ed DeMars, Cty. of Mty.
Sam Farr, Sup., Mty. Co.
Wilson Fieberling, City of S.C.
Peter Larson, Citizens Committee
Kenneth R. Jones, RWQCB
*Lawrence Kelly, San Lorenzo Valley
William R. Leonard, RWQCB
Karen Martin, San Lorenzo Valley
R. Edwin Norris, Sup., Mty. Co.
Gary Patton, Sup., S.C. Co.
Pat McGrath, Citizens Committee
Stephen Ross, Mayor, City of Seaside
*Andy Schiffrin, S.C. Cty.
Herman Schull, City of Carmel
*Les Strnad, Coastal Comm.
Ted Thoeny, City of Seaside
*Colene Walden, Carmel
Ben Wells, Corps of Engineers
Glen Chang, Citizens Committee
William G. Rummel, Citizen Committee
*Marit Evans, Mty. Cty.
*Oscar Lawson, Seaside
Ray Rianda, Mission Soledad RCD
Eleanor Taylor, Coastal Commission
William Gianelli, Pebble Beach
Bob Gray, Peter Paul Co.
Alfredo Navaroo, Aptos Central Coast Development Corp.
*Robert Greenwood, Carmel
Jan Stofkopper, SWRCB
Harold Widemar, Citizens Committee

* Alternate

Seawater Intrusion Technical Advisory Committee

Ed Demars, Monterey County Planning Director
Henry Baker, Santa Cruz County Director of Community Resources Agency
Loran Bunte, Monterey County Flood Control
Jim Palabay, Santa Cruz County Public Works
Ben Wells, Corps of Engineers
Larry Fluharty, Bureau of Reclamation
John Cooper, City of Watsonville
Bob Ellenwood, City of Watsonville
Robert L. Mills, Brown & Caldwell (Santa Cruz 201 Consultants)
Santa Cruz County LAFCO
Monterey County LAFCO

Committee never met

Laguna Grande Technical Advisory Committee

Mr. Gary Tate, Monterey Pen. Regional Park Dist.
Mr. William Fell, Mo. Plng. Dept.
Mrs. Joyce Dettman, City Clerk, Del Rey Oaks
Mr. John Carlson, Plng. Dir., Seaside
Mr. Ted Thoeny, Dir. Public Works, Seaside
Dr. Michael Martin, Dept. Fish & Game
Mr. Bruce Elliott, Dept. Fish & Game
Mr. Mike Johnson, Dept. Fish & Game
Mr. Loran Bunte, Mo.Co. Flood Control and WCD
Mr. Ed DeMars, Plng. Dir.
Mr. Harold Greenfield, North Salinas Mosquita Abatement Dist.
Mr. Les Strnad, Central Coast Regional Coastal Comm.
Mr. Bruce McClain, Public Works Dir.
Mr. Clayton Neill, Jr., City Eng., Del Rey Oaks
Mr. Leo McIntyre, Dir. Public Works, Mty.
Mr. Roger Briggs, RWQCB
Mr. Dave Hanline, EPA

Agricultural Advisory Committee

Gene Andreucetti, Area Conservationist, SCS
Gene Ares, Dist. Conservationist, SCS
Bob Hulbert, Project Coord., CCRC&D
Bill Huffman, County Dir., AES Mo.Co.
Dick Nutter, Ag. Commissioner, Mo.Co.
Ron Tyler, Cty. Dir., AES S.C. Cty.
John Simmen, Ag. Commissioner, S.C. Cty.
Al Harner, Cty. Dir., ASCS

Septic Tank Technical Advisory Committee

Walter Wong, Monterey County

Ray Talley, Santa Cruz County

Ken Jones, Regional Water Quality Control Board
Roger Briggs, Alternate

Ron Johansen, S.C. Cty. Watershed Mgt.

Aquifer Recharge Technical Advisory Committee

Ron Johansen, Santa Cruz County Watershed Management

Robert Aston, Santa Cruz County Watershed Management

Jim Palabay, Santa Cruz County Department of Public Works

John Fanthan, Santa Cruz County Department of Public Works

John Gilchrest, Santa Cruz County Department of Planning

Al Haines, City of Watsonville, Planning Department

Karen Martin, San Lorenzo Valley

Bob Binder, Monterey County Flood Control & Water Conservation District

David Young, Monterey County Department of Planning

Bill Stevens, Monterey County Department of Public Works

Robert Griggs, City of Carmel, Planning Director

Bill Peters, Carmel Valley Master Plan Committee

Kevin Walsh, Carmel Sanitary District

Ken Muir, U.S. Geological Surv.

Vic McIntyre, Department of Water Resources

Dick Zipp, Department of Water Resources

Roger Briggs, Regional Water Quality Control Board

Dave Hanline, Environmental Protection Agency

APPENDIX I

RECOMMENDED MONITORING PROGRAM

SUMMARY FINDINGS

1. In recent years, four agencies have shared primary monitoring responsibilities: California Department of Water Resources (DWR), Monterey County Flood Control and Water Conservation District (MCFCWCD), Santa Cruz County Flood Control and Water Conservation District (SCCFCWCD), and the Santa Cruz County Watershed Manager's Office (SCCWMO). Numerous water suppliers and agencies such as the U.S. Geological Survey monitor streams and wells on a more limited basis or as part of Special Studies.
2. The primary monitoring agencies have developed an effective and low-cost sampling program to monitor salt water intrustion. Most sampling is conducted by the two flood control districts, who determine water levels, conductivities and chloride concentrations. More complete analyses of a smaller number of wells are made by DWR and SCCWMO.
3. Nitrate, sulfate, and total salt buildups are not monitored at sufficient densities to adequately determine the extent of waters with excessive concentrations nor to evaluate short- and long-term rates of change in these constituents.
4. Reductions in groundwater monitoring programs carried out by DWR are expected to continue. An expanded analytic program by local agencies will be required to maintain present monitoring levels. This need is especially acute in the Salinas Valley south of Chualar.

5. Regular and systematic monitoring is not associated with any of the principal waste disposal sites in the study area, except possibly for the program initiated by SCCWMO in Santa Cruz County.

6. Trace element concentrations significantly restrict use of water in several sub-areas. In the past, information on their distribution has been limited to intermittent analyses by DWR and USGS, plus analyses for selected constituents once every five years by the water suppliers or private irrigators. The diminishing role of DWR in sampling for trace elements has partially been offset by SCCWMO in Santa Cruz County.

7. Exchange of data between the four primary monitoring agencies has been regular and effective. About 100 general mineral analyses are available annually or bi-annually from the various water supply agencies, water companies, or other public supplies such as the State parks or farm labor camps. Improved cooperation with the larger private and other public agencies involved in groundwater monitoring improve the effectiveness of the existing programs at minimal additional cost.

8. All three county-level monitoring agencies are operating efficient and reliable sampling programs. In addition, all three have demonstrated abilities to conduct special investigations where requested and to quickly monitor existing or potential critical water quality conditions.

9. A modest monitoring system for nonpoint source pollutants can be implemented using 530 wells in the two counties. Because most of these wells are already sampled for water levels or partial mineral analyses, additional costs would be limited to approximately $20,000 per year.

SUMMARY RECOMMENDATIONS

1. A monitoring program such as that outlined in Table XII-1 should be established at the earliest possible date.
2. Sample collection should be performed by all three county agencies, who have demonstrated abilities to carefully and consistently perform these tasks; analyses can effectively be performed by SCCWMO and MCFCWCD.
3. Monitoring programs in the vicinity of major landfills should be designed and established as soon as possible. Funding for these programs should be provided in the general operating budget of each facility and include sampling and analysis of leachate, groundwater and surface water at least twice per year.
4. Regional government may be best able to facilitate nonpoint source monitoring by establishing a water quality data bank incorporating the findings of the primary agencies and the results obtained from a nearly equal number of wells regularly sampled by water suppliers, health departments, and cooperating private indivuduals, ranchers, and food processors.

APPENDIX I

RECOMMENDED MONITORING PROGRAM

INTRODUCTION

A systematic monitoring program is required for effective implementation of a nonpoint source groundwater pollution control plan and for evaluating the effectiveness of the applied control measures. Fortunately, groundwater quality monitoring programs have been carried out in the AMBAG 208 Region over a considerable time period. However, the level of coverage, frequency of sampling and the number of parameters analyzed has not been adequate in all parts of this region. In this appendix, a brief review of existing groundwater monitoring programs is undertaken and recommendations are made on the scope of the required future monitoring programs.

Santa Cruz County Watershed Manager's Office (SCCWMO) is in the process of independently developing a groundwater monitoring program. If it is available in time, it will be included in this appendix in lieu of, or as a supplement to, the program now suggested for Santa Cruz County.

A nonpoint source monitoring program is properly oriented toward determining the distribution of contaminants. Such a program should logically adopt a strategy of monitoring a limited number of known contaminants over as broad an area as possible. Two important complementary approaches exist, and are being applied on a limited basis in the Monterey Bay area. The first method is based on eco-systemic monitoring, in which a comprehensive set of physical, chemical and biological characteristics are determined on a regular basis at a limited number of locations.

The second method is based on dispersion monitoring, in which the movement of contaminants is traced from a source area. Restricted programs adopting these methods are presently being implemented within the AMBAG region by the educational institutions and by the Geological Survey and the Department of Water Resources. Monitoring by the Santa Cruz County Watershed Manager's Office and the Monterey County Flood Control and Water Conservation District embody aspects of both approaches to varying degrees.

Limited water quality monitoring is also carried out by waste dischargers as mandated by the Regional Water Quality Control Board. In this regard more comprehensive groundwater quality monitoring at and near municipal, industrial and animal husbandry waste disposal sites is required to enable more accurate determination of the impact of these waste sources.

RELATIVE IMPORTANCE OF THE WATER QUALITY PROBLEMS

The relative priorities assigned within the monitoring program depend in large part on the local uses of water and the principal nonpoint sources in the vicinity. Thus, the monitoring requirements for each sub-area in the AMBAG 208 region vary to some extent and are discussed separately.

Different quality standards apply to water supplies in Santa Cruz and Monterey Counties depending on the intended use for such supplies. Suitability for agricultural use is generally gaged by standards developed by the University of California Agricultural Extension Service. These are intended solely as guidelines to growers; however, it would be difficult to sustain crop production

with "injurious" irrigation water supplies. Domestic and municipal supplies are governed by several sets of standards. The Environmental Protection Agency (EPA) has established mandatory limits for the concentrations of certain trace elements in drinking water supplies. Recommended maxima have also been set for other trace elements and contaminants, plus more common salts such as chloride, sulfare, and nitrate, and total dissolved solids. These maxima are to be complied with unless no better source of supply is available. The State Department of Health has mandated "administrative standards" for public water supplies which parallel the EPA regulations, but differ slightly in the amount of threshhold concentrations. Finally, federal standards for water used in processing canned, dried, and frozen fruits and vegetables are essentially identical to those for public water supplies, but also restrict the level of calcium and alkalinity in the water source.

Water is regarded as impaired in the AMBAG region when the concentrations of any constituent exceed the required or recommended limits. Table I.-1 lists water quality problems by severity of occurrence in each sub-area. If a substantial proportion of the wells within each water quality sub-area are affected by excessive concentration of one or more elements or if public health or economic activity in the sub-area may be adversely affected, the quality problem is ranked as significant and widespread. Occasional or local restrictions reflect a lower frequency of excessive concentrations, one which may also be limited in severity or geographic distribution. Sub-areas in which a water quality problem is suspected, or potentially expected to occur in the near future, or in which only isolated samples have shown excessive concentrations of undesirable constituents are designated as limited or potential problem areas in the above table.

Table F-1 Groundwater Quality Problems by Sub-area and Recommended Monitoring Densities[a]

Sub-basin and Sub-area	Regional Groundwater Problems: Intrusion	Nitrates	Salts Buildup	Landfill Leachate	Naturally-Occurring Salts	Trace Elements	Existing Partial	Existing General	Groundwater Monitoring: Total Required Partial	Total Required General	Additional wells required Partial	Additional wells required General	Special Monitoring
Santa Cruz Sub-basin	xx	xx		xx	xx	?	10	0	15	6	5	6	City landfill
San Lorenzo Sub-basin													
Upper East-side		xx			xxx	xx	0	5	0	11	0	6	
Lower East-side		xxx		xx	xx	x	0	15	0	15	0	0	Ben Lomond Landfill
West-side		xx					0	5	0	5	0	0	
Soquel-Aptos Sub-basin													
North of Zayante Fault		x			xx	?	0	few	d	d	d	d	
South of Zayante Fault		x				x	0	20	d	d	d	d	
Pajaro Valley													
North	x	xx				xx	55	20	55	23	0	3	
Northeast					xxx	xx	0	1	0	1	0	0	
East		xxx	xxx			xxx	18	3	18	6	0	3	Domestic use of
Southeast	x	x				xx	e	e	e	e	e	e	degraded water
South	xx	xxx[f]	xx[f]	xx			25	20	30	20	5	0	Elkhorn Road area
Southwest	xxx	xxx	xxx			x	25	15	25	18	0	3	
Prunedale													
East of San Miguel Rd		xx	x		x	x[e]	26	few	26	15	0	15	
West of San Miguel Rd	xxx	xx	x	?	?	xxx							
Salinas Valley													
Pressure 180	xxx	xxx	xx	?		x	140	40	140	65	0	25	
Pressure 400	xxx	xxx	x		?	xx							
East	x	xx	?		xxx	x	50	5	50	25	0	25	
Fairbay		xxx	xx		xxx	xx	35	10	35	25	0	15	See text
Arroyo Seco Cone		xx			x	x	25	5	25	20	0	15	
Upper Valley		xxx	xx	xx	xxx	xxx	40	5	40	25	0	20	
Marina-Fort Ord	xxx	xx		?		x	10	10	10	10	0	0	
Carmel Sub-basin													
Canyon del Rey	xxx	xxx[g]			xx	x	3	5	5	10	2	5	
Carmel Valley					xx	x	30	5	30	8	0	3	Schulte Rd. area
El Toro Sub-basin		x			xxx	?	30	0	30	8	0	8	
Total[h]							520	190	530	320	12	130	

[a] Numbers are approximate, usually rounded to nearest 5; existing general mineral analyses are slightly underestimated to allow for bi-annual sampling by the smaller water suppliers.

[b] See text for discussion of problems on a regional basis. The estimated severity of each problem within an individual sub-area is schematically indicated as:

- xxx Present in a significant number of wells, or is a significant threat to public health or economic development in a sub-area, based on present standards.
- xx Present in a limited number of wells, or seriously constrains the usage of water by several individual landowners.
- x Present in isolated wells, or considered to be an imminent potential problem.
- ? May be present; not determined due to lack of data.

[d] Monitoring recommendations for Soquel-Aptos to be developed in on-going USGS study of area. Not included in totals.

[e] Southeast area sampling wells included in Prunedale totals.

[f] San Andres Road and northern Springfield areas only.

[g] Reported in past; recent data not available.

[h] Totals rounded downward to reflect overlap between adjacent sub-areas.

EXISTING AND PROPOSED MONITORING PROGRAMS

Recommended locations and densities for the required monitoring program in the AMBAG region are discussed below for individual sub-areas.

Pajaro Valley

The Pajaro Valley has been divided into six water quality sub-areas, Figure I-1.

North Sub-area. The North sub-area extends from the San Andreas Fault to the coast, north of Watsonville. A sub-area with few and relatively minor water quality problems, the North unit has local concentrations of nitrates and other agricultural and human waste contaminants exceeding recommended limits. Intermittent salt water intrusion occurs near the coast. Levels of cadmium, chromium, and other trace elements are locally excessive in wells developed in the Aromas sands, especially south of Highway 1. Leachate from the Buena Vista and possibly the Watsonville landfills could contaminate the nearby water bodies.

The SCCFCWCD monitors water levels, conductivities, and chloride concentrations in about 55 wells within the sub-area and has compiled intermittent data for about a dozen more wells. The City of Watsonville, SCCWMO, and small water companies are the primary sources of information on groundwater composition, streams and the numerous lakes are sampled periodically by the city and by SCCWMO.

The north sub-area requires more concentrated monitoring than the sub-areas previously discussed due to the more intense agricultural use, the high susceptibility of the permeable substrate to contamination, and the regional significance of the

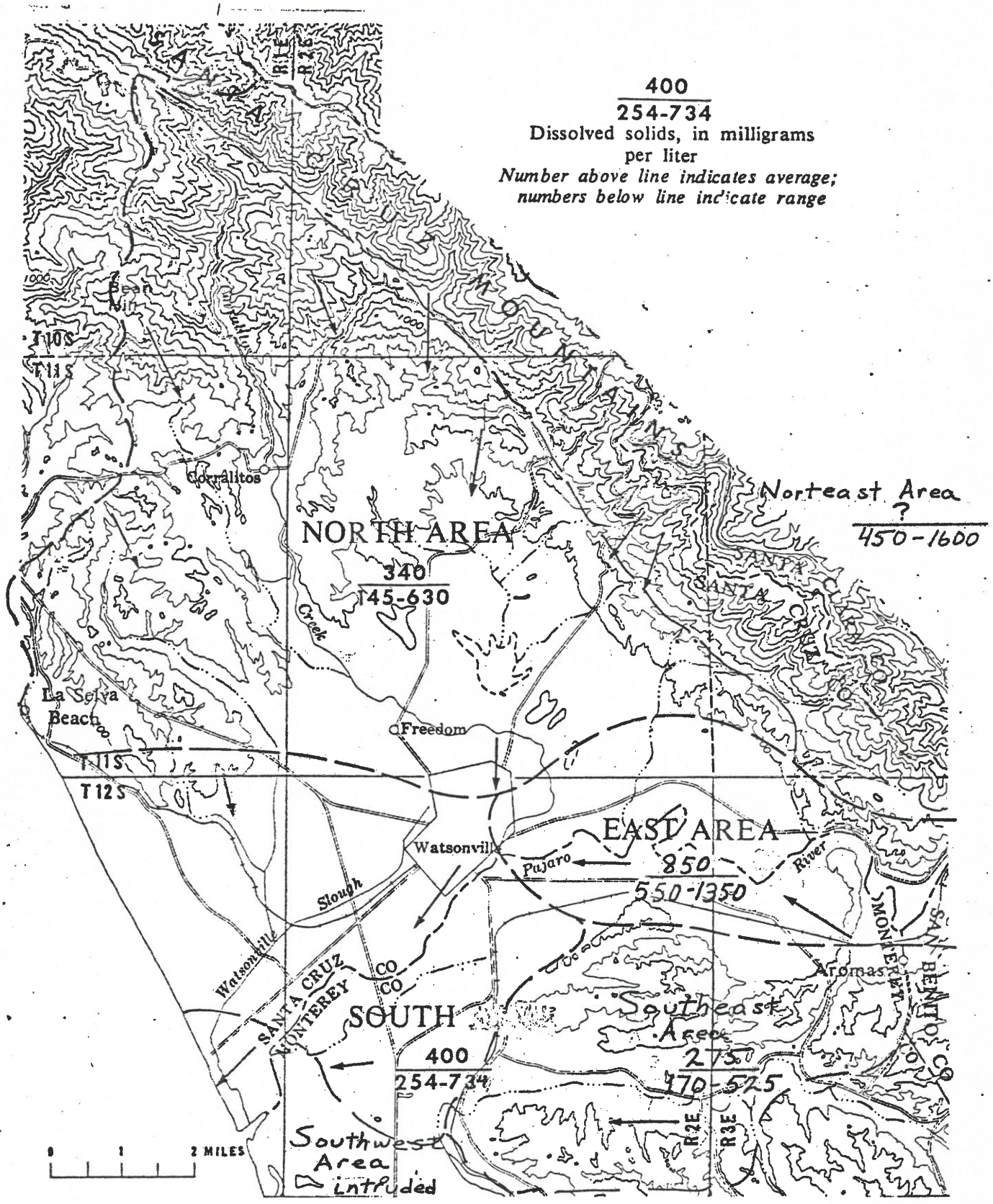


Figure I-1 Groundwater Quality Areas in the Pajaro Valley (Modified from Muir, 1972).

recharge to the groundwater system. Additional wells in the recharge areas should be added to the SCCWMO network in the Pleasant Valley and White Road areas, with emphasis on analysis for chlorides, nitrogen species and sodium. The range of constituents analyzed in the SCCFCWCD monitoring program might alternatively be expanded to include nitrates and other selected ions, in a number of wells, particularly in the western part of the area. More intensive monitoring of the leachate plume from the landfills is required once the full extent of the plume has been defined.

Northeast Sub-area. Comprising the uplands between the San Andreas Fault Zone and the crest of the Santa Cruz Mountains, this sub-area has primarily ranching and dispersed residential land uses. The principal water quality limitation is the apparent high concentration of salts in the near-surface waters. The extent of this problem remains to be fully defined.

Existing monitoring is limited to one well near the fault at the head of Green Valley Road, and to occasional stream samples obtained by SCCWMO. Annual sampling of the city's Browns Valley diversion gives some indication of the quality of water emanating from the northern part of the sub-area.

The extent of salty formation waters will be gradually defined as new wells are developed in this area. Unless this is shown to be very widespread, the need for additional monitoring is not apparent in this area.

East Sub-area. Most of the Pajaro Valley lowlands between Watsonville and Chittenden Pass fall within the East sub-area. The principal water quality problems are high - and increasing - total salts, nitrates, chlorides, sulfates, and boron. Concentrations of the last four constituents are among the highest reported in Santa Cruz County. Calcium content and alkalinities, occasionally exceed recommended limits for food processing. Boundaries of the sub-area are essentially the limits of the degraded "Class II" waters in both counties. At present, only the outer fringe of the Class II water body reaches Watsonville and Pajaro, and it appears to be contracting. Expansion of this boundary could lead to severe economic hardships.

Existing groundwater monitoring consists of water level measurement and chloride and conductivity analyses in 18 wells by the two county flood control districts, 3 wells are sampled semi-annually by SCCWMO, and an intermittent sampling program is carried out by DWR that generally includes about a dozen wells every three or four years. Water quality is measured at two locations on the Pajaro River by SCCWMO.

Monitoring should address the dual problems of quantifying salt buildup in the groundwater and observing the fluctuations of the Class II groundwater body. Present sampling programs are generally adequate for the first objective, although SCCFCWCD should consider adding two wells south of Riverside Road and west of Murphy's Crossing to their program. Defining the fringe of the Class II groundwater body is somewhat more demanding. In Monterey County the present sampling grid is sufficiently dense; broadening the scope of the analyses to include boron, sulfate, chloride, alkalinity, sodium and calcium should prove desirable. In Santa Cruz County,

groundwater level contours indicate potential movement of degraded water toward Tynan Lake. It would be advisable to add one well to the SCCWMO network between their existing monitoring stations at wells 12S/2E-3A1 and 12S/3E-6K8, and one or two general mineral determinations along San Juan Road to the MCFCWCD network.

Finally, the public health aspects of using East sub-area groundwater for domestic consumption may merit attention by the counties. Analyses for sodium, chlorides, sulfate, nitrate, arsenic and hardness might be recommended to private parties concerned about their drinking water quality.

Southeast Sub-Area. The sub-area includes the sand hills south of the Pajaro bottomlands. The primary water quality problems are occasional excessive nitrates and isolated high concentrations of heavy metals.

Existing groundwater monitoring is limited to several wells sampled by MCFCWCD and to annual samples taken by the water purveyors for Los Lomas and Aromas. The state irregularly samples several wells. Surface waters are very limited in extent, and regular sampling is neither practiced nor needed.

Existing sampling appears to be generally adequate except for the absence of observation wells near the Lewis Road land disposal facility. Supplementary monitoring for this area is discussed in the Prunedale sections of this chapter.

South Sub-area. The South sub-area extends from Watsonville to the coast between Buena Vista Road and the continuous area of intrusion in the southern and western Springfield district. Principal water quality problems include salt water intrusion, nitrate buildup, and potential contamination from agricultural percolate and landfill leachate.

A dense network of monitoring wells presently exists, sampled by the two county flood control districts, DWR and SCCWMO. Additional data are available from water supply wells of the City of Watsonville, the State park, and from individual growers and processors. Water quality in the sloughs and tributaries is monitored by SCCWMO; little data are available for the lower Pajaro River.

The existing monitoring program is adequate with two exceptions. There is a need to check for potential contamination from landfill leachate, which should be incorporated into the management programs for the Watsonville and Buena Vista sites. Also, five additional wells in the Elkhorn Road area between Los Lomas and Pajaro should be tested for chlorides to monitor possible salt water intrusion from the head of Elkhorn Slough.

Southwest Sub-area. This sub-area includes the continuous intruded zones of southern and western Springfield and the Pajaro mouth areas. Major groundwater quality problems are caused by salt water intrusion, excessive nitrates, and general salt buildup even in areas of marginal intrusion.

Many wells near the coast are monitored by DWR or MCFCWCD. Along some roads, every available well is checked.

The existing monitoring program is adequate for establishing changing salt concentrations. Additional data on nitrate concentrations especially along Highway 1, would be strongly desirable. This information may be collected by expanding the scope of the MCFCWCD analyses to include nitrates.

Prunedate Area

Most nonpoint source pollution problems in the Prunedale area have been considered in discussions relating to the Salinas Valley or Pajaro Valley areas. However, due to its unique environment and settlement pattern, this area merits separate consideration. Water quality problems differ east and west of San Miguel Road;both share high nitrate loadings from rapidly expanding strawberry cultivation and residential development.

In the area to the east of San Miguel Road, principal problems include slight increases in nitrate and general salinity due to pumpage from deeper wells. Elevated concentrations of arsenic, below the mandatory limits, occur in isolated wells.

In the area to the west of San Miguel Road, salt water intrusion is the dominant quality constraint on water use. Nitrates in several wells are excessive and are increasing slowly. A number of wells yield waters with cadmium and chrome concentrations near or above the recommended limits for drinking water supplies.

MCFCWCD monitors 26 wells for chloride content and conductivity, and nearly twice as many for water levels.

These wells are almost evenly divided on either side of San Miguel Road. DWR intermittently monitors groundwater quality at several locations. Only four wells have significant chemical histories. Surface flows are generally ephemeral, and have been sampled only very occasionally.

Monterey County's monitoring program has been invaluable in

describing the dynamics of flow in the area's unusual "sandy substrate" hydrology. Expansion of the program to include determinations of nitrate and sulfate concentrations in at least half of the Prunedale wells is recommended.

Santa Cruz Coastal Sub-Basin

This sub-basin includes the coastal drainages north of the City of Santa Cruz. Primary water quality problems are salt water intrusion, leachate contamination, and possibly nitrate buildup in agricultural or rural residential areas. Present monitoring includes 10 wells along the coast analyzed for chloride and total salts by SCCRCWCD and 5 wells in Bonny Doon and along the coast sampled and fully analyzed semi-annually by SCCWMO. Surface waters are sampled regularly by SCCWMO and the City of Santa Cruz Water Department; semi-annual samples are collected and analyzed by DWR for Scott Creek.

Several additional wells should be monitored for chlorides, especially in lower Scott Creek and the Majors Creek area. A monitoring program below the city solid waste disposal site should also be established to evaluate the water quality impact of leachate flow from this site. In all other respects, present groundwater monitoring is minimally sufficient to detect quality changes in this lightly-populated area.

San Lorenzo Sub-Basin

Several groundwater sub-areas have been identified in this sub-basin.

Upper East-Side Sub-Area. This sub-area includes all land north of the Zayante Fault. Principal water chemistry problems

are contamination of the streams and adjacent alluvium by failing septic tanks, storm runoff, and groundwater salination related to high-salt formation waters. Regular monitoring is limited to five wells sampled semi-annually by SCCWMO. Irregular but generally frequent sampling of the surface water is carried out by a number of agencies for a variety of constituents. SCCWMO has recently implemented a regular program of sampling and analysis on the San Lorenzo River and many of its tributaries.

The extent of water quality problems in the upper San Lorenzo Valley is presently being ascertained as part of the county's proposed Growth Management Plan. Additional information is required on the distribution of salty waters and on the occurrence of contaminating bacteria and nutrients in the alluvial groundwater bodies before a suitable monitoring program can be designed. It is tentatively estimated that an additional six wells sampled at least twice a year will be needed. The stream sampling program recently initiated by SCCWMO is adequate for monitoring of surface water quality.

Lower East-side Sub-area. Included are areas in the San Lorenzo Valley south of the Zayante Fault and east of the San Lorenzo River, the Branciforte Creek and Arana and Rodeo Gulch watersheds. The primary water quality problems, among the many occurring in this sub-area, are contamination from septic tank effluent; migration of salts, nutrients, and heavy metals from land and wastewater disposal sites; mineralization of groundwaters; and general pollution related to storm runoff.

The existing water quality sampling network is well-developed, but distributed amongst many agencies. Five wells are sampled

semi-annually by SCCWMO. Other groundwater sources are tested at least annually by the four principal water purveyors. A number of industrial and commercial wells are also sampled regularly. Most major streams are sampled regularly by SCCWMO, and DWR tests the San Lorenzo River, and Zayante and Branciforte Creeks approximately semi-annually. Surface water quality in the lower San Lorenzo and Loch Lomond are closely monitored by the City of Santa Cruz Water Department. Presently, SCCWMO is systematically sampling the coastal lagoons; recommendations for a regular testing program are to be developed as a part of this effort.

The existing data collection system is generally considered adequate. Groundwater sampling points are well-distributed. Interagency cooperation is essential to the effective use of the limited data available for this sub-area.

West-side Sub-area. Lands lying between Empire Grade and the San Lorenzo River are within the West-side sub-area. Septic tank effluent is the main nonpoint source in this area. Surface and groundwater salt concentrations are generally very low throughout the subarea.

At present, developed springs sampled by water purveyors are the principal source of groundwater quality data for the area. Surface waters are sampled by SCCWMO and by some water suppliers.

Current levels of monitoring are deemed adequate. Any special investigations of the effects of septic tanks in the valley- and canyon-floor areas might be most suitably accomplished in this area, as there are few other sources of chloride, nitrate, and other salts contributed by septic tanks.

Soquel-Aptos Sub-basin

The differing water quality problems of the northern and southern portions of this area are noted in Table I-1. The entire sub-basin is presently being studied by the U.S. Geological Survey.

Seven wells are currently sampled on a regular basis by SCCWMO. The Soquel Creek County Water District tests nearly twice as many wells which it operates near the coast. Five wells are monitored by the Central Santa Cruz County Water District. Extensive one-time testing has been carried out as a part of the USGS investigation. Soquel Creek is sampled semi-annually by DWR; SCCWMO samples Aptos Creek and some tributaries of both major streams.

Recommendations for future water quality monitoring in this area are to be developed in the on-going USGS investigation.

Salinas Valley

Five groundwater sub-areas were distinguished in early investigations of the valley: Pressure, East, Forebay, Arroyo Seco Cone, and Upper Valley. The Forebay and Upper Valley areas have similar water quality problems, and are considered jointly. Sub-area boundaries are shown in Figure I-2.

Pressure Sub-area. The Pressure sub-area nearly coincides with the valley floor north of Gonzales and west of Highway 101. The primary water quality problems are extensive salt water intrusion, increasing nitrates and sulfates concentrations in several areas, and salt buildup in the Blanco Road area. All major problems appear more severe in the upper (180-foot) aquifer than in the lower (400-foot) aquifer. The upper aquifer has boron concentrations of 0.8-1.0 in the Blanco-Nashua area; excessive amounts of cadmium-chrome-vanadium group occur in the lower aquifer within 3 miles of the coast.

Table I-2 Groundwater Quality Problems by Sub-area and Recommended Monitoring Densities[a]

Sub-basin and Sub-area	Regional Groundwater Problems: Intrusion	Nitrates	Salts Buildup	Landfill Leachate	Naturally-Occurring Salts	Trace Elements	Existing: Partial	Existing: General	Groundwater Monitoring: Total Required: Partial	Total Required: General	Additional wells required: Partial	Additional wells required: General	Special Monitoring
Santa Cruz Sub-basin	xx	xx		xx	xx	?	10	0	15	6	5	6	City landfill
San Lorenzo Sub-basin													
Upper East-side		xx			xxx	xx	0	5	0	11	0	6	
Lower East-side		xxx		xx	xx	x	0	15	0	15	0	0	Ben Lomond Landfill
West-side		xx					0	5	0	5	0	0	
Soquel-Aptos Sub-basin													
North of Zayante Fault		x			xx	?	0	few	d	d	d	d	
South of Zayante Fault		x				x	0	20	d	d	d	d	
Pajaro Valley													
North	x	xx				xx	55	20	55	23	0	3	
Northeast					xxx	xx	0	1	0	1	0	0	
East		xxx	xxx			xxx	18	3	18	6	0	3	Domestic use of
Southeast	x	x				xx	e	e	e	e	e	e	degraded water
South	xx	xxx[f]	xx[f]	xx			25	20	30	20	5	0	Elkhorn Road area
Southwest	xxx	xxx	xxx			x	25	15	25	18	0	3	
Prunedale													
East of San Miguel Rd		xx	x		x	x	26	few	26	15	0	15	
West of San Miguel Rd	xxx	xx	x	?	?	xxx							
Salinas Valley													
Pressure 180	xxx	xxx	xx	?		x	140	40	140	65	0	25	
Pressure 400	xxx	xxx	x		?	xx							
East	x	xx	?		xxx	x	50	5	50	25	0	25	
Fairbay		xxx	xx		xxx	xx	35	10	35	25	0	15	See text
Arroyo Seco Cone		xx			x	x	25	5	25	20	0	15	
Upper Valley		xxx	xx	xx	xxx	xxx	40	5	40	25	0	20	
Marina-Fort Ord	xxx	xx		?		x	10	10	10	10	0	0	
Carmel Sub-basin													
Canyon del Rey	xxx	xxx[g]			xx	x	3	5	5	10	2	5	
Carmel Valley					xx	x	30	5	30	8	0	3	Schulte Rd. area
El Toro Sub-basin		x			xxx	?	30	0	30	8	0	8	
Total[h]							520	190	530	320	12	130	

[a] Numbers are approximate, usually rounded to nearest 5; existing general mineral analyses are slightly underestimated to allow for bi-annual sampling by the smaller water suppliers.

[b] See text for discussion of problems on a regional basis. The estimated severity of each problem within an individual sub-area is schematically indicated as:

- xxx Present in a significant number of wells, or is a significant threat to public health or economic development in a sub-area, based on present standards.
- xx Present in a limited number of wells, or seriously constrains the usage of water by several individual landowners.
- x Present in isolated wells, or considered to be an imminent potential problem.
- ? May be present; not determined due to lack of data.

[d] Monitoring recommendations for Soquel-Aptos to be developed in on-going USGS study of area. Not included in totals.

[e] Southeast area sampling wells included in Prunedale totals.

[f] San Andres Road and northern Springfield areas only.

[g] Reported in past; recent data not available.

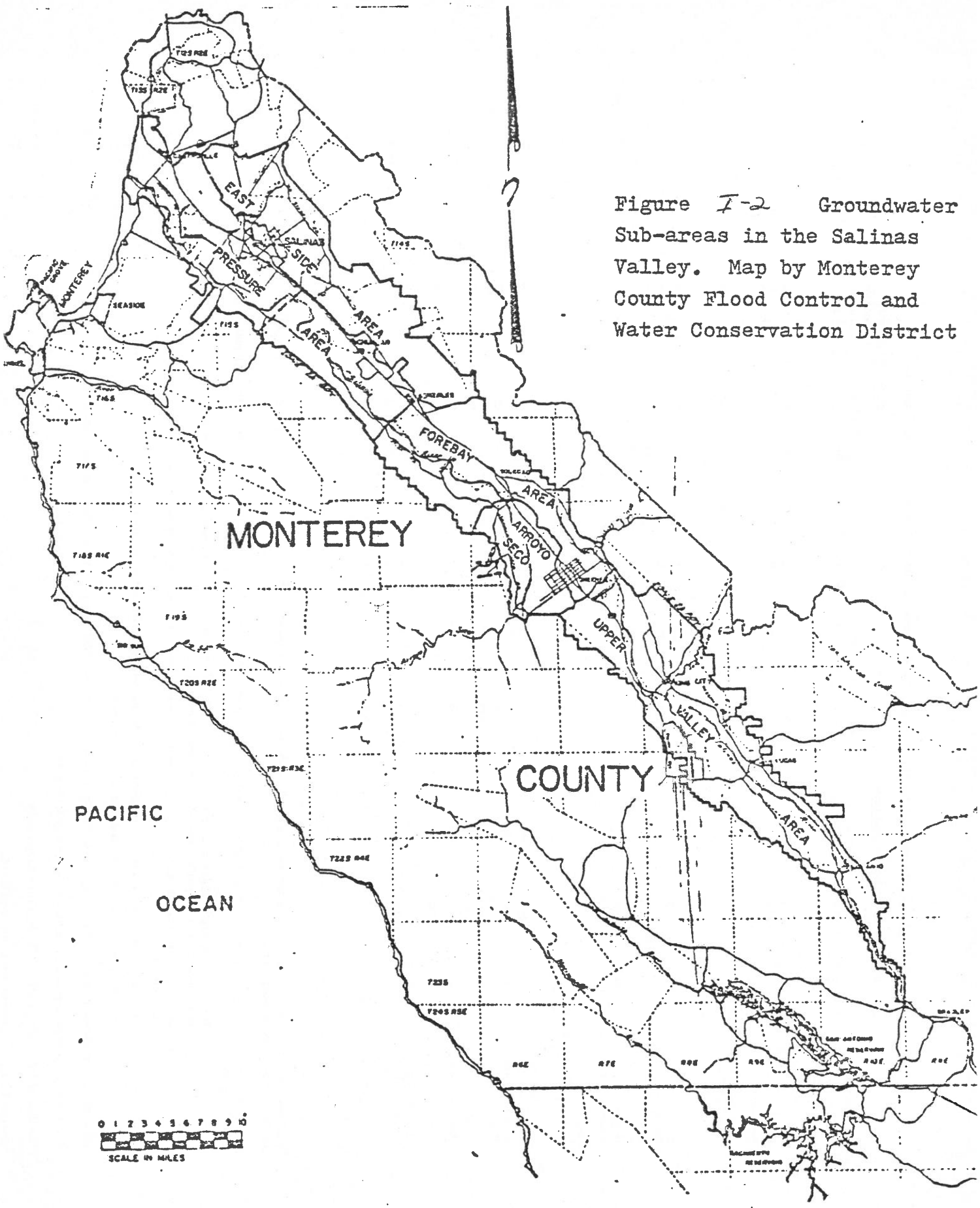


Figure I-2 Groundwater Sub-areas in the Salinas Valley. Map by Monterey County Flood Control and Water Conservation District

The existing groundwater monitoring program consists largely of the approximately 140 wells which the MCFCWCD samples for chlorides and conductivities. The DWR sampling program is somewhat irregular, and emphasizes areas near the edge of the intrusion wedge. Each year, DWR conducts general mineral analyses for a varying number of wells. Annual or bi-annual analyses for general mineral composition are available from about 40 wells belonging to water purveyors and labor camp operators. Cumulatively, about half of all monitored wells are perforated in each aquifer. Surface water quality is monitored in detail by USGS at the Spreckles station on the Salinas River, and MCFCWCD obtains samples three times per year from the Main Reclamation Drain.

The present sampling program amply monitors the extent of salt water intrusion. Data on excessive nitrates has therefore been obtained mainly from analyses by water suppliers and DWR Laboratory reports. These wells tend to be concentrated near the urban areas; some areas of high groundwater nitrates may not yet be known. At present, nitrate buildup is documented primarily from increasing concentrations in several individual wells. Repeated sampling of a regular set of wells is desirable to more realistically quantify the extent of changing nitrate concentrations. Densities of at least 4 wells per township for each aquifer sustained over 10 years are required for meaningful results; densities averaging 8 wells per aquifer per township are recommended, including existing wells. Samples from these wells should be analyzed at least on an annual basis. Analyses should minimally include conductivities and

concentrations of sodium, chloride, sulfate, nitrate, and alkalinity. The salts buildup in the Blanco Road area can be monitored using the same network, supplemented by the analyses for the public water supply wells which are located in the vicinity of this area.

East-Side Sub-Area. The alluvial fans with unconfined groundwater comprise this sub-area; it extends eastward from Highway 101 and northward from Soledad. Principal water quality problems in the alluvial fan areas east of Highway 101 include increasing and sometimes excessive concentrations of nitrates and salts. Increases in sulfates, chlorides, and other salts may have been associated with a 20-60 foot drop in the water levels during the past three decades. Boron concentrations are occasionally high, especially in the southern part of the area. Intruding salt waters may possibly enter the East-Side pumping depression in the foreseeable future.

MCFCWCD monitors the conductivities and chloride concentrations in over 50 wells in this sub-area. DWR used to be quite active in both sampling and analysis; however, the most current listing of mineral analyses by the state includes no samples since summer, 1972.

Very few groundwater analyses are carried out by public water systems or farm labor camps in this area.

Monitoring well densities in this area should be similar to those suggested for the Pressure sub-area, or at least 4 and preferably 8 wells per township. A uniform distribution of wells may help define whether nitrates are entering from the Pressure and

Forebay sub-areas or if they percolate downward from the land surface. Chemical analyses should include conductivity, chloride, and nitrate determinations. Inclusion of sulfate, alkalinity, and sodium determinations would also be advisable.

Forebay and Upper Valley Sub-areas. Including all the valley floor areas south of Gonzales exclusive of the Arroyo Seco Cone, these two sub-areas share principal water quality problems of increasing and sometimes excessive nitrates, and high natural salinities, particularly near the eastern side of the valley. Excessive concentrations of boron and cadmium occur with increasing frequency toward the south. Leachate from waste disposal facilities near King City is a potential source of localized groundwater quality problems.

MCFCWCD monitors about 70 wells in the two areas for conductivity and chloride concentrations. A number of public water supply and farm labor camp wells are tested annually. While DWR has historically been active in monitoring wells in this area, few analyses have been done since mid-1972. The Salinas River is sampled regularly by the U.S. Geological Survey at Soledad and Gonzales. Tributary streams are sampled infrequently.

Monitoring for nonpoint source constituents should supplement the regular MCFCWCD program and emphasize several sets of wells. Regular sampling should occur near the edges of the communities of Gonzales, Soledad, Greenfield, and King City, including two wells each on the uphill and downhill edges of the towns. In addition, four monitoring wells should be sampled twice per year near the municipal wastewater percolation ponds or land application sites. Two of these wells should be located upgradient and the other two

should be located downgradient from these waste disposal sites. These should complement a set of monitoring wells in the agricultural areas spaced roughly uniformly at a density of at least four wells per township. A minimum of two wells located downhill from the major feedlots should be monitored to determine long-term groundwater impact of these operations. All wells should be analyzed for conductivity, chloride, sulfate, sodium, alkalinity, boron, and nitrate.

Individual domestic water supply wells in the area south of Greenfield and west of the river should be occasionally sampled and analyzed for cadmium content.

Arroyo Seco Cone Sub-area. The Arroyo Seco Cone is an area of generally good water quality. The principal water quality constraint is the high and growing concentration of nitrates in the lower parts of the fan. Salty formation waters are also a local difficulty, often including sulfates well above recommended limits. Geologic conditions are favorable for the potential occurrence of excessive cadmium.

Present monitoring includes about 10 wells sampled annually by MCFCWCD for chlorides and conductivity. Regular sampling by DWR was somewhat more sparse than in adjacent sub-areas, and has also been curtailed during the past five years. The Arroyo Seco is only very rarely sampled for its mineral composition.

Monitoring of groundwater should emphasize the lower cone. In all other respects, the program outlined for the Forebay-Upper Valley sub-areas can be applied to the cone, including the four wells around the outskirts of Greenfield and the suggested wells for monitoring wastewater disposal sites. Periodic sampling of Arroyo Seco, when possible, is also advisable.

Marina-Fort Ord Area

Salt water intrusion and nitrates are the primary water quality constraints. Nitrate concentrations may be decreasing slightly, possibly as a result of sewering the Marina area in about 1970.

Ten wells are monitored by MCFCWCD, and are analyzed annually for conductivity and chloride concentrations. The Marina County Water District presently operates five wells, which are analyzed annually for general mineral content. Fort Ord draws its supplies from a number of wells, but limited data are available on water quality monitoring at the base.

The present monitoring program in this area is considered adequate provided data from Fort Ord are incorporated in reports on other ongoing programs.

Carmel Sub-Basin

Two developed groundwater sub-areas have been distinguished in the Carmel sub-basin: Canyon del Rey and the Carmel Valley.

Canyon del Rey. This area, including the Arroyo del Rey drainage and Seaside, is affected primarily by salt water intrusion, high-salt groundwaters and possibly nitrates.

Present monitoring is based primarily on annual analyses made by water purveyors. MCFCWCD monitors three wells in the upper watershed for chlorides and conductance.

A minimum of 15 wells should be monitored for either general or partial mineral analyses, inclusive of annual analyses required of the water suppliers.

Carmel Valley. Water quality problems are limited essentially to excessive sulfate and iron concentrations in the Schulte Road area and generally high salt concentration in the consolidated sediments.

About 25 wells in the valley are regularly monitored by MCFCWCD. More intensive investigation is presently underway as part of a special MCFCWCD study of groundwater in the valley. Periodically, DWR samples wells extensively in this area. Regular analyses are presumably made for wells in the Schulte Road and general mid-valley area developed as part of the Monterey Peninsula water supply system. Mineral analyses of the Carmel River at Robles del Rio are made regularly by DWR.

The present monitoring program is adequate for most portions of the valley, assuming continued periodic DWR sampling. More intensive investigation of the Schulte Road problem area is strongly indicated, requiring perhaps 10 observation wells sampled for conductivity, pH, chloride, sulfate, alkalinity, iron, and manganese.

El Toro Area

Boundaries of the area essentially coincide with the El Toro Creek watershed. The principal water quality constraint in the El Toro Creek watershed is the excessive concentrations of salts in local groundwater. Nitrates are known to occur in elevated concentrations, but their distribution in the area is not adequately known.

MCFCWCD monitors over 30 wells in the watershed, analyzing samples for conductivity and chloride content annually. No other significant water quality testing takes place in this area.

Residential development is rapidly expanding in this area. Increasing salt concentrations following intensifying groundwater development and rising nitrate levels are potential problems to be addressed by the monitoring program. Approximately

eight annual analyses for conductivity, nitrate, chloride, sulfate, alkalinity, sodium, calcium, iron, and manganese could adequately indicate any significant water quality problems.

COST AND PHASING OF THE MONITORING PROGRAM

The proposed monitoring program includes two distinct components (Table I-2). First, mineral and trace element analyses currently prepared annually or bi-annually for water purveyors, other public suppliers such as state parks and labor camps, industrial and food processing concerns, and individual land owners should be compiled. Secondly, general mineral data for 130-150 wells should be obtained. In most cases, suitable wells are presently being sampled for conductivities and chloride contents. Most wells would be sampled annually; some wells in Santa Cruz County and problem-oriented monitoring wells in the Salinas Valley would be sampled semi-annually. Partial trace element analyses are indicated for 10-20 percent of the wells.

Costs related to the first component are estimated at $3000 per annum, requiring one engineer-month.

Estimated costs related to the second component are almost entirely analytical expenses, and include overhead and data handling charges. If conducted by the three primary county water quality agencies, additional sampling costs would be negligible.

It is likely that perhaps 20 percent of the samples would be analyzed by the Department of Water Resources; the estimates of annual analytical costs are therefore somewhat higher than those likely to be encountered.

Table I-3: Cost Estimates for the Proposed Monitoring Program

Component	Cost Basis	Annual Cost
Data collection from secondary sources of water quality data	1 engineer-month	$ 3000
Expanded analyses and additional monitoring	approx. 180 physical and mineral analyses @ $80	$14400
	approx. 12 partial mineral analyses @ $10	$ 120
	approx. 25 partial trace element analyses @ $30	$ 750
	incidental operating expeses	$ 750
Subtotal:		$16020
Total:		$19020

The proposed monitoring program emphasizes the use of wells presently sampled by the primary agencies. An estimated 20-30 existing wells not previously part of their sampling programs would be required. One-time costs incurred in arranging access, determining well properties, and describing and monumenting the new monitoring facilities are estimated to be $2000.

The monitoring program can be implemented at the time the non-point source control plan is adopted. The program does not require any substantive new equipment or capital costs, and heavily utilizes the experience of existing agencies. Many sub-areas have not been regularly sampled by primary agencies for their mineral content since 1972 or 1973. Significant water quality problems have developed in some of these sub-areas in the interim. There exists a need for and the ability to begin monitoring at the earliest possible date.

Appendix J-1

Septic System Training Program

Preliminary determination of the format and content of the training program was made by AMBAG's septic system Technical Advisory Committee.[1] The group agreed that development of a course for presentation in the AMBAG area could serve as a pilot for state-wide training. Course content may vary from region to region. Involvement of local authorities will lend credibility to a state-administered course and will ensure that it is locally relevant.

There was agreement on a two day (16 hour) course length as a target and it was suggested that the program be presented over a period of time to allow participants to best absorb information. The course may be organized into half day units and presented in both Monterey and Santa Cruz Counties to minimize staff travel time.

The use of community colleges as a forum and funding source for the course was discussed. Hartnell has indicated that the college is extremely flexible in tailoring courses to the needs of special groups and state funds will not be available unless all other funding sources are explored. This option will be considered further to ensure that use of community colleges will not prove excessively restrictive.

The proposed program syllabus (below) was agreed to be appropriate. Presentation of information on alternative systems will be useful if instruction is limited to proven alternative systems.

It was agreed that SWRCB, State Health Department and AMBAG would jointly develop a more detailed proposal for program implementation. A first step will be development of a questionnaire for distribution to county staffs, to determine what the perceived training needs are.

Proposed Syllabus

1. Soils and Parent Materials

    soil genesis
    soil horizons
    soil texture
    soil structure
    soil classification

[1]TAC met April 28, 1978, at AMBAG offices. Represented were Santa Cruz Watershed Management and Environmental Health, Monterey Environmental Health, Regional Water Quality Control Board, State Water Resources Control Board and State Health Department.

2. Surface and Subsurface Drainage

   topographical effects
   movement of fluids in soils
   seasonal watertables

3. Cumulative Effects

   hydraulic interference
   groundwater effects

4. Tools and Techniques

   geological surveys and maps
   soil surveys and maps
   field determination of texture
   field determination of structure
   field determination of plasticity
   determination of seasonal water table
   indicator plants
   evaluating the site

5. Septic Systems

   principles
   treatment of effluent in soil
   causes of failure
   prevention of failure

6. Alternative System Overview

7. Field Demonstration

Appendix J-2

Proposed Demonstration Program
Sidewall Raking During Trench Excavation

1. Document effects of smearing in selected soils under various soil/moisture conditions using percolation test.

2. Document effects of absorption system roughening in selected soils under various soil/moisture conditions using percolation test.

3. Develop procedure for documenting and,if possible, quantifying soil smearing in the field.

4. Evaluate initial percolation test data. Refine field test study plan and develop initial design of raker teeth.

5. Construct trenches under various soil/moisture conditions with and without the use of raker teeth -- inspect and evaluate sidewall condition.

6. Develop final design criteria for raker teeth. Develop guidelines for use.

Appendix J-3

San Lorenzo Valley Onsite Wastewater Disposal Zone
Proposed Minimum Service Arrangements

The goal of this program is to provide regular inspection of septic systems and needed maintenance and repair. The recommended service arrangements are designed to require minimal administrative overhead. Homeowners will pay costs of maintenance directly to servicemen. Savings to homeowners should be possible through reduced fee schedules. Costs of maintenance will be offset by extended system life. The SLVCWD, or the County, working through CSA#12, will provide administration.

The administering agency will require that all spetic systems within the Onsite Wastewater Disposal Zone be inspected and serviced as necessary, at a regular interval. A clerical mechanism (list of homeowners, "tickler" file, notification procedure) will be instituted to implement the program. An annual service fee will cover administrative costs.

The zone will contract for services from private operator(s), at a pre-agreed fee schedule. The homeowner will be notified that his system is scheduled for a maintenance inspection. He may contract with a service technician of his choice and submit documentation of service to the Zone or, by not taking action within a stated time, may have his system serviced by the Zone's contractee, at the pre-set fee schedule. The homeowner will then be billed for services. Non-payment will result in a property lien, assessed with annual taxes.

Criteria for determination of whether a septic tank needs pumping, or other service is required, will be set as part of the Zone's contract with the service technician. The base inspection interval will be three years, but may be modified according to specific criteria, such as condition of tank when first inspected and time since last cleaning, size of tank, and number of people in the household.

This program is intended to minimize the staffing requirement of the Zone. An estimated two man-months, distributed between administrative and clerical staff, will be needed for initial contract development and negotiation and institution of clerical procedures. An estimated two man-months per year will be required to maintain the program.

Appendix J-4

Generalized Strategy for Coordination Between Onsite Disposal Management and Facilities Planning

The Step One Facilities Planning process is usually when onsite disposal management is considered. Local costs are minimized, and it is to the advantage of funding agencies and local taxpayers to thoroughly evaluate onsite management as a potentially effective and economical wastewater management option.

The following tasks should be included in facilities plans when onsite disposal management is an option.

1. Evaluate Existing Systems

   current water quality/health problems
   historical failure rate
   location of failures
   causes of failures (design, construction, siting, maintenance)
   conformance of systems to current standards
   lot sizes of failing systems
   lot sizes in study area

2. Evaluate Environmental Constraints

   geology
   soils
   topography
   water table
   surface water
   aquifer recharge areas

3. Determine Groundwater Impacts

   document aquifer characteristics
   project ability of aquifer to absorb nitrate and TDS emissions without significant groundwater deterioration
   estimate population using septic systems which would exceed aquifer's capacity to absorb pollutants

4. Determine Onsite Disposal Management Needs

rehabilitation of existing systems
maintenance of existing systems
switching dual fields
density controls
water conservation
new design criteria
alternative onsite systems - design, construct, and maintain
monitor water quality, system performance

5. Cost Estimates and Cost-Effectiveness Analysis

APPENDIX J-5

Coordination of Land Use and Wastewater Management Planning

In the past, wastewater planning mostly referred to the provision of sewage treatment facilities when water quality problems became sufficiently severe. There are two drawbacks to this approach. First, water quality problems may occur long before population densities make central sewerage economical and second, an ad hoc approach to the provision of sanitary facilities makes comprehensive planning difficult because growth tends to follow facilities. Early scattered growth may lead to water pollution, which requires a sewage system, which commits the area to further unplanned and perhaps undesirable growth. The money and environmental costs of this pattern of development are high.

An alternate approach involves integrating wastewater disposal considerations into land use planning at an early date to avoid land uses which can lead to chronic patterns of failure. Development should be guided so as to allow long-term reliance on onsite disposal, or to permit economical service by central collection, community onsite systems, package plants or others of the technical options available. Of course, wastewater management is only one of the issues involved in comprehensive planning.

A general methodology for coordination of planning is outlined below. Emphasis should be placed on rapidly developing areas.

1. Assemble Data Sources

   geological maps and surveys
   soil maps and surveys
   failure records
   known problem areas
   existing constraint analyses
   water table data
   groundwater quality data

2. Display Constraints in Useable Form

   geology
   soils
   topography
   water table
   flood plains
   aquifer recharge areas

3. Determine Groundwater Effects (See Note)

4. Project Maximum Buildout(See Note)

   determine location and density of development which could be adequately accomodated by onsite disposal

5. Inventory Wastewater Managment Options

   identify land-use implications of each

6. Formulate Land Use Plans

   optimize wastewater management and other land-use considerations

Note - Determination of what level of development using septic tanks can be accommodated in a given area without harming groundwater can be made through an analysis of groundwater basin characteristics. According to AMBAG'g groundwater consultant, such analysis involves identifying subsections of the basin within which localized effects can be projected and determining absorption capacity of soils and vegetation, loading factors, denitrifications, recharge and withdrawal, and well perforation depths. Results would be accurate to within ± 25%.

For the San Lorenzo Valley, Carmel Valley, and North Monterey County areas, such studies would cost $20-25,000 each. In the case of North Monterey County the cost would be about $6,000 less because of work which has been done already as part of the 201 study for that area. Septic system groundwater impact studies would best be conducted during 201 facility planning to minimize local costs.

APPENDIX J-6

Pre-Sale Inspection of Septic Systems

Abstract

No legal or administrative impediments to implementation of a pre-sale inspection program for septic systems have been identified and the costs, both public and private, would be reasonable. Inspection could be either by private contractors or county personnel. Such a program would have significant water quality and consumer protection benefits.

Information to be Provided by Inspection

1. sketch map showing location and indicating depth of tank
2. estimated size of tank
3. structural integrity of tank
4. status of solids buildup in tank
5. indications of failure or marginal operation
   a. sluggish plumbing
   b. abnormally high liquid level in tank
   c. pooling of effluent in absorption system as indicated by inspection risers or backflow into tank
   d. pooling of effluent, saturated soil, or lush vegetation in vicinity of absorption system
6. description of work done
7. remarks and recommendations
8. date of inspection; name and business address of inspector

Reasons for Inspection

- Regular maintenance is necessary for the reliable operation of septic systems, but many new homeowners are unaware of this and are ignorant of the condition, location, or even existence of their systems. An inspection report would impress them with the need for maintenance and would allow them to provide it most conveniently and economically.

- An inadequate septic system can lower the value of a property and cause a new homeowner considerable expense and inconvenience. Although it is not possible to guarantee a system's future performance, inspection will assure that the unit is structurally sound, that it is working properly at the time of inspection, and that the tank has been cleaned (or is not in need of cleaning) in order to minimize future problems. Inspection may also indicate the future reliability and maintenance needs of the system by providing information on the size of the tank and the extent of pooling of effluent in the absorption system. Inspection should take place within a stated time period previous to the home sale -- say, one year.

Legal Issues

Opinions as to the legal feasibility of requiring pre-sale inspections of septic systems have been received from Santa Cruz Assistant County Counsel and from AMBAG's legal consultant. There is little doubt that it is within the powers of a county or city to require such inspections. Article XI, Section 7, of the California Constitution, gives local governments broad authority to make and enforce "...sanitary and other ordinances not in conflict with general law". There are only two general or state laws pertaining to septic systems (Health and Safety Code Sections 6950 et seq and 25000 et seq), neither of which pre-empts or conflicts with pre-sale inspections. The Porter-Cologne Water Quality Act, Section 13002, also specifically provides that local governments may impose "...conditions, restrictions, or limitations with respect to the disposal of waste..." so long as they do not conflict with state mandates.

Pre-sale inspections of septic systems would be analogous in many ways to the termite inspections which are now provided for residential property by Section 1099 of the Civil Code. As with termite inspections, enforcement would be through the mortgage and title clearing process. If necessary, the Daily Abstract of home sales could be checked for violations. Failure to provide the required inspection information (unless waived by the buyer) could make the seller liable in the event of subsequent system failure.

The issue of possible governmental liability with regard to pre-sale inspections has been raised. This does not seem to be a problem. Both counties currently conduct pre-sale inspections when called upon by lending agencies which require such inspections (VA, FHA and some private institutions) and no liability problems have been encountered. No liability problems have been encountered by the City of Monterey which administers a pre-sale inspection program for code violations. As stated above, inspection can provide

much valuable information but cannot be construed as guaranteeing trouble-free operation into the future.

Administrative Issues

A primary concern is the administrative burden which a pre-sale inspection program would place on county staffs. Inspections could be conducted either by county personnel (in which case the programs would be financed by inspection fees), or by private contractors, as is the case with termite inspections. Preliminary calculations indicate that costs for county inspection would not be prohibitive. In Santa Cruz County, the Board of Realtors indicates there are about 2000 homes using septic systems sold annually, with sales occurring at an even rate throughout the year. Assuming two inspectors, each costing the County $25,000 per year (including overhead and benefits); an average inspection time of slightly less than two hours; and 228 working days per year, the 2000 systems could be checked at a cost of $25 each. Doubling this figure to be safe indicates that an inspection fee of $50 would fund the program. It is assumed that the homeowner would be responsible for locating and uncovering his tank as is the practice with the existing San Lorenzo Valley Inspection District program.

Figures on the number of rural homes sold annually in Monterey County are not readily available. Assuming that these homes are sold once every seven years (the State-wide average), about 2500 inspections would be required per year. Using the same assumptions as above, two and a half person-years per year would be required to provide this service. Costs per inspection would be as above.

Although inspection by county personnel seems feasible, provision of service by private contractors can also be considered. One advantage would be to provide employment in the private sector, in an existing industry. Also, this might reduce costs to the homeowner, who in many cases will call in a private contractor anyway to locate and uncover the tank. On the other hand, if inspection were provided by members of the septic tank maintenance industry (the logical group to provide this service), a conflict of interests is possible, in that the inspector might be tempted to recommend the tank be pumped merely to augment his fee. If this potential abuse is considered a serious problem, the county environmental health officer could issue appropriate criteria for the certification of inspectors.

Another possible mechanism for protecting home buyers would require an "average repair cost escrow type account" be established to set money aside for a period of six months to deal with septic system problems that might arise. This would have the advantage of providing positive consumer protection

for the six month period. There would, however, be no prevention of failures through needed maintenance, and the new homeowner would not be educated as to his septic tank's maintenance requirements or location. The costs and legal feasibility of this proposal have not been documented.

APPENDIX J-7

HOMEOWNER'S SEPTIC TANK GUIDE

Reviewers of AMBAG's earlier reports on septic systems agreed that public information would be an important part of the plan. A key component of the information program is a manual of practical information for the homeowner. (The text of the Homeowner's Guide is printed at the end of this Appendix.)

Reasons For The Guide

Most rural homeowners are unfamiliar with the operation and maintenance of their septic systems. The tank and absorption field are buried, usually with no indication of their existence. Few owners are aware of even the exact location of their disposal device and an "out of sight, out of mind" attitude prevails. Former city dwellers especially may consider onsite disposal a mysterious process for which they feel no responsibility. These factors make voluntary maintenance of septic systems unlikely until an overt failure can no longer be ignored. In the absence of regular maintenance, absorption field failures occur, causing the homeowner unnecessary inconvenience and expense and leading to health hazard and water quality problems.

An inexpensive and effective way to focus a public information program is a pamphlet which clearly explains the importance of proper septic system care and how to provide it, in a format which can be widely distributed.

Objectives of the Guide

1. Provide clear information on how septic systems work.
2. Emphasize the economic and environmental benefits of maintenance.
3. Provide guidelines for detecting and diagnosing problems.
4. Provide directions for inspection.
5. Explain how a septic tank is cleaned.
6. Provide general information on septic system care.
7. Indicate costs of maintenance and of failure to maintain.
8. Indicate sources of further information.

Organization and Content

The sections of the manual are listed below, with a summary of each.

- Why This Guide? Introduces the concept of maintenance and indicates the economic and environmental consequences of septic system failure.

- How a Septic System Works Describes fundamentals of septic system operation.

- What Can Go Wrong? Describes the common causes of system failure, provides guidelines for troubleshooting and indicates repair costs.

- Cleaning Your Septic Tank Emphasizes the importance of regular septic tank cleaning, describes the process of locating and pumping the tank, and gives general costs.

- Other Maintenance Tips Gives tips on septic system management.

- Inspecting Your Tank Describes a procedure for determining when a tank needs pumping.

- Illustrations -- diagrams will be used to illustrate the text of the manual.

- Maintenance Record -- provides space for maintenance notes.

- Indentification of distributor -- provides space for anyone cooperating in the distribution of the manual to identify themselves.

Format

Size: 8-1/2" x 4-2/3" bookfold
(three-fold of 8-1/2" x 14" sheet)

Stock: 65 lb. text weight

This format can be used as a self-mailer. Space for a postage permit number and address will be provided. Size of illustrations and other details of format will be determined during the typesetting process.

Production Costs

Costs for paper, press run and folding will be about $260 per 10,000 pamphlets. (About 2-1/2¢ per pamphlet.) AMBAG will assume one-time typesetting costs and printing costs for an initial 1000 copies (about $135).

Distribution Alternatives

Widespread distribution of the Homeowners Guide is essential if it is to be effective. Promising opportunities for distribution are described below.

- The Septic Tank Permit Process The manual could be issued with septic tank permits. This method is administratively simple, under control of the agencies involved with septic system regulation and directly linked with the regulatory process. However, there is no assurance that a builder receiving the permit will transmit it to the eventual homeowner. Also, only new installations would be reached by this distribution process.

- Direct Mailing Copies of the manual could be sent to all addresses in non-sewered sections of the region. Alternatively, direct mailings could be used in selected areas where other modes of distribution were lacking, or where thorough coverage is particularly important. Media announcements publicizing a mailing would reduce the number of pamphlets discarded as "junk mail". The cost of a regional mailing (addressing and postage for about 31,000 addresses) through a commercial service would be about $580 for Monterey County and $515 for Santa Cruz County.

- Septic System Maintenance Contractors Distribution by cooperating servicemen would be directly tied to the maintenance process and would put the manual in the hands of homeowners who would be most receptive to it. It will be advantageous to service companies to distribute the manual because it emphasizes the importance of their service and would provide an opportunity for advertising their firm.

- Realtors Cooperating realtors could place the manual with new homeowners, who may be ignorant of septic system maintenance requirements. The manual will alert prospective home buyers to the possibilities of a malfunctioning system and will encourage pre-sale inspections. Realtors can provide better service to their clients through use of the manual and can use it as a means of advertising.

- Through "Piggyback" Mailings With Utility Bills Joint mailings would be cheaper than single-purpose direct mailing, although coverage would be restricted to the service areas of cooperating utilities. Utilities would benefit from improved public relations as a result of performing a public service.

- Homeowners Associations, PTA's, Service Clubs, Granges, 4-H Groups, and Other Civic Organizations Enlisting the cooperation of local groups could provide good coverage of particular areas and would encourage participation in septic system management at the community level.

- Agricultural Extension Service The Agricultural Extension is administratively geared to the distribution of information, and is known in rural areas as a source of practical advice.

- Commercial Establishments Placing brochures in rural shopping centers and other places of business would bring them to the attention of septic system owners and would make them immediately available. Merchants would be providing a public service to their customers and could use the manuals as a means of advertising.

- Over the Counter Distribution by Environmental Health and Other County Agencies Environmental Health Agencies will provide primary distribution of the manual. Display in county offices would bring the pamphlet to the attention of many rural dwellers.

- Handout by Field Sanitarians Environmental Health employees are in a position to place the manuals where they are most needed and should play a key role in a public information program.

- Media Announcements Maximum public awareness of the availability and utility of the manual should be sought through press releases, public service announcements and classified advertising. Media with a substantial rural audience would be providing useful information to their readers, listeners, or viewers, and would be encouraged to provide feature coverage.

Distribution Recommendations

- Method

  An initial region-wide distribution via direct mailing is recommended, supplemented wherever possible by "piggyback" mailing with utility bills. A direct mail campaign will ensure thorough distribution of the manual at reasonable cost, and will increase public participation in the formulation of AMBAG's forthcoming recommendations by creating an awareness of, and an interest in, the septic system study.

- Funding

  Distribution and printing costs for a regional mailing will amount to about $1150 for Monterey and $1050 for Santa Cruz County. "Piggyback" mailings could reduce these costs, especially in Santa Cruz County. Expenses should be paid out of general funds.

- Action

  The following actions would implement the above recommendations:

  1. AMBAG -- contact utilities, districts and other billing entities and inventory those which will cooperate in distribution.

  2. AMBAG -- plot service areas of cooperating billing entities and of sewer agencies on county maps for use by a commercial direct mail firm which would develop mailing lists for the remaining areas.

  3. Administrative Officers of Santa Cruz and Monterey Counties -- jointly administer production and distribution of manual in cooperation with county environmental health agencies and assisted by AMBAG.

4. Boards of Supervisors of Monterey and Santa Cruz Counties -- approve disbursement of funds adequate to cover costs of a regional mailing, plus printing costs for an additional ten thousand copies of the manual for subsequent distribution.

HOMEOWNERS SEPTIC TANK GUIDE

(What you always wanted to forget about your septic system, but couldn't afford to)

SANTA CRUZ ENVIRONMENTAL HEALTH

701 Ocean Street, Santa Cruz
425-2341

1430 Freedom Blvd., Watsonville
728-2206

MONTEREY ENVIRONMENTAL HEALTH

1270 Natividad Road, Salinas
757-1061

1200 Aguajito Road, Monterey
373-0111

1001 Division Street, King City
385-4824

WHY THIS GUIDE?

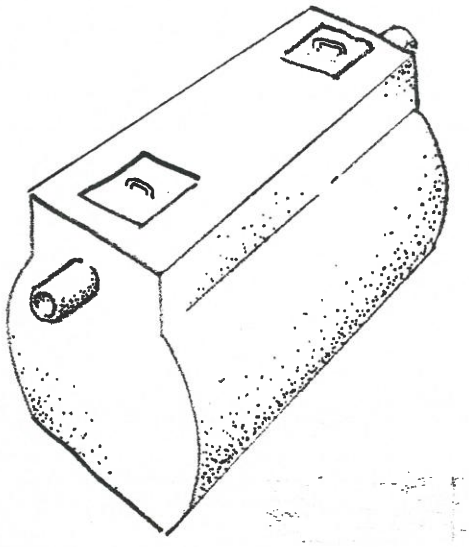
One quarter of the people living in the Monterey Bay region use septic tank systems. Well designed and well built septic systems, in suitable locations, can provide effective, low-cost treatment for wastewater but, like any other device, they must be properly maintained. When homeowners don't know how to care for their systems, expensive failures can result. When a septic system fails, plumbing backs up, sewage is forced up to the ground surface and causes health hazards, and natural water bodies may become polluted. The homeowner may have to install a new leach field and if many systems fail, a community may have to construct a sewer system. It makes good economic and environmental sense to take care of your septic system. This manual tells how.

HOW A SEPTIC SYSTEM WORKS

Septic systems are buried in the ground near the home they serve. They have two main parts: the septic tank and a soil absorption system ("leach field"). The tank receives the wastewater from the home and removes most of the solids so that the liquid can easily soak into the ground without clogging the soil pores.

The Septic Tank

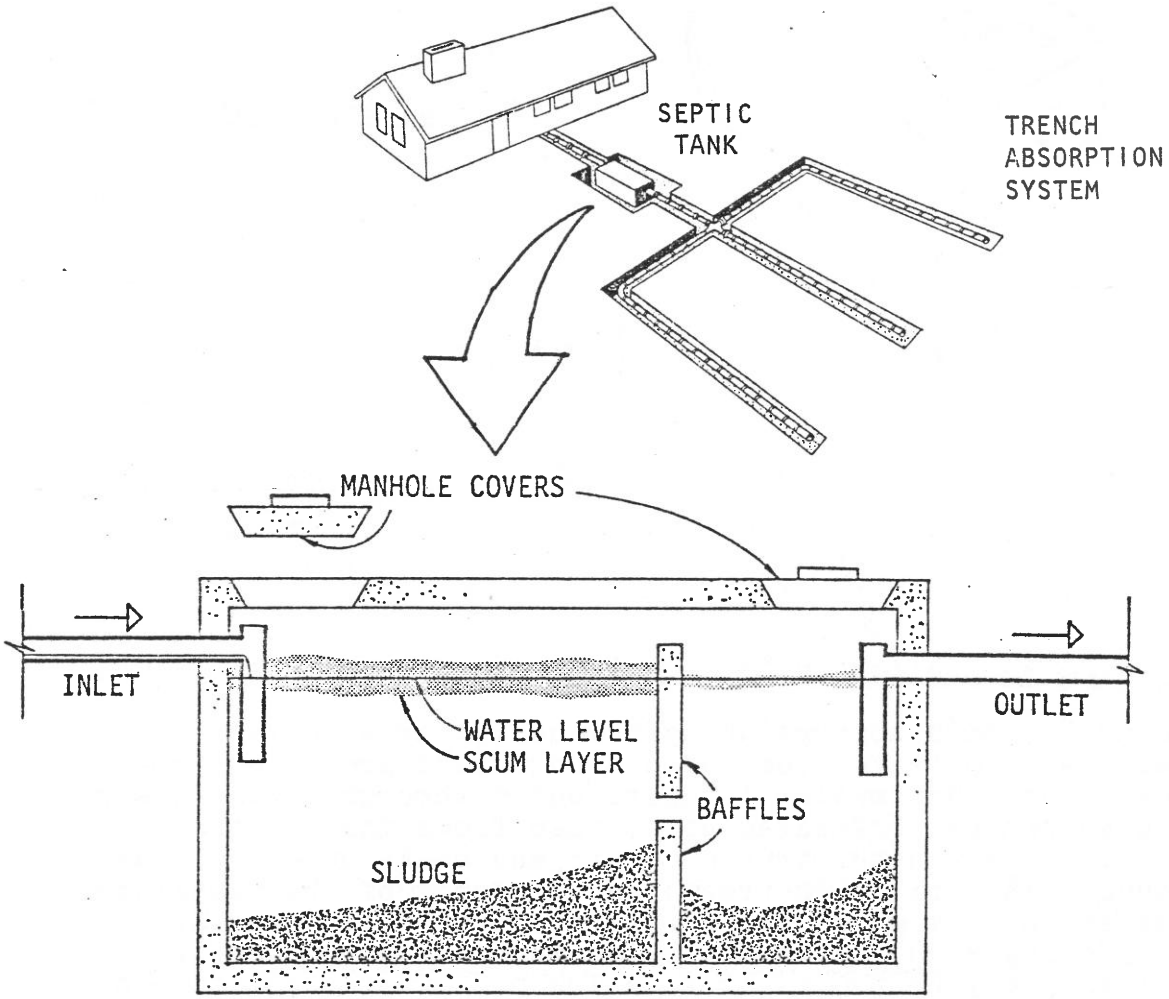
The tank holds 1000-1500 gallons and may be made of concrete, fiberglass or redwood. A typical tank is about eight feet long and five feet deep and wide. It has interior baffles to help it retain solids and manholes on the top to permit inspection and cleaning. Heavy solids form a sludge at the bottom of the tank and grease and light material form a scum near the top. Bacteria in the tank can break down some of the solids. Wastewater overflows from the clear space between the scum and sludge layers to the soil absorption system.



Typical Septic Tank

The Soil Absorption System

The most common absorption system design is a series of trenches five or ten feet deep. Deep pits are also sometimes used. Wastewater is distributed throughout the absorption system by perforated pipe, then flows through the gravel placed in the trench or pit and soaks down into the ground. The soil both treats and disposes of the wastewater. Most soils do a good job, but very coarse soil (sand or decomposing rock) may not provide much treatment, and very fine soil may be too tight to allow much wastewater to pass through.


SEPTIC
TANK
TRENCH
ABSORPTION
SYSTEM
MANHOLE COVERS
INLET
OUTLET
WATER LEVEL
SCUM LAYER
BAFFLES
SLUDGE

WHAT CAN GO WRONG?

There is little that can go wrong with the septic tank itself. Redwood or fiberglass tanks sometimes suffer structural damage, but problems much more often occur in the plumbing or in the absorption field. Blockages in the pipe between the home and the tank can usually be cleared with plumbers' tools. If your plumbing backs up suddenly under normal use in dry weather, this is probably the problem, but some pipe blockages, caused by tree roots entering the pipe, or detergent buildup, can develop over a period of time.

More serious difficulties occur when the absorption system becomes clogged. The most common cause of absorption system clogging is carryover of solids from the septic tank. When sludge and scum are not periodically removed from the tank, they accumulate until they are washed out into the absorption field. Eventually either the perforated distribution pipe or the pores in the earth walls of the soil absorption system become clogged. A leach field which is only partially clogged may work well during dry weather, but when winter rains soak the ground, or when household use is high, the system becomes overloaded and a failure becomes apparent. You may be able to clear blockages in the distribution pipe, but once the soil becomes clogged it will no longer accept the wastewater and you will need a new absorption system (average 1977 costs $750 - $1200.) It's a lot cheaper to keep your system working well through proper maintenance.

You can suspect a malfunctioning absorption field if

- there are odors, persistent wet spots or lush vegetation in the area of your system
- your plumbing becomes sluggish over a period of time
- your plumbing becomes sluggish when it is being heavily used or during wet weather
- problems persist even though your tank has been recently cleaned

CLEANING YOUR SEPTIC TANK

The most important step to achieving trouble-free septic system operation is to remove the solids from the tank before they start to wash out into the absorption field and before the system starts showing signs of failure. Remember, once the soil absorption system is clogged, cleaning the tank will do little good -- you will need a new leach field.

The easiest way to care for your system is to consult a professional. Septic tank servicemen are listed under "Septic Tanks" in the yellow pages of the phone book. They are exper-

ienced in locating, uncovering, and maintaining septic systems. If the location of your septic tank is unknown, the serviceman will find it by probing with a metal rod, following the pipe line from the house, or listening for the noise a plumber's snake makes when it hits the tank inlet. He will dig a hole to uncover the manholes in the top of the tank and then inspect the sludge and scum levels. If necessary, the serviceman will pump the contents of the tank into a tank truck for disposal at an approved site. Be sure that both compartments of the tank are emptied, and that all the solids -- not just the liquid -- are removed. Pumpers usually charge $60 - $85 for pumping a tank and about $25 per hour for locating and uncovering it. As with any service, it often pays to get several estimates.

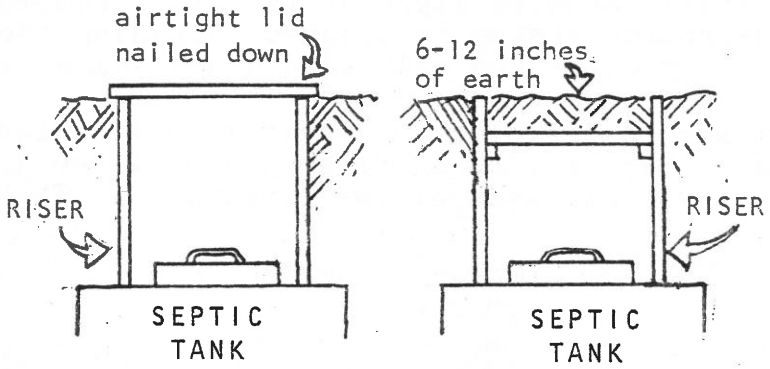
Frequency of Cleaning

How often your tank will need pumping depends largely on the size of the tank, the number of people in the household, and the kinds of appliances you use. As a general rule, tanks should be cleaned every three years, but the period can vary considerably. The best procedure is to inspect your tank every year and have it pumped as necessary. If your system hasn't been checked in two years or more, have it inspected now. You have a considerable investment in your septic system -- don't take a chance on needing an expensive leach field replacement. Some servicemen have maintenance programs under which they will regularly check your tank and recommend needed maintenance. If you want to inspect your tank yourself, see the directions at the end of this manual.

OTHER MAINTENANCE TIPS

Record the location of your septic tank. Once you have found your tank, make a diagram showing exactly where it is. Keep one copy with your deed and another where it will be handy.

Another way to save future searching and digging is to install risers from the septic tank with access lids at or near ground level. Risers can be constructed out of redwood or can be made from a section of large pipe. To prevent odor problems, seal the lids airtight with a non-hardening caulking compound, or recess them under 6 to 12 inches of earth. Secure the lids so they won't be a hazard for curious children.



Minimize the liquid load. The less wastewater you produce, the less the soil will have to absorb. Water conservation will help your septic system.

- Repair leaky fixtures. Check your toilet by dropping food dye in the tank and seeing if it shows up in the bowl without flushing.
- Wash clothes only when you have a full load. Avoid doing several loads in one day.
- Take short showers instead of baths. Don't turn the shower on all the way, and turn off the water while lathering.
- Use a water saving device in your toilet tank and don't flush unnecessarily.
- Don't let water run while washing teeth, hands, vegetables, dishes, etc. Use a stoppered basin.
- There are too many other ways of conserving water to list here. Be alert for other sources of water saving ideas.
- Don't let rain water drain onto the leach field area from higher ground.

Minimize the solids load. A good rule is: don't use your septic system for anything that can be disposed of some other way. The less you put into your tank, the less often it will need pumping.

- Avoid using your garbage disposal. Compost scraps or throw them out with the trash.
- Collect grease in a container near the sink rather than pouring it down the drain.
- Non-degradable items, such as disposable diapers and sanitary napkins, are especially harmful. Minimize the paper products you flush and use a good quality toilet tissue that breaks up easily when wet.

Ordinary use of household chemicals won't hurt the bacteria in your system, but don't use excessive amounts and don't use your tank to get rid of oils, paint thinner or other poisonous liquids.

Septic tank additives -- chemicals, bacteria, enzymes, etc., do not help solids break down in the tank and will not reduce the need for pumping. (Experiments with chemicals to unclog absorption fields are encouraging, but no proven products have reached the market.)

Keep heavy vehicles off your system -- underground pipes and soil porosity can be damaged.

If your absorption system fails -- you will have to replace it, but don't completely abandon the old system. Make provisions to enable you to switch back to the old field. Given a few years to dry out, the old field will be partially renewed and you can begin alternating between fields. The rest periods will help keep both systems in good condition.

If you have a dual system -- don't forget to switch fields regularly.

If your absorption system has inspection pipes -- check them regularly. Pooling of effluent in the system is an early indication of problems.

INSPECTING YOUR TANK

If you want to save some money, you can inspect your own tank. The best practice is to check both scum and sludge levels, but the following simplified procedure works well in most cases. Once you have uncovered the manholes, inspection only takes a few minutes.

To inspect, uncover your tank and remove the manhole cover at the inlet end. If you have a redwood tank, pull up a few boards at the end. Use a shovel to push the scum mat away from the side of the tank, so you can estimate its thickness. If the mat is a foot or more thick -- have your tank pumped now.

Replace the manhole cover and wash off the shovel and your hands as a sanitary precaution.

APPENDIX K

Gloria Resource Conservation District
Third Quarter Report
(w/cover letter to EPA)

ASSOCIATION OF MONTEREY BAY AREA GOVERNMENTS
MAIL ADDRESS: P.O. BOX 190, MONTEREY, CALIFORNIA 93940 • TELEPHONE (408) 624-2117
OFFICE LOCATION: 23845 HOLMAN HIGHWAY, SUITE 227

March 29, 1978

Mr. David Hanline
Environmental Protection Agency
215 Fremont Street
San Francisco, Ca. 94105

Dear Dave:

Attached are two copies of the Gloria Resource Conservation District's third quarter report under the AMBAG contract.

It is interesting to note (from Table A) that over the past five years the combined input of money from the federal, county, and local governments into the GRCD programs has averaged nearly $120,000 per year, about 2.7 man years of technical time per year, and resulted in the installation of about $2,162,000 worth of conservation measures per year by land owners in the district.

Since this kind of work and activity has not prevented the problems of erosion and sediment from occuring or increasing, you can get a rough idea of the magnitude of the problem we are facing when it comes to implementation.

As I have told you, Andy Foskett (the technician hired under the GRCD contract) has been very busy and well received by farmers in the area. His progress report shows the number of contacts he has made, the allocation of his costs (salary by time), the cost and amounts of applied conservation measures, acres benefitted, and some of the other activities in more detail.

If I could add a benefit column (dollars and cents, to land owners and taxpayers) to Table A, I would really have a product to use to make sales pitches to the Counties and Cities, for funds for staffs for themselves and for RCD's, but I don't have enough information yet.

Sincerely,

Jim Barrett

JB/ea

PROGRESS REPORT

CASE STUDY OF TECHNICAL ASSISTANCE AND
MATCHING FUNDS FOR NON-POINT POLLUTION CONTROL

GLORIA RESOURCE CONSERVATION DISTRICT

May 15, 1977 to February 15, 1978 (9 Months)

This report presents an up to date summary of the Conservation Technicians activities, (Scope of services item #3) a tabulation and/or report on the inventory of district records, (Scope of services item #5) and a map of the major problems of erosion from wind and water, sedimentation, and of salts. (Scope of services item #4).

During this time frame, the SCS (due to some retirements, transfers, and a death) had a serious shortage of trained personnel in the area. At the same time the King City office was confronted with an expanded workload. (Due to the emergency drought program, the Marble Cone fire, and the recent flooding). It is interesting to note that the Technician was able to provide needed training for new and inexperienced SCS people, and to help complete the additional work.

Table A shows:

- Cumulative Conservation Practices applied to 1976 (Approx. 40 yrs.)
- Cumulative Conservation Practices applied 1972-1976 (5 yrs.)
- Annual Conservation Practices applied 1972-1976 (5 yrs.)
- Technical Time required per practice unit.
- Technical Time for practices 1972-1976 (5 yrs.)
- Cost (value) per practice unit
- Cost (value) for practices 1972-1976 (5 yrs.)

Table B shows sources and amount of funds

GRCD-Technician-208

Progress Report: From May 16, 1977 to March 1, 1978

1. Contacts - 210 ea.
2. Technical Costs
   (a) Administrative - $2,550.00
   (b) Contacts - 3,950.00
   (c) Planning & Design - 5,065.00
   (d) Installing - 815.00
   (e) Other (Performance Check ACP Work - 1,340.00

3. BMP's Cost & Units Performed
   (a) Farmer 92,195.08
   (b) Costshare (ACP) 79,469.98

   (1) Stockwater Pipeline - 118,824 L. Ft.= 22.5 Mi.
   (2) Tanks & Troughs 74 ea.
   (3) Spring Development 6 ea.
   (4) Stock Wells 5 ea.
   (5) Tree Planting 320 ea.
   (6) Cross Fencing 10,197 L. Ft. = 1.93 Mi.
   (7) Irrigation Pipeline 13,207 L. Ft. = 25. Mi.
   (8) Land Leveling 153 Ac.
   (9) Wastewater Sump 1 ea.

4. Acres Benefitted 59,426 Ac.
5. Sprinkler System Design 5 ea.
6. Storm Diversions 4 ea.

7. To Control a serious flooding problem for King City - Recommended plan to the City, County Supervisor, Petrovic, County Department of Public Works, various land owners and homeowners in and around King City to control storm runoff. Computed Hydrology, culvert size and diversions. Plan accepted and work started.

8. Have assisted in training SCS Technician on design for sprinkler irrigation systems, stockwater systems, land leveling & hydrology studies.

9. Have been instrumental in securing a year long study and station on plant water use, in cooperation with SCS, State Department of Water Resources & GRCD. In conjunction with the above a year long irrigation water management study will be conducted on two (2) farms, in the King City area. This study will benefit the area from Chualar on the north to San Ardo on the South.

10. The King City SCS staff and myself are involved in considerable design and work for the 1978 ACP program which work will be reportable at a later date.

Other activities and accomplishments of the Gloria Resource Conservation District includes for the past 5 years:

1) Principal sponsors of the annual Salinas Valley Land Judging contest, which includes 60-70 high schools from four counties.

2) Gave direct support to SCS for completing the entire Monterey County Soil Survey.

3) They contributed $5000 of district funds for the publishing of the interim report, after the survey field work was done.

4) They are one of the principal sponsors and leaders of the Central California Resource Conservation & Development (RC&D) area, and now operate one of the first project measures installed on the ground - the Gonzales Slough. This project measure was completed in 1976 and involved putting together cooperation and finances from the city, the county, the federal government, and the RCD. Today, in recognition of their effectiveness, the Monterey County Board of Supervisors has appointed them managers of the project, even though there is a separate maintenance district for management and operation and maintenance costs.

The activity of the district has received national recognition by winning the statewide Goodyear contest and have received two other distinguished achievement Goodyear awards.

The district also publishes a monthly newsletter, for which they received in 1977, recognition as the best newsletter in the western region.

Directors regularly attend State and National associations, and have served in various leadership positions in these organizations. They also have appointed youth associate directors and financed their activities at State and National meetings.

The estimate of cost for these activities is shown in Table B, from 1972 through 1976. Also shown in this table is the amount and value of technical assistance provided by other agencies and the amount and source of the financial assistance received by the district.

TABLE B

	Source of Funds & Services			
Year	In Lieu of Tax Monterey Co.	Est. Value of Unpaid time of RCD Supervisors	Technical Value of SCS Assistance	Est. Amount of ACP Cost Sharing Assistance
1972	$ 9,134.33	$10,000	$25,541.20	$ 98,000
1973	8,215.00	11,000	20,574.10	95,000
1974	9,483.00	11,000	19,959.43	36,000
1975	15,519.67	14,000	38,167.51	46,000
1976	16,777.03	16,000	28,158.59	65,000
5 yr. Total	$59,129.03	$62,000	$132,400.83	$340,000
Av. per year	$11,825.81	$12,400	$ 26,480.17	$ 68,000

GLORIA RESOURCE CONSERVATION DISTRICT
INVENTORY OF RECORDS (conservation practices applied and used, time, and costs)

PRACTICE NAME	UNIT	UNITS APPLIED			TECHNICAL TIME		$ COSTS $ 2/	
		cumulative (through 76)	cumulative (1972-1976)	annual avg. (1972-1976) 1/	hours per unit	hours last 5 yrs.	per unit	last 5 yrs.
Ag Waste Mgt. System	No.	5	5		80	400	15,000	75,000
Ag Waste Storage Facility	No.	6	6		40	240	3,500	21,000
Brush Mgt.	Ac.	17,000	9,800		60 Ac./Hr.	.163	30	294,000
Chiseling & Subsoiling	Ac.	2,166	666		60 Ac./Hr.	11	12.50	8,325
Clearing & Snagging	Ft.			4,960	1,000 Ft./Hr.	25	.50	12,400
Conserv. Cropping System	Ac.			32,200	50 Ac./Hr.	3,200	1.50	241,500
Contour Farming	Ac.			13,000	25 Ac./Hr.	2,600	5	325,000
Critical Area Planting	Ac.	700	700		20 Ac./Hr.	35	150	105,000
Crop Residue Mgt.	Ac.			32,600	60 Ac./Hr.	2,715	.50	81,500
Dam - Multi purpose	No./ Ac.Ft.	2/44	2/44		80/2	160	11,000/500	22,000
Debris Basin	No.	23	1		16	16	1,500	1,500
Dike	Ft.	7,600			500 Ft./Hr.		2	
Disposal Lagoon	No.	9	9		40	360	3,500	31,500
Diversion	Ft.	159,364	13,012		500 Ft./Hr.	26	10	130,120
Pond	No.	116	10		40	400	4,500	45,000
Farmstd & Feedlot Windbreak	Ac.	20	20		16	320	2,000	40,000
Fencing	Ft.	6,568,000	232,000		5,000 Ft./Hr.	46	.30	69,600
Field Windbreak	Ft.	20,000	*		500 Ft./Hr.		10	

1/ Units in this column are for annual practices that are repeated and not cumulative. Since they are an average they are multiplied by 5 to figure the 5 year costs and time.

2/ The cost figures are for the land user, and include cash outlay, time and equipment, etc. to carry out the practices. These figures are values to be used for comparison.

INVENTORY OF RECORDS (conservation practices applied and used, time, and costs)

PRACTICE NAME	UNIT	UNITS APPLIED			TECHNICAL TIME		$ COSTS $ 2/	
		cumulative (through 76)	cumulative (1972-1976)	annual avg. (1972-1976) 1/	hours per unit	hours last 5 yrs.	per unit	last 5 yrs
Firebreak	Ft.	150,000	150,000		5,000 Ft./Hr.	30	.05	7,500
Grade Stabilization Structure	No.	40	5		8	40	500	2,500
Grass Waterway or Outlet	Ac.	21			8		100	
Holding Pond	No.	5	5		40	200	6,000	30,000
Irrigation Pipeline	Ft.	1,712,530	207,665		1,000 Ft./Hr.	208	3	622,995
Irrigation Storage Reservoir	No./ Ac.Ft	3/75			80/1		12,500/500	
Irrigation System - Drip	No./ Ac.	2/60	2/60		60/1	120	90,000/3,000	180,000
Irrigation System - Sprinkler (portable & solid)	No./ Ac.	261/26,621	33/3,300		40/1/3	1,320	150,000/1,500	4,950,000
Irrigation System - Surface & Subsurface	No./ Ac.	546/51,162	14/1,400		20/1/5	280	40,000/400	560,000
Irrigation Syst - Tailwater Ret	No.	59	12		40	480	5,000	60,000
Irrigation Water Mgt.	Ac.			40,200	50 Ac./Hr.	4,020	3	603,000
Irrigation Land Leveling	Ac.	23,007	1,967		2 Ac./Hr.	983	250	491,750
Land Smoothing	Ac.	3,000	560		10 Ac./Hr.	56	50	28,000
Minimum Tillage	Ac.			12,058	60 Ac./Hr.	1,005	2,50	150,725
Drainage Main or Lateral	Ft.	32,890	9,262		500 Ft./Hr.	19	3	27,786
Pasture & Hayland Mgt.	Ac.			3,710	20 Ac./Hr.	925	3	55,650
Pasture & Hayland Planting	Ac.			56	10 Ac./Hr.	6	25	7,000
Pipeline (stock water)	Ft.	843,135	148,185		1,000 Ft./Hr.	148	.40	59,274

1/ Units in this column are for annual practices that are repeated and not cumulative. Since they are an average they are multiplied by 5 to figure the 5 year costs and time.

2/ The cost figures are for the land user, and include cash outlay, time and equipment, etc. to carry out the practices. These figures are values to be used for comparison.

GLORIA RESOURCE CONSERVATION DISTRICT
INVENTORY OF RECORDS (conservation practices applied and used, time, and costs)

PRACTICE NAME	UNIT	UNITS APPLIED			TECHNICAL TIME		$ COSTS $ 2/	
		cumulative (through 76	cumulative (1972-1976)	annual avg. 1/ (1972-1976)	hours per unit	hours last 5 yrs.	per unit	last 5 yrs.
Proper Grazing Use	Ac.			167,887	400 Ac./Hr.	2,097	.40	335,775
Pump Plant for Water Control	No.	100	16		8	128	3,000	48,000
Range Seeding	Ac.	75	75		50 Ac./Hr.	2	10	750
Irrig Pit or Regulating Res	No.	211	34		16	544	3,000	102,000
Spring Development	No.	108	4		16	64	600	2,400
Stock Trail & Walkway	Ft.	350,000	11,000		500 Ft./Hr.	22	1	11,000
Streambank Protection	Ft.	52,730	7,600		100 Ft./Hr.	76	25	190,000
Open Channel	Ft.	65,012			1,000 Ft./Hr.		.25	
Streambank Stabilization	Ft.	19,921	19,508		200 Ft./Hr.	98	10	195,080
Stripcropping	Ac.	117			10 Ac./Hr.		3	
Structure for Water Control	No.	21	4		8	32	500	2,000
Drainage Field Ditch	Ft.	10,517	1,391		500 Ft./Hr.	3	.50	696
Subsurface Drain	Ft.	317,162	72,489		500 Ft./Hr.	145	3	217,467
Trough or Tank (stock water)	No.	431	35		8	280	1,500	52,500
Well (stock water)	No.	460	78		4	312	4,000	312,000

1/ Units in this column are for annual practices that are repeated and not cumulative. Since they are an average they are multiplied by 5 to figure the 5 year costs and time.

2/ The cost figures are for the land user, and include cash outlay, time and equipment, etc. to carry out the practices. These figures are values to be used for comparison.

APPENDIX L

CLUSTER DEVELOPMENT MODEL ORDINANCE

Submitted to the

ASSOCIATION OF MONTEREY BAY AREA GOVERNMENTS

By

SEDWAY/COOKE
Urban and Environmental
Planners and Designers
San Francisco, California

April 11, 1978

CLUSTER DEVELOPMENT MODEL ORDINANCE

Approach to Model Ordinance Formulation

The cluster development model ordinance is intended to encourage more sensitive site planning and a resultant clustering of development within a larger site. This should ensure that wastewater objectives and other natural resource and environmental quality objectives are fostered in areas of special sensitivity or significance.

The market for cluster development now appears to exist. Advances in site design and marketing have made such units easily saleable. Additionally, clustering provides more usable open area and carefully designed structures preserving views and ensuring recreational assets and amenity.

The major innovations in this ordinance are the comprehensiveness of standards, the use of a special cluster development combining zone and a systematic procedural process.

The regulations are proposed for application in a cluster development zoning district. These districts would be mapped in identified areas. This would require modification of existing zoning ordinances to include a cluster development combining district, which could use such letters as-CD after the normal zoning district name to indicate the combination.

The procedure would use a cluster development permit, issued upon a showing of adherence to all cluster development standards and permit criteria. The permit would be waived where the total development were less than a specified size considered negligible in terms of total environmental impact. The permit can be the use permit or conditional use permit operative in most jurisdictions.

Summary of Model Ordinance

Among the development standards and criteria for the permit are: compatibility with adjacent land uses; relationship to natural features; supersedence of normal density regulations; maximum residential coverage; a minor density bonus (not more than 5%) where the proposed development is kept at least 80% free from land alteration and is in permanent common open space through appropriate forms of perpetual restriction or public dedication; a majority of the open space is useable for recreational purposes with less than a 10% slope; mixture of housing types provided; creative site planning is evident; landscaping is effective; and a variety of transportation modes is fostered by site design reducing automobile usage.

Because of the more compact urban form, it may be feasible in some circumstances to override underlying height restrictions. A specific regulation is included which allows this up to a specified percentage over standard height. Moreover, normal restrictions relating to spacing between buildings can be waived if the site planning is such that it insures privacy, light and air, and proximity of compatible uses. Lot widths also may be reduced. Usable open space around buildings specifically is

required because of a temptation in compact development to build on steep and irregular sites.

A relatively generalized standard relating to building appearance requires that materials and colors blend in with, rather than provide stark contrast to, surroundings. Although such judgements can be subjective, they are legally defensible and highly important to the visual blending of a particular development to its setting.

Standards for streets are provided which suggest that all streets should reflect a rural rather than urban character, that they should be designed for minimum land coverage and disturbance of soil, that certain variations from standards are permitted to prevent dedication of unnecessarily large parcels of land for street purposes, that one-way streets be allowed where terrain and public safety permit, that streets generally follow contours, that maximum grades be respected and that streets not traverse slopes over 25% grade. Other standards are included which will insure that severe land disturbance and disharmony with the natural landscape is avoided.

A new cluster development procedure is included in the model ordinance to be included in the procedures section of local ordinances. It encompasses the notion of a concept plan at the time of application, providing a general narrative and development direction to which the local public agency can react. This includes a generalized site plan showing at least the approximate location of buildings, rights-of-way, parking spaces, parking areas, natural open spaces,etc. An initial environmental study would

be offered in conjunction with this concept plan. The plan is then reviewed and a conference held on it with the applicant.

Significant modifications could still occur in the site plan based upon application of standards. Thus, after the concept plan, conferences and reactions, a preliminary development plan is required. Here, the applicant provides more specific statements of intent and documentation of design and environmental character supported by specific graphic submissions, including contours, natural features, lot lines, building form and location, dedications, circulation system, vehicular and pedestrian utility systems, adjacent land areas, and perimeter treatment. Upon submission of the preliminary plan it is reviewed, again using a conference format, and a draft environmental impact is prepared, if necessary. The planning commission hears the preliminary development plan and makes a decision on it. Minor changes can be made in this, as authorized by the commission, without additional public hearings. After this, a final development plan is prepared incorporating major revisions required by the planning commission, which is then submitted to the director who has the authority to grant the cluster development permit without further action.

Legal Issues

Overriding authority exists in the state planning and zoning law to enact planning and development control procedures. Although planned unit development procedures are not specifically authorized in that law, they have been upheld under general police power authority. There is little reason to assume that a site-specific ordinance

would have less standing, and indeed may have more. However, the corollary of this is that the locations in which the cluster procedure would be mandatory must be thoroughly justified from a technical standpoint and the need for the procedure from the standpoints of erosion control, aquifer recharge, and other "208" findings must be noted. Otherwise, difficult equal protection issues may be raised.

A continuing legal issue is the extent to which an underlying cluster development plan can remain applicable over an extended period. Some provision in the ordinance may have to be made to cover this matter.

Pre-existing uses in the cluster development combining district may be troublesome. Such uses may have a significant effect on the larger area. Accordingly, non-conforming use provisions may have to be modified with some amortization provision included.

Administrative and Procedural Implications

The existing model ordinance or some variant, should be included in the zoning ordinances of the local jurisdictions. It would be inserted in two separate sections -- combining zones, which if they do not already exist in the ordinance should be located after the basic zones, and procedures, in which the cluster permit procedure would be an identifiable unit.

The requirements for additional drafting of ordinances are generally limited. However, the locally-devised "environmental impact report" guidelines must be carefully related to this procedure, and may require modifications. Additionally, subdivision control procedures should be reviewed in terms of timing of tentative map submittals to correspond to this procedure, or vice-versa.

The implications for administrative burdens are significant, even though the zone will be mapped in limited areas. A cluster development permit application constitutes a significant commitment by the applicant and deserves a correspondingly intensive and sensitive review by local government. The staff required to review the proposals need not be any more sophisticated in training or background than normal urban or environmental planning requires.

Many jurisdictions in the area already have planned unit development procedures similar in nature but less detailed. However, these procedures are permissive and not required in specific areas. They simply provide an opportunity for relaxation of requirements for developments of a certain size. It is clear that such procedures are not sufficient for "208" purposes. For instance, Monterey County has an "ST" District which is permissive and has few adjunct standards. The cluster development ordinance could be enacted, and placed following the other "combining" type zones after Section 28.12, with the procedure included as Section 33.

Uncontrolled runoff's threat pointed out in county tour

By DON DUGDALE
Californian Staff Writer

Las Lomas is an area of North Monterey County with a surprising number of green lawns for drought-plagued Northern California.

But most of the green lawns are not the result of regular watering by homeowners, but of failed septic tank systems whose natural fertilizer is seeping to the surface.

It's good for the lawns, but not for the health of the residents.

Las Lomas was one of five problem areas visited by area governmental leaders, civic representatives and newspeople Saturday on a bus tour sponsored by the Association of Monterey Bay Area Governments (AMBAG).

Other problem areas viewed first-hand by the tour's 20 or so persons were Seaside's Laguna Grande, threatened by surrounding development; hillside erosion caused by development throughout the Salinas-Monterey area; nitrate-contaminated wells in Boronda; and salt water intrusion near Castroville.

There are some of the problems AMBAG is trying to identify, assess and find solutions for in its $829,500 two-year 208 water quality study in Monterey and Santa Cruz counties.

The study is now in its final few months and is scheduled for completion next June.

Among the revelations made by AMBAG water and soil consultants on the tour were:

—That Seaside's Laguna Grande is a dying lake because of soil erosion and nutrient deposits from urban development and construction as far away as Hidden Hills.

—That thousands of tons of soil are eroded from the county's hillsides because of improper protection after cutting away soil for roads and buildings.

—That nitrates from fertilizers and other sources could threaten the underground water supply throughout the Salinas Valley.

—That keeping even one horse on a small rural lot can cause serious water runoff problems.

Cut Off

Laguna Grande used to be a coastal lagoon, but is now cut off from the ocean by man's development and cut in two by Del Monte Boulevard, forming Roberts Lake on the west side.

The lake's 17 square miles of watershed includes six square miles of urbanized area. Nutrients (food material) and sediments are coming into the lake and causing more extensive vegetation, according to Oscar Balaguer, assistant regional planner for AMBAG.

The Source

The 208 study is trying to find out exactly where the nutrients and sediments are coming from.

The result of man's influence is that a lake which might normally take 1,000 years to evolve into dry land now has that process shortened to perhaps 50 years. Balaguer estimates the lake could be 25 years from extinction.

The lake is also being proposed for development into a recreational area by the cities of Monterey and Seaside and the Monterey Peninsula Regional Park district, Balaguer notes.

"There is a question of what kind of natural ecosystem can be maintained here," he says. "Should it be maintained for wildlife or used for intensive recreation?"

Intensive commercial uses are also encroaching on the land surrounding the lake.

Consultant Jim Barrett, a resource conservationist from the U.S. Soil Conservation Service, points out that cutbanks for roads and buildings in the county "are producing tremendous amounts of sediment in the area and actually endangering the stability of new homes.

Slide Hazard

"You've got to cut them back to a stable slope and then protect them or they'll erode on you or slide on you," he says.

As one example, he pointed to the road leading to the Hidden Hills housing area from State Route 68 — a road which caused erosion so bad in the early 1970s that the road itself collapsed.

Barrett estimates 35 tons of sediment a year are swept up on every mile of Seaside pavement, due in part to the runoff from Canyon Del Rey and the [illegible] above it.

One of the most difficult problems to deal with is nitrate tamination of Salinas Valley water, Balaguer said. The nitrate content poses possibility of oxygen depriv in babies and has forced the ty health departments to clo wells in the Valley since Apri

Balaguer believes the pro is caused partly by nitrogen tilizers which have seeped into the groundwater aq after years of irrigation.

Other Sources

"There are no precedent control of irrigation water on scale," Balaguer said. O sources which may be tributing to the nitrate tamination include septic ta feed lots, and municipal perc tion ponds for sewage.

Over-irrigating may be cause of the nitrate seepa Balaguer said. "Maybe he farmer) turns it on at eight in morning and turns it off at fiv the afternoon. That's comm practice. Nitrate leaches into aquifer. It's easier for him over-irrigate than to take trouble to irrigate properly."

But Barrett notes that the study is trying to determine precise source of the nitrate. " don't really know who to blam he says.

Barrett also pointed out t horses kept on small lots in No County can cause a serious lective runoff problem when horses denude the hillsides vegetation and rain carries soil and the animal wastes o the roads.

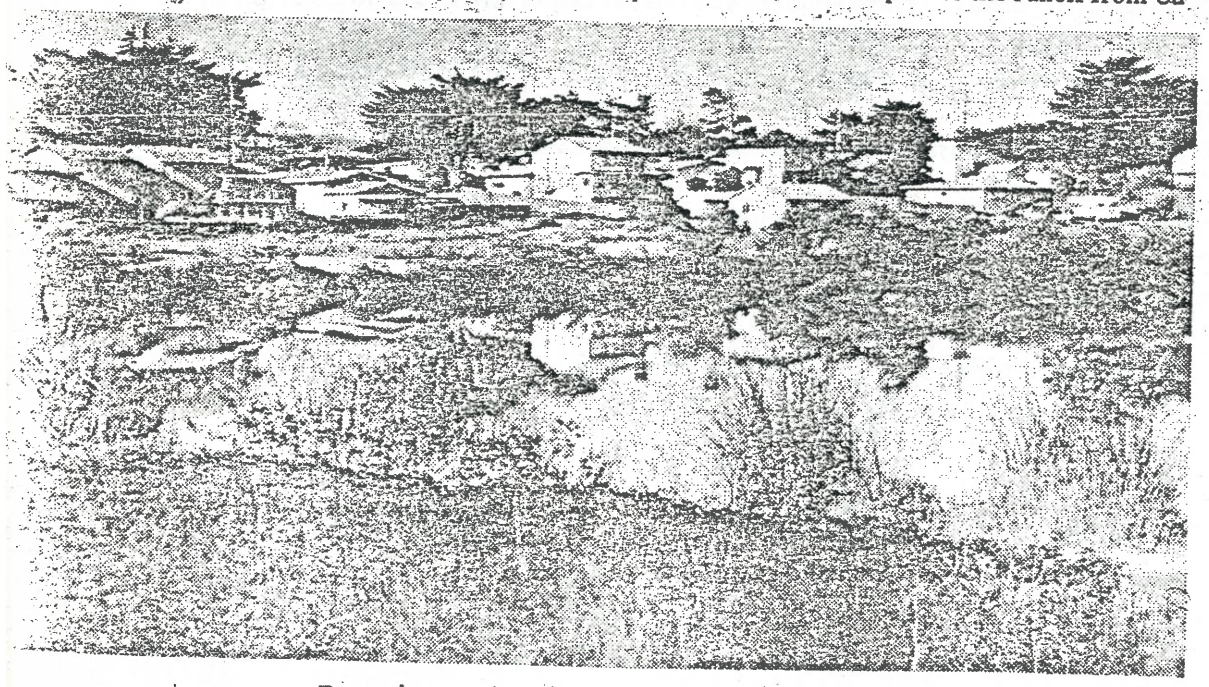
Five acres are required maintain one horse on a hillsi area, Barrett says, and the fen should be placed away from t property line so that the run has a place to be contained.

"California as a whole has be overgrazed in rangeland for t last 30 to 40 years," he notes.

And planting iceplant hillsides is not a panacea to er sion control, he says. "There's lot of erosion that takes pla under iceplant. It's not the be ground cover for erosion co trol."

Las Lomas's serious sept tank failure problem has bee known for several years, and th area's residents have vote higher taxes for themselves conduct an ongoing feasibili study of a future sewer system.

The community of 400 home



Development threatens Laguna Grande L-7

CLUSTER DEVELOPMENT MODEL ORDINANCE

GENERAL REGULATIONS

#____ TITLE AND PURPOSE. The provisions of Section ____ through Section ____, inclusive, shall be known as the Cluster Development Combining Zone Regulations. The purposes of this ordinance are to create a cluster development district and to establish procedures for designation of such districts. This ordinance makes provisions for areas unique in location and character and with highly vulnerable natural features and processes to be planned and developed on a unified basis. The creation of such combining districts is to promote flexibility in the design, location, and development of residential and nonresidential land uses; to promote more economical and efficient use of land; and to preserve and protect the area's natural features, processes, and aesthetic quality.

#____ DEFINITIONS.

Cluster Development. For purposes of these regulations, a cluster development is:

(a) Land under unified control, to be planned and developed as a whole;

(b) In a single development operation or a definitely programmed series of development operations, including all lands and buildings;

(c) For principal and accessory structures and uses substantially related to the character and purposes of the district;

(d) To be developed according to comprehensive and detailed plans that include not only streets, utilities, lots and building sites, but also site plans and floor plans for all buildings as they are intended to be located, constructed used, and related to each other, and detailed plans for other uses and improvements on the land as related to the buildings; and

(e) With a program for provision, operation, and maintenance of such areas, facilities, and improvements for use by some or all of the occupants of, or visitors to, the district, and for the protection of natural features and processes and the avoidance of natural hazards.

#_____ CONSTRUCTION. The provisions of this ordinance shall be liberally construed to accomplish its purposes and objectives.

#_____ SEVERABILITY. If any provision of this ordinance in the application thereof to any person or circumstances is held invalid, such invalidity shall not affect other provisions or applications of this ordinance which can be given effect without the invalid provisions or application, and to this end the provisions of this ordinance are severable.

#_____ EFFECTIVE DATE. This ordinance shall take effect and be in force on and after _____.

#_____ EFFECT ON OTHER LAWS. No provision of this ordinance is intended to repeal, abrogate, annul, impair, or interfere with any rules, regulations, ordinances or permits previously adopted, promulgated, or issued pursuant to law. However, wherever this ordinance imposes greater restrictions, the provisions of this ordinance shall govern.

#____ ADMINISTRATIVE STANDARDS. Whenever, in the course of administration and enforcement of this ordinance, it is necessary or desirable to make any administrative decision, then, unless other standards in this ordinance are applicable, the decision shall be made so that the result will not be contrary to the purpose of this ordinance or injurious to the surrounding areas.

#____ GENERAL PROHIBITORY CLAUSE. No structure shall be constructed, erected, placed or maintained, and no land use commenced or continued within the Cluster Development Zone except as specifically, or by necessary implication, authorized by this ordinance.

CLUSTER DEVELOPMENT REGULATIONS

#____ TITLE AND PURPOSE. The provisions of Section ____ through Secti
____, inclusive, shall be known as the Cluster Development Regulations. Th
purpose of these provisions is to insure the following: the preservation of la
areas within (jurisdiction) which possess unique natural characteristics and f
tures of a hydrological, geographical, geological, topographical or historical
to permit a more creative and imaginative design for development of an are
than is generally possible under conventional zoning regulations; and to perr
more economical and efficient use of land while providing a harmonious var
of structures, a higher level of amenities, and/or preservation of natural an
qualities and open spaces.

#____ APPLICATION OF CLUSTER DEVELOPMENT REGULATIONS. Tl
regulations shall be applied where appropriate to achieve the purpose set fo
in Section ____. The Cluster Development Regulations that follow shall ap
generally to the initiation and regulation of all planned development within
development zoning districts. Where there are conflicts between the speci
tions herein and general zoning, subdivision, or other regulations or require
these regulations shall apply in cluster development districts unless the (Bo
(Council) shall find, in the particular case, the provisions herein do not serv
purposes to a degree at least equivalent to such general zoning, subdivisio
other regulations or requirements. Where actions, designs, or solutions pr
by the applicant are not literally in accord with applicable cluster develop
or general regulations, but the (Board) (Council) makes a finding in the pc
case that public purposes are satisfied to an equivalent or greater degree,
(Board) (Council) may make specific modification of the regulations in the
cular case, as provided in #_____ of this ordinance.

Except as indicated above, notwithstanding procedures and requirements
in effect, procedures and requirements set forth herein and in guides and

officially adopted as part of regulations for particular classes of cluster development districts shall apply in cluster development districts, to any amendments creating such districts, and to issuance of all required permits therein.

#____ CLUSTER DEVELOPMENTS SUBJECT TO DEVELOPMENT CRITERIA; PERMIT REQUIRED. Cluster development zoning districts shall hereafter be established by amendment to the official zoning map and related amendatory action where areas suitable in location and character for the uses and structures are to be planned and developed on a unified basis, according to the requirements and procedures set forth herein.

Every development located in a zoning district to which these regulations apply shall be developed in accordance with the Cluster Development Standards commencing at Section ____ and shall require a cluster development permit issued in accordance with the Cluster Development Procedure commencing at Section ____; provided, however, that the Planning Commission may waive the application of this section for any such development less than ___ acres in area upon a finding that such waiver is consistent with the General Plan and the purpose of these regulations.

#____ PERMITTED USES. Any use permitted in the underlying zone shall be permitted in a cluster development subject to the standards set forth in Section ____ of this ordinance. No use shall be permitted except in conformity with a specific and precise Final Development Plan for the cluster development, pursuant to the procedural and regulatory provisions set forth in this ordinance. Whenever there is a conflict between provisions of the underlying zone and the cluster development combining zone regulations, the latter shall apply.

#____ USE TYPES EXISTING PRIOR TO APPROVAL OF PLANNED DEVELOPMENT. Uses or use types established within a zoning district prior to the application of the Cluster Development Regulations to the underlying district may be

expanded, extended, altered, replaced, or reestablished only when such uses or use types do not significantly alter the character of the district or hinder or detract from its eventual use for cluster development purposes. All expansions, alterations, replacements, or reestablishment of uses or use types shall be subject to obtaining a use permit in accordance with the procedures specified in #____ of the Zoning Ordinance.

CLUSTER DEVELOPMENT STANDARDS

#____ TITLE AND PURPOSE. The provisions of Section ____ through Section _____, inclusive, shall be known as the Cluster Development Standards. The purpose of these provisions is to set forth development standards that must be met by cluster developments before they are granted a cluster development permit in accordance with the Cluster Development Procedures commencing at Section ____.

#____ CONCEPT OF A CLUSTER DEVELOPMENT. A cluster development shall consist of a planned development as defined in #_____, located on a single tract of land, or on two or more tracts of land which may be separated only by a street or other right-of-way. In such planned development, the land and structures shall be confined to a specified portion of the site, leaving the remainder in a natural condition.

#____ GENERAL DEVELOPMENT CRITERIA.

(a) Compatibility with Adjacent Land Uses. A cluster development shall be designed and developed in a manner compatible with and complementary to existing and potential residential development in the immediate vicinity of the project site and shall be in substantial harmony with the General Plan. Site planning on the perimeter shall give consideration to protection of the property from adverse surrounding influences, as well as protection of the surrounding areas from potentially adverse influences within the development.

(b) Relation to Natural Features. A cluster development shall relate harmoniously to the topography of its site; shall make suitable provision for preservation of watercourses, aquifer recharge areas, wooded areas, rough terrain and similar

natural features and areas; shall avoid hazardous and damaging conditions, such as soil erosion; and shall otherwise be so designed as to use such natural features and amenities to best advantage.

#____ APPLICABILITY OF USE REGULATIONS. Except as provided in Section ____, of this ordinance, only those uses which are permitted by right or by use permit in the underlying zone or as modified by the cluster development permit shall be permitted in a cluster development.

#____ APPLICABILITY OF DEVELOPMENT REGULATIONS. Except as otherwise provided hereinafter, a cluster development shall conform to all portions of the Zoning Ordinance of (jurisdiction) which are relevant to the applicable underlying district or districts.

#____ MAXIMUM DENSITY. The density regulations specified in the underlying zone shall apply in a cluster development; provided, however, that the following conditions shall supersede such provisions. In the event of conflict between underlying density regulations and the provisions of this section, the latter shall govern.

(a) Computation of Residential Acreage in an Exclusively Residential Cluster Development. In a cluster development devoted exclusively to residential uses, the residential acreage of the proposed development shall be not more than ____ percent of the total land area within the boundaries of the development and shall be predominately confined to a specified portion within such boundaries; provided, however, that this configuration does not conflict with other development standards set forth herein. For the purpose of the application of this subsection, the "total land area within the boundaries of the development" shall be defined to exclude any land within rights of way of state and federal highways and of collector, major or prime arterial roads as defined in the General Plan.

(b) Computation of Residential Acreage in a Cluster Development Containing Non-Residential Use Types. In cluster developments containing both residential and non-residential uses, the combined acreage of residential and non-residential acreage shall not exceed ____ percent of the total land area within the boundaries of the development and shall be predominately confined to a specified portion of such boundaries; provided, however, that this configuration does not conflict with other development standards set forth herein. For the purpose of the application of this subsection, the "total land area within the boundaries of the development" shall be defined as in subsection (a) of this section. To compute the maximum density permitted in a cluster development containing non-residential use types, the following steps shall be followed in computing the residential acreage of the proposed development;

1. Determine the total land area within the boundaries of the development.

2. Determine the total land area in residential use types.

3. Determine the total land area in nonresidential use types. For the purpose of the application of this section, the "total land area in nonresidential use types" shall be defined to exclude any land dedicated as permanent open space and any land with dedicated open space easements.

4. Compute the ratio of the total land area in residential use types (subsection (b)2) to the sum of the total land area in residential use types (subsection (b)2) plus the total land area in nonresidential use types (subsection (b)3).

5. Multiply the ratio computed in subsection (b)4 times the total land area within the boundaries of the development (subsection (b)1) to determine the residential acreage.

6. The Concept Plan submitted pursuant to the provisions of Section ____ shall be used in the computation of residential acreage.

(c) Findings of Residential Acreage. The (Director) shall compute the residential acreage following the steps either in subsection (a) or (b). The findings of the (Director) regarding the residential acreage of a proposed cluster development shall be communicated to the applicant at the concept plan review conference held pursuant to the provisions of #____.

(d) Applicable Maximum Density. The maximum density provisions of the applicable underlying zoning district shall be used in the computation of the permitted number of dwelling units.

(e) Permitted Number of Dwelling Units. The ratio of the proposed number of dwelling units to the maximum density determined in subsection (d) shall not exceed the allowable percentage of residential acreage determined in subsection (a) or (b); provided, however, that the Planning Commission may grant a density bonus of not more than five percent only upon a finding that such increased density is consistent with the General Plan and the purposes of these development criteria and that the proposed cluster development contains any of the following:

1. Over 80% of the parcel is kept free from alteration (except as required for natural resource management purposes) and is held in permanent common open space through appropriate forms of restrictions or public dedication.

2. A majority of the open space is usable for recreational purposes with less than 10% slope.

3. A mixture of housing types is provided with a range of prices for differing income levels, with the most costly home being at least ___% more expensive than the least costly.

4. Creative site planning is provided with substantial and appropriate landscaping.

5. A variety of transportation modes is encouraged through site design to reduce automobile usage and land with impervious surfaces.

#_____ HEIGHT. The height regulations of the underlying district or districts shall apply in a cluster development; provided, however, that the Planning Commission may approve buildings and structures of ___ percent greater height, if, in its opinion, such additional height would not have an adverse effect on adjacent properties or on properties or development in the vicinity and would be consistent with the General Plan and the purpose of these development standards. No additional height shall be approved within ___ feet of any external boundary of the cluster development adjacent to land in any residential or agricultural zone.

#_____ SETBACKS--PERIMETER. Provisions regarding required setbacks, as detailed in the Zoning Ordinance of (jurisdiction), shall apply to the perimeter of a cluster development; provided, however, that a setback of at least ___ feet from centerline shall be maintained by any building or structure, except a wall or fence, from any street along an exterior boundary of the development; provided further, however, that when such street has a right of way width greater than __ feet, a setback of __ feet from the right of way of such street shall be maintained. Otherwise, a setback of not less than ___ feet from an exterior boundary shall be maintained.

#_____ SETBACKS--INTERIOR. Provisions regarding required setbacks, as detailed in the underlying zone shall not apply to the interior of a cluster development.

#_____ SPACING BETWEEN BUILDINGS. Regulations regarding the space between buildings and space for front, side, and rear yards, as stipulated in the underlying zone, shall apply; provided, however, that the Planning Commission may waive such requirements if the following characteristics prevail, and if the Commission finds that such modifications to yard and building spacing requirements will not be detrimental to the purposes of this ordinance.

(a) Privacy. The minimum building spacing requirement is intended to provide privacy within the dwelling unit. Where windows are placed in only one of two facing walls or there are no windows, or where the builder provides adequate screening

for windows, or where the windows are at such a height or location to provide adequate privacy, the building spacing may be reduced.

(b) Light and Air. The building spacing provides a method of ensuring that each room has adequate light and air. Building spacing may be reduced where there are no windows or very small window areas and where rooms have adequate provision for light and air from another direction.

(c) Use. Where areas between buildings are used as service yards, for storage of trash, clotheslines, or other uilitarian purposes, and this use is similar for both houses, a reduction of building space permitting effective design of a utility space shall be permitted.

(d) Building Configuration. Where building configuration is irregular so that the needs expressed in (a), (b), and (c) above are met by the building configuration, reduced building spacing is permissible, as determined by average spacing or by measuring spacing where rooms open toward adjacent buildings.

#_____ FRONT YARD. Where the developer provides privacy by reducing traffic flow through street layout such as cul-de-sacs, or by screening or planting, or by facing the structure toward open space or a pedestrian way, or through the room layout of front evaluation, a reduction of the front-yard requirement is permitted.

#_____ LOT WIDTH. In cul-de-sacs, steep slopes, or off-set lots where, because of lot configuration or topography, narrow or irregular lots provide the best possible design and the design is such that light, air, and privacy can be provided, especially for living spaces and bedrooms, a narrower lot width may be permitted.

#____ OPEN SPACE SURROUNDING BUILDINGS. Each building shall be surrounded by relatively level open space having a slope not greater than ___ percent and extending a minimum distance of ___ feet in all directions measured from the furthest projections of the external walls of the building.

#____ BUILDING APPEARANCE. Proposed developments shall use colors and materials which blend in with, rather than contrast with, the surrounding soil and vegetative cover of the sites. In wooded areas, all exterior construction materials shall be of deep earth hues such as dark browns, greens, and rusts. Materials shall absorb light (i.e., darker, rough textured materials). Exterior lighting shall be minimized, and earth tone colors of lights shall predominate (i.e. yellow toned lights rather than blue toned florescents). In grassland, or grassland/wooded cluster areas, exterior materials shall be of the same earth and vegetative tones as the predominant colors of the site. Highly reflective surfaces and colors shall be eliminated or ameliorated.

#____ OPEN SPACE. Regulations relating to the use of open space, as described in the underlying zone shall apply to a cluster development; provided, however, that the following requirements shall be met. In the event of a conflict between underlying provisions and those outlined herein, the more stringent shall apply.

(a) Minimum Usable Open Space. At least ___ percent of the open space in the development shall be usable open space. The area of each parcel of usable open space shall not be less than ___ square feet in area nor less than ___ feet in its smallest dimension and at least ___ percent of the required minimum usable open space shall have an overall finished grade not to exceed ___ percent.

(b) Remaining Open Space. Open space left in its natural state shall be kept free of litter and shall at no time constitute a health, safety, fire or flood hazard.

(c) Staged Development. If development is to be accomplished in stages, the development plan shall coordinate improvement of the open space, the construction of buildings, structures and improvements in such open space, and the construction of dwelling units in order that each development stage achieves a proportionate share of the total open space and environmental quality of the total cluster development.

(d) Reservation for Common Use. All or any part of the required open space, but not less than ___ percent of the total open space area, may be reserved for use in common by the residents of the cluster development. Areas permanently reserved for common open space shall be reserved for the use and enjoyment of the residents in a manner which makes the county or a public district or a public agency a party to and entitled to enforce the reservation. The Planning Commission may require that open space easements be conveyed to the county. Common open space shall be guaranteed by a restrictive convenant describing the open space and its maintenance and improvement running with the land for the benefit of residents of the cluster development or adjoining property owners or both. The developer must file in the office of the Recorder, at the time the approved final subdivision plat is filed, legal documents which will provide the aforesaid guarantees, and, in particular, will provide for restricting the use of common spaces for the designated purposes. All lands so conveyed shall be subject to the right of the grantee or grantees to enforce maintenance and improvement of the common space.

#_____ SIGNS. Signs shall be permitted in a cluster development in accordance with the underlying zone. Interior street, building and other signs shall be uniform in design.

#____ OFF-STREET PARKING. Off-street parking shall be provided in accordance with the underlying zone.

#____ CIRCULATION. All streets within the cluster development that by function fall within the system of classification of streets as specified in the General Plan shall be improved to road standards for the particular classification of street, and all such streets shall be offered for dedication to the public. When the developer desires to retain any such streets as private streets, the (Board) (Council) may reject the offer of dedication. Other forms of access, such as pedestrianways, courts, plazas, driveways or open parking lots shall not be offered for dedication. Forms of common access other than dedicated public streets shall be permanently reserved and maintained for their intended purpose by means acceptable to the (Planning Commission and local Counsel).

#____ADDITIONAL STANDARDS FOR STREETS. In addition to the provisions already prescribed by road standards, the following standards shall apply to all cluster developments streets. In the event of a conflict between existing standards and those stated herein, the more stringent shall apply.

(a) Hillside street standards shall reflect a rural, rather than urban, character.

(b) Streets shall be designed for minimum land coverage and disturbance of soil.

(c) Variations in right-of-way standards shall be permitted to prevent the dedication of unnecessarily large parcels of land.

(d) One-way streets may be permitted where appropriate for the terrain and public safety.

(e) Street alignments shall generally follow contours.

(f) The maximum grade of any street shall not be over 15%.

(g) Streets shall not traverse slopes over 25% grade. Exceptions may be reasonable for short sections, not over 100 feet in length, if only a minor portion of the entire roadway length.

(h) Where street construction is permitted on steeper hillside lands, the extent of vegetation and visual disruption shall be minimized by regrading to approximate the natural grades.

(i) Cul-de-sacs or dead-end streets shall not be more than 700 feet in length.

(j) Curb, gutter, and pavement design shall be such that water on roadways is prevented from flowing off the roadway in an uncontrolled fashion.

(k) Sidewalks and walkways shall be provided in accordance with a carefully conceived total circulation plan and not rigidly included with every street.

(l) Bicycle and equestrian trails shall be integrated into the overall circulation plan.

#____ EMERGENCY ACCESS. Any dwelling unit or other building that is located more than ___ feet from a public or private street or other vehicular way shall have access thereto capable of accommodating emergency and service vehicles.

#____ FIRE PROTECTION. Fire hydrants and connections shall be installed as required by the Planning Commission and shall be of a type approved by the fire chief.

#____ NIGHT LIGHTING. Lighting fixtures for walks, parking areas, driveways and other facilities shall be provided in sufficient number and at proper locations to assure safe and convenient nighttime use. For normal street lighting, applicable standards and regulations shall apply; however, in hillside areas every effort shall be made to minimize lighting where such reduction is not detrimental to the public safety and general welfare and to encourage low profile designs that are designed to enhance the area's rural character.

#_____ MODIFICATION OF REQUIREMENTS. Modification of the Cluster Development Standards in #_____ may be granted by the Planning Commission when it determines that such modification will not be detrimental to the subject development, adjacent properties or the public interest; provided, however, no modification shall be granted from the coverage/alteration provisions of Section _____.

CLUSTER DEVELOPMENT PROCEDURE

#_____ TITLE AND PURPOSE. The provisions of Section ____ through Section ____, inclusive, shall be known as the Cluster Development Procedure. The purpose of these procedures is to provide for the application, review, and issuance of permits necessary to allow the development of land in conformance with the Cluster Development Standards commencing at Section ____. Any development involving the issuance of a cluster development permit shall conform to the Cluster Development Standards. It is the intent of these provisions that a cluster development permit be regarded as a type of use permit and all provisions of the (jurisdiction's) Zoning Ordinance, shall apply to cluster development permits. It is the further intent of these provisions to coordinate the Cluster Development Procedures as closely as possible with the requirements of the Subdivision Ordinance, when applicable, and the Environmental Impact Review process.

#_____ CLUSTER DEVELOPMENT PERMIT REQUIRED. The following shall require cluster development permits:

(a) Cluster Development Regulations. Applications for granting, extending, or modifying a cluster development permit for any development requiring a cluster development permit pursuant to the provisions of the Cluster Development Regulations commencing at #_____.

(b) Use Regulations. Applications for granting, extending, or modifying a cluster development permit for any use requiring a cluster development permit as specified in #_____.

#____ APPLICATION FOR THE GRANTING OF A CLUSTER DEVELOPMENT PERMIT.

(a) Initiation of Review Process. By applying for the granting of a cluster development permit, the applicant initiates a three step review process comprised of concept plan review, preliminary development plan review, and final development plan review, which must be completed prior to the issuance of a cluster development permit. Each step of the review process is described in detail commencing at #____.

(b) Persons Eligible. An application for the granting of a cluster development permit may be made by any person having an interest in the property to be included in the proposed planned development; provided, however, that the applicant must evidence a full ownership interest in all of the property to be included in the proposed cluster development at the time of the submission of the final development plan.

(c) Required Documents. An application for the granting of a cluster development permit shall be accompanied by the following documents:

1. A list of the names of all persons having an interest in the application as well as the names of all persons having any ownership interest in the property involved. If any person indentified pursuant to this provision is a corporation or partnership, the names of all persons owning more than 10 percent of the shares in the corporation or owning any partnership interest in the partnership shall be listed. If any person identified pursuant to this provision is a non-profit organization or trust, the names of any person serving as director of the non-profit organization or as a beneficiary or trustee or trustor of the trust shall be listed.

2. A Concept Plan as prescribed in #____.

3. Application Form, Filing and Fee. An application for granting or extending, and waiving or modifying the conditions of a cluster development

permit shall be made on the prescribed form and shall be filed with the (_____) and shall be accompanied by the fee referenced in #____.

#____ CONCEPT PLAN. The applicant shall submit, at the time of his application for the granting of a cluster development permit, a Concept Plan containing the following:

(a) General Narrative. A generalized narrative describing the location of the site, its total acreage, and the existing character and use of the site and adjoining properties; the concept of the proposed cluster development, including proposed uses and activities, location of development, proposed residential densities if appropriate, coverage/land alteration percentages, and location of physical land alteration required by the development; as well as the relation of the proposed cluster development to the General Plan.

(b) General Site Plan. A generalized site plan showing the entire parcel with scehmatic indications of approximate locations of buildings, public and private rights-of-way, parking and loading areas, natural spaces, public and private usable open spaces, walkways, planting areas, etc.

(c) Environmental Impact Initial Study. An Environmental Impact Initial Study as provided by the (jurisdiction's) procedures for Environmental Impact Review.

#____ CONCEPT PLAN REVIEW.

(a) Intent. The concept plan review is designed to inform an applicant for the granting of a cluster development permit of the applicable regulations of (jurisdiction); to inform the (Director) of the applicant's intentions, and to provide an opportunity to identify environmental and other pertinent considerations associated with a proposed planned development before a substantial commitment of resources occurs.

(c) Timing. Concept Plan Review shall be initiated by the (Director) upon receipt of the cluster development permit application, including the Concept Plan.

(d) Elements of Review. Concept Plan Review includes the following elements: Concept Plan Review Conference held by the (Director) with the applicant; and a review of any Environmental Impact Initial Study.

#____ CONCEPT PLAN REVIEW CONFERENCE. On receipt of the application and preliminary concept plan and proposals as indicated above, the planning staff and other agencies and officials, as appropriate in the circumstances of the case, shall study the proposal to determine conformity with the General Plan, 208 Plan, zoning, and other regulations applicable in the case.

Following such study, unless complete conformity is found, the applicant shall be notified in writing of the discrepancies, and the planning department and other appropriate officials shall schedule a meeting to confer for the purpose of assisting him in bringing the material submitted as nearly as possible into conformity with requirements and/or to define specifically modifications of regulations or of the General Plan that seem justified in view of equivalent service of public purposes, by the proposal. Any recommendations for changes shall be recorded in writing, with reasons therefor, and shall become part of the record in the case. Applicants shall indicate, in writing, their agreement to such recommendations, or their disagreement and reasons therefor; and such response by applicants shall also be included in the record.

#____ DETERMINATION OF ENVIRONMENTAL EFFECT. Following the submission of any Environmental Impact Initial Study pursuant to application for granting of a cluster development permit, and within the time limit prescribed by the (jurisdiction's) procedures for Environmental Impact Review, the (Director) shall determine if the proposed cluster development could have significant environmental effects and requires the preparation of an Environmental Impact Report. If the proposed

cluster development is determined to require an Environmental Impact Report, the applicant shall be required to submit a draft Environmental Impact Report, with appropriate mitigation measures.

#____ PRELIMINARY DEVELOPMENT PLAN. The Preliminary Development Plan shall be prepared by the applicant based on the Concept Plan submitted during Concept Plan Review and on recommendations for changes pursuant to the Concept Plan Review Conference. All elements required within the Preliminary Development Plan shall be characterized as existing or proposed, and be sufficiently detailed to indicate intent and impact. The Preliminary Development Plan shall include the following:

(a) Statement of Intent. An overall development scheme which states the development intentions of the landowner respecting his property, including but not limited to the following:

1. Written Documents.

- A legal description of the total site proposed for development, including a statement of present and proposed ownership and present and proposed zoning.

- A statement of planning objectives to be achieved by the cluster development through the particular approach proposed by the applicant. This statement shall include a description of the character of the proposed development and the rationale behind the assumptions and choices made by the applicant.

- A statement of location and intensity of proposed uses and activities including public and private open spaces;

- A physical description of proposed facilities accommodating such uses, including types of buildings structures and landscape and circulation elements;

- A statement of location and general configuration of lands to remain in open space;

- A general designation of utilities;

- A general statement of form of site management proposed in areas of significant natural resources;

- A statement detailing the consistency of the proposed development project with major public development programs, including but not limited to freeways, highways, parks, trails, open spaces, utility transmission lines and the phased schedules of proposed major public facilities; and

- A statement of the applicant's intentions with regard to the future selling or leasing of all or portions of the cluster development, such as land areas, dwelling units, etc.

(b) Supporting Graphics. A Statement of Intent required in subsection (a) above shall be supported by such graphics as are necessary to establish the physical scale and character of the development and demonstrate the relationship among its constituent land uses, oepn spaces, buildings, and structures, and public facilities. Said graphics shall as a minimum indicate:

1. The existing site conditions including contours at ____ foot intervals (depending on local topographic conditions), watercourse, floodplains, unique natural features, and forest cover.

2. The location and extent of unique natural features, including but not limited to aquifer recharge areas, highly erodible soils, seismic hazard areas, flood prone areas, aesthetic views, and valuable wildlife, and plant habitats, that impose constraints on the location of various uses in the project area.

3. Proposed lot lines and plot designs.

4. The location and floor area size of all existing and proposed buildings, structures, and other improvements including maximum heights, types of dwelling units, density per type, and nonresidential structures, including commercial facilities.

5. The location and size in acres or square feet of all areas to be conveyed, dedicated, or reserved as common open spaces, public parks, recreational areas, school sites, and similar public and semipublic uses.

6. The existing and proposed circulation system of arterial, collector, and local streets including off-street parking areas, service areas, loading areas, and major points of access to public rights-of-way (including major points of ingress and egress to the development). Notations of proposed ownership--public or private--should be included where appropriate. (Detailed engineering drawings of cross sections and street standards should be handled in the final development plan stage.)

7. The existing and proposed pedestrian circulation system, including its interrelationships with the vehicular circulation system, indicating proposed treatments of points of conflict.

8. The existing and proposed utility systems including sanitary sewers, storms sewers, as well as other stormwater runoff control measures, and water, electric, gas and telephone lines.

9. A general landscape plan indicating the treatment of materials used for private and common open spaces.

10. Enough information on land areas adjacent to the proposed cluster development to indicate the relationships between the proposed development and existing and proposed adjacent areas, including land uses, zoning classifications, densities, circulation systems, public facilities, and unique natural features of the landscape.

11. The proposed treatment of the perimeter of the cluster development, including materials and techniques used such as screens, fences, and walls.

(c) Background Report. The purpose of the Background Report is to collect and present information pertinent to the actual execution and operation of the cluster development. The contents of the Background Report shall be determined during the Concept Plan Review Conference, required by #____, and may include but is not limited to the following information: a preliminary title report on the land included within the boundaries of the site; a preliminary development schedule including anticipated timing for commencement and completion of each phase of development, tabulation of the total number of acres in each separate phase and percentage of such acreage to be devoted to particular uses, and an indication of the proposed number and type of dwelling units by phase of development; a preliminary population schedule, including estimated residential population for the entire project at its completion and for each type of dwelling unit for each phase of development, calculation of the average residential density per gross acre and per net residential acre by phase, and estimated nonresidential population for each phase of development; an indication of the retail market area to be served by any nonresidential uses included in the proposal and sufficient economic data to support inclusion of such nonresidential uses; and engineering feasibility studies.

(d) Any additional information as required by the review authority necessary to evaluate the character and impact of the proposed cluster development.

#____ PRELIMINARY DEVELOPMENT PLAN REVIEW

(a) Intent. Preliminary Development Plan Review shall provide an opportunity for detailed review of proposed cluster developments by (jurisdiction's) officials and the general public.

(b) Timing. Preliminary Development Plan Review shall be initiated by the (Director) after the completion of all of the elements of Concept Plan Review, and upon the receipt from the applicant of a Preliminary Development Plan.

(c) Elements of Review. Preliminary Development Plan Review includes the following elements: a Preliminary Development Plan Review Conference; preparation and submission of a draft Environmental Impact Report, if required, by the applicant; review and acceptance of the draft Environmental Impact Report by the (Director); public review and response to the Preliminary Development Plan and the draft Environmental Impact Report through public hearing; preparation of the final Environmental Impact Report by the (Director); and decision by the Planning Commission on the Preliminary Development Plan and the final Environmental Impact Report.

(d) Coordination with Subdivision Ordinance. It is the intent of these provisions that subdivision review under the Subdivision Ordinance, if required, be carried out simultaneously with the review of the proposed cluster development prescribed by this section of the ordinance.

#_____ PRELIMINARY DEVELOPMENT PLAN REVIEW CONFERENCE. Within ___ days of receipt of the completed Preliminary Development Plan, the (Director) shall schedule and hold a Preliminary Development Plan Review Conference, which shall be attended by the applicant, and representatives from other departments or agencies invited by the (Director) to review the Preliminary Development Plan. At least the following shall be considered at the Conference: compliance of various elements proposed in the Preliminary Development Plan with the Cluster Development Regulations and other applicable regulations and ordinances of (the jurisdiction); new information, if any, not previously noted in the Concept Plan that would necessitate the inclusion of supplemental information in the Environmental Impact Report and particular subjects proposed in the Preliminary Development Plan to receive special detailed attention in the Environmental Impact Report. The Preliminary Development Plan shall be made available for public review and comment concurrently with the release of the Draft Environmental Impact Report, as provided in #_____.

#____ ENVIRONMENTAL IMPACT REPORT REVIEW. Upon submission of the draft Environmental Impact Report by the applicant, if required pursuant to #____, the (Director) shall review it and accept it if complete. The (Director) shall then make the completed draft Environmental Impact Report available for public review and comment as provided by the (jurisdiction's) procedures for Environmental Impact Review.

#____ PUBLIC HEARING BEFORE PLANNING COMMISSION. Within ___ but not less than ___ days after the Draft Environmental Impact Report is made available for public review, at least one public hearing, noticed as required by #____ shall be held before the Planning Commission to obtain public response to the Preliminary Development Plan and the Draft Environmental Impact Report. When appropriate, the hearing also may include material submitted as required by the Subdivision Ordinance.

#____ PREPARATION OF FINAL ENVIRONMENTAL IMPACT REPORT. Unless circumstances otherwise merit, within ___ days after acceptance of a Draft Environmental Impact Report, the (Director) shall cause to be prepared the final Environmental Impact Report on the proposed cluster development. When complete, the final Report shall be forwarded to the Planning Commission with the findings of the (Director).

#____ PLANNING COMMISSION DECISION. Upon receipt of the final Environmental Impact Report, the Planning Commission shall certify the final Report as provided by the (jurisdiction's) procedures for the Environmental Impact Report Review. Once the final Report is certified, the Commission shall determine if the Preliminary Development Plan, either in its present form or with minor revisions required by the Commission and agreed to by the applicant, satisfies the Cluster Development Standards, commencing at #____ and ___ fulfills the purposes expressed in this ordinance. If the Commission is able to make these required

findings, the applicant shall be granted a cluster development permit, subject to the condition that he shall provide the minor revisions required by the Commission and agreed to by him. If the Commission determines that the Preliminary Development Plan is unacceptable in its present form or requires major revisions, as such revisions are defined by the Commission, the applicant shall not be granted a cluster development permit, unless he complies with the requirements of Final Development Plan Review, as provided by #____. When appropriate, the Planning Commission decision pursuant to this Section may also include material submitted as required by the Subdivision Ordinance.

(a) Amendment to the Preliminary Development Plan. Minor changes in the location, siting, and height of buildings and structures may be authorized by the Commission without additional public hearings if required by engineering or other circumstances not foreseen at the time the preliminary development plan was approved. No change authorized by this subsection may cause any of the following:

1. A change in the use or character of the development;

2. An increase in overall coverage of structures;

3. An increase in the intensity of use;

4. An increase in the facilities for traffic circulation and public utilities;

5. A reduction in approved open space;

6. A reduction of off-street parking and loading space; or

7. A reduction of required pavement widths.

All other changes in use, or rearrangement of lots, blocks, and building tracts, or any changes in the provision of common open spaces and changes other than

listed above, must be made by the (Board) (Council) after report of the planning staff and recommendation by the (Commission). Such amendments may be made only if they are shown to be required by changes in conditions that have occurred since the plan was approved or by changes in community policy. Any changes which are approved in the plan must be recorded as amendments in accordance with the procedure established for the recording of the initial plan documents.

(b) Amendment to General Plan. If amendment of the General Plan is involved, (Board) (Council) shall not proceed on the cluster development amendment until it has acted on amendment of the General Plan.

If the amendment is granted, (Council) (Board) shall, in its amending action, approve the preliminary development concept plan as it may have been changed during earlier procedures, or indicate required modifications; and such approved development concept plan, with required modifications, if any, shall be binding in determinations concerning final development plans. If modifications are required, (Board) (Council) shall officially state its reasons therefor in the record.

If the amendment is granted, the development shall be required to be in accord with final development plans meeting the requirements of these and other regulations, as supplemented or modified by (Board) (Council) in the particular case as part of the amending action, and shall conform to any time or priority limitations established by (Board) (Council) on beginning and completion of the development as a whole, or in specified stages.

At the time of amendment (Board) (Council) shall pass upon the adequacy in form and substance of any agreements, contracts, deed restrictions, sureties, or other instruments involved; and, before development may proceed, such instruments shall be approved by appropriate officers and agencies.

#____ FINAL DEVELOPMENT PLAN REVIEW. A Final Development Plan shall incorporate major revisions required by the Planning Commission and must be

submitted to the (Director) within ___ days of the date of the Planning Commission decision pursuant to #____, accompanied by a supplemental draft Environmental Impact Report addressing all major revisions and changes to the Preliminary Development Plan. If the Final Development Plan has made recommended changes as required by #____ of this ordinance, a cluster development permit shall be granted and a cluster development district created. If the applicant fails to apply for final approval for any reason, the tentative approval shall be deemed to be revoked and all that portion of the area included in the development plan for which final approval has not been given shall be subject to the zoning and subdivision ordinances otherwise applicable thereto.

#____ APPROVAL OF FINAL PLANS AND REPORTS. After a cluster development district has been established, no building permit shall be issued therein unless the Planning Department has approved final plans and reports for the development as a whole or stages or portions thereof deemed satisfactory in relation to total development. The form and content of such final plans and reports shall be as prescribed in zoning, subdivision regulations, or other regulations involved, generally or for particular cluster development districts, and in rules of the Planning Department and other affected agencies.

Approval of final plans and reports shall be based on substantial compliance with the Concept Plan, with any modifications required by (Board) (Council) applying at the time the land was zoned to cluster development status, and with regulations applying at the time it was rezoned to cluster development status, including such specific modifications as were made by (Board) (Council), or at the option of the applicant or his successors in interest in accordance with regulations currently in effect when the final plan is being considered, subject to the same modifications if they affect current regulations in the same way.

Upon approval of final plans and reports, building permits shall be issued in the same manner as for building permits generally, provided that any requirements concerning the order and location in which building permits are to be issued in

the particular cluster development district shall be observed. Except as provided below, final plans and reports approved shall be binding on the applicants and any successors in title so long as cluster development zoning applies to the land.

#_____ FAILURE TO BEGIN DEVELOPMENT. If no construction has begun in the cluster development within ___ months from the approval of the permit and recording of documents, said approval shall lapse and be of no further effect. The Planning Commission, upon showing of good cause by the developer, may extend for period(s) of ___months, the time for beginning construction.

The applicant must begin and substantially complete the development of the planned unit within ___years from the time of its final approval. If the cluster development is to be developed in stages, the applicant must begin and substantially complete the development of each stage within ___ years of the time provided for the start of construction of each stage in the development schedule.

If the applicant does not begin and substantially complete the development, or any stage of the development, within the time limits imposed by the preceding section, the (Director) shall review the development and may recommend that the time for completion of the development be extended, that the approval of the development be revoked, or that the plan be amended.

APPENDIX - M

DESCRIPTIONS OF BEST MANAGEMENT PRACTICES

For purposes of water quality management planning in California, Best Management Practices (BMP's) are defined as Resource Management Sub-systems. Each resource management sub-system includes component conservation practices needed to maintain or improve one of the resources associated with the particular land use. The component practices shown on the preliminary lists for each of the following sub-systems have been selected because they have a direct impact on water quality by reducing sediment pollution from soil erosion. During the planning process, these lists will be modified by deleting practices not found to have a significant impact within a local area and by adding new practices that have local application. A bried description of each component practices is included in Appendix C. The complete standards and specifications for these practices can be found in the Technical Guide maintained by each field office of the Soil Conservation Service. These may not be available for new practices until after the necessary reviews and approval.

EROSION CONTROL SUB-SYSTEM

A combination of inter-related conservation practices and management techniques needed to reduce accelerated detachment and transport of the soil resource by water or wind. Practices are to be performed in a manner that protects water quality and permits a high level of crop productivity to be sustained economically and indefinitely.

Applies to all land uses where accelerated erosion is occurring or will result from planned activities.

One or more component practices shall be specified based on an on-site investigation or personal knowledge of the types of erosion problems that are typical for the local area.

Component Practices for Water Quality Planning: 1/

Access Road
Contour Farming (Cross-Slope Farming)
Contouring Orchard and Other Fruit Area
Cover & Green Manure Crop
Critical Area Planting
Crop Residue Use
Dam, Diversion
Debris Basin
Dewatering System (Horizontal Drain)
Diversion
Emergency Seeding of Burned Areas
Fencing
Floodwater Diversion
Grade Stabilization Structure
Grassed Waterway or Outlet
Heavy Use Area Protection
Lined Waterway or Outlet
Livestock Exclusion
Mulching
Road Culvert Downdrain Structure
Road Culvert Inlet Structure
Road Culvert Outlet Structure
Stream Channel Stabilization
Streambank Protection
Stripcropping
Terrace
Vegetative Stream/Lake Bufferstrip

1/ Preliminary list.

RANGE MANAGEMENT SUB-SYSTEM

A combination of inter-related conservation practices and management techniques needed to provide a source of forage from native, naturalized, or adapted seeded plants under natural climatic conditions to be grazed by livestock and to provide water for livestock. Practices are to be performed in a manner that prevents accelerated erosion of the soil resource, maintains the desired plant composition, provides habitat for wildlife, and protects water quality.

Applies to Grazing Lands identified as Rangeland and to Woodlands identified as Timber and Grazing.

One or more component practices shall be specified based on an on-site investigation or personal knowledge of the soils and plants that are typical for the local area.

Component Practices for Water Quality Planning: 1/

Brush Management	Pond
Deferred Grazing	Proper Grazing Use
Fencing	Range Seeding
Firebreak (Fuel Break)	Spring Development
Planned Grazing Systems	Well

PASTURE MANAGEMENT SUB-SYSTEM

A combination of inter-related conservation practices and management techniques needed to provide a source of forage from domesticated plants to be grazed by livestock. Practices are to be performed in a manner that prevents accelerated erosion of the soil resource, maintains the desired plant composition, provides habitat for wildlife, and protects water quality.

Applies to Grazing Lands identified as Irrigated Pastureland and Non-Irrigated Pastureland and areas that will be converted to these uses by planned activities.

One or more component practices shall be specified based on an on-site investigation or personal knowledge of the soils and plants that are typical for the local area.

Component Practices for Water Quality Planning: 1/

Fencing	Pasture and Hayland Planting
Firebreak (Fuel Break)	Pasture and Hayland Management

1/ Preliminary list

RECREATION MANAGEMENT SUB-SYSTEM

A combination of inter-related conservation practices and management techniques needed to provide desired outdoor recreation activities. Practices are to be performed in a manner that prevents accelerated erosion of the soil resource, maintains the quality of the recreation facility, and protects water quality.

Applies to Recreation Land and any other land use where recreation is a secondary product and areas that will be converted to this use by planned activities.

One or more component practices shall be specified based on an on-sit investigation or personal knowledge of the soil, plants, wildlife species, and recreation facilities adapted or typical for the local area.

Component Practices for Water Quality Planning: 1/

Access Road
Fencing
Heavy Use Area Protection
Recreation Area Improvement
Recreation Trail and Walkway

SOIL MANAGEMENT SUB-SYSTEM

A combination of inter-related conservation practices and management techniques needed to maintain soil productivity. Practices are to be performed in a manner that prevents accelerated erosion of the soil resource, supports the continuance of the particular land use, and protects water quality.

Applies to all land uses where the soil surface is disturbed by cultivation.

One or more component practices shall be specified based on an on-site investigation or personal knowledge of the soils in the local area.

Component Practices for Water Quality Planning: 1/

Chiseling and Subsoiling
Conservation Cropping System
Cover and Green Manure Crop
Crop Residue Use
Minimum Tillage
Mulching

1/ Preliminary List.

WATER MANAGEMENT SUB-SYSTEM

A combination of inter-related conservation practices and management techniques needed to meet the applied water requirements of plants. Practices are to be performed in a manner that prevents accelerated erosion of the soil resource, maintains soil moisture levels needed for uniform plant growth, applies water in an efficient manner, and protects water quality.

Applies to Irrigated Cropland, Irrigated Pastureland, and any other land use that receives irrigation water or is planned to receive irrigation water.

One or more component practices shall be specified based on an on-site investigation or personal knowledge of the soils and plants irrigation in the local area.

Component Practices for Water Quality Planning: 1/

Irrigation Ditch and Canal Lining
Irrigation Land Leveling
Irrigation Pipeline
Irrigation System - Drip
Irrigation System - Sprinkler
Irrigation System - Surface
Irrigation System Tailwater Recovery
Irrigation Water Management

WILDLIFE MANAGEMENT SUB-SYSTEM

A combination of inter-related conservation practices and management techniques needed to produce desired species of fish and wildlife. Practices are to be performed in a manner that prevents accelerated erosion of the soil resource, maintains needed habitat for fish and wildlife, and protects water quality.

Applies to Wildlife Land and any other land use where fish and wildlife are secondary crops or products and areas that will be converted to Wildlife Land by planned activities.

One or more component practices shall be specified based on an on-site investigation or personal knowledge of the soil, plants, and wildlife species that area adapted or typical for the local area.

Component Practices for Water Quality Planning: 1/

Firebreak (Fuel Break)
Wildlife Upland Habitat Management
Wildlife Wetland Habitat Management

1/ Preliminary List.

WOODLAND MANAGEMENT SUB-SYSTEM

A combination of inter-related conservation practices and management techniques needed for production of adapted wood crops. Practices are to be performed in a manner that prevents accelerated erosion of the soil resource, maintains the vigor of desired tree species including protection from wildlife damage, provides habitat for wildlife, and protects water quality.

Applies to Woodlands identified as Timber, Timber and Grazing, and areas that will be converted to these uses by planned activities.

One or more component practices shall be specified based on an on-site investigation or personal knowledge of the soils and tree species that are adapted or typical for the local area.

Component Practices for Water Quality Planning: 1/

Access Road	Woodland Direct Planting
Fencing	Woodland Improved Harvesting
Firebreak (Fuel Break)	Woodland Improvement
Livestock Exclusion	Woodland Proper Grazing
Tree Planting	Woodland Site Preparation

1/ Preliminary List.

BEST MANAGEMENT PRACTICES Resource Management Sub-Systems and Component Practices	GRAZING			TIMBER	CROPLAND							OTHER
	Rangeland, Grazing & Mineral Production	Non-Irrigated Pasture	Irrigated Pasture	Timber, Timber & Grazing	Non-Irrigated Row & Field Crop	Irrigated Row & Field Crops	Non-Irrigated Orchard/ Vineyard	Irrigated Orchard/ Vineyard	Recreation Land	Trans. Services Land	Wildlife Land	Mineral Production, Developing Land
EROSION CONTROL SUB-SYSTEM	X	X	X	X	X	X	X	X	X	X	X	X
Access Road	X	X	X	X	X	X	X	X	X	X	X	X
Contour Farming (Cross-Slope Farming)					X	X						
Contour Orchard and Other Fruit Areas							X	X				
Cover and Green Manure Crop					X	X	X	X				
Critical Area Planting	X	X	X	X	X	X	X	X	X	X	X	X
Crop Residue Use					X	X	X	X				
Dam Diversion	X	X		X	X		X		X		X	X
Debris Basin	X	X		X	X		X		X	X	X	X
Dewatering System (Horiz. Drain)	X			X					X	X		
Diversion	X	X		X	X	X	X	X	X	X	X	X
Emergency Seeding of Burned Areas	X	X		X					X		X	
Fencing	X	X	X	X					X	X		
Floodwater Diversion		X	X		X	X	X	X	X	X		X
Grade Stabilization Structure	X	X	X	X	X	X	X	X	X		X	X
Grassed Waterway or Outlet	X	X	X	X	X		X		X	X	X	X
Heavy Use Area Protection									X	X		
Lined Waterway or Outlet					X	X	X	X	X	X		
Livestock Exclusion	X	X		X	X	X	X	X	X	X		
Mulching					X	X	X	X		X		
Road Culvert Downdrain Structure										X		
Road Culvert and Inlet Structure										X		
Road Culvert Outlet Structure										X		
Road Edge Lining									X	X		X
Stream Channel Stabilization	X	X	X	X	X	X	X	X	X	X	X	X
Streambank Protection	X	X	X	X	X	X	X	X	X	X	X	X
Stripcropping					X	X	X	X				
Terrace					X	X	X	X				
Vegetative Stream/Lake Bufferstrip	X	X	X	X	X	X	X	X	X	X	X	X
RANGE MANAGEMENT SUB-SYSTEM	X			X								
Brush Management	X			X								
Deferred Grazing	X			X								
Fencing	X			X								
Firebreak (Fuel Break)	X			X								
Planned Grazing System	X			X								
Pond	X			X								
Proper Grazing Use	X			X								
Range Seeding	X			X								
Spring Development	X			X								
Well	X			X								

APPENDIX M

RELATIONSHIP OF BEST MANAGEMENT PRACTICES AND LAND USE

BEST MANAGEMENT PRACTICES Resource Management Sub-Systems and Component Practices	GRAZING			WOODLAND	CROPLAND							OTHER
	Rangeland, Grazing & Mineral Production	Non-Irrig. Pasture	Irrigated Pasture	Timber, Timber & Grazing	Non-Irrig. Row & Field Crops	Irrigated Row & Field Crops	Non-Irrig. Orchard/ Vineyard	Irrigated Orchard/ Vineyard	Recreation Land	Trans. Services Land	Wildlife Land	Mineral Production, Developing Land
PASTURE MANAGEMENT SUB-SYSTEM		x	x									
Fencing		x	x									
Firebreak (Fuel Break)		x										
Pasture and Hayland Management		x	x									
Pasture and Hayland Planting		x	x									
RECREATION MANAGEMENT SUB-SYSTEM									x			
Access Road									x			
Fencing									x			
Heavy Use Area Protection									x			
Recreation Area Improvement									x			
Recreation Trail and Walkway									x			
SOIL MANAGEMENT SUB-SYSTEM					x	x	x	x				
Chiseling and Subsoiling					x	x						
Conservation Cropping System					x	x	x	x				
Cover and Green Manure Crop					x	x	x	x				
Crop Residue Use					x	x	x	x				
Minimum Tillage					x	x	x	x				
Mulching					x	x	x	x				
WATER MANAGEMENT SUB-SYSTEM			x			x		x	x			
Irrigation Ditch and Canal Lining			x			x		x				
Irrigation Land Leveling			x			x		x				
Irrigation Pipeline			x			x		x				
Irrigation System--Drip			x			x		x	x			
Irrigation System--Sprinkler			x			x		x	x			
Irrigation System--Surface			x			x		x	x			
Irrigation System--Tailwater Recovery			x			x		x				
Irrigation Water Management			x			x		x	x			
WILDLIFE MANAGEMENT SUB-SYSTEM											x	
Firebreak (Fuel Break)											x	
Wildlife Wetland Habitat Management											x	
Wildlife Upland Habitat Management											x	

M-7

APPENDIX M

RELATIONSHIP OF BEST MANAGEMENT PRACTICES AND LAND USE

BEST MANAGEMENT PRACTICES Resource Management Sub-Systems and Component Practices	GRAZING			WOODLAND	CROPLAND							OTHER
	Rangeland, Grazing & Mineral Production	Non-Irrig. Pasture	Irrigated Pasture	Timber, Timber & Grazing	Non-Irrig. Row & Field Crops	Irrigated Row & Field Crops	Non-Irrig. Orchard/ Vineyard	Irrigated Orchard/ Vineyard	Recreation Land	Trans. Services Land	Wildlife Land	Mineral Production, Developing Land
WOODLAND MANAGEMENT SUB-SYSTEM				x								
Access Road				x								
Fencing				x								
Firebreak (Fuel Break)				x								
Livestock Exclusion				x								
Tree Planting				x								
Woodland Direct Planting				x								
Woodland Improved Harvesting				x								
Woodland Improvement				x								
Woodland Proper Grazing				x								
Woodland Site Preparation				x								

"x" indicates those component practices that should be considered for a given land use.

APPENDIX M

GLOSSARY OF

COMPONENT CONSERVATION PRACTICES 1/

OF BEST MANAGMEMENT PRACTICES

ACCESS ROAD

A road constructed as part of a conservation plan to provide needed access. Its purpose is to provide a route for travel, for moving equipment and supplies, and for providing access for proper operation and management of conservation enterprises.

BRUSH MANAGEMENT

Killing or suppressing brush by mechanical, chemical, biological, or other means on all areas except cropland and woodland. Its purpose is to eliminate or reduce competition of woody vegetation, and thereby facilitate the establishment or re-establishment of a satisfactory cover for soil protection, forage production, fire control, increased groundwater or to improve wildlife habitat and recreation sites.

CHISELING AND SUBSOILING

Loosening the soil, without inverting and with a minimum of mixing of the surface soil, to shatter restrictive layers below normal plow depth that inhibit water movement or root development. Its purpose is to improve water and root penetration and aeration.

CONSERVATION CROPPING SYSTEM

Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops. Its purpose is to improve or maintain good physical condition of the soil; protect the soil during periods when erosion usually occurs; help control weeds, insects, and diseases; and meet the need and desire of farmers for an economic return.

1/ Preliminary list.

CONTOUR FARMING (CROSS-SLOPE FARMING)

Farming sloping cultivated land in such a way that plowing, preparing land, planting, and cultivating are done on the contour or generally perpendicular to the slope. Its purpose is to reduce erosion and control water.

CONTOUR ORCHARD AND OTHER FRUIT AREA

Planting orchards, vineyards, or small fruits so that all cultural operations can be done on the contour. Its purpose is to reduce soil and water loss; to better control and use water; and to be able to operate farm equipment more easily.

COVER AND GREEN MANURE CROP

A crop of close-growing grasses, legumes, or small grain grown for 1 year or less, except where grown as permanent cover as in orchards. Its purpose is to control erosion during periods when the major crops do not furnish adequate cover; to add organic material to the soil; and to improve infiltration, aeration, and tilth.

CRITICAL AREA PLANTING

Establishing vegetation such as trees, shrubs, vines, grasses, or legumes on severely eroding areas. Its purpose is to stabilize the soil; reduce damage from sediment and runoff to downstream areas; improve wildlife habitat; and enhance natural beauty.

CROP RESIDUE USE

Using plant residues after harvest on the same cultivated field during the critical erosion periods. Its purpose is to conserve moisture; increase infiltration; reduce soil loss; and improve soil tilth.

DAM, DIVERSION

A structure built to divert part or all of the water from a waterway or stream into a different watercourse, an irrigation canal or ditch, or a waterspreading system. Its purpose is to divert part or all of the water from a waterway in such a manner that it can be controlled and applied to a beneficial use, or to divert periodic damaging flows from a watercourse to another watercourse having characteristics which reduce the damage potential of the flows.

DEBRIS BASIN

A barrier or dam constructed across a waterway or at other suitable locations to form a silt or sediment basin. Its purpose is to preserve the capacity of reservoirs, ditches canals, diversions, waterways and streams; to prevent undesirable deposition of sediment on bottomlands and developed areas; to trap sediment originating from construction sites; and to reduce or abate pollution by providing basins for deposition and storage of silt, sand, gravel, stone, agricultural wastes, and other detritus.

DEFERRED GRAZING

A management technique used to prevent livestock from grazing land for a prescribed period. Its purpose is to (1) promote natural revegetation by increasing the vigor of the forage stand and permitting desirable plants to produce seed; (2) provide a feed reserve for fall and winter grazing or emergency use; and (3) to improve hydrologic conditions and reduce soil loss.

DEWATERING SYSTEM (HORIZONTAL DRAIN) (Tentative)

Using one or more horizontal wells drilled into the cut and/or fill embankments of roads or landslide areas subject to additional slumping or sliding. Its purpose is to remove free water, to reduce the potential for future slumping or sliding, to protect the road, to reduce soil erosion, and to reduce sediment pollution of streams.

DIVERSION

A channel with a supporting ridge on the lower side constructed across the slope. The purpose of this practice is to divert water from areas where it is in excess to sites where it can be used or disposed of safely.

EMERGENCY SEEDING OF BURNED AREAS

Applying seed of adapted grasses or other plants on newly burned areas. The purpose of the practice is to help stabilize soils, to reduce soil erosion, and to reduce sedimentation damage on or below the burned areas.

FENCING

Enclosing or dividing an area of land with a suitable permanent structure that acts as a barrier to livestock, big game, or people. Its purpose is to: (1) exclude livestock or big game from areas that should be protected from grazing; (2) confine livestock or big game on an area; (3) subdivide land to permit use of grazing systems, including when pertinent, design of fence to permit free movement of game species; (4) protect new seedings and plantings from grazing; and (5) regulate access to areas by people.

FIREBREAK (FUEL BREAK)

A strip of bare land or fire-retarding vegetation. Its purpose is to protect soil, water, and plant resources by reducing or preventing damage from fire.

FLOODWATER DIVERSION

A graded channel with a supporting embankment or dike on the lower side constructed on lowland subject to flood damage. Its purpose is to divert floodwater from lowlands.

GRADE STABILIZATION STRUCTURE

A structure to stabilize the grade or to control head cutting in natural or artificial channels. Its purpose is to stabilize the grade and control erosion in natural or artificial channels, prevent the formation or advance of gullies, and reduce environmental and pollution hazards.

GRASSED WATERWAY OR OUTLET

A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose runoff from a field, diversion, terrace, or other structure. Its purpose is to prevent excessive soil loss and formation of gullies.

HEAVY USE AREA PROTECTION

Establishing vegetative cover on heavily used areas or surfacing them with suitable materials, ir installing needed structures. Its purpose is to stabilize urban, recreation or essential facility areas subjected to sustained heavy use by people, animals or vehicles.

IRRIGATION DITCH AND CANAL LINING

A fixed lining of impervious material installed in existing or newly constructed irrigation field ditch or irrigation canal or lateral. This includes shaping or reshaping of ditch and using material such as concrete, asphalt, or other durable lining. The principal purposes of ditch and canal lining are to prevent waterlogging of land, to maintain water quality, to prevent erosion, and to reduce water loss.

IRRIGATION LAND LEVELING

Reshaping the surface of land to be irrigated to planned grades. Its purpose is to permit uniform and efficient application of irrigation water without erosion, loss of water quality, or damage to land by waterlogging, and at the same time to provide for adequate surface drainage.

IRRIGATION PIPELINE

A rigid water conduit installed in an irrigation system. Its purpose is to convey water to fields of plants needing supplemental water, to prevent soil erosion, to maintain water quality, to prevent waterlogging adjacent land, and to reduce water losses.

IRRIGATION SYSTEM, DRIP

A planned irrigation system where all necessary facilities have been installed for the efficient application of water directly to the root zone of plants by means of applicators (orifices, emitters, porous tubing, perforated pipe, etc.) operated under low pressure. The applicators may be placed on or below the surface of the ground. Its purpose is to apply irrigation water efficiently directly to plant root zone in order to maintain soil moisture within the range for good plant growth without excessive water loss, erosion, reduction in water quality or salt accumulation.

IRRIGATION SYSTEM, SPRINKLER

A planned irrigation system where all necessary facilities have been installed for the efficient application of water for irrigation by means of perforated pipes or nozzles operated under pressure. Its purpose is to apply irrigation water efficiently and uniformly in order to maintain soil moisture within the range of optimum plant growth, without excessive water loss, erosion or reduction in water quality.

IRRIGATION SYSTEM, SURFACE

A planned irrigation system where all necessary water control structures have been installed for the efficient distribution of irrigation water by surface means, such as furrows, boarders, contour levees, or contour ditches. Its purpose is to efficiently convey and distribute irrigation water to the point of application without excessive erosion, water losses, or reduction in water quality.

IRRIGATION SYSTEM, TAILWATER RECOVERY

A facility to collect, store, and transport irrigation tailwater for re-use in the farm irrigation distribution system. Its purpose is to conserve farm irrigation water supplies and water quality by collecting the water that runs off the field surface and making this water available for re-use on the farm.

IRRIGATION WATER MANAGEMENT

A combination of management techniques used to determine and control the rate, amount and timing of irrigation water application to soils to supply plant needs in a planned and efficient manner. Its purpose is to effectively utilize the available irrigation water supply in managing and controlling the moisture environment of crops to promote the desired crop response; to minimize soil erosion and loss of plant nutrients; to control undesirable water loss; and to protect water quality.

LINED WATERWAY OR OUTLET

A waterway or outlet with an erosion resistant lining of concrete, stone, or other permanent material. The lined section extends up the side slopes to designed depth. The earth above the permanent lining may be vegetated or otherwise protected. Its purpose is to provide for safe disposal of runoff from other conservation structures of from natural concentrations of flow, without damage by erosion or flooding, in situtations where unlined or grassed waterways would be inadequate.

LIVESTOCK EXCLUSION

A management technique used to prevent livestock from grazing a specific area. Its purpose is to protect, maintain, or improve the quantity and quality of the plant and animal resources; to maintain enough vegetative cover to protect the soil from erosion; to maintain moisture resources; and to increase natural beauty.

MINIMUM TILLAGE

Limiting the number of cultural operations to those that are properly timed and essential to produce a crop and prevent soil damage. Its purpose is to retard deterioration of soil structure; reduce soil compaction and formation of tillage pans; and to improve soil aeration, permeability, and tilth.

MULCHING

Applying plant residues or other suitable materials not produced on the site to the soil surface. Its purpose is to conserve moisture; prevent surface compaction or crusting, reduce runoff and erosion; control weeds; and help establish plant cover.

PASTURE AND HAYLAND MANAGEMENT

A combination of management techniques used to control livestock grazing of pastureland or hayland. Its purpose is to prolong the life of desirable forage species; to maintain or improve the quality and quantity of forage; and to reduce soil erosion.

PASTURE AND HAYLAND PLANTING

Establishing or re-establishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants. Its purpose is to reduce soil erosion, to produce high quality forage, and to adjust land use.

PLANNED GRAZING SYSTEMS

A management technique used to prevent livestock from grazing two or more grazing units that are alternately rested from grazing in a planned sequence over a period of years. The rest period may be throughout the year or during the growing season of the key plants. Its purpose is to (1) - maintain or speed up improvement in plant cover while properly using the forage on all grazing units; (2) - To improve efficiency of grazing by uniformly using all parts of each grazing units; (3) To insure a supply of forage throughout the grazing season; (4) - For watershed protection; and (5) - To enhance wildlife habitat.

POND

A water impoundment made by constructing a dam or embankment or by excavating a pit or "dugout". Its purpose is to provide water for livestock, fish and wildlife, recreation, fire control, crop and orchard spraying, and other related uses.

PROPER GRAZING USE

A combination of management techniques used to control livestock grazing on pastureland and rangeland at an intensity which will maintain enough vegetative cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation. Its purpose is to: (1) Increase the vigor and reproduction of key plants; (2) Accumulate litter and mulch necessary to conserve soil and water; (3) Improve or maintain condition of the vegetation; (4) Increase forage production; (5) Maintain natural beauty; and (6) Reduce the fire hazard.

RANGE SEEDING

Establishing adapted plants by seeding on Rangeland. Its purpose is to, (1) Prevent excessive soil and water loss; (2) Produce more forage on rangeland or land converted to rangeland or land converted to range from other uses; and (3) Improve the natural beauty of grazing land.

RECREATION AREA IMPROVEMENT

Establishing grasses, legumes, vines, trees, or other plants or selectively reducing stand density and trimming woody plants to improve an area for recreation. Its purpose is to increase the attractiveness and usefulness of recreation areas and to protect the soil and plant resources.

RECREATION TRAIL AND WALKWAY

A pathway prepared especially for pedestrian, equestrian, and cycle travel. Its purpose is to provide recreation area users with travel routes for activities such as walking, sightseeing, horseback riding and bicycling, to prevent erosion and to preserve and protect soil, plant, animal and visual resources.

ROAD CULVERT DOWNDRAIN (Structures for Water Control)

A flexible or rigid stormwater conduit extending from a road culvert outlet to the toe of a sloping area where concentrated runoff would cause excessive soil erosion. Its purpose is to conduct storm runoff from one elevation to another, reduce soil erosion, reduce sediment pollution of streams, and to prevent damage to the roadbed.

ROAD CULVERT INLET STRUCTURE (Structures for Water Control)

A rigid water inlet structure installed at the inlet of a road culvert carrying stormwater containing suspended solids and where the road surface is several feet above the culvert. Its purpose is to raise the elevation of stormwater before it enters the culvert, to cause some of the suspended solids to settle out of the stormwater to reduce roadside erosion in the vicinity of the culvert, and to reduce sediment pollution of streams.

ROAD CULVERT OUTLET STRUCTURE (Structures for Water Control)

A rigid structure installed at the outlet of a road culvert or road culvert downdrain. Its purpose is to reduce stormwater velocity and dissipate its energy, to reduce soil erosion, and to reduce sediment pollution of streams.

SPRING DEVELOPMENT

Improving springs and seeps by excavating, cleaning, capping, or providing collection and storage facilities. Its purpose is to improve the distribution or to increase the quantity of livestock water supplies, but may be made for irrigation if water in suitable quantity and quality is available.

STREAM CHANNEL STABILIZATION

Installing structures in the bottom of streams where the channels are either aggrading or degrading. Its purpose is to maintain channel bottom elevations, to control stream velocities, and to maintain a stream's capacity to convey runoff water when vegetative protection or other means are not feasible.

STREAMBANK PROTECTION

Using structural and/or vegetative means to protect banks of streams, lakes, estuaries or excavated channels against scour and erosion. Its purpose is to (1) To prevent erosion, loss of land, or damage to utilities, roads, buildings, or other facilities adjacent to the eroding area, (2) To maintain the capacity of a channel, (3) To control channel meander which would adversely affect downstream facilities, (4) To reduce sediment loads causing damages and pollution or to improve areas for recreational use or as a habitat for fish and wildlife.

STRIPCROPPING, CONTOUR

Growing crops in a systematic arrangement of strips or bands on the contour to reduce soil erosion by water. The crops are arranged so that a strip of grass or close-growing crop is alternated with a strip of clean-tilled crop or fallow or a strip of grass is alternated with a close growing crop. Its purpose is to reduce soil erosion and control water. grass or close-growing crop is alternated with a clean-tilled crop or fallow. Its purpose is to reduce soil erosion and control runoff on sloping cropland where contour stripcropping is not practical.

STRIPCROPPING, WIND

Growing wind-resisting crops in strips alternating with row crops or fallow and arranged at angles to offset adverse wind effects. Includes any herbaceous vegetative barrier that reduces wind velocities of both the leeward and windward, but predominantely the leeward, flow of air across a land surface. Its purpose is to reduce wind erosion, trap snow, and increase stored soil moisture.

TERRACE

An embankment, channel, or a combination ridge and channel constructed across the slope. Its purpose is to (1) Reduce slope length, (2) Reduce erosion, (3) Reduce sediment content in runoff water, (4) Intercept and conduct surface runoff at a nonerosive velocity to a stable outlet, (5) Retain runoff for moisture conservation, (6) Prevent gully development, (7) Reform the land surface, (8) Improve farmability and (9) Reduce flooding.

TREE PLANTING

Establishing adapted trees by planting seedlings or cuttings on land without trees or on land with a partial stand of trees. Its purpose is to conserve soil and moisture; beautify an area; protect a watershed; or produce wood crops.

VEGETATIVE STREAM/LAKE BUFFERSTRIP

Establishing now or using existing adapted grasses, legumes, shrubs, and trees on areas adjacent to the streams or lakes and managing them for adequate vegetative cover. Its purpose is to remove suspended solids carried by water flowing overland toward the stream or lake, improve water quality, provide streambank stabilization, provide wildlife habitat, protect riparian vegetation, and improve natural beauty.

WELL

A hole drilled into the earth down to water bearing strata with the necessary mechanical equipment to pump the water to the surface. Its purpose is to facilitate proper use of vegetation on Rangeland, Pastureland, and Wildlife Land: to supply the water requirements of livestock and wildlife; to provide an adequate supply of water for conservation irrigation; and to provide for human use at recreation sites.

WILDLIFE UPLAND HABITAT

A combination of management techniques used to retain, create, or improve wildlife habitat on areas other than wetlands. Its purpose is to keep, establish, or improve food, escape, and nesting habitat for desired kinds of wildlife.

WILDLIFE WETLAND HABITAT MANAGEMENT

A combination of management techniques used to retain, create or improve wetland habitat for wildlife. Its purpose is to keep, establish, or improve food, escape, and nesting habitat for waterfowl, fur bearers, or other wildlife.

WOODLAND DIRECT SEEDING

Establishing adapted trees by planting tree seed by hand or by mechanical means on land without trees or on land with partial stand of trees. Its purpose is to conserve soil and moisture, produce wood crops, and protect a watershed.

WOODLAND IMPROVED HARVESTING

Systematically removing some of the merchantable trees from an immature stand or all the trees from a designated part of a woodland. Its purpose is to improve the conditions for forest growth and/or to harvest trees in a manner that encourates the regeneration and normal development of a new stand.

WOODLAND IMPROVEMENT

Removing unmerchantable or unwanted trees, shrubs, or vines from woodland areas. Its purpose is to fully use the potential of the site, to maintain plant cover for soil protection, to improve stand composition by leaving the best trees, to improve forage production on grazable woodland, and to improve the natural beauty, wildlife, or recreational values of the area.

WOODLAND PROPER GRAZING

A combination of management techniques used to control livestock grazing on woodland areas at an intensity that will maintain enough vegetative cover and maintain growth of the stand of trees. Its purpose is to increase forage production, to control vegetation impeding tree growth, to accumulate litter and mulch that will reduce soil erosion, and to reduce the fire hazard.

WOODLAND SITE PREPARATION

Treating areas to encourage natural seeding, growth of desirable trees, or to permit reforestation by planting or direct seeding. Its purpose is to prepare land for establishing a stand of trees in a manner that will conserve soil and water.

TABLE ALTERNATIVE MANAGEMENT PRACTICES ON TRANSPORTATION SERVICES LAND,

Alternative Management Practices	Estimated a/ Reduction in Soil Erosion (Percent)	Estimated b/ Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
Transportation Route Erosion - State/County/City Maintained Roadsides.			
Erosion Control Sub-System			
Critical Area Planting	80	80	No
Debris Basin	10	90	No
Dewatering System (Horiz. Drain)	80	80	No
Diversion	10	80	No
Fencing	40	40	No
Grade Stabilization Structure	70	80	No
Grassed Waterway or Outlet	70	70	No
Heavy Use Area Protection	90	90	No
Lined Waterway or Outlet	80	80	No
Mulching	60	60	No
Streambank Protection	70	70	No
Road Culvert Downdrain	80	80	No
Road Culvert and Inlet Structure	80	80	No
Road Culvert Outlet Structure	80	80	No
Road Edge Lining	90	90	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is(are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is(are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES ON TRANSPORTATION SERVICES LAND

Alternative Management Practices	Estimated a/ Reduction in Soil Erosion (Percent)	Estimated b/ Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
Transportation Route Erosion - Privately Maintained Roadsides			
Erosion Control Sub-System			
Critical Area Planting	80	80	No
Debris Basin	10	90	No
Dewatering System (Horiz. Drain)	80	80	No
Diversion	10	80	No
Fencing	40	40	No
Grade Stabilization Structure	70	80	No
Grassed Waterway or Outlet	70	70	No
Heavy Use Area Protection	90	90	No
Lined Waterway or Outlet	80	80	No
Livestock Exclusion	40	40	No
Mulching	60	60	No
Streambank Protection	70	70	No
Road Culvert Downdrain	80	80	No
Road Culvert and Inlet Structure	80	80	No
Road Culvert Outlet Structure	80	80	No
Road Edge Lining	90	90	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is(are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is(are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICE COMBINATIONS ON TRANSPORTATION SERVICES LAND

Alternative Management Practices	Estimated a/ Reduction in Soil Erosion (Percent)	Estimated b/ Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
Transportation Route Erosion - State/County/City Maintained Roadsides			
Erosion Control Sub-System			
Critical Area Planting and Debris Basin	80	90	No
Diversion and Road Culvert and Inlet Structure	85	85	No
Transportation Route Erosion - Privately Maintained Roadsides			
Erosion Control Sub-System			
Critical Area Planting and Debris Basin	80	90	No
Diversion and Road Culvert and Inlet Structure	85	85	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is(are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is(are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated Reduction in Soil Erosion [a/] (Percent)	Estimated Reduction in Sedimentation [b/] (Percent)	Part of Normal Farm Operation
	Slight and Moderate Sheet and Rill Erosion from Precipitation		
Soil Management Sub-System			
Conservation Cropping System	70	80	Yes
Crop Residue Use	50	60	Yes
Minimum Tillage	40	50	No
Water Management Sub-System			
Irrigation System-Surface	30	20	Yes
Irrigation System Tailwater Recovery	30	70	No
Irrigation Water Management	30	20	Yes
Erosion Control Sub-System			
Cover and Green Manure Crop	70	70	No
Stripcropping	40	70	No
Debris Basin	10	70	No
Vegetative Stream Bufferstrip	10	50	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICE COMBINATIONS FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
	Slight and Moderate Sheet and Rill Erosion from Precipitation		
Soil Management Sub-System			
Conservation Cropping System and Minimum Tillage	80	80	No
Crop Residue Use and Minimum Tillage	60	70	No
Water Management Sub-System			
Irrigation System-Surface and Irrigation Water Management	40	40	Yes
Irrigation Water Management and Irrigation System Tailwater Recovery	40	70	No
Erosion Control Sub-System			
Cover and Green Manure Crop and Vegetative Stream Bufferstrip	80	90	No
Stripcropping and Debris Basin	40	90	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated Reduction in Soil Erosion (Percent) [a/]	Estimated Reduction in Sedimentation (Percent) [b/]	Part of Normal Farm Operation
	Severe Sheet and Rill Erosion from Precipitation		
Soil Management Sub-System			
Conservation Cropping System	60	70	Yes
Crop Residue Use	40	50	Yes
Minimum Tillage	40	50	No
Water Management Sub-System			
Irrigation System-Surface	30	20	Yes
Irrigation System Tailwater Recovery	30	70	No
Irrigation Water Management	30	20	Yes
Erosion Control Sub-System			
Cover and Green Manure Crop	60	70	No
Stripcropping	40	70	No
Debris Basin	10	70	No
Vegetative Stream Bufferstrip	10	50	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICE COMBINATIONS FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
	Severe Sheet and Rill Erosion from Precipitation		
Soil Management Sub-System			
Conservation Cropping System and Minimum Tillage	60	70	No
Crop Residue Use and Minimum Tillage	50	60	No
Water Management Sub-System			
Irrigation System-Surface and Irrigation Water Management	40	40	Yes
Irrigation Water Management and Irrigation System Tailwater Recovery	40	70	No
Erosion Control Sub-System			
Cover and Green Manure Crop and Vegetative Stream Bufferstrip	60	80	No
Stripcropping and Debris Basin	40	80	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
	Slight and Moderate Sheet and Rill Erosion from Irrigation Water		
Soil Management Sub-System			
Conservation Cropping System	60	70	Yes
Crop Residue Use	60	50	Yes
Minimum Tillage	50	50	No
Water Management Sub-System			
Irrigation System-Surface	50	20	Yes
Irrigation System Tailwater Recovery	10	70	No
Irrigation Water Management	90	80	Yes
Erosion Control Sub-System			
Cover and Green Manure Crop	60	70	No
Stripcropping	40	70	No
Debris Basin	10	70	No
Vegetative Stream Bufferstrip	10	50	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICE COMBINATIONS FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated Reduction in Soil Erosion (Percent) [a/]	Estimated Reduction in Sedimentation (Percent) [b/]	Part of Normal Farm Operation
	Slight and Moderate Sheet and Rill Erosion from Irrigation Water		
Soil Management Sub-System			
Conservation Cropping System and Minimum Tillage	70	80	No
Crop Residue Use and Minimum Tillage	60	70	No
Water Management Sub-System			
Irrigation System-Surface and Irrigation Water Management	90	80	Yes
Irrigation Water Management and Irrigation System Tailwater Recovery	90	90	No
Erosion Control Sub-System			
Cover and Green Manure Crop and Vegetative Stream Bufferstrip	80	90	No
Stripcropping and Debris Basin	60	80	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
	Severe Sheet and Rill Erosion from Irrigation Water		
Soil Management Sub-System			
Conservation Cropping System	50	50	Yes
Crop Residue Use	40	40	Yes
Minimum Tillage	30	30	No
Water Management Sub-System			
Irrigation System-Surface	30	10	Yes
Irrigation System Tailwater Recovery	10	60	No
Irrigation Water Management	70	60	Yes
Erosion Control Sub-System			
Cover and Green Manure Crop	50	60	No
Stripcropping	40	60	No
Debris Basin	10	60	No
Vegetative Stream Bufferstrip	10	40	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICE COMBINATIONS FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated Reduction in Soil Erosion (Percent) [a/]	Estimated Reduction in Sedimentation (Percent) [b/]	Part of Normal Farm Operation
	Severe Sheet and Rill Erosion from Irrigation Water		
Soil Management Sub-System			
Conservation Cropping System and Minimum Tillage	60	60	No
Crop Residue Use and Minimum Tillage	50	50	No
Water Management Sub-System			
Irrigation System-Surface and Irrigation Water Management	80	60	Yes
Irrigation Water Management and Irrigation System Tailwater Recovery	80	70	No
Erosion Control Sub-System			
Cover and Green Manure Crop and Vegetative Stream Bufferstrip	60	70	No
Stripcropping and Debris Basin	40	80	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
	Gully Erosion from Precipitation--Small and Moderate Gullies		
Soil Management Sub-System			
Conservation Cropping System	50	40	Yes
Crop Residue Use	30	30	Yes
Water Management Sub-System			
Irrigation System-Surface	20	10	Yes
Irrigation Water Management	20	10	Yes
Erosion Control Sub-System			
Grade Stabilization Structure	90	90	No
Critical Area Planting	70	60	No
Grassed Waterway	70	60	No
Lined Waterway	90	90	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICE COMBINATIONS FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated Reduction in Soil Erosion (Percent) [a/]	Estimated Reduction in Sedimentation (Percent) [b/]	Part of Normal Farm Operation
	Gully Erosion from Precipitation--Small and Moderate Gullies		
Soil Management Sub-System			
Conservation Cropping System and Crop Residue Use	60	50	Yes
Water Management Sub-System			
Irrigation System-Surface and Irrigation Water Management	30	20	Yes
Erosion Control Sub-System			
Grade Stabilization Structure and Grassed Waterway	90	90	No
Grade Stabilization Structure and Lined Waterway	90	90	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated Reduction in Soil Erosion (Percent) [a/]	Estimated Reduction in Sedimentation (Percent) [b/]	Part of Normal Farm Operation
	Gully Erosion from Precipitation--Large Gullies		
Soil Management Sub-System			
Conservation Cropping System	30	20	Yes
Crop Residue Use	20	20	Yes
Water Management Sub-System			
Irrigation System-Surface	20	10	Yes
Irrigation Water Management	20	10	Yes
Erosion Control Sub-System			
Grade Stabilization Structure	70	80	No
Critical Area Planting	40	50	No
Grassed Waterway	40	50	No
Lined Waterway	90	90	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICE COMBINATIONS FOR IRRIGATED ROW/FIELD CROPLAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
Gully Erosion from Precipitation--Large Gullies			
Soil Management Sub-System			
Conservation Cropping System and Crop Residue Use	40	30	Yes
Water Management Sub-System			
Irrigation System-Surface and Irrigation Water Management	30	20	Yes
Erosion Control Sub-System			
Grade Stabilization Structure and Grassed Waterway	90	90	No
Grade Stabilization Structure and Lined Waterway	90	90	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES FOR RANGELAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
Slight and Moderate Sheet and Rill Erosion			
Range Management Sub-System			
Proper Grazing Use	50	50	Yes
Deferred Grazing	70	90	No
Erosion Control Sub-System			
Planned Grazing System	70	80	No
Severe Sheet and Rill Erosion			
Range Management Sub-System			
Proper Grazing Use	40	30	Yes
Deferred Grazing	50	60	No
Erosion Control Sub-System			
Planned Grazing System	60	70	No
Range Seeding	60	50	No
Livestock Exclusion	80	90	No
Emergency Seeding of Burned Areas	50	50	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICE COMBINATION FOR RANGELAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
	Slight and Moderate Sheet and Rill Erosion		
Range Management Sub-System			
Proper Grazing Use and Deferred Grazing	80	90	No
Erosion Control Sub-System			
No Practice Combinations			
	Severe Sheet and Rill Erosion		
Range Management Sub-System			
Proper Grazing Use and Deferred Grazing	60	70	No
Erosion Control Sub-System			
Planned Grazing System and Range Seeding	90	80	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES FOR RANGELAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
Gully Erosion--Small and Moderate Gullies			
Range Management Sub-System			
Proper Grazing Use	30	20	Yes
Deferred Grazing	40	30	No
Erosion Control Sub-System			
Planned Grazing System	40	30	No
Grade Stabilization Structure	70	80	No
Critical Area Planting	60	50	No
Livestock Exclusion	50	40	No
Gully Erosion--Large Gullies			
Range Management Sub-System			
Proper Grazing Use	20	10	Yes
Deferred Grazing	30	20	No
Erosion Control Sub-System			
Planned Grazing System	30	20	No
Grade Stabilization Structure	70	80	No
Critical Area Planting	40	30	No
Livestock Exclusion	30	20	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE *ALTERNATIVE MANAGEMENT PRACTICE COMBINATIONS FOR RANGELAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
Gully Erosion--Small and Moderate Gullies			
Range Management Sub-System			
Proper Grazing Use and Deferred Grazing	50	50	No
Erosion Control Sub-System			
Grade Stabilization Structure and Livestock Exclusion	90	90	No
Critical Area Planting and Livestock Exclusion	70	70	No
Gully Erosion--Large Gullies			
Range Management Sub-System			
Proper Grazing Use and Deferred Grazing	40	30	No
Erosion Control Sub-System			
Grade Stabilization Structure and Livestock Exclusion	90	90	No
Critical Area Planting and Livestock Exclusion	70	50	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICES FOR RANGELAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
Streambank Erosion			
Range Management Sub-System			
Proper Grazing Use	20	20	Yes
Deferred Grazing	30	30	No
Erosion Control Sub-System			
Planned Grazing System	30	30	No
Livestock Exclusion	40	40	No
Streambank Protection	60	60	No
Vegetative Stream Bufferstrip	50	50	No
Landslides			
Range Management Sub-System			
Proper Grazing Use	20	10	Yes
Deferred Grazing	30	20	No
Erosion Control Sub-System			
Planned Grazing System	30	20	No
Livestock Exclusion	50	50	No
Dewatering System	40	20	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

TABLE ALTERNATIVE MANAGEMENT PRACTICE COMBINATIONS FOR RANGELAND

Alternative Management Practices	Estimated [a/] Reduction in Soil Erosion (Percent)	Estimated [b/] Reduction in Sedimentation (Percent)	Part of Normal Farm Operation
		Streambank Erosion	
Range Management Sub-System			
Proper Grazing Use and Deferred Grazing	50	50	No
Erosion Control Sub-System			
Livestock Exclusion and Streambank Protection	80	80	No
Streambank Protection and Vegetative Stream Bufferstrip	90	90	No
		Landslides	
Range Management Sub-System			
Proper Grazing Use and Deferred Grazing	40	30	No
Erosion Control Sub-System			
Livestock Exclusion and Dewatering System	70	60	No

a/ Expected change in amount of accelerated soil loss if the practice(s) is (are) performed properly.

b/ Expected change in amount of sediment leaving the site and reaching a stream during a year with near average precipitation if the practice(s) is (are) performed properly.

APPENDIX N

The accompanying Federal Register analysis of the proposed Sole or Principal Source Aquifer Areas legislation discusses the implications of the regulations. The regulations have yet to be finalized due to an unresolved issue of how broadly "federal financial assistance" is to be defined. EPA is preparing a draft Manual establishing review criteria for proposed projects in designated aquifers.

The recent Fresno study provides extensive information on the evaluation process utilized by the EPA in determining that an aquifer qualifies as a sole source of drinking water. Two documents were prepared under the review and study process.

(1) Groundwater in the Fresno Area, California, U.S.G.S., June 1977:
Prepared for the purpose of supplying EPA with geologic and hydrologic infomration needed to:

a. Determine if the aquifer is a sole drinking water source
b. Determine if the aquifer can be contaminated, creating a significant hazard to public health
c. Evaluate the impacts of Federally assisted projects on the aquifer and its recharge area

The scope of the investigation included studying the geology with particular reference to the water-bearing deposits; determining the occurrence, direction of movement, recharge and discharge characteristics, depth to water, and fluctuations of water levels within the aquifer; describing the chemical quality of the groundwater; and discussing sources of drinking water other than ground water. There was adequate existing information to conduct the study.

(2) Sole Source Aquifer Determination Pursuant to Section 1424(e) of the Safe Drinking Water Act, Fresno County, California, EPA, Region IX, January 1977:
Uses the U.S.G.S. report and reports and data from other agencies to present the case for recommending designation of the Fresno basin. It also describes the nature of federally assisted projects which could contaminate the aquifer and are reviewable under the regulation.

Public hearing have been held on EPA's recommendation for designation and their findings challenged. The next action, after review and response to comments, will be the publication of final findings on designation.

[40 CFR Part 148]

[FRL 778-8]

WATER PROGRAMS

Sole or Principal Source Aquifer Areas

AGENCY: Environmental Protection Agency.

ACTION: Proposed rule.

SUMMARY: These proposed regulations implement aquifer requirements of the Safe Drinking Water Act. The regulations establish procedures for designating areas where an aquifer is the sole or principal source of drinking water, and for reviewing commitments of Federal financial assistance to projects in designated areas. The purpose is to prevent grants of Federal financial assistance to projects which may contaminate a "sole source" aquifer so as to create a significant hazard to public health.

DATE: Comment period: November 23, 1977.

ADDRESS: Send comments to: Environmental Protection Agency, Office of Water Supply (WH-550), 401 M Street SW., Washington, D.C. 20460.

FOR FURTHER INFORMATION CONTACT:

Ms. Zoraida J. Carballeira, Program Analyst, State Programs Division, Office of Water Supply (WH-550), Environmental Protection Agency (202-426-3934).

SUPPLEMENTARY INFORMATION: These proposed regulations implement Section 1424(e) of the Safe Drinking Water Act (42 U.S.C. 300f, 300h-3(e); 88 Stat. 1660 et. seq.; Pub. L. 93-523).

Section 1424(e) states:

> If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health, he shall publish notice of that determination in the FEDERAL REGISTER. After the publication of any such notice, no commitment for Federal financial assistance (through a grant contract, loan guarantee, or otherwise) may be entered into for any project which the Administrator determines may contaminate such aquifer through a recharge zone so as to create a significant hazard to public health, but a commitment for Federal assistance may, if authorized under another provision of law, be entered into to plan or design the project to assure that it will not so contaminate the aquifer.

In summary, Section 1424(e) authorizes:

(a) Designation of sole or principal source aquifer areas; and

(b) Review of Federal financially assisted projects which may contaminate the aquifer.

DESIGNATION

Subpart B of these regulations establishes requirements for an area to qualify for designation under Section 1424(e). Designation of an area will be made by the Administrator on his own motion, or upon receipt of a public petition meeting specified criteria, if the Administrator determines that an aquifer is the sole or principal source for the area and would, if contaminated, create a significant hazard to public health. The Administrator's determination will be based upon significant Regional input and upon the recommendation of the Regional Administrator.

The FEDERAL REGISTER notice of a designation will include a description of the boundaries of the recharge zone and the streamflow source zone of the aquifer in question. Maps of the area will be made available to the public upon request. Upon designation of an area, the EPA Regional Office in the area will also notify all regional Federal agencies of the designation and will provide the agencies with maps outlining the recharge zone and the streamflow source zone. EPA headquarters will notify the heads of all Federal agencies.

The only area which has been designated to date is the San Antonio, Texas area where the Edwards Underground Reservoir is the sole source of water supply for over 1,000,000 people.

PROJECT REVIEW

Section 1424(e) provides that no commitment of Federal financial assistance shall be made to a project which the Administrator determines may contaminate an aquifer in a designated area through its recharge zone so as to create "a significant hazard to public health." Subpart C of these regulations establishes procedures for review of projects for which an application for Federal financial assistance has been made. The project review process will be implemented by the Regional Administrators with the exception of the final determination which will be made by the Administrator. Regional Administrators are encouraged to explore all available alternatives with the Federal agencies involved, before a recommendation is submitted to the Administrator to determine that a project may contaminate an aquifer in a designated area so as to create a signigficant hazard to public health.

Programs and actions will be subject to EPA's project review authority only if an application for Federal financial assistance has been submitted. Federal actions such as dredging performed by the Army Corps of Engineers, which do not involve a grant of financial assistance to a project, are not affected by the project review authority granted by Section 1424(e). Similarly, Federal actions

of programs performed by contractors for the Federal Government, such as construction of roads on Federal lands by a contractor under the supervision of the Bureau of Land Management are not subject to project review. Although this type of Federal action does not fall within the scope of Section 1424(e), an obligation to evaluate ground water impact may exist based on other authority. Some actions may be subject to the provisions of the National Environmental Policy Act (NEPA), and the preparation of an environmental impact statement (EIS) may be required. Furthermore, in accordance with Executive Order 1752, all Federal facilities have a responsibility to take the initiative in the protection of the environment.

If a commitment of Federal financial assistance is sought which is within the meaning of Section 1424(e), the Administrator then has the authority to review the project for which financial assistance is sought, in order to determine whether the project may contaminate an aquifer in a designated area so as to create a significant hazard to public health. EPA will not be concerned with reviewing, on an individual basis, small, isolated commitments of financial assistance such as individual home mortgage loans (e.g., Farmers Home Administration loans and Veterans' Administration loans) which presumptively have an insignificant impact on aquifer quality. However, EPA may conduct review of the cumulative impact if a large number of such projects is of concern.

Because ground water impact evaluations are not only required under Section 1424(e), but are also an integral part of the responsibilities imposed under the National Environmental Policy Act (NEPA), the process of project review pursuant to Section 1424(e) will be integrated as fully as possible with the review of Federal actions subject to NEPA. All Federal agencies have published guidelines for the implementation of NEPA which provide the basis for determining whether a project will have a "significant impact on the environment." Review under Section 1424(e) requires the closely related determination of whether a project may contaminate an aquifer through its recharge zone so as to pose a "significant hazard to public health." Integration of the two types of review will allow EPA and other Federal agencies to avoid needless duplication of efforts under the two statutes and will prevent inefficient use of resources in carrying out ground water impact evaluations. It will also permit EPA to take advantage of the Federal agencies' and the public's familiarity with the NEPA process. The heads of all Federal agencies have been advised by the Council on Environmental Quality (CEQ) in a memorandum dated November 19, 1976, that NEPA guidelines should be amended to place specific emphasis on the evaluation of the ground water impact of projects which might affect the quality of an aquifer through its recharge zone and that projects should be submitted to a thorough ground water impact evaluation in accordance with NEPA procedures.

Assessment of environmental impact under NEPA results in the preparation of an Environmental Impact Statement (EIS) if an initial environmental assessment shows that a project will have a significant impact on the environment. EPA will ordinarily review the potential impact of projects on aquifers in designated areas pursuant to Section 1424(e) at the time that draft or final EIS's are submitted to EPA. An EIS prepared for a project which is subject to Section 1424(e) as well as NEPA should contain all the information which is necessary for EPA to properly evaluate a project's impact on ground water quality under Section 1424(e). EPA will routinely review under Section 1424(e) all EIS's prepared for projects which are to be located in the recharge zone or streamflow source zones of aquifers in designated areas which may have an impact on ground water quality and for which an application for Federal financial assistance has been made.

Although it is anticipated that established NEPA procedures will ordinarily be sufficient to ensure adequate review of ground water impact pursuant to Section 1424(e), the Regional Administrators shall also have the authority in implementing Section 1424(e) to specifically request that a ground water impact evaluation which will satisfy the requirements of Section 1424(e) be prepared by the Federal agency ~~from which a commitment of financial~~ upon the Administrator's own motion based on information available to him, or upon receipt of a public petition meeting certain specified criteria. A well-research ground water impact chapter extracted from an environmental assessment prepared in accordance with NEPA may be sufficient to satisfy such a request for a ground water impact evaluation under Section 1424(e).

To ensure that EPA and the public are informed of projects which may affect the quality of the aquifer, EPA will request from each funding Federal agency that a list of projects for which EIS's will be prepared and which are located in the recharge zone or streamflow source zones of sole source aquifers be periodically submitted to the appropriate Regional Administrator and made available to the public upon request. Once an area is designated the Regional Administrators shall also have discretionary authority to work out with regional Federal agencies any agreements or memoranda of understanding which they feel are necessary to supplement the

general regulations and to keep them informed of projects in the area. The Regional Administrators may assume the initiative in obtaining information on commitments of Federal financial assistance which are under consideration and in taking other steps to ensure that they are kept up-to-date on Federal funding of projects in the area. The Regional Administrators may, for example, request lists of applications for Federal financial assistance from the local A-95 Clearinghouse. EPA will rely as much as possible upon existing State capabilities in protecting the ground water quality of aquifers. This reliance will in no way constitute a delegation of project review authority, since this is clearly an EPA responsibility which may not be delegated. However, State assistance can be very valuable in providing the agency with information and comments based on knowledge of local ground water problems. The State's role will, of course, depend upon the individual State's capabilities and interests. Regional Administrators, upon designation of an area, may workout memoranda of understanding with the States in order to determine their participation in the protection of ground water quality in the area.

The content of these regulations is primarily procedural. EPA plans to initiate a study to provide technical guidance to EPA regional reviewers for the assessment of ground water impact evaluations prepared by Federal agencies in three major project categories: (1) Multi-unit housing development, (2) highways, and (3) sewage collection, treatment, and disposal facilities. Forthcoming technical guidance will also contain a detailed outline of the information which should be provided by Federal agencies for those project categories. In the meantime, Section 1424(e) review will be carried out in conjunction with NEPA review as currently implemented.

Experience with the interim guidelines issued for the San Antonio area (40 FR 58292, December 16, 1975) has been evaluated in formulating these national regulations.

Public comment on these proposed regulations shall be submitted on or before November 28, 1977 to the following address:

Environmental Protection Agency, Office of Water Supply (WH-550), 401 M Street SW., Washington, D.C. 20460.

Dated: September 22, 1977.

DOUGLAS M. COSTLE,
Administrator.

In consideration of the foregoing, it is proposed to add Part 148 as follows:

Subpart A—General Provisions

Sec.
148.1 Applicability.
148.2 Definitions.

Subpart B—Designation of Sole or Principal Source Aquifer Area

148.10 Submission of petitions.
148.11 Decision to initiate designation procedures.
148.12 Public hearing.
148.13 Determination by the Administrator.

Subpart C—Project Review

148.20 Project review authority.
148.21 Public information.
148.22 Submission of petitions.
148.23 Decision to review.
148.24 Notice of review.
148.25 Request for information.
148.26 Public hearing.
148.27 Decision under Section 1424(e).
148.28 Resubmittal of redesigned projects.
148.29 Funding to redesigned projects.

AUTHORITY: Sec. 1424(e), Safe Drinking Water Act 42 U.S.C. 300f, 300h-3(e); 88 Stat. 1660 et. seq.; Pub. L. 93-523).

Subpart A—General Provisions

§ 148.1 Applicability.

This part sets forth, pursuant to Section 1424(e) and 1450 of the Public Health Service Act, as amended by the Safe Drinking Water Act, Pub. L. 93-523, regulations relating to aquifers which are the sole or principal drinking water source for an area and which, if contaminated, would create a significant hazard to public health.

§ 148.2 Definitions.

As used in these regulations and except as otherwise specifically provided, the term(s):

(a) "Act" means the Public Health Service Act, as amended by the Safe Drinking Water Act, Pub. L. 93-523.

(b) "Contaminant" means any physical, chemical, biological, or radiological substance or matter in water.

recharge

(c) "~~Research~~ zone" means any area through which water enters the aquifer.

(d) "Administrator" (Regional Administrator) means the Administrator (Regional Administrator) of the United States Environmental Protection Agency.

(e) "Person" means an individual, corporation, company, association, partnership, state, or municipality.

(f) "Project" means a program or action for which an application for Federal financial assistance has been made.

(g) "Federal financial assistance" means any financial benefits provided directly as aid to a project by a department, agency, or instrumentality of the Federal government in any form including contracts, grants, and loan guarantees. Actions or programs carried out by the Federal government itself such as

dredging performed by the Army Corps of Engineers do not involve "Federal financial assistance." Actions performed for the Federal government by contractors, such as construction of roads on Federal lands by a contractor under the supervision of the Bureau of Land Management, should be distinguished from contracts entered into specifically for the purpose of providing financial assistance, and will not be considered programs or actions receiving "Federal financial assistance." "Federal financial assistance" is limited to benefits earmarked for a specific program or action and directly awarded to the program or action. Indirect assistance, e.g., in the form of a loan to a developer by a lending institution which in turn receives Federal assistance not specifically related to the project in question, is not "Federal financial assistance" under Section 1424(e).

(h) "Commitment of Federal financial assistance" means a written agreement entered into by a department, agency, or instrumentality of the Federal Government to provide financial assistance as defined in paragraph (g) of this section. Renewal of a commitment which the issuing agency determines has lapsed shall not constitute a new commitment unless the Regional Administrator determines that the project's impact upon a designated aquifer has not been previously reviewed under Section 1424(e). The determination of a Federal agency that a certain written agreement constitutes a commitment shall be conclusive with respect to the existence of such a commitment.

(i) "Streamflow source zone" means the upstream headwaters area which drains into the recharge zone.

(j) "Significant hazard to public health" means any level of contaminant which causes or may cause the aquifer to exceed any maximum contaminant level set forth in any promulgated National Primary Drinking Water Standard at any point where the water may be used for drinking purposes or which may otherwise adversely affect the health of persons, or which may require a public water system to install additional treatment to prevent such adverse effect.

(k) "Aquifer" means a geological formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells or springs.

(l) "Public water system" means a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least sixty (60) days out of the year. Such term includes (1) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and (2) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system.

(m) "Sole or principal source aquifer" means an aquifer which supplies 50 percent or more of the drinking water for an area.

(n) "Area" means a large territory, usually encompassing more than one county.

Subpart B—Designation of Sole or Principal Source Aquifer Areas

§ 148.10 Submission of petitions.

Any person may submit a petition requesting the Administrator to determine that an area has a sole or principal source aquifer. Petitions not meeting the requirements set forth below may be returned to the petitioner with a request that available information be submitted. Any petition shall be submitted in duplicate and shall include:

(a) The name, address, and telephone number of the individual, organization, or other entity submitting the petition;

(b) A brief statement of the requesting person's interest in the Administrator's determination;

(c) A statement of why, in the petitioner's view, contamination of the aquifer would result in a significant hazard to public health;

(d) All pertinent information known to the petitioner regarding:

(1) The aquifer and its location;

(2) The location of the area for which the petitioner alleges the aquifer is the sole or principal source of drinking water;

(3) The population in the area described under subparagraph (2) of this paragraph;

(4) Alternative sources of drinking water for the area described under subparagraph (2) of this paragraph;

(5) The recharge and streamflow source zone (or zones) for the aquifer and its location;

(6) The sources of recharge to the aquifer and their location;

(7) Projects which might contaminate the aquifer through the recharge zone; and

(8) The public water systems utilizing water from the aquifer, the number of people served by each system and the water treatment provided by each system.

(e) Maps showing, to the best of the petitioner's knowledge and belief:

(1) The location and boundaries of the aquifer;

(2) The location and boundaries of the recharge zone or zones for the aquifer; and

(3) The location of the source or sources of recharge to the aquifer.

§ 148.11 Decision to initiate designation procedures.

(a) The Administrator may consider designation of an area on his own initiative, on the initiative of a Regional Administrator, or as a response to a public petition.

(b) Upon receipt of a petition meeting the requirements of § 148.10, or upon his own initiative, the Regional Administrator shall review all the information readily available to him which is relevant to the existence of a sole or principal source aquifer. All such information shall be forwarded by the Regional Administrator to the Administrator along with this recommendation.

(c) The Administrator will review all information available to him, determine whether the region should initiate formal designation procedures, and notify the Regional Administrator. If the notification is affirmative, and where appropriate and in the public interest, the Regional Administrator will publish in the FEDERAL REGISTER notice of any petition submitted in accordance with § 148.10 hereof, and shall indicate in the FEDERAL REGISTER the availability for public review of data and information available to the Regional Administrator which are relevant to a determination regarding the existence of a sole or principal source aquifer in the area.

§ 148.12 Public hearing.

Where there is a significant public interest the Regional Administrator may hold a public hearing on whether an area should be designated under this subpart. Any such hearing shall be conducted by the Regional Administrator or his designee in an informal, orderly, and expeditious manner. Where appropriate, limits may be placed upon the time allowed for oral statements, and statements may be required to be submitted in writing. The Regional Administrator will give notice of such a public hearing by any reasonable means he deems appropriate.

§ 148.13 Determination by the Administrator.

The Regional Administrator will make his recommendation on designation to the Administrator no later than six (6) months after the date of publication of the FEDERAL REGISTER notice under § 148.11.

(b) Upon the recommendation of the Regional Administrator, the Administrator shall either make the designation or determine that the area should not be designated. In deciding whether to designate an area under Section 1424(e), the Administrator shall consider:

(1) The availability of alternative sources of drinking water;

(2) The size of the area and population served by the aquifer;

(3) The susceptibility of the aquifer to contamination through the recharge zone;

(4) The location of the aquifer;

(5) The number of public water systems utilizing water from the aquifer, the number of people served by such systems, and the treatment provided by such systems; and

(6) Such other factors as he deems relevant.

(c) If the Administrator determines that an area will be designated, he shall identify the boundaries of the recharge zone, the streamflow-source zone, or portions thereof, through which contamination could affect the area for which the aquifer is the sole or principal source of drinking water, and, to the extent known, the water body or bodies which contact such recharge zone.

(d) The Administrator shall publish his determination in the FEDERAL REGISTER, including the basis for his decision.

Subpart C—Project Review

§ 148.20 Project review authority.

(a) Once an area is designated pursuant to Subpart B of this part, no subsequent commitments of Federal financial assistance may be made to projects which the Administrator determines may contaminate the aquifer so as to create a significant hazard to public health.

(b) The Regional Administrator is hereby delegated the authority and assigned responsibility for carrying out the project review process assigned to the Administrator under Section 1424(e) of the Act, except the final determination that a project may contaminate a sole or principal source aquifer in a designated area through its recharge zone so as to create a significant hazard to public health.

(c) The Regional Administrator may review any project which he considers may potentially contaminate a sole or principal source aquifer in a designated area through its recharge zone so as to create a significant hazard to public health.

§ 148.21 Public information.

After an area is designated under Section 1424(e), Federal agencies, for projects located in the recharge zone and streamflow source zones, are required to:

(a) Maintain a list of projects for which environmental impact statements will be prepared in accordance with the National Environmental Policy Act (NEPA);

(b) Revise the list at regular intervals and submit to EPA; and

(c) Make the list available to the public upon request.

§ 148.22 Submission of petitions.

Any person may submit a petition requesting the Regional Administrator to

review a project to determine if such project may contaminate an aquifer in an area designated under Subpart B of this part through its recharge zone so as to create a significant hazard to public health. Any such petition shall identify:

(a) The name, address, and telephone number of the individual, organization or other entity submitting the petition;

(b) A brief statement of the requesting person's interest in the Regional Administrator's determination;

(c) The name of the project and Federal agency involved;

In addition, the petitioner is requested to submit to EPA available information on:

(d) Applicable action already taken by State and local agencies including establishment of regulations to prevent contamination of the aquifer and why, in the petitioner's judgment, that action was inadequate;

(e) Any actions taken under the National Environmental Policy Act and why, in the petitioner's judgment, the action was inadequate in regard to evaluation of potential effect on the aquifer;

(f) The potential contaminants involved;

(g) The means by which the contaminant might enter the aquifer; and

(h) The potential impact of the proposed project.

§ 148.23 Decision to review.

(a) The Regional Administrator shall review under Section 1424(e) all projects located in the recharge or streamflow source zone of sole source aquifers for which a draft or final EIS is submitted which may have an impact on groundwater quality and which involve Federal financial assistance as defined in these regulations.

(b) Upon receipt of a public petition, the Regional Administrator shall decide whether the project which is the subject of the petition should be reviewed under Section 1424(e).

(c) The Regional Administrator may decide to review a project upon his own motion.

(d) In determining whether to review a project upon receipt of a public petition or upon his own motion, the Regional Administrator shall consider whether the project is likely to directly or indirectly cause contamination of the aquifer through its recharge zone, taking into account any factors he deems relevant, including:

(1) The location of the project, and

(2) The nature of the project.

(e) In determining whether to review a project upon receipt of a public petition or upon his own motion, the Regional Administrator may consult with, or request information from, the Federal agency to which the project application has been made, the applicant seeking Federal assistance, appropriate State and local agencies, and other appropriate persons or entities.

(f) In determining whether to review a project which is the subject of a public petition, the Regional Administrator may request such additional information from the petitioner as he deems necessary

§ 148.24 Notice of review.

(a) Notice to Federal agency. If the Regional Administrator decides upon receipt of a public petition or upon his own motion to review a project under Section 1424(e), he shall give written notification of the decision to the Federal agency from which financial assistance is sought. The notification shall include a description and identification of the project.

(b) Notice to Public. When the Regional Administrator undertakes to review a project pursuant to § 148.23 above, he shall provide public notice of project review by such means as he deems appropriate. The notice shall set forth the availability for public review of all data and information available, and shall solicit comments, data and information with respect to the determination of impact under Section 1424(e). The period for public comment shall be 30 days after public notice unless the Regional Administrator extends the period at his discretion or a public hearing is held under § 148.26.

§ 148.25 Request for information.

In reviewing a project under Section 1424(e), the Regional Administrator may request any additional information from the funding Federal agency which is pertinent to reaching a decision. If full evaluation of the groundwater impact of a project has not been submitted in accordance with the agency's NEPA procedures, the Regional Administrator may specifically request that the Federal agency submit a groundwater impact evaluation of whether the proposed project may contaminate the aquifer through its recharge zone so as to create a significant hazard to public health.

§ 148.26 Public hearing.

If there is significant public interest, the Regional Administrator may hold a public hearing with respect to any project or projects to be reviewed if he finds that such a hearing is necessary and would be helpful in clarifying the issues. Public hearings held under this section should be coordinated, if possible, with other Federal public hearings held pursuant to applicable laws and regulations. Any such hearing shall be conducted by the Regional Administrator or designee in an informal, orderly and expeditious manner. Where appropriate, limits may

be placed upon the time allowed for oral statements, and statements may be required to be submitted in writing. The record will be held open for further public comment for seven (7) days following the close of the public hearing.

§ 148.27 Decision under Section 1424(e).

(a) As soon as practicable after the submission of public comments under Section 1424(e) and information requested by the Environmental Protection Agency from the originating Federal agency, on the basis of such information as is available to him, the Regional Administrator shall review the project taking all relevant factors into account, including:

(1) The extent of possible public health hazard presented by the project;

(2) Planning, design, construction, operation, maintenance and monitoring measures included in the project which would prevent or mitigate the possible health hazard;

(3) The extent and effectiveness of State or local control over possible contaminant releases to the aquifer;

(4) The cumulative and secondary impacts of the proposed project; and

(5) The expected environmental benefits of the proposed project.

(b) After reviewing the available information, the Regional Administrator shall:

(1) Determine that the risk of contamination of the aquifer through the recharge zone so as to create a significant hazard to public health is not sufficiently great so as to prevent commitment of Federal funding to the project; or

(2) Forward the information to the Administrator with his recommendation that the Administrator determine that the project may contaminate the aquifer through the recharge zone so as to create a significant hazard to public health.

(c) After receiving the available information forwarded by the Regional Administrator, the Administrator shall:

(1) Determine that the risk of contamination of the aquifer through the recharge zone so as to create a significant hazard to public health is not sufficiently great so as to prevent commitment of Federal funding to the project; or

(2) Determine that the project may contaminate the aquifer through the recharge zone so as to create a significant hazard to public health.

(d) Notice of any decisions by the Regional Administrator under paragraph (b)(1) of this section or by the Administrator under paragraph (c)(1) and (c)(2) to prevent a commitment of Federal funding shall be published in the FEDERAL REGISTER. Such notices shall include a description of the proposed project, and a statement of the decision with an accompanying statement of facts and reasons.

§ 148.28 Resubmittal of redesigned projects.

If a project is redesigned in response to EPA's objections, the applicant for Federal financial assistance or the grantor agency may file a petition with the Regional Administrator for withdrawal of the determination that the project may contaminate the aquifer through the recharge zone so as to create a significant hazard to public health. Any such petition shall demonstrate how the project has been redesigned so as to justify the withdrawal of EPA's objections. If appropriate, the Regional Administrator may request public comments or hold an informal public hearing to consider the petition. After review of pertinent information, the Regional Administrator shall either deny the petition or recommend to the Administrator that the initial determination that a project may contaminate the aquifer be vacated. Upon receipt of a recommendation from the Regional Administartor that a determination be vacated, the Administrator shall either deny the petition or order that the initial determination be vacated. The final decision regarding a petition shall be published in the FEDERAL REGISTER with an accompanying statement of reasons.

§ 148.29 Funding to redesigned projects.

After publication of a decision that a proposed project may contaminate a sole or principal source aquifer in a designated area through its recharge zone so as to create a significant hazard to public health, a commitment for Federal financial assistance may be entered into, if authorized under another provision of law, to plan or redesign such project to assure that it will not so contaminate the aquifer.

[FR Doc.77-28695 Filed 9-28-77;8:45 am]