PUGET SOUND WATER QUALITY AUTHORITY

1989 PUGET SOUND WATER QUALITY MANAGEMENT PLAN

Adopted October 19, 1988

Property of CSC Library

1989 PUGET SOUND WATER QUALITY MANAGEMENT PLAN

Adopted October 19, 1988

U.S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
2234 SOUTH HOBSON AVENUE
CHARLESTON, SC 29405-2413

TD225.P97 W37 1988
#20503498
JUN 16 1997

PUGET SOUND WATER QUALITY AUTHORITY
217 Pine Street, Suite 1100
Seattle, Washington 98101
(206) 464-7320 or 1-800-54-SOUND

PUGET SOUND WATER QUALITY AUTHORITY

Members

Katherine Fletcher, Chair
Seattle

Les Eldridge, Vice Chair (Third Congressional District)
Olympia

Marjorie Redman (First Congressional District)
Poulsbo

Hugh Spitzer (Seventh Congressional District)
Seattle

Michael Thorp (Eighth Congressional District)
Federal Way

Sheri Tonn (Sixth Congressional District)
Tacoma

Terry Williams (Second Congressional District)
Marysville

Ex-officio Members

Brian Boyle, Commissioner of Public Lands

Christine Gregoire, Director of the Department of Ecology

Former Members

Andrea Beatty-Riniker (July 1985 - March 1988)

Judith Runstad (July 1985 - May 1988)

John Sawyer (July 1985 - June 1987)

KATHERINE FLETCHER
Chair

STATE OF WASHINGTON

PUGET SOUND WATER QUALITY AUTHORITY

217 Pine Street, Suite 1100 • Seattle, Washington 98101 • (206) 464-7320

November, 1988

To the Governor, the Legislature, and Citizens of Washington State:

It gives us great pleasure to present to you the 1989 Puget Sound Water Quality Management Plan. This plan builds on and improves the first plan, transmitted to you in January 1987. Thanks to your actions and support, much progress has been achieved since that time. Implementing this new plan will take us even closer to the goal of a clean Puget Sound.

We represent diverse perspectives on the difficult issues involved in protecting the Sound. Our unanimous support of this plan is an important indication of the hard work, compromises, and spirit of cooperation embodied in it. We are particularly appreciative of the outstanding work of local governments, state agencies, tribes, federal agencies and innumerable citizens, both in taking the actions called for in 1987 and in helping us to evaluate and improve the plan.

Despite tremendous progress, much remains to be done. In adopting this plan, we went through a very difficult process to pare down and postpone important actions so that we could present a realistic budget request for the coming biennium. In doing so, we recognize that the protection of Puget Sound cannot be assured until the effort is augmented in the future. But we are proud of this plan, and we believe that the next two years will bring more successes on which to build.

We ask your full support in achieving this plan so that Puget Sound will remain a resource of unparalleled richness and diversity.

Katherine Fletcher
Chair

Les Eldridge
Vice Chair

Marjorie Redman
Member

Hugh Spitzer
Member

Mike Thorp
Member

Sheri Tonn
Member

Terry Williams
Member

Brian Boyle
Ex-officio Member

Christine Gregoire
Ex-officio Member

Contents

SUMMARY xv
CHAPTER 1. INTRODUCTION 1
CHAPTER 2. THE STATE OF THE SOUND 9
CHAPTER 3. ACTION PLAN 15
- Introduction 15
- Monitoring 17
- Research 26
- Education and Public Involvement 36
- Nonpoint Source Pollution 60
- Shellfish Protection 84
- Municipal and Industrial Discharges 91
- Contaminated Sediments and Dredging 114
- Stormwater and Combined Sewer Overflows 126
- Wetlands Protection 143
- Spill Prevention and Response 155
- Laboratory Support 161
- Household Hazardous Waste 167
- Legal and Personnel Support 171
- Estimated Costs and Potential Financing 176
- Summary of Local Government Tasks 184
- Programs that Request Tribal Involvement 188

CHAPTER 4. PLAN DEVELOPMENT AND IMPLEMENTATION 191
CHAPTER 5. THE UNFINISHED AGENDA 201
- Aquaculture 203
- Contamination of the Sea-surface Microlayer 205
- Effects of Air Pollution on Water Quality 207
- Federal Facilities 211
- Fish and Wildlife Habitat 214
- Freshwater Use and Availability 218
- Groundwater Contamination 222
- Hazardous Materials Spill Prevention and Response 229

Human Health Risks 233
Nutrient Effects 236
Pesticides 239
Plastic Debris in Marine Waters 243
Transboundary Pollution 246
Treatment of Domestic Wastes 248
Other Issues 252
APPENDIX A. ACRONYMS 255
APPENDIX B. GLOSSARY 257
APPENDIX C. PUGET SOUND WATER QUALITY ACT 269
APPENDIX D. SUMMARY OF CHAPTER 400-12 WAC , Local Planning and Management of Nonpoint Source Pollution 273
SEPA NOTICE 275

Margin illustrations © 1976 by Margaret Chodos-Irvine

PUGET SOUND WATER QUALITY AUTHORITY STAFF

Administrative Staff
Jim Abernathy, Executive Secretary
Jan Brieske, Administrative Assistant
Nancy McKay, Deputy Director
Kirvil Skinnarland, Director of Planning and Compliance

Planning Staff
Sarah Barton
Jerry Boese
Bill Britt
Cathy Carruthers
Andrea Copping
John Dohrmann
Roberta Feins
Michael Jacobson
Marcia Lagerloef
Dave Renstrom
Joanne Richter
Naki Stevens
Richard Tucker

Public Outreach Staff
Amy Bell
Claire Dyckman
Annette Frahm
Louise Forrest
Susan Handley
Nancy Hansen
Karl Holifield
Sheila Kelly
Joyce Nichols

Support Staff
Susan Folk
Nancy Kroening
Katherine Mantz

The contributions of the following people are also gratefully acknowledged: Leslie Brown, Kathy Callison, Carol Fielding, Sue Greene, Susan Gulick, Nanne Hassing, Lisa Molohon, Rachael Paschal, James Redel, Tim Strege, Anne Swensson, Beverly Wilson.

MONITORING MANAGEMENT COMMITTEE

Katherine Fletcher, Chair, Puget Sound Water Quality Authority

John Armstrong, Ph.D., U.S. Environmental Protection Agency

John Bernhardt, Washington Department of Ecology

John Carleton, Washington Department of Wildlife

Doris Cellarius, Sierra Club

Daniel Cheney, Ph.D., Bioaquatics International

Dick Cunningham, Washington Department of Ecology

Larry Dettmann, Western Oil & Gas Association,
Texaco U.S.A.

Charles Dunn, U.S. Fish & Wildlife Service

Frank Easter, Soil Conservation Service

Charles Eaton, Adopt-a-Beach

Will Ernst, The Boeing Company

Norm Glenn, Washington Department of Ecology

Jacques Faigenblum, Ph.D., Washington Department of Social and Health Services

Willa Fisher, M.D., Washington State Association of Local Public Health Officials, Bremerton-Kitsap County Health Department

Howard Harris, Ph.D., National Oceanic and Atmospheric Administration

Brian Hauger, Washington Department of Wildlife

Jim Heil, Puget Sound Alliance

James Henry, Washington State Association of Sewer Districts,
Des Moines Sewer District

David Jamison, Ph.D., Washington Department of Natural Resources

Mike MacKay, Northwest Indian Fisheries Commission,
Lummi Tribe

Commander R.M. McBride, U.S. Navy

Ed McGavock, U. S. Geological Survey

Bruce McKnight, Washington State Association of Water Districts

Mary Lou Mills, Washington Department of Fisheries

M.D. Nassichuk, Ph.D., Fisheries & Oceans Canada

Robert Parker, U. S. Army Corps of Engineers

Gary Plews, Washington Department of Social and Health Services

Martin Pomeroy, Ph.D., Environment Canada

Kerrie Schurr, U.S. Environmental Protection Agency

David Somers, Northwest Indian Fisheries Commission,
Tulalip Tribe

Robert Swartz, Municipality of Metropolitan Seattle

Ronald Thom, Ph.D., University of Washington

Erick Tokar, Northwest Pulp & Paper Association,
ITT Rayonier, Inc.

COMMITTEE ON RESEARCH IN PUGET SOUND

David W. Jamison, Ph.D., Chair, Washington Department of Natural Resources

Hal Beecher, Ph.D., Washington Department of Wildlife

Lee Ann Bonacker, Washington Aquaculture Council

Philip J. Carpenter, U.S. Geological Survey

Megan N. Dethier, Ph.D., Friends of the San Juans, Puget Sound Alliance, University of Washington

Larry Dettman, Western Oil and Gas Association, Texaco, U.S.A.

Alyn C. Duxbury, Ph.D., Washington Sea Grant Program

Louis Echols, Ph.D., Washington Sea Grant Program

Jacques Faigenblum,Ph.D., Washington Department of Social and Health Services

William H. Funk, Ph.D., State of Washington Water Research Center

Jack H. Gakstatter, Ph.D., U.S. Environmental Protection Agency

Maryanne Guichard, Seattle-King County Health Department

Ronald E. Hermanson, Ph.D., Washington State University

Eric Johnson, Washington Public Ports Association

Don Kane, U.S. Fish and Wildlife Service

Marsha L. Landolt, Ph.D., University of Washington

Mike MacKay, Northwest Indian Fisheries Commission, Lummi Tribe

Mary Lou Mills, Washington Department of Fisheries

Rodney Proctor, Municipality of Metropolitan Seattle

Tom Rainey, Ph.D., Evergreen State College

David Schroeder, Ph.D., Seattle University

Ron Stapley, Carnation Research Farm

John A. Strand, Ph.D., Battelle Marine Research Laboratory

Stephen D. Sulkin, Ph.D., Western Washington University

Ron Thomas, Coalition for Clean Water, City of Everett

Rudy N. Thut, Weyerhaeuser Company

Sally Van Niel, Washington Environmental Council, Puget Sound Alliance, Everett Community College

Usha Varanasi, Ph.D., National Oceanic and Atmospheric Administration

Fred Weinmann, Ph.D., U.S. Army Corps of Engineers

William E. Yake, Washington Department of Ecology

EDUCATION AND PUBLIC INVOLVEMENT ADVISORY GROUP

Tony Angell, Washington State Office of Environmental Education, Superintendent of Public Instruction
Wendy Bolender, Washington Association of Realtors
Harriet Bullitt, KING Broadcasting
Richard Conlin, Metrocenter YMCA
Bob Hulbert, Hulbert Farms
Bob Jacobson, U.S. Environmental Protection Agency
Karen Johnson, Washington Department of Ecology
James A. Kolb, Poulsbo Marine Science Center
Tony Meyer, Northwest Indian Fisheries Commission
Doug Pierce, Tacoma-Pierce County Health Department
Wendy Pugnetti, ITT Rayonier Inc.
Mike Reed, Washington State Parks and Recreation Commission
Bob Steelquist, writer

PUGET SOUND ESTUARY PROGRAM MANAGEMENT COMMITTEE

William A. Bush, Washington State Parks and Recreation Commission
Paul Cyr, Pierce County Council
John DeMeyer, Washington Department of Natural Resources
Frank Easter, U.S. Soil Conservation Service
Jack H. Gakstatter, Ph.D., U.S. Environmental Protection Agency
Peter Hahn, City of Edmonds
Howard Harris, Ph.D., National Oceanic and Atmospheric Administration
Dwain F. Hogan, U.S. Army Corps of Engineers
Kahler Martinson, Washington Department of Fisheries
Dave Peeler, Washington Department of Ecology
Rich Poelker, Washington Department of Wildlife
John Pitts, DVM, Washington Department of Agriculture
Kirvil Skinnarland, Puget Sound Water Quality Authority
Eric Slagle, Washington Department of Social and Health Services
Ron Thom, Ph.D., University of Washington

PUGET SOUND ESTUARY PROGRAM
TECHNICAL ADVISORY COMMITTEE

Ron Thom, Ph.D., Chair
Bob Barrick
Richard Branchflower, Ph.D.
Don Brown
Mary Burg
Edward Cokelet, Ph.D.
Eric Crecelius, Ph.D.
Curt Ebbesmeyer, Ph.D.
Jacques Faigenblum, Ph.D.
Tom Ginn, Ph.D.
David Jamison, Ph.D.
Ed Long
Bruce Miller, Ph.D.
Mary Lou Mills
Keith Phillips
Pat Romberg
Rick Swartz, Ph.D.
Jay Vasconcelos
Jack Word

STATE AND FEDERAL AUTHORITY FOR THIS PLAN

RCW 90.70.055 requires the Authority to "prepare and adopt a comprehensive Puget Sound water quality management plan, as defined in RCW 90.70.060." The 1987 Puget Sound Water Quality Management Plan was adopted in December 1986 pursuant to this requirement. RCW 90.70.055(3) requires that the plan be reviewed and revised every two years. The development of the draft 1989 plan was undertaken in compliance with this section. The Authority will prepare a 1991 plan following review of the implementation of the 1989 plan.

In March 1988 the Administrator of the Environmental Protection Agency formally designated Puget Sound as an estuary of national significance under Section 320 of the Clean Water Act, as amended by P.L. 100-4 (the Water Quality Act of 1987). In so doing, Puget Sound has become part of a nationwide program to develop management plans for the protection of the nation's estuaries. The Puget Sound Water Quality Authority, together with EPA Region 10 and the Washington Department of Ecology, co-manage the Puget Sound Estuary Program. Section 320 requires the development of a "comprehensive conservation and management plan" (CCMP) for each designated estuary. The designation of Puget Sound recognized the 1987 Puget Sound Water Quality Management Plan as a partial CCMP. The adopted 1989 plan will constitute an additional increment to the CCMP. Likewise, the 1991 plan will also be an increment to the CCMP and must meet all the requirements of a CCMP required under the Clean Water Act.

Preface

The legislature finds that Puget Sound and related inland marine waterways of Washington state represent a unique and unparalleled resource. A rich and varied range of marine organisms, composing an interdependent, sensitive communal ecosystem reside in these sheltered waters. Residents of this region enjoy a way of life centered around the waters of Puget Sound, featuring accessible recreational opportunities, world-class port facilities and water transportation systems, harvest of marine food resources, shoreline-oriented life styles, water-dependent industries, tourism, irreplaceable aesthetics and other activities, all of which to some degree depend upon a clean and healthy marine resource.

The legislature further finds that the consequences of careless husbanding of this resource have been dramatically illustrated in inland waterways associated with older and more extensively developed areas of the nation. Recent reports concerning degradation of water quality within this region's urban embayments raise alarming possibilities of similar despoliation of Puget Sound and other state waterways. These examples emphasize that the costs of restoration of aquatic resources, where such restoration is possible, greatly exceed the costs of responsible preservation.

The legislature declares that the utilization of the Puget Sound resource carries a custodial obligation of preserving it. The people of the state have the unique opportunity to preserve the gift of nature, an understanding of the results of inattentive stewardship, the technical knowledge needed for control of degradation, and the obligation to undertake such control.

The legislature further finds that the large number of governmental entities that now affect the water quality of Puget Sound have diverse interests and limited jurisdictions which cannot adequately address the cumulative, wide-ranging impacts which contribute to the degradation of Puget Sound. It is therefore the policy of the state of Washington to create a single entity with adequate resources to develop a comprehensive plan for water quality protection in Puget Sound to be implemented by existing state and local governments.

—excerpt from the 1985 legislation creating the Puget Sound Water Quality Authority (RCW 90.70.001)

Summary

This document is the 1989 Puget Sound Water Quality Management Plan. The 1989 plan builds on the progress made in carrying out the 1987 Puget Sound plan. This plan includes new initiatives in the areas of research, monitoring, and education, and continues and updates each of the programs in the 1987 plan. In addition, this plan includes a discussion of issues that could not be addressed in the 1987 plan. These issues, called the "unfinished agenda," represent a range of problems affecting Puget Sound's water quality, the most important of which should be addressed in the 1991 Puget Sound plan, the final plan required by both state and federal statutes.

This plan is organized into five chapters. Chapter 1 provides an introduction to the plan. Chapter 2 is a summary of findings about the Sound, its population and resources from *The State of the Sound 1988 Report*. The expanded and updated action plan is contained in Chapter 3. Chapter 4 discusses the role of the Authority in preparing and overseeing the implementation of the plan, as well as a discussion of the implications of the Authority's scheduled "sunset" in 1991. Chapter 5 discusses the unfinished agenda. A glossary, a list of acronyms, a summary of regulations for Local Planning and Management of Nonpoint Source Pollution (Chapter 400-12 WAC), and a copy of RCW 90.70, the statute establishing the Authority, are provided at the end of the document.

The Authority based the 1987 plan on a number of key findings about Puget Sound's water quality. Programs were developed to address major concerns, such as pollution from point and nonpoint sources, loss of wetlands, and shellfish protection. While much progress has been made in implementing these programs, the Sound's problems are long term and the solutions will necessarily be long term as well. An updated list of key findings is included here as a reminder of the problems in Puget Sound that require continued attention.

Key findings upon which the plan is based include:

* Most pollution is not "flushed" from the Puget Sound system. Water and pollutants are recirculated within Puget Sound, and some inlets and bays experience only limited tidal exchange.

* Between 1987 and the year 2000, population in the Puget Sound region is expected to grow by 20 percent, from almost 3 million to 3.6 million. The

four central Puget Sound counties (King, Pierce, Snohomish, and Kitsap) are expected to add 1.5 million more people between 1987 and 2020.

* Land use forecasts suggest an increase of 62 percent for urban use and 73 percent for rural non-farm use by the year 2000. Most of this intensively used land is projected to be in the central Puget Sound region.

* Toxic contaminants bind to particles and settle out in the sediments. Concentrations of toxicants in sediments in the Sound's urban bays are elevated 100 times or more over the levels in the cleanest rural bays.

* High concentrations of toxic contaminants in sediments have been associated with adverse biological effects in fish in urban bays, including fin erosion, liver tumors, and reproductive failures.

* While substantial progress has been made toward limiting conventional pollutants in discharges, the discharge of toxic pollutants has not been effectively controlled.

* Increased bacterial contamination from nonpoint sources has contributed to the closure of five additional commercial shellfish beds since December 1986. Sources include failed septic systems, animal wastes, and contaminated stormwater. Nonpoint source pollution is likely to increase as the Sound's rural areas continue to develop.

* Over half of the Sound's original wetlands have been lost. An increasing regulatory emphasis on wetland protection is slowing the net loss of wetland habitats and values. However, it has been conservatively estimated that 530 acres of unprotected freshwater wetlands are being degraded or destroyed statewide each year.

Despite the problems cited, there are significant success stories where water quality has been improved around the Sound. Industrial and municipal pollution controls have had dramatically positive results, and the banning of a few toxic chemicals and restrictions on some others have begun to be reflected in the lower rates at which they are accumulating in the bottom sediments of the Sound. Individual and local efforts have also begun to reduce sources of nonpoint pollution in some areas.

There has been considerable progress since the first plan for the Sound was adopted. All of the programs called for in the 1987 plan have begun, and several milestones have been reached. This 1989 plan updates and refines existing plan programs to reflect the experience to date in implementing them. The plan also proposes three initiatives called for in the 1987 plan: a comprehensive, coordinated ambient monitoring program; a draft long-range strategy for education and public involvement related to Puget Sound; and a program to support research and coordinate the setting of research priorities.

The plan includes a budget for its implementation. Because of concern about limited funding resources, the Authority significantly scaled down the plan's activities for the next biennium from the levels which would allow full implementation. The budget for the next biennium is about two-thirds of what would be needed for the full plan. This scaled-down budget was achieved by reducing and delaying activities in nearly all plan programs.

THE ACTION PLAN

The purpose of this plan is to restore and protect biological health and diversity of Puget Sound. The strategy for achieving this purpose is to protect and enhance three resources: the Sound's water and sediment quality; its fish and shellfish; and its wetlands.

Each of the programs in the plan is prefaced by a problem definition and a goal for the program. Cost estimates and target dates are also given for each program element.

Key features of the plan include:

NEW INITIATIVES

Monitoring

The plan establishes the Puget Sound Ambient Monitoring Program (PSAMP). The PSAMP will assess conditions over time of the water, sediments, fish, shellfish, birds, marine mammals, and habitat and will collect other information such as weather and population growth.

The PSAMP was developed by the Monitoring Management Committee (MMC), established by the Authority in the 1987 Puget Sound plan. The MMC consists of water quality professionals representing federal, state and local agencies, tribes, Canadian agencies, industry, the scientific community, and the public.

The monitoring program in this plan adopts the monitoring design developed by the Monitoring Management Committee, sets up a management structure for the PSAMP, develops a citizens' monitoring program, and arranges for data management, quality assurance, and monitoring reports.

The PSAMP will be implemented by several state agencies with help from federal agencies, local governments, and tribes. The management structure consists of the Monitoring Management Committee and a steering committee, with staff housed at the Authority. The monitoring program staff will develop and maintain a central database of PSAMP data and prepare a comprehensive annual monitoring report based on reports prepared by the agencies implementing the monitoring program. An independent evaluation will be conducted every few years to ensure that PSAMP remains a necessary, useful, and cost-effective program.

The Authority is also developing a citizens' monitoring program to collect data to supplement PSAMP and act as an educational and public involvement tool. Citizens will monitor nearshore habitat or collect water or clam samples. The Public Involvement and Education Fund (PIE-Fund) is supporting an initial citizens' monitoring program.

Research

The plan establishes a research program to coordinate the setting of research priorities, the sponsorship of research, and dissemination of research findings related to Puget Sound.

The 1987 plan established the Committee on Research in Puget Sound. The Committee was asked to make recommendations to the Authority on several key issues important to Puget Sound research, including: research priorities, institutional needs, data management, research reserves, and the publication and dissemination of research results. The Committee was composed of repre-

sentatives of academic institutions, state and federal agencies, the business community, agriculture, tribes, environmental groups, and private research organizations. The Committee's report provides the basis for this plan program.

The Authority will coordinate a Puget Sound research program with several components: funding high-priority research projects, translating and disseminating results to agency managers and the public, setting research priorities, and establishing a permanent research program. Research priorities will be set through a public process involving the research committee, scientists, agency managers, and others. This list will be updated biennially. The plan includes the first adopted priority list of research priorities.

The Authority will coordinate with the Puget Sound Ambient Monitoring Program in managing information and identifying research needs. Legislation to establish a Puget Sound research foundation will be drafted and considered by the Authority over the next one to two years in conjunction with other long-term institutional issues related to the Sound.

Education and Public Involvement

This program incorporates a long-range strategy to make Puget Sound education and public involvement more effective. The strategy was developed by the Education and Public Involvement Advisory Group. The Authority established the advisory group following the adoption of the 1987 plan. The 12-member group includes educators, media experts, and representatives of environmental and public interest groups, industry, business, agriculture, tribes, state and federal agencies, and local governments.

The education program includes support for local education and public involvement efforts through field agents located around Puget Sound. Interagency resource teams will be developed to provide information to public or private sector groups on specific water quality issues and to provide technical assistance and training on resource issues related to protecting Puget Sound.

State agencies will coordinate their programs to design comprehensive messages for particular audiences on how to reduce water pollution resulting from their activities. The Authority will also initiate public awareness campaigns that focus on tangible results related to cleaning up the Sound, such as reopening shellfish beds or reducing plastic debris.

The Public Involvement and Education Fund (PIE-Fund) is included as an ongoing program. Training will be provided for teachers in environmental education and for state and local agency staff in public involvement skills.

A steering committee will be established to develop long-range options for funding education and public involvement and to oversee the PIE-Fund.

ONGOING PROGRAMS

The Authority proposes to continue the existing programs in the 1987 plan with only minor modifications and improvements. Changes have been made to clarify program elements, to reflect the experience gained in implementation, and to make the programs more effective.

Nonpoint Source Pollution

"Nonpoint" pollution sources are numerous and dispersed, including all the forms of contamination that enter the water in surface runoff and from boats. Individually, sources may be insignificant, but taken together, they can have a substantial effect on water quality.

The 1987 plan called for the development of local watershed management programs in Puget Sound counties. Twelve "early action" priority watersheds were selected in 1987, and committees are in the process of preparing nonpoint pollution action plans for those watersheds. Local committees are also ranking all watersheds within each county to determine priorities for future action plans. Regulations adopted by the Authority following the 1987 plan provide guidelines for local watershed management.

The nonpoint sources to be addressed in priority watersheds include on-site septic systems, farm practices, and stormwater, as well as other sources. The priority watershed approach will be complemented by prevention efforts, including education and an examination of how local ordinances and programs affect water quality.

Local efforts are being augmented by several state government programs. A boaters task force is tackling pollution problems from boats through an education program and proposals for additional pumpout facilities. The nonpoint program also includes several initiatives that deal with on-site septic systems, including a legislative proposal addressing the need for owner education and on-site system inspection and maintenance.

Shellfish Protection

In addition to an emphasis on shellfish protection in the Nonpoint Source Pollution Program, the 1987 plan included an aggressive program that focuses on better protection of both recreational and commercial shellfishing. The strategy includes public education and involvement, periodic testing for both toxicants and bacteria in shellfish, and restoration projects.

Municipal and Industrial Discharges

Point sources of pollution include industries and municipal sewage treatment plants. The 1987 plan called for a substantial strengthening of the state Department of Ecology's regulation of point sources, including controlling toxicants and particulates through discharge permits, increasing the frequency of discharge inspections (including unannounced inspections), aggressively pursuing unpermitted discharges, requiring more complete discharge monitoring, using certified laboratories to analyze samples, and implementing pretreatment requirements. Ecology was also directed to develop and adopt standards for sediment contamination, and to use the standards in implementing various water quality and dredging programs. An expansion of the existing efforts to clean up urban bays complements the improvements in the point source regulatory program. Increased discharge permit fees, a 1987 plan proposal that was approved by the state legislature in October 1987, will fund a significant portion of the improvements in the program, although additional general fund is also needed to support this program.

Two new elements are added: element P-27 creates a new function in Ecology to provide technical outreach to dischargers; element P-28 requires a report on how well waste discharge permits issued after the effective date of the plan have met the requirements of this program.

Contaminated Sediments and Dredging

Toxic contaminants accumulate in sediments in the Puget Sound basin, causing harm to bottom-dwelling organisms and threatening the rest of the food web. Dredging to maintain navigation channels spreads and relocates these sediments. To reduce sediment contamination, several programs in the 1987 plan called for discharges of toxic contaminants to be reduced.

The 1987 plan included goals for sediment quality and for dredging and disposal programs. The plan also required development of standards for dredged material disposal, a feasibility study of multi-user disposal sites for contaminated sediments, and an expansion of targeted efforts in urban bays to find and respond to high levels of sediment contamination. The plan laid out close coordination between the Authority and the Puget Sound Dredged Disposal Analysis (PSDDA), coordinated by the U.S. Army Corps of Engineers, Environmental Protection Agency, and the state Departments of Natural Resources and Ecology.

Progress in this program has been hampered by severe underfunding in the current biennium, especially of element S-8, Investigations of Contaminated Sediment Sites. A new element, S-9, calls for enhanced public education and involvement about contaminated sediments issues.

Stormwater and Combined Sewer Overflows

Stormwater runoff is a pervasive pollution problem. As urbanization of the Puget Sound basin continues, the problem is likely to increase. The 1987 plan required stormwater control programs in all the cities and other urbanized areas in the Puget Sound basin, phased in between now and the year 2000. Source controls and best management practices are emphasized rather than end-of-pipe treatment.

In addition to the urban stormwater programs, the 1987 plan required all jurisdictions to control quantity and quality of stormwater from new development and to ensure that existing stormwater control systems are adequately maintained and operated. Stormwater considerations are also integrated with the nonpoint program, where stormwater is one of the pollution sources addressed in priority watersheds. The Department of Ecology will provide technical assistance, including manuals and model ordinances. The plan incorporates Ecology's current program of guidelines and other efforts to address combined sewer overflows.

Extensive revisions have been made in the organization and wording of elements SW-1 through SW-5 to provide improved clarity and simplicity. These changes are not intended to change the basic thrust of the program.

Wetlands Protection

To help reduce the loss of wetlands in the Puget Sound basin, the 1987 plan called for protection of significant wetlands through preservation, enhanced regulations, and a program for wetlands on state-owned lands. The preservation program uses a systematic approach to identify wetlands to be preserved through acquisition and other mechanisms and is designed to complement similar efforts of private organizations. Enhancement of local regulatory programs will be guided by regulations adopted by the Department of Ecology. The Department of Natural Resources is required to preserve and protect wetlands on the aquatic lands and uplands it manages, and other state agencies have similar requirements.

A wetlands restoration element is added to augment the preservation effort, and significantly increased funding is proposed for preservation. Another new element establishes a long-range wetlands education strategy to support successful implementation of wetland program elements.

Spill Prevention and Response

The 1987 plan required a policy analysis and revision of spill contingency plans. The 1989 plan includes creation of a spill prevention and response committee and an examination of techniques to prevent spills of oil and other hazardous substances.

Laboratory Support

The 1987 plan required the Department of Ecology to design a laboratory certification program and to produce a plan to ensure adequate laboratory capacity for state environmental programs. New elements have been added that establish a process for developing, adopting, and updating the Puget Sound Estuary Program protocols, and that require Ecology to prepare a quality assurance/quality control plan for the department's programs and projects.

Household Hazardous Waste

The 1987 plan called for phased implementation of recent legislation that requires local household hazardous waste plans, including accelerated implementation of programs in a few counties. In addition, education is required, focusing on local plans and on less-toxic alternatives for household products.

Legal and Personnel Support

The 1987 plan addressed the need for adequate staff and legal support at both the state and local levels in order to carry out the Puget Sound plan. At the local level, the plan calls for financial assistance to local governments for enforcement of laws protecting wetlands and controlling nonpoint pollution sources.

PLAN DEVELOPMENT AND IMPLEMENTATION

The Puget Sound Water Quality Authority was given responsibility by the legislature to develop and oversee the implementation of the Puget Sound Water Quality Management Plan. This responsibility includes writing and updating the plan, reviewing the actions of implementing agencies, coordinating interagency activities, preparing the biennial State of the Sound Report, and involving the public in the planning process. The Authority also co-manages the Puget Sound Estuary Program with the Department of Ecology and the Environmental Protection Agency.

The Authority is scheduled to go out of existence on June 30, 1991, and the Puget Sound Estuary Program is also to have completed its work by that time. Thus no entity will exist with responsibility for long-term planning and oversight. To assure the long-term protection of Puget Sound, there is a need to consider whether the functions performed by the Authority should continue and in what form.

The plan calls for the governor to appoint a committee to make recommendations about the appropriate institutional mechanisms. Options could include assigning the Authority's tasks to existing state agencies, asking the federal government to continue the Puget Sound Estuary Program, creating a new entity or entities, or continuing the Authority in its current form or a different form for some period of time.

THE UNFINISHED AGENDA

When the Authority was developing the first water quality plan, the public suggested that a number of issues related to the Sound and its resources be addressed. Due to budget and time constraints, the Authority could not deal

with many of these issues in either the 1987 or the 1989 plan. In the 1989 draft plan the Authority included a list of these "unfinished agenda" issues that could potentially be addressed in the 1991 plan and asked for public comment. Public response was excellent. Over 200 people provided comments on the unfinished agenda, and over 300 people participated in ranking the issues.

The issues included in the unfinished agenda are:

* Aquaculture
* Contamination of the sea-surface microlayer
* Effects of air pollution on water quality
* Federal facilities
* Fish and wildlife habitat
* Freshwater use and availability
* Groundwater contamination
* Hazardous materials spill prevention and response
* Human health risks
* Nutrient effects
* Pesticides
* Plastic debris in marine waters
* Transboundary pollution
* Treatment of domestic wastes

In response to public comment, the Authority made the following decisions on how to address each of the unfinished agenda issues. The Authority will analyze the technical and regulatory issues related to fish and wildlife habitat and pesticides and may prepare issue papers on these two topics. Authority staff will also coordinate a technical study of the effects of air pollution on water quality. Ongoing work on federal facilities and human health risks will be continued, and a study is planned on means to prevent spills of hazardous materials. The Authority will request that the U.S. Geologic Survey carry out a special study on the effects of contaminated groundwater on Puget Sound and will request that the International Joint Commission pay special attention to transboundary water quality concerns.

Other Authority actions include general review and comment on major activities related to aquaculture, freshwater use and availability, groundwater contamination, plastic debris in marine waters, and treatment of domestic wastes. Contamination of the sea-surface microlayer and nutrient effects issues will be referred to the Committee on Research in Puget Sound.

Authority action on other issues raised during the public review process will include special consideration of island issues and inclusion of an island ecology section in the 1990 *State of the Sound Report*; review and comment on major is-

sues related to public access to beaches and sole source aquifers; and referral of the issue of seal bacteria contamination to the Department of Wildlife.

COSTS AND FINANCING

The plan includes cost estimates for each of the programs. It also discusses potential revenue sources to fund the plan, including the Centennial Clean Water Fund (cigarette tax), discharge permit fees, the state general fund, the state toxics fund, local funding, and federal funding.

The projected public sector cost to implement the first two years of the 1987 plan was $36.6 million. This initial biennial budget reflected phase-in schedules for each of the plan's programs to allow for orderly implementation. However, phasing the programs also meant that budgets for the succeeding biennium would have to be higher than the initial costs. Of the $36.6 million total for the first biennium, $15.1 million was requested from the state legislature. The remainder reflected primarily local costs (to be assisted by the Centennial Clean Water Fund). The legislature appropriated $11.9 million which was later augmented by about $1.8 million in expected discharge permit fee revenues. This left a shortfall of about $1.4 million in state funds, which resulted in the delay of several important plan programs. The worst effects were felt in the programs for municipal and industrial discharges and contaminated sediments.

The budget for the draft 1989 plan for the FY 1990-91 biennium was intended to restore full funding to the plan's existing programs. It also included funding for essential new programs which were called for in the 1987 plan and developed over the past two years—research, monitoring, and education. The budget in the draft plan called for expenditures in the next biennium (fiscal years 1990-1991) of $88.2 million.

In an effort to propose a realistic budget for the FY 1990-91 biennium, the Authority cut back the draft plan to about two-thirds of the funding needed for full implementation. This was accomplished by delaying and scaling back activities in nearly every program. The projected public sector cost for the next biennium is now $54 million. The table on the next page shows the projected plan costs for fiscal years 1990-91 and lists the anticipated sources of funding for both the draft 1989 plan and the final, scaled-down plan.

Recognizing that stable, long-term funding is crucial for success in protecting the Sound, the plan calls for a study of funding options to support the long-term implementation of the Puget Sound plan. The study will be conducted in consultation with cities, counties, tribes, the legislature and governor, citizens' and business associations, and state agencies. The study will identify new and existing potential sources of funding and may result in proposals for legislative or regulatory changes so that potential funding sources may be more easily used.

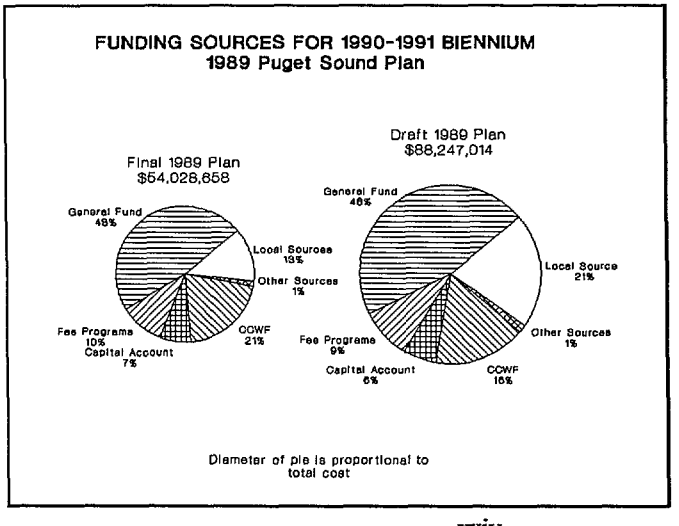
The estimated costs shown do not include possible Environmental Protection Agency funding from the Puget Sound Estuary Program that may be available for plan implementation in the FY 1990-91 biennium. EPA Region 10 has received approximately $1.2 to 1.6 million per year for the Puget Sound Estuary Program for several years, and this funding is expected to continue at similar or decreased levels until 1991. This money has been used to fund technical studies and some plan implementation activities.

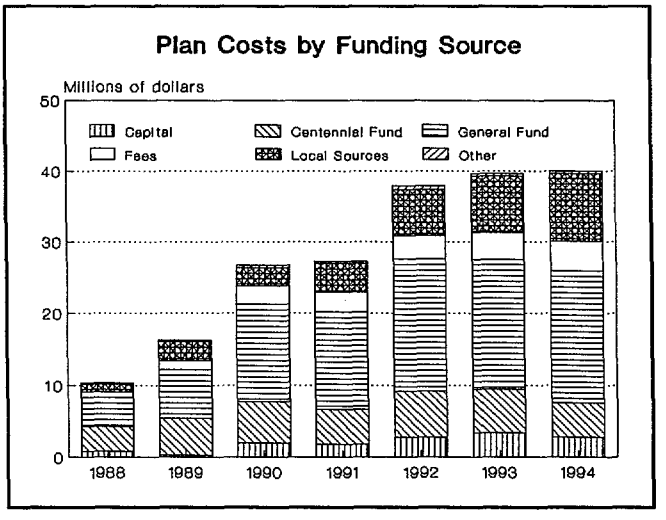
ESTIMATED COSTS FOR FY 90/91 BIENNIUM: DRAFT AND FINAL 1989 PLANS

	Draft Plan FY 90/91	Final Plan FY 90/91
1989 PLAN COSTS		
Continuation of 1987 Plan Programs	66,200,813	41,231,889
Authority Activities	3,408,515	2,888,822
New Programs:		
Monitoring	7,191,980	4,621,701
Research	4,602,175	1,796,814
Education and Public Involvement	6,713,405	3,359,056
Other (CF and PDI)	130,126	130,376
TOTAL	$88,247,014	$54,028,658
POTENTIAL FUNDING SOURCES		
State Capital Account	5,180,000	3,710,000
Federal Funding	406,156	449,980
Toxics Account	983,802	319,548
Centennial Clean Water Fund (CCWF)	14,531,990	10,568,664
State General Fund	40,735,135	27,108,564
State Fee Programs	8,000,966	5,308,433
Local Sources	18,408,965	6,563,469
TOTAL	$88,247,014	$54,028,658

Funding Notes

Federal	Depends on appropriations to various federal agencies. Amounts shown do not include funding from the EPA National Estuary Program.
Toxics	State and local accounts under the Washington Superfund Act.
CCWF	Actual amount will depend on how funds are awarded by the Department of Ecology.
General Fund	Depends on appropriations from the state general fund by the legislature.
Fees	Fees for waste water discharge permits and laboratory certifications.
Local	Includes local matches to anticipated grants from the Centennial Clean Water Fund and revenue from stormwater utilities and septic maintenance districts.





Chapter 1. Introduction

Puget Sound is recognized worldwide as an extraordinary natural resource. The region's three million residents enjoy boating, beachcombing, and other activities on the Sound's waters and beaches. Its deep waterways support international commerce, abundant commercial and recreational fisheries, and varied wildlife habitats.

The Environmental Protection Agency recently designated Puget Sound an "estuary of national significance" under the federal Water Quality Act of 1987. The federal government's action recognizes not only the value of Puget Sound, but also the need to protect and improve the Sound's water quality and resources.

In the pattern of other American waterways, the Sound is showing early symptoms of inadequate management. A steadily increasing population in the region has led to urbanization and industrialization of many nearshore areas. As a result, the Sound's urban bays show evidence of contamination from toxic chemicals: sediments forming toxic "hot spots," liver tumors in bottomfish, and contamination of the sea-surface microlayer. The rural areas of the Sound have also seen increased development. One of the effects has been bacterial pollution, which has forced closure of many important shellfish harvest areas. Shoreline development has also eliminated more than half of the Sound's natural wetlands.

We hope that we are responding in time to protect and restore Puget Sound. We have faced and overcome similar problems before, when municipal waste was fouling Lake Washington and when pulp mill effluent was damaging some of our bays. Moreover, we do not face the same magnitude of difficulties confronting older, more developed regions in this country—such as the Chesapeake Bay, Boston Harbor, or Narragansett Bay—yet we can draw on these for valuable lessons. We can recognize that it is far easier and less expensive to prevent degradation than it is to correct it (when correction or restoration is even possible). We can also see the price to be paid when these problems are ignored.

At the same time, Puget Sound's problems are sobering. The region is expected to add 600,000 more people by the year 2000, increasing development pressures and waste disposal problems. This growth means that success in

protecting the Sound will depend on long-term, expensive, and dedicated effort.

In recognition of the need to protect the Sound, the 1985 Washington State Legislature passed ESSB 3828 (Chapter 90.70 RCW), restructuring the Puget Sound Water Quality Authority (PSWQA) and charging it with developing a comprehensive management plan for Puget Sound and its related waterways.

In establishing the Authority, the legislature found:

"that Puget Sound and related inland marine waterways of Washington state represent a unique and unparalleled resource...

"that the consequences of careless husbanding of this resource have been dramatically illustrated in inland waterways associated with older and more extensively developed areas of the nation...

"that the costs of restoration of aquatic resources, where such restoration is possible, greatly exceed the costs of responsible preservation...

"that utilization of the Puget Sound resource carries a custodial obligation for preserving it..."

and

"that the large number of governmental entities that now affect the water quality of Puget Sound have diverse interests and limited jurisdictions which cannot adequately address the cumulative, wide-ranging impacts which contribute to the degradation of Puget Sound."

The Puget Sound Water Quality Authority consists of seven members appointed by Governor Booth Gardner. In addition, the Director of the Department of Ecology and the Commissioner of Public Lands serve as ex-officio members. The Authority holds official monthly meetings, as well as many other informal and formal meetings, in different locations around the Sound, listening to citizens and local government and tribal officials.

The principal responsibility of the Authority is to develop, adopt, and oversee the implementation of the Puget Sound Water Quality Management Plan. The Authority adopted the 1987 plan in December 1986. Recognizing the magnitude of the problems confronting the Sound, the legislature charged the Authority to engage in a continuing planning process through 1991. The Authority is to revise the plan every two years, evaluating progress toward previous goals and addressing additional concerns. The 1989 Puget Sound Water Quality Management Plan is the first plan revision. The Authority is to develop one more revision before it goes out of existence in June 1991.

The planning area defined by the legislature includes Puget Sound south of Admiralty Inlet (including Hood Canal and Saratoga Passage); the waters north to the Canadian border, including portions of the Strait of Georgia; the Strait of Juan de Fuca south of the Canadian border; and all the land draining into these waters. There are 12 counties in the planning area. The terms "Puget Sound," "Puget Sound basin," "Puget Sound region," and "the Sound" are used interchangeably in this document to refer to the planning area (see Figure 1-1).

The legislation requires state agencies and local governments to evaluate and incorporate applicable provisions of the plan into their policies and activities.

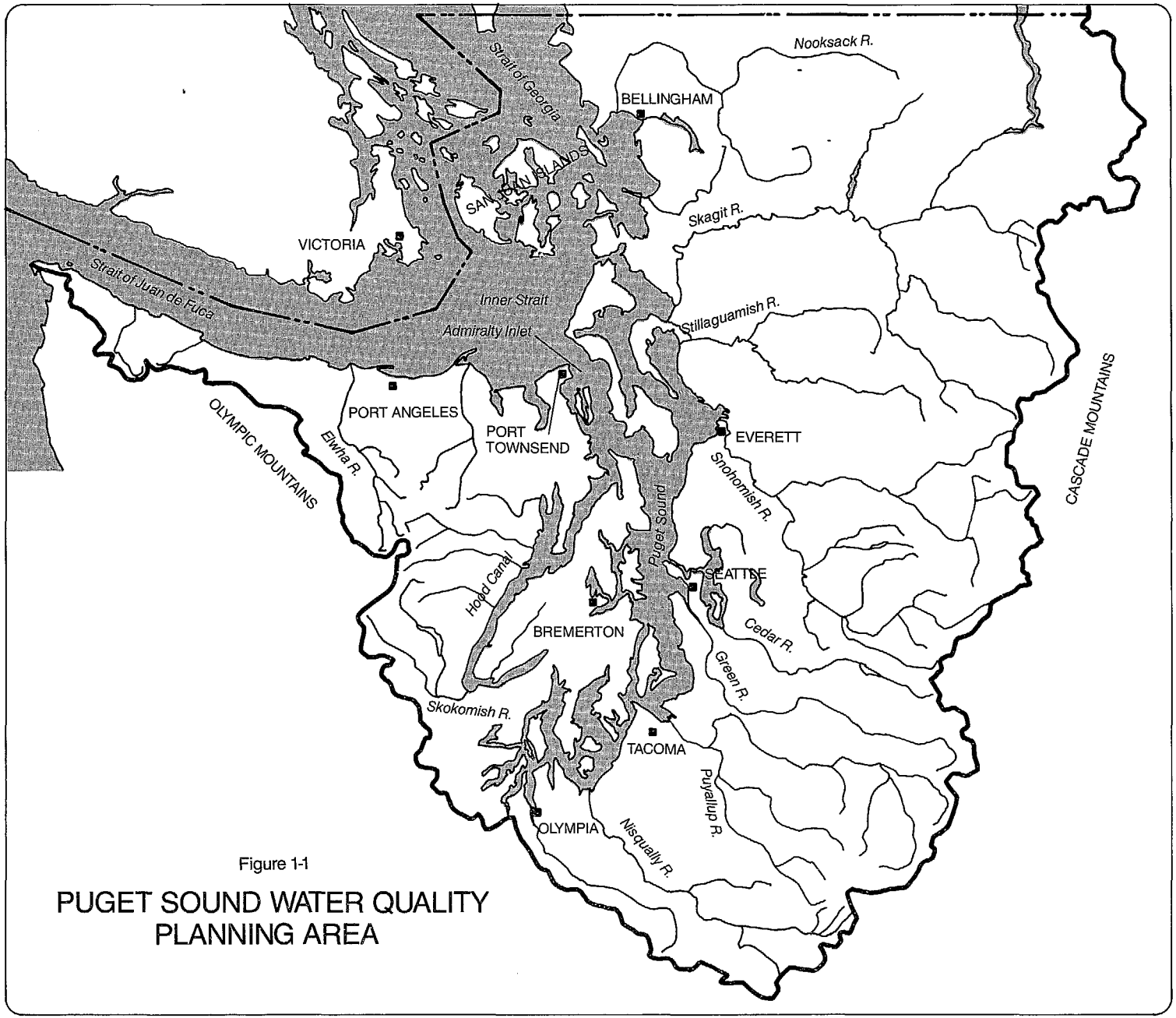


Figure 1-1

PUGET SOUND WATER QUALITY PLANNING AREA

The Authority is to propose funding mechanisms, propose new legislation as needed, and oversee the implementation of the plan.

THE PLANNING PROCESS FOR THE 1987 PLAN

The Authority developed the first Puget Sound plan in 1985 and 1986. An advisory committee and a scientific review planel assisted the authority in developing the plan. The members of these advisory groups represented a range of expertise and a variety of interests. The Authority held public meetings and hearings throughout the planning process to hear from people around the Sound. Many informal meetings were also held with interested groups and individuals.

In 1985 the Authority's initial planning task was to establish the scope of the first plan. This was accomplished through public meetings, review of previous studies, consultation with the advisory committee, and review of the mandates of the Authority's authorizing legislation. Major issue areas selected for the first plan were point and nonpoint sources of pollution, contaminated sediments and dredging, and wetlands.

During 1986 the Authority developed nine issue papers on major water quality issues. The papers examine the environmental and institutional problems and outline alternative approaches for problem solving in each area. These papers were released for public comment, and public forums were held in each of the Sound's 12 counties.

The issue papers, and comments on the papers, formed the basis for the draft plan/draft environmental ipact statement which was issued in September 1986. Over 340 letters were received commenting on the draft plan, and about 275 people testified at the 13 public hearings held throughout the Puget Sound region. The Authority responded to comments by issuing a revised preferred plan and final environmental impact statement in early December 1986. The Authority adopted the final 1987 plan on December 17, 1986.

UPDATE ON IMPLEMENTATION OF THE 1987 PLAN

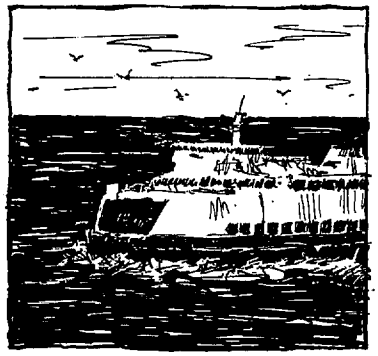
The 1987 plan assigned many tasks to state agencies, local governments, and others. The Authority has worked closely with those implementing the plan to provie guidance and assistance and to oversee implementation. Progress has been made in all of the 1987 plan's programs.

Among the signs of progress:

* Local committees are developing plans to reduce nonpoint source pollution (pollution from surface runoff) in 12 "early action" watersheds around Puget Sound. All 12 Puget Sound counties have also formed committees to rank local watersheds for future nonpoint pollution planning. The Department of Ecology has funded these efforts through the Centennial Clean Water Fund (cigarette tax).

* The Authority developed regulations (Chapter 400-12 WAC) to provide guidance to the Puget Sound counties for nonpoint source pollution planning. The Departments of Ecology, Agriculture, and Social and Health Services, along with tribes, local governments, farmers, and others participated in developing the regulations.

* In October 1987 the state legislature passed legislation requested by the Authority that increases fees paid for discharge permits. The Department of Ecology has developed interim regulations to collect permit fees under



this legislation. The fees will provide funds to improve Ecology's point source control program.

* The legislature also passed legislation requested by the Authority authorizing Ecology to certify laboratories that provide the department with data. Ecology expects to adopt regulations and begin certifying labs in early 1989.

* The Authority provided $1 million in contracts from its Public Involvement and Education Fund (PIE-Fund) for 48 model projects that educate people about Puget Sound and/or involve them in water quality projects. The PIE-Fund received its money from the Centennial Clean Water Fund (cigarette tax).

* The Authority cosponsored, with other state and federal agencies, universities, and consulting firms, the First Annual Meeting on Puget Sound Research in March 1988. Researchers presented 80 technical papers, and about 700 people attended the meeting.

* The Department of Social and Health Services began monitoring 144 recreational shellfish beaches and in June 1988 published the first annual inventory of the status of shellfish beds in Puget Sound.

* The Department of Natural Resources made a tentative commitment to purchase important wetlands in the Snohomish Delta. This is a first step in implementing the plan's wetlands program.

* The Department of Ecology has developed criteria for preservation of wetlands and has called for nominations of wetlands for the preservation list. Ecology has also formed an advisory committee to help develop state rules for local wetland protection programs.

* The Boaters Task Force, working with the State Parks and Recreation Commission, has developed a boaters education program and a legislative proposal to provide for additional pumpout stations around the Sound.

The 1987 plan called for the Authority to develop three major new programs crucial to the Puget Sound plan: (1) a comprehensive ambient monitoring program for Puget Sound; (2) a long-range strategy for education and public involvement related to Puget Sound; and (3) a system of priorities and funding for research. The plan called for each of these programs to be designed with an advisory committee composed of representatives from government agencies, the private sector, tribes, citizens' groups, and others. The committees have accomplished their tasks assigned in the plan, and the programs for monitoring, education and public involvement, and research form the new initiatives included in the 1989 Puget Sound plan.

Funding for implementation of rovide guidance to the Puget Sound counties for nonpoint source pollution planning. The Departments of Ecology, Agriculture, and Social and Health Services, along with tribes, local governments, farmers, and others participated in developing the regulations.

The state general funds appropriated for 1987 plan implementation were less than the amount requested by the Authority. As a result, implementation of some portions of the plan was postponed. Ecology was able to disburse some initial funds from the Centennial Clean Water Fund to allow early startup of portions of the nonpoint and shellfish programs at the local level. Ecology

adopted the final guidelines for disbursement of grants from this account in July 1988.

The permit fee bill was defeated in the 1987 legislative session, and was later adopted in special session in October 1987 as part of the state superfund legislation. An initiative which proposes an alternative to the superfund bill, including a permit fee provision, will be on the ballot in November 1988, along with the superfund bill itself. This causes some uncertainty concerning the amount of money that will be available from the increased permit fees.

THE 1989 PLAN REVISION PROCESS

The draft 1989 plan was released for public comment in June 1988. The draft plan built on the progress made in carrying out the first plan. The draft included new initiatives in the areas of research, monitoring, and education, and continued and updated each of the programs in the 1987 plan.

In developing the first plan, the Authority became aware of a number of important issues related to Puget Sound that could not be addressed due to time and resource constraints. The 1987 plan included a list and description of these issues called the "unfinished agenda." The issues on the unfinished agenda range from transboundary pollution to the impacts of air pollution on the Sound. Unfortunately, lack of funding during the past two years prevented work necessary to address these problems.

This 1989 plan expands the list and provides more information about what work would be necessary to address these important issues in the 1991 plan or through other means. The Authority plans to carry out or coordinate studies to obtain more information on some of these issues. Other issues will be addressed by other agencies or through other means. See Chapter 5 for details.

Public hearings on the draft plan were held in every Puget Sound county and in other parts of the state in July 1988. Nearly 300 people attended the public hearings, and over 100 written comments were received.

The plan's three new programs in monitoring, research, and education and public involvement received the majority of comments. Many comments were also received on the Wetlands Protection Program, the Nonpoint Source Pollution Program, the Sediments Standards (element P-2), and the unfinished agenda. Some of the major themes of the commenters were:

* Support for the education, monitoring, and research programs.

* Support for local education field agents and the Public Involvement and Education Fund (PIE-Fund).

* Concern about the plan's costs. Commenters suggested that the plan include a more thorough accounting of all costs and/or cost-benefit information, that it address the need for long-term funding, and that priorities be set to keep costs down.

* Support for a stronger Wetlands Protection Program, including restoration, education, and a better use of existing authorities to protect wetlands.

* Concerns about schedules, especially from those involved in nonpoint watershed planning programs.

* High ranks for fish and wildlife habitat and groundwater contamination on the unfinished agenda as topics needing attention. Other unfinished agenda items that received widespread support included hazardous materials spills, pesticides, and the effects of air pollution on water quality.

The Authority used the hearing testimony and written comments to develop the final 1989 plan.

The Authority adopted this final plan on October 19, 1988. The plan is comprehensive, addressing the Sound's problems through a range of programs. It anticipates future problems and builds on past achievements. It provides a framework for continuing efforts by all of us to protect Puget Sound over the long term.

Chapter 2.
The State of the Sound

This plan, which builds on the 1987 Puget Sound plan before it, focuses on reducing pollution entering the Sound and protecting the Sound's biological resources, including shellfish and wetlands. In developing both plans, the Authority researched current scientific knowledge of the Sound's processes and the status of its pollution and resources. Following is a brief summary of important findings from the *State of the Sound 1988 Report.*

ESTUARINE CIRCULATION

Puget Sound shows a characteristic estuarine circulation pattern: fresh water is lighter than saltwater and tends to flow seaward on top of the saltwater; the saltwater in the lower layers tends to flow landward. The Sound's shallow sills—along with inlets, channels, and other local conditions—disrupt this general pattern. Strong mixing caused by the Sound's strong tides occurs at the sills, recirculating some of the outflowing surface water. For instance, at the sill at Admiralty Inlet up to two-thirds of the outflowing water may become a part of the deeper layer where it will flow back into the Sound instead of exiting to the Pacific Ocean.

This recirculation of water means that contaminants are not readily flushed out of Puget Sound as was once believed. This is particularly true of contaminants that do not stay in solution or suspension but bind to sediment particles. Perhaps one to five percent of sediment particles initially in the surface waters of the Sound are carried out through Admiralty Inlet; the rest are trapped in the Sound.

POPULATION AND LAND USE

The population of Puget Sound is currently estimated at nearly 3 million, with King County accounting for 46.4 percent of the 1987 estimated population. Most of Washington's population growth since 1980 has occurred in the state's largest counties, five of which border on Puget Sound. King, Kitsap, Pierce, Snohomish, Thurston, and Whatcom Counties increased by about 276,000 people between 1980 and 1987, which accounts for 79 percent of the entire state's population growth in that time period.

The rate of population growth, rather than sheer numbers of people, is often a good indicator of potential environmental and institutional stresses and

problems in an area. This is because land use planning activities, the provision of basic services, and local enforcement of laws and regulations may not be able to keep up with the demands of an increasing population in rapidly growing areas. Puget Sound counties represented nine of the ten fastest growing counties in the state for the period between 1980 and 1987. Much of this growth took place in unincorporated areas. Island County had the highest rate of growth in the state (18 percent), while San Juan, Thurston, Snohomish, and Mason counties also had very high rates of the growth.

Between 1987 and the year 2000 population in the Puget Sound region is expected to grow by 20 percent, from almost 3 million to 3.6 million. The four central Puget Sound counties (King, Pierce, Snohomish, and Kitsap) are expected to add 1.5 million more people between 1987 and 2020.

Land use forecasts for the year 2000 suggest that almost 1.3 million acres or 15 percent of the land in the Puget Sound area will be in intense urban or rural non-farm use by the year 2000--an increase of 62 percent for urban use and 73 percent for rural non-farm use. Most of this intensively used land is projected to be in the central Puget Sound region.

ECONOMY AND RESOURCES

The harvest of fish and shellfish has been one of the most important human uses of the Puget Sound basin for as long as there have been people in the area. The total value of all commercial and recreational fish and shellfish in Puget Sound was estimated at $168 million in 1986. Salmon harvests represent the bulk of the value of the Puget Sound catch. The commercial salmon catch in the Sound in 1986 was worth $44.45 million (based on price per pound paid at the boat). The retail value of this same catch was estimated at $131.84 million. The shellfish harvest (both traditional fisheries and aquaculture production) in 1987 was valued at over $76 million (retail).

The popularity of recreational or sport fishing has increased over the last 15 years. The value of the 1986 sport salmon fishery was estimated at $74.56 million (based on an estimate that people will pay $74.16 per fishing day). The Department of Fisheries estimates that over 3.3 million pounds of clams alone are harvested recreationally each year from Puget Sound beaches, for a retail value of over $11 million.

The marine waters of the Puget Sound basin represent an invaluable aesthetic and recreational resource for residents and tourists alike. A recent study found that one-third of all outdoor recreational activities by Washington residents involved fresh or salt water. The most popular in-state vacation destination area was the western Puget Sound/Olympic Peninsula region which was visited by 27.9 percent of all 1986 vacationers.

Recreational boating is clearly important to the region's economy. A study of the recreational marine boating industry in Washington estimated that in 1986 direct and indirect boating sales generated $895 million and $2.4 billion, respectively, and provided jobs for 17,300 people statewide. The recreational boating industry in the Puget Sound area contributed at least 80 percent of this total.

Resident and non-resident travelers spent $3.51 billion and supported 74,620 jobs statewide in 1986. Seventy-eight percent of these expenditures ($2.75 billion) were made in counties bordering Puget Sound. Travel-generated employment accounted for 54,825 jobs in the Puget Sound region (73 percent of the statewide figure).

TOXIC CONTAMINATION

Toxic contaminants represent the most acute and greatest long-term threat to the habitats and biological resources of the Sound. Toxicants reach the marine waters of Puget Sound from many sources, but the principal known sources are municipal and industrial point source discharges, stormwater runoff, pesticides from nonpoint sources, and unpermitted discharges of wastewater. In addition, the dredging and disposal of contaminated sediments can disturb and redistribute these materials. There are 52 toxic chemical compounds in Puget Sound that have been identified by EPA as "pollutants of concern." However, other chemicals may be concentrating in the environment that may also be of concern.

Toxic contaminants bind to particles and are largely retained as sediments in the Puget Sound basin rather than being flushed out to open ocean waters. Many toxic substances tend to persist in the environment; thus contamination is not easily reversed.

Concentrations of PAHs (polyaromatic hydrocarbons; primarily derived from burning of fossil fuels) in sediments in central Puget Sound are currently less than half of the peak concentrations from the 1950s, but are still about 15 times higher than the baseline levels from the 1880s.

Concentrations of toxicants in surface sediment in the Sound's urban bays are elevated 100 times or more over the levels in the cleanest rural bays. High concentrations of toxic contaminants in sediments have been associated with high prevalences of fish diseases and other adverse biological effects.

Groundfish in contaminated areas of Puget Sound have been found to have abnormalities such as fin erosion and liver lesions, including liver tumors. Liver tumors in English sole have been found in as many as 18 percent of the fish population in certain urban bays, and pre-tumors have been found in as many as 36 percent of the fish population. In the Sound's non-urban areas these figures are about one and four percent, respectively.

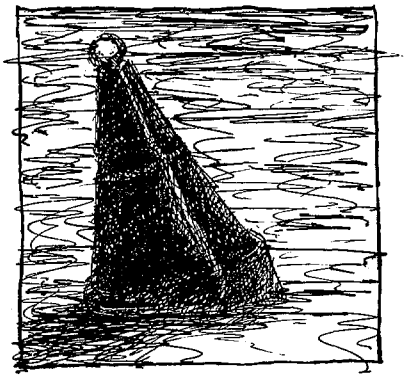
More than half of female English sole tested in Eagle Harbor, and almost 40 percent of those tested in the Duwamish Waterway, failed to mature sexually and could not reproduce. Both of these areas have high levels of aromatic hydrocarbons in the sediments.

Toxic contamination of sediment and biota may become more severe as population and commercial and industrial activities increase, particularly in areas that are now relatively undeveloped. However, improvements to the National Pollutant Discharge Elimination System (NPDES) permit system (as called for by the Puget Sound plan's Municipal and Industrial Discharges Program) to better control discharge of toxicants may reduce loading of toxic contaminants. As cleaner sediments are deposited on the bottom, they will begin to bury older sediments with higher concentrations of contaminants.

POINT SOURCE POLLUTION

Sewage treatment plants and industrial facilities that discharge into rivers and the Sound are considered "point source" dischargers (because they discharge through pipes at a specific point). Point source discharges (and stormwater and combined sewer overflows that are discussed below) occur throughout the Sound, but tend to be concentrated in urbanized areas. Contaminated sediments from these discharges tend to be localized in these urbanized bays and inlets. Consequently, improvements in the control of point source discharges (particularly toxic contaminant reduction) will slowly improve the quality of water and surface sediments in these areas.

Since the 1960s substantial progress has been made toward limiting conventional pollutants including bacteria, sediments, and oxygen-demanding substances. For example, pulp mills have reduced oxygen-demanding discharges from two million pounds per day in 1969 to about 30,000 pounds per day in 1986. In addition, most sewage treatment plants in the Puget Sound area either have converted, or are working toward converting, from primary to secondary treatment. Conversion to secondary treatment will significantly reduce the discharge of many conventional and toxic pollutants to Puget Sound. The Municipality of Metropolitan Seattle (Metro) has estimated that upgrading to secondary treatment at its four primary treatment plants will reduce loading of most types of toxicants to the Sound by 100 tons per year.



In the past the discharge permit system for point source dischargers has not effectively controlled the discharge of toxic pollutants into Puget Sound. Major weaknesses of the regulatory program identified prior to the adoption of the 1987 Puget Sound plan have been that discharge permits typically include effluent limits for only a few contaminants (usually conventional pollutants) with few limits placed on toxicants; there are few requirements for monitoring the environment that the pollutants are discharged to; and there is no systematic program for detecting unpermitted discharges, particularly outside of the urban bays.

Largely as a result of the Puget Sound plan, the Department of Ecology is substantially strengthening its regulation of point source dischargers to deal with some of these problems. This effort is being aided by substantial funding increases from discharge permit fees and from state general funds. However, it is still too early to see direct environmental benefits from these new programs.

One program that has been effective at identifying and eliminating point source toxic contamination in several urban bays around the Sound has been the Urban Bay Toxics Control Program. This program was developed in 1985 by EPA, Ecology, and other agencies and organizations. Since 1985 Elliott Bay action teams have inspected 124 sites and facilities, assessed 28 penalties amounting to $44,200, and issued 36 notices of permit violations and 22 administrative orders for cleanup actions.

STORMWATER AND COMBINED SEWER OVERFLOWS

Stormwater, or surface water runoff, contains a complex mixture of suspended solids, oil and grease, nutrients, bacteria, viruses, and toxic materials such as lead, cadmium, mercury, organic pesticides, ammonia, and petroleum products. Stormwater samples in the Seattle area typically exceed EPA water quality criteria for cadmium, copper, lead, nickel, and zinc. Some storm drains in Seattle were found to be the major sources of lead and polychlorinated biphenyls (PCBs) found in the sediments of Elliott Bay.

In more rural areas of the Sound stormwater runoff tends to contain fewer toxic chemicals and more fecal coliform bacteria. For example, stormwater discharging into Henderson Inlet in southern Puget Sound periodically violates state fecal coliform standards for water, and has been found to be one factor in the closure of commercial shellfish beds at the head of the inlet.

Ten cities around the Sound have combined sewers where sanitary sewage, industrial wastewater, and stormwater are collected in a single sewer system. Discharges from these systems typically contain high concentrations of fecal coliform bacteria, nutrients, and suspended sediment (with associated high levels of metals and organic toxicants). During large storms some of this combined effluent is discharged directly to the Sound without treatment. For ex-

ample, in an average year Metro discharges about two billion gallons of raw sewage, untreated stormwater, and industrial effluents from about 20 combined sewer overflows (CSOs) in the Seattle area.

NONPOINT SOURCE POLLUTION AND SHELLFISH

Nonpoint source pollution is typically defined as pollution that is discharged from diffuse, scattered sources rather than through pipes. Nonpoint pollution includes bacteria, sediments, nutrients, and toxicants that are picked up by rainwater and carried into streams, rivers, and eventually the Sound, or that are discharged directly into the water from boats and other water-based sources. Because sources of nonpoint pollution are so numerous, varied, and difficult to detect, their cumulative effects on water quality and habitats of the Sound can be significant.

The effects of nonpoint source pollution are experienced throughout Puget Sound. One of the more notable effects is the number of commercial shellfish growing areas that have been closed because of high levels of fecal coliform bacteria.

Some commercial shellfish beds were closed to harvest as early as the 1950s. More recent closures include five commercial shellfish beds that have been reclassified to a more restricted status since December 1986. Preliminary monitoring results show five recreational sites that consistently exceed fecal coliform standards. This bacterial contamination appears to originate from failed on-site sewage disposal (septic) systems, domestic and wild animal wastes, and contaminated stormwater.

In many areas bacterial contamination has increased with increasing rural development of residences and small (but numerous) noncommercial farms that use septic systems and maintain animals on their property. Since rural development is expected to continue at a high rate, nonpoint source contamination is likely to increase.

Forest practices are another potential contributor to nonpoint source pollution. Sediment loading from timber harvesting and road construction can damage stream fish habitat, and poor forest practices can introduce pesticides, nutrients, and organic debris to streams.

The Timber/Fish/Wildlife (T/F/W) agreement is a precedent-setting effort that was negotiated in 1986-87 by state resource agencies, timber industry representatives, Indian tribes, and environmental groups. The agreement provides for a more holistic approach to forest practices and includes, among other things, provisions for interdisciplinary teams to inspect and approve on-site harvest plans; protection of riparian areas along larger streams; training and more emphasis on research and monitoring; and the provision for upland management areas for the use and protection of wildlife in harvested areas. Full implementation of this agreement will help protect water quality and fish and wildlife habitat in streams and rivers affected by forestry activities.

Agricultural practices can introduce a variety of nonpoint pollutants including sediment, fecal bacteria, nutrients, salts, organic chemicals, and pesticides. Programs have been developed by Ecology and the Washington State Conservation Commission (e.g., the Dairy Waste Management Program), the U.S. Department of Agriculture Soil Conservation Service (SCS), and conservation districts to manage and control agricultural nonpoint pollution. These programs generally rely on voluntary implementation of best management practices (BMPs) although enforcement of water quality standards may also be

used. Examples of farm BMPs include manure storage lagoons, pasture management, stream fencing, streamside protection, and erosion control.

The overall effectiveness of these programs has been limited in the past by inadequate funding and too little attention to noncommercial farms. These small farms represent a significant, largely uncontrolled source of agricultural nonpoint pollution in the Sound.

Voluntary implementation of BMPs is increasing throughout the Sound by both commercial and noncommercial farms, and improved water quality has been found in certain areas where the majority of land owners are implementing BMPs. Puget Sound conservation districts report that in 1986 481 landowners were using some type of BMP to reduce nonpoint source pollution; 412 additional landowners used BMPs in 1987.

Failing on-site sewage disposal (septic) systems can discharge bacteria and household chemicals to groundwater, streams, and eventually to Puget Sound. Approximately one-third of the residents in the Puget Sound area are served by on-site systems. About 405,000 septic systems were operating in Puget Sound in 1987, and the Department of Social and Health Services estimates the overall failure rate at 3.5 to 5.0 percent. This means that as many as 14,000 to 20,250 septic systems may have failed in Puget Sound in 1987. A recent survey of local health agencies found estimated failure rates of up to 12 percent in some areas of the Sound.

Sewage discharge from boats is a potential problem during the boating season wherever large numbers of boats congregate. Boat fueling and maintenance activities can also be sources of pollution. It is difficult to quantify direct effects of boat bacterial waste because of variations in temperature, turbidity, tides, season of the year, and the number of persons aboard each boat. Some studies have found that boating activities significantly increase water and shellfish bacterial levels; others have been less conclusive. However, state and local health agencies are increasingly recommending the closure of recreational shellfish beds near popular boating areas and marinas.

LOSS OF WETLANDS

One major environmental consequence of Puget Sound's growth has been the destruction of wetlands for agricultural, port, industrial, residential, and commercial development. Of the approximately 22,500 acres (9,000 hectares) of coastal wetlands present in 1800, nearly 14,000 acres (5,600 hectares) have been diked, filled, and converted to other uses. Virtually all of the saltwater and estuarine wetlands in the Lummi, Duwamish, and Puyallup deltas have been lost. In stream corridors where pastures continue to be created there has been a 50 to 60 percent loss of wetlands. In farming areas such as the Skagit Valley wetland losses are estimated to be as high as 90 to 95 percent. Commercial development in areas such as the Green/Duwamish river basin has eliminated over 95 percent of the original wetlands. A recent analysis of the State Environmental Policy Act conservatively estimated that 530 acres of unprotected freshwater wetlands are being degraded or destroyed statewide each year.

Chapter 3.
Action Plan

INTRODUCTION

This chapter contains the 1989 action plan for cleaning up and preventing pollution of Puget Sound. The purpose of this plan is to restore and protect the biological health and diversity of Puget Sound. The strategy for achieving this purpose is to protect and enhance three resources: water and sediment quality; fish and shellfish; and wetlands.

The following goal provides the basis for the plan:

It shall be the long-term goal of the state to prevent increases in the introduction of pollutants to the Sound and its watersheds, and to reduce and ultimately eliminate harm from the entry of pollutants to the waters, sediments, and shorelines of Puget Sound. In seeking this goal, agencies shall take into consideration the net environmental effect of their decisions in order to minimize the transfer of pollutants from one environmental medium to another.

The plan's emphasis on prevention recognizes the simple truth that it will cost far more to clean up pollution later than to prevent it now. The plan is based on a premise of shared responsibility among all of us in the Puget Sound region and recognizes that both water and pollutants cross jurisdictional lines. It establishes a framework based on a partnership among levels of government, each having a defined set of responsibilities in different program areas. The plan recognizes and includes actions by state and local governments, tribes, the private sector, citizens, and the federal government.

The 1987 Puget Sound Water Quality Management Plan, which was adopted unanimously by the Authority in December 1986,[1] provides the basis for this updated 1989 plan. This plan continues (with some modifications) each of the programs in the 1987 plan and includes new initiatives in the areas of research, monitoring, and education. The 1989 plan supersedes the 1987 plan.

The programs for research, monitoring, and education are based on recommendations developed by three committees[2] whose members contributed many hours to the development of this plan. The education strategy, which is included as elements ES-1 through ES-12 in the Education and Public Involvement Program, outlines the actions necessary to achieve a well-informed and active citizenry engaged in the protection of Puget Sound. The Research Program calls for the Authority to set research priorities, sponsor research, disseminate research findings, and develop a long-term institutional structure for these functions. The Monitoring Program will assess conditions over time of water, sediments, and biological resources in order to create a comprehensive information base for management of the Sound.

The programs that follow this introduction are organized in a consistent format. Each program is prefaced with a brief statement of the problem that led to the creation of the program and a summary of progress made in implementing the program since the adoption of the 1987 plan. This is followed by the program goal, the strategy for achieving this goal, and the elements comprising the program. Following each element is a brief status section which describes the progress in implementing that element. For each program, the major actions flowing from the program which the Authority intends to review are listed and any legislation required by the program is specified. Finally, the program's estimated cost is summarized.

Following the programs is a discussion of the costs and proposed financing for the plan as a whole. When this plan was released for public review in June 1988, the public sector cost of implementing the programs for fiscal years 1990-91 was estimated to be $88.2 million. This compares to an estimated $26.6 million that is projected to be spent during the current (1988-89) biennium. Due to concern regarding the level of funding that might be available for the next two years, the Authority made reductions in all programs. The projected cost for the plan is now 61 percent of $88.2 million, or $54.0 million. This is significantly less than what the Authority believes is needed to achieve the plan's goals for the Sound. Reductions in plan programs were achieved by postponing activities until the FY 1992-93 biennium. The Costs and Financing section at the end of this chapter includes a table showing the reductions made in each program to achieve a scaled-down plan. Summaries of local government responsibilities under the plan and programs that request tribal involvement conclude the chapter.

1 The Authority has amended the 1987 plan twice since its adoption. After action by the 1987 legislature on the plan's budget, the Authority amended the plan in September 1987 to reflect a funding shortfall for several of the plan's programs. Some of this funding shortfall was relieved by the passage of SB 6085 which increased fees for waste discharge permits (as called for by plan element P-4). The plan was amended in February 1988 to reflect this partially restored funding and to make minor changes in wording or target dates for some elements. The 1989 plan incorporates all amendments to date.

2 These committees are: the Committee on Research in Puget Sound, the Monitoring Management Committee, and the Education and Public Involvement Advisory Group. Lists of committee members are provided at the front of this plan.

MONITORING

PROBLEM DEFINITION

There is currently no long-term, comprehensive program to monitor Puget Sound and its resources. Some programs of federal, state, and local agencies measure the condition of water, sediment, and biological resources of the Sound, but these programs are generally not Soundwide and there is little cooperation or coordination among the programs. Frequently, substantial amounts of data are gathered as part of specific, project-related intensive surveys, short-term or localized monitoring, and compliance monitoring. These programs are designed and implemented independent of one another. Ambient monitoring, discharge monitoring, intensive surveys, and other programs to assess the quality of Puget Sound water, sediments, habitat, and biological resources are not currently integrated or coordinated. Currently, over $1 million is spent annually by federal, state, and local agencies monitoring various aspects of Puget Sound.

A comprehensive monitoring program will determine the effectiveness of regulatory programs, evaluate long-term trends in environmental quality, and assist in resource management decisions. Preventing overlap and duplication of programs is a concern in implementing a comprehensive program.

PROGRAM STATUS

The Monitoring Program in the 1987 plan directed the Authority to form a Monitoring Management Committee (MMC) consisting of representatives of federal, state, and local agencies, tribes, Canadian agencies, industry, the scientific community, and the public. The MMC was charged with developing a monitoring recommendation for the Authority, including: (1) goals and objectives for an ambient Soundwide monitoring program; (2) a technical design for ambient monitoring; (3) a data management system to handle all ambient monitoring data; (4) a cost estimate and potential funding sources for the program; (5) opportunities for citizens' monitoring; and (6) a strategy for updating and integrating the Puget Sound Atlas with the monitoring program. This committee was established in October 1986.

Prior to the formation of the MMC, a monitoring design had been developed by a private contractor (Tetra Tech) under the direction of the Office of Puget Sound, Region 10, Environmental Protection Agency (EPA). This draft monitoring design was given to the MMC in November 1986 for review and further refinement.

Throughout 1987 and early 1988 the MMC worked on changes and refinements to the monitoring program design. The committee met monthly to discuss the sampling design and to develop a data management system, an institutional framework for implementing the Puget Sound Ambient Monitoring Program (PSAMP), and a cost estimate for the program. The consensus process was used throughout for decision-making. Eleven technical subcommittees met during the course of PSAMP development. The membership of the subcommittees was drawn from the MMC and from outside experts.

In support of the committee's work, EPA Region 10 surveyed most existing monitoring programs in Puget Sound. Federal, state, and local agencies, special purpose districts (water districts, sewer districts, etc.), tribes, selected professional organizations, and the shellfish industry were asked about their monitoring programs, legal mandates for monitoring, cooperation with other agencies, data needs, and capabilities. The results of this survey were used to

identify overlaps among existing monitoring programs and to aid in the assignment of field collection and analysis efforts for PSAMP.

The draft PSAMP design was reviewed by a broad audience; workshops were held for the general public and for local government and tribal staff during September 1987. Members of the Puget Sound Estuary Program (PSEP) Technical Advisory Committee (TAC) and other scientists in the Puget Sound area provided scientific review of the draft design in December 1987 and January 1988.

The MMC presented their final report and recommendation to the Authority in April 1988. The committee's report provides the basis for this program.[3]

Implementation tasks of PSAMP accomplished during 1988-89 include: initiation of field sampling and laboratory analysis of sediments by Ecology funded by $500,000 state general fund money; redirection of current marine water column and freshwater efforts by Ecology; sampling for paralytic shellfish poisoning by DSHS; and citizens' monitoring pilot projects funded through the Authority's Public Involvement and Education Fund (PIE-Fund).

PROGRAM GOAL

To implement the Puget Sound Ambient Monitoring Program (PSAMP). This program was designed to: (1) assist decision-making of agencies by characterizing and interpreting spatial and temporal trends and identifying problem areas; (2) take measurements to support specific program elements and measure the success of the Puget Sound plan by providing a permanent record of significant natural and human-caused changes in key environmental indicators over time; and (3) provide an ongoing assessment of the health of the Sound.

PROGRAM STRATEGY

The strategies for achieving these goals are (1) to establish an institutional structure to manage the monitoring program; (2) to implement the monitoring program design, data management system, and quality assurance plan recommended by the Monitoring Management Committee in April 1988; (3) to collect, analyze, interpret and report data in a manner that is useful to water quality managers and to the public; and (4) to annually review the monitoring program to ensure that the most appropriate and cost-effective monitoring elements are included.

PROGRAM ELEMENTS

The previous program elements M-1 and M-2 have been replaced in total by new elements.

M-1. PSAMP Management Structure

The management structure for the Puget Sound Ambient Monitoring Program (PSAMP) will consist of the PSAMP Steering Committee, the MMC, and the

3 Certain of the environmental variables examined by the MMC were not included in the PSAMP recommendation due to high costs, lack of adequate protocols, or logistic constraints. For example, sampling and analysis of freshwater sediments for toxics could not technologically be accomplished for a reasonable price and were therefore not included in the program. Many of the variables rejected for this initial PSAMP design should be given serious consideration in future iterations of the program. Funding levels and/or technological advances may allow for their addition to the program.

Authority. Staff, housed at the Authority, will provide technical and administrative support to the program.

The PSAMP Steering Committee will be chaired by the Authority and will be composed of one representative from each of the implementing agencies (see M-2), the Environmental Protection Agency (EPA), tribal government, and local government. Additional members will be added in the future if deemed necessary by the Authority. The PSAMP Steering Committee will be responsible for the overall coordination and management of PSAMP; coordination of agency activities; the review of technical and interpretive reports of PSAMP information; and the sanction of protocols for use in PSAMP. The PSAMP Steering Committee shall meet every month or as needed, and shall reach decisions by consensus.

The MMC shall be chaired by the Authority and shall consist of representatives from: the state Departments of Ecology, Fisheries, Wildlife, Natural Resources, and Social and Health Services; Metro; local water and sewer districts and local public health officials; tribes; federal agencies including the National Oceanic and Atmospheric Administration, EPA, Fish and Wildlife Service, U.S. Geological Survey, Soil Conservation Service, and the Army Corps of Engineers; Canadian agencies; industry; shellfish growers; the scientific community; and citizen organizations.

The MMC shall act as the advisory group to the PSAMP Steering Committee. Proposed major changes to PSAMP shall be referred to the MMC by the PSAMP Steering Committee. Major changes include but are not limited to: addition or deletion of a PSAMP task or major sub-task; change in assignment of an implementing agency; setting funding priorities among PSAMP tasks; changes in protocols, sampling design, or criteria for locating sampling stations; and any other technical issue upon which the PSAMP Steering Committee cannot reach agreement. The MMC shall meet twice a year or more frequently as needed.

If the PSAMP Steering Committee cannot reach agreement on major changes to PSAMP or other technical issues after consultation with the MMC, or on any other issue, the PSAMP Steering Committee as a whole, or any member individually, may refer the matter to the Authority for resolution.

The PSAMP Steering Committee and the MMC shall review and reassess the design of PSAMP on an annual basis.

The Authority shall facilitate agency cooperation among the state agencies implementing PSAMP; provide arbitration for interagency disagreements concerning PSAMP; provide and house the monitoring program staff; provide the central data management functions; and distribute integrated, interpretive reports of PSAMP results.

The Authority shall: implement PSAMP Steering Committee and Authority decisions; coordinate the monitoring program; manage a central database system; provide technical review of field collection and laboratory analysis design; provide quality assurance review of PSAMP data; prepare technical assessments of PSAMP progress for the PSAMP Steering Committee; ensure that program revisions are coordinated among agencies; provide technical assistance to program participants in areas of data analysis and interpretation and field and laboratory activities; organize outside technical assistance, where needed, to help in review of monitoring data and program revisions; prepare

integrated reports from data reports; and coordinate with other monitoring and research efforts.

Memoranda of agreement shall be negotiated between each implementing agency and the Authority in order to: ensure the implementation of PSAMP; allow for future modifications of the program, as needed; secure long-term stable funding for PSAMP; and develop a permanent record of data for Puget Sound. These agreements shall include commitments of work to be performed by one agency to support products of another agency, product reviews, consultation, and technical support.

When the Authority sunsets, those Authority functions associated with the management of PSAMP will be assumed by another organization. The committee on long-term Puget Sound institutional structure, described under element PDI-1, will include consideration of appropriate organizations to assume the Authority's functions.

Target Dates: The management structure for PSAMP will be operational by July 1989. Memoranda of agreement will be negotiated and signed between the implementing agencies and the Authority during the fall of 1988.

[**Status:** The Monitoring Management Committee was formed in October 1986. The PSAMP Steering Committee was formed in August 1988.]

M-2. Puget Sound Ambient Monitoring Program (PSAMP)

The design of PSAMP, completed by the MMC in April 1988, and subject to future amendment, is adopted for use in Puget Sound. The Puget Sound Ambient Monitoring Program shall collect and analyze samples and carry out surveys to determine the quality of the water, sediments, biological populations, and habitats of the Puget Sound basin, using protocols, quality assurance checks, data storage, and reporting procedures, as detailed in the PSAMP document.

The implementing agencies shall carry out specific assignments for implementing PSAMP, as directed by the PSAMP Steering Committee.

Initially, the state Departments of Ecology, Fisheries, Wildlife, Natural Resources, and Social and Health Services have been chosen as the implementing agencies. Other federal, state, and local agencies, tribal governments and other organizations may become implementing agencies in the future. Program tasks outlined in the 1988 MMC report shall be assigned to the implementing agencies as follows:

Sediment, Water Column, Freshwater, River Mouths - Ecology

Fish - Fisheries

Birds, Marine Mammals - Wildlife

Nearshore Habitat - Natural Resources

Shellfish - Social and Health Services

Changes to the program shall require approval of the PSAMP Steering Committee in consultation with the MMC. The program shall include, at the least, sampling for sediments, water quality variables, biological populations, and habitat, within the limits of available funding.

Location, timing, and frequency of sampling stations in each program task shall follow the approach outlined in the MMC 1988 report and shall include a

network of fixed and rotating stations for each task as specified in the MMC report.

Target Dates: The state Departments of Ecology, Fisheries, Wildlife, Natural Resources, and Social and Health Services shall begin implementation of PSAMP by July 1, 1989.

[**Status:** Sediment sampling will take place during the spring of 1989, with $500,000 of 1987 plan funds. Marine water column funding within Ecology has been redirected beginning in spring 1988; freshwater funding within Ecology will be redirected during fall 1988. Sampling and analysis for paralytic shellfish poisoning is ongoing by DSHS. Waterfowl surveys by Wildlife are ongoing. DNR and EPA began a pilot project to inventory nearshore habitat by remote sensing during summer 1988. Other portions of PSAMP are scheduled to begin in July 1989. Partial funding for this element will be requested for FY 1990-91. Full implementation of all the program tasks will be delayed until FY 1992.]

M-3. Citizens' Monitoring

The Authority shall develop a citizens' monitoring program to collect data which will supplement PSAMP and act as an educational and public involvement tool (see element ES-3 for further details on citizens' monitoring). At a minimum, at least one citizens' monitoring project shall be carried out each year.

Those portions of PSAMP which may be suitable for citizens' monitoring programs include: (1) field checking of nearshore habitat; (2) collection of water column chlorophyll and nutrient samples; (3) digging of clam samples for chemical and bacteriological analysis; or other tasks deemed appropriate by the monitoring program staff in consultation with the PSAMP Steering Committee. The monitoring program staff will provide technical support for citizens' monitoring projects funded under this element.

Data collected under citizens' monitoring programs shall be subject to the same protocols and quality assurance checks as all other portions of PSAMP.

Target Date: Citizens' monitoring projects associated with PSAMP will begin in July 1989.

[**Status:** The Authority began implementation of a citizens' monitoring program in June 1988 through funding provided by the Public Involvement and Education Fund (PIE-Fund). Only partial funding is being requested for this element for FY 1990-91, which allows a limited level of citizens' involvement in PSAMP.]

M-4. Data Management and Quality Assurance

Data management and quality assurance for PSAMP shall be carried out through a centrally coordinated data management system. Responsibility for data storage and analysis shall be distributed among the implementing agencies and the monitoring program staff.

Each implementing agency shall develop data management systems, as specified in the PSAMP report, to manage all data generated under those tasks of PSAMP for which they are responsible. The monitoring program staff shall develop and maintain a central database of PSAMP data, as specified in the PSAMP report, including a computerized data inventory.

All data generated under PSAMP shall meet the quality assurance requirements specified in the PSAMP report and those subsequently ratified by the PSAMP Steering Committee.

The implementing agencies shall transfer data to the central database, following quality assurance checks. Standardized computer codes and formats shall be specified by the PSAMP Steering Committee and used uniformly for all data transfers between and among the implementing agencies and the Authority.

The monitoring program staff shall prepare a recommendation for updating the Puget Sound Atlas. The recommendation shall be reviewed by the MMC and the PSAMP Steering Committee, modified as appropriate, and adopted by the Authority. The relationship of the Atlas to a Puget Soundwide geographic information system (GIS) shall be assessed as a part of that recommendation.

Target Dates: The state Departments of Ecology, Fisheries, Wildlife, Natural Resources, and Social and Health Services shall have operational data management systems by December 31, 1989. The monitoring program staff shall have an operational central database by July 1, 1989. The Authority shall adopt the recommendation on the Puget Sound Atlas and GIS by June 1, 1989.

[**Status**: As of October 1, 1988, progress in this program included the following: The implementing agencies are in the planning stages for developing data management systems. Systems for sediment, nearshore habitat, and paralytic shellfish poisoning will be operational by July 1989. The central database design document was completed in July 1988; implementation of the design will begin in October 1988. Partial funding is requested for FY 1990-91, commensurate with the amount of data that will be collected under M-2.]

M-5. Monitoring Reports

The implementing agencies shall analyze and report data for those tasks of the program for which they are responsible, as specified in the PSAMP report, in consultation with the monitoring program staff.

The implementing agencies shall each prepare an annual report which shall include a compilation of data, statistical analyses, interpretation, and recommendations for changes in the monitoring program design.

The monitoring program staff shall prepare an integrated technical report, as specified in the PSAMP report, using information supplied in reports from the implementing agencies and the monitoring databases. The PSAMP Steering Committee and the MMC shall review the integrated technical report prior to its release.

The monitoring program staff shall translate the findings of the technical report into an annual Puget Sound Update, which will be written for a non-technical audience.

Target Dates: The first annual reports shall be completed by the state Departments of Ecology, Fisheries, Wildlife, Natural Resources, and Social and Health Services by November 1, 1989. The first annual technical report and Puget Sound Update shall be prepared by the monitoring program staff by March 1, 1990.

[**Status:** As of October 1, 1988, there has been no activity under this element. Partial funding is requested for FY 1990-91, commensurate with the amount of data that will be collected under M-2.]

M-6. Additional Monitoring and Data Management Needs

The goals of PSAMP would be enhanced by the addition of appropriate intensive survey data that are compatible. The PSAMP Steering Committee shall consult with state and local agencies concerning the applicability of their intensive survey data to PSAMP. The state Departments of Ecology and Social and Health Services and other state agencies shall collect and store information from intensive surveys, to the maximum degree feasible, according to sampling and analysis protocols specified by the PSAMP Steering Committee. Ecology and DSHS, and other agencies as appropriate, shall, to the maximum extent practicable, transfer appropriate intensive survey information to the central database at the request of the monitoring program staff. Transfer of the information shall be accomplished using data transfer formats developed under element M-4.

Collection and storage of information in a manner compatible with PSAMP is addressed for compliance monitoring surveys in elements P-8 and P-17; for nonpoint monitoring in elements NP-7.1 and MB-6; for shellfish monitoring in elements SF-3 and SF-5; and for wetlands evaluation in elements W-2 and W-6.

Target Date: Ecology and DSHS shall begin using PSAMP protocols by July 1, 1989. Intensive survey data shall be stored in compatible format by December 31, 1989.

[**Status:** As of October 1, 1988, there has been no activity under this element.]

M-7. Evaluation of PSAMP

In order to ensure that PSAMP remains a necessary and cost-effective program that generates data useful to scientists and water quality managers, periodic evaluations of the program shall be conducted. Five years after the start of the program and every three years thereafter, the PSAMP Steering Committee shall identify an independent organization with appropriate technical expertise to evaluate PSAMP. The independent organization shall prepare a report for the PSAMP Steering Committee which evaluates: (1) the effectiveness of PSAMP sampling, analyses, and data management in meeting program goals; (2) the degree to which quality assurance requirements are met and are effective in generating high quality data; (3) the degree to which PSAMP reports are effective and appropriate in meeting the program goals; (4) the continuing need for PSAMP sampling and analysis tasks, parameters, sampling frequencies, and station locations; (5) the degree to which PSAMP is being implemented according to the overall design strategy; and (6) the degree to which PSAMP results are used in water quality management decisions. The report shall also make recommendations for improvements to the program including the addition or deletion of monitoring tasks.

Target Dates: First evaluation starts by July 1994 with report due to the PSAMP Steering Committee by December 1994.

[**Status:** As of October 1, 1988, there has been no activity under this element. No funding is requested for this element for FY 1990-91.]

MAJOR PUBLIC ACTIONS FOR REVIEW

None

LEGISLATION REQUIRED

None

ESTIMATED COST

Development of the monitoring program cost approximately $197,800 during fiscal years 1988 and 1989, including participation by members of the MMC and Authority staff time. Individual agencies and organizations contributed their staff time for participation on the MMC, while Authority staff time devoted to the monitoring program was largely funded by the Environmental Protection Agency. This does not include the costs of earlier reports prepared by EPA and NOAA that provided the basis for the MMC work.

During 1987-1989 portions of the planning and startup costs for PSAMP were funded by EPA: development of the central Puget Sound database, coordination of the program, protocol development, and characterization of nearshore habitat. $500,000 in state general fund money was directed toward startup and baseline monitoring of sediments during fiscal year 1989.

Full funding for the monitoring program would cost $3.2 million a year to implement ($6.4 million over the biennium), with additional startup costs of $650,000 incurred over the first one to two years. However, only $4.6 million is being requested for the FY 1990-1991 biennium. Field sampling and laboratory analysis of sediment, water quality, and biological population samples constitute the most costly element of the program, with an annual cost of $2 million. Cost estimates are shown in the following table, which includes costs for: field sampling, laboratory analysis of samples, coordination and management of the program, providing a central data management system, coordination of a citizens' monitoring program, development and maintenance of individual agency data management systems, implementation of quality assurance procedures, and production of technical and public-release reports.

The elimination of duplicative efforts and redirection of state agency monitoring programs has reduced the annual cost of the monitoring program by $480,000. Cost savings (as well as educational benefits) are also proposed through the involvement of the public in collecting samples at several locations around the Sound, although there are costs associated with running a citizens' monitoring program.

No significant private sector costs have been identified for this program, with the exception of staff time provided by representatives of the private sector who serve on the Monitoring Management Committee. Increased monitoring costs for dischargers are addressed in the Municipal and Industrial Discharges Program.

ESTIMATED PLAN COSTS: MONITORING

COSTS BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
M-1,2	Monitoring Committee and Recommendation	96,250	0	0	0	0	0	0
M-1	PSAMP Management Structure	45,009	56,509	120,880	120,880	151,240	151,240	151,240
M-2,4,5	Monitoring, Data Management and Reports							
	Freshwater task	0	0	130,300	53,300	339,282	339,282	339,282
	Sediments task	0	496,382	504,993	520,750	589,014	589,014	589,014
	River Mouths task	0	0	274,612	240,940	381,880	381,880	381,880
	Water Column Task	0	0	268,732	95,366	561,710	561,710	561,710
	Fish task	0	0	359,012	279,008	318,345	318,345	318,345
	Birds and Mammals task	0	0	205,279	171,088	172,422	172,422	172,422
	Shellfish task	0	0	175,932	150,027	192,034	192,034	192,034
	Nearshore Habitat task	0	0	222,861	172,261	145,994	145,994	145,994
	Central Data Management	0	0	188,720	158,720	135,120	135,120	135,120
M-3	Citizens' Monitoring	0	0	103,521	104,521	104,581	104,581	104,581
TOTAL		$145,926	$649,141	$2,554,841	$2,066,860	$3,091,622	$3,091,622	$3,091,622

Element Notes

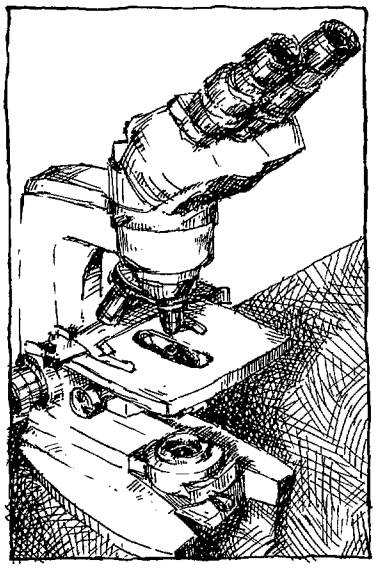
M-1,2 Costs of 1987 plan elements that developed the ambient monitoring program.
M-1 Includes cost of PSAMP Steering Committee, MMC, and monitoring program staff.
M-2,4,5 Includes costs from detailed estimates for individual monitoring tasks. Start-up costs are included in the first year.
M-3 Start-up costs of $15,000 in 1989 are shown in the Education program under the PIE-Fund.
M-7 Independent program evaluation will occur every three years beginning in fiscal year 1995.

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
EPA	0	0	7,000	7,000	7,000	7,000	7,000
Other Federal	13,500	13,500	0	0	0	0	0
Ecology	5,700	502,082	1,188,488	920,207	1,881,737	1,881,737	1,881,737
DSHS	1,572	1,572	179,389	153,484	195,491	195,491	195,491
PSWQA	100,917	107,750	370,903	341,903			
Fisheries	1,215	1,215	362,822	282,818	322,155	322,155	322,155
Wildlife	1,442	1,442	211,684	177,493	178,828	178,828	178,828
Natural Resources	1,853	1,853	226,977	176,377	150,110	150,110	150,110
Local Government	19,729	19,729	7,577	7,577	7,577	7,577	7,577
Monitoring Organization	0	0	0	0	348,723	348,723	348,723
TOTAL	$145,926	$649,141	$2,554,841	$2,066,860	$3,091,622	$3,091,622	$3,091,622

COSTS BY FUNDING SOURCE							
Federal Funding	82,750	94,250	7,000	7,000	7,000	7,000	7,000
State General Fund	43,447	535,162	2,540,264	2,052,283	3,077,045	3,077,045	3,077,045
Local Sources	19,729	19,729	7,577	7,577	7,577	7,577	7,577
TOTAL	$145,926	$649,141	$2,554,841	$2,066,860	$3,091,622	$3,091,622	$3,091,622

RESEARCH

PROBLEM DEFINITION



Research[4] is essential for understanding Puget Sound and its associated watersheds and for developing management options for the long-term protection of the Sound. Research and monitoring together form the technical underpinning of the plan. Monitoring can establish baseline conditions and determine trends in those conditions. Research can take the monitoring findings and establish the underlying processes and relationships that result in particular monitoring observations. Research is also integral to developing more accurate, practical, and cost-effective methods and technologies for monitoring and sample analysis.

There is no comprehensive and coordinated program of research for the management of water quality in Puget Sound. Although much research on the physical and biological systems of Puget Sound has been completed, there are significant questions to be resolved. For example:

* We know less about the shallow nearshore zone, the southern and northern portions of the Sound, and the embayments than about the central basin of the Sound;

* We know very little about the natural variability in the living populations of the Sound; and

* We know very little about the biological and geochemical processes that transform toxic chemicals in the estuary and therefore control their fate and toxicity.

At present, the funds for most of the research conducted on Puget Sound are administered by federal agencies or state program offices that were set up as the regional managers for federal program funding. None of these agencies claim responsibility for Puget Sound as a whole or view their primary objective as the support of research. Rather, research and contract studies are funded specifically to provide information that supports the agency's ability to carry out its mission. As such, the scope of the research is necessarily limited to the perspective of the agency, and there is limited research that looks at the cumulative effects of decisions on the Puget Sound ecosystem as a whole.

On some occasions the purposes of the separate agencies have been combined in the same research due to communication among the funders, regulators, and researchers through the Puget Sound Estuary Program and other formal and informal arrangements. However, there is no mechanism through which the producers, consumers, and funders of research can agree on the priorities for research on Puget Sound. As federal dollars available for research on water quality are being steadily reduced and other sources of research funds have not yet increased, making best use of the funds that are available (while seeking additional funds) is essential.

The present system often falls short of delivering research results to decision-makers, other involved parties, and the general public in a form and time

4 Scientific investigation in which a hypothesis, idea, or assumption is developed and tested through systematic collection and objective analysis of data.

frame that allows the results to be used in decisions. A portion of agency-sponsored research resides in "gray" literature—internal reports that may not receive formal peer review and for which the distribution is limited. Academic research is generally published in peer-reviewed journals, but agency managers have little opportunity or encouragement to devote time and effort to keep abreast of these multiple literature sources. Staff at the local planning level have a particularly strong need for research results that are translated into operating guidelines or model programs that they can readily adapt to their specific situations.

Decision-makers and others concerned with Puget Sound have been confused by disputes among scientists about the appropriate interpretation of existing research. Scientists feel equally frustrated that their expertise and guidance is not requested or given appropriate weight in decision-making. Scientists who do speak publicly find they are all too easily tagged as advocates of a particular interest group or policy. This may hinder the acceptance of their technical expertise in the future on issues of public concern.

As population grows in the Puget Sound basin, the potential for pollution increases along with the demands on Puget Sound and its resources. The issues involved in balancing these demands are becoming increasingly complex. Decisions on these issues need to be supported by a knowledge of the natural system and the effects of human activities on that system. Separating the natural variability from the human-induced changes requires a sustained research effort. The present fragmented pattern of agency-sponsored, short-term contract studies needs to be augmented to: (1) provide a closer connection between the research agenda of the scientific community and the information needs of managers, regulators, and those involved in decisions to manage the Sound; and (2) support research that increases our general knowledge of the Puget Sound system but that is beyond the purview of a single agency.

The problems encountered in the present research system distill down to two questions: (1) How can we ensure that the effort and resources that are devoted to research are commensurate with and appropriate for the problems we will confront in managing the Sound? and (2) How can we ensure that the results of existing research are understood and available for the decisions that we make on Puget Sound water quality?

PROGRAM STATUS

As called for in the 1987 Puget Sound plan, the Committee on Research in Puget Sound was established in February 1987 and asked to make recommendations to the Authority on eight issues important to Puget Sound research, including: research priorities, institutional needs, data management, research reserves, and the publication and dissemination of research results. The committee was composed of 20 representatives of academic institutions, state and federal agencies, the business community, agriculture, environmental groups, and private research organizations. The committee organized itself into two subcommittees which met monthly to accomplish their tasks.

The Subcommittee on Establishing Research Priorities developed a process for establishing priorities and then, beginning in July 1987, used the process to generate the first list of research priorities. The process had three steps:

1. Identification of research needs and questions: Agencies and other groups and individuals involved in Puget Sound decision-making were asked to identify the issues and concerns where they felt additional research was needed.

2. Expert analysis of research questions: Technical work groups of research scientists were convened to discuss the status of research in six general areas encompassing the questions from step 1. These areas were: the distribution and physical/chemical factors related to toxic chemicals, the biological effects of toxic chemicals, habitat modification, conventional pollutants and nutrients, microbiological contamination, and environmental and regulatory policy. Each group attempted to reach a consensus on the five to ten priority research questions in each of these areas.

3. Ranking of research topics: The research committee reviewed the priorities from the technical work groups and ranked the research priorities within each general area based on three criteria: the importance or significance of the problem; timeliness; and the benefit for resources committed.

This ranked list of priorities is included in the committee's final report (see below).

The Subcommittee on Institutional Issues identified the desired functions and characteristics of an institutional structure to address the current problems related to coordination and funding of research, dissemination of research results, and use of research results in decision-making. The subcommittee then reviewed the structure, responsibilities, and operation of existing institutions in the Puget Sound region relative to these functions. They also looked at institutions elsewhere in the country to see what could be learned and adapted from those institutions to suit the specific needs in Puget Sound. Based on this analysis the research committee developed a recommendation for a new institutional structure, the Puget Sound Research Foundation. This proposed foundation is a unique combination of the successful features of the other institutions.

The draft report of the committee was completed in January 1988 and was circulated to tribes, state and federal agencies, industrial, agricultural, and environmental organizations, academic institutions, and the Technical Advisory Committee of the Puget Sound Estuary Program for their review and comment. The final report was printed and distributed in March 1988.[5]

The Authority also directed the research committee to convene a meeting on Puget Sound research. The First Annual Meeting on Puget Sound Research was convened in Seattle on March 18-19, 1988. More than 700 people attended the meeting. Scientists presented recent research results related to Puget Sound and explained the implications of their results to other researchers, water quality managers, and the public. Also, the committee

5 Copies of the final report of the Committee on Research in Puget Sound are available upon request from PSWQA.

presented its final report at the meeting and received comment from a diverse panel of responders and from other meeting participants.[6]

PROGRAM GOAL

To establish a system of priorities and funding for research that (1) adds to our knowledge of the physical and biological systems of Puget Sound; (2) identifies causes and solutions of pollution problems; and (3) assists decision-making activities of regulatory and management agencies while stimulating creativity and excellence in research.

STRATEGY

The strategy for achieving this goal includes: (1) establishing under the Authority a Puget Sound Research Program to promote the coordination and funding of Puget Sound research and to assist in making the results of research available for decision-making; (2) developing legislation to establish an independent foundation to accomplish these functions on a long-term basis; and (3) adopting a list of initial research priorities for sponsorship by the Puget Sound Research Program.

PROGRAM ELEMENTS

R-1. Puget Sound Research Program

The Puget Sound Research Program shall be established under the auspices of the Authority to serve as the regional focal point to set research priorities, sponsor research, and disseminate research findings related to Puget Sound and its watersheds.

The Puget Sound Research Program shall be organized and managed as follows: (1) the Authority shall set policy and provide oversight of the program; (2) a senior scientist shall serve as director to oversee administration and serve as spokesperson for the program; (3) a 12-member scientific council appointed by the Authority shall recommend research priorities and manage the review of proposals for research; and (4) a management council shall provide input on research priorities, assist in coordinating funding for research, and jointly with the scientific council sponsor forums on technical issues and other activities to foster translation and dissemination of research findings. The management council shall consist of representatives from federal and state agencies and local and tribal governments which either manage a program to fund Puget Sound research or have responsibility for managing Puget Sound water quality and natural resources. Representatives of industry, citizens' groups, and other associations or groups that use the results of research will be non-voting members of the management council.

The Puget Sound Research Program shall carry out the following functions:

6 The two-volume proceedings of the First Annual Meeting on Puget Sound Research, containing manuscripts of the papers presented, the executive summary of the committee's report, and transcripts of the panel discussions, is available at a cost of $20.00 from PSWQA. Copies are also available at most public libraries around the Sound.

1. *Research Needs and Priorities*: The program shall manage a process that takes a comprehensive regional approach to identifying and setting priorities for Puget Sound research needs (including problems or processes occurring in watersheds draining into and affecting Puget Sound). Specifically, this process shall provide for:

a. Interactions among scientists and agency managers in setting priorities;

b. Involvement by agencies that support research in order to foster their use of the priority list in deciding which research to fund in Puget Sound; and

c. Periodic updates of the priority list so that it is useful to federal, state, and local agencies, industry, tribes, and other groups involved with Puget Sound in meeting their management needs.

The program shall encourage agencies, industry, and other organizations that fund research to consider the list of research priorities in their own process for allocating research funds.

2. *Fund Raising*: The program shall initiate a funding development program to establish a permanent and stable funding base from industry and other private sources as well as from federal and state entities for support of the research program and other functions of the program.

3. *Research Grants Program*: The program shall establish and manage a competitive research grants program to support research on the priority list that is not adequately funded by government agencies or other sources. The program shall solicit peer reviews of proposals submitted in each high-priority research area. Proposals shall be selected on the basis of established criteria, including, but not limited to: quality, significance of expected scientific contribution, importance to an affected Puget Sound resource, and cost. The program shall work cooperatively with agencies to allocate funds, including supporting basic or process-oriented research that may not be within a particular agency's mission but that is required to understand and use the results of applied research.

4. *Translation and Dissemination of Research Results*:[7] The overall program shall support timely dissemination and translation of Puget Sound research results useful to the public and resource managers. Specifically, the program shall:

a. Establish a policy that research supported by the program should undergo peer review and where appropriate be published in technical and scientific journals;

b. Support preparation of synthesis or review papers on key Puget Sound issues;

c. Publish an annual report summarizing progress on program-supported research and other activities;

d. Sponsor conferences on Puget Sound research that include presentations on current research, discussion of the implications of the research, and an assessment of research priorities for the coming year;

7 This function shall be coordinated or integrated as appropriate with the Puget Sound Ambient Monitoring Program and the Education and Public Involvement Program.

e. Sponsor forums for discussion of differences in scientific interpretation of research results; the forums should lead to consensus on points of agreement and identification of ways to resolve disparities; and

f. Communicate and provide educational opportunities to increase public understanding of how research contributes to the resolution of current and future issues related to water quality in Puget Sound.

5. *Data/Information Management*: The program shall facilitate access to data and other information dealing with Puget Sound that is not readily available through the open literature, particularly unpublished research and data. The program will not become a repository for raw data and publications but it shall act as a "broker" between those having information and those needing it, including the public, the scientific community, regulatory and resource management agencies, and environmental and community groups. This function shall be coordinated with the data management functions of PSAMP, which include the use of a central database of PSAMP data and the development of a computerized data inventory. The PSAMP data inventory will serve as a source of information on what computerized data are available and how they may be obtained.

6. *Coordination With Other Programs*: The program shall ensure that research and monitoring activities are coordinated. This includes reviewing the integrated technical report of the PSAMP to identify research needs related to developing analytical and sampling methodologies or investigating questions raised by the monitoring results. In addition, the program shall coordinate to the greatest extent possible with research and monitoring programs including: the Puget Sound Estuary Program, NOAA, watershed monitoring programs, and T/F/W.

7. *Inventory and Recommendation of Research Reserves*: The program shall coordinate with the Natural Heritage Program of the Department of Natural Resources and others to inventory geographic areas that are reserved for research, e.g., the University of Washington areas at Friday Harbor and Shaw Island, Western Washington University's Shannon Point Marine Center, federal and state wildlife refuges and parks, the Padilla Bay National Estuarine Research Reserve, and other public and private preserves. The program shall recommend establishment of additional reserves if specific ecosystems are missing or underrepresented, either for use as reference areas for monitoring or for research.

Target Dates: The research program will be established under the Authority in July 1989.

[**Status**: The first research priority setting process was completed by the Research Committee and documented in their final report in March 1988. All other portions of this new element are proposed to begin in July 1989. Only partial funding is requested for this element in FY 1990-91.]

R-2. Puget Sound Research Foundation

Concurrent with establishing the Puget Sound Research Program the Authority shall commence the necessary steps to ensure the long-term functioning of the program after the sunset of the Authority. The Authority shall draft legislation to establish the Puget Sound Research Foundation as an independent nonprofit corporation. This draft shall serve to foster discussion and shall be considered in 1989 by the Authority in conjunction with recom-

mendations for long-term institutional solutions to protect Puget Sound (element PDI-1).

The mission of the foundation would be as follows:

1. To promote the coordination and support of research most needed to understand the character and functioning of Puget Sound and the significance of human impacts on natural processes and resources of the Sound; and

2. To assist in making the results of that research available and useful to the decision-making process.

If legislation is pursued, the Authority would seek a joint state-federal charter for the foundation by requesting that the Washington state Congressional delegation submit proposed legislation in the U.S. Senate and the U.S House of Representatives to establish the foundation and to provide for Congressional matching funds for the support of its research grants program.

The Authority would submit proposed legislation to the Washington state legislature to charter the foundation and to provide funding for administration of the corporation and for operation of the research grants program.

The foundation would be chartered to perform seven functions related to research: (1) identifying and setting research needs and priorities, (2) managing a research grants program, (3) conducting fund raising, (4) assisting in the translation and dissemination of research results, (5) assisting in data/information management, (6) coordinating with the Puget Sound Ambient Monitoring Program (PSAMP), and (7) performing an inventory of and recommending research reserves.

The organizational structure of the foundation would be designed to:

1. Facilitate and enhance the potential for generating broad-based, permanent, and regionally-controlled funding;

2. Provide for active participation in the activities of the foundation (especially the setting of research priorities) by the scientific community, industry, tribes, citizens' groups, local governments, and state and federal regulatory and resource management agencies;

3. Ensure that scientific experts in a range of technical disciplines are available to provide independent advice and guidance to the processes of establishing research priorities, recommending research grant awards, and translating and disseminating research results;

4. Foster interagency coordination and funding of research efforts pertinent to Puget Sound;

5. Enhance access to and communication of research data and results for all parties concerned with Puget Sound management.

Target Dates: The decision on when to submit legislation to the state legislature and to the Congress shall be dependent on the outcome of the study conducted under element PDI-1 (Long-Term Puget Sound Institutional Structure).

[**Status:** Draft legislation will be prepared during the winter of 1988-89. All other portions of this new element are proposed to begin in July 1989 under the auspices of the Authority.]

R-3. Research Priorities

The Authority hereby adopts the following list of research priorities developed by the Committee on Research in Puget Sound. This list shall serve as a guide to agencies in their decisions to fund research pertinent to Puget Sound. The Puget Sound Research Program shall review and the Authority shall readopt the research priorities on a biennial basis.

The long-term research goals and the research priorities for FY 1990-91 are listed below.

Long-Term Research Goals:

1. Understand the effects of conventional pollutants on Puget Sound and adjacent habitats.

2. Understand the effects of toxics on Puget Sound and adjacent habitats.

3. Understand the effects of adjacent habitat alterations on Puget Sound aquatic resources.

4. Understand and improve the effectiveness of environmental decision-making on Puget Sound.

Research Priorities for FY 1990-1991:

1. Develop background data on the effects of agricultural runoff on offsite water quality.

2. Characterize the input, cycling, and effects of nutrients in embayments and nearshore waters, and the relationship of these processes to activities in the watershed.

3. Identify and investigate biological effects in the sea-surface microlayer and other zones of contaminant concentration.

4. Develop a better understanding of the chemical and physical processes that control the fate and effects of chemicals introduced by effluents into Puget Sound.

5. Investigate the impacts of changes in water quantity on wetlands and the effects of wetlands on watershed hydrology.

6. Develop an understanding of regional wetlands functions and values, and develop objective criteria for their measurement and evaluation.

The Puget Sound Research Program shall provide support under the research grants program for scientists to conduct research on these priorities. This support shall include appropriate funding and encouragement to ensure that research findings are communicated and translated into a form that is usable by decision-makers. This should be accomplished through prompt publication of research results in technical journals and in publications that are accessible to local government planners, agency staff, and others. The Puget Sound Research Program shall sponsor and convene forums, workshops, and conferences to discuss technical issues and the implications of the collected body of research information.

Target Dates: This list shall be reviewed, revised as appropriate, and readopted by March 1990 and thereafter on a biennial basis.

[**Status:** This new element is proposed to begin in July 1989.]

MAJOR PUBLIC ACTIONS FOR REVIEW

None

LEGISLATION REQUIRED

1. Potential federal legislation establishing a foundation and authorizing Congressional appropriations as matching funds for state and private dollars that are contributed to support the foundation's research grants program (R-2).

2. Potential state legislation chartering the foundation and appropriating funds to administer the foundation and operate the research grants program (R-2).

3. Potential federal legislation to create additional national estuarine research reserve(s) in the Puget Sound basin or state legislation to set aside land for protection as a long-term, undisturbed site for monitoring and research on Puget Sound (R-1).

ESTIMATED COST

The work of the Committee on Research in Puget Sound, including convening the First Annual Meeting on Puget Sound Research, cost $179,000 for the fiscal year 1988-89 biennium. Individual agencies and organizations contributed their staff time for participation on the committee. The primary costs were for Authority staff for the committee, contractor support to organize the research meeting, and other costs associated with the research meeting and the publication of the committee's report and the proceedings of the research meeting.

Full funding for the research program would have cost $4.5 million, but only $1.8 million is being requested for the FY 1990-91 biennium. This figure includes $600,000 in state general funds each year for research grants. Costs are estimated at $3.4 million in FY 1992, increasing to $4.0 million in FY 1994. The increases would provide additional staff to provide program support along with research grants of $3 million in fiscal years 1992 and 1993 and $3.5 million in fiscal year 1994.

The annual research conference is estimated to cost $57,000 each year during the FY 1990-91. These amounts include an assumed contribution from agencies and the private sector that is based on the level of support that was provided for the First Annual Meeting on Puget Sound Research.

ESTIMATED PLAN COSTS: RESEARCH

COST BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
R-1	Committee on Puget Sound Research	103,745	75,541	0	0	0	0	0
R-1,2,3	Puget Sound Research Program	0	0	898,407	898,407	3,352,027	3,410,164	3,969,206
TOTAL		$103,745	$75,541	$898,407	$898,407	$3,352,027	$3,410,164	$3,969,206

Element Notes

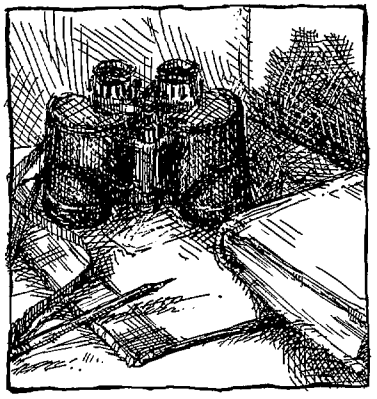
R-1 Activities called for by the 1987 plan and interim activities.
R-1,2,3 Includes $600,000 per year for fiscal years 1990 and '91, $3,000,000 for fiscal years 1992 and '93, and $3,500,000 in 1994 to fund competitively selected research projects. Assumes that donations provide partial funding for the research conference.

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
PSWQA	103,745	75,541	898,407	898,407			
Research Foundation					3,352,027	3,410,164	3,969,206
TOTAL	$103,745	$75,541	$898,407	$898,407	$3,352,027	$3,410,164	$3,969,206

COSTS BY FUNDING SOURCE							
Federal Funding	59,235	58,129	48,000	48,000	52,000	53,000	53,000
State General Fund	44,510	17,412	850,407	850,407	3,300,027	3,357,164	3,916,206
TOTAL	$103,745	$75,541	$898,407	$898,407	$3,352,027	$3,410,164	$3,969,206

EDUCATION AND PUBLIC INVOLVEMENT

PROBLEM DEFINITION



Pollution prevention requires an ongoing commitment from an informed, involved public. Both education and public involvement are necessary components of a long-term management strategy for the Sound and its resources.

Education is necessary to foster public recognition of the Sound as a regional and national resource, and to stimulate public, governmental, and private sector support for the changes in lifestyle and financial commitment necessary to preserve the Sound. Education is necessary both as a supplement and an alternative to enforcement programs. While enforcement can act as an educational tool, it does not entirely correct many pollution problems which result from individual actions such as improper disposal of wastes from households, automobiles, or boats. Enforcement is an impractical and often infeasible tool to address these problems. Individual responsibility and appropriate disposal actions are better achieved through education and public involvement. Overall management and protection of Puget Sound will require both regulatory and voluntary or educational programs.

An educational survey conducted by the Authority (August 1986) and the information gathered from the 200 individuals from the public and private sectors who participated in developing the strategy (1987-88) reveal that:

1. Most education programs related to water quality or Puget Sound have suffered because they were not tied to any sustained funding base.

2. Most programs are developed on an institution-by-institution basis; these programs are not coordinated with other potentially similar efforts in the region.

3. There has been no consistent access to information bases on Puget Sound for formal education programs in schools and colleges, for nonformal educational programs, (i.e., interpretive centers, business and industry bulletins) or for citizen committees and resource managers involved in public policy decisions.

4. Agencies generally do not have the resources to provide coordinated technical assistance or training to public and private sector groups which have the potential to undertake significant education and public involvement programs.

5. Educational programs in state agencies are sporadic, and very few positions are allocated for educational activities.

6. Messages about resource management are generally presented on a piecemeal program-by-program basis rather than delivered with a complete and concrete message about a resource and the actions needed to protect it.

7. Educational messages have been addressed to general rather than specific audiences.

8. Many environmental curricula related to Puget Sound have been developed for K-12, but there have been limited funds to train teachers to use them.

Public involvement in actions to clean up and protect Puget Sound is important because the public can bring information, expertise, values, funding, and priorities to the decision-making process. Experience has also shown that resource management programs which have not adequately educated or involved the public are often met with resistance or animosity, and some ultimately fail as a result. Successful agency and local government programs need to include participation both by highly organized citizen groups which might be designated as representative of certain sectors or perspectives and by individuals who, unaligned with any group, are representing themselves or the general public.

The 1986 PSWQA issue paper on Public Involvement in Water Quality Policy-making noted that the level of public involvement in water quality programs and activities varies widely with the issue and the agency. Generally, staff time and training are not specifically dedicated to public involvement. Certain requirements for effective public involvement are generally not being met. These include: (1) timely, understandable, and complete notice of pending actions; (2) access early in any decision-making process; (3) ease of access to the process; and (4) response to citizens on how comments or recommendations are used.

While education and public involvement activities are sometimes very distinct activities aimed at different audiences for different purposes, the two frequently are inseparable and work toward the same end. For example, community programs such as adopt-a-stream and adopt-a-beach can be equally effective as public involvement and education techniques. Furthermore, public policy decisions require participation by citizens who have been educated about the issues. For example, agencies and governments have a responsibility to educate individuals who serve on advisory committees.

Within this context, education and public involvement should be considered together in order to integrate and reinforce their complementary aspects.

PROGRAM STATUS

In its first two years, the Authority focused more formally on public involvement than on education. Based on the Authority's 1986 issue paper on Public Involvement in Water Quality Policy-making, a public involvement policy was defined and included in the 1987 plan. Public involvement is defined as an ongoing dialogue between interested and affected parties and decision-makers in all steps in the decision-making process. The public involvement policy (EPI-3) must be followed by all state and local agencies in activities related to implementing the plan and will be considered in evaluating local and state agencies' compliance with the plan.

Since the adoption of the Puget Sound Water Quality Management Plan in 1987, one of the major activities of the Authority has been the funding of a series of demonstration projects through the Public Involvement and Education Model Projects Fund (the PIE-Fund, EPI-2). State agencies and local governments have, to varying degrees, been following the public involvement policies for plan implementation, with the Authority providing limited technical assistance for public involvement and education (EPI-3, EPI-5). The Authority is preparing a list of materials about the economic and ecological value of Puget Sound which are available from federal and state agencies and local governments; a water quality directory for Puget Sound issues is also being prepared (EPI-6). Ecology has designated a public involvement coordinator and is preparing a brochure explaining its mailing lists (EPI-7). The Authority has also funded support for teacher training in existing curricula on

Puget Sound (EPI-8). The Authority has minimal staff support for its library, and as a result there is very limited public access to these materials (EPI-9).

The major new development in the Education and Public Involvement Program is the long-range strategy. The 1987 Puget Sound Water Quality Management plan called upon the Authority to "coordinate the development of a long-range education and public involvement strategy in support of cleaning up and protecting Puget Sound." According to the plan, the development of the strategy was to include:

a. An inventory of existing information and education programs related to Puget Sound.

b. Examination of the effectiveness of existing education and public involvement strategies on Puget Sound.

c. Analysis of the potential role of the media.

d. Assessment of the potential roles of private sector and grass roots community resources and programs.

e. Coordination and integration of the education and public involvement efforts in other programs called for in the plan.

Since public involvement was significantly addressed through the public involvement policy, the strategy focuses more on education. The strategy includes expanded training in public involvement for state agencies, local governments, citizens' groups, and individuals. Other elements of the strategy will also provide resources to support implementation of the public involvement policy, for example, the field agents, resource teams, and access to public information.

To advise the Authority in developing the strategy, the Education and Public Involvement Advisory Group (EPIG) was established. This 12-member group was composed of educators, media experts, and representatives of environmental and public interest groups, industry, business, agriculture, tribes, state and federal agencies, and local governments. In turn, to assist the advisory group in examining the many diverse components which any comprehensive strategy must address, work teams were set up to assess the existing and potential roles of various institutions and types of activities. Each work team produced a report based on the consensus of its members who represented a wide range of skills and perspectives. The reports included:

Formal Education—K-12 and Post-Secondary;

Media;

User Groups (or private sector groups);

Action Programs (e.g., adopt-a-stream, oil recycling, etc.);

State Agencies and Interpretive Centers;

Nonformal Education (the many agency, local government, and private sector activities happening outside the formal education system); and

Public Involvement

The education strategy proposes:

1. Local field agents or facilitators for education and public involvement.
2. Continued support of education and public involvement programs through the continuation of a modified PIE-Fund.
3. Coordination of state programs to design comprehensive messages for particular audiences on how to keep waste out of water (these programs can then be used by local governments and the private sector).
4. An ongoing Puget Sound information base or clearinghouse.
5. Funding to improve school and interpretive center programs.
6. Integration of technical expertise, training, and educational programs of resource agencies which have responsibilities related to issues in the Puget Sound Water Quality Management Plan.
7. Training to improve public involvement programs and processes.
8. A steering committee to further examine the means to raise funds to support education and public involvement programs.

The full strategy developed by the Authority as a result of the advisory process appears in the plan. However, due to concern over the limited availability of state general funds, only partial funding is sought for the next biennium. Specifically, the field agents, resource teams, the PIE-Fund, the K-12 programs, the steering committee, and the coordinated messages for target audiences are proposed at partial funding levels for the 1990-91 biennium. The information base and most support to interpretive programs are being delayed for two years.

PROGRAM GOAL

To support, improve, and sustain education and public involvement programs in the region over the long term in order to: (1) inform, educate, and involve individuals, groups, businesses, industry, and government in the cleanup and protection of Puget Sound; (2) increase understanding of the Sound's ecosystem; and (3) create the kind of commitment that will be necessary to sustain efforts to improve and protect water quality over the long term.

STRATEGY

The strategies for achieving this goal include: (1) a public involvement policy to be followed by agencies and local governments; (2) increased resources to state agencies for coordinated interagency education programs; (3) field agents to coordinate among local and regional education and public involvement programs; and (4) a Public Involvement and Education Fund (PIE-Fund) to support public involvement and education efforts of both the private and public sectors.

PROGRAM ELEMENTS

EPI-1. Long-Range Strategy (ES-1 through ES-10)

ES-1. Guidelines

The following guidelines shall be used in developing programs as part of the long-range strategy for education and public involvement:

* Support activities which develop an ethic which promotes protecting Puget Sound as a treasure.
* Move beyond the "us versus them" attitude and emphasize water quality as being in everyone's self-interest.
* Develop mechanisms for cooperation among the public sector, private sector, and educational institutions.
* Focus on local issues and resources and how they relate to the larger picture, promoting a sense of place.
* Emphasize interesting, innovative activities which involve people, put them in charge of decisions, and lead to local action.
* Provide people with solutions, with things they can do.
* Include concrete goals toward which everyone can work and which will visibly demonstrate progress and success.
* Include connection with an ongoing information base which provides accurate information on Puget Sound issues.
* Build on existing programs.
* Improve coordination of and cooperation among the education and public involvement resources and activities of state and local governments.
* Design and organize activities, training, and information which are tailored to the target audience.
* Include youth.
* Concentrate resources at the local level but include a Soundwide entity or process which will provide common direction, standards, and coordination for local actions.
* Include an ongoing public awareness "theme" campaign which will support and connect education and public involvement activities.
* Conduct educational activities in a variety of settings, both regulatory and non-regulatory.

* Have clear goals and objectives and a built-in means of evaluating and modifying the strategy.

ES-2. Local Audiences

2.1. Local Field Agents

The Washington Sea Grant Program, the Washington State Cooperative Extension Service, and the Authority shall together provide field agents to help coordinate and implement education and public involvement efforts related to water quality and the Puget Sound plan, with an emphasis on working with local governments. The locations and responsibilities of the agents shall be publicized through agency and local government publications and hotlines.

Specific responsibilities of the field agents shall include:

a. *Assistance to Local Governments.* Providing or arranging technical and staff support to help local governments develop and implement education and public involvement activities or programs which are directly related to implementation of the Puget Sound plan. In the counties where field agents are working, each county will work with the field agents to develop a list of the education and public involvement priorities for that county, based on consultation with other local governments and interested groups in the county. Field agents will use these priorities as a basis for design of their work plan.

b. *Public Involvement.* Facilitating public involvement in local, state, and national water quality issues: aiding and encouraging agencies to follow the public involvement policy of the Puget Sound plan (EPI-3); using local means to notify groups of impending decision-making processes and opportunities; providing or arranging for public involvement training at the local level.

c. *Funding.* Facilitating funding of local education and public involvement programs by identifying sources of funds, including informing groups about the PIE-Fund (ES-8).

d. *Technical Assistance.* Providing or arranging for technical assistance and training for local education and public involvement programs, including the use of the resource teams (ES-5).

e. *Coordination.* Coordinating local programs with regionwide or statewide programs and with programs in the Puget Sound plan; participating in the technical coordinating committee (ES-7.2).

f. *Watershed Committees.* Publicizing the work of local watershed committees to local residents and providing information to those committees upon request (NP-2).

g. *Evaluation.* Assisting in evaluation of the success, effectiveness, and direction of education and public involvement programs related to the Puget Sound plan and the education strategy (ES-7.2): working with a local advisory process; aiding local programs to develop evaluation techniques; working with the Authority and the steering committee to develop overall evaluation techniques for the long-range strategy (ES-9).

For the 1990-91 biennium Sea Grant and Cooperative Extension will designate six field agents to begin a model program in which agents carry out the above responsibilities. An additional six field agents shall be added over the next two biennia.

A management group consisting of representatives from Sea Grant, Cooperative Extension, and the Authority shall oversee the program.

The management group will involve local governments in the process of hiring and evaluating the field agents and in determining where the agents will be located. The management group will decide the location of the field agents based upon the following criteria: (a) interest shown in participating in the program as indicated in writing by local governments, groups such as the Hood Canal Coordinating Council, or other interest groups; (b) the need to test the field agent model in different geographic areas and in both urban and rural settings; and (c) the need to test the field agent model as both a regional and a local approach to developing programs.

Target Date: The management group shall request letters of interest from local governments and private sector groups which would like a field agent in a particular region by August 1, 1989. Sea Grant and Cooperative Extension shall hire field agents by September 1, 1989. Counties in regions designated for field agents shall provide a list of education priorities to the management group by November 1989.

[**Status:** This is a new element. Funding is requested for the 1990-91 biennium to support six field agents. The long-term goal is to have 12 to 14 agents in the region.]

2.2. Target Audiences

With Ecology as lead, Ecology, DSHS, and the Departments of Agriculture, Fisheries, and Wildlife shall organize their educational resources to provide different audiences in business and industry with comprehensive messages on the actions necessary to prevent pollution generated by the particular activities of each audience. This program would integrate information for each audience on issues such as municipal sewage treatment systems, pretreatment programs, discharge permits, stormwater systems, septic systems, solid waste landfills, hazardous waste disposal, and waste reduction. Ecology shall designate the order in which target audiences are addressed by this program.

With Cooperative Extension as lead, Cooperative Extension, conservation districts, the Departments of Agriculture, Ecology, Social and Health Services, Fisheries, and Wildlife shall organize their educational resources to provide target agricultural audiences and pesticide applicators with a comprehensive message on the actions necessary to prevent their wastes from entering water.

With State Parks as lead, Parks, DSHS, Ecology, and Fisheries shall continue to work with the Boaters Task Force (see MB-3).

With Sea Grant as lead, Sea Grant, Ecology, and Fisheries, requesting assistance from the Coast Guard, shall organize a similar program for commercial fishing and marine transport industry audiences.

Counties, cities, and special purpose districts, with support materials from the state or local field agents (ES 2.1), shall provide education programs for local homeowners or residents. They shall utilize existing programs such as the early

action watershed programs, countywide nonpoint education programs, and the local hazardous waste management planning process.

The lead agency in each case described above shall invite representatives of other appropriate agencies, including the Business Assistance Office of the Department of Trade and Economic Development, local field agents, and members of the target audience to develop the information and materials, and to define the best mechanisms to deliver the message (e.g., trade fairs, bulletins, trade association seminars or conferences, in-house training, community college classes, videos, agency programs, etc.) The lead agency, in consultation with members of the target audience, shall determine who should deliver the program (the state, the private sector, local field agents, local governments, or educators). As a rule, the state should develop the program, and other appropriate groups should deliver them.

Target Dates: Ecology shall hire its education coordinator by July 1, 1989. By June 30, 1990, Ecology shall develop and begin implementation of programs for six audiences, Cooperative Extension and Agriculture shall develop and begin implementation of programs for agricultural audiences, and field agents shall begin coordinating the programs for local audiences.

[**Status:** This program is partially funded. Cooperative Extension and Agriculture will develop programs for agricultural audiences. Sea Grant will not begin its program. Ecology will target six audiences in conjunction with its waste reduction program. The department will address more than six audiences if possible. The Business Assistance Office of Trade and Economic Development will not be funded to support this program in the 1990-91 biennium.]

ES-3. Schools

3.1. Teacher Training

The Office of Environmental Education of the Office of the Superintendent of Public Instruction shall coordinate and fund a Soundwide program to train elementary, middle school, junior high, and high school teachers in environmental education. School districts shall be provided with funds for teacher-release time to attend workshops to learn to use existing curricula related to Puget Sound and water quality. Matching funds shall be made available to existing programs for workshop facilitation and materials.

Target Dates: SPI will begin to advertise and organize workshops and training programs by July 1, 1989. Approximately 400 teachers will be trained by June 30, 1990.

[**Status:** Funding is requested to train approximately 600 teachers, instead of the 1,200 proposed in the full strategy. This is an increase in the funds currently available to train teachers in environmental education.]

3.2. School and Citizens' Monitoring Programs

The Office of Environmental Education shall provide water quality kits to schools to undertake pilot freshwater monitoring projects related to agency and citizen programs. When these programs have been operating for a year, the Office of Environmental Education shall consult with the Authority, Ecology, the Monitoring Management Committee, community college faculty, elementary and high school teachers, and citizens to provide recommendations

to the Authority on: (1) the feasibility of expanded citizens' and school monitoring programs; (2) the parameters for which citizens and students can best provide information for PSAMP and freshwater programs; (3) appropriate laboratory support and training for such a program; (4) data access and feedback mechanisms for effective citizen and school participation in monitoring programs; and (5) the practicality of integrating monitoring into existing school curricula. (See element M-3 for more information on citizens' monitoring.)

Target Date: Provide kits to schools by January 1, 1990. Make recommendation to the Authority by April 1991.

3.3. The Office of Environmental Education

The Office of Environmental Education of the Office of the Superintendent of Public Instruction shall hire certificated professional staff to support and improve K-12 environmental education in the Puget Sound region. Specifically, the office shall: (1) coordinate and implement the teacher training and monitoring assessment programs described above; (2) staff the interagency Environmental Education Task Force (ES-7); (3) facilitate access to Puget Sound information resources for schools and teachers (ES-6); (4) work with local field agents to facilitate school and student participation in other programs related to the Puget Sound plan—watershed planning, adopt-a-beach programs, household hazardous waste collection days, interpretive center displays, etc. (ES-2, ES-8.1); and (5) publish annual educational schedules and activities of regionwide interpretive centers (ES-4.1).

Target Date: SPI shall hire staff by September 30, 1989.

[**Status:** Partial funding is proposed for this new element. SPI is allocated staff to carry out tasks one and two above. The other tasks will be carried out at status quo until the Office of Environmental Education receives increased funding.]

ES-4. Interpretive Activities

4.1. Existing Centers

The Authority shall provide funding to existing interpretive centers[8] around the Sound to support staff development and training, workshops, displays, and interpretive activities on Puget Sound. The Authority shall publish criteria under which interpretive centers may apply for capital funds to develop facilities or displays. The Authority and the Office of Environmental Education will publicize the schedules and activities of interpretive centers on a regionwide basis. The Authority shall provide funding for one half-time staff for each of two interpretive centers a year. The Environmental Education Task Force will determine which centers should receive staff.

8 Snake Lake Nature Center (City of Tacoma); Bellingham Maritime Heritage Center (nonprofit); Padilla Bay (Department of Ecology); Nisqually Delta (U.S. Fish and Wildlife Service); Poulsbo Marine Science Center (nonprofit); Fort Worden Marine Science Center (nonprofit); Feiro Marine Lab (Port Angeles); Seattle Aquarium (City of Seattle); Point Defiance Aquarium (City of Tacoma); Whale Museum, Friday Harbor (nonprofit); Jetty Island (City of Everett); Blaine Marine Resource Center (being developed; Blaine).

Target Dates: The Authority shall publish criteria by November 30, 1989. Interpretive center staff will conduct one staff training session for the centers by June 30, 1990.

[**Status:** Most of this new element is being delayed until the 1992-93 biennium. A small amount of capital funds will be available to fund facilities and displays. A small staff cross-training fund will be available.]

4.2. New Centers

In 1991 the Authority shall convene a committee of existing representatives of interpretive centers, public and private nonprofit organizations, state agencies, local governments, tribes, and business and industry to provide recommendations for the development of new interpretive centers which would fill both geographical and topical gaps in interpretative activities related to the Sound. The committee shall specifically examine the need for centers which interpret (a) river systems in the Sound, and (b) the Sound as a whole.

Target Date: Delayed.

[**Status:** This new element is being delayed until the 1992-93 biennium.]

4.3. Washington State Ferries

The Department of Transportation shall initiate a program on the Washington State Ferry system which will train volunteers to make presentations on topics directly related to Puget Sound such as the history of the ferry system, the history of ports, marine resources of the Sound, protection of Puget Sound, etc.

The display system implemented by the Washington State Ferries for the Centennial Celebration shall be continued and expanded after the conclusion of the Centennial.

Target Date: The Department of Transportation shall hire staff by July 30, 1989. The volunteer program will begin for the ferry "off-season" by October 15, 1989.

[**Status:** This is a new program.]

4.4. Interpretive Programs

Policy: For each topic or issue which would benefit from interpretive programs or projects (as opposed to major centers), the interagency Environmental Education Task Force (ES-7) shall designate a lead agency to develop a pilot interpretive project. The lead agency shall convene a committee including private and public sector representatives to develop a cooperative interpretive project which identifies the issues, perspectives, controversies, expertise, and educational approaches related to a comprehensive interpretive program for that topic or issue. Lead agencies are already designated for those topics listed below:

Watersheds and Fish Habitat: The Department of Fisheries shall convene a committee including representatives of Wildlife, tribes, sports fishermen, commercial fishermen, nonprofit organizations, DNR, local governments, and the private sector to develop a model watershed interpretive program at one or more hatcheries located at sites easily accessible to visitors. This planning process and model shall provide the basis for coordinated interpretive programs on watersheds, fish habitat, and nonpoint pollution at many Fisheries, Wildlife, and tribal hatcheries, following the policy above.

Fisheries shall create a major display at one hatchery a year for the next five years, to be staffed by Conservation Corps members or by interns who would ideally be provided by business, industry, or sports groups. Fisheries shall fund smaller displays, workshop activities, and tours at three hatcheries a year for the next five years, staffed by Conservation Corps members, interns, or volunteers, as necessary. Wildlife shall create a major display at one hatchery every two years. Fisheries, working with the Northwest Indian Fisheries Commission, shall grant funds to one tribe a year for development of an interpretive display at its hatchery. Pilot activities will focus on those hatcheries which can draw the largest recreational audiences and also on those which would best support countywide education and local watershed action programs under the Puget Sound plan.

Target Dates: Fisheries will convene a meeting to discuss the program by September 30, 1989. Two hatcheries will be provided a minimum amount in capital funds to enhance or create interpretive displays by November 30, 1989.

[**Status**: This program is being delayed until the 1992-93 biennium. However, a small amount of capital funds will fund projects at two hatcheries.]

Shellfish: The Department of Fisheries shall convene a work group that includes agencies, boaters, shellfish growers, and tribes to develop an interpretive program at an appropriate location in Puget Sound (see Shellfish element SF-7).

Target Date: The program shall begin by May 1, 1990.

Wetlands: The Department of Ecology shall develop and implement a long-range wetlands education strategy that augments Ecology's existing wetlands education program (see Wetlands element W-7). Ecology shall work with groups and agencies specified in W-7 to implement the components of the strategy.

Target Date: Ecology shall submit the strategy to the Authority by May 1, 1990. Agencies shall complete the interpretive program by September 1, 1990.

[**Status**: This is a new program.]

Contaminated Sediments: Ecology, in cooperation with DNR, shall develop educational materials dealing with sediment contamination issues. This effort shall be integrated with the public information/public involvement activities under elements S-4 and S-7. The resulting materials shall be maintained and made available, independent of those elements, to educators, the media, and the public. The materials shall address how particles collect in estuaries, how contaminants bind to particles and the relative concentrations in water and sediment of various types of contaminants, how sediment-bound contaminants come into contact with organisms, sources of contamination, known distribution of sediment contamination in Puget Sound, sediment criteria, the dredged material management system including confined disposal, and contaminated sediment investigations including remedial actions. In addition, the ecology of bottom-dwelling organisms, their importance to the overall ecosystem, and their dependence on sediment quality shall be explained. Individual actions that may contribute to sediment contamination shall be identified.

Target Date: An initial package of materials shall be developed and made available by January 1, 1990.

[**Status:** This is a new program that will begin in July 1989.]

ES-5. Agency Training and Resource Teams

5.1. Public Involvement Workshops

The Department of Personnel shall sponsor or conduct workshops on public involvement skills for state agency staff responsible for carrying out the programs of the Puget Sound plan. These workshops shall be held in Olympia and in the agencies' regional offices and shall be open to local governments and citizens interested in the Puget Sound plan.

Target Date: The Department of Personnel shall conduct three workshops by December 30, 1989.

[**Status:** This is a new program.]

5.2. Short Course on Local Planning

The Department of Community Development shall develop and conduct an expanded Short Course on Local Planning which includes a component on Puget Sound water quality protection and shall widely advertise the availability of the course.

Target Date: The Department of Community Development shall develop the class and be ready to advertise and respond to requests by December 30, 1989.

[**Status:** This is a new program.]

5.3. Resource Teams

Policy: The interagency Environmental Education Task Force shall designate lead agencies for interagency resource teams on resource issues related to Puget Sound such as wetlands, nonpoint pollution, shellfish, fisheries, or wildlife habitat, as needed. The teams shall be available to:

* Identify all regulatory, scientific, policy, and technical issues related to the management and protection of a particular water quality topic or Puget Sound resource;
* Identify the controversies concerning management of that resource;
* Identify what is and is not known about both problems and solutions related to managing or protecting the resource.

The teams should identify local government, tribal, and private sector expertise and perspectives.

These teams should be available at the request of the local field agents to provide an introduction, outline, or course on resource issues in order to provide complete and current information for use in programs which a public or private sector group might undertake (e.g., a conference, an adopt-a-beach or protect-a-wetland project, or a citizens' committee on local wetland issues). The teams will also provide support for education and public involvement elements of plan programs. Resource teams shall be formed to support work in coordination with the nonpoint technical assistance team (NP-6).

Salmonid Enhancement and Habitat: The Departments of Fisheries and Wildlife shall each hire an additional field biologist. With Fisheries as the lead, these staff shall establish an interagency resource team, including tribes and inviting volunteer sports fishermen or other citizens, to respond to requests for training by community and school groups wishing to undertake salmon enhancement, stream restoration and related nonpoint pollution issues. The biologists shall be available to provide information on local fish runs, salmonid habitat, and local watersheds to local government, community, school, and private sector education and public involvement programs. The biologists will also be part of the monitoring and stormwater resource teams (below) and will contribute to the wetlands resource team as necessary (W-7).

Target Dates: Fisheries and Wildlife staff will be hired by September 30, 1989. The resource team will be convened, trained, and ready to respond to requests by January 1, 1990.

[**Status**: Only partial funding is being requested for this element for the FY 90-91 biennium. Fisheries and Wildlife are scheduled to hire only 0.5 FTE biologist each for this element.]

Monitoring: Ecology shall establish an interagency technical assistance team to respond to requests for technical assistance and training by community, school, and local government water quality monitoring programs, unless the committee designing the freshwater monitoring program decides another training system is preferable (see ES-3).

Target Date: The resource team will be convened and trained by November 1, 1989.

Stormwater: Ecology shall establish an interagency resource team to respond to requests for technical assistance and training on stormwater by local government or private sector groups.

Target Date: The resource team will be convened and trained by December 1, 1989.

Nonpoint: Target Dates: Nonpoint resource team is delayed. Funding is provided for the nonpoint technical assistance team to provide resources only for the watershed ranking and planning programs (NP-2).

[**Status:** While the nonpoint resource team will be delayed, many of the resources it would provide will be covered by other teams.]

Wetlands: See element W-7.

Shellfish: Fisheries shall establish an interagency resource team to respond to requests for technical assistance and training on shellfish and adopt-a-beach issues from local government or private sector groups.

Target Date: The resource team will be convened and trained by December 1, 1989.

[**Status**: This is a new element.]

ES-6. Information Base

In order to ensure an ongoing reliable information base the following activities shall be supported.

Puget Sound Access: The University of Washington shall continue and update the Puget Sound Access, a computerized bibliography of documents on Puget Sound. The University of Washington shall hire a person to expand the database to include a bibliography of non-technical resources: brochures, videos, slide shows, interpretive centers, and community projects which address Puget Sound and regional water quality issues.

State of the Sound Report: The State of the Sound Report should continue to be published biennially after the scheduled sunset of the Authority.

The Puget Sound Ambient Monitoring Program and the Puget Sound Research Program: The Authority shall make available summary reports of the Puget Sound Ambient Monitoring Program and Puget Sound Research Program for use by the public. This function should continue after the scheduled sunset of the Authority.

Geographic Information Systems: Major geographic information systems on the Sound, its watersheds, and freshwater and saltwater monitoring, shall be made accessible to the public.

Case Studies: The Authority shall make available one scholarship each quarter for a graduate student to prepare a comprehensive case study on a major issue related to Puget Sound. Copies of the case study shall be printed by the Authority for use by college and high school faculty and shall be made available to the public.

Visual Representation of Puget Sound: The Authority shall provide for the development of visual and graphic educational materials for use in education and public involvement programs related to Puget Sound. As part of this program, Shoreline Community College shall complete its series of topographic representation of major features of Puget Sound and shall print the drawings for use by the public.

Technical Library: The Authority shall convene a committee of business, industry, and agency representatives, including Ecology and the Business Assistance Office of the Department of Trade and Economic Development, to create a joint private sector/public sector technical library easily accessible to and usable by business and industry which shall provide information on laws, regulations, standards, and compliance technologies.

Speakers' Bureau: The Authority shall convene a committee of private and public sector representatives to establish a speakers' bureau. Speakers will be screened both for comprehensive and accurate knowledge of a topic and for effective presentation. The Authority shall make funds available for travel and a small honorarium for speakers and shall publicize the bureau.

Target Date: The policy on geographic information systems goes into effect with adoption of the plan. With the exception of the State of the Sound Report and the monitoring report, no funding for these activities is being requested for the FY 1990-91 biennium.

ES-7. Coordination

7.1. Environmental Education Task Force

SPI shall provide part-time staff to the interagency Environmental Education Task Force to better enable it to:

* Provide a forum for communication and coordination among general education and information programs of agencies.

* Provide the link between the general education and public involvement programs of agencies and the overall management and direction of the long-range strategy by working with the local field agents and by participating on the technical advisory committee described in ES-7 below.

* Provide a forum in which to decide which agency should be the lead on cooperative interpretive efforts (see ES-4.4 above), interagency training teams (see ES-5.3 above), or other cooperative educational programs; and, where appropriate, act as the planning committee for cooperative or coordinated projects.

* Publish the educational planning schedules of agencies.

* Annually publish a list of the individuals (and phone numbers) in each resource agency who have formal responsibilities for education and public involvement.

* Continue to coordinate agency support to K-12 teacher training and program implementation by working with SPI (ES-3.1) and the local field agents.

The Environmental Education Task Force should include representatives of the Conservation Commission or Conservation Districts, Washington Sea Grant, Washington State Cooperative Extension, local governments, and tribes.

Target Date: SPI shall hire staff by September 30, 1989.

[**Status:** The Environmental Education Task Force is an ongoing interagency group. This is a new program.]

7.2. Puget Sound Plan Education Strategy

The Authority shall establish a technical advisory committee to meet a minimum of three times a year to advise the Authority on coordination needed for education and public involvement programs related to the Puget Sound plan. The agenda for these meetings will provide an opportunity for education and public involvement program staff to discuss: (1) discrete program needs which might be met with resources or ideas from other programs, (2) timing and coordination issues, and (3) techniques for evaluating programs.

The committee shall include agency staff from programs such as the local field agents (2.1) and appropriate staff from the Authority and Ecology. Ecology representatives shall include: the public involvement coordinator (EPI-7), the education coordinator (ES-7.3), hazardous waste information office staff (HHW-2), a member of the nonpoint technical assistance team (NP-6), wetland education staff (W-7), point source outreach staff (P-26), and stormwater education staff (SW-2). The committee shall also include SPI staff to the En-

vironmental Education Task Force (ES-3); staff for the Boaters Task Force (MB-3); and staff from appropriate educational programs of Fisheries (ES-5), DSHS, Wildlife (ES-5), and DNR. In addition, representatives of staff from local watershed programs which include education (NP-3 and NP-4), conservation districts, and education staff for tribes shall serve on the committee. The committee shall encourage the participation of education and public involvement staff from private sector programs.

Target Date: The Authority shall convene the first meeting of the Technical Advisory Committee by November 1989.)

[**Status:** This is a new program.]

7.3. Ecology Education Coordinator

The Department of Ecology shall hire a public education coordinator who will coordinate Ecology's education programs related to Puget Sound. The coordinator will ensure that agency education programs related to Puget Sound are consistent with the direction of Ecology's education programs statewide. Specific responsibilities of the coordinator include coordinating Ecology's education resources with those of other agencies to develop the target audience program (ES-2.2) and overseeing Ecology's participation in the Environmental Education Task Force (ES-7.1) and the technical advisory committee (ES-7.2).

Target Date: Ecology shall hire the coordinator by July 31, 1989.

[**Status:** This is a new program.]

7.4. Fisheries Education Coordinator

The Department of Fisheries shall hire a part-time public education coordinator who will coordinate the Department's education programs related to Puget Sound. The coordinator will ensure that agency education programs related to Puget Sound are consistent with the direction of the department's education programs statewide. Specific responsibilities of the coordinator include coordinating Fisheries' education resources with those of other agencies to develop the resource team program (ES-5.3); overseeing the shellfish interpretation program (SF-7); enhancing Fisheries' support to volunteer stream enhancement efforts in the Puget Sound region; and overseeing Fisheries' participation in the technical advisory committee (ES-7.2).

Target Date: The Department of Fisheries shall hire a coordinator by September 1, 1989.

[**Status:** This is a new program.]

7.5. Wildlife Education Coordinator

The Department of Wildlife shall hire a part-time public education coordinator who will coordinate the department's education programs related to Puget Sound. The coordinator will ensure that agency education programs related to Puget sound are consistent with the direction of Wildlife's education programs statewide. Specific responsibilities of the coordinator include coordinating Wildlife's education resources with those of other agencies to develop the resource team program (ES-5.3), and overseeing Wildlife's participation in the technical advisory committee (ES-7.2).

Target Date: The Department of Wildlife shall hire a coordinator by September 1, 1989.

[**Status:** This is a new program.]

ES-8. PIE-Fund

The Authority shall support the funding of local programs through a Public Involvement and Education Fund (PIE-Fund). The Authority shall publish requests for proposals for local programs which:

a. Raise awareness of water quality issues by engaging people in actions to protect Puget Sound. These action projects could include such activities or projects as adopt-a-beach, adopt-a-stream, protect-a-wetland, household hazardous waste collection days, water quality monitoring, and biological surveys. To be effective, these programs often require funds for signs, equipment, and brochures and may require technical expertise and training.

b. Raise awareness of water quality issues through general and diverse education activities. These communications programs could include such activities as workshops, conferences, plays, poster projects, tours, festivals, and brochures. To be effective, these programs often require funds for printed and audiovisual materials or staff and may require technical expertise and training.

Groups will apply for these funds through a request-for-proposals process which would include the criteria in ES-1.

A portion of the PIE-Fund would be directed toward programs that specifically support the educational needs of local governments which are directly related to the Puget Sound plan, particularly those governments that are not receiving direct support from the field agent program [ES-2.1].

Target Date: The first round of contracts shall be awarded by December 31, 1989.

[**Status:** This element will continue and modify the PIE-Fund program which was included in the 1987 plan. Under that program the Authority issued guidelines by September 1, 1987, and began to award contracts by December 31, 1987. Eligible groups included citizen and environmental organizations, tribes, local governments, and educational institutions. Forty-seven contracts were awarded for public involvement and education model projects--$584,000 for the first round of contracts (December 1987) and $400,000 for the second round (June 1988).]

ES-9. Steering Committee

The Authority shall appoint a steering committee which will: (1) develop options for securing long-term funding for educating and involving the public in the cleanup and protection of Puget Sound; (2) refine guidelines and criteria and review proposals for the Public Involvement and Education Fund (ES-8); (3) evaluate the effectiveness of the Education and Public Involvement Program; and (4) assess the need for establishing a foundation to carry out these functions. The committee shall include educators and representatives of nonprofit organizations involved in the protection of Puget Sound, local governments, and business and industry.

Target Date: The Authority shall appoint the committee by July 30, 1989.

[**Status:** The Authority established the Education and Public Involvement Advisory Group (EPIG) to oversee the development of the long-range education

strategy and the PIE-Fund. This steering committee would be similar to EPIG, but the emphasis would be on developing long-range options for funding and overseeing the PIE-Fund.]

ES-10. Campaigns for Puget Sound

The Authority shall initiate public awareness campaigns or activities which:

* Focus on tangible results toward which individuals in both the private and public sectors can easily direct initiative and resources; and
* Provide an opportunity to show measurable results which present clear and visible feedback on success in meeting a water quality goal or objective for Puget Sound.

Campaigns could address tangible results in meeting such goals as:

* Reopen commercial and recreational shellfish beds.
* Reduce plastic debris in Puget Sound.
* Protect wetlands around the Sound.
* Reduce the amount of oil in Puget Sound.
* Reduce septage in Puget Sound.
* Reduce contaminants in stormwater.

Target Dates: The Authority shall initiate the first campaign by March 1990.

[**Status:** This is a new program.]

ES-11. Year of the Sound

The Authority shall request that the governor declare 1991 the Year of the Sound and appoint a Year of the Sound Committee which includes representatives of both the public and private sectors. The committee shall seek funding and support for schools, colleges, agencies, and industry to work together to promote and create events which highlight the Sound and what people are doing to protect it, and which provide in-depth educational opportunities on the Sound and its management issues.

Target Date: The Authority shall make its request to the governor by July 1989.

[**Status:** This is a new program.]

ES-12. Sound Waters Award Program

The Authority shall develop an annual "Sound Waters Award" program which recognizes small or large businesses, trade associations, local governments or local government officials, service clubs, youth groups, individuals, and others for positive action taken to protect water quality.

Target Date: Delayed.

[**Status:** No funding for this element will be requested for the FY 1990-91 biennium.]

Elements ES-1 to ES-12 above compose the new long-range education strategy. The following elements are ongoing programs of the 1987 Puget Sound plan.

EPI-2. Funding for Model Education and Public Involvement Projects

PSWQA shall provide funding for a short-term program (1987-89) until the long-range strategy is developed. The program will focus on projects that could serve as models for public involvement and education, community cleanup, or citizen monitoring of water quality or biological resources. Groups eligible for funding will include citizen and environmental organizations, tribes, local governments, and educational institutions. Projects eligible will include existing and new programs as well as proposed activities related to any topic addressed in the plan and any area of Puget Sound. PSWQA shall issue guidelines, call for proposals, and select participants.

[**Status:** Completed. Transferred to ES-8.]

EPI-3. Public Involvement Policy

The following public involvement policies shall be followed by all state and local government agencies in implementing the Puget Sound plan:

a. A broad representation of the public, both those being directly affected and members of the general public, shall be consulted in developing and adopting rules, establishing criteria, setting guidelines, selecting sites or target areas, developing action plans, and carrying out other activities related to the Puget Sound plan.

b. A variety of public involvement techniques shall be used. Where advisory or review committees are deemed helpful to provide public involvement in the implementation of the plan, existing standing committees or commissions and established processes such as SEPA, the Shoreline Management Act, and local comprehensive plan procedures should be evaluated and improved where possible rather than creating new committees. However, new or additional committees or processes should be created if needed to achieve full public involvement. Agencies shall consider reimbursing travel expenses of members of advisory bodies.

c. Agencies shall allocate adequate staff resources to their public involvement programs. Agency staff responsible for public involvement shall receive training in public involvement techniques and skills.

d. State and local government agencies shall use public information techniques that exceed requirements for legal notice or publication in the State Register to ensure that: (1) public information on decisions to be made or actions to be taken for the Puget Sound plan is complete and understandable; (2) the effects--especially effects on special groups or geographic areas--of the proposed decision or action are fully described; (3) the ways in which the public might be affected by the decision or action are fully presented; and (4) the ways in which the public may influence the decision-maker and appeal the decision are explained.

e. To facilitate access to decision-making processes, state and local government agencies shall send notification for public hearings or meetings as early as possible, shall seek to provide both day and evening meetings and hearings, and shall explain how public comment was incorporated into decisions and actions. For decisions affecting a large geographic area, meetings and hearings shall be held at locations throughout the area.

Target Dates: Policy in effect upon plan adoption, but agencies and local governments may phase implementation.

[**Status:** As programs from the 1987 plan are being implemented, the public involvement policy is being followed, to varying degrees, by state agencies and local governments.]

EPI-4. PSWQA Activities

PSWQA shall continue to use its planning and oversight process as a means to provide education and public involvement on water quality issues through seminars, field trips, conferences, public meetings, publications, media, and distribution of PSWQA information to local libraries. The Authority shall use its newsletter, slide shows, and media contacts to publicize opportunities for the public to become involved in policy-making, monitoring, cleanup, or educational activities related to the Sound. PSWQA shall also use its newsletter and slide shows to give recognition to new and existing efforts and programs which are supportive of the goals of the plan.

PSWQA shall coordinate the integration of education and public involvement elements of all programs in the plan in order to avoid duplication of resources.

PSWQA shall work with the Superintendent of Public Instruction and with the Environmental Education Task Force created by the 1986 legislature to coordinate educational programs on water quality.

[**Status:** Through its newsletter, *Soundwaves*, PSWQA has publicized opportunities for the public to become involved in policy-making and has given recognition to new and existing efforts and programs which are supportive of the goals for the plan. PSWQA held a major research conference and conducted various seminars, field trips, and public meetings on issues in the plan. The Authority's numerous publications were widely distributed to regional libraries and interested parties. The Authority did not receive adequate funding to carry out this element at the level originally intended. Funding for this element has been further reduced for the 1990-91 biennium.

Coordination and integration of education elements from all programs will be expanded and improved under ES-7; the work with the Superintendent of Public Instruction and with the Environmental Education Task Force was focused on the development of the long-range strategy and on teacher training and will continue.]

EPI-5. PSWQA Technical Assistance on Public Involvement

PSWQA shall establish a program of technical assistance on public involvement for state agencies and local governments to assist them in implementing the Puget Sound plan. Technical assistance shall include developing materials, providing training, evaluating agency public involvement programs upon request, and making recommendations. PSWQA shall monitor public involvement activities of agencies implementing the plan.

[**Status:** Completed. Transferred to ES-5.1 and 5.2. Due to a lack of funding for additional staff, PSWQA has provided minimal technical assistance on public involvement to state agencies and local government. Training in public involvement skills will now be provided under ES-5. PSWQA has been monitoring public involvement activities of agencies implementing the plan.]

EPI-6. Information on Water Quality Issues

List of Agency Materials: PSWQA shall ask federal and state agencies and local governments to make available to educators and the public reports, brochures, pamphlets, and other up-to-date information related to water quality and the economic and ecological values of Puget Sound. PSWQA shall identify relevant agencies and types of information and shall prepare a preliminary list of materials available and their locations. This list shall be updated regularly and distributed widely.

[**Status:** Scheduled for completion by October 31, 1989. PSWQA identified relevant agencies and types of information related to water quality and the economic and ecological values of Puget Sound and has prepared a preliminary list of materials. There are no funds to update and distribute this list. This function would be carried out under the information base (ES-6) in the long-range strategy which has been delayed until the 1990-91 biennium.]

Water Quality Directory: PSWQA shall prepare a directory, for public use, describing the appropriate contacts for obtaining information on specific issues related to the Puget Sound plan. This directory shall be updated as necessary and shall be widely distributed. PSWQA shall also coordinate with other agencies to make use of existing hot lines to handle inquiries on a wide range of environmental issues related to Puget Sound.

[**Status:** Scheduled for completion by October 31, 1989. PSWQA prepared a directory for public use, listing appropriate contacts for information on specific issues related to the Puget Sound plan. There are no funds to update the directory for wide distribution. PSWQA has coordinated with other agencies to make use of existing hot lines to handle inquiries on environmental issues related to Puget Sound.]

EPI-7. Ecology Coordinator and Mailing List Brochure

Ecology shall designate a public involvement coordinator who shall be responsible for coordinating public involvement activities related to Ecology's responsibilities under the Puget Sound plan. In addition, Ecology shall prepare a brochure describing the various mailing lists maintained within the department, defining the purpose of each, and giving instructions on how to get on each list. This list will be updated periodically.

Target Dates: Ecology designates coordinator by January 1, 1988. Ecology prepares brochure by April 1, 1988.

[**Status:** The Ecology coordinator was designated October 7, 1987. The initial mailing list brochure was completed in April 1988. The initial brochure material will be expanded for broader distribution when Ecology's centralized mailing list system is in place by December 1988.]

EPI-8. K-12 Funding for Teacher Training

PSWQA shall support teacher training programs related to the Sound by providing funds for release time for teacher workshops through the model education program.

[**Status:** $55,000 from the Public Involvement and Education Fund (see EPI-2) was allocated to teacher training: $27,500 each year for fiscal years 1987 and 1988.]

MAJOR PUBLIC ACTIONS FOR REVIEW

The Authority will consider the adequacy of public involvement when reviewing major public actions identified in other programs. As part of its review of biennial reports of state and local agencies (see Chapter 4), the Authority will consider implementation of the public involvement policy.

LEGISLATION REQUIRED

None

ESTIMATED COST

The full program would cost approximately $6 million for the 1990-91 biennium. However, in recognition of budget constraints, only $3.4 million is now proposed for funding during that biennium. This would increase to approximately $6 million per biennium in future biennia as activities and staff are added to carry out the strategy. Funding for the long-range educational strategy only (ES elements) would be increased; existing programs (EPI elements) would be funded at the 1990-91 levels in future biennia. To effect this reduction in state general funds, many elements in the strategy have been postponed or reduced for the 1990-91 biennium, resulting in a general fund request of $1.9 million. In addition, the program budget would include $1.1 from the Centennial Clean Water Fund and $360,000 in capital funds.

The elements of the long-range strategy with the largest costs include the local field agents or coordinators at an biennial cost of $636,000, resource teams at an biennial cost of $348,000, integrated water quality programs for business and industry at a biennial cost of $417,000 and a continued Public Involvement and Education Fund to support local programs at an annual cost of $500,000.

Some educational activities related to the long-range strategy are funded as components of other plan programs (MB-3, W-7, S-7, and P-27).

ESTIMATED PLAN COSTS: EDUCATION AND PUBLIC INVOLVEMENT

COST BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
EPI-1	Long-Range Strategy	48,247	21,500	0	0	0	0	0
ES-2	Local Audiences	0	0	526,492	526,492	1,141,351	1,141,351	1,141,351
ES-3	Schools	0	0	237,800	57,800	212,028	379,528	210,791
ES-4	Interpretive Activities	0	0	123,500	123,500	399,068	739,068	412,099
ES-5	Agency Training and Resource Teams	0	0	106,943	97,943	178,386	178,386	178,386
ES-6	Information Base	0	0	0	0	238,768	233,568	224,318
ES-7	Coordination	0	0	72,865	72,865	118,561	118,561	118,561
ES-8	PIE-Fund	0	0	500,000	500,000	393,750	393,750	393,750
ES-10	Campaigns for Puget Sound	0	0	15,000	15,000	15,000	15,000	15,000
ES-12	Sound Waters Award Program	0	0	0	0	16,395	16,195	16,595
EPI-2	Model Education and Public Inv. Projects	699,436	721,332	0	0	0	0	0
EPI-4	PSWQA Activities	68,500	81,500	50,000	50,000	0	0	0
EPI-5	PSWQA Tech Assistance on Public Inv.	9,600	7,600	0	0	0	0	0
EPI-6	Information on Water Quality Issues	67,491	57,143	0	0	0	0	0
EPI-7	Ecology Coordinator and Brochure	73,539	82,805	55,993	55,993	55,993	54,993	54,993
EPI-8	K-12 Funding for Teacher Training	25,500	25,500	0	0	0	0	0
TOTAL		$992,313	$997,380	$1,774,028	$1,585,028	$2,854,734	$3,355,834	$2,851,280

Element Notes

ES — PSWQA staff to coordinate the education strategy are provided through the PSWQA public outreach/education program (see Costs and Financing Section).
ES-4 — Funding for sediment materials is included in Sediment element S-9.
ES-5 — Local and tribal support for wetlands resource teams is funded under Wetlands element W-7.
ES-8 — Includes $550,000 for local government PIE-Fund projects.

EDUCATION AND PUBLIC INVOLVEMENT

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Sea Grant & Coop Extension	0	0	355,500	355,500	711,000	711,000	711,000
Ecology Pass Through to Local	0	0	0	0	166,064	166,064	249,096
Ecology	73,539	82,805	205,450	205,450	427,933	426,733	427,133
DSHS	5,499	5,499	20,166	20,166	25,928	25,928	25,928
PSWQA Pass Through to Local	533,500	533,500	550,000	550,000			
PSWQA	135,219	168,515	333,500	153,500			
Fisheries	5,749	3,999	111,004	111,004	165,106	165,106	165,106
Wildlife	8,249	5,499	55,544	55,544	151,076	151,076	151,076
Parks and Recreation	8,249	5,499	4,781	4,781	10,757	10,757	10,757
Natural Resources	8,249	5,499	0	0	6,860	6,860	6,860
Superintendent of Public Instruction	0	0	21,136	21,136	70,456	70,456	55,456
Agriculture	3,499	3,499	38,448	38,448	12,816	12,816	12,816
Personnel	0	0	10,500	3,500	3,500	3,500	3,500
Community Colleges	0	0	0	0	33,819	33,819	33,819
Local Government	210,561	183,065	35,000	35,000	35,000	35,000	35,000
Other State Agencies	0	0	33,000	31,000	146,881	86,881	86,881
Education Organization					887,537	1,449,837	876,851
TOTAL	$992,313	$997,380	$1,774,028	$1,585,028	$2,854,734	$3,355,834	$2,851,280

COSTS BY FUNDING SOURCE							
Capital Account	0	0	270,000	90,000	56,000	636,000	56,000
Centennial Clean Water Fund	550,019	550,019	550,000	550,000	518,750	518,750	518,750
State General Fund	231,732	264,296	954,028	945,028	2,279,984	2,201,084	2,276,530
Local Sources	210,561	183,065	0	0	0	0	0
TOTAL	$992,313	$997,380	$1,774,028	$1,585,028	$2,854,734	$3,355,834	$2,851,280

NONPOINT SOURCE POLLUTION

PROBLEM DEFINITION

Nonpoint source pollution originates from surface water runoff, discharges from boats, or atmospheric deposition. It is a general category for pollution that is not collected in and discharged through pipes. Nonpoint source pollutants include pathogens (as indicated by fecal coliform bacteria), sediments, nutrients, and toxicants. Most pollutants originate on the land, where they are picked up by rainwater and carried into streams and rivers that empty into the Sound. Because a bay can receive the drainage from a large land area (watershed) as well as discharges from boats and other water-based sources, sources are numerous and often can be difficult to identify individually.

Bacterial contamination from nonpoint source pollution has required DSHS to condition, restrict, or prohibit the harvest of shellfish at 15 Puget Sound growing areas since 1981.[9] The major sources appear to be: increasing development of noncommercial farms, failing on-site sewage disposal (septic) systems, large commercial farms, and boats and marinas. In some cases, stormwater from newly urbanizing areas adds additional bacterial and possibly toxic contamination to shellfish beds. (Existing urban areas typically have high levels of fecal contamination and were prohibited for shellfish harvest many years ago.)

Since the 1970s each nonpoint source (on-site septic systems, agricultural practices, boats, marinas, and forest practices) has been addressed by its own control program, each one usually by a different government agency. These programs produced some important local successes. However, prior to the watershed management program adopted in the 1987 Puget Sound plan, overall control of nonpoint pollution of the Sound was generally inadequate. This was true partly because there was a lack of coordination among the agency programs and also because there was no integrated process to manage all nonpoint sources in a bay or watershed.

Failure to prevent nonpoint pollution (and impacts on beneficial uses like shellfish) also has resulted from a continual underfunding of programs at federal, state, and local levels. The state legislature established the Centennial Clean Water Fund (cigarette tax) in 1986 to provide dedicated funds for statewide water quality control facilities and activities. Long-term competition for the fund is expected to be intense, especially as programs and activities accelerate. In addition, the fund was not designed to support state agency operations.

On-Site Septic Systems

Failing on-site septic systems can discharge pathogens and household and other chemicals to streams, groundwater, and eventually Puget Sound. Failures occur because many soils in the Puget Sound region are poorly suited for conventional systems, because water tables are high, or because the systems are improperly designed, installed, or maintained. Many older systems have failed because they were designed to serve as temporary units for summer cottages or until an area was sewered. Today, approximately one-third of the resi-

9 DSHS classifies all actual and potential shellfish growing waters in Washington as Approved, Conditionally Approved, Restricted, or Prohibited.

dents in the Puget Sound basin are served by on-site systems. This fraction is increasing as more population growth occurs in semi-rural areas.

New on-site septic systems must comply with local health codes, which meet the minimum standards in regulations promulgated by the state Board of Health (Chapter 248-96 WAC). Most systems that are failing today (three to five percent in Puget Sound) were installed prior to the adoption of these state regulations in 1974 and are therefore generally exempt from their provisions. Moreover, implementation of current standards is subject to substantial discretion exercised by local permitting officials.

State and local health agencies lack adequate funds for education and enforcement. When enforcement actions are taken, they are rarely pursued to the point of achieving results. Existing regulations do not require system maintenance or inspections for proper functioning when property is transferred.

Agricultural Practices

Pollutants that can come from agricultural practices are sediments, nutrients, organic materials, pésticides, and pathogens. Pathogens arise from poor animal-keeping and pasture-management practices. Sediments, which carry pathogens and toxic contaminants and can damage salmonid habitat, can be generated by livestock trampling and eroding stream banks and by poor row crop practices.

State programs for control of nonpoint pollution from agricultural practices rely on voluntary implementation of best management practices (BMPs), with enforcement of water quality standards as a last resort. (Agricultural BMPs include, for example, manure lagoons, streamside fences, better management of fields, and crop rotation.) Conservation districts, the Cooperative Extension Service, and the federal Soil Conservation Service all provide technical assistance to farmers and promote farm planning and the use of BMPs. The Washington Conservation Commission and conservation districts are currently updating BMPs to ensure they are effective in protecting water quality. The Department of Ecology provides grant funding for cooperative agricultural construction projects, such as manure lagoons. Partial funding of BMPs by federal cost-share programs has been important in controlling sources at commercial farms. Federal cost-share funds, however, have been significantly reduced in the 1980s. The effectiveness of these programs is generally limited by inadequate funding and lack of technical and other assistance for noncommercial farms.

Forest Practices

Most of the rivers and streams that flow into Puget Sound have their origin in forest lands. Sediment from timber harvesting and road construction can damage fish habitat in these streams, which in turn can damage migratory species that are harvested in Puget Sound. Logging roads built prior to the current Forest Practices Act and since abandoned are one example of areas where there is a particular concern.

Forest practices are regulated by Washington's Forest Practices Act, RCW 76.09. Timber operators are required to submit applications to and comply with regulations administered by the state Department of Natural Resources. Other state agencies perform limited monitoring, review, and advisory functions. A serious deficiency in the forest practices program has been inadequate funding for enforcement and monitoring. With the adoption of the Timber/Fish/Wildlife Agreement in late 1986, improved agency coordination and increases in budgets have begun to address these concerns.

Marinas and Recreational Boating

Contaminants from marinas and recreational boating can include pathogens, petroleum products, and toxicants in antifouling paint.[10] Sewage discharge from boats is a potential problem during the boating season wherever boats congregate, but especially in smaller bays with poor water circulation, near shellfish beds and public swimming areas, and at marinas occupied by "liveaboard" boats. Many boaters, however, do not believe that boats are a significant source of water pollution.

In Puget Sound the Coast Guard is not actively enforcing federal regulations requiring marine sanitation devices (MSDs) to hold and/or treat boat sewage. Even with a vigorous enforcement program, widespread violations of discharge standards could still occur because enforcement cannot ensure the use of an MSD. In addition, major boating areas such as the San Juan Islands and Hood Canal lack sufficient pumpout facilities for holding tanks.

Most local shoreline master programs lack specific design standards for marinas that address protection of shellfish beds, pumpout and sewage treatment facilities, education, and runoff from boat repair and fueling facilities.

PROGRAM STATUS

The nonpoint program integrates control of nonpoint sources at three levels of involvement—watershed, local jurisdiction (counties, cities, and tribes), and state. A cooperative watershed management program has been initiated that establishes committees to rank watersheds in each of the 12 Puget Sound counties. Watershed management committees prepare action plans for watersheds in the order in which they were ranked.

To supplement the watershed action plans and address nonpoint source pollution outside of priority watershed boundaries, counties, cities, and tribes are evaluating the effectiveness of their existing water quality-related programs, policies, and ordinances. Counties will also be carrying out nonpoint education activities in conjunction with the long-range education strategy (element ES-2.1).

The nonpoint program also includes state programs for addressing nonpoint pollution from marinas and boats and forest practices and for providing assistance to local governments in addressing pollution from on-site septic systems and agricultural practices. Implementation of the nonpoint program began in early 1987 and is summarized in the following paragraphs.

Twelve "early action" watersheds have been selected and funded by Ecology, six under the Round One process (NP-1) and six from Ecology's pre-existing Shellfish Protection Program. Watershed management committees (NP-3) were set up by early 1988 in each of the 12 watersheds. In addition, each Puget Sound county has established a watershed ranking committee to carry out the long-term watershed selection process (NP-1, Round 2). Ecology also made a grant to the Northwest Indian Fisheries Commission to support tribal involvement in the nonpoint program.

Guidelines for the watershed management program (NP-2) were adopted as regulations (Chapter 400-12 WAC) by the Authority in early 1988, and two months later the Authority and Ecology issued the first chapters of the non-

10 State legislation passed in 1987 prohibits most uses of paints containing tributyl tin, the antifoulant component most toxic to marine life.

point source handbook for local governments and ranking and management committees.

Ecology adopted a regulation in mid-1988 establishing funding criteria and procedures for the Centennial Clean Water Fund. This fund is the primary funding source for watershed management committees, action plans, and other water quality projects and activities (NP-5.1). There is concern on the part of many state agencies and local governments, however, that available funds will fall short of needs. Conservation districts are also being partially funded through this account via grants administered by the Washington Conservation Commission (NP-5.2). Like local governments, however, the Conservation Commission and conservation districts feel funding will prove to be inadequate. In addition, the Washington Conservation Corps continues to lack adequate funding to assist in implementation of watershed action plans (NP-5.3).

In late 1987 Ecology formed and is now managing a technical assistance team that has aided watershed ranking and management committees (NP-6). Ecology will conduct audits (NP-7.1) and monitoring (NP-7.2) after implementation of watershed action plans begins. Guidance for county and city water quality evaluations (NP-9) was distributed by the Authority in July 1988, and evaluations will be returned to the Authority by July 1, 1989. DSHS has begun local on-site program audits and has formed an advisory committee to assist the department in revising the on-site regulations (NP-10).

Proposed legislation to require information on septic systems to be provided when property is transferred (NP-11) passed the House and failed in the Senate in both 1987 and 1988. DSHS, Ecology, and the Washington Conservation Commission are beginning work on, respectively, Certification of On-Site Professionals (NP-12, DSHS), Dairy Waste Management Plan (NP-13, Ecology), and Cost-Sharing Program (NP-14, Washington Conservation Commission).

In mid-1989 Ecology will begin revising the Shoreline Management Act regulations (Chapter 173-16 WAC) to include specific standards for design and siting of marinas (MB-1). DSHS is currently drafting a model ordinance for sewer hookups for liveaboards, to be completed by 1989 (MB-2).

The Boaters Task Force did not submit legislation on pumpout facilities to the 1988 session but plans to do so for the 1989 session (MB-2). The task force has developed the boater education program and has begun implementation of several educational activities, including providing information to boaters during the summer of 1988 (MB-3). The State Parks and Recreation Commission selected Mystery Bay State Park to be the site of the first pumpout facility, and the Boaters Task Force has identified other sites at state parks in need of pumpout facilities (MB-4). DSHS has initiated intensive surveys at several boating areas and marinas (MB-6). With target dates in the 1990s for Enforcement of MSD Regulations (MB-5), Study of "No Discharge" Areas (MB-7), and "No Anchorage" Areas (MB-8), implementation of these elements has not yet begun.

Implementation of the Timber/Fish/Wildlife agreement began in 1987 with administrative changes at DNR; increased numbers of field agents at the Departments of Wildlife, Fisheries, and Ecology; participation of tribal and environmental representatives in T/F/W field and educational activities; and the development of a research and monitoring program.

The Department of Ecology completed a nonpoint source pollution assessment and management program in 1988 to comply with Section 319 of the federal Water Quality Act of 1987. The nonpoint program in the Puget Sound plan is incorporated into Ecology's statewide nonpoint management program, with enhancements for lakes and groundwater. Ecology's management program calls for accelerated implementation of watershed action plans in Puget Sound.

PROGRAM GOAL

To reduce and ultimately eliminate harm from nonpoint sources of pollution to Puget Sound, including pathogens, toxic contaminants, and sediment.

STRATEGY

The strategy for achieving this goal is (1) to target state and local resources on priority watersheds through a cooperative local watershed planning process, (2) to supplement the watershed plans with education and preventive programs, and (3) to develop or enhance state programs or regulations for those nonpoint sources that are most effectively controlled at the state level.

PROGRAM ELEMENTS

NP-1. Selection of Priority Watersheds

Selection of priority watersheds shall be in two steps: Round 1 or early action watersheds to be selected by Ecology from nominations, and Round 2 consisting of a ranking of all watersheds in each county to be compiled by countywide committees.

Round 1. Early Action Watersheds: Funding shall be continued and in some cases increased for the six existing Ecology shellfish protection strategy watersheds. Additional early action watersheds shall be selected as follows:

Ecology shall request nominations for priority watersheds from local governments, tribes, special purpose districts, environmental and public interest groups, agricultural groups, state agencies, and organizations such as the Hood Canal Coordinating Council. Ecology shall rank the nominations in order of priority and shall hold public hearings on the proposed ranking. The conservation districts, working through the Soil Conservation Service, will provide local governments with assistance in the nomination process by providing information and coordination through the U.S. Department of Agriculture's Puget Sound Cooperative River Basin Study Team. The conservation district process of preparing nominations will be taken into account in making the final selections. The total number of early action watersheds to be selected by Ecology shall depend on funds available.

Target Date: Final selection by June 30, 1987.

Round 2. Long-Term Watershed Selection Process: Using guidelines developed by PSWQA (NP-2), each county shall convene a committee of representatives from cities, special purpose districts, tribes, and other appropriate entities in the county for the purpose of identifying and ranking all watersheds for future nonpoint watershed action plans. The county is assumed to be the committee lead, but the committee may select a lead other than the county where circumstances warrant. The watershed selection process shall include public participation. Both the general public and affected individuals shall be involved

either through a separate citizen advisory committee and/or inclusion of citizen groups, farming organizations, and others on the selection committee.

Each county committee shall submit to Ecology its identification and ranking of all watersheds within the county. The submittal shall include maps showing watershed boundaries, identification of probable nonpoint sources, identification of all local jurisdictions and special purpose districts with territory within the boundary of each watershed, and identification of all affected tribes.

Target Date: Submittal to Ecology by January 1, 1989.

Criteria

Ecology and county committees shall use the following criteria for selection of priority watersheds in Round 1 and Round 2:

a. The watershed has a beneficial use such as recreational or commercial shellfish beds, fish habitat, or drinking water, that is impaired or threatened by pollution from nonpoint sources.

b. The watershed has a likelihood of intensified land or water use, including a likelihood of being logged, in the next 10 years.

c. Environmental factors, such as soil, slope, and precipitation on land and/or limited flushing in the Sound increase the probability of future water quality degradation.

d. The watershed produces more contaminants or causes greater harm to a beneficial use than other watersheds.

e. Nonpoint source control programs in the watershed are likely to succeed in protecting water quality in Puget Sound as evidenced by programs already underway, existing institutional arrangements for interjurisdictional cooperation such as the Hood Canal Coordinating Council, or other factors.

Hood Canal

The Hood Canal Coordinating Council is an example of a watershed managed by interlocal agreements between three counties and two tribes. It was created after several years of discussion by an advisory committee formed in response to a directive by former Governor Spellman. An action plan, published in the summer of 1986, outlines procedures for dealing with nonpoint pollution problems in Hood Canal. The Council is currently implementing the septic system and farm animal provisions of the plan, as well as education activities and monitoring of shellfish beds; forest practices and boating activities will be part of the ongoing agenda. The Authority has provided administrative assistance to the Council and will continue such support. The Council should report to PSWQA and Ecology by December 31 each year on the progress of its work on nonpoint pollution control. Ecology will consider continued funding of this program under its grants programs.

[**Status**: Ecology funded 12 early action watersheds as well as watershed ranking committees in each of the 12 Puget Sound counties in the FY 1988-89 biennium. The Puget Sound Cooperative River Basin Study Team prepared guidance for use in watershed ranking and provided technical assistance to many ranking committees. Each county ranking committee will submit its ranking to Ecology by January 1, 1989. The Hood Canal Coordinating Coun-

cil has reported annually to the Authority and quarterly to the Department of Ecology.]

NP-2. Guidelines for Watershed Action Plans

PSWQA shall prepare and adopt guidelines for use by watershed management committees in developing watershed action plans and by county committees in identifying and ranking watersheds (NP-1). Ecology, DSHS, and the state Department of Agriculture shall each assign to PSWQA one staff member who is an expert on nonpoint source pollution control to form a team to develop the guidelines. PSWQA shall also consult with the U.S. Environmental Protection Agency, the Departments of Fisheries and Wildlife, the Washington Conservation Commission, the U.S. Soil Conservation Service, conservation districts, tribes, counties and cities, farming organizations, educators, and other affected parties during the preparation of the guidelines.

The goal of watershed action plans shall be to meet water quality and shellfish standards in priority watersheds. The objectives of watershed action plans shall include reopening closed/correctable shellfish beds, preventing further closures, protecting fish habitat, and achieving other objectives appropriate to each watershed. Watershed action plans shall address nonpoint pollution from animal keeping/pasture management, on-site septic systems, stormwater, and any other significant nonpoint source but need not include programs for all of the sources if the watershed is found not to have problems from one or more of these sources. The early action watershed plans already underway by fiscal year 1988 shall not be required to meet every detail of the guidelines but must be consistent with the intent of the PSWQA plan and as consistent as possible with Chapter 400-12 WAC.

The guidelines shall permit watershed management committees to select regulatory and/or educational approaches for each source and shall make recommendations on the development of effective programs using either or both approaches. The guidelines shall specify that if regulatory programs are chosen, adequate enforcement must be provided; and if educational programs are chosen, agencies and/or individuals with expertise in education must be involved in program development and implementation.

The Authority and Ecology shall jointly review the effectiveness of the guidelines, and the Authority shall revise them as needed, including consideration of the need for more prescriptive standards, prior to July 1, 1991. The Authority shall provide assistance as necessary in interpreting the guidelines.

Agricultural Practices: The guidelines shall specify how local action plans address agricultural practices. The guidelines shall recommend but not require the use of conservation district/SCS farm management plans as the preferred approach to controlling pollution from both commercial and noncommercial farms, and shall adopt the conservation districts' farm conservation planning and practices documents as the recommended standard. The guidelines shall permit watershed management committees to address animal keeping/pasture management through other regulatory or educational approaches, but the guidelines shall specify that any farm which has implemented an approved farm management plan through either the Dairy Waste Management Plan or the conservation district/SCS program shall be exempt from further agricultural practices regulations unless water quality violations occur. (See also NP-13, Dairy Waste Management Plan.) The selection of an educational approach to controlling pollution sources shall not be construed to overrule or prevent the enforcement of existing regulations and laws by local, state, or federal agen-

cies nor shall it be construed to exempt local governments from other requirements of this plan.

On-site Septic Systems: The guidelines shall provide approaches to controlling nonpoint pollution from on-site systems, including regulation, education, and on-site system maintenance programs.

Stormwater: The guidelines shall recommend a basic approach but leave latitude to the watershed management committees. The guidelines shall suggest different approaches for different land use patterns and shall be consistent with stormwater elements described in the Stormwater and CSOs program. The inclusion of stormwater in a priority watershed does not exempt local governments from carrying out the additional stormwater requirements of SW-1 and SW-2.

Forest Practices: In endorsing the Timber/Fish/Wildlife Project in FP-1 and recognizing that state law preempts local action on forest practices, the Authority intends that watershed action plans which include forest practices be closely coordinated with the T/F/W Project, especially in the areas of preplanning and basin planning, enforcement, data management, orphaned roads, and extended review.

Target Date: Preliminary guidelines to be published by June 30, 1987. Final guidelines to be published by December 31, 1987.

Nonpoint handbook to be published by March 31, 1988. Additional sections of handbook prepared and distributed by the Authority and Ecology as necessary.

[**Status**: The Authority adopted regulations for Local Planning and Management of Nonpoint Source Pollution (Chapter 400-12 WAC) in February 1988 and distributed the first installment of the nonpoint handbook on March 30, 1988. A synopsis of the nonpoint rule is contained in Appendix D.]

NP-3. Watershed Management Committees

When funding becomes available for each priority watershed, Ecology shall notify the county with jurisdiction within the watershed and the county shall be responsible for convening a watershed management committee. If two or more counties share a watershed, the counties may agree on a temporary lead to convene the committee or may jointly convene the committee. The committee shall consist of all affected local governments, special purpose districts, tribes, interested state agencies, and others. If nonpoint pollution from boats and/or forest practices has been identified as a problem source in the watershed, staff of the State Parks and Recreation Commission and/or Department

of Natural Resources forest practices personnel shall participate in the committee.

The county is presumed to be the lead for each watershed management committee. However, the committee may designate a city, a local health agency, a conservation district, or other agency if circumstances warrant.

Planning and implementing agencies[11] for each source to be controlled in the watershed shall be selected by the watershed management committee. Criteria for selection shall include territory governed, legal authority, and expertise. It is not the intent of the designation process to impose new jurisdictional arrangements on watershed committees, but to allow use of existing institutional structures while giving maximum flexibility to watershed management committees to achieve effective development and implementation of the action plan. If a watershed management committee cannot agree on implementing agencies, Ecology shall designate them and may require interlocal agreements.

The lead agency selected by the watershed committee shall be responsible for convening meetings, coordinating among local jurisdictions and other agencies, working with planning and implementing agencies in preparation of the plan, compiling and publishing the plan, and submitting the plan to Ecology for approval.

The watershed action planning process shall include public participation. Both the general public and affected individuals shall be involved either through a separate citizen advisory committee and/or inclusion of citizen groups, farming organizations, and others on the management committee.

To ensure full participation of tribes in watershed planning, tribes shall evaluate their desired level of participation in watershed management committees following each round of the watershed selection process and shall submit coordinated grant applications to Ecology.

[**Status:** This element is proceeding on schedule.]

NP-4. Plan Adoption and Implementation

Each watershed action plan submitted to Ecology for approval shall include goals and objectives; identification of types of nonpoint sources; a description of the general planning approach for the watershed and for each type of source; identification of planning and implementing agencies and their authorities; program plans and/or ordinances including enforcement and/or education programs; and an implementation schedule. Ecology shall have 60 days to approve/disapprove the plan. If a plan is disapproved, the watershed management committee shall revise the plan as necessary and the lead shall negotiate with Ecology for final approval. Ecology may approve portions of a plan

11 For the purpose of this program, a planning agency is the agency that prepares reports and makes recommendations, and an implementing agency is the agency that carries out the day-to-day activities of the plan once it is adopted by a county and/or city council. An agency could be both a planning agency and an implementing agency, for example, a health department could both propose regulations for on-site systems and enforce them after they have been adopted by the county council or commission. In watersheds with two or more counties or cities there could be several implementing agencies for the same source, for example, two different health departments carrying out on-site programs prepared by a single planning agency and adopted by the two different county councils or commissions.

before approving the entire plan and require those portions to be implemented during the revision process for the remainder of the plan.

Each implementing agency identified in the plan approved by Ecology shall be responsible for carrying out its portion of the watershed action plan using the approaches described in the plan. The lead implementing agency shall be responsible for coordinating among implementing agencies and for preparing reports to Ecology. Each local and state implementing entity identified in an approved action plan shall be responsible for carrying out its portion of the action plan within the prescribed schedule.

Watershed action plans may be revised by watershed management committees following submission of revisions to and approval by Ecology.

[**Status:** This element is on schedule.]

NP-5. Program Funding and Incentives

In addition to the following elements, new funding sources for nonpoint pollution management may be identified or proposed as the result of a study of potential funding sources to support the long-term implementation of the Puget Sound plan (element C-1, Study of Long-Term Funding Options).

5.1. Nonpoint Watershed Planning Grants

The Department of Ecology shall administer a program for disbursing grant funds to watershed management committees for preparing and implementing watershed action plans. Disbursal of grant funds to agencies may be funneled through the lead administrative agency or paid directly to implementing agencies according to procedures established in the Centennial Clean Water Fund.

5.2. Funding for Conservation Districts

Ongoing funding shall be provided by the Washington Conservation Commission to enable Puget Sound conservation districts to participate in planning and implementing priority watershed action plans. The Authority recognizes the need for ongoing funding to maintain districts' basic administrative functions and expects that such funding will be made available, within the limitations of statewide responsibilities and a competitive grant process, from the 2.5 percent appropriation to the Commission from the Centennial Clean Water Fund.

5.3. Continued Funding for Washington Conservation Corps

The Department of Ecology shall request funds through its biennial budget process for the Washington Conservation Corps to allow it to continue to provide assistance in implementation of activities under the Puget Sound plan.

5.4. Tax Assessment of Stream Corridors with Restricted Use

In instances where property owners have fenced along streams as part of a watershed action plan, the Dairy Waste Management Plan, or an approved farm management plan through the SCS/conservation district program, counties should consider granting open space tax status pursuant to the Open Space Act (Chapter 84.34 RCW) to lands with restricted use resulting from fencing.

[**Status:** Watershed grants have been made, conservation districts have received water quality grants from the Conservation Commission, and the Conservation Corps has received some funding for plan-related activities.]

NP-6. Technical Assistance for Watershed Plans

Ecology, with assistance from PSWQA on education and public involvement, shall form an interagency team consisting of staff from Ecology, the Department of Social and Health Services, the Department of Wildlife, the Department of Fisheries, the Department of Natural Resources, the Washington Department of Agriculture, the Washington Conservation Commission, the State Parks and Recreation Commission, the Cooperative Extension Service, and other appropriate state agencies and tribes to provide technical assistance to each watershed management committee throughout the planning and implementation phases of watershed action plans. Ecology shall coordinate among team members to keep them active and informed and shall provide watershed committees with clear direction as to which individuals/agencies to call directly for specific types of assistance. Ecology shall ensure that technical information and assistance provided under this program is coordinated with the federal assistance provided by the Puget Sound Cooperative River Basin Study Team and with the long-range education strategy (elements ES-1 through ES-10), other Ecology nonpoint-related grants programs (such as 205(j) grants), the boater education program (element MB-3), and the Ecology and DSHS shellfish protection programs.

[**Status:** Ecology established a technical assistance team in late 1987. This team, in conjunction with the Puget Sound Cooperative River Basin Study Team, has been assisting both watershed ranking and watershed management committees.]

NP-7. Program Management

7.1. Audits

Ecology, in cooperation with PSWQA, shall audit each watershed action plan every two years to ensure consistent and adequate implementation.

7.2. Monitoring

Ecology (or Ecology and DSHS for watersheds in which shellfish or drinking water is an issue) shall monitor water quality in each priority watershed after substantial progress has been made in implementation of the action plan. The purpose of the monitoring shall be to provide information for measuring the success of action plans in achieving water quality goals. Watershed monitoring shall be coordinated with the Puget Sound Ambient Monitoring Program (element M-2), including use of the Puget Sound protocols. Ecology shall make data available, upon request, for transfer to the PSAMP central database using data transfer formats developed under element M-4.

7.3. Default Watersheds

If local governments fail to prepare and implement nonpoint watershed action plans, Ecology shall either prepare and implement watershed action plans itself or use its regulatory authority under Chapter 90.48 RCW, the Puget Sound Water Quality Management Plan, or other authority to direct local governments to prepare and implement nonpoint watershed plans. In the event of nonperformance or unsatisfactory completion of watershed action plans, Ecology shall require repayment of grant funds disbursed to grantees.

7.4. Program Management and Evaluation

Ecology shall be responsible for overall nonpoint program management and shall provide ongoing oversight of watershed action plans. Management shall include program planning, intra- and inter-agency coordination, financial monitoring, public outreach, information management, enforcement, and evaluation activities for all nonpoint program elements except NP-9 through NP-12 and MB-2 through MB-6 and MB-8. The effectiveness of the nonpoint program, including the effectiveness of the watershed plans, shall be evaluated by PSWQA as part of the 1991 revisions to the Puget Sound plan. Procedures and guidelines shall be revised as necessary.

Target Date: Ecology shall report progress on this element in its biennial reports to the Authority.

[**Status:** While it is too early for the Authority to evaluate the effectiveness of watershed action plans, implementation of the nonpoint program is discussed in general terms in the Program Status section and in more detail at the end of each element. Local watershed monitoring is taking place under the guidelines for watershed action plans (NP-2). Ecology audit and monitoring tasks will begin in the next biennium. There have been no default watersheds to date.]

Countywide Programs

NP-8. Education Programs

[**Status:** Countywide education on nonpoint pollution will be conducted as part of the long-range education strategy. Counties will identify priorities and programs for nonpoint education as part of their work with local field agents (element ES-2.1). Because full funding for field agents will not be available during the next biennium, some counties will have to postpone working with field agents on nonpoint education until the FY 1992-93 biennium.]

NP-9. Prevention

Using guidance prepared by PSWQA, each city and county in the Puget Sound planning area shall evaluate the items below for that portion of its jurisdiction within the Puget Sound planning area. PSWQA shall consult with the Departments of Ecology and Social and Health Services in preparing the guidance. Each city and county shall involve the public in the evaluation, including the holding of a public hearing, and shall submit a written report to PSWQA. While the hearing may be informal, the involvement of the public is important in this evaluation. The purpose of the evaluations is to provide cities and counties with information on (a) the effectiveness of their programs relating to water quality, and (b) the effects on water quality of other programs not specifically focused on water quality. The Authority will consider the evaluations in the 1991 plan revision.

a. How water quality considerations are incorporated into land use decisions.

b. The effectiveness of its regulations for new on-site systems, including the soil types and other conditions under which they are permitted. Effectiveness in this case refers to protection of public health and water quality.

c. The need for on-site system maintenance programs to protect both public health and water quality.

d. The effectiveness of local enforcement programs for zoning, shoreline, and health regulations affecting nonpoint pollution. (To be coordinated with Legal and Personnel Support element LP-4.)

The report shall be made available to citizens and to Watershed Management Committees within the jurisdiction.

Recognizing tribal sovereignty, the Authority requests that tribes conduct similar evaluations. PSWQA shall work with the Northwest Indian Fisheries Commission and individual tribes to design an evaluation of tribal programs that can be used by tribal governments.

Target Date: PSWQA guidance on preparing the evaluation shall be completed by June 30, 1988. PSWQA/NWIFC guidance for use by tribes shall be prepared by November 15, 1988. Cities and counties complete reports and submit them to PSWQA by July 1, 1989. Cities and counties hold public hearings prior to submitting reports to the Authority.

[**Status:** This element is on schedule.]

State Elements to Supplement Local Planning

NP-10. On-Site Regulations and Programs

DSHS shall study the effectiveness of current statewide standards for on-site systems, with special attention paid to sensitive areas. Effectiveness in this case refers to protection of public health and water quality in the Puget Sound basin. The study shall also include recommended strategies for maintenance and remedial programs for on-site sewage disposal systems, audits of the local on-site programs in all 12 Puget Sound counties, and an evaluation of the following specific issues:

a. Minimum vertical separation (distance between bottom of drainfield and impermeable layer).

b. Required soils evaluation during the high water-table season.

c. Definition of and proximity to surface water.

d. Required inspection ports on new on-site systems.

e. Required inspection during construction.

f. Required use of alternative technologies (proven enhanced treatment systems) under appropriate soil and other conditions.

g. Procedures for identifying and enforcing correction of failures, especially where conventional or alternative technology will not result in proper subsurface soil disposal and including resolution with Ecology of the issue of surface discharging systems.

h. Land area requirements.

i. Comprehensive inspection, operation, and maintenance requirements, including local health agency and private sector roles.

j. Applicability of rules to systems installed prior to promulgation of the 1974 state Board of Health on-site sewage disposal regulations.

k. Design criteria for increased treatment efficiencies of conventional systems.

l. Expanded monitoring of local on-site programs and of alternative systems.

m. Identification of sensitive areas where more stringent regulations, especially relating to the above issues, should apply.

n. Other issues deemed appropriate by DSHS.

If the study concludes that revised regulations are needed, either Soundwide or in sensitive areas, DSHS shall present proposed regulations to the state Board of Health for consideration.

Target Date: Develop interim proposals by July 1, 1988, and final report by April 1, 1989. Adopt regulations by July 1, 1989. Develop recommended maintenance and remedial strategies and begin implementation by July 1, 1990.

[**Status:** DSHS has begun the audits of local on-site programs and has formed an advisory committee to assist the department in revising the Board of Health on-site regulations.]

NP-11. On-Site Inspections and Education

PSWQA, in consultation with DSHS, shall propose legislation addressing the need for owner education and on-site system inspection and maintenance. This may include requiring sellers to submit the following information to buyers at the time of sale of residential or commercial property: (a) whether the building has an on-site system or a sewer hook-up; (b) location of the septic tank and, if available, information on location of the drainfield; (c) verification that the septic tank and drainfield have been inspected within the last three years; (d) the date the tank was last pumped and if pumping is now required; and (e) a maintenance manual for on-site systems.

The Authority will also continue to work with interested groups and possibly consider additional legislative initiatives to address on-site system issues.

Target Date: Submit to 1989 legislature.

[**Status:** Legislation requiring inspection and education at the time of property transfer failed in 1987 and 1988.]

NP-12. Certification of On-Site Professionals

DSHS shall develop a program, including any required legislation or amendments to WAC 249-96 and RCW 18.43.070, for state certification of designers (including professional engineers), installers, environmental health specialists, and others involved in the design, installation, and maintenance of on-site septic systems. DSHS shall require all on-site systems to be installed, designed, given permit approval, and inspected by certified professionals. As part of this program, DSHS shall conduct a continuing education program for certified professionals.

Target Date: Begin program implementation by June 30, 1989.

[**Status:** DSHS began implementation of this element in February 1988 by developing a work plan, surveying other states' certification programs, contacting potentially affected parties, and studying the need for legislation.]

NP-13. Dairy Waste Management Plan

The existing Dairy Waste Management Plan shall be funded to focus on priority watersheds, and Ecology shall be encouraged to continue its use for commercial dairies regardless of size. Any farm which has fully implemented a farm management plan through either the Dairy Waste Management Plan or the conservation district/SCS system shall be exempt from further regulations on animal keeping/pasture management under a priority watershed action plan unless water quality violations occur.

[**Status:** Ecology is carrying out this element. Conservation districts are applying to the Conservation Commission for funds provided from the Centennial Clean Water Fund, since a major source of funding for this program (Referendum 39) ran out in 1988.]

NP-14. Cost-Sharing Program

The Washington Conservation Commission, with assistance from Ecology, shall conduct a study and design a program, legislation, or constitutional amendment to establish a cost-sharing program for animal keeping, pasture management, on-site systems, or other situations where BMPs are required by priority watershed action plans.

Target Date: Complete study by June 1989. Program in place by June 1990.

[**Status:** Background material has been compiled, and the element is on schedule.]

NP-15. Larger and Alternative On-Site Systems and Septage

DSHS, with assistance from Ecology, shall expand its program for larger on-site systems and alternative systems. The program shall provide: (a) an inventory of systems, (b) a performance analysis and an assessment of the need for new performance, siting, or other requirements, and (c) maintenance of a data base. This program shall also include an investigation of existing requirements and procedures for disposal of on-site sewage from recreational vehicles.

DSHS shall provide technical assistance and training on such systems for local health agency staff and shall prepare design, performance, and other manuals and materials as needed. DSHS shall conduct a literature review, develop a handbook, and provide training and technical assistance for local governments on the environmentally sound disposal of septage.

Target Date: Complete inventory and recreational vehicle investigation by June 30, 1992. Prepare manuals by January 1, 1993. Conduct septage literature review and prepare handbook by July 1, 1992.

[**Status:** Implementation of this element is delayed until the 1992-93 biennium.]

Marinas and Recreational Boating

[NOTE: The marinas and recreational boating program shall focus on recreational boating because of its widespread occurrence throughout Puget Sound. However, small (less than 65 feet in length) uninspected commercial vessels

using areas where nonpoint pollution from boats has been identified as a problem shall be subject to education and enforcement programs.]

MB-1. Shoreline Master Program Amendments for Marinas

Ecology shall revise WAC 173-16 guidelines to include specific standards for siting, design, renovation, or expansion of new marinas, existing marinas, and associated fuel docks and boat repair facilities. Ecology shall coordinate with DSHS to develop standards for siting marinas to prevent any restriction in the use of commercial and recreational shellfish beds and specific regulations requiring best management practices to control pollutants from boat repair facilities associated with marinas and recreational boating. The revised guidelines shall also specify that local governments must condition shoreline permits for marinas to require boater education and to provide for proper boat sewage disposal facilities.

Target Date: Revised guidelines by January 1991.

Local jurisdictions shall amend their shoreline master programs to be consistent with the revised WAC 173-16.

Target Date: Programs amended by January 1992.

[**Status:** Since the target date is 1992, implementation of this element has not yet begun.]

MB-2. Model Ordinances for Sewer Hookups for Liveaboards

DSHS shall draft a model ordinance requiring slipside pumpouts ("sewer hookups") or other means of sewage disposal for liveaboards at public and private marinas. Local governments shall be encouraged but not required to adopt and enforce ordinances requiring slipside pumpouts or other sewage disposal methods. The ordinance shall be accompanied by a report providing information for local governments on designing and installing slipside pumpouts at marinas and methods of ensuring their use by liveaboard boaters.[12] Following publication of the model ordinance and report, DSHS shall evaluate progress under the nonmandatory program and recommend additional action as necessary.

Target Date: January 1, 1989.

[**Status:** DSHS is currently working on preparation of the ordinance, and expects to complete it by January 1989.]

MB-3. Boaters Task Force

The State Parks and Recreation Commission shall form a task force consisting of representatives from the boating community, PSWQA, DSHS, WDF, DNR, Ecology, Interagency Committee for Outdoor Recreation, tribes, shellfish

12 The discharge of untreated sewage from liveaboard boats at a marina is currently illegal under the general provisions of the Clean Water Act. The provision of a model ordinance is intended to assist local governments in dealing with illegal discharges from liveaboard boats. The discretionary nature of the ordinances does not mean discharge of sewage is legal where such ordinances have not been adopted.

growers, marina owners, the Washington Public Ports Association, the marine sanitation industry, owners of small commercial vessels, and other appropriate entities to accomplish the following tasks:

a. Design an accelerated education program to be implemented by State Parks and Recreation with the following purposes:

i. Encourage the use of marine sanitation devices (MSDs) in shallow water bays and other sensitive areas.[13]

ii. Discourage anchoring near shellfish beds.

iii. Encourage environmentally safe habits in the use of antifouling paint, cleaning agents, and petroleum products.

In designing the education program the task force shall include an ongoing evaluation of the effectiveness of the program, including its effectiveness with regard to boats anchoring near commercial shellfish beds. This evaluation shall be used by DSHS in its determination of the need for anchorage prohibitions (MB-8).

Target Date: Task force convened by July 1, 1987. Education program underway by January 1988 (for 1988 boat shows).

b. Prepare legislation requiring sufficient pumpout facilities at existing and new moorage facilities (marinas, yacht clubs [including outstations], and parks with moorage). The legislation shall not require pumpouts at all moorage facilities but shall specify circumstances where pumpouts shall be required and shall establish an enforcement program. Legislation shall also specify (or require a rulemaking process to specify) operating characteristics of pumpouts including water depth, pumping pressure, maneuvering room, fees, and operating hours.

Target Date: Legislation submitted to 1989 legislature.

[**Status:** The Boaters Task Force has assisted State Parks in developing the Boater Education Program and the pumpout legislation. State Parks will submit the legislation during the 1989 session.]

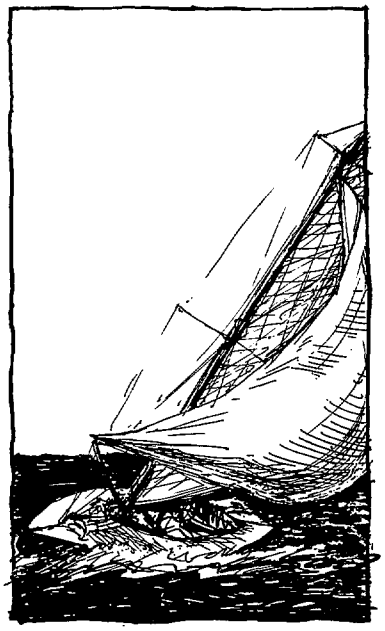
3.1. Boater Education Program

The State Parks and Recreation Commission shall implement the following three-phase boater education program developed by the Boaters Task Force:

Phase 1, Boater Survey. State Parks, in cooperation with DSHS (MB-6), the Washington Public Ports Association, and other appropriate organizations, shall conduct a survey of boaters' waste disposal practices and shall provide educational materials, developed in consultation with the Boaters Task Force, to those surveyed.

Target Date: Survey conducted and educational materials distributed summer of 1988.

13 Sensitive areas are defined as restricted water bodies where discharge of untreated sewage from boats is especially detrimental because of limited flushing, shallow water, commercial and recreational shellfish, swimming areas, or other characteristics.



Phase 2, Program Design. State Parks shall design, based in part on the results of the phase 1 boater survey, a long-term boater education program for target audiences, conduct an annual training program for park rangers and other appropriate groups, and identify mechanisms to distribute educational and interpretive materials. The program shall (a) provide information to boaters on how to properly select, install, and operate a marine sanitation device (MSD); (b) encourage the use of MSDs, pumpout facilities, and dump stations; (c) discourage the anchoring of boats and the discharge of Types I and II MSDs within areas where commercial and recreational shellfish beds are located; and (d) include information for boaters and marina operators about environmentally sound use of antifouling paints, cleaning agents, and petroleum products. Appropriate information developed from the boater education program shall be coordinated with the nonpoint technical assistance team (NP-6).

Target Date: Report on survey results submitted to the Authority by January 1, 1989. Preparation of educational materials for specific audiences completed by February 1, 1989. First annual training of park rangers completed by May 1989 at park ranger regional meetings.

Phase 3, Program Implementation and Evaluation. State Parks shall work with local governments and boating groups and encourage the use of state public educational materials to develop local boater environmental education programs. State Parks shall complete the construction of interpretive signs at marine state parks where pumpout and dumpout facilities are installed (MB-4) and shall consider installing such signs at marinas where DSHS conducts its water quality studies under MB-6. State Parks, in coordination with the Boaters Task Force, shall evaluate the effectiveness of the boater education program in coordination with DSHS water quality studies under MB-6. This evaluation shall be used by DSHS in its consideration of no discharge (MB-7) and no anchoring (MB-8) areas and by State Parks in its enforcement of MSD regulations (MB-5). State Parks representatives shall assist the Nonpoint Technical Assistance Team in providing information on boats and water quality to watershed management committees.

Target Date: State Parks to contact local governments by July 1989. Installation of interpretive signs at existing pumpout stations at state parks by June 1990. Complete first annual program evaluation by December 1990.

[**Status:** State Parks conducted the boater survey during the summer of 1988. Design and implementation of the education program is underway.]

MB-4. Construction of Pumpouts at Priority State Parks

The State Parks and Recreation Commission shall install pumpout stations at selected state parks with priority given to parks located in poorly flushed bays with shellfish resources and without other nearby pumpout facilities. State Parks shall consult with PSWQA, DSHS, Ecology, WDF, DNR, and the Boaters Task Force of MB-3 for assistance in identifying those parks with the highest need for pumpouts.

Target Date: Installation of at least one pumpout by the summer of 1988, additional pumpout services at up to four state parks by the summer of 1991, and at two more parks per year thereafter until the need for pumpout services is met.

[**Status:** State Parks installed a pumpout at Mystery Bay State Park in the summer of 1988, and the Boaters Task Force has developed a list of recommended additional sites for pumpouts.]

MB-5. Enforcement of MSD Regulations

State Parks and Recreation shall develop a comprehensive strategy to ensure compliance with federal marine sanitation device (MSD) installation and use. The strategy shall include methods to protect environmentally sensitive areas. In developing the strategy, State Parks shall consult with the U.S. Coast Guard, DNR, the Environmental Protection Agency, the Departments of Social and Health Services, Ecology, Natural Resources, Fisheries, and Wildlife, sheriff's departments, local governments, and the boating community. Public meetings shall be held in several locations in Puget Sound to take comment on the strategy prior to its adoption. If State Parks and the consulted agencies and groups determine a memorandum of understanding with the Coast Guard is a preferred strategy, State Parks shall take early action to obtain an MOU with the U.S. Coast Guard and prepare any necessary legislation to permit state inspection of recreational vessels and other uninspected vessels under 65 feet in length for marine sanitation devices (MSDs).

In developing the strategy, State Parks and the consulted agencies and groups shall consider including an inspection program coordinated with the accelerated education program (MB-3) and focused on shallow water bays and other sensitive areas. State Parks shall also consider including enforcement of "no anchorage" areas and "no discharge" areas if instituted under MB-7 and MB-8 below. Parks and Recreation shall consult with the Boaters Task Force (MB-3) for assistance in designing an effective enforcement program to complement the education program.

Target Date: State Parks takes early action, if necessary, to negotiate an MOU with the Coast Guard and prepare any necessary legislation by July 1, 1990. Implementation of strategy begins by July 1, 1991.

[**Status:** Since the target date is 1990, implementation of this element has not yet begun.]

MB-6. Monitoring Program for Boating Areas

DSHS shall conduct an ongoing water quality monitoring program of boating areas to determine the extent of contamination by boats, to provide information for use in the boater education programs and watershed action plans (NP-2 through NP-4), and to evaluate the effectiveness of various control methods. The surveys shall include water and shellfish samples and boat counts. The monitoring program shall be consistent with the Puget Sound Ambient Monitoring Program.

Target Date: Ongoing.

[**Status:** DSHS has selected five sites and begun monitoring.]

MB-7. Study of "No Discharge" Areas

Two years after the implementation of MSD enforcement (MB-5), Ecology and DSHS shall evaluate the need for "no discharge"[14] areas; if a need is found, Ecology shall apply to EPA for their designation. Need shall be based

14 "No discharge" areas are areas where the use of Type I and Type II MSDs (treatment devices as opposed to Type III holding tanks) is prohibited. Vessels with Type I and Type II devices are permitted in "no discharge" areas but may not discharge. The process of designation requires application by the governor or the Department of Ecology to the U.S. Environmental Protection Agency and a showing that sufficient pumpout facilities for all vessels exist.

upon the inability to achieve water and shellfish quality standards in boating areas if Type I and II MSDs are permitted. In making a determination as to whether a boating area needs a "no discharge" designation, Ecology and DSHS shall consider the water circulation and other natural characteristics of the area, the presence of commercial and recreational shellfish and swimming areas, the results of the monitoring of boating areas (MB-6), the number of boats using an area, and, if applicable, the percent of boats with Type I and II devices found by the inspection program (MB-5).

Target Date: Study complete and any applications to EPA made by December 1992.

[**Status:** Since the target date is 1992, implementation of this element has not yet begun.]

MB-8. "No Anchorage" Areas

DSHS shall provide ongoing evaluation of the results of the monitoring of boating areas and the success of the education program (MB-3) in protecting commercial and recreational shellfish beds from closures due to anchored boats. If DSHS finds that the education program has been unsuccessful in protecting commercial and recreational shellfish beds from such closures, DSHS shall draft legislation with anchorage prohibitions to prevent any restriction in the use of commercial and recreational shellfish beds. "No anchorage" areas shall be enforced by State Parks and Recreation as part of its MSD enforcement program (MB-5). The education program shall warn boaters of the potential for anchorage prohibitions if the education program is unsuccessful in achieving water quality and shellfish standards in boating areas.

Target Date: If necessary, legislation shall be submitted to the 1992 legislature.

[**Status:** Evaluation of the effectiveness of the Boater Education Program (MB-3) and the results of monitoring (MB-6) will occur by 1992.]

Forest Practices

FP-1. Timber/Fish/Wildlife Project

The Authority endorses the Timber/Fish/Wildlife Project and the revisions in 1987 and 1988 to the Forest Practices Act and Regulations. The Authority supports in concept the process and proposed regulatory and programmatic changes outlined in the T/F/W Final Report (February 1987). In particular, the Authority supports the T/F/W approach of significantly increasing enforcement and monitoring of forest practices, preplanning and basin planning, interdisciplinary identification (ID) teams, data management, a comprehensive program for identifying and correcting problems with orphaned roads, riparian management zone regulations, extended forest practice application review period (extended from 15 to 30 days), reorganization and staff increases at DNR, and continuing program evaluation. The Authority will support statutory and regulatory actions, including any federal and state funding proposals, necessary to implement the T/F/W Agreement.

The Authority will review and comment on major milestones and documents of the T/F/W Project as they relate to Puget Sound, both providing the Forest Practices Board with comments on regulatory and policy initiatives of the T/F/W Project and participating in the annual T/F/W evaluation process.

[**Status:** The Authority has continued its participation in the T/F/W process.]

MAJOR PUBLIC ACTIONS FOR REVIEW[15]

1. The results of the study by DSHS evaluating the need for revisions to WAC 248-96 for on-site septic systems and any subsequent proposed revisions (NP-10).

2. Ecology guidelines on shoreline master program requirements for marina siting and design (MB-1).

3. Washington Conservation Commission Cost Share Program (NP-14).

LEGISLATION REQUIRED

1989 Session

1. Legislation requiring sellers to provide septic system information to purchasers prior to transfer and financing of property (NP-11).

2. Legislation for pumpout facilities at existing and new moorage facilities (MB-3).

Subsequent Sessions

1. Legislation amending RCW 18.43.070 to allow inclusion of professional engineers among the professionals to be covered by the state certification program for designers and installers of on-site systems (NP-12).

2. Legislation would be required to expand Boating Safety enforcement powers to allow inspections of marine sanitation devices on vessels (MB-5).

3. If "no discharge" areas are designated, legislation would be required to prohibit use of Type I and Type II MSDs in those areas (MB-7).

4. Legislation would be required to prohibit anchorage near commercial and recreational shellfish beds (MB-8).

5. Legislation or constitutional amendment may be required to establish a cost-sharing program (NP-14).

ESTIMATED COST

The estimated cost for the nonpoint program is approximately $13.6 million in the FY 1990-91 biennium. Full funding for this program for the biennium would have cost approximately $20 million, but only 68 percent of that total is being requested for FY 1990-91. Costs will increase to $9.4 million in fiscal year 1992, and decrease to $8.9 million in fiscal year 1993 and $6.9 million in fiscal year 1994. Cost estimates for each element for fiscal years 1989 through 1994 are shown in the following tables.

Costs are for developing and implementing watershed action plans and carrying out augmented state programs for forest practices, marinas and boats, commercial dairy farms, and on-site septic systems. Most elements would likely be financed from the Centennial Clean Water Fund, state general fund and capi-

15 Although PSWQA will not be reviewing as major public actions the actual selection of priority watersheds or the individual action plans adopted for each priority watershed, the selection process and the plans will be reviewed by PSWQA through its general oversight role, as part of the audit of the program described in NP-7, and through the reports required of state agencies and local jurisdictions described in Chapter 6.

tal funds, and/or local government general funds. Fees (for on-site systems inspections and maintenance) or rates (for watershed action plan components) are other possible funding sources.

Some of the costs for controlling nonpoint pollution would be borne by the private sector. At the local level, in watershed action plans (NP-4), there will be costs for implementing agricultural and stormwater BMPs and for on-site septic system pumpouts or possible replacement.

Agricultural BMP costs may be minimal, for example, sealing leaks in animal confinement areas; moderate, for example, stream fencing (approximately $1.00/foot plus watering costs); or high, for example, building manure lagoons. The cost of constructing lagoons may be $50,000 or more per farm. However, farmers implementing BMPs may be eligible for cost-sharing with government agencies.

The costs of stormwater BMPs vary widely depending upon the nature of the source and the type of BMP or good housekeeping measure needed. Two examples of stormwater BMPs are building berms and paving drum storage areas at industrial sites and constructing detention basins at residential and commercial developments. Examples of costs for stormwater BMPs are given in the Stormwater and CSOs program.

On-site septic systems can be pumped out for about $120, but if they need to be repaired or replaced, the costs would be much higher. For example, a new drainfield would cost $1,000 to $2,000 while costs for alternative systems range from $3,000 to $10,000. Low-interest loans from the state Department of Community Development may be available in some cases for sewering areas with high numbers of on-site system failures.

There will also be private sector costs for state-level programs. Costs related to the Dairy Waste Management Plan (NP-13) will be for implementing BMPs to minimize pollution from agricultural practices, as mentioned above for the watershed action plans, and may be subject to cost-sharing. Providing required information about on-site systems at property transfers (NP-11) is expected to cost about $75 per transfer.

In the marinas and boats program, State Parks estimates an average cost of $100,000 for pumpout facilities at state parks. Although some boaters may have to spend money installing marine sanitation devices because of the state enforcement program (MB-5) ($200 to $1,000 depending on type of MSD and installation costs), the requirement for MSDs already exists in federal regulations. Similar costs would be borne by boaters with Type I or II MSDs who might wish to use their toilets legally in "no discharge" areas (MB-7) and therefore might choose to replace their MSDs with holding tanks (replacement would not be required by law). Boat repair facilities may also incur additional costs for runoff controls, and marinas may incur costs for education and sewage treatment facilities resulting from the revised shoreline master program guidelines (MB-1).

For forest practices, there is a potential for private sector costs from actions taken through the T/F/W Project.

ESTIMATED PLAN COSTS: NONPOINT SOURCE POLLUTION

COST BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
NP	Administration	0	0	127,046	127,046	127,046	127,046	127,046
NP-1	Selection of Priority Watersheds	176,978	162,000	0	0	0	0	0
NP-2	Guidelines for Watershed Action Plans	152,545	103,644	5,704	5,704	0	0	0
NP-3	Watershed Management Committees	1,410,133	962,053	962,053	1,197,333	1,197,333	1,013,253	
NP-4	Plan Adoption and Implementation	1,576,739	1,024,416	2,384,307	1,666,309	3,128,734	2,699,401	1,123,404
NP-5	Program Funding and Incentives	35,000	35,000	150,000	150,000	288,000	288,000	72,000
NP-6	Technical Assistance for Watershed Plans	267,290	250,567	488,981	504,857	703,484	703,484	671,732
NP-7	Program Management	49,864	253,116	197,095	197,095	289,862	289,862	289,862
NP-8	Education Programs	77,576	20,000	56,988	56,988	96,988	66,988	76,988
NP-9	Prevention	13,748	1,025,047	7,500	3,750	0	0	0
NP-10	On-Site Regulations and Programs	39,733	79,466	135,545	135,545	135,545	135,545	135,545
NP-11	On-Site Inspections and Education	30,777	60,000	45,000	45,000	60,000	60,000	60,000
NP-12	Certification of On-Site Professionals	30,777	30,777	27,109	59,640	81,327	81,327	81,327
NP-13	Dairy Waste Management Plan	308,560	2,067,562	1,755,410	1,384,348	1,932,333	1,916,957	1,916,957
NP-14	Cost-Sharing Program	0	41,628	20,916	20,916	29,879	29,879	29,879
NP-15	Larger/Alternative On-Site Systems/Septage	0	0	0	0	162,654	162,654	162,654
MB-1	Shoreline Amendments for Marinas	0	0	151,533	149,226	0	0	0
MB-2	Model Ordinances for Liveaboards	14,748	5,499	5,421	5,421	5,421	5,421	5,421
MB-3	Boaters Task Force	149,269	132,520	209,400	217,086	270,502	270,502	270,502
MB-4	Construction of Pumpouts at Priority State Parks	555,000	107,000	193,000	193,000	230,000	230,000	230,000
MB-5	Enforcement of MSD Regulations	20,000	20,000	40,674	607,724	536,394	536,394	536,394
MB-6	Monitoring Program for Boating Areas	25,881	53,761	48,796	48,796	54,218	54,218	54,218
MB-7	Study of "No Discharge" Areas	0	0	0	0	103,790	0	0
MB-8	"No Anchorage" Areas	0	0	5,421	10,843	13,554	0	0
TOTAL		$4,934,618	$6,882,136	$7,017,901	$6,551,349	$9,447,063	$8,855,011	$6,857,181

Element Notes

NP	Ecology administrative costs for nonpoint program as a whole.
NP-3	Assumes 15 watersheds underway in fiscal year 1990.
NP-4	Local planning staff are budgeted under NP-3. All watersheds are assumed to have septic programs, 80% are assumed to have farm programs and 25% are assumed to have stormwater programs. PSWQA will review watershed actiion plans and other reports with Ecology. Ecology costs are included under NP-7.
NP-5	Assumes 12 conservation districts, budgeted under NP-3 and NP-4.
NP-14	Cost estimate covers development of a cost sharing program but not implementation.
MB-7	Enforcement is budgeted under MB-5.

NONPOINT SOURCE POLLUTION

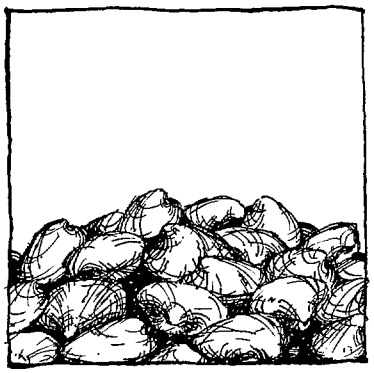
COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Sea Grant & Coop Extension	0	0	9,750	9,750	32,500	32,500	32,500
Ecology	252,518	593,552	815,823	812,554	1,186,484	1,067,318	1,067,318
DSHS	281,604	233,431	327,157	359,688	587,584	564,029	564,029
PSWQA	98,093	74,596	62,745	62,745			
Fisheries	12,498	12,498	57,153	68,267	133,358	133,358	101,606
Wildlife	10,999	10,999	17,349	13,345	26,691	26,691	26,691
Parks and Recreation	701,772	237,023	408,439	1,005,921	1,040,896	1,040,896	1,040,896
Natural Resources	11,499	11,999	13,721	13,721	34,302	34,302	34,302
Conservation Commission	79,792	104,872	80,675	80,675	139,518	119,518	129,518
Agriculture	12,247	11,873	6,408	6,408	32,040	32,040	32,040
Washington Conservation Corps	35,000	35,000	195,000	195,000	348,000	348,000	132,000
Local Government	3,032,597	5,393,894	4,560,959	3,460,555	5,117,692	4,688,359	3,422,362
Conservation Districts	406,000	162,400	462,720	462,720	768,000	768,000	273,920
TOTAL	$4,934,618	$6,882,136	$7,017,901	$6,551,349	$9,447,063	$8,855,011	$6,857,181

COSTS BY FUNDING SOURCE							
Capital Account	549,000	0	175,000	175,000	200,000	200,000	200,000
Centennial Clean Water Fund	2,636,739	3,517,116	3,619,957	2,768,707	4,325,954	4,087,954	2,738,594
State General Fund	947,021	1,325,842	1,819,222	2,453,074	3,361,372	3,198,652	2,960,900
Local Sources	801,858	2,039,178	1,403,722	1,154,568	1,559,737	1,368,405	957,687
TOTAL	$4,934,618	$6,882,136	$7,017,901	$6,551,349	$9,447,063	$8,855,011	$6,857,181

SHELLFISH PROTECTION

PROBLEM DEFINITION

Importance of the Shellfish Resource



Puget Sound is one of the most productive shellfish growing areas in the country. The Department of Ecology determined that the commercial harvest of oysters, clams, and mussels in 1987 was over 14 million pounds, with an estimated retail value of $76 million. Ecology has noted that existing commercial shellfish operations represent only a fraction of the potential production of Puget Sound. In addition, Ecology has estimated the economic losses attributable to prohibited, restricted, or conditionally approved shellfish beds to be over $3 million annually.

The Department of Fisheries estimates that over one million recreational clamming trips are made to Puget Sound each year, yielding over 3.3 million pounds of clams for an approximate retail value of over $11.2 million. Fisheries also reports that in 1986 approximately 57,700 pounds of oysters were harvested in Hood Canal for noncommercial consumption, a potential retail value of approximately $250,000.

The value of the shellfish resource, however, extends far beyond strictly economic benefits. There are few other places where the tie between people and their natural surroundings is as close as on Puget Sound. An important part of this tie is the use of the Sound's shellfish resource—for years people have depended on shellfish for food or have enjoyed shellfish harvesting. For numbers of people, including many who do not themselves harvest shellfish, these and other living resources of the Sound represent historical and cultural values integral to the quality of life of the region.

Causes of Contamination

Some commercial shellfish beds in Puget Sound were closed to harvest as early as the 1950s. These early closures occurred mainly in urbanized areas due to the beds' proximity to sewage treatment plants and other urban sources of pollution. A significant change in this pattern has occurred since 1981. Most restrictions placed on harvesting shellfish now occur in rural, not urban, bays. Animal-keeping practices, failing on-site septic systems, stormwater, sewage treatment plants, marinas, and boats are all sources of fecal coliform bacteria and have been implicated in recent harvest restrictions at commercial shellfish beds.

Since December 1986 five additional commercial shellfish beds have been reclassified to a more restrictive status. Preliminary results of monitoring under the recreational shellfish program (SF-4) show five recreational sites that consistently exceed fecal coliform standards. An ongoing Department of Social and Health Services/Environmental Protection Agency study of 25 recreational shellfish areas (SF-3) has revealed bacterial contamination at three sites that consistently exceeded national shellfish standards throughout the two-year study.

There is limited information on toxic contamination of commercial and recreational shellfish in Puget Sound. The DSHS study at recreational beaches (SF-

3) includes testing for some toxicants. This testing may be expanded by DSHS if results indicate potential toxic contamination of shellfish.

PROGRAM STATUS

The two major elements of the shellfish protection program are the restoration and protection of commercial shellfish beds (SF-2) and the recreational shellfish program (SF-4). Both of these elements are well into the implementation phase. Six "early action" shellfish watershed programs are in place around the Sound as part of the nonpoint source pollution program (SF-2). Ecology provides technical assistance to these local programs, and DSHS coordinates its monitoring of shellfish beds with watershed management committees. Based on the results of the DSHS-EPA study of toxicant levels in Puget Sound shellfish, DSHS is conducting additional sampling under the toxicant testing program to establish baseline and trend information (SF-3).

Under the recreational shellfish program (SF-4), DSHS has inventoried recreational shellfish beds, established a schedule for monitoring these beds, and initiated sampling at many sites. DSHS is drafting regulations it will propose to the state Board of Health that will govern the recreational harvest of shellfish. The Recreational Shellfish Program Committee has outlined a restoration and protection grants program for local government projects to protect recreational shellfish. Preliminary results from monitoring of recreational shellfish areas show that harvesting at a significant number of these beaches may have to be restricted due to bacterial pollution. There may be a need, therefore, for a higher number of recreational shellfish restoration projects than anticipated in the 1987 plan.

DSHS published the first annual inventory of shellfish resources (SF-5) in July 1988. It has been distributed to local health agencies, Ecology, other state agencies, and watershed management committees. The Ecology funding assessment (SF-6) will begin by 1989. Several public involvement and education activities have taken place (SF-7). Ecology included education and involvement in its contract requirements for the six early action shellfish watersheds. Ecology also developed a shellfish and watershed display for the early action watersheds. The Department of Fisheries will soon expand and reprint its shellfish booklet. DSHS public information staff coordinate the agency's educational activities related to the Puget Sound plan.

PROGRAM GOAL

To prevent contamination of commercial and recreational shellfish beds. Beginning in 1989, to reopen (upgrade classification) at least one commercial shellfish bed every year.[16] To prevent additional closures of commercial and recreational shellfish beds. To ensure continued measurable improvement in water quality at all shellfish beds.

16 "Commercial shellfish beds" refers to growing areas that are classified by Ecology as "closed/correctable", that are not intensively developed, that do not have major or numerous sewage discharges, and that may be reopened by application of pollution control strategies such as those developed under the Nonpoint Source Pollution Program. DSHS uses the classification system of the National Shellfish Sanitation Program. "Upgrade classification" refers to this national system where shellfish beds may be reclassified up from a more restrictive to a less restrictive status, such as from "restricted" to "prohibited" or from "conditionally approved" to "approved."

[**Status:** DSHS has significantly expanded its monitoring program and, as a consequence, has restricted harvest at several more shellfish beds since the plan was adopted. Most restrictions were due to nonpoint pollution.]

STRATEGY

The strategy for achieving this goal is to (1) adopt shellfish policies that will ensure that pollution source control programs protect shellfish; (2) respond to existing and potential shellfish contamination with an aggressive restoration and protection program; (3) test for toxicants in targeted commercial and recreational shellfish beds; (4) begin monitoring in recreational shellfish areas, implement recreational shellfish restoration and protection projects, and adopt rules governing the recreational harvest of shellfish; (5) develop an inventory and data base on the location and status of shellfish resources;(6) identify funding sources for shellfish protection programs; and (7) increase public involvement and education in shellfish protection.

PROGRAM ELEMENTS

SF-1. Shellfish Protection and Restoration Policy

In developing the programs for Nonpoint Source Pollution (including local watershed action plans), Stormwater and Combined Sewer Overflows, and Municipal and Industrial Discharges, state and local agencies shall ensure that the programs meet these objectives:

a. Protection of shellfish beds from contamination and from reclassification to a more restrictive status;

b. Lifting of harvest restrictions at commercial beds, especially closed/correctable areas; and

c. Reduction of contamination of recreational shellfish beds.

Target Date: Upon plan adoption.

[**Status:** This element is on schedule.]

SF-2. Restoration and Protection of Commercial Shellfish Beds

Ecology, in cooperation with PSWQA, DSHS, and local governments, shall continue and expand its existing shellfish protection program, to be implemented primarily under the nonpoint priority watershed program (NP-1 through 4). The objective of this shellfish program is to reopen closed/correctable commercial shellfish beds and protect open/high threat commercial beds. The program provides that:

a. Current Ecology/local government shellfish projects shall be treated as early action watersheds under the nonpoint program, and future Ecology grants to local governments for shellfish protection shall be integrated with the nonpoint program. Ecology shall provide technical assistance, in coordination with the nonpoint technical assistance team (NP-6), to local governments, tribes, conservation districts, or other entities carrying out shellfish projects under the nonpoint program. Where shellfish beds needing restoration or protection projects are not being addressed under the nonpoint program watershed management process (NP-3 and NP-4), Ecology shall attempt to target other funding sources on these shellfish beds.

Other funding sources may include Clean Water Act Section 205(j) grants or Section 319 funds, EPA monies, or funds from the discretionary category of the Centennial Clean Water Fund.

b. DSHS shall (i) expand and coordinate its investigations and monitoring program with Ecology, tribes, and local governments; (ii) retest sites where harvest restrictions apply; (iii) monitor sites being addressed by local shellfish protection projects; and (iv) develop plans for those watersheds not addressed under the nonpoint program. Information on monitoring results and source investigations shall be transmitted as soon as available to Ecology and the appropriate local governments and local health agencies, tribes, and agencies.

c. The Authority shall review during the plan revision process the success of state and local agencies in controlling identified and potential sources of shellfish contamination.

Target Date: Ongoing.

[**Status:** The Authority has reviewed the success of shellfish watershed action plans and has adopted several Puget Sound plan revisions to assist local governments, tribes, and state agencies in controlling nonpoint pollution of shellfish resources. The shellfish watersheds have been incorporated into the nonpoint early action watershed program. DSHS has expanded and coordinated its monitoring program, including restoration monitoring and planning. The department has placed harvest restrictions on five additional commercial shellfish beds (eight recreational shellfishing areas exceed standards).]

SF-3. Testing Selected Shellfish Beds for Toxicants

DSHS shall establish an ongoing program, consistent with the Puget Sound Ambient Monitoring Program and including the use of Puget Sound protocols, to test for toxicants at commercial and recreational areas beginning where recent studies have found toxicants to occur. The results of the tests shall be used to establish baseline and trend information on toxicants in shellfish around the Sound. Beds where toxicants exceed existing FDA action levels, or other accepted standards as developed, shall be closed and routinely reevaluated. PSWQA shall request FDA to reconsider, in consultation with EPA and NOAA, the need to establish standards and require testing for toxicants not covered by existing FDA action levels.

Target Date: Ongoing.

[**Status:** This element is proceeding on schedule.]

SF-4. Recreational Shellfish Program

Representatives from Ecology, DSHS, Fisheries, DNR, State Parks, tribes, a public interest group, and local health departments (with DSHS and Ecology as co-leads) shall comprise a committee for jointly developing a program to protect recreational shellfish from pollution, including: responsibilities of agencies; a schedule that identifies which recreational beds will be tested within a given time frame; water quality and shellfish tissue sampling—consistent, to the extent practicable, with the Puget Sound Ambient Monitoring Program—in targeted recreational areas; public notification about areas that do not meet Board of Health regulations governing the recreational harvest of shellfish; and initiation of restoration and protection projects in contaminated or threatened areas.

Under the authority of RCW 43.20 DSHS shall propose regulations governing the recreational harvest of shellfish for consideration by the state Board of Health for adoption. DSHS shall evaluate the effectiveness of these rules and submit the evaluation to the Authority.

Target Dates: Submit scope of work to PSWQA by October 1, 1987. Begin implementation of survey and testing of recreational areas by October 1, 1987. Adopt regulations by February 1, 1989. Start restoration projects by July 1, 1989. Submit evaluation of rules by January 1, 1990.

[**Status:** The Recreational Shellfish Program Committee has developed an outline of a plan to guide this program and has drafted recommendations for the restoration and protection projects grants. DSHS has inventoried recreational shellfish beaches and begun monitoring. DSHS will present proposed regulations governing the recreational harvest of shellfish to the Board of Health in late 1988. EPA has funded a recreational shellfish restoration project at Penrose Point State Park.]

SF-5. Annual Inventory and Information Management

DSHS shall annually publish and distribute to local health departments, Ecology and other state resource agencies, tribes, and local watershed management committees (see NP-3) an inventory of all shellfish beds, including sites in the Puget Sound basin where recreational and commercial shellfish beds have been found to be contaminated, indicating the types of contamination tested for and the types found. DSHS, in coordination with the Puget Sound Ambient Monitoring Program, shall prepare a guide to all existing data bases and information sources on the shellfish resource. DSHS shall consult with Ecology, the Departments of Fisheries and Natural Resources, the State Parks and Recreation Commission, tribes, and local health agencies and shall update and distribute the guide annually to watershed management committees, recreational shellfish restoration projects, and the entities named above.

Target Date: Distribute first inventory by November 1, 1987. DSHS distributes first shellfish information guide by July 1, 1990.

[**Status:** The first annual inventory was completed and distributed in July 1988.]

SF-6. Funding Sources Assessment

Ecology shall assess the adequacy of existing funding mechanisms for shellfish protection programs, identify new sources, and develop and implement a strategy for securing funds. Ecology shall consult with its Shellfish Protection Advisory Committee and with PSWQA and the Departments of Fisheries and Natural Resources in the development of this program. Ecology shall also consult with DNR about the use of funds from the Aquatic Lands Enhancement Account for the shellfish program.

Target Date: Submit assessment to PSWQA by May 1, 1989. Implement strategy by January 1, 1990.

[**Status:** Ecology will begin this element by 1989 in coordination with C-1.]

SF-7. Public Involvement and Education

Ecology, in consultation with the Recreational Shellfish Program Committee and the Departments of Social and Health Services, Fisheries, and Natural Resources shall implement a program for public involvement in and education on the protection of the shellfish resources of Puget Sound.

The program shall implement improved mechanisms for disseminating information among agencies and to the public on shellfish issues, especially beach closures and public health risks. The program shall also include procedures for coordinating workshops and the updating and distribution of agency shellfish publications, citizen involvement in shellfish protection projects, and the prevention of shellfish contamination.

DSHS and local health departments shall implement a program of posting, press releases, and other techniques to prevent harvesting of contaminated shellfish and to inform the public, including shellfish growers, of commercial and recreational shellfish contamination and closures and of programs addressing these issues.

The Department of Fisheries shall establish a work group that includes agencies, boaters, shellfish growers, and tribes to develop an interpretive program at an appropriate location in Puget Sound (element ES-4.4).

Ecology and other agencies shall include, as appropriate, information about shellfish and shellfish protection in other educational programs developed under the Puget Sound plan. Education shall be a required element of all local programs under SF-2 and SF-4 and shall be included, as appropriate, in nonpoint program watershed action plans, nonpoint technical assistance team activities (NP-6), and the boater education program (MB-3).

Target Date: Ecology submits progress report to the Authority by November 1, 1989. Fisheries begins interpretive program by May 1, 1990.

[**Status:** Ecology has included education and involvement in its contract requirements for the six early action shellfish watersheds. Ecology also has developed a shellfish and watershed display for the early action watersheds. The Department of Fisheries expanded and reprinted its shellfish booklet, and DSHS public information staff coordinates the agency's Puget Sound plan public education activities.]

MAJOR PUBLIC ACTIONS FOR REVIEW

1. Restoration/protection program for commercial shellfish beds (SF-2)
2. DSHS program for testing of toxicants in selected areas (SF-3).
3. Recreational shellfish program and regulations (SF-4).
4. Funding sources assessment (SF-6).
5. Public involvement and education program (SF-7).

LEGISLATION REQUIRED

None

ESTIMATED COST

The shellfish program is estimated to cost approximately $4.6 million in the FY 1990-91 biennium. The greatest costs are for implementation of the recreational shellfish program (SF-4). This cost is approximately evenly divided between monitoring and restoration. Most costs for continuation and expansion of Ecology's shellfish protection program under SF-2 are estimated in element NP-3, 4, and 6 of the nonpoint program. Additional program

development, administration, education, and other shellfish program support activities are postponed to the FY 1992-93 biennium, reducing the FY 1990-91 budget request by approximately $0.5 million.

Private sector costs resulting from shellfish restoration and protection projects would primarily involve repairs for failed on-site septic systems or implementation of farm animal waste control programs. These costs are discussed in the nonpoint program.

ESTIMATED PLAN COSTS: SHELLFISH PROTECTION

COSTS BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
SF	Administration	0	0	18,598	18,598	18,598	18,598	18,598
SF-2	Restoration & Protection of Commercial Beds	186,261	187,261	334,978	334,978	323,570	323,570	323,570
SF-3	Testing Selected Beds for Toxicants	26,663	27,663	0	0	0	0	0
SF-4	Recreational Shellfish Program	131,348	817,468	1,534,975	1,534,975	1,586,986	1,586,268	1,586,268
SF-5	Annual Inventory & Information Management	29,819	29,819	48,214	48,214	48,214	48,214	48,214
SF-6	Funding Sources Assessment	0	62,905	38,533	32,829	32,829	32,829	32,829
SF-7	Public Involvement & Education	66,952	346,062	342,141	352,141	417,965	391,299	391,299
TOTAL		$441,044	$1,471,179	$2,298,842	$2,303,138	$2,409,564	$2,382,179	$2,382,179

Element Notes

SF-4 Includes DSHS funding to carry out Board of Health regulations and to certify and fund local labs. Includes Ecology funding for program development, project selection, grants administration, data management and technical assistance, and coordination with other agencies.

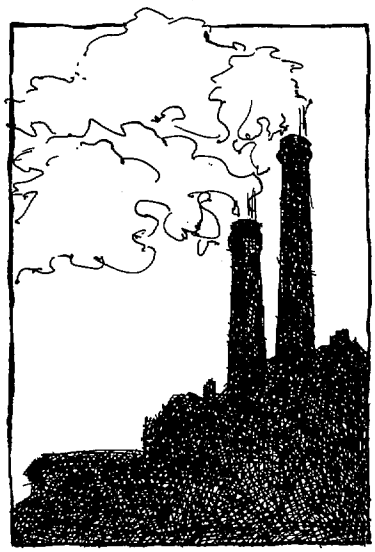
SF-7 Includes funding for activities and materials that would support the Education Strategy in the Education program.

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Ecology Pass Through to Local	0	0	205,000	205,000	255,000	255,000	255,000
Ecology	54,177	145,381	159,916	159,916	159,916	159,916	159,916
DSHS	366,371	807,134	840,461	840,461	840,461	840,461	840,461
PSWQA	5,499	5,499	37,077	31,373			
Fisheries	3,999	24,339	177,931	187,931	275,012	275,012	275,012
Parks and Recreation	5,499	5,499	4,781	4,781	5,499	4,781	4,781
Natural Resources	5,499	24,622	0	0	0	0	0
Washington Conservation Corps	0	0	108,360	108,360	108,360	108,360	108,360
Local Government	0	458,705	765,317	765,317	765,317	738,650	738,650
TOTAL	$441,044	$1,471,179	$2,298,842	$2,303,138	$2,409,564	$2,382,179	$2,382,179

MUNICIPAL AND INDUSTRIAL DISCHARGES

PROBLEM DEFINITION

Environmental Problems



Industries and municipal sewage treatment plants release about 900 million gallons of effluent (wastewater) to Puget Sound every day.[17] Municipal and industrial discharges of wastewater are often referred to as "point sources" of pollution because they are discharged into the water at a specified point such as a pipe or ditch.

Extensive and continuing efforts to control conventional pollutants[18] from point sources with wastewater discharge permits have proved increasingly successful, and water quality problems related to these pollutants are now relatively rare in Puget Sound.[19] Where such problems do occur, they are generally localized and transient.

Toxic pollutants are of greater concern in Puget Sound. Of greatest concern are toxicants that are persistent (remaining in existence indefinitely) and those that are irreversibly accumulated and concentrated in sediments and living tissues and passed through the food chain.

Many toxicants discharged by point sources bind to particles and settle out to become part of the sediment. The concentration of toxicants found in recent sediments from Puget Sound's urban bays is up to 100 times the levels in the cleanest rural bays. Toxicant concentrations in sediments from the central basin and rural bays are much lower but are still elevated over preindustrial levels. High concentrations of toxic contaminants have been associated with high incidences of diseased fish and other adverse biological effects in Puget Sound's urban bays. Toxic substances may also pose health risks to consumers of Puget Sound seafood.

While many industries and municipal treatment plants that discharge directly to the Sound and its tributaries discharge significant quantities of toxicants, current effluent monitoring is insufficient to estimate accurately their contribution relative to other sources of toxicants such as stormwater, CSOs, and nonpoint sources.

17 This volume would cover an area of 4.3 square miles to a depth of one foot. It is approximately equal to the average daily discharge of the Green/Duwamish River.

18 The federal Clean Water Act divided pollutants into categories with varying requirements for control of each. Conventional pollutants are oxygen-depleting substances, suspended solids, fecal coliform bacteria, pH, and oil and grease. Toxic pollutants include 13 heavy metals, 111 organic compounds (such as pesticides and polychlorinated biphenyls, or PCBs), asbestos, and cyanide. All other pollutants are classified as nonconventional pollutants.

19 Water quality problems related to conventional pollutants from point sources in Budd Inlet are an example of an exception to this generalization. Overflows from combined sewers are another exception. Another significant exception exists in the case of shellfish beds within approximately one mile of municipal discharges. Because of the risk of contamination with pathogens, current rules automatically require closure of such shellfish beds.

In cases where municipal treatment systems receive industrial discharges, these "indirect discharges" generally contribute a high proportion of the toxicants discharged by the treatment plant. These toxicants can interfere with the operation of the sewage treatment plant, expose plant workers or equipment to damaging substances, or pass through the treatment plant to contaminate the water, air, or sludge. Industrial pretreatment programs are designed to reduce such problems by removing the problem wastes before they enter the municipal wastewater.

While toxic pollution of sediments has become a dominant concern, recent reports show that the sea surface may also be contaminated with toxicants in sufficient concentrations to kill or cripple larvae and fish eggs that are found in this "microlayer." The water itself also sometimes shows concentrations of toxicants that exceed EPA's criteria for the protection of marine life from adverse chronic effects.

The rate of contamination of sediments by some highly regulated toxicants (e.g., lead, DDT, PCBs) is decreasing. However, the same cannot be said for all toxicants. As population and industrial activity increase, toxic contamination may become more severe. Because of the persistence of many toxic substances, the contamination is not easily reversed.

Institutional Problems

The federal Clean Water Act and Washington state law have established a strong institutional framework for controlling municipal and industrial discharges. Direct dischargers must obtain a National Pollutant Discharge Elimination System (NPDES) permit from the Department of Ecology (for nonfederal facilities) or EPA (for federal facilities). Ecology also administers state waste discharge permits, which regulate discharges to sewers (and related pretreatment requirements) and to groundwater. Ecology has been delegated authority to administer the pretreatment program, which regulates certain industrial and commercial discharges to sewers.

Under the point source control system, (1) a permit is required for any point source discharge; (2) the permit establishes specific limits on the quantity and concentration of contaminants allowed to be discharged (or on the overall toxicity of the effluent), together with other requirements (for monitoring, spill prevention, and others); (3) dischargers must monitor their effluent and report compliance with the conditions of the permit; and (4) the administering agency periodically inspects the facility and takes enforcement action as necessary. Effluent limits in permits must include minimum technology-based limits (generally based on criteria of "Best Available Technology" from federal law or "all known, available, and reasonable treatment" from state law) plus more stringent limits where necessary to meet state water quality standards.

A number of weaknesses have been identified in the current implementation of the point source control system that allow toxic contamination to continue. These weaknesses include:

* Permits have generally imposed very few limits on toxicants or particulates (either by limits on overall toxicity or on specific toxicants).

* EPA effluent guidelines do not cover all industries, waste streams within industries, or contaminants within waste streams.

* Permit writers often lack sufficient information, guidelines, and standards to write toxicant limits in permits, and must rely on best professional judgment in developing permit conditions.

* Current, informal guidelines for dilution zones do not take into consideration persistent toxicants and reconcentration of toxicants in sediments.

* The scope of discharger self-monitoring is limited and does not detect problems in sediments.

* Past enforcement has been weak and inconsistent.

* Felony provisions do not exist in state law for serious, intentional violations.

* Inspections are infrequent and are generally announced in advance.

* There is no system to detect unpermitted discharges, except to a limited extent in urban bays.

* Self-monitoring is rarely independently verified.

* Laboratory data are sometimes inaccurate and are therefore unreliable.

* Municipal operator training is limited in scope, e.g., operators generally receive no training related to pretreatment.

* Public participation in permits and related decisions has been limited.

* Ecology has lacked adequate resources to effectively carry out its functions under the NPDES and pretreatment programs.

PROGRAM STATUS

This program calls for extensive improvement in the effectiveness of the state's point source control program (including the pretreatment program) and emphasizes control of toxicants from both industrial and municipal discharges.

The program directs the Department of Ecology to include specific conditions in waste discharge permits aimed at controlling the introduction of toxicants into the Sound in both dissolved and particulate forms. In addition, comprehensive monitoring requirements are added to permits to ensure compliance with permit conditions and to detect contamination not controlled by effluent limits and other permit requirements. The program also devotes substantially increased resources to the inspection and enforcement roles of the Department of Ecology, and includes information and education measures to ensure that those individuals with a direct impact on the Sound are fully aware of their responsibilities.

The initial implementation of this program was substantially delayed due first to budget uncertainty and ultimately to an overall reduction in the implementation budget of over 50 percent, necessitated by the failure of permit fee legislation during the 1987 regular legislative session. Following passage of this legislation in a special session in October 1987, funding was partially restored, and activity has accelerated.

Ecology's 1987-88 activities have emphasized (1) the development of criteria, guidance, and procedures necessary for subsequent implementation of several

key elements; (2) initiation of enhanced sampling inspections by Ecology inspectors for the more significant dischargers; and (3) implementation of the new permit fee law.

Specific accomplishments include adoption of water quality criteria for 22 toxicants as part of the state's water quality standards (P-1), drafting of sediment quality standards (P-2), development of regulations to implement the increased discharge permit fees (P-4), development of interim guidelines for biomonitoring and toxicity control (P-8), and continued funding and staffing for the pretreatment program (P-22) and for urban bay action teams (P-13). Additional experience has been gained with Ecology's enforcement policy, which has now been in place since 1985, and useful discussion has occurred regarding the role of the Pollution Control Hearings Board in reviewing Ecology enforcement actions (P-18).

Although delayed by an inadequate budget, crucial work to develop a permit-writer's procedures manual (P-5) and to complete the monitoring guidelines (P-8) is now well underway. Improvements in the requirements included in waste discharge permits (i.e., to better monitor and control the release of toxicants—the essence of the municipal and industrial discharges program) will follow the completion of these elements.

Little progress has occurred on the information/education elements. As a result of extensive discussions with affected groups, the Authority in February 1988 revised the municipal operator training element (P-23) to ease what was perceived as an unnecessarily onerous training requirement and to give greater discretion to the Wastewater Operator Certification Board. Little action took place on the industrial operator certification element (P-24) as funding was not available; consideration was given to changing this element to reflect a voluntary approach to industrial operator certification. No activity occurred to carry out the Employee Education Assistance element (P-25) due to lack of funding.

Finally, implementation of several other elements was significantly delayed or not begun due to lack of funding. This includes development of dilution zone criteria (P-3), searching for unpermitted discharges (P-20), and carrying out cross-training for inspectors (P-19). Dilution zone criteria have assumed increased importance in view of questions on how to apply the new water quality standards for toxic substances within dilution zones. Felony provisions (P-21) were considered by the legislature but were not enacted into state law.

PROGRAM GOAL

To achieve comprehensive improvement in the control of toxic and other pollutants discharged into Puget Sound by industrial and municipal dischargers, reducing and eventually eliminating harm from such contaminants entering or accumulating in the Sound.

STRATEGY

The strategy for achieving this goal is (1) to require that all waste discharge permits include appropriate monitoring requirements and limitations on toxicants and other pollutants of concern; and (2) to devote substantially increased resources to the inspection and enforcement of waste discharge permits for industrial and municipal discharges throughout the Puget Sound basin as well as the discovery and control of unpermitted discharges.

PROGRAM ELEMENTS

Standards

P-1. Adopt EPA Water Quality Criteria

To assure better control of toxicants, Ecology shall adopt numerical water quality criteria equivalent to those published in EPA's Quality Criteria for Water. These criteria may be adopted by reference; if so, a summary of the criteria (including the numerical values) shall be appended to copies of the state water quality standards distributed by Ecology.

Target Date: September 30, 1987 (as part of Ecology's current review and revision of the state water quality standards).

[**Status:** This element was completed on January 5, 1988.]

P-2. Standards for Classifying Sediments Having Adverse Effects

Ecology shall develop and adopt by regulation standards for identifying and designating sediments that have acute or chronic adverse effects on biological resources or pose a significant health risk to humans. The sediment standards will establish the levels of sediment contamination that are acceptable throughout the Sound over the long term. The standards may use physical, chemical, and biological tests and shall clearly identify pass/fail standards for the prescribed tests. Because methodologies to assess the human health risks of chemical contamination of sediments are not well developed, the initial standards may deal only with adverse effects on biological resources. The standards shall be revised to incorporate information on human health risks as it becomes available. Ongoing work by EPA and the Puget Sound Dredged Disposal Analysis (PSDDA) to develop sediment quality values may be used as the technical basis for these standards.

Various technical and legal issues will be considered by Ecology during the development of these standards including the selection of appropriate methods for measuring or predicting harm, the relationship of these standards to existing state and federal permit programs, and the possible need to allow sediment dilution (or impact) zones.

In developing these sediment standards, Ecology shall form an advisory committee which shall include representatives of environmental and public interest groups, ports, industry, appropriate state and federal agencies, local governments, and tribes.

The standards shall be reviewed and updated as necessary, at least every three years. If apparent effects threshold (AET) values are used as a basis for establishing the standards, the AET values shall be recomputed periodically to incorporate new data.

Ecology shall use these standards as the desired goal for sediment quality in implementing the municipal and industrial discharges program (see element P-7), the stormwater and CSO program (see element SW-2), and the nonpoint program. These standards shall also be used as a basis to manage the disposal of dredged material (see elements S-3 and S-4), and to identify locations with sediment contamination (see elements S-7 and S-8). In implementing these programs, Ecology will consider other appropriate factors, including the

availability and reasonableness of treatment and control methods. This consideration of other factors may prevent this goal from being achieved in the near term. In particular, municipal, industrial, CSO, and stormwater discharges may not initially be able to meet these standards without the application of sediment dilution (or impact) zones (see elements P-3 and P-6).

Sediments that exceed the sediment standards are undesirable in Puget Sound. When they are dredged, they may only be disposed of by meeting the requirements for use of PSDDA open water disposal sites (see element S-3) or the requirements for confined disposal to be developed under Sediments element S-4 (which may include in-water as well as upland disposal methods). Sediments that exceed the sediment standards shall not be used as cap material for dredged material disposal or remedial actions.

Ecology may determine that it is not cost-effective to cap, treat, or remove all sediments that exceed the standards developed under this element. Ecology may identify higher (more contaminated) levels that would result in cleanup actions or define cleanup levels (see Sediments element S-7).

Target Dates: Interim sediment guidelines are to be completed by June 30, 1988. Final adoption of the initial standards shall be completed by June 30, 1989.

[**Status:** Ecology released a first draft of "Sediment Quality Standards" in March 1988, and a second draft in September 1988. The Authority has accepted the drafts as meeting the "interim guidelines" target date. The draft standards are based on the apparent effects threshold method using the Puget Sound sediment database developed by EPA and Ecology. The Sediment Advisory Group met for the first time in August 1988.]

P-3. Dilution Zone Criteria

In order to provide adequate opportunity for public review and comment on the criteria governing dilution zones surrounding wastewater discharges (within which water quality standards do not apply), Ecology shall adopt administrative rules specifying criteria for establishment of dilution zones in wastewater discharge permits. As part of this effort, Ecology shall develop specific criteria for sediment impact zones that shall include provisions for interim management and closure plans, where appropriate.

Target Date: Final adoption of rules by June 30, 1989.

[**Status:** Staff hired spring 1988 to begin this effort.]

Permits

P-4. Permit Fees

The Authority shall resubmit proposed legislation to the 1988 legislature amending RCW 90.48.460 and directing Ecology to assess permit fees on all permitted dischargers statewide (including industrial, municipal, and federal) to recover the cost of administering the NPDES and state waste discharge permit programs. Costs to be included in calculating fees shall include (1) initial permit issuance, (2) compliance review and evaluation, (3) inspections and related monitoring, (4) laboratory support, and (5) overhead expenses directly related to the preceding items. Fees would not be designed to recover expenses related to enforcement (including discovery of unpermitted discharges) or expenses that are funded by federal grants. Fees for pretreatment-related state

discharge permits shall recover expenses related to administration of the pretreatment program. Ecology shall ensure that indirect dischargers are not assessed a double permit fee (i.e., once for their state discharge permit and again as a contribution to the treatment plant's permit fee).

[**Status:** Permit fee legislation was enacted in October 1987, see RCW 90.48.600 through 90.48.640.]

Ecology shall adopt an initial schedule for waste discharge permit fees authorized by RCW 90.48.600 through 90.48.640 and shall submit to the Authority a study of the feasibility of establishing a variable charge based on the quantity, toxicity, persistence, and other characteristics of the effluent. A variable component of the permit fee would, to the maximum extent possible, create an incentive for dischargers to reduce the quantity and harmful characteristics of their effluent.

In establishing the fee schedule Ecology shall consider impacts of fees on small dischargers and provide appropriate relief if such impacts would be excessive.

In accordance with RCW 90.48.610(4), Ecology shall submit a report by January 1, 1991, and biennially thereafter to the legislature and to the public on actions it has taken over the past biennium to improve the administrative efficiency of the NPDES and pretreatment permit systems. Ecology shall develop evaluation criteria against which its success in improving administrative efficiency can be measured from year to year.

Target Date: Begin assessing expanded permit fees by July 1, 1988. Submit feasibility study of the variable charge by January 1, 1990.

[**Status:** Permit fee legislation was enacted October 1987. Fee schedule adoption on schedule. Variable fee study not started.]

P-5. Procedures Manual and Internal Technical Assistance for Permit Writers

Ecology shall prepare and revise as necessary a procedures manual for permit writers. This manual shall include guidelines and procedures to ensure that all pertinent information is made available and used by permit writers in determining appropriate effluent limits, particulate contamination limits (see P-7), source control measures, and other conditions in NPDES and state permits. Such information may be derived from documents already available to the department (e.g., the applicant's most recent hazardous waste annual reports) or additional information that would be requested from the applicant (e.g., information on the overall distribution of contaminants between the dissolved and suspended phases of the effluent).

The procedures manual shall require that all NPDES permits include appropriate conditions addressing all stormwater runoff from permitted facilities.

The procedures manual shall incorporate other requirements of this plan related to permit writing, including enhanced information in public notices and fact sheets pertaining to draft permits, monitoring requirements (P-8), spill control (P-9), 401 certifications (P-11), assuring inspection access, and assuring that inspection results are provided to permit writers and permit modifications made if necessary (P-14). The procedures manual shall encourage Ecology staff to make the best possible use of industry expertise and resources in carrying out permit writing and appropriate related activities.

The procedures manual shall also include guidelines for permit writers to use in evaluating the potential for cross-media transfer of pollutants. These guidelines shall emphasize mechanisms available to permit writers to encourage waste reduction at the source rather than end-of-pipe treatment if such treatment results in cross-media transfer of pollution.

Ecology shall provide opportunity for the public to review and comment on the draft procedures manual.

Ecology shall establish an internal technical assistance team to assist permit writers in researching and writing appropriate conditions for NPDES and state permits. Ecology is encouraged to develop such effluent guidelines and technical standards as may be necessary to assist in the efficient administration of the permit program.

Following completion of the permit writer's procedures manual, Ecology shall prepare an inspector's manual which shall incorporate all appropriate components of this plan, and shall make use of existing manuals, such as those published by the U.S. Environmental Protection Agency, to the maximum extent possible.

Target Dates: Complete interim procedures manual by June 30, 1988. Complete final procedures manual by December 31, 1988. Establish internal technical assistance team by January 1, 1989.

Complete inspector's manual by December 31, 1989.

[**Status:** Interim target date not met due to hiring delays; final procedures manual on schedule; initial technical assistance staff hired.]

P-6. Toxicant Effluent Limits in Permits

The objective of toxicant effluent limits in permits is to control through the use of all known, available, and reasonable methods[20] the sources of toxicants in the waste discharge. In issuing or reissuing NPDES or state waste discharge permits, Ecology permit writers shall follow the procedures set out in the permit procedures manual developed under element P-5 and shall review the dischargers' operations and incorporate permit conditions which require all known, available, and reasonable methods to control toxicants in the dischargers' wastewater. Such conditions may include, but are not limited to, limits on the discharge of specific chemicals and/or limits on the overall toxicity of the effluent. The toxicity of the effluent shall be determined by techniques such as chronic or acute bioassays. Such conditions shall be required regardless of the quality of receiving water and regardless of the minimum water quality standards. In no event shall the discharge of toxicants be allowed that would violate any water quality standard, including toxicant standards, sediment standards, and dilution zone criteria.

In the fact sheet accompanying each draft major permit, Ecology shall clearly explain how the draft permit fulfills the goal of reducing and eventually eliminating harm from toxic contaminants in Puget Sound, including a sum-

20 Ecology has considered the following criteria, among others, in determining "reasonable methods:" (1) status of planning needed to proceed with the proposed method, (2) environmental or siting constraints, and (3) economic factors. The Pollution Control Hearings Board has upheld Ecology's use of these criteria (see PCHB Nos. 84-178, 84-206, 84-211).

mary of the information used to determine which limits on specific toxicants and/or overall effluent toxicity should be included in the permit (see also element P-28, Reporting Requirements). The Authority requests EPA to provide a similar explanation for any draft major permit issued by EPA.

Target Date: Begin implementing this element by June 30, 1988.

[**Status:** Language nearly identical to the first paragraph of this element was enacted by the 1987 legislature and is now RCW 90.48.520. Implementation not started due to delays in interim procedures manual (P-5). Implementation to be phased in as monitoring guidelines (P-8) and procedures manual are completed.]

P-7. Effluent Limits in Permits—Particulates

In issuing or reissuing NPDES permits, Ecology shall obtain and review information on particulate contamination in the applicant's effluent and shall include specific conditions on particulate contamination, appropriate to each case, sufficient to assure that the ambient sediment standards will not be violated, subject to any authorized sediment impact or dilution zones. Such conditions may include source control measures, best management practices, numeric limits on toxicity of the particulate fraction of the effluent, numeric limits on the concentration or mass of specific chemicals discharged, or other conditions deemed appropriate by Ecology. However, permittees shall not be required to comply with conditions for which there is no appropriate laboratory protocol, as determined by Ecology. Any draft of a major permit proposed without conditions on particulate contamination shall include, in the accompanying fact sheet, a written explanation of reasons why such limits are not applicable to the specific discharger (see also element P-28, Reporting Requirements).

The Authority requests EPA to carry out this element with respect to every NPDES permit issued by EPA in the Puget Sound basin (see also element P-11).

Target Date: This element shall become effective December 31, 1989.

[**Status:** Implementation not started, will be phased in as sediment standards (P-2) and procedures manual (P-5) are developed.]

P-8. Monitoring Requirements in Permits

In issuing, modifying, or reissuing NPDES permits, Ecology shall consider the need for each of the five types of monitoring listed below and shall include requirements in permits for all types of monitoring that are appropriate to each permittee. Monitoring requirements included in permits shall be tiered so that if initial sampling discloses no problems, a reduced monitoring schedule may then apply. Likewise, if initial sampling indicates the possibility of problems, a more frequent and/or more comprehensive monitoring schedule would apply.

Ecology shall develop (and revise as necessary) guidelines for the frequency and methodology of these tests and for reporting requirements and format. The guidelines shall include the tiered approach described above. The guidelines shall use the Puget Sound protocols when available and data management systems compatible with the Puget Sound Ambient Monitoring Program. The guidelines shall also define triggers for determining when action is necessary to modify a permit. Ecology shall develop the guidelines in consultation

with municipal and industrial dischargers, laboratories, EPA, the Authority, and others as appropriate.

The fact sheet accompanying each draft major permit shall include a brief discussion of how the draft permit has dealt with each of the five types of monitoring specified below and shall explain those situations where any of these types of monitoring have not been required in the draft permit. Although these monitoring requirements shall be primarily directed toward the detection of impacts from individual wastewater discharges, as a second priority, and to the extent practicable, Ecology shall develop monitoring requirements for permits that will facilitate the calculation of total contaminant mass loading to Puget Sound.

The five types of monitoring are as follows:

1. Monitor specified parameters in the sediment in the vicinity of every significant outfall;

2. Separately analyze samples of the particulate fraction of the effluent from each significant outfall;

3. Conduct periodic acute and chronic toxicity bioassays on a sample of the effluent from each outfall and on the sediment near each outfall;

4. Conduct periodic surveys of the population, species composition, and health of biota in the vicinity of each significant outfall;

5. Monitor water quality at the boundary of the dilution zone.

If, for a given test, Ecology finds that there is no analytical protocol reasonably available, or if there is no public or private laboratory capability to carry out the test, Ecology may suspend the testing requirement for that test until such time as such a protocol and/or laboratory capability becomes available. Ecology shall promote the development of protocols and laboratory capability in cases where these are not available for the types of monitoring tests listed above (see also Laboratory Support elements L-1 and L-2).

Ecology, in cooperation with EPA, shall prepare a list of the highest priority permits (based on the probability of effluent containing a significant quantity of toxic pollutants of concern) to be reopened prior to expiration for inclusion of these monitoring requirements. Ecology shall submit this list to the Authority together with a schedule for completion of permit modifications to include these requirements.

Every major and minor permit issued or reissued by Ecology before the monitoring guidelines are implemented shall include a reopener provision allowing the modification of the permit to incorporate monitoring requirements in accordance with this element. Every permit issued or reissued by Ecology shall include a reopener clause allowing Ecology to modify, based on monitoring results or other causes consistent with state and federal regulations, the effluent limitations, monitoring requirements, or other conditions in the permit. The Authority requests EPA to include similar reopener provisions in every NPDES permit issued by EPA in the Puget Sound basin.

Ecology shall submit a report to the Authority on the advisability of providing an "option B" in which Ecology would arrange for an independent organization to conduct some or all of the monitoring activities (especially those in-

volving sampling outside the effluent pipes—e.g., 1, 4, and 5 above) for some dischargers in lieu of the individual dischargers performing this monitoring themselves, to be funded by a surcharge on the NPDES permit fee paid by these dischargers. The study shall estimate the amount of the fee surcharge that would be necessary to support this alternative and whether the overall cost to dischargers would be reduced. The study shall also address whether the quality of information derived under such an alternative would be improved. This study shall not be construed as authorizing any delay in the implementation of the monitoring requirements described in this element.

Target Dates: Include reopener language in all permits issued or reissued after March 31, 1987. Complete monitoring guidelines by December 31, 1988. Submit report on "option B" by March 31, 1989. Include monitoring requirements in permits issued or reissued after December 31, 1988. Submit list of high priority permits and schedule for completing modifications by March 31, 1989.

[**Status:** Delayed start due to Ecology hiring delays. Reopener language is now routinely included in permits; interim biomonitoring guidelines have been drafted but full guidelines delayed; neither the "option B" report nor the list of high priority permits has been started.]

P-9. Spill Control Plans Required

Every major permit issued or reissued shall include appropriate conditions requiring the development or updating, if necessary, of spill prevention control and countermeasure (SPCC) plans. At a minimum, such plans shall apply to both oil and hazardous substances. Ecology, in consultation with EPA, shall actively review and comment on the SPCC plans and shall require the permittee to implement the approved plan. Ecology shall take enforcement action, consistent with its enforcement guidelines, against any permittee found out of compliance with its SPCC plan (refer to SP-3).

Target Date: Begin implementation by March 31, 1988.

[**Status:** Many major permits already include basic spill control provisions, but implementation and follow-up are not complete and not consistent across Ecology regional offices.]

P-10. Explanation of Relaxed and Increased Limits in Permits

For any draft permit whose effluent limitations are in any way less stringent than those in the preceding permit, Ecology shall include a conspicuous notice and clear explanation of the reasons for such limits in the public notice of the draft permit. This requirement shall apply to all effluent limitations that are, or appear to be, a relaxation of limits in comparison to the previous permit. This requirement for notice and written explanation shall also apply to any draft permit proposing to allow a greater amount of effluent to be discharged due to increases in production. In every such explanation, Ecology shall report on measures available to and undertaken by the discharger to reduce the production of pollutants per unit of product. Ecology shall adopt rules implementing this program element. See also element P-28, Reporting Requirements.

Target Dates: Begin notice and explanation process by March 31, 1987. Adopt final rules by June 30, 1989.

[**Status:** Guidance to Ecology permit writers to implement this element was issued on schedule. Due to lack of a reporting mechanism to date, it is unclear whether the notice requirement is being implemented in all applicable cases.]

P-11. Enhanced Requirements for EPA-Issued Permits/Ecology Certifications

11.1. EPA-Issued Permits

The Authority requests that the Environmental Protection Agency include conditions in EPA-issued permits at least as stringent as those that are required under this plan in permits issued by Ecology. This request applies to all toxicant and particulate limits and to monitoring, spill control, frequency of inspection, and public notice requirements. The Authority also requests EPA to review existing EPA-issued permits and modify any permit as necessary to include such limits and requirements.

11.2. Ecology Certifications

Ecology shall not issue an NPDES permit, nor certify the issuance or renewal of any NPDES permit for a federal facility under Section 401 of the Clean Water Act, unless the permit includes numeric limits and other conditions required to comply with all applicable water quality and sediment standards and other elements of this plan. Before considering a permit or 401 certification for a federal facility permit, Ecology shall seek to be familiar with the facility site, through site visits, inspections or other means.

Target Date: This element shall be applied to Ecology 401 certifications in a phased manner, beginning April 30, 1988. All appropriate guidance from the procedures manual (P-5), monitoring guidelines (P-8), and sediment standards (P-2) shall be used as those products are completed.

[**Status:** Not started. Implementation delayed pending completion of procedures manual, monitoring guidelines, and sediment standards.]

P-12. Reevaluate Allocation of Permits into Major/Minor Categories

The Authority requests that EPA give special consideration to early completion of its reevaluation of the major/minor permit classification for permits in the Puget Sound basin. Ecology shall communicate to EPA any discrepancies it is aware of in the classification of permits in the Puget Sound basin.

[**Status:** Delayed at national level. EPA currently expects to propose a revised system for rating discharges by October 1988, with rating of actual discharges to begin in mid-1989. Any modifications to the list of major dischargers that result from this revised rating system could then be formalized in the fiscal year 1990 State/EPA agreement.]

Compliance Assurance

P-13. Urban Bay Action Teams

The Authority recognizes the "Urban Bay Approach" as an essential part of a comprehensive strategy to control point source pollution and requests EPA to continue providing resources for the urban bay programs. Support for the urban bay action teams is included in the cost estimates for elements related to permit writing (P-6, -7, -8), inspections (P-14), searching for unpermitted dis-

charges (P-20), and investigations and cleanup of contaminated sediments (S-8).

[**Status:** Urban bay action teams are functioning in Elliott Bay, Commencement Bay, and Everett Harbor. Teams are planned for Sinclair Inlet, Budd Inlet, and Bellingham Bay.]

P-14. Inspections

Ecology shall conduct a significant number of class I inspections on an unannounced basis. Similarly, a significant number of class II inspections shall include an unannounced sampling visit. Ecology shall assure that such conditions as may be necessary to provide a prearranged means for Ecology inspectors to obtain unannounced samples of effluent on a 24-hour basis are included in appropriate permits.

Ecology shall conduct inspections in accordance with the following minimum schedule:

Type of permit	Number of inspections per year per permit	
	Class I	Class II
Major	2	1
Significant minor	1	0.5
State and minor NPDES	1	0.1

Additional inspections (both announced and unannounced) shall be conducted based on the permittee's record of compliance.

Ecology shall ensure that results of inspections are promptly made available to permit writers. Ecology shall ensure that discharge permits are modified as necessary to incorporate appropriate monitoring requirements or effluent limits to correct problems identified through inspections.

Ecology shall submit a report to the Authority on the number and type of inspections (including unannounced inspections) undertaken between July 1, 1988, and December 31, 1989, together with records of the number and type of violations discovered and actions initiated in response to violations. Ecology shall also report any occasions on which an authorized Ecology inspector was denied access to a facility.

Target Date: Begin phasing in enhanced inspection schedule by September 30, 1987. Complete phase-in by July 1, 1992. Submit report on inspections by March 31, 1990.

[**Status:** First staff hired January 1988 to begin phase-in of increased inspection schedule. Policies for unannounced class I inspections have been developed. Policies for unannounced class II inspections still must be evaluated.]

P-15. Study of Independent Verification of Self-Monitoring

Ecology shall submit to the Authority the results of a study evaluating alternative methods of carrying out independent verification of self-monitoring reports submitted by dischargers, together with Ecology's proposed plan and estimated costs for implementing a verification program. Possible methods to

be evaluated may include combining the independent verification function with the quality assurance/quality control procedures contemplated under the laboratory certification program (see elements L-1 and element P-16) and also "option B" in element P-8.

Target Date: Submit study by September 30, 1990.

[**Status:** Not funded; no activity during 1988-89 biennium.]

P-16. Use of Certified Labs for Self-Monitoring

Ecology shall adopt regulations requiring all permittees to use a certified laboratory for their wastewater analyses and requiring all certified laboratories to use specified protocols and comply with specified quality assurance/quality control procedures (see Laboratory Support program). Before implementing this requirement of permittees, Ecology shall ensure that the laboratory certification program is operational (see element L-1) and that a sufficient number of certified labs are available to carry out needed analyses. Labs owned and operated by individual industrial and/or municipal dischargers shall be eligible for certification. The Authority shall include authorization for Ecology to require use of certified labs in proposed legislation to be submitted to the 1987 legislature under element L-1.

Target Dates: Adopt regulations by March 31, 1989. Permittees to begin using certified labs by July 1, 1989.

[**Status:** Lab certification program being developed; implementation of this element is expected to begin on schedule.]

P-17. Data Management

Ecology shall complete the initial implementation of its computerized Wastewater Discharge Information System for tracking self-monitoring reports of dischargers and other information related to major NPDES permits.

Ecology shall complete the initial loading of data related to state (pretreatment) and minor NPDES permits and begin incorporating routine self-monitoring data for these permits into the Wastewater Discharge Information System (WDIS). Ecology shall ensure that the WDIS system incorporates results of class I and class II inspections.

Ecology shall store monitoring data of the five types outlined in element P-8 submitted by dischargers in a manner compatible with information in the Puget Sound Ambient Monitoring Program (see element M-6).

Target Dates: Complete initial implementation of the WDIS system by March 31, 1987. Load state and minor permit data and ensure that inspection results are routinely entered by June 30, 1989.

[**Status:** Basic data entry is largely completed, but the WDIS system is not yet fully operational. Ecology anticipates meeting 1989 target date.]

Enforcement

P-18. Adopt Enforcement Policies as Regulations; Report on Enforcement

In accordance with Chapter 7, Laws of 1987, 1st Ex. Session, Ecology shall adopt regulations specifying minimum penalties for permit violations. Ecology shall also consider adopting as regulations other significant policy elements of its enforcement guidelines, including the escalation policy for continuing or repeated violations. It is the intent of this element that Ecology fully consider for adoption the significant policy aspects of its enforcement guidelines rather than the procedural details. It is the intent of the Authority in directing that enforcement policies be considered for adoption as rules that significant changes to these policies be subject to the public review and comment process required by the Administrative Procedure Act before such changes are implemented.

Ecology shall submit to the Authority a list of all water-quality related civil and criminal enforcement actions taken during the previous two years, together with statistics on the percentage of Ecology enforcement actions that were appealed and the dollar amounts of penalties assessed versus those sustained. Where possible, Ecology may include statistics on cases in which the Pollution Control Hearings Board has considered the post-penalty behavior of a violator in determining the amount of penalty to be sustained. Ecology is encouraged to submit its analysis of the effects of the Board's actions on the Department's enforcement program together with any recommendations it may have.

Target Date: Ecology to adopt rules and submit an enforcement report as soon as resources permit but not later than December 31, 1989.

[**Status:** PCHB's report on de novo review was submitted on schedule. PCHB could not review Ecology's enforcement guidelines due to lack of information—the guidelines are not considered in appeals due to their status as guidelines rather than formal regulations. Due to a later target date, Ecology has not yet started its enforcement report.]

P-19. Training for Inspectors and Permit-Writers

Ecology shall establish an ongoing, vigorous program of training for inspectors and permit-writers, including cross-training in other environmental regulatory programs, recognition of problems related to cross-media transfer of pollution, and opportunities to reduce or recycle waste at the source. Ecology shall assure that an appropriate percentage of inspectors' and permit-writers' time is allocated to training activities. Ecology shall take advantage of existing training programs, such as those offered by the U.S. Environmental Protection Agency, to the maximum extent practicable.

Target Date: Establish the program by September 30, 1988.

[**Status:** Funding to begin this element became available in February 1988. Ecology expects to begin implementation of the program by the revised target date, with hire of a training coordinator/facilitator to follow at a later date.]

P-20. Search for Unpermitted Discharges

Ecology shall carry out a coordinated program for detection of wastewater discharges not covered by permits. This shall apply to both direct and indirect wastewater discharges and to direct discharges of stormwater from industrial facilities. Ecology shall ensure that its enforcement guidelines incorporate ap-

propriate automatic penalty provisions for instances when dischargers without permits are discovered. Ecology shall submit a report to the Authority on the number and characteristics of unpermitted discharges discovered though this element and through the urban bay action teams, together with any analysis and recommendations that the Department may have.

Ecology shall amend chapter 173-216 WAC (and other rules as necessary) to clarify that the "domestic sewage exclusion" under federal law does not apply under Washington's hazardous waste rules and that a hazardous waste may not be legally discharged to a sewer unless this is specifically permitted. Ecology shall take steps to ensure that hazardous waste generators are aware of this clarification.

Target Date: Implement search for unpermitted discharges by January 1, 1990, and submit report by January 31, 1991. Adopt amendment to rules and disseminate information to generators by December 31, 1989.

[**Status:** Not funded during 1988-89 biennium; there has been no effort to discover unpermitted discharges except to a limited degree in areas where urban bay action teams are functioning.]

P-21. Felony Provisions

The Authority shall submit proposed legislation to the 1989 legislature to amend the state water pollution control act to provide for felony penalty provisions.

Target Date: Resubmit to 1989 legislature.

[**Status:** Proposed legislation passed the House but failed to pass the Senate in the 1987 and 1988 legislative sessions.]

Pretreatment

P-22. Additional Staff for Pretreatment Program

Ecology shall assign sufficient staff to fully carry out the pretreatment program, including permitting (with appropriate conditions for monitoring and control of toxicants in accordance with elements P-5 through P-8), compliance tracking, inspections, spill control, public notice, auditing of local programs, and enforcement as needed. Ecology is encouraged to develop such effluent guidelines and technical standards as may be necessary to assist in the efficient administration of state and local pretreatment programs.

Target Dates: Begin phasing in additional staff by January 1, 1988. Reach full staffing by July 1, 1992.

[**Status:** Plan resources were used during fiscal year 1988 to allow Ecology to retain existing pretreatment staff when federal funding ceased. A modest increase in staff levels is planned for fiscal year 1989. Staffing level remains below the target level contemplated in the budget for this element.]

Information/Education/ Technical Assistance

P-23. Municipal Operator Training

The Waterworks and Wastewater Certification Board shall ensure that each wastewater treatment plant operator certification examination covers basic issues and facts about industrial discharges, pretreatment laws and regulations, treatment technologies, maintenance and troubleshooting, and recognition of pretreatment-related problems. The Board shall consult with PSWQA and affected groups of wastewater treatment plant operators in drafting any additional test questions related to these topics. The Board shall also assist the Department of Ecology in the preparation of handouts identifying up-to-date pretreatment rules, regulations, and technology. Such handouts shall be mailed to all certified operators annually. The Board shall encourage certified operators to attend pretreatment workshops, conferences, and courses for credit toward the mandatory professional growth requirement.

The Board is encouraged to review its testing and certification methodology to reflect the level of responsibility of the operator for pretreatment programs.

Target Date: Board initiates annual mailing by December 31, 1988. Board adopts test changes, if necessary, by April 30, 1989.

[**Status**: The element shown here is the amended version adopted by the Authority in February 1988. Ecology and the Board expect to meet the target dates.]

P-24. Certify Industrial Treatment Plant Operators

In conjunction with its technical outreach to dischargers under element P-27, Ecology shall explore and facilitate the development of a voluntary process for certification of industrial treatment plant operators, through a private trade or professional association or other appropriate entity. In exploring this approach, Ecology shall consult with industrial dischargers and treatment plant operators, private trade and/or professional organizations, appropriate labor unions, the Authority, and other interested individuals and groups in Washington and other states. Ecology shall report to the Authority on its experience in implementing this element, together with its analysis of the expected effectiveness of the voluntary approach and any recommendations it may have.

Target date: Seek to establish a certification program by October 31, 1989, and submit report to the Authority by February 28, 1990.

[**Status**: Not funded; no activity during 1988-89 biennium.]

P-25. Employee Education Assistance

(See also element ES-2.2) In connection with the current employee education programs required under the state Worker Right-to-Know law (Chapter 49.70 RCW), Ecology and the Department of Labor and Industries shall prepare and implement a coordinated plan for developing and distributing educational materials for employees to appropriate employers in the Puget Sound basin. This plan shall establish a schedule for distribution of such materials to these employers and shall establish a schedule for any necessary rulemaking by Ecology or Labor and Industries. Educational materials to be prepared shall provide information on the environmental consequences of waste disposal

decisions typically made by employees of the firms and/or agencies included in the program.

Target Dates: Complete employee education plan by December 31, 1989. Begin distribution of educational materials by March 31, 1990.

[**Status:** Not funded; no activity during 1988-89 biennium.]

Public Involvement

P-26. Public Outreach

Ecology shall establish a public outreach position to actively contact and assist groups and individuals regarding the NPDES and state waste discharge permit program and related activities. For each permit or action under consideration, this person shall seek out those who may be interested or affected, inform them of the significance of the action, highlight key decision-making points, and provide technical assistance in working through the process.

Ecology shall also expand its permit mailing lists to achieve broad circulation, regularly provide program information in general publications (e.g., newsletters, brochures), provide informative and widespread public notice of draft permits, and establish criteria for deciding when a public hearing will be held on a permit. In establishing criteria, adopting guidelines, and developing rules, Ecology shall actively seek and provide opportunity for meaningful public involvement in accord with the public involvement policy (EPI-3) of this plan.

Target Date: Establish position by September 30, 1988.

[**Status:** Staff was hired on schedule.]

P-27. Technical Outreach to Dischargers

(This element constitutes a part of element ES-2.2. The "target audience" is municipal and industrial dischargers.)

Ecology shall develop (or contract with an appropriate organization to develop) a program to provide technical outreach to dischargers on the environmental requirements with which they are expected to comply, beginning with the requirements of Ecology programs. To the maximum extent possible, Ecology shall consolidate water pollution control information with other environmental requirements to provide useful, timely, coordinated, and accessible information and "one-stop" answers regarding multiple environmental programs. For maximum efficiency, the program shall emphasize delivery of information through existing mechanisms such as trade and professional organizations rather than to individual dischargers. In developing the program, Ecology shall consult with staff who operate similar functions in other states. Ecology shall coordinate this program with the business assistance ("pollution prevention pays") program authorized by RCW 70.105B.200.

Experience gained in providing consolidated information to dischargers shall be transmitted to agency program development staff to ensure that environmental programs are consistent with each other.

Target Date: Establish program by March 31, 1990.

[**Status:** This new element is proposed to begin in July 1989.]

P-28. Ecology Report on Waste Discharge Permits

In addition to the biennial reporting requirement under RCW 90.70.070, Ecology shall publish a report on the NPDES and state permits in the Puget Sound basin that it has considered for issuance, renewal, or modification.

Ecology shall consider the following items for inclusion in the report:

a. Toxicants present in wastewater as reported in the applicant's permit application;

b. Toxicant-related (P-6) and particulate-related (P-7) effluent limits or other conditions that were included in final permits:

c. Monitoring requirements (parameters required to be monitored, including type(s) of biomonitoring tests required) included in each final permit (P-8);

d. Spill control requirements included in each permit (P-9);

e. Permits containing water quality-based effluent limitations (as opposed to technology-based limits);

f. Action taken by Ecology in relation to the Section 401 certification of EPA-issued permits (P-11);

g. Effluent limits and conditions in previous versus reissued permits (including permits issued with relaxed or increased limits as addressed in element P-10), limits in draft and final versions of reissued permits, and reasons for differences;

h. Appeals of permit conditions and the outcome of each completed appeal;

i. Analyses of the rate of compliance and significant noncompliance for categories of dischargers, based on WDIS data (P-17).

Ecology is encouraged to include other information that may be useful, to present the information in tabular, comparative, or other form that facilitates review and analyses, to comment on its experience in implementing these elements, and to provide appropriate recommendations.

Target Date: Submit report outline to Authority for approval by September 1, 1989. Submit report by March 1, 1990, and annually thereafter.

[**Status:** This new element is proposed to begin in July 1989.]

MAJOR PUBLIC ACTIONS FOR REVIEW

1. Adoption of amendments to water quality standards to include toxicant criteria and sediment standards (P-1, P-2).

2. Adoption of rules for expanded permit fees (P-4).

3. Adoption of permit writers' procedures manual (P-5).

4. Adoption of monitoring guidelines (P-8).

5. Employee education program (P-25).

6. Report on waste discharge permits (P-28).

LEGISLATION REQUIRED

1987 Session

1. Expanded permit fees (P-4).

2. Felony provisions (P-21).

[**Status:** Legislation authorizing expanded permit fees was enacted in October 1987; felony provisions were considered but not enacted by the 1987 and 1988 legislatures.]

1989 Session

1. Felony provisions (P-21).

ESTIMATED COST

Full funding for this program would have cost approximately $4.1 million during fiscal year 1990 and $5 million during fiscal year 1991. Present funding requests are for $3.1 million for fiscal year 1990 and $3.4 million for fiscal year 1991. Cost estimates for each element for fiscal years 1990 through 1994 are shown on the table below. The elements with the largest costs include inspections (P-14), incorporation of effluent limits and monitoring requirements into permits (P-6, -7, -8), full staffing for the pretreatment program (P-22), and searching for unpermitted discharges (P-20).

In accordance with legislation enacted in October 1987, Ecology began charging increased permit fees on July 1, 1988. The legislation authorizes Ecology to collect $3.6 million per year statewide to operate the permit program. It is assumed that about $2 million per year would be available to support the fee-eligible activities in the Puget Sound basin. Activities in the Municipal and Industrial Discharges Program that are not fee-eligible as defined in RCW 90.48.600, as well as fee-eligible activities that exceed the fee revenues authorized, would be funded from other sources such as the general fund.

The cost estimates shown do not include costs that may be incurred by dischargers in complying with the more stringent monitoring requirements, permit limits, and other elements of the plan.

Most dischargers would incur increased costs for the additional monitoring that would be required under element P-8. While the specific costs would depend on the content of the guidelines that Ecology is directed to prepare and on the particular characteristics of each effluent stream and the local receiving environment, the tiering approach would be expected to minimize additional monitoring costs for dischargers where no problems are discovered during first-tier monitoring. A rough estimate of the maximum cost of first-tier monitoring for the largest, most complex discharges is $20,000 to $30,000 per year. Monitoring costs would be much less for smaller, less complicated discharges. In cases where problems are discovered in first-tier monitoring, costs for further monitoring to confirm and characterize the source of the problem (and for additional pollution control of any problem pollutants discovered) could be substantial, but cannot be estimated with current information.

Some dischargers would have new or more stringent limits imposed on the discharge of specific toxicants (in the dissolved or particulate phase) or on the overall toxicity of the effluent. The cost of meeting more stringent limits would depend not only on the specific limits that are chosen by Ecology but also on the particular circumstances of the plant involved. Costs to meet effluent limits could vary widely, from virtually no cost to many millions of dollars for new treatment systems or process changes. For example, a toxicant in the effluent of a pulp mill was traced to contamination in one of the chemicals purchased by the mill. This toxicant was controlled at virtually no cost to the mill by having a chemical supplier provide uncontaminated chemicals. On the other hand, some toxicants are either unavoidable by-products of or required in the discharger's process. Requiring "known, available, and reasonable" treatment to control these toxicants may necessitate substantial modification of the process or the installation of a new, end-of-pipe treatment system. Costs for toxicant control cannot be estimated until Ecology determines specific case-by-case limits and each discharger determines what modifications, if any, are necessary to meet the limits.

Other elements of the program may also affect costs to dischargers. Permit fees under this program have increased substantially in accordance with the legislative changes enacted in 1987. Laboratory costs may increase slightly due to the requirement to use certified labs. The greater cost per test might be offset by the need to do fewer tests because of greater accuracy. Industrial treatment plant operators would incur some cost in complying with certification requirements to be established and in paying certification costs. Some dischargers would incur costs as a result of enforcement action taken when violations are detected through increased inspections and compliance review efforts by Ecology. Finally, dischargers would incur some increased costs to comply with spill and stormwater control requirements for plant sites. These costs would be extremely variable and would depend on the characteristics of the site and the types of materials used or stored on the site.

ESTIMATED PLAN COSTS: MUNICIPAL AND INDUSTRIAL DISCHARGES

COSTS BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
P	Implementation and Coordination	0	26,000	260,325	260,325	231,804	231,804	231,804
P-2	Sediment Standards	139,558	60,305	102,930	99,930	13,172	13,172	13,172
P-3	Dilution Zone Criteria	0	27,496	6,385	6,385	3,193	3,193	3,193
P-4	Permit Fee	160,936	0	120,976	120,976	30,244	30,244	30,244
P-5	Procedures Manual and Internal Tech Assist	123,991	120,608	136,436	136,436	150,080	150,080	150,080
P-6-10	Effluent Limits and Monitoring in Permits	54,156	520,875	606,585	678,124	1,063,900	1,307,772	1,577,484
P-11	Enhanced Requirements for EPA-issued Permits	7,431	24,120	91,966	91,966	91,966	91,966	91,966
P-14	Inspections	358,052	360,579	886,798	966,798	1,112,600	1,250,714	1,243,026
P-15	Study of Self-monitoring Verification	0	0	31,222	0	0	0	0
P-16	Use of Certified Labs for Self-monitoring	0	0	3,903	3,518	3,518	3,518	3,518
P-17	Data Management	59,583	95,386	100,308	100,308	100,308	100,308	100,308
P-18	Adopt Enforcement Guidelines	17,000	0	35,184	0	0	0	0
P-19	Cross Training for Inspectors	0	33,441	41,927	44,427	46,927	46,927	46,927
P-20	Search for Unpermitted Discharges	0	0	88,055	129,395	184,578	90,367	90,367
P-21	Felony Provisions	0	0	8,556	0	0	0	0
P-22	Additional Staff for Pretreatment	85,710	110,832	254,783	337,149	419,514	501,879	584,244
P-23	Municipal Operator Training	14,000	65,991	93,903	93,518	93,518	93,518	93,518
P-24	Certify Industrial Treatment Plant Operators	2,852	0	35,184	14,073	0	0	0
P-25	Employee Education Assistance	0	0	0	119,552	21,110	21,110	21,110
P-26	Public Outreach	0	54,156	65,860	65,860	65,860	65,860	65,860
P-27	Technical Outreach to Dischargers	0	0	78,325	109,800	145,118	141,274	141,274
P-28	Ecology Reporting Requirement	0	0	11,708	14,458	14,073	14,073	14,073
TOTAL		$1,023,269	$1,499,789	$3,061,318	$3,392,997	$3,791,484	$4,157,780	$4,502,169

Element Notes

P	PSWQA and Ecology administration and coordination.
P-1	Assumes that WQ standards revisions are funded from Ecology "current level" budget.
P-3	Assumes that permit writer training is funded by P-6, 7, 8, and 19.
P-6-10	Combines elements P-6 through P-10 which involve writing discharge permits and establishing effluent limits and monitoring requirements.
P-11	Includes state certification of EPA-issued permits under section 401 of the federal Clean Water Act.
P-12	Delayed at EPA.
P-13	Cost included in P-6,7,8,9,10,14,20, and S-8.
P-19	Element estimate is for trainers. Staff being trained are included in elements P-6, 7, 8, 9, 10, 14, and 22.
P-23	Assumes test changes are adopted during FY 89.
P-25	Estimate includes start-up costs in FY 91.

MUNICIPAL AND INDUSTRIAL DISCHARGES

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
EPA	0	0	66,426	66,426	66,426	66,426	66,426
Ecology	1,003,417	1,407,798	2,867,816	3,199,721	3,635,058	4,001,354	4,345,743
PSWQA	2,852	26,000	37,077	28,521			
Labor & Industry	0	0	0	8,330	0	0	0
Pollution Control Hearings Board	17,000	0	0	0	0	0	0
Local Government	0	65,991	90,000	90,000	90,000	90,000	90,000
TOTAL	$1,023,269	$1,499,789	$3,061,318	$3,392,997	$3,791,484	$4,157,780	$4,502,169

COSTS BY FUNDING SOURCE							
Federal Funding	0	0	66,426	66,426	66,426	66,426	66,426
State General Fund	180,841	192,077	774,140	871,050	731,431	633,376	633,376
State Fee Programs	842,428	1,241,721	2,130,752	2,365,522	2,903,627	3,367,978	3,712,367
Local Sources	0	65,991	90,000	90,000	90,000	90,000	90,000
TOTAL	$1,023,269	$1,499,789	$3,061,318	$3,392,997	$3,791,484	$4,157,780	$4,502,169

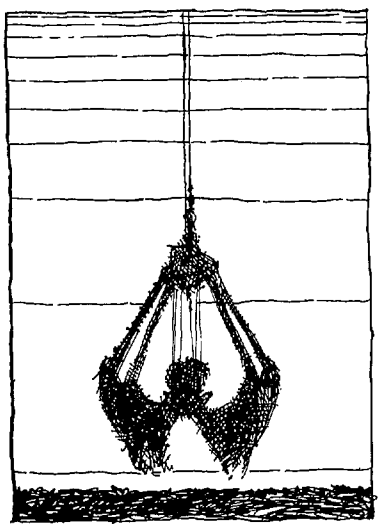
Funding Notes

The estimate for state fee programs is based on the existing legislation. This estimate may change if Initiative 97 passes on November 8.

CONTAMINATED SEDIMENTS AND DREDGING

PROBLEM DEFINITION

Environmental Problems



The accumulation of toxicants in sediments and resulting damage to natural populations is increasingly recognized nationally and internationally as one of the most serious threats to the marine ecosystem. Toxic contaminants bind to particles and are retained as sediments in the Puget Sound basin. Toxic compounds are found in a wide range of concentrations in recently deposited surface sediments at many locations in the Puget Sound area. Contamination levels of surface sediments in the deep central Puget Sound basin are significantly higher than estimated preindustrial levels. In urban areas the present levels of contamination are much higher, up to 100 times the levels in the cleanest rural bays.

As reported in the EPA Pollutant of Concern Matrix[21] (EPA, 1986), 40 chemicals have each been found in at least one sediment sample in the Puget Sound basin at a level that causes biological harm.

Sediment samples collected in recent years from many locations in Puget Sound—including Bellingham Bay, Commencement Bay, Port Gardner Bay, Elliott Bay, and Eagle Harbor—were very toxic to bioassay organisms. Lower levels of toxicity have been observed in samples from many other locations. These samples were generally collected from the top two centimeters of sediment—the material that had accumulated within the last one to five years—indicating recent or ongoing sources of contamination.

The benthic (bottom-dwelling) populations at many locations are also considered damaged (significantly altered in composition or seriously reduced in total abundance) by sediment pollution.

Toxicants reach the water from many sources, but the principal ones are unpermitted discharges, raw sewage discharges (e.g., combined sewer overflows), stormwater runoff, and permitted point source discharges (industrial and municipal outfalls). In addition, dredging and disposal can disturb and redistribute these materials.

Institutional Problems

Sediment contamination is generally regulated by programs aimed at protecting water quality. Since toxicants can concentrate in sediments, harmful sediment contamination can occur even when the water column is not seriously contaminated. Prior to adoption of the 1987 plan, the existing programs

21 The matrix contains information on 52 toxic substances that are of concern in Puget Sound. The matrix reports observed sediment concentrations of 41 pollutants of concern along with apparent effect threshold (AET) values. These AET values, as described in the PSWQA Contaminated Sediments and Dredging issue paper, are estimates of the sediment concentration at which adverse biological effects will always occur. If sediments at a station exceed the AET values, one can be reasonably certain that biological harm is actually occurring at that site.

lacked clearly stated goals or policies for the prevention of sediment contamination.

The regulation of discharges, the management of dredging and disposal, and the identification and ranking of contaminated sediment sites for cleanup have all been hampered by the absence of any adopted sediment standards. In addition, regulation of sources of toxicants has generally not addressed the contaminated sediment particles suspended in effluents.

Dredging is necessary to create and maintain docks and navigation channels. Dredging and disposal are highly regulated through state and federal permit systems. Dredged material with low levels of contamination may be disposed of at open water sites. Dredged material with higher levels of contamination is required by these programs to be disposed of at confined disposal sites. The Puget Sound Dredged Disposal Analysis (PSDDA), a cooperative effort by the Corps of Engineers, EPA, DNR, and Ecology, has recommended new standards and sites for unconfined open water disposal in central Puget Sound. PSDDA has also recommended improved permitting and management of monitoring and disposal sites. But PSDDA is not designed to develop or adopt standards for disposal of sediments that are too contaminated to be disposed of in unconfined open water sites. In addition, although there is some agency interest in establishing multiuser disposal sites for the more contaminated sediments, many unknowns must be resolved about the utility and viability of such sites before any are proposed.

Areas that have been identified as having serious sediment contamination are being addressed in several locations through the EPA-Ecology Urban Bay Action Program and Superfund investigations. But no complete inventory of locations with contaminated sediments exists, and it is unlikely that the existing level of funding for the urban bay program will allow even the known areas of contamination to be addressed very soon. The decision criteria for identifying contamination, addressing sources, and deciding whether to propose sediment cleanup actions tend to be reinvented for each contaminated sediment site.

PROGRAM STATUS

Implementation of the contaminated sediments program has been delayed by severe funding limitations, timing of hiring, and delays in the PSDDA program. The program received only 40 percent of the Ecology funding needed in the FY 1988-89 biennium to implement the program. To allow progress on elements that will produce crucial management rules, most of the shortfall was taken out of the investigations of contaminated sediment areas (S-8). Significant progress is now being made on other elements.

The first phase of PSDDA, covering central Puget Sound, was completed during the summer of 1988, and shoreline permit decisions on the three proposed disposal sites are pending as of October 1, 1988. Baseline studies of the three phase 1 sites are completed.

Ecology has issued draft marine sediment standards (a vital part of the sediment program required under element P-2) for review. A work plan to develop confined disposal standards (S-4) has been completed, an advisory committee formed, and work is under way. A work plan for the study of multiuser confined disposal sites (S-6) has also been developed.

Funding restrictions prevented any significant increases in the investigations of contaminated sediment sites (S-8). This element received only about 10 per-

cent of the desired funding level. The EPA/Ecology urban bay investigations have continued, but the increase in effort contemplated by element S-8 has been postponed. EPA is undertaking a review of the past urban bay efforts to determine whether the methodology should be changed.

A number of major projects related to contaminated sediments have been, or are now, under consideration. The Navy Everett Homeport project involves capped in-water disposal of sediments unsuitable for open water disposal. The project received a water quality certification from Ecology requiring extensive monitoring. The city of Everett also granted a shoreline permit for the project. The shoreline permit and the water quality certification were immediately appealed to the Shorelines Hearings Board and the Pollution Control Hearings Board. A federal court granted an injunction to prevent construction from proceeding until such time as the shoreline permit is finally granted. The Pollution Control Hearings Board affirmed the water quality certification and the Shoreline Hearings Board was divided, which has the effect of approving the shoreline permit. As of October 1, 1988, federal court has ruled that the EIS for the project was not adequate and has issued another injunction.

In a major project involving a cleanup action, Simpson Tacoma has capped highly contaminated sediments at its plant on Commencement Bay. The Port of Tacoma is proposing burial of dredged material unsuitable for open water disposal in a proposed fill of a portion of the Milwaukee waterway. Metro has proposed placing "clean" dredged material on the hot spot caused by the Denny Way combined sewer overflow in Elliott Bay.

PROGRAM GOAL

To reduce and ultimately eliminate adverse effects on biological resources and humans from sediment contamination throughout the Sound by reducing or eliminating discharges of toxic contaminants and by capping, treating, or removing contaminated sediments.

STRATEGY

The strategy for achieving this goal is (1) to classify sediments that cause adverse biological effects; (2) to implement Soundwide controls on sources of contaminants causing sediments to fail the sediment standards; (3) to provide rules and sites for disposal of dredged materials; and (4) to expand the urban bay program to provide for additional source control and consideration of cleanup actions for existing areas of high sediment contamination levels.[22]

22 The first two elements of this strategy, classification of contaminated sediments and source controls, are included in the Municipal and Industrial Discharges Program and the Stormwater and CSOs Program.

PROGRAM ELEMENTS

Policies

S-1. Sediment Program Policies

The following policies shall be followed by all state and local agencies in actions affecting sediment quality, including rulemaking, setting priorities for funding and actions, and developing permit programs:

a. All government actions will lead toward eliminating the presence of sediments in the Puget Sound basin that cause adverse effects to biological resources or pose a serious health risk to humans.

b. Programs for management of dredging and disposal of sediments should result in a net reduction in the exposure of organisms to adverse effects.[23]

c. Sediment cleanup programs (which may include capping in place) shall be undertaken when reasonable to reduce, with the intent of eliminating, the exposure of aquatic organisms to sediments having adverse effects.[24]

[**Status:** Agencies are incorporating these policies into their programs and activities.]

Unconfined Open Water Disposal

S-2. Program for Unconfined Open Water Disposal

The Authority shall review each draft report and environmental impact statement (EIS) of the Puget Sound Dredged Disposal Analysis (PSDDA) and provide timely comments to the Corps of Engineers (lead PSDDA agency). In addition, Authority staff shall review preliminary drafts of PSDDA draft EISs and advise the Authority of any significant changes needed. Comments will then be forwarded to PSDDA. Every effort will be made to resolve PSWQA concerns with PSDDA recommendations so that the recommendations in the final reports by PSDDA can be adopted by the Authority. The Authority shall review, modify if necessary, and adopt the recommendations of each phase of PSDDA within three months of the publication of the final reports and EISs.

In commenting on the draft EIS and adopting final unconfined open water disposal recommendations, the Authority will specify how state agencies and local governments should conform their programs to the recommendations.

23 The intent of this policy is that dredging and disposal contribute to the cleanup of the Sound by allowing unconfined open water sites to have only low levels of contamination and to dispose of more contaminated sediments in a manner that prevents continued exposure of organisms to adverse effects. For proposals where dredging will expose contaminated sediments, project-specific mitigation measures may be required.

24 Element S-7 directs Ecology to develop a decision process which will resolve the question of when cleanup actions are "reasonable."

After adoption by PSWQA, the recommendations shall become part of the Puget Sound Water Quality Management Plan and shall be used by state agencies and local governments in reviewing and acting on proposals for unconfined open water disposal. If required, all state and local agencies shall promptly modify their regulations and programs as necessary (including shoreline master programs) to conform to the adopted recommendations. Revisions to regulations and programs shall be completed within one year of adoption by PSWQA. Agencies which cannot act within one year shall notify the Authority immediately to request an extension to this time limit.

Target Dates: Schedule is governed by PSDDA document production.

[**Status:** PSDDA Phase I report is complete. Authority adoption of recommendations for Phase I is incorporated as element S-3. In adopting Phase I recommendations, the Authority is not requiring local governments to amend shoreline master programs to conform to the PSDDA recommended language. Phase II draft is expected in late 1988.]

S-3. Unconfined Open Water Disposal Sites

The Authority adopts by reference the following portions of the Management Plan for Unconfined Open Water Disposal Phase I:

* Selection of dredged material disposal sites in Everett, Seattle, and Tacoma harbors to serve as regional sites for disposal of dredged material that meets the PSDDA evaluation procedures (page 4-5 of the PSDDA Phase I Management Report).

* Selection of site condition II for the phase I sites (page 4-5 and Chapter 5 of the PSDDA Phase I Management Report). It is the Authority's long-term goal that dredged material disposal sites have NO chemical adverse effects. The Authority concurs with the PSDDA recommendation of Site Condition II ("minor" adverse effects) for the near term because: the sites are being selected to minimize the resources affected; the sites will receive large of amounts of material that would pass a Site Condition I standard, which will moderate the potential effects of the material that falls between conditions I and II; and the proposed program of monitoring and reevaluation will allow protective adjustments to the evaluation procedures if problems develop.

* Evaluation procedures (Chapter 5 and Appendix A of the PSDDA Phase I Management Report).

* Disposal Site Management Plans (Chapter 6 of the PSDDA Phase I Management Report). The Authority supports model shoreline master program language proposed by PSDDA for adoption by local governments and suggests that local governments consider amending their programs but is not requiring local governments to do so.

* Disposal site environmental monitoring (Chapter 7 of the PSDDA Phase I Management Report).

* Data management (Chapter 8 of the PSDDA Phase I Management Report).

* Annual review and program update (page 9-6 of the PSDDA Phase I Management Report).

Changes to any of these PSDDA recommendations are considered major public actions subject to Authority review.

Target Dates: As described in PSDDA Phase I Management Report.

[**Status:** Permits for the three Phase I sites are pending as of October 1, 1988.]

Confined Disposal

S-4. Confined Disposal Standards for Sediments

Ecology shall develop and adopt by regulation standards for reuse or disposal of dredged material that exceeds the sediment standards developed under element P-2 and that will not be disposed of at unconfined open water disposal sites established by the PSDDA process. These standards for confined disposal will be used by Ecology, shoreline jurisdictions, and local health departments in approving or denying permits for the use or disposal of dredged material that exceeds the P-2 standards. The objective of these disposal standards is to prevent the exposure of aquatic or terrestrial organisms, including humans, to adverse effects from the contaminants in the sediments.

In developing the standards Ecology shall consult with agencies and other parties with technical expertise and shall provide a public education/public involvement program. The standards shall address treatment as well as in-water and upland confined disposal methods.

Target Dates: Adopt interim standards by September 1, 1989. Adopt final standards by July 1, 1990.

[**Status:** Ecology has begun developing standards.]

S-5. Revision of Rules and Programs

After the adoption by Ecology of disposal standards for sediments that exceed sediment standards (S-4), the Authority shall review the standards and consider the degree to which local governments and other state agencies should conform their programs to the Ecology standards so that the use or disposal of sediments in compliance with the disposal regulations is not unreasonably precluded. Shoreline master programs, solid waste rules, and the hydraulics permit rules may be affected. The Authority may then amend the Puget Sound Water Quality Management Plan to direct state agencies and local governments to revise their programs. If required, these revisions shall occur no later than two years after final action by the Authority. Any agency or local government that cannot meet this deadline shall request, at the earliest possible time, an extension from the Authority.

Target Dates: Begin review on April 1, 1990. Adopt plan language by October 1, 1990. Complete state/local revisions by October 1, 1992.

[**Status:** Will follow S-4. The schedule for state agencies and local governments to revise their programs has been extended by one year because of funding restrictions.]

S-6. Multiuser Confined Disposal Sites Study

Ecology shall undertake a study of the utility and viability of establishing a system of multiuser confined disposal sites. This study shall consider the amounts, locations, and contaminant characteristics of sediments projected to be dredged; the fraction of this material that might be disposed of at multiuser

sites; the legal feasibility, including liability issues; the financial feasibility of establishing such sites including fee options; the institutional options for such sites; and the technical feasibility of such sites, including in-water and upland methods. The results of the study, including specific recommendations as to whether, and by whom, multiuser sites should be established, shall be provided to the Authority.

In carrying out this element, Ecology shall consult with agencies and other parties with technical expertise and shall provide a public education/public involvement program.

Ecology may choose to make an early recommendation on whether a multiuser confined disposal site program should be established and then prepare recommendations on siting guidelines, liability management, and possible candidate sites.

The Authority will review the status of this element and decide whether a supplemental budget request should be submitted to the legislature for the 1990 session to support actual site development.

Target Date: Begin study by July 1988. Complete study by July 1, 1990.

[**Status:** On schedule.]

Contaminated Sediment Investigations and Cleanup

S-7. Guidelines for Sediment Cleanup Decisions

To establish a uniform decision process concerning what to do about sediment contamination, Ecology shall develop guidelines for deciding whether existing sediments that exceed the sediment standards developed under element P-2 should be capped, excavated, or otherwise treated, or whether no action should be taken. In developing the guidelines, Ecology shall consult with agencies and parties with expertise in these issues and provide a public education/public involvement program. Development of the guidelines shall include consideration of deadlines for making decisions on cleanup actions. As a guide in deciding whether to wait for natural processes to cap or dilute the sediments or to undertake cleanup actions, the guidelines shall also include consideration of a time by which surface sediments should no longer have adverse effects. Because of the high cost of treatment or removal of contaminated sediments, the guidelines shall include a process and criteria for establishing priorities for such actions, including consideration of the cost of cleanup. Development of the guidelines should include trigger levels for identifying high levels of contamination requiring expedited cleanup actions.

Target Dates: Complete guidelines by January 1, 1991.

[**Status:** Should be completed ahead of schedule.]

S-8. Investigations and Cleanup of Contaminated Sediments

This element constitutes an expansion of the ongoing EPA and Ecology program of investigations and source control efforts in urban bays and other areas of the Sound where sediment contamination is known or suspected. This element deals with sediment contamination in three tiers. In element 8.1, specific sample locations that exceed sediment standards are inventoried. In 8.2, Ecology uses the inventory and other information to identify bays or other similarly sized areas for further investigation under elements 8.3 and 8.4. In 8.6, Ecology identifies specific sites that should be considered for cleanup actions under elements 8.6 and 8.7.

Although this element contains specific directives and assignments, the Authority intends that EPA, Ecology, and other agencies and local governments exercise flexibility in resolving contaminated sediment problems. EPA is requested to continue or increase existing support for this effort through various programs including the national funding for estuary programs, federal Superfund activities, and federal funding for Ecology water quality and hazardous waste programs. To organize and coordinate the program, Ecology, in cooperation with EPA, shall undertake an integrated program consisting of the guidelines called for in S-7 and the following components:

8.1. Inventory of Locations With Contaminated Sediments

To provide information to PSWQA and the public and to allow for tracking of increases or decreases in the extent of sediment contamination, Ecology shall maintain an inventory of points or locations in the basin where sediment samples have been taken which violate the sediment standards developed under element P-2. The inventory should consist of maps with locations of contamination indicated. All available sources of data, including monitoring, permit applications, and published research studies, should be used in developing the inventory. The inventory shall be integrated into the Puget Sound Atlas if possible. This inventory shall be published every two years. The Authority shall assist in distributing the inventory and include a summary of the inventory in the State of the Sound Report. As an aid in targeting source control activities, Ecology's inventory shall identify the chemicals or other characteristics for each location that causes it to be on the inventory.

8.2. Contaminated Sediment Area Priority List and Investigation Schedule[25]

Ecology shall develop decision criteria for identifying areas of Puget Sound where locations with sediment contamination have been identified or are suspected and where investigations both to control sources and to consider cleanup actions should be undertaken. These criteria will be used to establish a priority list of areas to be investigated, to allocate resources for contaminated sediment investigations, and to establish a schedule for these investigations. Every effort should be made to investigate each area on this priority list within five years of its first appearance on the list. Ecology shall reevaluate both the area priority list and the investigation schedule every two years.

25 An "area" is a bay or similar-sized region where sediment contamination might be studied and an effort made to control sources of contamination. A "site" is smaller than an "area" and defines a specific hot spot that might be caused by a single source and considered for cleanup actions.

8.3. Investigations of Contaminated Sediment Areas (formerly 8.4)

Ecology and EPA, in cooperation with other agencies and local governments, shall carry out investigations of contaminated sediment areas identified and listed under element 8.2. Investigations shall be designed on a case-by-case basis using Elliott Bay and Commencement Bay studies as the models. The investigations shall include reviews of existing information on contamination and sources as well as field investigations designed to refine information on levels and distribution of contamination and probable sources.[26]

8.4. Action Teams and Source Control (formerly 8.5)

For each contaminated sediment area being investigated, Ecology, EPA, and other appropriate agencies will form a team of investigators to work on source controls. The teams should include Ecology regional office inspectors and permit writers who normally handle the area. The team's activities shall be integrated with the Municipal and Industrial Discharges Program by focusing activities under that program in locations associated with contaminated sediment areas. The teams shall carry out various source control and investigation actions including:

* Review existing discharge permits and compliance with them;
* Reopen and modify discharge permits of sources in the vicinity to control toxicants identified at problem levels in the sediments;
* Search for unpermitted discharges and take enforcement actions;
* Investigate contamination in storm drains or groundwater and search for sources of such contamination;
* Take other actions to control sources of sediment contamination by seeking to achieve full compliance with applicable laws and regulations in locations that drain into the contaminated area; and
* Identify sites within the area that should be considered for cleanup.

Ecology and EPA are encouraged to make use of industry scientists, engineers, and other experts to assist in these efforts.

8.5. Ranking Method Study (formerly 8.3)

Ecology shall review the existing method of ranking contaminated sites in urban bays as well as the ranking systems used under the federal Superfund law (CERCLA and SARA) and the state Hazardous Waste Cleanup Act (HWCA) and recommend how the ranking of sites with sediments that violate the sediment standards established under the Municipal and Industrial Discharges Program can be made consistent with the other programs. The study also shall identify and compare various funding sources for contaminated sediment area investigations, sediment site cleanup action feasibility studies, and actual cleanup actions, and shall make recommendations on future funding. Contaminated sediment sites should be ranked and investigated under a separate system that is comparable to the state and federal Superfund

26 Costs for this element are estimated assuming that most of the work will be performed by consultants. If this work is to be done by agency staff, additional staff (FTEs) would be required, but the total cost would be about the same.

programs. Then funding from these programs may be available should sediment cleanup actions with public funds be necessary. The results of this study shall be used in updates of the site priority list called for in element 8.6.

8.6. Sediment Site Cleanup Actions

Following the guidelines developed under S-7, when sites with high levels of sediment contamination are identified, Ecology shall consider the feasibility and reasonableness of sediment cleanup actions. Ecology, as part of this element, shall develop decision criteria for determining when sediment cleanup actions should be taken pursuant to water quality and discharge permit laws (sediment restoration activities) and when cleanup actions should be taken pursuant to the Hazardous Waste Cleanup Act (sediment remedial actions). If sediment cleanup actions are necessary, funds for such actions will be sought first from responsible parties and then from public sources. Ecology shall maintain a priority list of specific sediment sites where cleanup will be considered.

8.7. Responsible Parties

The Authority recognizes that identifying the parties responsible for sediment contamination is generally difficult. Often neither the underlying property owner nor the abutting property owner is responsible for the contamination. But cases have occurred and will occur when responsible parties can be identified. Where treatment or removal of contaminated sediments is recommended, Ecology shall attempt to have such cleanup actions, including investigations and feasibility studies, undertaken and paid for by responsible parties whether they are dischargers under water quality laws or liable persons pursuant to HWCA. Every reasonable attempt will be made to recover cleanup costs from responsible parties including study costs.

Target Dates: Complete ranking system study by June 1, 1990. Complete area priority list by June 30, 1991. Complete initial location inventory by January 1, 1990.

[**Status:** Extremely limited funding has prevented the proposed increase in urban bay activities. Funding during the FY 1988-89 biennium was only 10 percent of that requested. Some work is proceeding. This element is further delayed by the reduced funding request for FY 1990-91.]

Education

S-9. Public Involvement/Education/ Technical Assistance

Ecology shall increase staffing for public involvement for sediment program issues including sediment standards (P-2). A staff person will be assigned to coordinate Ecology public outreach and education on sediment issues and improve the response to technical inquiries. This element will be coordinated with the development of educational materials on sediments under element ES-4.4.

Target Date: Ecology shall assign staff for this element by August 1, 1989.

[**Status:** This new element is proposed to begin in 1989.]

MAJOR PUBLIC ACTIONS FOR REVIEW

1. Changes to PSDDA recommendations adopted by reference in element S-3.
2. Adoption of contaminated sediment disposal standards (S-4).
3. Priority list for contaminated sediment area investigations (S-8).

LEGISLATION REQUIRED

New legislation may eventually be required to allow the establishment of multi-user dredged material disposal sites.

ESTIMATED COST

The estimated cost of the sediment program, as scaled back for the 1990-91 biennium, is $1.4 million in fiscal year 1990 and $1.7 million in fiscal year 1991. The cost increases to $2.0 million in fiscal year 1992 and decreases to $1.5 million per year thereafter. Full funding for the same period would require over $2.5 million per year. The largest cost of the program is the investigation and cleanup of contaminated sediments (elements S-7 and S-8). About $850,000 per year is being requested. This would allow some progress on site investigations and source control but does not include public funds that might be needed to clean up contaminated sediments. Such costs could run $100,000 per acre for removal or treatment and $5,000 per acre for capping. Estimates of costs to dredge and dispose of sediment "hot spots" in Commencement Bay ranged from $8 to $79 per cubic yard depending on the type of disposal selected. Establishing standards for sediment disposal is projected to cost $1 million over three years. Preparing a recommendation on multiuser confined disposal sites is estimated to cost $200,000 over two years.

The PSDDA recommendations that will be reviewed by the Authority are expected to result in costs for monitoring and baseline studies of up to $1.3 million in the peak year and more than $600,000 per year on an ongoing basis. DNR and Ecology would share these costs, which are not included in the plan estimates.

Large public and private sector costs are currently associated with dredging or disposal of dredged material. As recently as 1984 dredging and open water disposal of clean material cost only $2 to $3 per cubic yard. For the past few years testing of material suspected of being contaminated has cost an additional $1 per cubic yard. In addition, disposal fees have increased and will increase more in the future. Disposal of dredged material that cannot go to open water now costs anywhere from $15 to $40 per cubic yard. Disposal of highly contaminated material, as discussed above for cleanup actions, has been estimated at up to $79 per cubic yard. Since annual dredging volumes are in the hundreds of thousands of cubic yards, these are significant costs for the region.

Private sector costs associated with investigating and dealing with contaminated sediments sites may also increase. This would occur when responsible parties are required to investigate and remedy sediment "hot spots" resulting from their discharges.

ESTIMATED PLAN COSTS: CONTAMINATED SEDIMENTS AND DREDGING

COSTS BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
S-2,3	Unconfined Open Water Disposal	5,704	11,400	11,408	11,408	0	0	0
S-4	Confined Disposal Standards for Sediments	303,489	470,826	196,862	70,860	0	0	0
S-5	Revision of Rules and Programs	0	0	0	567,716	593,866	0	0
S-6	Multiuser Confined Disposal Sites Study	0	270,108	144,544	65,171	0	0	0
S-7	Guidelines for Sediment Cleanup Decisions	0	75,704	214,739	67,930	0	0	0
S-8	Investigations and Cleanups	91,554	392,022	710,528	705,054	1,332,866	1,430,784	1,415,784
S-9	Public Involvement	0	0	110,775	80,498	70,498	70,498	70,498
TOTAL		$400,747	$1,220,061	$1,388,856	$1,568,636	$1,997,230	$1,501,282	$1,486,282

Element Notes

S-2,3 Costs to develop and implement PSDDA are not included.
S-5 Assumes 12 counties and 25 cities have to modify programs.
S-6 If Ecology recommends that multiuser sites be developed, supplemental funding may be requested for FY91.
S-8 EPA funding will be sought for continued urban bay field investigations.
S-9 Cost estimate includes cost to develop educational materials called for in element ES-4.4 in the Education program.

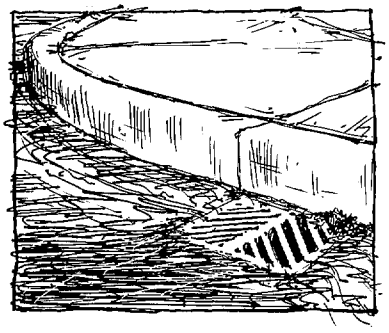
COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Ecology	350,192	1,017,586	1,031,621	760,268	1,201,682	1,226,644	1,211,644
PSWQA	8,556	34,212	45,633	34,224			
Fisheries	0	0	22,226	25,321	30,956	12,701	12,701
Wildlife	0	0	0	11,406	16,940	0	0
Natural Resources	0	0	183,487	175,452	146,836	128,604	128,604
Local Government	41,999	168,262	105,890	561,964	600,815	133,333	133,333
TOTAL	$400,747	$1,220,061	$1,388,856	$1,568,636	$1,997,230	$1,501,282	$1,486,282

COSTS BY FUNDING SOURCE							
Centennial Clean Water Fund	31,500	126,200	65,000	65,000	100,000	100,000	100,000
State General Fund	358,748	1,051,798	1,282,967	1,006,672	1,396,415	1,367,949	1,352,949
Local Sources	10,499	42,062	40,890	496,964	500,815	33,333	33,333
TOTAL	$400,747	$1,220,061	$1,388,856	$1,568,636	$1,997,230	$1,501,282	$1,486,282

STORMWATER AND COMBINED SEWER OVERFLOWS (CSO_S)

PROBLEM DEFINITION

Combined Sewer Overflows (CSOs)



Nine cities[27] around Puget Sound have combined sewers where sanitary sewage, industrial wastewater, and stormwater are collected in a single sewer system. Metro, because it accepts wastewater for treatment from Seattle, handles wastewaters from combined sewers, although Metro owns no combined system. In a combined sewer system neither the pipes nor the sewage treatment plants are sized to carry all of the volume of combined wastewater, and during large storms some of the effluent is discharged directly to the Sound and adjacent waters without treatment.

Except for Metro and Seattle, basic information on frequency, quantity, and effects has been lacking for most CSOs discharging into Puget Sound. In an average year, Metro and Seattle discharge about 2.8 billion gallons of raw sewage, untreated stormwater, and industrial effluents from about 110 CSOs in the Seattle area. This volume is approximately six percent of the annual discharge from the West Point treatment plant. The Metro and Seattle discharge contains approximately five percent of the total annual load of biochemical oxygen demand (BOD) and total suspended solids discharged from the West Point treatment plant. Although the volume of effluent of CSOs is relatively small compared to the discharge of sewage treatment plants, CSO discharges are untreated and are usually in close proximity to sensitive shoreline areas.

The discharge of raw sewage from CSOs contains high concentrations of fecal coliform bacteria, nutrients, and suspended solids. Sediment samples collected around the Denny Way CSO in Seattle have shown highly elevated concentrations of heavy metals and organic toxicants. The biota around the CSO has also been adversely affected by the discharge. Because the high numbers of fecal coliform bacteria in raw sewage indicate the presence of pathogens, areas around CSOs have been closed to swimming and shellfishing.

Until recently, the control of CSOs was given a low priority by federal and state agencies. EPA policy, and standard engineering practice, has been to separate sanitary and storm sewers, and, in fact, EPA will no longer fund construction of combined systems. With the passage of HB 815 by the Washington State Legislature in 1985, all municipalities with CSOs are required to develop plans for the "greatest reasonable reduction at the earliest possible date." The legislation required submittal of CSO reduction plans to Ecology by January 1, 1988. Each of the municipalities with CSOs is making efforts to control its CSOs. Ecology and those local jurisdictions which have yet to submit plans are negotiating schedules to submit CSO reduction plans during 1988. These plans are to include locations, baseline annual frequency and volume, and some water quality and sediment sampling.

27 Anacortes, Bellingham, Bremerton, Everett, Mt. Vernon, Olympia, Port Angeles, Seattle, and Snohomish.

CSO control techniques have typically involved separation and/or storage. Separation involves construction of storm drainage systems which collect stormwater and discharge to natural waters. Storage means using tanks, vaults, oversized pipes, and related equipment and facilities to hold and store combined effluent for later discharge to the treatment plant. Typically, separation systems are the less expensive to construct of the two alternatives. Separated drainage systems will be subject to stormwater management programs as mandated by the stormwater elements of the plan (SW-1 and SW-2).

Stormwater

Rainfall may evaporate, be transpired by plants, infiltrate into the ground, or run off into drainage courses. Residential, commercial, and industrial land uses have a much higher volume of runoff than rural land uses. This is because urban land uses have a much higher percentage of impervious areas. Impervious areas are hard surfaces such as rooftops, driveways, streets, parking lots, and highways. Stormwater is defined as runoff from these land uses and is often called urban runoff.

In developed areas, certain pollutants are more prevalent than in undeveloped areas. Typically, contaminants include suspended solids, nutrients, bacteria, oils and grease, and metals and other toxicants. Many of these contaminants are associated with motor vehicles; others with applications of fertilizers, pesticides, or herbicides; pet feces; or poor management of various wastes. Atmospheric deposition, or dust, contains particulates and associated contaminants from cars, factories, and wood stoves. Runoff from developed areas carries these pollutants into the nearest body of water—a stream, lake, or Puget Sound. Stormwater is a significant source of the pollutants that have concentrated in sediments in several urban bays. Some storm drains in Seattle were found to be major sources of lead and PCBs found in the sediments of Puget Sound.

The potential for significant pollution from stormwater has been increasingly recognized in the past 10 years. Metro[28] detected six metals in all 78 samples collected in the Seattle area between 1980 and 1982, including arsenic, cadmium, chromium, copper, lead, and zinc. Nickel was detected in over 50 percent of the samples. The average stormwater concentrations exceeded chronic water quality criteria for cadmium, copper, lead, nickel, and zinc. The concentrations of metals did not appear to be different between the three basic land use types sampled—residential, commercial, and industrial. Runoff from freeways, however, was consistently higher for most metals. Compared to effluent from secondary sewage treatment, urban runoff in Bellevue contained higher concentrations of lead and zinc. Average concentrations of total suspended solids, chemical oxygen demand, and nitrate/nitrite from the Nationwide Urban Runoff Program[29] runoff data were higher than the annual mean concentrations in secondarily treated effluent from the Renton treatment plant.

28 Toxicants in Urban Runoff, Metro, 1982.

29 A five-year study (1978-82) sponsored by EPA and many cooperating federal, state, regional, and local agencies, addressing the quality of urban runoff, the significance of the urban runoff problem, and the effectiveness of best management practices.

Based on the known volume of discharge from municipal and industrial sources and the relative area of urban development in the Puget Sound basin, the quantity of pollutants contributed to the Sound and area waters from stormwater runoff is approximately equal to the contribution from municipal and industrial sources. As urbanization of the Puget Sound basin continues, the contribution of stormwater to the pollution of surface waters will become more severe—unless effectively managed.

Construction activities contribute to the stormwater pollution problem because of the potential for erosion from construction sites. Local governments typically attempt to control erosion and sedimentation during construction by requiring certain techniques known as best management practices (BMPs). Proper application of appropriate BMPs can significantly reduce the amount of sediment leaving a site. Additionally, local governments often regulate the construction of drainage systems by requiring permits and reviewing designs. These processes are most effective in controlling erosion and the quality and quantity of runoff following development when utilized together.

Preventive measures such as drainage and land use regulations can stop problems before they occur. Examples include ordinances to limit development on sensitive features such as steep hillslopes, floodplains, and wetlands. Establishment of stream corridors and native growth protection easements protect water quality and fish habitat in natural drainage systems. Areas experiencing frequent flooding and erosion can be designated as critical areas subject to special restrictions that minimize impacts or improve conditions within a specific stream drainage basin.

The primary effect of development on streams has been to increase both the volume and speed of peak flows. The resulting erosion, scouring, and deposition of sediment affect the ecological balance in the stream. Diversity of species decreases and more tolerant (and usually less desirable) species remain.

To date, drainage management has focused on controlling flooding problems. Detention basins are used to control the release rate of stormwater from developed properties. Stormwater is then discharged to surface water, groundwater (via infiltration systems), and/or combined sewers. Now many jurisdictions are considering both quality and quantity in surface water management. Traditional techniques to manage quantity offer opportunities to improve water quality; for instance, detention basins while slowing the rate of flow may also settle out particulates and associated pollutants.

Management of surface water may conflict with other management goals, including management of fisheries, groundwater, and wetlands. The potential for groundwater contamination from stormwater is significant. Seven of the 12 counties in the Puget Sound basin rely on groundwater for more than 75 percent of their domestic water supply. In urban areas, stream flows are higher in the wet season, because of the increased rate of runoff, and lower in the dry season because of the decrease in groundwater recharge resulting from covering the ground with impervious areas. Management of streams and rivers for stormwater conveyance may hinder the movements of migratory fish, both by obstructing their passage and by changing flows. Wetlands, both natural and artificial, are being used for storage and treatment of stormwater, with only limited knowledge of the effect of stormwater on wetland habitats.

Because most stormwater quality programs are just beginning, we do not know how successful they will be in keeping contaminants out of surface water and groundwater. Even if source controls and BMPs are considered successful, we

still don't know whether the resulting water will be clean enough to fully protect Puget Sound from harm.

Stormwater pollution is a problem associated with land development and the common use of potential pollutants such as pesticides, fertilizers, petroleum products, and numerous others. The pervasiveness of the stormwater problem requires solutions from diverse segments of society—the development community, business, and individuals. Federal, state, and local governments may lead the way by defining control methods, leading educational efforts, conducting investigations, and providing enforcement activity where necessary, but success in solving the problem will be a function of society-wide efforts.

PROGRAM STATUS

CSOs

With the passage of HB 815 (RCW 90.48.460-490) by the Washington State Legislature in 1985, all municipalities with CSOs were required to develop plans for the "greatest reasonable reduction at the earliest possible date." The legislation required submittal of local CSO reduction plans to Ecology by January 1, 1988. Ecology established a new regulation (Chapter 173-245 WAC) to implement the law consistent with these requirements. The 1987 Puget Sound plan called for CSO reduction guidelines by Ecology (SW-8) and CSO reduction plans by cities with CSOs (SW-9). Ecology's guidelines for the implementation of Chapter 173-245 WAC were completed in September 1987.

As of August 1988 the CSO reduction plans of Metro, Seattle, and Everett have been approved by Ecology. Ecology will issue or has issued compliance orders to the other cities, although deadlines have not been established in all cases. The regulation provides that CSO reduction plans will be updated every five years.

In its report to the legislature on the implementation of HB 815,[30] Ecology defined "greatest reasonable reduction" as one overflow per year at each CSO location. In addition, Ecology has negotiated interim goals of 75 percent and 79 percent reductions of CSO volumes systemwide over the next 20 years with Metro and Seattle, respectively. This will continue the effort to reduce discharges of raw sewage from all sources. In Metro's case, such efforts have resulted in a 90 percent reduction in raw sewage discharges since 1960.

As a specific example of actions to be taken under CSO reduction plans, Metro's Denny Way CSO in Seattle, which now discharges approximately 370 million gallons per year into nearshore waters in Seattle's Elliott Bay, will be reduced to approximately 42 million gallons per year within 20 years. The quality of the discharge will be also be improved by the source control efforts under way in the drainage basin.

Stormwater

Progress on the stormwater elements of the plan has included establishment of a stormwater unit at Ecology in early 1988 and the start of development of the

30 The Status and Future of Combined Sewer Overflow Control, Washington Department of Ecology, September, 1987.

highway runoff program at the Department of Transportation. The Puget Sound Wetlands and Stormwater Management Research Program, led by King County, has continued without funding from the plan. Independent development of stormwater management programs at the local level has made rapid progress.

The federal Water Quality Act of 1987, which reauthorized the Clean Water Act,[31] establishes new procedures, requirements, and deadlines for the regulation of stormwater discharges by municipal and industrial sources. Cities with populations greater than 250,000 are to be issued permits by 1991, and sources are to be in compliance by 1994. Cities with populations greater than 100,000 are to be issued permits by 1993 and are to be in compliance by 1996. EPA will issue regulations for smaller sources by October 1992. The new law provides that permits for municipal discharges may be issued on a systemwide basis. The law also includes a requirement effectively prohibiting non-stormwater discharges to storm sewers. It also requires controls to reduce the discharge of pollutants to the maximum extent practicable.[32] Industrial stormwater sources are still subject to BAT/BCT[33] based standards.

EPA has recently provided guidance documents for new initiatives in the Water Quality Act. "Nonpoint Source Guidance" describes how states should assess their waters to determine where uses are impaired by nonpoint sources (including stormwater) and develop nonpoint source management plans.[34] "State Clean Water Strategies: Meeting the Challenges of the Future" is intended to serve as an umbrella document for a number of initiatives[35] and describes what EPA views as a rational process for states to use in satisfying their Water Quality Act requirements.

Ecology formed a stormwater unit early in 1988 to address the requirements of the stormwater section of the Puget Sound Water Quality Management Plan—specifically the requirements for manuals, model ordinances, and technical guidance to local governments. Ecology is also in the process of developing a draft areawide stormwater permit for Bellevue. This permit (which will probably be issued early in 1989) will include monitoring requirements and numerical standards for certain pollutants.

Stormwater is being addressed on a watershed basis through the plan's Nonpoint Source Pollution Program. Regulations adopted by the Authority (Chapter 400-12 WAC) encourage local development of management frameworks which will facilitate nonpoint source pollution management. Section 400-12-630 specifically addresses stormwater and erosion management.

31 33 U.S.C. Section 1342 amended by PL 100-4 Section 402(p).

32 A new standard from the Water Quality Act of 1987, 33 U.S.C. Section 1345 as amended by PL 100-4, Section 405.

33 Best Available Technology/Best Conventional Technology, as defined by the CWA.

34 33 U.S.C. Section 1251 et. seq., as amended by PL 100-4, Section 319.

35 Surface Water Toxics Control, Nonpoint Source, Estuary, Clean Lakes, and Great Lakes program areas.

The Uniform Fire Code (UFC) can be used to control surface water runoff pollution. The UFC is adopted by reference in RCW 19.27A.010; the current version is the 1982 UFC. Local jurisdictions adopt the UFC with minor variations. The 1988 draft of the UFC, Article 80, Section 104(b) (Release of Hazardous Materials), says, "Hazardous materials shall not be released into any sewer, storm drain, ditch, drainage canal, lake, river or tidal waterway, or upon the ground, sidewalk, street, highway or into the atmosphere." This section, if adopted by local jurisdictions, will give local fire departments wide latitude to deal with inappropriate release and control of hazardous materials. Some jurisdictions, including Bellevue and Redmond, have adopted the 1988 version early, and use this authority, in coordination with other local agencies and departments, to help control environmental impacts. Since all fire departments conduct regular inspections of commercial/industrial facilities, they can be particularly effective at detecting and correcting potential problems.

The Urban Bay Action Program, a joint effort by Ecology, EPA, and local agencies, has conducted source control programs in urban bays since 1985. Stormwater is one source of toxic contamination to many urban bays. The urban bay action teams have developed specific source control programs to control stormwater and other sources of toxic contamination in these bays (see element P-13).

At the local level, the trend has continued toward establishment of surface water utilities. Anacortes, Auburn, Bellevue, Gig Harbor, Issaquah, Kent, Lacey, Mountlake Terrace, Olympia, Port Townsend, Poulsbo, Redmond, Renton, Seattle, Steilacoom, Tacoma, Tumwater, Winslow, and portions of King, Snohomish, and Thurston counties have surface water utilities at this time. Several other cities, including Bellingham, Bremerton, Kirkland, Marysville, and Mukilteo, are considering formation of utilities. Many more cities are reviewing and revising stormwater management policies, programs, and ordinances.

The Puget Sound Wetlands and Stormwater Management Research Program is a regional effort coordinated by King County to scientifically establish the short- and long-term effects of urban stormwater on regional wetlands and to determine the downstream water quality benefits which might be provided by the use of wetlands to treat stormwater. While the bulk of the research is long-term and results will not be available for several years, a survey of the characteristics of upland wetlands both affected and unaffected by urban runoff as well as a literature review have been completed.

PROGRAM GOAL

To protect shellfish beds, fish habitat, and other resources, to prevent the contamination of sediments from urban runoff and CSOs, and to achieve standards for water and sediment quality by reducing (to the maximum extent practicable) pollutant discharges from stormwater and CSOs throughout Puget Sound.

STRATEGY

The strategy for achieving this goal is (1) to develop stormwater programs in urbanized areas of Puget Sound in a phased program starting with the largest cities; (2) to require that all cities and counties develop operation and maintenance programs, adopt ordinances for new development, and develop stormwater education programs; and (3) to require all cities with CSOs in the Puget Sound basin to develop and implement plans providing for the greatest reasonable reduction of CSO events.

PROGRAM ELEMENTS

SW-1. Stormwater Programs for All Counties and Cities[36]

All counties and cities in the Puget Sound basin shall adopt ordinances requiring stormwater controls for new development and requiring maintenance of private stormwater systems. This program shall not affect the Department of Ecology's authority to require appropriate corrective action (pursuant to Chapter 90.48 RCW) whenever existing facilities cause or contribute to violations of state water quality standards.

Each county and city also shall develop operation and maintenance programs for new and existing public stormwater systems. Each county and city shall maintain records of new public and private storm drainage systems and appurtenances. Counties are responsible for the stormwater programs in unincorporated residential, commercial, and industrial areas. Ecology will ensure that all appropriate areas are included in these programs. All programs and ordinances developed under this element shall be consistent with Ecology rules, guidelines, and model ordinances in elements SW-3 and SW-4. Each city and county shall adopt ordinances consistent with Ecology's model ordinances (SW-4) requiring stormwater quality and quantity controls for new development and requiring and enforcing maintenance of privately owned stormwater systems. Education programs to inform citizens about stormwater and its effects on water quality, flooding, and fish/wildlife habitat, and to discourage dumping of waste material or pollutants into storm drains are included in the Education and Public Involvement Program elements (ES-2 and ES-5.3).

Ecology shall oversee compliance with these requirements, auditing each city's and county's operation and maintenance and runoff control program every two years to ensure consistent and adequate implementation. If local governments fail to prepare and implement the required programs under this element, Ecology shall either prepare and implement these programs itself or use its regulatory authority under Chapter 90.48 RCW, the Puget Sound Water Quality Management Plan, or other authority to direct local governments to prepare and implement operation and maintenance programs for stormwater systems and runoff ordinances for new development. The status of the stormwater ordinances and maintenance programs shall be evaluated by PSWQA as part of the 1991 Puget Sound Water Quality Management Plan.

Target Date: All cities and counties shall adopt ordinances and comply with the operation and maintenance program requirements by June 30, 1991. By the same date, cities and counties with ordinances and operation and maintenance programs predating Ecology guidance under element SW-4 shall bring

36 Elements SW-1 and SW-2 are reversed from the 1987 plan.

their ordinances and programs into compliance with Ecology guidelines. By June 30, 1993, Ecology shall complete the first round of biennial audits.

SW-2. Stormwater Programs for Urbanized Areas[37]

Starting with six of the larger cities in the basin and four other cities or unincorporated or watershed areas[38] and eventually expanding to cover all urbanized areas, each city and unincorporated urbanized area shall develop and implement a stormwater management program consistent with Ecology rules and guidelines (SW-4). This program shall not affect the Department of Ecology's authority to require appropriate corrective action (pursuant to Chapter 90.48 RCW) whenever existing facilities cause or contribute to violations of state water quality standards. The program shall be submitted to Ecology for approval. Ecology will schedule submittal of stormwater management programs by the remaining cities and counties.

The purposes of the management program shall be:

1. To control erosion and manage the quantity and quality of stormwater runoff from public and private activities;

2. To protect and enhance water quality, and achieve water quality and sediment quality standards;

3. To reduce the discharge of pollutants to the maximum extent practicable; and

4. To protect beneficial uses, as described in Chapter 173-201 WAC.

Each urban stormwater program shall seek to control the quality and quantity of runoff from public facilities and industrial, commercial, and residential areas including streets and roads. Each program shall cover both new and existing development. Ecology shall allow for early action by urbanized areas which are prepared to implement stormwater control programs. Emphasis shall be placed on controlling stormwater through source controls and best management practices. In some cases, significant stormwater problems may be originating in urbanized areas outside of a local jurisdiction. In those situations, the sequencing of areas for urban stormwater programs may be modified by Ecology to address problems in shared watersheds. The neighboring jurisdictions will develop local coordination mechanisms to cooperatively resolve the identified problems. Where joint programs are not developed, Ecology shall ensure consistency in programs through its oversight role.[39]

The urban stormwater programs shall be based on minimum standards contained in the technical manuals, model ordinances, rules, and guidelines

37 Urbanized areas are as defined by the United States Bureau of the Census. Counties are responsible for the comprehensive urban stormwater programs (SW-2) in unincorporated urbanized areas. Ecology will ensure that all appropriate areas are included in these programs.

38 The six cities are Seattle, Tacoma, Bellevue, Everett, Bellingham, and Bremerton. The four other areas will be selected by Ecology following a procedure which ranks local willingness to participate and includes the likelihood of significant success.

39 The priority watershed process (elements NP-2, NP-3, and NP-4) would require joint efforts.

developed in SW-3 and SW-4. Ecology shall provide technical assistance to the cities and counties developing and implementing stormwater programs. Ecology will coordinate its stormwater program development with other state programs which have stormwater implications, i.e., wetlands, floodplain management, nonpoint, underground injection control, and the sediment quality criteria development program. Ecology will comply with the federal regulations for the municipal areawide NPDES stormwater permits, which may be used to implement urban stormwater programs. Each city or urban area will have the flexibility to design its own program to be phased in over several years, but the content, priorities, and deadlines for compliance for the program shall be subject to review and approval by Ecology.

At a minimum, each urban stormwater program shall include:

a. Identification of potentially significant pollutant sources and their relationship to the drainage system and water bodies.

b. Investigations of problem storm drains, including sampling.[40]

c. Programs for operation and maintenance of storm drains, detention systems, ditches, and culverts.[41]

d. A water quality response program, to investigate sources of pollutants, spills, fish kills, illegal hookups, dumping, and other water quality problems. These investigations should be used to support compliance/enforcement efforts.

e. Assurance of adequate local funding for the stormwater program through surface water utilities, sewer charges, fees, or other revenue-generating sources.

f. Local coordination arrangements such as interlocal agreements, joint programs, consistent standards, or regional boards or committees.

g. Ordinances requiring implementation of stormwater controls for new development as defined by Ecology per SW-3 and SW-4.[41]

h. A stormwater public education program aimed at residents, businesses, and industries in the urban area.

i. Inspection, compliance, and enforcement measures.[42]

j. An implementation schedule.

40 The Elliott Bay Revised Action Program: Storm Drain Monitoring Approach, March 1988 (draft), Tetra Tech, for EPA Region 10 presents an approach particularly suited to industrial areas.

41 Items c and g are parts of the areawide stormwater programs (SW-1), but may be developed under SW-2 by those cities and counties which proceed directly with the comprehensive stormwater program.

42 Local government may request Ecology's assistance with enforcement measures.

k. If after implementation of the control measures listed in a-j above, there are still discharges that cause significant environmental problems, retrofitting of existing development and/or treatment of discharges from new and existing development may be required.

Stormwater quality in public stormwater systems in commercial and industrial areas shall have a high priority in city and county programs. Ecology shall determine, in compliance with EPA regulations, and in consultation with local governments, the appropriate approach to controlling stormwater discharges from industrial and commercial facilities which are not currently required to have point source discharge permits. Stormwater controls are included in NPDES permits for discharges of stormwater from commercial and industrial point source facilities, which are addressed in the Municipal and Industrial Discharges Program (P-5).

Ecology shall have compliance oversight responsibilities for the urban stormwater programs. Ecology shall audit each urban stormwater program every two years to ensure consistent and adequate implementation. If local governments fail to prepare and implement urban stormwater programs, Ecology shall either prepare and implement programs itself or use its regulatory authority under Chapter 90.48 RCW, the Puget Sound Water Quality Management Plan, or other authority to direct local governments to prepare and implement urban stormwater programs. The effectiveness of the urban stormwater programs shall be evaluated by PSWQA as part of the 1991 Puget Sound Water Quality Management Plan.

Ecology shall participate with Bellevue in a pilot areawide stormwater permit process intended to result in issuance of an areawide stormwater permit to Bellevue at the earliest possible date. The purpose of this permit process is to gain experience with use of the permit to implement the urban stormwater programs.

Urban stormwater programs may be part of the priority watershed action plans (NP-2 and -4).

Target Dates: By December 31, 1989, the six named cities and another four cities or unincorporated areas begin developing stormwater programs. By the year 2000, all urbanized areas in the Puget Sound basin implement urban stormwater programs. Ecology shall audit each city or county program for substantial progress toward implementation of the elements listed above within two years of its initiation.

SW-3. Technical Manuals on Stormwater and Erosion Controls

Ecology shall produce technical manuals for use by local jurisdictions in stormwater planning. In preparing these manuals Ecology shall use existing information. The technical manuals shall define minimum standards for inclusion in local programs (SW-1 and SW-2). The technical manuals shall include:

a. Best management practices for the control of erosion and sedimentation from construction sites, including standards for operation, maintenance, and inspection procedures.

b. Hydrologic analysis procedures, including selection of design storms and estimation of runoff.

c. Design, operation, and maintenance standards for public and private retention/detention facilities and conveyance systems. Emphasis is to be placed on systems which will maximize water quality benefits as well as water quantity control, such as the inclusion of biofiltration techniques where practicable.

d. Techniques for the reduction or elimination of pollutants in runoff from problem land uses.

The development of these manuals shall be closely coordinated with the development of the guidelines and model ordinances for stormwater programs (SW-4). Ecology shall also update these manuals as needed and provide technical assistance in interpretation of these manuals to local jurisdictions.

Target Dates: Complete the technical manuals by December 31, 1989.

[**Status:** A stormwater unit was established at Ecology in January 1988 and has begun work on this element.]

SW-4. Rules, Guidelines, and Model Ordinances for SW-1 and SW-2

Ecology shall prepare and update guidance, consisting of rules, guidelines, and model ordinances, for stormwater programs for all cities and counties (SW-1) and for comprehensive urban stormwater programs (SW-2). Ecology, in consultation with local governments and the Puget Sound Water Quality Authority, shall prepare an evaluation to determine which aspects of the guidance (see 4.1 below) should be in rule, and which in supplemental guidelines. Ecology shall consult with cities, counties, developers, citizens' groups, and other interested parties, as it develops the rules, guidelines, and model ordinances. The rules, guidelines, and model ordinances shall be used by local jurisdictions in preparing their stormwater programs. The rules and guidelines shall provide minimum program requirements. Ecology shall also provide technical assistance to local jurisdictions during preparation and implementation of their stormwater programs.

4.1. Guidance for SW-1 and SW-2

The guidance for SW-1 and SW-2 shall include:

a. Procedures for developing local programs, including procedures for Ecology review and approval of programs.

b. Minimum requirements for runoff controls required in local ordinances.

c. Minimum requirements for control of private sector maintenance of private drainage systems.

d. Minimum requirements for the operation and maintenance programs, including record-keeping requirements for new drainage systems and facilities.

Additionally, the guidance for the comprehensive urban stormwater programs (SW-2) shall include:

a. Procedures for identification of potentially significant pollutant sources and their relationship to the drainage system and water bodies.

b. Procedures for source tracing investigations, including sampling of problem storm drains.

c. Procedures for investigations, implementation of spill control measures, enforcement, and remedial actions.

d. Methods for assuring adequate local funding for the urban stormwater program.

e. Provisions for agreements with neighboring jurisdictions when stormwater and watersheds do not follow jurisdictional boundaries.

f. Requirements for public education programs.

g. Requirements for retrofitting and/or treatment measures, if necessary.

h. Procedures for inspection, compliance, and enforcement measures.

i. Requirements for implementation schedules.

The guidance shall lay out acceptable approaches to control stormwater from new development, such as water quality policies for use in SEPA and other permit decisions; density controls to limit development in sensitive areas; development standards to limit the amount of impervious surfaces; regional detention ponds; oil separators or other treatment facilities; drainage ordinances; erosion control programs; preservation of wetlands; or other elements.

In the guidance for SW-1 and SW-2, Ecology shall address the issue of responsibility and procedures for dealing with direct discharges of stormwater from industrial and commercial facilities into the waters of the state.

4.2 Model Ordinances

The model ordinances for elements SW-1 and SW-2 are intended to set minimum standards for adoption by local governments, and shall include at least the following elements:

1. A drainage element which (a) sets policy; (b) defines the role of surface water management; (c) defines water quality criteria and standards; (d) provides local enforcement authority; (e) provides for inspection and maintenance of private drainage facilities; (f) authorizes administrative development of operation and maintenance standards, development standards, and spill response procedures; and (g) generally integrates the management of surface waters with other appropriate codes affecting water quality, (i.e., the Uniform Fire Code, public health codes, and land-use codes).

2. A clearing and grading element which specifies erosion-control authority and provides for inspection and enforcement.

3. An element ensuring protection of streams and wetlands that is consistent with Ecology standards developed under plan element W-4.

Target Date: Ecology submits the completed evaluation of items for inclusion in rules and supplemental guidelines to the Authority for approval by February 1, 1989. Ecology completes the rules, guidelines, and model ordinances by December 31, 1989.

[**Status:** A stormwater unit was established at Ecology in January 1988 and has begun work on this element.]

SW-5. Puget Sound Highway Runoff (WDOT)

The Washington Department of Transportation (WDOT) shall develop a program to control runoff from freeways and highways in the Puget Sound basin. This program shall be consistent with Ecology guidelines.

Ecology shall develop guidelines for the Puget Sound Highway Runoff Program and shall coordinate with WDOT in its development of a runoff program. During preparation of these guidelines, Ecology shall consult with WDOT, other appropriate Ecology programs, the Puget Sound Water Quality Authority, and affected local jurisdictions. Ecology shall provide technical assistance to WDOT and local jurisdictions during development and implementation of this program.

The guidelines shall include requirements for:

a. Control and/or treatment of runoff from highways in the Puget Sound basin.

b. Implementation of BMPs and/or treatment facilities for new construction.

c. The use of BMPs addressing water quality and quantity control, the use of herbicides and pesticides in highway rights of way, and the use of de-icing chemicals.

d. Compliance with Ecology and local stormwater programs. Ecology shall seek to provide consistent requirements for the highway program in different jurisdictions.

e. For phasing in the runoff program, priority will be given to the most heavily traveled highways, while keeping in mind the site-specific constraints of implementing best management practices.

f. WDOT funding of construction and operation and maintenance of local or private stormwater systems receiving highway runoff. Such funding shall be commensurate with the proportional water quantity and pollutant loading contribution of such runoff. Ecology will describe methods to determine quantity and loading contributions to the stormwater system.

g. Determining site-specific constraints in implementing best management practices and/or treatment measures for existing highways.

h. An implementation schedule.

Target Date: The Department of Transportation shall begin implementation of its highway runoff program by June 30, 1990. Ecology shall complete the final guidelines by December 31, 1989.

[**Status:** A highway runoff unit was established at WDOT in March 1988 and has begun work on this element.]

SW-6. Runoff from Federal Facilities

As part of the state certification process under Section 401 of the federal Clean Water Act, Ecology will require that all NPDES permits for federal facilities, including military bases, written by EPA contain stormwater controls that are at least as stringent as those required for industrial facilities in

Municipal and Industrial Discharges Program element P-5, including all toxicant and particulate limits and requirements for monitoring, spill control, and public notice. EPA is requested to review existing EPA-issued permits and modify any permit as necessary to include such limits and requirements. (See Municipal and Industrial Discharges Program elements P-5 through P-11). Before considering a 401 certification for a federal facility permit, Ecology shall seek to be familiar with the facility site through joint site visits or inspections with EPA or other means (for discharges of wastewater from federal facilities, see Municipal and Industrial Discharges Program element P-11).

Target Date: Ecology shall initiate this program on January 1, 1987. After September 30, 1987, Ecology shall not certify the renewal of any NPDES permit for a federal facility under Section 401 of the Clean Water Act unless the permit includes numerical limits and/or other conditions required to comply with all applicable water quality and sediment standards and other elements of this plan.

[**Status**: Not started. Implementation delayed pending completion of procedures manual (P-5).

SW-7. Stormwater-Related Research

7.1. Stormwater-Wetlands Research

Ecology shall partially fund and participate in research on the use of wetlands for stormwater quality and quantity control. Ecology shall cooperate with state and local agencies that are participating in the Puget Sound Wetlands and Stormwater Management Research Program developed by King County, which addresses the water quality benefits of wetland treatment and the impacts of stormwater on wetland ecology. Ecology shall encourage a research program designed to obtain the data necessary to support policy and regulatory decisions regarding water quality and the effects of stormwater discharges on wetlands. The King County wetlands study will require five years to complete. After the second year, Ecology shall evaluate the results and determine their applicability to Ecology's needs.

7.2. Stormwater Research Needs

Ecology shall conduct a comprehensive search of the literature to identify and prioritize stormwater research needs, in collaboration with the Research Program (see element R-1), and report the results.

Target Date: Ecology shall participate in the wetlands research project which commenced on January 1, 1987. Ecology shall report on other research needs by June 30, 1990.

[**Status**: The research project is proceeding with King County, Metro, and other funding. Ecology funding has not been available as of October 1988.]

SW-8. CSO Reduction Guidelines

The Authority recognizes that Ecology is nearing completion of guidelines for local planning to achieve greatest reasonable reduction of CSOs. The goal of the guidelines shall be to achieve greatest reasonable reduction of pollutants from both stormwater and sanitary sewage in CSOs. If local governments choose stormwater separation as a CSO reduction technique, best management practices, including a source control program, shall be required and the

impacts of stormwater on receiving waters shall be monitored by the municipality as required by Ecology. Ecology shall also update the guidelines and provide technical assistance to local governments implementing the guidelines (SW-9).

[**Status:** Ecology completed the regulations for CSO reductions (Chapter 173-245 WAC) in January 1987 and the guidelines for implementation in September 1987.]

SW-9. CSO Reduction Plans by Cities (or Sewer Districts)

As required by RCW 90.48.480, each city, sewer jurisdiction, or other entity with CSOs[43] shall submit to Ecology a plan to achieve greatest reasonable reduction of CSOs consistent with Ecology guidelines. The plans will include priority ranking of CSOs, implementation schedules, and provisions for funding of the corrections. Ecology will review the plans, develop compliance schedules, and modify NPDES permits.

Target Dates: Cities with CSOs were to submit CSO reduction plans to Ecology for approval by November 1, 1987. Ecology was to approve or disapprove of the plans by January 1, 1988. The controls are to be implemented according to a compliance schedule negotiated between Ecology and each jurisdiction.

[**Status:** As of September 1988 Metro, Seattle, and Everett have submitted plans. Ecology either has issued or will issue compliance orders to the remaining cities, although the deadlines have yet to be established in some cases.]

MAJOR PUBLIC ACTIONS FOR REVIEW

1. Ecology guidelines for urban stormwater programs (SW-4).
2. Program for Puget Sound highway runoff (SW-5).
3. Ecology CSO guidelines (SW-8) (completed).

LEGISLATION REQUIRED

None

ESTIMATED COSTS

The costs to the state for the stormwater and CSO program are estimated to be $741,000 in fiscal year 1990, $809,000 in 1991, and $1 million in fiscal year 1992. These costs are reduced approximately 30 percent from a full program budget resulting in emphasis on implementation of the regionwide stormwater program (SW-1) and slower implementation of the comprehensive urban stormwater programs. Local costs are estimated to be $600,000 in fiscal year 1990, increasing to $1,800,000 in 1991, $3,900,000 in 1992, $6 million in 1993, and $8.1 million in 1994. For planning purposes, the local costs are considered to be the incremental, or additional, cost of providing water quality

43 Deadline set by current state law. All CSO deadlines in this program are based upon the need to comply with current state law requiring CSO reductions. Cities known to have CSOs and therefore affected by this requirement are Seattle (and Metro), Anacortes, Bellingham, Bremerton, Everett, Mount Vernon, Olympia, Port Angeles, and Snohomish.

programs above and beyond other drainage activities, typically oriented towards water quantity control.

Although some of the local costs may be supported by the Centennial Clean Water Fund, the bulk of the costs are expected to be funded through the formation of drainage districts or utilities.

Comprehensive control of stormwater from non-NPDES permitted industrial or commercial facilities is a potentially expensive task, not currently included in cost estimates for the stormwater or municipal and industrial discharges programs.

CSOs

The CSO control programs are expensive. Costs for CSO reduction were estimated by Metro, Seattle, and Everett, and by Ecology for the other cities. Over the next 18 years these costs are estimated to be $223 million. Total costs for these cities to control CSOs to the ultimate goal of the one overflow per year level is approximately $425 million, of which $289.5 million is for Metro. These costs are a result of existing requirements; this plan does not impose new requirements on CSOs.

Urban Stormwater Program

An informal survey was conducted in 1988 of local stormwater management programs, including all of the drainage utilities which could be identified. The survey included King, Skagit, and Snohomish Counties, and Anacortes, Auburn, Bellevue, Bellingham, Kent, Lacey, Mountlake Terrace, Olympia, Port Townsend, Poulsbo, Redmond, Renton, Seattle, Shelton, Steilacoom, Tacoma, Tumwater, and Winslow. Many of these cities and counties have already completed several elements of the urban stormwater program. Local governments which already have vigorous stormwater programs underway would be expected to have less of an increase in costs than those with only minimal programs. The total budgets for drainage and stormwater functions currently in place by the jurisdictions surveyed was approximately $35.3 million. An extrapolation of this figure to the region indicates an annual budget of $50 to $160 million dollars to perform current functions, which typically include drainage operation and maintenance, capital improvements, comprehensive drainage planning, and drainage-related permitting for property development. Given the tendency of most local surface water management programs to emphasize flood control rather than water quality control, some additional costs would be incurred by virtually all local governments to implement water quality programs.

Because source controls and best management practices are emphasized before treatment, the costs to local government may not be as significant as they would be if treatment were required. There will, however, be costs for operation and maintenance of systems, remedial actions, public education, and the other elements of the comprehensive stormwater management programs.

Operation and Maintenance Programs and Runoff Ordinances

Because there are fewer requirements, the costs for the regionwide stormwater programs to be developed by all cities and counties (SW-1) will be less than the urban stormwater programs (SW-2). Also under the regionwide stormwater programs, the cities and counties will have to review or adopt ordinances for maintenance of privately owned stormwater systems.

Highways

The Washington State Department of Transportation (WDOT) estimates that it would cost $50 million to implement stormwater controls on all state highways in the Puget Sound basin.

ESTIMATED PLAN COSTS: STORMWATER AND CSOs

COSTS BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
SW-1	Stormwater Programs for All Counties & Cities	8,556	2,800	707,652	1,688,512	1,861,377	2,701,377	3,541,377
SW-2	Stormwater Programs for Urbanized Areas	0	2,800	241,588	680,932	2,815,128	4,052,065	5,312,065
SW-3	Stormwater/Erosion Technical Manuals	54,200	176,563	92,212	0	0	0	0
SW-4	Guidelines and Model Ordinances	57,104	116,235	66,212	0	0	0	0
SW-5	Puget Sound Highway Runoff	14,355	63,105	81,048	86,786	75,378	75,378	75,378
SW-6	Runoff from Federal Facilities	28,349	55,636	30,754	30,754	31,669	31,669	31,669
SW-7	Stormwater-Related Research	2,852	17,921	60,386	60,386	57,534	57,534	0
SW-9	CSO Reduction Plans	81,011	123,462	78,196	78,196	75,344	75,344	75,344
TOTAL		$246,427	$558,522	$1,358,049	$2,625,567	$4,916,430	$6,993,367	$9,035,833

Element Notes

SW-1,2 Estimates for local costs represent the incremental costs of the water quality activities required by the plan. Significant local costs to control drainage (quantity rather than quality) are not included.
SW-1 Regionwide stormwater quality controls.
SW-2 Urban stormwater quality programs which apply in urbanized areas and are in addition to the regionwide SW-1 programs.
SW-7 Wetlands research money is intended to support King County regional wetland research projects.

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
EPA	16,600	16,600	16,600	16,600	16,600	16,600	16,600
Ecology	207,063	516,462	698,668	766,186	999,830	976,767	919,233
PSWQA	22,764	25,460	42,781	42,781			
Local Government	0	0	600,000	1,800,000	3,900,000	6,000,000	8,100,000
TOTAL	$246,427	$558,522	$1,358,049	$2,625,567	$4,916,430	$6,993,367	$9,035,833

COSTS BY FUNDING SOURCE							
Federal Funding	16,600	16,600	16,600	16,600	16,600	16,600	16,600
State General Fund	229,827	541,922	741,449	808,967	999,830	976,767	919,233
Local Sources	0	0	600,000	1,800,000	3,900,000	6,000,000	8,100,000
TOTAL	$246,427	$558,522	$1,358,049	$2,625,567	$4,916,430	$6,993,367	$9,035,833

WETLANDS PROTECTION

PROBLEM DEFINITION

The Importance of Wetlands

Wetlands are an economically, biologically, and physically valuable resource. They are the most biologically productive ecosystems in nature, anchoring the estuarine and freshwater food chains through photosynthesis and the production of innumerable small organisms upon which larger creatures depend.

For a vast diversity of species, including birds, fish, reptiles, invertebrates, and mammals, wetlands[44] are an essential habitat for feeding, nesting, cover, and breeding. At least one-third of our state's threatened and endangered species require wetlands for their survival. The state Department of Wildlife lists over 175 wildlife species that use wetlands for primary feeding habitat and 140 species that use them for primary breeding habitat. Wetlands are critical to the survival of shellfish, salmonids, and other marine and freshwater species. The annual retail value of these fisheries to the Puget Sound region is over $202 million.[45]

Other physical and economic values of wetlands include the slowing and storage of floodwaters and reduced shoreline erosion from wind and tidal action. These functions may eliminate the need in some cases for costly engineered flood and erosion control measures such as dredging, diking, and construction of detention facilities. Wetlands function naturally to recharge groundwater supplies and to improve water quality. Wetlands filter out sediments, use excess nutrients, and break down some toxic chemicals. Economic values for the overall benefit to the Puget Sound region of both the water quality and water quantity control functions of wetlands have not been estimated, but experts recognize they are high.

Wetlands also provide quality-of-life benefits. Wetlands are scenic destinations for hiking, boating, photography, and nature appreciation. It is difficult to derive economic values for these benefits. One measure might be annual tourist expenditures in the 12 Puget Sound counties. These were nearly $3 million in 1986, supporting almost 55,000 jobs.[46] Individuals visiting wetlands often gauge the value of these benefits in more qualitative terms, such as per-

44 For the purpose of this plan, the definition of wetlands used by the U.S. Fish and Wildlife Service has been adopted:

> Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoils and is saturated with water or covered by shallow water at some time during the growing season each year.

45 PSWQA, *State of the Sound 1988 Report.* Table 2-1: Fish and wildlife uses of different wetland types.

46 Ibid, page 2-23.

sonal fulfillment and renewal. Finally, wetlands furnish us with important educational and research opportunities.

The Loss of Wetlands

More than half of the wetlands along the coasts and riverbanks of Puget Sound have been destroyed by human activity. In the Skagit Valley, for example, 90 to 95 percent of the wetlands have been lost, primarily to agriculture. Commercial development in areas such as the Green/Duwamish and Puyallup river basins has eliminated over 95 percent of the original wetlands. Sensitive, rare, and important wetland types, including herring and smelt spawning beds and salt marshes, have been lost or are threatened. In some cases, such as inland freshwater wetlands, the nature and extent of wetland loss is unknown because wetland inventories are lacking.

Some of the original causes of wetland loss, such as diking wetlands to create pastureland, no longer pose a threat to wetlands. However, wetlands, especially marine shorelines, remain choice locations for certain types of industrial, commercial, and residential use. Incremental loss of some estuarine wetlands continues to occur from port industrial development and to an unquantified extent from small projects such as bulkheading. These losses can represent significant percentages of some habitat types in certain areas.

Laws and Programs for Protecting Wetlands

A variety of federal, state, and local laws are now in effect that help control wetland losses. The scope of these laws is limited, however, and programs derived from them are often inadequately funded and not well coordinated among different levels of government. The decision to protect wetlands is discretionary rather than mandatory under many of these laws.

A recent study by the Department of Ecology shows that the State Environmental Policy Act (SEPA) provides inadequate protection to isolated wetlands and fails to satisfactorily identify wetland areas and impacts.[47] This study also provides evidence of a general lack of knowledge about wetlands at the local level. Another study, by the Region 10 Office of the Environmental Protection Agency, shows that most efforts to compensate wetland losses by enhancing existing wetlands or creating new ones have not been successful at replacing the functions and values of the eliminated wetland.[48]

Most of the applicable laws exclude small water bodies and wetlands from regulation or contain various exemptions. Minor development projects and activities, for example, are typically exempted. Actions adjacent to wetlands but lying outside a regulatory boundary, such as the 200-foot limit of the Shoreline Management Act, can also adversely affect wetlands. In the past, no program has focused exclusively on either the protection of wetlands on state-owned lands or the restoration of degraded wetlands.

47 Hull, S.W. and J.S. MacIvor. 1987. State environmental policy act wetlands evaluation project. Washington Department of Ecology, Wetlands Section, as cited in PSWQA, *State of the Sound 1988 Report.*

48 U.S. Environmental Protection Agency. 1987. Implications of wetland mitigation practices pursuant to Section 404 permitting activities in Washington state. Region 10, unpublished report, as cited in PSWQA, *State of the Sound 1988 Report*

The cumulative effect of these exemptions, programmatic gaps, and limitations is that wetlands throughout the Puget Sound basin continue to be degraded or lost.

PROGRAM STATUS

The wetlands protection program includes preservation through fee-simple or other type of acquisition, enhanced regulations, protection for wetlands on state-owned lands, education, and restoration. By October 1988 Ecology had formed technical review and citizen advisory committees for both the preservation and the enhanced regulatory programs. Under Criteria Development and Program Planning (W-1), Ecology submitted a report to the Authority on criteria and techniques for preservation in September 1988. Ecology has widely distributed a nomination questionnaire requesting groups and individuals to identify wetlands to be preserved (W-2). A draft working list of wetlands to be preserved will be prepared by Ecology in November 1988, consisting of sites from the Puget Trough Coastal Wetlands Report. The final list of important wetlands is due in April 1990.

As an early action under Wetlands Preservation (W-3), the Department of Natural Resources has committed funds allocated by the legislature for this program to Snohomish County to acquire portions of the Snohomish Delta wetlands. By August 1988, acquisition of one site had been completed, with a second pending and two additional candidate sites identified. DNR actively participates in drafting wetland selection criteria (W-1) and in compiling the working list of important wetlands (W-2). DNR will use the additional criteria for marine and estuarine wetlands it is preparing under W-1 for the development of its management program for state-owned wetlands (W-6). W-7, Wetlands Education Strategy, and W-8, Wetlands Restoration Program, are scheduled to begin in July 1989.

PROGRAM GOAL

To ensure that there is no net loss of wetland functions, values, and acreage and that in the long term there is a net gain through restoration and enhancement of wetlands in the Puget Sound basin.

STRATEGY

The strategy for achieving the goal of no net loss and a net gain of wetlands has several facets. First, wetlands will be preserved, either through purchase or some other mechanism, to safeguard their functions and values (W-1, -2, and -3). Second, local governments will develop and implement programs that meet minimum state standards for protecting wetlands promulgated in rule by Ecology (W-4 and -5). Next, the Department of Natural Resources will develop and implement a program for protecting wetlands on state-owned uplands and aquatic lands. DNR will also evaluate, along with other state agencies with land management responsibilities, applicable authorities and programs to determine their adequacy in protecting wetlands on all lands managed by the state (W-6). Finally, Ecology will develop and implement a long-range wetlands education strategy (W-7) and a wetlands restoration program (W-8).

PROGRAM ELEMENTS

W-1. Criteria Development and Program Planning

With Ecology as lead and with assistance from DNR, a preservation program shall be prepared. The first element of this program shall include a report consisting of the following:

1. Detailed criteria for selection of wetlands to be preserved, including representative wetlands of various types. DNR shall provide additional criteria for marine/estuarine wetlands based on biological and physical functions and characteristics (M-2).

2. Evaluation of techniques and mechanisms for preservation of wetlands that may be used by state agencies, local governments, and private organizations, including acquisition by purchase, exchange, or gift, and use of innovative methods such as conservation easements and transfers of development rights.

This report shall include written concurrence from DNR with the wetlands preservation program and shall be submitted to the Authority for review.

Technical assistance in developing the program shall be provided to Ecology by state agencies, such as the Departments of Natural Resources, Fisheries, and Wildlife. Close coordination with the existing DNR Natural Heritage Program shall be maintained. A working group shall be formed by Ecology consisting of wetland scientists, wetland specialists from state and local government agencies, and representatives of Indian tribes, landowners, developers, conservation groups, and industry. The expertise and advice of this group shall be used to develop innovative approaches to wetland preservation, to recommend sources of long-range funding for wetland preservation, and to assist in making a broad range of potentially interested individuals, local governments, and organizations aware of the wetlands preservation program. This group shall continue to provide assistance throughout the implementation process.

Target Date: Submit report on criteria and techniques for preservation by September 1, 1988, with marine/estuarine components submitted by December 1, 1989.

[**Status:** The final criteria have been completed and presented to the Authority. DNR will complete components based on biological functions and characteristics for marine/estuarine wetlands by December 1989.]

W-2. Identification of Wetlands to be Preserved

With Ecology as lead and with assistance from DNR and technical assistance from other state agencies, such as Wildlife and Fisheries, the wetlands to be preserved shall be identified. Nominations of wetlands to be preserved shall be solicited from a broad range of potentially interested parties, including local governments, citizens' and other groups, tribes, and individuals.

Wetlands already identified in the Puget Trough Coastal Wetlands Report as having high value shall comprise the first draft of a working list of wetlands to be preserved. This working list shall be updated periodically prior to completion of the final list of wetlands to be preserved. Ecology shall identify those sites on the working list that are candidates for early action, and DNR shall

take the necessary steps under W-3 to preserve these sites. The final list may be periodically revised as necessary.

Documentation shall accompany the final list describing the size, location, and general functions and values of the selected wetlands and demonstrating how the final list of wetlands was chosen. When documentation includes field investigations, sampling shall use, to the extent practicable, protocols and a data management system compatible with the Puget Sound Ambient Monitoring Program. The final list and documentation shall be jointly submitted by Ecology and DNR. The Authority shall review the final list and documentation of wetlands selected for preservation.

Public workshops shall be held to provide education and to encourage participation by local governments and a broad spectrum of the public in the selection process.

Target Date: First draft of the working list of Puget Trough Report sites submitted to the Authority by November 1, 1988. Final list submitted to the Authority by April 1, 1990.

[**Status:** Ecology held public workshops around the Sound in March and April 1988. In September 1988, Ecology distributed a questionnaire to local governments, citizens' groups and other entities, and individuals to solicit nominations of wetlands for preservation.]

W-3. Wetlands Preservation

With DNR as lead and with assistance from Ecology and other state agencies, the state shall take actions necessary to preserve and protect in perpetuity those wetlands identified under element W-2. This is an ongoing program in which specific sites are protected as funds and other mechanisms become available. DNR may make grants to local governments and other entities wishing to sponsor wetlands preservation projects.

DNR, Ecology, and other state agencies shall develop general management standards to ensure that wetlands secured by the preservation program are protected in perpetuity. These agencies shall recommend a preservation strategy for each site that includes (a) a technical rating of site preservation value; (b) preliminary site management and preservation methods; (c) an analysis of effects that recent federal and state court decisions[49] dealing with the public trust doctrine may have on preservation strategies; and (d) an appropriate management entity(ies).

Funds appropriated to DNR to carry out this program shall be expended consistent with the agencies' recommended site preservation strategy. All government and private entities are encouraged to use other appropriate funds available to them to acquire wetlands in accordance with each specific site preservation strategy. DNR shall take early action to preserve available sites on the working list, and acquisition may continue prior to completion of the final list.

After sites are secured, a detailed site management plan shall be developed and implemented. Site plans shall be developed by the management entity in

49 For example, Phillips Petroleum Company v Mississippi 108 S. Ct. 791 (1988).

consultation with DNR, Ecology, and other state agencies and shall meet the general management standards and include any necessary site-specific requirements. Management plans may include educational components that are developed in consultation with the Environmental Education Task Force (see element ES-7.1) and with the wetlands education strategy (W-7).

DNR and Ecology shall provide technical advice and limited staff support to any agency, local government, organization, tribe, or private party wishing to take the lead in preserving any site, including those not on the final list. State preservation actions should coordinate with and complement preservation programs of private organizations such as The Nature Conservancy and Trust for Public Lands. Data on functions, values, and acreages of all wetlands preserved under this program shall be provided to the Department of Ecology for measuring progress in achieving the wetlands program goal of no net loss of wetlands in Puget Sound.

Target Date: Initiate acquisition for most important sites on August 1, 1988. Identify recommended preservation strategies and appropriate management entities for sites on the final list by December 1, 1990. Develop site preservation and management plans as funding and other mechanisms become available.

[**Status:** DNR has taken early action to acquire wetlands in Snohomish County.]

W-4. State Rules for Wetlands Protection

By rule, Ecology shall adopt minimum standards for local wetlands programs in the Puget Sound basin. These rules shall prescribe the minimum features that must be contained in local programs. In developing the rules, Ecology shall study means of enhancing regulatory protection for water quality and habitat functions of wetlands. This study shall include the identification of wetland types or sizes which require additional protection and necessary and optional means of providing such protection. The study shall also contain a recommendation on whether wetlands protection should be included in the state water quality standards (Chapter 173-201 WAC) when these are revised in 1990.

The rules may contain standards for wetland use and development, such as requirements for water dependency, an absence of practical alternatives, public benefit exceeding public loss from wetland changes, and use of mitigation. The rules shall set forth a schedule and process for local legislative bodies and Ecology to approve the local programs and shall require extensive public involvement in the development of local programs. In developing the rules, Ecology shall identify legislative actions, including funding for the development and implementation of local wetland programs, that may be necessary to carry out the enhanced regulatory program.

Ecology shall also review existing wetland inventories and determine if they are adequate to meet the needs of the enhanced regulatory program. If Ecology determines that they are not, Ecology shall, as part of the rulemaking process, establish minimum requirements for wetland inventories. Ecology shall use existing wetland inventory and other trends analysis information to establish a tracking system for monitoring progress in achieving the wetlands program goal of no net loss and a net gain of wetlands in Puget Sound.

Prior to adopting the rules, Ecology shall work closely with entities having expertise in wetlands management and regulation, such as federal, state, and

local governmental agencies and tribes. In particular, Ecology shall coordinate with efforts of the federal Environmental Protection Agency in classifying and protecting wetlands.

Target Date: Adopt rules by September 1, 1989.

[**Status:** Ecology has established technical review and advisory committees and has begun developing the rules. Ecology has held meetings with local government officials to explain the program and to seek their comments.]

W-5. Local Wetlands Programs

Local governments shall measure their wetlands protection efforts against the state standards contained in Ecology's wetlands protection rules (W-4) and take those actions necessary to implement a local program that meets the standards. Local governments shall submit programs to Ecology for review. Ecology shall approve programs that meet the state standards. Ecology shall provide technical assistance to local governments for program development.

Local governments are encouraged to use existing authority to implement wetlands programs prior to the dates identified by this plan, and to implement programs that exceed the minimum state standards adopted in Ecology rules.

Target Date: Submit local wetland programs for all Puget Sound counties to Ecology by September 1, 1990. Submit programs for all cities with marine or estuarine wetlands to Ecology by December 1, 1990. Submit programs for all other jurisdictions in the Puget Sound basin to Ecology by May 1, 1991. Ecology completes approval process within three months of submittal.

[**Status:** No wetlands programs will be submitted until Ecology adopts the rules. Local governments are participating in the rule development process (W-4), and many are currently implementing programs and ordinances related to wetlands protection.]

W-6. Program to Protect Wetlands on State-Owned Lands

For state-owned uplands and aquatic lands managed by DNR, DNR shall use its authorities and programs to ensure that existing wetlands are preserved and protected. At a minimum, DNR's program for protecting wetlands on state-owned uplands managed by DNR shall:

* Inventory wetlands on state-owned uplands under DNR management. DNR shall use protocols and data management systems for the inventory that are consistent, to the extent practicable, with the Puget Sound Ambient Monitoring Program.

* Develop procedures for complying with adopted local wetlands programs in the department's management of wetlands on state-owned uplands, consistent with laws pertaining to state land management.

* Study the laws, regulations, policies, and programs and their implementation pertaining to DNR's uplands management responsibilities to determine their effectiveness in protecting wetlands on lands under DNR management. DNR shall propose amendments if needed.

* Coordinate with Ecology to ensure that DNR management programs for state-owned uplands are consistent with Ecology wetland rules (W-4).

* Prepare and implement an overall strategy based on the above four elements, as well as any additional elements the department determines are necessary for protecting wetlands on DNR-managed uplands.

At a minimum, DNR's program for protecting wetlands on aquatic lands shall:

* Implement a management program for wetlands on state-owned aquatic lands in the Puget Sound basin. This program shall (a) be implemented through DNR's proprietary authorities for state-owned aquatic lands; (b) be based on the nearshore habitat inventory under M-2; (c) address habitat protection; (d) consider use of appropriate wetlands for educational purposes, including development of interpretive programs and displays (in coordination with W-3 and with the wetlands education strategy (W-7)); and (e) include review of key regulatory actions of other agencies, use of appropriate conditions in aquatic lands leases, and withdrawal of critical aquatic land areas from leasing.

* Meet the standards in Ecology rules and be consistent with local adopted wetlands programs.

* Study the laws, regulations, policies, and programs and their implementation pertaining to DNR's management of aquatic lands to determine their effectiveness in protecting wetlands on aquatic lands, and propose required amendments.

DNR shall submit a progress report to the Authority that describes DNR's program for preserving and protecting wetlands on lands managed by DNR. At a minimum, the report shall include:

* A summary of the programs for protecting wetlands on state-owned uplands managed by DNR and on aquatic lands;

* The types and values of wetlands inventoried on state-owned aquatic lands;

* A description of the procedures developed for complying with local wetland programs and Ecology rules in DNR's management of wetlands on state-owned uplands;

* The results of the study of laws, regulations, programs, and policies pertaining to DNR's land management responsibilities, including recommendations, if needed, for strengthening provisions for wetlands protection;

* An estimate of funding required to implement the overall wetlands protection program for state-owned lands under DNR management.

Other state agencies shall study applicable laws, regulations, programs, and policies and their implementation to determine their adequacy in protecting wetlands on the lands they manage. These agencies shall include, but not be limited to, the Departments of Wildlife, Fisheries, Transportation, Corrections, Social and Health Services, General Administration, the University of Washington and other state educational institutions managing lands in the Puget Sound basin, and the State Parks and Recreation Commission. Each agency's study shall include the general status of the wetlands on lands the agency manages (including acreage information, if available) and recommendations for the revisions that would be needed to ensure that implementation provides protection of wetlands on state-owned lands under that agency's management.

DNR and other state agencies shall provide the Department of Ecology with information on the status of wetland functions, values, and acreage on state-owned lands under each agency's management to assist in Ecology's monitoring of progress in achieving the wetlands program goal of no net loss and a net gain of wetlands in Puget Sound.

Target Date: DNR submits progress report to the Authority by April 1, 1990, and submits the protection program for wetlands on DNR-managed uplands and aquatic lands to the Authority by May 1, 1991. Other state agencies submit reports to the Authority on the results of their studies by January 1, 1990.

[**Status:** DNR has begun the inventory of aquatic wetlands. The department will begin the inventory of state-owned upland wetlands in the FY 1992-93 biennium. DNR will prepare the program in conjunction with Ecology's development of the rules (W-4).]

W-7. Wetlands Education Strategy

Ecology shall develop and implement a long-range wetlands education strategy that augments Ecology's existing wetlands education program. The strategy shall involve entities and individuals possessing expertise in the field of wetlands education. These include staff from DNR, Fisheries, Wildlife, the Environmental Education Task Force, tribes, local government, and private nonprofit conservation groups.

The strategy shall target schools and the general public, as well as groups, such as landowners, professional and civic organizations, local governments, and interest groups. It shall address wetland characteristics, functions, values, the Wetlands Protection Program, and other important wetland issues.

Ecology shall work with those state agencies and groups mentioned above to implement the components of the strategy, which may include (a) guidebooks on wetlands protection techniques, such as a technical bulletin on wetland acquisition (based in part on W-1 report); (b) wetland resource teams in coordination with ES-5; (c) model and site-specific interpretive programs in coordination with W-3; and (d) public workshops. To the extent possible, public libraries shall be provided with wetland education materials for their patrons.

Target Date: Ecology submits wetlands education strategy to the Authority by May 1, 1990. Agencies complete interpretive program by September 1, 1990.

[**Status:** This program will begin in July 1989. Due to funding limitations in the FY 1990-91 biennium, the primary focus of activities in the FY 1990-91 biennium will include the resource teams, short-term educational needs, and support for other elements of the wetlands protection program.]

W-8. Wetlands Restoration Program

Ecology shall develop and implement a program to restore wetlands in the Puget Sound basin. At a minimum, this program shall include:

* Definition of the term "restoration;"

* Description of goals and objectives for the restoration program, including how the program contributes to achieving the no net loss and net gain goal of the Wetlands Protection Program;

* Analysis of existing research on restoration methods, costs, and sites;

* Action to restore specific wetland sites in Puget Sound, especially diked estuarine wetlands no longer utilized for agriculture;

* Site management plans and identified management entities for appropriate restoration projects;

* Estimate of the costs of a comprehensive restoration program and options for funding, for example, bond measures, excise taxes, funds allocated by the legislature for wetland preservation (W-3), and other mechanisms for purchase or non-fee simple acquisition (this analysis is to be coordinated with the Puget Sound Cost and Financing Study (C-1)), ;

* Procedures for coordinating the restoration program with the preservation program (W-1, -2, and -3); the enhanced regulatory program (W-4 and -5); the program to protect wetlands on state-owned lands (W-6); and the wetlands education strategy (W-7).

Ecology shall work with federal agencies, especially EPA, and the Department of Natural Resources and other state and local agencies, as well as interested and affected parties, in developing and implementing this program. Ecology shall prepare a report describing its strategy for accomplishing the tasks outlined above. Restoration projects at specific wetland sites may proceed prior to completion of the report.

Target Date: Ecology submits report to the Authority May 1, 1990. Restoration projects will be undertaken as funding becomes available.

[**Status**: This element will begin in July 1989. EPA is currently funding a study to identify potential restoration sites in Puget Sound. It is anticipated that Ecology's analysis of existing research (under item #3) will include an examination of the results of this EPA study to determine if adequate information is provided to identify specific candidate restoration sites in Puget Sound and to initiate restoration activities. Total costs for implementing the restoration program, both for staff resources and for capital funds for restoration projects, will be high. Budget constraints in the FY 1990-91 biennium will therefore limit Ecology's effort to preparation of a strategy, to include estimates of long-term costs, for implementing the program.]

MAJOR PUBLIC ACTIONS FOR REVIEW

1. Ecology's acquisition criteria (W-1).

2. Ecology's final preservation list (W-2).

3. Ecology's adoption of state rules (W-4).

4. DNR's program for wetlands on state-owned land (W-6).

5. Other agencies' wetland protection reports (W-6).

6. Ecology's wetlands education strategy (W-7).

7. Ecology's wetlands restoration program (W-8).

LEGISLATION REQUIRED

Some amendments to existing statutes may be recommended to provide funding for local government wetland programs and to implement other aspects the program.

ESTIMATED COST

This program is estimated to cost approximately $5.7 million in the FY 1990-91 biennium. Full funding for the program would require an additional $3.0 million for the biennium. Of this, $2.0 million would be dedicated to W-3 acquisition funds, with the remainder providing additional staff support for agencies carrying out tasks in elements W-3, W-6, W-7, and W-8. Consequently, the following tasks will be postponed to the FY 1992-93 biennium: (1) completion of management plans for all sites on the final list of wetlands to be preserved under W-3; (2) DNR's inventory of upland wetlands under W-6; (3) completion of the model interpretive program and full development of the final long-range education strategy under W-7; and (4) early implementation of wetland restoration projects in Puget Sound.

Of the $5.7 million for the FY 1990-91 biennium, the greatest public cost is for wetland acquisition, at $3.0 million ($1.5 million from the Aquatic Lands Enhancement Account and $1.5 million from the state building construction account). It is intended that the expenditure of these public funds will be coordinated with the wetland acquisition program of The Nature Conservancy to achieve the most effective wetlands protection.

Implementation of local wetland programs may entail substantial public and private expense, but the amount of expense is unknown until the rules are developed.[50] Private sector costs are potentially greatest—and most difficult to estimate—where development activities are severely restricted in wetland areas.

If state assistance to local governments for the development of wetlands management programs (W-5) cannot be provided through the Centennial Clean Water Fund, other sources should be considered. Ecology is provided with resources for technical assistance to local governments (W-5). DNR will require additional funds in the FY 1992-93 biennium to conduct upland inventories. Education strategy development (W-7) and the wetland restoration program (W-8) are each estimated to cost approximately $130,000 and $79,000 respectively in the FY 1990-91 biennium.

The following table shows fiscal year costs for individual elements.

50 A potential substantial public cost for the 1990-91 biennium is conducting wetland inventories by local governments. However, the need for these inventories will not be determined until September 1, 1989, when Ecology adopts the rule. These potential costs are therefore not included in this plan.

ESTIMATED PLAN COSTS: WETLANDS PROTECTION

COSTS BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
W-	Administration and Coordination	0	0	18,598	18,598	18,598	18,598	18,598
W-1	Criteria Development and Program Planning	54,907	0	0	0	0	0	0
W-2	Identification of Wetlands to be Preserved	68,574	103,237	81,991	11,087	10,119	10,119	10,119
W-3	Wetlands Preservation	278,496	318,293	1,669,837	1,698,748	2,656,297	2,656,297	2,656,297
W-4	State Rules for Wetlands Protection	118,563	120,610	0	0	0	0	0
W-5	Local Wetland Programs	0	0	937,541	937,541	588,023	588,023	588,023
W-6	Protecting Wetlands on State-owned Lands	0	28,496	71,456	71,456	137,208	137,208	137,208
W-7	Wetlands Education Strategy	0	0	65,173	61,329	119,345	115,501	115,501
W-8	Wetlands Restoration Program	0	0	41,516	37,672	37,672	37,672	37,672
TOTAL		$520,540	$570,636	$2,886,112	$2,836,431	$3,567,262	$3,563,418	$3,563,418

Element Notes

W- Ecology administration and coordination costs.
W-3 Assumes $1.5 million from Aquatic Lands Enhancement Account and $1.5 million from other capital accounts for acquisition in FY-90/91.
W-5 Assumes programs in all 12 counties and 25 cities in FY90 and FY91. In FY92-94, assumes all 12 counties and 32 cities have programs.
W-7 Provides materials and resources to support wetlands portions of the education strategy in the Education program.

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Ecology	178,146	180,915	307,224	297,543	331,372	327,528	327,528
PSWQA	8,249	16,799	11,408	11,408			
Fisheries	5,205	4,136	9,526	9,526	6,350	6,350	6,350
Wildlife	7,200	4,800	8,007	8,007	10,676	10,676	10,676
Parks and Recreation	0	0	5,157	5,157	5,157	5,157	5,157
Natural Resources	321,741	363,985	1,721,510	1,681,510	2,715,812	2,715,812	2,715,812
Local Government	0	0	818,498	818,498	488,332	488,332	488,332
Other State Agencies	0	0	4,781	4,781	9,562	9,562	9,562
TOTAL	$520,540	$570,636	$2,886,112	$2,836,431	$3,567,262	$3,563,418	$3,563,418

COSTS BY FUNDING SOURCE							
Capital Account	250,000	250,000	1,500,000	1,500,000	2,500,000	2,500,000	2,500,000
Centennial Clean Water Fund	0	0	600,000	600,000	340,000	340,000	340,000
State General Fund	270,540	320,636	586,114	536,433	613,930	610,086	610,086
Local Sources	0	0	199,998	199,998	113,332	113,332	113,332
TOTAL	$520,540	$570,636	$2,886,112	$2,836,431	$3,567,262	$3,563,418	$3,563,418

SPILL PREVENTION AND RESPONSE

PROBLEM DEFINITION

In November 1985 jet fuel spilled into Des Moines Creek, killing fish and other organisms in four miles of stream. The spill eventually reached Puget Sound. In December 1985 crude oil was spilled in Port Angeles harbor as a result of the grounding of the tank ship Arco Anchorage. These events served to renew the concern for oil spills and their effects on Puget Sound and its tributaries. Several major spills have occurred more recently. In January 1988 an oil barge sank near Anacortes releasing heavy bulk and lighter grade oil. In March 1988 crude oil was released from an oil tanker moored at March Point near Anacortes. Numerous minor spills also occur every year in Puget Sound. Such spills have obvious potential for significant water quality impacts, both short and long term.

When a spill occurs, the oil can remain at the surface of the water where it is encountered by marine birds, fish and shellfish eggs and larvae, and other organisms; it can sink to the bottom of the water body where it can smother organisms and contaminate sediments; and it can remain suspended in the water column where it can be encountered by fish and fishermen. Bird mortality, fish kills, and fouled beaches are dramatic acute effects of spilled oil. The chronic and long-term effects are not as well known.

Spills of oil and hazardous materials in Puget Sound are violations of both federal and state law. Under the Clean Water Act, the party causing a petroleum spill is responsible for cleaning it up and paying the costs of doing so. The federal CERCLA (Superfund) statute assigns the same responsibilities for spills of other hazardous materials. Cleanup efforts are conducted pursuant to national, regional, and state contingency plans, which identify what is to be done by whom in the event of a spill. The U.S. Coast Guard is the lead agency responsible for spill response in Puget Sound, with state and local governments performing a secondary role. The grounding of the Arco Anchorage demonstrated that several areas of confusion and possible improvement exist in spill response. These include: reporting procedures, the role of local authorities, the use of volunteers, damage assessment methodologies, and wildlife rescue and rehabilitation. Other issues related to spill prevention and response have arisen with subsequent spills, including barge design and modification, operator training, and financial responsibility. Additional efforts to prevent spills and improve spill response are warranted. For more information, refer to Hazardous Materials Spill Prevention and Response in Chapter 5.

PROGRAM STATUS

Ecology established the Oil Spill Advisory Committee in 1986 as required by Engrossed House Concurrent Resolution No. 19. The committee issued its report to the legislature in December 1986, listing 29 specific recommendations. Two recommendations did not require further action. Efforts were ongoing on two of the recommendations at the time the report was published: legislation passed in 1987 required that containment and recovery equipment be available during bunkering and lightering, and directed that investigation of alternative methods of spill damage assessment be performed. The equipment will be required for all bunkering and lightering operations after June 30, 1988. Thomas Leschine at the University of Washington completed a preliminary draft report to the legislature of his study of damage assessment methods in October 1988. The remaining recommendations in the Oil Spill Advisory

Committee Report will be included in a workplan to be completed by Ecology by February 1, 1989.

Ecology produced a Spill Management Policy Recommendations report in January 1987, addressing some of the issues listed under Policy Implementation (SP-1), such as guidelines for the use of volunteers, and failing to address others, such as equipment placement and critical resource area identification.

Ecology has increased its inventory of spill response equipment, adding equipped vans, radio systems, and a boat for the Northwest Regional Office. Ecology has placed on-scene coordinators in the Northwest and Southwest Regional Offices to deal with spills.

Ecology issued a draft Contingency Plan for Spills of Oil and Hazardous Substances for review in January 1988. Major portions of the plan were blank in the review copies. A second issue of the Contingency Plan was produced in July 1988 which included previously missing appendices but still lacked the Operational Spill Response sections.

PROGRAM GOAL

To enhance spill prevention and response capability in Puget Sound and its tributaries and to ensure that the spill response and prevention actions of state agencies are coordinated among themselves and with federal, local, tribal, and private efforts.

STRATEGY

The strategy for achieving this goal is to analyze issues and policies, and use cooperative state and local contingency planning to address prevention of and response to major spills of oil and hazardous materials.

PROGRAM ELEMENTS

SP-1. Oil Spill Policy Implementation

Ecology shall address the issues described below and implement the recommendations contained in the 1986 Oil Spill Advisory Committee Report to the legislature, the 1987 Ecology Spill Management Policy Recommendations report, and any further recommendations generated by continuing policy analyses. In instances where the responsibility for implementing a recommendation properly rests with another entity, Ecology shall specify the responsible party and contact them directly concerning a specific task. When the responsibility rests with the legislature, Ecology shall prepare draft legislation. Issues of particular importance to be addressed include:

Role of Local Governments and Tribes: Methods to maximize involvement of local governments and tribes shall be developed including using existing state and local emergency management channels. Local governments and tribes shall be requested to indicate what specific roles they could fulfill in spill prevention and response.

Role of Volunteers: Guidelines shall be developed for the use of volunteers in spill response.

Wildlife Rescue and Rehabilitation: Legal authorities and responsibilities shall be clarified. Funding, coordination and participation, and preparedness shall be addressed.

Equipment: Placement of and authority over public and private spill response equipment shall be analyzed with respect to maximizing the speed and effectiveness of spill response.

Cleanup Authority: Methods shall be examined to maximize Ecology authority to manage cleanup and damage assessment while recognizing the legitimate role of other entities.

Training: Careful attention shall be paid to training which ensures that the contingency plan is implemented correctly. Ecology shall cooperate with local governments, federal agencies, and industry in staging annual spill response drills. Post-drill debriefing and evaluation shall result in contingency plan modifications as needed.

Critical Resource Areas: An evaluation shall be made of whether information on priorities for protection of critical resource areas in Puget Sound is available and accessible. The need for additional information and/or synthesis of existing information will be evaluated.

Cleanup Funding: An examination of current cleanup funding shall be made with recommendations for alleviating potential shortfalls.

Damage Assessment: An evaluation of the Leschine damage assessment report shall be made. The availability of funding for damage assessment from spills shall also be examined and recommendations made for alleviating potential shortfalls. Draft legislation implementing the recommendation on damage assessment shall be prepared.

Target Dates: Ecology shall complete a schedule of the work program to implement the Oil Spill Advisory Committee recommendations by February 1, 1989. All Ecology's tasks are to be completed by February 1, 1990. Quarterly progress reports shall be submitted by Ecology to the Authority by May 1, August 1, and November 1, 1989. Spill response drills by Ecology, federal agencies, and industry shall occur at least annually, beginning prior to March 1989.

[**Status**: The Oil Spill Advisory Committee Report to the legislature was completed in December 1986. Ecology completed its Spill Management Policy Recommendations report in January 1987. The reports did not address several issues in a comprehensive manner, such as the role of local governments and tribes in spill response, the placement of spill response equipment, and means to alleviate potential shortfalls in cleanup funding. Follow-through on recommendations produced by the advisory committee and by Ecology has been limited.]

SP-2. Contingency Plan and Spill Response

Ecology shall complete major revisions to the existing state Contingency Plan for Spills of Oil and Hazardous Substances. The plan shall be consistent with the policy and roles of local, state, and federal entities involved with spill response. The plan shall be updated on an ongoing basis. The plan shall be reviewed by the Spill Prevention and Response Advisory Committee (SP-4).

Ecology shall provide for implementation of the revised contingency plan with increased staff, including on-scene coordinators and spill support and damage assessment specialists.

Spill response drills by Ecology, federal agencies, and industry shall occur at least annually, beginning prior to March 1989. Ecology shall perform post-drill analysis and debriefing and modify the contingency plan accordingly on an ongoing basis.

Target Dates: Ecology shall complete revisions to the existing state Contingency Plan for Spills of Oil and Hazardous Substances by July 1, 1989. Ecology shall implement the revised contingency plan in fiscal year 1989.

[**Status:** The draft contingency plan was distributed for review in January 1988. The plan contained numerous blank appendices and incomplete Operational Spill Response procedures. Ecology has identified On-Scene Coordinators in the Northwest and Southwest Regional Offices. A second version of the contingency plan was produced in July 1988. The Operational Spill Response sections were still missing. Ecology hired one additional staff person in November 1987.]

SP-3. Spill Prevention

The Authority, in consultation with interested and affected federal, state, and local agencies, tribes and industry, and other private entities, shall assess the adequacy of federal, state, and local spill prevention measures for oil and hazardous materials. The investigation will examine regulations, policies, and procedures that affect spill prevention, including state requirements for spill prevention plans (P-9), building permits, land use regulations, and federal preemption of certain functions. The investigation will also examine measures implemented in other states and localities in the United States in order to determine the state of the art in spill prevention. The investigation will build upon the Ecology report on storage tank spill prevention, being prepared pursuant to Section 4 of Engrossed Substitute Senate Bill 6741. This study will address public and agency recommendations made during the review of the draft 1989 Puget Sound plan.

Based upon these analyses, the Authority shall prepare a report containing recommendations regarding legislation, regulations, policies, and procedures that would decrease the likelihood of spills affecting Puget Sound. Implementation of oil spill measures in SP-1 and SP-2 will continue simultaneously. As the oil spill policies and methodologies are already more developed, the report will be divided into two sections: (1) oil spills and prevention, and (2) hazardous materials spills and prevention. This will allow the forward momentum of the oil spill program to continue.

In addition, Ecology shall hire one full-time employee to perform on-site inspections, to enforce Spill Prevention Control and Countermeasure (SPCC) Plan provisions, and to review NPDES permits for SPCC compliance. (See Element P-9 of the Municipal and Industrial Discharges Program.)

Ecology is encouraged to use spill response staff for spill prevention when not actually responding to spills. Prevention activities could include post-event analysis and prevention education during on-site and community visits.

Target Dates: The Authority shall complete the spill prevention investigation by January 1, 1990. Ecology shall hire inspection and enforcement personnel

for fiscal years 1990 and 1991. Prevention activities by Ecology's spill response staff shall be ongoing.

[**Status:** This is a new element.]

SP-4. Spill Prevention and Response Advisory Committee

A Spill Prevention and Response Advisory Committee shall be created under the management of the Puget Sound Estuary Program (PSEP) agencies: Ecology, EPA, and the Authority. This committee shall review and comment on contingency plan updates, review and comment on Ecology's quarterly progress reports, and assist in the investigation of spill prevention issues (SP-3) to be produced by the Authority. The committee shall include representatives from industry, Ecology, citizen groups, the Washington Public Ports Association, the academic community, PSWQA, the U.S. Coast Guard, EPA, the Corps of Engineers, NOAA, and other appropriate entities.

Target Date: The committee is to be convened by March 1, 1989.

[**Status:** This is a new element.]

MAJOR PUBLIC ACTIONS FOR REVIEW

1. Implementation schedule by Ecology (SP-1).

2. Contingency plan revisions by Ecology (SP-2).

ESTIMATED COST

The following table provides costs associated with policy implementation, contingency plan revision and printing, increased staffing necessary to implement the plan, and the study of prevention measures. The spill program is estimated to cost $439,000 in fiscal year 1990 and about $578,000 for fiscal year 1991. The program will cost $573,000 in subsequent years. Some private sector costs may result from future changes to the contingency plan. Improvements in spill response coordination may actually reduce ultimate cleanup costs to the spiller. Additional costs that may be incurred by state and local governments and the private sector based upon spill prevention recommendations cannot be estimated at this time.

ESTIMATED PLAN COSTS: SPILL PREVENTION AND RESPONSE

COSTS BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
SP	Administration and Coordination	0	0	2,426	2,527	2,527	2,527	2,527
SP-1	Oil Spill Policy Implementation	0	0	84,717	0	0	0	0
SP-2	Contingency Plan and Spill Response	81,908	78,092	152,876	386,949	469,981	469,981	469,981
SP-3	Spill Prevention	0	0	170,037	160,037	83,032	83,032	83,032
SP-4	Advisory Committee	0	0	28,943	28,943	17,534	17,534	17,534
TOTAL		$81,908	$78,092	$438,998	$578,456	$573,074	$573,074	$573,074

Element Notes

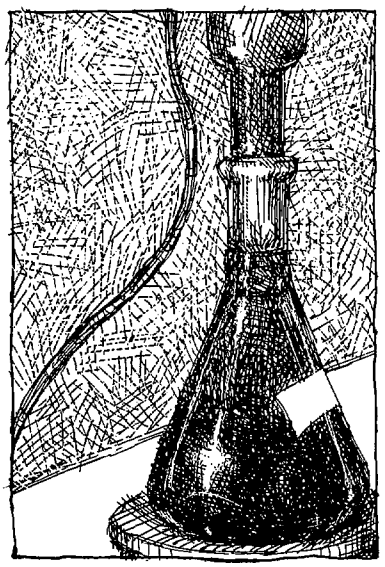
SP Ecology costs for administration and coordination.
SP-2 Assumes that Fisheries and Wildlife coordinate with Ecology on the list of maps and data for critical resource area protection. Does not include local costs for contingency plans since such plans are required under federal law (Title 3 of SARA).

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
EPA	0	0	10,000	10,000	10,000	10,000	10,000
Ecology	81,908	78,092	324,740	474,198	557,230	557,230	557,230
PSWQA	0	0	98,414	88,414			
Fisheries	0	0	3,175	3,175	3,175	3,175	3,175
Wildlife	0	0	2,669	2,669	2,669	2,669	2,669
TOTAL	$81,908	$78,092	$438,998	$578,456	$573,074	$573,074	$573,074

COSTS BY FUNDING SOURCE							
Federal Funding	0	0	10,000	10,000	10,000	10,000	10,000
State General Fund	81,908	78,092	428,998	568,456	563,074	563,074	563,074
TOTAL	$81,908	$78,092	$438,998	$578,456	$573,074	$573,074	$573,074

LABORATORY SUPPORT

PROBLEM DEFINITION



Many of the programs in this plan depend on the accuracy and timeliness of laboratory analyses. These include the programs for nonpoint source pollution, shellfish protection, municipal and industrial discharges, contaminated sediments and dredging, stormwater and combined sewer overflows, monitoring, research, and household hazardous waste. Labs provide information on presence, concentrations, and effects of contaminants in Puget Sound. Lab information will be needed to design programs to remedy the effects of contaminants and prevent or limit future contamination.

Many lab analyses are conducted pursuant to federal, state, or local laws designed to prevent degradation of water quality and threats to human health. For example, the Clean Water Act requires routine monitoring of municipal and industrial wastewater discharges. Ecology and EPA rely on the results to assess compliance with the law and specific permit requirements, and to determine whether enforcement action is necessary. The Department of Social and Health Services relies on results of water quality and shellfish tissue analyses to determine whether fecal coliform bacteria levels are within specific levels designed to protect human health. Lab analyses are also conducted for routine ambient monitoring to establish trends and for investigations designed to answer specific questions.

Ecology's laboratory program has insufficient staff and financial resources to adequately service the analytical needs of the programs it supports. This lack of sufficient analytical capability results in delays in supplying the program offices with data critical to responsible enforcement and planning decisions.

Standardized protocols (procedures) for the collection and analysis of environmental samples within Puget Sound exist, but their use is not uniform. The Puget Sound Estuary Program protocols were developed under contract to EPA to standardize sample collection and analysis within the Sound, allowing for comparability of data and determination of long-term environmental trends. Nonetheless, other protocols continue to be used, resulting in data that are not comparable.

Standardized, clearly-defined quality assurance and quality control procedures are lacking for many types of analyses. When they exist, there is no method to determine the extent to which they are followed. Thus, lab results may come into question, and their usefulness can be impaired.

PROGRAM STATUS

The Washington State Legislature passed a law in 1987 RCW 43.21A.230 that authorizes Ecology to establish a laboratory certification program (L-1). The law exempted from certification those labs owned by dischargers that operate solely for their own use and that participate in a quality assurance program administered by the U.S. Environmental Protection Agency.

Ecology completed the plan for the laboratory certification program by August 1, 1988, and expects to begin lab certification by the designated target date of April 1, 1989.

Ecology did not complete the first laboratory plan (L-2) by the August 1, 1988, target date. The target date is now November 1, 1988. Concurrently with

developing the plan, Ecology has been implementing changes to improve services and data quality.

Ecology established a Quality Assurance Section in March 1988, in Manchester, separate from the Manchester Laboratory facility. The section is staffed by two FTEs and will be responsible for the tasks outlined in element L-4.

PROGRAM GOAL

To assure the quality and timeliness of physical, chemical, and biological laboratory tests necessary to support the protection and enhancement of the waters of Puget Sound.

PROGRAM STRATEGY

The strategy for achieving this goal is: (1) to establish a laboratory certification program administered by Ecology that will review the capability of environmental laboratories to generate data of known quality; (2) to assure that adequate laboratory support exists for agency and other sampling programs; and (3) to develop protocols to standardize data collection, analysis, storage, and transfer within Puget Sound.

PROGRAM ELEMENTS

L-1. Laboratory Certification Program

PSWQA shall submit proposed legislation to the 1987 legislature authorizing Ecology to conduct a laboratory certification program and to charge fees to laboratories seeking certification.

[**Status**: The required legislation was submitted and passed in 1987.]

Ecology shall prepare a plan for a laboratory certification program. Under the program, Ecology shall certify all labs performing environmental analyses for substances and chemical groups and media in a phased manner with first priority given to certifications that support water quality programs. During the design and implementation of the certification program Ecology shall work with federal, state, and local agencies and consult with individuals from the scientific community, private labs, environmental groups, and industry. Laboratories owned and operated by individual industrial and/or municipal dischargers shall be certified unless exempted by the enabling legislation. Agency-operated laboratories shall also apply for certification under the same rules that apply to private laboratories. The certification program shall be coordinated to the maximum extent possible with existing laboratory certification programs. Ecology shall negotiate agreements with other state certification programs meeting the standards of the Washington program to allow for reciprocity.

As a part of the certification program Ecology shall adopt rules requiring all certified laboratories to use approved field and laboratory protocols and to comply with specified quality assurance/quality control procedures. Ecology shall assure that all certified labs have the capability to use adopted Puget Sound protocols (L-3). Ecology shall implement the protocols in the Ecology laboratory at Manchester prior to implementation of the certification program.

Lab users shall not be required to use certified labs until the certification program is operational and an adequate number of certified labs are available to perform needed analyses. (See also element P-16.)

Target Dates: PSWQA submits legislation to the 1987 legislature. Ecology completes draft certification program plan by August 1, 1988. Certification of labs begins by April 1, 1989.

[**Status:** Ecology hired two staff to develop the certification program and completed the certification program plan on schedule. Ecology created a Quality Assurance Section to administer the certification program and conduct other quality assurance activities. Ecology has indicated that certification of labs will begin by the indicated target date.]

L-2. Laboratory Capacity

Ecology shall prepare a laboratory plan that addresses Ecology and other agency short- and long-term needs, capacity, and data management, and make recommendations regarding means to rectify shortfalls in the ability of the labs to support agency programs. The plan shall: specify acceptable holding times for analyses; assess available means to assure that all samples are analyzed within those times while meeting the highest possible quality standards; include sample tracking and data management systems; include a consideration of the need for additional staff, including night shifts, to fully utilize existing agency lab equipment and facilities; fully explore the use of lab capacity possessed by other agencies and the use of contract labs before recommending establishment of new lab facilities.

Ecology shall biennially submit to the Authority and the legislature an updated laboratory plan that includes (1) a revised estimate of the number and types of analyses needed to support Ecology programs; (2) a review of the service provided by Ecology laboratories including holding and sample turnaround times, data quality, data management, and staff communication during the preceding two years; and (3) an updated analysis of the additional laboratory capacity needed to carry out these analyses within the target turnaround times which Ecology shall specify.

In preparing the laboratory plan, Ecology shall consult with other state agencies, including DSHS, Agriculture, and Labor and Industries, and incorporate their laboratory needs and capabilities related to the Puget Sound plan in the reports.

Target Dates: Ecology submits the laboratory plan to the Authority by November 1, 1988, and biennial updates every two years thereafter.

[**Status:** Ecology did not complete the laboratory plan by the original target date of August 1, 1988, and a revised target date of November 1, 1988, was agreed upon. Ecology has implemented a sample allocation system to improve turnaround times, and increased the number of samples sent to contract labs.]

L-3. Puget Sound Protocols

The Authority, in consultation with EPA and Ecology, shall develop and implement a process for review and adoption of Puget Sound Estuary Program protocols. The process shall provide for development of new protocols, for review and revision of existing protocols, and for formal adoption of the protocols.

The development and review of the protocols shall involve technical experts in fields relevant to the individual protocols. The technical experts shall prepare recommendations which shall undergo extensive peer review. Consideration shall be given to involving experts from federal, state, and local agencies, tribes, the private sector, the academic community, and the public. The Authority shall recommend the protocols to the Puget Sound Estuary Program Management Committee for adoption.

New protocols shall be developed as needed and all existing protocols shall be reviewed biennially. The need for additional protocols shall be reevaluated in the 1991 plan.

Target Dates: Authority staff makes its initial recommendation to the Management Committee for adoption of protocols by December 1, 1989. The Management Committee adopts protocols by January 31, 1990. Authority staff completes design of the development, review, and adoption process by March 31, 1990.

[**Status:** This new element is proposed to begin in July 1989.]

L-4. Ecology Quality Assurance/Quality Control

Ecology shall prepare a plan that addresses quality assurance and quality control (QA/QC) issues as they pertain to sampling and analysis in support of Ecology programs and projects. The plan shall result in a program which complements the laboratory certification program by requiring that quality assurance be incorporated into all Ecology data development activities, and that data collection, analysis, storage, and transfer be standardized within Puget Sound.

The QA/QC program shall include the following:

* Establishment of guidelines for preparing quality assurance program plans (QAPP) and individual quality assurance project plans (IQAPP) developed under the QAPPs as required by the state/EPA agreement. The guidelines shall include establishment of specific objectives and development of sampling plans commensurate with objectives for major surveys.

* Audits of data quality (based on selected IQAPPs), including checks that sampling and analytical procedures have been correctly performed, and reviews of data to verify that they meet user requirements including data quality objectives.

* A training plan for Ecology staff, including training needed to determine the appropriate number and type of samples and analyses for areas of investigation commonly encountered. Training needs will build upon information gained during the planning process and during implementation and oversight of the resulting program.

* QA/QC assistance to the Ecology staff, including guidelines for use by regional office and Industrial Section staff in reviewing discharge monitoring report (DMR) data, guidelines for use by regional and Environmental Investigations staff in their evaluation of environmental laboratories, and technical guidance to Ecology staff concerning QA/QC in general.

* Other appropriate measures resulting from issues identified during the planning process.

Target Dates: Ecology submits QA/QC plan to the Authority by April 1, 1989. Ecology completes QAPPs for programs requiring analytical services by August 1, 1989. Ecology prepares IQAPPs as needed and performs audits of data quality for the purpose of identifying QA/QC deficiencies and corrective measures, and provides annual reports to the Authority beginning July 1, 1990.

[**Status:** Ecology has created a Quality Assurance Section and located the section in Manchester separate from the laboratory. The location is intended to assure independence but facilitate coordination and interaction.]

MAJOR PUBLIC ACTIONS FOR REVIEW

1. Ecology's laboratory certification program (L-1).
2. Ecology's laboratory plan (L-2).
3. Ecology's QA/QC plan (L-4).

LEGISLATION REQUIRED

Legislation authorizing Ecology to conduct the laboratory certification program and to administer certification fees (L-1).

[Status: The required legislation was approved in 1987.]

ESTIMATED COST

This program is estimated to cost approximately $850,000 a year in fiscal year 1990, $825,000 in fiscal year 1991, and $775,000 per year for fiscal years 1992 through 1994.

Costs presented for element L-1 of this program are for the water quality component of the certification program and do not include costs for other areas (such as hazardous waste) for which Ecology may eventually certify laboratories. Costs for laboratory analyses needed by other programs in the Puget Sound plan are found in the cost estimates for the programs. Certification fees are expected to fund a large portion of the certification element.

The laboratory certification program may entail private sector costs beyond the certification fees to those NPDES permit holders not participating in an EPA-approved quality assurance program, to private laboratories, and to others who utilize private laboratories. These costs will vary depending upon several factors, including the current quality of the equipment and staff of the lab applying for certification and the protocols called for in the certification program Ecology designs. Given that these factors will not be defined until the certification program is designed, it is not possible to estimate the actual costs to the private sector.

Because the certification program will require quality assurance/quality control protocols and other measures designed to ensure accurate results, additional samples will be required. It is likely, however, that fewer repeat analyses will need to be conducted. This could result in reduced laboratory costs to NPDES permittees and others who use private laboratories.

If the laboratory plan (L-2) recommends new lab facilities for agencies, considerable additional costs could be incurred. The magnitude of those costs would depend on the location and size of the new lab. Any such costs would only be incurred after approval by the legislature.

Responsibilities for quality assurance and quality control within the Department of Ecology have been transferred from element L-2 to element L-4. Appropriate financial resources have also been transferred.

A goal of elements L-3 and L-4 is to achieve greater efficiencies in Ecology and other programs and activities. These efficiencies should result in cost savings in the long term.

ESTIMATED PLAN COSTS: LABORATORY SUPPORT

COSTS BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
L-1	Laboratory Certification Program	0	50,000	406,080	406,080	406,080	406,080	406,080
L-2	Laboratory Capacity	153,769	294,073	198,289	103,668	103,668	103,668	103,668
L-3	Puget Sound Protocols	0	0	112,471	112,471	43,950	43,950	43,950
L-4	Ecology QA/QC Program	0	0	139,778	201,423	219,917	219,917	219,917
TOTAL		$153,769	$344,073	$856,617	$823,642	$773,615	$773,615	$773,615

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
EPA	0	0	15,000	15,000	15,000	15,000	15,000
Ecology	114,946	304,250	718,612	685,636	704,130	704,130	704,130
DSHS	17,774	17,774	17,285	17,285	17,285	17,285	17,285
PSWQA	0	0	68,521	68,521			
Fisheries	12,274	13,274	6,350	6,350	6,350	6,350	6,350
Wildlife	0	0	5,338	5,338	5,338	5,338	5,338
Agriculture	8,774	8,774	6,408	6,408	6,408	6,408	6,408
Labor & Industry	0	0	4,165	4,165	4,165	4,165	4,165
Local Government	0	0	14,938	14,938	14,938	14,938	14,938
TOTAL	$153,769	$344,073	$856,617	$823,642	$773,615	$773,615	$773,615

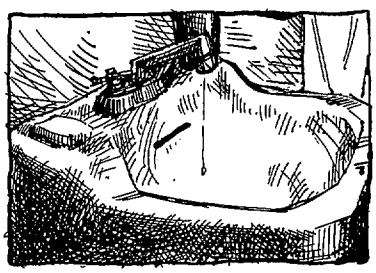
COSTS BY FUNDING SOURCE							
Federal Funding	0	0	15,000	15,000	15,000	15,000	15,000
State General Fund	153,769	294,073	423,099	390,124	340,097	340,097	340,097
State Fee Programs	0	50,000	406,080	406,080	406,080	406,080	406,080
Local Sources	0	0	12,438	12,438	12,438	12,438	12,438
TOTAL	$153,769	$344,073	$856,617	$823,642	$773,615	$773,615	$773,615

HOUSEHOLD HAZARDOUS WASTE

PROBLEM DEFINITION

Household hazardous wastes come from a variety of toxic products used in the home: paints, paint thinners, lawn and garden pesticides, fertilizers, cleansers, degreasers, medicines, cosmetics, transistors, dyes, and automotive products such as antifreeze, batteries, and oil. The use and disposal of many of these products are a chronic source of pollution to Puget Sound both in urban and rural areas.

Environmental Problems



Toxicants from household products enter the Sound as components of both point and nonpoint source pollution. Many of them are emptied down drains or flushed down toilets and enter municipal sewage treatment plants. Metro estimates that residential areas contribute 7 to 11 percent of the metals, 31 to 36 percent of the volatile organics, and 55 to 64 percent of the extractable organics to Metro sewage treatment plants. The percentage contribution of household toxicants to smaller treatment plants may be much larger. While secondary treatment degrades or dilutes some of these toxicants, others settle in the sludge, evaporate into the air, or continue in suspension or solution through the discharge pipe. Those in sludge or in the air can then enter Puget Sound through rains and runoff.

Many household wastes are disposed of at landfills. Toxicants can then be transported to the Sound when the landfill leachate is taken to municipal treatment plants or when the leachate in uncontained landfills contaminates surface runoff and groundwater. Many wastes are dumped in storm drains, ditches, or backyards, where they contribute to nonpoint pollution by entering streams, rivers, and groundwater in both rural and urban areas. Fish kills in small streams can occur when concentrated amounts of oil, antifreeze, fertilizers, or pesticides are dumped by householders. Finally, household wastes are sometimes incinerated. They can then contaminate runoff through rainfall or through the ash being spread in yards, backyard pits, or even landfills.

Institutional Problems

Until recently, household hazardous wastes were not regulated. While specific toxicants found in household products were prohibited from disposal at solid waste landfills, "household quantities" of these toxicants were accepted. However, in 1985 household hazardous wastes were included in the state Hazardous Waste Management Act under the definition of "moderate risk waste." This puts them into the same category of wastes as those generated by small commercial and industrial operations which use very similar products.

While these household substances are now technically regulated, there are very few legal, conventional, proper, or practical disposal mechanisms available to the householder or to small businesses. Several counties and a few cities have collection sites for some household chemicals, and some counties and cities hold collection days when citizens may bring household wastes for appropriate disposal. Only Whatcom County and Thurston County have an ongoing collection system for all household chemicals, but these, too, are systems only for those willing to deliver their wastes to the site, and they are not well utilized. These collection days and sites are resource-intensive, have their own safety and health issues, and rely on the participation of citizens who have been informed. They depend on local government funding or private sector underwriting of costs, and potentially expose local governments to long-term liability for the wastes. With the exception of these sporadic collection events,

the dumpster, garbage can, ditch, storm drain, and backyard incinerator remain as the only disposal mechanisms for most citizens around the Sound.

RCW 70.105.220 addresses this issue by mandating that local governments undertake a planning process to identify local moderate risk disposal options and to implement a disposal program by December 31, 1991. The implementation of this RCW is dependent on funding which was not initially appropriated. There is now $2.3 million from the Local Toxics Control Account which is available to local governments for local moderate risk waste plans.

The legislature specifically asked that PSWQA address the issue of household hazardous waste education in the Puget Sound Water Quality Management Plan. With the exception of providing education on less-toxic household alternatives, educational efforts on household hazardous wastes are frustrating and futile until household hazardous waste disposal options are available for all citizens. This will happen only when the local hazardous waste planning process is completed and disposal programs are implemented.

PROGRAM STATUS

This program provided for management of household hazardous waste through a phased implementation of local hazardous waste plans (RCW 70.105.220) and for education on less-toxic alternatives for household products. Under this program, King, Kitsap, Pierce, and Island counties received grants to act as pilot programs to complete their local hazardous waste management planning process by June 1989. In addition, Whatcom, Skagit, Snohomish, Clallam, and Jefferson counties have pending applications to undertake their planning process with funding from the Local Toxics Control Account. The Authority and Ecology provided information on less-toxic alternatives for household products through the Authority's newsletter, *Soundwaves*.

Household hazardous waste collection days were held successfully throughout the region in 1987 and 1988. Several hundred people had to be turned down at a collection day held for Bellevue, Seattle, and Kent because response was much greater than anticipated.

Several other collection days are scheduled for 1988, including some conducted under the Public Involvement and Education Fund (PIE-Fund).

PROGRAM GOAL

To improve management of household hazardous waste through the provision of appropriate disposal options and associated education of the public.

STRATEGY

The strategy for achieving this goal is to ensure a phased approach to full implementation of recent amendments to the Hazardous Waste Management Act.

PROGRAM ELEMENTS

HHW-1. Phased Funding of Local Hazardous Waste Management Plans

PSWQA shall recommend to the legislature that adequate funds be appropriated to: (1) implement the preparation of local hazardous waste management programs (RCW 70.105.220-235) as currently scheduled by Ecology, including public involvement in and education on the management of household hazardous waste; (2) accelerate the preparation of plans in a few Puget Sound counties for the purpose of early implementation; and (3) carry out those duties of the hazardous substance information office (RCW 70.102.020(4)) that are related to these activities.

Target Dates: Planning activities per current Ecology schedule for 1987-89 with plans completed by December 31, 1990. Accelerated pilot plans completed by June 30, 1989.

[**Status:** Five Puget Sound counties are awaiting funding under the Local Toxics Control Account which was created in October 1987. Regulations governing grants from this account were proposed in April 1988. Ecology has proposed to make $2.3 million available through June 30, 1989. Plan preparation was accelerated in four counties to meet June 30, 1989, target date. The hazardous substance information office has had limited involvement with this program because it was not funded to work with the program.]

HHW-2. Information and Education on Less-Toxic Alternatives for Household Products

Ecology and PSWQA shall work with local governments to make information available on less-toxic alternatives to household toxicants. Ecology shall continue its support and monitoring of ongoing efforts to collect and develop information on alternative products or practices for toxic household products. The Authority shall distribute this information in its newsletter or by other appropriate means.

Target Date: Authority begins information distribution by March 30, 1987.

[**Status:** Ongoing. Ecology and the Authority have worked together to publish a series of articles on less-toxic alternatives in the Authority newsletter, *Soundwaves*. However, Ecology has not had staff to research less-toxic alternatives.]

MAJOR PUBLIC ACTIONS FOR REVIEW

None

LEGISLATION REQUIRED

None

ESTIMATED COST

This program would cost approximately $231,000 during fiscal year 1990, $171,000 during fiscal year 1991, increasing to approximately $310,000 during fiscal year 1992. Program costs include oversight and education staff for Ecology and local governments during both the creation and implementation of local hazardous waste management plans, and funds for education on less-toxic alternatives.

ESTIMATED PLAN COSTS: HOUSEHOLD HAZARDOUS WASTE

COSTS BY ELEMENT	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
HHW-1 Phased Funding for Local Plans	0	32,000	69,774	69,774	7,500	0	0
HHW-2 Information on Less-Toxic Alternatives	0	0	161,516	101,516	301,516	181,516	181,516
TOTAL	0	$32,000	$231,290	$171,290	$309,016	$181,516	$181,516

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Ecology	0	32,000	131,290	131,290	69,016	61,516	61,516
Local Government	0	0	100,000	40,000	240,000	120,000	120,000
TOTAL	0	$32,000	$231,290	$171,290	$309,016	$181,516	$181,516

COSTS BY FUNDING SOURCE							
Toxics Account	0	0	189,774	129,774	309,016	181,516	181,516
State General Fund	0	32,000	41,516	41,516	0	0	0
TOTAL	0	$32,000	$231,290	$171,290	$309,016	$181,516	$181,516

LEGAL AND PERSONNEL SUPPORT

PROBLEM DEFINITION

Legal Support for State Agencies

The Office of the Attorney General provides legal advice and representation to all state agencies, including those which have enforcement responsibilities. Some state agencies, such as Ecology and Fisheries, have their own enforcement units that work with attorneys from the Attorney General's office. The Attorney General's office also provides advice on agency rulemaking, permit writing, and other tasks related to implementation of state laws and regulations.

A lack of sufficient attorneys to provide advice at various stages of agency activity hinders effective enforcement. Legal advice during the early stages of agency activity (such as permit writing) can dramatically reduce the need for lengthy and expensive litigation. The Puget Sound plan has increased the need for attorneys as existing programs are more vigorously enforced and as new programs are implemented.

Local Government Enforcement

One of the themes which emerged from the analyses conducted for the plan is that many existing laws and programs designed to protect the water quality and resources of Puget Sound are not being fully enforced. This is true not only of state and federal laws, but also of city and county ordinances regulating land use and development, such as shoreline master programs, zoning ordi nances, and local health codes governing on-site septic systems. Due to inadequate resources or law enforcement priorities, enforcement of these laws has not received adequate emphasis from prosecuting attorneys and others.

Personnel Support

State agencies hire new employees through the state Department of Personnel and must follow the procedures and job classifications established by the Department of Personnel. If appropriate job classifications do not exist, state agencies can work with the Department of Personnel to create new job classifications, but this takes time and requires advance planning. Salaries of many state job classifications currently lag behind salaries for similar positions in the private sector. These factors can lead to delays in hiring and difficulties in acquiring qualified staff.

Lack of sufficient staffing has been identified as a major weakness in the ability of several state agencies to carry out their existing responsibilities. The Puget Sound plan increases the responsibilities of several state agencies and requires them to hire new staff to carry out these new responsibilities.

PROGRAM STATUS

This program reflects the Authority's concern that agencies responsible for implementing the plan need highly qualified staff and an adequate level of legal support. It calls on the Attorney General and Department of Personnel to provide adequate resources for plan implementation by providing support to state agencies responsible for implementing the plan. The October 1, 1987, report submitted by the Attorney General analyzing the legal support needs of state agencies called for additional legal support for Ecology, DSHS, and

DNR. The Attorney General has recently authorized the Ecology Division of the Attorney General's office to have 14 attorneys, up from 10 in December 1986. Additional legal support may be warranted due to the passage of the permit fee legislation (see element P-4) in 1987.

Under Department of Personnel Assistance (LP-3), the Department of Personnel assisted the Department of Ecology in filling new positions as well as developing new examinations. Other support in hiring was supplied to DSHS, DNR, and other agencies involved in plan implementation.

The local enforcement component (LP-4) reflects the Authority's belief that much can be done to improve protection of wetlands and to prevent nonpoint source pollution if local governments are vigorous in exercising existing legal authority. To assist in this regard, the plan calls for matching grants to local governments for enhanced enforcement efforts. The funds for the grant program will be derived from the Centennial Clean Water Fund. The permanent rule for fund disbursement was adopted in June 1988. It is unclear how much of the fund will be available for this purpose.

The plan envisioned that the Attorney General support and the enhanced local enforcement programs be continued beyond the 1988-89 biennium. Support from the Department of Personnel will continue to be provided as needed.

PROGRAM GOAL

To ensure that state agencies implementing the plan have adequate support by legal counsel and by the state personnel system and that local agencies have adequate staff for enforcement of local programs.

STRATEGY

The strategy for achieving this goal is (1) to provide resources to the Attorney General and the Department of Personnel to allow them to continue their support to state agencies carrying out the Puget Sound plan; and (2) to make funds available to local governments for enhanced enforcement.

PROGRAM ELEMENTS

LP-1. Attorney General Support

The Attorney General shall make every effort to support the Puget Sound plan by providing enough attorneys to assist in agency rulemaking, permit writing, and enforcement. Legal expertise should be provided at all stages of environmental protection activities.

The Attorney General shall provide the Authority with estimates of the legal staff support needed by agencies responsible for implementing the plan and shall propose a program for supplying that legal support. In preparing the report the Attorney General's office shall consult with affected agencies to obtain their estimates of support needed. During the interim the Attorney General's office shall plan for three attorneys in its personnel allocation in addition to attorney support needs reflected in agency budget requests for fiscal years 1988-1989.

Target Date: Ongoing.

[**Status:** The Attorney General's report was received and circulated to agencies for their review and comments. The report called for additional support for the Ecology, DSHS, and DNR divisions of the Attorney General. All agencies concurred with the report and only Ecology added a caveat. Ecology was unsure at the time whether additional legal support was required due to the passage of the permit fee legislation last year. The Attorney General's office and Ecology are meeting during the next few months to determine the actual need.]

LP-2. Department of Personnel Support

Each state agency responsible for implementing the Puget Sound Plan shall prepare a report to the Authority and Department of Personnel concerning whether existing job descriptions, qualifications, salary levels, and hiring procedures are adequate to support their activities. The Authority shall host a meeting of agencies to discuss the results. Based on the reports, the Department of Personnel's response, and resulting discussions, the Authority may amend the plan and make specific recommendations to agencies or the legislature to improve personnel support for the plan.

Target Date: State agencies report to the Authority and the Department of Personnel by November 1, 1987.

[**Status:** Minimal response was received from the agencies regarding this task. Only one agency, the state Department of Agriculture, submitted a report. Not a high priority—will be reconsidered in 1991 plan.]

LP-3. Department of Personnel Assistance

In order to fill positions authorized for fiscal years 1988 and 1989, state agencies responsible for implementing the plan need immediate support from the Department of Personnel. The Department of Personnel shall provide such assistance to the maximum extent possible and shall immediately designate one staff member to coordinate this effort. The Department of Personnel shall also hire one part-time staff member for fiscal year 1988 to assist with this effort.

[**Status:** The Department of Personnel did not receive funding during the current biennium for this task and utilized existing resources. This task is ongoing.]

LP-4. Enhanced Local Enforcement

Local governments are encouraged to strengthen enforcement of laws which protect the water quality and habitat functions of wetlands and which control specific sources of nonpoint pollution. The state will provide matching funds to counties, cities, or local health agencies to augment investigations and prosecutions under those laws.

The enhanced enforcement of wetland protection laws may encompass shoreline master programs, zoning ordinances, or other land development or construction codes which protect wetland water quality or habitat functions. Nonpoint enforcement efforts eligible for state grants include on-site septic systems, pumpout facilities at marinas, farm practices, or other sources which are identified as a result of the local nonpoint planning process. Local governments or health agencies are encouraged to use existing legal authority (including general police power, state health authority, or other legal tools) to adopt such ordinances or regulations as may be necessary to address nonpoint sources of pollution.

Funds will be made available for investigation and prosecution of violations. Preference for grant awards shall be given to applicants whose enhanced enforcement program includes an educational component that publicizes enforcement actions. Efficient and innovative approaches to enforcement such as civil penalties, dedicated fines, and community service shall be encouraged.

Target Date: Program established August 1988.

[**Status**: The funding for this element is proposed to come from the Centennial Clean Water Fund. The element had been delayed until the permanent rule for fund disbursements is adopted. The rule was adopted in June 1988. It is unclear at this time whether adequate funds will be available from the fund for this element.]

MAJOR PUBLIC ACTIONS FOR REVIEW

None

LEGISLATION REQUIRED

None

ESTIMATED COST

Full funding for this program would cost approximately $750,000 per year. Of this, $660,000 per year would be for enhanced local enforcement (LP-04) to be funded by state matching grants to local governments.

Only $842,000 is being requested for this program for the 1990-1991 biennium. Of this, $667,000 is requested for local government enhancement (LP-4).

No private sector costs have been identified for this program.

ESTIMATED PLAN COSTS: LEGAL AND PERSONNEL SUPPORT

COSTS BY ELEMENT		FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
LP	Administration	0	8,556	8,556	8,556	0	0	0
LP-1	Attorney General Support	44,159	0	79,310	79,310	79,310	79,310	79,310
LP-2	Department of Personnel Support	45,468	1,141	0	0	0	0	0
LP-3	Department of Personnel Assistance	0	0	0	0	0	0	0
LP-4	Enhanced Local Enforcement	186,822	687,423	333,333	333,333	666,667	666,667	666,667
TOTAL		$276,449	$697,120	$421,200	$421,200	$745,977	$745,977	$745,977

Element Notes

LP-1 Ecology Attorney General costs covered by indirect charges included in costs of other Ecology staff.

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Ecology	195,987	20,758	0	0	0	0	0
DSHS	13,702	0	40,333	40,333	40,333	40,333	40,333
PSWQA	1,141	9,697	8,556	8,556			
Fisheries	8,434	0	2,540	2,540	2,540	2,540	2,540
Wildlife	11,434	0	2,135	2,135	2,135	2,135	2,135
Natural Resources	14,202	0	34,302	34,302	34,302	34,302	34,302
Attorney General	31,549	0	0	0	0	0	0
Local Government	0	666,665	333,333	333,333	666,667	666,667	666,667
TOTAL	$276,449	$697,120	$421,200	$421,200	$745,977	$745,977	$745,977

COSTS BY FUNDING SOURCE							
Centennial Clean Water Fund	186,822	520,758	250,000	250,000	500,000	500,000	500,000
State General Fund	89,627	9,697	87,866	87,866	79,310	79,310	79,310
Local Sources	0	166,665	83,333	83,333	166,667	166,667	166,667
TOTAL	$276,449	$697,120	$421,200	$421,200	$745,977	$745,977	$745,977

ESTIMATED COSTS AND POTENTIAL FINANCING

PLAN COSTS

The plan imposes costs on federal and state agencies, local governments, the private sector, and individuals. Potential revenue sources to meet public sector costs include the state general fund, the Centennial Clean Water Fund (cigarette tax), the state superfund (Toxics Control Accounts), a variety of fees, and the National Estuary Program. Financing decisions by the U.S. Congress, the governor, the legislature, the Authority, and local jurisdictions will affect the implementation of the plan.

Revenue constraints have affected plan implementation in the FY 1988-89 biennium. After action by the 1987 legislature on the plan's budget, the Authority delayed and scaled back activities in many of the plan's programs to reflect a funding shortfall. In an effort to propose a realistic budget for the FY 1990-91 biennium, the Authority cut back this plan to about two-thirds of the funding needed for full implementation. This was again accomplished by delaying and scaling back activities in nearly every program. (Table A compares funding in the current biennium with cost estimates for the draft 1989 and final scaled-down plan.) Recognizing that stable, long-term funding is crucial for success in protecting the Sound, a new element, C-1, Study of Long-Term Funding Options, has been included in this section. The study will identify new and existing potential sources of funding to support the long-term implementation of the Puget Sound plan.

Public agency costs for implementing the draft 1989 plan have been estimated. Tables B and C summarize the federal, state, and local costs of each program for each year through fiscal year 1994 (through June 1994 for state and local, September 1994 for federal). Programs in the plan continue past 1994, but costs have not been estimated past that date. Estimated public sector costs from fiscal year 1989 through fiscal year 1994 average about $31 million per year. Annual costs rise from $16 million in fiscal year 1988 to $40 million in fiscal year 1994. Possible public capital costs resulting directly from plan implementation are discussed within each program. Tables summarizing the estimated costs of each program by element, by year, and by public agency are included with each program description.

These estimated costs represent the best judgment of the Authority in assessing the public agency work involved in plan implementation. The Authority has consulted extensively with federal, state, and local agencies to develop these estimates. Several agencies provided specific estimates of their program costs for both the full plan amounts listed in the Draft 1989 Puget Sound Water Quality Management Plan and for the final scaled-down plan.

Federal Agencies

The Authority believes that the Puget Sound effort should be more significantly assisted by federal appropriations. The U.S. Environmental Protection Agency has minimal resources to perform its role under the plan. Further, the Authority expects a decline in federal estuary program funds due to the designation of several new programs in other areas of the country. These additional designations mean that the limited estuary program funding will have to be divided over a growing number of estuary programs. The Washington State Congressional delegation is seeking a line item for increased funding for the Puget Sound Estuary Program.

TABLE A. EFFECTS OF SCALING DOWN THE 1989 PLAN

PROGRAMS	FY 88	FY 89	Draft 1989 Plan FY 90	Draft 1989 Plan FY 91	Final 1989 Plan FY 90	Final 1989 Plan FY 91	% of Draft Plan[1]
Monitoring	145,926	649,141	3,945,712	3,246,268	2,554,841	2,066,860	64%
Research	103,745	75,541	2,271,675	2,330,500	898,407	898,407	39%
Education and Public Involvement	992,313	997,380	3,233,064	3,480,341	1,774,028	1,585,028	50%
Nonpoint Source Pollution	4,934,618	6,882,136	10,110,069	9,841,362	7,017,901	6,551,349	68%
Shellfish Protection	441,044	1,471,179	2,386,654	2,390,951	2,298,842	2,303,138	96%
Municipal & Industrial Discharges	1,023,269	1,499,789	4,118,778	5,026,269	3,061,318	3,392,997	71%
Contaminated Sediments	400,747	1,220,061	2,145,868	2,904,610	1,388,856	1,568,636	59%
Stormwater and CSOs	246,427	558,522	2,373,009	11,780,137	1,358,049	2,625,567	28%[2]
Wetlands Protection	520,540	570,636	4,686,660	3,875,187	2,886,112	2,836,431	67%
Spill Prevention	81,908	78,092	405,515	583,284	438,998	578,456	103%
Laboratory Support	153,769	344,073	830,407	830,407	856,617	823,642	101%
Household Hazardous Waste	0	32,000	231,290	171,290	231,290	171,290	100%
Legal and Personnel Support	276,449	697,120	754,533	754,533	421,200	421,200	56%
Costs & Financing	0	0	115,666	0	115,916	0	100%
Institutional Analysis	0	14,029	10,764	3,696	10,764	3,696	100%
Authority Activities	1,027,161	1,140,341	1,637,080	1,771,435	1,430,998	1,457,824	85%

COSTS BY AGENCY	FY 88	FY 89	Draft 1989 Plan FY 90	Draft 1989 Plan FY 91	Final 1989 Plan FY 90	Final 1989 Plan FY 91	% of Draft Plan[1]
Federal Agencies (incl. EPA)	30,100	30,100	488,130	488,130	480,276	480,276	98%
Conservation Commission	79,792	104,872	115,614	125,494	80,675	80,675	67%
DSHS	686,522	1,065,410	1,855,617	1,755,959	1,430,553	1,431,417	79%
Ecology	2,517,592	4,881,680	12,638,138	13,604,101	8,457,951	8,412,970	64%
Fisheries	49,373	59,461	802,715	749,994	759,079	696,932	94%
Natural Resources	363,042	407,958	3,448,475	3,368,828	2,186,858	2,081,362	63%
Other State Agencies	73,070	24,146	349,379	302,270	174,845	124,175	46%
Parks and Recreation	715,520	248,022	597,736	1,523,159	427,940	1,020,640	68%
PSWQA	2,047,696	2,231,939	6,082,081	6,246,055	4,035,305	3,781,873	63%
Washington Conservation Corps	35,000	35,000	384,360	384,360	303,360	303,360	79%
Wildlife	39,322	22,739	382,819	357,443	308,065	275,938	79%
Local Governments	3,304,887	6,956,312	11,494,720	19,467,517	7,636,510	8,132,183	51%[2]
Conservation Districts	406,000	162,400	616,960	616,960	462,720	462,720	75%
TOTAL	$10,347,916	$16,230,040	$39,256,744	$48,990,270	$26,744,137	$27,284,521	61%

COSTS BY FUNDING SOURCE	FY 88	FY 89	Draft 1989 Plan FY 90	Draft 1989 Plan FY 91	Final 1989 Plan FY 90	Final 1989 Plan FY 91	% of Draft Plan[1]
State Capital Account	799,000	250,000	2,500,000	2,680,000	1,945,000	1,765,000	72%
Federal Funding	158,585	168,979	202,078	204,078	224,990	224,990	111%
Toxics Account	0	0	521,901	461,901	189,774	129,774	32%
Centennial Clean Water Fund	3,405,080	5,111,696	7,960,995	6,570,995	5,709,957	4,858,707	73%
State General Fund	4,100,176	6,829,851	20,137,202	20,597,933	13,559,310	13,549,254	67%
State Fee Programs	842,428	1,291,721	3,446,485	4,554,481	2,536,832	2,771,601	66%
Local Sources	1,042,647	2,577,793	4,488,083	13,920,882	2,578,274	3,985,195	36%[2]
TOTAL	$10,347,916	$16,230,040	$39,256,744	$48,990,270	$26,744,137	$27,284,521	61%

[1] The final 1989 plan was significantly scaled down from the "full funding" levels called for in the draft 1989 plan. This column displays the final 1989 plan as a percent of the draft 1989 plan for the FY-90/91 biennium.

[2] The large apparent reduction in the Stormwater program was caused by a change in how local costs are estimated. In the final 1989 plan, only the incremental cost to local governments resulting from plan requirements is estimated. Anticipated local costs to control stormwater volumes were included in the draft 1989 plan estimates.

TABLE B. ESTIMATED PLAN COSTS: COSTS BY PROGRAM

	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Monitoring	145,926	649,141	2,554,841	2,066,860	3,091,622	3,091,622	3,091,622
Research	103,745	75,541	898,407	898,407	3,352,027	3,410,164	3,969,206
Education & Public Involvement	992,313	997,380	1,774,028	1,585,028	2,854,734	3,355,834	2,851,280
Nonpoint Source Pollution	4,934,618	6,882,136	7,017,901	6,551,349	9,447,063	8,855,011	6,857,181
Shellfish Protection	441,044	1,471,179	2,298,842	2,303,138	2,409,564	2,382,179	2,382,179
Municipal & Industrial Discharges	1,023,269	1,499,789	3,061,318	3,392,997	3,791,484	4,157,780	4,502,169
Contaminated Sediments & Dredging	400,747	1,220,061	1,388,856	1,568,636	1,997,230	1,501,282	1,486,282
Stormwater & CSOs	246,427	558,522	1,358,049	2,625,567	4,916,430	6,993,367	9,035,833
Laboratory Support	153,769	344,073	856,617	823,642	773,615	773,615	773,615
Wetlands Protection	520,540	570,636	2,886,112	2,836,431	3,567,262	3,563,418	3,563,418
Spill Prevention & Response	81,908	78,092	438,998	578,456	573,074	573,074	573,074
Household Hazardous Waste	0	32,000	231,290	171,290	309,016	181,516	181,516
Legal & Personnel Support	276,449	697,120	421,200	421,200	745,977	745,977	745,977
Costs & Financing	0	0	115,916	0	0	0	0
Institutional Analysis	0	14,029	10,764	3,696	0	0	0
Authority Activities	1,027,161	1,140,341	1,430,998	1,457,824			

ESTIMATED PLAN COSTS: COSTS BY FUNDING SOURCE

	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Capital Account	799,000	250,000	1,945,000	1,765,000	2,756,000	3,336,000	2,756,000
Federal Funding	158,585	168,979	224,990	224,990	167,026	168,026	168,026
Toxics Account	0	0	189,774	129,774	309,016	181,516	181,516
Centennial Clean Water Fund (CCWF)	3,405,080	5,111,696	5,709,957	4,858,707	6,409,704	6,151,704	4,802,344
State General Fund	4,100,176	6,829,851	13,559,310	13,549,254	18,386,761	18,048,133	18,372,334
State Fee Programs	842,428	1,291,721	2,536,832	2,771,601	3,309,707	3,774,058	4,118,447
Local Sources	1,042,647	2,577,793	2,578,274	3,985,195	6,490,883	7,925,402	9,614,684
TOTAL	$10,347,916	$16,230,040	$26,744,137	$27,284,521	$37,829,097	$39,584,839	$40,013,351

Funding Notes

CCWF Ecology will have nearly twice the usual annual amount to distribute in FY89 because the administrative rule governing distribution was not completed in time for the FY88 amount to be distributed in FY88. The undistributed FY88 funds will be distributed in FY89.

Capital Half of the $3,000,000 for wetlands acquisition in FY90/91 will be requested from the Aquatic Lands Enhancement Account (ALEA). The rest will be requested from a different state capital account.

TABLE C. ESTIMATED PLAN COSTS: COSTS BY AGENCY

	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Sea Grant & Coop Extension	0	0	365,250	365,250	743,500	743,500	743,500
EPA	16,600	16,600	115,026	115,026	115,026	115,026	115,026
Other Federal	13,500	13,500	0	0	0	0	0
Ecology Pass Through to Local	0	0	205,000	205,000	421,064	421,064	504,096
Ecology	2,517,592	4,881,681	8,457,951	8,412,970	11,154,387	11,390,873	11,663,127
DSHS	686,522	1,065,410	1,430,553	1,431,417	1,707,082	1,683,528	1,683,528
PSWQA Pass Through to Local	533,500	533,500	550,000	550,000			
PSWQA	1,514,196	1,698,439	3,485,305	3,231,873			
Fisheries	49,373	59,461	759,079	696,932	945,003	926,748	894,996
Wildlife	39,322	22,739	308,065	275,938	394,354	377,414	377,414
Parks and Recreation	715,520	248,022	427,940	1,020,640	1,062,309	1,061,591	1,061,591
Natural Resources	363,042	407,958	2,186,858	2,081,362	3,088,223	3,069,991	3,069,991
Conservation Commission	79,792	104,872	80,675	80,675	139,518	119,518	129,518
Superintendent of Public Instruction	0	0	21,136	21,136	70,456	70,456	55,456
Agriculture	24,521	24,146	51,263	51,263	51,263	51,263	51,263
Washington Conservation Corps	35,000	35,000	303,360	303,360	456,360	456,360	240,360
Personnel	0	0	10,500	3,500	3,500	3,500	3,500
Attorney General	31,549	0	0	0	0	0	0
Labor & Industries	0	0	4,165	12,495	4,165	4,165	4,165
Pollution Control Hearings Board	17,000	0	0	0	0	0	0
Community Colleges	0	0	0	0	33,819	33,819	33,819
Local Government	3,304,887	6,956,312	7,431,510	7,927,183	11,926,338	12,982,857	13,816,859
Conservation District	406,000	162,400	462,720	462,720	768,000	768,000	273,920
Other State Agencies	0	0	87,781	35,781	156,443	96,443	96,443
Education Organization					887,537	1,449,837	876,851
Monitoring Organization					348,723	348,723	348,723
Research Foundation					3,352,027	3,410,164	3,969,206
TOTAL	$10,347,916	$16,230,040	$26,744,137	$27,284,521	$37,829,097	$39,584,839	$40,013,351

Agency Notes

PSWQA Central coordination and support activities for the monitoring, research, and education programs are assigned to PSWQA through FY91 and to the Monitoring Organization, the Research Organization and the Education Foundation thereafter. Host agencies for those programs after FY91 have not been identified.

Overhead Estimated FY88/89 expenditures for some agencies do not include overhead costs. Forecast values for FY90 and beyond include overhead estimates.

Several other federal agencies are making significant contributions to the Puget Sound effort. For example, the Army Corps of Engineers is playing a major role in developing a dredging management program for the Sound. NOAA maintains an ongoing research program addressing a wide range of Puget Sound issues. The Soil Conservation Service (U.S. Department of Agriculture) is providing essential support to local nonpoint programs through its Puget Sound Cooperative River Basin Study. The U.S. Geologic Survey is assisting in development of computerized mapping systems for the Sound and in the monitoring program. Several of the military installations around Puget Sound have expressed an interest in more direct participation in many plan activities.

State Agency Costs

State agency responsibilities under the plan are primarily funded by appropriations from the state general fund, although there are some revenues from fees and a few activities which are capital expenditures. Expenditures from the general fund will be $10.9 million in the current biennium (FY 1988-89). The draft 1989 plan called for $40.7 million from the general fund in the next biennium (FY 1990-91). The final plan calls for $27.1 million. Substantial cuts were made in nearly every program to achieve this scaled-down level. About half of the increase over the current biennium is due to the new initiatives for research, monitoring, and education. The rest is due to the continued phase-in of activities started during the current biennium.

In October 1987 the state legislature passed legislation popularly known as the state superfund. One section of the legislation authorized an increase in waste discharge permit fees. One result is that general fund money previously allocated to Ecology's waste discharge permit program became available for implementation of the Puget Sound plan as well as other Ecology activities.

In addition to the general fund and waste discharge fees, state agencies may use funds from the federal Coastal Zone Management Act, the Puget Sound Estuary Program (EPA funds), the USGS, and the federal Clean Water Act to implement some plan elements. Improvements by the state Department of Transportation to highway drainage systems are expected to be paid for by federal interstate funds, state gasoline tax, and other highway revenue sources. Element C-1, Study of Long-Term Funding Options, addresses the issue of additional sources of funding.

Puget Sound Water Quality Authority Budget

The Puget Sound Water Quality Authority carries out a number of activities to protect Puget Sound. These responsibilities are specified in RCW 90.70, the Puget Sound Water Quality Act. These responsibilities include the development of the plan, preparation of the State of the Sound Report, public outreach and education activities, and ensuring compliance with the plan. The Authority's costs for these activities during the FY 1988-89 biennium and estimates for the FY 1990-91 biennium are included in Tables A, B, and C (as Authority activities) and detailed in Table D.

The Authority is directly responsible for certain tasks in the plan's programs. These tasks generally fall within the areas of planning, coordination, and education. These plan costs are included in the cost tables associated with each program.

Table D summarizes the Authority's costs for all of these assignments. A major part of the increase in the Authority's budget for the next biennium would fund a temporary "home" for coordination of the three new initiatives in

TABLE D. PUGET SOUND WATER QUALITY AUTHORITY BUDGET

	FY 88	FY 89	FY 90	FY 91
AUTHORITY ACTIVITIES				
Administration	206,218	208,055	198,463	188,515
Plan Development	358,247	441,957	486,855	505,502
Public Outreach/Education	263,665	305,853	333,530	352,902
State of the Sound Report	92,684	31,060	188,558	131,498
Plan Compliance	106,347	153,416	223,592	279,407
Authority Activity Subtotal	$1,027,161	$1,140,341	$1,430,998	$1,457,824
PLAN IMPLEMENTATION AND OVERSIGHT				
Monitoring	100,917	107,750	370,903	341,903
Research	103,745	75,541	898,407	898,407
Education & Public Involvement	668,719	702,015	883,500	703,500
Nonpoint Source Pollution	98,093	74,596	62,745	62,745
Shellfish Protection	5,499	5,499	37,077	31,373
Municipal & Industrial Discharges	2,852	26,000	37,077	28,521
Contaminated Sediments & Dredging	8,556	34,212	45,633	34,224
Stormwater & CSOs	22,764	25,460	42,781	42,781
Laboratory Support	0	0	68,521	68,521
Wetlands Protection	8,249	16,799	11,408	11,408
Spill Prevention & Response	0	0	98,414	88,414
Household Hazardous Waste	0	0	0	0
Legal & Personnel Support	1,141	9,697	8,556	8,556
Costs & Financing	0	0	28,521	0
Institutional Analysis	0	14,029	10,764	3,696
Plan Implementation Subtotal	$1,020,535	$1,091,598	$2,604,307	$2,324,049
TOTAL	$2,047,696	$2,231,939	$4,035,305	$3,781,873

Program Notes

The Research budget includes $600,000 per year for competitively selected research studies.
The Education program budget includes $550,000 per year for local PIE-Fund projects.

This table represents the Authority's budget request as of October 19, 1988.

the 1989 plan: research, monitoring, and education. Support activities for these programs would be housed in the Authority through the end of fiscal year 1991. Chapter 4 calls for a study (PDI-1) to examine the long-term institutional options for these programs as well as for the Authority's other functions.

Local Government Costs

The Centennial Clean Water Fund (cigarette tax) will be disbursed to local governments starting in fiscal year 1989.[51] Local government activities required under the plan are expected to receive between $4 million and $6 million annually through grants from the Department of Ecology. Other sources of local funds may include sewer and storm drainage utility revenue, fees for inspections of on-site septic systems, state superfund monies, USGS, National Estuary Program, federal Farmers Home Administration grants, and local general fund sources. Some elements of the plan will require substantial funding at the local level. While the Centennial Clean Water Fund will provide some funding, local governments may find it necessary to pay for the increasing costs for some of these activities with new long-term revenue sources. For example, funding to cover the cost of stormwater activities is expected to come from drainage utility revenues and the Public Works Trust Fund. These long-term funding issues created by the plan will be addressed by work done under element C-1, Study of Long-Term Funding Options.

Private Sector Costs

Many program elements will result in pollution control actions by private parties. The private sector, including individuals, may incur added costs as plan elements are implemented (for example, the private costs of upgrading septic systems). These expenses are broadly identified, where possible, in the text of each program area. It is not possible to determine private costs more precisely until public agencies adopt regulations called for in the plan and the nonregulatory programs are developed and implemented.

Private entities may participate in the financing of certain plan elements. For example, The Nature Conservancy and the Trust for Public Lands regularly assist in the acquisition of Puget Sound wetlands. Private consulting firms and research institutions helped finance the First Annual Meeting on Puget Sound Research. Corporations and other private entities have participated extensively in funding and carrying out public involvement and education activities. This kind of support is expected to continue and grow.

SUMMARY

Implementing the 1989 plan will cost agencies and local governments approximately $54 million during the period from July 1989 through June 1991. The Authority is concerned that there will continue to be unmet funding needs, especially over the long term. A new element addresses these funding needs and potential funding mechanisms. The element calls on state and local agencies and their representatives to provide information to the Authority regarding funding problems and existing and potential funding sources.

51 Ecology disbursed some initial funds to local governments from this fund under emergency regulations in fiscal year 1988.

PROGRAM ELEMENT

C-1. Study of Long-Term Funding Options

PSWQA shall identify new and existing potential sources of funding to support the long-term implementation of the Puget Sound plan. This study shall be conducted in consultation with the Association of Washington Cities, the Washington State Association of Counties, tribes, the members and staffs of the legislative Ways and Means Committees, other legislators, the Governor's Office, citizens' groups, business associations, other relevant public and private entities, and state agencies. Agencies include but are not limited to the Departments of Ecology, Natural Resources, Social and Health Services, Wildlife, the Washington Conservation Commission, the State Parks and Recreation Commission, the Interagency Committee for Outdoor Recreation, the Office of Financial Management, and the Department of Revenue. At the conclusion of the study PSWQA shall propose appropriate legislative or regulatory changes necessary to facilitate the use of potential long-term funding sources.

Target Date: Identify and list revenue sources by June 30, 1989. Propose legislative and regulatory changes by December 1, 1989.

This element is estimated to cost $115,700 in fiscal year 1990.

ESTIMATED PLAN COSTS: COSTS AND FINANCING

COSTS BY ELEMENT	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
C-1 Study of Long-Term Funding Options	0	0	115,916	0	0	0	0
TOTAL	0	0	$115,916	0	0	0	0

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Ecology	0	0	8,303	0	0	0	0
DSHS	0	0	5,762	0	0	0	0
PSWQA	0	0	28,521	0			
Fisheries	0	0	6,350	0	0	0	0
Wildlife	0	0	5,338	0	0	0	0
Parks and Recreation	0	0	4,781	0	0	0	0
Natural Resources	0	0	6,860	0	0	0	0
Other State Agencies	0	0	50,000	0	0	0	0
TOTAL	0	0	$115,916	0	0	0	0

COSTS BY FUNDING SOURCE							
State General Fund	0	0	115,916	0	0	0	0
TOTAL	0	0	$115,916	0	0	0	0

SUMMARY OF LOCAL GOVERNMENT TASKS

Participation of local governments and regional organizations is a vital part of the overall management scheme for protecting Puget Sound. In the Puget Sound Water Quality Management Plan local governments play an important role in plan implementation. Although plan implementation has only recently begun, local governments have been involved in the efforts to improve Puget Sound's water quality for several years in numerous ways. The plan requires significant commitment of local expertise and resources for programs to protect wetlands and control pollution from nonpoint sources and stormwater. Not all local governments in the Puget Sound basin will have implementing responsibilities while some may have several tasks for which they are responsible.

Below is a list of tasks that local governments have responsibility for implementing. For more detail, please refer to the appropriate plan program discussion.

NONPOINT SOURCE POLLUTION PROGRAM

(NP-1)

Local governments participate in the nomination of early action watersheds. Completed.

Local governments are represented on watershed ranking committee (chaired by counties) to rank all watersheds in each county. Ranking submitted to the Department of Ecology. Ongoing.

(NP-3)

Local governments within selected watersheds are represented on watershed management committee to develop a watershed action plan for submittal to Ecology. Ongoing.

(NP-9)

Local governments evaluate their water quality programs and submit a written report to the Puget Sound Water Quality Authority. By July 1, 1989.

(NP-10)

Local governments participate in DSHS study of local government on-site system programs. Ongoing until April 1, 1989.

(MB-1)

Local governments amend their shoreline master programs to incorporate state standards for siting and design of marinas to be prepared by the Department of Ecology. Programs amended by January 1992.

(MB-2)

Local governments may adopt a model ordinance for sewer hook ups for liveaboards. (This is a voluntary program for local governments.) Model ordinance complete by January 1, 1989.

SHELLFISH PROTECTION PROGRAM

(SF-1)

Local governments incorporate the plan's shellfish protection/restoration policy into local programs for nonpoint, stormwater, combined sewer overflows, and point sources developed under the Puget Sound plan. Ongoing.

(SF-2)

Local governments participate in the program to restore and protect commercial shellfish beds. Ongoing.

(SF-4)

Local health departments, in cooperation with several state agencies, begin testing, closing, and posting contaminated shellfish areas. Ongoing.

Local health departments participate in the development of a program to restore recreational shellfish beds. Ongoing.

(SF-7)

Local health departments begin informing the public of contaminated shellfish beds through posting, press releases, and other public information processes. Ongoing.

CONTAMINATED SEDIMENTS AND DREDGING PROGRAM

(S-5)

After Ecology adopts disposal standards for contaminated sediments, local governments revise shoreline master programs, solid waste rules, and rules for hydraulics permits if required by the Puget Sound Water Quality Management Plan. Complete revisions by October 1, 1992.

STORMWATER AND COMBINED SEWER OVERFLOWS (CSOS) PROGRAM

(SW-1)

All cities and counties demonstrate that they have (1) met the requirements for operation and maintenance of stormwater systems; (2) adopted ordinances requiring stormwater controls for new development (Ecology to prepare model ordinances with assistance from local government representatives); and (3) reviewed existing maintenance ordinances for privately owned stormwater systems to determine the adequacy of the ordinances. By June 30, 1991.

(SW-2) Urbanized areas develop and implement comprehensive stormwater management programs consistent with Ecology guidelines. Begin developing programs by December 31, 1989, and implement program by the year 2000.

(SW-9) As required by RCW 90.48.480, Seattle, Metro, Anacortes, Bellingham, Bremerton, Everett, Mount Vernon, Olympia, Port Angeles, and Snohomish submit a plan to Ecology to achieve the greatest reasonable reduction of CSOs. By November 1, 1987. Not fully completed.

WETLANDS PROTECTION PROGRAM

(W-4) Local governments participate in the development of state rules for wetlands protection. Rules to be adopted by September 1, 1989.

(W-5) Local governments measure their wetlands protection efforts against state standards and identify what actions are necessary to establish a local program which meets the standards. Assessments and proposed actions are to submitted to Ecology. By September 1, 1990.

(W-7) Local governments assist in the development of a wetlands education strategy. Strategy to be completed by May 1, 1990.

(W-8) Local governments assist Ecology in the development of the wetlands restoration program. Program to be developed by May 1, 1990.

HOUSEHOLD HAZARDOUS WASTE PROGRAM

(HHW-1) Selected counties prepare local hazardous waste programs (pilot plans) required by RCW 70.105.220-235. All counties prepare local hazardous waste programs required above. By December 31, 1990. Accelerated pilot plans by June 30, 1989.

EDUCATION AND PUBLIC INVOLVEMENT PROGRAM

Local governments will have the opportunity to participate in the Education and Public Involvement Program although participation is not mandatory.

(ES-2.1)

Local governments participate in evaluating, hiring, and placing of local field agents. Placement to be based upon interest shown by individual local governments. By August 1, 1989.

Local governments assist local field agents in developing countywide nonpoint education programs. Begin September 1, 1989.

(ES-8)

Funding to be available for local education efforts. Ongoing.

LEGAL AND PERSONNEL SUPPORT PROGRAM

(LP-4)

Matching funds available for enhanced local enforcement efforts. By August 1988.

LOCAL COSTS

Total local expenditures for implementation of these plan programs for the 1990-1991 biennium is estimated at $15,608,694. In addition, other water quality-related efforts, e.g., CSO reduction and secondary treatment, require expenditures by local governments.

CSO Reduction

The total costs for CSO reduction is expected to reach $380 to $425 million of which $224 million is for projects after the year 2000. These projects are partially grant funded or grant eligible.

Secondary Treatment

As required by the federal Clean Water Act, all sewage treatment plants discharging to Puget Sound are required to achieve secondary level of treatment of effluent. The costs to provide secondary treatment at municipal facilities in the Puget Sound region is estimated to be $995 million. These projects are in various stages of planning, design, or construction. All projects should be completed or under construction by 1992. All projects are partially grant funded or grant eligible, typically at 50 percent local match.

PROGRAMS THAT REQUEST TRIBAL INVOLVEMENT

Following are brief descriptions of elements in the 1989 Puget Sound Water Quality Management Plan that request the involvement of tribes in the Puget Sound basin. There are other programs and elements in the plan which may be of interest to tribes or in which they may need or wish to be involved.

Dates noted are those by which specific elements or activities under elements are targeted for completion.

NONPOINT SOURCE POLLUTION PROGRAM

(NP-1) Tribes participate in nomination of early action watersheds. Completed.

Tribes are represented on watershed ranking committees to identify and rank watersheds within their jurisdiction. By January 1989.

(NP-2) Tribes assist PSWQA on guidelines for watershed ranking, management committees, and action plans. Completed.

(NP-3) Affected tribes serve on watershed management committees. Tribes evaluate their desired level of participation following each round of watershed selection process. Ongoing.

(NP-4) Tribes carry out their portions of watershed action plans. Ongoing.

(NP-6) Tribes assist Ecology in preparing technical assistance information for watershed management committees. Ongoing.

(NP-9) Tribes evaluate their water quality programs. Guidance prepared by PSWQA and Northwest Indian Fisheries Commission by November 1988.

(MB-3) Tribes participate in Boaters Task Force. Ongoing.

SHELLFISH PROTECTION PROGRAM

(SF-2) Tribes receive technical assistance in carrying out shellfish projects under the nonpoint program. Ongoing.

Tribes participate in monitoring program with DSHS. Ongoing.

(SF-4) Tribes participate in a committee to develop a program to protect recreational shellfish from pollution. Ongoing.

(SF-5) Tribes receive an annual inventory of shellfish beds from DSHS. Ongoing.

Tribes are consulted by DSHS on information for shellfish information guide. Ongoing.

(SF-7) Tribes participate in a work group established by Fisheries to develop an interpretive program. Ongoing.

WETLANDS PROTECTION PROGRAM

(W-1) Tribal representatives participate in wetlands preservation working group. Ongoing.

(W-2) Tribes nominate wetlands to be preserved. By February 1989.

(W-3) Tribes taking the lead in wetlands preservation projects receive technical assistance from DNR and Ecology. Ongoing.

(W-4) Ecology consults with tribes on state rules for wetlands preservation. By November 1, 1989.

(W-7) Ecology consults with tribes regarding development and implemention of a long-range wetlands education strategy. See ES-4.4 below. Begins by May 1, 1990.

(W-8) Ecology consults with tribes on development and implementation of wetlands restoration program.

MONITORING PROGRAM

(M-1) Tribes are represented on Monitoring Management Committee. Ongoing.

(M-2) Tribes may serve as implementing agencies of the Puget Sound Ambient Monitoring Program. Ongoing.

EDUCATION AND PUBLIC INVOLVEMENT PROGRAM

(ES-4.2) Tribes are represented on a committee convened by the Authority to recommend development of new interpretive centers. Delayed until 1992/93 biennium.

(ES-4.4) Tribes are represented on a committee convened by Fisheries that will develop a model watershed interpretive program at a hatchery. Begins by September 30, 1989.

Tribes are represented on a committee convened by Fisheries that will develop an interpretive program on shellfish. Begins by May 1, 1990.

Ecology consults with tribes regarding development and implemention of a long-range wetlands education strategy. Begins by May 1, 1990.

(ES-5.3) Tribal representatives serve on resource teams to respond to groups wishing to do stream enhancement or restoration. Begins by January 1, 1990.

(ES-7.1) Tribal representatives serve on the Environmental Education Task Force. Begins by September 30, 1989.

(ES-7.2) Tribal representatives serve on a technical coordinating committee for implementing the Puget Sound Plan education strategy. Begins by November 1989.

Chapter 4. Plan Development and Implementation

INTRODUCTION

This chapter describes the role of the Authority in developing and overseeing the implementation of the Puget Sound Water Quality Management Plan. The first part of the chapter summarizes the various planning and public outreach activities that the Authority carries out under its authorizing legislation. The second part describes the oversight procedures that the Authority has established to assure that the plan is fully implemented. The third part addresses the question of how to assure the continued protection of Puget Sound following the scheduled "sunset" of the Authority in 1991.

PLANNING AND PUBLIC OUTREACH FUNCTIONS

Long-Range Planning

The Puget Sound Water Quality Authority was charged by the legislature with developing a comprehensive management plan for the protection of Puget Sound's water quality. The Puget Sound Water Quality Management Plan, developed pursuant to RCW 90.70.055, affects state agency and local government decision-making related to water quality throughout the Puget Sound basin. RCW 90.70.060 lists the requirements of the plan, addressing subjects such as nonpoint source pollution, wetland preservation, municipal and industrial discharges, and contaminated sediments. This is the second of three plans required before 1991.

Plan Update

The plan establishes a long-range approach to maintaining and enhancing water quality in Puget Sound. In order to incorporate new information and make adjustments in the long-range strategy, the statute creating the Authority directed that the plan be reviewed and revised every two years (RCW 90.70.055(3)). The 1989 plan reflects the Authority's review of progress to date in implementing the plan. Similarly, the Authority will review the

progress of implementation over the next two years as a basis for preparing the 1991 plan.

Authority Activities Under the Plan

Although nearly all activities to implement the plan are carried out by other state and local agencies, the Authority carries out a number of direct responsibilities under various plan programs. These direct responsibilities fall in the areas of planning, coordination, analysis, and education. For example, the Authority developed and adopted as a state regulation (Chapter 400-12 WAC, "Local Planning and Management of Nonpoint Source Pollution") the guidance and procedures needed by state and local agencies to implement a major portion of the plan's nonpoint source pollution program.

Puget Sound Estuary Program

The Authority, along with Region 10 of the Environmental Protection Agency and the state Department of Ecology, co-manage the Puget Sound Estuary Program, a joint federal-state program for the protection of Puget Sound. The federal Water Quality Act of 1987, which amended the Clean Water Act, named Puget Sound an "estuary of national significance." In February 1988 the EPA Administrator formally designated the Puget Sound Estuary Program as part of the National Estuary Program. Under the national program, each designated estuary is to develop a "comprehensive conservation and management plan" (CCMP) that recommends actions to restore and protect the estuary. The 1987 Puget Sound Water Quality Management Plan is now recognized as a partial CCMP. The 1989 and 1991 Puget Sound plans will serve as additional increments to the CCMP. Under the terms of the federal designation, the 1991 plan must meet all of the requirements of the federal program.

Coordination Role

To carry out its responsibilities under the enabling legislation, the Authority plays a major coordinating role essential for successful implementation of the plan. The Authority has played an important role in catalyzing actions in other agencies that are necessary to implement the plan and carry out the legislated mission of protecting the Sound. The Authority has coordinated a number of interagency activities, including the development of the Puget Sound Ambient Monitoring Program and the development of a long-range education strategy. RCW 90.70.060 requires the Authority to develop procedures to "assure" local government-initiated planning for Puget Sound water quality and requires that the plan include ways to improve coordination among the various levels of government. The Authority is also represented on numerous state and local committees, task forces, and work groups dealing with Puget Sound water quality and resources.

Public Outreach

The legislature required the Authority to develop public involvement strategies and solicit public participation in the planning process (RCW 90.70.060(10)). The Authority has taken a lead role in conducting and coordinating public educational activities relating to Puget Sound. Through its

Public Education and Involvement Fund (PIE-Fund),[52] the *Soundwaves* newsletter, and active efforts to maintain ongoing relationships with local governments, tribes, and constituencies around the Sound, the Authority keeps people informed and involved in the plan's implementation.

State of the Sound

The *State of the Sound Report* is prepared every two years by the Authority pursuant to RCW 90.70.055(4). This report provides an analysis of the status and conditions of Puget Sound including a determination of the Sound's economic value. The report also addresses current and foreseeable trends in water quality and management of Puget Sound resources.

Additional Duties and Responsibilities

In addition to the responsibilities discussed above and the Authority's plan implementation oversight role discussed below, the Authority has additional program support responsibilities which include contract and grant administration, conducting studies and research relating to Puget Sound water quality, preparation of a biennial budget request, and the adoption of rules to implement Chapter 90.70 RCW.

Authority Costs for Planning and Outreach Activities

The Authority costs for these responsibilities are divided among administration, plan development, public outreach and education, and the State of the Sound Report. Table D in the Costs and Financing Section in Chapter 3 shows these costs. The total for these activities is $1.9 million for the fiscal year 1988-89 biennium and $2.4 million for the 1990-91 biennium.

ASSURING PLAN IMPLEMENTATION

Plan Consistency

The Authority is responsible for overseeing the implementation of the Puget Sound Water Quality Management Plan. This section describes some of the statutory requirements and other procedures the Authority uses in carrying out its oversight role. The Authority emphasizes assistance and coordination, attempts to focus on the most significant activities related to Puget Sound water quality, and endeavors to meet all of its statutory obligations.

The principal means by which this plan is implemented is through the actions of state agencies and local governments. The Authority assists those entities in various ways to assure that their actions are consistent with the plan as required by the Puget Sound Water Quality Act (Chapter 90.70 RCW). There are also significant features of the plan which require close coordination with federal agencies. The Authority provides information and assistance to those entities and coordinates plan implementation at all levels. These efforts are supplemented by the following specific responsibilities under the act.

52 The PIE-Fund was established to support model public involvement and education projects. In January 1988 the Authority awarded 20 PIE-Fund contracts totaling $584,200. In June 1988 28 contracts were awarded totaling $412,000.

First, the Authority must monitor the performance of state agencies and local governments in implementing specific programs prescribed in the adopted plan. This includes compliance with implementation time schedules as well as attainment of specific management goals, such as the acquisition of important wetlands.

Second, the Authority must review major proposed public actions and determine if a proposed action, whether specifically prescribed as a plan element or not, is consistent with the policy of the Puget Sound Water Quality Act and with the general intent and objectives of the Puget Sound plan. For example, a proposal to construct a cross-Sound oil pipeline might be evaluated for water quality ramifications regardless of whether such an action was specifically identified in the plan.

Plan Consistency Procedures

There are several specific reporting and reviewing requirements laid out in the statute creating the Authority. The Authority attempts to minimize bureaucratic reporting requirements by making sure that the statutory requirements are used as meaningful steps in implementing the plan.

Oversight of Plan Implementation

1. Each state agency and local government which is given responsibilities by this plan has been assigned an Authority staff liaison. The staff assures that the agency or government understands its responsibilities under the plan, assists the agency or government in implementation, monitors progress, and assists in resolving problems that arise during program implementation. The Authority staff accomplishes these tasks through communicating with and, when necessary, coordinating the various agency and local government efforts regarding a particular program; providing technical assistance to implementing agencies; assisting agencies in plan interpretation; and representing the Authority on numerous committees, work groups, task forces, and other organizations that are called for in the plan. In addition, the Authority conducts briefings for state and local agencies to inform agency employees about the plan and about program implementation and reporting.

2. Biennially, state agencies and local governments identified in the plan must submit written reports to the Authority documenting their consistency with the plan as required by RCW 90.70.070(3). The Authority provides instructions to implementing agencies for that purpose. The Authority uses the information gathered during the biennial review process to prepare revisions to the plan as required by RCW 90.70.055(3).

3. Biennially, the Authority reviews the success of plan implementation (including public and private actions) and reports the results to the legislature and the governor in the State of the Sound Report as required by RCW 90.70.055(4)(c). The Authority is also using the 1989 and 1991 plans as an additional means to report on plan progress.

4. In addition to the biennial review described above, the Authority may review budgets and regulatory and enforcement activities of state and local implementing agencies as prescribed by RCW 90.70.055(5). The purpose of this review is to assist agencies in meeting timelines and other plan requirements and to ensure that they have adequate resources to fulfill their responsibilities under the plan.

To assist the Authority in its review and tracking of plan implementation each agency is encouraged to prepare a work plan for major program responsibilities. In addition, each state agency shall:

a. Notify the Authority, in writing, whenever modifications are proposed to be made to plan budget allocations for transfers to nonplan activities, for transfers between plan programs, or for transfers within plan programs where target dates or implementation of a task are affected. Notice shall be sent prior to any irretrievable commitment of resources to allow the Authority an opportunity to comment, if necessary;

b. Submit a brief report periodically to the Authority regarding the status of the tasks assigned to the agency. The reports shall be submitted at least once every six months. The Authority will provide guidance to implementing agencies regarding this requirement; and

c. Provide copies to the Authority of reports, interagency agreements, work plans, and other significant work products developed pursuant to its implementation of each plan element.

The information obtained above will allow the Authority to make mid-term adjustments to target dates and program tasks as necessary to ensure plan implementation.

Review of Major Public Actions

As provided in RCW 90.70.070 the Authority reviews major public actions being considered by federal and state agencies and local governments in order to determine whether the proposed action is consistent with the Puget Sound Water Quality Act and the Puget Sound plan, with Authority goals and objectives, and with review criteria developed by the Authority. As a result of such review the Authority may respond to a proposal in a variety of ways. The Authority staff may respond to projects or documents which fall short of "major" but where clarification of plan requirements or technical comments would be of assistance to the responsible agency. The chair of the Authority may submit comments on actions which are critical to plan implementation or affect more than one program. The Authority shall submit comments where unmitigated water quality impacts or substantial conflicts with the plan are involved. The Authority keeps a record of its review and comment activities.

The Authority is authorized to intervene in administrative or judicial proceedings (RCW 90.70.070 (4)). While the Authority intends that intervention in judicial proceedings would be the least common form of response, reserved for very rare circumstances, the Authority may intervene in administrative proceedings as warranted.

The Authority emphasizes that its review of major public actions does not replace the authority of the permit-issuing agency to make the substantive decision on a permit or other matter. Furthermore, Authority review of a proposed action does not in any sense constitute an appeal of an agency decision; the Authority does not intend to function as an appellate body.

In order to further define the Authority's role in reviewing major public actions and to provide guidelines for determining an appropriate level of Authority response, the Authority establishes the following criteria governing its involvement:

* Whether the action is critical to implementation of the Puget Sound Water Quality Management Plan.

* Whether the action may be in direct and substantial conflict with the plan.

* Whether the action entails significant adverse water quality impacts which cannot be mitigated.

* Whether the action will have multiple effects or implications for various water quality issues or programs.

The Authority will respond to a proposal within the established review period or within a timely period if no formal response period exists.

Notice of Actions Subject to Review

In order to ensure that the Authority is aware of activities which potentially merit its attention, the Authority will inform state and local agencies of the specific types of actions for which notice to the Authority should be given.[53]

To determine which actions to review other than actions specifically implementing the Puget Sound plan, the Authority will use the criteria listed above to determine which proposed actions are "major." These actions may include program, policy, and permit actions, including actions taken under the State Environmental Policy Act (SEPA). All state agencies and local governments shall provide SEPA documents to the Authority wherever water quality, wetlands, or related issues within the Puget Sound plan area are involved. The Authority will respond when the proposal being analyzed meets one of the criteria listed above.

Authority Costs for Compliance Activities

Plan compliance activities, including review of major public actions, are estimated to cost $260,000 for the fiscal year 1988-89 biennium and $503,000 for the 1990-91 biennium.

ASSURING THE LONG-TERM PROTECTION OF PUGET SOUND

RCW 90.70 calls for the Authority to go out of existence on June 30, 1991, at the end of the third biennium of its tenure. By that time the Puget Sound plan will have gone through three planning and evaluation cycles. Coincidentally, the Puget Sound Estuary Program is to have met all the requirements of the federal Clean Water Act by that time. Therefore, although the management plan requires programs to be implemented well beyond 1991, neither the state nor federal mechanisms for planning and overseeing plan implementation are scheduled to exist after the 1991 legislative session.

At the time the Authority was created, discussion focused on the need for a comprehensive plan for all state and local entities to follow. As 1991 approaches, the discussion is shifting to a focus on assuring long-term commitment to the actions necessary to protect the Sound. And it is becoming critical to address the continuing needs for coordination, planning, and oversight—both generally for Puget Sound and for specific programs.

53 Failure of a state agency or local government to provide such notice to the Authority should not void or otherwise invalidate the action taken.

Several interested parties have urged that the functions now being performed by the Authority be continued. In addition, the three task forces that reported to the Authority this year on recommended research, monitoring, and education strategies each recognized the need for an ongoing institutional structure to coordinate those efforts. In each case, the task forces have asked that the Authority play at least an interim role as the coordinator of those efforts until some alternate suitable "home" can be created or found. One of the committees recommended the formation of an independent Puget Sound Research Foundation, which could of course be given a broader mandate. Another recommended a foundation to secure long-term funding and coordination of the Puget Sound education effort. It is also obvious from the nature of the Sound's problems and the likelihood of more difficult challenges in the future that some thought must be given to how to accomplish ongoing, or at least periodic, efforts to reassess the situation, to make sure that the Sound is being protected, and to take corrective actions.

There is already a strong emphasis in the plan on building the institutional capability in state agencies, local governments, and other places to carry out the activities that are necessary to protect the Sound. The municipal and industrial ("point") source control program is a good example of this approach. The program emphasizes procedures, criteria, training, and other institutional initiatives. The nonpoint source control program is another example of a program designed to run over a long period of time. The watershed ranking process will lay out many years of work in a priority order and is combined with a long-term funding source (the cigarette tax). But over the next two years, much more thought will have to go into how to assure the long-term success of the plan.

The problems of Puget Sound have developed over more than a century. While it shouldn't take a century to solve them, the pollution sources which must be addressed take lengthy efforts to bring under control, and this is an ecosystem which does not show quick results. In addition, because the Authority planning process is unique, there are no models which can help predict the likelihood of success of the current plan. The most troubling issue is that while trying to control pollution sources, protect wetlands, and understand Puget Sound better, the population is growing and the causes of the problems are changing.

It will not be easy to sustain sufficient support over the many years that will be needed to bring success. That is why it is important to consider the future of the Sound in the context of uncertainty about the institutional framework after 1991. Such an examination should assess the functions now being performed by the Puget Sound Water Quality Authority and other agencies with responsibilities for the Sound to see which of them are necessary over the long term to achieve the goal of a healthy and productive Sound. The following questions are an important part of that assessment:

1. Is there a need for the continued development and revision of comprehensive plans for Puget Sound water quality?

2. Should some agency have the responsibility for oversight of the implementation of those plans?

3. Should some agency have the responsibility to review, comment, and intervene in actions in order to prevent negative effects on the Sound and to ensure that plans will be implemented?

4. Should outreach to and education of constituencies about the Sound and plans for the Sound be a function of state government?

5. How can coordination among the federal, state, and local government agencies with responsibilities for the Sound be maintained?

As the last scheduled Puget Sound Water Quality Management Plan, the 1991 plan will need to address the mechanisms for implementation in the long term. To assist in the planning process, the Authority recommends that the governor appoint a committee to address the above questions and make recommendations for plan language, legislation, or other means to achieve the goal of assuring the restoration and preservation of Puget Sound in the long term. The following plan element addresses this need:

PDI-1. Long-Term Puget Sound Institutional Structure

The Authority shall request that the governor appoint a committee to make recommendations about the appropriate mechanisms for assuring the restoration and preservation of Puget Sound in the long term, including the institutional requirements of the Research, Monitoring, and Education and Public Involvement programs.[54] Among other options, the committee could recommend:

1. Assigning the responsibilities of the Authority to one or more existing state agencies.

2. Asking the federal government to continue the Puget Sound Estuary Program for an additional time or indefinitely.

3. Creating one or more new entities to carry out part or all of the functions needed.

4. Continuing the Authority but giving it a different role and shifting some of its responsibilities to other agencies.

5. Continuing the Authority as is for an additional period of time.

The committee shall consult affected constituencies and experts in government structure. The committee shall be appointed by the governor and shall present its report to the governor, the legislature, and the Authority. After presenting its report, the committee shall remain in existence to assist the Authority and the legislature as they take action on the committee's recommendations.

Target Date: Governor appoints committee by November 1988. Committee presents its report by August 1989.

ESTIMATED COST

Total cost for this element are approximately $14,000 for fiscal year 1989, $10,800 for fiscal year 1990, and $3,700 for fiscal year 1991. These costs include the establishment of the committee, related expenses such as travel and printing, consultant fees, and PSWQA staff assistance.

54 See elements R-2 and M-1 and the Education and Public Involvement Program discussions in Chapter 3.

ESTIMATED PLAN COSTS: INSTITUTIONAL ANALYSIS

COSTS BY ELEMENT	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
PDI-1 Long-Term Institutional Structure	0	14,029	10,764	3,696	0	0	0
TOTAL	0	$14,029	$10,764	$3,696	0	0	0

COSTS BY AGENCY	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
Governor's Office/PSWQA	0	14,029	10,764	3,696			
TOTAL	0	$14,029	$10,764	$3,696	0	0	0

COSTS BY FUNDING SOURCE							
State General Fund	0	$14,029	10,764	3,696	0	0	0
TOTAL	0	$14,029	$10,764	$3,696	0	0	0

Chapter 5.
The Unfinished Agenda

INTRODUCTION

The Authority conducted a public "scoping" process during the fall of 1985 as part of its initial efforts to prepare a comprehensive list of Puget Sound environmental problems and possible causes. Many issues of concern were suggested for consideration. In December 1985 the Authority selected the issues to be addressed in the 1987 plan. A number of issues could not be dealt with during the 1987 plan process. Many of these were presented in chapter 7 of the 1987 plan as the "unfinished agenda." At that time it was hoped that at least some of the unfinished agenda issues would be addressed by proposals in this 1989 plan. However, inadequate funding for the Authority made it necessary to put them off until the 1991 plan, the final edition of the plan that will be adopted by the Authority prior to its scheduled "sunset" in 1991.

There is now also a federal mandate to address the unfinished agenda. On March 17, 1988, Puget Sound was designated as part of the National Estuary Program under Section 320 of the federal Water Quality Act of 1987. This act, which amended the Clean Water Act, created the National Estuary Program and called for each estuary in the program to develop a Comprehensive Conservation and Management Plan (CCMP). The Authority's 1991 plan must be the complete CCMP for Puget Sound under that program. It is therefore essential that all significant issues affecting Puget Sound water quality and habitat be addressed by the time the 1991 plan is adopted.

This portion of the plan describes issues that may affect the health of the Sound but are not currently addressed by plan programs. The public was asked to comment on the importance of these issues as part of their review of the draft 1989 plan. Public response to the unfinished agenda issues was excellent. Over 200 people submitted written comments or provided verbal comments in the July 1988 public meetings on one or more of the unfinished agenda issues. In addition, over 300 people participated in ranking the issues they thought were most important by responding to a ranking questionnaire mailed with the draft plan or by voting on the issues at the public meetings. All comments and results of the ranking exercise were considered by the Authority in the process of determining how to address each of the 14 unfinished agenda issues, as well as other issues that were raised by commenters. Summaries of comments received and the resulting Authority actions are provided for each issue in the following discussions. In addition, these discus-

sions include specific language changes that were made in response to review comments on the draft plan.

The unfinished agenda issues that are addressed in this chapter are:

* Aquaculture
* Contamination of the Sea-surface Microlayer
* Effects of Air Pollution on Water Quality
* Federal Facilities
* Fish and Wildlife Habitat
* Freshwater Use and Availability
* Groundwater Contamination
    * hazardous wastes
    * solid waste
    * underground storage tanks
    * infectious wastes
* Hazardous Materials Spill Prevention and Response
* Human Health Risks
    * human use of beaches
    * human consumption of seafood
* Nutrient Effects
* Pesticides
* Plastic Debris in Marine Waters
* Transboundary Pollution
* Treatment of Domestic Wastes
    * integration of treatment issues
    * treatment bypasses and failing infrastructure
    * sludge and septage management
    * chlorination
* Other Issues
    * islands
    * public access to beaches
    * sole source aquifers
    * fecal coliform bacteria contamination by seals

In summary, Authority actions on the unfinished agenda include further technical and regulatory analysis and possible preparation of issue papers on fish and wildlife habitat and pesticides. Authority staff will also coordinate a technical study of the effects of air pollution on water quality. Other Authority actions will include continuation of ongoing work on federal facilities and human health risks; a request for a special study by the U.S. Geological Survey on the effects of contaminated groundwater on Puget Sound; study of preventive issues related to hazardous materials; a request for special focus by the International Joint Commission on transboundary water quality concerns; and general review and comment on major activities related to aquaculture, freshwater use and availability, groundwater contamination, plastic debris in marine waters, and treatment of domestic wastes. Contamination of the sea-surface microlayer and nutrient effects issues will be referred to the Committee on Research in Puget Sound.

Authority action on other issues raised during the public review process will include special consideration of island issues and inclusion of an island ecology section in the 1990 State of the Sound report; review and comment on major issues related to public access to beaches and sole source aquifers; and referral of the issue of seal bacteria contamination to the Department of Wildlife.

AQUACULTURE

Problem Definition

Aquaculture in the state of Washington involves the controlled cultivation and harvest of aquatic animals and plants such as shellfish, finfish, and edible "sea vegetables" (marine algae). This industry utilizes a number of different production methods to produce a wide variety of species. Methods include tideland cultivation, off-bottom culture (for oysters), open water suspension, net-pen rearing, and pond or tank culture. In 1986 state aquaculture production in processed weight totalled 8,412 tons (7,630 metric tons) with an estimated reported value of $22.7 million. Aquaculture production in Puget Sound in 1986 had a reported value of $15.8 million. Pacific oyster production accounted for about 30 percent of this value, while coho salmon and manila clams were also important. Other species with the economic potential to become viable aquaculture industries include nori (an edible seaweed), geoduck, and sturgeon.

There are 12 salmon net-pen facilities operating in Puget Sound in 1988, located in Clallam, Kitsap, Mason, Jefferson, and Skagit Counties. Two more facilities are in the construction phase and 12 more are actively seeking permits to begin development in Clallam, Island, Jefferson, and Mason Counties. There is substantial public controversy over some aspects of the aquaculture industry, particularly over the floating culture of salmon, shellfish, and nori. Navigational areas, recreational fishing areas, open space, and unobstructed views are considered by many to be limited resources in the Sound, particularly with the increasing pressures of population growth in the area. As a result, opposition to the siting of these aquaculture facilities has focused on potential conflicts with boating, fishing, and aesthetic values (such as residential views). Other concerns are related to the potential effects on water quality and bottom organisms. There have been some additional questions about the introduction of disease, antibiotics, and competition with natural fishery stocks. Four counties (Island, Jefferson, San Juan, and Skagit) have instituted temporary moratoria on facility siting until these and other concerns can be resolved.

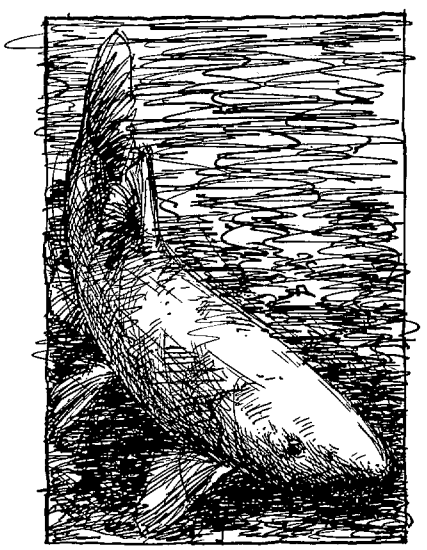
A recent study of the environmental (physical, chemical, and biological) effects of salmon net-pens found that a potentially adverse effect which may occur is the accumulation of organic-rich sediments beneath the pens, although the degree and potential effects of this accumulation are related to site-specific characteristics such as depth and currents. Sediment accumulation can reduce the oxygen available for bottom-dwelling organisms as well as change the bottom community to species that are more tolerant of organic enrichment (e.g., certain polychaete worms). According to the study, other quantifiable potential effects associated with salmon net-pens (e.g., effects on water circulation, water quality, phytoplankton productivity; the introduction of diseases and exotic species; and potential effects associated with the use of antibiotics) were considered less probable and highly dependent upon site-specific conditions or the species cultured. The study was based on a literature review of current research and did not attempt to quantify the use

conflicts or aesthetic effects potentially associated with floating aquaculture in Puget Sound.

Regulatory Framework

The state Shoreline Management Act (SMA) and local shoreline master programs are the primary vehicle for regulating the siting and development of aquaculture facilities. The act identifies aquaculture as an "activity of statewide and national interest" and as a preferred use of the water under the act (RCW 90.58.020). Prior to facility siting and development, numerous federal, state, and local permits must be acquired by any aquaculture facility. Depending on the location and facility type these permits may include: (1) dredge and fill permits from the Corps; (2) navigational markings for fixed or floating structures from the U.S. Coast Guard; (3) aquatic land lease from the Department of Natural Resources (DNR) for any use of publicly owned aquatic lands; (4) hydraulic project approval from the Department of Fisheries or Wildlife (WDF or WDW) for the modification of natural flow or bed of any salt or fresh waters; (5) statement of consistency with the Coastal Zone Management Act from the Department of Ecology; (6) water quality certification from Ecology; (7) water quality standards modification from Ecology; (8) NPDES or state waste discharge permit from Ecology; (9) identification of private sector aquaculture products from the state Department of Agriculture (WSDA); (10) registration of aquatic farmers from WDF; (11) a fish disease control permit from WDF and WSDA; (12) shellfish certification from the Department of Social and Health Services (DSHS); and (13) a shoreline substantial development permit from the appropriate county or city.

Public opposition to salmon net-pens and county difficulties over permitting facilities through local shoreline master programs prompted Ecology, in conjunction with the state Departments of Agriculture, Fisheries, and Natural Resources, to release interim guidelines in 1986 for the siting of salmon net-pen facilities in Puget Sound. The guidelines specify minimum requirements for water depth, localized current velocity, and the horizontal separation from significant bottom habitats. The guidelines also restrict salmon production in 19 Puget Sound sub-basins to eliminate potential nutrient enrichment problems. These guidelines are intended to allow permitting to proceed on salmon net-pen operations while a programmatic environmental impact statement (EIS) is being prepared. Although not designed to be adopted as regulations, the guidelines provide criteria for selection of culture sites, husbandry practices, monitoring programs, and state reporting requirements. Ecology has stated that these guidelines will "mitigate most anticipated adverse environmental effects" and that projects that meet the guidelines will result in minimal impacts to water quality, bottom sediments, and critical habitats. However, the guidelines do not address aesthetic or navigational impacts, both of which are issues that must be resolved if conflicts and controversy are to be minimized.



WDF is currently preparing a programmatic EIS for salmon net-pen culture to improve the level of knowledge, evaluate impacts, and develop mitigation measures which might reduce potential conflicts associated with the siting of net-pen facilities. The draft EIS is scheduled to be released in December 1988.

Opposition to nori culture operations (such as those proposed near Guemes Island in Skagit County) has focused primarily on the large size of the proposed facilities and their potential hazards to recreational boating and commercial fishing, interference with recreational and commercial crabbing, and interference with views. In October 1987 DNR released a programmatic EIS

for nori culture which provides guidance for the siting of nori and other sea vegetable operations.

Another issue which involves all forms of aquaculture is the question of whether counties or the state should have the primary regulatory responsibility for the siting and development of aquaculture facilities. For example, Jefferson and San Juan counties are developing shoreline master program amendments in 1988 that specifically address aquaculture.

Results

Comment summary

This issue generated a considerable number of written and verbal comments in the scoping process. Many people noted the controversial nature of the issue and the importance of the size of aquaculture facilities. A number of people expressed the view that the aquaculture industry is being adequately regulated so the Authority should not get involved. Others indicated that there is a need for an objective look at the issue which the Authority might be able to provide. Relative to the other issues on the unfinished agenda, Aquaculture was generally ranked low in priority.

Authority action

The aquaculture industry is currently receiving the attention of a wide range of state and local agencies, industry representatives, and citizen groups. The Authority will continue to review and comment on significant actions related to this issue, including the upcoming programmatic EIS on salmon net-pen culture being prepared by WDF.

CONTAMINATION OF THE SEA-SURFACE MICROLAYER

Problem Definition

The sea-surface microlayer, located at the interface between the water and the air, is only about 0.002 inches (50 micrometers) thick. It may contain high concentrations of floating material composed of a complex mixture of natural and (sometimes) synthetic substances. This material has a patchy distribution on the sea-surface and is often visible as a "slick". The sea surface is a highly productive habitat, supporting an abundance of bacteria, microalgae, and planktonic animals that feed on these sources of food. Natural bacteria concentrations in the microlayer are typically several thousands of times greater than concentrations in the subsurface water. Moreover, the surface-dwelling eggs and larvae of numerous species of invertebrates and fish (e.g., crabs, sole, flounder, cod, and hake) may be sufficiently buoyant during certain life stages to be exposed to the sea-surface microlayer. In Puget Sound, the eggs of English sole and sand sole develop on the sea surface, suspended under but possibly in contact with the microlayer. In addition, planktonic organisms (e.g., the early larval stages of the Pacific octopus) may vertically migrate daily from the water column into the surface layer to feed on the highly productive surface film.

Contaminants with low solubility in water and contaminants associated with floating particles can become concentrated at the sea surface. Concentrations

of contaminants can be orders of magnitude greater than the concentrations of the same contaminants in the underlying water (e.g., PCBs have been found at 10,000 times the subsurface concentrations). Substances that have been found to concentrate in the microlayer in Puget Sound include both natural and anthropogenic PAHs, PCBs, pesticides, metals, oils, greases, inorganic nitrogen compounds, and bacteria. Concentrations of microlayer contaminants tend to be higher near their sources (i.e., urban areas). Sources of contamination to the sea-surface microlayer may include the atmosphere (e.g., dust, smoke, or rain), petroleum or fuel spills, dredged material disposal, recreational and commercial boating activities, stormwater runoff and other nonpoint sources, and the water column (e.g., floatable oil and grease and organic matter from wastewater treatment plants or industrial outfalls).

Several laboratory bioassays have demonstrated that microlayer samples from visible slicks in Elliott Bay, Commencement Bay, and Port Angeles harbor are often toxic to fish and invertebrate eggs and larvae. For example, in a laboratory bioassay the hatching success of sand sole eggs exposed to a concentrated sample of the microlayer material from Port Angeles harbor was reduced as much as 42 percent compared to the hatching success of sand sole eggs exposed to a sample of the microlayer material from Sequim Bay (a rural "control area"). Toxicity and the resulting reduced hatching success was believed to be due to a mixture of chemicals rather than to one particular contaminant. However, results of these laboratory bioassays cannot yet be extrapolated to determine what effects the microlayer may be having on naturally occurring surface-dwelling eggs and larvae. There is little field evidence that naturally spawned pelagic fish eggs actually come into contact with the sea-surface microlayer, and the distribution of eggs in the water column is not well described. More research is needed to verify the results of the laboratory studies, to determine whether actual exposure to the microlayer is occurring in the field, and to determine whether microlayer exposure may be affecting adult populations of Puget Sound fish and invertebrates.

The significance of sea-surface microlayer contamination is unknown for Puget Sound. For instance, very little is known about (1) the extent of sea-surface contamination throughout the Sound; (2) how winds may be able to move patches of the contaminated microlayer from place to place; (3) the deposition of sea-surface contaminants on beaches and other intertidal areas and potential effects on human health as well as on fish and shellfish resources located in shoreline areas (see the Human Health Risks discussion); (4) persistence of the microlayer, which relates to how long organisms may be exposed to the contaminants; (5) the relative contributions from various point and nonpoint sources including atmospheric deposition; and (6) what lethal or sublethal effects the microlayer may be having on natural populations of fish and invertebrates in Puget Sound. Researchers have found high levels of contaminants (including nutrients and toxic pesticides) in the microlayer in the Chesapeake Bay and other areas on the East Coast; as much as one-fourth of the nutrients appear to be introduced from atmospheric sources (see the Effects of Air Pollution on Water Quality discussion). Microlayer contamination thus appears to be an emerging concern around the nation and the world.

Regulatory Framework

There is currently no direct regulatory control of sea-surface microlayer contamination. However, under the National Pollutant Discharge Elimination System (NPDES) permitting system for point source discharges, some potential microlayer contaminants may be controlled from some sources. For example, discharge permits typically contain oil and grease limits (if appropriate) as well as some language related to no visible sheen. Permits for

the disposal of dredged material also may contain language that requires monitoring of floatable material and slicks, particularly if the sediments are suspected of having significant concentrations of oil and grease. Recent legislation that prohibits the ocean dumping of plastics, food wastes, and other waste products (MARPOL Annex V; see the Plastic Debris in Marine Waters discussion) may also assist in the reduction of microlayer contamination. However, no direct monitoring of the sea-surface microlayer is required because very little is known about the relative significance of various sources or what effects microlayer contaminants may be having on living resources in the Sound. In addition, there are no standards or criteria available with which to evaluate the results of any monitoring of the microlayer.

Results

Comment summary

People who commented on this issue generally recognized that more research is required to better understand sea-surface microlayer contamination and the consequences of this form of pollution. Several commenters emphasized the relationship between microlayer contamination and air pollution, and indicated that these two unfinished agenda topics should be addressed together. Relative to the other issues, Contamination of the Sea-surface Microlayer was ranked medium to high in priority.

Authority action

Because more research is required before microlayer contamination can be adequately understood, this issue will be referred to the Committee on Research in Puget Sound. The Authority will also recommend that a workshop on microlayer research be funded through the Puget Sound Estuary Program (PSEP) to help determine the extent of the problem in Puget Sound. Microlayer contamination, as related to the effects of air pollution, will be addressed in an upcoming PSEP study of atmospheric deposition of toxic contaminants in Puget Sound.

EFFECTS OF AIR POLLUTION ON WATER QUALITY

Problem Definition

There are many types of air pollution from both point sources and area sources. Examples of sources include industrial smokestacks, motor vehicle exhausts, woodstoves, aerial spraying of pesticides, evaporation from waste treatment plants, slash burning, landfill gases, incinerator emissions, and release of volatile substances from dry cleaners. Pollutants may eventually be deposited directly to Puget Sound waters through precipitation or direct fallout. Pollutants may also enter Puget Sound via surface water runoff that picks up contaminants that have been similarly deposited on the ground or into streams that flow into Puget Sound.

Recent studies indicate that atmospheric deposition is the major pathway by which toxic pollutants, such as metals, pesticides, polycyclic aromatic hydrocarbons (PAHs), and PCBs enter the upper Great Lakes. In some coastal areas (such as the southern California Bight) measurements show that up to half of the PAHs and particulate metals entering the water come from direct atmos-

pheric deposition. Logically, it is possible that air pollution is a significant source of contamination in Puget Sound.

There are currently no direct measurements of atmospheric deposition of contaminants to Puget Sound, although the chemistry of fog and precipitation has been measured in the Puget Sound region as part of acid rain studies. These chemical analyses typically did not include organics, heavy metals, or other toxics. The Puget Sound Air Pollution Control Agency (PSAPCA) and the state Department of Ecology (Ecology) conduct an annual survey of toxic industrial emissions in some of the Puget Sound counties. In 1986 81 different toxic air contaminants were reported by industries in King, Kitsap, Pierce, and Snohomish Counties including toluene, methylene chloride, benzene, and chloroform. Ecology is currently concerned about 87 air toxics statewide including volatile organics, phenols, xylene, toluene, manganese, formaldehyde, and benzene. Because ambient concentrations of toxic air contaminants have largely not been measured in the Puget Sound area, it is not known whether the deposition of these and other airborne contaminants into Puget Sound or its tributaries is a serious problem. PSAPCA and the Environmental Protection Agency (EPA) are currently conducting limited studies to quantify ambient concentrations of some toxic air pollutants in the central Puget Sound basin. This will help determine the extent of atmospheric contributions to the water quality problems of Puget Sound.

Contaminants that reach the Sound via direct atmospheric deposition are likely to accumulate, at least for the short term, in the sea-surface microlayer. The microlayer is the top 50 micrometers of the water column and is in direct contact with the atmosphere. The microlayer often contains high concentrations of metals and organic compounds which can be several orders of magnitude greater than the remainder of the water column or overlying atmosphere. Some research indicates that the eggs and larval forms of several economically important fish and shellfish species may be in close proximity with the microlayer and possibly in contact with it. Laboratory bioassays with microlayer water show that it can be toxic to fish larvae and can also cause biological abnormalities. Characteristics of the Puget Sound microlayer suggest that significant PAH contamination is from fossil fuel combustion (and therefore atmospheric deposition) rather than spills or direct discharges.

The ultimate accumulation of air contaminants in the sediment, either through settling of particles or food chain processes, is also of concern. Arsenic from the ASARCO smelter emissions in Tacoma is detectable in sediments at some distance from the stack, including the northern end of Lake Washington (the smelter closed in 1985). PAH concentrations are particularly high in sediments that date back to the 1940s and 1950s when there were a higher number of coal-fired power sources than today. Although PAH levels in more recently deposited sediments appear to be lower, this apparent trend could change somewhat when the power plant located at the Puget Sound Naval Shipyard in Bremerton converts to coal-fired operation in the summer of 1989. Lead concentrations in Puget Sound sediments generally have been decreasing since the 1960s, corresponding with restrictions on lead in gasoline and control of the ASARCO emissions.

There is increasing concern about the potential air quality impacts of solid waste incineration facilities in the Puget Sound basin. Solid waste incinerators represent a new source of air contaminants to the region. Burning solid waste can result in emissions of dioxin and increased levels of particulates. Any air contaminants that are collected by control equipment at the facility remain in the ash, which sometimes meets the state's criteria for hazardous wastes. If im-

properly disposed of, the contaminants from the ash could enter Puget Sound via surface water runoff or as leachate from landfills.

There are at least four incineration facilities under consideration in the Puget Sound area, including Skagit County, Tacoma, King County, and the Tulalip Tribes Reservation. The Skagit County and Tacoma facilities are scheduled for completion during 1988. The King County project has been delayed and a construction site has not been selected. The Tulalip Tribes will not begin construction until waste stream commitments from local governments are received. In addition to these projects, there are incinerators already operating in Whatcom and San Juan counties.

Regulatory Framework

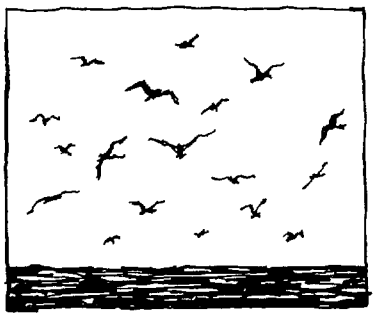
There is a three-tiered regulatory scheme for air pollution control in Washington with overlap of federal, state, and local regulations. The minimum standards for air emissions are prescribed by the federal Clean Air Act. Pursuant to this law EPA is responsible for designating pollutants and establishing acceptable standards. EPA, however, has failed to formally designate many pollutants (particularly toxic air pollutants) and there are some who feel that the standards for the identified pollutants are too lenient to adequately protect human health. It is important to note that the primary standards required by the Clean Air Act are developed to protect the health of persons who breath the air, while secondary standards are designed to protect the environment and human welfare. The data base for setting both of these standards is limited, however, and primary and secondary ambient standards have been established for only six pollutants.

Under the state Clean Air Act, the state is responsible for enforcing the state's air pollution standards. These standards must be at least as stringent as, or more stringent than, federal standards. There are also local air pollution control authorities that may adopt and enforce standards that are additional to and/or more stringent than the state's. However, primarily due to lack of resources, the state generally is forced to rely on EPA's data, and seldom does the state identify pollutants that are not listed by EPA.

As a result of this tiering, the local agencies generally play the lead role in enforcement in the Puget Sound region while EPA establishes most standards. There are three local authorities in the Puget Sound region. The Puget Sound Air Pollution Control Agency (PSAPCA) is responsible for King, Pierce, Snohomish, and Kitsap counties. The Northwest Air Pollution Control Authority (NWAPCA) is responsible for Island, Skagit, and Whatcom counties. The Olympic Air Pollution Control Authority (OAPCA) is responsible for Clallam, Jefferson, Mason, Thurston, Grays Harbor, and Pacific counties. Ecology is the lead agency in the areas of the state where there is no local agency or where the local agency is not adequately enforcing air quality laws. Ecology also retains jurisdiction for chemical pulp mills, primary aluminum plants, and motor vehicles.

All industries that emit air pollutants must register with either Ecology or the local air pollution control authority. At most local air authorities (but not at Ecology) a registration fee is charged to cover the costs of administering the registration program. The registration is a one-time requirement and no annual permit is required. The state Clean Air Act establishes monitoring requirements and minimum standards for all facilities and establishes more stringent requirements for new construction.

Industries are classified by type and regulated in accordance with their classification. All sources must meet reasonably available control technologies (RACT). General regulatory requirements apply to industries that do not fit into a specific category. Typical regulatory standards include opacity (a visual measure of the amount of the pollution) and emission limits on the amount of specific pollutants. Industries must also comply with regulatory orders issued by the state or local agency. These orders, issued on a case-by-case basis, may require the industry to install additional control technologies beyond RACT. The orders may result in more stringent emission controls than those prescribed by the emission standards. The regulatory orders generally include a compliance schedule and deadlines.



Routine monitoring of emissions is required for many new sources and for Ecology-registered sources such as pulp mills. For some industries monitoring is required monthly; other industries must monitor continuously. The regulatory agency generally must rely on the monitoring data provided by the industry. Source tests, surveillance, and annual or unscheduled compliance inspections constitute the bulk of local agency compliance assurance programs. The agencies may take enforcement action if the monitoring data reveal a violation or if a violation is discovered during an inspection.

There are more stringent requirements for the construction of new industries that emit air pollutants. A notice of construction must be submitted to the regulatory agency. All new sources must (1) meet federal new source performance standards (NSPS) and national emission standards for hazardous air pollutants (NESHAPS); and (2) install the best available control technology (BACT) for emission control. These requirements would apply to the construction of new solid waste incinerators, as would the requirements of the new state incinerator regulation (WAC 173-434).

If the proposed new source is located in a nonattainment area (i.e., an area designated by EPA as exceeding a national ambient air quality standard), stricter standards apply. There are nonattainment areas for various pollutants in the Tacoma and Seattle metropolitan areas. In addition to the requirements of NSPS, NESHAPS, and BACT, any new industry in a nonattainment area that emits more than 100 tons per year of a regulated pollutant must also (1) comply with the lowest achievable emission rate for those contaminants designated as being out of compliance with attainment standards; (2) ensure that emissions from the new source will not add to total pollution levels; and (3) demonstrate that any other major sources owned and operated by the applicant are in compliance with the federal Clean Air Act. In areas that exceed national air quality standards for carbon monoxide or ozone, and that were granted the five-year extension to reach attainment, applicants for new sources must demonstrate that the benefits of the source significantly outweigh the resulting environmental and social costs.

If these requirements are met, an order for approval of construction is granted. The order may contain conditions to ensure continual compliance with the air quality standards. If the regulatory agency finds that the proposed source does not comply with the requirements of the air quality laws, an order is issued preventing construction.

Results

Comment summary

A number of people commented on the importance of this issue and how air pollution relates to sea-surface microlayer contamination. Several people also suggested that the issue requires more research. This issue had a medium to high priority relative to the other unfinished agenda issues.

Authority action

The Authority will coordinate a PSEP-funded study that will evaluate atmospheric deposition of toxic contaminants to Puget Sound. Personnel from the Puget Sound Air Pollution Control Agency and other air quality experts will assist with this study. The study will examine direct deposition of air pollutants to the surface waters of Puget Sound, the indirect contribution of atmospheric pollutants in stormwater that flows to the Sound, and the occurrence of air pollutants in the sea-surface microlayer. The study will also include an analysis of the regulatory structure affecting this issue. Results of the study will be due in time to consider recommendations in the 1991 plan.

FEDERAL FACILITIES

Problem Definition

The concerns arising from the normal activities on military installations and other federal facilities around Puget Sound are almost identical to those arising from the normal activities in homes, farms, and industry throughout the region. The Puget Sound plan addresses these issues for the civilian population through a program that emphasizes prevention of future problems. Individuals and organizations throughout the 12-county region are being asked to take on new tasks as their part in implementing the plan. In order for the plan to be as effective as possible, it is important that everyone in the region carry an equal share of the responsibility and that progress be made in all geographic areas at roughly the same pace. Therefore, it is important that federal facilities participate in the implementation of the plan.

Federal facilities in the Puget Sound area include:

* McChord Air Force Base
* Fort Lewis Army Base
* Defense Fuel Support Point at Mukilteo
* Trident Submarine Base at Bangor
* Naval Supply Center at Manchester
* Naval Undersea Warfare Engineering Station at Keyport
* Naval Undersea Warfare Engineering Station on Indian Island
* Naval Air Station on Whidbey Island
* Naval Station Puget Sound, Seattle
* Puget Sound Naval Shipyard, Bremerton
* Navy Homeport at Everett (proposed)

In addition, there are numerous small federal facilities including national parks, used ammunition disposal sites, abandoned missile silos, National Oceanic and Atmospheric Administration (NOAA) facilities, and the EPA laboratory.

There are many water quality concerns involving federal facilities in the Puget Sound region. It is probable that the types of significant pollution problems addressed in the plan are present in the waters bordering military bases.

Toxic or Hazardous Wastes. There are federal Superfund sites pending at the Fort Lewis Army Base, McChord Air Force Base, the Trident Submarine Base at Bangor, the Naval Undersea Warfare Engineering Station at Keyport, and two sites at the Whidbey Island Naval Air Station. EPA has compiled a national priority list of federal facilities that have handled hazardous substances. The purpose of EPA's list is to (1) identify all federal facilities that must be evaluated to determine if they pose a risk to public health and the environment; (2) compile and maintain the information submitted to EPA on these facilities; and (3) provide a mechanism to make this information available to the public. This region (EPA Region 10) has the highest percentage and highest actual number of federal facilities on the national priority list of any EPA region nationwide. EPA has identified 25 federal facilities in the vicinity of Puget Sound that have handled hazardous substances. Federal and state authorities periodically inspect federal facilities and develop compliance schedules when problems are discovered. EPA has recently conducted multimedia environmental inspections and Superfund work at some Navy facilities, and others are planned for the near future. There are real limits to the administrative authority necessary to force compliance in most programs.

Point Source Discharges. Nine Department of Defense facilities have received NPDES permits. All of these permits are issued by EPA as there has been no delegation of the program to Ecology. The industrial pretreatment facilities at the Puget Sound Naval Shipyard at Bremerton is an example of an NPDES permit for a federal facility. The sewage treatment plant at the Naval Air Station on Whidbey Island has failed to meet the standards of its permit. A Memorandum of Agreement has been established between EPA and the Navy that focuses on bringing that facility into compliance, and the facility is now being redesigned. EPA has required biomonitoring of facility discharges in those instances where there is a significant potential problem from the discharge of toxicants (e.g., at the Puget Sound Naval Shipyard at Bremerton and the Naval Supply Center at Manchester). Ecology has not made full use of its authority under the federal Clean Water Act (Section 401) to place additional conditions on the permits.

Nonpoint Sources. The primary nonpoint pollution concerns relate to surface water runoff and hazardous waste sites. McChord Air Force Base and the Whidbey Island Naval Air Station use solvents to clean airplanes and accumulate significant amounts of jet fuel on runways. Some solvents used are recycled and there are systems for managing jet fuel runoff, but the effectiveness of those programs is unclear. The Puget Sound Naval Shipyard at Bremerton also uses many types of toxic substances. The Bangor, Fort Lewis, McChord, and Whidbey facilities all have significant resident populations with the same types of nonpoint problems as small cities. The Keyport facility may represent a serious threat to recreational shellfish due to toxicants from historical waste disposal sites.

Sediments and Dredging. Several of the Naval facilities require dredging and disposal of dredged material in order to maintain navigational channels and to create new dock space. In addition to the proposed Everett Navy Homeport, dredging practices at the Puget Sound Naval Shipyard at Bremerton may present problems due to the levels of contaminants in Sinclair Inlet sediments. The shipyard recently had to dispose of contaminated dredge material upland.

Future dredging and the subsequent disposal of dredged material will also be necessary.

Wetlands. The Fort Lewis, Whidbey Island, Indian Island, and Bangor facilities have many miles of shoreline and some significant upland wetlands. There is no inventory of these wetlands or a consistent policy for preservation. Fort Lewis, however, is engaged in an aggressive program to restore wetlands for habitat purposes. Each Navy installation maintains a Natural Resources Management (NRM) Program for shore activities. The NRM Program addresses a wide range of natural resource topics including the protection and identification of wetlands, floodplains, and coastal barrier islands; soil and water conservation; fish and wildlife management; and development and management of ecological reserves and research areas.

Spills. The Naval Supply Center at Manchester annually receives and disperses an average of 23 million gallons of diesel fuel for ships and 123 million gallons of jet fuel. This base has a very good record for spill prevention, but the potential for spills will increase with the significant increase in ships and planes expected to result from the proposed Everett Homeport. There is capacity for storage of 753,000 barrels of jet fuel at the Defense Fuel Support Point at Mukilteo. The Mukilteo facility is quite old and contains no safety dikes, underground pipes, or any system for stormwater collection and separation. The base may be phased out by the Department of Defense in the near future. In addition, there is a large number of hazardous materials regularly handled on military bases. Radioactive materials are handled at Bangor, Bremerton, Whidbey, and Indian Island, and perhaps also at Fort Lewis Army Base and McChord Air Force Base. In the Puget Sound region the Navy has oil spill response teams and equipment at Indian Island, Keyport, Bangor, Whidbey Island, Bremerton, Manchester, and the Naval Station Puget Sound facility in Seattle. In August 1988 the Navy used its spill response team and equipment to contain a spill of 50,000 gallons of JP-5 jet fuel at the Whidbey Island Naval Air Station on Crescent Harbor.

Regulatory Framework

All federal environmental laws apply to federal facilities unless the President grants an exemption. These are generally only granted on a case-by-case basis and must be renewed periodically, usually once a year. The Justice Department has not helped recent enforcement efforts by EPA at federal facilities. As a result, EPA concedes that enforcement of federal environmental laws in some cases may result only from state actions. Congressional efforts to clarify EPA's role and the authority of the states have been opposed by the Justice Department. The acting assistant attorney general for the Justice Department's Land and Natural Resources Division claims that legislation granting EPA clear authority to enforce environmental laws on federal facilities is unconstitutional because it would interfere with the President's authority to mediate disputes among executive agencies. He also claims enforcement of environmental laws could weaken national security. The extent to which a federal facility would be subject to fines or penalties depends upon the environmental statute and the particular waiver of sovereign immunity in question. Basically, the Justice Department has taken the position that internal disputes between federal executive agencies should be resolved internally without court intervention. Several statutes have been proposed recently by Congress to aid EPA in enforcement actions with federal facilities.

Several programs have been developed specifically for military facilities to supplement the basic requirements of federal hazardous waste and water quality laws. The Installation Restoration Program (IRP) for the Air Force, Army,

FISH AND WILDLIFE HABITAT

Problem Definition

Fish and wildlife habitat consists of the combination of factors such as available food, water, cover, and open space that enables animals to survive in their environment. Without food and water, protection from predators, room to breed and raise young, and territory such as migratory corridors to meet their basic needs through the seasons, animals will not survive. Habitat is typically lost or degraded when land and water bodies are developed for human uses or contaminated by waste from human activities. This forces organisms into habitats that are not optimal, or puts them in competition with other individuals for remaining optimal habitat. Diminished habitat also may create "ecological islands" that are too small to support or maintain ecological functions that are necessary for survival. Fish and wildlife individuals perish, populations are reduced, and the species composition of an area may change as a result of the loss of preferred habitat. The protection of fish and wildlife habitat is thus crucial for the maintenance and enhancement of an ecosystem such as Puget Sound. Likewise, the ultimate purpose of protecting water quality is to provide habitat that supports the survival and enhancement of fish and wildlife species that are important economically, as well as to enhance the general quality of life in the Puget Sound region.

Habitats of the Puget Sound area can be distinguished by the extent to which they are saturated by water. Three broad habitat categories present in the area are non-wetland terrestrial habitats (including old growth forests, upland riparian corridors, riverine floodplains, and shrub and grassland areas), wetlands (marine, estuarine, and freshwater), and the deep/open water of the Sound. The boundaries between these habitats are blurred by the continual movement of water and life across them, and they together form the single, integrated network of interdependent species and habitats that constitutes the Puget Sound ecosystem.

The Puget Sound Water Quality Act calls for the Puget Sound plan to include recommendations on "protecting, preserving and, where possible, restoring wetlands and wildlife habitat and shellfish beds throughout Puget Sound" (RCW 90.70.060 (11)). The Puget Sound plan includes a wetlands protection program and a shellfish protection and restoration program, both of which are currently being implemented. However, there is no comparable program for the protection and restoration of non-wetland terrestrial or deep/open water habitats.

Non-wetland terrestrial habitat

The condition and availability of habitats in upland areas can be of vital importance to Puget Sound fish and wildlife species. Many of these species are dependent on non-marine/estuarine and non-wetland habitats during portions of their life cycle for such critical activities as breeding or feeding. The Department of Wildlife estimates that up to 70 terrestrial species plus all the anadromous fish species rely on both the marine waters of the Sound and non-wetland terrestrial habitats (usually upland riparian corridors). For example, numerous songbirds, water-related birds (e.g., eagles, herons, egrets, shorebirds) and other wildlife (e.g., beaver, otter, racoon) depend on both wetland and non-wetland habitats. Many species that use wetlands for primary breeding habitat may depend on other habitats during other life stages. In addition, upland buffer zones adjacent to wetland habitats are important for protecting sensitive wetland habitats as well as providing escape habitat for

resident species. The type and extent of development of upland areas (e.g., parking lots, clearcuts, and feed lots) can also directly affect the water quality and therefore habitat value of nearby water bodies.

The Authority's 1986 *Habitat and Wetlands Protection Issue Paper* concluded that maintenance of existing populations of many Puget Sound species will depend on preservation of upland habitats as well as the wetlands and freshwater and marine habitats of the Puget Sound area. Although it is important to protect those habitats seemingly most important to the most species (e.g., wetlands), the protection of critical non-wetland habitats is also important. The trend in land development to residential multi-unit construction on the hillsides of rural areas surrounding suburban communities has increased the losses of wooded wetlands and uplands, particularly those not directly associated with streams. With a 20 percent increase in population around the Sound projected by the year 2000, there will be a 70 percent increase in lands developed for rural non-farm use. Many of these lands currently provide habitat critical to the survival of Puget Sound fish and wildlife populations. Despite the recognition that a variety of habitats are both important and threatened, we have a very incomplete understanding of the extent of (1) overall habitat losses in the Puget Sound area, and (2) the tools needed for widespread habitat protection and restoration.

Deep/open water habitat

The open waters of the Puget Sound area provide critical habitat for thousands of organisms. Primary inhabitants include phytoplankton and zooplankton, subtidal macroalgae (kelp), benthic invertebrates (e.g., amphipods, worms, clams, shrimp, and crabs), benthic and pelagic fish (e.g., sole, flounder, herring, salmonids, hake, pollock, and cod), marine birds (e.g., loons, grebes, and alcids), and marine mammals (e.g., harbor seals, sea lions, and orca whales). Many programs in the Puget Sound plan are focused on water and sediment quality in the marine waters of Puget Sound, with an emphasis on control of toxicants. However, the plan does not directly address the question of quantitative physical losses of deep/open water and non-wetland habitats due to development or other human-induced perturbations (although it does address the introduction of toxicants). For example, the Contaminated Sediments and Dredging Program of the plan is intended to improve the quality of sediment in the Sound but does not directly focus on the physical loss of benthic habitat (e.g., that may result from the open water disposal of dredged material). The protection of subtidal eelgrass beds (critical habitats for a number of species) from dredging or marina construction would not necessarily be enhanced by programs in the Puget Sound plan, yet the state Department of Wildlife estimates that the state has lost 33 percent of its historic eelgrass beds. In addition, while the Nonpoint Source Pollution Program may be expected to address sources of contaminants in priority watersheds, the plan does not include a comprehensive program for stream or riparian zone protection.

Regulatory Framework

There is no law specifically designed for habitat protection in Washington State. Protection, to the extent it is achieved, is through implementation of several laws administered by federal, state, and local governments. Each law applies to a different geographic area and to a different set of activities, which results in variable levels of protection for important habitats. For example, multiple laws will apply to an action in the intertidal area of an estuary, whereas a similar major development in an inland wildlife habitat may require no approval other than local building permits. In some cases the laws are

and Navy is a program instituted by the Department of Defense to comply with the requirements of the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or, more commonly, Superfund). These programs are designed to (1) identify inactive hazardous waste disposal sites; (2) assess their potential for contaminating the environment; and (3) plan and implement appropriate corrective actions. These studies are underway at all of the major bases.

In addition to these investigations, the U.S. Army Corps of Engineers is responsible for a program that evaluates the waste sites on abandoned military installations. There are at least 150 of these around Puget Sound in such places as Vashon Island, Kingston, Poulsbo, Sand Point, Discovery Park, Paine Field, Olympia Municipal Airport, Port Angeles, Blaine, and Tulalip.

EPA's Region 10 office has initiated a joint effort with the state to identify the various environmental concerns at federal facilities. Inspections have been completed at the Trident Submarine Base at Bangor, Fort Lewis Army Base, and the Puget Sound Naval Shipyard in Bremerton. An inspection of the Naval Undersea Warfare Engineering Station at Keyport is planned for 1988. EPA and the Department of Defense are negotiating interagency compliance agreements to begin a program of regular environmental self-audits of these facilities.

Most federal environmental laws also require that federal facilities comply with state and local laws and standards. The federal Clean Water Act states: "Each department . . . of the Federal Government . . . engaged in any activity resulting . . . in the discharge or runoff of pollutants . . . shall be subject to and comply with all federal, state, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution in the same manner, and to the same extent as any non-governmental entity . . . " (Section 1323). Similar provisions exist for hazardous waste management and cleanup. If there is a discrepancy between state and federal requirements, however, the federal requirements may supersede the state's.

Results

Comment summary

Public comments encouraged federal compliance and cooperation with the plan. Descriptions of ongoing agency enforcement and inspection activities as well as several existing environmental programs on military bases were omitted from the draft plan discussion. This issue was ranked of medium to high priority relative to other issues on the unfinished agenda.

Authority action

An overview of existing programs and enforcement actions was added to the above discussion. The Authority, in cooperation with EPA and Ecology, will continue ongoing efforts to achieve plan compliance by Department of Defense facilities. After on-site visits in 1988, compliance agreements will be negotiated. Other action items may be addressed in the 1991 plan pending evaluation of the compliance progress. The Authority will work with the Puget Sound Estuary Program (PSEP) to ensure that its federal consistency report is integrated with the plan, and to assist the PSEP Management Committee in developing action recommendations related to federal activities for the 1991 plan.

tightly coordinated, for example, the federal Clean Water Act Section 404 and the Rivers and Harbors Act Section 10 programs are integrated with other federal and state programs. However, in many cases coordination is minimal or lacking, and the quality and quantity of habitats are not sufficiently protected.

Federal laws that address habitat are the Clean Water Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the Marine Mammal Protection Act, and the Coastal Zone Management Act. Section 404(b)(1) guidelines are adopted pursuant to the Clean Water Act and contain provisions for habitat preservation. These guidelines require, among other things, project applicants to document that practicable alternatives to fill in aquatic/wetland sites do not exist. In Puget Sound the permit process under the Clean Water Act is also supported by the strong mitigation policies of EPA Region 10 and the U.S. Fish and Wildlife Service. Some limitations of the Section 404 process are that it pertains solely to waters of the United States (including wetland habitats) and actions in areas less than one acre are exempt. As a result there may be cumulative effects from the losses of small isolated wetlands.

The Fish and Wildlife Coordination Act requires that wildlife conservation be given equal consideration to the other aspects of water resource development. The Endangered Species Act prohibits funding or permitting of projects by the federal government if such projects would threaten the continued existence of an officially threatened or endangered species. Likewise, the Marine Mammal Protection Act affords some protection to habitat, although the focus of this act is on prevention of harassment and harvesting of marine mammals.

Washington has a state shoreline management program that addresses those shoreline activities that are regulated by the federal Coastal Zone Management Act. While wetland areas are specifically included in the federal act, many local shoreline master programs do not specifically identify valuable riparian and other habitats or contain explicit policies concerning habitat protection. The state Shoreline Management Act (SMA) provides some protection for wildlife habitat in that it requires preparation of land use plans for any development on Puget Sound shorelines. The SMA also institutes a permit program for construction activities in and on shorelines in the state. However, the SMA does not explicitly and effectively prevent either the loss or degradation of habitat, particularly because of its exemption of wetlands associated with streams and lakes smaller than 20 acres.

The state hydraulic project approval (HPA) process is administered by the Washington Departments of Fisheries and Wildlife and is required for "... any person or government agency desiring to construct any form of hydraulic project or other work that will use, divert, obstruct, or change the natural flow or bed of any river or stream or that will utilize any of the salt or fresh waters of the State." The HPA process is linked to the U. S. Army Corps of Engineers permitting process under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. While the evaluation criteria are very specific for some habitats and resources, HPA does not apply to resources other than fisheries. Thus, wetlands, riparian corridors, and other habitats that are considered to be primarily wildlife habitat are not protected under the program. This is partially due to a lack of information which would definitively show the value of non-stream habitats (such as wetlands adjacent to the Sound) to fisheries resources.

Other state laws and programs which affect habitat protection are the State Environmental Policy Act (SEPA) and the Department of Natural Resources aquatic lands management and leasing program. Mitigation for habitat loss may be required under SEPA, but the act lacks specific guidance on appropriate types of mitigation or the extent to which mitigation should be required for given types of habitat impact. DNR management and leasing of state-owned aquatic lands does affect habitat protection, and DNR may use funds collected from leasing fees for habitat improvements.

In certain areas (for example, estuarine areas) existing regulatory authority can successfully protect important habitats. However, these protective measures are not based on clearly defined state objectives for habitat protection but rather on individual agency interpretations of their authorities; both the authorities and their interpretations tend to vary. An additional problem related to fish and wildlife habitat is that the quantity, quality, and comparative importance of specific habitats in the Puget Sound area has not been comprehensively determined. It is also not well understood what minimum size may be required for a habitat to retain its functional value or how important adjacent but different habitats may be to resident species. A Soundwide inventory based on carefully developed criteria (e.g., functional values of individual habitats) should be completed in order to determine the extent of the need for habitat protection and restoration throughout the Sound.

Results

Comment summary

This issue received a considerable number of comments and was ranked very high in priority relative to the other unfinished agenda issues. A number of people suggested that more studies are needed and that more needs to be done to protect important habitats in the Puget Sound area (e.g., by improving existing regulations). Several commenters suggested that important "indicator species" should be used to monitor the health of the Sound, and another stressed the importance of maintaining the ecological functions and diversity of key habitats in the Sound.

Authority action

Because of the complexity of this issue and the range of comments received in the scoping process, Authority staff will conduct additional scoping of the technical and policy/regulatory questions related to fish and wildlife habitat and report back to the Authority in March 1989 with a recommendation for the best way to address the issue. Depending on the results of this scoping exercise, an issue paper may be prepared to further analyze unanswered technical and regulatory questions related to fish and wildlife habitat (e.g., the link between habitat protection and water quality standards, the use of indicator organisms, and various jurisdictional questions). The issue paper may lead to a 1991 plan program or to possible modifications to existing plan programs.

FRESHWATER USE AND AVAILABILITY

Problem Definition

There are many competing interests for the use of fresh water. Some interests require that water remain in the streams or rivers. For example, fisheries depend on adequate instream flows and habitat conditions. Hydroelectric

power and some recreational activities (such as boating and fishing) also depend on adequate instream water supplies. Other activities require diversion of the water for out-of-stream uses. Industrial, commercial, residential, and agricultural users compete for the water that is withdrawn from the stream. Estimates of water consumption in the Puget Sound basin indicate that 52 percent is consumed for domestic use, 12 percent for commercial use, and 36 percent for industrial use, including agriculture. While some interests compete for the right to withdraw available water, others fight to keep water in the streams for fish, energy production, and recreation.

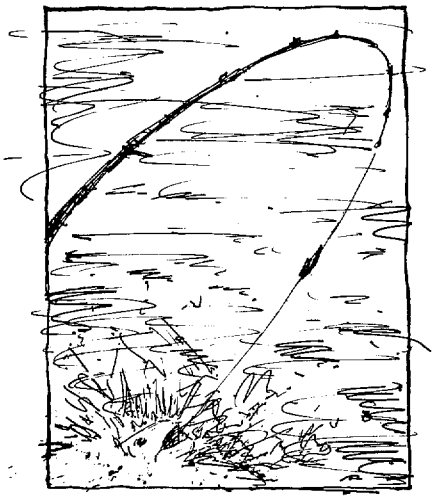
Water availability is a function of hydrologic conditions and the patterns and extent of existing uses. Although western Washington generally receives adequate precipitation on an annual basis, the rainfall pattern creates some problems. Most of the precipitation is received during the winter, while summer and early fall tend to be rather dry. Nearly all streams in the state reach their lowest flows during this period. Water demand for many uses, including irrigation and municipal use, peaks during this dry period. The low flow period is also a critical time for recreation, aesthetic values, water quality, and fish and wildlife. In many cases the level of fish production is determined by flows during this low flow period.

The primary concern of fresh water availability for Puget Sound, as defined by state law, is the effect on fisheries resources and habitat. If too much water is allocated to out-of-stream uses such as municipal water supplies and industrial processing, the remaining instream flow can be too low to provide adequate habitat. Decreased quantity is often associated with decreased water quality due to less flushing and higher concentrations of sediment and pollutants. The small streams in the Puget Sound basin are particularly vulnerable. Even small allocations to out-of-stream uses can leave these streams unsuitable for fish migration, spawning, and rearing. If anadromous fish do not find suitable habitat for spawning, fish production in Puget Sound could drastically decline.

There are other potential problems to Puget Sound with increased allocation of fresh water. Wetlands can be reduced or eliminated when they are not adequately replenished by fresh water. Much of the fresh water that is removed from natural systems becomes wastewater and must receive treatment in wastewater systems. There is also a potential problem when reduced freshwater flow allows saltwater to move upstream at the mouth of an estuarine river. This can harm biological resources that rely on freshwater flows. All of these concerns are accentuated during droughts.

Some of the competing needs for fresh water include:

Fisheries. The inland waters of Washington provide habitat for 76 species of fish, 46 of which are native. Fourteen species are anadromous; they spawn in fresh water but spend most of their adult lives in marine waters. The rest are resident fish and spend all of their lives in fresh water. There are over 10,000 individual streams draining into Puget Sound which are suitable as fish habitat. Salmon and trout need clean, oxygen-rich, cool flowing streams for rearing and clean gravel for spawning. Water flow is also an important element of fish habitat. Too much flow can scour a stream bed and reduce water quality. Too little water can reduce habitat, overly expose eggs, or result in water temperatures that are too high. Fisheries studies show a clear correlation between total fish production and the level of lowest persistent flow during fresh water life phases. "Wet" summer and fall years consistently produce more fish than "dry" summer and fall years. This is of particular im-



portance to Puget Sound tribes who believe that maintaining their fishery resources through adequate instream flows is a reserved treaty right.

Municipal and Domestic Water Supplies. The cities of Seattle, Tacoma, and Everett operate municipal water supply projects on the Cedar and Tolt Rivers, the Green River, and the Sultan River, respectively. These systems provide the majority of the domestic water supply for the central Puget Sound metropolitan region, although some cities are supplemented significantly with groundwater, particularly Tacoma. Other large surface water systems in western Washington include Bellingham, Olympia, Bremerton, and Port Angeles. New surface water diversions are being considered by Seattle, Bellevue, Tacoma, Jefferson County, and Kitsap County. Many small independent private and public domestic water systems exist throughout Washington. Many of these water supply systems were severely hit by the 1987 drought, which intensified the competition for water.

Industrial and Commercial Water Supplies. The primary industrial and commercial uses of water are chemical and mechanical processing and cooling. Pulp mills, the production of semiconductor chips, and food processing are examples of industries that require heavy water usage. Most industrial and commercial users obtain water from municipal water systems, and this accounts for more than half of the water taken from some municipal water systems.

Agriculture. Agricultural water use in western Washington is primarily divided between livestock watering and irrigation. Livestock watering involves providing drinking water to animals directly from streams or diverting water from streams to maintain a drinking water supply. Dairy farming in northwestern Washington is the primary livestock use in the Puget Sound basin. Although reliance on irrigation is not as great in western Washington as it is in the eastern part of the state, there is scattered irrigation throughout the lowland areas of the Puget Sound basin. Irrigation water may be drawn from private wells, supplied by municipal water systems, or drawn from surface water diversions.

Energy. Hydropower represents over 70 percent of the electrical energy capacity in Northwest. Many hydroelectric plants were installed on the rivers of western Washington in the early part of the century. Smaller plants were removed from service as large hydro plants on the Columbia provided ample inexpensive electricity. Some of these small plants (generally run-of-river plants that do not use a dam) have been under consideration for redevelopment as a part of the trend toward small, decentralized facilities. All hydroelectric plants can affect the fish, wildlife resources, recreation, and scenic values of rivers.

Habitat. Riparian habitats are characterized by high diversity, density, and productivity of plant and animal species. Numerous species can be affected by varying stream flows. Riparian areas provide necessary food, water, cover, breeding and rearing space, hiding and resting areas, and thermal protection for many species. Some amphibians and mammals and many waterfowl are totally dependent on riparian or wetland areas for food, either from riparian vegetation or from predation on the species that live in riparian habitats. Low stream flows can destroy riparian vegetation and drastically alter habitat areas.

Recreation. Water-related recreation is becoming increasingly popular in western Washington. Water-dependent recreation includes such things as boating (including kayaking and canoeing), fishing, and swimming. In addition, activities such as camping, backpacking, picnicking, and hiking often depend on water for scenic value.

Regulatory Framework

The issue of instream flows was specifically addressed in 1949 when the legislature declared it to be the policy of the state "...that a flow of water sufficient to support game fish and food fish populations be maintained at all times in the streams of this state." The legislation (RCW 75.20.050) authorizes the Department of Ecology to deny water allocation permits "if in the opinion of the director of Fisheries or the director of Game [now Wildlife], such permit might result in lowering the flow of water in any stream below the flow necessary to adequately support food and game fish populations in the stream." Under this authority, Ecology has closed approximately 250 streams to further appropriation and has applied low stream provisions to another 250 streams.

The Minimum Water Flows and Levels Act (Chapter 90.22 RCW) requires Ecology, when requested by the directors of Wildlife or Fisheries, to establish minimum stream flows and lake levels in order to protect fish, game, birds, other wildlife, recreation, aesthetics, or water quality. The law does not define criteria for the determination of the minimum flows.

The Water Resources Act of 1971 (Chapter 90.54 RCW) provides that "perennial rivers and streams of the state shall be retained with base flows necessary to provide for the preservation of wildlife, fish, scenic, aesthetic and other environmental values, and navigational values." Ecology adopted the Water Resources Management Program regulation in 1976 to provide guidelines for instream flow and water allocation activities. This regulation establishes 62 Water Resource Inventory Areas (WRIA) as planning units. Of the 19 WRIAs surrounding Puget Sound, 12 have established instream resource protection programs.

Instream flows protect streams only from water appropriations approved after the adoption of the minimum flows. When the flow of the stream falls below a specified level, these new appropriations must stop removing water until the minimum instream flow is met or exceeded (RCW 90.22.030 and 90.54.900). However, under existing law water rights issued prior to the establishment of the minimum instream flow cannot be affected by a later instream flow regulation.

There has been increasing controversy over the approval or denial of water right permits based on the need to protect instream resources. In September 1985 the state Ecological Commission advised against adoption of Ecology's instream flow regulations for the Skokomish-Dosewallips Water Resource Inventory Area because of concern that it would not adequately protect pristine streams. In response to public concern, the Commission sponsored a public instream flow workshop. In February 1986 Ecology appointed a 20-member Instream Flow And Water Allocation Advisory committee. Ecology prepared a programmatic environmental impact statement for instream resources and water allocation, and the report of the Advisory Committee is addressed in the EIS. In November 1987 Ecology proposed a preferred alternative comprised of various components of the alternatives in the EIS.

The preferred alternative met with some dissatisfaction, primarily by municipal water suppliers and agricultural interest groups who felt Ecology was exceeding its authority to set instream flows. There was also concern that the alternative did not adequately address the economic impacts of limiting out-of-stream uses. As a result of the controversy, the 1988 legislature passed a bill that required Ecology to contract with an independent fact-finder. This objective fact-finder has facilitated discussions among the various interest groups and evaluated the clarity and consistency of existing water policy laws. The fact-finder reported his findings to the Joint Select Committee on Water

Resource Policy of the legislature in June 1988. The joint select committee will prepare recommendations by December 1, 1988, for the full legislature to consider in January 1989. Until July 1, 1989, Ecology may not (1) amend current guidelines, (2) adopt the preferred alternative for instream resources and water allocation, (3) adopt new water reservations, or (4) issue any new permanent appropriation permits for surface water. Ecology is also staffing the Water Use Efficiency Study Committee of the legislature which is simultaneously exploring conservation measures.

Results

Comment summary

Much of the public concern expressed was for groundwater contamination and the availability of drinking water. Water conservation measures were encouraged. Comments reflected the ongoing debates about the use of water for fish habitat, farming, fishing, and drinking. Recognition of functioning state and local programs led to a low ranking of this issue for future Authority effort.

Authority action

The Authority will continue to review and comment on significant activities, such as the recommendations of the Joint Select Committee on Water Resource Policy and the Water Use Efficiency Study Committee.

GROUNDWATER CONTAMINATION

Problem Definition

In addition to surface water sources, contaminated groundwater can carry pollutants to the waters of Puget Sound. Groundwater basins can be hydrogeologically linked to both surface waters in the basin and to the Sound itself. Thus, pollutants in groundwater can affect water quality in the Sound. Contaminants can reach groundwater from a variety of sources including improper disposal of solid or hazardous wastes, failing on-site sewage disposal (septic) systems, spills and accidents, and other activities that allow potential contaminants to migrate underground.

Groundwater is found in porous underground geological formations that form dynamic reservoirs known as aquifers. In the Puget Sound basin groundwater is found throughout subsurface water-bearing sediments deposited within the last million years by streams and glaciers.

A critical physical connection exists between surface water and groundwater. Although the amounts are not known, water from aquifers discharges into Puget Sound at shoreline areas. On the land, shallow aquifers tend to fill and deplete with an obscure distinction between surface and groundwater boundaries. These aquifers are recharged by surface infiltration during wet seasons and discharge water to streams throughout the year. Deeper aquifers also exist that are recharged by shallow aquifers in upland areas. These deeper aquifers discharge to overlying aquifers near streams at lower elevations and along the Sound.

Due to these hydrogeological relationships there are several potential routes for contaminated groundwater to reach Puget Sound: (1) subsurface movement from an aquifer to the Sound; (2) introduction of contaminated

groundwater to a surface stream which flows to the Sound; (3) groundwater that is removed for irrigation, domestic, or industrial use and then discharged into Puget Sound or a tributary; and (4) seepage of contaminated groundwater into an underground storm drain which discharges to the Sound. A variety of site-specific factors influence the potential for contaminated groundwater to reach Puget Sound such as the degree and type of contamination, the proximity of the contamination to the Sound, and local hydrogeologic conditions.

Although relatively little is known about the extent of contamination of Puget Sound by groundwater, some cases have been documented. One of the best known examples is Commencement Bay where groundwater contaminated by historical industrial activity joins the many surface water discharges. Groundwater contamination was confirmed in at least two waterways in the Commencement Bay vicinity due to past waste disposal practices and leakage from underground storage tanks and pipelines. In one waterway groundwater was found to contribute 74 percent of the total loadings of trichloroethylene and tetrachloroethylene (or 5.9 pounds per day). These contaminants are from solvent plant wastes that were disposed on site from 1947 to 1973.

Groundwater carrying contaminants to Puget Sound has also been confirmed in Eagle Harbor and Budd Inlet. Both sites involve wood preserving operations where creosote and other organic compounds have built up in the ground over time and are now visibly seeping into Puget Sound. The direct link between contamination of surface water and groundwater is illustrated in the Nooksack River where applications of the pesticide EDB to farm fields has contaminated both surface and groundwater.

Although only relatively few cases of groundwater contamination of Puget Sound are verified, other studies are in progress. For example, EPA is conducting a groundwater investigation of the Harbor Island Superfund site. The investigation will assess the impact of contaminated groundwater on Puget Sound.

Regulatory Framework

In addition to the general water quality provisions of state and federal laws there are some programs that are specifically focused on groundwater. The federal Safe Drinking Water Act (SDWA) contains groundwater management provisions to protect sole source aquifers (i.e., aquifers that are the only source of drinking water for a given population). The SDWA also defines a program which states may utilize to develop and implement a wellhead protection program to protect wells from contamination.

In order to deal with the institutional problems of groundwater that flows through many jurisdictional boundaries, the legislature required Ecology to establish a statewide Groundwater Management Strategy. The strategy placed the highest priority on the development of groundwater quality standards. These are currently being developed for release in the fall of 1988. The strategy identifies and designates groundwater management areas. Once these areas are designated, the various governmental entities with jurisdiction develop a groundwater management program. As of January 1988 nine groundwater management areas had been designated in the Puget Sound area, and grants totalling $2.7 million were given to local agencies to support the effort. These efforts are to be coordinated with local watershed planning efforts to control nonpoint pollution.

Sources of Groundwater Contamination

It is becoming increasingly clear that sources of groundwater contamination are often the same sources that contaminate surface water. This demonstrates a need to have a regulatory system that integrates protection measures for both surface water and groundwater. Given the variety of sources of contamination and their corresponding regulatory structures, there is often a failure to recognize potential problems and correct them before damage is done. For example, the Department of Social and Health Services is responsible for regulating drinking water while Ecology is responsible for regulating groundwater. Within Ecology the hazardous waste regulators sometimes act independently of the groundwater regulators. There is clearly a need to improve regulatory decision-making processes so that cross-media effects are addressed and hopefully prevented. Ecology has established an internal groundwater coordination committee to address these issues. Ecology has also undertaken a pilot study to test for agricultural chemicals in groundwater in selected areas of the state.

Many sources of groundwater contamination could threaten Puget Sound including pesticides, failing septic systems, and stormwater. In addition, four sources of groundwater contamination are currently receiving a lot of attention and are not specifically addressed elsewhere in the plan: hazardous wastes, solid wastes, underground storage tanks, and infectious wastes.

1. Hazardous Wastes

Problem definition

Hazardous wastes are the highly toxic wastes that can cause cancer, birth defects, or other human health problems. Hazardous wastes also include materials that are explosive, corrosive, or flammable. (Radioactive wastes are not generally regulated as hazardous wastes unless the two wastes are mixed together). The primary environmental effect of improper management and disposal of hazardous wastes is water pollution, either to surface waters or groundwater. Nearly every site that is being addressed by state and federal hazardous waste cleanup laws is either contaminating a body of water or is threatening to contaminate the water. Because the movement of groundwater is not documented it is difficult to assess the impact of hazardous wastes on Puget Sound. However, the majority of sites designated by the state and federal governments as the most severely contaminated sites in the state are in the Puget Sound region (e.g., Harbor Island, Eagle Harbor, and Commencement Bay). Therefore, hazardous wastes represent a potential source of contamination to Puget Sound.

Regulatory framework

There are two major state laws that deal with hazardous wastes: one to regulate the current production of the wastes in order to prevent future problems, and another to address the cleanup of past problems. Washington's Hazardous Waste Management Act (HWMA) provides a management scheme intended to prevent future problems but does not regulate the cleanup of hazardous waste sites. Any person who generates waste in Washington is responsible for proper classification and management of that waste. A waste generator must first determine if the wastes are defined as solid wastes or hazardous wastes. This involves testing for hazardous characteristics of the waste and determining the quantities generated. If the generator produces less than 220 pounds of hazardous wastes per month the wastes are classified as solid wastes. The generator is not required to comply with any other state laws or procedures for these "moderate risk" wastes, although local governments are

currently developing plans for handling these wastes. The local plans required by state law are subject to Ecology review.

If the generator has classified the waste as hazardous the HWMA establishes permit, reporting, and handling requirements. Although the HWMA establishes management priorities for hazardous wastes (waste reduction and recycling are the top two priorities, and land disposal is the lowest priority) in practice they are not often followed. This is due to a combination of cost considerations, a lack of available technologies, and inadequate enforcement of the priorities.

The Hazardous Waste Cleanup Act (HWCA) was enacted by the state legislature in October 1987 to establish a process to clean up dangerous sites and to establish liability for persons who generate hazardous wastes or are responsible for a site where wastes are disposed.[55] The HWCA basically provides that any person who contributes to a hazardous waste problem is responsible for cleaning up the site even if the contribution represents only a small portion of the problem. If a responsible party cannot be identified or fails to assume cleanup responsibilities, Ecology is authorized to conduct the cleanup, issue strict penalties to persons who fail to cooperate, and recover their costs from responsible parties. The HWCA also imposes a tax on the first sale of hazardous substances to fund cleanup and enforcement activities. Because this program is so new it is impossible to assess its effectiveness. However, it is clear that the new tax will generate substantially more revenue to conduct cleanup actions and to initiate enforcement.

These two state laws supplement federal law. The federal Resource Conservation and Recovery Act (RCRA) establishes regulations for the management of hazardous wastes, but in most instances the regulatory responsibility has been delegated to the state. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; commonly known as Superfund) provides financing and minimum requirements for cleanup of the worst sites in the country. Twenty-eight sites in Washington are designated as federal Superfund sites. Eighteen of these sites surround Puget Sound including those in Commencement Bay and Eagle Harbor. The state list includes over 50 additional sites with more than 30 in the Puget Sound area. These state sites have not been designated under the federal law and therefore the state is responsible for financing the cleanup and for establishing the cleanup standards.

2. Solid Waste

Problem definition

In order to eliminate the air pollution problems associated with open burning, in 1972 the state required that garbage be disposed in "sanitary" landfills. Although these landfills were once considered safe they have caused severe environmental and social problems. Some communities are faced with contaminated groundwater and methane gas migration. In fact, many of the

55 The November 1988 ballot will include an initiative regarding hazardous waste cleanup. If the initiative passes, it will replace the state's existing hazardous waste cleanup law.

contaminated sites needing to be cleaned up under state and federal hazardous waste cleanup laws are former solid waste landfills.

Although the Solid Waste Management Act establishes management priorities (i.e., (1) waste reduction, (2) recycling, (3) incineration, and (4) landfill) the state continues to rely on the lowest management priority: landfills. Today over 80 percent (2.5 million tons) of the state's garbage is landfilled while only 15 percent is recycled. Many communities have reached capacity at their current landfill sites. For example, Seattle no longer has an operating landfill and is using King County's facilities.

In 1984 the legislature directed Ecology to adopt new standards for landfill design, construction, operation, and closure. The standards are intended to eliminate the leachate, methane gas, and other environmental problems associated with landfills. Existing landfills must comply with these standards by November 1989, although there is concern that this deadline will not be met or enforced.

Replacing existing landfills with environmentally sound "state-of-the-art" landfills will require a substantial investment. Ecology estimates it will cost between $450 million and $1 billion over the next 20 years to bring landfills up to the minimum functional standards (this excludes land acquisition, legal fees, environmental review, and financing costs). While waste disposal has been a bargain in the past, today's garbage ratepayers will be paying the true cost of disposal for past and future generations.

Although incineration is not one of the top management priorities, many communities (Spokane, King, Skagit, and Pierce counties, and others) are looking to incineration facilities to reduce their reliance on landfills. However, siting either an incinerator or a landfill is a controversial local issue and is generally met with significant public opposition. Citizens continue to be concerned with the environmental and financial issues surrounding both types of facilities, and few people want a landfill or an incinerator in their backyard.

In addition to the problems posed by permitted solid waste facilities, the most severe problems affecting Puget Sound may be from unknown landfills that are operating without a permit as well as from abandoned landfills (particularly those located in shoreline areas). These sites are often discovered only when a serious environmental problem (such as contaminated drinking water) requires an investigation of its cause. Unfortunately, this approach does not facilitate preventive actions.

Regulatory framework

Responsibility for proper solid waste management rests primarily with local governments. Local health departments are responsible for issuing permits for all solid waste facilities and for enforcing the conditions of the permits. Ecology is responsible for ensuring appropriate statewide management of solid wastes. Ecology may appeal the issuance of a permit by a local health department to the Pollution Control Hearings Board but does not have ultimate approval or denial authority. Ecology is responsible for approving local solid waste management plans and for establishing statewide standards for solid waste facilities. However, because local health departments are the primary enforcement entity and cities and counties are often the owners or operators of landfills, there can be a conflict of interest. County health departments are placed in a difficult position when enforcement actions must be taken against county commissioners who also oversee the health department.

Ecology has taken a limited role in solid waste enforcement due to inadequate statutory authority and budget.

3. Underground Storage Tanks

Problem definition

Petroleum products and other chemicals enter groundwater through undetected leakage of underground storage tanks and lines. Many of the underground tanks and lines in the country were installed in the mid-1970s or before. As is the case with many aspects of our infrastructure, they are wearing out.

Ecology coordinates a federally required underground storage tank notification program which has identified almost 35,000 such tanks in Washington. Fifty-seven percent are located in counties surrounding Puget Sound. About 99 percent of the tanks store or once stored petroleum products; the rest store chemicals.

The primary method used to detect leaks in tanks is a daily inventory record. Although this record is required by the state Uniform Fire Code, it is kept for only 42 percent of the tanks in the state. About 25 percent of the tanks currently in service employ no leak detection method at all. At least 90 percent of the tanks are single-wall and have no protection from corrosion.

More than 40 percent of the tanks identified are over 15 years old. The nationwide average for the safe life of a tank is 16 years; after this tanks are statistically likely to leak. Ecology estimates that, at a minimum, more than 1,500 tanks are leaking in Washington and concludes that this could lead to a very serious threat to public health and the environment. Approximately 1,000 of these leaking tanks may be located in the counties that surround Puget Sound. Because of current leak detection practices many existing leaks may not be identified until environmental or public health damage occurs.

Although it is clear that underground storage tanks may represent a severe threat to groundwater in the Puget Sound region, it is less clear that they represent a significant threat to Puget Sound water quality. The extent of the problem depends on the type of contaminant that is leaked, the migration patterns of the groundwater, and the sensitivity of the resources.

Regulatory framework

The federal Resource Conservation and Recovery Act (RCRA) requires that storage tanks be identified and that a federal program to properly manage these tanks be developed. This portion of RCRA has not been delegated to Ecology and therefore EPA is primarily responsible for implementation. EPA is currently adopting regulations which will be in effect in Washington unless the regulatory responsibility is delegated to the state (if the state seeks such delegation). Ecology may request that the legislature authorize the agency to request delegation of the program, but this will not happen for at least a year. The 1988 legislature created a Joint Select Committee on Storage Tanks to assess the need for state delegation as well as the need for additional state and local regulation of storage tanks. The committee will report its recommendations to the legislature by December 1988.

4. Infectious Wastes

Problem definition

Infectious wastes are generally defined as wastes capable of transmitting an infectious disease. They can range from used band-aids and disposable diapers to highly contaminated medical wastes. Typical medical wastes include waste blood, bandages, instruments, supplies, and lab cultures. Health officials are devoting increasing attention to the public health risks associated with the management and disposal of potentially infectious wastes. Considerable uncertainty exists within the public health community regarding the specific sources of infectious wastes and their associated risks. One of the concerns expressed is that infectious wastes can contaminate groundwater if they are improperly disposed of.

The Seattle-King County Department of Public Health recently conducted an examination and risk evaluation of infectious waste in King County. One conclusion was that because a majority of infections occur in people while at home, residential waste must be seen as equally infectious as most medical waste. The study also concluded that exposure pathways to the public are low if solid waste storage and disposal regulations are observed. Public education and worker safety programs were recommended.

Regulatory framework

The state Board of Health is authorized to adopt regulations for the prevention of health hazards related to solid and liquid waste disposal and for the prevention of infectious diseases. The Board has adopted regulations requiring proper handling and disposal of potentially infectious wastes by hospitals and nursing homes, but has not adopted regulations for other types of facilities or institutions. The Board's regulations are written only in general terms and do not specifically define infectious wastes. Although the state has statutory authority to regulate infectious waste as a hazardous waste under RCW 70.105, it has not yet promulgated regulations.

The legislature recently passed a bill that will require Ecology to study the infectious waste problem. The department must review existing infectious waste management practices in the state and assess the preferred management practices. The study will be conducted with the assistance of the Department of Social and Health Services (DSHS). A report and recommendations will be presented to the legislature by January 1, 1990.

Results

Comment summary

Many comments were received which focused on the availability of drinking water rather than the potential contamination of Puget Sound via groundwater. The need for more study of aquifers and water quality was recognized. This issue was ranked high by technical reviewers and the general public. The specific conditions of island water systems and sole source aquifers were discussed. One commenter suggested stronger links between the Authority staff and professional organizations of engineers to facilitate exchange of information. The important coordination role of the conservation districts was noted. Overall, the connection between land use planning and groundwater was recognized.

Authority action

The Authority will inform Ecology of the extent of public concern for this issue which surfaced during the public review process. Ecology will be encouraged to provide the public with more information on groundwater management. Coordination of the Ecology comprehensive groundwater program with the nonpoint program will be encouraged more strongly by the Authority, particularly by working with the watershed ranking and management committees.

Because more information is needed on the extent to which contaminated groundwater may be affecting water quality in Puget Sound, the Authority will support U.S. Geological Survey (USGS) research on groundwater transport. USGS has an ongoing regional aquifer-system analysis (RASA) program, which will target Puget Sound over the next three to six years. The program includes definition of the aquifer boundaries, description of the flow system and water budget, and quantification of the geohydrologic, hydraulic, and water quality characteristics of Puget Sound aquifers.

The Authority will continue to review and comment on significant related activities such as the pilot study by Ecology, DSHS, and the Department of Agriculture to test for agricultural chemicals in groundwater, and ongoing efforts by the local groundwater management committees.

HAZARDOUS MATERIALS SPILL PREVENTION AND RESPONSE

Problem Definition

There are approximately 18,000 shipments of hazardous materials on Washington's highways each year and nearly 5,000 shipments on the state's railways. In addition, there are many hazardous materials transported by air, water, or pipe, or by a combination of the various modes of transportation. Vast quantities of hazardous substances are stored throughout the state, particularly in areas with heavy industrial or military activity. Over a hundred accidents involving hazardous materials occur each year, and an unknown quantity of hazardous substances enters the environment from undetected leaks.

The Puget Sound basin is a central industrial area and, according to a report by the Washington Utilities and Transportation Commission, more than half of the state's nonradioactive hazardous substances pass through the region at one time or another. Many dangerous pollutants enter Puget Sound from accidental spills, leaks, and other inadvertent discharges of contaminants. Sometimes a discharge enters Puget Sound directly, other times it flows into a tributary.

There are many examples of the significant danger of accidental discharges of hazardous substances into water. In November 1986 there was a severe chemical spill into the Rhine river near Basel, Switzerland. Over 30 tons of pesticides and mercury compounds were accidentally released into the river which created a chemical slick over 25 miles long. The spill destroyed the progress of a 10-year effort to clean up the river. In the end, over 500,000 fish were killed. The chemicals continued to flow for over 170 miles through France, West Germany, and the Netherlands before entering the North Sea. The impacts on the marine environment of the North Sea are still unclear.

In January 1988 a fuel tank collapsed on the bank of the Monongahela River in Pennsylvania. The tank held 3.5 million gallons of diesel fuel. Retaining walls contained 2.5 million gallons; the rest entered the river. Many people complained that the spill could have been prevented. The tank had been rebuilt a year before the spill, and inspection and permitting requirements should have identified its weaknesses. In addition, preventive measures such as building concrete dikes around the tank were not required.

In 1986 a discharge of jet fuel into Des Moines creek near the Sea-Tac airport nearly destroyed the creek's fish population. In January of 1988 an oil barge sank near Anacortes releasing both heavy bulk oil and a lighter grade oil. These incidents plus the 1985 Port Angeles oil spill have renewed public concern about the existing spill prevention and response programs in the Puget Sound region. While the 1987 plan addressed oil spill response, it did not address spill prevention or other aspects of hazardous materials management. (See p. 5-88, 1987 Puget Sound Water Quality Management Plan.)

In addition to the effects of large discharges of hazardous substances, Puget Sound is also threatened by the cumulative impacts of small leaks and spills. These are often not detected and therefore it is impossible to quantify their contribution or to assess their effects on water quality and marine resources.

Regulatory Framework

The regulatory scheme for the transportation and storage of hazardous substances and for response to spills and leaks is extremely complex and continually changing. Without a thorough understanding of the regulatory scheme, however, it is impossible to assess the vulnerability of Puget Sound to accidental spills.

Pollutants that threaten Puget Sound through accidental discharge can be loosely placed in three categories: (1) petroleum products, (2) other hazardous substances/hazardous waste, and (3) radioactive materials. Hazardous substances and hazardous wastes are defined in state law as substances that may be harmful to human health or the environment due to toxicity, flammability, explosiveness, or other factors. For regulatory purposes hazardous substances do not generally include petroleum products or radioactive substances. The federal Hazardous Materials Transportation Act, however, does cover petroleum products and radioactive materials and thus there are some requirements regarding transportation.

While petroleum products are not generally regulated as hazardous substances under state law, they have received increasing attention as a potential threat to water quality, primarily through leaking underground storage tanks and lines. In addition, oil spills have been recognized as a serious threat to water quality since 1969 when the legislature enacted stringent penalties and liability provisions for the discharge of oil into waters of the state.

Radioactive substances and radioactive wastes have a complex regulatory framework. Radioactive materials are used on some of the military bases in the Puget Sound region. This includes radioactive fuel used in the nuclear reactor propulsion systems of ships as well as nuclear weapons. It is difficult to gather information on the type or quantity of these materials because the military asserts that, for purposes of national security, this information may not be released to the public.

There are many international, federal, state, and local agencies that make regulatory decisions affecting the management of hazardous materials. In

most cases federal agencies are the predominant regulators, and federal laws and regulations often preempt state and local regulations. This provides consistency for purposes of interstate commerce. Unfortunately, it can also exclude local involvement in situations where local populations are the most heavily affected and where local governments are in the best position to provide adequate oversight and response. Another problem is that federal programs that preempt state and local regulations are often not adequately funded. This can leave state and local governments and the public with inadequate protection and no authority to address the problems.

There are at least seven areas of regulation for each category of potential pollutants: (1) transportation, (2) storage, (3) routing limitations, (4) prenotification, (5) prevention, (6) spill response, and (7) incident reporting.

* *Transportation regulations* provide requirements for such things as labeling, vessel design, packaging, navigational rules, licensing requirements, and certification of crew members.

* *Storage regulations* provide requirements for container suitability, inspections of the storage site and the containers, monitoring, and worker safety.

* *Routing limitations* ensure that dangerous substances are not transported over precarious routes or near sensitive areas such as schools or densely populated areas.

* *Prenotification* is often desired by state or local entities so that precautionary measures can be taken prior to the entry of a dangerous substance.

* *Preventive measures* include inspection requirements for vessels or other modes of transport, training requirements for crew members, restrictions on dangerous activities in certain areas, zoning or siting standards, building code specifications, and speed limits.

* *Spill response* generally involves all levels of government as well as private contractors who must work together to efficiently clean up spills.

* *Incident reporting requirements* ensure that adequate information on the spill is compiled and provided.

For each of these areas there can be overlapping federal, state, and local regulations as well as numerous agencies involved at each level of government. International safety standards have been developed by at least five organizations: the United Nations Committee of Experts on the Transport of Dangerous Goods, the Intergovernmental Maritime Consultative Organization, the International Civil Aviation Organization, the European Economic Community (or the Common Market) Group of Experts on the Transport of Dangerous Goods, and the International Atomic Energy Agency. The United States has representation in all of these organizations. Exporters of hazardous materials must comply with the regulations established by these five entities. In addition, the Canada-United States Joint Marine Pollution Contingency Plan was signed in 1983 to establish a procedure for spills that affect both countries or are of such magnitude that international assistance is necessary.

Federal agencies involved in some aspect of hazardous materials management include: the Department of Transportation, the U.S. Coast Guard, the National Oceanic and Atmospheric Administration, the Federal Emergency Management Agency, the Federal Aviation Administration, the Federal Highway

Administration, the Federal Railway Administration, the Hazardous Materials Regulations Board, the Environmental Protection Agency, the Nuclear Regulatory Commission, the Department of Energy, the Department of Defense, the Occupational Safety and Health Administration, the Interstate Commerce Commission, the National Transportation Safety Board, and the Materials Transportation Bureau.

State agencies that have a role in hazardous materials management include the Washington Utilities and Transportation Commission, the Department of Ecology, the Department of Labor and Industries, the State Patrol, the Department of Community Development, the Department of Social and Health Services, the Department of Agriculture, the Energy Facility Site Evaluation Council, and the State Fire Marshall's office.

In addition to international, federal, and state organizations, many cities and counties have developed procedures to deal with the transportation and storage of hazardous materials. These regulations can include zoning and building code requirements, siting requirements for transfer and storage facilities, waste disposal standards, notification requirements, and routing requirements.

The 1989 Puget Sound Water Quality Management Plan (element P-9) requires that every major discharge permit issued or reissued in the Puget Sound area must require an adequate spill prevention control and countermeasure (SPCC) plan. The plans, at a minimum, must address oil and hazardous substances. Questions about the adequacy of existing spill prevention measures have not been researched to date. However, the 1989 Puget Sound plan includes a new element which addresses spill prevention, element SP-3 of the Spill Prevention and Response Program.

Results

Comment summary

Most commenters indicated that a stronger program was desirable, particularly in the area of prevention. Specific issues included were drill frequency, training, new technology, transportation, and risk assessment. The significance of land spills and cumulative small spills was noted. Suggestions were made to merge the study of hazardous waste with the Oil Spill Program. Due to the inherent health risks this issue ranked medium to high with public and technical reviewers.

Authority action

The Authority will study the specific recommendations made by agencies and citizen groups as part of SP-3 of the Spill Prevention and Response Program, formerly the Oil Spill Response Planning Program. A report will be produced by January 1990 focused on preventive issues related to petroleum products and hazardous materials. A new advisory committee will be formed to help guide the scoping of this study. (See SP-4 of the Spill Prevention and Response Program.)

HUMAN HEALTH RISKS

Problem Definition

Human health risks associated with Puget Sound and its resources can be categorized into two general areas: (1) human health implications associated with direct physical contact with the shorelines or waters of the Sound; and (2) health implications associated with the recreational and commercial harvest and ingestion of sea vegetables, shellfish, and fish from the Sound.

Human use of beaches

There are about 500 miles of publicly owned shoreline in the 12 counties bordering Puget Sound. Very little is known about the potential health risks associated with recreational uses of public or private beaches around the Sound such as swimming, playing, walking, exploring, tidepools, and clamming. Despite the fact that beaches may be affected by a wide variety of pollutants, few beaches are monitored on a regular basis for the presence of hazardous chemicals, pathogenic organisms, or other pollutants of concern. However, the state Department of Social and Health Services (DSHS) has recently begun to monitor the water quality (as indicated by the presence of fecal coliform bacteria) of 144 beaches where shellfish are harvested by recreational users.

There are numerous sources of pollutants which may potentially affect beaches. For example, storm drain and combined sewer overflow outfalls commonly discharge water containing high levels of sediments, metals, oil and grease, and bacteria directly onto beaches in the urbanized portions of the Sound. Emergency overflows of untreated sewage from malfunctioning sewage treatment plants or broken pipes may also wash up onto beaches. Fresh water from creeks, streams, and rivers may contribute sediments, nutrients, bacteria, and other contaminants to beaches. Groundwater that surfaces along the shoreline of the Sound (through seeps, springs, and wetlands) may be contaminated with pollutants from underground storage tanks, industrial and agricultural activities, landfills, and malfunctioning on-site sewage disposal systems (see the Groundwater Contamination discussion in this chapter). Contaminants concentrated in the sea-surface microlayer may wash up onto the shoreline. Like the ring left in a bathtub after the water is drained, these contaminants may be deposited and accumulate in sediments and organisms found on the beach (see the Contamination of the Sea-Surface Microlayer discussion). The deposition of garbage and debris of all types is also an aesthetic as well as health problem on the beaches in Puget Sound (see the Plastic Debris in Marine Waters discussion in this chapter).

People are often unaware that contaminants may be present on a beach or affecting the biological resources present on a beach. Even if people become aware of a problem on the shoreline (e.g., as evidenced by excessive odors or the presence of oily or unnatural looking substances), local public health officials or state environmental personnel may not be available to inspect the problem or determine its cause. Because of the many miles of shoreline around the Sound and the limited number of personnel available to regularly monitor or inspect beaches, problems often go undetected or untreated.

Human consumption of seafood

Each year thousands of tons of fish and shellfish are harvested recreationally and commercially from around Puget Sound. In 1986 the recreational catch of salmon, groundfish, shellfish, and other species from the Sound was valued at

over $102 million. Popular species harvested include nori and other species of marine algae, clams, mussels, oysters, squid, crabs, shrimp, sea cucumbers, sea urchins, sole, flounder, halibut, rockfish, lingcod, and salmon. Commercial landings of fish and shellfish from the Sound had a reported value of $68 million in 1986. No part of the Sound is completely free of contaminants. Concentrations of biological and chemical contaminants are typically highest in urbanized embayments around the Sound. Algae, shellfish, and groundfish living near these polluted areas have been found to contain high levels of certain contaminants. Less-developed areas may also be contaminated as evidenced by the restriction of commercial shellfish harvest in certain rural areas throughout the Sound. While most of the seafood captured in the Sound is probably consumed with no unpleasant or dangerous side effects, the routine ingestion of large quantities of contaminated seafood over a lifetime may pose a health risk to a consumer of Puget Sound resources.

Several possible health problems might occur from the ingestion of contaminated seafood. Eating shellfish contaminated with bacteria or viruses from human or animal fecal material may cause illnesses ranging from mild stomach upsets (gastroenteritis) to serious diseases such as typhoid or hepatitis. Unfortunately, many of the less serious illnesses associated with the ingestion of contaminated seafood probably go unreported and/or untreated so it is difficult to know how common or extensive the problem might be. Shellfish and possibly fish may also be contaminated with a toxin produced by the naturally occurring dinoflagellate *Gonyaulax catenella*. This neurotoxin causes paralytic shellfish poisoning (PSP) which may result in numbness, paralysis, and possibly death. In addition, the ingestion of large amounts of shellfish and fish contaminated with toxic chemicals may promote the development of cancer or other diseases, although this represents a low-probability, long-term risk to the seafood consumer.

Largely as a result of shellfish protection elements in the Puget Sound plan, selected recreational shellfish beds around the Sound are monitored for the presence of bacteria and toxic contaminants (see plan elements SF-3 and SF-4). Standards are also being developed for biological and chemical contaminants in recreationally harvested shellfish in Puget Sound. However, funding and personnel are limited and not all shoreline areas used for the recreational harvest of shellfish can be monitored for the presence of potentially harmful substances. Little is currently known about the potential risks associated with eating recreationally harvested marine algae and fish species because these categories of seafood are not routinely monitored for the presence of contaminants. (Some monitoring of these seafood groups is proposed in the Puget Sound Ambient Monitoring Program, plan element M-2).

In 1986 and 1987 EPA sponsored sampling and analysis programs to determine the concentrations of PCBs, pesticides, metals, and other toxic contaminants that may be present in the edible portions of marine algae, shellfish, and fish collected in the Sound. Using these and other data EPA has undertaken an assessment of the potential human health risks associated with the long-term consumption of locally harvested seafood. The study found that there are eight chemicals or compound groups of potential concern with respect to health risks. High priority carcinogens evaluated in the risk assessment were arsenic, carcinogenic PAHs, total PCBs, alpha-HCH, and total DDT; high priority noncarcinogens evaluated were cadmium, lead, and mercury. Results of the study indicate that over a lifetime of consumption, total PCBs in Puget Sound fish pose the highest potential carcinogenic risk; mer-

cury in fish and cadmium in shellfish pose the highest potential noncarcinogenic risk.

NOAA has conducted a two-year study of the degree to which consumers of recreationally caught fish from the urban embayments in Puget Sound may be exposed to contaminants. The study focused on five main elements: (1) what species people are fishing for, actually catching, and eating from the urban bays; (2) the average ingestion rate of the typical consumer (fish eaten per year); (3) the contaminant levels that are present in the tissue of the species eaten; (4) the effects of cooking on tissue contaminant levels; and (5) average contaminant uptake rate (which is a factor of both typical ingestion rates and tissue contaminant levels). This study found that tissue from recreationally caught fish generally contained low levels of organic compounds and metals (with the exception of arsenic). Arsenic levels varied greatly among species and geographic locations but were highest in squid and walleye pollock (particularly those collected from Commencement Bay). Although generally present in low concentrations, PCBs were found in all of the recreationally caught fish from the urban bays. Cooking the fish was found to reduce tissue levels of PCBs and other organic contaminants by 50 to 90 percent, but cooking had little or no effect on arsenic concentrations. This study did not attempt to assess the risk associated with eating fish from urban bays but did provide estimates of contaminant doses being consumed by urban anglers.

Regulatory Framework

Responsibility for protection of human health generally rests with the state Board of Health, DSHS, and local health departments. With regard to health implications associated with the recreational use of beaches around the Sound, local health authorities generally are able to deal with emergency situations as they occur (e.g., closing beaches in response to overflows of raw sewage). However, few local programs have the time or resources to adequately deal with non-emergency or potential health problems associated with the public use of beaches. It is often not clear what agency has jurisdiction over or is better equipped to handle overflows, spills, or the presence of noxious substances on beaches that may pose a human health risk. Several potential sources of beach contaminants are addressed by existing regulations and programs such as improved treatment of municipal wastes, pretreatment programs, and the permitting of stormwater outfalls. However, fecal coliform bacteria standards are the only standards that apply to beach contamination and, as a result, many potential problems may never be reported by recreational users.

DSHS and local health agencies are generally responsible for protecting public health from the recreational and commercial harvest of shellfish in Puget Sound; water and shellfish tissue samples must meet national standards. However, no local, state, or federal agency has clear responsibility for the determination of health risks associated with the ingestion of other forms of seafood or for the overall protection of recreational harvesters in the Sound. This is particularly a problem in the urban areas where noncommercial seafood from polluted bays may make up a significant portion of the diets of some segments of the population, even though these areas may be posted with health advisories warning people not to eat the seafood caught there. EPA, DSHS, Ecology, the Authority, and several local health departments are currently in the process of characterizing the magnitude of risks associated with the consumption of seafood in the Sound. Based on this risk evaluation the agencies may develop, if needed, a series of recommendations (e.g., fishing bans, beach postings, etc.) to ensure the adequate protection of public health. However, more information is needed on the potential risks associated with the harvest of all forms of seafood from around the Sound.

Results

Comment summary

Those who commented on this issue generally indicated that more information is required to better understand human health risks and to put these risks into perspective. Several indicated that there needs to be a better reporting of information on health risks in Puget Sound. A number of commenters encouraged the Authority to become more involved in the issue while several others indicated that this should be a low priority for Authority involvement. Relative to other unfinished agenda issues, human health risks received a mixed priority rating by being ranked quite high by some and low by others.

Authority action

The Authority will continue to participate on the interagency human health risk work team that is examining potential health risks associated with the consumption of Puget Sound seafood. The Authority will also continue to review and comment on this issue and will encourage the coordination of regulatory programs related to human health risks.

NUTRIENT EFFECTS

Problem Definition

Nutrients such as nitrogen and phosphorus are some of the primary elements required for the growth and reproduction of all plants including phytoplankton species. Optimal phytoplankton production depends on the proper balance of available light and nutrients; when one or the other is limited, growth is slowed. Conversely, when sunlight and nutrients are readily available to phytoplankton species over an adequate time period (for example, in the springtime), phytoplankton growth may be stimulated and may result in a large increase in phytoplankton abundance (known as a "bloom").

Phytoplankton production is closely linked to circulation patterns in estuaries. When fresh or brackish river runoff encounters seawater, a two-layered estuarine circulation pattern develops with the fresh water flowing seaward over the top of the landward-flowing saltwater. The two layers are separated, or stratified, by the physical barrier created by the difference in density between the freshwater and saltwater layers. Nutrients required for phytoplankton growth may become limited in vertically stratified estuaries. This occurs when phytoplankton production depletes the nutrients available in the surface layer and the stratification of the water column inhibits mixing with the nutrient-rich bottom layer. Nutrients may also become limited in nearshore and shoreline areas during periods of high algal productivity in the spring and summer months.

Sewage effluent that is discharged into the fresh and marine waters of the Puget Sound area contains high levels of both organic and inorganic forms of nitrogen and phosphorus. Other sources of excess nutrients include fertilizers, animal wastes, and on-site sewage disposal systems. These nutrients can, in certain instances, stimulate the growth of phytoplankton, sediment microalgae, macroalgae, kelp, seagrasses, and marsh plants, particularly in stratified bays and inlets and along shorelines where nutrients might otherwise be limiting. Excessive phytoplankton growth that may result from the anthropogenic introduction of nutrients can lead to oxygen depletion in the bottom waters. This is because the sinking and decomposition of plankton and other organic matter can create high biochemical oxygen demand (BOD) and reduce oxygen

levels in areas that are not well mixed with oxygen-rich surface waters. Fish kills and other biological effects may occur as a result of this depleted oxygen. For example, just a few decades ago excessive nutrients from human sewage led to the very serious degradation of Lake Washington (which has subsequently been cleaned up by diverting nutrient discharges from the lake). Currently, researchers have shown that shallow, poorly-mixed stratified bays and inlets in the Sound are particularly susceptible to problems created by excess nutrients (e.g., Budd Inlet, Dabob Bay, Dyes Inlet, Liberty Bay, and Lynch Cove have had documented cases of oxygen depletion during certain times of the year).

Budd Inlet in southern Puget Sound is one area where low dissolved oxygen levels, occasional fish kills, and water quality violations have been reported over the last 15 years. The water quality problems in this shallow, stratified inlet have been largely attributed to blooms and subsequent decay of phytoplankton and algal species in the late summer and early fall. A recent study of Budd Inlet conducted for Ecology determined that phytoplankton growth in the inlet is nutrient-limited by the relatively low availability of nitrogen during the peak of the growing season when plankton blooms are present. Hence the magnitude of the spring plankton bloom in Budd Inlet is controlled by the supply of nutrients. In addition, phytoplankton blooms in the late summer and early fall are sustained by nutrient additions to the vertically stratified inlet. These sustained blooms tend to extend periods of low dissolved oxygen for two to four weeks beyond what might occur naturally.

An analysis of the relative contributions of various sources of nutrients in Budd Inlet indicated that the Lacey, Olympia, Tumwater, Thurston County (LOTT) sewage treatment plant contributes about 75 percent of the nitrate, 95 percent of the nitrite, and 95 percent of the ammonia from all measured sources. Nutrients in the effluent discharged from the LOTT plant are believed to increase the intensity of phytoplankton blooms by 30 to 50 percent compared to natural levels in the inlet. As a result, Ecology has required that the plant remove (by April 1, 1993) at least 90 percent of the nutrient load from its effluent during the months of April through October. After the plant completes the additional level of treatment to accomplish this removal, phytoplankton blooms are expected to be no more than 10 percent greater than background conditions.

In addition to sewage treatment plants, nutrients may be contributed to shallow stratified embayments in the Sound from a variety of other sources including stormwater, on-site sewage disposal (septic) systems, nonpoint runoff from heavily fertilized agricultural and forest lands, industrial dischargers (e.g., pulp and paper mills), and atmospheric deposition. Research conducted on the East Coast of the United States has shown that airborne nitrates originating mostly from motor vehicles, power plants, and other industrial facilities are a significant source of excess nitrogen that is causing nutrient enrichment and eutrophication (excessive growth of algae) in Eastern coastal waters. The study found that atmospheric sources accounted for about one-fourth of the nitrates that enter Chesapeake Bay while fertilizers accounted for about one-third of all sources. Nitrogen in acid rain appears to be significantly contributing to the serious nutrient enrichment problems in the waters of the Chesapeake Bay, Long Island Sound, the New York Bight, and the Albemarle-Pamlico Sound in North Carolina.

The increased population that is projected for the Puget Sound area will result in increased land disturbances, increased runoff which can transport nutrients to the Sound, and increased sewage flows. As a result of this increased popula-

tion, nutrient effects in shallow stratified bays and inlets around the Sound may potentially increase unless sources of excess nutrients are detected and controlled. Although there have been few reported fish kills in the marine waters of the Sound in recent years, there may be other biological effects from nutrient enrichment that are currently not well understood or are not being detected. For example, there is some limited evidence to suggest that the growth and population dynamics of the planktonic dinoflagellate *Gonyaulax catenella*, the organisms that causes paralytic shellfish poisoning (PSP), may be influenced in some cases by anthropogenic additions of nutrients. Nutrient inputs may shift the natural population patterns of phytoplankton species which may have effects further up the food chain. In addition, macro-algal growth may be enhanced by nutrient additions in the nearshore and shoreline areas of the Sound. Further research is required to address these questions as well as others dealing with the potential effects of nutrients in Puget Sound.

Regulatory Framework

The addition of excessive nutrients from pulp and paper mills was a serious problem in the past for Puget Sound. The problem was largely corrected by improving the treatment of industrial wastes from these mills. Nutrients in the effluent of point sources such as municipal sewage treatment plants are subject to regulation as part of the NPDES permit system. While limitations on the discharge of conventional pollutants such as BOD and total suspended solids may also reduce nutrient discharges, very few permits include any explicit limit on the discharge of nutrients. The requirement for advanced treatment at the LOTT treatment plant is the only such limit for any major discharger to Puget Sound. This is partially because the case-by-case development of nutrient effluent limits for individual dischargers is time-consuming and expensive.

The regulation of nutrients from nonpoint sources is accomplished indirectly through regulations and programs such as the inspection of on-site sewage disposal systems, local health board regulations for on-site systems, farm plans for the implementation of best management practices (BMPs) to control runoff of animal wastes, the state's Dairy Waste Management Plan, the nonpoint program elements of the Puget Sound plan, stormwater permits, and others. However, none of these programs directly controls the introduction of nutrients to Puget Sound or addresses the potential effects of nutrient enrichment in the Sound.

Results

Comment summary

This issue received few comments in the scoping process and was generally rated quite low relative to other issues on the Unfinished Agenda. Those who did comment indicated that more control of nutrient additions to Puget Sound is needed.

Authority action

Because of projected increases in population growth and development, the potential effects of increased nutrients on Puget Sound water quality and ecosystems is an important research topic that needs further study. This issue will be referred to the Committee on Research in Puget Sound, and the Authority will continue to review new information that may become available on nutrient effects in the Sound.

PESTICIDES

Problem Definition

Pesticides are a large and varied group of substances that are specifically designed to kill biological organisms including weeds, insects, and rodents. Included in this diverse group are fungicides, herbicides, insecticides, nematicides, rodenticides, fumigants, disinfectants, wood preservatives, and antifoulants. Pesticides are most commonly used to control weeds and insect pests on agricultural and forest land, on highway and utility rights of way, on military land, and in residential lawns and gardens.

Pesticides may reach surface water and groundwater resources and sediments in the Puget Sound area through a number of different mechanisms including direct application, stormwater runoff, accidental spills and leaks, and improper storage, handling, and disposal. Pesticides applied to the land may be transmitted through the atmosphere by winds and precipitation; pesticides bound to eroded sediments or dissolved in runoff water can be carried to surface water bodies and eventually Puget Sound; and pesticides may leach into groundwater through infiltration at the site of application or where runoff water might be retained such as in storage ponds. Pesticides may also be directly applied to water bodies. For example, pesticides are used to kill undesirable fish and to control aquatic vegetation in freshwater lakes, and the pesticide Sevin is applied to tidelands to kill ghost shrimp which interfere with oyster cultivation.

Spills and leaks of pesticides can occur at manufacturing facilities, at other facilities where bulk pesticides are stored and handled (such as agricultural chemical dealerships or commercial applicator facilities), or during transportation. A major concern are the currently unregulated evaporation pits and rinsate holding tanks used by commercial applicators. In addition, contamination may result from small spills at mixing and loading areas at the site of application and where equipment is washed. Improper disposal of pesticides and pesticide containers may also result in contamination of surface water or groundwater. This may occur at hazardous and municipal waste landfills, at other waste handling or treatment facilities, or at the application site.

A principal concern regarding the effects of pesticides upon fresh and marine water quality, sediment quality, and biological resources in the Puget Sound area is the extent to which the pesticides degrade, bioaccumulate, or biomagnify. Many pesticides degrade readily and therefore present little risk to aquatic ecosystems. However, certain chemicals used in pesticide formulas do persist and degrade much more slowly in aquatic environments. They represent a potential hazard that is a function of the frequency and duration of exposure and the toxicity of the chemical. Toxic effects related to exposure to pesticides include a wide variety of sublethal responses such as reduced growth, impaired reproductive success, liver dysfunction, kidney failure, and cancerous growths, as well as death.

Preliminary results of an EPA survey indicate that over 120 pesticide active ingredients are known to be used in the Puget Sound area. It is roughly and conservatively estimated that total annual usage of active ingredients in Puget Sound approaches 2.7 million pounds. There is virtually no monitoring for any of these pesticides. Little is known about the persistence of many of these pesticides or their ability to accumulate and biomagnify in the environment. Studies typically test for a few pesticides including DDT, aldrin, dieldrin, endrin, and lindane (because they are on the priority pollutant list established by EPA in 1976). All have been detected in Puget Sound. However, with the

exception of DDT, very little is known about pesticide concentrations that may be present in the water, sediments, and organisms in the fresh and marine water of the Puget Sound region, or about the chronic and acute toxicity of pesticides in the environment. In many cases laboratory methods are not available to analyze many of the "new generation" pesticides. This makes it virtually impossible to monitor the environment for their presence. DDT, aldrin, dieldrin, and endrin have been banned from use, and as a result concentrations (of at least DDT) appear to be decreasing in the Sound (although DDT is still found in relatively high concentrations in the urban bays such as Elliott and Commencement Bays). Information on ambient concentrations and potential effects for most of the pesticides currently in use today is lacking.

There are over 45,000 pesticide products in use nationwide and these products contain over 600 basic chemical groups. However, pesticide labels are not required to disclose "inert ingredients" in their products; these are ingredients that have no effect on targeted pest organisms but that may be poisonous to other species. Seven of the 52 "pollutants of concern" in Puget Sound are pesticides, but other pesticides may be concentrating in the environment and may also be a concern. The key question, which is currently unanswered, is what compounds are present in the environment and to what extent and when do these pesticides represent a threat to the water quality and biological resources of the Puget Sound area?

The potential for groundwater contamination by pesticides in some areas of the Puget Sound area is high. For example, the pesticide ethylene dibromide (EDB), a potent animal carcinogen, was found in well water in Skagit County in 1984 and also has been found in wells in Thurston County. There are many specialty crops (e.g., raspberries, strawberries, cranberries, and ornamentals) grown in the Puget Sound area whose cultivation relies on the application of insecticides, herbicides, and fungicides in the late fall, winter, or early spring when rainfall is high and soils are often saturated. Pesticides applied during these times may more readily enter groundwater resources in harmful concentrations. Pesticides present in groundwater not only represent a threat to public drinking supplies but may also enter the surface waters of the Sound (through seeps, springs, and wetlands) and potentially affect biological resources.

To fill some of the data gaps regarding pesticide use (types, volumes, toxicity, etc.) in the Puget Sound area, EPA Region 10 commissioned a study to review and synthesize available information on the uses, environmental fates, and potential biological effects of pesticides in the Sound. The objectives of this study were to identify pesticides of concern in the Sound; identify the geographic areas and the media (sediments, water, biota) in which the pesticides of concern are most likely to accumulate; and recommend a sampling strategy to identify areas where pesticide exposure may be presenting risks to biological communities. EPA's Office of Puget Sound also conducted a one-time reconnaissance sampling of pesticides in urban drainage and estuary delta sediments in July 1988. Results of that reconnaissance sampling will be available in late 1988.

Ongoing research being conducted by Western Washington University, the Padilla Bay National Estuarine Research Reserve, and the Skagit County Conservation District is examining agricultural pesticide transport to Padilla Bay and what effect pesticides may be having on the biota found in the bay. Preliminary results indicate that measurable concentrations of two of the 14 pesticides being studied (dicamba and 2,4-D) are found in the water and sedi-

ments of the bay after periods of significant rainfall. These and other studies are needed to further quantify the issue of whether pesticides may be affecting the water quality and biological resources of Puget Sound. Studies of the sea-surface microlayer in the Chesapeake Bay found a large number of pesticides in the microlayer, some in very high concentrations. The possible presence of pesticides in microlayer samples from around the Sound needs further investigation.

Regulatory Framework

EPA is the primary agency that regulates pesticides, generally under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA was enacted in 1947 to replace the Federal Insecticide Act of 1910. FIFRA originally addressed only those pesticides used in interstate commerce and left most of the regulation of pesticide use to the individual states. Increasing environmental and human health concerns due to pesticide use led Congress to substantially amend FIFRA in 1972. The amendments established a regulatory program to oversee the registration and use of all pesticides. Congress is currently considering further amendments to FIFRA.

Unlike most other environmental laws which focus on pollution control, FIFRA requires EPA to determine whether a pesticide can control pests without causing "unreasonable adverse effects on the environment." By definition, FIFRA requires that adverse environmental effects be balanced against the economic, social, and environmental costs and benefits. This balancing of risks and benefits underlies all regulatory decisions under FIFRA.

The 1972 amendments to FIFRA require all new pesticides to be registered with EPA before they enter the marketplace. FIFRA also requires pesticides that were on the market prior to the 1972 amendments to be reviewed by EPA in accordance with a reregistration process. In order to evaluate the risks and benefits of pesticides and to assess the safety of any pesticide prior to registration, EPA requires health and environmental effects data and information from pesticide producers. These data must include assessments of hazards to non-target organisms (those that are not intended to be harmed by the pesticide, including fish and wildlife). The ecological fate and effects of the chemical in the environment, after it is applied, must also be assessed. However, in many cases, there are no effective laboratory procedures available to analyze samples collected in the field for the presence of potentially harmful levels of pesticides. Nor is it clear what federal or state agency has the primary responsibility for regularly monitoring the environment for the presence of pesticides and pesticide residues that may be harmful to biological organisms.

As of 1987 registration standards had been developed for only about 120 of more than 600 pesticide active ingredients. Many standards will not be completed until after the year 2000. Once the standards are developed, pesticide manufacturers are responsible for supplying data to support registration. This data gathering can take four to five years. As a result, there are only a handful of ingredients that have been tested and reregistered. In addition, all data are supplied by pesticide manufacturers; EPA does no independent testing. All pesticides may remain in use during this testing period. It is clear that there is a high probability that dangerous pesticides are on the market today that may not be tested to ensure compliance with the registration standards for many years. This situation is further compounded by the fact that many new generation pesticides are not being regularly monitored for in the environment.

EPA does have authority to cancel a chemical's usage in certain situations. However, whenever EPA does this the agency becomes responsible for com-

pensating the pesticide manufacturer, dealers, and applicators for their remaining inventory and for the actual task of disposing of the chemical. As of late 1988 EPA has banned four pesticides on an emergency basis. The agency now faces the prospect of paying hundreds of millions of dollars out of its budget, money that could have been spent on developing standards.

FIFRA includes provisions for monitoring the distribution and use of pesticides. Civil and criminal penalties are established for violations. For example, it is illegal to use a registered pesticide in a manner inconsistent with its label or to alter the approved label. However, EPA's recent survey of pesticide use in the Puget Sound region found that information on sales, distribution, or use is not readily available for pesticide compounds currently being marketed and used in the state. Apparently this information is not collected or monitored by the pesticide industry or by state or federal regulatory agencies. The 1972 amendments also authorized cooperative enforcement agreements between EPA and the states, and a certification and training program for professional applicators. Additional amendments in 1978 gave the states primary enforcement responsibility for pesticide use violations, subject to oversight by EPA.

The state Department of Agriculture is responsible for inspecting pesticide production facilities and enforcing against the illegal sale of unregistered pesticides or pesticides that are being used in violation of the label requirements (see Chapters 15.58 and 17.21 RCW). The states have the authority to require more stringent registration standards than EPA's, but usually the procedure is to charge a small fee and generally allow use of a product that has not been banned by EPA. The Department of Agriculture is currently reviewing its pesticides programs and is considering expansion of the programs to include such measures as an annual pesticide use report to better determine potential environmental hazards associated with the use of certain compounds.

Results

Comment summary

People who commented on this issue generally felt that more information is needed on the potential occurrence and effects of pesticides in Puget Sound, and more education is needed on the safe use, storage, and disposal of pesticides. A number of commenters pointed out that the pesticide issue is closely related to the issue of groundwater contamination as well as to the plan's program addressing nonpoint source pollution. Pesticides were rated medium to high in priority relative to the other issues on the unfinished agenda.

Authority action

The Authority will convene an advisory committee to address the technical and regulatory aspects of this issue. The Authority will also prepare an issue paper that will analyze the unanswered technical questions and address the existing regulatory structure that is established to control the use and disposal of pesticides. The Authority will encourage Puget Sound Estuary Program funding of additional characterization studies to determine the distribution, ambient concentration, and potential effects of selected pesticides in Puget Sound water bodies, sediments, and biota. Educational efforts by the Cooperative Extension Service and others to promote the safe application, storage, and disposal of pesticides will also be encouraged.

PLASTIC DEBRIS IN MARINE WATERS

Problem Definition

The production of plastics in the world more than doubled between 1975 and 1981. Plastics have become increasingly popular because they are inexpensive, lightweight, and durable. Because of this durability plastics are causing substantial pollution of marine waters. Plastics have become the most common objects sighted at sea. They typically comprise one-half to two-thirds or more of all surface objects sighted. Studies have indicated that the coasts of Oregon and Washington have one of the highest concentrations of marine plastic debris in the world. In fact, a recent Japanese survey concluded that the Washington coast had a higher percentage of floating debris than anywhere else in the Pacific. This concentration is probably due to the active fishing industry in the north Pacific and to the offshore currents that generally carry plastics southward from the Aleutian chain. This form of marine pollution is likely to increase because of the persistence and increasing production of plastics.

Estimates made over 10 years ago indicated that more than six million metric tons of plastics were discarded into the ocean each year from merchant ships, passenger ships, naval vessels, fishing vessels, pleasure boats, and offshore oil platforms. In addition, it is believed that over 100,000 metric tons of commercial fishing gear is lost or discarded each year. Other sources of plastic pollution include discharges from rivers and stormwater systems.

Plastic pollution is harmful to the fishing industry and other boaters. Plastic ropes or fishing nets can ensnare boat propellers and can block water intake valves. Some plastic debris is so large that collisions result in serious damage to boats. Fishing nets and gear can also be destroyed by the debris.

The most serious concern of marine plastic pollution, however, is the harm to marine life though entanglement or ingestion. Entanglement can lead to drowning, starvation, strangulation, or predation. Loss of limbs through infection from entanglement is also common. It is estimated that between 30,000 and 50,000 fur seals die each year from entanglement. There is concern that this is a primary factor in the species' population decline. Entanglement can occur from trawl webbing, cargo strapping bands, six-pack rings, ropes, lines, and net fragments. In addition, lost or discarded fishing nets and crab pots continue to catch fish, crabs, diving seabirds, and other forms of marine life for several years after they are lost.

Ingestion of plastics also has harmful consequences for marine life. The impact of ingestion varies with the species and the amount ingested, but malnutrition or starvation due to blockage of the intestine or ulceration of the stomach is the primary concern. Plastic pellets resulting from resin spills and the physical degradation of plastic products can be mistaken for fish eggs or other food sources. Sea turtles readily ingest plastic bags or plastic sheeting that they mistake for jellyfish. This is a particular concern because all sea turtle species are listed as either threatened or endangered under the federal Endangered Species Act.

Although it is clear that entanglement and ingestion are dangerous to individual animals, there has been insufficient research to determine whether or not plastics are affecting entire populations of marine organisms. Early indica-

tions are that plastics may have an impact on populations of northern fur seals, but the impact on sea lion or fish populations is unknown.

There have been no studies to date of the effects of plastics on marine life in Puget Sound. Many fishing nets have been lost in Puget Sound; these have been observed catching fish, birds, and crabs in shallow waters. Although there is increasing concern that plastics are becoming a dangerous pollutant in Puget Sound, there has been little effort to quantify the total amount of plastics in the Sound or the amount that is transported from the North Pacific into Puget Sound. In 1987 volunteers cleaned six tons of litter from 100 miles of Puget Sound beaches. The Washington State Parks and Recreation Commission, a joint sponsor of the beach cleanup program with Ecology, estimates that 40 percent of the debris was plastic and 70 percent of all debris was from ocean sources. There has also been no effort to quantify the contribution of plastic debris from Puget Sound to the plastic pollution problem on the Washington coast. It is possible that a substantial amount of plastics are deposited into Puget Sound via tributaries and stormwater systems and subsequently transported to the ocean.

Regulatory Framework

There are a multitude of state and federal laws that require plastics or other debris to be disposed of only at permitted facilities. The state Solid Waste Management Act prescribes penalties for persons who illegally dispose of waste on land or in water unless the waste is disposed of on their own property. In addition, the federal Ocean Dumping Act prohibits the transportation and dumping of materials in the ocean without a permit. The Magnuson Fisheries Conservation and Management Act contains general regulations which state that foreign vessels fishing in the U.S. fishery conservation zone may not release any materials into the water that may be potentially harmful to living marine resources or maritime activity. The enforcement of these laws is extremely difficult, however, because dumping at sea is generally done in isolation. These laws also only apply to U.S. territorial waters, and marine plastics is an international problem.

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the primary hope for addressing the problems of marine plastics that originate from vessels. The MARPOL convention regulates five types of pollution from ships through five annexes: oil, bulk chemicals, packaged hazardous substances, sewage, and garbage. Annex V (Regulations for the Prevention of Pollution by Garbage from Ships) contains a provision that prohibits "the disposal into the sea of all plastics, including but not limited to synthetic fishing nets and plastic garbage bags." The MARPOL treaty does not apply to military vessels but does apply to all other commercial and recreational vessels in all navigable waters of the United States. The MARPOL annexes go into effect one year after they are ratified by nations collectively representing at least 50 percent of the world's shipping tonnage.

Annex V was ratified by Congress in November of 1987 and was signed by the President and delivered to the MARPOL convention on December 30, 1987. When Congress ratified Annex V, it also amended the "Act to Prevent Pollution from Ships" in order to implement the Annex V provisions. These amendments go into effect the same time as the international treaty. The amendments make the U.S. prohibitions on dumping plastics at sea consistent with the Annex V provisions. The amendments require the Coast Guard to adopt regulations to implement Annex V. These regulations should be completed in the fall of 1988. The amendments also provide that U.S. military vessels must comply within five years. However, Congress has not appropriated

any money to implement Annex V or the regulations and therefore enforcement will probably be weak.

The federal Driftnet Fishing Control Act of 1987 (enacted at the same time as ratification of Annex V) establishes a process for the United States to monitor and enforce regulations controlling driftnets used on the high seas. The intent is to minimize the amount of noncommercial fish inadvertently caught by driftnets and to reduce the number of nets lost. If enforcement agreements are not negotiated with a nation, the act stipulates that the United States can embargo imports of fish from that nation.

The state legislature considered numerous bills in the 1988 legislative session that would have banned the sale of certain plastic items in Washington including disposable diapers, plastic grocery bags, and nonbiodegradable six-pack rings. None of these bills passed. Industry representatives claim that all six-pack rings sold in Washington are photodegradable (i.e., they degrade in sunlight). This voluntary marketing decision was made for Washington after other states banned nonbiodegradable six-pack rings due to litter and entanglement concerns. However, it is unclear exactly how long it takes for plastics to photodegrade. It is also unclear whether or not byproducts remain in the water after photodegradation occurs. It is important to question whether nondegradable plastic debris might not be more manageable and environmentally preferable to plastic dust (material which might have more serious effects on water quality and biological resources). Current industry response has been to address the highly visible aesthetic and entanglement issues rather than the potential toxicity of degradation products.

The Commissioner of Public Lands convened a state task force of about 40 members to prepare a state plan of action for marine plastics. The Authority is one of the agencies represented on the task force. The task force addressed public education, institutional and legal issues, economics, and environmental concerns of marine plastics. The task force met through July 1988. The action plan was completed by September 1988 for presentation to agency directors in October 1988. The Washington Sea Grant Program, under a current Public Involvement and Education Fund (PIE-Fund) contract, is working to reduce marine plastic debris with a pilot collection and recycling project at Squalicum Harbor and an educational campaign for commercial fishermen and boaters. The state Department of Fisheries, in conjunction with NOAA and citizen volunteers, has a program for removal of derelict fishing gear. Ecology supports cleanups, education, and related public involvement projects statewide. The Center for Environmental Education in Washington, D.C., has been designated as the nationwide clearinghouse for information about marine debris. In addition, many volunteer groups are active in the marine debris issue.

Results

Comment summary

Public response to this issue was mixed. Some citizens reported on local volunteer efforts. Others proposed extreme measures such as going to the source by banning the production of plastics. The threat to human health was perceived as minor. Continued research in biodegradability was advised. Current state and federal efforts under MARPOL were recognized. This issue was ranked low in priority relative to the other issues on the unfinished agenda.

Authority action

Comprehensive and long-term solutions to the problems associated with non-degradable marine debris will require a combination of innovative and broad-based remedies at the local, state, and national levels. The Authority will continue to participate in the state's Marine Plastic Debris Task Force as its recommendations are presented to agency directors and the legislature in October 1988. Implementation efforts will be tracked. This issue will be coordinated with the Boaters Task Force, especially in terms of boater education. Other agency efforts will be reviewed and continued, including the Public Involvement and Education Fund (PIE-Fund) projects.

TRANSBOUNDARY POLLUTION

Problem Definition

The contaminants that enter British Columbia's waters often end up in the Strait of Georgia and can be transported into Puget Sound. It is unclear exactly how much pollution is transported either way across the boundaries between British Columbia and Washington, but it appears that prevailing winds can have a great influence, especially on floating material such as oil or debris. Studies of currents and floating material have shown that the marine waters of British Columbia and Washington are part of the same regional system of the North Pacific.

In addition to pollution that crosses the international boundary in marine waters, nonpoint pollution enters the Canadian rivers and streams that discharge to the Strait of Georgia. This may represent the greatest portion of pollutants that travel from British Columbia to Puget Sound. Pollutants originating from the United States side of the border may also travel northward into Canada creating water quality problems in the Strait of Georgia and other waters. However, it is unclear to what extent this may take place.

Nearly all of the problems identified in the Puget Sound Water Quality Management Plan are also problems in Canada. Although pollution originating in the Puget Sound basin may be transported to Canada, the Puget Sound plan should help reduce the volume. Therefore, although this discussion focuses on the pollution that flows into Puget Sound from Canada, the need for an international water quality management plan that could comprehensively address pollution issues on both sides of the border should also be examined. The primary problems include:

Municipal and Industrial Discharges. British Columbia does not have the same standards as Washington for discharges into water and in many cases the standards are much less stringent. Most sewage receives primary treatment. In the Victoria area the two largest outfalls receive no treatment. Many industrial and commercial facilities in the Vancouver area discharge wastewater to the sanitary sewers. In addition, pulp and paper mills that discharge effluent into marine waters are controlled to a much greater extent in the United States than in Canada. These issues are being studied by Environment Canada, the country's principal environmental agency.

Nonpoint Source Pollution. British Columbia has all the same contributors to nonpoint pollution as Washington. The primary problems in Canada arise from forestry, agricultural practices, and on-site sewage disposal (septic) systems. In addition, Vancouver's solid waste landfills are located in the Fraser River delta area just north of the U.S./Canada border. The leachate from

these landfills has been shown to be toxic to fish. Due to fecal coliform contamination many shellfish beds in southern British Columbia have been closed, including those in Boundary Bay just north of Blaine, Washington. In addition, stockpiles of coal at the Point Roberts coal terminal could be a source of airborne contaminants.

Hazardous Materials Transportation/Oil Spill Prevention and Response. Oil is the most common hazardous material to be transported in the boundary waters between Washington and British Columbia. There are multiple laws and programs in both nations to address spill prevention and response. In many cases the laws and procedures are complementary; in other cases it is unclear who is responsible for what. Discharge of hazardous materials during storage and use is a problem on both sides of the border.

Fraser River Contributions. The annual flow of the Fraser River in British Columbia is three to five times greater than that of all of the tributaries to Puget Sound. Information provided at a meeting of the Authority indicates that the U.S. waters may receive about 10 percent of the sediments (with associated pollutants) that are discharged into the Fraser River and subsequently into the Strait of Georgia.

Contaminated Sediments and Dredging. The Fraser River has an annual sediment load of 15 million cubic yards per year. Much of this must be dredged at the mouth of the river to maintain channels for commercial navigation. Limited monitoring in British Columbia's marine waters has shown sediment contamination and abnormalities in groundfish. Dredged material disposal sites may be contributing to these problems.

Regulatory Framework

Unlike the United States where the federal government develops minimum standards, Canada's constitution grants nearly all powers of environmental regulation to the provinces. This leaves much greater authority to British Columbia to set either very stringent or very minimal standards. For example, municipalities are not typically required to install and are not assisted with the installation of sewage treatment facilities. The primary agency involved in environmental regulation in British Columbia is the Ministry of the Environment and Parks. The federal Department of Fisheries and Oceans can regulate discharges if they affect fish. The federal Environment Canada also can conduct monitoring of municipal outfalls under the Federal Fisheries Act. Local government entities are also involved in environmental regulation. Canadian local government entities have complained about interference from their federal or provincial governments as they tried to informally address regulatory concerns.

Canadians do not have the level of public participation that is sought or required in most American water quality programs. There is no initiative process for the public to alter governmental decisions. If an interest group is dissatisfied with a government program it often must wait until elections to influence a course of action. On the other hand, elected officials do have broad discretion to impose environmental controls if they choose.

There are examples of international cooperation in solving water resources disputes. Under the Boundary Waters Treaty Act of 1909 the U.S. and Canada formed the International Joint Commission (IJC). The IJC has dealt mainly with water flow and storage issues along the boundary but has also examined water quality issues when both countries have asked it to do so, for example, in the Great Lakes. In the 1960s Canada and the U.S. engaged in the joint

development of water resources in the Columbia River. Other examples in this region include the recent settlement of the Skagit River/Ross Dam dispute and the development of the traffic control system for shipping in the Strait of Juan de Fuca, Puget Sound, and the Strait of Georgia. The Canada-United States Joint Marine Pollution Contingency Plan was signed in 1983 to establish a procedure for spills that affect both countries or are of such magnitude that international assistance is necessary.

Results

Comment summary

There were few public comments on this issue. All encouraged continued cooperation with Canada. The issue of Transboundary Pollution was not perceived by the reviewing public as an issue requiring significant Authority action at this time.

Authority action

The Authority will encourage joint efforts with the Canadian and British Columbia governments to examine scientific issues, planning, and prevention technologies associated with transboundary pollution. The Authority will request that the International Joint Commission give some attention to transboundary water quality concerns in Puget Sound, and will seek other mechanisms to prompt work on this issue.

TREATMENT OF DOMESTIC WASTES

Problem Definition

Homes and businesses generate about 80 to 100 gallons of domestic wastewater per person per day. With nearly three million people living in the Puget Sound area this means that over 300 million gallons of domestic sewage are produced each day. About 75 percent of the area's population is connected to sanitary sewer systems, so over 245 million gallons of domestic sewage are collected and delivered to wastewater treatment plants around the Sound each day.

Many elements of the Puget Sound plan and regulatory programs administered by Ecology and EPA deal with the treatment of domestic wastes. However, as called out in chapter 7 of the 1987 plan, there are a number of issues that are not being adequately addressed by the plan or existing regulatory systems. Some of these issues include: the need for integration of programs dealing with domestic wastewater; the correction/rehabilitation/repair of emergency overflows, combined sewer overflows, and failing infrastructure (conveyance and treatment systems); the production, treatment, conveyance, use, and disposal of domestic sludge; and the use and effects of chlorine in the wastewater treatment process. The development and analysis of alternative onsite sewage disposal systems is addressed in the 1989 plan (see element NP-15). Several of these other issues are discussed below.

Integration

The federal Clean Water Act, state law including the Puget Sound plan, and other government initiatives require that municipalities and other local governments address issues such as (1) the upgrade of wastewater treatment plants to secondary treatment; (2) the construction of new treatment facilities;

(3) the reduction or elimination of emergency and combined sewer overflows; (4) management of stormwater; (5) pretreatment of industrial wastes; (6) reduction of the infiltration and inflow of groundwater and surface water into sanitary sewers; and (7) the maintenance and repair of aging/failing infrastructure. However, the institutional, financial, and engineering integration of these matters is not being adequately addressed. Although a significant amount of planning may occur on any one of the above issues, it is questionable whether the planning is comprehensive enough in most cases to adequately address the overlap and interdependency of many of these issues. Lack of coordination among the jurisdictions carrying out these programs can result in excessive costs to the public. This is particularly critical given the costs of, and the limited funding available for, pollution control activities in the Puget Sound area.

A recent EPA analysis of the nation's wastewater treatment needs concluded that in 1986 $60.3 billion was needed to build facilities used for the conveyance, storage, treatment, recycling, and reclamation of municipal wastewater. These costs included estimates to enlarge, upgrade, and replace/rehabilitate substandard facilities, but did not include operation and maintenance costs and other costs not directly related to treatment (e.g., land acquisition or connections from houses to sewers). Estimated needs for the year 2005 were projected to be $67.2 billion.

The federal Water Quality Act of 1987 (1987 amendments to the Clean Water Act added by Public Law 100-4) will have a significant impact on the federal role in wastewater treatment. The act phases out the construction grants program over the next few years and replaces it with individual state revolving funds. As a result, local governments will likely have to pay a larger portion of their wastewater treatment needs. It was estimated in 1987 that $19.68 billion is available from federal and state funding sources for nationwide wastewater treatment up to 2005. To meet their wastewater treatment needs, local governments in Washington could have a total financing burden of over $2 billion between 1986 and 2005. It is therefore critical that wastewater infrastructure funding needs be integrated to make the most efficient use of limited financial resources.

Treatment bypasses and failing infrastructure

Treatment bypasses occur when sewer systems either malfunction (e.g., emergency overflows and broken pipes) or become overloaded because of the influx of excessive rainfall runoff (e.g., combined sewer overflows or CSOs). Treatment bypasses can result in significant levels of bacteria, viruses, sediments, metals, and organic toxicants being discharged directly into the fresh and marine waters of the area. Many sewer systems have emergency overflow pipes at pump stations and other locations. In cases of power outages, equipment failure, and other malfunctions, raw sewage may be discharged from these locations to the nearest water body. The discharge of untreated sewage to Puget Sound water bodies may also occur if sewer pipes leak or accidentally break. In addition to emergency overflows and occurrences of pipe breakages, there are nearly 150 known CSOs belonging to 10 different municipalities in the Puget Sound area that at times may discharge untreated stormwater and sanitary sewage. Current Ecology efforts include gathering more data on the quality of CSO discharges and the sediments adjacent to them as part of state regulatory requirements.

The NPDES permit for each municipality includes a list of emergency overflow locations. The permits include a condition which explains that discharges from these locations are not permitted and that any discharge must be

reported. Municipalities which comprise Metro do not have their own NPDES permits (except Seattle) so there is no legal document which requires them to report the location and occurrence of overflows. Municipalities are not spending sufficient funds to maintain their sewer systems. This underfunding leads to comprehensive sewer deterioration and excessive flows with potential for bypass. Federal money is not available for maintenance.

Sludge and septage management

Municipal sewage sludge is the semi-solid material left over after treatment of sewage while septage is the semi-solid material that is pumped from septic tanks and marine holding tanks. Metro, which produces more sludge than any other jurisdiction in the Puget Sound area, produced about 91,000 tons of sludge in 1987. The production of sludge in the region will double by the early 1990s as new secondary treatment plants begin operation. Septage quantities are also anticipated to increase in the future as more homes are built with on-site sewage disposal (septic) systems.

Sludge may be treated to reduce its volume and to lessen risks to public health and the environment. The anaerobic digestion of sludge kills about 90 percent of the pathogens, stabilizes it, and removes most of the odor and the tendency to decay further. After digestion sewage sludge may be dewatered, treated with heat or chemicals, placed in sludge lagoons, or composted. Treated sludge is a useful fertilizer, and most sludge in the Puget Sound area is applied to the land for silviculture, land reclamation, and composting; a small amount is incinerated. Two percent of the land area in the Puget Sound region, or 12.8 acres out of every square mile of land, could accommodate all of the sludge produced in the region for the next 40 years.

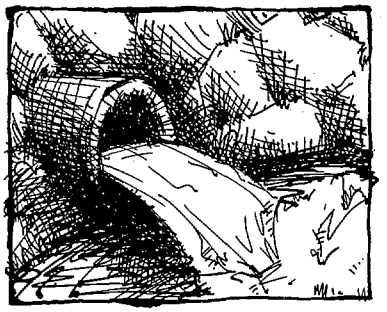
Certain risks are associated with the use of sludge due to its contamination with heavy metals, pathogens, and toxic organic compounds. Cadmium in sludge can be taken up by plants and potentially could poison animals or humans. Excessive use of sludge can also contaminate groundwater or surface water with nitrates.

Analysis of Metro sludge indicated that, with the exception of cadmium, sludge quality meets recommended federal standards for "high quality" sludge compatible with agricultural uses. Metals concentrations in sludge have declined in recent years primarily because of Metro's industrial pretreatment program and the Seattle Water Department's corrosion control program.

Programs designed to effectively and safely manage sewage sludge may include monitoring of soils, groundwater, and runoff; limiting annual and total application of sludge containing heavy metals; careful site selection and choice of crops where sludge may be applied (non-food chain crops); control of soil acidity (acid soils promote metal uptake by plants); limiting public access to the application site for some time after application; and requiring advanced levels of treatment for the sludge (e.g., heat treatment to destroy pathogenic organisms). However, one of the most efficient means of promoting high sludge quality is industrial pretreatment that removes or reduces many toxic contaminants at their sources.

Chlorination

Chlorine is applied to wastewater in the final stages of treatment to kill bacteria, viruses, and protozoans that may be harmful to humans. However, chlorination of sewage effluent may create other problems in the fresh and marine waters where treated wastewater is discharged. For example, chlorination may result in the formation of harmful chlorine residuals and of toxic or-



ganic compounds in the water column and sediments near sewage outfalls. Chlorine can chemically combine with organic substances in the effluent and form highly toxic chlorinated organic compounds. Chronic toxicity effects have been detected in fish exposed to low concentrations of residual chlorine compounds in water. Chlorination may also be a public health concern because of the harmful effects of chlorinated organic compounds (e.g., organohalogens) in wastewater effluents. Chlorine residuals may be reduced (a process known as dechlorination) by the addition of chemicals such as sulfur dioxide or activated carbon or by ozone treatment. However, not all means of dechlorination are known to effectively remove the most toxic residuals such as the organochlorines.

Another potentially undesirable consequence of chlorination is that while the microbial organisms (usually fecal coliform and fecal streptococci bacteria) that serve as indicators of the potential presence of harmful organisms are killed by the process, pathogenic viruses and other microorganisms may pass through the treatment process unharmed by the chlorine and undetected (depending on the degree and type of chlorination treatment used). Researchers have found that chlorine-treated wastewater effluent may contain viruses even though no fecal coliform bacteria are present. Although fecal coliform and fecal streptococci bacteria are useful indicators of viruses in effluents from which these bacteria are recovered, the absence of these bacteria from chlorinated effluents does not ensure that viruses are also absent. This is a public health concern because viruses cause many of the diseases that are spread by the presence of domestic wastewater, and most of the more important viruses cannot be easily measured with existing technology. The most prevalent viruses in domestic wastewater are the vaccine-strain polioviruses.

Regulatory Framework

There is currently no regulatory framework established to ensure the overall coordination and integration of the domestic wastewater issues discussed above, although the administration of the federal grants program may accomplish some degree of coordination. The regulation of treatment bypasses could be accomplished through NPDES permits. NPDES permits generally require a contingency plan only to prevent illegal discharge during power failures. Owners of plants are currently required to inform Ecology and local health departments immediately if an overflow event occurs so that bathing beaches and shellfish harvest areas can be closed. Ecology's 1989 work plan includes development of a policy for correction of municipal and industrial overflows and bypasses.

There is no regulatory structure in place that requires municipalities and sewer districts to systematically repair and replace sewers and related facilities before failures occur. In addition, funds for rehabilitation and repair of the existing infrastructure are often more difficult to secure than funds for new facilities (federal funds are not available for rehabilitation/repair of existing facilities). As a result, the reasonable lifetimes of the existing infrastructure may be exceeded and failures may occur because of the lack of funds for repair/rehabilitation.

The federal Water Quality Act of 1987 amended Section 405 of the Clean Water Act to require the implementation of sludge standards and the development of requirements for sludge use and disposal. Once the standards have been promulgated, all NPDES permits (or other approved state permits) issued to domestic sewage treatment plants will be required to include standards for sludge. These standards will address land application, distribution and marketing, landfilling, incineration, and ocean disposal of sewage sludge.

Generally, the standards will specify limits on pollutants of concern that may interfere with safe disposal. These federal regulations will become more rigorous and more specific for management of trace organic compounds and trace element residuals in sewage sludge. More stringent federal regulations will likely make it more difficult for sludge producers to use sludge on food crops and may affect composting projects involving public markets.

Sludge is regulated in Washington as a solid waste by Chapter 70.95 RCW and Chapter 173-304 WAC. Sludge utilization is reviewed and approved by local health departments. Ecology has oversight responsibilities for the solid waste and sludge disposal programs. The agency published sludge utilization guidelines in 1982. Washington is considered to have a model sludge management program. The new federal regulations are not expected to significantly change existing management programs, but will establish minimum procedures for sludge use and numerical criteria for toxic pollutants in sludge. State permitting requirements must be extended, however, to cover all domestic sludge generators rather than just publicly owned treatment facilities. Ecology will continue to oversee solid waste and sludge disposal programs and to administer federal regulations.

The regulation of chlorination and the control of harmful chlorine residuals is incorporated into some NPDES permits. However, questions still remain about the degree of harm chlorine residuals may be causing in natural populations in the vicinity of sewage treatment discharges. In addition, it is not clear what effect viruses that are not killed by chlorine treatment of domestic wastewater may be having in the marine and fresh waters of the Sound. Ecology is currently in the process of reviewing its disinfection policy, including an evaluation of various disinfection technologies and an identification of where chlorine is causing water quality problems and what alternatives are available. This study should be completed in 1989.

Results

Comment summary

Very few public comments were received on this issue. The primary public concern was sludge management. Generally, domestic waste was ranked low by technical and agency reviewers because of considerable existing local, state, and federal involvement.

Authority action

The Authority will continue to review and comment on regulations and related programs proposed by Ecology and by federal and local governments.

OTHER ISSUES

Comment summary

A number of commenters identified other issues that they felt should be addressed as part of the unfinished agenda. These issues included island ecology and the special needs of islands, improved public access to Puget Sound beaches, sole source aquifers, and the effects of seal populations on fecal coliform bacteria levels in the Sound.

Authority action

With respect to islands, the Authority will make it a general policy to consider the special needs of islands and ensure that all plan programs give special consideration to island issues (e.g., note the proposed expansion of the Oil Spill program). The Authority will also encourage other agencies to give islands special consideration in their respective programs. In addition, the 1990 State of the Sound Report will include a separate section discussing island ecology and the special issues related to islands in the Sound.

With respect to public access to beaches, the Authority supports and encourages improved and expanded public access to Puget Sound shorelands. The Authority will continue to review and comment on other agency's programs related to this issue, including public access aspects of Ecology's shorelands program and public access acquisition efforts by the Department of Natural Resources (DNR).

With respect to sole source aquifers, the Authority will review and comment on Ecology's groundwater program and encourage the special protection of sole source aquifers.

With respect to fecal coliform bacteria contamination generated by seal populations, the Authority will refer the issue to the Department of Wildlife for their consideration.

ESTIMATED COST

Work on the unfinished agenda issues is estimated to cost approximately $113,000 per year in fiscal years 1990 and 1991. Of this, about $40,000 per year will be used to fund work on the Fish and Wildlife Habitat issue, another $40,000 per year will fund work on the Pesticides issue, and about $33,000 per year will fund work on the Hazardous Materials issue. Activity on the other unfinished agenda issues will be covered by the Authority's normal operating budget.

Appendix A. Acroynms

AET—Apparent effects threshold
BMP—Best management practice
BOD—Biochemical oxygen demand
CERCLA—Comprehensive Environmental Response, Compensation, and Liability Act (also known as "Superfund")
CFR—Code of Federal Regulations
CSO—Combined sewer overflow
CWA—Clean Water Act
DNR—Washington Department of Natural Resources
DSHS—Washington Department of Social and Health Services
EIS—Environmental Impact Statement
EPA—U.S. Environmental Protection Agency
FDA—U.S. Food and Drug Administration
FTE—Full-time equivalent
FY—Fiscal year
MGD—Millions of gallons per day
MSD—Marine sanitation device
NEPA—National Environmental Policy Act
NOAA—National Oceanic and Atmospheric Administration
NPDES—National Pollution Discharge Elimination System
PAH—Polycyclic (polynuclear) aromatic hydrocarbon
PCB—Polychlorinated biphenyl
PCHB—Pollution Control Hearings Board
PIE-FUND—Public Involvement and Education Fund
POTW—Publicly-owned treatment works
PSDDA—Puget Sound Dredged Disposal Analysis
PSEP—Puget Sound Estuary Program
PSP—Paralytic Shellfish Poisoning
PSWQA—Puget Sound Water Quality Authority
RCRA—Resource Conservation and Recovery Act
RCW—Revised Code of Washington
SCS—U.S. Soil Conservation Service
SEPA—State Environmental Policy Act
SMA—Shoreline Management Act
SPCC—Spill prevention control and countermeasure
SPI—Superintendent of Public Instruction
T/F/W—Timber/Fish/Wildlife Project
USC—United States Code
WAC—Washington Administrative Code

WDF—Washington Department of Fisheries
WDW—Washington Department of Wildlife
WDIS—Wastewater Discharge Information System
WDOT—Washington Department of Transportation

Appendix B. Glossary

ACUTE TOXICITY
Any toxic effect that is produced within a short period of time, generally 96 hours or less. Although the effect most frequently considered is mortality, the end result of an acute effect could be any harmful biological effect.

AEROBIC
Living, active, or occurring only in the presence of oxygen. For example, soil microorganisms which degrade sewage effluent from septic systems need oxygen in order to function.

ALGAE
Aquatic, nonflowering plants that lack roots and use light energy to convert carbon dioxide and inorganic nutrients such as nitrogen and phosphorus into organic matter by photosynthesis. Common algae include dinoflagellates, diatoms, seaweeds, and kelp. An algal bloom can occur when excessive nutrient levels and other physical and chemical conditions enable the algae to reproduce rapidly.

AMBIENT MONITORING
Monitoring that is done to determine existing environmental conditions, contaminant levels, rates, or species in the environment, against which future conditions can be compared.

AMPHIPODS
Small shrimp-like crustaceans such as sand fleas and related forms. Many live on the bottom (i.e., are benthic) and feed on algae and detritus.

ANADROMOUS FISH
Species, such as salmon, which hatch in fresh water, spend a large part of their lives in the ocean, and return to fresh water rivers and streams to reproduce.

ANTHROPOGENIC
Effects or processes that are derived from human activity, as opposed to natural effects or processes that occur in the environment without human intervention.

APPARENT EFFECTS THRESHOLD (AET)
The highest sediment concentration of an individual chemical contaminant which is not associated with adverse biological effects. Samples with concentrations of contaminants above the AET have always shown adverse biological effects.

AQUACULTURE
The controlled cultivation and harvest of aquatic plants or animals (e.g., edible marine algae, clams, oysters, and salmon).

AQUIFER
The underground layer of rock or soil in which groundwater resides. Aquifers are replenished or recharged by surface water percolating through soil. Wells are drilled into aquifers to extract water for human use.

AROMATIC
A chemical substance characterized by the presence of at least one benzene ring. These substances may have a strong smell and are often persistent in the environment due to the stability of the benzene ring.

BASELINE STUDY
A study that documents the existing state of an environment to serve as a baseline against which future changes are measured.

BENTHIC ORGANISMS
Organisms that live in or on the bottom of a body of water.

BEST MANAGEMENT PRACTICE (BMP)
A method, activity, maintenance procedure, or other management practice for reducing the amount of pollution entering a water body. The term originated from the rules and regulations developed pursuant to Section 208 of the federal Clean Water Act (40 CFR 130).

BIOACCUMULATION
The process by which a contaminant accumulates in the tissues of an organism. For example, certain chemicals in food eaten by a fish tend to accumulate in its liver and other tissues.

BIOASSAY
A test procedure that measures the response of living plants, animals, or tissues to potential contaminants. For example, marine worms have been exposed to the sediments of Puget Sound, and their responses have been used to determine areas in the Sound where the sediments may be harmful to life.

BIOCHEMICAL OXYGEN DEMAND (BOD)
The quantity of oxygen-demanding materials present in a sample as measured by a specific test. A major objective of conventional wastewater treatment is to reduce the biochemical oxygen demand so that the oxygen content of the water body will not be significantly reduced. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

BIODEGRADATION
The conversion of organic compounds into simpler compounds through biochemical activity. Toxic compounds can sometimes be converted into nontoxic compounds through biodegradation. In some cases complex compounds are first converted into intermediate substances that can be more toxic than the original substance.

BIOMAGNIFICATION
The process by which concentrations of contaminants increase (magnify) as they pass up the food web such that each animal in the food web has higher tissue concentrations than did its food. For example, concentrations of certain contaminants can increase as they are passed from plankton to herring to salmon to seals.

BIOTA
The animals, plants, and microbes that live in a particular location or region.

BIVALVE
An aquatic invertebrate animal of the class Bivalvia. Bivalves, such as clams and oysters, have two shells (valves) and most are filter feeders.

CARCINOGENIC
Capable of causing cancer.

CENTENNIAL CLEAN WATER FUND (CCWF) also known as the WATER QUALITY ACCOUNT
In 1986 legislation was passed creating the Water Quality Account in the state treasury (RCW 70.146). The purpose of the account is to provide financing of water pollution control facilities and activities. The account receives revenue from a tax on tobacco products. Ecology, in adopting rules for administration of the account, has named it the Centennial Clean Water Fund.

CERTIFIED SHELLFISH BED

An area where commercial shellfish harvesting is approved by the Washington Department of Social and Health Services (DSHS), based on measurements of fecal coliform bacteria in the overlying waters. Fecal coliform bacteria are used as an indicator of human health risk.

CHRONIC TOXICITY

Any toxic effect on an organism that results after exposure of long duration (often 1/10th of the life span or more). The end result of a chronic effect can be death although the usual effects are sublethal (e.g., inhibited reproduction or growth). These sublethal effects may be reflected by changes in the productivity and population structure of the community.

CLEAN WATER ACT (CWA)

Also known as the federal Water Pollution Control Act (33 U.S.C. 1251 et seq.).

CLEANUP ACTIVITIES

Actions taken by a public agency or a private party to correct an environmental problem. Activities generally consist of the treatment or removal from the environment of contaminants introduced by past practices (for example, capping part of a public park contaminated with carcinogenic compounds or digging up and incinerating soil contaminated with dioxin).

CODE OF FEDERAL REGULATIONS (CFR)

The compilation of federal regulations adopted by federal agencies through the rulemaking process. For example, pretreatment regulations are found in 40 CFR 403.

COLIFORM BACTERIA

A type of bacteria that is coil or helix shaped. Fecal coliform bacteria are those coliform bacteria that are found in the intestinal tracts of mammals. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces. These organisms may also indicate the presence of pathogens that are harmful to humans. High numbers of fecal coliform bacteria therefore limit beneficial uses such as swimming and shellfish harvesting.

COMBINED SEWER OVERFLOW (CSO)

A pipe that discharges untreated wastewater during storms from a sewer system that carries both sanitary wastewater and stormwater. The overflow occurs because the system does not have the capacity to transport, store, or treat the increased flow caused by stormwater runoff.

COMBINED SEWER SYSTEM

A wastewater collection and treatment system where domestic and industrial wastewater is combined with storm runoff. Although such a system does provide treatment of stormwater, in practice the systems may not be able to handle major storm flows. As a result, untreated discharges from combined sewer overflows may occur.

CONTAMINANT

A substance that is not naturally present in the environment or is present in amounts that can, in sufficient concentration, adversely affect the environment.

CONVENTIONAL POLLUTANT

Conventional pollutants as specified under the Clean Water Act are total suspended solids, fecal coliform bacteria, biochemical oxygen demand, pH, and oil and grease. Today a large number of nonconventional and toxic contaminants are of concern in addition to the conventional pollutants.

CUMULATIVE EFFECTS

The combined environmental impacts that accrue over time and space from a series of similar or related individual actions, contaminants, or projects. Although each action may seem to have a negligible impact, the combined effect can be severe.

DETENTION
The process of collecting and holding back stormwater for delayed release to receiving waters.

DISCHARGE, DIRECT OR INDIRECT
The release of wastewater or contaminants to the environment. A direct discharge of wastewater flows directly into surface waters while an indirect discharge of wastewater enters a sewer system.

DISINFECTION
The destruction of infectious agents such as bacteria or viruses. Most wastewater treatment plants use chlorine or bromine for disinfection.

DISPOSAL
Methods by which unwanted materials are relocated, contained, treated, or processed. Unless contaminants are converted to less harmful forms or removed from the material before disposal, they may be released again into the environment.

DISSOLVED OXYGEN
Oxygen that is present (dissolved) in water and therefore available for fish and other aquatic animals to use. If the amount of dissolved oxygen in the water is too low, then aquatic animals may die. Wastewater and naturally occurring organic matter contain oxygen-demanding substances that consume dissolved oxygen.

DOMESTIC WASTEWATER (SEWAGE)
Human-generated wastewater that flows from homes, businesses, and industries.

DREDGING
Any physical digging into the bottom sediment of a water body. Dredging can be done with mechanical or hydraulic machines, and it changes the shape and form of the bottom. Dredging is routinely done in many parts of Puget Sound in order to maintain navigation channels that would otherwise fill with sediment and block ship passage.

ECOSYSTEM
A community of living organisms interacting with one another and with their physical environment, such as a rain forest, pond, or estuary. Damage to any part of a complex system, such as Puget Sound, may affect the whole. A system such as Puget Sound can also be thought of as the sum of many interconnected ecosystems such as the rivers, wetlands, and bays. Ecosystem is thus a concept applied to communities of different scale, signifying the interrelationships that must be considered.

EFFLUENT
The liquid that flows out of a facility or household into a water body or sewer system. For example, the treated liquid discharged by a wastewater treatment plant is the plant's effluent.

ENVIRONMENTAL IMPACT STATEMENT (EIS)
A document that discusses the likely significant impacts of a development project or a planning proposal, ways to lessen the impacts, and alternatives to the project or proposal. EISs are required by the national and Washington state environmental policy acts.

EROSION
Wearing away of rock or soil by the gradual detachment of soil or rock fragments by water, wind, ice, and other mechanical and chemical forces.

ESTUARY
A coastal water body where ocean water is diluted by out-flowing fresh water.

FECAL COLIFORM see COLIFORM BACTERIA

FECES
Waste excreted from animals.

FOREST PRACTICE
Any activity conducted on or directly pertaining to forest land related to growing, harvesting, or processing timber. These activities include but are not limited to: road and trail construction, final and intermediate harvesting, precommercial thinning, reforestation, fertilization, prevention and suppression of disease and insects, salvage of trees, and brush control. Forest practices are subject to regulation by the Washington Department of Natural Resources.

FULL-TIME EQUIVALENT (FTE)
The work one person does in one year--used to estimate costs and people needed to perform certain actions.

FUNGICIDE
A substance that destroys or inhibits growth of fungus.

GROUNDFISH
Fish (also known as bottomfish) that live on or near the bottom of water bodies, for example, English sole.

GROUNDWATER
Underground water supplies stored in aquifers. Groundwater is created by rain which soaks into the ground and flows down until it is collected at a point where the ground is not permeable. Groundwater then usually flows laterally toward a river, lake, or the ocean. Wells tap the groundwater for use. (See AQUIFER)

HABITAT
The specific area or environment in which a particular type of plant or animal lives. An organism's habitat must provide all of the basic requirements for life and should be free of harmful contaminants. Typical Puget Sound habitats include beaches, marshes, rocky shores, the bottom sediments, intertidal mudflats, and the water itself.

HAZARDOUS WASTE
Any solid, liquid, or gaseous substance which, because of its source or measurable characteristics, is classified under state or federal law as hazardous and is subject to special handling, shipping, storage, and disposal requirements. Washington state law identifies two categories, dangerous and extremely hazardous. The latter category is more hazardous and requires greater precautions.

HERBICIDE
A substance used to destroy or inhibit growth of vegetation.

HOLDING TANK
An enclosed container used as part of a sewage disposal system on a boat. The tank is used to temporarily store sewage for later pumpout at a marina pumpout facility.

HUMAN HEALTH RISK
The risk or likelihood that human health will be adversely affected. Estimating health risks is a complex and inexact practice.

HYDROCARBON
An organic compound composed of carbon and hydrogen; for example, petroleum compounds.

HYDROLOGIC CYCLE
The continual cycling of water between the land, the sea, and the atmosphere through evaporation, condensation, precipitation, absorption into the soil, and stream runoff.

IMPERVIOUS
A surface that cannot be easily penetrated. For instance, rain does not readily penetrate asphalt or concrete pavement.

INSECTICIDE
A substance, usually a chemical, that is used to kill insects.

INTERFERENCE
A contaminant can interfere with the normal sewage treatment plant process by diminishing the efficiency of the treatment process. For example, a toxic chemical can kill the beneficial bacteria in a treatment plant and interfere with the biological treatment process, thus causing the release of excessively contaminated effluent.

INTERTIDAL AREA
The area between high and low tide levels. The alternate wetting and drying of this area makes it a transition between land and water and creates special environmental conditions and habitats.

LAND USE
The way land is developed and used in terms of the types of activities allowed (agriculture, residences, industries, etc.) and the size of buildings and structures permitted. Certain types of pollution problems are often associated with particular land use practices, such as sedimentation from construction activities.

LEACHATE
Water or other liquid that has washed (leached) from a solid material, such as a layer of soil or debris. Leachate may contain contaminants such as organics or mineral salts. Rainwater that percolates through a sanitary landfill and picks up contaminants is called the leachate from the landfill.

LIVEABOARD
Those using a boat, other than a houseboat, as a primary dwelling.

LOADING
The total amount of material entering a system from all sources.

MARINE SANITATION DEVICE (MSD)
A device installed on a boat to treat or hold sewage. Section 312 of the federal Clean Water Act requires all vessels with installed toilets to have approved MSDs. Federal regulations describe three types of MSDs: Type I and Type II MSDs are treatment devices while Type III MSDs are holding tanks.

MARSH
A wetland where the dominant vegetation is non-woody plants such as grasses and sedges, as opposed to a swamp where the dominant vegetation is woody plants like trees.

METABOLISM
All chemical processes occurring within an organism, including both synthesis and breakdown of organic materials.

METALS
Metals are elements found in rocks and minerals that are naturally released to the environment by erosion, as well as generated by human activities. Certain metals, such as mercury, lead, nickel, zinc, and cadmium, are of environmental concern because they are released to the environment in excessive amounts by human activity. They are generally toxic to life at certain concentrations. Since metals are elements, they do not break down in the environment over time and can be incorporated into plant and animal tissue.

MICROLAYER, SEA-SURFACE MICROLAYER
The extremely thin (usually estimated as 50 microns) layer at the top of the water. Contamination of this layer is of concern because many contaminants such as oil, grease, organic toxicants, and pathogens are buoyant in seawater and therefore may concentrate at much higher concentrations in the microlayer than in the water column. The atmospheric deposition of toxicants into the microlayer is also of concern. These contaminant concentrations may pose a danger to fish eggs and other organisms that may come into contact with the water surface.

MICROORGANISMS
Microscopic organisms, (e.g., bacteria, viruses, and protozoans) that are not visible to the unaided eye. Some cause diseases in humans, animals, and plants; some are important because they are involved in breaking down and stabilizing sewage and solid waste.

MONITOR
To systematically and repeatedly measure conditions in order to track changes. For example, dissolved oxygen in a bay might be monitored over a period of several years in order to identify trends in concentration.

MUNICIPAL DISCHARGE
Effluent from a municipal sewage treatment plant.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
A part of the federal Clean Water Act, which requires point source dischargers to obtain discharge permits. These permits are referred to as NPDES permits and are administered by the Washington Department of Ecology.

NONPOINT SOURCE POLLUTION
Pollution that enters water from dispersed and uncontrolled sources (such as surface runoff) rather than through pipes. Nonpoint sources (e.g., forest practices, agricultural practices, on-site sewage disposal, and recreational boats) may contribute pathogens, suspended solids, and toxicants. While individual sources may seem insignificant, the cumulative effects of nonpoint source pollution can be significant.

NUTRIENTS
Essential chemicals needed by plants or animals for growth. If other physical and chemical conditions are optimal, excessive amounts of nutrients can lead to degradation of water quality by promoting excessive growth, accumulation, and subsequent decay of plants, especially algae. Some nutrients can be toxic to animals at high concentrations.

OXYGEN-DEMANDING MATERIALS
Materials such as food waste and dead plant or animal tissue that use up dissolved oxygen in the water when they are degraded through chemical or biological processes. Biochemical oxygen demand (BOD) is a measure of the amount of oxygen consumed when a substance degrades.

PARALYTIC SHELLFISH POISONING (PSP)
An illness, sometimes fatal to humans and other mammals, caused by a neuro-toxin produced by a type of plankton called *Gonyaulax*. During certain times of the year and at certain locations, these organisms proliferate in "blooms" (sometimes called red tides) and can be concentrated by clams, mussels, and other bivalves. The nervous system of shellfish is unaffected. Consumption of the shellfish can cause acute illness in humans and other mammals.

PARAMETER
A quantifiable or measurable characteristic. For example, height, weight, sex, and hair color are all parameters that can be determined for humans. Water quality parameters include temperature, pH, salinity, dissolved oxygen concentration, and many others.

PATHOGEN
An agent such as a virus, bacterium, or fungus that can cause diseases in humans. Pathogens can be present in municipal, industrial, and nonpoint source discharges to the Sound.

PELAGIC
Associated with or living in the water column as opposed to the bottom or the shoreline.

PERCOLATE
To pass through a permeable substance. For instance, septic effluent and rainfall percolates through soil.

PERSISTENT
Compounds that are not readily degraded by physical, chemical, or biological processes.

PESTICIDE
A general term used to describe chemical substances that are used to destroy or control pest organisms. Pesticides include herbicides, insecticides, algicides, fungicides, and others. Many of these substances are manufactured and are not naturally found in the environment. Others, such as pyrethrum, are natural toxins which are extracted from plants and animals.

pH
The degree of alkalinity or acidity of a solution. A pH of 7.0 indicates neutral water while a pH of 5.5 is acid. A reading of 8.5 is alkaline or basic. The pH of water influences many of the types of chemical reactions that will occur in it. For instance, a slight decrease in pH may greatly increase the toxicity of substances such as cyanides, sulfides, and most metals. A slight increase may greatly increase the toxicity of pollutants such as ammonia.

PHOTOSYNTHESIS
The process by which plants use light energy to make simple sugars and carbohydrates from carbon dioxide and water.

PLANKTON
Small plants (phytoplankton) and animals (zooplankton) that are suspended in the water and either drift with the currents or swim weakly.

POINT SOURCE
A source of pollutants from a single point of conveyance such as a pipe. For example, the discharge pipe from a sewage treatment plant or a factory is a point source.

POLLUTANT
A contaminant that adversely alters the physical, chemical, or biological properties of the environment. The term includes pathogens, toxic metals, carcinogens, oxygen-demanding materials, and all other harmful substances. With reference to nonpoint sources, the term is sometimes used to apply to contaminants released in low concentrations from many activities which collectively degrade water quality. As defined in the federal Clean Water Act, pollutant means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water.

POLYCHLORINATED BIPHENYLS (PCBs)
A group of manufactured chemicals including about 70 different but closely related compounds made up of carbon, hydrogen, and chlorine. If released to the environment they persist for long periods of time and can biomagnify in food chains because they have no natural usage in the food web. PCBs are suspected of causing cancer in humans. PCBs are an example of an organic toxicant.

POLYCYCLIC or POLYNUCLEAR AROMATIC HYDROCARBONS (PAHs)
A class of complex organic compounds, some of which are persistent and cancer-causing. These compounds are formed from the combustion of organic material and are ubiquitous in the environment. PAHs are commonly formed by forest fires and by the combustion of gasoline and other petroleum products. They often reach the environment through atmospheric fallout and highway runoff.

PRETREATMENT
The treatment of industrial wastewater to remove contaminants prior to discharge into municipal sewage systems.

PRIMARY TREATMENT
A wastewater treatment method that uses settling, skimming, and (usually) chlorination to remove solids, floating materials, and pathogens from wastewater. Primary treatment typically removes about 35 percent of BOD and less than half of the metals and toxic organic substances.

PRIORITY POLLUTANTS
Substances listed by EPA under the federal Clean Water Act as toxic and having priority for regulatory controls. The list currently includes metals (13), inorganic compounds (two), and a broad range of both natural and artificial organic compounds (111). The list of priority pollutants includes some substances which are not of immediate concern in Puget Sound, and it does not include all known harmful compounds.

PROTOCOL
A standardized procedure for field collection, laboratory analysis, and/or interpretation of samples. Good protocols improve the quality of data and make data from different sources comparable. The Puget Sound Estuary Program protocols were developed under contract to EPA to standardize sample collection and analysis within the Sound, allowing for comparability of data and determination of long-term environmental trends.

PUGET SOUND, WATERS OF
As defined in RCW 90.70.005, all salt waters of the state of Washington inside the international boundary line between Washington and British Columbia, and lying east of 123° 24' west longitude (east of Port Angeles).

PUGET SOUND WATER QUALITY AUTHORITY (AUTHORITY)
The state agency which is responsible for development and oversight of the Puget Sound Water Quality Management Plan.

REGULATORY FRAMEWORK
A particular set of laws, rules, procedures, and agencies designed to govern a particular type of activity or solve a particular problem.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
The federal law that classifies and regulates solid and hazardous waste.

REVISED CODE OF WASHINGTON (RCW)
The compilation of the laws of the state of Washington published by the Statute Law Committee. For example, the law that created the Puget Sound Water Quality Authority is incorporated in the code as Chapter 90.70 RCW.

RIPARIAN HABITAT
Terrestrial habitat adjacent to and associated with streams.

SALINITY
A measure of the quantity of dissolved salts in water.

SALMONID
A fish of the family Salmonidae (as distinct from a salmonoid which is merely a fish that resembles a salmon). Fish in this family include salmon and trout. Most Puget Sound salmonids are anadromous.

SANITARY WASTEWATER
Wastewater which includes domestic sewage and may contain pathogens. Sanitary wastewater is not sanitary.

SECONDARY TREATMENT
A wastewater treatment method that usually involves the addition of biological treatment to the settling, skimming, and disinfection provided by primary treatment. Secondary treatment may remove up to 90 percent of BOD and significantly more metals and toxic organics than primary treatment.

SEDIMENT
Material suspended in or settling to the bottom of a liquid, such as the sand and mud that make up much of the shorelines and bottom of Puget Sound.

SEPARATED SEWER SYSTEM
A wastewater collection and treatment system where domestic and industrial wastewater is separated from storm runoff. A separated system consists of independent sanitary wastewater and stormwater systems. The stormwater is generally discharged directly into open water and the sanitary wastewater goes to a treatment plant.

SEPTAGE
The sludge and scum material that is pumped out of a septic tank.

SHELLFISH
An aquatic animal, such as a mollusc (clams and snails) or crustacean (crabs and shrimp), having a shell or shell-like exoskeleton.

SHELLFISH CONTAMINATION
The contamination of certain bivalves (clams, mussels, oysters) which filter water to feed and tend to collect or concentrate waterborne contaminants in their tissues.

SHORELINE DEVELOPMENT
As regulated by the Shoreline Management Act (Chapter 90.58 RCW) the construction over water or within a shoreline zone (generally 200 feet landward of the water) of structures such as buildings, piers, bulkheads, and breakwaters, including environmental alterations such as dredging and filling, or any project which interferes with public navigational rights on the surface waters.

SHORELINE MANAGEMENT ACT (SMA)
The state law (90.58 RCW) that requires local governments to develop a shoreline master program, and requires permits for water and associated land uses. Many local governments promote the protection of wetlands, habitat, and water quality through their shoreline master program.

SLUDGE, WASTEWATER TREATMENT SLUDGE
Semi-solid matter resulting from the treatment of wastewater. Some of the contaminants (especially toxic metals) that were in the wastewater remain in the sludge after treatment. The treated wastewater can be discharged to the Sound, but the sludge must be disposed of elsewhere. Sludge is usually at least partially dried before disposal and if relatively uncontaminated may be added to soil to increase plant growth.

SOLE SOURCE AQUIFER
The single source of groundwater for human use in any one area. Areas with a sole source aquifer have no other source of groundwater; any contamination of the aquifer could contaminate the entire water supply.

SOURCE CONTROL
A practice, method, or technology that is used to reduce pollution from a source; for example, best management practices or end-of-pipe treatment.

STATE ENVIRONMENTAL POLICY ACT (SEPA)
A state law (Chapter 43.21C RCW) that requires that state agencies and local governments consider environmental factors when making decisions on activities, such as development proposals over a certain size, and comprehensive plans. As part of this process, environmental impacts are documented and opportunities for public comment are provided.

STORM DRAIN
A system of gutters, pipes, or ditches used to carry stormwater from surrounding lands to streams, lakes, or Puget Sound. In practice storm drains carry a variety of substances such as sediments, metals, bacteria, oil, and antifreeze which enter the system through runoff, deliberate dumping, or spills. This term also refers to the end of the pipe where the stormwater is discharged.

STORMWATER
Water that is generated by rainfall and is often routed into drain systems in order to prevent flooding.

SUSPENDED SOLIDS
Organic or inorganic particles that are suspended in and carried by the water. The term includes sand, mud, and clay particles as well as solids in wastewater.

TECHNOLOGY-BASED STANDARDS
Technology-based effluent standards are developed by considering the effluent quality that can be achieved using various process or treatment technologies, and the costs of those technologies, rather than basing effluent standards on the environmental effects of different loadings of pollutants.

TIMBER/FISH/WILDLIFE AGREEMENT (T/F/W)
An agreement between timber, fish, and wildlife interests that promotes the monitoring and protection of fish and wildlife resources as an integral component of forestry management practices.

TOTAL SUSPENDED SOLIDS (TSS)
The weight of particles that are suspended in water. Suspended solids in water reduce light penetration in the water column, can clog the gills of fish and invertebrates, and are often associated with toxic contaminants because organics and metals tend to bind to particles.

TOXIC
Poisonous, carcinogenic, or otherwise directly harmful to life.

TOXIC SUBSTANCES AND TOXICANTS
Chemical substances such as pesticides, plastics, detergents, chlorine, and industrial wastes that are poisonous, carcinogenic, or otherwise directly harmful to life.

TREATMENT
Chemical, biological, or mechanical procedures applied to an industrial or municipal discharge or to other sources of contamination to remove, reduce, or neutralize contaminants.

TRIBUTYL TIN (TBT)
An organic-metal compound used as an additive in many marine antifoulant paints used to prevent algal and barnacle growth. Tributyl tin is highly toxic to many marine organisms.

TURBIDITY
A measure of the amount of material suspended in the water. Increasing the turbidity of the water decreases the amount of light that penetrates the water column. High levels of turbidity are harmful to aquatic life.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)
The federal agency which administers many federal environmental laws. EPA Region 10, which includes Puget Sound, is headquartered in Seattle.

UPLAND MANAGEMENT AREA
A mandatory unharvested area for wildlife use and protection in a forest clearcut. These areas typically represent two percent or more of the clearcut area. This term originated from the Timber/Fish/Wildlife agreement.

VOLATILE
Can be readily vaporized at a relatively low temperature.

WASHINGTON ADMINISTRATIVE CODE (WAC)
Contains all state regulations adopted by state agencies through the rulemaking process. For example, Chapter 173-201 WAC contains water quality standards.

WASHINGTON DEPARTMENT OF ECOLOGY (ECOLOGY)
The state agency which is responsible for developing, implementing, and enforcing many environmental protection laws and policies, including the state Clean Water Act and the Shoreline Management Act. Note that the abbreviation DOE is confusing because the federal Department of Energy uses the same term. Ecology is the preferred term for referring to the Department of Ecology.

WATER COLUMN
The water in a lake, estuary, or ocean which extends from the bottom sediments to the water surface. The water column contains dissolved and particulate matter, and is the habitat for plankton, fish, and marine mammals.

WATER QUALITY ACCOUNT see CENTENNIAL CLEAN WATER FUND

WATER TABLE
The upper surface of groundwater or the level below which the soil is saturated with water.

WATERSHED
The geographic region within which water drains into a particular river, stream, or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains. Watershed boundaries are defined by the ridges of separating watersheds.

WELLHEAD
The immediate area around the top of a well. Contamination of the aquifer may occur from surface water if the wellhead is not sealed to prevent flow down the well casing.

WETLANDS
Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoils and is saturated with water or covered by shallow water at some time during the growing seasons each year.

ZONING
To designate by ordinances areas of land reserved and regulated for different land uses.

Appendix C. Puget Sound Water Quality Act

Chapter 90.70
PUGET SOUND WATER QUALITY AUTHORITY

Sections

90.70.001 Legislative findings——Policy.
90.70.005 Definitions.
90.70.011 Puget Sound water quality authority——Membership——Terms——Vacancies——Compensation.
90.70.025 Authority's powers.
90.70.035 Appointment of advisory committees——Duties.
90.70.045 Hiring of staff——Assignment of government employees to authority.
90.70.055 Water quality management plan——Progress reports——"State of the Sound" report——Budget and activities review.
90.70.060 Water quality management plan——Requirements——Record of public comments.
90.70.070 Water quality management plan——Incorporation by state and local governments——Review and report on implementation——Deviations from plan.
90.70.080 Adoption of rules, ordinances, and regulations.
90.70.900 Termination of authority——Expiration of chapter.
90.70.901 Severability——1985 c 451.

90.70.001 Legislative findings——Policy. The legislature finds that Puget Sound and related inland marine waterways of Washington state represent a unique and unparalleled resource. A rich and varied range of marine organisms, composing an interdependent, sensitive communal ecosystem reside in these sheltered waters. Residents of this region enjoy a way of life centered around the waters of Puget Sound, featuring accessible recreational opportunities, world–class port facilities and water transportation systems, harvest of marine food resources, shoreline–oriented life styles, water–dependent industries, tourism, irreplaceable aesthetics and other activities, all of which to some degree depend upon a clean and healthy marine resource.

The legislature further finds that the consequences of careless husbanding of this resource have been dramatically illustrated in inland waterways associated with older and more extensively developed areas of the nation. Recent reports concerning degradation of water quality within this region's urban embayments raise alarming possibilities of similar despoliation of Puget Sound and other state waterways. These examples emphasize that the costs of restoration of aquatic resources, where such restoration is possible, greatly exceed the costs of responsible preservation.

The legislature declares that utilization of the Puget Sound resource carries a custodial obligation for preserving it. The people of the state have the unique opportunity to preserve this gift of nature, an understanding of the results of inattentive stewardship,

the technical knowledge needed for control of degradation, and the obligation to undertake such control.

The legislature further finds that the large number of governmental entities that now affect the water quality of Puget Sound have diverse interests and limited jurisdictions which cannot adequately address the cumulative, wide-ranging impacts which contribute to the degradation of Puget Sound. It is therefore the policy of the state of Washington to create a single entity with adequate resources to develop a comprehensive plan for water quality protection in Puget Sound to be implemented by existing state and local government agencies. [1985 c 451 § 1.]

90.70.005 Definitions. Unless the context clearly requires otherwise, the definitions in this section apply throughout this chapter:

(1) "Authority" means the Puget Sound water quality authority.

(2) "Chair" means the presiding officer of the Puget Sound water quality authority.

(3) "Plan" means the Puget Sound water quality management plan.

(4) "Puget Sound" means all salt waters of the state of Washington inside the international boundary line between the state of Washington and the province of British Columbia, lying east of one hundred twenty-three degrees, twenty-four minutes west longitude. [1985 c 451 § 2.]

90.70.011 Puget Sound water quality authority——Membership——Terms——Vacancies——Compensation. (1) There is established the Puget Sound water quality authority composed of seven members who are appointed by the governor and confirmed by the senate. The governor shall select one of the seven members to act as chair of the authority and be presiding officer of the authority. In making these appointments, the governor shall seek to include representation of the variety of interested parties concerned about Puget Sound water quality. The commissioner of public lands and the director of ecology shall serve as ex officio, nonvoting members of the authority. The six appointed members, one from each of the six congressional districts surrounding Puget Sound, shall serve four-year terms. Of the initial members appointed to the authority, two shall serve for two years, two shall serve for three years, and two shall serve for four years. Thereafter members shall be appointed to four-year terms. Vacancies shall be filled by appointment for the remainder of the unexpired term of the position being vacated. The chair of the authority shall serve at the pleasure of the governor.

(2) The voting members, exclusive of the chair, shall be compensated as provided in RCW 43.03.250. The voting members shall be reimbursed for travel expenses as provided in RCW 43.03.050 and 43.03.060.

(3) The chair of the authority shall be a full time employee responsible for the administration of all functions of the authority, including hiring and terminating staff, contracting, coordinating with the governor, the legislature, and other state and local entities, and the delegation of responsibilities as deemed appropriate. The salary of the chair shall be fixed by the governor, subject to RCW 43.03.040.

(4) The chair shall prepare a budget and a work plan which are subject to review and approval by the authority. [1985 c 451 § 3.]

90.70.025 Authority's powers. In order to carry out its responsibilities under this chapter, the authority may:

(1) Develop interim proposals and recommendations, before the plan is adopted, concerning the elements identified in RCW 90.70.060;

(2) Enter into, amend, and terminate contracts with individuals, corporations, or research institutions for the purposes of this chapter;

(3) Receive such gifts, grants, and endowments, in trust or otherwise, for the use and benefit of the purposes of the authority. The authority may expend the same or any income therefrom according to the terms of the gifts, grants, or endowments;

(4) Conduct studies and research relating to Puget Sound water quality;

(5) Obtain information relating to Puget Sound from other state and local agencies;

(6) Conduct appropriate public hearings and otherwise seek to broadly disseminate information concerning Puget Sound;

(7) Receive funding from other public agencies;

(8) Prepare a biennial budget request for consideration by the governor and the legislature; and

(9) Adopt rules under chapter 34.04 RCW as it deems necessary for the purposes of this chapter. [1985 c 451 § 5.]

90.70.035 Appointment of advisory committees——Duties. (1) The authority shall appoint one or more advisory committees to assist in the development of the plan. In making these appointments, the authority shall seek to include representation of all interested parties, including local governments, environmental and health agencies, tribal organizations, business, labor, citizens' groups such as environmental and public interest organizations, agricultural interests, recreational interests, and the fisheries and shellfish industries.

(2) The advisory committee or committees shall assist the authority to formulate policy goals and strategies, review the plan and make recommendations for its amendment to the authority, review the authority's reports, and review the authority's budget request proposals. [1985 c 451 § 6.]

90.70.045 Hiring of staff——Assignment of government employees to authority. (1) The chair shall hire staff for the authority. In so doing, the chair shall recognize the many continuing planning and research activities concerning Puget Sound water quality and shall seek to acquire competent and knowledgeable staff from state, federal, and local government agencies that are currently involved in these activities.

(2) As deemed appropriate, the chair may request the state departments of ecology, community development, fisheries, *game, agriculture, natural resources, and social and health services to each assign at least one employee to the authority. The chair shall enter into an interagency agreement with agencies assigning employees to the authority. Such agreement shall provide for reimbursement, by the authority to the assigning agency, of all work-related expenditures associated with the assignment of the employees. During the term of their assignment, the chair shall have full authority and responsibility for the activities of these employees.

(3) The chair shall seek assignment of appropriate federal and local government employees under available means. [1985 c 451 § 7.]

***Reviser's note:** References to the "department of game" mean "department of wildlife." See note following RCW 77.04.020.

90.70.055 Water quality management plan——Progress reports——"State of the Sound" report——Budget and activities review. The authority shall:

(1) Prepare and adopt a comprehensive Puget Sound water quality management plan, as defined in RCW 90-.70.060. In preparing the plan and any substantial revisions to the plan, the authority shall consult with its advisory committee or committees and appropriate federal, state, and local agencies. The authority shall also solicit extensive participation by the public by whatever means it finds appropriate, including public hearings throughout communities bordering or near Puget Sound, dissemination of information through the news media, public notices, and mailing lists, and the organization of workshops, conferences, and seminars;

(2) During the plan's initial development and any subsequent revisions, submit quarterly progress reports to the governor and the legislature.

(3) Submit the plan to the governor and the legislature no later than January 1, 1987. The authority shall review the plan at least every two years and revise the plan, as deemed appropriate;

(4) Prepare a biennial "state of the Sound" report and submit such report to the governor, the legislature, and the state agencies and local governments identified in the plan. Copies of the report shall be made available to the public. The report shall describe the current condition of water quality and related resources in Puget Sound and shall include:

(a) The status and condition of the resources of Puget Sound, including the results of ecological monitoring, including an assessment of the economic value of Puget Sound;

(b) Current and foreseeable trends in water quality of Puget Sound and the management of its resources;

(c) Review of significant public and private activities affecting Puget Sound and an assessment of whether such activities are consistent with the plan; and

(d) Recommendations to the governor, the legislature, and appropriate state and local agencies for actions needed to remedy any deficiencies in current policies, plans, programs, or activities relating to the water quality of Puget Sound, and recommendations concerning changes necessary to protect and improve Puget Sound water quality; and

(5) Review the budgets and regulatory and enforcement activities of state agencies with responsibilities for water quality and related resources in Puget Sound. [1985 c 451 § 4.]

90.70.060 Water quality management plan——Requirements——Record of public comments. The plan adopted by the authority shall be a positive document prescribing the needed actions for the maintenance and enhancement of Puget Sound water quality. The plan shall address all the waters of Puget Sound, the Strait of Juan de Fuca, and, to the extent that they affect water quality in Puget Sound, all waters flowing into Puget Sound, and adjacent lands. The authority may define specific geographic boundaries within which the plan applies. The plan shall coordinate and incorporate existing planning and research efforts of state agencies and local government related to Puget Sound, and shall avoid duplication of existing efforts. The plan shall include:

(1) A statement of the goals and objectives for long and short-term management of the water quality of Puget Sound;

(2) A resource assessment which identifies critically sensitive areas, key characteristics, and other factors which lead to an understanding of Puget Sound as an ecosystem;

(3) Demographic information and assessment as relates to future water quality impacts on Puget Sound;

(4) An identification and legal analysis of all existing laws governing actions of government entities which may affect water quality management of Puget Sound, the interrelationships of those laws, and the effect of those laws on implementation of the provisions of the plan;

(5) Review and assessment of existing criteria and guidelines for governmental activities affecting Puget Sound's resources, including shoreline resources, aquatic resources, associated watersheds, recreational resources and commercial resources;

(6) Identification of research needs and priorities;

(7) Recommendations for guidelines, standards, and timetables for protection and clean-up activities and the establishment of priorities for major clean-up investments and nonpoint source management, and the projected costs of such priorities;

(8) A procedure assuring local government initiated planning for Puget Sound water quality protection;

(9) Ways to better coordinate federal, state, and local planning and management activities affecting Puget Sound's water quality;

(10) Public involvement strategies, including household hazardous waste education, community clean-up efforts, and public participation in developing and implementing the plan;

(11) Recommendations on protecting, preserving and, where possible, restoring wetlands and wildlife habitat and shellfish beds throughout Puget Sound;

(12) Recommendations for a comprehensive water quality and sediment monitoring program;

(13) Analysis of current industrial pretreatment programs for toxic wastes, and procedures and enforcement measures needed to enhance them;

(14) Recommendations for a program of dredge spoil disposal, including interim measures for disposal and storage of dredge spoil material from or into Puget Sound;

(15) Definition of major public actions subject to review and comment by the authority because of a significant impact on Puget Sound water quality and related resources, and development of criteria for review thereof;

(16) Recommendations for implementation mechanisms to be used by state and local government agencies;

(17) Standards and procedures for reporting progress by state and local governments in the implementation of the plan;

(19) An analysis of resource requirements and funding mechanisms for updating of the plan and plan implementation; and

(20) Legislation needed to assure plan implementation.

The authority shall circulate and receive comments on drafts of the plan mandated herein, and keep a record of all relevant comments made at public hearings and in writing. These records should be made easily available to interested persons. [1985 c 451 § 8.]

Reviser's note: Subsection (18) of this section was vetoed.

90.70.070 Water quality management plan——Incorporation by state and local governments——Review and report on implementation——Deviations from plan. (1) In conducting planning, regulatory, and appeals actions, the state agencies and local governments identified in the plan must evaluate, and incorporate as applicable, the provisions of the plan, including any guidelines, standards, and timetables contained in the plan.

(2) The authority shall review the progress of state agencies and local governments regarding the timely implementation of the plan. Where prescribed actions have not been accomplished in accordance with the plan, the responsible state agencies and local governments shall, at the request of the authority, submit written explanations for the shortfalls, together with their proposed remedies, to the authority.

The results of the review and a description of the actions necessary to comply with the plan shall be included in the biennial state of the Sound report.

(3) The state agencies and local governments identified in the plan shall review their activities biennially and document their consistency with the plan. They shall submit written reports or updates of their findings to the authority.

(4) The authority shall review the major actions affected by the plan being considered by the state agencies and local governments and shall comment in a timely manner regarding consistency with the plan and may participate in administrative and subsequent judicial proceedings with respect to such actions. Any deviations from the plan, identified by the authority, shall be transmitted in writing by the authority to the responsible state agency or local government. [1985 c 451 § 9.]

90.70.080 Adoption of rules, ordinances, and regulations. (1) To implement this chapter, state agencies are authorized to adopt rules that are applicable to actions and activities on a less than state–wide geographic basis. State agencies are encouraged to adopt rules that protect Puget Sound water quality before the adoption of the plan by the authority.

(2) To implement this chapter, counties, cities, and towns are authorized to adopt ordinances, rules, and regulations that are applicable on less than a county–wide, city–wide, or town–wide basis. Counties, cities, and towns are encouraged to adopt ordinances, rules, and regulations that protect Puget Sound water quality before the adoption of the plan by the authority. [1985 c 451 § 10.]

Reviser's note: "This act" [1985 c 451] has been changed to "this chapter." "This act" consists of the enactment of RCW 90.70.001, 90.70.005, 90.70.011, 90.70.025, 90.70.035, 90.70.045, 90.70.055, 90.70.060, 90.70.070, 90.70.080, 90.70.901, the 1985 c 451 amendment to RCW 90.70.900, and the repeal of RCW 90.70.010, 90.70.020, 90.70.030, 90.70.040, and 90.70.050.

90.70.900 Termination of authority——Expiration of chapter. The Puget Sound water quality authority shall cease to exist and this chapter shall expire on June 30, 1991. [1985 c 451 § 11; 1983 c 243 § 6.]

90.70.901 Severability——1985 c 451. If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected. [1985 c 451 § 14.]

Chapter 90.72
SHELLFISH PROTECTION DISTRICTS

Sections

90.72.010 Legislative encouragement.
90.72.020 Shellfish tidelands.
90.72.030 Shellfish protection districts——Establishment——Governing body——Programs.
90.72.040 Shellfish protection districts——Creation——Boundaries——Abolition.
90.72.050 Coordination of plans and programs.
90.72.060 Decisions addressing conflicting uses——Integration of the state environmental policy act and county ordinances and resolutions with programs.
90.72.070 Program financing.
90.72.900 Certain authority of counties not affected by chapter.

90.72.010 Legislative encouragement. In recognition of the fact that tidelands historically used for shellfish farming are threatened by nonpoint pollution sources that have been identified as resulting from agricultural grazing practices, failing septic drainfield systems, and stormwater runoff; in recognition of the fact that some of the historical and productive shellfish areas within the state already have been contaminated by these pollution sources and as a result may not be used for shellfish farming; and in recognition of the fact that shellfish harvesting both commercially and for home consumption is a way of life in many areas of the state, particularly in the Hood Canal, southern Puget Sound, and Willapa

Appendix D.
Summary of Chapter 400-12 WAC
Local Planning and Management of Nonpoint Source Pollution

INTRODUCTION

The Puget Sound Water Quality Authority, in cooperation with the Department of Ecology, has adopted a rule to provide direction for local watershed planning and management. Watershed planning is an important component of the Nonpoint Source Pollution program in the Puget Sound Water Quality Management Plan. Under the program, committees in each of the 12 Puget Sound counties are identifying and ranking local watersheds. Watershed management committees will develop action plans to prevent and reduce nonpoint source pollution in top-ranked watersheds. Sources addressed may include stormwater runoff, on-site sewage disposal (septic) systems, agricultural practices, and other sources.

Additional information and copies of the full text of the rule (Chapter 400-12 WAC, Local Planning and Management of Nonpoint Source Pollution) may be obtained by calling the Authority office at (206) 464-7320 or 1-800-54-SOUND.

PUBLIC INVOLVEMENT

The public involvement provisions of the rule require meaningful and substantive participation by the general public and affected parties. The rule requires adequate opportunities for public comment throughout the watershed ranking and action planning processes. This includes public meetings, consultations with interested and affected parties, and other means of soliciting public comment.

WATERSHED RANKING PROCESS

A watershed ranking committee has been formed in each county, in accordance with the Puget Sound plan and the nonpoint rule, to establish a priority order of the county's watersheds that most need preventive and/or corrective actions to manage nonpoint source pollution.

Watershed Ranking Committee Formation

The lead agency (usually a county) invites other local government entities, special purpose districts, and tribes to appoint representatives to the ranking committee. Representatives of the general public and "affected parties" (those who are either negatively affected by nonpoint source pollution or associated with nonpoint pollution sources) are included on the committee or on an advisory committee.

Watershed Ranking Process

The ranking committee defines watershed and subwatershed boundaries. Using criteria in the Puget Sound plan and the Puget Sound Cooperative River Basin Study,[56] the committee obtains information on water quality, beneficial uses, and biological condition of the county's watersheds.

The committee develops a proposed watershed ranking based on the criteria and/or comment at public meetings or workshops and holds a public hearing on the proposed ranking. The lead agency submits the final ranking to Ecology. As funding from the Centennial Clean Water Fund (cigarette tax) becomes available, action plans will be developed for watersheds in the order in which they are ranked locally.

The lead agency will convene a ranking committee every five years to revise the ranking based on new information.

WATERSHED ACTION PLAN PROCESS

Watershed management committees will be formed in priority watersheds to prepare coordinated action plans to prevent and abate nonpoint sources of pollution. The management committee will have 18 months to prepare an action plan after the schedule and work plan are determined (up to 24 months in large or complex watersheds).

Watershed Management Committee Formation

The lead agency (initially the county unless the watersheds are entirely within city or tribal boundaries) invites local governments, conservation districts, and tribes to appoint representatives to form an initial committee. The lead agency and invited entities consult with affected parties in determining the size and structure of the full committee.

Representatives of planning and implementing entities are included on the committee, and representatives of the general public and affected parties are included on the committee or on an advisory committee. The lead agency convenes the committee and the committee determines a schedule and work plan within 90 days of the effective date of its Ecology grant agreement.

56 This is a team of technical assistance staff from the U.S.D.A. Soil Conservation Service, U.S. Forest Service, and the Washington Department of Fisheries.

Phase 1: Identification of Nonpoint Source Pollution Problems and Action Plan Policies

The committee conducts a water quality assessment and a characterization of the watershed. The purpose of these two tasks is to identify nonpoint sources and evaluate water quality, beneficial uses, land use patterns, and the physical and biological conditions in the watershed.

The committee identifies the categories of nonpoint source pollution and develops a statement of goals and objectives for preventing and correcting nonpoint sources.

Phase 2: Draft Plan Development

The committee develops source control programs for the nonpoint source problems it has identified and prepares an implementation plan for the proposed source control programs (see descriptions of source control programs below).

Phase 3: Adoption of Action Plan

The watershed management committee forwards the draft action plan and accompanying documentation to the lead agency. Entities involved in developing and implementing the action plan and Ecology review the draft action plan. The committee revises the action plan after considering comments from reviewers and holds a joint public hearing with implementing entities.

Each implementing entity submits a statement to the watershed management committee indicating its intent to implement the plan, or a statement of nonconcurrence that recommends revisions to the plan. The committee attempts to resolve statements of nonconcurrence, prepares final revisions to the action plan, and approves it.

The final revised action plan is forwarded to the lead agency for review and submittal to Ecology. The lead agency proposes solutions to unresolved statements of nonconcurrence and submits them to Ecology as part of the final action plan. Ecology notifies the lead agency of its decision on final approval of the action plan, and the lead agency notifies all appropriate federal and state agencies, planning and implementing entities, and affected parties of Ecology's decision.

The lead implementing agency coordinates implementing entities and provides regular progress reports on implementation to Ecology. Ecology conducts an ongoing review of compliance with the action plan to ensure consistent and adequate implementation.

SOURCE CONTROLS

Watershed management committees are to develop source control programs for significant and/or potential sources of nonpoint pollution. The goal of source control programs is to minimize water pollution, protect beneficial uses, and enhance water quality in the watershed. If the watershed management committee determines that a particular source is not significant (or potentially significant), no source control program is required.

Agricultural Practices

Use of best management practices (BMPs) in approved farm plans (such as "208" water quality management plans) is the recommended approach. Programs will also include education, incentives, and a compliance element. Regulations may be considered when the severity of problems and the number of individual sources make it ineffective to rely on voluntary programs alone. (Farms implementing approved farm plans are exempt from further regulations unless water quality violations occur.)

On-Site Sewage Disposal

Control programs should focus on areas with the greatest potential for on-site system failure, although areas of low or moderate risk must also be identified. Provisions for regular maintenance of on-site systems in all high-risk areas are required.

Education programs will be designed for users and servicers of on-site systems about proper siting, operation, and maintenance. Remedial programs may require repair, replacement, and the use of alternative systems such as mounds and sand filters.

Stormwater and Erosion

Emphasis is on controlling stormwater quality and quantity at the source before it is discharged into public drainage systems or natural water bodies. Control strategies will evaluate existing efforts at controlling stormwater, identify significant stormwater and erosion problems, and identify monitoring needs. Corrective and preventive measures should be planned, including public education, training of field staff, maintenance of stormwater systems, and use of best management practices for stormwater and erosion control.

Forest Practices--Coordination with Timber/Fish/Wildlife

Watershed action plans should be coordinated with the T/F/W process where forest practice activities affect water quality. Procedures must be developed for all jurisdictions to exercise their authorities under the state Forest Practices Program in a consistent fashion.

Marinas and Boats--Coordination with State Program

The watershed management committee will develop a source control program for marinas and boats in coordination with the State Parks and Recreation Commission and Department of Social and Health Services. Education programs will be developed informing marina operators and the boating public about pollution from boating activities and ways to prevent it. The watershed management committee may require shoreside sewage disposal facilities at marinas and facilities for disposal of boating-related fuels, paints, and solvents.

Other Sources

Watershed action plans should also address correction or prevention of pollution from other sources such as pesticides, landfills, mines, sand/gravel pits, septage, and contaminated sites.

ADOPTION OF EXISTING ENVIRONMENTAL DOCUMENT

Adoption for (check appropriate box): __DNS x EIS __Other

Description of current proposal: The Authority proposes to revise the 1987 Puget Sound Water Quality Management Plan, adopted December 17, 1986, by amending the language of the existing Plan programs and by the addition of the following expanded programs: Research; Monitoring; and Education and Public Involvement. The Authority proposes to amend the plan by updating cost estimates for the 1990-91 biennium and calling for a study of financing options [the Estimated Cost and Financing program] and the addition of the element PDI-01, Long Term Puget Sound Institutional Structure. The Authority may decide to adopt the proposed language or a revised alternative.

The Authority is scheduled to make a decision on this proposal on October 19, 1988.

Proponent: Puget Sound Water Quality Authority

Location of current proposal: Puget Sound basin

Title of document being adopted: Final Environmental Impact Statement and Revised Preferred Plan for the 1987 Puget Sound Water Quality Management Plan, and 1987 Draft Puget Sound Water Quality Management Plan and Environmental Impact Statement.

Agency that prepared document being adopted: Puget Sound Water Quality Authority

Date adopted document was prepared: Published September 17, 1986 (dEIS) and December 10, 1986 (fEIS).

Description of document (or portion) being adopted: The documents describe the draft and revised preferred versions of a comprehensive Puget Sound Water Quality Management Plan together with potential environmental impacts, mitigating measures, and alternatives.

If the document being adopted has been challenged (197-11-630), please describe: No challenge.

The document is available to read at (place/time):

Puget Sound Water Quality Authority
217 Pine Street, Suite 1100
Seattle, Washington 98101
8:00 a.m. to 5:00 p.m., Monday through Friday

We have identified and adopted this document as being appropriate for this proposal after independent review. The document meets our environmental review needs for the current proposal and will

accompany the proposal to the decisionmaker.

Name of agency adopting document: Puget Sound Water Quality Authority

Contact person, if other than responsible official: Ms. Kirvil Skinnarland, (206) 464-7320 or (toll-free) 1-800-54-SOUND

Responsible official: Katherine Fletcher, Chair

Address: 217 Pine Street, Suite 1100, Seattle, WA 98101
(206) 464-7320

Date: October 7, 1988 Signature: Katherine Fletcher

[Form per WAC 197-11-965]