FINAL
EAST LAKE SAMMAMISH BASIN AND NONPOINT ACTION PLAN

December 1994

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(SWM) Division:
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Watershed Management Committee (WMC):

- King County
- City of Issaquah
- WA Dept. of Natural Resources
- King Conservation District
- Muckleshoot Indian Tribe

Responsible Official:

Paul Tanaka, Director
Department of Public Works

Funded in part by the Washington Department of Ecology Centennial Clean Water Fund.

Text will be made available in large print, Braille, or audiotape as requested.

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EXECUTIVE SUMMARY

BASIN OVERVIEW

The East Lake Sammamish basin encompasses about 16 square miles of unincorporated King County, on the eastern side of Lake Sammamish (Figure 1). This basin has six sub-basins with four main stream systems, small lakes, and many wetlands and small hillside drainages. The small, often seasonally dry streams flow in a predominantly westerly direction from lake and wetland headwaters over the rolling plateau. The streams then flow down the steep, erosive western slope of the basin, through ravines, before discharging to Lake Sammamish. The basin currently has a mixed development pattern, ranging from low-density residential and pasture uses to high-density residential and commercial land uses. Its surface-water systems are in good to fair condition. However, the quality of the basin's surface waters, the stability of its slopes and stream channels, and the extent to which residents are protected from flooding and environmental degradation, will be threatened as the basin urbanizes according to existing land-use plans. Control of these problems requires prompt implementation of the management program recommended in this plan.

MANAGEMENT GOALS

This plan has three management goals: 1) to reduce surface water-problems that threaten public health and safety; 2) to protect the value of waterbodies for recreation, fish and wildlife habitat, and aesthetic enjoyment; and 3) to reduce the contribution of nonpoint source pollution to these surface-water problems.

1. Reduce Health and Safety Problems. There currently are no significant surface water-related health and safety problems in this basin. However, two such problems could be initiated as the area grows. First, some of the domestic water supply for basin residents is susceptible to contamination and should be protected from infiltration of poor-quality urban runoff. Second, increases in flows and erosion in areas with inadequate culvert capacities or road elevations could result in roads that are flooded more frequently, blocking access during large storms.

2. Protect the Value of Waterbodies. The surface waters of the East Lake Sammamish basin provide habitat for fish and wildlife, recharge areas for local aquifers, recreational opportunities, and aesthetic enjoyment for basin residents. Wetlands provide many of these resource values. The diversity of the basin's more than 40 inventoried wetlands is as great as anywhere in King County, with nine wetlands rated as unique and outstanding. The major lakes of the basin (Pine Lake, Beaver Lake, and Lake Sammamish) provide recreational opportunities, aesthetic enjoyment, and fish and wildlife habitat. However, recreational values in these lakes are impaired or threatened by nonpoint source pollution including sediment and phosphorus from adjacent pastures and urban land uses. Phosphorus is of particular concern given the role of this nutrient in reducing the recreational value of Lake Sammamish, the receiving waterbody for all of the East Lake Sammamish streams. Most of those streams on the plateau are small, seasonally dry, and inaccessible, but their riparian areas still offer valuable wildlife habitat, water-quality and flood benefits, and aesthetic values to basin residents. Important salmonid habitat remains in other areas, however, particularly habitat for a unique remnant stock of kokanee in the lower reaches of some streams and habitats along the Lake Sammamish shoreline for shore-spawning sockeye.

3. Reduce Nonpoint Pollution. Water quality in the basin's streams generally is good. However, high

suspended solids, nutrients, and fecal coliform levels were found during both storm and non-storm conditions in lower George Davis, Pine Lake and Laughing Jacobs creeks. High nutrient levels also cause algal blooms in Pine and Beaver lakes. These pollutants are typical in runoff from residential and pasture areas and likely will increase as the area develops to higher densities. Despite these periodic problems, the basin contributes only about seven to ten percent of the total phosphorus loading to Lake Sammamish. These low loadings are due to the basin's generally good water quality and small drainage area. This plan seeks to control nonpoint source pollutants so that the use of streams, lakes, and wetlands for fish and wildlife habitat, recreational use, and aesthetic enjoyment can continue unhindered.

RECOMMENDATIONS

The management program outlined in this plan will substantially reduce the harmful effects of urban development on surface-water systems; however, it cannot entirely maintain the current quality of surface-water resources in this basin nor restore all of the historic functions of the watershed. With the recommended management program, increases in average peak flows are predicted to be up to 17 percent higher than 1989 levels at the outlets of the Inglewood, Thompson, and Pine Lake sub-basins. At the outlet of the sub-basin with the largest changes in land use, Laughing Jacobs, future peak flows will be between about 30 and 40 percent (29 to 38 cubic feet per second) higher than 1989 flows. The recommendations for flow control and channel stabilization should substantially reduce, but not eliminate, channel instability, erosion, and habitat damage in the western portion of the basin. In addition, if unprecedented care is taken in implementing water quality best management practices (BMPs), the contribution of the basin to phosphorus loading in Lake Sammamish should not increase significantly. These predicted changes will result in low-level degradation of the surface-water systems, but this plan seeks to limit the degradation so that no significant surface water-related public health and safety problems begin and the current uses of surface waters for recreation, fish and wildlife habitat, and aesthetic enjoyment are not lost.

Pre-Existing Management Program Elements

The agencies responsible for plan implementation have already implemented many measures that are important to the basin management program. In King County, these measures include:

- Sensitive Areas Ordinance (SAO) protection measures for streams, wetlands, and adjacent buffers of waterside vegetation; mitigation guidelines for water-feature alterations; grading and erosion-control measures; and guidelines for livestock pasturing practices;
- *King County Surface Water Design Manual* requirements that new development provide control of peak flows and water-quality treatment of stormwater;
- Education programs to teach residents about nonpoint pollution;
- Technical assistance programs to help residents institute water-quality best management practices; and
- Programs to provide reduced property taxes for properties constrained by stream and wetland regulation.

New Basin Management Recommendations

In addition to the continuation of the basin management measures that are already in place, the plan recommends a comprehensive surface water management program with several inter-dependent components including:

o Regulatory Controls

- Standards that allow a broader range of water-quality facilities to be built with new development;

- Improved onsite retention/detention (R/D) standards that will result in post-development peak stream flows that more closely match pre-development conditions;

- Standards to reduce water pollution and erosion in the steep Panhandle and Monohon drainages by requiring runoff from new development to be treated in water-quality facilities and piped down the west slope;

- Requirements for development clustering, strict impervious surface limits, and clearing limits in the areas that drain to significant wetlands; and

- Requirements for single-family residential land uses and water-quality best management practices in the area near Wetland 26 where the local geology provides little protection of water-supply aquifers from infiltration of poor-quality urban runoff.

o Capital Improvement Projects (CIP's)

Forty-seven projects are proposed to control flows and erosion, to reduce water pollution, and to repair damage to aquatic habitat. These projects include larger culverts at the East Lake Sammamish Parkway, stormwater and water-quality ponds in the Inglewood sub-basin, trestles to restore hydrologic connections within significant wetlands, and channel restoration projects to reduce erosion and to improve fish habitat and migration access.

o Programs and Monitoring

- Increased education programs to inform basin residents of their effect on water quality and surface water resources;

- Improved enforcement of County environmental codes;

- Monitoring of the changes in water quality, stream channels, habitat, and flow conditions to determine the success of the basin management program and to identify needed adjustments to the basin management program; and

- Hiring of a basin caretaker, called a "basin steward", to lead implementation of the basin plan, to monitor basin changes, and help to educate basin residents about surface waters.

IMPLEMENTATION

IMPLEMENTING AGENCIES

More than 20 agencies and organizations have a role in implementing the plan. Key tasks for which these agencies will be responsible include: 1) development of programs, projects, budgets, and regulations that are consistent with this plan, 2) advocacy for adoption of programs, budgets, and regulations by elected officials, and 3) implementation of recommended programs, projects, and regulations. Implementing agencies include:

King County Agencies:

- Department of Assessments
- Department of Parks, Planning, and Resources (PPR)
  - Planning and Community Development Division
  - Community Planning (CP) Section
- Department of Development and Environmental Services (DDES)
  - Environmental Division (ED)
- Department of Public Works
  - Roads and Engineering (Roads) Division
  - Surface Water Management (SWM) Division
  - Solid Waste Division (SWD)
- Department of Metropolitan Services (Metro)
- Seattle/King County Department of Public Health (SKCDPH)

Regional Agencies and Special Purpose Districts:

- King Conservation District (KCD)
- King County Cooperative Extension (KCCE)

Indian Tribes:

- Muckleshoot Indian Tribe

State Agencies:

- University of Washington Center for Water Resources Management (UW)
- Washington State Department of Agriculture (DOA)
- Washington State Department of Ecology (DOE)
- Washington State Department of Fisheries (DOF)
- Washington State Department of Health (DOH)
- Washington State Department of Natural Resources (DNR)
- Washington State Department of Wildlife (DOW)
- Washington State Parks and Recreation Commission (WSPARC)

Federal Agencies:

- United States Fish and Wildlife Service (USFWS)

Community Groups:

- Save Lake Sammamish

COSTS AND SCHEDULE

The capital projects, programs, and regulations needed to adequately control surface water impacts will have substantial public and private costs. About 45 percent of the programmatic recommendations could be fully accommodated within existing programs and budgets, and about 17 percent could be partially accommodated. Added costs for the remaining programmatic recommendations are estimated at about $1.5 million for staff and start-up costs in the first year following plan adoption, and about $1.1 million for ongoing programs. Funds for capital programs are also limited. The cost of capital projects is estimated at $13 million of which only about 25 percent can be covered under current SWM Division CIP funding programs. To clarify funding choices, priorities have been established for all of the plan's recommendations. The top-priority capital projects and program development tasks are recommended to be implemented within three years of plan adoption. However, due to funding limits, the implementation timeframe is uncertain for the recommendations that have no readily apparent near-term funding source other than State nonpoint action grants. However, the approval of these increased budgets, and thus the implementation schedule for those recommendations that are not accommodated within existing programs, remains to be determined.

TABLE OF CONTENTS

ACRONYMS

AS	King County Department of Assessments
BMP	Best Management Practice
BNRR	Burlington Northern Railroad
BW	Basinwide Recommendation
cfs	Cubic feet per second
CIP	Capital Improvement Project
CP	King County Community Planning Section
DDES	King County Department of Development and Environmental Services
DIR	King County SWM Division Drainage Investigation and Regulation Section
DPW	King County Department of Public Works
ED	King County Environmental Division
FEMA	Federal Emergency Management Agency
FPA	Forest Practices Application
HPA	Hydraulic Permit Approval
HSPF	Hydrologic Simulation Program-Fortran
ISS	City of Issaquah
KCD	King Conservation District
KCCE	King County Cooperative Extension
LSRA	Locally Significant Resource Area
Metro	Municipality of Metropolitan Seattle (King County)
MT	Muckleshoot Indian Tribe
NPDES	National Pollutant Discharge Elimination System
OHWM	Ordinary High Water Mark
PPR	King County Department of Parks, Planning, and Resources
PSWQA	Puget Sound Water Quality Authority
RCW	Revised Code of Washington
R/D	Retention/Detention
RM	River Mile
RDS	King County Roads and Engineering Division
SAO	King County Sensitive Areas Ordinance
SCKDPH	Seattle/King County Department of Public Health
SCS	United States Soil Conservation Service
SEPA	State Environmental Policy Act
SLS	Save Lake Sammamish
SQHWG	Small Quantity Hazardous Waste Generator
ST	Snoqualmie Tribe
SWM	King County Surface Water Management Division
SWD	King County Solid Waste Division
TP	Total Phosphorus
U & A	Usual and Accustomed
ULID	Utility Local Improvement District
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
UW	University of Washington
WAC	Washington Administrative Code
WDH	Washington State Department of Health
WMC	Issaquah/East Lake Sammamish Watershed Management Committee
WSDOA	Washington State Department of Agriculture
WSDOE	Washington State Department of Ecology
WSDOFW	Washington State Department of Fisheries and Wildlife
WSDNR	Washington State Department of Natural Resources
WSPARC	Washington State Parks and Recreation Division
WSU	Washington State University

CHAPTER 1
INTRODUCTION

1.1 PLAN PURPOSE AND GOALS

This plan evaluates the water quality, aquatic resources, and surface-water problems of the East Lake Sammamish basin under past, current, and future land-use conditions. It also defines a comprehensive surface-water management program for the basin. This plan combines a King County-funded basin plan and a Washington Department of Ecology (DOE) Centennial Clean Water Fund nonpoint source pollution action plan. As a combined basin plan and nonpoint action plan, it was developed by the Issaquah/East Lake Sammamish Watershed Management Committee with the King County Surface Water Management (SWM) Division as lead agency. A citizen-based Basin Advisory Team and a technical advisory committee of agency, business, and community-group representatives also participated in plan development. The documents already published include:

- *Conditions Report* (September 1990)
- *Draft Basin and Nonpoint Action Plan (Volume 1 of the WMC-Proposed Plan)* (May, 1992)
- *WMC-Proposed Basin and Nonpoint Action Plan (Volume 2)* (December 1992)

This plan has three management goals that are discussed here: 1) to reduce surface water-problems that threaten public health and safety; 2) to protect the value of waterbodies for recreation, fish and wildlife habitat, and aesthetic enjoyment; and 3) to reduce the contribution of nonpoint source pollution to these surface-water problems.

This plan was developed with the philosophy that the land and waters of the East Lake Sammamish basin must be evaluated and managed as a whole integrated system—that erosion cannot be managed without controlling the high flows that cause erosion; that water pollution cannot be adequately reduced without controlling the runoff and sediment by which pollutants are transported; and that aquatic habitat cannot be managed without considering all of the chemical, physical, and hydrologic elements that define each habitat.

By definition, nonpoint pollution originates from diffuse sources and is carried to waterbodies by rainfall that runs off the land's surface. Under natural forested conditions, much of the rainfall infiltrates into the soil and reaches streams slowly through groundwater. In these conditions, nonpoint pollutants that may have been on the land's surface may never reach streams or lakes because they are largely removed by contact with soil during infiltration. With development, the soil is compacted and trees are removed, resulting in less infiltration of rainfall and more surface water runoff. As more people move into the basin, they bring many nonpoint pollutants with them, including oils, greases, and metals from automobiles and commercial activities, and nutrients from fertilizers, household pets, and construction site erosion. Thus development results in more sources of nonpoint pollution, more surface runoff to carry those pollutants to waterbodies, and less removal of those pollutants through infiltration.

The erosive action of the increased runoff also degrades water quality. Sediment eroded from construction sites and stream channels increases the suspended solids and turbidity in streams. Nutrients that were once tightly bound to soil particles become biologically available when washed off into waterbodies. This release of soil nutrients results in increased aquatic plant and algal growth in wetlands and lakes, particularly in Lake Sammamish, the receiving water for all of this basin's streams. The sediment also

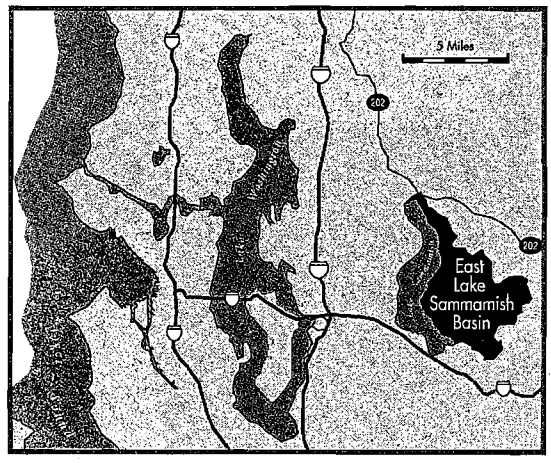
settles in low-gradient areas throughout the basin, degrading salmon spawning habitat in streams and reducing habitat quality in wetlands and lakes.

1.2 PLAN RECOMMENDATIONS

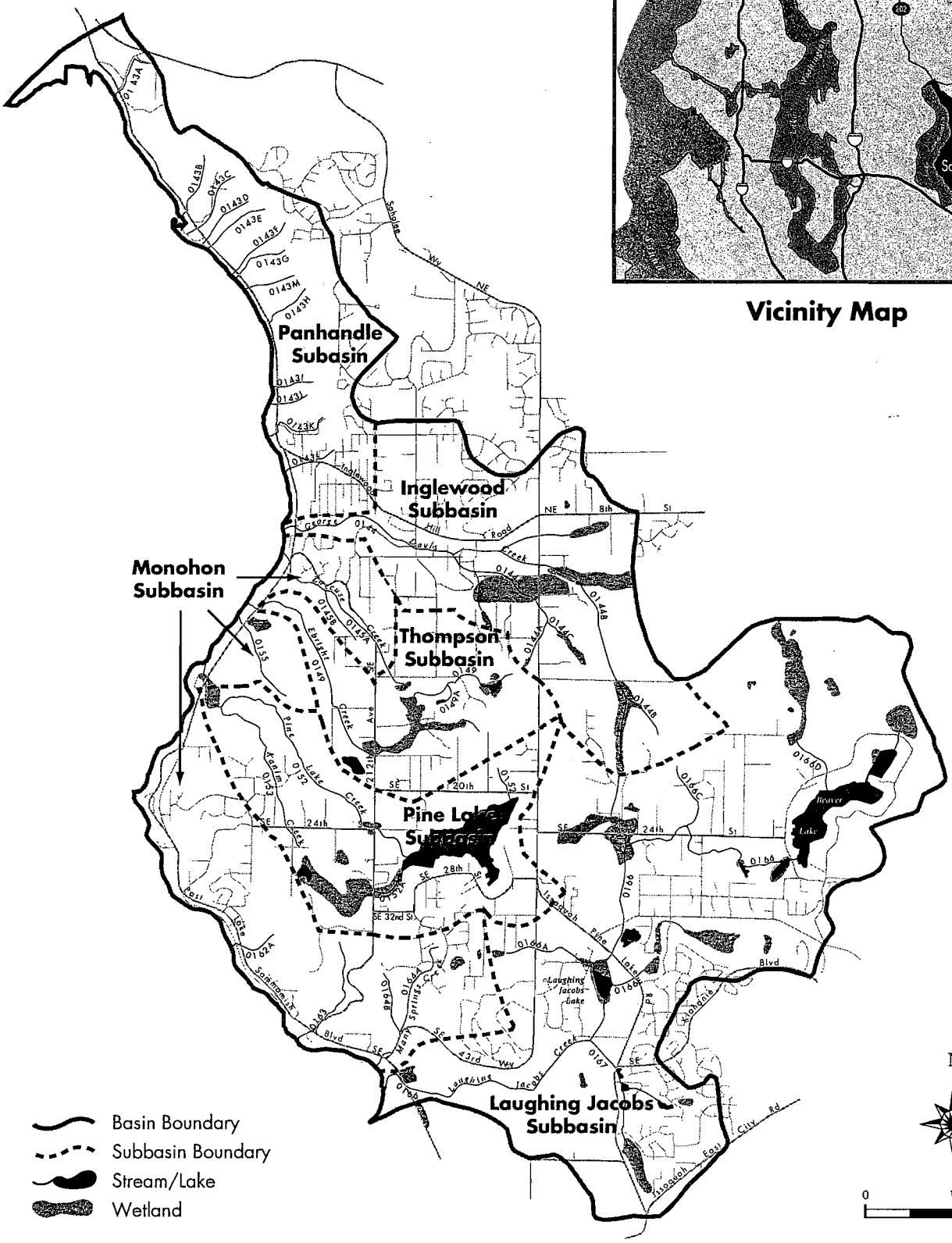
The management program outlined in this plan will substantially reduce the harmful effects of urban development on surface-water systems; however, it cannot entirely maintain the current quality of surface-water resources in this basin nor restore all of the historic functions of the watershed. With the recommended management program, increases in average peak flows are predicted to be up to 17 percent higher than 1989 levels at the outlets of the Inglewood, Thompson, and Pine Lake sub-basins. At the outlet of the sub-basin with the largest changes in land use, Laughing Jacobs, future peak flows will be between about 30 and 40 percent (29 to 38 cubic feet per second) higher than 1989 flows. The recommendations for flow control and channel stabilization should substantially reduce, but not eliminate, channel instability, erosion, and habitat damage in the western portion of the basin. In addition, if unprecedented care is taken in implementing water quality best management practices (BMPs), the contribution of the basin to phosphorus loading in Lake Sammamish should not increase significantly. These predicted changes will result in low-level degradation of the surface-water systems, but this plan seeks to limit the degradation so that no significant surface water-related public health and safety problems begin and the current uses of surface waters for recreation, fish and wildlife habitat, and aesthetic enjoyment are not lost.

1.3 SUMMARY OF CONDITIONS AND RECOMMENDATIONS (see following pages)

- Location maps of the basin and subbasin (**Figure 1**)
- Map of stream and wetland classification (**Figure 2**)
- Location and status of recommended Capital Improvement Projects (**Figure 3**)
- Subbasin maps of identified surface-water problems (**Figures 4a-f**)
- Map of development requirements by parcel (**Figure 5**)
- Distribution of salmonid species and habitat by tributary (**Table 1**)
- Index and priority of programmatic recommendations (**Table 2**)

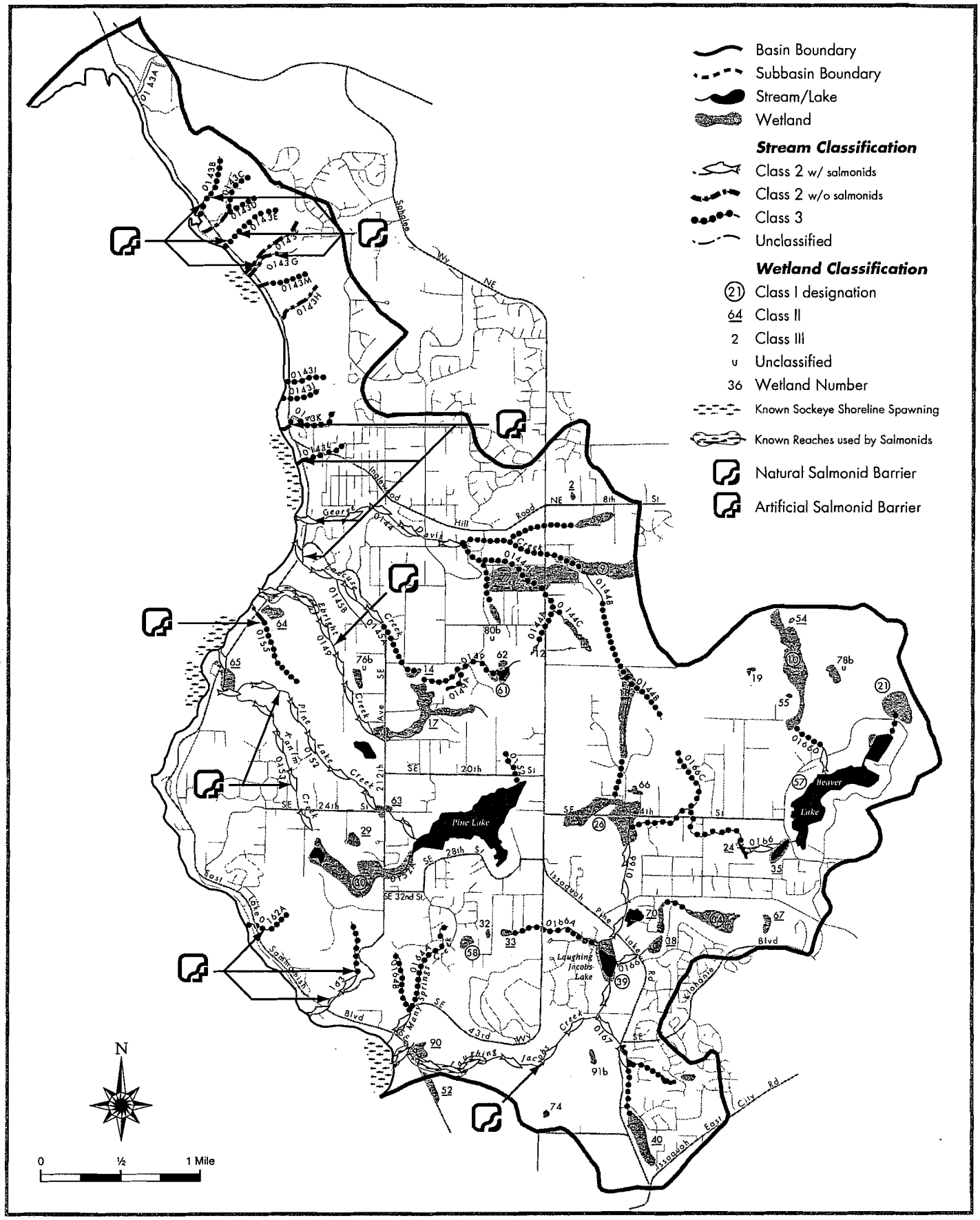


Vicinity Map



EAST LAKE SAMMAMISH BASIN

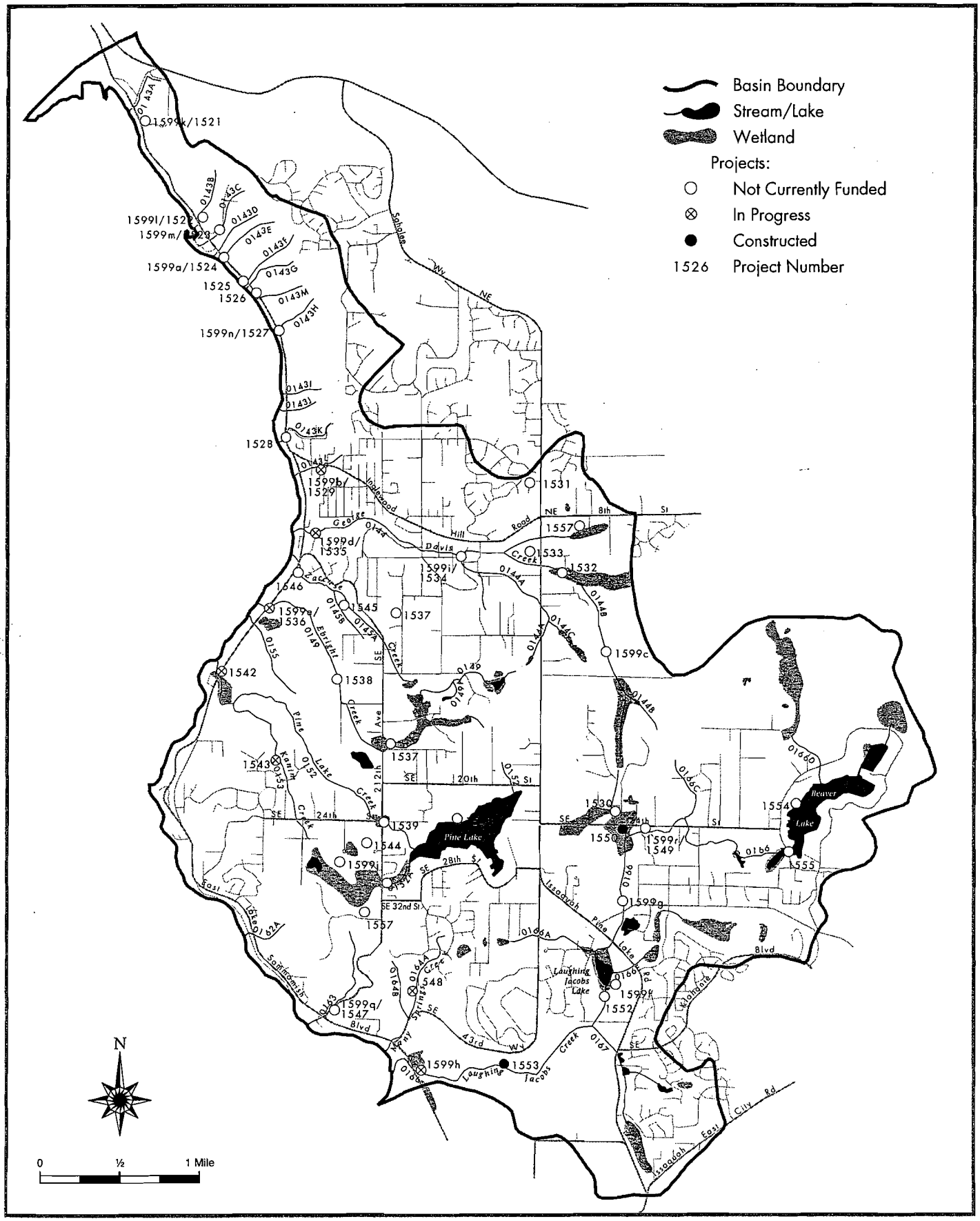
Figure 1



WETLAND & STREAM CLASSIFICATIONS & SALMONID DISTRIBUTION

East Lake Sammamish

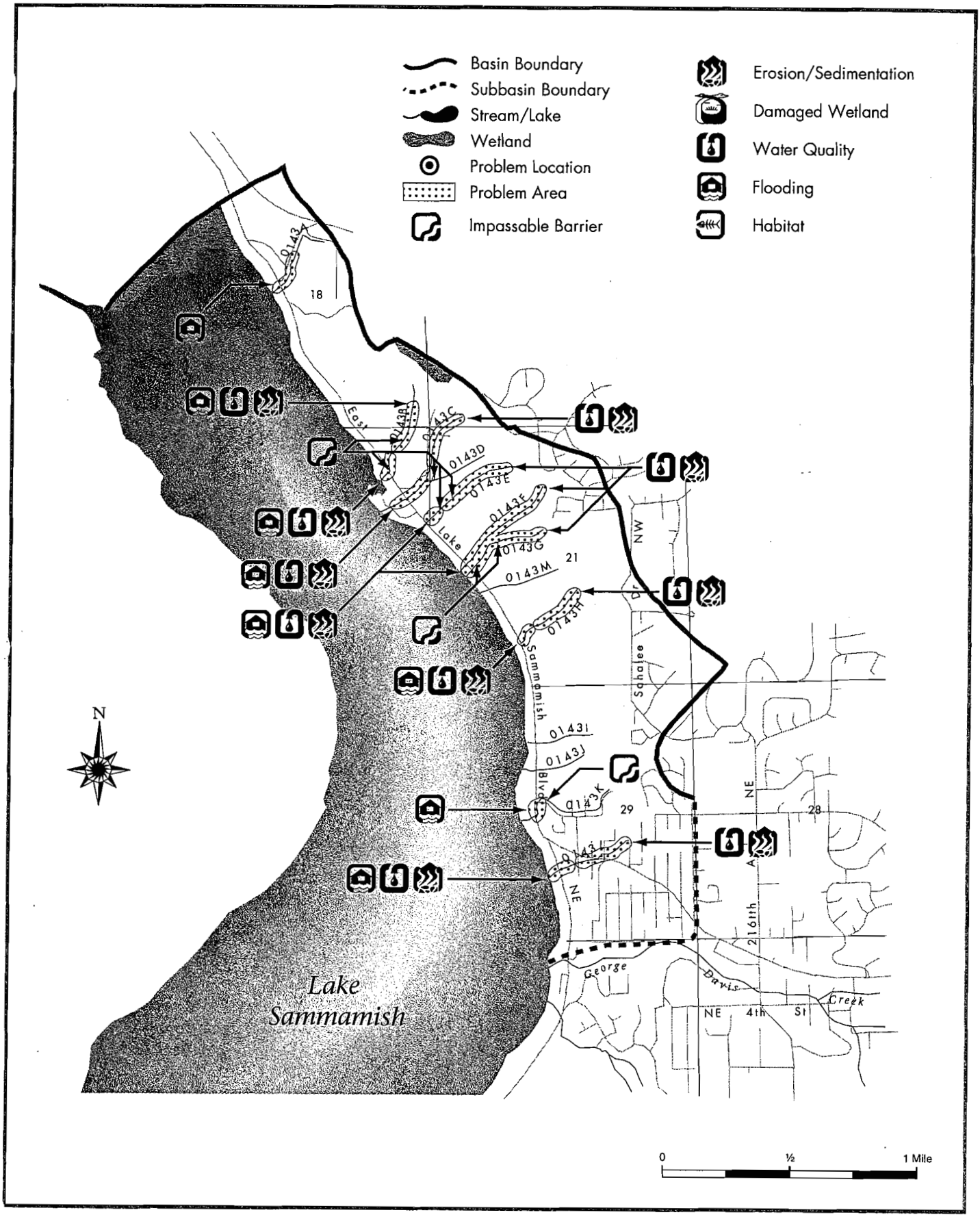
Figure 2



RECOMMENDED CAPITAL IMPROVEMENT PROJECTS

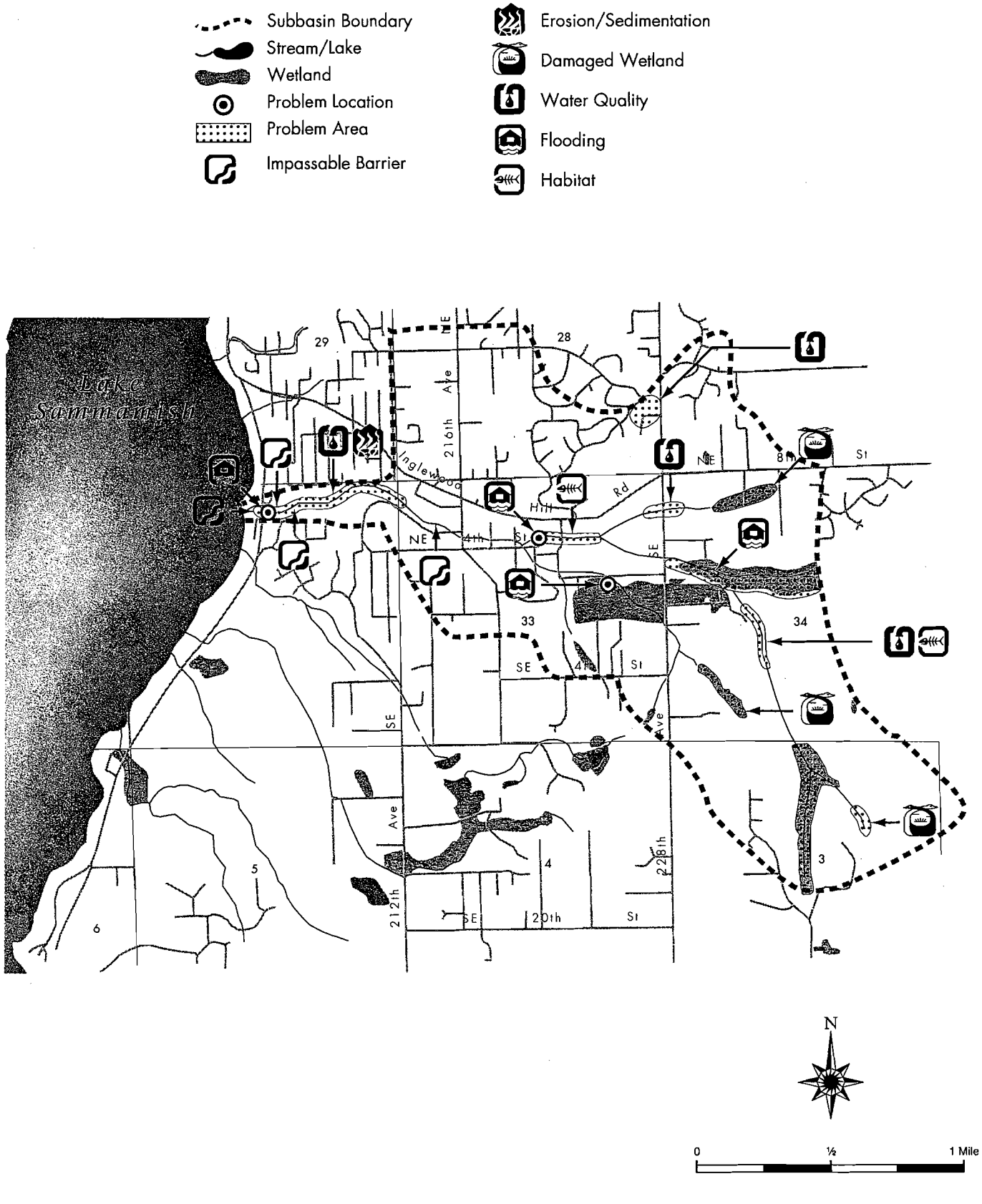
East Lake Sammamish

Figure 3



PANHANDLE SUBBASIN PROBLEM CONDITIONS
East Lake Sammamish

Figure 4a



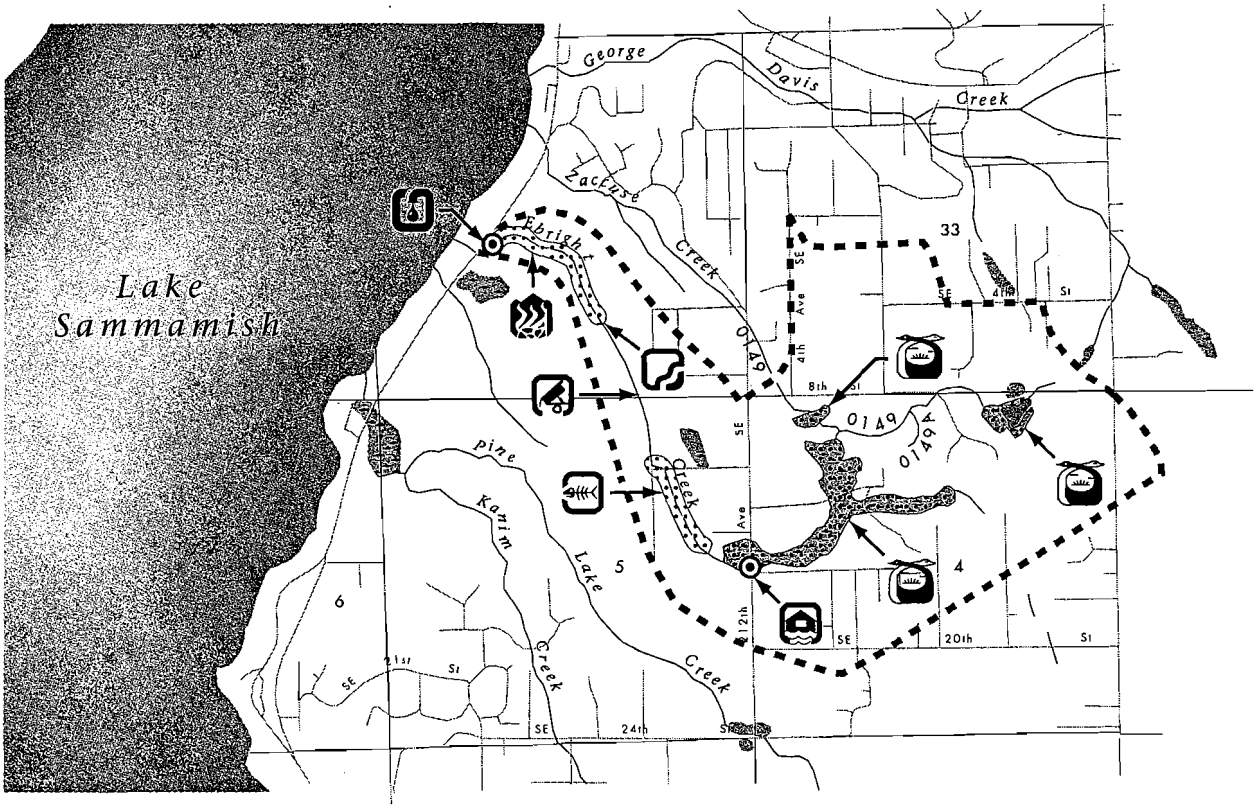
INGLEWOOD SUBBASIN PROBLEM CONDITIONS
East Lake Sammamish

Figure 4b

Subbasin Boundary
Stream/Lake
Wetland
Problem Location
Problem Area
Impassable Barrier

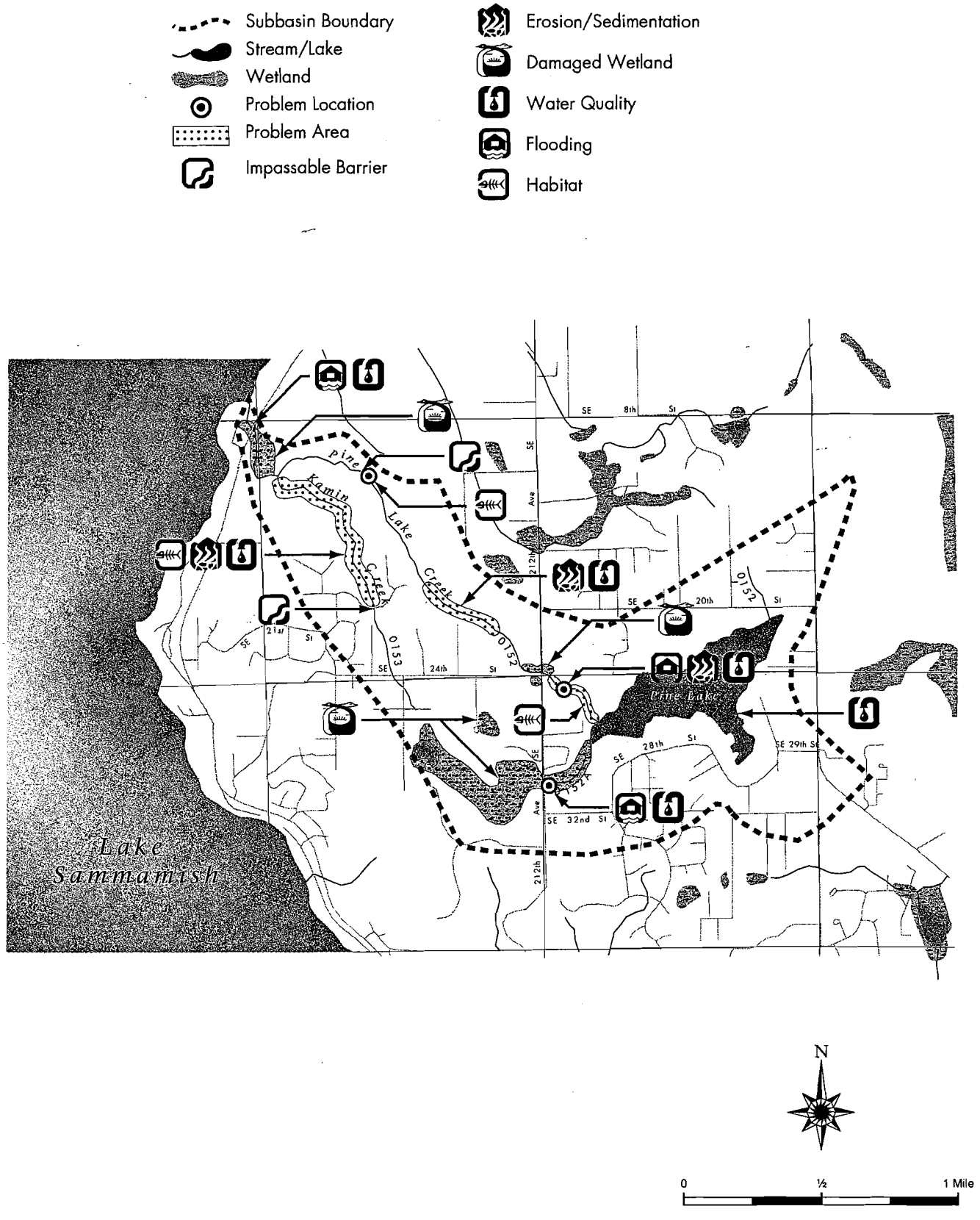
Erosion/Sedimentation
Damaged Wetland
Water Quality
Flooding
Habitat

Dumping



THOMPSON SUBBASIN PROBLEM CONDITIONS
East Lake Sammamish

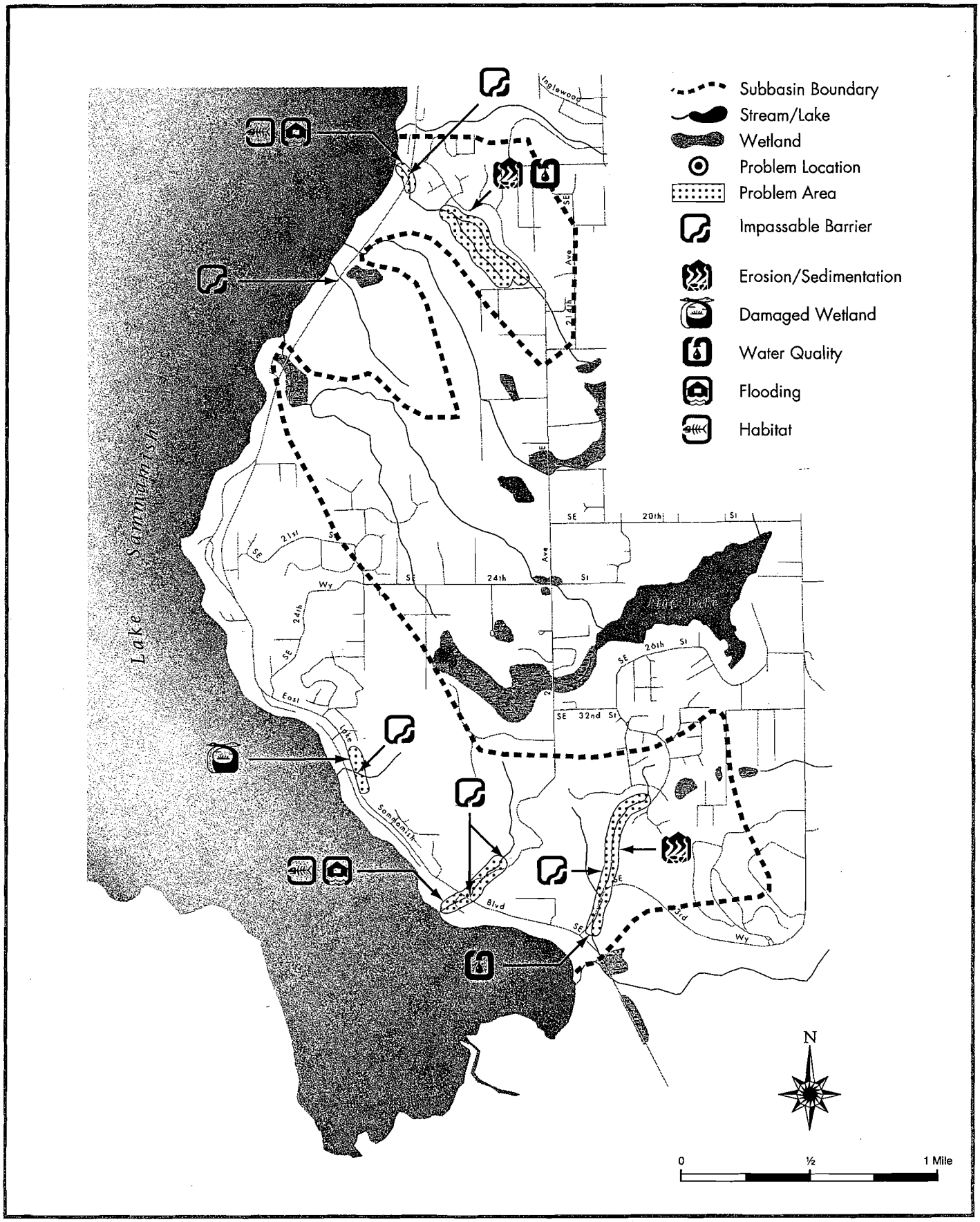
Figure 4c



PINE LAKE SUBBASIN PROBLEM CONDITIONS

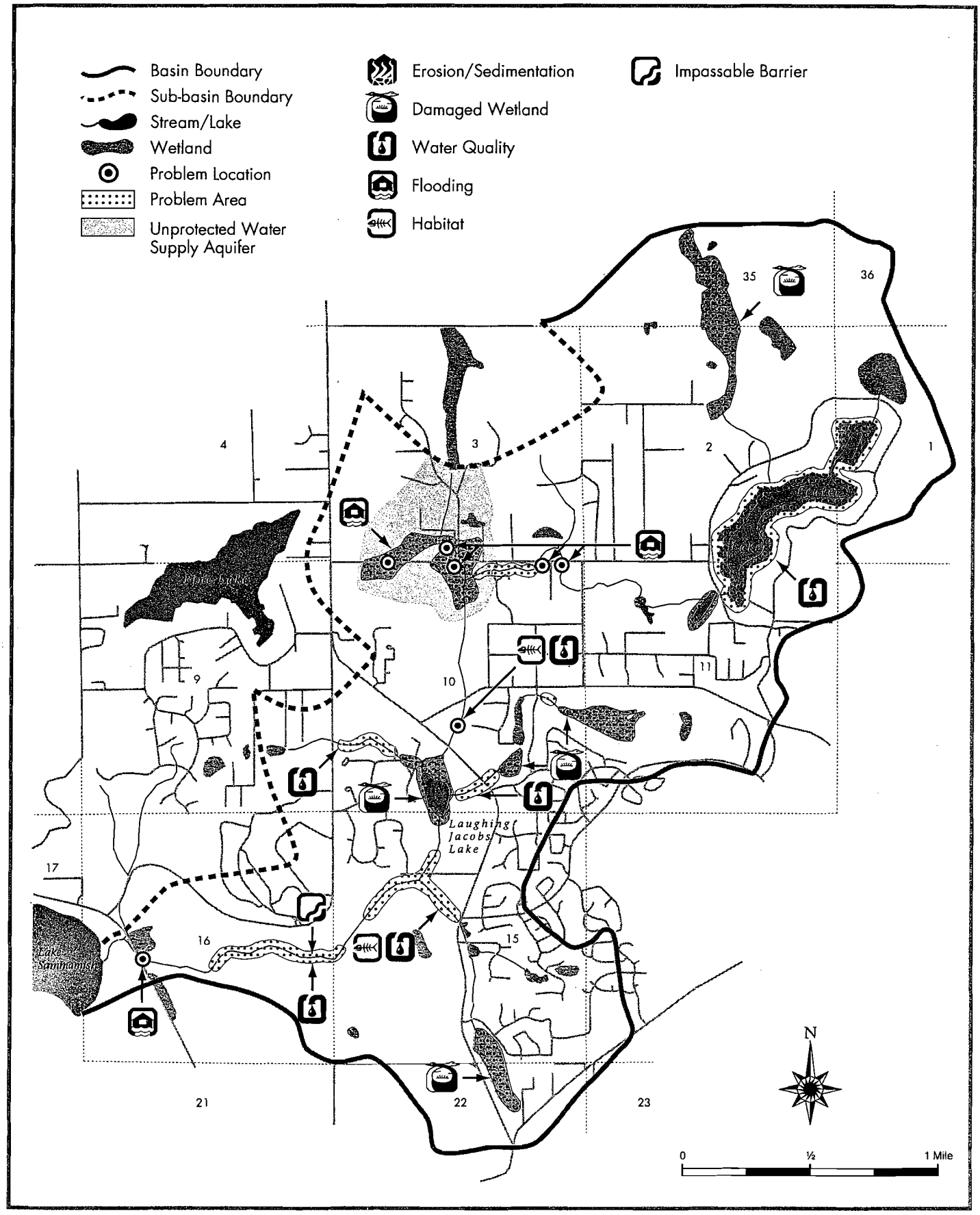
East Lake Sammamish

Figure 4d



MONOHON CREEK SUBBASIN PROBLEM CONDITIONS
East Lake Sammamish

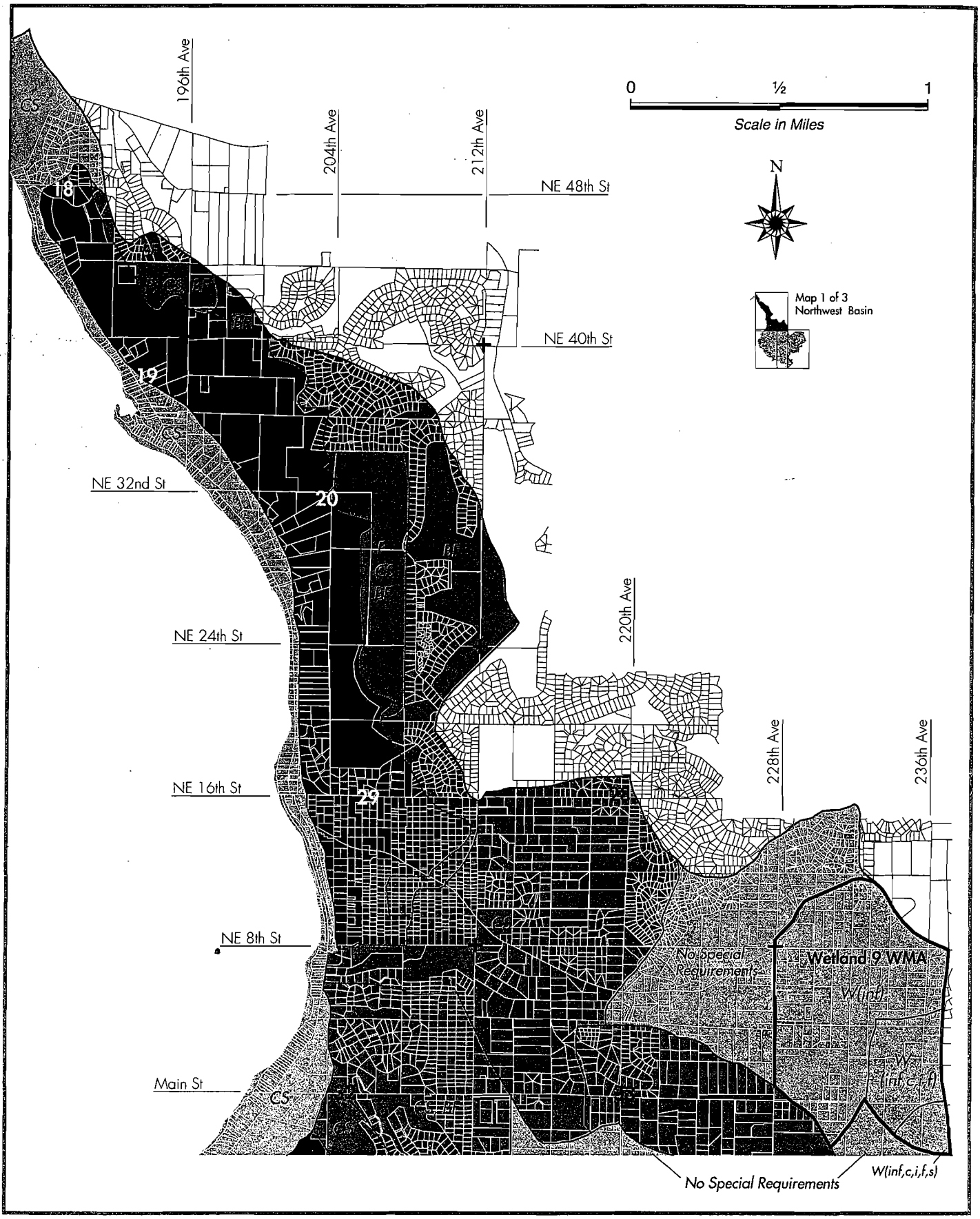
Figure 4e



LAUGHING JACOBS CREEK SUBBASIN PROBLEM CONDITIONS

East Lake Sammamish

Figure 4f



DEVELOPMENT CONDITIONS– NORTHWEST

East Lake Sammamish Basin

Figure 5a

Legend for Figure 5
Development Conditions Map

- No Disturbance Area (BW-3) (includes *CS* & *BF*)
- Stream Protection Detention Standard (BW-2)
- Conventional Detention Standard (BW-1)
- *CS* Culvert Sizing Criteria (BW-45)
- *BF* Baseflow Maintenance (PH-2 & MH-2)
- *P* Pipeline Drainage Area (BW-3) [* See note P 23 Para A. 5. for Areas South of Main St.]
- *RT* Restrict Ravine-Top Clearing and Grading (LJ-6)
- *LJ* Protect Floodplain (LJ-4) (to SE 42nd St.)
- *Ph* Control Phosphorus (see plan)

- —— Condition Area Boundary
- ▬ Wetland Management Area (WMA) & Condition Area Boundary

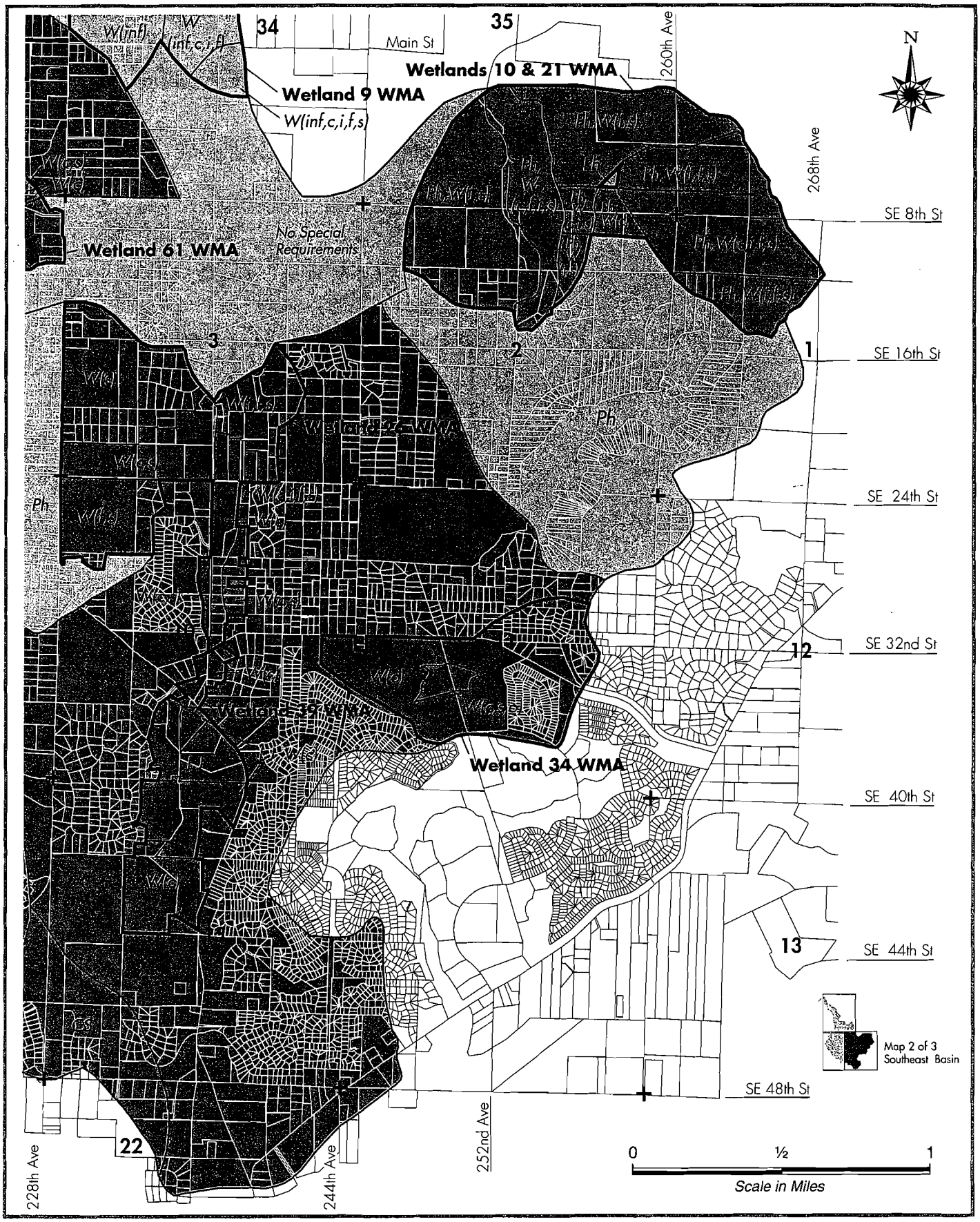
Wetland Management Area Conditions

- *W* Wetland Management Area (BW-5 plus site specific requirements)
- *f* Retain 50% Forest or Other Existing Vegetation
- *c* Cluster New Development
- *s* Require Dry Season Clearing and Grading
- *i* Limit Impervious to 8% Site Area
- *inf* Require Infiltration of Stormwater Runoff
- *o* Other

+ 21 Section Corner & Section Number

Sources: King County Digital Parcels Coverage, Nov, 1991
USGS 1:25000 Metric Series Topographic Maps
USGS 1:24000 Series Topographic Maps
USGS Digital Elevation Model
Thomas Brothers Street Atlas
Field Surveys 3/94—8/94

Date: November, 1994 FB



DEVELOPMENT CONDITIONS - SOUTHEAST

East Lake Sammamish Basin

Figure 5b

Legend for Figure 5
Development Conditions Map

- No Disturbance Area (BW-3) (includes CS & BF)
- Stream Protection Detention Standard (BW-2)
- Conventional Detention Standard (BW-1)
- *CS* Culvert Sizing Criteria (BW-45)
- *BF* Baseflow Maintenance (PH-2 & MH-2)
- *P* Pipeline Drainage Area (BW-3) (* See note P 23 Para A. 5. for Areas South of Main St.)
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- *o* Other

- **+21** Section Corner & Section Number

Sources: King County Digital Parcels Coverage, Nov, 1991
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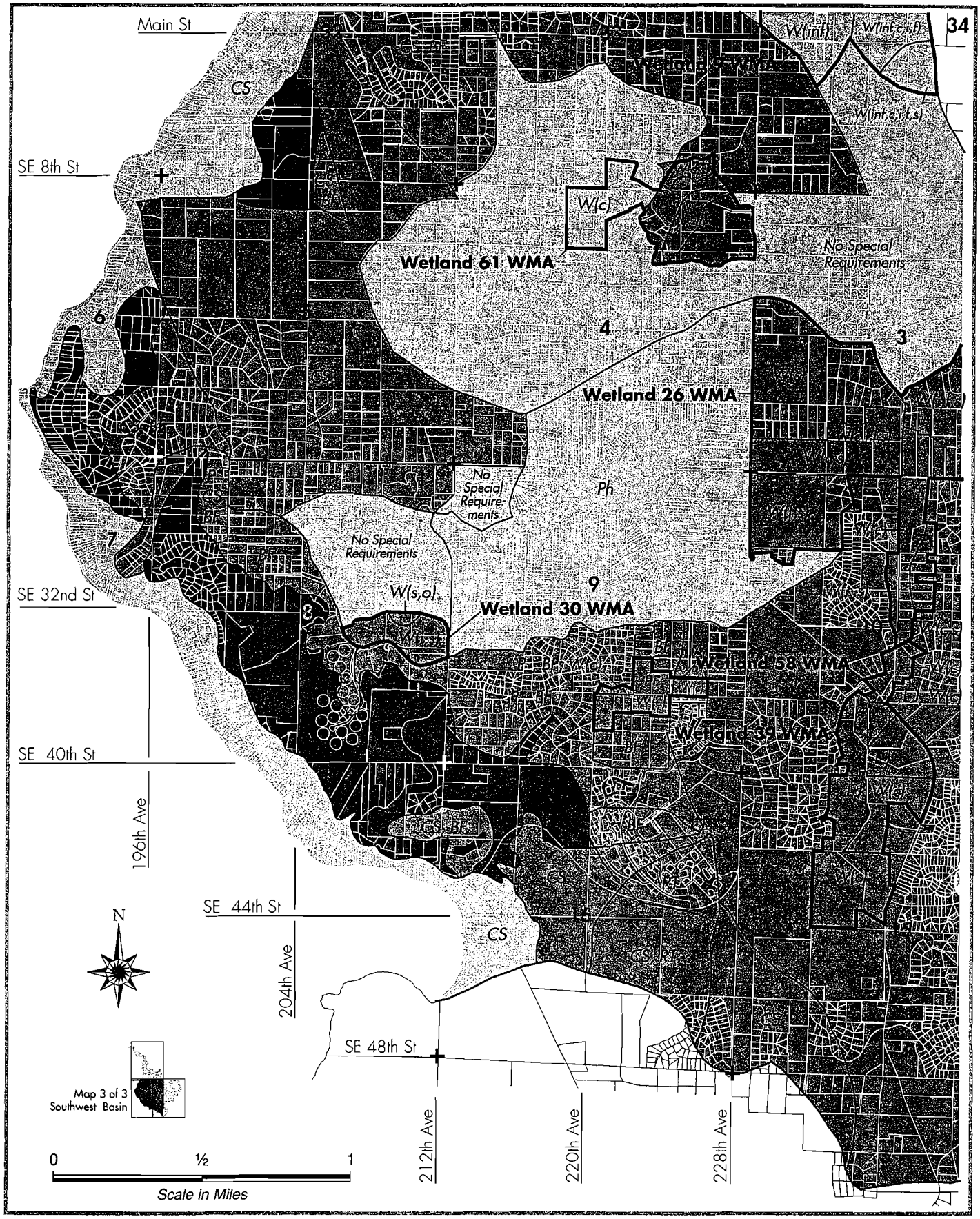

DEVELOPMENT CONDITIONS - SOUTHWEST

East Lake Sammamish Basin

Figure 5.5C

Legend for Figure 5
Development Conditions Map

- No Disturbance Area (BW-3)
  (includes *CS* & *BF*)
- Stream Protection Detention Standard (BW-2)
- Conventional Detention Standard (BW-1)
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- *W* Wetland Management Area
  (BW-5 plus site specific requirements)
- *f* Retain 50% Forest or Other Existing Vegetation
- *c* Cluster New Development
- *s* Require Dry Season Clearing and Grading
- *i* Limit Impervious to 8% Site Area
- *inf* Require Infiltration of Stormwater Runoff
- *o* Other

+ 21 Section Corner & Section Number

Sources: King County Digital Parcels Coverage, Nov, 1991
USGS 1:25000 Metric Series Topographic Maps
USGS 1:24000 Series Tapagraphic Maps
USGS Digital Elevation Model
Thomas Brothers Street Atlas
Field Surveys 3/94—8/94

Date: November, 1994 FB

TABLE 1

DISTRIBUTION OF SALMONID SPECIES AND HABITAT
(Table 11 of the Conditions Report, September 1990)

Stream	Length (miles)	Accessible Length[1]	Species[2]	Spawning/ Rearing[3]
0143A	0.43	0/N		
0143B	0.52	0/N		
0143C	0.46	0/N		
0143D	0.28	0/N		
0143E	0.30	0/N		
0144	3.46	0.40/RES	CO/CT/RB	R/RS/RS
0144A	0.98	RES	CT	RS
0144B	0.28	RES	CT	R
0144C	0.10	RES	CT	R
0144D	0.43	RES	CT	R
0145	0.23	RES	CT	RS
0145A	1.18	0.05/RES	CO/CT	R/RS
0149	2.65	0.45/RES	CO/KO/CT/RB	RS/S/RS/RS
0149A	0.20	0/N		
0149B	0.06	0/N		
0149C	0.11	0/N		
0150A	0.59	0/N		
0152	2.84	1.80/RES	CO/SE/CT/RB	RS/S/RS/RS
0152A	0.20	0/N		
0153	1.14	0.60/RES	CO/CT/RB	RS/RS/RS
0162A	0.28	0/N		
0163	0.70	0.10/RES	CO/CT/RB	R/RS/R
0164A	0.86	0.27/RES	CO/CT	R/RS
0164B	0.38	RES	CT	RS
0166	4.90	0.57/RES	CO/SE/KO/CT/RB	RS/S/S/RS/RS
0166A	0.53	RES	CT/RB	R/R
0166B	0.25	RES	CT	R
0166C	0.42	RES	CT	R

Stream	Length (miles)	Accessible Length[1]	Species[2]	Spawning/ Rearing[3]
0166D	0.40	RES	CT	R
0166E	0.70	RES	CT	R
0167	0.68	RES	CT	R
0167A	0.38	0/N		
TOTAL:	26.92	4.14		

[1] X.XX = accessible by anadromous fish to this river mile
0 = inaccessible to anadromous fish
X.XX/RES = resident fish above river mile
RES = resident fish only
N = no fish observed

[2] CO = coho; SE = sockeye; KO = kokanee; CT = cutthroat; BB = rainbow

[3] R = rearing; S = spawning

TABLE 2

INDEX AND PRIORITY OF REGULATORY AND PROGRAMMATIC RECOMMENDATIONS (see Chapter 2)

RECOM-MEND. NUMBER[1]	SEC-TION	DESCRIPTION	LEAD PARTY	PRIORITY[2]
BW-1	2.1.1	Onsite R/D: SCS 7-day storm	Development-Permit Applicant	
BW-2	2.1.2	Enhanced onsite R/D	Applicant	
BW-3	2.1.2	Ravine protection standard	Applicant	
BW-5	2.1.2	Wetland management areas	Applicant	
BW-9	2.2.1	WQ design standards	SWM	1a
BW-10	2.2.1	WQ facility retrofitting	SWM	1b
BW-11	2.2.1	WQ performance standards	SWM	1a
BW-12	2.2.2	Point source discharges	SWM	2
BW-13	2.2.3	Commercial BMPs	SWM	3
BW-14	2.2.2	WQ emergency response	SWM	2
BW-15	2.2.3	Underground storage tanks	SKCDPH	3
BW-16	2.2.1	Farm management BMPs	DDES	1b
BW-17	2.2.3	Onsite septic as-builts	SKCDPH	3
BW-18	2.2.3	Onsite septic maintenance	SKCDPH	3
BW-19	2.2.3	Boat-waste disposal	SKCDPH	3
BW-20	2.3.3	Marina recycling	WSPARC	3
BW-21	2.3.1	Watershed implementation	SWM	1b
BW-22	2.3.3	State/local data sharing	WSDA	3
BW-23	2.3.2	Kokanee recovery plan	WSDOW	2
BW-24	2.2.2	Shoreline protection	SWM	2
BW-25	2.2.2	Fish access; reconstruction	SWM	2
BW-26	2.1.1	Seasonal clearing & grading	Applicant	
BW-27	2.3.2	Forest practices MOU	KCED	2
BW-28	2.2.1	Building lot BMPs	DDES	1a
BW-29	2.3.2	Small farms BMP plans	KCD	2

RECOM-MEND. NUMBER[1]	SEC-TION	DESCRIPTION	LEAD PARTY	PRIORITY[2]
BW-30	2.2.2	Urban WQ measures	SWM	2
BW-31	2.2.3	Onsite septic education	SKCDPH	3
BW-32	2.3.3	Boater WQ education	WSPARC	3
BW-33	2.2.2	Sensitive Areas brochure	KCED	2
BW-34	2.2.1	Basin-regulations workshops	SWM	1b
BW-35	2.2.1	Basin steward	SWM	1a
BW-36	2.3.3	Animal waste composting	KCD	3
BW-37	2.3.3	Farms programs	KCD	3
BW-38	2.2.3	Waterside BMPs	SWM	3
BW-40	2.2.3	Failing onsite septics	SKCDPH	3
BW-41	2.2.2	R/D maintenance	SWM	2
BW-42	2.2.1	Road mainten. & vegetation control	Roads	1b
BW-44	2.2.3	Maintenance disposal station	SWM	3
BW-45	2.2.1	Culvert sizing criteria	SWM	1a
BW-46	2.3.2	Enforcement protocol	SWM	2
BW-47	2.2.2	SWM WQ enforcement	SWM	2
BW-49	2.2.3	Simplified violation reports	SWM	3
BW-50	2.3.1	Annexation agreements	PPR	1a
BW-51	2.2.1	Basin data base development	SWM	1b
BW-52	2.2.1	Annual report	SWM	1b
BW-53	2.2.1	Plan amendment	SWM	1b
BW-54	2.2.1	Flow, development monitoring	SWM	1b
BW-55	2.2.1	Channel monitoring	SWM	1b
BW-56	2.3.1	Aquatic habitat inventory	SWM	1b
BW-57	2.3.1	Aquatic habitat monitoring	SWM	1b
BW-58	2.3.1	WQ Inventory	SWM SKCDPH WSDOE	1b
BW-59	2.2.1	WQ monitoring	SWM SCKDPH	1b
PH-2	2.1.2	Baseflow maintenance	Applicant	

RECOM-MEND. NUMBER[1]	SEC-TION	DESCRIPTION	LEAD PARTY	PRIORITY[2]
PH-3	2.1.2	Reduced onsite R/D	Applicant	
I-2	2.1.2	Wetland protection (# 9)	Applicant	
I-3	2.2.2	WQ education, enhancement	SWM	2
T-2	2.1.2	Wetland protection (# 61)	Applicant	
T-3	2.2.3	Illegal fill in Wetland 17	DDES	3
PL-1	2.2.2	Wetlands 30 & 63 education	SWM	2
PL-2	2.1.2	Wetland protection (# 30)	Applicant	
PL-3	2.2.2	Pine Lake WQ education	SWM	2
MH-2	2.1.2	Baseflow maintenance	Applicant	
MH-3	2.1.2	Reduced onsite R/D	Applicant	
MH-5	2.1.2	Wetland protection (# 58)	Applicant	
LJ-2	2.2.3	Beaver Lake WQ	SWM	3
LJ-3	2.1.2	Wetland protection (#s 10,21,26,34,39)	Applicant	
LJ-4	2.1.2	Identify LJ Lake floodplain	Applicant	
LJ-5	2.3.3	WQ control, conference ctr.	SWM	3
LJ-6	2.1.2	Ravine clearing & drainage	Applicant	
LJ-7	2.2.1	Zoning, aquifer protection	PPR	1b
CP-58 & CP-59[3]	2.1.2	Pine Lake phosphorus control	Applicant	
BLMP[4]	2.1.2	Beaver L. phosphorus control	Applicant	

[1] Missing recommendation numbers reflect deletions during final plan development and adoption

[2] Priorities are defined as follows (see also discussion in Chapter 6): **1a**=offer significant means to achieve the major goals of the plan; **1b**=less effective in solving problems within the major themes but bolster the effectiveness of 1a solutions and prevent the plan from becoming obsolete; **2**=lesser improvement to problems within the major goals or a significant improvement to problems within the secondary goals; **3**=good management practices that would offer some improvement to surface waters in the basin.

[3] King County Council amendment numbers to the adopted East Sammamish Community Plan

[4] Beaver Lake Management Plan recommendation

CHAPTER 2
BASINWIDE AND AREA-SPECIFIC RECOMMENDATIONS

2.0 CONTENTS AND ORGANIZATION OF THIS CHAPTER

This chapter defines the regulatory and programmatic recommendations to surface water problems that apply in the East Lake Sammamish basin. In contrast to the Draft Basin Plan, these recommendations are here grouped by the party responsible for implementation. First are the regulatory requirements of individual development-permit applicants (Section 2.1); then follows programmatic recommendations that primarily or exclusively affect King County agencies (Section 2.2) and those involving non-County (or multiple) agencies (Section 2.3). Within each of the programmatic sections, the recommendations are grouped by priority categories. The rationale for these recommendations are outlined thematically in Section 2.4 and geographically in Chapter 5.

The special drainage requirements that apply in this basin result from both the *East Lake Sammamish Basin and Nonpoint Action Plan*, adopted by the King County Council on November 8, 1993, and the *East Sammamish Community Plan*, also adopted by the King Council on May 25, 1993. The Basin Plan was written and adopted as a statement of King County policy; its requirements are administered through "Special Requirement #4" of the *King County Surface Water Design Manual* (1990). The Community Plan was a policy statement but the adopted document also includes zoning changes that impose these drainage requirements through "P-suffix" conditions. Most of the special drainage requirements appear in both plans.

Two regulatory requirements apply throughout the basin (unless superseded by other area-specific requirements) and are listed first: BW-1, the Basinwide Onsite Detention Standard, and BW-26, Seasonal Clearing and Grading. Of course, all applicable drainage requirements of the *King County Surface Water Design Manual* apply in full to any development project in this basin, unless specifically superseded by the requirements here.

2.1 REGULATORY SOLUTIONS FOR DEVELOPMENT-PERMIT APPLICANTS

2.1.1 *Basinwide Requirements*

Except where superseded by alternative requirements specified for particular areas in Section 2.1.2 of this plan, the following two recommendations apply to all property in the East Lake Sammamish basin.

BW-1 **Basinwide Onsite Detention Standard**

To control downstream and downslope impacts of new development, including public and private streets and highways, onsite retention/detention (R/D) facilities in the East Lake Sammamish basin shall be designed to control the post-development 2- and 10-year flows to corresponding pre-development levels. The calculated storage volume shall be increased by a safety factor of 30 percent.

Either of two alternative techniques may be used. The first is a calibrated continuous flow hydrologic simulation model. The Hydrologic Simulation Program—Fortran (HSPF) model used for the analysis in this basin plan is an example of this type of model.

The second alternative uses a modified King County *Surface Water Design Manual (Design Manual)* method, replacing the Soil Conservation Service (SCS) Type Ia 24-hour rainfall distribution with a seven-day rainfall distribution and calculating separate times of concentration for surface and subsurface flow paths. The technical requirements of this method are available from either DDES or SWM.

BW-26 **Seasonal Clearing and Grading Limits**

The following recommendation should be implemented in the East Lake Sammamish Basin:

> During the period from October 1 to March 31, bare ground associated with clearing, grading, utility installation, building construction, and other development activity should be covered or revegetated in accordance with the *King County Surface Water Design Manual*. This limitation may be waived outside of designated Wetland Management Areas and the Pine Lake and Beaver Lake watersheds, however, if the property owner implements erosion control measures that meet the following conditions:
>
> 1. No significant silt-laden runoff leaves the construction site; and
>
> 2. The erosion and sediment control measures shown on an approved plan, or alternate best management practices as approved or required by the inspector or the Department of Development and Environmental Services (DDES), are installed and maintained throughout the course of construction.

Activities exempt from these requirements include routine maintenance of public facilities (including roads); public agency response to emergencies that threaten public health, safety, and welfare; typical landscaping of single-family residences; Class I and II forest practices; quarrying and mining within sites with approved permits; clearing and grading where there is 100 percent infiltration of surface water runoff within the site in approved and installed construction-related drainage facilities; and routine maintenance of utility structures as provided in K.C.C. 21.54.030.D.

2.1.2 *Area-Specific Requirements*

BW-2 **Stream Protection Onsite Detention Standard**

In subcatchments where higher future flows are expected to have significant adverse impacts on stream stability and habitat, onsite R/D facilities should be designed to reduce post-development flow durations to their pre-developed levels for all flows greater than 50 percent of the 2-year event and less than the 50-year event. Additionally, the 100-year post-development peak flow should be reduced to pre-development levels. *{Note: the*

boundaries of these areas correspond to the appropriate drainage divides of the indicated subcatchments.}

It is recommended that a calibrated continuous flow simulation model, such as HSPF, be used for this analysis. If a continuous model cannot be used, the method of the 1990 *King County Surface Water Design Manual* may be used with the 24-hour design event with the following release requirements:

Post-Development Storm Event	Pre-Development Flow-Release Target
2-year	½ of the pre-developed 2-year
10-year	pre-developed 2-year
100-year	pre-developed 10-year

This recommendation is implemented as an amendment to the *Design Manual.*

BW-3 **Ravine Protection Standard**

A. **Requirements.** The following requirements apply to the Panhandle subbasin, the Monohon subbasin, and any other areas tributary to a steep valley along the west slope of the East Lake Sammamish basin that does not (or did not, in its predevelopment state) maintain a continuous surface-water channel from the base of the west slope to the flat surface of the plateau *{basis for the mapped boundaries are described in section A.2 below}*. In these areas, new development shall be held to the following standards:

1. A no-disturbance area should be established on the western slope of the subbasin, to prevent damage from erosion in this extremely sensitive area. Land clearing or development should not occur in this no-disturbance zone, except that necessary clearing for, and construction of, single-family residences on pre-existing building lots. Any clearing that does occur, as a result of single-family residential construction on pre-existing lots, should be limited to the minimal area and duration of exposure necessary for construction.

2. The upslope boundary of this no-disturbance area lies at the first, obvious break in slope at the western edge of the upland plateau. The downslope boundary of this zone includes those areas designated as Erosion or Landslide Hazard Areas pursuant to the Sensitive Areas Ordinance. The Sensitive Areas Folio indicates the general location of these hazard areas but it cannot be used to specify the areas' precise boundaries. Instead, the Surface Water Management Division is directed to conduct field assessment and prepare parcel-specific maps of these boundaries following adoption of the Basin Plan. Single-family or multi family residential density from the no-disturbance area may be fully reallocated onto the buildable portion of the site, in accord with K.C.C.21.54.080, or possibly transferred to other sites pursuant to a transfer of density credits program.

3. The drainage requirements listed in paragraphs A.4-A.9 below may be waived only

for development proposals that meet any of the following criteria. These criteria substitute for the thresholds listed in section 1.1.1 of the 1990 *Surface Water Design Manual*:

a. Proposals that construct less than 2,000 square feet of impervious surface area. The applicable impervious area should exclude the area of driveways for single-family residential building permits and short plats.

b. Proposals of any size that achieve 100 percent infiltration, evapotranspiration, and/or consumption of surface runoff from impervious and disturbed surfaces.

4. All runoff from newly constructed impervious surfaces must be retained on-site to the maximum extent feasible, as determined by DDES, consistent with underlying zoning. *{Note: the current limitations on infiltration, stated in section 1.2.3 of the 1990 Design Manual, will be reevaluated in subsequent updates of the Design Manual. More permissive retention criteria will apply once adopted.}*

5. Runoff from all development proposals that involve the parcels identified as required Pipeline Areas in the Development Conditions maps of Chapter 1, except single-family building permits and those that achieve 100% on-site retention, must be conveyed down the western slope of the basin via continuous pipeline(s). Connection into one of these pipelines by subsequent downslope development projects is required, if determined feasible by DDES. *{Note: The SWM Division is preparing a recommendation for action by the Metropolitan King County Council that this requirement be altered or dropped on all pipeline areas south of Main Street. Until action is taken, however, this requirement remains in effect.}*

6. Before discharging into a natural stream or waterbody, runoff must receive water-quality treatment according to Core and Special Requirements in the King County *Surface Water Design Manual*, in order to meet the goals of the Lake Sammamish Water Quality Management Project which seek to maintain current phosphorus loading levels and to maintain groundwater recharge. Pretreatment of the Water-Quality Design Storm is required; it must be achieved by infiltration or other methods of on-site retention, if feasible and if permitted by drainage regulations. *{Note: currently, on-site retention is permitted only by infiltration into any of eight soil types listed in section 1.2.3 of the Design Manual.}* If on-site retention is not possible, alternative requirements include biofiltration (Core Requirement #3) and wetponds (for those projects meeting the threshold of Special Requirement #5) as specified by the *Design Manual*.

7. The discharge of the pipeline must be non-erosive, either into Lake Sammamish directly or to a open channel that is demonstrably stable from the point of discharge to the lakeshore. All outfalls must comply with existing Shoreline and wetland regulations; they must be designed and/or located to avoid disruption of shoreline spawning areas.

8. Pipeline installation should be above ground wherever feasible and **must** be above ground over all designated Erosion or Landslide Hazard Areas pursuant to King County's Sensitive Areas Ordinance. Pipeline routes down the west slope of the basin should avoid ravine valleys as much as possible.

9. Development projects in the Ravine Protection Area that cannot achieve 100% on-site stormwater retention and are not required to construct a new pipeline or connect to an existing one (under A.5 above) should provide on-site detention to the level of the Stream-Protection Standard (BW-2).

B. Relationship to Other Drainage Codes and Standards. The Ravine Protection Standard is intended to supplement existing County drainage requirements and to work in consort with other recommendations of the East Lake Sammamish Basin Plan. In particular:

1. Peak rate runoff control (Core Requirement #3 of the *Design Manual*) is unnecessary for piped discharges, unless the discharge point is **not** Lake Sammamish, a designated "receiving water." All facilities must convey the 100-year 24-hour design storm.

2. All required treatment (including those in Core Requirement #3 and Special Requirements #5 and #6 of the *Design Manual*) must occur prior to final discharge.

3. Discharge of runoff at the natural location (Core Requirement #1 of the *Design Manual*) can be waived without need for a SWM variance for pipelines constructed in order to satisfy this recommendation.

4. The threshold for imposition of these drainage controls is lowered from those of the *Design Manual* to include all projects with 2000 square feet or more of impervious surface (excluding the area of driveways for single-family residential building permits and short plats).

5. Baseflow Maintenance (recommendations PH-2 and MH-2 of the Basin Plan) requires evaluation of infiltrative soils and/or clearing restrictions in many of the same areas covered by the Ravine Protection Standard.

C. Administration. This standard is administered by DDES as an amendment to the *Design Manual*.

BW-5 Wetland Management Area Protection (Significant Resource Areas)

Beyond the limits of Sensitive Areas Ordinance buffers, certain slopes and corridors adjacent to number-1-rated wetlands, and certain areas tributary to those wetlands, should be maintained at low densities, have limited impervious area coverage, or a combination of these and other development conditions. The specific requirements are listed in this section, by subbasin, for each Wetland Management Area.

BW-45 Culvert Sizing Criteria

{Note: this recommendation is currently inactive. When the recommended study is complete, requirements will be adopted by Public Rule and added to the Design Manual.}

Once revised design criteria are developed by the SWM Division to determine the size

of culverts and bridges necessary to pass the flow of water plus sediment (see section 2.2.1), these criteria should be used for the design of all stream crossings in the following locations:

a. Panhandle Subbasin: all subcatchments;

b. Inglewood Subbasin: subcatchments I1 and I2;

c. Thompson Subbasin: subcatchment T1;

d. Pine Lake Subbasin: subcatchments P1, P2, and P3;

e. Monohon Subbasin: all subcatchments; and

f. Laughing Jacobs Subbasin: subcatchments L1, L1a, L2c, and L3.

{Note: the mapped boundaries of these areas in Chapter 1 correspond to the drainage divides of the listed subcatchments.}

PH-2
MH-2 **Baseflow Maintenance**

New development in the mapped areas should be required to evaluate the suitability of onsite soils for infiltration. *{Note: the boundaries of these areas correspond to the drainage divides of the Panhandle and Monohon subbasins.}* All runoff from newly constructed impervious surfaces must be retained on-site to the maximum extent feasible, consistent with underlying zoning. *{Note: the current limitations on infiltration, stated in section 1.2.3 of the 1990 Design Manual, will be reevaluated in subsequent updates of the Design Manual. More permissive retention criteria will apply once adopted.}* For the non-infiltrative parts of proposed subdivisions and short subdivisions, at least 25 percent of the land area should remain undisturbed and set aside in a Native Growth Protection Easement. For the non-infiltrative parts of all development applications, no more than 35 percent of the land area should be covered by impervious surfaces, exclusive of stormwater facilities. For new subdivisions and short subdivisions, the maximum lot coverage allowed by this requirement should be specified for subsequent residential building permits on individual lots.

PH-3
MH-3 **Reduced Onsite Detention**

Direct discharge of runoff into Lake Sammamish, *via* tightline or stable open channel, is an acceptable alternative to the recommended R/D standard for new development (the basinwide, BW-1; or stream protection, BW-2), if the discharge can be accomplished after appropriate biofiltration and other water-quality treatment.

HEADWATER WETLAND PROTECTION--SPECIFIC REQUIREMENTS

I-2 **Headwater Wetland Protection--Wetland 9**

Wetland Management Area protection (*see* BW-5) is recommended for Wetland 9, with standards recommended for the following three management areas.

a. Area A: Eastern Tributary Area *{all area tributary to wetland upstream of 0144}*

1. Cluster new development on no more than 50 percent of the total lot area to maximize available buffers and to limit disturbance to the ground surface.

2. For subdivisions and short subdivisions of SC-zoned properties *{equivalent to R-1 zoning after 1/95}*, impervious surface coverage, including buildings and roadways/driveways, should be limited to a maximum of eight percent of the total area being subdivided, including common open space. Retention/detention facilities and off-site roads are excluded from this limitation. This condition should be waived only where unusual site access conditions make achievement infeasible, as determined by DDES.

3. Retain at least 50 percent of new development sites in existing vegetative cover, preferably forest, and retain in a separate tract.

4. Using methods specified in the King County *Surface Water Design Manual*, require infiltration of all stormwater runoff up to and including the 25-year event.

b. Area B: Southeast Slopes *{slopes ≥ 15 percent within Area A}*

This area is contained within Area A. Therefore, with the exception of Requirement a.4 (which is infeasible here), all requirements for Area A apply. In addition, limit clearing and grading work to the period from May 1st through September 30th of each year. Also, the impervious-area restriction in a.2 above shall apply to the affected parts of the RS-7200-zoned parcels *{equivalent to R-6 or R-8 zoning after 1/95}* in this area.

c. Area C: Western Tributary Area *{area tributary to Wetland 9, 0144, or outlet to Wetland 59 upstream of 228th Avenue NE}*

Using methods specified in the King County *Surface Water Design Manual*, require infiltration of all stormwater runoff up to and including the 25-year event.

T-2 **Headwater Wetland Protection--Wetland 61**

Wetland Management Area protection (BW-5) is recommended for the Wetland 61 system, with standards recommended for three areas tributary to the wetland.

a. Area A: Tributary Area *{area tributary to wetland}*

Provide stream protection detention standard (BW-2) for all new development in this area.

b. Area B: Adjacent Slope Areas *{slopes ≥ 6 percent adjacent to wetland as indicated on map}*

1. On the moderate slopes to the southeast and northeast of the wetland, cluster new development on no more than 50 percent of the total lot area farthest from the wetland to maximize available buffers and to limit disturbance of the land surface.

2. Limit clearing and grading activity to the five-month period from May 1 to September 30 of each year.

c. Area C: West Corridor

Cluster new development away from the axis of the corridor that follows tributary 0149 westward from Wetland 61.

PL-2 **Headwater Wetland Protection--Wetland 30**

Wetland 30 should be provided with Wetland Management Area protection (BW-5). The following four management areas are outlined for this purpose.

a. Area A: Southern Tributary Sub-Area *{area tributary to south wetland edge west of 212th Avenue SE}*

1. For subdivisions and short subdivisions of SC-zoned properties *{equivalent to R-1 zoning after 1/95}*, impervious surface coverage, including buildings and roadways/driveways, should be limited to a maximum of eight percent of the total area being subdivided, including common open space. Retention/detention facilities and off-site roads are excluded from this limitation. This condition should be waived only where unusual site access conditions make achievement infeasible, as determined by DDES.

2. Apply the stream protection detention standard (BW-2) for all new development in the sub-area.

3. Limit clearing and grading activity to the five-month period from (and including) May 1st through September 30th.

b. Area B: Southern Wetland Area *{currently grazed part of Wetland 30 proper}*

Along the boundary of the wetland in this area, erect a fence to exclude grazing activity and replant the area with appropriate wetland species.

c. Area C: North Swale *{axis of valley extending northwest through Wetland 29 to SE 24th Street}*

1. Cluster new development on no more than 50 percent of the lot area to maximize buffers around Wetland 29 and 30 and away from the axis of the swale that connects them.

2. For subdivisions and short subdivisions of SC-zoned properties *{equivalent to R-1 zoning after 1/95}*, impervious surface coverage, including buildings and roadways/driveways, should be limited to a maximum of eight percent of the total area being subdivided, including common open space. Retention/detention facilities and off-site roads are excluded from this limitation. This condition should be waived only where unusual site access conditions make achievement infeasible, as determined by DDES.

3. Retain at least 50 percent of the land cover in forest or existing vegetation for all new development, and retain in a separate tract.

4. Provide stream protection detention standard (BW-2) for all new development in the sub-area.

MH-5 **Headwater Wetland Protection--Wetland 58**

Wetland 58 should be provided with Wetland Management Area protection (BW-5). The following two management areas are outlined for this purpose.

a. Area A: Tributary Area *{area tributary to wetland}*

Apply the stream protection detention standard (BW-2) for all new developments in this area.

b. Area B: Eastern Swale *{valley axis extending east through Wetlands 32 and 33}*

1. Require clustering of new development on no more than 50 percent of the total lot area to maximize buffers around Wetlands 58, 32, 33, and the axis of the swale that connects them, in order to maximize the buffers that protect these wetlands.

2. Apply the stream protection detention standard (BW-2) for all new developments in this area.

LJ-3 **Headwater Wetland Protection--Wetlands 10, 21, 26, 34, and 39**

Wetland protection measures should be applied to the following five wetlands.

- **Wetland 10 (Saddle Swamp)**

Wetland Management Area protection (BW-5) is recommended for Wetland 10. Specific management strategies for the three management areas are as follows.

a. Area A: Tributary area *{area tributary to wetland}*

1. For subdivisions and short subdivisions, impervious surface coverage, including buildings and roadways/driveways, should be limited to a maximum of eight percent of the total area being subdivided, including common open space. Retention/detention facilities and off-site roads are excluded from this limitation. This condition should be waived only where unusual site access conditions make achievement infeasible, as determined by DDES.

2. Limit clearing and grading activity in the tributary area to the five-month period from (and including) May 1st through September 30th.

b. Area B: East Corridor

In order to maintain corridor connections between Wetland 10 and Wetland 21 to the east, cluster new development away from the axis of the corridor (see "d" for Wetland 21, below).

c. Area C: Wetland Buffer

Beyond the SAO-mandated 100 foot buffer surrounding Wetland 10, maintain a low-impact zone of 200 feet *{300 feet total from wetland edge}*:

1. Within this zone, retain at least 50 percent of new development sites in existing vegetative cover, preferably forest, and retain in a separate tract.

2. Cluster structures and impervious areas on those portions of the lots farthest from the wetland and its buffer.

- **Wetland 21**

Wetland Management Area wetland protection (BW-5) is recommended in the following four management areas:

a. Area A: Tributary Area *{area tributary to wetland}*

1. For subdivisions and short subdivisions of AR-5 and SC-zoned properties *{equivalent to RA-5 and R-1 zoning after 1/95}*, impervious surface coverage, including buildings and roadways/driveways, should be limited to a maximum of eight percent of the total area being subdivided, including common open space. Retention/detention facilities and off-site roads are excluded from this limitation. This condition should be waived only where unusual site access conditions make achievement infeasible, as determined by DDES.

2. Retain at least 50 percent of new development sites in existing vegetative cover, preferably forest, and retain in a separate tract.

3. Apply the stream protection detention standard (BW-2) for all new development within the tributary area.

4. Limit clearing and grading activity in the tributary area to the five-month period from (and including) May 1st through September 30th.

b. Area B: East Swale *{axis of valley as mapped}*

In addition to the requirements for Area A, new development in the swale area should be clustered away from the axis of the swale to preserve the hydrologic function.

c. Area C: Northwest Swale *{axis of valley as mapped}*

In addition to the requirements for Area A, new development in the area of this swale should be clustered away from the axis of the swale to preserve the hydrologic function.

d. Area D: West Corridor

In order to maintain corridor connections between Wetland 10 and Wetland 21, cluster new development away from the axis of the corridor (see "b" for Wetland 10, above).

- **Wetland 26**

Wetland Management Area protection (BW-5) is provided for this wetland. These recommendations are specified for five management areas. The three distinct sub-areas together encompass almost the entire tributary area of the wetland:

a. Area A: Northeast Tributary Sub-Area *{area tributary to wetland lying north of SE 24th Street and east of 236th Avenue SE}*

1. For subdivisions and short subdivisions of SC-zoned properties *{equivalent to R-1 zoning after 1/95}*, impervious surface coverage, including buildings and roadways/driveways, should be limited to a maximum of eight percent of the total area being subdivided, including common open space. Retention/detention facilities and off-site roads are excluded from this limitation. This condition should be waived only where unusual site access conditions make achievement infeasible, as determined by DDES.

2. Retain at least 50 percent of new development sites in existing vegetative cover, preferably forest, and retain in a separate tract.

3. Apply the stream protection detention standard (BW-2) for all new development within the sub-area.

4. Limit clearing and grading activity in the sub-area to the five-month period from May 1st through September 30th.

b. Area B: Southwest Tributary Sub-area *{area tributary to western lobe of wetland lying south of SE 24th Street}*

1. Retain at least 50 percent of new development sites in existing vegetative cover, preferably forest, and retain in a separate tract.

2. Apply the stream protection detention standard (BW-2) for all new development within the sub-area.

3. Limit clearing and grading activity in the sub-area to the five-month period from May 1st through September 30th.

c. Area C: Northwest Tributary Sub-area *{area tributary to wetland lying north of SE 24th Street and not included in Area A, above}*

Limit clearing and grading activity in the sub-area to the five-month period from May 1st through September 30th.

d. Area D: North Corridor *{centered on tributary 0144 to edge of Wetland 18}*

In order to maintain corridor connections to the north of Wetland 26, cluster new development away from the axis of the corridor.

e. Area E: South Corridor *{centered on tributary 0166 south to Wetland 39}*

In order to maintain corridor connections to the south of Wetland 26, cluster new development away from the axis of the corridor (see "a.1" for Wetland 39, below).

- **Wetland 34 (Queen's Bog)**

Much development already surrounds this wetland and precludes various measures applied to other systems. Nevertheless, Wetland Management Area protection should be applied to the following three management areas of this wetland:

a. Area A: East Tributary Area *{area tributary to eastern boundary of wetland}*

Given the existing zoning for this sub-area, future development should adhere to the following requirements:

1. Total effective impervious surface coverage in the sub-area should be minimized; roadway widths should be as narrow as allowed by the King County Road Engineer.

2. Retain as much forest or other existing cover as possible.

3. Apply the stream protection detention standard (BW-2) for all new development within the sub-area.

b. Area B: North and South Buffers

Maintain the currently preserved buffer strips north and south of the wetland in "Park/Open Space" zoning.

c. Area C: Eastern Swale *{valley axis of wetland east to 256th Avenue SE}*

This swale is wholly contained within Area A. In addition to the recommendations for

Area A, the following standards should apply in this area:

1. Cluster new development in the swale area away from the axis of the swale to preserve the hydrologic function.

2. Limit clearing and grading activity in the swale to the five-month period from May 1st through September 30th.

- **Wetland 39 (Laughing Jacob's Lake)**

Wetland Management Area protection (BW-5) is recommended for this wetland in two management areas. Recommended standards for this wetland are as follows:

a. Area A: Northern Corridor *{centered on tributary 0166 north to Wetland 26}*

1. In order to maintain corridor connections to the north of Wetland 39, cluster new development away from the axis of the corridor (see "e" for Wetland 26, above).

2. On the slopes *(with inclination ≥ 15 percent)* to the west of the corridor, limit clearing and grading activity to the five-month period from May 1st through September 30th.

b. Area B: Southern Corridor *{centered on tributary 0166 to confluence with 0167}*

In order to maintain corridor connections to the south of Wetland 39, cluster new development away from the axis of the corridor.

LJ-4 Protection of Laughing Jacobs Lake Floodplain

A floodplain analysis of Laughing Jacobs Lake and tributary 0166 between the lake and SE 42nd Street should be required by DDES whenever any development is proposed within 10 vertical feet of the ordinary high water mark, measured at the lake cross-section nearest to the development. The floodplain analysis should include the determination of a "Zero-rise floodway" for future conditions as defined by the King County Sensitive Areas Ordinance.

LJ-6 Ravine-Top Clearing and Drainage Standards *{areas tributary to Laughing Jacobs Creek via slopes ≥ 15 percent between RM 0.5 and RM 1.0}*

To reduce hillslope erosion and slope failures, runoff from new development or clearing on ravine-top lands that discharge into Laughing Jacobs Creek between RM 0.5 and 1.00 of that creek should be detained according to the standard (BW-1 or BW-2) that is recommended for the area and tightlined to the base of the ravine before it is discharged with adequate energy dissipation to the stream. This recommendation is administered by DDES as an amendment to the *Design Manual*.

CP-58

CP-59[1] **Pine Lake Phosphorus Control**

1. Clearing and grading shall be limited to the five month period from and including May 1 through September 30, except for those activities exempted under Chapter IV of the *East Sammamish Community Plan*. Deviations from these standards may be allowed as provided for in that same chapter.

2. SWM shall require all known, available and reasonable methods of prevention, control and treatment for phosphorus control for all new development in the area draining to Pine Lake. Unless it can be demonstrated that a method or combination of methods is effective to prevent, control and treat phosphorus, and is more feasible, the following shall be required until the *Drainage Manual* is revised to deal with phosphorus loading to small lakes, at which time the *Drainage Manual* requirements shall apply. If soils are suitable, SWM shall require infiltration to and including the 25-year event, for all new development. If soils are not suitable for infiltration, a grass-lined swale or constructed wetland shall be provided together with sand filtration.

BLMP[2] **Beaver Lake Phosphorus Control** ***(this requirement is currently inactive)***

Total phosphorus increases above background levels should be reduced by 80 percent through stormwater treatment and applied to all future development. All known and reasonable treatment for phosphorus control should be employed as the standard to achieve this goal.

{Note: The Metropolitan King County Council adopted an ordinance on October 3, 1994, authorizing the Surface Water Management Division to adopt the Beaver Lake Management Plan as an administrative rule. The Beaver Lake Management Plan contains the following recommendation for phosphorus removal (recommendation BL-2):

> *An 80-percent reduction of total phosphorus (above background levels) should be established as a stormwater treatment goal for all future development. AKART or "all known, available, and reasonable methods of prevention, control, and treatment" for phosphorus control should be employed as the standard to achieve this goal.*

The anticipated adoption of this administrative rule is January 1995.}

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[1]Amendments 58 and 59 of the adopted East Sammamish Community Plan

[2]Beaver Lake Management Plan

2.2 PROGRAMMATIC RECOMMENDATIONS (KING COUNTY)

2.2.1 *Highest Priority*

BW-9 Water-Quality Design Standards

Based on the outcome or preliminary results from the Lake Sammamish Water Quality Management test projects, SWM Division BMP monitoring, the *Design Manual* Update, and the results of the evaluation of sediment decant disposal studies, additional water-quality facility/treatment requirements should be developed for this basin by the SWM Division. In the interim, the *Design Manual* Special Requirement 5 should be amended to allow the use of the most effective combination of the following water-quality methods: soil infiltration basins, wet R/D ponds, constructed wetland treatment, biofilters, alum treatment of stormwater ponds, and dry ponds with biofilters. All methods should be consistent with existing federal, state, and local water-quality requirements. Implementation costs are covered by existing County programs.

BW-10 Water-Quality Facility Retrofitting

The SWM Division should perform a survey of existing detention and water-quality facilities to evaluate their potential for cost-effective retrofitting to reduce phosphorus and other pollutants. The survey should include a review of any existing water quality and quantity data, a site visit, and a hydraulic review of the facility. After identification of facilities which could be retrofitted, a capital improvement program should be established to perform these retrofits, focusing on small (less than $50,000) projects. Implementation costs are covered by existing County programs.

BW-11 WQ Performance Standards

As part of the *Manual* Update Project and the Lake Sammamish Water Quality Project, the SWM Division should develop appropriate water-quality performance goals or standards from the East Lake Sammamish basin and other basins that drain to Lake Sammamish. These goals or standards should address phosphorus loading during construction and in the post-development phase. Performance data from ongoing water-quality demonstration projects should be used to develop these goals or standards. Implementation costs are covered by existing County programs.

BW-16 Farm Management

Best management practices (BMP's) for management of existing livestock should be adopted as part of the King County Zoning Code Update or as Sensitive Areas Ordinance rules. The updated code or rules should use design standards and/or conservation plans by the King Conservation District to limit livestock access to streams, wetlands, and their associated buffers, and should include measures to provide good management of pastures, manure, water, and soils. Implementation costs are covered by existing County programs.

BW-28 Building Lot BMP's

To reduce erosion and phosphorus transport from individual building lots, King County DDES should:

a. Allow only ten percent of the building lots in new residential subdivisions to be cleared at the time of road and utility installation. Other lots should not be cleared until after building permits are issued. DDES should consider this standard during their development of a countywide clearing ordinance.

b. Require that at least minimal landscaping (e.g. hydroseeding, sodding) be installed upon completion of the construction of a single-family home and prior to occupancy. DDES should include this standard as part of the Zoning Code Update.

c. Identify, in cooperation with the SWM Division, a procedure for systematically applying and enforcing erosion-control BMP requirements for individual building lots. In developing this procedure, the divisions should consider the distribution of BMP information with approved building permits and training for inspectors.

Implementation costs within the basin are estimated to be under $100/year.

BW-34 Basin Requirements

The SWM Division should conduct workshops with contractors, developers, basin residents, and County staff to provide education about adopted basin plan requirements. Implementation costs are included in other plan recommendations.

BW-35 Basin Steward

The King County SWM Division should hire a basin steward, in addition to the two already working in other basins, to lead the implementation of the East Lake Sammamish basin management program. The basin steward will:

a. Work with community groups, schools, and agencies to educate the basin residents about how their actions affect water quality and stream and wetland resources;

b. Communicate citizen reports of code violations to appropriate enforcement officials;

c. Facilitate the negotiation and installation of aquatic improvement projects;

d. Assist citizen-based water-quality and aquatic-resource protection and monitoring efforts;

e. Assist in field data collection in the basin;

f. Facilitate interdepartmental communication regarding implementation of the plan, including providing information to implementing agencies regarding plan requirements; and

g. Prepare an annual status report describing the condition of the basin and management program accomplishments (*see also* BW-52).

Implementation costs are covered by existing County programs.

BW-42 Road and Utility Right-of-Way Maintenance and Vegetation Control

The goal in road and utility rights-of-way maintenance is to reduce the impact of pollutant laden runoff on the natural and constructed drainage system in order to promote the restoration, preservation, and enhancement of natural resources and habitat. The Roads and Surface Water Management Divisions of the King County Department of Public Works will continue working together on an ongoing basis to develop programs to reduce adverse impacts of runoff from roads. Such programs will emphasize education and involvement of the general public and persons responsible for road and right-of-way maintenance in road rights-of-way, prioritization of types and timing of maintenance practices used in environmentally sensitive areas, and the implementation of source and treatment-control BMP's as needed for water-quality and quantity control. Implementation costs within the basin are estimated to be $400/year.

BW-45 Culvert Sizing Criteria

The King County SWM Division should develop design criteria to determine the size of culverts and bridges necessary to pass the flow of water plus sediment for streams where there is a significant risk of culvert overtopping due to clogging by sediment. These criteria should be published as a revision to the *King County Surface Water Design Manual* and considered for adoption as revisions to the *King County Road Standards*. The locations where such criteria would be applied in this basin are indicated on the map of development conditions in Chapter 1 and described in greater detail in Section 2.1.1 of this chapter. Estimated implementation cost: $10,000.

BW-51 Data Base Management and Update

A basin-specific data base that includes data collected during plan development and basin monitoring as well as the recommendations that apply to various subbasins, should be developed by the SWM Division. The data base should be updated at least annually or after a plan amendment. The data base should be computerized, geographically based, consistent with DOE and PSWQA data base requirements, and readily available to interested agencies. Estimated implementation cost: $1,400/year.

BW-52 Annual Report

An annual report should be prepared by the basin steward (BW-35) at the end of each water year for input to the SWM Division budget process in the upcoming year. The report should perform the following functions:

a. Describe the status of, and schedule for, plan implementation;

b. Interpret monitoring results and significant unpredicted changes in the condition of the basin;

c. Recommend adjustments to management of the basin based on identified significant changes; and

d. Identify appropriate processes for basin management program changes, such as basin plan amendments, capital project list changes, added costs, and staffing changes.

Implementation costs are included in other plan recommendations.

BW-53 Plan Amendment

Some significant physical or regulatory changes in the basin may require changes in basin plan recommendations or development of new data. Major adjustments or reevaluations, called basin plan amendments, should be considered and reflected in the SWM Division work programs when the annual report identifies the need for significant new analyses that would delay other scheduled basin plan activities by three or more months. Examples of actions that could trigger a plan amendment include:

a. Identification of significant unanticipated threats to public health and safety or to beneficial uses of the basin in the annual report or at any time during the year; and

b. The annual report recommends changes in the original basin plan recommendations that require Council approval.

BW-54 Flow and Development Monitoring

To identify whether flows are increasing in the manner predicted by hydrologic modeling, the SWM Division should maintain two continuous recording gages near the mouths of Pine Lake and Laughing Jacobs Creek for a period of at least five years from the date of plan adoption. An assessment of the flows in relation to land cover will be conducted using the HSPF model at the end of the five years. The Washington State Parks and Recreation Commission should continue to allow operation of the Laughing Jacobs flow gage in Lake Sammamish State Park. Estimated implementation cost: $7,200/year.

BW-55 Channel Monitoring

Ongoing monitoring of stream channels and sediment transport in the basin is not recommended. However, channel conditions in several tributaries should be reevaluated by the SWM Division and other interested agencies in the future for significant changes relative to the data first collected for the basin plan. Based on the magnitude of potential future land-use changes, availability of gage data, and the relative significance of the stream system in the basins, Pine Lake Creek (tributary 0152) and Laughing Jacobs Creek (tributary 0166) are the

recommended channels for reevaluation. This should occur in 1995, to allow time for further basin development and partial implementation of the basin plan recommendations. This schedule would also allow opportunities for adjustment to the recommended management strategy. This reevaluation should accompany remodeling of the two subcatchments (BW-54). Implementation costs are covered by existing County programs.

BW-59 **Water-Quality Monitoring**

a. SWM Division. The SWM Division in cooperation with Metro should conduct the following water-quality monitoring programs:

1. An ongoing sediment sampling program to supplement the recommended water-quality monitoring should be performed at twelve sites throughout the basin (Figure 12 in the draft plan). Sampling will be performed annually during the dry season shortly after the previous wet season. Indicator variables will be selected from a subset appropriate to sediment sampling and the surrounding land use.

2. An ongoing baseflow and stormflow water-quality monitoring program should be designed to distinguish various nonpoint pollution sources using appropriate water-quality indicator variables (*e.g.*, pH, dissolved oxygen, temperature, bacteria, metals, nutrients, conductivity, suspended solids, oil/grease, *etc.*) depending on the surrounding land use. A subset of the twelve original sampling sites should be monitored twice during base flow and four times during stormflow events for five consecutive years after plan adoption.

3. The SWM Division Watershed Support Unit and Public Involvement Program in cooperation with Metro should develop a citizen program to monitor water quality and aquatic habitat in the basin and in other parts of the County. The guidelines of the Puget Sound Nonpoint Source Handbook should be considered when developing this program.

b. SKCDPH. As part of an existing monitoring program, the SKCDPH should unify ongoing field checks into one monitoring program including annual field review of alternative onsite systems, complaint investigations, repairs, operational checks, and building permit checks. The results of these field checks should be maintained in a data base.

Estimated implementation cost: $39,000/year.

LJ-7 **Aquifer Protection**

To protect shallow aquifers used for public water supply, the East Sammamish Community Plan should not establish high-density zoning, particularly commercial uses in the Wetland 26 Groundwater Concern Area. Implementation costs are covered by existing County programs.

2.2.2 *Medium Priority*

BW-12 **Stormwater Discharge from Point Sources**

The SWM Division and the Roads and Engineering Division should inventory and map the artificial (constructed) drainage network to trace sources of pollutants from developed areas to receiving waters. The major discharge points should be screened periodically during dry weather conditions for illicit, or non-stormwater, discharges, particularly in the Pine Lake and Inglewood commercial areas. Such discharges should be prohibited as required under the National Pollutant Discharge Elimination System (NPDES) program. Implementation costs are covered by existing County programs.

BW-14 **Water-Quality Emergency Response**

In coordination with Metro, DOE, and local hazardous waste plans, the SWM Division's Drainage Investigation and Regulation Unit should consider the acquisition of the necessary equipment and the training of staff to provide routine and on-call emergency response for water-quality testing, investigations, and small spill response. If such a program proves justified, emergency response personnel could be equipped to handle events such as small spills (typically 0-5 gallons) of motor oil, antifreeze, hydraulic fluid, brake fluid, paint and other materials that fall below the threshold for DOE response and present significant risks to beneficial uses in the basin. The response team could also perform clean-up and education functions. Implementation costs within the basin are estimated to be under $100/year.

BW-25 **Fish Access and Habitat Reconstruction**

Impassable artificial barriers on all historically used tributaries (especially George Davis, Ebright, and Zaccuse creeks) should be removed and accessibility to these streams restored (see Figure 9 in the draft plan). Where upstream accessibility is restored and conditions warrant, habitat should be restored for the use of all appropriate species. These measures should be implemented through public projects (including those implemented by the King County SWM and Roads Divisions) and as part of the mitigation required for private projects. Implementation costs are covered by existing County programs and other plan recommendations.

BW-30 **Urban Residents and Businesses**

1. In coordination with the existing programs of other organizations, the SWM Division should sponsor, and the basin steward should coordinate, the following education and involvement programs or activities:

a. Conduct half-day water-quality seminars for fifth and sixth graders at local elementary schools.

b. Conduct a survey of business owner and operator needs for water-quality enhancement. Upon identification of specific needs, the SWM Division should work with existing

commercial and business BMP programs in the area to facilitate the transfer of appropriate educational materials and resources.

c. Conduct at least one storm drain stenciling event.

d. Conduct at least one water-quality workshop that highlights the harmful effects of careless residential practices including the dumping of used motor oil and other waste into storm drains, over-application of fertilizers, misapplication of pesticides, and the improper disposal of household hazardous wastes. The workshop should foster community stewardship and include hands-on activities which demonstrate alternatives to hazardous chemical products such as garden improvement with organic fertilizers.

e. Conduct a wetland-naming project which includes identification of existing names and historical names, and that culminates in a naming ceremony and wetland signage. In addition, a voluntary program should be investigated to facilitate installation of signs by Lake Sammamish shoreline landowners to indicate areas of shoreline spawning.

2. The SWM Division, in conjunction with the University of Washington's Professional Engineering Practice Liaison, Metro, and other interested agencies, should develop and provide a training and certification program for developers, permit reviewers, contractors, and employees of businesses on water quality, environmental regulations, and methods to reduce surface water impacts. Training should be offered on an annual basis and refresher training required every two years.

3. The SWM Division should coordinate with the King County Solid Waste Division's Business Recycling Program (and other applicable Solid Waste Division recycling and disposal programs), SKCDPH, Metro, homeowners associations, and local businesses to disseminate information (including agency referral) regarding household hazardous waste; pet waste management; BMP's for waterside land owners; proper use of fertilizers, pesticides, and detergents; and business-specific BMP's including waste reduction, solid-waste recycling, and hazardous product alternatives. In addition, inform residents about proper handling and disposal of household hazardous waste by distributing information from the King County Solid Waste Division's Waste-Mobile, and by including such information in regular utility or hauler mailings and various Solid Waste Newsletter mailings. Estimated implementation cost: $15,000.

BW-33 **Sensitive Areas Brochure**

The King County Environmental Division should prepare a brochure that describes Sensitive Areas Ordinance requirements and tax relief programs. This brochure should be sent by the King County Assessor with property tax statements. Estimated implementation cost: $15,000.

BW-41 **R/D Maintenance**

To ensure proper water quality and quantity control, catch basins, onsite R/D facilities, and other drainage facilities in areas with active construction should be inspected by the SWM Division and the necessary maintenance performed by the developer at least twice a year, once

before fall and once during late winter/early spring. Implementation costs are covered by existing County programs.

BW-47 SWM Division Enforcement

The SWM Division should expand their responsibilities to include inspection and enforcement of water quality BMP requirements including erosion-control practices for new construction, clearing and grading requirements, and County-imposed water quantity and quality standards. The Division should coordinate with DDES enforcement staff to report and enforce violations of SAO requirements, clearing and grading requirements, and animal density limits. Implementation costs are covered by existing County programs.

I-3 Water-Quality Education and Enhancement

a. To reduce the levels of nutrients and fecal coliform bacteria in runoff from the portion of the Inglewood subbasin upstream of 228th Avenue NE, the SWM Division and KCD should use education programs and revegetation programs to encourage the restoration of streamside vegetation in pasture areas.

b. Tenants of commercial properties should be educated about BMP's for handling materials, drainage system maintenance, and spill response techniques. An inventory of potential illicit hook-ups in the commercial center also should be conducted in conjunction with the NPDES inventory (*see* Recommendation BW-12). Implementation costs are covered by existing County programs plus an additional $1,000/year.

PL-1 Wetland Degradation

Both Wetlands 30 and 63 have been severely impacted by human intrusion. Both wetlands are bisected by roads and receive road runoff and trash. As part of a basin-wide education program, the SWM Division should provide residents with the opportunity to learn about wetlands; their functions and the roles they play in flood control, water quality, and wildlife habitat. A neighborhood adopt-a-wetland or stewardship program is recommended for this subbasin. Residents would serve as wetland caretakers, periodically collecting and removing roadside trash which accumulates seasonally and serving as conservators for the wetlands. Implementation costs are covered by existing County programs.

PL-3 Pine Lake Subbasin Water Quality

To reduce the harmful effects of historic rural and urban land uses in this subbasin, the following programs are recommended:

a. The SWM Division should conduct a water-quality workshop to inform Pine Lake lakeside and streamside residents about maintenance of septic systems, phosphate detergent alternatives, fertilizer and pesticide use and alternatives, oil and grease impacts, bird feeding, and the function of waterside vegetation.

b. Tenants of commercial properties should be educated on BMP's for handling materials, drainage system maintenance, and spill response techniques. An inventory of potential illicit hook-ups in the commercial center also should be conducted in conjunction with the NPDES inventory (*see* Recommendation BW-12). Monitoring of the effectiveness of water-quality facilities in the commercial center should also be conducted.

c. An operational tour of the commercial horse farm should be conducted by KCD staff and the SWM Division's Basin Steward to evaluate current land-use management practices and to make recommendations to the land owners. As part of this evaluation, a farm conservation plan should be developed with the KCD.

Estimated implementation cost: $4,000.

2.2.3 *Lowest Priority*

BW-13 **Commercial BMP's**

King County codes and regulations should be amended by the SWM Division to require businesses to comply with BMP's consistent with the County's plan to comply with NPDES requirements and the liquid storage, hazardous waste storage, fueling practices described in the proposed State Stormwater Manual. These BMP's should include such practices as installation of containment structures and prohibition of discharge to storm drains or to natural drainage systems of carwash effluent, compressor cooling water, roof-wash effluent, concrete truck rinse water, and cutting-slurry waste. Emergency spill response plans should be required of, and displayed at, all businesses that store, handle, or transport oil or hazardous and toxic substances. Implementation costs are covered by existing County programs.

BW-15 **Underground Storage Tank (UST) Management**

The SKCDPH, in cooperation with other King County departments and local governments, should develop a program and ordinances, as needed, to improve the management of UST's. The local program should:

a. Provide verification that the most important elements of the federal and state requirements are being met by tank owner/operators;

b. Ensure that home heating oil UST's are properly installed, maintained, and removed/abandoned upon conversion to another heat source; and

c. Educate citizens regarding home heating oil tank UST regulations.

Implementation costs within the basin are estimated at $600.

BW-17 **Onsite Septic System As-builts**

SKCDPH should amend KCC Title 13 to require that as-built sewage disposal system plans

and facility locations be recorded documents that accompany the title transfer of property. Implementation costs within the basin are estimated to be under $100.

BW-18 Onsite Septic System Maintenance

SKCDPH should evaluate the feasibility of amending Title 13 to require that proof of onsite septic system maintenance be sent to SKCDPH every three years. If it is determined that the above is feasible, residential units due for maintenance could be notified by the SKCDPH three months prior to the end of each three-year period. Implementation costs within the basin are estimated to be under $100.

BW-19 Boat-Waste Disposal

The SKCDPH should evaluate the need for sewage pumpout facilities and regulation of such facilities at new boat marinas. The SKCDPH should propose an ordinance to the King County Board of Health to implement such a program if it is found to be desirable. Implementation costs within the basin are estimated to be under $100.

BW-31 Onsite Septic Systems (Education)

The SKCDPH should enhance current education efforts so that they:

a. Reduce the potential for groundwater and surface water contamination by providing ongoing education regarding system siting, design, installation, operation, and maintenance for those who use or service onsite sewage disposal systems. Educational efforts should be particularly targeted to home buyers and residents of high-density neighborhoods and areas subject to groundwater contamination.

b. Work cooperatively with utilities to mail brochures on septic system maintenance to homeowners via utility bills and provide information on water-saving devices.

c. Increase clerical support staff for the purpose of verifying addresses to reduce return rates on the as-built drawings mailed to homeowners.

Estimated implementation cost: $15,000/year.

BW-38 Waterside BMP's

The SWM basin steward (*see* BW-35) should:

a. Improve implementation of lakeside BMP's by facilitating the creation of Lake Management Districts for Beaver and Pine Lakes by local community clubs (lake steward);

b. Provide residential revegetation incentives for property owners who develop drought-

tolerant native plant landscaping. This incentive could be in the form of a revegetation consultation from knowledgeable staff (lake and basin stewards); and

c. Create a program to recognize individuals and organizations that incorporate innovative water quality design features (basin stewards) into new or existing developments.

Estimated implementation cost: $500.

BW-40 **Onsite Septic Systems (Incentives)**

The SKCDPH should:

a. Explore incentives such as the State Revolving Fund as an additional funding source for system maintenance and repair of failing systems.

b. Inform individuals with failing septic systems that a housing rehabilitation loan program exists through the King County Planning and Community Development Division and that specific information on this program is available through the Housing Hotline.

Implementation costs within the basin are estimated to be under $100/year.

BW-44 **Waste Disposal**

The King County SWM and Roads and Engineering Divisions along with other affected parties (local jurisdictions and private vendors) should evaluate whether to build a permanent residual (sediment and decant) disposal site in or near the basin. The King County Solid Waste Division will continue to advise the SWM Division on issues related to planning, development, and implementation of such a facility. Estimated implementation cost: $10,000.

BW-49 **Violation Reporting**

The SWM Division should simplify the reporting of surface-water-related code violations by publishing in the blue pages of the telephone book a central telephone number for reporting surface water-related problems. Implementation costs within the basin are estimated to be under $100/year.

T-3 **Illegal Fill Abatement**

Illegal fills into Wetland 17 that have occurred since 1989 should be removed as part of an enforcement action by DDES and the areas restored to pre-fill slope and soil conditions. Native vegetation should then be planted to further rehabilitate the sites. No further filling or grading of any kind or volume should be allowed within the wetland and its buffer. Implementation costs are covered by existing County programs.

LJ-2 **Beaver Lake Water Quality**

{Note: The recently completed Beaver Lake Management Plan supercedes the specific recommendations that were made in earlier drafts of the East Lake Sammamish Basin Plan. Those earlier recommendations included the following:

a. *In cooperation with the SWM Division, DDES should develop and enforce sediment and erosion control requirements for single-family residential development in subcatchment L10 (see also BW-28).*

b. *The two agencies (the SWM Division and DDES) should develop a consistent shoreline regulations policy for this lake in compliance with the Sensitive Areas Ordinance except for the Beaver Lake Park shoreline. This area should remain rural in designation in order to implement the Council-adopted Master Plan for park development.*

c. *The SWM Division and SKCDPH should develop and conduct a nonpoint water-quality workshop to inform lakeside residents, lake users and commercial land users of their impacts on Beaver Lake and its subcatchment. Education program topics should include landscaping practices (fertilizer and pesticide use), septic system maintenance, sanitary sewer and storm drain hookups, and alternatives to the use of phosphate soaps and detergents.}*

2.3 PROGRAMMATIC RECOMMENDATIONS (NON-KING COUNTY AND MULTI-AGENCY)

2.3.1 *Highest Priority*

BW-21 **Watershed Implementation Committee (WIC)**

An interagency committee should be established to coordinate agency activities in implementing this plan. To ensure coordination with the management program for the entire Lake Sammamish Basin, the interagency committee should be an expanded subcommittee of the Lake Sammamish Project Management Committee (PMC). The expanded subcommittee would include current PMC members with interests in the basin -- Metro, the City of Issaquah, and the King County SWM Division -- as well as representatives of the other major implementing agencies including the Muckleshoot Tribe, Washington Department of Natural Resources (DNR), Washington State Parks Department, Washington State Department of Ecology, King Conservation District, King County DDES, King County Roads and Engineering Division, Seattle-King County Department of Public Health, and other affected parties. The committee should meet twice yearly and be staffed by the basin steward (BW-35). The steward, in conjunction with the WIC, should prepare annual reports and implementation schedule updates. The role of the PMC as the group that convenes the WIC will be reevaluated after three years. Estimated implementation cost: $6,000/year.

BW-50 **Jurisdictional Consistency**

If annexations or incorporations remove areas of the basin from King County's jurisdiction, an interlocal agreement (developed by the cities and the King County Department of Parks, Planning, and Resources and Department of Public Works) should be adopted to ensure that city basin management programs are consistent with, or more protective than, the management program recommended in this plan. King County should oppose annexations or incorporations that do not meet this standard. Implementation costs are covered by existing programs.

BW-56 **Aquatic Habitat Inventory**

The SWM Division should conduct a five-year biological survey program to identify remaining spawning areas for tributary sockeye, lake-spawning sockeye, and kokanee. This survey should identify use of tributaries, actual spawning sites within tributaries, and shoreline spawning locations for Lake Sammamish salmonids. Furthermore, population estimates, sex ratios, and age structure of the populations should be examined, and trophic relationships should be clarified. This project should be undertaken with the cooperation of the Departments of Wildlife and Fisheries, the U.S. Fish and Wildlife Service, Metro, and the Muckleshoot Tribe. Estimated implementation cost: $18,000.

BW-57 **Aquatic Habitat Monitoring**

The SWM Division, with cooperation of the Departments of Wildlife and Fisheries, the U.S. Fish and Wildlife Service, Metro, and the Muckleshoot Tribe, should undertake the following monitoring program:

a. Wetlands

1. Use existing inventory data and color and infrared aerial photographs to identify vegetation classes in East Lake Sammamish wetlands. Every two years, obtain similar photographs and evaluate all of the number-1-rated wetlands, three randomly selected number-2- and number-3-rated wetlands, and any wetlands determined to be at significant risk.

2. Place staff gages in all number-1-rated wetlands and other at-risk wetlands to evaluate water level changes every two years.

3. All number-1-rated and six randomly selected wetlands should be checked using King County methodology every two years for wetland class, vegetation, and fauna.

b. Streams

1. Annual spawner counts should be conducted for anadromous salmonids in accessible stream reaches and along shorelines.

2. Riparian zones should be monitored using aerial photographs every two years.

3. Habitat surveys should be conducted every three years in three randomly selected reaches of each fish-bearing stream.

4. Detailed habitat surveys should be conducted at established (permanent) sites for Laughing Jacobs, Ebright, and Pine Lake creeks each year to provide data on habitat trends.

Estimated implementation cost: $87,000/year.

BW-58 Water-Quality Inventory

a. SWM Division. The SWM Division should conduct an inventory of all commercial business sites to identify and correct illicit sanitary sewer and stormdrain hook-ups.

b. KCD. The KCD should conduct a systematic inventory of commercial and non-commercial farms to be used as a basis for instituting farm conservation plan requirements.

c. DOE. The Washington Department of Ecology should work with the SWM Division and SKCDPH to review monthly UST monitoring and inventory data collected in the East Lake Sammamish basin.

Estimated implementation cost: $39,000.

2.3.2 *Medium Priority*

BW-23 Kokanee Recovery Plan

A recovery plan for native Lake Sammamish kokanee should be developed by the Washington Department of Wildlife and the U.S. Fish and Wildlife Service, in coordination with the Muckleshoot Indian Tribe, the King County SWM and Environmental Divisions, and other appropriate agencies if federal, tribal, state, and local inventory data identify a need for such a plan (*See* also BW-56). Estimated implementation cost: $57,000.

BW-27 Forest Practices

A memorandum of understanding between King County (with the Environmental Division as the lead) and the DNR should be developed to identify those areas that are "likely to convert" and to allow direct County involvement in conversion applications. Implementation costs are covered by existing programs.

BW-29 Small Farms

The KCD should hire a full-time specialist ("conservation plan specialist") for three years to work cooperatively with owners of small farms to develop and implement conservation plans

in the East Lake Sammamish basin. The plans should recommend the establishment and maintenance of best management practices including ways to reduce pesticide and fertilizer use, proper manure storage and disposal, reseeding of denuded pastures, limiting pasture use during wet seasons, and limiting the number of animals per acre. Resources from the King County Cooperative Extension program should be used to the fullest extent possible. As part of this small farm program, the KCD should conduct evening or weekend workshops to address the water-quality concerns of owners of small farms. Implementation costs within the basin are estimated at $60,000.

BW-46 **Enforcement Protocol**

The King County SWM Division should initiate efforts to establish an enforcement protocol that is consistent with the goals and objectives of section 319 of the 1987 Clean Water Act. This protocol should identify a lead enforcement agency and the specific roles and responsibilities of Metro; the Department of Ecology; King County SWM and DDES; DNR; SKCDPH; and KCD in responding to spill reports, animal keeping-related pollution, forest practice violations, septic system failures, or other explicit water-quality violations. This process should update the current Interagency Water-Quality Trouble Call/Emergency Response Program that is coordinated by Metro. Implementation costs within the basin are estimated to be under $200.

2.3.3 *Lowest Priority*

BW-20 **Solid Waste Recycling**

Oil recycling (at marinas only), solid waste recycling drop boxes, and water quality-related educational displays should be provided at launches for motorized boats or marinas. Such drop boxes and displays for existing boat launches should be developed by the State Parks and Recreation Commission and coordinated with the King County Solid Waste and SWM Divisions. Estimated implementation cost: $5,000.

BW-22 **State/Local Data Sharing**

The Washington State Department of Agriculture (WSDA) should collect, monitor, and make available to SKCDPH (or other interested agencies) upon request data regarding permits issued to commercial pesticide applicators. Information available should include the type of chemical applied, quantities, location of application, potential for public health effects, and emergency measures in case of poisoning or spills. Implementation costs within the basin are estimated to be under $300/year.

BW-32 **Boaters**

The Washington State Parks and Recreation Commission and the State Department of Health, in cooperation with the King County SWM Division and Save Lake Sammamish should:

a. Conduct an annual education seminar to educate users of the Lake Sammamish State Park boat launch and lakeside (resident) users about their impact on lake water quality. The seminars should include information about proper sewage and garbage disposal, and the effects of oil, grease, gas, paint, and solvent residues on the lake.

b. Install an informational gazebo with water quality brochures and displays at the Lake Sammamish State Park boat launch ramp.

Estimated implementation cost: $3,000 plus an additional $4,700/year.

BW-36 Animal Waste

In cooperation with the King County Solid Waste Division and the SKCDPH, the KCD should examine the feasibility of incorporating farm animal manure into the existing yard waste composting program, developing a separate composting program specifically for animal manure, and/or educating residents on the current manure processing opportunities available in King County. The use of any resulting program should be facilitated by distributing brochures with regular utility or hauler billings. Implementation costs within the basin are estimated to be under $100/year.

BW-37 Farms

The KCD Conservation Plan Specialist (*see* BW-29) should:

a. Use federal funds and other funding sources to provide grants, low cost loans, matching funds, or technical assistance for small farmers to implement BMP's including direction of roof-top drainage away from animal waste storage areas, fencing, and pasture revegetation;

b. Recognize farms that follow approved conservation plans as model farms; and

c. Develop voluntary provisions for farm operators without farm plans to participate in programs to improve water quality on their farms.

Estimated implementation cost: $22,000.

LJ-5 Water-Quality Control Program

To reduce water pollution due to nonpoint sources of phosphorus, suspended solids, zinc, copper, and bacterial concentrations, DOE and SWM Division water-quality enforcement staff should encourage the Lutheran Conference Center to eliminate fuel spills by retrofitting an existing sump pump system. Implementation costs are covered by existing programs.

2.4 JUSTIFICATION AND DISCUSSION OF SOLUTIONS

2.4.1 *Discharge and Conveyance*

Computer modeling results show that existing methods of detention pond design are not adequate for the hydrologic conditions found in the planning area. When the current King County *Surface Water Design Manual* standards were applied to undeveloped areas using the HSPF model, peak flows were found to increase substantially over current conditions. Ponds designed using the 24 hour, Type Ia rainfall distribution overtop more frequently under actual rainfall conditions than the *Design Manual* predicted, because they are still partially filled from the previous storm. The use of a 7-day design storm, together with more realistic times of concentration (BW-1), largely corrects this problem.

Specific areas have special characteristics, however, that warrant an onsite detention standard more restrictive than the general basinwide standard of BW-1. These areas are more sensitive to increased flow durations from urbanization as a consequence of their susceptibility to channel erosion. Hydrologic modeling demonstrates that onsite detention using the standards recommended in BW-2 would reduce both peak flows and flow durations to pre-developed levels. Thus the potential for increased stream channel erosion in the future is substantially reduced.

In several areas, construction of regional detention was considered as an alternative to enhanced onsite detention. However, these options were rejected, in part due to the exceptionally large pond volumes required to mitigate future flows without additional onsite detention, and their attendant (public) costs. Even with regional detention, some channel and wetland damage could be expected upstream from the facility.

If no action is taken and the basin develops under the 1990 *Design Manual* detention standards, the basin will be subjected to several harmful effects. The 1990 standard would increase peak stream flows, and thus increase flooding problems and habitat damage due to wetland inundation. For example, in subcatchment T2, the 1990 design methodology barely reduces the post-development 100-year peak flow. Average flow increases are predicted to range from 116 percent to 215 percent in the basin at full development under the 1990 standard compared to a range of 9 to 31 percent under the plan-recommended standards.

In contrast to these consequences, alternative detention standards have little impact on the level of Lake Sammamish. The East Lake Sammamish basin contributes on the order of one-tenth of the flow from Issaquah Creek or only about five percent of the total inflow into Lake Sammamish. In addition, lake level is controlled by a broad weir in Marymoor Park that allows little increase in water level (about 5 feet for a 500-year event) for even extreme changes in discharge.

The Ravine Protection Standard (BW-3) addresses the area of most sever historic (and predicted) channel erosion. Application of this recommendation will reduce future instances of the most damaging aspect of upland development in the west-slope subbasins, the headward extension of surface-water channels and the expansion of their lower reaches. Many of the currently undeveloped properties are already in some stage of permit application and review, and so the vehicle to apply this recommendation varies in every case. Its achievement, however, is critical in avoiding additional public cost in the future. Even enhanced upland detention cannot fully compensate for the change in hydrologic processes imposed by development, namely the creation of overland runoff.

Where onsite retention cannot fully manage stormwater runoff, the history of non-pipeline alternatives

in this basin is poor. Existing dispersion spreaders and top-of-slope point discharges with energy dissipators, even using the specifications of the current *Design Manual*, have not adequately mitigated the impacts of new runoff from developed areas. Even enhanced detention will not be adequate, if the discharge is into a channel that never previously drained the now-developed area via a surface water channel.

In such settings, impacts do result from pipeline construction but are judged to be less significant than the consequences of not constructing these facilities. Construction-related erosion should be negligible for above-ground installation, rendered feasible by the current generation of high-density plastic pipe and by demonstrably successful performance in existing installations off the Sammamish Plateau. Water-quality impacts are no different than from runoff from any developed area, and so that runoff should be treated in equivalent fashion. Indeed, the reduction of hillslope erosion that results from tightlining should dramatically reduce the loading of phosphorus, the pollutant of greatest concern in the basin, into Lake Sammamish. Avoidance of impacts to shoreline resources must be addressed on a site-by-site basis, but the impacts of a well-mitigated installation should be dramatically less than the consequences of top-of-slope discharge into an open channel. Finally, the loss of groundwater recharge and perennial streamflow in the west slope drainages, although a legitimate and serious concern, will not be affected by this recommendation because changes in recharge are almost exclusively a consequence of land development itself.

With no action, impacts to stream channels are significant. Under the 1990 *Manual* standard, future flow increases would mean that channel-incising, habitat-disrupting flows (flows greater than or equal to the forested 10-year flow) will not be a decadal, or even a bi-annual event--they would occur many times in a single winter season, eliminating the possibility that vegetation regrowth or the lodging of large organic debris in the channel can begin any natural restabilization after a large flood. Because flows are responsible for the formation, maintenance, and destruction of habitats in stream channels, changes in historic flow patterns are also the primary source of urban habitat problems. Reduction of these damaging flows is critical to the protection of habitat integrity in urbanizing catchments.

Irrespective of the detention standard applied, erosion of stream beds will still occur from preexisting development and unavoidable flow increases as a result of new development. Subsequent deposition will occur in any portion of a stream where the flow has been slowed. Sediment buildup in culverts can reduce their effective capacity, resulting in localized flooding upstream of the deposition and overtopping of the road downstream. In such cases, culverts designed to pass clear water are undersized for real-world conditions of sediment transport. Current design manuals, both for the County and those published by other organizations, do not include methods for designing culverts to account for these conditions. Development of a design method will involve formulation of desktop models to incorporate streambed sediment yield prediction into existing manuals. New culverts sized according to these criteria would result in reduced maintenance and improved public safety.

***Applicable Recommendations:** BW's 1-3, 45; PH-3: MH-3; LJ-4; LJ-6*

2.4.2 Water Quality and Nonpoint Source Pollution

Surface water quality in the East Lake Sammamish basin generally meets state and federal water quality standards, though nonpoint-source pollution problems exist that reflect the various rural and urban land uses. Urbanization and small farm animal-keeping were identified as significant sources of nonpoint pollution needing attention. Urbanization issues include land development, stormwater facility and road

maintenance, resident and business activities (pesticide and herbicide application, hazardous waste generation, underground storage tank usage). Animal-keeping issues include farm management, animal waste, and animal densities. Onsite sewage disposal systems, boating activities, and forest practices were examined, but not considered a significant nonpoint problem; some recommendations were made to address these issues to prevent them from becoming a problem in the future.

Because management of the quantity and quality of surface water is integrally related, nonpoint pollution control measures often cannot be separated from measures to control stormflows, protect habitat, and reduce erosion. Thus many recommendations in this plan benefit water quality, though they may not address water quality directly. These recommendations include improved drainage controls (BW-1, BW-2, BW-3), wetland protection (BW-5), erosion control (BW-28), education programs (BW-30 through BW-34), maintenance and waste disposal (BW-41, BW-42, BW-44), and monitoring (BW-57, BW-58, BW-59). All of these recommendations are important in reducing nonpoint pollution from urban sources.

The pollutant of greatest concern in the Lake Sammamish watershed is phosphorus, because of its impact on lake water quality. The *Lake Sammamish Water Quality Management Project Technical Report* (Metro, 1989) described three management levels for phosphorus reduction. Alternative 1 included two structural controls, biofiltration and dry detention and presumes implementation of 1987 SWM drainage requirements. Alternative 2 included four structural controls: soil infiltration, wet retention/detention ponds, constructed wetland treatment, and biofilters. Alternative 2 also included nonstructural controls: basin planning, sensitive areas mitigation, development inspection, implementation of a clearing permit program, and contractor/developer education. Alternative 3 included all structural items described in Alternative 2 plus infiltration basins with underdrains and regional stormwater alum treatment facilities. Additional nonstructural control strategies include implementation of water corridor policies, drainage/steep slope protection, designation of the Lake Sammamish watershed as a Critical Drainage Area, and increased operation and maintenance efforts on existing drainage systems.

Each alternative is predicted to reduce phosphorus loading (as bioavailable phosphorus) to Lake Sammamish. Implementation of Alternatives 1, 2, and 3 in the entire Lake Sammamish basin is expected to reduce future phosphorus loading by 12, 48, and 107 percent respectively. The *Lake Sammamish Report* established a goal of maintaining phosphorus at the current external loading levels of 6,175 kilograms (kg) per year of bioavailable phosphorus and maintaining secchi depth at four meters or more.

If the recommendations described in the East Lake Sammamish Basin and Nonpoint Action Plan are implemented, they will meet all of the Alternative 1 and 2 criteria, and many of the Alternative 3 criteria. Current bioavailable phosphorus loading estimates for the East Lake Sammamish basin are 778 kg per year. An annual loading increase of 404 kg per year (1,182 kg per year total) would be expected if only Alternative 2 was implemented. Implementation of Alternative 2 throughout the Lake Sammamish basin would result in a 25 percent decrease of water clarity and a 7 percent increase of algae (as chlorophyll *a*). A reduction from current annual loading would be expected if the Alternative 3 management program were fully implemented.

Urbanization. A major source of phosphorus in the basin is from eroded forest soils. The clearing recommendations (BW-26 to BW-28, I-2, LJ-3) offer protection for the habitat, water quality, and hydrologic benefits that are provided by undisturbed vegetated areas. To be effective, these clearing limits should be consistently applied throughout the basin, regardless of whether the clearing activity is regulated by the County or by DNR under the Forest Practices Act (RCW 76.09). The forest practices recommendation (BW-27) is needed to protect sensitive areas and provide local review of forest practices on land that will be converted to residential use.

Because there is currently no mechanism to ensure that erosion control measures are consistently applied and enforced during development of individual building lots, significant erosion can occur during site development. The building-lot BMP recommendation (BW-28) is needed to establish requirements for individual lot construction. However, even if erosion-control BMP's were required on all construction activities, the East Lake Sammamish system would not be adequately protected from fine sediments. A study by the King Conservation District (Tiffany and others, 1990) found that 95 percent of monitored construction sites had either improperly installed, or poorly maintained, erosion-control BMP's. Because these erosion-control methods are often implemented improperly, a more vigorous enforcement program and targeted seasonal restrictions (BW-26, I-2, T-2, PL-2, LJ-3) are needed to reduce the introduction and transport of fine sediment.

Specific requirements to improve phosphorus removal from new developments located in the Pine and Beaver Lake watersheds (CP-58, CP-59, and provisions of the Beaver Lake Management Plan) were passed as amendments to the East Sammamish Community Plan. These requirements should help reduce phosphorus levels in stormwater from 40 to 80 percent compared with no controls.

Although phosphorus is the pollutant of greatest concern in this basin, a variety of other contaminants are present. Many of the nonpoint water quality recommendations focus on the full suite of constituents in stormwater. The most significant sources of future water-quality degradation will result from conversion of forests to commercial and residential land uses. Recommendations BW-9 and BW-11 address the development of water-quality design and performance standards for all stormwater treatment BMP's constructed by new developments. These recommendations should substantially reduce future water quality degradation. Recommendation BW-10 addresses retrofitting of existing stormwater facilities to improve their water quality treatment effectiveness.

Commercial activities such as vehicle service stations use a wide variety of hazardous compounds including volatiles, oils, solvents, and gasoline. When these materials are improperly stored, dispensed, or disposed of, they can enter storm drainage systems and flow directly to surface waters. Specific BMP's are presented in the State Stormwater Manual (WSDOE, 1992) to manage these materials at their source. Management practices, such as those recommended in BW-13, can help reduce nonpoint source pollution associated with specific activities. Elimination of illicit or non-stormwater discharges from commercial uses to storm drainage systems (BW-12) will also control pollutants at the source. Education on BMP's for materials handling, drainage system maintenance, and spill response is particularly recommended for tenants and owners of commercial properties in the Inglewood subbasin (I-3).

Hazardous household materials such as pesticides, solvents, and other chemicals, when improperly applied or disposed of, can also degrade water quality. Educational programs can encourage the use of alternative methods and improve the use and disposal of these hazardous materials (see BW-30).

Recommendation BW-15 addresses underground storage tank (UST) management. By encouraging owners to comply with the leak detection requirements of WAC 173-360-330 through 355, problems associated with UST's can be minimized. These regulations require phased-in leak detection for all UST's installed prior to December, 1988. Because there are only 21 UST's in the basin, it should be simple to review the upgrading status of all tanks and encourage owners to upgrade as soon as possible.

Animal Keeping. Pastures are a significant source of nonpoint pollution in the basin. When animals have direct access to streams, there are problems with streambank erosion and direct fecal contamination of streams. Also, riparian vegetation cannot be maintained or enhanced. A vegetated riparian corridor serves to filter out pollutants (sediment, bacteria, and nutrients) thereby protecting water quality. Farm

plans, that include reduced animal access to streams (BW-16), can reduce the amount of pollutants entering surface waters from animal-keeping activities.

Small animal keeping operations (hobby farms) were identified as a significant nonpoint pollution source. The recommendation for the King Conservation District to hire a conservation plan specialist to work specifically in the East Lake Sammamish basin (BW-29) was made to address the need for a one-on-one working relationship with small farmers to institute BMP's on their farms. The proposed responsibilities of the conservation plan specialist are listed in BW-37. The development of an animal manure disposal and composting program (BW-36) is intended to reduce a significant source of nonpoint source pollution resulting from improper storage and disposal of animal waste on small farms.

Onsite Septic Systems. A 1990 survey by the SKCDPH of onsite septic systems in this basin found failure rates which are comparable to regional rates (about four percent). Future pollution problems may occur as the density and age of the systems increase. Therefore, the recommendations focus on public education (BW-17, BW-30), ongoing maintenance (BW-18), and rehabilitation of failed systems when necessary (BW-40).

Boating Activities. The extent of water pollution from boating activities is difficult to quantify. Boating-related impacts to Beaver Lake and Pine Lake are minimal. Both lakes have restricted motorized boat usage. The absence of commercial or private marinas on Lake Sammamish reduces the likelihood of most marina nonpoint source problems. Since the Lake Sammamish State Park boat ramp is the center of greatest boating concentration, the boating recommendations (BW-19, BW-20) focus on activities at this location.

Drainage Facility and Road Maintenance. Parking lots and roads are sources of high concentrations of solids, toxics, oils, and heavy metals that wash into the basin's surface waters. Proper maintenance of stormwater facilities, vegetated roadside ditches, and biofiltration swales (BW-41 and BW-42) is critical in order to maintain their effectiveness. Increased frequency of facility maintenance and greater attention to vegetation establishment in ditches will help improve water quality.

The King County Roads Division (Roads) is licensed as a Public Pesticide Operator by the Washington State Department of Agriculture (WDA). Herbicides are applied according to EPA label requirements and no chemicals are applied in ditches, on ditch banks, or in SAO-mandated waterside buffers. The Roads Division also selects chemicals which have the lowest toxicity rating given to herbicides. The chemicals are reviewed annually by a panel of County applicators, the SKCDPH, and a toxicologist from the academic community. For these reasons, no specific recommendations are contained in the plan to address application of herbicides by the Roads Division.

Cleaning of stormwater facilities generates residual water (decant) and solids, often called vactor wastes. These wastes typically contain high concentrations of metals, petroleum hydrocarbons, oil and grease that often exceed environmental criteria or standards. Due to the toxic nature of these wastes, they should be disposed of in specialized treatment facilities (BW-44). These facilities are designed to prevent residual materials from coming in contact with surface waters or groundwater.

Subbasin-Specific Recommendations. Surface water problems are distributed unequally across the basin. In certain subbasins, water-quality problems are particularly significant, either because of land use activities or the sensitivity of the resource. Development in Pine Lake's watershed likely accounts for the continued degraded water quality of the lake. Since 1976, developed land has increased from 5 to 50 percent in the watershed. Much of the new development has been residential, with some

commercial land use in the Pine Lake shopping center. Recommendation PL-4 focuses on reducing sources of nonpoint source pollution in this basin through education of both residential and commercial land owners. Recommendations CP-58 and CP-59 focuses on phosphorus control from new developments.

Pine Lake Creek is one of the major tributaries from the basin to Lake Sammamish. Currently, Pine Lake Creek water quality exceeds water quality standards or criteria for several parameters. The source identification program (PL-3) would further identify and confirm the origins of water quality pollutants (most likely stormwater runoff from residential and small farm areas) so that source-control strategies can be developed for this area.

Degraded water-quality is also evident throughout the Laughing Jacobs Creek subbasin. A Water-Quality Control Program (LJ-5) is recommended to educate residents on their impacts to water quality. Other topics include eliminating animal access to streams and wetlands, restoring riparian zones with native vegetation, and improving the water-quality features of detention ponds. Project 1558 will identify specific areas of the subbasin for improved source-control strategies and retrofitting of existing facilities for greater water quality control. Recommendations in the Beaver Lake Management Plan (BLMP) that focus on phosphorus control are anticipated to be adopted by administrative rule in early 1995.

Applicable Recommendations: *BWs 9-22, 26-32, 36-40, 42-49, 58-59; I-3; PL-3, 4; LJ-5, 6, 7; CP-58 and 59; BLMP.*

2.4.3 *Fisheries*

Sub-populations of Lake Washington sockeye salmon spawn along the shorelines of Lake Washington, Lake Sammamish and in the Cedar River. Shore-spawning populations appear to have declined in recent years but the actual number of spawners is unknown. Shore-spawning sockeye are particularly susceptible to modification in the physical condition of the lakeshore. The construction of docks, piers, bulkheads, and skirted docks and piers has eliminated spawning areas, has interrupted shoreline currents, gravel movement, gravel deposition, and has modified near-shore wave action. Recreational activities, especially power boating, in the shallow, near-shore environment also affect spawning activity and success. Shoreline and upland development have caused excessive sedimentation of spawning areas as scoured stream bed material and fines eroded from building sites is carried downstream to the lake. Further development, if performed in or where spawning areas are affected, will further diminish this component of the sockeye population of the lake.

This basin is part of the Usual and Accustomed (U & A) fishing area of the Muckleshoot Indian Tribe. However, to conserve salmon stocks, the Tribe currently does not fish in the basin or in Lake Sammamish. Within this U & A area, the Muckleshoot Tribe and the State are co-mangers of the fishery. The Muckleshoot Tribe has participated in the development of this plan as a member of the Watershed Management Committee.

Applicable Recommendations: *BW's 23-25, 56, 57; PH-2; MH-2.*

2.4.4 *Wetlands*

Existing Ordinance. Current wetland protection in the basin and throughout King County is mandated

by the 1990 King County Sensitive Areas Ordinance (SAO). This ordinance protects wetlands with buffer widths assigned by the rating (1, 2, or 3) given to a particular wetland system. Although a significant effort was made to integrate a wide range of resource elements into the rating scale, that scale is derived predominantly from structural features (*e.g.*, water, soils, and vegetation). The rating scale does not incorporate or adequately reflect functional characteristics (*e.g.*, wildlife nesting, feeding, food-web support and nutrient cycling, water storage and purification) of the wetlands at a meaningful level. By this system, functional attributes are assumed to be reflected in structural attributes, but the correlation is weak for many functions. For example, the presence of snags provides opportunities for cavity nesting or raptor perching but does not insure that such a function is actually taking place. As research into wetland structure and function proceeds, many of these relationships will undoubtedly be clarified.

The wetland protection in the SAO provides for discrete buffer widths as a function of the assigned rating: number-1-rated wetlands are assigned buffer widths of 100 feet; number-2-rated wetlands are assigned 50 feet; and number-3-rated wetlands are assigned 25 feet. Provisions are made for increasing buffer widths should specific circumstances warrant; these circumstances can be defined by site-specific investigations undertaken during the development process, or by studies conducted as part of a basin planning effort such as this one.

Buffers of this type ("static buffers") are critical if wetland protection is to be achieved; they are also easy to administer. However, they only confer protection on certain structural elements of wetlands, and so their effectiveness is typically limited for many functional characteristics. Wetlands are integrated elements of the landscape; simple, uniform buffers often result in wetlands that are physically isolated from adjacent geologic, hydrologic, and biologic elements of the ecosystem by intervening development. As a result, the wetland functions that ultimately are the object of protection may ultimately be lost. The reasons are three-fold:

- Administratively established, static buffers generally do not account for functional attributes of wetlands, which typically are variable and dependent upon processes in part external to the wetland;

- Static buffers generally do not account adequately for differences among the types, sizes, and levels of complexity of wetlands; and

- Static buffers generally do not account for differences in the structural and functional characteristics of the buffers themselves.

The following sections establish the context for the recommended wetland management program by first defining wetlands as Significant Resource Areas (SRA's), then by defining critical wetland functions, establishing criteria for determining whether the functions exist in a particular wetland, and finally, by applying appropriate management programs to the wetland and its surrounding landscape.

Significant Resource Areas (SRA's). Previous basin plans have designated certain habitats -- particularly stream habitats -- as SRA's. The Soos Creek Basin Plan, the Hylebos Creek Basin Plan, and the Bear Creek Basin Plan have all used this designation to identify habitats possessing characteristic features and functions that are of overriding importance to fish, wildlife, water quality or aesthetic appreciation in a particular basin. The designation is continued in this plan as well, and it is applied to all number 1-rated wetlands in the East Lake Sammamish basin.

SRA's are aquatic or terrestrial habitats that are important to the viability of plant and animal species and populations because of the species or population's value as a biological and social resource. Areas may

be "Regionally Significant Resource Areas" (RSRA) or "Locally Significant Resource Areas" (LSRA) based not only on their intrinsic condition and value, which is typically related to the size, complexity, and functional attributes of the habitats; but also on the size, functional condition, and structural complexity of the surrounding watershed. These external elements depend largely on the existing degree of degradation caused by development activity in and around the habitat and within its tributary basin.

Regionally Significant Resource Areas (RSRA's) contribute to the resource base of the entire southern Puget Sound region by virtue of exceptional species and habitat diversity and abundance, when compared to aquatic and terrestrial systems of similar size and structure elsewhere in the region. RSRA's may also support rare, threatened, or endangered species or communities.

These basic criteria are used to recognize RSRA's in the watersheds of King County:

1. Watershed functions are not appreciably altered from predevelopment conditions, as measured by corridor integrity, hydrologic regime, sediment movement, and water quality; ***or***

2. The diversity and abundance of aquatic or terrestrial habitats are of consistently high quality and are well dispersed throughout the system; ***or***

3. Aquatic and terrestrial life, particularly salmonids, exhibit abundance and diversity consistent with undisturbed habitats and make a significant contribution to the regional resources of Puget Sound.

Locally Significant Resource Areas (LSRA's) also contribute to the resource base of the region, but at a lower level of both abundance and diversity than RSRA's. They are, however, significant within a particular basin, providing habitat that is important for plants and animals.

These basic criteria are used to recognize LSRA's in the watersheds of King County:

1. Watershed functions have been altered from clearing and filling, but corridor integrity, hydrologic regime, sediment movement, and water quality are adequate for spawning and rearing of salmonids or for maintenance of other plant and animal species; ***and***

2. The diversity and abundance of aquatic and riparian habitats are good but not exceptional; instability and damage are evident but confined to localized sites; ***and***

3. Aquatic and terrestrial life, particularly salmonids, are supported at one or more species and life stages at population levels that are low but sustainable.

Consistent with previous basin plans, the SRA criteria outlined above can be applied to wetlands in the East Lake Sammamish basin. Based on the King County Wetland Ranking Criteria (in the King County Wetlands Inventory, 1983, revised 1990) this plan recognizes all number 1-rated wetlands in the plan area as SRA's. In the following sections, attributes of these SRA wetlands are evaluated according to the criteria for RSRA's and LSRA's, and management programs established for each wetland.

SRA Designation of Significant Wetlands in the ELS Basin. Using the above criteria, the following SRA designations are made for the ten "unique and outstanding" (i.e. number 1-rated) wetlands in the basin:

RSRA Wetlands: 10, 21, 57, 58, 61;

LSRA Wetlands: 9, 26, 30, 34, 39.

Mitigation Approaches. Although Significant Resource Areas themselves are specific wetlands, shorelines, streams, or other habitats, their function and structure depend on conditions often far-removed from their immediate boundaries. Two levels of these physical conditions can thus be defined:

1. ***Catchment*** conditions, which affect the rate and volume of runoff, groundwater movement, water chemistry ("quality"), and sediment delivery; and

2. ***Local*** or adjacent conditions, which determine the degree of bank and buffer vegetation, the magnitude and frequency of human intrusions, and the presence of structural elements (such as large woody debris in streams and snags in wetlands).

Two categories of development mitigation are also suggested by this classification. ***Catchment-level*** mitigation affects the entire tributary area and may include land-use restrictions or special detention standards, among other controls. ***Local-scale*** mitigation includes both presently adopted regulations such as fixed-width buffers, and additional restrictions targeted to specific landscape features such as adjacent steep slopes, wooded areas, or swales.

The full functions of an aquatic system can be preserved or restored only through attention to both levels of conditions and mitigations. No degree of attention to local conditions alone can substitute for a degraded catchment. This fact is reflected in the existing County drainage code, where on-site stormwater detention and water-quality treatment is required for virtually all development, irrespective of distance between the edge of the development itself and the downstream water body.

However, catchment-level mitigation is often costly or burdensome; in many cases preexisting development renders such extensive efforts ineffectual. As a result, this broadest level of resource protection is recommended to exceed existing County codes only for RSRA's and less degraded LSRA's, choosing only those settings where the likelihood of successfully maintaining or recovering long-term resource function is high. More localized resource-protection measures are generally recommended for LSRA's and RSRA's alike.

The discussion that follows serves to integrate this programmatic approach to wetland protection, recognizing the constraints imposed by basin conditions and preexisting development, with a functional understanding of wetland processes.

Protection of Wetland Functions--Application. In this plan, two levels of management are proposed based on these five characteristics of the wetland and the surrounding geologic, hydrologic and biologic landscape.

The first level is the management strategy defined in the SAO, where specified buffers of 25 to 100 feet are maintained without any permitted disturbance to them. The value of this level is acknowledged for all wetland systems; its recommended application is implicit and without exception.

The second management level is evaluated for all number-1-rated wetlands (SRA's) in the East Lake Sammamish basin, with the exception of Wetland 57, whose recent designation as a number-1-ranked system did not allow time for analysis. This level of management extends protection beyond the SAO

buffers to include adjacent slopes, swales, and migration corridors that directly affect the particular existing functions of each wetland. For RSRA's in this basin, it may also extend to the boundaries of the area draining directly to the wetland, wherever that scale of protection is judged appropriate. Recommended limits to the intensity or method of development in these management areas are specified where existing development has not eliminated such options. Where necessary to maintain wetland function and where feasible by virtue of existing land use, recommended management strategies include limitations on aggregate impervious area, maintenance of undisturbed forest land cover, and requirements for enhanced stormwater detention. They are discussed for each individual wetland in section 2.1.2.

Discussion. The intended result of the management program is to minimize the effects of urban development on the functional and structural integrity of wetlands within the basin, particularly those wetlands designated as SRA's. By doing so, the mosaic of habitats that support various plant communities, fish, other wildlife, and high water quality can be maintained for many decades. In addition, the potential damage associated with pollution, flooding, erosion and sedimentation can be greatly reduced.

A major component of the management strategy for certain wetlands is the limitation of total impervious area in the catchment. Choosing a specific threshold for impervious area is critical; the limits on impervious surface area and disturbed ground recommended in this plan are based on a variety of well-documented sources of information, including the Puget Sound Wetlands and Stormwater Management Research Program (based in the King County Resource Planning section), which has been collecting water-quality, water-quantity, and wildlife information on 19 King County wetlands since 1988. Analysis of their data suggests that a boundary between relatively degraded and relatively pristine wetlands correlates well with the degree of urban development in the tributary area, lying in the range of 35 to 40 percent urbanized land. The area of impervious surface would be correspondingly lower, perhaps even somewhat less than 10 percent.

An apparent threshold of urban development is also supported by related studies of other aquatic systems. A review of observed stream-channel conditions in the Soos Creek, Hylebos, and Lower Puget Sound basins (King County, 1990a) showed an almost perfect correlation between seriously degraded aquatic habitat and contributing impervious areas greater than eight percent.

These data support the conclusion that avoiding disturbance in one-half of a wetland catchment area, corresponding to about 10 percent impervious area, will likely correlate with the maintenance of critical aquatic resource functions including natural hydrologic functions. A 50 percent limitation on catchment development is also consistent with the reserve tract requirements of clustered and growth-reserve zoning. In addition, aerial photograph analysis completed during preparation of the *Bear Creek Basin Plan* (King County, 1990b), covering an area just north of the East Lake Sammamish basin, showed that 50 percent forest cover remained even in many areas without specific regulations to limit clearing. Although greater forest retention would undoubtedly yield even greater value, this recommended level appears readily attainable with substantial, demonstrated benefits to the wetland system.

Applicable Recommendations: *BW's 5, 33, 34; I-2; T-2, 3; PL-1, 2; MH-5; LJ-3.*

2.4.5 *Future Conditions*

The major portion of the East Lake Sammamish basin is in unincorporated King County. Only a few of its northernmost acres in Marymoor County Park are within the City of Redmond. However, annexation

to the City of Issaquah of the southern two-thirds of the basin was narrowly defeated in 1990 and incorporation of the portions of the plateau is periodically discussed in the community. Withdrawal of any part of the basin from County jurisdiction without the adoption of consistent basin management practices could lead to greater resource damage and the initiation of new flooding and pollution problems.

Independent of who has jurisdiction over the planning area, conditions in this basin will continue to change. Plan recommendations can be updated as changing conditions mandate, but only if those changing conditions are recognized through monitoring. In preparing this plan, many assumptions and predictions were developed about the future of the East Lake Sammamish basin. Although these assumptions and predictions are based on the best available information, many of them were made in 1989, over 4 years prior to the adoption of this plan. New information may require a reevaluation of the plan's analyses, recommendations, or implementation strategies. New state and federal regulations also will require local monitoring of nonpoint source water quality problems.

The choice of recommended actions reflects the suite of data that are needed for effective follow-up. Continuous stream-flow data provide the information needed to identify if detention facilities are functioning as designed or if they need adjustment. Monitoring of channel incisions provides a direct indicator of the effectiveness of upstream flow controls. Monitoring of sediment deposition areas and channel stabilization projects also will track the success of these projects. Water quality monitoring will help to identify nonpoint sources of pollution, evaluate the effectiveness of BMP's, and establish a data base to document water quality changes in the basin. It is anticipated that this program will also include a NPDES monitoring site to be located in the basin. The Annual Report Recommendation (BW-52) will provide the watershed implementation committee with the information they need to identify any necessary management program adjustments. This report will be the biennial report required by the nonpoint planning rule.

Applicable Recommendations: *BW's 35, 50-55, 57, 59.*

CHAPTER 3
CAPITAL IMPROVEMENT PROJECTS

3.0 INTRODUCTION

Capital improvement projects (CIP's) are a significant component of the recommendations for the East Lake Sammamish basin. The estimated cost of all projects exceeds of $13 million, which places the construction of all recognized potential projects beyond the means of foreseeable funding sources. As a result, priority rankings were determined for the full set of projects. Below is a description, in project-number order and with the subbasin and priority class[3] notated, of each of the recommended projects. Estimated costs were made at the time of initial Basin Plan preparation (1992) and have not been updated except for those marked † (in 1993 dollars) or ‡ (in 1993 dollars but including 5% inflation over the three years of project design and construction).

3.1 DESCRIPTION OF EAST LAKE SAMMAMISH CIP's

Project 1521: Tributary 0143A Conveyance and Water-Quality Improvements near Parkway **(Panhandle; priority 2)**

Install control structure at outlet of degraded class 3 wetland just upstream of the parkway to increase residence time and improve water quality. Estimated cost: $87,000.

Project 1522: Tributary 0143B Culvert Replacement, Channel Reconstruction, and R/D Pond Retrofit **(Panhandle; priority 3)**

Reconstruct open channel upstream of East Lake Sammamish Parkway; relocate culvert crossing beneath parkway; increase culvert size beneath railroad; and increase pipe capacity downstream to lake. Retrofit detention pond at end of NE 42nd Street for water-quality improvement; in conjunction with the proposed plats of Chrysalis Estates and Northridge, provide diversion of the pond outlet to be constructed by these new developments to a tightline system along 196th Avenue NE. Estimated County cost: $154,000.

Project 1523: Tributary 0143C Culvert Replacement at 196th Avenue NE **(Panhandle; priority 3)**

Relocate crossing of East Lake Sammamish Parkway into new culvert south of 196th Avenue NE; abandon existing culvert under 196th Avenue NE. Excavate channel east of railroad grade and join flow with tributary 0143B just above railroad crossing. Estimated cost: $103,000.

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[3]Priorities are defined as follows: **1a**=offer significant means to achieve the major goals of the plan; **1b**=less effective in solving problems within the major themes but bolster the effectiveness of 1a solutions and prevent the plan from becoming obsolete; **2**=lesser improvement to problems within the major goals or a significant improvement to problems within the secondary goals; **3**=good management practices that would offer small improvement to surface waters in the basin; **X**=unranked in basin plan.

Project 1524: Tributary 0143E Channel Reconstruction and Stabilization at and above ELS Parkway **(Panhandle; priority 3)**

Reconstruct open channel above ELS Parkway; relocate and expand culvert beneath parkway; expand culvert under railroad; increase channel capacity downstream to lake. Add check dams or large woody debris to upstream channel to decrease sediment loading to downstream system (*see* Project 1599a). Estimated cost: $125,000.

Project 1525: Tributary 0143F Channel Reconstruction and Stabilization at East Lake Sammamish Parkway **(Panhandle; priority 3)**

Reconstruct open channel above East Lake Sammamish Parkway; relocate and expand culvert beneath parkway; expand culvert under railroad; increase channel capacity downstream to lake. Add check dams or large woody debris to upstream channel to decrease sediment loading to downstream system (*see* Project 1599b). Estimated cost: $149,000.

Project 1526: Tributary 0143G Channel Reconstruction and Culvert Replacement at ELS Parkway **(Panhandle; priority 3)**

Expand and relocate culverts beneath driveways, parkway, and railroad. (Design in conjunction with proposed tightline and drainage-system retrofit for Timberline Ridge and Timberline Highlands II developments.) Estimated County cost: $98,000.

Project 1527: Tributary 0143H Channel Reconstruction and Culvert Replacement at East Lake Sammamish Parkway **(Panhandle; priority 3)**

Enlarge existing channel above and below railroad; expand culverts beneath parkway and railroad. Design in conjunction with proposed tightline for Timberline Ridge development. Estimated cost: $124,000.

Project 1528: Tributary 0143K Culvert Replacement at Railroad **(Panhandle; priority 3)**

Install larger culvert beneath railroad to eliminate backwater flooding of residence. Estimated cost: $78,000.

Project 1529: Tributary 0143L Tightline **(Panhandle; priority 1a)**

Tightline road-ditch runoff from the corner of 208th Avenue NE and NE 15th Street downslope to Inglewood Hill Road NE; add check dams or large woody debris to channel downstream to decrease erosion and sediment loading (*see* Project 1599b). Increase culvert capacity beneath ELS parkway and railroad. Estimated cost: $576,000[‡].

Project 1530: Wetland 26/236th Avenue SE Trestle **(Laughing Jacobs; priority 2)**

To reduce flooding of 236th Avenue SE by Wetland 26, build a trestle to raise the roadway out of the future 25-year floodplain and to restore natural hydrologic connections in Wetland 26. Estimated Cost: $1,604,000.

Project 1531: Inglewood Glen Pond Retrofit **(Inglewood; priority 2)**

Retrofit the existing detention pond at plat of Inglewood Glen, located near 228th Ave NE and NE 12th Place, to enhance water quality treatment capability. Estimated cost: $67,000.

Project 1532: George Davis Creek Flood Damage Reduction **(Inglewood; priority 1a)**

See Chapter 4 ("Further Studies").

Project 1533: Sammamish Highlands Infiltration Pond **(Inglewood; priority 2)**

Construct a regional infiltration pond near the confluence of tributaries 0144 and 0144D. The pond would be designed to reduce the water quality impacts of the commercial land uses upstream. This project would also reduce peak flows from extreme storm events. Coordinate with the Water Quality Enhancement program recommendation (I-3) for source control of pollutants. Estimated cost: $364,000.

Project 1534: George Davis Creek Culvert Replacement at 221st Avenue NE **(Inglewood; priority X)**

Replace existing collapsed curvert under the 400 block of 221st Avenue NE with a precast bottomless box culvert. Adject the channel grade as necessary to meet the culvert invert and restore riparian vegetation adjacent to the channel. Estimated cost: $77,000.

Project 1535: George Davis Creek Conveyance Improvements **(Inglewood; priority 2)**

Construct a new 72 inch culvert under East Lake Sammamish Parkway and the BNRR tracks. Connect this culvert to a new channel constructed between the Parkway and BNRR tracks. This channel would outlet to Lake Sammamish approximately 400 feet north of the existing culvert. Estimated cost: $268,000.

Project 1536: Ebright Creek Conveyance Improvements **(Thompson; priority 1a)**

To reduce flooding and improve fish passage, the existing culverts at the East Lake Sammamish Parkway and Burlington Northern Railroad should be replaced with bridges, the lower 75 feet of Ebright Creek (tributary 0149) should be stabilized using bioengineering techniques (*see* Project 1599e), and rock clusters added to improve instream habitat diversity. Estimated Cost: $400,000†.

Project 1537: Wetland 17/212th Avenue SE Trestle **(Thompson; priority 2)**

At such time as 212th Avenue SE is to be widened or significantly repaired, install a trestle or oversized culverts to raise the roadway above the flood elevation. This will also serve to restore more normal hydrologic connectivity between portions of the wetland now separated by the roadway. In the near term, install "Water over Roadway" signs that can be displayed during periods when water over 212th Avenue SE is six inches deep or less; close the road when water exceeds that depth. Estimated Cost: $1,528,000.

Project 1538: Ebright Creek Dumping Prevention **(Thompson; priority 2)**

To reduce future dumping of garbage into the Tributary 0149 ravine at the east terminus of SE 8th Street, install barriers and "No Dumping" signs. Conduct a stream clean-up to remove historically dumped garbage as part of the Basin Steward program (*see* BW-35). Estimated Cost: $3,300.

Project 1539: Pine Lake Creek/Wetland 63 Restoration **(Pine Lake; priority 3)**

In areas where Pine Lake Creek is ditched adjacent to Wetland 63, the creek should be relocated into the wetland; remaining roadside ditches should be revegetated to reduce street flooding and restore wetland function. Estimated cost: $331,000†.

Project 1540: Wetland 30/212th Avenue SE Trestle **(Pine Lake; priority 2)**

Construct a trestle bridge at 212th Avenue SE to eliminate road flooding and restore hydrologic connectivity within Wetland 30. Estimated cost: $1,030,000.

Project 1541: Pine Lake Shoreline Native Vegetation Restoration **(Pine Lake; priority 3)**

In conjunction with the lakeside education program, restore native vegetation buffers along lake edge. Estimated cost: $10,000.

Project 1542: Pine Lake Creek Culvert Replacement **(Pine Lake; priority 1a)**

Replace culverts where tributary 0152 crosses East Lake Sammamish Parkway and the Burlington Northern Railroad right-of-way. Estimated cost: $343,000†.

Project 1543: Kanim Creek Channel Stabilization **(Pine Lake; priority 1a)**

Enhance on-site detention and stabilize the stream channel to reduce in-stream erosion and channel incising. Estimated cost: $463,000†.

Project 1544: Pine Lake Subbasin Nonpoint Source Identification **(Pine Lake; priority 2)**

See Chapter 4 ("Further Studies").

Project 1545: Channel Stabilization---Zaccuse Creek and Tributary 0145B **(Monohon; priority 1b)**

Control point discharges and erosion sites along road embankment and at pump-station overflow on 0145A; stabilize main channels of 0145A and 0145B with large organic debris (LOD) and/or check dams. Potential need for additional channel stabilization along 0145B, between outfall of Montage and private drainage system beneath 206th Avenue NE, should be evaluated after LOD/check-dam installation. Estimated County cost: $862,000†.

Project 1546: Lower Zaccuse Creek Channel Reconstruction **(Monohon; priority 1b)**

Remove pipe and replace with open channel between existing lakeshore residences to provide fish access to upstream stream habitat (*see also* Project 1599p). Estimated cost: $570,000†.

Project 1547: Tributary 0163 Culvert Replacement and Stream Enhancement **(Monohon; priority 2)**

Replace culverts upstream of East Lake Sammamish Parkway and make fish passage possible. In cooperation with streamside homeowners, add streamside vegetation and improve in-channel diversity in the lowermost 0.10 river miles through Alexander's on the Lake. Estimated cost: $132,000.

Project 1548: Many Springs Creek Channel and Ravine Stabilization **(Monohon; priority 1a)**

Add to, and maintain, existing check dams in channel to stabilize upper reach. Reconstruct channel reach below major landslide at RM 0.5 with engineered fill, non-erosive channel, and bank planting; construct new check dams below new channel reach. Project was substantially completed in September 1991. Estimated cost to completion (lower plantings and check dams): $359,000†.

Project 1549: Laughing Jacobs Creek/SE 24th Street Stream Relocation **(Laughing Jacobs; priority 2)**

To improve streamside habitat, relocate the channel to the north side of SE 24th Street. Construct culverts that will allow for the passage of resident fish, construct swales to provide biofiltration for road runoff, and revegetate the realigned portions of the stream channel. Estimated Cost: $100,000.

Project 1550: Wetland 26/SE 24th Street Road Raising **(Laughing Jacobs; priority 2)**

To prevent flooding of SE 24th Street by Wetland 26, rebuild the trestle to raise the roadway one to two feet to provide sufficient clearance for a 25-year level of protection against future water levels in the wetland. This should be implemented as part of a proposed King County Roads Division project (Beaver Lake Trestle 422-A). An additional road raising and trestle project should be built to the east of Project 422-A to further reduce flooding and improve hydrologic connections within Wetland 26. Estimated cost: Costs for the King County Roads Division Project 422-A is $920,000;

costs for extending the road raising/trestle project to the east are about $228,000.

Project 1551 is not an assigned number.

Project 1552: Laughing Jacobs Lake Outlet Control **(Laughing Jacobs; priority 3)**

Construct a control structure to regulate lake stage on Laughing Jacobs Lake. Floodplain mapping should be completed for Laughing Jacobs Lake, and tributary 0166 from the lake downstream to SE 42nd Street. Estimated Cost: $311,000.

Project 1553: Lower Laughing Jacobs Sediment Management **(Laughing Jacobs; priority 1a)**

Several active landslides are located in the tributary 0166 ravine between River Miles 0.50 and 0.80. Stabilize road fills and culvert outfalls on the right bank between RM 0.50 and 0.80 to minimize sediment input to the lower channel and thus reduce flooding potential. Estimated Cost: $748,000‡.

Project 1554: Beaver Lake Revegetation **(Laughing Jacobs; priority 3)**

In conjunction with the education program in LJ-2, purchase native vegetation to be planted on the shore of Beaver Lake by volunteer landowners. Establish the shore area as a demonstration site to reintroduce native flora. Estimated Cost: $10,000.

Projects 1555-8

See Chapter 4 ("Further Studies").

A PROBLEM COMMON TO ALL SUBBASINS

Although the physical characteristics of each subbasin are different, some stream system alterations, such as removal of streamside vegetation, have occurred in all subbasins. In addition, many of the subbasin projects will require similar channel restoration measures, including streambank revegetation. Revegetation of streambanks typically does not require the detailed engineering and design work that is required of other types of projects. Revegetation also does not require heavy equipment or highly trained construction crews and the season for revegetation often does not coincide with the construction season for instream projects. In an effort to provide job training for non-traditional construction crews, involve volunteers, and lower costs, a series of revegetation projects, generically called Project 1599, is proposed. This project would use crews similar to those used for the Washington Conservation Corps who are not the traditional County construction force. Some projects might also use volunteers. The costs for each of the eighteen small projects that comprise Project 1599 are estimated separately to allow these projects to be completed in increments within a timeframe that coincides with other restoration measures on the stream reach.

Project 1599a: Tributary 0143E Revegetation **(Panhandle; priority 3)**

In conjunction with Project 1524, revegetate streambanks and conduct minor channel reconstruction activities. Estimated cost: $2,400.

Project 1599b: Tributary 0143L Revegetation **(Panhandle; priority 1a)**

In conjunction with Project 1529, revegetate streambanks and conduct minor channel reconstruction activities. Estimated cost: $1,700.

Project 1599c: George Davis Creek Fencing and Enhancement **(Inglewood; priority 1b)**

If consistent with pending SAO rules for livestock, install fencing or other measures in pasture areas to exclude livestock from stream; educate residents on water quality improvement techniques. This project is proposed to be done by special County crews. Combine with BW-10. Estimated cost: $47,800.

Project 1599d: George Davis Creek Channel Stabilization **(Inglewood; priority 2)**

In conjunction with Project 1535, plant vegetation and place woody debris, rocks, and other elements to stabilize the stream channel upstream of East Lake Sammamish Parkway. This project is proposed to be done by special County crews. Estimated cost: $49,900.

Project 1599e: Ebright Creek Revegetation **(Thompson; priority 1a)**

In conjunction with Project 1536, revegetate streambanks and conduct minor channel reconstruction activities. Estimated Cost: $3,100.

Project 1599f: Laughing Jacobs Revegetation **(Laughing Jacobs; priority 2)**

Plant a vegetated buffer of western red cedar and western hemlock at least 15 feet high along the southern boundary of Wetland 38. Estimated cost: $20,000.

Project 1599g: Laughing Jacobs Creek Water Quality Improvement **(Laughing Jacobs; priority 1b)**

Construct a biofiltration swale in existing roadside ditch. Combine with BW-10. Estimated cost: $46,700.

Project 1599h: Laughing Jacobs Creek Sediment Removal **(Laughing Jacobs; priority 1a)**

In conjunction with Project 1553, remove sediment from overbank area and active flood bars, during the summer months as needed, immediately upstream of the footbridge at RM 0.35 to 0.4. Maintain in accordance with periodic inspection by SWM Division geologist. Estimated cost: $2,000.

Project 1599i: George Davis Creek Bank Revegetation **(Inglewood; priority X)**

In conjunction with Project 1534, revegetate banks through the residential area to restore native riparian vegetation. This project is proposed to be done by special County crews. Estimated cost: $1,700.

Project 1599j: Wetland 30 Buffer Restoration **(Pine Lake; priority 2)**

Fence wetland buffers along areas where residential and agricultural development has occurred. Estimated cost: $10,000.

Project 1599k: Tributary 0143A Revegetation **(Panhandle; priority 2)**

In conjunction with Project 1521, revegetate wetland and its buffer. Estimated cost: $2,200.

Project 1599l: Tributary 0143B Revegetation **(Panhandle; priority 3)**

In conjunction with Project 1522, revegetate streambanks and conduct minor channel reconstruction activities. Estimated cost: $1,800.

Project 1599m: Tributary 0143C Revegetation **(Panhandle; priority 3)**

In conjunction with Project 1523, revegetate streambanks and conduct minor channel reconstruction activities. Estimated cost: $1,700.

Project 1599n: Tributary 0143H Revegetation **(Panhandle; priority 3)**

In conjunction with Project 1527, revegetate streambanks and conduct minor channel reconstruction activities. Estimated cost: $1,500.

Project 1599o is not an assigned number

Project 1599p: Lower Zaccuse Revegetation **(Monohon; priority 1b)**

Revegetate streambanks in conjunction with Project 1546. Estimated Cost: $3,700.

Project 1599q: Tributary 0163 Revegetation **(Monohon; priority 2)**

In conjunction with Project 1547, revegetate streambanks and conduct minor channel restoration activities. Estimated cost: $18,900.

Project 1599r: Laughing Jacobs/SE 24th Revegetation **(Laughing Jacobs; priority 2)**

In conjunction with Project 1549, revegetate streambanks and conduct minor channel reconstruction activities. Estimated cost: $29,700.

CHAPTER 4
FURTHER STUDIES

4.0 INTRODUCTION

Because this Basin Plan covers the entire East Lake Sammamish watershed, a number of specific problems were recognized that could not be fully analyzed, or solutions fully developed, in the time and scope of the overall plan. In these areas, additional information must be collected before determining if, or what kind of, a solution is appropriate. The recommended studies are listed below, in project-number order and with the subbasin and priority class[4] notated. Estimated costs were made at the time of initial Basin Plan preparation (1992) and have not been updated except for those marked † (in 1993 dollars).

4.1 FURTHER STUDIES

Project 1532: George Davis Creek Flood Damage Reduction **(Inglewood; priority 1a)**

Conduct a design level drainage study to determine the frequency and extent of flooding at this location. If warranted, construct a berm to protect affected houses from flooding up to the 100-year event as determined by flows from the future land-use condition. Estimated cost: $26,000†.

Project 1544: Pine Lake Subbasin Nonpoint Source Identification **(Pine Lake; priority 2)**

This source identification program will target the Pine Lake subbasin and evaluate the effectiveness of existing water quality control features (residential and commercial swales, ponds, and vaults) and identify nonpoint pollutant sources to the lake. The study, conducted by King County SWM Division, will have four components which include: 1) subbasin source identification, 2) effectiveness monitoring, 3) an illegal hook-up survey, and 4) a public involvement and education program (PL-3). An illegal hook up survey of the Pine Lake commercial center will be conducted to insure proper hook up by businesses to the sanitary sewers and storm drains. The results of this study will be used to guide additional source control recommendations for the Pine Lake area. Estimated cost: $30,000.

Project 1555: Beaver Lake Enhanced Detention Study **(Laughing Jacobs; priority 1a)**

Determine the feasibility of increasing the active storage capacity of Beaver Lake by about 40 acre-feet. This would increase peak lake stages by six inches. The study should consider the impacts on water-quality and to lakeside property owners. Estimated Cost: $27,000†.

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[4]Priorities are defined as follows: **1a**=offer significant means to achieve the major goals of the plan; **1b**=less effective in solving problems within the major themes but bolster the effectiveness of 1a solutions and prevent the plan from becoming obsolete; **2**=lesser improvement to problems within the major goals or a significant improvement to problems within the secondary goals; **3**=good management practices that would offer small improvement to surface waters in the basin; **X**=unranked in basin plan.

Project 1556: Inglewood Illicit Hookup Survey **(Inglewood; priority 2)**

Identify discharges to the surface water system that do not meet current codes and regulations. Work in cooperation with the property owners to connect any discharges identified to the sanitary sewer system or to arrange for appropriate means of disposal. Estimated Cost: $10,000.

Project 1557: Wetland 30 Inventory Update **(Pine Lake; priority X)**

Conduct a detailed soil, vegetation, and hydrologic inventory of Wetland 30. Use the functional boundary approach to establish the interior buffer edge for this weland. Perform an analysis to determine whether Wetland 30, and subcatchment P5a in particular, meets the requirements for LSRA designation and subcatchment management (as in Recommendation I-2). Estimated cost: $20,000.

Project 1558: Laughing Jacobs Water-Quality Study **(Laughing Jacobs; priority 3)**

Water-quality monitoring should be conducted to identify specific areas of the subbasin for source-control strategies and to identify additional facilities for water-quality retrofits (*see also* BW-59). Estimated Cost: $40,000.

Project 1588: Water-Quality Retrofit Study **(Basinwide; priority 1b)**

Review existing retention/detention facilities in the basin, identify which may be amenable to modification or reconstruction to improve water-quality performance, and accomplish the retrofitting. Estimated Cost: $182,000†.

CHAPTER 5
WATERSHED CHARACTERIZATION

5.0 INTRODUCTION

This chapter provides a summary of the watershed characteristics of the East Lake Sammamish basin by individual subbasin. The issues covered in this chapter include land use, geology, hydrology, water quality, groundwater, flooding, erosion and deposition of stream channel sediment, and aquatic habitat. A complete discussion of these issues for the entire basin can be found in Chapter 4 of the WMC-proposed East Lake Sammamish Basin and Nonpoint Action Plan (Volume 1). Chapter 4 of Volume 1 also contains the more detailed water quality assessment required by WAC 400-12-510.

Surface-water problems are distributed unequally across the basin. Variations in the infiltration capacity and erosiveness of soils, the steepness of topography, the complexity of stream systems, and the extent of past development all play a role in determining whether a subbasin is buffered from the harmful effects of urbanization, or is susceptible to such effects. The differences in the landscape are particularly distinct between the eastern and western portions of the basin. To the east, small and often seasonally dry streams flow from lake and wetland headwaters over rolling terrain. The subbasins with areas of infiltrative soils and more complex stream systems—Inglewood and Laughing Jacobs—have a greater capacity to withstand urbanization effects. However, these subbasins have experienced significant historic encroachment upon, and alteration of, their upper-reach streams and wetlands. The recommendations in these subbasins include projects to correct localized flooding and habitat damage caused by past development as well as area-specific programs and regulations to reduce the initiation of new problems.

All of the basin's streams flow westward down a steep slope into Lake Sammamish. Significant channel downcutting and landsliding have occurred along these west slopes, with adverse effects on streamside properties, fish habitat, and base-of-slope roads where eroded sediment clogs culverts and causes flooding. The erosion and landslide problems are most severe in the Panhandle and Monohon drainages which share the steepest slopes in the basin and erosive soils, and have extensive urban development in their headwaters. Historic development along the shore of Lake Sammamish also has substantially altered shoreline and lower-reach fish habitat and blocked anadromous fish access to most streams. Subbasin recommendations for the western basin include projects to reduce roadway flooding and restore habitat as well as programs and regulations to reduce erosion and protect water quality and habitat.

5.1 PANHANDLE SUBBASIN

At the north end of the East Lake Sammamish basin, a narrow strip of land about three miles long but less than a mile wide drains westward into Lake Sammamish. Over three-quarters of this subbasin consists of steep slopes, with only the lakeshore area at the base and the western-most edge of the East Lake Sammamish plateau providing near-level areas. Thirteen discrete drainage courses have been identified in this subbasin. Of these drainages, all flow at least half of the year and several are perennial. They originate from springs and seeps on the steep western slope of the subbasin; in recent time some of these surface channels have eroded upslope onto the plateau surface itself, invariably as a result of surface discharge from upland development. Because of limited tributary areas, flows in the Panhandle drainages were not modeled using HSPF.

Land use in the subbasin varies dramatically. Lakeshore development is intensive, with single-family

residences lining both sides of East Lake Sammamish Parkway. Although some of that development activity creeps a short way up the west slope, most of that steeply sloping area is undeveloped except for a few old water supply sites and one recent clearcut. The upland plateau is presently a mix of high-density single-family subdivisions and undeveloped land. Additional development, however, is indicated by recent plat applications that propose to occupy nearly all of the remaining area within the next several years.

The topography and hydrologic response of the Panhandle subbasin are determined by its geologic setting. The upland is mainly till-covered, contiguous with the upland of the Evans Creek basin and almost imperceptibly separated from it by a gentle topographic divide. The till is underlain by extremely erodible sand and minor gravel of the Vashon advance outwash, a thick deposit that carries much of the groundwater of the area and feeds the hillslope drainages throughout much of the year. Beneath that sand is a layer of silt and clay, limiting the downward migration of groundwater and localizing a zone of saturation, and of landsliding, across the middle of the western slope.

Aquatic habitat in the Panhandle drainages is minimal. None of the catchments are large and none of the channels are particularly varied or complex. This limitation has been exacerbated by barriers to migration and by high flows entering some of the channels from upland development. These flows have eroded the channels, leaving them more barren than in the undisturbed state. As a result, no fish use has been observed in any of them. Lakeshore spawning, however, has been reported near the center and the southern edge of the subbasin. There are no water quality data available for this subbasin, but the presence of surface-water-supply systems suggests that historic quality has been quite high. Water quality likely will deteriorate as surface water drainage systems from the upland urban areas are discharged into these channels.

Flooding problems in the Panhandle are localized along East Lake Sammamish Parkway. They result mainly from the clogging of highway cross-culverts from upstream-derived sediment. Of the thirteen drainages, two-thirds of them (nine) overtopped onto the Parkway during the January 1990 storm; a tenth is projected to fail under future development conditions. These problems are symptomatic of the difficulty of achieving genuine mitigation of development impacts in this problematic setting, where the predevelopment runoff patterns typically supported no overland flow whatever.

Problems in the Panhandle drainages result from fundamental alterations in the natural hydrologic regime as a result of upland development. In the predeveloped state, these channels were fed almost entirely by subsurface flow. A surface drainage course was established only part way up the western slope of the subbasin, where springs and seeps emerged with sufficient discharge to carve a channel. Tributary 0143J, for example, still reflects this drainage pattern. Precipitation moves only very slowly through the subsurface into the lower channels, delaying storm peaks by many days or weeks and so greatly reducing the magnitude of peak flows.

Following development, however, upland runoff no longer infiltrates into the subsurface. It is collected by the storm-drain system and runs off cleared and compacted ground, even if that ground is later landscaped. This flow then erodes from the very top of the western slope, forming a new channel and transporting substantial amounts of sediment that is derived from the new channel formation. In addition, the rate and volume of surface water from the development, even if detained, is greatly increased over predevelopment values.

Thus the change in runoff from development is basic—what was once subsurface flow is now collected on the surface. In the largely till-covered uplands of the Panhandle, concentrated surface flow can no longer be dispersed back into the subsurface, because only the undisturbed soil and vegetated mat developed on top of the till have sufficient permeability and thickness to store and transmit that water.

In addition to increasing surface-water flow, groundwater recharge commensurately decreases. This is expressed by a reduction in the baseflow of the drainages in their lower reaches. But reestablishment of an active regime can only happen at the source, namely at the ground surface on which the precipitation first lands. Recommendation PH-2 is an effort to maintain some of that recharge, because once collected the runoff cannot be effectively reinfiltrated.

5.2 INGLEWOOD SUBBASIN

The Inglewood subbasin occupies approximately two and one-half square miles of the northern portion of the East Lake Sammamish basin. George Davis Creek (tributary 0144) is also known locally as Inglewood Creek or Eden Creek. The stream rises in Wetland 26 east of 228th Avenue NE and north of SE 24th Street. Current land use in the subbasin area is a mix of rural and single-family urban with one neighborhood commercial center.

Due to the soil characteristics of this subbasin, its hydrology is the most complex of any area studied in this plan. This subbasin is characterized by extensive recessional outwash deposits which are highly permeable. The stream channels generally follow the course of these outwash deposits below 228th Avenue NE. Flanking these outwash deposits, till caps the upland portions of the subbasin.

Relatively high rates of runoff occur in these uplands. Stream channels flow nearly year-round upstream of Wetland 9 at 228th Avenue NE. The runoff then rapidly infiltrates once the surface flow reaches the deposits of outwash soils, generally downstream of 228th Ave NE. During most of the year, there is no surface flow in the stream bed between approximately 228th and 216th Avenue NE except in the most extreme storms. During dry weather, the surface flow reemerges in several springs below 216th at about the 280-foot elevation contour. Downstream from these springs, the stream becomes perennial again.

Two deep wells for public domestic supply in the subbasin withdraw from over 300 feet below sea level. Any shallow wells in this subbasin, however, may be subject to contamination in the future due to the impacts of urbanization.

The subbasin is expected to develop almost entirely as single-family urban land in the future. Land cover is predicted to change from about 7 percent impervious and 65 percent forest in 1989 to 24 percent impervious and 69 percent grass. These changes are predicted to result in the largest flow increases of any subbasin in the planning area, if no mitigation is provided. The average flow increase is higher than 200 percent for most of the stream system below 228th Avenue NE. Subcatchment I3 is predicted to experience the largest flow increase of any subcatchment modeled in the basin plan area (over 400 percent). This level of increase means that the average of the 2-year through 100-year return period flows will increase from 7.5 to 38.3 cfs in this subcatchment.

Several localized flooding problems have been reported in the subbasin during large storms. A crushed 12-inch culvert at 221st Avenue NE on George Davis Creek (tributary 0144) floods the roadway and the yard of a residential lot during storms large enough to produce surface flow in the channel. Flooding of private property also occurs on the mainstem of George Davis Creek above 228th Avenue NE and on tributary 0144A at NE 2nd Street. Reported flooding includes both house flooding and inundation during periods of high flows of land surrounding a garage.

Flooding of East Lake Sammamish Parkway occurs due to undersized culverts and sediment buildup at the Parkway and Burlington Northern Railroad (BNRR) tracks. The source of sediment is the ravine above river mile (RM) 0.2. The section of stream has also been piped under a house along the lake shore.

The pipe is a barrier to fish passage.

Anadromous fish use in the lower 0.4 miles is possible, although sedimentation in the lower reaches and the stream culvert under the residence limit the amount of usable habitat. Between river miles 0.2 and 0.8, the stream channel contains relatively large volumes of woody debris and habitat conditions are generally favorable to salmonids. The upper tributary streams in the subbasin all have some rearing habitat available for resident cutthroat trout and some limited spawning areas are also available in the system. Lakeshore spawning by kokanee may also occur near the outlet of George Davis Creek.

The two largest headwater wetlands in this subbasin, Wetland 9 and the northwestern portion of Wetland 26, are classified as bog systems, and are number-1-rated by King County. The remaining headwater wetlands in this subbasin, Wetlands 2, 11, 12, 18, 61, 62, 77, 80b, and 81b, are rated as number 2 or 3. Of these wetlands, numbers 9 and 26 are particularly critical for maintaining both stable stream channels and the diversity of plant and animal species. Both of these wetlands have storage, recharge and wildlife habitat functions. In addition, Wetland 26 supports a broadly based food web support. Both wetlands have already been affected by road construction and surrounding development. Wetland 18 is also threatened by substantial future development.

Wetland 26 also drains into the Laughing Jacobs Subbasin and is described in more detail in that section of the plan. Wetland 9 comprises 55 acres with four sub-classes of vegetation communities. It lies on the boundary between the East Lake Sammamish and Evans Creek basins. It drains into both basins as a result of past dredging and utility construction that has disrupted the natural flow regime. Two of its sub-classes—forested with western red cedar and scrub-shrub with labrador tea—should be considered particularly sensitive to alterations of existing wetland hydrology, particularly to increases in the frequency and duration of inundation. Level outwash soils to the north of Wetland 9 provide excellent infiltrative capacity while the steeper slopes and till soils to the south produce greater amounts of surface runoff.

Several water-quality concerns have been identified in this subbasin. Livestock access in the headwaters has caused nutrient and bacteria levels in George Davis Creek to exceed state standards during storm events. Stormwater samples from commercial areas contain high levels of bacteria, suspended solids, and heavy metals that enter tributary 0144D during periods of heavy rainfall. A residential detention pond draining to the same tributary provides minimal water quality benefit.

Hydrologic conditions and the geology of this subbasin make it particularly sensitive to the impacts of urbanization. In the absence of careful management, the flooding, water quality, habitat loss, and erosion problems already seen in this subbasin will worsen due to the large predicted increases in flows in this subbasin.

Because this subbasin has large areas that are only lightly developed at present, the opportunity exists to reduce future peak flows locally by applying enhanced onsite detention standards. This reduction in peak flows could be accomplished by applying the stream protection onsite detention standard in subcatchments I1, I2, and I3 (Recommendation I-1). Lowering future peak flows from new development, in conjunction with regional infiltration (Project 1533) and bank stabilization (Project 1599d), would lessen future increases in erosion and sediment problems in the lower 0.8 miles of the system. Matching existing durations would lessen future increases in flooding at NE 2nd Street and east of 228th Avenue NE. Implementing these recommendations is predicted to limit future flow increases from an average of 215 percent over current flows for the unmitigated case to an average of 31 percent over current flows.

In the case of the two number-1-rated wetlands, management of the subcatchments listed above will result

in a decrease in density of the subcatchments from high-urban densities to low-urban densities. With less impervious surface and a reduced road network, the hydrologic function and continuity of the wetlands and the surrounding landscape, (*i.e.*, storage, infiltration, and recharge), will more closely approximate the existing conditions. Downstream flows that are predicted to increase dramatically in this subbasin will not increase. Flooding, erosion and sedimentation will likewise not increase as much as predicted for the unmitigated future land use condition.

5.3 THOMPSON SUBBASIN

The Thompson subbasin occupies an area of approximately three square miles in the west central portion of the East Lake Sammamish basin some three-quarters of a mile to the north of Pine Lake. It is bounded by SE Fourth Street on the north, by 228th Avenue SE on the west, and by SE 20th Street on the south.

The subbasin is formed in the rolling swale topography characteristic of the plateau. It is underlain by recessional outwash in the headwaters, by till deposits in the mid-reaches, and by advance outwash, transitional beds of silt and clay and deposits of landslide debris progressively downstream through the ravine.

A single major stream, Ebright Creek (tributary 0149, together with two small tributaries) drains from a groups of four wetlands that lie near the western edge of the plateau. The stream is used by small numbers of coho salmon, sockeye salmon and kokanee although a small dam blocks anadromous fish passage at RM 0.45; a population of resident cutthroat trout occupies the stream above this point. Of the four wetlands in the subbasin, only Wetland 61 is a number-1-rated system. Although it is quite small, four wetland classes occupy its five acres. The other three wetlands—-14, 17, and 62—-are number-2-rated. Total wetland acreage in the subbasin is 40 acres.

Wetland 61 lies in the upper reaches of Ebright Creek (tributary 0149) in a narrow valley, flanked on the north by a subdivision and an active farm, and on the south by another subdivision, a large church (Saint Mary), and wooded slopes. This five-acre wetland consists of two open water vegetation subclasses and two deep marsh subclasses. The southern portion of the wetland has been designated a wildlife preserve and is somewhat protected from adjacent development by wooded slopes that extend to the southeast; other wooded areas extend downstream to the west and northwest. The open water areas provide feeding, nesting and resting areas for waterfowl. Although these vegetative types are not particularly sensitive to increases in the frequency and duration of flooding, they may be quite sensitive to pollutant loadings brought about by urban runoff. Because of its position in the mid-reaches of the subcatchment, and because of its small size, this system is quite susceptible to damage from upstream development. Although partly constrained, opportunities still exist to protect the remaining functions of this wetland.

Current land use (1989) in the subbasin is dominated by single family rural to the north and east of Wetland 17 and at the mouth of Ebright Creek; some forest use occurs in the eastern and southeastern portions of the subbasin and along the western slopes of the plateau; single family urban uses are found in the south central plateau portion. Future land-use projections
indicate that the majority of the subbasin is intended for single-family urban use. About 10 percent of the subbasin in the lower stream ravine will remain as rural.

Current problems in the subbasin include: bed and bank erosion in the upper and mid-reaches of Ebright Creek resulting in sedimentation of lower reach salmonid spawning and rearing habitat and of culverts under East Lake Sammamish Parkway; wetland encroachment and filling in Wetland 17; and occasional

flooding of the roadway traversing Wetland 17. No major water-quality problems occur in this subbasin although elevated nutrient and turbidity levels have been recorded.

Under future land-use conditions without mitigation, peak flows in Ebright Creek are predicted to increase by some 100 to 150 percent, an absolute increase of between 20 and 40 cubic feet per second. Such increases will exacerbate existing erosion and sedimentation problems. Future land uses are expected to produce water-quality problems far greater than those presently observed. Increases in turbidity, nutrients, metals, and organic pollutants are likely with projected urban uses. Further encroachment and isolation of wetlands, particularly Wetland 17, should be expected as well.

The stream protection standard (BW-2) that should be applied downstream of Wetland 17 is intended to reduce flows sufficiently to prevent further erosion of the streambeds and banks of tributary 0149. Conditions of soil and slope combine to produce a high susceptibility to such erosion. Even current flows have caused damage to the channel that has resulted in deposition in downstream areas used by salmonids for spawning and rearing. Without such enhanced detention, the existing problems will be exacerbated. Using the standard, estimated unmitigated future flows will be reduced from an average 50 cfs to approximately 25 cfs. This mitigated flow is about nine percent higher than 1989 conditions and should not produce the catastrophic damage that would be expected without the standard.

Wetland 61 is the only number-1-rated wetland in the Thompson subcatchment. It is a small (five-acre) headwater system with a diverse plant community. The maintenance of wetland structure and function is predicated on protecting the integrity of adjacent slopes and tributary area by several interdependent methods.

Because of its size and location in the catchment, Wetland 61 could be harmed easily by both upstream and adjacent development effects. Urban stormwater, sedimentation, pollutant loading, noise and glare could have serious detrimental effects on the flora and fauna of this system and the water quality of tributary 0149. Provisions for limiting impervious area, for clustering development, for erosion and sediment control, and for protecting existing wildlife corridors are combined to reduce the effects of urban development on the wetland.

5.4 PINE LAKE SUBBASIN

The Pine Lake subbasin drains 1,175 acres in the center of the East Lake Sammamish basin. The subbasin has numerous water-resource features including Pine Lake, an 86-acre lake; Wetland 30, a number-1-rated wetland; Pine Lake Creek (tributary 0152); and Kanim Creek (tributary 0153).

Most of the Pine Lake subbasin lies on the upland plateau, with its northwestern edge located on the steep western slope down to the shoreline of Lake Sammamish. Pine Lake Creek and Kanim Creek flow across each of these topographic elements from lake and wetland headwaters into Lake Sammamish. The plateau geology is dominated by glacial till; on the western slope, the till is underlain by highly erodible sandy outwash deposits.

Almost one-half of the basin is forested. The majority of the remaining areas is a mix of rural and urban-density residential uses. The entire area is projected to be developed to urban density in the future.

One number-1-rated wetland, Wetland 30, is located in this subbasin. This system is 54 acres in size and lies immediately to the southwest of Pine Lake; it appears to drain primarily to Pine Lake (which is now diverted into Pine Lake Creek) but drainageways for agriculture have resulted in a second outlet from

the northwest corner of the system, following a swale that connects this system with Wetland 29. Wetland 30 provides fish and wildlife habitat and food-web support but has been severely impacted by agricultural and residential land uses, including a large commercial horse farm that occupies the southwestern edge of the wetland and the headwater reaches of Kanim Creek.

Wetland 30 consists of four vegetative subclasses and has been extensively altered for pasture use in the western portion. The center of the wetland consists of moss/lichen/labrador tea association that is very sensitive to changes in water level and frequency of inundation. A connection with the western slope of the plateau provides wildlife with a relatively unbroken corridor to the plateau.

Pine Lake is an important recreational and aesthetic resource to the community. Pine Lake water quality has been historically poor, with high phosphorus concentrations, seasonal algal blooms, and medium water clarity. In 1979-1980 a water quality study was performed on Pine Lake. Subsequently, diversion of the wetland inflow was recommended because of its contribution to lake phosphorus loading. The surface water from Wetland 30 was finally diverted in 1988. Recent improvements in winter phosphorus levels and the elimination of spring algal blooms in the lake suggest that the wetland diversion project has resulted in improved lake water quality in the spring. However, water quality during the late summer and fall has worsened since 1979-1980, when the original diagnostic study was performed.

Water quality in the base flows of Pine Lake Creek was monitored monthly by Metro between May 1987 and April 1988 as part of the development of this plan. These data showed bacteria and phosphorus concentrations frequently exceeding water quality standards or recommended guidelines.

Monitoring of water quality in stormflow samples from Pine Lake Creek showed bacteria and phosphorus concentrations were the highest recorded in the entire basin (during a May 2, 1990 event), exceeding standards or recommended guidelines by a factor of 157 times (bacteria) and seven times (phosphorus). Small farms and residential land uses are the most probable sources of these pollutants.

Pine Lake provides valuable fish and wildlife habitat for many species. The lake is home to largemouth bass, pumpkinseed, rainbow trout, and cutthroat trout; it is managed by Washington Department of Wildlife for rainbow trout. Many species of birds (including Canadian geese, Mallards, and Ruddy ducks) and other wildlife make the Pine Lake area their home.

Pine Lake Creek provides fish habitat for resident and anadromous fish. Excellent pool/riffle habitat remains, particularly where the streams fall from the plateau to Lake Sammamish. Pine Lake Creek is one of the two systems in the basin that regularly flows year-round (Laughing Jacobs [0166] is the other). Some of the Panhandle streams (0143B-L), the lower portion of George Davis Creek (0144), and possibly others may also flow year round. Kanim Creek and Pine Lake Creek have anadromous fish use up to RM 1.80 and 0.60, respectively, and resident fish use above.

The problems in the subbasin include current and future erosion, flooding, wetland and habitat loss, stream channelization, and water quality degradation. For example, severe erosion exists along RM 0.0 to 0.64 of Kanim Creek. Minor flooding problems occur at the intersection of 212th Avenue SE and SE 24th Street and where Wetland 30 crossed 212th Avenue SE. Future flooding is expected to occur at the East Lake Sammamish Parkway where Pine Lake Creek crosses the road.

Solutions to many of the problems in this basin are interrelated. The flooding and erosion problems in the subbasin are minor when compared to the number and magnitude found in other subbasins (*i.e.* Panhandle and Monohon drainages). Water quality, wetland degradation, and habitat loss are the dominant themes linking the remaining problems.

Pine Lake is a significant recreational, aesthetic, and wildlife resource of the plateau and lake water quality protection is a major goal of the subbasin recommendations. A nonpoint source identification program specific to the subbasin can be used to identify residential and commercial land use impacts and guide additional basin and subbasin recommendations for preventing further degradation of the lake and subbasin water quality.

5.5 MONOHON SUBBASIN

Along the western edge of the East Lake Sammamish basin, a number of short drainages with small tributary areas drain to Lake Sammamish. North of George Davis Creek, these streams are grouped into the "Panhandle" subbasin. South of George Davis Creek, these streams, together with their tributary areas and adjacent lands that have no discrete drainage courses, are collectively called the Monohon subbasin. The subbasin includes the areas tributary to Zaccuse Creek (0145A), 0145B, and 0150A (north Monohon); and to 0162A, 0163, Many Springs Creek (0164A), and 0164B (south Monohon). Between 0162A and the Pine Lake subbasin, several hundred acres drain to Lake Sammamish without any apparent natural channels; this area is also included in the south Monohon area. Because of limited tributary areas, none of the Monohon drainages were modeled with HSPF.

Topographic and geologic conditions throughout the Monohon subbasin are similar to those in the Panhandle farther north. The upland drainage area is quite limited; most of this subbasin's area lies on the western slope. Hillside gradients here are not as steep as in the Panhandle. The geologic layers, however, are similar in both subbasins, with easily erodible sand underlying much of the western slope (particularly along tributaries 0145A, 0163, 0164A, and 0164B). As a result, stream-channel incision is ubiquitous in these drainages and most severe along Many Springs Creek (tributary 0164A), where the level of upstream development is greatest.

Land-use patterns in the subbasin follow those of the basin as a whole, with scattered areas of relatively dense single-family residences located on both the top and bottom of the western slope. Development has occurred at all elevations only where that slope is flattest, between Kanim Creek and tributary 0162A in the vicinity of SE 24th Way. In the future, urban-level single-family development is anticipated throughout the subbasin, except on the steepest and most landslide-prone parts of the western slope.

Aquatic resources are limited in the subbasin, although shoreline spawning occurs in both the south and north Monohon areas. Above the lake, however, steep gradients and impassible culverts limit the fish-accessible stream length to about 2000 feet in aggregate for the entire subbasin, with the greatest amount located at the base of Many Springs Creek (0164A). The only water-quality data are also from this creek and showed minimal problems except for a high suspended-sediment load, associated with the upstream problems from stream incision and landsliding.

One number-1-rated wetland (#58) is located in this subbasin. This wetland is only 3.7 acres in size and has a single vegetative subclass, consisting of labrador tea, bog laurel, and cranberry. These plants are quite sensitive to hydrologic and chemical disturbance, particularly critical here because of the small size of the wetland relative to its subcatchment. An old drainage ditch traverses the wetland and residential development has occurred to the north and west of the wetland; forested tracts remain to the east and south although these areas are also partly developed now.

Because most of the channels of this subbasin carry little water, flooding at road crossings near Lake Sammamish is not widespread. Yet the two largest tributaries, Zaccuse and Many Springs creeks, also suffer from the greatest amount of upstream erosion and thus downstream sedimentation. As a result, road

flooding occurred near the base of Many Springs Creek in January 1990; both crossings flood under modeled 25-year current flows with observed sediment loading.

In the absence of this suite of corrective measures in the Monohon subbasin, potentially severe property damage is likely as a result of future development. In particular, downstream sedimentation impacts from upstream development (as already experienced along tributary 0145B) and catastrophic stream-channel incision (as seen along Many Springs Creek) could become more common, because topography and geology are similar throughout the west slope of the subbasin. Maintenance of some fraction of the existing functions of Wetland 58 is also recommended, because the fate of equivalent small bogs in fully urbanized drainages without such controls is historically poor. In contrast, the habitat restoration projects seek to regain the past level of watershed functions that have been lost. Without these recommended projects, some of the once-productive lower channel reaches of the subbasin will become, or remain, permanently barren of fish.

5.6 LAUGHING JACOBS SUBBASIN

The 3,600-acre Laughing Jacobs Creek subbasin is situated in the southeastern one-third of the basin, mostly east of 228th Avenue SE. On the upland area, hills of till and bedrock are dissected by a broad valley, generally floored in gravelly ice-contact sediments. The area contains two lakes (Beaver and Laughing Jacobs) and is drained by Laughing Jacobs Creek (tributary 0166) and five smaller streams (tributaries 0166A-0166D and 0167). Although resident fish populations are found throughout the drainage, anadromous fish production is restricted to the western mainstem ravine below a cascade at RM 0.57.

In 1989, about 63 percent of the subbasin was forested with most of the remainder being single-family residential. In the future, 89 percent of the subbasin is expected to be developed at urban densities. With no onsite detention, this change in land use would cause channel flows to increase between 40 and 250 percent. In the planning area only the Inglewood subbasin shows greater flow increases.

Solids, nutrients, and bacteria associated with both urban and rural land uses are threatening water quality within the subbasin. Water-quality criteria or recommendations were exceeded for fecal coliform, enterococcus, total phosphorus (TP), and total suspended solids (TSS) concentrations during storm and some baseflow monitoring events. Beaver Lake water quality is considered mesotrophic (productive) with some excessive macrophyte growth. A King County Phase I Lake Restoration study which began in August 1991, is examining water quality and will recommend a management plan for Beaver Lake and the surrounding watershed. The East King County Groundwater Management Plan is also underway, but it has not yet identified areas where poor quality surface water might harm critical aquifer recharge areas. Analysis of local geology shows that, as the area develops, domestic water supply aquifers that underlie the area around Wetland 26 may be threatened by the pollutants generated by commercial or industrial uses. These pollutants, such as solvents or metals, are more difficult to treat in stormwater facilities.

Channel erosion is minor in the low-gradient streams on the upper plateau. Flooding also occurs in these reaches and around many of the associated wetlands, particularly where development has encroached on these water bodies. SE 24th Street, an arterial, frequently floods between 228th Avenue SE and 244th Avenue SE. Even in some of its steepest reaches, past the lip of the plateau, Laughing Jacobs Creek is underlain by bedrock. As a result, erosion is less than might otherwise be expected. Unfortunately, ill-directed runoff from developed areas has resulted in the delivery of significant amounts of hillslope sediments to the channel. Downchannel transport of these sediments contributed to flooding of the East Lake Sammamish Parkway during the January 1990 storm. Both flooding and sedimentation problems

will be severely aggravated by the large projected increases in channel flows.

Twenty-two wetlands have been identified in this subbasin. These wetlands are representative of habitat as diverse and abundant as can be found anywhere in King County. Some wetland damage has occurred as a result of agricultural activity, road building, and urban development. However, the most severe threat to these wetlands is the fragmentation and the isolation from the surrounding landscape caused by the typical pattern of suburban development.

Five of these twenty-two wetlands are number-1-rated, unique and outstanding. These wetlands are as follows:

- Wetland 10 (Saddle Swamp) is a complex wetland of 31 acres. This number-1-rated system consists of scrub-shrub, deep marsh and two open water subclasses. Numerous beaver dams occur in the downstream reaches of the wetland and should be considered sensitive to human disturbance and to unusual fluctuations in water levels. The beaver ponds of the wetland provide excellent over-wintering habitat for waterfowl, as well.

  The wetland lies upon till soils and is relatively large for its subcatchment; these factors suggest that the hydrologic response of the wetland to surrounding land-use changes is somewhat insensitive.

  The area surrounding this wetland has been platted and an EIS is in progress. Buffers have been established according to the King County Sensitive Areas Ordinance.

- Wetland 21, another number-1-rated wetland, is 13.4 acres in size. It is dominated by a single vegetative subclass consisting of labrador tea and its acid-tolerant associates: cranberry, bog laurel, sphagnum moss, and northern starflower. This association is rare and should be considered extremely sensitive to changes in existing hydrologic conditions. A small, intermittent stream enters the wetland from the northeast, apparently draining the adjacent hillslopes through a broad, shallow swale that is an important hydrologic adjunct of the wetland. A second swale lies to the northwest, also an integral hydrologic connection. The system is surrounded by extensive mixed deciduous forest that supports numerous species of wildlife. Soils surrounding the wetland appear extremely porous but are generally saturated at or near the surface at winter's end.

- Wetland 26 is a 37 acre, number-1-rated system that consists of three vegetative subclasses: deep marsh, spirea-dominated scrub-shrub and labrador tea-dominated scrub-shrub. The latter subclass (fen) is boglike and is extremely sensitive to hydrologic change. This subclass is isolated in the northeast corner of the wetland by two roadways that intersect the wetland, dividing it into four parts. The remainder of the wetland had been tiled some years ago and ditched for agricultural use, reducing its sensitivity to further disturbance. Some recovery of vegetation seems to be occurring in these previously disturbed areas.

  Connections with surrounding forest occur to the north and south, providing transportation corridors for wildlife into and through the wetland.

  The wetland lies at the headwaters of the Laughing Jacobs Creek system and provides seasonal storage and release of stormwater to the creek.

- Wetland 34 (Queen's Bog) is also number-1-rated. This 17.5 acre wetland consists of four vegetative subclasses of which three have bog-like characteristics. In particular, the moss/lichen bog subclass should be considered very sensitive to hydrologic and chemical disturbance. The wetland is

extensively developed on the southern and eastern perimeters with provisions for a 200 foot wide buffer. A gasline bisects the wetland from north to south and has resulted in the formation of a deep marsh subclass through the trenched area. An apparent hydrologic connection exists with wetland 67 which lies approximately 1,000 feet to the east.

- The number-1-rated wetland system of Laughing Jacobs Lake (Wetland 39) consists of two subclasses totaling 21 acres. The scrub-shrub subclass has bog-like characteristics with sphagnum moss and some few sitka spruce. The wetland lies in a mid-reach subcatchment and is being rapidly surrounded with urban development. Livestock grazing occurs in the northern and southern portions of the wetland. Flooding occurs regularly and hydrologic modelling suggests that this condition will be exacerbated in the future as development proceeds in upstream subcatchments.

Sediment from several active landslides in the Laughing Jacobs ravine has settled in the flat lower reaches and caused flooding problems in the East Lake Sammamish State Park and at the East Lake Sammamish Parkway. These failures are caused by discharge of runoff from cleared or developed land in the ravine edge. This situation is aggravated by the historic diversion of the lower channel route to Lake Sammamish that has reduced the gradient and increased localized sediment deposition. Management of sediment in the lower reach of Laughing Jacobs Creek (RM 0.4-0.3) is therefore a specific goal. This ongoing problem can be addressed by constructing sediment traps in the form of logs and other diversity-fostering structures to the upper channel (1599h).

Flow increases associated with urbanization result in erosion and subsequent sediment transport leading to higher concentrations of turbidity and suspended solids. These impacts on water quality become disturbance mechanisms for aquatic habitat through the deposition of fine sediment material that settles into the interstitial cavities of gravels. The intrinsic link between water quality and quantity cannot be ignored as the effects of water quantity are a continual focus of surface water problems in the subbasin.

CHAPTER 6
PLAN DEVELOPMENT AND IMPLEMENTATION

6.1 PLAN DEVELOPMENT

As a combined basin and nonpoint action plan, this plan was developed by the Issaquah/East Lake Sammamish Watershed Management Committee (WMC), with SWM as the lead agency. The WMC consists of representatives of King County, the City of Issaquah, the Muckleshoot Indian Tribe, the King Conservation District, and the Washington Department of Natural Resources. The WMC was advised during plan development by the citizen-based Basin Advisory Team (BAT) and a technical advisory committee, composed of agency, business, and community group representatives. Early in the planning process, the WMC decided to develop separate plans for the East Lake Sammamish and Issaquah Creek basins, because of the physical differences between the two basins.

The WMC has been active on the East Lake Sammamish Plan since late 1989. The WMC meetings were working sessions where the WMC made decisions by consensus. The committee remained active throughout the King County Council adoption process and for development of the final plan. Many members of the WMC will continue their involvement with the basin on the Watershed Implementation Committee. More detail on WMC selection, process, and milestones can be found in section 1.2 of Volume 1: Draft East Lake Sammamish Basin and Nonpoint Action Plan (1992).

The WMC approved a public involvement and education program for the East Lake Sammamish basin in September, 1990. The core program consisted of regularly scheduled BAT meetings, and technical advisory committee and open houses/public meetings scheduled at key points during plan development. In addition to these core elements, public involvement projects such as streambank and wetland revegetation, storm-drain stenciling, and stream naming occurred during the course of plan development. Finally, a formal public meeting and public hearing were held by the King County Council during the adoption process. More detail on the public involvement process can be found in section 1.3 of Volume 1 of the draft plan.

6.2 SEPA REVIEW

The East Lake Sammamish Basin and Nonpoint Action Plan was subjected to environmental review and the threshold determination process as required under RCW 43.21C of the SEPA process. After review of a completed environmental checklist, a Supplemental Nonproject Action Sheet, and other relevant information, the lead agency (King County Department of Public Works, Surface Water Management Division) issued a Determination of Nonsignificance under WAC 197-11-340(2). Individual capital improvement projects (CIP's) will initiate SEPA determinations when the CIP's go to the design phase of plan implementation. Section 6.3 of Volume 1 of the draft plan contains the environmental checklist and threshold determination.

6.3 AFFECTED PARTIES

Private landowners throughout the basin and more than 20 agencies and organizations have a role in implementing the plan. These implementing agencies (and their acronyms) are as follows.

King County Agencies:

- Department of Assessments
- Department of Parks, Planning, and Resources (PPR)
  - Planning and Community Development Division
  - Community Planning (CP) Section
- Department of Development and Environmental Services (DDES)
  - Environmental Division (ED)
- Department of Public Works
  - Roads and Engineering (Roads) Division
  - Surface Water Management (SWM) Division
  - Solid Waste Division (SWD)
- Department of Metropolitan Services (Metro)
- Seattle/King County Department of Public Health (SKCDPH)

Regional Agencies and Special Purpose Districts:

- King Conservation District (KCD)
- King County Cooperative Extension (KCCE)

Indian Tribes:

- Muckleshoot Indian Tribe

State Agencies:

- University of Washington Center for Urban Stormwater (UW)
- Washington State Department of Agriculture (DOA)
- Washington State Department of Ecology (DOE)
- Washington State Department of Fisheries (DOF)
- Washington State Department of Health (DOH)
- Washington State Department of Natural Resources (DNR)
- Washington State Department of Wildlife (DOW)
- Washington State Parks and Recreation Commission (WSPARC)

Federal Agencies:

- United States Fish and Wildlife Service (USFWS)

Others:

- Save Lake Sammamish

6.4 RECOMMENDATION PRIORITIES

Solutions to the many problems in this basin are costly, and funds to implement the plan's recommendations are limited. Given funding limits, the WMC and advisory team set priorities to ensure that the most important recommendations are most likely to receive funding in the near-term.

Priority 1 Recommendations. The Priority 1a recommendations constitute the bare bones of the management program -- detention and water quality standards, wetland protection standards, clearing/grading limits, and the basin steward. This category also has 14 CIP's that address the most severe erosion, water quality, and wetland damage problems. The Priority 1b recommendations bolster the effectiveness of Priority 1a solutions, keep the basin planning program vital over time, or offer substantial improvement to the most significant surface water problems in the future. This priority category includes basin monitoring programs, annual program review, training to ensure proper plan implementation, retrofitting of existing drainage facilities, improved facility maintenance, and livestock BMP requirements.

Priority 2 Recommendations. The Priority 2 recommendations are either: (1) less effective ways to solve the basin's major problems including lake phosphorus, flooding due to high flows and erosion, and wetland protection, or (2) effective ways to address other important problems such as protection of limited remaining habitat in the lower stream reaches. This category includes fifteen CIP's and supplemental education and information programs, maintenance practices, enforcement and clearing protocols, nonpoint source and facility inventories, stream habitat protections, and water-quality emergency response.

Priority 3 Recommendations. The Priority 3 recommendations are good basin management practices that offer small improvements to the basin's problems. This category includes twelve CIP's and supplemental education and information programs, ways to improve the administration of existing regulatory programs, and inventories to improve our knowledge of nonpoint pollution sources.

6.5 PROJECTED FINANCING

The capital projects, programs, and regulations needed to adequately control surface water impacts will have substantial public and private costs. About 45 percent of the programmatic recommendations could be fully accommodated within existing programs and budgets, and about 17 percent could be partially accommodated. Added costs for the remaining programmatic recommendations are estimated at about $1.5 million for staff and start-up costs in the first year following plan adoption, and about $1.1 million for ongoing programs. Funds for capital programs are also limited. The cost of capital projects is estimated at $13 million of which only about 25 percent can be covered under current SWM Division CIP funding programs. To clarify funding choices, priorities have been established for all of the plan's recommendations. The top-priority capital projects and program development tasks are recommended to be implemented within three years of plan adoption. However, due to funding limits, the implementation timeframe is uncertain for the recommendations that have no readily apparent near-term funding source other than State nonpoint action grants. However, the approval of these increased budgets, and thus the implementation schedule for those recommendations that are not accommodated within existing programs, remains to be determined.

6.6 STATUS OF IMPLEMENTATION

(see following tables)

TABLE 3

IMPLEMENTATION STATUS OF PLAN RECOMMENDATIONS (from Chapter 2)

RECOM-MEND. NUMBER[1]	DESCRIPTION	STATUS[2] (11/94)	NOTES[2]
BW-1	Onsite R/D: SCS 7-day storm	IS	DM,CP
BW-2	Enhanced onsite R/D--Stream Protection	IS	DM,CP
BW-3	Ravine protection standard	IS	CP (land use); DM (drainage)
BW-4	SAO wetland protection	IS	Countywide ordinance
BW-5	Wetland management areas	IS	CP (land use); DM (drainage)
BW-6	Level 3 wetland management	X	combined with BW-5
BW-7	Phosphorus reduction	X	Countywide ordinance
BW-8	Lk. Sammamish WQ project	IP	
BW-9	WQ design standards	IP	DM
BW-10	WQ facility retrofitting	IP	
BW-11	WQ performance standards	P	
BW-12	Point source discharges	P	
BW-13	Commercial BMPs	A	Countywide: K.C.C. Ch. 8.12
BW-14	WQ emergency reponse	I	
BW-15	Underground storage tanks	I	
BW-16	Farm management BMPs	IP,A	Countywide livestock ordinance
BW-17	Onsite septic as-builts	I	
BW-18	Onsite septic maintenance	I	
BW-19	Boat-waste disposal	I	
BW-20	Marina recycling	I	
BW-21	Watershed implementation	IS	

RECOM-MEND. NUMBER[1]	DESCRIPTION	STATUS[2] (11/94)	NOTES[2]
BW-22	State/local data sharing	I	
BW-23	Kokanee recovery plan	IP	
BW-24	Shoreline protection	I	
BW-25	Fish access; reconstruction	IP	
BW-26	Seasonal clearing & grading	A	CP
BW-27	Forest practices MOU	IP	
BW-28	Building lot BMPs	I	
BW-29	Small farms BMP plans	IS	KCD provides service
BW-30	Urban WQ measures	IP	
BW-31	Onsite septic education	I	
BW-32	Boater WQ education	I	
BW-33	Sensitive Areas brochure	IS	Provided by DDES
BW-34	Basin-regulations workshops	IS	
BW-35	Basin steward	IS	
BW-36	Animal waste composting	IP	
BW-37	Farms programs	IS	KCD has grant funds
BW-38	Waterside BMPs	P	
BW-39	Fast-track permitting	X	feasibility dubious
BW-40	Failing onsite septics	I	
BW-41	R/D maintenance	I	
BW-42	Road-ditch maintenance and veg. control	IS	
BW-43	Mechanical veg. control	X	combined with BW-42
BW-44	Maintenance disposal station	P	
BW-45	Culvert sizing criteria	I	
BW-46	Enforcement protocol	I	
BW-47	SWM WQ enforcement	IS	2-year grant funding
BW-48	Grading inspection	X	redundant with existing staff

RECOM-MEND. NUMBER[1]	DESCRIPTION	STATUS[2] (11/94)	NOTES[2]
BW-49	Simplified violation reports	I	
BW-50	Annexation agreements	P	
BW-51	Basin data base development	IP	
BW-52	Annual report	IS	First report 1/95
BW-53	Plan amendment	IS	
BW-54	Flow, development monitoring	UR	Laughing Jacobs Ck.
BW-55	Channel monitoring	UR	
BW-56	Aquatic habitat inventory	I	
BW-57	Aquatic habitat monitoring	I	
BW-58	WQ Inventory	I	
BW-59	WQ monitoring	UR	
PH-1	Ravine protection	-	BW-3
PH-2	Baseflow maintenance	A	DM
PH-3	Reduced onsite R/D	A	DM
PH-4	Culvert sizing	-	BW-45
I-1	Enhanced R/D	-	BW-2
I-2	Wetland protection (# 9)	A	CP,DM
I-3	WQ education, enhancement	I	
I-4	Culvert sizing	-	BW-45
T-1	Enhanced R/D	-	BW-2
T-2	Wetland protection (# 61)	A	CP,DM
T-3	Illegal fill in Wetland 17	IS	
T-4	Culvert sizing	-	BW-45
PL-1	Wetands 30 & 63 education	P	
PL-2	Wetland protection (# 30)	A	CP,DM
PL-3	Pine Lk. WQ education	P	
PL-4	Pine Lake WQ	-	PL-3
PL-5	Culvert sizing	-	BW-45

RECOM-MEND. NUMBER[1]	DESCRIPTION	STATUS[2] (11/94)	NOTES[2]
MH-1	Ravine protection	-	BW-3
MH-2	Baseflow maintenance	A	DM,CP
MH-3	Reduced onsite R/D	A	DM
MH-4	Culvert sizing	-	BW-45
MH-5	Wetland protection (# 58)	A	CP,DM
LJ-1	Enhanced R/D	-	BW-2
LJ-2	Beaver Lake WQ	R	Superceded by Beaver Lake Management Plan (BLMP)
LJ-3	Wetland protection (#s 10,21,26,34,39)	A	CP,DM
LJ-4	Identify LJ Lake floodplain	IS	DM
LJ-5	WQ control, conference ctr.	I	
LJ-6	Ravine clearing & drainage	A	DM,CP
LJ-7	Zoning, aquifer protection	R,A	CP
LJ-8	Culvert sizing	-	BW-45
CP-58 & CP-59	Pine Lake phosphorus control	A	CP
BLMP	Beaver L. phosphorus control	A	in Beaver Lake Management Plan

[1] All recommendations from the Draft Basin Plan are listed. "CP" refers to adopted amendments to the East Sammamish Community Plan.

[2] KEY TO SYMBOLS:

X	Eliminated prior/during Council adoption	**CP**	In East Sammamish Community Plan (P-Suffix condition)
-	Now included in referenced BW	**DM**	Administered through Drainage Manual
A	Adopted by Council	**UR**	Recommendation under revision
AC	At Council for consideration	**IP**	Development of program in progress
IS	Program in service	**P**	Planned or scheduled
R	Revised from plan	**I**	Inactive

TABLE 4

IMPLEMENTATION STATUS OF CAPITAL IMPROVEMENT PROJECTS (from Chapter 3)

PROJECT NUMBER		PROJECT DESCRIPTION	PRI-ORITY[1]	COST-SHARE[2]	STATUS[3] (11/94)	PLANNED COMPLE-TION
PLAN #	CIP #					
1550 & 1599g	200389	Wetland 26 trestle @ NE 24th St	2*	100% Roads	PC	1994
1535 & 1599d	2T1786	George D. Ck. culvert	2*	100% FEMA	1535-D 1599d-C	1995 1994
1553 & 1599h	AC1005	LJ Ck. sediment	1a*		1553-PC 1599h-D	1993 1996
1529 & 1599b	AJ1005	0143L conveyance	1a*	35% Roads	S	1996
1543	OV1005	Kanim Ck.	1a*		P	1997
1542	OK1005	Pine Lk. Ck. culvert	1a*		P	1997
1536 & 1599e	OJ1005	Ebright Ck. conveyance	1a*	50% Roads	P	1997
1532 & 1555	AB1005	0144 berm & Beaver Lk. studies	1a		NF	
1548	OW1005	Many Springs Ck.	1a*		P	1997
1545	OY1005	Zaccuse Ck.	1b		NF	
1546 & 1599p	OL1005	Lower Zaccuse Ck.	1b		NF	
1588	AB1005	WQ study: retrofits	1b		NF	
1599c	in BW-10	Geo. Davis fencing	1b		NF	
1599f,j	AK1005	Small reveget.	2		NF	
1533	OX1005	Infilt. pond (0144)	2		NF	

1547 & 1599q	OM1005	lower 0163	2		NF	
1549 & 1599r	OR1005	LJ Ck. relocation	2		NF	
1530	OS1005	Wetland 26 trestle	2		NF	
1540	OU1005	Wetland 30 trestle @ 236th Ave NE	2		NF	
1537		Wetland 17 trestle	2	88% Roads	NF	
1521 & 1599k	OA1005	lower 0143A	2		PC/NF	
1531 & 1538	AB1006	Small WQ CIP's	2		NF	
1526	OF1005	0143G at Parkway	3	70% Roads	NF	
1523 & 1599m	OC1005	0143C at Parkway	3	70% Roads	NF	
1528	OH1005	0143K RR culvert	3		NF	
1527 & 1599n	OG1005	0143H at Parkway	3	80% Roads	NF	
1522 & 1599l	OB1005	0143B at Parkway	3	70% Roads	NF	
1524 & 1599a	OD1005	0143E above Parkway	3		NF	
1525	OE1005	0143F at Parkway	3		NF	
1541	AH1005	Pine Lake reveget.	3		NF	
1552	AE1005	LJ Lake outlet	3		NF	
1539	AA1005	Pine Lk. Ck. restor.	3	100% Roads	NF	
1554		Beaver Lk. reveg.	3		NF	

1534 & 1599i		0144-212th NE culvert	X		NF	

[1] Starred projects are funded. Other numbers show current basin-plan priority categories but projects are not currently funded; "X" indicates projects unranked in basin plan.

[2] Listed agencies ("Roads" = King County Roads Division; "FEMA" = Federal Emergency Management Agency) have agreed to pay the indicated percentage of project cost.

[3] KEY:

P	Pending	**PC**	Project constructed
S	Study	**NF**	Not currently funded
D	Design	**PD**	Project dropped
C	Under construction	**PC/NF**	Part constructed only

TABLE 5

IMPLEMENTATION STATUS OF RECOMMENDED FURTHER STUDIES (from Chapter 4)

PROJECT NUMBER	STUDY DESCRIPTION	PRI-ORITY[1]	STATUS[2] (1/94)	NOTES
1532	0144 berm	1a*	P	Part of (funded) CIP project AB1005
1544	Pine Lk. nonpoint ID	2	NF	In conjunction with PL-3
1555	Beaver Lake enhanced R/D	1a*	P	Part of (funded) CIP project AB1005
1556	Inglewood hookups	2	NF	In conjunction with I-3
1557	Wetland 30 update	X	PD	Now in conjunction with I-2
1558	LJ subbasin WQ	3	NF	In conjunction with LJ-5
1588	WQ retrofit	1b	P	CIP project AB1006

[1] Starred projects are funded. Other numbers show current basin-plan priority categories but projects are not currently funded; "X" indicates study unranked in basin plan.

[2] KEY:

P	Pending	**NF**	Not currently funded
IP	In progress	**C**	Completed

CHAPTER 7
REFERENCES

King County, 1990a, Hylebos and Lower Puget Sound Basins Current and Future Contitions Report: Seattle, WA, King County Surface Water Management Division.

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Tiffany, C., Minton, G., and Friedman-Thomas, R., 1990, Erosion and sedimentation control: an evaluation of implementation of BMPs on construction sites in King County, Washington, January 1988-April 1989: Seattle, WA, King County Conservation District.

WSDOE, 1992, Stormwater Managenement Manual for the Puget Sound Basin: Olympia, WA, Publication 90-73.

APPENDIX A
NONPOINT WATER POLLUTION SOURCES

A.1 INTRODUCTION

This appendix summarizes nonpoint pollution problems in the East Lake Sammamish basin and overviews specific goals and objectives for controlling these sources. The problem definition, and goals and objectives were developed by the Issaquah/East Lake Sammamish WMC with staff support from the lead agency, King County SWM Division, the King County Resource Planning Section, and Seattle-King County Department of Public Health. A complete discussion of these issues can be found in Chapter 5 of the WMC-proposed East Lake Sammamish Basin and Nonpoint Action Plan (Volume 1).

A.2 NONPOINT-SOURCE POLLUTION PROBLEMS

Several categories of nonpoint water pollution sources have been identified and characterized in accordance with Chapter 400-12 WAC. The categories of nonpoint pollutant sources evaluated in this plan include urbanization (e.g., new development, stormwater runoff, clearing and grading, pesticide application, hazardous waste disposal, underground storage tanks), animal keeping, onsite septic systems, and boating. Mining, landfilling, and forestry activities do not contribute to nonpoint source pollution in this basin and, therefore, are not discussed.

Urbanization-Related Problems. Stormwater runoff represents both a quantity and quality problem in urbanizing areas where land has been converted from primarily forest cover or open-space to residential, commercial, and industrial uses that include significant amounts of impervious surface. High stream flows associated with urbanization result in streambed scouring, erosion, and degradation of spawning and rearing habitat for fish. The quality of surface water also changes as a basin urbanizes. Typical pollutants found in stormwater runoff in urbanized watersheds include solids, nutrients, pathogens, heavy metals, petroleum by-products, organics, and toxins.

The conversion of forest and pasture lands to residential developments is the most common land use change presently occurring in the basin. A survey of the basin showed many new developments (less than ten years old) and many new sites currently under construction. Erosion and sediment-related problems caused by increased flows from new developments are concentrated along the western slope of the East Lake Sammamish basin. Related water quality problems observed in these areas include elevated levels of suspended solids, turbidity, and nutrients during high flow events.

Commercial development is concentrated in two areas along 228th Ave SE, one near Inglewood Hill Road and the other on the eastside of Issaquah Pine Lake Road. These areas host a variety of businesses including restaurants, convenience marts, dry cleaning establishments, and several gas stations. Pollutants associated with dry cleaning and gas stations include cleaning chemicals, detergents, oil, grease, fuel, and petroleum by-products.

Erosion from developing land was identified as a nonpoint pollution problem associated with land clearing and grading in the basin. Erosion problems at construction sites result from lack of a systematic review process for erosion and sediment control for single family (individually permitted) residential construction, insufficient staffing for inspection and enforcement, lack of seasonal restrictions on grading activities, inconsistency of enforcement, and confusion and inadequate information among both

contractors and County staff. In some cases the codes may not provide sufficient penalty to be an effective deterrent.

The use of pesticides in agriculture, roadside maintenance, and by private landowners represents a potential problem in the basin The potential for groundwater and surface water contamination from chemical residuals and over-sprays is a concern. Pesticide and herbicide use in this basin was investigated by the Seattle-King County Department of Public Health (SKCDPH). Although accurate use figures are not available, the Washington State Department of Agriculture reports that the majority of pesticide and herbicide use within the basin is through household applications. The King County Roads Division also carries out limited roadside herbicide spraying within the basin. Other sites of pesticide or herbicide use include the powerlines that bisect the basin.

Small quantity hazardous waste generators (SQHWG) were also investigated by SKCDPH as potential nonpoint pollution sources in the basin. The increased use of chemicals in the home and in small businesses has resulted in growing amounts of hazardous wastes entering the environment. Auto service and repair shops, print shops, dry cleaners, beauty salons, medical facilities, and school shops are some of the businesses which are potential SQHWG in the basin.

Underground storage tanks (UST's) were investigated by the SKCDPH as potential nonpoint pollution sources in the basin. UST's are used for the storage of petroleum and other regulated substances and pose a threat to public health through potential pollution of groundwater aquifers. Tank leakage may be caused by tank deterioration, improper installation, pipe failures, and spills. There are 21 registered UST's in the basin; however, there are no records of any past or present tank leakage problems within this basin.

Animal-Keeping Problems. In the East Lake Sammamish basin, agricultural activities include commercial livestock (equestrian or cattle) and smaller, non-commercial farms. The operations in the basin include horse boarding and training, small cattle herds, goat farms, and poultry farms. Small-acreage, non-commercial, animal keeping is the predominant agricultural activity in this watershed. Farms in this basin typically keep a few animals on one or two acres of pasture. Other agricultural practices which typically create sources of nonpoint pollutants such as commercial dairy or cattle farming, commercial cropping, improper soil tillage, and improper timing and application of fertilizers and pesticides are not found in this watershed.

Nonpoint pollution from animal keeping activities typically originates from three general farm practices: animal waste management, animal access to streams or lakes, and improper pasture management. Sediment, nutrients, pathogens, organic material, and pesticides are the typical pollutants associated with these animal keeping activities.

In a recent King Conservation District survey (Minton and Fitch, 1988) of the agricultural activity in the Lake Sammamish basin, nearly 100 percent of the farming practices were characterized as consisting of small commercial operators and hobby farmers. In this study, it was estimated that only 10 to 20 percent of the land was adequately protected from erosion. During field reconnaissance, many small farms throughout the basin were noted as having denuded pastures, overgrazed pastures, lack of adequate pasture size or overstocked pastures, and improper facilities for animal waste storage. Some programs do exist in King County to reduce pasture-related nonpoint pollution; however, these programs are voluntary and receive limited funding. The programs have not been successful in adequately controlling agricultural nonpoint pollution sources.

Onsite Septic Systems. The status of onsite sewage disposal systems was reviewed and analyzed by SKCDPH to identify potential failures. The review included examination of past field surveys, a review

of 804 septic system records, and a 1990 field survey of 95 systems. Based on the record review, SKCDPH estimated the failure rate of septic systems in the basin to be four percent (Szabo, 1990). A field survey revealed only a two percent failure rate, but the limited sample size (95 systems) may account for the difference.

The current septic system failure rate (based on file review) of four percent does not represent a significant water quality threat. However, the number of systems over 20 years old comprises approximately 25 percent of the systems reviewed. Failing onsite septic systems in the future may pose a water quality threat. Moreover, the onsite sewage disposal systems installed prior to 1970 were generally designed for disposal, not treatment, of wastewater. These older systems may be a source of nonpoint pollution to groundwater if located in excessively permeable soils or within shallow soils above groundwater. Additionally, the apparent lack of maintenance (pumping) of systems reviewed (only 15 percent of files reviewed showed a record of pumping) may contribute to an increase in the number of failures in the future.

Boating Activities. Recreational boating and associated facilities such as marinas and launching/access sites can contribute pollutants to lakes. Nonpoint contaminants from boating activities include: oils and grease, petroleum hydrocarbons, detergents, solvents, paints, and litter. Lake Sammamish State Park, located near the south end of the basin, offers the only major motorized boat access in the area. The state park site has nine boat launching lanes and parking spaces available for 250 vehicles. Boat launch attendance for 1989 was 606,777 people or 173,363 vehicles. Eighty-five percent of the park's boat launch activities occur between the months of April through September. Public restrooms are available at the site, but there is no pumpout facility available to boaters with holding tanks. Currently, nonpoint pollution originating from boating activities is minimal as compared to other land use practices and activities in the basin. However, boating-related pollution may pose a future problem in the basin as usage of the area lakes for recreation increases.

A.3 GOALS AND OBJECTIVES

The goals and objectives for nonpoint pollution reduction address the significant problems identified in the source-by-source water quality assessment completed for this plan. The WMC considered state water quality and pollution reduction standards (173-201 WAC and 90-48 RCW) during development of the goals and objectives. The goals and objectives were adopted by the WMC and Basin Advisory Team in accordance with 400-12 WAC.

Basinwide Goals

1. Protect water quality by minimizing sources of water pollution to surface water and groundwater;

2. Protect beneficial uses where applicable including swimming, fishing, boating, aquatic habitat (fisheries and wildlife), water supply and aesthetics in Lake Sammamish, Pine Lake, Beaver Lake and all tributary waters and wetlands in the basin; and

3. Enhance water quality through corrective and preventive methods including best management practices (BMP's), education, planning, regulation, enforcement, incentives, capital projects, natural and constructed system maintenance, and restoration of degraded natural and constructed systems.

Source-Specific Goals and Objectives

I. Urbanization

A. Stormwater and Phosphorus

1. Control stormwater quality and quantity before it is discharged into public drainage systems and natural water bodies by:

   a. Implementing and enforcing improved erosion control BMP's and water quality standards;

   b. Implementing an education program for residents and businesses regarding their impacts on water quality;

   c. Improving compliance with regulations prohibiting the disposal of toxic materials to natural water bodies and storm drains;

   d. Improving design and maintenance of existing and future stormwater systems;

   e. Improving training of field staff;

   f. Implementing and enforcing King County's Sensitive Areas Ordinance;

   g. Reducing commercial/residential fertilizer use;

   h. Implementing pet waste recycle/disposal program;

   i. Reducing the use of detergents and soaps containing phosphorus;

2. Consider land use density controls for development in areas of groundwater quality concern.

3. Adopt the nonpoint and point source control strategies from the Lake Sammamish Water Quality Management Project for protection of Lake Sammamish water quality.

B. Land Clearing and Grading

1. Implement clearing and grading education program for developers, construction workers, enforcement officers, and citizens;

2. Reduce erosion and sedimentation impacts to water quality from land clearing through BMP implementation;

3. Improve code enforcement for BMP's.

C. Pesticides

1. Reduce road maintenance, commercial, and residential use of pesticides and fertilizers through development and implementation of education programs, technical assistance, and use of alternative methods;

2. Encourage the proper application and timing of pesticides and fertilizers;

3. Improve commercial, public, and private compliance with existing regulations through education programs.

D. Small Quantity Hazardous Waste Generators

1. Implement an education program for watershed residents and businesses regarding the impacts of small quantity hazardous waste generation on water quality;

2. Facilitate the collection and proper disposal of household hazardous waste;

3. Promote alternative cleaning products and hazardous waste substitutes;

4. Improve compliance with existing regulations.

E. Underground Storage Tanks

1. Routinely inspect UST's for leakage and replace older and failing UST's;

2. Ensure that all UST's are registered with DOE;

3. Implement an education program for UST users;

4. Improve compliance with existing regulations.

II. Animal Keeping

A. Implement small farm education and BMP programs to inform livestock owners about their impacts on water quality. Focus attention on areas such as:

1. Animal access to streams;

2. Revegetation of denuded pastures and pasture management;

3. Proper disposal of animal waste;

4. Reduction of pesticides and fertilizers use;

5. An incentives program to encourage the utilization of BMP's;

6. Animal density limitations.

B. Improve compliance with existing regulations and programs.

III. Onsite Septic Systems

A. Educate homeowners and other onsite septic operators regarding proper maintenance and functioning;

B. Promote repair and replacement of septic systems and use of alternative systems where needed;

C. Ensure that all regulations for onsite septic systems are routinely enforced.

IV. Boating and Marinas

A. Implement an education program for boat owners and users, including use, handling, storage, and transfer of above ground fuel;

B. Reduce trash, sewage, and other pollutant discharge to the lakes;

C. Achieve compliance with existing regulations and programs.

APPENDIX B
WMC RESPONSE
TO KING COUNTY COUNCIL CHANGES
OF THE WMC-PROPOSED PLAN

The Watershed Management Committee (WMC)-proposed East Lake Sammamish Basin and Nonpoint Action Plan was submitted to the King County Council for review and adoption in December 1992. During the council review process changes were made to several recommendations which are reflected in the text of this final document (the WMC-approved and King County Council-adopted plan). Most of the changes were supported by the WMC, but others were not supported in their entirety. This appendix provides the WMC perspective on these recommendations.

Seasonal Clearing and Grading Limits (BW-26)

The WMC-proposed plan contained the following recommendation on seasonal clearing and grading limits:

> During the period from October 1 to March 31, bare ground associated with clearing, grading, utility installation, building construction, and other development activity should be covered or revegetated in accordance with the King County Surface Water Design Manual. Earth-moving or land-clearing activity should not occur during this period within the East Lake Sammamish basin except for the following exemptions: routine maintenance of public facilities (including roads), public agency response to emergencies that threaten public health, safety, and welfare, landscaping of single-family residences, Class I and II forest practices, quarrying and mining within sites with approved permits, and clearing and grading where there is 100 percent infiltration of surface water runoff within the site in approved and installed construction-related drainage facilities, and routine maintenance of utility structures as provided in K.C.C. 21.51.030.D.

Except in Wetland Management Areas, the seasonal clearing limit component of this recommendation was deleted in the final plan. It was replaced, in part, with a comprehensive temporary erosion and sediment control (TESC) program jointly developed by SWM and DDES, which contains the following elements:

(1) Studies necessary to determine extent and nature of TESC problems
(2) Regulations (Surface Water Design Manual and Grading Code updates)
(3) Education and certification of contractors
(4) Inspector education and new programs
(5) Adaptive management program
(6) Monitoring and evaluation of the TESC program
(7) TESC program coordination

The WMC was skeptical about the long-term success of this program because of funding, the number of inspectors, and the record of similar programs in the past. The WMC expressed qualified support for the proposed program if the following conditions were met:

(1) There was immediate funding of the proposed TESC program. [*The first-year program was funded by King County in 1993 and includes funding for the program through 1994*]. The WMC recommends

ongoing funding as part of a long-term program.

(2) Clear deadlines were established for evaluating the success of the TESC program. [*A progress report was completed in February, 1994, and the adopted basin plan included a requirement for an evaluation report and proposed revisions of the first-year program by August 31, 1994*]. The WMC recommends ongoing annual reports on the program. If the program is found to be inadequate in controlling construction-site erosion, the WMC recommends amending the East Lake Sammamish plan to include additional requirements such as targeted seasonal clearing and grading limits, more enforcement, or construction phasing.

(3) Seasonal clearing limits remain in sensitive watersheds, such as in Wetland Management Areas. [*The adopted plan retained seasonal clearing limits in these areas*].

(4) Incentives/disincentives are incorporated into the program to "reward" contractors that do a good job and penalize those who do not do a good job of erosion and sediment control. [*Incentives and disincentives are being examined as part of the update to the Surface Water Design Manual*].

Ravine Protection Standard (BW-3)

The WMC-proposed plan recommends tightlines as a means to control ravine erosion in the Panhandle and Monohon sub-basins (Ravine Protection Standard, BW-3). Prior to development most of these streams were fed by interflow with no point discharges. Recent development where stormwater was discharged at the top of slope to the land's surface has resulted in substantial ravine erosion, flooding, habitat damage, and water quality degradation.

The MIT formally concurred with the WMC-proposed East Lake Sammamish plan with the exception of BW-3. The MIT is concerned about the potential impacts and cumulative impacts of stormwater tightlining on salmonids and on salmonid habitat, noting: (1) reduced baseflows in streams because of reduced infiltration, (2) reduced groundwater upwelling along the lakeshore potentially affecting successful salmonid spawning, (3) increased exposure of salmonids and salmonid food sources to toxic compounds found in stormwater, and (4) detrimental effects from stormwater pollutants on fish habitat, including sedimentation of spawning gravels and excess weed growth in spawning areas. The MIT recommends monitoring of any tightlines currently being constructed to assess the impacts, and the development of contingency plans to address potential impacts. Alternatives to the tightline recommendation that the MIT has supported include less dense development, and greater onsite management of stormwater (accomplished by increased forest retention, infiltration, and onsite storage of stormwater).

Basinwide Baseflow Maintenance

Future loss of baseflow is reduced in the Panhandle and Monohon subbasins (recommendations PH-2 and MH-2) through mandatory evaluation of infiltration and maintenance of some forest cover. This recommendation also provides additional benefits, including (1) greater recharge of groundwater resources in the basin, and (2) maintenance of groundwater upwelling along the east shore of Lake Sammamish that is important for the fishery resources of the lake.

In future updates or amendments to the plan, the WMC would like to apply a similar requirement for baseflow maintenance to the entire East Lake Sammamish basin. This could be evaluated by the

Watershed Implementation Committee (see BW-21) or as part of a countywide study to determine which basins should have a requirement for baseflow maintenance.

APPENDIX C
LETTERS OF APPROVAL AND CONCURRENCE

This appendix contains letters from agencies and organizations who will be responsible for implementing the East Lake Sammamish Basin and Nonpoint Action Plan. Each letter indicates the agency and organization's support for the plan and responsibility for implementing different recommendations. As the lead agency for developing this plan, the King County Surface Water Management (SWM) Division will coordinate plan implementation among the participating agencies and organizations.

The Washington State Department of Ecology approval letter is also contained in this appendix. Review and approval by Ecology is carried out to ensure that the plan complies with all applicable requirements of Chapter 400-12, Washington Administrative Code ("Local Planning and Management of Nonpoint Source Pollution"). Upon plan approval, implementing agencies are eligible to apply for state funding for plan implementation.

In lieu of obtaining concurrence letters from individual departments or divisions within King County, the King County Council adopted the plan as a functional plan that implements the surface water management and environmental policies of the King County Comprehensive Plan (Ordinance No. 11111). Specific decisions on funding of plan recommendations and allocation of County staff to implement the plan will be made during the development of annual work programs and budgets for individual departments.

Development of this plan has been funded in part with a grant from the Washington Department of Ecology. The grant requires that the content of the plan be prepared in accordance with Washington Administrative Code (WAC) chapter 400-12. WAC 400-12-545 requires that each agency and organization responsible for implementing a portion or portions of the plan submit a statement of concurrence indicating its intent to follow through with the recommendations contained in the plan. Agencies and organizations also have the option of submitting a statement of nonconcurrence with the plan.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600 • (206) 407-6000 • TDD Only (Hearing Impaired) (206) 407-6006

May 16, 1994

Issaquah/East Lake Sammamish Watershed Management Committee
c/o Lorin Reinelt, Ph.D.
King County Surface Water Management
700 5th Avenue, Suite 2200
Seattle, WA 98104

Dear Committee Members:

I am happy to inform you that the Department of Ecology has formally approved the East Lake Sammamish Basin and Nonpoint Action Plan. This Plan is dated June 1994 and was transmitted by letter dated March 18, 1994.

I particularly want to commend and thank the members of the committee and their staff for their commitment over the many months of meetings, and for their dedication to protecting water quality in the East Lake Sammamish watershed.

Ecology staff have prepared a report on the Plan. The staff report, dated May 13, 1994, is enclosed. Please note the comments in the report. While our approval of the plan does not depend on accommodating these comments, you should take them into consideration prior to publishing the plan in its final form.

This nonpoint and basin plan successfully brings together intertwined subjects of nonpoint pollution and stormwater control that have traditionally been dealt with separately. I want to congratulate you on achieving this synergistic milestone for the East Lake Sammamish watershed. I look forward to the successful implementation of the action plan.

Sincerely,

Linda Crerar

Linda Crerar
Assistant Director, Water and Shorelands Programs

LC:BD:lb
Enclosure

cc: Kathy Minsch, PSWQA

w:\...\WM\BOBBERS\BDELSAPV.LTR

A REPORT OF THE ECOLOGY REVIEW COMMITTEE ON THE JUNE 1994 EAST LAKE SAMMAMISH BASIN FINAL BASIN AND NONPOINT ACTION PLAN

An Ecology review committee, consisting of Bob Duffy, Gail Dorf, and Norm Stewart reviewed the Final Basin and Nonpoint Action Plan for the East Lake Sammamish Basin dated June 1994 during the month of May, 1994.

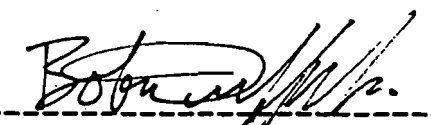
The Plan was read by committee members, statements of concurrence were evaluated, and the plan was compared with the provisions of Chapter 400-12 WAC. Due to time considerations, comments on the preliminary draft plan were not reviewed and plan revisions were not analyzed.

The Issaquah/East Lake Sammamish Watershed Management Committee has developed a concise, well focused plan that incorporates both nonpoint source prevention and control as well as a basin stormwater action agenda. The Plan does a very good job of describing the ecosystem and linking control strategies to the political and physical environment. The Plan successfully meets the requirements of Chapter 400-12. The WMC and staff are to be commended for an excellent job!

The Ecology review committee report consists of two sections: Determinations pursuant to the Process for Final Approval of Watershed Action Plans, dated November 1989, and Detailed Comments. (The Process for Approval provides procedural guidance to Ecology staff regarding the review of watershed management committee approved plans.)

Because the Ecology review committee feels the Plan is consistent with the Nonpoint Rule and meets the criteria in the Ecology Process for Final Approval of Watershed Action Plans, we recommend that the Plan be approved. Review committee comments should be considered prior to final printing of the Plan.

FOR THE COMMITTEE:



Bob Duffy, Committee Member

Date of Report: May 13, 1994

File: W:\...\WM\BOBBERS\BDELSAPV.LTR

JUNE 1994 EAST LAKE SAMMAMISH BASIN FINAL BASIN AND NONPOINT ACTION PLAN

DETERMINATIONS PURSUANT TO THE PROCESS FOR FINAL APPROVAL OF WATERSHED ACTION PLANS DATED NOVEMBER 1989

We have reviewed the Plan as provided in Section 560 of the 1988 version of Chapter 400-12, Washington Administrative Code ("Local Planning and Management of Nonpoint Source Pollution"). We used the 1988 rule because the Plan was developed under this version.

It is our opinion that the Plan meets the requirements of Chapter 400-12 WAC, and recommend the Plan for approval by the Department of Ecology. We have made the following determinations:

(a) The Plan is consistent with the provisions of the rule.

(b) The Plan is consistent with the goals and requirements of the Puget Sound Water Quality Management Plan.

(c) The implementation strategy is feasible and adequate to protect beneficial uses and control nonpoint source pollution in the watershed.

(d) Implementing agencies have the authority and commitment to carry out those portions of the action plan for which concurrence was completed.

(e) Public involvement was adequate to meet the intent and purposes of the plan.

(f) The plan complies with applicable state and federal laws.

FILE: W:\...\WM\BOBBERS\BDELSAPV.LTR

November 1, 1993
ESBP(sub)\MMcF:hdm

Introduced by: Barden

Proposed No.: 93-341

ORDINANCE NO. 11111

AN ORDINANCE adopting the East Lake Sammamish Basin Plan and Non-Point Action Plan as a functional plan amplifying and augmenting the King County Comprehensive Plan, adopting surface water management and environmental policies in the plan area and adding a new Section to K.C.C. 20.12.

PREAMBLE:

For the purpose of effective surface water management in the East Lake Sammamish Basin, the King County council makes the following findings of fact:

1. The East Lake Sammamish Basin covers approximately 16 square miles lying east of Lake Sammamish and includes a large part of the East Sammamish Plateau.

2. Parts of the East Lake Sammamish Basin experiences flooding, erosion, sediment deposition, water pollution, and loss of fish habitat due to land development and insufficient standards for storm water management.

3. The East Lake Sammamish Basin Plan was developed as authorized by K.C.C. 9.08.040 to protect the basin's valuable aquatic resources and reduce surface water problems.

4. Implementation of the policies set out in the basin plan will substantially reduce the impacts of additional development on the basin and protect the basin's aquatic resources and water quality.

5. The recommendations of the draft Basin Plan with regard to development standards have been integrated into the East Sammamish Community Plan, and implemented in the East Sammamish Area Zoning through P-suffix conditions. Based on the recommended amendments to the basin plan policies attached to this ordinance, the P-suffix conditions will need to be revised.

6. The ravine protection standards may reduce the residential capacity of the East Sammamish Community Plan by approximately 1200 units. This lost capacity needs to be replaced elsewhere in the planning area. A number of ways to do this have been discussed, including use of the incentive bonuses in the new zoning code and/or increasing the zoned density of specific sites in the community planning area.

BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

SECTION 1. There is hereby added to K.C.C. 20.12 a new section to read as follows:

The East Lake Sammamish Basin Plan and Non-Point Action Plan consisting of Volume 1, dated May 11, 1992 and Volume 2 dated December 1992 as shown in Attachment A, as amended in Attachment B, is adopted as a functional plan that implements the surface water management and environmental policies of the King County Comprehensive Plan. As an amplification and augmentation of the King County Comprehensive Plan, it constitutes official county policy with regard to surface water management in the East Lake Sammamish Basin.

SECTION 2. The Executive is directed to reprioritize the zoning code conversion process to implement the conversion first in the East Sammamish Community Planning Area, and to forward his recommendations on that conversion to the Council by May 2, 1994.

INTRODUCED AND READ for the first time this 3rd day of May, 1993.

PASSED this 8th day of November, 1993.

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

Audrey Grugen
Chair

ATTEST:

Gerald A. Peterson
Clerk of the Council

APPROVED this _____ day of _____, 19__.

DEEMED ENACTED WITHOUT
COUNTY EXECUTIVE'S SIGNATURE
DATED: 11-22-93
King County Executive

Attachments: A. Volumes 1 & 2, East Lake Sammamish Basin Plan and Non-Point Action Plan
B. Policy amendments as recommended by Utilities Committee

N:\ords\ESBP(sub).MMcF:hdm
November 1, 1993

City of Issaquah
Post Office Box 1307
Issaquah, WA 98027-1307
Public Works Department
(206) 391-1004
Fax: (206) 391-1050

February 23, 1993

Ms. Meg Moorehead
King County
Surface Water Management Division
Yesler Building
400 Yesler Way, Room 400
Seattle, Washington 98104-2637

Subject: East Lake Sammamish Basin & Nonpoint Action Plan

Dear Ms. Moorehead:

As a member of the Watershed Management Committee for the East Lake Sammamish and Issaquah Creek Basins, the City concurs with the goals, objectives, and recommendations of the East Lake Sammamish Plan.

The City requests that its participation in the implementation be limited to participating in the Watershed Implementation Committee for items which require City action.

Please contact me if there are any questions.

Sincerely,
Public Works Department

Victor Salemann, P.E.
Public Works Director

VS/stl

cc: Project/Day Files
Mayor/City Administrator

Lorin

WASHINGTON STATE DEPARTMENT OF
Natural Resources

JENNIFER M. BELCHER
Commissioner of Public Lands

KALEEN COTTINGHAM
Supervisor

July 29, 1993

Meg Moorehead
Issaquah/ELS Watershed Management Committee
King County Surface Water Management Division
400 Yesler Way, Suite 400
Seattle, WA 98104

Dear Ms. Moorehead:

RE: Concurrence with the East Lake Sammamish Basin and Nonpoint Action Plan

The Department of Natural Resources supports the East Lake Sammamish Basin and Nonpoint Action Plan. The implementation of this document will lead to improved water quality in the Lake Sammamish basin. The staff at King County Surface Water Management Division, the technical advisory and citizen committee members and interest groups who worked for over two years should be proud of their accomplishments.

The Department of Natural Resources will work closely with the responsible parties to implement the plan. The Department concurs with the specific recommendations for which it has implementation responsibility. It will take a strong coordinated effort to meet the management goals of public safety, habitat protection and control of nonpoint pollution in the basin.

There is some uncertainty about the costs and time commitments associated with actions BW 21 - Watershed Implementation Committee and BW 46 - Enforcement Protocol. Department participation may be limited by these unknowns. The costs associated with BW-27 - Forest Practices MOU is already expended and the MOU is ready for final approval.

The Department is committed to working with local government and the community, and looks forward to working with King County and the East Lake Sammamish Watershed Committee during implementation.

Please contact Dave Dietzman, Watershed Plan Coordinator, at (206) 902-1633 if you have questions or concerns regarding these comments.

Sincerely,

Kaleen Cottingham
Supervisor

c: Bonnie Bunning, South Puget Sound Region Manager

King Conservation District
935 Powell Ave. SW - Renton, WA 98055 - (206) 226-4867

April 12, 1993

Meg Moorehead
East Lake Sammamish WMC
King County Surface Water Mgmt. Division
400 Yesler Way, Suite 400
Seattle, WA. 98104

Dear Ms. Moorehead:

We are happy to send you and the committee a concurrence letter for the East Lake Sammamish Basin and non-point action plan. The Basin and non-point action plan should lead to decreased flooding and improved water quality in the basin as well as Lake Sammamish on into Puget Sound, when fully implemented.

Following is a listing and concurrence on a recommendation by recommendation basis for King Conservation District.

Basinwide (BW) - 16 Farm Management -
At this time the King County Council is in the process of developing the Recommended Zoning Code 21A updates to include livestock regulations or the alternative of a farm management plan developed by the owner with the assistance of King Conservation District. The Conservation District has been providing assistance to the King County Council, as have many individuals and organizations. While the livestock provisions of the zoning code are not particularly liked by some livestock owners, the new code, when adopted and implemented, will decrease water pollution from livestock operations.

Funding for the Conservation District is crucial to successful implementation by the King Conservation District. The proposed code has a five year phase in period. For the Conservation District to do the work proposed in all of King County will require approximately $1 million dollars per year. A funding source is being considered by the King County Council at this time and also has preliminary consideration to provide funding on a cost share basis for landowners to implement best management practices.

BW-21 Watershed Implementation Committee
King Conservation District would agree to be a part of the implementation committee. This recommendation provides a mechanism to ensure the plan is implemented, and not just sitting on shelves gathering dust.

BW-29 Small Farms

King Conservation District will hire several full time farm plan specialists to work throughout the county and will include the East Lake Sammamish basin. Plans developed will depend on the eventual King County Council decisions on Conservation District funding and zoning code updates (See BW-16). Landowners may choose to do their own work in accordance with the code. In either case the Conservation District will provide technical assistance. Educational assistance is expected to be shared by the District, Cooperative Extension, and perhaps King County Environmental Division, depending on funding available for each entity. Work will be conducted on schedules deemed best to achieve maximum participation by landowners, either individually or in groups.

BW-36 Animal Waste

King Conservation District is in complete agreement with this recommendation. King County Solid Waste Division is working on the analysis of the proposal for incorporation of animal manure into the existing yard waste recycle program.

In addition, the King Conservation District is holding composting workshops designed for small farm owners. It is expected that a combination of these two programs will be essential for widespread proper treatment of animal manure from small farms.

BW-37 Farms

a. Cost share funding is being explored by the King County Council (see BW-16).

b. The Conservation District will develop and implement an awards program and also model farms as part of the educational activities, assuming funding is made available.

c. The Conservation District will assist all landowners in planning and implementing best management practices for livestock and agriculture activities. District assistance will be made to all landowners, whether for a full plan of just partial assistance.

BW-46 Enforcement Protocol

King Conservation District expects to develop an agreement with King County similar to an existing agreement between King Conservation District and the Washington State Department of Ecology. The agreement would provide for Conservation District assistance to landowners found in violation of codes by the County enforcement agencies.

BW-58 Water Quality Inventory
King Conservation District will provide assistance to landowners in planning and implementation of best management practices to reduce non-point pollution from livestock and agricultural activities.

Inglewood 3 - Water Quality Education and enhancement

a. King Conservation District will provide education for livestock owners and in addition will provide a source of vegetation for streamside areas.

Pine Lake 3 - Pine Lake Sub-Basin Water Quality

c. King Conservation District will offer assistance to the commercial horse farm owners. However, the owners may reject District assistance for planning and implementation. If that were to happen, enforcement of County or State codes by the appropriate agency would be required to get the landowner in compliance.

We expect to carry out activities in the above 9 recommendations. However, as stated in the BW-16 discussion, funding will be the key ingredient for swift implementation. Should expected funding not be provided, the Conservation District would still attempt to do some of the work, but at a very low level of activity that would not noticeably cause landowner compliance with accepted best management practices. In the next few months, the King County Council will most likely make decisions that are key to implementing these recommendations.

If you have any questions, please call me at 226-4867.

Sincerely,

Jack Davis

Jack Davis
District Manager

MUCKLESHOOT INDIAN TRIBE

FISHERIES DEPARTMENT

39015 172nd Avenue SE • Auburn, WA 98002 • (206) 931-0652 • FAX (206) 931-0752

May 21, 1993

Issaquah/East Lake Sammamish Watershed Management Committee
c/o Meg Moorehead, Project Manager
King County Surface Water Management Division
Department of Public Works
Yesler Building
400 Yesler Way, Suite 400
Seattle, WA 98104-2367

Dear Watershed Management Committee:

The Muckleshoot Indian Tribe Tribal Council formally concurs with the East Lake Sammamish Basin and Nonpoint Action Plan with exception to Basinwide Recommendation #3 (BW-3). The Council has found most of the plan to be consistent with the Tribe's goals and objectives regarding water quality and restoration of fisheries habitat. Furthermore, the Council interprets the Tribe's responsibility to the plan to involve participation in the Watershed Implementation Committee (BW-21), the Kokanee Recovery Plan (BW-23), and Aquatic Habitat Inventory and Monitoring (BW 56 and 57). The Tribe's participation will consist of providing staff support, as available, to complete the recommendations.

The Tribe is particularly supportive of elements of the plan which aid in the protection and enhancement of fisheries resources. Since both kokanee and lake spawning sockeye populations have declined dramatically and may both become endangered species, the Tribe emphasizes that recommendations in the plan which focus on the long term recovery of these fish stocks be implemented regardless of the proposed plan rankings. These recommendations include:

BW-23 Development of a recovery plan for native Lake Sammamish kokanee.

BW-24 Protection of the Lake Sammamish shore by designating the area as critical fish and wildlife habitat in the Growth Management Act and by imposing moratoriums on shoreline developments, dock construction, dredging on the east shore, and development on the plateau which would adversely affect shore spawning areas.

BW-25 Removal of impassable artificial barriers to fish passage on all tributaries currently and historically used by salmonids, and restoration of habitat.

BW-56 Conducting appropriate surveys and research to identify remaining spawning areas for tributary sockeye, lake-spawning sockeye, and kokanee and to determine population estimates, sex ratios, population age structures and trophic relationships.

BW-57 Monitoring of fish resources and habitats via annual spawner counts for anadromous salmonids in streams and habitat surveys in fish bearing streams.

Regarding BW-3, the Tribe is concerned about the potential impacts of stormwater tightlining on salmonids and on salmonid habitat. The potential results of this practice include reduction of the groundwater component of stream flows, reduction of groundwater upwelling along the lake shore, increased exposure of salmonids and salmonid food resources to toxic compounds found in stormwater,

and detrimental impacts from stormwater pollutants on fish habitat. Stream flows provided by groundwater are critical for maintaining cool temperatures and sufficient depth for salmonids to survive. Groundwater upwelling along the lake shoreline is critical to successful spawning. Toxic compounds such as metals can bioaccumulate in fish and can cause toxicity problems especially in young fish. Fine sediments and nutrients carried in stormwater can smother spawning gravels and promote weed growth in spawning areas.

The Tribe recommends that a moratorium on tightlining be imposed until issues regarding the impacts are fully addressed. At a minimum, any tightlines currently being constructed should be monitored for impacts and contingency plans for impacts be developed. No new tightlines should be allowed until the impacts from initial tightlines is understood and mitigated.

In addition, the following changes to specific recommendations are requested:

BW-16 Farm Management
In addition to updating codes or rules to limit livestock access to streams, wetlands and their associated buffers, and to provide good management of pastures, manure, water and soils, the recommendation should include the necessity of monitoring of water quality to ensure that management practices are working effectively. When they are not working they need to be revised.

BW-29 Small Farms
The King County Conservation District is recommended to develop and implement conservation plans with the intent of establishing and maintaining best management practices. These practices should also include ways to limit livestock access to streams and wetlands.

BW-55 Channel Monitoring
Monitoring of stream channels and sediment transport should be expanded to include those channels that have salmonids present.

PL-3 Pine Lake Sub-basin Water Quality
An operational tour of the commercial horse farm in the sub-basin is recommended to be conducted by King County Conservation District and the SWM Basin Steward. A farm conservation plan should be developed with the King County Conservation District. Additionally, language should be added to specify that the conservation plan must be implemented and maintained by the land owner and that the Basin Steward should monitor water quality and habitat to evaluate the effectiveness of the plan and to recommend changes to the plan as necessary.

Also, in Section 2.5 of the Plan which is entitled Salmon Habitat Protection, perspective on the fish resources which were present historically is lacking. A discussion and map describing historical anadromous fish runs in streams and in Lake Sammamish should be included. Without such a comparison, the document is incomplete and provides no perspective on fish resources and their dramatic declines. This information will be vital for reference by future generations which will be involved in managing the basin.

The Muckleshoot Tribe holds federally guaranteed rights under the Treaty of Point Elliot and the Treaty of Medicine Creek and has legal property rights to half the harvestable salmon and steelhead within the Tribe's Usual and Accustomed Fishing Areas (U&A). Through tradition and culture, the Tribe is dependent upon the quality and quantity of water and fish for its livelihood. Protecting the natural resources and the economic, traditional, and cultural well being of our people has become one of great difficulty and challenge. The U&A of the Muckleshoot Tribe are located in one of the most developed shoreline environments and are within the boundaries of the fastest growing cities and counties of Washington State. Major urban and industrial development has occurred through major portions of the U&A, making fish habitat and water quality degradation a significant concern of the Muckleshoot Tribe.

The Muckleshoot Indian Tribe has been an active participant in the development of a plan to control nonpoint pollution, restore fisheries habitat, and enhance the aquatic resources in the Lake Sammamish Basin . The Muckleshoot Indian Tribe applauds the work of the Watershed Management Committee and we are supportive of the committee's efforts towards the control of nonpoint source pollution and fisheries habitat improvement in the East Lake Sammamish Watershed.

Sincerely,

Virginia Cross
Tribal Chairwoman

METRO

Municipality of Metropolitan Seattle
Exchange Building • 821 Second Ave. • Seattle, WA 98104-1598

Meg Keith file

RECEIVED
MAY 14 1993
WATER AND LAND RESOURCES DIVISION

May 13, 1993

Issaquah/ELS Watershed Management Committee
ATTN: Meg Moorehead, Project Manager
King County Surface Water Management Division
Department Of Public Works
400 Yessler Way - Suite 400
Seattle, WA 98104

RE: Concurrence with East Lake Sammamish Basin and Nonpoint Action Plan

Dear Issaquah/ELS Watershed Management Committee:

Thank you for the opportunity to review and comment on the implementation requirements of the East Lake Sammamish Basin and Nonpoint Action Plan. Metro supports this effort and sees it as an important part of assuring a high quality of water resources for the region. In addition, the plan directly supports the goals of the Lake Sammamish Water Quality Management Project and will help ensure the success of this program. It is our understanding that the stated dollar figures represent an estimate of staff time to participate in implementation.

Metro has several ongoing programs such as Emergency Trouble Call, Water Quality Monitoring and Household Hazardous Waste Education that will compliment projects outlined in the ELS plan.

Specifically, recommendations BW-14;
BW-21;
BW-30;
BW-46;
BW-56; and,
BW-59, will be supported through existing Metro programs.

We look forward to working collaboratively with you on the protection, preservation and enhancement of the East Lake Sammamish basin. If you have any questions please feel free to call me at 684-1713 or, Josh Marx at 684-2026.

Sincerely,

Robert G. Swartz
Supervisor Water Resources Section

:jgm

cc: Daryl Grigsby, Environmental Programs Manager
Dave Galvin, Supervisor Hazardous Waste Management Program
Josh Marx, Contract Water Quality Planner

SAVE LAKE SAMMAMISH
1420 N.W. Gilman Blvd., Suite 2565
Issaquah, Washington 98027

June 10, 1993.

King County Surface Water Management Division
400 Yesler Way, Room 400
Seattle, WA 98104.

Attention: Meg Moorehead
Project Manager

Dear Sirs,

Save Lake Sammamish is in concurrence with its responsibilities under the proposed East Lake Sammamish Basin and Nonpoint Action Plan. Such responsibilities are to continue educational efforts within the community to heighten awareness of the impact of human land-use practices on water quality, and to encourage practices that would lessen such impacts.

Very truly yours,

Joanna Buehler

Joanna A. Buehler
President

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Civil Engineering

Center for Urban Water Resources Management, FX-10
(206) 543-7923

May 10, 1993

Issaquah/East Lake Sammamish Watershed Management Committee
c/o Meg Moorehead
King County Surface Water Management Division
400 Yesler Way, 4th Floor
Seattle, WA 98104

Dear Meg:

This letter provides my concurrence with Recommendation BW-30(2) in Volume 2 of the WMC-Proposed Basin & Nonpoint Action Plan for the East Lake Sammamish Basin. That provision recommends development of a training program in conjunction with the University of Washington's Center for Urban Water Resources Management.

My concurrence is conditioned upon the establishment of a working arrangement for this purpose with the Professional Engineering Practice Liaison (PEPL) Program within the University's Engineering Continuing Education branch and of the provision of sufficient funding support to develop and offer the courses. I am certain that establishing an arrangement with PEPL will be very easy, as I work regularly with the program and its director Ron Bucknam (543-1178).

I actually will not be the director of the Center after next month and will be taking a leave of absence from it and the Department of Civil Engineering. I will still be doing some work with the University, however, including teaching short courses through PEPL. Brian Mar (543-7941) will be taking over the Center. It is likely that he will want to concentrate on research fund raising instead of noncredit education. Accordingly, it probably would be best to work with Ron Bucknam and me to develop and offer the program, and I would be glad to do so.

Sincerely,

Rich Horner

Richard Horner, Director and
Research Assoc. Professor

STATE OF WASHINGTON
DEPARTMENT OF AGRICULTURE
P.O. Box 42560 • Olympia, Washington 98504-2560 • (206) 902-1800

May 11, 1993

Mr. Lorin Reinelt
King County Surface Water
Management Division
Department of Public Works
Yesler Building
400 Yesler Way - Room 400
Seattle, Washington 98104-2637

Dear Mr. Reinelt:

The Washington State Department of Agriculture (WSDA) appreciates the opportunity to comment on the Draft Basin and Nonpoint Action Plan for the East Lake Sammamish Basin.

WSDA concurs with the basic plan and recognizes that this is a comprehensive surface water management program for the basin.

One minor item on page 58, Vol. 1. WSDA does not issue permits as such to pesticide applicators. WSDA requires all commercial applicators and all applicators applying restricted use pesticides (includes all aquatic applications) to be licensed. As licensed applicators, they are required to keep records for seven years including the type of chemical applied, quantities, location of applications, and other such information. The Department of Health is the agency responsible for public health effects and possible emergency measures in case of poisoning and the Department of Ecology regulates spill response requirements.

Although homeowners can apply general use pesticides to their own property and must follow label instructions, they are not required to be licensed. They must keep records if they apply to one acre or more of agricultural land in a calendar year.

WSDA can request records from anyone required to keep records. A general record call-in from a significant land area however, is financially unfeasible unless there is significant cause. Record availability outside the agency may be constrained by legal requirements also. Since the basin is changing from rural to urban, a record request may not provide the type of information needed by your plan.

WSDA fully supports the intent of the plan and looks forward to any assistance we can provide on the implementation of your recommendations.

Sincerely,

PESTICIDE MANAGEMENT DIVISION

Ann Wick

Ann Wick
Program Manager
Program Development

AW:bh

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Northwest Regional Office, 3190 - 160th Ave. S.E. • Bellevue, Washington 98008-5452 • (206) 649-7000

May 24, 1993

Ms. Meg Moorehead, Project Manager
Issaquah/East Lake Sammamish Watershed
Management Committee
King County Surface Water Management
Department of Public Works
Yesler Building
400 Yesler Way - Room 400
Seattle, WA 98104-2637

Dear Ms. Moorehead:

Congratulations on producing such a high quality public review draft of the East Lake Sammamish Nonpoint Action Plan. Because the actions in the Plan requiring Ecology's concurrence will primarily involve our Northwest Regional personnel, this letter of concurrence is being issued from Ecology's Northwest Regional Office. Ecology agrees with the overall goals and objectives identified in the draft plan. Our specific comments and statements of concurrence for the four actions Ecology is to implement are enclosed.

Again, congratulations! Successful implementation of this plan and protection of water quality in the East lake Sammamish watershed will require the active participation of many agencies, groups, and citizens. Ecology looks forward to the final plan and participating in this truly team effort to protect water quality.

Sincerely,

Michael Rundlett
Regional Director
Northwest Regional Office

MR:GD:gm
Enclosure

cc: John Glynn, Water Quality, NWRO
Dick Storey, Spill Response, NWRO
Joe Hickey, Hazardous Waste, NWRO
Bob Duffy, Watershed Unit, HQ
Dayle Ann Stratton, Watershed Unit, HQ

STATEMENT OF CONCURRENCE: EAST LAKE SAMMAMISH MANAGEMENT PLAN

Action BW-14 Water Quality Emergency Response

> "In conclusion with METRO, DOE, and local hazardous waste plans, the SWM Division's Drainage Investigation and Regulation Unit should consider the acquisition of the necessary equipment and the training of staff to provide routine and on-call emergency response for water-quality testing, investigations, and small spill response. If such a program proves justified, emergency response personnel could be equipped to handle events such as small spills (typically 0-5 gallons) of motor oil, antifreeze, hydraulic fluid, brake fluid, paint and other materials that fall below the threshold for DOE response and present significant risks to beneficial uses in the basin. The response and team could also perform clean-up and education functions."

Ecology concurs with this recommendation. Please contact Dick Storey of the Spill Response Section at Ecology's Northwest Regional Office, (206) 649-7116 for coordinating Ecology's participation in implementing this water quality emergency response recommendation.

BW-21 Watershed Implementation Committee (WIC)

> "An interagency committee should be established to coordinate agency activities in implementing this plan. To ensure coordination with the management program for the entire Lake Sammamish Basin, the interagency committee should be an expanded subcommittee of the Lake Sammamish Project Management Committee (PMC). The expanded subcommittee would include current PMC members with interests in the basin--METRO, the City of Issaquah, and the King County SWM Division--as well as representatives of the other major implementing agencies including the Muckleshoot Tribe, Washington Department of Natural Resources (DNR), Washington State Parks Department, Washington State Department of Ecology, King County Conservation District, King County BALD, King County Environmental Division, King County Roads and Engineering Division, Seattle-King County Department of Public Health, and other affected parties. The committee should meet twice yearly and be staffed by the basin steward (BW-35). The steward, in conjunction with the WIC, should prepare annual reports and implementation schedule updates. The role of the PMC as the group that convenes the WIC will be reevaluated after three years."

Ecology concurs with this recommendation, but suggests the frequency of meetings be increased to quarterly meetings. Quarterly meetings are suggested because more frequent meetings foster better communication and relationships between implementing agencies; encourage implementing agencies to keep more contact with the plan and their responsibilities, increasing the likelihood for successful implementation; and although King Co. SWM will be the lead agency, more frequent meetings foster a feeling of mutual ownership and importance in implementing the plan. Additionally, experience has shown that implementation committees that meet more frequently are more successful in maintaining the needed momentum and interest for implementing the plans. Please contact Gail Dorf of the Water Quality Section at the Northwest Regional Office, (206) 649-7276 for coordinating Ecology's participation in implementing this recommendation.

BW-58 Water Quality Inventory

"a. SWM Division. The SWM Division should conduct an inventory of all commercial business sites to identify and correct illicit sanitary sewer and stormdrain hook-ups.

b. KCCD. The KCCD should conduct a systematic inventory of commercial and non-commercial farms to be used as a basis for instituting farm conservation plan requirements.

c. DOE. The Washington Department of Ecology should establish monitoring wells at a representative sample of USTs to assist in routine UST inspection."

Ecology agrees with the intent of BW-58 c., to assess the effectiveness of leak control detection equipment on UTS, but we believe the most cost effective way of analyzing the effectiveness is by reviewing and analyzing data that has been and will continue to be collected as required by regulation. Current regulations require new and existing underground storage tanks to install leak detection equipment. Minimum regulatory requirements include monthly monitoring or monthly inventory control and tank tightness testing every year. Monthly monitoring can include automatic tank gauging, vapor monitoring, interstitial monitoring, ground-water monitoring, or other approved methods. Therefore, Ecology would prefer the following wording of recommendation BW-58.c:

"Ecology will work with King County SWM to obtain for review monthly UST monitoring and inventory data collected in the East Lake Sammamish Watershed. "

Please contact Gail Dorf of the Water Quality Section at the Northwest Regional Office, (206) 649-7276 for coordinating Ecology's participation in implementing this recommendation.

BW-46 Enforcement Protocol

> "The King County SWM Division should initiate efforts to establish an enforcement protocol that is consistent with the goals and objectives of section 319 of the 1987 Clean Water Act. This protocol should identify a lead enforcement agency and the specific roles and responsibilities of METRO; the Department of Ecology; King County SWAM, Environmental Division, and BALD; DNR; SKCDPH; and KCCD in responding to spill reports, animal keeping-related pollution, forest practice violations, septic systems failures, or other explicit water-quality violations. This process should update the current Interagency Water-Quality Trouble Call/Emergency Response Program that is coordinated by METRO."

Ecology concurs with this recommendation. Please contact Gail Dorf of the Water Quality Section at the Northwest Regional Office, (206) 649-7276 for coordinating Ecology's participation in implementing this recommendation.

ROBERT TURNER
ng Director

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
1111 Washington Street S.E., P.O. Box 43135 • Olympia, Washington 98504-3135 • (206) 902-2200 • (SCAN) 902-2200

March 22, 1993

Meg Moorehead, Project Manager
King County Department of Public Works
Surface Water Management Division
400 Yesler Building, Room 400
Seattle, Washington 98104-2637

SUBJECT: Concurrence with the East Lake Sammamish Basin and Nonpoint Action Plan, WRIA 08.0057

Dear Ms. Moorehead:

Washington Department of Fisheries (WDF) reviewed the above-referenced document and submits the following statement of concurrence.

WDF commends you on the excellent and thorough plan which has been produced for the East Lake Sammamish basin. It is our intention to work closely with King County in helping to implement the plan to the maximum extent possible, given the limited resources within which we have to work. At this time, it is not possible to commit financially to the expenditures which have been identified due to the uncertainty of our budget for the next biennium, which commences in July 1993.

WDF is now requesting legislative appropriations for a statewide wild salmon stock assessment project. A search for funding for studies to evaluate problems with the Lake Washington sockeye stock has also been initiated. This evaluation will include Lake Sammamish. It may be possible to fulfill the goals of the habitat inventory and monitoring projects through these funding sources.

Concerning individual projects in the plan which will require Hydraulic Project Approval from WDF, our staff prefer to be involved in project review as early as possible in the planning process. It is not appropriate to concur that these projects as proposed will provide proper protection of fish life until WDF staff has conducted a more thorough review.

If you have questions or need additional information, please contact Larry Fisher, Regional Habitat Manager, at (206) 392-9159.

We appreciate your cooperation in our efforts to protect, perpetuate, and manage the fish resources of the state of Washington.

Sincerely,

Millard S. Deusen

Millard S. Deusen
Regional Supervisor, Freshwater Permits
Habitat Management Division

MSD:LDF:lt

cc: Hal Michael, WDF
Larry Fisher, WDF

CURT SMITCH
Director

STATE OF WASHINGTON
DEPARTMENT OF WILDLIFE
16018 Mill Creek Blvd., Mill Creek, WA 98012 Tel. (206) 775-1311

May 18, 1993

Meg Moorehead, Project Manager
King County Department of Public Works
Surface Water Management Division
400 Yesler Building, Room 400
Seattle, Washington 98104-2637

RE: WMC - PROPOSED BASIN AND NONPOINT ACTION PLAN EAST LAKE SAMMAMISH BASIN, WRIA 08.0057

Dear Ms. Moorehead:

Washington Department of Wildlife (WDW) staff have reviewed the referenced document and this letter contains our statement of concurrence with the substance and intent of this plan.

WDW commends your division for a comprehensive plan, which when implemented will effectively resolve many of the ongoing (and potential future) water quality/quantity and fish habitat problems in the basin. WDW plans to work as diligently as possible, within the constraints of budget and staffing levels, to see the goals of the plan implemented.

WDW has already received our legislative appropriation for the 1993-95 biennium and it contains no new funding or FTEs with which to take on new projects. In fact, it appears more likely there will be mandated reductions in programs.

However, WDW is committed to establishing fishable populations of kokanee and other gamefish in Lake Sammamish and its tributary streams - assuming the water quality and fish habitat problems are remediable.

WDW Habitat Management staff will welcome the opportunity to provide technical assistance and support to the county in your efforts to remove fish migration barriers and restore fish habitats.

We appreciate your concern for the state's precious fish and wildlife resources and your efforts to participate in their stewardship.

Sincerely,

Theodore A. Muller
Regional Habitat Resource Manager

TAM:ks

cc: Habitat, Olympia