

APPENDIX A: REGULATORY AUTHORITY FOR BASIN PLAN MEASURES

This section reviews past and present federal, state, and local policies and regulations guiding flood control and flood plain management, water quality management, stormwater management, and related land use planning and management in Thurston County and Olympia.

A.1 FEDERAL REGULATORY AUTHORITY MANAGEMENT

A.1.1 NATIONAL FLOOD INSURANCE ACT (1968)

The National Flood Insurance Act of 1968 established the National Flood Insurance Program (NFIP), administered at the national level by the Federal Insurance Administration, a division of the Federal Emergency Management Agency (FEMA). The state Department of Ecology (DOE) coordinates the NFIP in Washington State. The purpose of this program is to encourage local land-use management of floodplains and other flood prone areas. The program emphasizes regulating development rather than physically controlling floods, and offers federally subsidized flood insurance for local property owners, to induce local management to participate in the program.

Floodplain management regulations include zoning, subdivision or building requirements, and special-purpose floodplain ordinances. To participate in the NFIP, a community must prohibit new construction within the floodway and require new buildings in the flood hazard area to be flood proofed to the 100-year flood level. These regulations apply to existing buildings only at the time they are substantially improved.

In 1972 and 1973 all cities, towns, and counties were reviewed for their susceptibility to flooding and a flood hazard boundary map was created. This map also serves as a preliminary assessment of the flood hazard boundaries of a community. In Thurston County, the following communities have flood hazard areas within their boundaries: unincorporated Thurston County, Olympia, Lacey, Tumwater, Tenino, and Bucoda. All these jurisdictions now participate in the National Flood Insurance Program.

FEMA issues the community's Flood Insurance Rate Map (FIRM) after conducting a flood insurance study. The FIRM is used to determine the degree of flood hazard and corresponding actuarial flood insurance premium rates for specific properties. Thurston County's FIRM was last updated December 1, 1982. These maps are available for public inspection at Thurston County's Storm and Surface Water Utility or can be ordered from FEMA for a small fee.

A.1.2 FLOOD DISASTER PROTECTION ACT (1973)

The Flood Disaster Protection Act of 1973 mandates the purchase of flood insurance by residents as a condition of federal funding for acquisition or construction of buildings in the floodplain. No federal financial assistance can be provided for the permanent repair or reconstruction of insurable buildings in the floodplain if a presidentially declared flooding disaster occurs in a non-

participating community. Eligible applicants in these communities may still receive forms of disaster assistance that are not related to permanent repair and reconstruction of buildings.

A.1.3 CLEAN WATER ACT

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

A.1.4 NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM

The 1987 amendment to the Federal Clean Water Act required EPA to write regulations for stormwater discharges associated with industrial activity and municipal storm sewer systems. The ruling became final November 13, 1990 with an effective date of December 17, 1990. National Pollutant Discharge Elimination System (NPDES) permits for discharges from municipal separate storm sewer systems prohibit non-stormwater discharges into the storm sewers; and require measures to reduce the discharge of pollutants to the maximum extent practicable. These measures include management practices; control techniques and system, design and engineering methods; and other provisions appropriate for the control of such pollutants.

The NPDES permits for discharges from municipal separate storm sewer systems are conditioned to specific sites. The permit application requirements provide municipal applicants an opportunity to propose appropriate management programs to control pollutants in discharges from their municipal systems. The proposed management program must include: structural and source control measures to reduce pollutants in runoff from commercial and residential areas; maintenance activities; planning procedures to develop, implement, and enforce controls for new development; and water quality impact assessments for flood management projects. The program also must contain a method to detect and remove illicit discharges, monitor and control pollutants from municipal landfills, and control pollutants in construction site runoff, including non-structural and structural management practices.

A.2 STATE REGULATORY AUTHORITY

A.2.1 FLOOD CONTROL ASSISTANCE ACCOUNT PROGRAM (86.26 RCW)

The Flood Control Assistance Account Program (FCAAP) provides local jurisdictions with assistance to maintain flood control facilities and prepare comprehensive flood control plans. The purpose of the plan (as defined in RCW 86.26.105) is to establish the need for flood control maintenance work; consider alternatives to instream flood control work; identify and consider potential impacts of instream flood control work on the state's resources; and outline the stream's floodway. Thurston County received \$151,700 of FCAAP funds to assist in the development of this plan, which must meet the requirements listed above.

The Washington State DOE administers FCAAP, which has provided approximately four million dollars statewide during each of the last two bienniums. Counties are eligible for up to \$500,000 per biennium in FCAAP grants. The counties are responsible for administering grants to all eligible municipal corporations within the county. No municipal corporation can apply directly to the state for a FCAAP grant.

Under FCAAP guidelines, construction of new facilities is not eligible for FCAAP funding since the program is intended to restore, maintain, and repair natural conditions, works, and structures. The amount of program funding for any non-emergency project cannot exceed 50% of the total cost including planning and design costs. A maximum of 80% for emergency projects and up to 75% of comprehensive flood control management plan preparation costs are allowed by FCAAP.

Funding of emergency projects requires the declaration of an emergency by the appropriate local authority. The maximum amount of money available for emergency projects statewide is \$500,000 per biennium. The maximum amount of emergency funds initially available for any one county is \$150,000 per biennium; however, if the total is not used by other counties and emergency work in a county exceeds \$150,000, that county can request additional emergency funds. Payment from the emergency fund is allocated on a first-come first-serve basis.

A.2.2 STATE FLOODPLAIN MANAGEMENT ACT (86.16 RCW)

Originally named the Flood Control Zone Act of 1935, this regulation gave the state the authority to form flood control zones along streams and rivers, to control stream systems for the protection of life and property, the preservation of public health, and the preservation of the natural resources of the state. The act specifies state regulatory authority over all waters in Washington's designated flood control zones, including the authority to regulate construction and planning within flood plains and floodways.

The statute has been extensively revised since passage of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. In 1987, the statute was renamed "Floodplain Management" and the state's permitting responsibility was abolished. Under the new version of the statute, the state Department of Ecology (DOE) is responsible for coordinating the

floodplain management regulations required for participation in the National Flood Insurance Program (NFIP).

Generally, the DOE acts in an oversight capacity with respect to local governments. The DOE helps local governments, at their request, to prepare and enforce floodplain management ordinances. In turn, local governments must submit any new floodplain management ordinance or amendment to the DOE for approval within thirty days.

The Floodplain Management Act gives the DOE the authority to supervise all dams and obstructions in streams, and regulate flows to minimize potential downstream flood damages. The DOE accomplishes this through minimum state requirements for floodplain management that exceed the minimum federal requirements for participation in NFIP. Local governments may adopt floodplain management ordinances or requirements that exceed the DOE requirements. The act also gives the DOE the authority to examine and approve or reject future developments and modifications to existing developments located within a floodway, although this power is rarely exercised. Both state and local floodplain management regulations are based on Federal Emergency Management Agency (FEMA) maps that designate special flood hazard areas (100-year floodplains). A community's participation in this program is required for its residents and property owners to be eligible for federally subsidized flood insurance.

A.2.3 PUGET SOUND WATER QUALITY AUTHORITY (90.70 RCW)

The *Puget Sound Water Quality Act of 1985* created the Puget Sound Water Quality Authority (PSWQA) to "develop a comprehensive plan for water quality protection in Puget Sound to be implemented by existing state and local government agencies". PSWQA developed the Puget Sound Water Quality Plan of 1986, which identified urban stormwater as a significant source of pollution in Puget Sound, and recommended watershed action plans to address this and other concerns. The Henderson Inlet Watershed Action Plan was developed under this mandate, and adopted in 1989.

The 1991 Puget Sound Water Quality Management Plan recommends implementing watershed action plans to reduce urban runoff and nonpoint pollution, and improve shellfish protection. The 1991 plan aims to provide long-term protection for the region's aquatic resources. This plan contains fifteen programs for cleaning up and preventing pollution of Puget Sound, including programs to manage nonpoint source pollution and stormwater and combined sewer overflows.

A cooperative watershed management program established committees to prioritize watersheds in each of the 12 Puget Sound counties, including Thurston County. Thurston County's watershed ranking project assigned top priority to the Woodland and Woodard creek watersheds, and the Henderson Inlet Watershed Action Plan recommended developing basin plans for those two basins.

A.2.4 STATE PLANNING ENABLING ACT (36.70 RCW)

The State Planning Enabling Act authorizes local governments such as Thurston County and the cities of Lacey and Olympia to conduct land use planning and regulation. The act requires local jurisdictions to prepare comprehensive plans that contain land use elements that designate the proposed general distribution, location, and extent of uses of land. Included in this element are standards of population density and building intensity and estimates of future population growth. This element contains provisions for protecting the quality and quantity of groundwater used for public water supplies.

The act was amended in 1984 and 1985 to require the land use elements under the Comprehensive Plan to include a review of drainage, flooding and stormwater runoff, and provide guidance for corrective actions to mitigate or clean discharges that pollute Puget Sound or waters entering Puget Sound.

A.2.5 FOREST PRACTICES ACT (76.09 RCW)

The Forest Practices Act, administered by Department of Natural Resources, governs the conditions under which land may be logged. A Class 4 Forest Practices Act permit is required for converting land from forestry to urban uses and is subject to county review. The county may require the applicant to submit a drainage plan and an erosion control plan under certain conditions.

A.2.6 GROWTH MANAGEMENT ACT (RCW 36.70A)

The Growth Management Act of 1990 requires local jurisdictions to plan for growth and allows the charging of impact fees for mitigation of development.

The Growth Management Act requires updating existing comprehensive land use plans to reflect a coordinated and consistent effort among jurisdictions. The goals adopted by the act include encouraging urban growth development where adequate public facilities and services exist; reducing urban sprawl; encouraging efficient transportation systems; providing affordable housing to all economic segments of the population; promoting economic opportunity; providing compensation for private property taken for public use; processing of permits in a timely and fair manner; maintaining and enhancing natural resource-based industries; encouraging the retention of open space and conservation of habitat; protecting the environment and quality of life; encouraging the involvement of citizens in planning activities; ensuring public facilities and services are adequate; and encouraging the preservation of historical relics. These goals are the impetus for amendments to the 1988 Thurston County Comprehensive Plan and the City of Olympia Comprehensive Plan.

A.2.7 WASHINGTON STATE SHORELINE MANAGEMENT ACT

The purpose of the Washington State Shoreline Management Act (SMA) is to protect the public interest in public resources such as water, fish, wildlife, and associated habitat, by regulating public and private development in shoreline areas. The SMA defines state policy and authorizes the implementing regulations adopted as Washington Administrative Code (WAC 90.58). It defines several shoreline designations; provides guidance to DOE and local jurisdictions on procedures, rules, and plans for shoreline activities; establishes time lines for developing local shoreline management plans; and identifies activities exempt from shoreline permits.

The SMA includes significant regulatory requirements for all major shorelines including the ocean coastline, Puget Sound, the Strait of Juan de Fuca, lakes of 20 acres or larger, rivers and streams with mean annual flows of 20 cubic feet per second or greater, and their associated wetlands. The area of jurisdiction includes associated wetlands, floodplains, and all land within 200' of the ordinary high water mark of the shoreline. Thus, any public or private action proposed in floodways and many actions proposed in the flood fringe of most rivers and larger streams in the county are subject to SMA regulations.

The SMA requires cities and counties to adopt local shoreline master programs that include policies and regulations for land use in shoreline areas. Thurston County and Olympia adopted the Shoreline Master Program as mandated by the SMA.

A.2.8 STATE ENVIRONMENTAL POLICY ACT (43.21C RCW)

The Washington State Environmental Policy Act (SEPA) of 1971 provides a process to analyze the environmental impacts of public and private development. Extensive amendments enacted in 1983 apply to all agencies of state and local government. SEPA shapes state and local government decisions on public projects and publicly regulated private projects by requiring consideration of environmental impacts. The most recent implementing rules were adopted by DOE in 1984.

SEPA does not create a permitting process. It gives local jurisdictions the authority to review proposals and evaluate their potential environmental impacts, in conjunction with existing policies, regulations, permits, approvals and/or licenses. Information provided during the SEPA process helps agency decision-makers and the general public understand how a project would affect the environment.

A.2.9 WASHINGTON STATE HYDRAULIC CODE (75.20 RCW)

Washington State Hydraulic Code requires the Department of Fish and Wildlife (DFW) to regulate activities within marine and fresh waters of the state. The Hydraulic Code Rules (Chapter 220-11 WAC) describe specific requirements of the regulation.

The primary function of the Hydraulic Code is to protect the states fisheries resources, including spawning and rearing habitat. Therefore, any shore protection works, including dikes or instream work such as gravel removal require approval from the DFW. The Hydraulic Code also requires approval for any work within the high water areas of state waters, which often includes wetlands and floodplains. The hydraulic approval requirements apply only to a small portion of the total area of the flood plain.

A.3 LOCAL REGULATORY AUTHORITY

A.3.1 FLOOD CONTROL ZONE DISTRICTS (86.15 RCW)

Local Flood Control Zone Districts (FCZDs) may be established through RCW 86.15 in 1961, for the purpose of "undertaking, operating or maintaining flood control projects or storm water control projects" for the counties of the state. A zone may be formed by a majority vote of the county legislative authority, or by a petition signed by 25 percent of the electors within a proposed zone, based on votes cast in the last county general election. The County Commissioners can establish a county-wide FCZD, which could then be divided into subzones. Establishment of any FCZD is dependent on the approval of all the cities, towns and districts within the proposed zone boundaries.

FCZDs are quasi-municipal corporations, legally separate from counties. The County Commissioners and Executive, working through the county engineers, administer FCZDs. The County Commissioners may also choose to appoint an unpaid advisory committee for each district.

The County Commissioners may authorize improvements within the zone or any participating zones through resolution. The resolution specifies that a comprehensive plan of development for flood control has been prepared, and that the proposed improvements contribute to the goals of that plan; that the plan has been submitted to the state DOE ninety days before initiating the improvement; that engineering plans and studies for the improvement are on file with the county engineer; that estimated costs for the improvement are available; and that the improvement will benefit either a single zone, two or more zones, or the county as a whole.

A.3.2 FLOOD EMERGENCY OPERATIONS PLAN

The Thurston County Emergency Operations Plan provides for management of county emergency operations. Natural and human caused disasters may occur with little or no warning. Natural disasters which pertain to this report are floods and storms. The emergency plan is based on the assumption that the county may be subjected to floods from a number of rivers and/or heavy rainfall, which may occur as often as once a year. Floods have historically affected both people and property, and caused extensive damage to certain areas of the county. Severe storms include wind, rain, snow, or hail, and could be accompanied by cold waves, ice, or flooding. The greatest impact/damage is usually to property.

The basic emergency plan determines the authorities and references, defines operational situations, identifies the county government emergency organization, assigns emergency responsibilities, and provides a concept of operations, including operations from a county emergency operations center. The annexes amplify the basic plan and outline the direction and control required by county departments to accomplish their emergency responsibilities.

The emergency plan represents the combined planning efforts of Thurston County Emergency Management, the State Division of Emergency Management, and Region 10 of the Federal Emergency Management Agency. It meets the requirements of RCW 38.52, and is compatible with the Washington State Comprehensive Emergency Management Plan and the laws of the State of Washington.

A.3.3 THURSTON COUNTY COMPREHENSIVE PLAN

The Board of Thurston County Commissioners adopted the current Comprehensive Plan by Resolution No. 8932, June 6, 1988, to provide a legally recognized framework for making decisions about land use in Thurston County.

The plan establishes a policy for storm water management, with the objective that "jurisdictions sharing watersheds should coordinate, and development practices should be promoted which do not lead to surface or ground water degradation or chronic flooding from storm water". The plan further outlines actions needed to accomplish this objective, including support for implementing storm water management programs, watershed planning, correction of polluted runoff, stream and wetland assessment, public education, and comprehensive drainage design standards.

The plans also establish general boundaries and development guidelines for growth and rural areas. Guidelines for more detailed land use is provided by geographic area Sub-Area plans. Various ordinances reflect the Comprehensive Plan's components with regards to zoning, building and subdivision standards, and drainage design and erosion control.

The county and cities started a growth management program because of rapid growth in the unincorporated urban area around Lacey, Olympia, and Tumwater. A memorandum of understanding was signed in 1983 which established an Urban Growth Management Area to focus development in a specified "urban area" and provide efficient public services. It emphasized compatible urban development standards and coordinated utility and land use planning. The 1983 memorandum was updated and expanded in 1988, to place more emphasis on phasing of growth. Policies for joint city-county plans through the Thurston County Regional Planning Department were initiated to achieve greater reliability of plans as areas annex to the cities.

A.3.4 OLYMPIA COMPREHENSIVE PLAN

Olympia updated its comprehensive plan on July 12, 1994. The comprehensive plan includes several goals and policies for the unincorporated Urban Growth Management Area that were jointly adopted by the city and Thurston County. The Comprehensive Plan defines the city's vision for the future, and specifies policies for land use, environment, economic development, urban growth management and annexation, utilities and public services, transportation, parks and open space, energy, historic preservation, urban forestry, housing, and public involvement. The plan also includes the city's Capital Facilities Plan as required by the state Growth Management Act.

The comprehensive plan contains several policies that support and authorize the basin plan recommendations. The most relevant policies are summarized in Chapter 1. These policies are used by the city and county to review development proposals and local ordinances. The policies will require changes to several local ordinances, most of which have not been implemented yet.

A.3.5 THURSTON COUNTY STORM AND SURFACE WATER UTILITY

The Board of Thurston County Commissioners established the Storm and Surface Water Utility by Resolution No. 8069, April 1985, to plan, design, operate, and manage storm and surface water controls.

A.3.6 CITY OF OLYMPIA STORM AND SURFACE WATER UTILITY

The City of Olympia established a Storm and Surface Water Utility in 1990 to operate and maintain storm or surface water drains, channels and facilities or outfalls for such waters and rights and interests.

A.3.7 INTERLOCAL AGREEMENT

An interlocal agreement adopted in 1987 assigns joint responsibility for surface water management in Green Cove Creek drainage basin to Thurston County and the City of Olympia. The interlocal agreement establishes joint benefits and obligations for developing a hydrologic model of the basins, developing this basin plan, developing a nonpoint source pollution control program, and other related stormwater planning activities. Local share of the costs were based on the acreage of each jurisdiction contained in the basins.

A.3.8 DRAINAGE DESIGN AND EROSION CONTROL MANUAL

Thurston County (by Resolution #9859) and the cities of Lacey, Olympia and Tumwater adopted nearly identical drainage ordinances in 1991. The ordinances establish standards for construction of drainage facilities including minimum standards for detention/retention and stormwater treatment.

A.3.9 THURSTON COUNTY STORM AND SURFACE WATER ADVISORY BOARD

On May 29, 1990, by Resolution #9514, Thurston County established a Storm and Surface Water Advisory Board (SSWAB) to provide public involvement and accountability for the stormwater utility and to provide recommendations to the Board of County Commissioners regarding the utility.

Thurston County and the cities of Olympia and Lacey began to prepare the Woodland/Woodard Creeks Comprehensive Drainage Basin Plan in July 1989. This plan, when approved by the Washington Department of Ecology and adopted by the cities and county, will fulfill the requirements of the FCAAP and DOE Centennial Clean Water Fund grants. The plan will also achieve the intent of the stormwater utilities through comprehensive planning and development of a facility construction plan to reduce or control erosion, pollution and danger to health, life and property in Thurston County.

A.3.10 CRITICAL AREAS ORDINANCES

Chapter 17.15 of the Thurston County Code contains the current critical areas regulations. In Olympia Chapter 18.76 covers critical areas. The purpose of critical areas ordinances is to preserve the beneficial functions of these areas, and minimize the potential dangers and public costs caused by inappropriate use of such areas. Critical areas ordinances accomplish this purpose through regulation of uses and activities in, near, or directly affecting such areas.

Thurston County and Olympia recently amended their ordinances to satisfy the requirements of both the *1991 Puget Sound Water Quality Management Plan* and the Growth Management Act guidelines for critical areas. Included in the new amendments are sections dealing with: review standards, special reports, aquifer protection areas, flood hazard areas, landslide hazard area, significant wildlife habitat areas, special plants and plant communities, special management areas, streams, and wetlands.

Flood Hazard Areas. Those lands which can be expected to flood at a frequency of once every 100 years or have a one percent or greater chance of flooding in any one year are designated flood hazard areas. Uses allowed within a flood hazard area shall be limited to low intensity land uses which will not create additional hazards to life or property and which maintain the natural functions of floodplains.

Streams. Streams are defined as those areas where surface waters flow sufficiently to produce a defined channel or bed. A defined channel or bed is an area which demonstrates clear evidence of the passage of water and includes but is not limited to bedrock channels, gravel beds, sand and silt beds, and defined-channel swales. The channel or bed need not contain water year-round. This does not include irrigation ditches, canals, storm or surface water runoff devices or other artificial watercourses unless they are used by salmon.

The Critical Areas Ordinances limit uses and activities within a stream or its buffer to low intensity land uses which will not degrade the natural functions of the stream. These natural functions include controlling siltation, minimizing turbidity, protecting nutrient reserves, maintaining stream flows, preserving natural flood storage capacity, protecting fish bearing water, providing groundwater recharge, and protecting wildlife habitat associated with this area.

Streams are defined as Type 1 through Type 5 following the criteria established by the Washington Department of Natural Resources, WAC 222-16-020. Associated buffers for these stream types range from 25 feet to 200 feet to retain the natural functions, depending on the jurisdiction.

Wetlands. Thurston County, Lacey, Olympia and Tumwater define wetlands according to the definition in the federal Clean Water Act. Lacey and Olympia regulate only those wetlands larger than about 1/4 acre, and Thurston County regulates wetlands larger than about 1/4 acre in the urban area, and larger than about 1/2 acre elsewhere. Regulated wetlands generally include swamps, marshes, bogs, and similar areas.

To assist in the preparation of the Critical Areas Ordinance, the Thurston Regional Planning Commission mapped wetlands in several areas of the county using aerial photography, and randomly ground-checked the mapped boundaries. The maps are available from the regional planning office. (These maps do not represent legally delineated wetlands.)

Currently, natural wetlands may not be used to control or treat stormwater runoff. Early research results by the Puget Sound Wetlands and Stormwater Management Research Program (Reinelt, et al, 1990) indicates that uncontrolled stormwater discharges have a significant impact on natural wetlands. The trend in protecting wetlands is to require peak rate control and stormwater treatment prior to discharge to a wetland. These requirements probably will not be imposed on all wetlands, but only those wetlands designated for protection by local governments.

A.3.11 VEGETATION PROTECTION AND LAND CLEARING AND GRADING ORDINANCES

Thurston County regulates grading activities and tree clearing that requires a state forestry permit, only if the land is intended to be converted to a different use. The county does not regulate other forms of vegetation clearing. Chapter 18.76 establishes grading guidelines for the City of Olympia.

A.4 PERMITS AND REGULATIONS FOR DEVELOPMENT AND LAND USE

The purpose of this section is to provide an overview of existing federal, state, and local regulations that affect resource areas subject to stormwater runoff and flood protection which may limit activities in the flood plain.

The counties and cities of Washington State are required by state and federal agencies to adopt specific regulations relating to development. These regulations include development of a comprehensive plan, zoning, subdivision code, flood plain management ordinance, building code, and Shoreline Master Program. The discussion below focuses on categories of regulations pertinent to surface water management including flood control and floodplain management, federal permits and requirements, resource and shoreline management, and land use management.

A.4.1 FEDERAL PERMITS AND REQUIREMENTS

Clean Water Act - Section 404(b)(1) Permits Section 404 of the Clean Water Act of 1972 gave the U.S. EPA the authority to regulate the discharge of dredged or fill material into all waters of the United States, including wetlands. The EPA delegated permitting functions for this activity to the US Army Corps of Engineers (COE), which has been regulating navigable waters of the United States for over 100 years. More recently, the EPA has agreed to give the Department of Agriculture the permitting functions for wetland activities in farm lands.

Waters of the United States as defined by the Rivers and Harbors Act of 1899 include adjacent wetlands and tributaries to navigable waters of the United States and other waters, the degradation or destruction of which could affect interstate or foreign commerce. As defined by the Clean Water Act, wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include marshes, swamps, bogs, and similar areas. Fill material is defined as material used for replacing aquatic areas with dry land or changing the bottom elevation of a water body. Dredged material is material removed from wetlands, stream, or lakes. The COE uses the rules established in section 404 (6)(1) "Guidelines of the US Environmental Protection Agency" to determine if a permit should be issued.

There are two types of permits that may be required from the COE by Section 404 of the Clean Water Act. These are Nationwide Permit 26 and the Individual Permit.

Nationwide Permit. Nationwide Permit 26 applies to fills involving one to ten acres of isolated wetlands or adjacent wetlands located above the headwaters (adjacent to a water body that has an average annual flow of less than 5 cubic feet per second). Applying for the Nationwide Permit involves notifying the COE for a review of the potential environmental impacts. The review also involves notification of the US Environmental Protection Agency (EPA), the US Fish and Wildlife Service, the National Marine Fisheries Service, and the Washington State Department of Ecology (Ecology). The COE uses the feedback provided by the other regulatory agencies to base their decision of acceptance or denial of the Nationwide Permit. If the Nationwide Permit is denied, the applicant can appeal the decision by application for an Individual Permit.

Individual Permit. The COE requires an Individual Permit for the discharge of dredged or fill materials within the previously defined jurisdiction of the COE that does not fit the criteria for a nationwide permit.

In their evaluation of an Individual Permit, the COE must decide whether the benefits of the project outweigh the predicted environmental impacts. The COE evaluation is known as a public interest review and the process includes the following steps:

1. Preapplication meetings with the COE and other resource agencies (optional).
2. Submittal of a permit application to the COE.
3. Distribution of a COE public notice for a 30-day period for review by federal, state, and local permitting agencies, tribes, interest groups and the general public.
4. Consideration of all comments received from notified agencies, tribes, interest groups, and general public.
5. The applicant may be required to submit additional information by the COE for further consideration.
6. The COE decides whether to prepare an Environmental Assessment and Finding of No Significant Impact, or to prepare a Federal Environmental Impact Statement.
7. A public hearing is held, if needed.
8. The COE prepares the appropriate decision documentation.
9. The District Engineer makes the decision to approve or reject the permit application.
10. The permit is issued or denied and the applicant is advised of the decision.

The 10-step procedure outline above for the public interest review is a synopsis of the steps described in an Information Paper published by the COE in January 1989, titled "Permit Requirements for Wetland Fill Projects."

Rivers and Harbors Act - Section 10 Section 10 of the Rivers and Harbors Act prohibits the unauthorized obstruction or alteration of navigable waters of the United States without a permit from the Army Corps of Engineers. The provisions apply to all work below the mean high water mark of navigable tidal waters and the ordinary high water mark of navigable fresh waters, and to proposed actions "in, over or affecting" navigable waters.

Clean Water Act - Section 401 A Water Quality Certification is a statement, similar to a permit, issued by DOE that an activity requiring a federal permit (such as a Section 404 Permit) will comply with water quality standards and discharge limitations for waters of the State of Washington (WAC 173-201). The Certification is required by federal law as a prerequisite to obtaining a federal permit. Usually, the federal agency notifies DOE that application has been made for a federal permit.

Structural flood control measures such as stream bank protection and gravel removal have the potential to create temporary instream turbidity (sedimentation) in excess of state water quality standards during the construction period. Such projects will require a Temporary Modification of Water Quality Criteria (also referred to as a "short-term exception to water quality standards"). For stream bank protection and gravel removal projects, a modification will be required before DOE can issue a water quality certification. Each such certification is reviewed and issued on an individual basis as an administrative order, and includes specific limitations on how and when construction activities may be carried out.

A.4.2 STATE PERMITS AND REQUIREMENTS

State Environmental Policy Act. All proposed public or private projects must submit a SEPA Environmental Checklist. These are administered by the Thurston County Department of Development Services in Thurston County. Some projects are categorically exempt from the SEPA process. Most categorical exemptions use size criteria to differentiate between an exempt or nonexempt action. Exempted projects include most single-family homes, commercial buildings under 4,000 square feet, parking lots for 20 cars or less, and any landfill or excavation of 100 cubic yards or less.

The Environmental Checklist is not a permit. It is a tool that the local jurisdictions use to review the environmental impacts of a proposal, and insure that the proposal conforms to existing policies and regulations. The Checklist requires a full disclosure of a proposal's likely environmental impacts, and a description of measures to prevent or mitigate those impacts. Proposals likely to have a significant adverse impact on the environment are required to prepare an Environmental Impact Statement (EIS).

Agencies or local governments may deny or add conditions to permits or other approvals under SEPA if the proposal is likely to cause significant adverse environmental impacts that cannot be prevented or mitigated. SEPA rules emphasize developing mitigation measures to avoid or reduce environmental impacts. These may be required under SEPA as conditions for receiving related permits.

Shoreline Permits under the Shoreline Management Act. Developments on the shores of the ocean, Puget Sound, the Strait of Juan de Fuca, lakes of 20 acres or larger, rivers and streams with mean annual flows of 20 cubic feet per second or greater, and their associated wetlands are all subject to Shoreline Permit requirements. The area of jurisdiction includes associated wetlands, floodplains, and all land within 200' of the ordinary high water mark of the shoreline. In general, any action within such a shoreline area requires a Shorelines Permit.

Shoreline permits are issued by the planning departments of Thurston County and Olympia. The permit requirements are contained in zoning overlays, and they apply in addition to any other local regulations. Any project that has a total cost or fair market value over \$2,500 or that materially

interferes with the normal public use of the water or shorelines requires a substantial development permit, with certain exceptions. However, all development and land use must conform to the master program.

Hydraulic Project Approval Permits. Any shore protection works, including dikes or instream work such as gravel removal require a Hydraulic Project Approval Permit (HPA) permit from the Department of Fish and (DFW). Although not directly aimed at the protection of wetlands or floodplains, the HPA is required for any work within the high water areas of state waters, which often includes wetlands and floodplains.

Hydraulic Code Rules (WAC 220-110) contain technical provisions that may apply to different types of projects. Depending upon the individual proposal and site-specific conditions, these technical provisions may be included in the HPA as permit conditions. Special permit provisions may also be included where site-specific conditions warrant them.

The DFW recently began implementing its own special stormwater requirements whenever a Hydraulics Permit Application is submitted. Although primarily focused towards new developments, the stormwater requirements can be applied to any project where a permit is required.

A.5 LOCAL PERMITS AND REQUIREMENTS

A.5.1 CLEARING AND GRADING PERMITS

Thurston County and Olympia require permits for most earthmoving activities. Olympia also require permits for most tree removal activities. Section A.3.13 has more details.

A.5.2 ZONING ORDINANCES

The Thurston County Zoning Ordinance regulates land uses. Certain land uses require special types of approvals. The City of Olympia defines zoning in Title 12. The regulations take the form of density and construction limitations.

A.5.3 DRAINAGE DESIGN AND EROSION CONTROL MANUAL

The Drainage Design and Erosion Control Manual for Thurston County contains specific design standards and requirements for drainage and erosion control on new developments and remodels. This is available from the Thurston County Storm and Surface Water Utility, the Lacey Public Works Water Resources Program, and the Olympia Public Works Water Resources Program.

APPENDIX B: REGIONAL NONSTRUCTURAL MANAGEMENT PROGRAM

Since 1990, several basin plans have been completed for watersheds within the north Thurston County area. Each plan contains basin-specific capital recommendations that focus on problems that occur and that can be solved within the context of an individual drainage basin. In addition, the plans contain recommendations that address non-capital issues existing in every drainage basin throughout the region. Jurisdictions within the north Thurston County area have worked together to create a package of regional non-capital recommendations to be included in each basin plan. Until this package is fully implemented, all basin plans will include the following identical recommendations for a regional non-capital program. (As of 1998, many of these recommendations have been fully or partially implemented.)

IMPLEMENTATION STRATEGIES FOR REGIONAL RECOMMENDATIONS

Two strategies have been developed to streamline implementation of regional recommendations. Both are described briefly below:

Coordinate and Implement Regionally: The scope of the recommendations under this strategy go beyond basin and jurisdictional boundaries and require regional participation to succeed. All jurisdictions will coordinate and contribute financially to one lead agency for each program recommendation, which will coordinate activities throughout the region.

Total recommendations under this strategy: 14

Examples: Multijurisdictional plan coordination, community grants.

Coordinate Regionally, Implement Locally: The scope of the recommendations under this strategy also go beyond basin and jurisdictional boundaries, but the recommendations would be implemented by individual jurisdictions. Each jurisdiction would have programs and staff in place to support these recommendations. Coordination would occur through existing processes.

Total recommendations under this strategy: 22

Examples: Public information and outreach, drainage manual revisions.

STORMWATER FACILITIES

While most stormwater facilities serve a particular basin, the jurisdictions can work together to Achieve enhanced operation of existing facilities and construction of new ones.

RECOMMENDATION R-1: **Maintain public and private stormwater management facilities on a scheduled basis.**

Discussion: The potential to lose valuable open space is extremely high due to the rapid rate of development in north Thurston County. Preservation of open space is an important component of protecting water resources. By supporting and coordinating with parks and planning on the protection and acquisition of lands that offer especially valuable open space traits, these areas will not be lost.

Benefit: Protection of lands providing exceptional visual and wildlife amenities. Preservation of the natural beauty and character of the north Thurston County area.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-6: **Minimize the number of street and utility crossings through critical areas. When crossing creeks, encourage necessary street crossings to use bridges or arch culverts that maintain the natural creek substrate. Encourage new utilities to use existing utility corridors.**

Discussion: Streams and wetlands are severely impacted by the construction and use of road and utility crossings. Minimization of the number of crossings would diminish resource impacts and hydrologic changes to the stream system. When no other reasonable alternative to creating a stream crossing exists, the use of arched culverts would maintain the natural stream substrate which is a critical component of stream habitat. Existing frameworks could be utilized to implement this recommendation, the most appropriate is probably through the development review process.

Benefit: Reduced degradation of water quality and habitat.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

REGULATIONS/DEVELOPMENT CONTROLS

The jurisdictions can more effectively regulate development to protect natural resources if they work cooperatively.

RECOMMENDATION R-7: **Amend the *Drainage Design and Erosion Control Manual for the Thurston Region, Washington* (Regional Drainage Manual) to require half the current**

stormwater release rate for new development located on poorly drained soils, including all hydrologic Class C and D soils and many Class B soils as defined by the Regional Drainage Manual and the 1990 Soil Survey of Thurston County.

Discussion: The Regional Drainage Manual established stormwater facility storage needs and release rates based on the best available information at the time. Section 1.3 of the manual supports the establishment of storage requirements and release rates by the basin planning process. Many jurisdictions in the Puget Sound area are evaluating the need to increase storage requirements. The recommendation is supported by recent Washington Department of Ecology (WDOE) proposals in the *Stormwater Management Manual for the Puget Sound Basin*.

The computer modeling efforts of the basin planning process have provided state-of-the-art analysis of the Indian/Moxlie, Percival, Woodard, and Woodland basins. These analyses provide far greater accuracy than past evaluations made possible.

These basins encompass approximately 49 square miles in the urban area. Much of the basins are within the Urban Growth Management Area (UGMA). The portions of the urban area not included in the basin planning areas include Ellis, Mission, Schneider, Green Cove, and Chambers Basins. These basins and creek systems have been evaluated through a WDOE Centennial Clean Water Basin Reconnaissance grant (TAX90202). Through these various planning efforts, all basins and associated creek systems in the urban area have been investigated. The infiltration standards for these basins will be reevaluated and adjusted if necessary, when basin plans for them are developed.

The need to increase the drainage regulations is a function of the tendency of many local soil types to become saturated during storm events. Subsequently, rainfall creates runoff rather than being infiltrated. Although portions of the urban area have not been evaluated by the basin planning process, the soils in these areas are typically as prone to saturation as the soils in the evaluated basins.

The proposed drainage requirements are critical to the success of the basin plans. Failure to adopt this proposal would result in the continuation of existing management problems or a reliance on the local jurisdictions to provide appreciable quantities of stormwater storage.

In addition to the costs associated with the jurisdictions providing regional storage, numerous conveyance systems upgrades would be necessary to accommodate future high flows. The implications of appreciably higher future flows is readily apparent in the Indian Creek Basin. Prior to its confluence with Moxlie Creek, Indian Creek is conveyed in pipe at 19 locations. Many of these pipes are currently at capacity. Without increased storage requirements, potential development could result in the need to replace many of the high cost pipe systems.

The recommendation to increase the storage requirements is being pursued with several qualifiers. These are as follows:

- Areas with highly permeable soils would not be required to comply with the proposed storage requirement. These soils may be capable of infiltrating stormwater and meeting the proposed release rate requirement without increasing storage volume. Numerous areas in the southern portion of the urban area typically have highly permeable soils.
- The proposed requirements provide an impetus for developers to minimize impervious surfaces and effectively infiltrate runoff within a development. Developments designed to accomplish these goals could expect an appreciable reduction in stormwater management requirements. Innovative design techniques are numerous and may include narrower road widths, porous pavement, yard infiltration, depressional landscaping, and cluster development.
- With the necessary jurisdictional fee-in-lieu policies in place, stormwater management requirements for a proposed development could possibly be reduced. The reduction would be contingent upon a jurisdictional need to correct an existing stormwater problem. Fee-in-lieu contributions could be used only in the same drainage area as the proposed development.
- The goal of this recommendation is to maintain existing, pre-development stream flows through consistent design standards that do not place unnecessary complications on developers and engineers. For specific development sites, other methods may be considered to meet this goal.

The cost savings associated with more stringent standards are substantial when considered against potential necessary infrastructure upgrades.

Benefit: Stormwater runoff is often the primary detrimental influence on urban creek systems. Often, artificially high flood flows often have a greater impact on the integrity of urban creeks than does water quality contamination. The effects of stormwater flows are apparent in the creeks in the urban area. More stringent storage requirements than those currently provided by the Regional Drainage Manual are justifiable for the protection of natural resources and the minimization of future flooding problems in developed areas.

The recommendation would also provide substantial saving in public infrastructure needs. While the proposed storage requirement continues to allow increased flows to be released from a site following development, the recommendation does effectively reduce peak flows.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-8: **Amend the Drainage Manual to require adequate treatment of stormwater prior to infiltration in highly permeable, Class A soils in industrial/high risk areas, as specified in the North Thurston County Ground Water Management Plan.**

Discussion: Groundwater recharge is important to the health of creeks, water supplies, and the minimization of stormwater management costs. Stormwater infiltration is supported by current drainage design regulations. However, infiltrating contaminated waters through highly porous soils may provide inadequate treatment thereby threatening groundwater quality. A recent study conducted in the Puget Sound area supports the need for treatment prior to infiltration (Brown and Caldwell, 1990).

Benefit: Minimization of threats to groundwater quality.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-9: **Require new homes and remodels which increase impervious area to install stormwater management systems capable of managing the volume of runoff generated by the new development.**

Discussion: While large development projects are required to install stormwater management facilities, single-family home construction is not required to do so. This type of development, called in-fill, can have considerable cumulative effects on stormwater. There are several low cost, effective techniques that can be used for single-family in-fill development that effectively reduce the quantity of runoff generated from the site. This recommendation does not propose that systems with sufficient capacity to accommodate the additional runoff should be upgraded.

Benefit: Reduced quantity of stormwater runoff from in-fill development.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-10: Evaluate current staffing levels and employ adequate staff to fully implement and enforce key elements of the Regional Drainage Manual.

Discussion: Many requirements of the Regional Drainage Manual require considerable staff time to implement and enforce effectively. Key elements such as analysis of upstream and downstream impacts caused by new development are critical to the protection of water resources. However, the jurisdictions cannot adequately meet these requirements due to current staffing and budgetary restraints.

Benefit: Minimization of future flooding and natural resource problems.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-11: Restrict development in flood hazard area so that existing flood elevations are not increased under build-out conditions.

Discussion: New development within the 100-year flood plains of all north Thurston County creeks would be limited. Existing structures would be reduced over time. Flood plain filling and construction that results in loss of local stream capacity and increased downstream flows would be eliminated.

The intent of this recommendation is to restrict development in the flood plain, not to prohibit compatible uses such as agriculture, or parks and trails. The basin plans place many new requirements on developers and new homeowners to meet higher standards to prevent increases in flooding. Common sense dictates that the capacity of existing natural drainage should be maintained. Developments in the flood plain reduce natural drainage capacities and force flood waters further out into surrounding areas.

Benefit: The natural ability of streams to control floods would be protected.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-12: Consider development standards to minimize future impervious surfaces by such measures as narrower streets, porous pavements, reduced parking

requirements, and revised landscaping requirements. Encourage common standards throughout the jurisdictions.

Discussion: Streets generate approximately 25 percent of total urban stormwater. Parking lots and driveways contribute lesser but appreciable quantities of runoff. Landscaping requirements can be incompatible with the efficient management of stormwater. Elimination of conflicting regulatory objectives and minimization of impervious surfaces reduces stormwater management costs and promotes groundwater recharge. Local planning departments are currently conducting preliminary investigations of these issues. The implementation of improved standards is important to effective long-term water resource management.

Benefit: Surface water management problems would be minimized by reducing the generation of runoff.

Project lead: Olympia.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-13: Encourage innovative land use planning techniques (such as cluster housing) that preserve undisturbed open space and natural stormwater functions where appropriate throughout the region.

Discussion: Innovative development techniques such as cluster housing are effective means of reducing runoff, improving runoff quality, enhancing groundwater recharge, and protecting critical areas. Because cluster housing maintains a substantial amount of undisturbed vegetation, the natural functions and characteristics of an area may continue after development. The areas most appropriate for cluster development and other creative development techniques will be identified on a basin-specific level.

Benefit: Reduction of runoff quantity and improved runoff quality, groundwater recharge, and critical area protection.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-14: Establish uniform standards for land clearing and grading within the Urban Growth Management area

that minimize removal of native vegetation, improve water quality, and reduce stormwater runoff quantity.

Discussion: The single largest impact on stormwater is the conversion of land from natural vegetation (including trees and shrubs) to grass or development. Olympia, Lacey, Tumwater, and Thurston County all regulate vegetation removal and grading through ordinances. A detailed clearing and grading plan is required for all new development. The plan must specifically identify vegetation to be removed, a schedule for vegetation removal and replanting, and the method of vegetation removal. Thurston County is developing a vegetation protection ordinance that will require a permit for all land clearing.

Uniform standards are an effective method to ensure that vegetation is properly managed during preparation of new development sites. Because the Urban Growth Management Area (UGMA) is intended to be developed at similar densities across the jurisdictions, uniform clearing and grading standards throughout the area are appropriate.

Benefit: Preservation of soil infiltration capacities, reduction of erosion, protection of creek channels, and protection of wildlife habitat.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

ENFORCEMENT/COMPLAINT RESPONSE

Historically, jurisdictions in northern Thurston County have not supported a sufficient level of regulation enforcement and complaint response. Regulations would be more effective if consistently enforced throughout the region.

RECOMMENDATION R-15: **Evaluate current staffing levels and employ adequate staff to fully enforce development and environmental protection regulations which impact water resources. Improve coordination, management, and effectiveness of complaint response to water quality, habitat, and flooding issues regionally.**

Discussion: The jurisdictions in north Thurston County have limited staff available for the enforcement of existing local regulations. Mechanisms aimed at protecting water resources (such as maintenance agreements between homeowners associations and the jurisdictions) are not well enforced. Improving enforcement would help protect the important functions of wetlands, creeks, and other critical areas within the basins.

Cooperation among the jurisdictions would improve public access to complaint systems, increase technical assistance staff, and increase public awareness of complaint system availability. More highly publicized complaint phone numbers and staff for response would increase the efficiency and effectiveness of existing complaint response efforts. Complaint response would be coordinated with Stream Team database and monitoring.

Benefit: Protection of creek channels, preservation of soil infiltration capacities, and reduction of illegal land grading and alterations which will decrease flooding, habitat degradation, erosion, and sedimentation. Better field inspection and analysis, public access and involvement, and remedial action.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

POLLUTION SOURCE CONTROL PROGRAMS

Programs aimed at reducing pollution at its source are especially adaptable to regional implementation. The use of a diverse set of programs to stop the release of contaminants into the environment would improve the quality of water resources throughout the region.

RECOMMENDATION R-16: **Support the adoption of a nonpoint pollution source control ordinance that defines practices and procedures to protect the public health and water quality of the Thurston region from polluted surface water runoff. Define penalties for infractions, responsibilities for clean-up, and train enforcement staff.**

Discussion: The state has limited resources to enforce nonpoint source regulations. A nonpoint pollution source control ordinance will enable local jurisdictions within northern Thurston County to regulate nonpoint sources when state agencies are unable to enforce their regulations. Such an ordinance does not replace state regulations, but rather complements them. Thurston County adopted such an ordinance in September 1992.

Benefit: Protection of water quality and public health.

Project lead: Thurston County Health Department

Implementation strategy: Coordinate regionally, implement locally.

SYSTEM MONITORING

System monitoring is a crucial element of water resource protection. While many monitoring efforts will be specific to each individual basin, it is also important to establish a regional monitoring program to oversee all water resources in the north Thurston region.

RECOMMENDATION R-17: **Establish a long-term regional water quality, stream gaging, and stream assessment program for key streams throughout the north Thurston region.**

Discussion: Monitoring environmental trends permits staff to evaluate the effectiveness of corrective measures, and provides an early warning system for problems. This program could utilize both volunteers and professional staff.

Benefit: Protection of aquatic resources within the north Thurston region, remedial measures will be evaluated and improved, and impacts related to specific projects will be identified.

Lead jurisdiction: Thurston County.

Implementation strategy: Coordinate and implement regionally.

RECOMMENDATION R-18: **Monitor stormwater facilities to assess the performance of best management practices (BMPs) and promote improved management techniques.**

Discussion: The performance of stormwater treatment techniques is rarely evaluated. A degree of uncertainty exists regarding the long-term level of treatment provided by the best available, and current required, techniques.

Benefit: Accurate evaluations of performance would provide the basis for improvements in currently used techniques.

Project lead: To be determined.

Implementation strategy: Coordinate and implement regionally.

PUBLIC INVOLVEMENT AND EDUCATION

The following recommendations are identified as either high or medium priority. Recommendations of high priority represent the minimum level of service required to fulfill the centennial grant stipulations relating to public involvement and education (PIE). Medium priority recommendations would provide the optimum level of service for PIE activities.

Recommendations are organized by these general categories of PIE activities: community grants, education and training, public information and outreach, coordination and evaluation, and data management.

COMMUNITY GRANTS

RECOMMENDATION R-19: **Establish a regional community grants program to support volunteer action projects, school projects, and community education.**

Discussion: A permanent funding source will provide community groups and businesses with the means to participate in solving local storm and surface water problems. Some of the grants will target high priority projects and activities in each basin. There are no existing community grant programs devoted to water resources issues.

Benefit: Community initiated projects to address local storm and surface water problems, and additional funding for school projects focusing on water resources.

Project lead: Thurston County.

Implementation strategy: Coordinate and implement regionally.

EDUCATION AND TRAINING

RECOMMENDATION R-20: **Present Stream Team activities for volunteers including: networking meetings, regional Stream Team workshops and action projects, and advanced training seminars. Involve school and community groups, and lake and streamside property owners in Stream Team activities and provide technical assistance for volunteers.**

Discussion: Volunteer projects increase the sense of responsibility for water resources among local residents. The Stream Team program will result in hundreds of skilled volunteers who are actively protecting and restoring water resources, training other volunteers, and educating their friends and neighbors. This measure will extend and expand the existing Stream Team program which currently relies partly on grant funding.

Benefit: Increased awareness and protection of water resources throughout the north Thurston region.

Project lead: Olympia and Thurston County.

Implementation strategy: Coordinate and implement regionally.

RECOMMENDATION R-21: **Establish Public Involvement and Education (PIE) internships or work-study positions in local stormwater**

programs, and encourage local colleges to offer graduate and undergraduate projects and classes on water resources public involvement and education.

Discussion: College interns and projects will help to produce educational materials, interpret natural resources, coordinate volunteers, evaluate programs, and manage data. This will create a pool of trained, experienced resource people who can assist community water resources PIE programs in Thurston County.

Benefit: Inexpensive assistance for local stormwater programs, and development of qualified public involvement professionals.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-22: Create a Stream Team naturalist program.

Discussion: The Stream Team Naturalist program will present interpretive programs on the natural resources of the watersheds to schools, community groups, and the general public. Stream Team volunteers will also be trained to present information. The Stream Team program will coordinate training and field activities. No such program currently exists.

Benefit: Support for public involvement and outreach activities, and improved environmental awareness in the community.

Project lead: Olympia and Thurston County.

Implementation strategy: Coordinate and implement regionally.

RECOMMENDATION R-23: Provide business and industry with education and training opportunities.

Discussion: Business education activities will help forge a partnership between businesses and local government, with the common goal of protecting and improving water resources. Activities associated with this recommendation would include: workshops with Thurston Conservation District to implement conservation plans; workshops on implementing the new drainage manual and basin plan requirements; technical support on waste management and water resource issues (source control and BMPs through Operation: Water Works); and coordination with business organizations and public agencies.

The improved relationship between public and private sectors will eventually reduce the need for enforcement. Operation: Water Works is a temporary, grant-funded project to encourage best management practices for businesses; the other parts of this recommendation, such as drainage manual training and technical support would constitute a new program.

Benefit: Heightened awareness and understanding of water resources within the business community. Potential reduced need for enforcement of environmental codes.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-24: Present water resource training workshops for school teachers, and provide water resource education kits that include predesigned curricula and teaching aids.

Discussion: Water resource education for young people is a long-term investment in developing public values that support environmental protection and stewardship. Because environmental education is currently required in all Washington public schools, local governments have an opportunity to work cooperatively with school districts. Three educator workshops were presented in 1990 through a centennial grant that will expired in June, 1991.

Benefit: Increased environmental education within public schools focusing on water resources.

Project lead: Thurston County.

Implementation strategy: Coordinate and implement regionally.

RECOMMENDATION R-25: Train jurisdictional staff to implement and enforce basin plan recommendations such as new drainage standards and land use regulations.

Discussion: Adoption of the basin plan will result in a variety of new practices and regulations. Effective plan implementation will require retraining local government employees because they have the primary responsibility for enforcement and technical assistance. This recommendation would apply in Percival, Indian/Moxlie, Woodard/Woodland, McAllister/Eaton, Chambers/Ward/Hewitt, and Green Cove basins.

Benefit: Heightened awareness and enforcement of basin plan recommendations by jurisdictional staff.

Project lead: Lead jurisdiction for basin plan.

Implementation strategy: Coordinate and implement regionally.

RECOMMENDATION R-26: Provide opportunities to involve youth, families, teachers, and schools in special, water-related community activities.

Discussion: A program of special community activities will include Family Fun Days, children's Stream Team day camp, "hands-on" displays for schools, field trips to areas of special interest, cold water aquaria for classrooms, and classroom water quality presentations by staff. This program will involve residents who have not been reached by existing Stream Team programs, and will encourage active participation among entire family groups.

Benefit: Helps local schools meet Washington's environmental education requirements, and creates long-term improvements in water resources management.

Project lead: Olympia and Thurston County.

Implementation strategy: Coordinate and implement regionally.

PUBLIC INFORMATION AND OUTREACH

RECOMMENDATION R-27: Create a storm and surface water public information program to provide consistent, accurate information to the media and increase educational outreach to the public.

Discussion: The public information program will supply the primary communication between local water resource management agencies, the media, and the public. The program will manage all media contacts by arranging interviews and filming sessions, producing accurate news releases and briefings, publishing frequent articles in newspapers and periodicals, and mounting high profile media campaigns. Outreach activities will include publishing educational brochures, posters, and publicity materials for local events that highlight the national significance of local issues. This program will improve the public perception of local water resource protection efforts, and prevent damaging misinformation from reaching the public through the media.

Currently, numerous local agencies provide bits and pieces of public information on water resource issues, with little consistency between information sources. This measure would consolidate these scattered sources of information and provide reliable funding. Most existing outreach relies on temporary project funds.

Benefit: More accurate and consistent public information, improved public perception of resource protection programs, and increased public participation in water resources programs.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-28: Investigate incentives that encourage schools to incorporate water resources curriculum and meet established criteria.

Discussion: Utility rates will offer a financial incentive for schools to develop and maintain water resources education programs. The City of Olympia currently offers grants to schools for stormwater projects.

Benefit: Helps schools meet state environmental education requirements, and creates long-term improvements in water resources management.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-29: Create a Citizen Stream Patrol program.

Discussion: The Citizen Stream Patrol program will train local citizens to identify destructive practices such as illegal dumping, land clearing and grading, inadequate erosion controls, grazing in streams, and other violations. The Stream Team program will coordinate training and field activities. Stream-specific teams will work closely with existing enforcement and complaint-response programs. No such program currently exists.

Benefit: Increased personal responsibility for protection and stewardship of local stream basins, and improved regulations enforcement.

Project lead: Olympia and Thurston County.

Implementation strategy: Coordinate and implement regionally.

RECOMMENDATION R-30: Develop new water resource exhibits for fairs and local events.

Discussion: Public exhibits will include portable, free-standing display boards as well as permanent interpretive signs for critical resource sites. Portable displays will be updated regularly to show progress on current projects. Exhibit topics will include stream systems, volunteer projects, impacts of runoff, and suggestions for homeowners. Exhibits will be displayed at all major local events including Harbor Days, Wooden Boat Festival, Capitol Lakefair, Earth Day, Lacey Fun Fair, County Fair, Community Awareness Days, etc. Exhibits will also be displayed at schools, libraries, and community centers. Currently, exhibits often include out-of-date information.

Benefit: Improved outreach to audiences which have not received other types of public information, and increased public participation in volunteer projects

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-31: Manufacture and install watershed boundary signs for each major drainage in Thurston County using a region-wide design.

Discussion: The most important challenge for public water resource education is making residents aware of the existing natural resources in their local areas. Stream crossing signs have already helped improve public awareness, and watershed boundary signs will increase awareness by identifying drainage boundaries. Existing signs on Interstate-5 in the Nisqually watershed provide a good example.

Benefit: Increased public awareness of water resources.

Project lead: Thurston County.

Implementation strategy: Coordinate and implement regionally.

COORDINATION AND EVALUATION

RECOMMENDATION R-32: Devote staff to a regional Education Technical Advisory Committee (ETAC).

Discussion: Water resources education demands regional coordination because water resources transcend local boundaries. Each basin jurisdiction needs to devote ongoing staff to the regional PIE program, so as to avoid duplication with other programs and provide a consistent method for evaluating public involvement and education activities. The ETAC would be responsible for

coordination and evaluation of plan PIE elements, implementation of the public education guidelines in the Puget Sound Water Quality Management Plan, creation of a database to help monitor and evaluate plan implementation, and organization of a regional citizen advisory committee to monitor public education and involvement.

Benefit: Enhanced interjurisdictional coordination on public education issues.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

DATA MANAGEMENT

RECOMMENDATION R-33: **Create a computerized data management system to organize and analyze data collected by Stream Teams, public workshops, and volunteer projects. Publish results biannually, including photos, monitoring data, and volunteer participation.**

Discussion: The data management system will help managers to coordinate and evaluate the effectiveness of PIE activities, provide quick access and consistent information to all stormwater programs, and could be expanded to improve existing complaint response programs. Currently, data management is haphazard and inconsistent between jurisdictions.

Benefit: Improved PIE coordination and public assistance.

Project lead: Olympia.

Implementation strategy: Coordinate and implement regionally.

REGIONAL PROGRAM MANAGEMENT

Several basins in north Thurston County are the subject of basin plans. Because drainage basins do not recognize jurisdictional boundaries, it is imperative that the governments work cooperatively to implement the plans.

RECOMMENDATION R-34: **Support multijurisdictional basin plan coordination and implementation.**

Discussion: Although basin plan implementation would necessitate increased levels of interjurisdictional coordination and decision making, existing administrative practices could be utilized depending upon the funding approach chosen to facilitate these needs.

Benefit: More comprehensive approach to coordinating the implementation of current and future basin plans.

Project lead: All jurisdictions.

Implementation strategy: Coordinate regionally, implement locally.

RECOMMENDATION R-35: Establish a technical support position to assist jurisdictions in identifying appropriate funding sources and preparing grant applications for implementation of basin plan recommendations.

Discussion: Due to budgetary constraints, many of the recommendations within the basin plans will have to be implemented using outside financial assistance. Current staffing levels do not allow adequate time to be dedicated to searching for potential funding sources and preparing numerous grant applications.

Benefit: Heightened awareness of potential funding sources and competitiveness in the grant awarding process.

Project lead: Thurston County.

Implementation strategy: Coordinate and implement regionally.

RECOMMENDATION R-36: Establish a five-year implementation strategy for increased cooperation in water resource management within the Urban Growth Management Area.

Discussion: Stormwater issues are most effectively managed on a regional basis. As the UGMA becomes increasingly developed it will be necessary for expanded regional management of stormwater issues. Interjurisdictional management is the most cost-effective and least duplicative method of handling stormwater concerns.

Benefit: Increased effectiveness and comprehensiveness of stormwater management programs.

Project lead: To be determined.

Implementation strategy: Coordinate and implement regionally.

APPENDIX C: SOILS DESCRIPTION

This section describes the soils found in the basin. The information is summarized from the Soil Survey of Thurston County, Washington (US Soil Conservation Service 1990).

Most of the soils found in Green Cove basin belong to the Alderwood-Everett Association. These soils range from moderately to very deep, moderately to somewhat excessively well drained. They are mostly level soils found on glacial till plains.

Alderwood-Everett soils are found mostly in the northern part of Thurston County, at elevations of 50 to 700 feet. The vegetation is mainly conifers and hardwoods. This association comprises about 35% of the county. The association includes about 22% Alderwood soils, 21% Everett soils, and 57% other soils.

Alderwood gravelly sandy loam soils predominate in the Green Cove basin. Alderwood soils are moderately deep, moderately well drained soils formed over weakly cemented glacial till. The surface layer typically consists of about 6" of very dark brown gravelly sandy loam. Below this lies about 9" of dark brown gravelly sandy loam, and then 15" of dark brown very gravelly sandy loam. The weakly cemented hardpan lies at a depth of about 30", and is strongly compacted. Depth to hardpan ranges from 20" to 40". Other soils in the basin include:

Bellingham silty clay loam. This soil is very deep, poorly drained, and found in depressions. Drainage has been altered by tilling and ditching. The native vegetation is mainly hardwoods and conifers. The surface layer consists of about 5" of black silty clay loam, underlain by 9" of gray, mottled silty clay and 60" or more of gray and dark gray mottled silty clay and clay. Permeability is slow, and the soil has a seasonal high water table.

Dystric xerochrepts. This soil formed on escarpments in glacial till, and can be found in the lower Green Cove Creek ravine. The native vegetation is mainly conifers and hardwoods. No single profile is typical of this soil, which usually contains layers of very gravelly brown loam and compact glacial till. Permeability is moderate above the glacial till and very slow through the till. Erosion hazard is high.

Giles silt loam. This soil is found in a few small pockets in the basin. The soil is deep and well drained. The native vegetation is mainly conifers and hardwoods. The surface layer is about 3" of dark brown silt loam, underlain by 7" of dark yellowish brown silt loam and 38" of olive brown silt loam. Up to 60" more olive brown silt loam lies beneath.

McKenna gravelly silt loam. This soil is moderately deep and poorly drained, formed in drainageways and depressions. The native vegetation is mainly hardwoods. The surface layer is about 9" of black gravelly silt loam, underlain by 4" of very dark grayish brown gravelly silt loam, 8" of dark brown very gravelly silt loam, and 15" of dark brown and dark yellowish brown, mottled very gravelly loam. The substratum is 60' or more of grayish brown, dense glacial till. Depth to till ranges from 20" to 40". A perched seasonal high water table occurs on this soil.

Mukilteo muck. This soil occurs in many of the basin's wetlands. The soil is very deep and very poorly drained. Drainage has often been altered by surface drains and ditches. The soil formed in organic material derived mainly from sedges. The native vegetation is mainly sedges and rushes. The surface layer is about 6" of dark yellowish brown and dark reddish brown muck, underlain by 60' or more of dark reddish brown mucky peat. A seasonal high water table occurs in this soil.

Skipopa silt loam. This soil occurs in many of the basin's wetlands, often in association with Mukilteo muck. The soil is moderately deep and somewhat poorly drained. The native vegetation is mainly conifers and hardwoods. The surface soil is about 8" of dark brown silt loam, underlain by 7" of brown silt loam and 3" of grayish brown, mottled silty clay loam. The substratum is 60" or more of greenish gray, mottled silty clay and clay. A perched seasonal high water table occurs in this soil.

Tisch silt loam. This soil occurs in wetlands and drainages in the basin. The soil is deep and very poorly drained. The native vegetation is mainly hardwoods, spiraea, sedges and grasses. The surface soil is about 6" of very dark brown silt loam, underlain by 5" of very dark grayish brown silt. The substratum is 60" or more of stratified black, very dark brown, dark grayish brown, and dark brown silt and muck. A seasonal high water table occurs in this soil.

Yelm fine sandy loam. This soil is deep and moderately well drained. The native vegetation is mainly conifers and hardwoods. The surface soil is about 8" of dark brown fine sandy loam, underlain by 9" of dark yellowish brown fine sandy loam, and 29" of dark, grayish brown and olive brown, mottles fine sandy loam. The substratum is 60" or more of light olive brown loamy sand. A seasonal high water table at a depth of 18" to 36" occurs in this soil.

APPENDIX D: GREEN COVE BASIN WILDLIFE

Compiled from: Shapiro study appendix D, Mark Upton, Blackham et al, Puhich et al

REPTILES AND AMPHIBIANS

red-legged frog
Pacific chorus frog
western red-backed salamander
Oregon salamander
northwestern garter snake
garter snake species
northern alligator lizard
rough-skinned newt
northern long-toed newt
red-tailed frog
Pacific tree frog
green tree frog

FISH

Olympic mud minnow
Perch
Coho salmon
Chum salmon
Chinook salmon
Steelhead
Cut-throat
Eastern brook trout
Western brook lamprey

MAMMALS

beaver
black bear
brush rabbit
bushy-tailed woodrat
chickaree
Columbia black-tailed deer
cottontail rabbit
coyote
deer mouse
Douglas squirrel
dusky shrew
flying squirrel

Appendix D: Wildlife

house mouse
little brown myotis
long-tailed vole
long-tailed weasel
masked shrew
meadow vole
mountain beaver
mule deer
muskrat
Norway rat
opossum
raccoon
red fox
river otter
shrew mole
striped skunk
Townsend's big-eared bat
Townsend's chipmunk
Townsend's mole
Townsend's shrew
Townsend's vole
vagrant shrew
western grey squirrel
yellow pine chipmunk

BIRDS

accipiter species
American bittern
American coot
American robin
American goldfinch
American widgeon
Audubon's warbler
bald eagle
band-tailed pidgeon
barn owl
barn swallow
belted kingfisher
Bewick's wren
black-capped chickadee
black-headed grosbeak
black-throated gray warbler
blue grouse

Bohemian waxwing
 Brewer's blackbird
 brown creeper
 brown-headed cowbird
 bufflehead
 Bullock's oriole
 bushtit
 California quail
 Canada goose
 canvasback
 cedar waxwing
 chestnut-backed chickadee
 chipping sparrow
 cinnamon teal
 cliff swallow
 common bushtit
 common crow
 common flicker
 common yellowthroat
 common goldeneye
 common merganser
 common snipe
 Cooper's hawk
 double-crested cormorant
 downy woodpecker
 eared grebe
 european starling
 evening grosbeak
 fox sparrow
 gadwall
 glaucous-winged gull
 golden-crowned kinglet
 golden-crowned sparrow
 goshawk
 great horned owl
 great blue heron
 greater yellowlegs
 green-backed heron
 green-winged teal
 gull species (*Larus sp.*)
 hairy woodpecker
 hermit thrush
 hooded merganser
 house finch
 house sparrow

house wren
Hutton's vireo
kestrel
kildeer
long-billed marsh wren
MacGilluray's warbler
mallard
meadowlark
merlin
nighthawk
northern flicker
northern harrier
northern oriole
northern shoveler
olive-sided flycatcher
orange-crowned warbler
Oregon junco
osprey
pied-billed grebe
pileated woodpecker
pine siskin
pintail
purple finch
purple martin
red-breasted nuthatch
red-breasted sapsucker
red crossbill
red-shafted flicker
red-tailed hawk
red-winged blackbird
ring-necked duck
ring-necked pheasant
rock dove
rough-legged hawk
ruby-crowned kinglet
ruddy duck
ruffed grouse
rufous hummingbird
rufous-sided towhee
rusty song sparrow
savannah sparrow
saw-whet owl
scaup sp.
screech owl

sharp-shinned hawk
snipe
solitary vireo
song sparrow
sora rail
spruce grouse
starling
Steller's jay
Swainson's thrush
Townsend's solitaire
Townsend's warbler
tree swallow
varied thrush
violet-green swallow
Virginia rail
warbling vireo
western flicker
western flycatcher
western grebe
western tanager
western wood pewee
white-crowned sparrow
willow flycatcher
Wilson's warbler
winter wren
wood duck
yellow-bellied sapsucker
yellow-headed blackbird
yellow-rumped warbler
yellow warbler

APPENDIX E: HABITAT SURVEY DATA

Cumul. Dist	Bed Elev	Habitat Type	Depth	Surf. Elev	Wet. Width	B.F. Length	Pool Length	Rifle Length	Res Depth	Res Width	Res Area	Wetted Pool Area	Rifle Area	Woody Debris Sizes					Woody Debris Traversin	Position Sill	Notes		
														Sm	Med	Lrg	Rt.	Wa				Total	
SEGMENT #1: Tidal mudflat from end segment 2/start segment 1 to mouth																							
1020.6	1.75	P	0.32	2.07	2.1	10	5		0.18	1.18	22.44	39.90	NG								0		
1025.6	2.02	R	0.14	2.16	2.1			18.5					38.85								0		
1044.1	1.68	P	0.25	1.93	2.1	33	10.5		0.13	1.09	11.47	22.05		1							1		
1054.6	1.82	R	0.12	1.94	3.0			22.5					67.50	1	1						2		
1077.1	1.06	P	0.3	1.36	3.0	33	3.4		0.20	2.00	6.80	10.20			10	10					20		EST. MED, LARGE
1080.5	1.22	R	0.1	1.32				36.1					*****								0		
1087.5			0											1	4	1					6		
1116.6	0.6	P	0.44	1.04	3.3	33	4.9		0.36	2.70	13.23	16.17								0			
1121.5	0.91	R	0.08	0.99				20.1					66.33								0		
1138.1						24								10	2						12		EST SMALL W.D.
1141.6	0.45	P	0.23	0.68	3.3	24	3		0.11	1.58	4.73	9.90								0			
1144.6	0.56	R	0.12	0.68				15.8					52.14								0		
1155.6			0											5	2						7		EST SMALL W.D.
1160.4	0.08	P	0.38	0.46	2.0	24	6.2		0.20	1.05	6.53	12.40								0			
1166.6	0.27	G	0.18	0.45	2.9			11.3					32.77								0		
1177.9	0.34	R	0.1	0.44	4.0	28.5		23.6					94.40								0		
1187.1			0											6							6		EST SMALL WD
1201.5	-0.4	P	0.36	-0.0	1.5	28.5	2.9		0.26	1.08	3.14	4.35								0			
1204.4	-0.1	R	0.1	0				9.2					13.80								0		
1208.6			0											7	1	3					11		
1213.6	-0.39	G	0.2	-0.2				19					28.50								0		
1232.6	-0.39	R	0.17	-0.2	5.1			42.7					*****								0		
1275.3	-0.94	G	0.3	-0.6				9.7					49.08								0		
1285.0	-0.82	R	0.13	-0.7				50.3					*****								0		
1304.4			0												2						2		
1335.3	-1.4	G	0.3	-1.1	3.0			14.1					42.30								0		
1349.4	-1.24	R	0.1	-1.1		45		73.2					*****								0		
1422.6	-1.24	R	0.05	-1.2																	0		AT MOUTH
AGE			0.203		2.87	28.3									31	19	17				0	67	
L							35.9	366.1					114.97	1284									
							8.93%	*****					8.22%	*****									

Cumul. Dist.	Bed Elev.	Habitat Type	Depth	Surf. Elev.	Wet. Width	B.F. Width	Pool Length	Rifle Length	Res Depth	Res Width	Res Area	Wetted Pool Area	Rifle Area	Sm	Med	Lrg	Woody Debris Sizes	Total	NOTES
SEGMENT #2A: 36TH Ave. south to start of segment																			
0.0	1162.7							7.3					9.49		1			1	SEG. 2 CONTINUES BELOW 36TH
1.0	1161.7	29.47	Rifle	0.06	29.53	1.30	3.70											0	CUM 1162.7 IS S SIDE OF 36TH
3.1	1159.6																	0	
7.3	1155.4	29.18	Pool	0.11	29.29	1.30	3.70	16		0.05	0.59	13.18	20.80					0	
12.0	1150.7	28.82	Pool	28.82														0	
23.3	1139.4	29.17	Rifle	0.12	29.29	1.30		8.7					11.09	1	1			2	
32.0	1130.7		Pool	0.12	0.12	1.25	6.7					13.40						0	
34.8	1127.9	29.07	Pool	0.35	29.42	2.00		3.4		0.23	1.31							0	
38.7	1124.0	29.29	Rifle	0.12	29.41								6.80					0	
42.1	1120.6	29.51	Pool	0.12	29.63	2.30	18.1					63.35						0	
52.1	1110.6	29.22	Pool	0.40	29.62	2.53		8		0.51	2.83			10		3	13	EST SMALL WD	
55.2	1107.5	28.96	Pool	0.63	29.59	3.50	9.10						29.60					0	
60.2	1102.5	29.48	Rifle	0.15	29.63													0	
68.2	1094.5	29.72	Pool	0.10	29.82	3.70	8.8					25.96						0	
71.5	1091.2	29.42	Pool	0.40	29.82	2.20		1.9		0.25	1.38		2.47		2			0	
77.0	1085.7	29.58	Rifle	0.20	29.78		4.10					37.12						2	
78.9	1083.8	29.72	Pool	0.12	29.84	1.30	23.2							1	1			2	
80.4	1082.3	29.30	Pool	0.51	29.81	1.80	4.80			0.31	1.09			1	1			2	
82.1	1080.6																	2	
96.8	1065.9																	0	
98.4	1064.3												8.14	10	1	1		12	EST SMALL WD
102.1	1060.6	29.69	Rifle	0.13	29.82	1.70		3.7				12.15						0	
105.8	1056.9	29.90	Pool	0.09	29.99	2.70	4.5											0	
108.7	1054.0	29.60	Pool	0.37	29.97	3.50			0.24	2.27							1	1	
110.3	1052.4	29.79	Rifle	0.19	29.98	1.50		9.6				16.56	18.24					0	
119.9	1042.8	30.07	Pool	0.16	30.23	2.30	7.2											0	
121.1	1041.6	29.79	Pool	0.48	30.27	2.30	4.4			0.29	1.39			3	4	2		7	
126.4	1036.3																	2	
127.1	1035.6	30.05	Rifle	0.20	30.25	2.30		3.4					7.82					2	
130.5	1032.2	30.23	Pool	0.12	30.35		2.95					31.28						0	
134.8	1027.9	29.94	Pool	0.41	30.35	2.30			0.21	1.18								0	
141.5	1021.2													2		1		3	
144.1	1018.6	30.20	Glide	0.17	30.37	2.05		10.4					21.32					0	
152.5	1010.2																	3	
154.5	1008.2	29.90	Pool	0.50	30.40	2.05	3.1					9.23		5	1			6	EST SMALL WD
159.0	1003.7	30.24	Rifle	0.16	30.40	2.05	4.5		0.33	1.35			39.32					0	
178.2	984.5	30.65	Pool	0.65	31.30	2.05		19.18				70.53						0	
179.8	982.9	30.47	Pool	0.30	30.77		35.62		0.49	1.55								0	
182.1	980.6	30.68	Pool	0.10	30.78		3.6							8	3			11	
188.8	973.9	30.47	Pool	0.34	30.81													0	
192.3	970.4																	0	
199.4	963.3																	2	
208.6	954.1	30.97	Pool	0.15	31.12		6											0	
210.0	952.7	30.57	Pool	0.55	31.12									5	2	1		8	EST SMALL WD
213.8	948.9	31.01	Glide	0.10	31.11	1.70	10.8	13.6					23.12					0	
221.2	941.5																	3	
227.4	935.3	30.99	Pool	0.13	31.12	2.15	6.5					13.98						1	
230.5	932.2	30.75	Pool	0.41	31.16	2.15		4.5	0.31	1.63								0	
233.9	928.8	30.99	Rifle	0.14	31.13	2.15							9.68					0	

Cumul. Dist	Distance	Bed Elev	Habitat Type	Depth	Surf. Elev	Wet. B.F. Width	Pool Length	Riffle Length	Res Depth	Res Width	Res Pool Area	Wetted Pool Area	Riffle Area	Woody Debris Sizes			Total	NOTES
														Sm	Med	Lrg		
238.4	924.3	31.23	Glide	0.10	31.33	2.00		10.4					20.80				0	
248.8	913.9	30.97	Pool	0.38	31.35	2.00	3.7	4	0.28	1.47	5.89	8.20	43.89	1		1	1	
252.8	909.9	31.18	Riffle	0.16	31.34	2.10		20.9									1	
257.8	904.9																0	
273.7	889.0	31.67	Glide	0.10	31.77			24					50.40				0	
297.7	865.0	31.68	Riffle	0.16	31.84			0.4					0.84				0	
298.1	864.6	31.83	Pool	0.16	31.99						1.52	3.15		1	1	1	3	
298.9	863.8	31.67	Pool	0.31	31.98	2.10	6.2	1.5	0.15	1.02			8.26				0	
299.6	863.1	31.85	Riffle	0.14	31.99	1.40		5.9					7.28				0	
305.5	857.2	32.07	Glide	0.09	32.16			5.2			13.91	17.70					0	
310.7	852.0	32.00	Pool	0.16	32.16	2.50	5.3							1			1	
0.0	852.0	32.00	Pool	0.17	32.17												0	
3.8	848.2	31.74	Pool	0.42	32.16	3.34		12.9	0.33	2.62			37.41	1			1	
5.3	846.7	32.06	Riffle	0.12	32.18	2.80								1			1	
16.5	835.5																0	
18.2	833.8	32.20	Pool	0.09	32.29	3.00	5.2				14.44	15.60					0	
21.0	831.0	31.97	Pool	0.32	32.29	3.00			0.2	1.88				2	2	1	5	
23.4	828.6	32.19	Riffle	0.10	32.29	3.00		1.6					4.80				0	
24.2	827.8													1			1	
25.0	827.0	32.25	Pool	0.09	32.34		8.14				19.54	24.42					0	
28.7	823.3	32.00	Pool	0.30	32.30											1	1	
30.0	822.0	31.84	Pool	0.50	32.34	3.00			0.4	2.40						1	1	
33.1	818.9	32.16	Riffle	0.15	32.31		10	5.83					19.24				0	
36.9	815.2																0	
39.0	813.0	32.49	Glide	0.08	32.57	3.60		11.13					33.95				0	
44.8	807.2													1			0	
50.1	801.9	32.51	Riffle	0.09	32.60	2.50	12	5.3					14.84				1	
55.4	796.6	32.63	Pool	0.08	32.71	3.10	6.4				16.27	21.12		1			0	
60.7	791.3	32.20	Pool	0.50	32.70	3.10			0.41	2.54							1	
61.8	790.2	32.54	Riffle	0.16	32.70	3.50		1.02					3.29	1			0	
62.8	789.2	32.73	Pool	0.10	32.83	3.20	4.24				8.48	12.30					1	
64.9	787.1	32.37	Pool	0.48	32.85	3.00			0.32	2.00					5		5	
67.1	784.9	32.64	Riffle	0.20	32.84	2.50		2.65					8.82				0	

Dist	Cumul. Dist.	Bed Elev	Habitat Type	Surf. Elev	Wet. Width	B.F. Width	Pool Length	Rifle Length	Res Depth	Res Width	Res Area	Wetted Pool Area	Rifle Area	Woody Debris Sm	Woody Debris Med	Woody Debris Lrg	Orientation in Stream	NOTES
SEGMENT #2B-36th Ave to Country Club Drive																		
0	688	18.14						9.5										CUM. 888 AT S. EDGE OF COUNTRY CLUB
1	687	18.14	Rifle	0.12	18.26	1.3	6.9						12.35	1	2	0	2	
9.5	678.5	18.60	Pool	0.15	18.75		2.4		0.32	0.95	2.27	3.12		1			1	0
11.3	676.7	18.21	Pool	0.44	18.65	1.3	6.9										0	0
11.9	676.1	18.50	Rifle	0.28	18.78			13.9					35.45	1	1	1	2	2
15	673																	
20	668																	
20.7	667.3				3.8	7.22								2	2	2	2	
25.8	662.2	18.52	Pool	0.60	19.12	3.8	7.22	0.7	0.32	2.03	1.42	3.15		2	2	1	1	Pool formed by woody debris
26.5	661.5	18.93	Rifle	0.18	19.11	5.2			14				72.80				0	Cobble/Gravel substrate
30	658													1	1	1	1	
34	654													1	1	1	1	
40.5	647.5	19.21	Pool	0.10	19.31		6.5		0.44	3.19	20.76	31.525					0	1 Fallen tree. Mid channel gravel bar
44	644	19.08	Pool	0.30	19.38											1	1	Debris Jam
45.5	642.5	18.76	Pool	0.62	19.38	4.5											0	Mid channel gravel bar.
47	641	19.27	Rifle	0.12	19.39			7.5					26.25			1	1	Creating small pools
54	634																	Angle point
54.5	633.5																	Debris Jam
78.5	609.5	19.78	Pool	0.08	19.86	2.5	29.5		0.28	1.96	57.82	82.6		2	3	3	5	Cobble. Shallow water.
82	606	19.45	Pool	0.40	19.85	2.8	9.5											
84	604	19.75	Rifle	0.12	19.87	5.5		15.5					64.33				0	
99.5	588.5	20.15	Pool	0.10	20.25		35.5			4.10	145.40	195.25					0	
102	586	19.80	Pool	0.43	20.23	5.5											0	
106	581.6	20.05	Pool	0.18	20.23												0	
112	576.4	20.30	Pool		20.30											1	1	
116	572.4		Pool														0	
126	562	20.32	Pool	0.15	20.47											1	1	
131	556.8	20.14	Pool	0.32	20.46											2	2	
134	554.5	20.07	Pool	0.47	20.54	5.5	8.5		0.35								0	
135	553	20.36	Rifle	0.13	20.49			5					27.50				0	
140	548	20.54	Glide	0.06	20.60			11					60.5			1	1	
145	543.5																0	
145	543																0	
151	537	20.55	Rifle	0.15	20.70			4.5					*****				0	
156	532.5	20.75	Glide	0.11	20.86	2.2	6.2	7					15.4				0	
163	525.5	20.78	Rifle	0.10	20.88			4					8.8				0	
167	521.5	20.90	Pool	0.10	21.00		9.5		1.76		16.72	20.9		1			1	
171	517	20.57	Pool	0.50	21.07	2.2	6.4		0.4								0	
176	512		Rifle					19					41.80	5	1	1	6	EST SMALL WD
185	503		Rifle														0	
195	493		Pool				16.3		6.00		97.80	97.8		1	1		2	
196	492	20.95	Pool	0.31	21.26												0	
206	482	21.42	Pool	0.18	21.80												0	
210	478.5	20.74	Pool	0.86	21.80	6	7.6		0.86							1	1	
211	476.7	21.46	Glide	0.14	21.80	6		4.5									0	
216	472.2	21.36	Pool	0.23	21.59		3.2		4.32		13.82	19.2	27.00			2	2	
218	470.5	21.10		0.50	21.60	6			0.36					5	1	1	7	EST. SMALL WD
218	470	Ang. Pt.															0	
219	469	21.30	Rifle	0.32	21.62			6					27.00				0	
225	463	21.66	Glide	0.11	21.77	3		5.2					15.60				0	
230	457.8	21.51	Pool	0.28	21.79		3.3		3.00		9.90	9.9					0	
233	455	21.44	Pool	0.36	21.80	3			0.36							1	1	
234	454.5	21.67	Rifle	0.12	21.79			4.5					11.25			1	7	8

Dist	Cumul. Dist.	Bed Elev	Habitat Type	Surf. Elev	Wet. Width	B.F. Width	Pool Length	Pool Depth	Res Depth	Res Width	Res Area	Wetted Pool Area	Riffle Area	Sm	Med	Lrg	Woody Debris	Rt	Wd	Total	Orientation in Stream	NOTES
238	450	21.84	Pool	0.12	21.96	2	5	17		2.50	42.53	47.6								0		
243	445.5	21.58	Pool	0.36	21.94	3.2														0		
250	438.5	21.40	Pool	0.55	21.95	3.2			0.43								1	1		2		
255	433	21.74	Riffle	0.20	21.94			5					14.50							0		
260	428	21.98	Glide	0.06	22.04	2.6		11.5					29.9				3			3		
264	424.3		Glide														1			1		
265	423	0	Angle Pt																	0		
272	416.5	21.93	Riffle	0.16	22.09	2.7	3.2	24.5					66.15				1	1		2		
276	412		Riffle																	1		
282	406	22.16	Riffle	0.13	22.29			4									1			1		
296	392	22.62	Glide	0.10	22.72	9.8							12.9							0		
300	388	22.36	Pool	0.35	22.71	3.7		7.8		3.04	23.71	28.86					1			1		
305	383	22.25	Pool	0.56	22.81	3.7	3.5		0.46											1		
308	380.2	22.56	Riffle	0.25	22.81	3.7														0		
318	370	22.71	Pool	0.30	23.01			6.4		2.42	15.46	23.68	37.74				5	5	5	15		DEB JAM QTY EST.
322	366	22.28	Pool	0.72	23.00	3.7			0.47											0		
324	363.6	22.78	Riffle	0.30	23.08			16.6					42.66							0		
328	360.4	23.52	Riffle	0.05	23.57	1.8														0		
330	358		Angle Pt.																	0		
341	347	23.95	Glide	0.13	24.08	2.2	5.8	6					13.2				5	5	5	15		DEB JAM QTY EST.
347	341	23.91	Cascade	0.18	24.09			0.5					1.38							0		
348	340.5	24.13	Glide	0.12	24.25			6.5					17.88				1			1		
354	334	24.15	Pool	0.11	24.26			8.3		2.46	20.40	27.39								0		
359	329	23.81	Pool	0.47	24.28	3.3			0.35											0		
362	325.7	24.09	Riffle	0.17	24.26	3.3		10.7					35.31							0		
373	315	24.34	Glide	0.10	24.44			2.4					7.92							0		
0	315	24.34																		0		
2.4	312.6	24.08	Pool	0.35	24.43			5.1		3.30	16.83	16.83								0		
3.5	311.5	23.92	Pool	0.52	24.44	3.3	3.1		0.52								2	1		3		
7.5	307.5	24.21	Riffle	0.24	24.45	3.3		6.4					21.12							0		
13.9	301.1	24.65	Glide	0.07	24.72		13	8.1					26.73							0		
22	293	24.48	Pool	0.25	24.73			15.2		2.30	34.96	39.976					1	3		4		
26.5	288.5	24.27	Pool	0.46	24.73	2.3			0.46											0		
30	285																			0		
35	280	24.39	Pool	0.34	24.73												1	1		2		
37.2	277.8	24.62	Riffle	0.12	24.74	2.3		1.3					2.99							0		
38.5	276.5	24.74	Pool	0.12	24.86	2		3.5		2.03	9.74	8.575					10	4	2	16		EST SMALL WD
41	274	24.46	Pool	0.40	24.86	2.9			0.28								1			1		
42	273	24.70	Riffle	0.16	24.86			9					23.40							0		
47	268		Riffle																	0		
51	264	25.08	Glide	0.10	25.18	2.3		15					28.5							0		
60	255	24.72	Glide	0.38	25.10		20													0		
66	249	24.98	Riffle	0.12	25.10	1.5		9					13.5							0		
71.5	243.5	25.26	Riffle	0.10	25.36												10	2	1	13		EST SMALL WD
75	240	24.86	Pool	0.50	25.36	1.5		9.5	0.4	1.20	11.40	23.09								2		
83	232	24.95	Pool	0.40	25.35	2.9														0		
84.5	230.5	25.15	Riffle	0.20	25.35	2.9		20.5					70.73							0		
95.5	219.5		Riffle														1			0		
99	216	25.69	Riffle	0.07	25.76												1			1		
105	210	23.68	Pool	1.15	24.83	4		5	1.08	3.76	18.78	17.50					1			1		
109	206.5		Pool																	0		
110	205	25.70	Riffle	0.10	25.80	3							21.00				10	3		1		EST SMALL WD
117	198	25.80	Pool	0.06	25.86			5	0.25	2.14	10.71	15								0		
122	193.5	25.49	Pool	0.35	25.84	3											1			1		

Dist	Cumul. Dist	Bed Elev	Habitat Type	Depth	Surf. Elev	Wet. Width	B.F. Width	Pool Length	Rifle Length	Res Depth	Res Width	Res Pool Area	Wetted Pool Area	Rifle Area	Woody Debris Sizes			Orientation in Stream			NOTES
															Sm	Med	Lrg	Rt	Wd	Total	
122	193		Rifle			3			6.8					20.40				0			
123	192	26.01	Rifle	0.10	26.11	3												0			
129	186.2	25.71	Pool	0.38	26.09	3		3.2		0.28	2.21	7.07	9.60			1	1	2			
132	183	25.94	Glide	0.15	26.09	3			11.7							1		1			
137	178.5		Glide														3	3			
140	175		Glide															0			
144	171.3	26.11	Rifle	0.10	26.21				19												EST SMALL WD
163	152.3	26.52	Pool	0.07	26.59			3.3		0.3	2.25	7.43		9.9	57	5		5			
164	151.3	26.22	Pool	0.40	26.62	3										1		1			
166	149	26.45	Rifle	0.15	26.60	3	15		5						15.00	1		0			
171	144	26.54	Pool	0.15	26.69		3.5	19		0.35	2.10	39.90		57				1			
175	140																	0			
177	138	26.22	Pool	0.50	26.72	3												0			
190	125	26.48	Rifle	0.26	26.74	3			5						15.00			0			
195	120	26.61	Pool	0.15	26.76			8.9		0.23	1.41	12.53		26.7		10	10	20			QUANTITIES ESTIMATED
196	119	26.27	Pool	0.49	26.76	3												0			
204	111.1	27.03	Glide	0.10	27.13				11.6						56.84		1	0			
215	100					6.8	15											1			
216	99.5	27.02	Rifle	0.16	27.18				12						81.6			0			
228	87.5	27.40	Pool	0.12	27.52			16.5		0.66	3.22	53.12	81.345					0			
235	80	26.68	Pool	0.82	27.50	4										10		0			EST SMALL WD
240	75		Pool															0			
244	71	27.27	Rifle	0.23	27.50	4			3						12.00			0			
247	68	27.44	Glide	0.14	27.58				5						18.5			0			
249	66		Glide													1	1	2			
250	65																	0			
252	63	27.43	Rifle	0.17	27.60	3.4			2						6.8			0			
254	61	27.55	Pool	0.10	27.65			10		0.37	2.33	23.30						0			
256	59	27.11	Pool	0.54	27.65	3.4										1		0			
264	51	27.44	Rifle	0.22	27.66	3.4			13.5						45.90			0			
272	43		Rifle	0.12	0.12													0			
278	37.5	27.81	Pool	0.18	27.99			18.5			NG						1	1			
284	31	27.48	Pool	0.52	28.00	4												0			
296	19	27.76	Rifle	0.22	27.98				3.5						*****			0			
300	15.5	28.03	Pool	0.11	28.14	3.5		9.5		0.41	2.28	21.64	33.25					0			
305	10	27.52	Pool	0.63	28.15	3.5												0			
309	6	27.99	Rifle	0.15	28.14	3.5			1									0			
310	5	28.02	Pool	0.16	28.18			5		0.85	4.25	25.50	21.25		3.50			0			
313	2	27.17	Pool	1.00	28.17	5	5											0			
315	0																	0			

Cumul. Dist.	Bed Elev	Habitat Type	Surf. Elev	Wet. Width	B.F. Width	Pool Length	Rifle Length	Res Depth	Res Width	Res Pool Area	Wetted Pool Area	Rifle Area	Sm Area	Med Lrg	Rt Lrg	Wa Total	Lateral Traversin	Position Notes
SEGMENT #2C-Country Club Dr. to end of segment 2																		
0.0																		CUM. STA 0+00 AT N SIDE OF COUNTRY CLUB
1.6	16.8	Pool	0.36	17	1.7	4.00	4.00	7.00		6.80		18.36	1			1	1	.79 m
4.0	16.7	Cascade		16.7	1.7									1		1	1	1.3 m
8.7	16.6	Cascade	0.09	16.7												0		
11.0	16.7	Cascade	0.07	16.7										1		1	1	
14.8	16.2	Glide	0.06	16.2	1.7		10.10					10.88			2	2	2	
18.5	16.1	Glide	16.1													0		
23.8			0													0		
24.9	15.7	Pool	0.34	16	1.7	4.00	0.80			1.36						0		
25.7	16.1	Rifle	0.07	16.2	1.7		20.40					34.68				0		
44.2	15.6	Rifle	0.08	15.7										1	2	3	3	
46.1	15.6	Pool	0.19	15.8	1.7	4.00	2.80			7.99						0		
48.9	15.5	Rifle	0.16	15.7	1.7		25.00					46.25				0		Sand Bar L.B.
53.7	15.5	Rifle	0.13	15.6	2.0											0		
62.0	15.5	Rifle	0.08	15.6												0		
66.4	15.4	Rifle	0.15	15.4												0		
73.9	15.3	Glide	0.15	15.4			1.40					2.80		1		1	1	End of Rifle L.B.
75.3	15.2	Pool	0.29	15.4	2.0	4.00	2.60			5.20						0		
77.9	15.3	Rifle	0.19	15.5			40.60					81.20		1		1	1	WD L.B. Gravel Bar L.B.
98.4	15.2	Rifle	0.1	15.3												0		
105.6	15	Rifle	0.08	15.1												0		
114.7	14.9	Rifle	0.07	15												0		
118.5	14.5	Pool	0.38	14.9	2.0	4.00	4.50			9.00						0		Small Debris Jam Large Stump L.B.
123.0	14.7	Rifle	0.07	14.7	2.0		18.90					37.80				0		
131.4	14.5	Rifle	0.07	14.5												0		Gravel/Cobble substrate Gravel Sub.
141.9	14.2	Cascade	0.1	14.3	2.0		3.20					6.40				0		
145.1	13.7	Pool	0.29	14		9.80				11.88				3	2	5	2	
146.9	13.7	Pool	0.33	14	2.0	4.00										0	3	
154.9	13.9	Glide	0.13	14	2.0		7.40					14.80				0		
162.3	13.8	Cascade	0.11	13.9	2.0		2.50					5.00				0		
164.8	13.6	Glide	0.24	13.8	2.0		9.50					19.00			1	1	1	L.B.
174.3	13.6	Cascade	0.15	13.8	2.0		4.70					9.40				0		
179.0	13.2	Pool	0.2	13.4	2.0	4.00	3.00			6.00						0		
182.0	13.4	Rifle	0.07	13.2	2.0		11.80					23.60				0		
193.8	13.2	Cascade	0.29	13.2	2.0		2.70					5.40				0		
196.5	12.9	Pool	0.29	13.2		19.70				31.67				2		2	1	R.B.
198.3	12.8	Pool	0.36	13.2												0		
205.0	12.7	Pool	0.51	13.2	2.0	4.00								4		4	1	
214.0			0													1	1	
216.2	13.1	Rifle	0.1	13.2	2.0		17.80					35.60				0		
222.7	12.9	Rifle	0.16	13.1												0		
230.0	12.8	Rifle	0.06	12.9												0		
234.0	12.6	Pool	0.14	12.8		9.30				11.45		NG				0		Debris Jam/Bluff failure
239.0	12.5	Pool	0.26	12.8	2.0	4.00										0		
243.3	12.7	Rifle	0.1	12.8												0		
249.9	12.4	Pool	0.21	12.6		8.60						13.20				0		
252.2	12.1	Pool	0.52	12.6	2.0	4.00				11.25				1		1	1	Sand Bar L.B. Large boulder L.B.
256.0	11.9	Pool	0.17	12.1										2		2	2	
258.5	12.1	Cascad	0.18	12.3	2.0		1.30					2.60				0		
259.8	11.9	Pool	0.38	12.3		8.20										0		
262.9	11.9	Pool	0.4	12.3	2.0	4.00								4		4	4	
264.1	12.2	Pool	0.1	12.3												0		
268.0	12	Glide	0.25	12.2			7.30					14.60	1			1	1	CL channel
275.3	12.1	Rifle	0.12	12.2	2.0		8.20					16.40				0		

Cumul. Dist	Bed Elev	Habitat Type	Surf. Elev	Wet. Width	B.F. Width	Pool Length	Riffle Length	Res Depth	Res Width	Res Pool Area	Wetted Pool Area	Riffle Area	Sm	Med	Lrg	Rt. Wa	Total	Woody Debris	Position	Notes
																		Traversin	Sill	
283.5	12	Cascade	0.1	12.1			1.60					3.20	1	1			1	1		
285.1	11.7	Pool	0.35	12	2.0	4.00	6.40	0.20	1.14	7.31	12.80		1	1			2	2		Cobble fill area
291.5	12	Riffle	0.15	12.2	2.0		9.50					19.00					0	0		
301.0	11.4	Pool	0.2	11.6		2.10		0.20	1.33	2.80	4.20						0	0		
302.1	11.4	Pool	0.3	11.7	2.0	4.00									1		1	1		
303.1	11.5	Glide	0.1	11.6	2.0		11.90					23.80					0	0		
315.0	11.4	Riffle	0.21	11.6			5.00					10.00			2		2	2		CL channel
320.0	11.4	Pool	0.16	11.6		4.50		0.21	1.40	6.30	9.00		1				1	1		
322.0	11.2	Pool	0.3	11.5	2.0	4.00											0	0		
324.5	11.3	Riffle	0.09	11.4	2.0		6.50					13.00					0	0		
327.0	11.3	Riffle	0.21	11.5													0	0		
331.0	11.4	Pool	0.28	11.7	2.0	4.00	4.30	0.21	1.50	6.45	8.60						0	0		
335.3	11.4	Glide	0.07	11.4	2.0		10.60					21.20					0	0		
345.9	11.3	Riffle	0.1	11.4			3.10					6.20					0	0		
349.0	11.2	Glide		11.2			13.00					26.00					0	0		Raw bank (begin)
353.9	11.3	Glide	0.09	11.3													0	0		
362.0	10.7	Pool	0.26	11		3.50		0.15	0.83	2.92	7.00						0	0		
363.9	10.6	Pool	0.36	11	2.0	4.00											0	0		
365.5	10.8	Glide	0.21	11			5.40					10.80			3		3	3		Raw bank . End
370.9	10.9	Riffle	0.08	11			5.30					10.60	3				3	3		Lat = CL channel
376.2	10.4	Pool	0.34	10.8	2.0	4.00	5.60	0.19	1.12	6.26	11.76		1				1	1		
377.7	10.4	Pool	0.3	10.7													0	0		
378.6		gle Pt															0	0		
381.8	10.6	Riffle	0.15	10.7	2.2	7.4	10.80					23.76			1		1	1		
392.6	10.3	G	0.14	10.4	1.7		9.50					16.15		5	1		6	6		
402.1	10.3	R	0.12	10.4	2.8		5.00					14.00					0	0		
407.1	10	P	0.22	10.2	3.1	8.4	3.5	0.08	1.13	3.95	10.85						0	0		
410.6	10.1	G	0.14	10.2	1.3		8.10					10.53		1	1		2	2		
418.7	10.1	R	0.08	10.2	2.8	6.6	3.10					8.68		1			1	1		
421.8	9.74	P	0.36	10.1	1.5	2.4		0.22	0.92	2.20	3.60						0	0		
424.2	9.92	G	0.14	10.1	1.5	6.8	9.40					14.10		3			3	3		
433.6	10.2	TP	10.2			6.50		0.43	3.16	20.53	28.15						0	0		
436.2	9.49	P	0.49	9.86	3.6	6.8											0	0		
440.1	9.91	R	0.06	9.97	4.7		13.90					65.33		1			1	1		
454.0	9.43	P	0.28	9.71	4.7	4.1		0.20	3.36	13.76	19.27		1				1	1		
458.1	9.62	R	0.08	9.7			28.10					*****	1	2	1		4	4		
486.2	9.08	P	0.24	9.32	1.3	6.8	9.3	0.14	0.76	7.05	12.09		4				4	4		
495.5	9.21	R	0.1	9.31	3.6		6.60					23.76					0	0		
502.1	8.97	G	0.24	9.21			6.50					23.40					0	0		
508.6	9.11	R	0.07	9.18			6.00					21.60	1	3	1		5	5		
514.6	8.31	P	0.72	9.03	3.1	6.8	26.2	0.58	2.50	65.43	81.22		1	4	1		6	6		
519.6			0											1	2		3	3		
533.3	7.11	P	0.51	7.62													0	0		
538.3	8.95	TP		8.95													0	0		
540.8	8.49	R	0.14	8.63	5.1		4.50					22.86					0	0		
545.3	8.19	P	0.31	8.5	1.5	20.30		0.52	4.16	84.45	66.38						0	0		
555.6	6.74	P	0.6	7.34	4.8	6.8								2	1		3	3		
565.6	8.22	R	0.08	8.3	3.5		9.50					33.25					0	0		
575.1	7.91	G	0.15	8.06	2.0		11.00					22.00					0	0		
586.1	7.53	P	0.51	8.04	2.6	8.5	9.5	0.41	2.12	20.16	25.08						0	0		
595.6	7.94	R	0.1	8.04	2.7							7.53					0	0		
598.4	8.27	TP		8.27		6.7											0	0		
605.1	7.56	G	0.21	7.77	1.9	7.9	2.80					30.02			1	1		2		
620.9	7.52	P	0.22	7.74	1.9	7.9		0.16	1.38	14.79	20.33	NG					0	0		

Cumul. Dist.	Bed Elev	Habitat Type	Depth	Surf. Elev	Wet. Width	B.F. Width	Pool Length	Rifle Length	Res Depth	Res Width	Res Pool Area	Wetted Pool Area	Rifle Area	Woody Debris Sizes				Woody Debris Position		Notes	
														Sm	Med	Lrg	Rt.	Wa	Total		Lateral
631.6	7.64 C		0.06	7.7	1.9			2					3.80	10					10		
633.6	6.79 P		0.47	7.26			4.5		0.73	4.10	18.43	20.70							0		
633.8	6.45 P		0.82	7.27	4.6	7.9									1	1			2		
638.1	7.17 R		0.09	7.28	4.6			3.5					16.10		1				1		
641.6	6.78 P		0.43	7.21	4.6	8.2	3.6		0.33	3.53	12.71	16.56							0		
645.2	7.08 R		0.1	7.18	1.6			20.2					43.03						0		
653.3	6.72 R		0.2	6.92											1				1		
665.4	6.44 P		0.33	6.77	2.7	8.2	7.2		0.24	1.96	14.14	19.44			6	1	1		8		
668.6	6.61 P		0.15	6.76															0		
672.6	6.66 R		0.09	6.75	2.1	6		6					12.60						0		
678.6	6.51 P		0.1	6.61			9.5		0.27	2.55	24.26	33.25			10		2		12		
685.6	5.76 P		0.37	6.13	3.5	3.8													0		
688.1	6.04 R		0.1	6.14	3.5			8.7					30.45		1				1		
696.8	5.79 P		0.17	5.96		2			0.29	2.22	26.17	37.76							0		
703.1	5.61 P		0.34	5.95	2.6	5.3	22												0		
708.6	5.89 R		0.05	5.94	3.8	12.5		16.5					62.70						0		
725.1	5.35 P		0.35	5.7	2.6	12.5	8		0.29	2.15	17.23	20.80			1	1			2		
733.1	4.65 R		0.06	4.71				6.2					9.92						0		
739.3	5.22 P		0.3	5.52	1.6	8	2.7		0.18	0.96	2.59	4.32							0		
742.0	5.34 R		0.12	5.46	2.0	4.3		18.4					36.80						0		
760.4	4.88 P		0.24	5.12	3.0		17.2		0.28	2.42	41.57	51.60							0		
766.5	4.79 P		0.36	5.15	3.0	4.3									1	1	2		4		
777.6	5.08 R		0.07	5.15	2.7			10.2					30.09		1				0		
779.6				0	3.2	6													1		
787.8	4.77 Pool		0.2	4.97			21.8												0		
794.1				0															0		
804.7	4.24		0.5	4.74	2.4														2		
809.6	4.64 R		0.1	4.74				5.1					24.17			1	1		2		
810.9				0															0		
814.7	4.45 P		0.09	4.54	3.6	4	13.9		0.60	3.26	45.27	50.04		1	2				2		
821.3	3.82 P		0.7	4.52	3.8	4.6													1		
828.6	4.43 R		0.1	4.53	1.7	8.8		16.5					46.20		2		1		3		
845.1	4.19 G		0.25	4.44	3.9			7.3					20.44						0		
852.4	4.26 R		0.11	4.37	2.0	5.3		13.5					31.05						0		
857.0				0											1				1		
865.9	3.7 P		0.35	4.05	2.6	5.3	2.5		0.22	1.63	4.09	6.50			1				1		
868.4	3.9 R		0.13	4.03				6.7					16.75						0		
875.1	3.53 P		0.25	3.78	2.5		2.9								10	3			13		
878.0	3.57 R		0.14	3.71	2.2			4.1					9.02						0		
882.1	3.42 P		0.2	3.62			8.5		0.39	2.50	21.22	27.20			3	1			4		
885.6	3.09 P		0.5	3.59	3.2	5.3													0		
889.6				0															0		
890.6	3.48 G		0.11	3.59	3.2			9.5					30.40						0		
900.1	3.52 R		0.04	3.56	3.5	7		7.5					26.25						0		
903.1				0											1				1		
907.6	3.19 P		0.2	3.39			6		0.45	3.27	19.64	24.00							0		
910.6	2.83 P		0.55	3.38	4.0	7									1				1		
913.6	3.3 G		0.1	3.4	4.0			11					44.00						0		
924.6	3.29 C		0.08	3.37	4.0			0.3					1.20		1				1		
924.9	2.94 R		0.26	3.2				5.7					22.80						0		
930.6	2.71 P		0.47	3.18	4.0	7	8.3		0.32	2.72	22.60	33.20							0		
938.9	3.01 C		0.15	3.16	4.3			1.7					7.31		3				3		
939.1	2.77 C		0.14	2.91	4.6														0		
940.6	2.28 P		0.61	2.89	4.6	7	1.5		0.51	3.85	5.77	6.90							0		

DEBRIS COMPLEX

DEBRIS JAM

DEBRIS PILE

Cumul. Dist	Bed Elev	Habitat Type	Surf. Elev	Wet. Width	B.F. Width	Pool Length	Rifle Length	Res Depth	Res Width	Res Pool Area	Wetted Pool Area	Rifle Area	Woody Debris Sm	Woody Debris Med	Woody Debris Lrg	Rt. Wa	Total	Woody Debris Position Notes
942.1	2.8	R	0.1	2.9	4.6	7	4.2	1.4	0.30	3.14	13.17	19.32	6.44	5	1	2	8	ESTIMATED SMALL
943.5	2.35	P	0.44	2.79	4.6			7.9										
947.7		R	0									16.27					0	
948.4	2.64	R	0.14	2.78	2.1	11											0	
955.6	2.48	P	0.3	2.78	2.1	11	5.8	0.20	1.39	8.04	12.06						0	
961.4	2.66	R	0.1	2.76	2.1			14.7				30.58	5				5	ESTIMATED SMALL
976.1	2.13	P	0.4	2.53			5	0.27	1.34	6.69	10.40		10	1			11	ESTIMATED SMALL
978.1	2.09	P	0.42	2.51	2.1	11						NG					0	
981.1	2.36	R	0.15	2.51	1.5	10		7				10.15					0	
988.1	1.86	P	0.48	2.34	3.5	10	6.5	0.36	2.63	17.06	22.75		4	2			6	
994.6	2.21	R	0.12	2.33	2.1			7				14.56					0	
1001.6			0												1		1	END #2 START #1
AGE			1.16		2.8	7.53												
L ALL OF SEG 2							823.6	1237		1739.42	2349.16		35	21	6	4	66	
							*****	*****			40.96%	*****						

Cumul. Dist.	Bed Elev	Habitat Type	Surf. Elev	Wet. Width	B.F. Length	Pool Length	Riffle Length	Res Depth	Res Width	Res Pool Area	Wetted Pool Area	Riffle Area	Woody Debris Sizes				Total	NOTES
													Sm	Med	Lrg	Rt. Wad		
SEGMENT #3-From end segment 3/start segment 2 to Evergreen Parkway																		
69.7	782.3	33.03	Pool	0.10	33.13	4.50	28.19			70.87	102.89		5	6	1	1	1	END #3 START #2
81.9	770.1																12 EST SMALL WD	
89.7	762.3																0	
91.3	760.7	32.86	Pool	0.34	33.20	4.50											0	
94.4	757.6	32.48	Pool	0.71	33.19	3.50		0.51	2.51								0	
97.9	754.1	33.01	Riffle	0.18	33.19	2.10	27.6					63.48	1			1	1	
108.7	743.3															2		
125.5	726.5	33.26	Pool	0.13	33.39	2.50	3.7			3.57	9.25				1	1	1	
127.6	724.4	33.07	Pool	0.31	33.38	2.30		0.13	0.96								0	
129.2	722.8	33.33	Riffle	0.07	33.40	2.60	18.6					33.48					0	
138.8	713.2	33.31	Riffle	0.12	33.43	1.00											0	
147.8	704.2	33.48	Glide	0.10	33.58	2.30	8.3					19.09					0	
156.1	695.9	33.44	Riffle	0.14	33.58		4.8					10.08	2	4			6	
160.9	691.1	33.63	Glide	0.10	33.73	2.10	3.9					9.36					0	
164.8	687.2	33.56	Riffle	0.13	33.69	2.70	19.74					63.17	1	1	1		3	
172.8	679.2																0	
184.5	667.5	33.73	Pool	0.20	33.93	3.70	7	12.16		33.74	44.99						0	
186.0	666.0	33.43	Pool	0.52	33.95	3.70		0.39	2.78				2	2			4	
196.7	655.3	34.23	Glide	0.10	34.33	3.40	6.5					7.84					0	
199.9	652.1	34.26	Riffle	0.10	34.36	1.50		3.2				2.07					0	
200.8	651.2	34.31	Glide	0.10	34.41	3.10	34.4					91.85		1			1	
218.3	633.7	34.18		0.24	34.42	2.10								2			2	
228.5	623.5																0	
235.2	616.8	34.38	Riffle	0.08	34.46	2.80		11				31.35					0	
246.2	605.8	34.58	Glide	0.10	34.68	2.90	4	9.4				25.85					0	
255.6	596.4	34.60	Riffle	0.07	34.67	2.60		31.1				75.57	16	1			17	
273.9	578.1	34.84		0.10	34.94	2.20											0	
286.7	565.3	34.91	Pool	0.24	35.15	2.60	11.7			26.16	30.42						0	
288.3	563.7	34.14	Pool	0.50	34.64	2.60		0.43	2.24								0	
298.4	553.6	34.97	Glide	0.18	35.15	1.60		6.1					2				2	
304.5	547.5	35.04	Riffle	0.10	35.14	2.20		0.2				13.42					0	
304.7	547.3	35.07	Glide	0.13	35.20			3.6				0.44					0	
308.3	543.7	35.04	Riffle	0.15	35.19		30.7	3.1				7.92					0	
311.4	540.6	34.79	Pool	0.31	35.10	2.20		0.31	2.20	67.54	67.54		5				5 EST SMALL WD	
316.4	535.6																0	
319.4	532.6	35.47	Pool	0.18	35.65	2.10							10	1	1		12	
321.8	530.2																0	
333.3	518.7	35.35	Pool	0.30	35.65	1.70											0	
342.1	509.9	35.64	Riffle	0.06	35.70	1.70		2.9				4.93					0	
345.0	507.0	35.60	Pool	0.11	35.71	1.70	10	6.4		10.88	10.88		1	1			2 EST SMALL WD	
351.4	500.6	35.57	Glide	0.13	35.70		1.9	4.2				7.14					0	
355.6	496.4	35.57	Riffle	0.18	35.75		30.9	30.9				72.23	1			1	1	
366.8	485.2												15				15	
367.5	484.5	35.85	Riffle	0.07	35.92	2.00											0	
384.1	467.9	35.92	Riffle	0.12	36.04	2.25											0	
386.5	465.5	35.25	Pool	0.80	36.05	3.40	4.8	9.8		13.87	16.32		10	5	2		17 EST SMALL WD	
391.3	460.7	35.55	Cascade	0.50	36.05	3.40						33.32					0	
391.5	460.5	36.14	Cascade	0.07	36.21												0	

Dist.	Cumul. Distance	Bed Elev	Habitat Type	Depth	Surf. Elev	Wet. Width	B.F. Width	Pool Length	Riffle Length	Res Depth	Res Width	Res Pool Area	Wetted Pool Area	Riffle Area	Sm	Med	Lrg	Woody Debris Sizes	Total	NOTES
401.1	450.9	36.20	Riffle	0.06	36.26				18.6					36.27					0	
403.4	448.6																		0	
412.7	439.3	36.24	Riffle	0.10	36.34	1.70													1	
419.7	432.3	36.31	Pool	0.10	36.41	2.50		6.8							1	1	1		2	
426.5	425.5	36.09	Glide	0.11	36.20				20.8		0	0.00	NG						0	
447.3	404.7	36.11	Riffle	0.10	36.21	1.50			8.3					31.20					0	
455.6	396.4	36.24	Glide	0.09	36.33	2.50			40.9					16.60					0	
471.4	380.6	36.24	Glide	0.10	36.34	2.70	5.4							103.27		2			2	
489.1	362.9	36.30	Glide	0.13	36.43	1.90													0	
496.5	355.5	36.31	Riffle	0.14	36.45	3.00			8.6					34.40					0	
505.1	346.9	36.48	Pool	0.06	36.54	5.00		11				44.15	55.00						0	
507.5	344.5	35.98	Pool	0.54	36.52											2	1		3	
509.0	343.0	35.80	Pool	0.71	36.51	5.00				0.57	4.01								0	
515.1	336.9																		0	
516.1	335.9	36.38	Glide	0.15	36.53				15.22					43.38					0	
518.9	333.1	36.47	Glide	0.10	36.57	2.80										1	1		0	
529.4	322.6														5	1	4		2	
531.3	320.7	36.41	Pool	0.17	36.58	2.90		5.78	22.4	0.07	1.19	6.90	16.76	38.08					10	
537.1	314.9	36.47	Glide	0.11	36.58														0	
548.6	303.4	36.55	Glide	0.10	36.65	1.70													0	
553.2	298.8														10				0	10 EST SMALL WD
559.5	292.5	36.30	Pool	0.34	36.64	1.70		13.5		0.24	1.20	16.20	27.00						0	
570.0	282.0	36.34	Pool	0.30	36.64											5			5	
573.0	279.0	36.54	Riffle	0.11	36.65	2.00		6.6	8			8.36	17.62	16.00					0	
581.0	271.0	36.60	Pool	0.11	36.71					0.19	1.27								0	
582.5	269.5	36.42	Pool	0.30	36.72	2.00													0	
585.0	267.0	36.58	Pool	0.14	36.72	3.50										2			2	
587.6	264.4	36.60	Glide	0.12	36.72	2.50		6.6	5.8	0.16	0.96	6.34	19.80	12.47					0	
593.4	258.6	36.30	Pool	0.30	36.60	1.80			15.1					48.32					2	
600.0	252.0	36.65	Glide	0.10	36.75	3.00													0	
606.9	245.1														1	2	1		4	
615.1	236.9	36.80	Pool	0.66	37.46	3.40		45.1		0.56	2.88	130.11	153.34			1	1		2	
624.3	227.7	36.90	Pool	0.14	37.04	1.80									2				2	
632.6	219.4	36.72	Pool	0.32	37.04	1.90									2				2	
649.5	202.5	36.82	Pool	0.22	37.04	2.40									3				3	
656.7	195.3	36.56	Pool	0.48	37.04	3.00									2			1	3	
660.2	191.8	36.84	Glide	0.20	37.04				9.7					25.22		2	3		5	
663.3	188.7																		0	
669.9	182.1	36.96	Pool	0.08	37.04			26.2				49.49	78.60						0	
672.5	179.5	36.84	Pool	0.20	37.04										6	1	1		0	
682.2	169.8	36.50	Pool	0.54	37.04	3.00				0.34	1.89								8	
688.4	163.6	36.74	Pool	0.30	37.04														0	
696.1	155.9	36.78	Glide	0.28	37.06	3.00			39.4					98.50		1			1	
704.6	147.4	36.83	Glide	0.25	37.08	2.60									1	2			3	
711.5	140.5																		0	
718.4	133.6	36.89	Glide	0.21	37.10	2.00													0	
723.5	128.5	36.87	Glide	0.24	37.11														2	
735.5	116.5	36.93	Pool	0.19	37.12			6.5				23.07	29.90						0	
736.5	115.5	36.07	Pool	1.05	37.12	4.60			6	0.81	3.55								0	
742.0	110.0	36.92	Glide	0.19	37.11	1.70								10.20		1			1	

Dist	Cumul. Distance	Bed Elev	Habitat Type	Depth	Surf. Elev	Wet. Width	B.F. Width	Pool Length	Riffle Length	Res Depth	Res Width	Res Pool Area	Wetted Pool Area	Riffle Area	Woody Debris Sizes			Total	NOTES
															Sm	Med	Lrg		
743.8	108.2	36.87	Glide	0.24	37.11							89.42	90.30					0	
748.0	104.0	36.24	Pool		36.24			30.1										0	
750.0	102.0																	2	
756.0	96.0	37.01	Pool	0.17	37.18	2.30										2	1	3	
763.5	88.5																	0	
770.0	82.0	36.08	Pool	1.10	37.18	3.80				0.86	2.97					2		2	
775.3	76.7					2.50										4		4	
778.1	73.9	36.93	Glide	0.25	37.18	1.30			2.4					3.96		1		1	
780.5	71.5	37.03	Riffle	0.16	37.19	2.00			9.6					19.20		3		3	
790.1	61.9	37.20	Glide	0.10	37.30				12.9					28.06		1	1	2	
794.1	57.9	37.04	Glide	0.26	37.30	1.85												0	
800.1	51.9	37.04	Glide	0.26	37.30											3		3	
803.0	49.0	36.40	Pool	0.90	37.30	2.50		7		0.64	1.78	12.44	17.50					0	
806.5	45.5	36.96	Pool	0.34	37.30									16.25				0	
810.0	42.0	37.07	Riffle	0.23	37.30	1.30			12.5							10		0	10 EST SMALL WD
814.1	37.9	37.26	Riffle	0.12	37.38													0	
819.6	32.4	37.19	Riffle	0.12	37.31											10	1	11	EST SMALL WD
822.5	29.5	37.01	Pool	0.30	37.31	1.30		4.2		0.18	0.78	3.28	5.46	6.56			1	1	
826.7	25.3	37.19	Glide	0.12	37.31				10.1		0.24	0.87	8.75	13.13				0	
836.8	15.2	37.51	Pool	0.36	37.87	1.30		10.1										0	
839.4	12.6																	0	
846.9	5.1	37.62	Riffle	0.19	37.81				5.1					6.63				0	
849.5	2.5	37.62	Riffle	0.19	37.81													0	
852.0	0.0	TWIN CULVERTS																0	CUM 0 IS N SIDE KAISER RD
START SEGMENT 3				0.24		2.52	5.80											0	
AVERAGE																			
TOTAL								277.13	505.16			823.7095	1167.16	*****	*****	*****	2.00	223.00	