

**Appendix 6-4 –  
Everett's Watershed Control Program**

**City of Everett**

**WATERSHED CONTROL PROGRAM**

**October 2006**

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1. Article 44 of FERC License #2157
2. City of Everett Chaplain Tract Usage and Shoreline Regulations
3. Order Approving Interim Recreation Plan and Amending License Article--Exhibit R, Article 52 of FERC License #2157 (1986)
4. Authorized and Prohibited Activities Governing Public Use of Jackson Hydroelectric project Recreation and Mitigation Lands--Spada Reservoir (1991)
5. Regulations and Guidelines which Relate to Water Quality in the Sultan Basin
6. Agreement between DNR and City of Everett to communicate on forest practices in the Sultan Basin (1981)
7. Amended Agreement between City of Everett and PUD (1981)
8. Additional Water Quality Data

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## LIST OF ACRONYMS

CFR	Code of Federal Regulations
DNR	Washington Department of Natural Resources
DOC	Dissolved organic carbon
DOE	Washington Department of Ecology
DOH	Washington Department of Health
EEL	Everett Environmental Laboratory
EMC	Environmental Monitoring and Compliance group
EPA	United States Environmental Protection Agency
EWSA	Everett Water Supply Area
FERC	Federal Energy Regulatory Commission
GMA	Growth Management Act
HCP	Habitat Conservation Plan
HPA	Hydraulic Project Approval
ICF	Interim Commercial Forestry
IOC	Inorganic compounds
Jackson Project	Henry M. Jackson Hydroelectric Project
LIMS	Laboratory Information Management System
M.S.L.	mean sea level
MGD	Million gallons per day
NEPA	National Environmental Policy Act
NRCA	Natural Resources Conservation Area
NTU	Nephelometric Turbidity Unit
O&M	Operations and Maintenance
ORV	Off Road Vehicle
PL	Public Law
PUD	Snohomish County Public Utility District
RCW	Revised Code of Washington
RM	River Mile
SEPA	State Environmental Policy Act
TOC	Total organic carbon
USC	United States Code
USDA	U.S. Department of Agriculture
USFS	US Forest Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WFP	Water Filtration Plant
WHMP	Wildlife Habitat Management Plan

# **WATERSHED CONTROL PROGRAM SULTAN RIVER BASIN**

## **1.0 INTRODUCTION**

The City of Everett provides drinking water to a large portion of Snohomish County, including Everett and many other communities. The area receiving water from the City of Everett's supply system is known as the Everett Water Supply Area (EWSA). The population served in the EWSA is approximately 516,000 and is projected to rise to over 750,000 by 2025 (Everett, 2006). Everett's supply source is surface water from the Sultan River Basin.

This Watershed Control Program documents Everett's program to manage source water quality conditions. It has been prepared under Washington State Board of Health Drinking Water Regulations at Chapter 246-290-668 Washington Administrative Code (WAC). Those regulations require that water purveyors "develop and implement a department-approved watershed control program." An evaluation of the watershed must be completed at least every six years and submitted with the purveyor's water system plan. The evaluation report (i.e. this Watershed Control Program document) must meet the following requirements:

The report shall describe the watershed, characterize the watershed hydrology, and discuss the purveyor's watershed control program. The report shall also describe:

- (a) Conditions/activities in the watershed that are adversely affecting source water quality;
- (b) Changes in the watershed that could adversely affect source water quality that have occurred since the last watershed evaluation;
- (c) The monitoring program the purveyor uses to assess the adequacy of watershed protection including an evaluation of sampling results; and
- (d) Recommendations for improved watershed control.

A Watershed Control Program was included in the previous update of the City's Water Comprehensive Plan (City of Everett, 2000). This updated program has been prepared for inclusion in the 2006 Update of the Water Comprehensive Plan.

## **2.0 THE SULTAN BASIN**

### **2.1 Location/Description-General**

The Sultan Basin has functioned as Everett's water supply since the early 1900s. The basin is located about 20 miles east of Everett in the Cascade Mountain Range and is characterized by rugged and mountainous topography (Figures 1 and 2). The hydrologic boundary of the basin extends to Gothic and Del Campo Peaks on the east, unnamed lateral ridges on the north and south and on the west by the Puget lowlands. The upper reaches of the Sultan River form a broad, deep, glaciated U-shaped valley bound by steep slopes that rise abruptly to high mountain ridges up to 6,000 feet. Downstream, at the confluence of the Sultan and Skykomish Rivers, elevations average 130 feet.

Dams at Chaplain and Spada Reservoirs, a city diversion dam and tunnel along the Sultan River, and a Snohomish County Public Utility District (PUD) tunnel, penstock and water line provide storage, transfer and sediment settling for the domestic water supply (see Figure 3). Everett's Comprehensive Water System Plan Update (City of Everett 2006) summarizes the diversion, treatment, transmission, storage and distribution of the water supply to the EWSA.

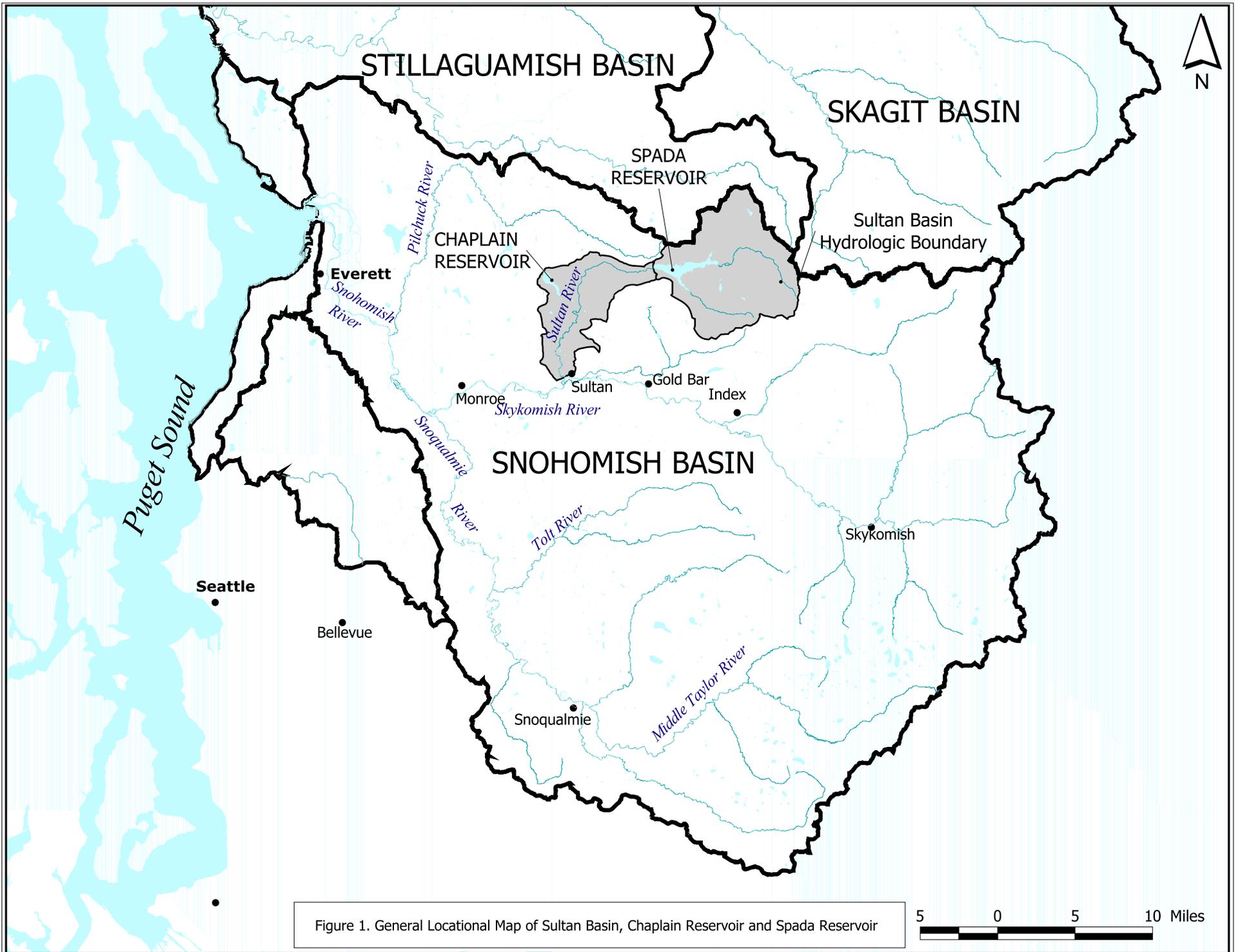
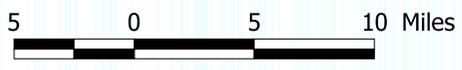


Figure 1. General Locational Map of Sultan Basin, Chaplain Reservoir and Spada Reservoir



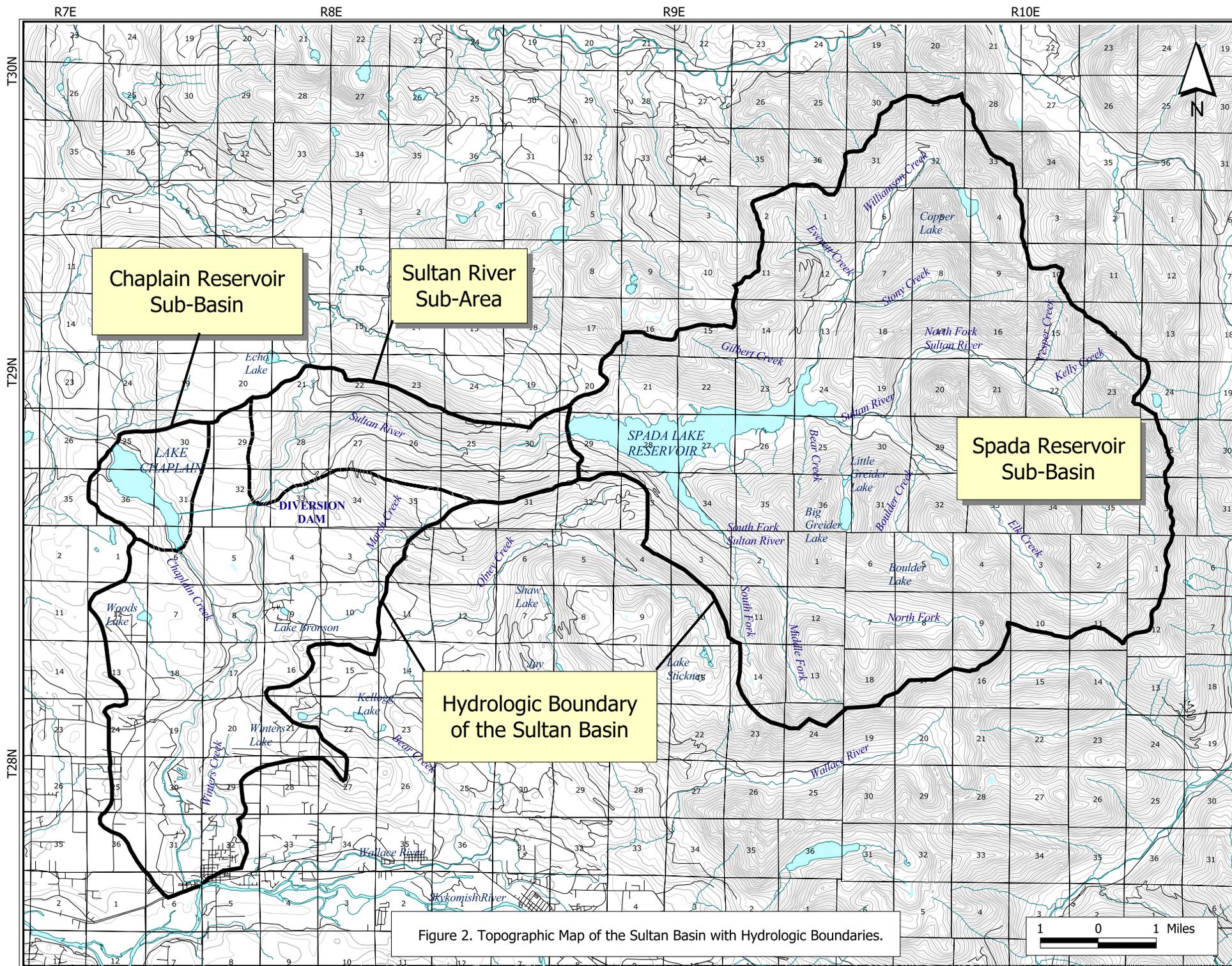


Figure 2. Topographic Map of the Sultan Basin with Hydrologic Boundaries.

The drainage area for Spada Reservoir, including major headwater drainages of the Sultan Basin, is approximately 85 percent forested. For about four miles downstream from Spada Reservoir, the Sultan River flows through a rugged, steep-sided, nearly inaccessible canyon. The lower three miles of river between Spada Reservoir and the City diversion dam are generally low gradient with gravel bars, islands and numerous riffle/pool areas. Below this, rural and urban development commences along the river and flood plain.

The Henry M. Jackson Hydroelectric Project (Jackson Project), a joint project of the City of Everett and PUD, consists primarily of Spada Reservoir, Culmback Dam, an 8-mile tunnel and pipeline, and a powerhouse containing four turbines (Figure 3). Water passing through the two of the Francis turbines is re-routed uphill (400' in elevation) and through a 3-milelong pipeline where a portion enters Chaplain Reservoir for Everett's water supply. The remaining portion is returned via pipeline and tunnel to the river immediately above the diversion dam for instream flow needs (Figure 3) (see Section 3.1.7 for more information on the Jackson Project).

### **2.1.1 Chaplain Reservoir**

Chaplain Reservoir is impounded by two earthen dams along its southern and northern edges and has a storage capacity of 4.5 billion gallons. Originally, water was supplied to the reservoir from the Sultan River via a 7,000'-long diversion tunnel which enters the reservoir on its eastern edge. Since completion of the Jackson Project in the Sultan Basin, water is supplied to Chaplain Reservoir from the PUD's powerhouse through a 265 million gallon per day (mgd) capacity pipeline. The diversion tunnel now functions to return Sultan River instream flows and as a backup supply tunnel (Figure 3).

The City of Everett operates a water filtration plant located at the southern end of Chaplain Reservoir, which was completed in 1983. An expansion of the water filter plant was completed in late 1993. In 1999 the finished water pump station capacity was increased from 50 MGD to 100 MGD. A surge tower was also added which increased the maximum flow on the Number 5 transmission line to 72 MGD. Currently, the plant provides an average of 53 mgd of treated drinking water (peak design capacity is 132 mgd).

### **2.1.2 Spada Reservoir**

Spada Reservoir, located about nine miles east of Chaplain Reservoir at river mile (RM) 16.5, is impounded by Culmback Dam (Figure 3). Construction of the Culmback Dam was completed in two stages as a joint project between the PUD and the City of Everett. The first stage (original construction) was completed in 1965; the second stage (raising the dam) was completed in 1984. The surface area of the reservoir at the normal full pool elevation of 1450 feet is 1,870 acres, providing 50 billion gallons of total storage. The PUD operates Jackson Project facilities for water supply to Chaplain Reservoir, power generation, flood control and instream flow requirements.

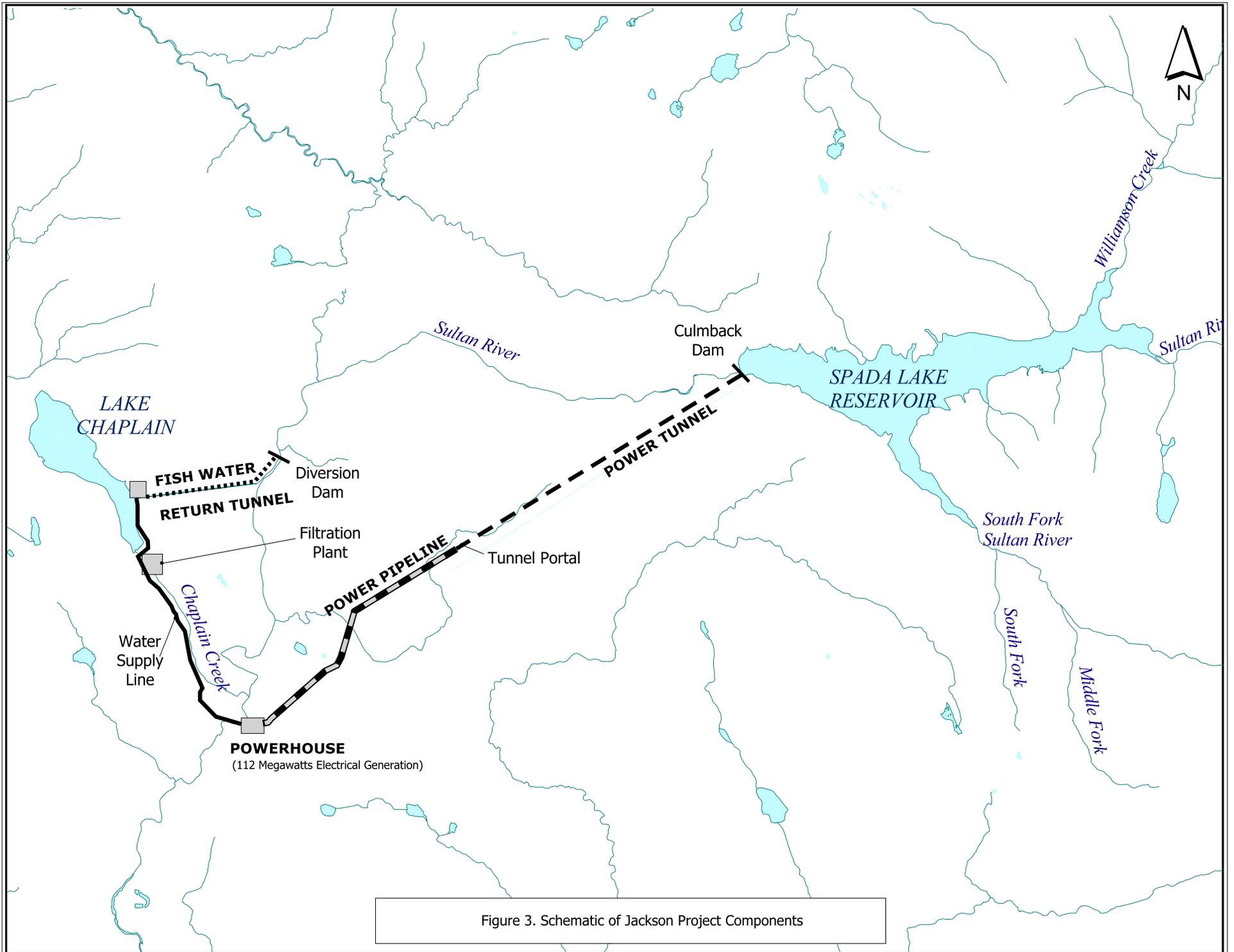


Figure 3. Schematic of Jackson Project Components

## **2.2 Hydrology**

The hydrology of a watershed is determined by the interactions of climate, plants, soils, topography and geology of an area. This interaction influences streamflows within a watershed. Thin soils, steep terrain, and localized heavy precipitation especially during winter months, all contribute to extreme runoff conditions within the Sultan Basin drainage area.

This document addresses the hydrology of the Sultan Basin in general terms. The basin is comprised of smaller sub-basin components. For the purposes of this document, sub-basins are defined as the smaller catchment areas which collectively make up the Sultan Basin. The sub-basins are defined geographically as the Chaplain Reservoir sub-basin, the Spada Reservoir sub-basin and the Sultan River sub-basin (Figure 2). Activities which occur within these three sub-basins are of particular concern regarding the issue of water quality in the Sultan Basin and, where appropriate, are addressed specifically within this document.

The Sultan Basin consists primarily of steep slopes and mountainous terrain which acts as a catchment for rain and snow melt. Average annual precipitation can exceed 150 inches, making this one of the wettest areas in Washington State (The Environmental Sciences Group (TESL) 1974:3; Wilsey and Ham 1977:5).

The pattern of Sultan River discharge is typical of streams draining the western face of the Cascade Mountains. The highest discharges occur during the fall and early winter and again in May and June (due to snowmelt). Minimum flows typically occur during August and September. Major floods occur as a result of a combination of warm winds and heavy rain on early winter snowpack. Extended periods of heavy rain during peak snow melt in the spring can also produce flooding.

The Sultan River's major tributaries--Williamson and Elk Creeks, and the North and South Forks of the Sultan River--flow into Spada Reservoir. Downstream from Culmback Dam, the Sultan River flows west and then southward to its confluence with the Skykomish River (Figure 4).

### **2.2.1 Chaplain Reservoir Sub-basin**

Prior to the Jackson Project, water diverted to Chaplain Reservoir by the City of Everett's diversion dam on the Sultan River was the primary source of inflow to the reservoir (Figure 4). Water was diverted to Chaplain Reservoir only during periods when turbidity in the Sultan River was low (below 10 NTUs). The detention time (storage) in Chaplain Reservoir allowed pre-sedimentation and provided reserve storage for high water supply demand periods. During times of high river turbidity, water supply demands were met by drawing on the storage capacity of Chaplain Reservoir (Bechtel Inc. 1979:6-39).

As a result of the Jackson Project, water is now supplied to Chaplain Reservoir from the PUD's powerhouse water return pipeline. The reservoir has a capacity of 4.5 billion gallons. The pipeline and tunnel from the diversion dam now supply reverse flows for fisheries maintenance in the Sultan River below the diversion dam. They are also used as a backup for routing water to Chaplain Reservoir in the event of a shutdown or failure of the return flow line from the powerhouse. Chaplain Reservoir still provides storage and pre-sedimentation for the Everett Water Treatment Plant, except when the Treatment Plant intakes water directly from Spada Lake Reservoir through the Powerhouse return water pipeline.

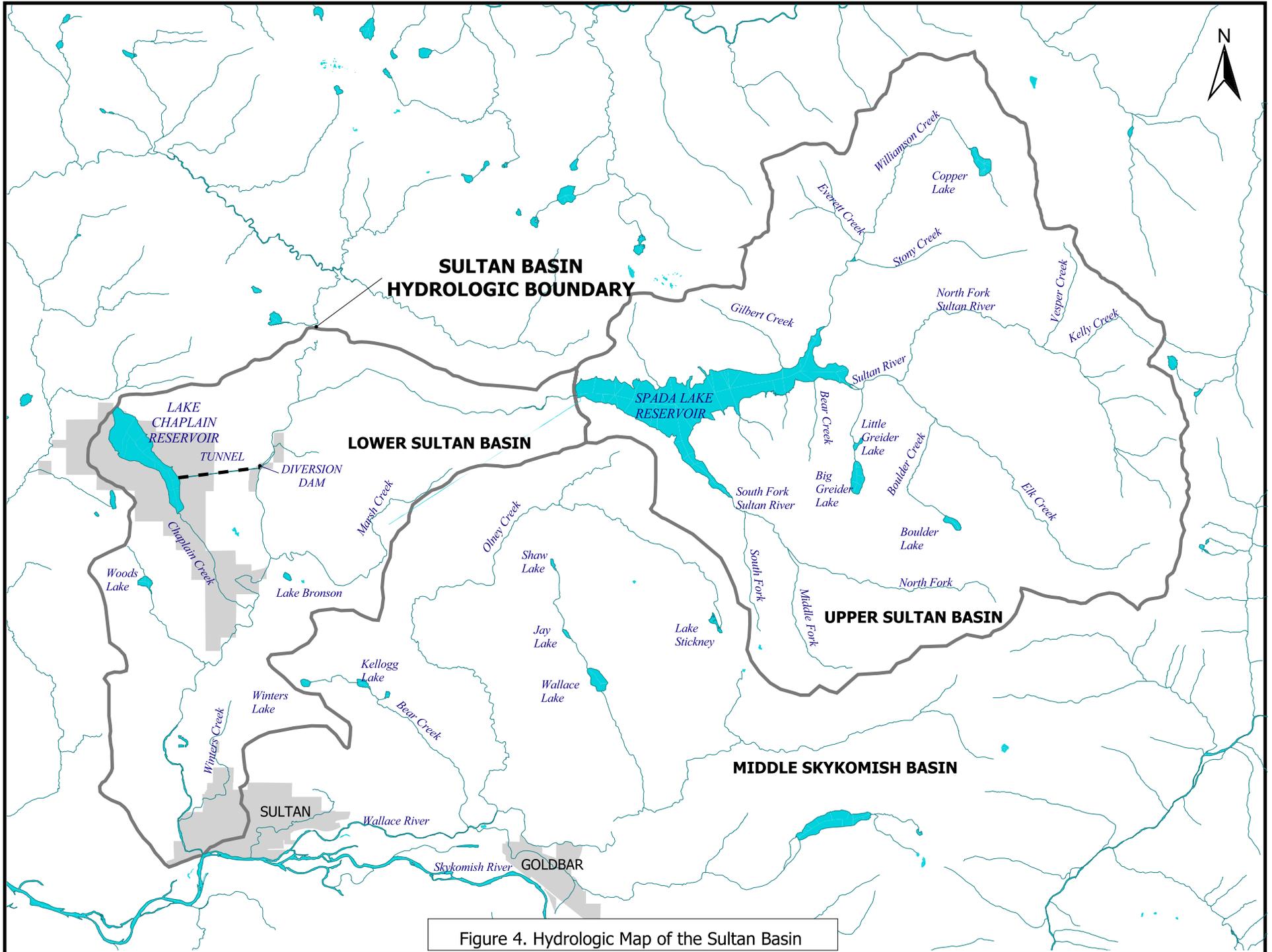


Figure 4. Hydrologic Map of the Sultan Basin

Water elevation in the reservoir is maintained as a part of the Jackson Project operating plan. Project operation is a PUD responsibility. Based upon average annual precipitation records and the size of the drainage area, the average flow into the reservoir (excluding PUD return line flows) is approximately 5 to 10 cfs (City of Everett 1989, Appendix A). Surface water runoff into Chaplain Reservoir is an additional source of water. This can contribute as much as 31 cfs during the month of December and as little as 4 cfs during August (Bechtel, Inc. 1979). Primary outflow from Chaplain Reservoir consists of water transported to Everett via four pipelines.

### **2.2.2 Spada Reservoir Sub-basin**

Spada Reservoir is fed by numerous perennial and intermittent creeks including Williamson and Elk Creeks and the North and South forks of the Sultan River (Figure 4).

The maximum storage volume of Spada Reservoir is 50 billion gallons. Volume and elevation are influenced by weather conditions and hydroelectric power generation schedules.

### **2.2.3 The Sultan River Sub-basin**

The reach of the Sultan River between Culmback Dam and the City diversion dam is the area of interest for the City of Everett water supply. Below the City's diversion dam the river does not contribute directly to the City's water supply operations. Therefore in this sub-basin watershed management is considered only for the reach between Culmback Dam and the diversion dam.

## **2.3 Soils**

The Sultan Basin contains a variety of soil series types including shallow to moderate residual soils (2-5' deep), deep residual soils, and deep glacial soils (Bechtel, Inc. 1979:6-10).

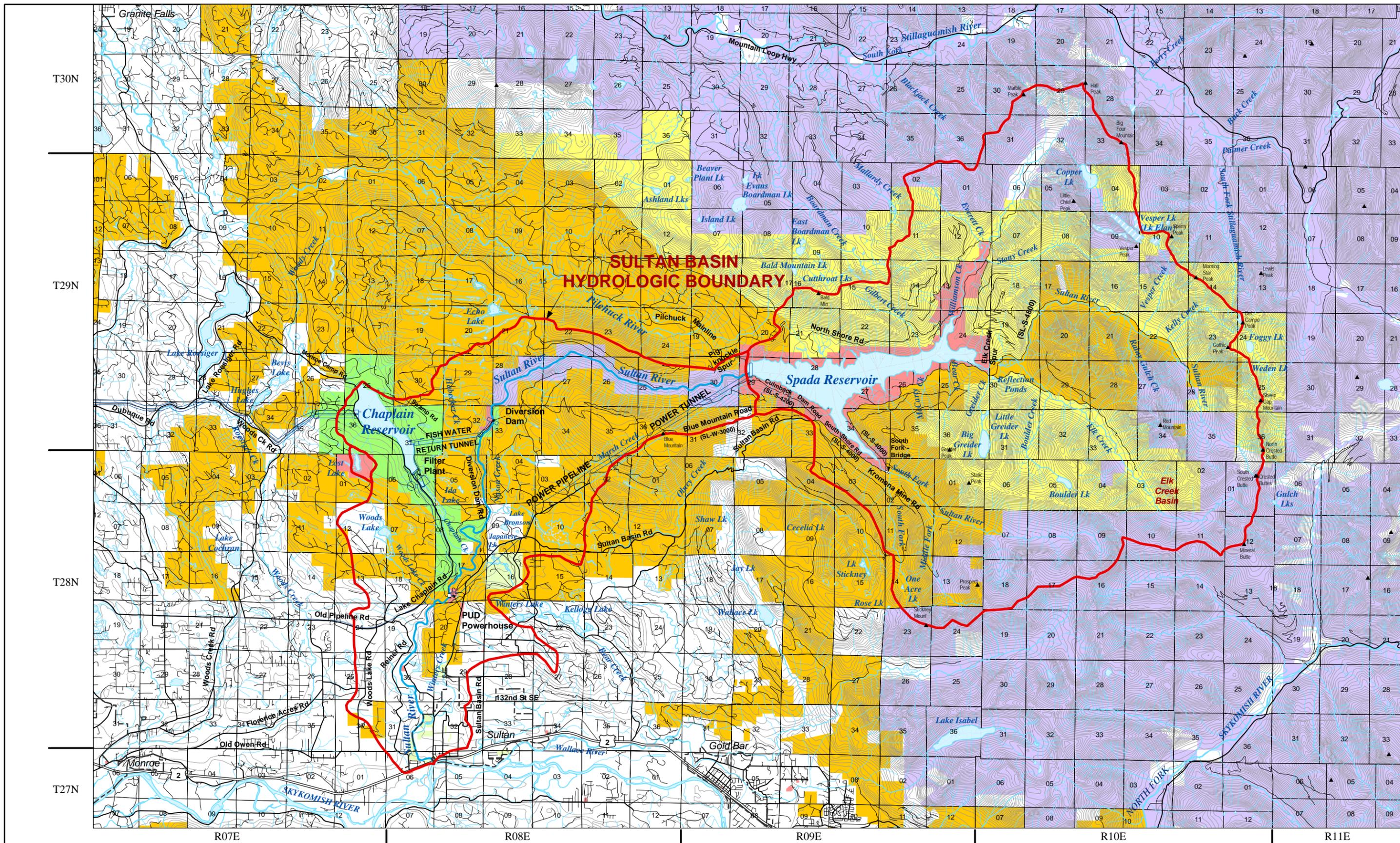
Most of the forested areas of the basin exist on soils derived from glacial till, outwash or drift material located on the hillslopes. The upper forest zone, subalpine and alpine areas contain weakly developed residual or azonal soils formed on bedrock. Recent alluvium and colluvium also provide material for soil formations, many also azonal (Bechtel, Inc. 1979).

Detailed soil units (or soil resource inventory units) and descriptions for the Sultan River Basin are presented in Bechtel, Inc. 1979:6-11 to 6-14; Washington Department of Natural Resources (DNR) n.d.; TESSG 1974:65-82; U.S. Department of Agriculture (USDA) 1983; and Wilsey and Ham 1977:49-51.

A fine-grained soil known locally as "blue clay" is prevalent in certain areas of the Sultan Basin. This material can be prone to slumping when hillsides are disturbed, and soil slumps can lead to turbidity spikes. Therefore in monitoring watershed conditions and activities, Everett pays close attention to activities that could disturb blue clay on steep hillsides.

## **2.4 Land Ownership**

Land owners in the Sultan River drainage include the DNR, the US Forest Service (USFS), the City of Everett, the Snohomish County PUD and private interests (Figure 5).



**SULTAN BASIN  
HYDROLOGIC BOUNDARY**

**FIGURE 5 OWNERSHIP MAP OF LAND WITHIN  
THE SULTAN BASIN**



This Map has been Produced using the Best Information Available. However, the City of Everett in no way guarantees its accuracy.

Roads locations and designations are compiled in part from DNR transportation datasets 5/2006  
Water Body locations and designations are compiled in part from DNR hydro datasets 5/2006.  
Major Public Lands based on DNR and Snohomish County Assessor datasets 6/2006.

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**OWNERSHIP:**

0 0.5 1 2 Miles  
1 In equals 1.8 Mi

Map Produced 7/24/2006  
City of Everett Utility Mapping

- Major Public Lands**
- City of Everett
  - Snohomish County PUD
  - City of Sultan
  - US Forest Service
  - DNR NRCA
  - DNR Managed
  - Private



### **2.4.1 Chaplain Reservoir Sub-basin**

The City of Everett currently owns most of the land within the Chaplain Reservoir sub-basin and all of the land immediately adjacent to Chaplain Reservoir. Landowners adjacent to the City of Everett property include the PUD, DNR and private interests (Figure 5).

### **2.4.2 Spada Reservoir Sub-basin**

Owners of land within the hydrologic boundary of Spada Reservoir include the PUD, DNR, USFS and several small private holdings (Figure 5).

### **2.4.3 Sultan River Sub-basin**

The USFS, DNR, the City of Everett and the PUD own lands located within the hydrologic boundary of the Sultan River area between Culmback Dam at RM 16.5 and City diversion dam at RM 9.5 (Figure 5).

## **2.5 Land Use**

Jurisdictional authority for land use within the Sultan Basin consists of local, state and federal entities. Applicable rules, plans and statutes are presented in Tables 1-3. A summary of land use activities in the Sultan Basin is presented below.

Land uses in the Sultan Basin area include municipal watershed, commercial forestry, wildlife management, hydroelectric power production and recreation. Conflicts can potentially arise in the basin because of its abundant natural resources and the differing mandates and functions of the four landowning agencies. However, there is broad acknowledgment among all of these agencies that protection of water quality for municipal supply is an important objective, and one that can be compatible with other resource management objectives.

As part of mitigation requirements for Stage II of the Jackson Project in 1984 (raising Spada Reservoir elevation from 1,360' to 1,450'), co-licensees under Federal Energy Regulatory Commission (FERC) license #2157 must manage designated lands owned by the co-licensees in the Sultan Basin for wildlife habitat (Figure 6). Article 44 of FERC license #2157 stipulates that water quality has precedence over other land use considerations (Addendum 1). It is the intent of the agreement that land uses shall be restricted to those which do not jeopardize water quality. The reader is referred to the Wildlife Habitat Management Plan (WHMP) (PUD and City of Everett 1988) and the Wildlife Habitat Management Supplement for the Spada Lake Tract (Spada Supplement) (1997) for a complete description of land use activities and associated restrictions.

In general, land uses around Chaplain Reservoir (Figure 2) focus on the protection of water quality. Any manipulation of forest lands in these areas for the benefit of wildlife per the WHMP is done so with the understanding that water quality takes precedence over other activities (PUD and City of Everett 1988). There is an on-going forestry program for the city-owned lands around Chaplain Reservoir (see PUD and City of Everett 1988).

<b>TABLE 1 Federal Regulations &amp; Guidelines Pertinent to Sultan Basin Water Quality</b>		
<b>Regulations/Guidelines</b>	<b>Administrative Authority (if applicable)</b>	<b>Statutory Authority (if applicable)</b>
National Forest Land Management Act	USFS	16 U.S.C. 1600
Land and Resource Management Plan (Mt. Baker-Snoqualmie National Forest)	USFS	
Federal Power Act (FERC License #2157)	FERC	16 U.S.C. 791A
Safe Drinking Water Act	EPA/WA DOH	P.L. 99-339
National Environmental Policy Act	EPA	P.L. 91-190
Management of Municipal Watershed	USFS	36 CFR 251.9

<b>TABLE 2 State Regulations &amp; Guidelines Pertinent to Sultan Basin Water Quality</b>		
<b>Regulations/Guidelines</b>	<b>Administrative Authority (if applicable)</b>	<b>Statutory Authority (if applicable)</b>
Forest Practices Act	DNR	RCW 76.09 WAC 222 Forest Practice Board Manual
Forest Resource Plan	DNR	-
1997 DNR HCP	DNR	
Natural Resources Conservation Areas	DNR	RCW 79.71
State Environmental Policy Act	DOE	RCW 43.21C WAC 197-11
Protection from Water Pollution	DOE	RCW 35.88
Surface Mining Permit	DNR	RCW 78.44 WAC 332-18
Hydraulic Project Approval Permit	WDFW	RCW 75.20.100 WAC 220-110
Hunting/Trapping Licenses	WDFW	RCW 77.32
Forest Protection (Fire Control)	DNR	RCW 76.04
Off-Road and Non-Highway Vehicles	DNR	RCW 46.09
Watershed Control	DOH	WAC 246-290-668

**TABLE 3**  
**Local Regulations & Guidelines Pertinent to Sultan Basin Water Quality**

<b>Regulations/Guidelines</b>	<b>Administrative Authority (if applicable)</b>	<b>Statutory Authority (if applicable)</b>
State Shoreline Management Act	City of Everett for Chaplain Reservoir	RCW 90.58
Everett Shoreline Master Program	City of Everett	Everett Municipal Code Ordinance #723-80
Agreement Between City of Everett & DNR RE: Forest Activities	City of Everett	RCW 90.58
Amended Agreement Between PUD & City of Everett RE: Development of Sultan Basin	Snohomish County for Spada Reservoir & Sultan River	Title 21 Snohomish County Code
City of Everett Lake Chaplain Tract Usage Regulations	PUD & City of Everett	
Informal Agreement Between DNR and City of Everett RE: Harvesting, recreation, fire control	City of Everett	
MOU Between USFS & City of Everett RE: Harvesting, recreation, fire control		
Wildlife Habitat Management Plan	PUD & City of Everett	

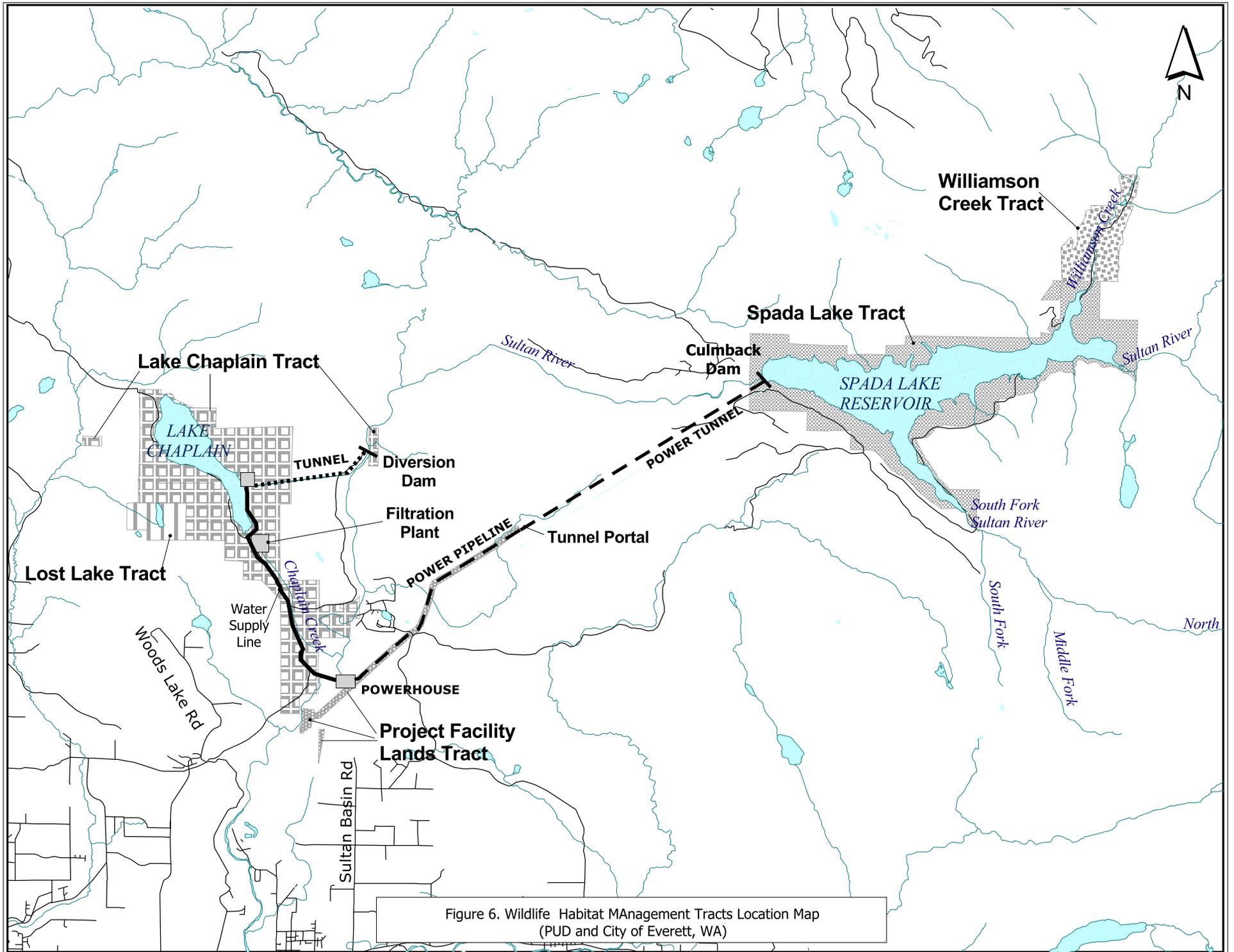


Figure 6. Wildlife Habitat Management Tracts Location Map (PUD and City of Everett, WA)

Lands surrounding Spada Reservoir now owned by the PUD are managed to protect water quality and wildlife habitat (see PUD and City of Everett 1988 and Spada Supplement 1994). Water quality takes precedence over all other activities on those lands regulated under FERC License #2157. Other lands which fall within the hydrologic boundaries surrounding the reservoir are managed for commercial forestry and limited recreation. The DNR and USFS manage their lands for a variety of activities including day use, limited overnight camping, hunting, etc.

DNR manages three Natural Resource Conservation Areas (NRCAs) that occupy approximately 35% of the land within the Spada Reservoir sub-basin. These are the Mt. Pilchuck, Morning Star and Greider Ridge NRCAs<sup>1</sup>. These are generally in the upland areas of the sub-basin, and not directly adjacent to the reservoir shore. Under State law, NRCAs are set aside to preserve scenic and ecological values and to provide for low-impact recreation uses. These lands are generally preserved in their natural state and not harvested for commercial timber production purposes. Limited access for recreation and environmental education is permitted, so long as this does not compromise the natural and undeveloped character of the three NRCAs. The NRCA designation thus helps to preserve natural conditions in the Spada Reservoir sub-basin that are also beneficial in terms of protecting water quality.

Lands owned by the USFS and DNR along the Sultan River are managed for water quality protection, forest practices activities, fish habitat, and recreation. USFS lands are subject to 36 Code of Federal Regulations (CFR) 251.9 (Management of Municipal Watersheds) in which it is stated that:

"The Forest Service shall manage National Forest watersheds that supply municipal water under multiple use prescriptions in forest plans."

This allows the USFS to accept applications from municipalities for consideration of municipal watershed needs to be incorporated into the appropriate forest planning document. It also allows the USFS to enter into agreements with municipalities to restrict public access or control resources uses within watersheds. An agreement of this nature was executed among USFS, Everett and the PUD, with respect to the Sultan River Basin, and this agreement remains in effect today.

### **2.5.1 Forest Practices**

Forestry-related activities in the Sultan Basin are governed by the Washington Forest Practices Act (Revised Code of Washington (RCW) 76.09) and Rules and Regulations (Title 222 WAC) adopted by the Forest Practices Board. This legislation and accompanying rules and regulations are designed to provide minimum standards for forest harvest operations on private and state lands. State forest lands are also regulated by the DNR Habitat Conservation Plan, 1997. The overall objectives of these regulations and guidelines focus on enhancement of forest water quality. See Section 3.1.1 for more detail on the Forest Practices Act.

Everett meets with DNR and USFS annually to discuss timber harvest plans. This gives the City the opportunity to monitor forestry management and assess consistency with water quality

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<sup>1</sup> DNR has proposed combining the three NRCAs into a single NRCA to be known as the Upper Sultan NRCA.

objectives in the Sultan Basin. USFS does not currently pursue timber sales on its lands in the Basin.

In addition, the City engages in forest practices on their lands surrounding Chaplain Reservoir. This plan is outlined in the WHMP (PUD and City of Everett 1988). This plan is being implemented cooperatively by the City and PUD.

As discussed above, DNR manages NRCA lands in the Spada Reservoir sub-basin, to preserve scenic and ecological values and to provide for low-impact recreation uses. At this time a management plan has not been adopted by DNR for the three designated NRCAs. An internal draft plan has been prepared by DNR (Bergvall, July 2006 personal communication). However, since the plan has not been adopted its provisions are not binding at this time. The draft plan does include provisions to protect water quality, and recognizes that municipal water supply is one of the various functions supported by NRCA lands in the Spada Reservoir sub-basin. It also notes that DNR “has agreed to consult with the Manager of the (Everett) Water Filtration Plant on land management and fire control activities within the Spada (Reservoir) watershed.” It indicates that all roads within the NRCA have been abandoned consistent with state Forest Practices requirements (DNR 2002).

### **2.5.2 Wildlife Habitat Management**

As a result of the Jackson Project, designated lands around Chaplain and Spada Reservoirs are managed for wildlife by the City of Everett and the PUD respectively. The Wildlife Habitat Management Plan is a strategy for mitigating impacts to terrestrial wildlife resulting from the construction and operation of the Jackson Project. The plan includes monitoring and wildlife habitat enhancement with water quality receiving first priority. The WHMP acknowledges the fact that water quality issues are of primary importance in wildlife management issues (PUD and City of Everett 1988:1-9).

Lands covered under the WHMP are divided into five tracts (Figure 6):

- Lake Chaplain Tract (2,657 acres) - protection of water quality of public water supply is a principal concern in this tract. Chaplain Reservoir, existing old-growth, mixed forest, deciduous forest and wetland habitats will be preserved; other forested areas will be managed to optimize habitat value for a wide range of species (PUD and City of Everett 1988:1-9, 3-8 to 3-13).
- Lost Lake Tract (205 acres) - the lake and wetlands, and their associated buffers, will be preserved. Forest lands surrounding them will be managed to optimize the value for a wide range of species (PUD and City of Everett 1988:1-9). Objectives for the Lost Lake Tract regarding water quality include minimizing impact and degradation of the area and the protection/control of water quality (PUD and City of Everett 1992:33).
- Project Facility Lands Tract (79 acres) - Lands will be managed to provide meadow, shrub and open woodland habitat on a permanent basis (PUD and City of Everett 1988:1-9).
- Spada Lake Tract (3,683 acres) – A plan (Spada Supplement) has been prepared for about 1745 acres of land surrounding Spada Reservoir above 1,460' M.S.L. (mean sea level).

Goals for the this plan are to preserve water quality; preserve and enhance old growth, riparian and wetland habitats; manage second growth for deer; and consider aesthetics in implementation of the plan. Forest and riparian areas 1,460' M.S.L, and below will be maintained in permanent forested cover. Areas below 1,460' M.S.L. are managed under the WHMP (see above). Some big game trails may be provided and two osprey nesting platforms have been provided (PUD and City of Everett 1988, 1994).

- Williamson Creek Tract (344 acres)–This tract will be preserved as old-growth and riparian forest and managed for late-successional wildlife species (PUD and City of Everett 1988:1-10).

Other lands located within the hydrologic boundaries of Spada Reservoir and the Sultan River are managed by the USFS and DNR.

### **2.5.3 Mining**

No commercial mining activities currently exist in the Sultan Basin; though there is on-going recreational prospecting in the area. However, commercial mining is a possibility on DNR, USFS and privately-owned lands (Figure 5) within the Sultan Basin hydrologic boundary. As mining activities could adversely affect the water quality in the Sultan Basin (see Section 3.1.3), the City will utilize its opportunity to comment on proposed mining projects through the State Environmental Policy Act (SEPA), the National Environmental Policy Act (NEPA) and the Hydraulic Project Approval (HPA) processes. Mining on State land that is included in a NRCA is very restricted and in many cases prohibited under the NRCA Statewide Management Plan (Dept. of Natural Resources, 1992b).

### **2.5.4 Recreation**

#### Chaplain Reservoir Sub-basin

Recreation activities and public access are prohibited on city-owned lands located within the hydrologic boundary of Chaplain Reservoir. The intent of this restriction is the maintenance and improvement of water quality.

Public access for recreation is available to the south of the hydrologic boundary on adjacent City-owned land subject to requirements of the WHMP (Figure 6). Access is regulated by the Chaplain Tract Usage Regulations (Addendum 2).

Recreational prospecting is prohibited on lands owned by the City in the Chaplain Reservoir sub-basin, primarily to protect fish spawning habitat.

PUD-owned land to the southwest of Chaplain Reservoir (Lost Lake area, Figure 6) is managed for wildlife habitat. Limited recreational activities are permitted but not encouraged. Public access is restricted to hike-in only (PUD and City 1992:30).

#### Spada Reservoir Sub-basin

Article 52 of FERC License #2157 requires that the PUD and the City of Everett develop a recreation plan as mitigation for impacts to recreation opportunities affected by the

construction of the Jackson Project. In 1986, the Interim Recreation Plan was approved by FERC (Addendum 3). As mandated by FERC, the co-licensees were required to develop a Final Recreation Plan to implement the measures in the Interim Recreation Plan. This Final Plan was submitted to FERC for approval on April 30, 1991 (PUD and City of Everett 1991). The plan was approved in December 1995.

Land within the hydrologic boundary of Spada Reservoir sub-basin is open for limited recreational activities. This involves land around the reservoir including seven recreation sites owned or leased by the PUD (Figure 7). Those facilities regulated under Articles 44 and 52 of the FERC License are restricted to activities which are believed to have minimal potential to jeopardize water quality (Addenda 1, 3 and 4).

Examples of uses that are specifically prohibited on PUD-owned lands surrounding the reservoir include overnight use, wood cutting/collection, depositing human waste on the ground or in the water, use of motorized vehicles off improved roads, and public access on the north shoreline or within 200' of the shoreline (Addendum 4).

Under the FERC license, authorized uses of Spada Reservoir include day use, fishing (as regulated by the Washington Department of Fish and Wildlife (WDFW)) and non-motorized boating. Uses that are specifically prohibited include internal combustion engines, swimming, wading, use between dusk and dawn, cleaning fish, use of inflatable devices, depositing human waste on ground or in water, and public access on the north shoreline or within 200' of shoreline (Addendum 4).

Lands within the Spada Reservoir sub-basin administered by DNR and USFS allow day use, hiking, and hunting (except within 200 feet of the reservoir and as regulated by the WDFW).

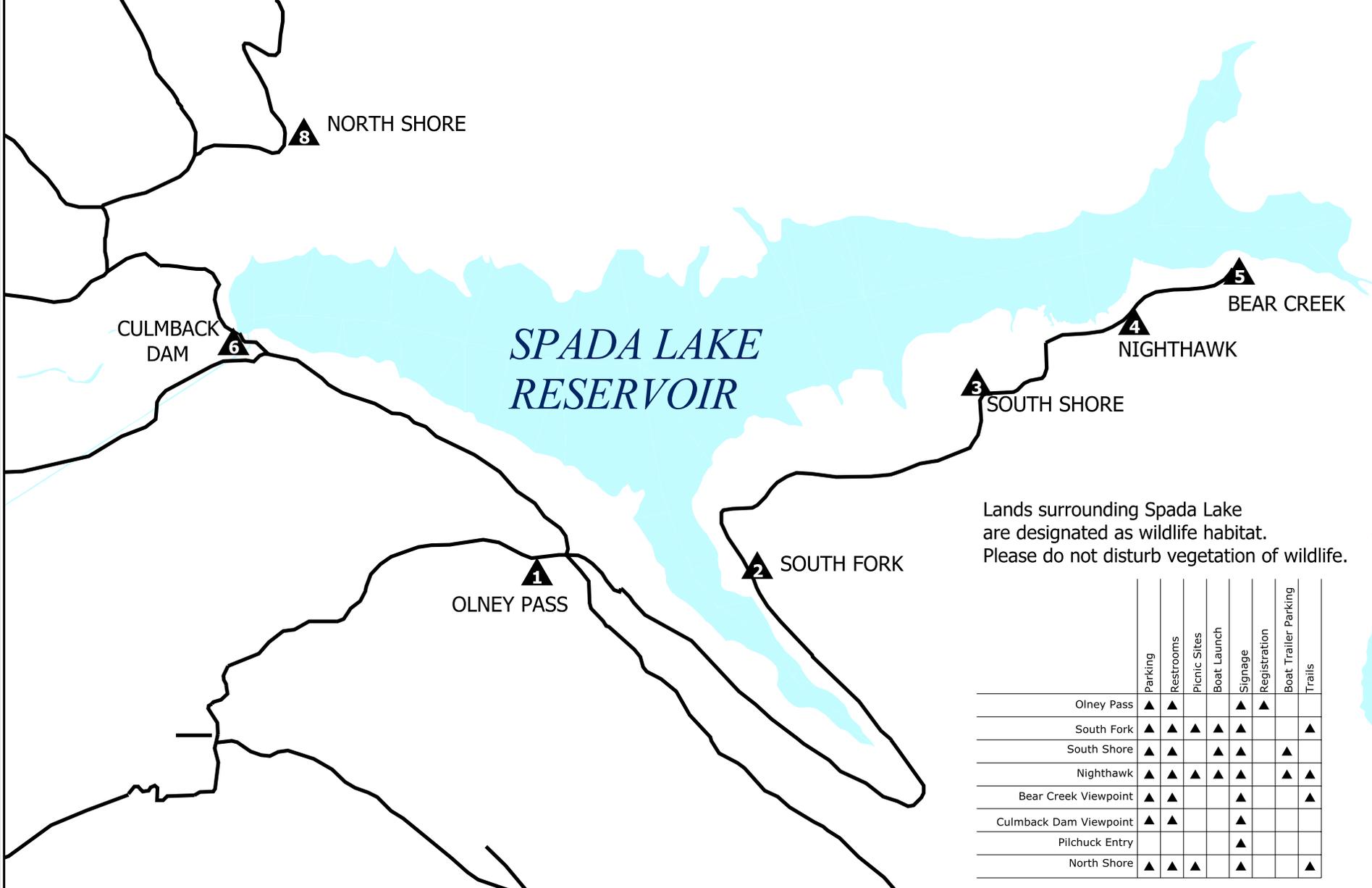
Overnight camping is allowed at Boulder Lake and Greider Lake (DNR land). These two areas are located within Spada Reservoir's tributary drainage. Dispersed camping occurs on USFS lands along the outer perimeters of the hydrologic boundary of the Spada Reservoir sub-basin.

The PUD conducts surveys of visitation in the Spada Reservoir sub-basin, related to the recreation plan under the FERC license. From 1988 through 2005 the average number of visitors to Spada Reservoir recreation sites and the vicinity was 4,700 people per year. Visitation has been highly variable from year to year, with a downward trend from 1995 through 2003 (low of about 1,000 in 2003), and higher visitation in 2004 and 2005 (about 6,500 in 2005). (EDAW 2006).

#### Sultan River Sub-basin

Lands owned by the DNR and USFS along the Sultan River are available for a variety of recreational activities including fishing, hiking, overnight camping, picnicking and other day uses. Public access is extremely limited due to topography and lack of roads and trails. There are requests periodically from recreational groups to improve access to this area. Everett works with the respective land-owning agencies to highlight the importance of water quality issues in responding to such requests.

# Sultan Basin Recreation Sites



Lands surrounding Spada Lake are designated as wildlife habitat. Please do not disturb vegetation of wildlife.

	Parking	Restrooms	Picnic Sites	Boat Launch	Signage	Registration	Boat Trailer Parking	Trails
Olney Pass	▲	▲			▲	▲		
South Fork	▲	▲	▲	▲	▲			▲
South Shore	▲	▲	▲	▲	▲		▲	
Nighthawk	▲	▲	▲	▲	▲		▲	▲
Bear Creek Viewpoint	▲	▲			▲			▲
Culmback Dam Viewpoint	▲	▲			▲			
Pilchuck Entry					▲			
North Shore	▲	▲	▲		▲			▲

Figure 7. Jackson Hydroelectric Project Recreation Sites around Spada Reservoir (PUD and City of Everett, WA)

### **2.5.5 Backwash Solids Drying Bed and Disposal Site**

The filtration plant operates a backwash water settling lagoon, a backwash solids drying bed, and a backwash solids disposal site at the Chaplain Reservoir facilities.

During the normal course of filtration plant operations the filter media is periodically cleaned by backwashing. Suspended sediment in backwash water is allowed to settle in a pond built for this purpose. Supernatant is decanted from the pond and returned to the raw water intakes. Settled solids are dredged from the pond and pumped to drying beds. After sufficient drying, the solids are used to reclaim a gravel pit located on city property at the northeast corner of the Chaplain property.

The settling pond is contained within the fenced area immediately surrounding the filtration plant and downstream of Chaplain Reservoir. The drying bed and disposal site are contained within the area surrounding Chaplain Reservoir. Studies, permits, and specifications are contained in Water Treatment Facilities Wastewater Disposal (Gray & Osborne, Inc., 1986). The solids disposal site is operated under the jurisdiction of the Snohomish Health District, which issues a solid waste disposal permit annually.

## **3.0 WATERSHED CONTROL**

The Washington State Board of Health's Watershed Control Program requires that water purveyors identify existing conditions in source watersheds, monitor these conditions and activities which adversely affect source water quality, and make recommendations for improved watershed control (WAC 246-290-668).

Activities within Everett's municipal supply watershed are monitored 365 days a year by the City's Watershed Patrol. The patrol routinely visits all areas accessible by vehicle in both the Chaplain and Spada Reservoir sub-basins and the reach of the Sultan River between Culmback Dam and the Diversion Dam. In addition they make regular forays on trails within the Sultan Basin. The patrol keeps unauthorized visitors out of protected areas, prevents prohibited activities on lands accessible to the public, has contact with recreational visitors to educate them on the importance of the watershed, and provides a daily point of contact with the other agencies that manage watershed lands, including the PUD, DNR and USFS. Where problematic activities or conditions occur, such as turbid water from logging sites, road construction/maintenance, or unsanitary use of recreational facilities, they are noted, investigated and discussed with the appropriate authority or land owners.

Prior to construction of Stage 2 of the Jackson Project in 1984 the City commissioned several studies to evaluate the issue and recommend ways to maintain excellent water quality. The "Sultan River Basin Resource Management Plan" (Wilsey and Ham 1977) set forth a framework to guide the desired activities of a variety of governmental agencies having jurisdiction and interests in the Basin. The strategy was designed to allow maximum utilization of resources while preserving and maintaining the highest levels of water quality (Wilsey and Ham 1977:2). This document was compiled under the guidance of an interagency committee of twelve local, state and federal agencies and private parties with jurisdiction or interests in the Sultan River Basin. The plan was designed to limit adverse impacts on water resources of the basin while

minimizing conflict. In the years following completion of Stage 2 of the Jackson Project, the watershed control program has been continually adjusted in response to actual conditions in the watershed and ongoing interactions with other agencies and landowners in the Sultan River Basin.

The City and the PUD are co-licensees on FERC license #2157 for the Jackson Project. Article 44 (Addendum 1) of that license restricts certain public uses around Spada Reservoir due to its function as the primary water source for over 500,000 residents of Snohomish County.

All public access and recreation are prohibited by the City on lands within the hydrologic boundary of Chaplain Reservoir and at the diversion dam on the Sultan River (Addendum 2). Those activities at Spada Reservoir which are restricted include overnight camping, shoreline fishing on the north shore, bodily contact with waters of the reservoir, use of inflatable devices and use of combustion-powered boats. Recreational activities allowed around the Spada Reservoir area are less restricted but are also designed around the maintenance/improvement of water quality (see Section 2.5.4 and Addendum 3).

Legislation which addresses the use and protection of municipal watersheds exists at both the federal and state levels. Federal legislation 36 CFR 251.9 (Management of Municipal Watersheds) is administered by the USFS and is designed to provide, upon request by a municipality, protective action or restrictions within watershed areas. Chapter 222.22 WAC (Watershed Analysis, Forest Practices Rules and Regulations) is administered by the DNR and is designed to address the impacts of forest practices on a watershed. Chapter 35.88 WAC is administered by the Washington Department of Health (DOH) and gives water suppliers certain authority over the protection of their water sources. (See Tables 1-3 and Addendum 5 for additional information on regulations related to watershed management.)

### **3.1 Management of Potentially Adverse Activities**

#### **3.1.1 Forest Practices**

##### **3.1.1.1 Discussion**

Commercial forestry activities are allowed on USFS, DNR, PUD, City of Everett and private lands in the Sultan Basin. Logging activities have the potential to contribute to high turbidity conditions in reservoirs and streams of the Sultan Basin. This effect is primarily due to road building, landings, and roadbed abrasion by logging and recreation vehicles in the area.

The State Forest Practices Act (RCW 76.09) requires specific consideration of the effect that forestry activities will have on water quality prior to operations. Unless carefully controlled and monitored, forestry activities have the potential to degrade water quality.

The City of Everett owns all lands in the Chaplain sub-basin and has complete control over the forest harvest schedule and practices. Everett carefully manages the limited harvest within the sub-basin, with water quality as the top priority. Forest practices in the municipal watershed are restricted in the City's Shoreline Management Program.

**3.1.1.2 Pertinent legislation/regulations/agreements regarding forest practices which consider water quality issues (for more specific information, see Addendum 5)**

Federal

- 16 U.S.C. 791 a (Federal Power Act )--FERC license #2157, Article 44 (Addendum 1)
- 16 U.S.C. 1600 (National Forest Management Act)
- USFS, Land and Resource Management Plan--Mt. Baker/Snoqualmie National Forest (USDA 1990)
- Public Law (PL) 91-190 (NEPA)

State

- RCW 76.09 (Forest Practices Act)
- Title 222 WAC (Forest Practices Rules)  
Chapter 222-12: Policy and Organization  
Chapter 222-22: Watershed Analysis  
Chapter 222-24: Road Construction and Maintenance  
Chapter 222-30: Timber Harvesting  
Chapter 222-34: Reforestation  
Chapter 222-38: Forest Chemicals
- Forest Practices Board Manual
- Forest Resource Plan (DNR 1992a)
- RCW 43.21C (SEPA) where applicable (Class IV forest practices)
- Habitat Conservation Plan (DNR 1997)
- Natural Resources Conservation Areas Statewide Plan (DNR 1992)

Local

- Spada Reservoir and the Sultan River: Title 21, Snohomish County Code (Shoreline Management Permits for Developments of Shorelines of the State)--County. Shoreline Permit process pursuant to RCW 90.58 (Shoreline Management Act of 1971)
- Chaplain Reservoir: Everett Municipal Code, Ordinance #723-80 (Shoreline Permit Procedures)--City Shoreline Permit process pursuant to RCW 90.58

(Shoreline Management Act of 1971)—Chaplain Tract Public Usage/Access, EMC Chapters 8.47 and 14.24, and Everett Shoreline Master Program

- Wildlife Habitat Management Plan (PUD and City of Everett 1988)
- DNR/City of Everett agreement to consult regarding forestry activities (Addendum 6)
- Memorandum of Understanding between USFS and the City of Everett regarding forest harvest, controlled recreation, and control of fire within, the Sultan Basin
- Wildlife Habitat management Plan Supplement for the Spada Lake tract (PUD/City 1997)

### **3.1.2 Roads Maintenance and Construction**

#### **3.1.2.1 Discussion**

Turbidity levels in Sultan basin waters are primarily related to suspended clay particles and stormwater runoff. This is especially so during periods of high storm water runoff volumes in the winter months and to a lesser extent during spring snow melt. During these peak flows, new channels, gulying, and stream bank erosion, in conjunction with the many logging roads in the area, contribute large quantities of clay particles and sediment to the Sultan Basin surface waters. Because logging practices, road building, maintenance level of existing roads, drainage diversions and construction activities can greatly increase the discharge of clays and sediments, they are carefully monitored.

The significance of logging roads in production of sediment has been documented by a number of authors. Erosion potential for unmaintained roads is very high. However, when properly abandoned and revegetated, soil erosion from abandoned roads declines and returns to normal. One of the problems in the Sultan Basin is the difficulty of re-establishing vegetation, especially at higher elevations.

Road building in the area can involve cutting a bench into relatively steep slopes which may undermine upslope material support and may cause sliding. In certain areas where slope stability is lacking, it may be necessary to prohibit or severely restrict road construction. In general there has been no new road-building activity in the watersheds in many years, and there are no plans for new road construction in the future.

Because the level of road maintenance, degree of use and deterioration play an important role in soil erosion and ultimately the contribution of sediment in runoff to Spada Reservoir, the DNR makes it a practice to abandon roads which are no longer necessary to logging operations or will not be used for extended periods. DNR is required to abandon roads in accordance with current "Forest Practices" rules in order to ensure minimal water quality impacts.

During the period 1994 to 2000, the DNR abandoned approximately 25 miles (60%) of the roads in the Sultan Basin (personal communication, Dean Warner, DNR Engineer, April 19, 2000).

Abandonment efforts were concentrated on the roads and road systems with the greatest risk for failure and subsequent related water quality problems. Included in the abandonment efforts are: all roads on the north side of Spada Lake Reservoir, roads up Elk creek from about 0.5 miles beyond the Boulder Lake trailhead, roads at the higher elevations east of Boulder Lake Trailhead, and other sections of roads and road systems generally at the higher elevations in the sub-basin on the southern and southeastern portions of Spada Lake Reservoir.

**3.1.2.2 Pertinent legislation/regulations/agreements regarding road construction, use and abandonment which consider water quality issues (for more specific information, see Addendum 5)**

Federal

- 16 U.S.C. 791a (Federal Power Act)--FERC License #2157, Article 8
- 16 U.S.C. 1600 (National Forest Management Act)
- USFS, Land and Resource Management Plan--Mt. Baker/Snoqualmie National Forest, Chapter 4 (USDA 1990)
- PL 91-190 (NEPA)

State

- RCW 76.09 (Forest Practices Act)
- Title 222 WAC (Forest Practices Rules)  
Chapter 222-24: Road Construction and Maintenance--sections of the Chapter pertain to water quality protection specifically and include the general policy and issues regarding water-crossing structures and road maintenance
- Forest Practices Board Manual
- Forest Resource Plan (DNR 1992a)
- RCW 75.20.100--Hydraulic Project Approval permit
- Natural Resources Conservation Areas Statewide Plan (DNR 1992)
- Habitat Conservation Plan (DNR 1997)

Local

- Wildlife Habitat Management Plan (PUD and City of Everett 1988)
- Spada Supplement (PUD/City 1997)

### 3.1.3 Prospecting and Mining

#### 3.1.3.1 Discussion

Turbidity caused by mining activities can pose a threat to water quality in the basin in a number of ways:

- earth moving related to initial road/building construction may expose soils to erosion;
- after any mine or mill is operating (and after abandonment) wind and water may erode the tailings and carry them into a stream;
- a tailings dam failure could release large amounts of sediment.

Certain geologic hazards associated with mining activity in the Sultan Basin can also threaten water quality. Damage to mines and tailings sites from earthquakes is a potential hazard. Possible mobilization of mine tailings due to steep slopes, fragile soils, earthquakes, etc. is a great hazard due to the potentially large volumes of material and the presence of a municipal water supply downstream. Erosion of associated mining haul roads can also exacerbate turbidity problems at Chaplain and Spada Reservoirs (TESG 1974:82).

Mining activities which take place in avalanche-prone areas can also pose a threat to water quality. Certain portions of the course of Williamson Creek are determined by the avalanche debris deposited there. Any tailings piles built along Williamson Creek must be designed to withstand shifting stream courses (see TESG 1974:16-38) and avalanche impact. (See TESG 1974:83-87 for detail on how avalanches in mining operations area may affect water quality and TESG 1974:95-98 for greater detail on specific mining impacts, e.g., revegetation, toxic mining wastes).

Long term degradation of water quality as a result of mining operations in the Sultan Basin is a credible possibility. TESG (1974) noted that mining operations in Chelan County to the east resulted in Railroad Creek remaining barren of fish for decades after operations had been abandoned. Everett will carefully monitor proposals for new commercial mining activity in the watersheds.

The City's Shoreline Master Program prohibits mining on city-owned municipal watershed lands (Chaplain Reservoir Watershed) except as needed for drying and disposal of backwash solids from the water filtration process.

#### 3.1.3.2 Pertinent legislation/regulations/agreements regarding mining which consider water quality issues (for more detailed information, see (Addendum 5)

##### State

- RCW 75.20.100 (Hydraulics Project Approval law)
- RCW 78.44 (Surface Mining Permit)

- RCW 43-21C (SEPA)
- NRCA Statewide Plan (1992)

#### Local

- Title 21, Snohomish County Code (Shoreline Management Permits for Developments of Shorelines of the State)–County Shoreline Permit process pursuant to RCW 90.58 (Shoreline Management Act of 1971)
- Everett Shoreline Master Program

### **3.1.4 Recreation**

#### **3.1.4.1 Discussion**

Potential impacts as a result of increased human activity in the Sultan Basin area include degradation of water quality due to increased nutrient and microbiological contamination in basin waters. Land use in the basin must reflect careful consideration of this fact because the Sultan River from Chaplain Reservoir to its headwaters is classified by the Washington Department of Ecology (DOE) as "Class AA Extraordinary." Under State law the "water quality of this class shall markedly and uniformly exceed the requirements of all uses" (Chapter 173-201 WAC). The Washington State Board of Health regulations which pertain to coliform bacteria in raw water can be found in WAC 248-54360(5).

Everett staff periodically review data available from the PUD related to recreational use of watershed lands. This, coupled with field observations from the Watershed Patrol, provides an effective means of tracking the extent and character of recreational use.

Article 44 of the FERC license specifically names public health and safety (water quality) as priority over other management issues (Addendum 1). It also gives the co-licensees the authority to close public access to areas if public health and safety hazards are caused by certain activities taking place in the basin.

Exhibit R of Article 52 of the FERC license (Addendum 3) requires that public access to the Sultan River be provided upstream and downstream of the powerhouse. This type of activity is carefully monitored on city-owned lands in the Sultan Basin and on lands upstream of the diversion dam to ensure that water quality is not being jeopardized.

The PUD and City of Everett are engaged in the FERC re-licensing process, which is scheduled to be concluded in 2011. A City staff person is assigned to this process. The City will actively participate and seek to ensure that any modifications to recreation requirements under the FERC license remain consistent with the objective of protecting water quality for municipal supply purposes.

Everett's Watershed Patrol actively patrols watershed lands 365 days a year. The mere presence of the patrol tends to discourage prohibited activities. Where activities occur that violate policies for recreational use they are immediately identified and corrective actions taken.

The DNR also retains the authority to close public access on state forest lands in certain circumstances to accomplish specific management objectives, e.g., public safety, protection of soils, forest protection, water quality, etc.—see Forest Resource Plan (1992:41). Closure of the North Shore Road several years ago substantially reduced visitation to a large portion of the Spada Reservoir sub-basin, including the Williamson Creek drainage.

Recreation groups periodically request increased access to roads in some parts of the Sultan River Basin. For example the 6122 road managed by USFS has been the subject of such requests. The City actively communicates with USFS and DNR to request that water quality needs receive due consideration in responding to requests of this nature. This is particularly important where unstable soils are present, such as the “blue clay” prevalent in the basin.

In response to security concerns, the PUD has restricted access to Culmback Dam since 2001. This action has reduced activities that could potentially affect water quality in that area of the Spada Reservoir sub-basin.

Off Road Vehicle (ORV) and four-wheel drive vehicle use in and around the Sultan Basin still can cause significant erosion problems if not controlled. Of particular concern is the Woods Creek/Monroe Log Road area north of Chaplain Reservoir. Erosion problems as a result of ORV and four-wheel activity can be extreme in fragile forested areas. The Watershed Patrol exercises vigilance in this regard. Recent road closures by DNR and the PUD have reduced ORV use in some areas. Where ORV users seek to bypass closed gates, the Watershed Patrol quickly identifies the problem, and the land management agencies have cooperated in repairing gates and installing ancillary barriers to prevent unauthorized entry.

Occasionally, helicopters and small aircraft have used the reservoirs and lands immediately adjacent to them as landing sites. Most of the pilots have done so for recreational reasons. Both reservoirs are closed to air traffic (with the exception of USFS and DNR fire fighting aircraft) and it is illegal for recreational aviators to use the reservoirs for landing. The FAA has jurisdictional authority over enforcement.

#### **3.1.4.2 Pertinent legislation/regulations/agreements regarding recreation which consider water quality issues (for more detailed information, see Addendum 5)**

##### Chaplain Reservoir Sub-basin

No recreation is allowed within the hydrologic boundary of Chaplain Reservoir per city policy (Addendum 2). Some recreation is allowed on adjacent lands owned by PUD (Lost Lake), DNR and private entities. The PUD and the City have completed the "Resource Management Plan" for the Lost Lake tract, as well as the other WHMP tracts, which, among other things, address water quality issues.

Where allowed, recreation activities must comply with the following:

### Federal

- PL 99-339 (Safe Drinking Water Act)
- 16 U.S.C. 1600 (National Forest Management Act)
- Final Recreation Plan (see Addendum 4)
- USFS, Land and Resource Management Plan--Mt. Baker/Snoqualmie National Forest
- FAA--recreational and commercial air traffic illegal on reservoirs

### State

- RCW 43.21C (SEPA)
- RCW 35.88 (Protection from Water Pollution)
- Forest Resources Plan (DNR 1992a:41)
- RCW 77.32--hunting and trapping licenses (for PUD's Lost Lake tract)
- RCW 76.04 (Forest Protection)
- RCW 46.09 (Off-Road and Non-Highway Vehicles)

### Local

- City of Everett Chaplain Tract Usage Regulations (Addendum 2)
- City of Everett Shoreline Master Program (updated 2005)
- PUD/City of Everett Amended Agreement (1981: Article II, Section 1) states the City and PUD agree to cooperate fully to maintain water quality

### Spada Reservoir Sub-basin

Areas around Spada Reservoir are not as restricted to recreation as are those around Chaplain (Addenda 3 and 4). Although bodily contact with the water and use of inflatable devices is prohibited, fishing (lures only) and boating (non-combustion engines) are allowed at the reservoir. Other than designated campgrounds, overnight use is prohibited within the hydrographic boundary of Spada Reservoir and on FERC project lands.

Recreational activities allowed on the PUD-owned Williamson Creek Tract (upstream from Spada Reservoir) include hiking and hunting. The PUD and City have completed "Resource Management Plans" for the WHMP tracts which address, among other things, water quality issues.

On USFS, DNR and private lands surrounding the reservoir, hunting, hiking and other day uses are allowed. Seasonal overnight camping is allowed at DNR campgrounds (Grieder Lake and Boulder Creek) above the reservoir. Dispersed camping on surrounding USFS is also permitted. All of these activities have the potential to adversely impact water quality.

Where allowed, recreation activities must comply with the following:

#### Federal

- 16 U.S.C. 1600 (National Forest Management Act)
- USFS--Land and Resource Management Plan, Mt, Baker/Snoqualmie National Forests
- 16 U.S.C. 791 a ( Federal Power Act )--FERC License #2157, Article 52, Exhibit R
- PL 99-339 (Safe Drinking Water Act)
- PL 91-190 (NEPA)

#### State

- RCW 43.21C (SEPA)
- Forest Resources Plan (DNR 1992a)
- RCW 77.32--hunting and trapping regulations
- RCW 35.88 (Protection from Water Pollution)
- RCW 74.04 (Forest Protection)
- RCW 46.90 (Off-Road and Non-Highway Vehicles)
- NRCA Statewide Plan (1992)

#### Local

- Title 21, Snohomish County Code (Shoreline Management Permits for Developments of Shorelines of the State)—County Shoreline Permit process pursuant to RCW 90.58 (Shoreline Management Act of 1971)

#### Sultan River Sub-basin

Recreation activities along the Sultan River between Culmback Dam and the City of Everett Diversion Dam are managed by the USFS and DNR, Both allow hiking, fishing, picnicking and

other day uses. The USFS allows dispersed camping along the river corridor. The river corridor has very limited access.

Where allowed, recreation activities must comply with the following:

#### Federal

- 16 U.S.C. 1600 (National Forest Management Act)
- USFS—Land and Resource Management Plan, Mt. Baker/Snoqualmie National Forests
- 16 U.S.C. 791 a (Federal Power Act )--FERC License #2157, Article 52, Exhibit R
- PL 91-190 (NEPA)

#### State

- RCW 43.21C (SEPA)
- Forest Resources Plan (DNR 1992a)
- RCW 77.32--hunting and trapping regulations
- RCW 35,88 (Protection from Water Pollution)
- RCW 76.04 (Forest Protection)
- RCW 46.09 (Off Road and Non-Highway Vehicles)

#### Local

- Title 21, Snohomish County Code (Shoreline Management Permits for Developments of Shorelines of the State)--County Shoreline Permit process pursuant to RCW 90.58 (Shoreline Management Act of 1971)

### **3.1.5 Forest Fire Control**

#### **3.1.5.1 Discussion**

The USFS has jurisdictional authority for fire-fighting on federal lands in the Sultan Basin; the DNR serves this function on state and private lands (RCW 76.04). Both jurisdictions have agreed to a mutual response strategy which can result in both groups initially responding to a forest fire in the basin.

The City of Everett has agreements with the DNR and the USFS which acknowledges that water quality is of paramount importance in the basin. As a result, fire-fighting techniques may vary

according to where forest fires occur. The city forester and basin Watershed Patrol person are consulted as to what forest-fighting techniques are most appropriate for the area. They also monitor the fire-fighting activities as they are occurring. For example, certain fire-fighting substances added to water to improve fire-fighting ability may not be used around Chaplain Reservoir because of the potential to contaminate the water supply (Farwell, personal communications 1993; Reis, personal communications 1993). While it is not encouraged, water may be drawn from Spada and Chaplain Reservoirs by fire-fighting aircraft.

### **3.1.5.2 Pertinent legislation/regulations/agreements regarding forest, fire controls which consider water quality issues (for more detailed information, see Addendum 5)**

#### Local

- Agreements with City of Everett and DNR and USFS regarding consultation on methods of fire-fighting to be used in the Sultan Basin

### **3.1.6 Wildlife Management**

#### **3.1.6.1 Discussion**

An increase in populations of certain wildlife (e.g., beaver, nesting waterfowl) at either Spada or Chaplain Reservoirs could affect water quality adversely. These populations are closely monitored and should over-populations occur, mitigative measures may be taken (e.g., trapping and removal).

#### **3.1.6.2 Pertinent legislation/regulations/agreements regarding wildlife populations which consider water quality issues (for more detailed information, see Addendum 5)**

#### Federal

- USFS, Land and Resource Management Plan--Mt. Baker/Snoqualmie National Forest (USDA 1990)
- 16 U.S.C. 1600 (National Forest Management Act)

#### State

- RCW 75.20.100 (Hydraulics Project Approval)
- RCW 77.32--hunting and trapping regulations
- RCW 35.88 (Protection from Water Pollution)
- Habitat Conservation Plan (DNR 1997)
- NRCA Statewide Plan (DNR 1992)

### Local

- Wildlife Habitat Management Plan (PUD and City of Everett 1988)
- PUD/City of Everett Amended Agreement (1981)
- Spada Supplement (PUD/City 1997)

### **3.1.7 Jackson Project**

#### **3.1.7.1 Discussion**

The Jackson Project is a joint City of Everett/PUD endeavor which includes goals regarding hydroelectric production and water storage. The PUD and the City of Everett (1981) executed an amended agreement for multi-purpose development of the Sultan River (Jackson Project) (Addendum 7). The amended agreement states that water quality has precedence over other considerations and that both parties will cooperate fully to maintain water quality and meet appropriate state and federal water quality standards. This agreement is designed to ensure that water quality will not be compromised by recreation or operation of the hydroelectric power facility in the Sultan Basin.

The FERC license for the Jackson Project is up for renewal in 2011. The City of Everett is participating actively in studies and discussions related to permit conditions. The City will continue to work with the PUD, FERC and other agencies to ensure any changes to the license and related plans account for water quality considerations.

#### **3.1.7.2 Pertinent legislation/regulations/agreements regarding the Jackson Project which consider water quality issues (for more detailed information, see Addendum 5)**

### Federal

- FERC license #2157, particularly Article 44 (Addendum 1)

### Local

- PUD/City of Everett Amended Agreement (1981)(Addendum 7)

### **3.2 Health Prioritization**

Article 44 of the FERC licenses (Addendum 1) stipulates that public health and safety are of primary concern.

If at any time in the future the use of said areas by the public shall, in the opinion of the Department of Health of the State of Washington, or in the opinion of Snohomish County, City of Everett, or PUD No. 1 of Snohomish County, constitute a hazard to the public health and safety, said areas may be closed to public access by the licensees (FERC license #2157, Article 44).

The City of Everett views their primary responsibility in the Sultan Basin area as one of maintenance and improvement of water quality and, consequently, public health and safety.

To protect the public health, the licensees may close specific areas within the FERC project boundaries to public access and impose regulations controlling conduct of persons on said property (FERC license #2157, Article 44).

#### **4.0 SYSTEM OPERATION**

##### **4.1 Water Supply Operations**

The elements of the Jackson Project which provide for the delivery of raw water to Lake Chaplain Reservoir and the Filter Plant, are:

- Spada Reservoir
- Culmback Dam
- An 8 mile tunnel and pipeline which delivers water to the powerhouse
- A powerhouse containing four turbines
- A three mile return water line that delivers Spada Reservoir water from the powerhouse uphill to Chaplain Reservoir
- A diversion dam on the Sultan River upstream of the powerhouse (though water is not diverted at this location under normal operating conditions)
- Tunnel #1, which allows water from the return water line to be sent back to the Sultan River to support fish flows, and also serves as a backup supply source permitting water from the diversion dam on the Sultan River to be supplied to Chaplain Reservoir
- A diversion structure at Portal #2 on the east shore of Lake Chaplain Reservoir which is used to split return line flows between Lake Chaplain (for domestic and industrial supply purposes) and tunnel #1 (fish return flows)

Please refer to figure 3 of this document for a schematic representation of these features.

Water from Spada Reservoir is routed to Chaplain Reservoir via the powerhouse and return water line. This water is used to supply Chaplain reservoir for municipal purposes and supplement Sultan River flows upstream of the powerhouse to enhance fish habitat. Alternatively, water from Spada Reservoir can also be delivered to Chaplain Reservoir from the Sultan River via the diversion dam and tunnel #1 (which terminates at the east shore of Chaplain reservoir at the diversion box). In order to comply with in-stream flow requirements, a corresponding release of water at Culmback Dam directly to the Sultan River is necessary when using the diversion dam and tunnel #1 to deliver water to Lake Chaplain Reservoir.

Detention time in Chaplain Reservoir is sufficient to provide reliable presedimentation prior to being withdrawn to the filter plant for treatment from Chaplain reservoir.

The capability also exists for water from the return line to be routed directly into the filter plant raw water intake, bypassing Chaplain reservoir.

During normal operation water is routed to the diversion structure on the east shore of Chaplain reservoir via the powerhouse and return water line.

There are effectively four "outlets" for water from Chaplain Reservoir: the filter plant, tunnel #2, tunnel #3 (both tunnels are located on the west side of the Reservoir) and an overflow at the south end of Chaplain reservoir. The tunnels can be used interchangeably should the need arise. However, due to system separation considerations (treated water separated from untreated water) and valving/piping configurations, doing so is a complex procedure requiring planning and coordination.

During normal operation, tunnel #3 is used to deliver unfiltered water from Chaplain Reservoir to the Kimberly-Clark Paper Company for industrial use. In a water-supply emergency, Tunnel #3 can also be used to deliver either unfiltered water or filtered water to domestic customers.

During normal operation, tunnel #2 is used to deliver treated water to the northern right-of-way customers. Tunnel #2 could also be used to deliver treated water to Kimberly-Clark. Additionally, tunnel#2 could be used (in an extreme emergency only) to deliver raw water (this water could be chlorinated) directly from Chaplain Reservoir to domestic customers.

The Snohomish County PUD #1 is responsible for overall and day to day Jackson Project Operations. It is the direct responsibility of the PUD to maintain the level of Chaplain Reservoir within certain agreed upon limits (between 640 and 645 ft M.S.L.). Monitoring and control of this task is accomplished by the PUD with a SCADA system, which is set up to monitor and control all flows pertinent to the Jackson Project Operation (turbine operations, return water flows, withdrawals from Spada, in-stream flows).

The City of Everett Filter Plant Operators coordinate closely with PUD Hydropower Plant Operators on all related issues, especially flow management.

#### **4.2 Disinfection and Treatment Facilities**

The City of Everett drinking water supply is protected and treated by application of multiple treatment barriers to prevent the introduction of contaminants. First are the Sultan Basin and Spada Reservoir. The combination of remoteness, geology, size, and hydrology of this site has created a unique high quality source of water. Spada Reservoir is the primary pre-sedimentation basin for the water treatment process. By working to mitigate the public and private uses within the basin, the City seeks to insure the availability of a high quality source of water for future generations.

The second stage of the treatment process is Chaplain Reservoir, another pre-sedimentation basin in the water treatment process. Residence time for water in Chaplain Reservoir is up to 30 days.

In 1983, the City completed construction of a direct filtration plant located at Chaplain Reservoir. These facilities are the next stage in the treatment process. The plant processes include pre-chlorination, coagulation, flocculation, filtration, fluoridation, corrosion control and final disinfection.

The DOH has granted Everett a 2.5 log filtration removal credit for giardia cysts and a 1.0 log filtration removal credit for virus reduction. Everett's disinfection process is therefore required to meet a minimum inactivation requirement of 0.5 log for giardia cysts and 3.0 log virus inactivation. The Everett filter plant disinfection process routinely achieves 1.5 to 3.0 logs of giardia inactivation.

### **4.3 List of Agencies with Authority and Responsibilities**

As explained in Sections 2.4 and 2.5, land within the Sultan Basin is owned and/or managed by a variety of agencies and private owners. These are listed below with a brief summary of their authority. See Addendum 5 for greater detail on jurisdictional authority.

#### **4.3.1 City of Everett**

As the major purveyor of municipal water in Snohomish County, the City of Everett has a proprietary interest in the Sultan Basin. In addition to supplying water to the City of Everett, the system also supplies the cities of Snohomish, Monroe, and Marysville, the Alderwood Water and Wastewater District and fourteen smaller districts. The total system serves approximately 516,000 people. The City possesses water rights to 245 mgd. The City of Everett Public Works Department conducts all water quality monitoring, operates the water treatment plant, maintains a Watershed Patrol and is responsible for the maintenance and operation of all treatment, transmission and distribution facilities.

##### FERC License #2157

As a co-licensee with the PUD on FERC License #2157, the City is responsible for compliance with all agreements pertaining to it. The City of Everett is part owner (with the PUD) of Culmback Dam at Spada Reservoir and has contractual/ financial commitments to the Jackson Project (PUD and City of Everett 1981).

The City owns and exercises primary control over Chaplain Reservoir and lands adjacent to it. These are managed for water quality protection and wildlife habitat enhancement under the WHMP (PUD and City of Everett 1988).

##### Land Use

The City also administers the Shoreline Master Program for development at Chaplain Reservoir requiring a shoreline permit (see Addendum 5 for more detail).

##### SEPA

Where appropriate, the City of Everett functions as lead agency for environmental review required under SEPA.

### **4.3.2 Snohomish County PUD**

As a co-licensee, the PUD is part owner of Culmback Dam at Spada Reservoir and has contractual/financial commitments to the Jackson Project (PUD and City of Everett 1981).

The PUD's primary interest in the Sultan Basin is focused on Spada Reservoir and the associated hydroelectric facilities. As a co-licensee on the FERC License (#2157), it is responsible for compliance with all agreements pertaining to it.

The PUD owns the lands immediately adjacent to Spada Reservoir and currently manages them under the FERC License for the project.

The PUD is responsible for operating the Jackson Project in such manner as to maintain the water level in Chaplain Reservoir between 640' and 645' M.S.L.

### **4.3.3 Federal Energy Regulatory Commission**

The City and PUD are co-licensees on FERC License #2157 (the Jackson Project). The FERC monitors the project for compliance with all conditions and agreements.

### **4.3.4 Washington Department of Natural Resources**

The DNR administers all permits/approvals for forest practices, mining, recreation and fire control activities on state and private lands in the Sultan Basin. This includes two camping areas (Greider and Boulder Lakes) and associated trails in the Sultan Basin.

In addition, the passage of the Natural Resources Conservation Areas Act (RCW 79.71) in 1987 established a program whose primary purpose is to:

Protect outstanding examples of native ecosystems and habitat for endangered, threatened and sensitive plants and animals (DNR 1992b:2).

DNR has set aside three NRCAs in the Sultan Basin area (Figure 8). The DNR is required to compile a site management plan and identify potential uses for each NRCA. At this time DNR has assembled a draft management plan for the three NRCAs jointly, under the name Upper Sultan Basin Natural Resources Conservation Area Management Plan (DNR, undated draft). The draft plan does not have legal status since it has not been formally adopted. However, management of these lands as NRCAs is generally protective of water quality objectives since NRCAs are managed to support wildlife habitat, scenic beauty, and associated values.



#### **4.3.5 Washington Department of Fish and Wildlife (WDFW)**

The WDFW administers the Hydraulic Project Approval permit process on the west side of the Cascade Mountains. In addition, WDFW manages fishing, hunting and trapping activities. A concern of the WDFW is the steady decline in the number and size of fish being caught in Spada Lake Reservoir since the mid 1980s. WDFW has proposed the concept of fertilization of Spada Lake to provide more food for fish. The City and the PUD are strongly opposed to such measures due to potential impacts on drinking water quality.

#### **4.3.6 Washington Department of Health**

The DOH administers all permits related to water quality/domestic water supply under RCW 35.88 (Protection from Water Pollution) and WAC 246-290-668 (Watershed Control).

#### **4.3.7 US Forest Service**

Small portions of the Sultan Basin fall within the USFS Mt. Baker/Snoqualmie National Forest (Figure 9). Much of the land along the Sultan River between Spada Reservoir and the diversion dam is controlled by the USFS. Forest management objectives for specific resources include issues of watershed, minerals, land ownership/users, roads, fire, etc. (USDA 1990: Chapter 4).

#### **4.3.8 Washington Department of Ecology**

DOE functions as the final clearinghouse for all SEPA findings made by local jurisdiction.

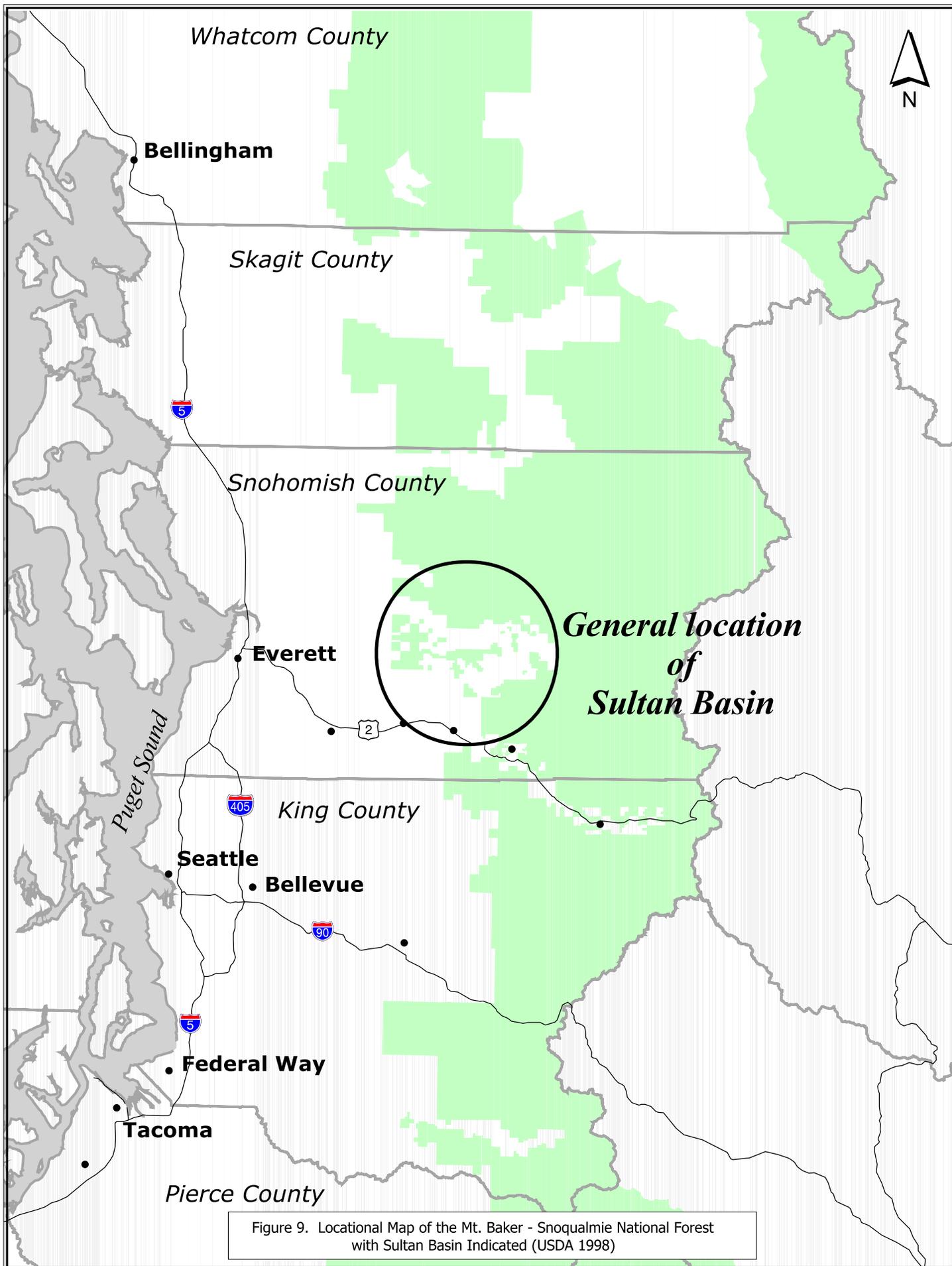
#### **4.3.9 Snohomish County**

##### Land Use

Snohomish County is the jurisdictional authority for PUD-owned and privately owned lands within the Sultan Basin. All development must conform with the designated zoning for the area. The majority of land located within the Sultan Basin, particularly east of Chaplain Reservoir, is currently zoned “Forestry.” South of the city’s diversion dam, “Forestry and Recreation” and “Residential” zones occur (this area is not of paramount concern regarding water quality in the Sultan Basin).

The intent and function of the “Forestry” zone is to conserve and protect commercial forest lands for long-term forestry and related uses. Commercial forest lands are normally large tracts under one ownership and located in remote areas away from residential and intense recreational uses. Activities allowed in the “Forestry” zone include some recreational uses, low density residential, resource processing (timber and minerals), some types of agriculture, etc. (Snohomish County Code Title 18).

The Growth Management Act (GMA) of 1990 states, as one of its goals, the maintenance and enhancement of natural resource-based industries and the encouragement of the conservation of productive forest lands and agriculture lands. As a result, the Snohomish County Comprehensive Plan addresses the forest resource needs of the timber industry, classifies and designates commercial forest lands, and adopts policies to conserve them for timber production consistent with the GMA. Such lands as identified have been designated as Interim Forest Land Conservation by the County.



More specifically, some lands within the Sultan Basin have been designated as Interim Commercial Forestry (ICF) lands under GMA. This designation is actually an overlay zone which is superimposed over the existing zoning for an area for the purposes of managing development. No subdivisions are allowed in the ICF zone.

#### Shoreline Management

Where applicable, the county also administers the shoreline permit process. Spada Reservoir and the Sultan River between Culmback and the City's diversion dam at Chaplain Reservoir currently have no shoreline designation. The County is currently in the process of revising their Shoreline Management Program and intends to assign shoreline designations to these areas at that time. Other areas within the Sultan Basin (Sultan River tributaries and lakes) are classified as "Conservancy" or "Natural" under the County Shoreline Master Program (see Addendum 5 for greater detail).

#### SEPA

Where appropriate, Snohomish County functions as lead agency on environmental reviews required by SEPA.

#### **4.3.10 Private Landowners**

In addition to the PUD, several private holdings exist within the Sultan Basin, all of which are mining claims. If developed, these mine operators would be required to comply with all applicable federal and state legislation regarding such activities.

#### **4.4 Emergency Response Plan**

Timely response to a water supply or water quality emergency originating in the watershed is contingent on the City being aware of or being notified of a problem or a potential problem. To facilitate timely notification, the City's Watershed Patrol monitors activities around both Spada and Chaplain Reservoirs. The Sultan Basin is also routinely checked by Snohomish PUD personnel. Filter Plant Operators and the Watershed Patrol possess radio communications capability with the PUD and local law enforcement agencies.

In the event of an earthquake, or other major disaster, the Snohomish County Sheriff has attached top priority to an aerial inspection of Culmback Dam.

Procedures relating to any structural problems within the Jackson Project that might result in the interruption of drinking water service are contained in the Jackson Hydroelectric Project Emergency Action Plan (City of Everett and PUD 2006). Structural failure and other emergencies relating to the Chaplain sub-basin are addressed in the City of Everett Chaplain Reservoir Dams Emergency Action Plans and other City emergency response plans (Everett water System Emergency Response Program 2006).

If localized water quality problems occur in the Sultan Basin (as a result of contamination or other emergency), the City of Everett Watershed Patrol will take charge of assessment and if

necessary initiate immediate cleanup. The Watershed Patrol carries materials for immediate response to small incidents.

In the event of large scale or particularly dangerous contamination of Spada Lake Reservoir, the water intake to Chaplain Reservoir will be closed and all water from Spada Reservoir by-passed directly into the Sultan River. There is approximately thirty days of water storage in Chaplain Reservoir. This is sufficient time to allow both cleanup and, if necessary, flushing of Spada Reservoir. Contaminant concentrations are readily sampled from the PUD return line (sample tap and sample pump) as it passes through the grounds of the City of Everett Water Filtration Plant.

If serious contamination occurs within the hydrologic boundary of Chaplain Reservoir, the City may by-pass the reservoir and receive water directly from Spada Reservoir. This by-pass may be used for as long as is necessary to mitigate damage within the hydrologic boundary of Chaplain Reservoir.

In the event of a failure of the Jackson Project Facilities water supply delivery system for Lake Chaplain Reservoir, water can be routed to Lake Chaplain via the diversion dam on the Sultan River and tunnel # 1.

Specific operating procedures for responding to a watershed emergency are addressed in the City of Everett Water Filtration Plant O&M Manual and in the Filter Plant Emergency Operations Plan.

## **5.0 WATER QUALITY MONITORING AND TRENDS**

### **5.1 Historical Water Quality Data Discussion**

Baseline water quality in the Sultan Basin was documented in Temperature and Turbidity Studies for Spada Lake and the Sultan River (Bechtel Civil & Minerals, Inc. 1981). Other studies of the Sultan River Basin include City of Everett Water Filtration Facilities Supplemental Studies (Gray & Osborne 1978), Geochemistry of Williamson Creek (Dethier 1977), Spada Lake/Lake Chaplain Restoration Program--SNOMET 104(h) (City of Everett 1977), and Sultan Dam Project Water Supply & Control Study (US Department of Interior 1967).

### **5.2 Water Quality Monitoring Program Description**

Raw source water quality is monitored at the intake to the Everett Water Filtration Plant and in the supply pipeline flow from Spada Reservoir to Lake Chaplain Reservoir. For the most part, the City does not conduct routine or regular water quality monitoring in, around or upstream of Spada Reservoir. This is due to the limited access in the upper Sultan Basin (especially in winter) and because the monitoring program at Lake Chaplain provides suitable data for assessing raw water quality. In addition to monitoring at the plant intake pipelines, a limited amount of limnological and plankton monitoring is conducted by boat on Lake Chaplain. Frequency of monitoring varies by parameter from once annually to continuously. Monitoring frequency of some parameters is based on the regulatory monitoring requirements for those parameters. See Table 4 for a list of the parameters that are monitored at the plant intakes and the Spada return water pipeline.

**TABLE 4**  
**Raw source water quality monitoring description by parameter group.**

Parameter	Monitoring Location	Frequency	Group responsible for sample collection	Analysis	Comments
Turbidity	PLNTINFSP1, PLNTINSIPH, PUDRTNSP15	Continuous and every 4 hour grab	WTP operators	WFP WQ Lab	
Temperature	PLNTINFSP1, PLNTINSIPH, PUDRTNSP15	Continuous and every 4 hour grab	WTP operators	WFP WQ Lab	
pH	PLNTINFSP1, PLNTINSIPH, PUDRTNSP15	Every 4 hour grab	WTP operators	WFP WQ Lab	
Conductivity	PLNTINFSP1, PLNTINSIPH,	Continuous	WTP operators & EMC staff	WFP WQ Lab and EEL <sup>4</sup>	
Regulated inorganics <sup>1</sup>	PLNTINFSP1 or PLNTINSIPH, and PUDRTNSP15	Quarterly	EMC staff	EEL <sup>4</sup>	Required once annually
Unregulated inorganics <sup>2</sup>	PLNTINFSP1 or PLNTINSIPH, and PUDRTNSP15	Quarterly	EMC staff	EEL <sup>4</sup>	
Total organic carbon (TOC)	PLNTINFSP1 or PLNTINSIPH, and PUDRTNSP15	Monthly	EMC staff	Edge Analytical	Required under SDWA
Dissolved organic carbon (DOC)	PLNTINFSP1 or PLNTINSIPH, and PUDRTNSP15	Monthly	EMC staff	EEL <sup>4</sup>	
UV-254	PLNTINFSP1 or PLNTINSIPH, and PUDRTNSP15	Monthly	EMC staff	EEL <sup>4</sup>	
Total and Fecal Coliform bacteria	PLNTINFSP1, PLNTINSIPH, PUDRTNSP15	10 per month at intake	EMC staff	EEL <sup>4</sup>	5 per month for intake not in use (usually PUDRTNSP15) 10 per month required at plant intake under SDWA
<i>Giardia</i>	At intake in use	Monthly	EMC staff	LabCor -Seattle	
<i>Cryptosporidium</i>	At intake in use	Monthly	EMC staff	LabCor -Seattle	Required under SDWA
Heterotrophic bacteria (std & R2A)	PLNTINFSP1 or PLNTINSIPH, and PUDRTNSP15	Monthly	EMC staff	EEL <sup>4</sup>	
<i>Holopedium gibberum</i>	Lake Chaplain at two sites	Twice-Monthly May-October, monthly Nov-April	EMC Staff	EMC Staff and Univ of Wash contractor	One site above plant intake and one at mid lake.
Nutrients <sup>3</sup>	PLNTINFSP1 or PLNTINSIPH, and PUDRTNSP15	Monthly (May-Sept) Quarterly (Oct-April)	EMC staff	EEL <sup>4</sup>	
Gross Alpha	At plant effluent	Annually	EMC staff	DOH Lab Seattle	Required under SDWA
Gross Beta	At plant effluent	Annually	EMC staff	DOH Lab Seattle	Required under SDWA
Radium-228	At plant effluent	1 each for 2 quarters every 4 years	EMC staff	DOH Lab Seattle	Required under SDWA

<sup>1</sup>Regulated IOC parameters: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Thallium, Cyanide, Nitrate, Nitrite, Fluoride, Chloride, Sulfate, Iron, Manganese, Silver, Zinc

<sup>2</sup>Unregulated IOC parameters: Silica, Aluminum, Boron, Hardness, Alkalinity, Molybdenum, Sodium

<sup>3</sup>Nutrients: Total Phosphorus, Ortho Phosphorus, Ammonia, Nitrate, Nitrite, Kjeldahl Nitrogen, Alkalinity, Temperature, Dissolved Oxygen, Total and Ca Hardness, pH, Conductivity, Chlorophyll-a

<sup>4</sup>EEL: Everett Environmental Laboratory

The treatment plant staff summarizes the results of the daily treatment process control raw water parameters (temperature, turbidity and pH) analyses they conduct on an annual basis. The Public Works Department Environmental Monitoring and Compliance group (EMC) is responsible for most of the other raw source water monitoring activity the City undertakes. The EMC group summarizes the results of monitoring it conducts for microbes, physical, inorganic, and organic parameters annually. Any negative change in water quality observed at the plant intakes or in treated water from the plant is potentially a trigger for modifications to the existing raw source water monitoring plans and/or for further investigation in the watershed.

If activities within the basin are identified that may have a negative impact on drinking water quality, the City will evaluate limited monitoring of water quality downstream of locations where such activity is taking place. Such limited duration projects will be evaluated and implemented on a case-by-case basis. As potential threats to water quality develop, or as development of more stringent drinking water standards under the Safe Drinking Water Act continues, or as possibly required as part of the renewal of the Jackson Project's FERC operating license, the City may be obligated to increase the intensity and scope of its raw source water quality monitoring program.

### **5.3 Plant Intake Water Quality Monitoring**

#### **5.3.1 Purpose**

The purpose of Everett's efforts to monitor the quality of water coming from the Sultan Basin into the treatment plant is to document water quality trends as they relate to drinking water supply, to provide warning of the need to prevent or mitigate any decline in source water quality at the plant intakes, and in some cases to meet the monitoring requirements of the state and federal drinking water regulations.

#### **5.3.2 Sampling Locations and Parameters**

There are three possible EWTP raw water intake configurations. Two of the intake systems supply water to the plant from the south end of Lake Chaplain Reservoir. Lake Chaplain Reservoir is filled from Spada Lake Reservoir via a power generation system "PUD return water pipeline." The return water pipeline runs from the Snohomish County PUD #1 powerhouse located on the Sultan River below Spada Reservoir up past the treatment plant to a discharge point located at the middle of the east shore of Chaplain Reservoir. The third intake configuration bypasses Chaplain Reservoir and supplies water to the plant directly from Spada Reservoir via an intertie to the return pipeline where it is routed through the treatment plant site. Under normal operating conditions, the plant intakes water from Lake Chaplain Reservoir via either the gravity or siphon intakes. To avoid filter clogging problems caused by zooplankton that increase to significant levels in Lake Chaplain Reservoir during warm weather months, the plant utilizes water from the PUD return line/Lake Chaplain bypass intertie for a few weeks each year during mid to late summer.

The EWTP has sample taps located on each of the three potential intake pipelines. Samples from these taps are pumped continuously to a water quality laboratory in the treatment plant operations building. The Everett sample site codes for these sample collection points are:

**PLNTINFSP1** - plant influent sample pump #1, gravity intake from Lake Chaplain;

**PLNTINSIPH** - plant influent siphon sample pump #1, siphon intake from Lake Chaplain;

**PUDRTNSP15** - PUD return line from Spada Reservoir to Lake Chaplain and the Sultan River, sample pump #15.

### **5.3.3 Data Storage**

Source water monitoring data from Everett's various source water monitoring programs is stored in three locations. Data from the raw water monitoring conducted at the influent to the filtration plant and Chaplain Reservoir for operational purposes (i.e. pH, temperature, turbidity, and some conductivity data) from 1987 through part of 2001 is stored in electronic spreadsheet files on the treatment plant computer network file server. Beginning in late 2001, process water quality data collected at the treatment plant has been stored on the City's Everett Environmental Laboratory (EEL) Laboratory Information Management System (LIMS) database. Monitoring results that are analyzed at or contracted out via the EEL are also stored in the EEL LIMS database. All monitoring conducted by the EMC group is routed through the EEL LIMS system. The EMC group stores results for parameters that cannot be stored in the current LIMS database in a series of annual water quality monitoring results spreadsheet files stored on the network at the Public Works Department service center in Everett. Installation of a new LIMS database that can accept all monitoring parameters from the treatment plant and EMC programs is undergoing installation and development.

## **5.4 Summary of Historical Water Quality Trends**

Selected monitoring data collected from the Lake Chaplain Reservoir and Spada Lake Reservoir effluents (PLNTINSIPH, PLNTINFSP1, and PUDRTNSP15 respectively) between 1995 and 2005 are presented in Tables 5 and 6. Data for additional parameters are included in Addendum 8. Throughout the past ten years, raw source water quality from Stage 2 of the Jackson Project has remained high and relatively static. Exceptions to the static trend include years with higher turbidity and coliform bacteria density, a small decline in annual average pH values, and an increase in the duration and density of a filter clogging zooplankton (*Holopedium gibberum*) in Lake Chaplain in summer months. Increased annual turbidity and coliform bacteria levels in 1995-1996 and 2003-2004 appear to correlate with high intensity late fall or winter storms that occurred during those time periods. A small declining trend for average pH occurred in both reservoir effluents between 1996 and 2005 (approximately 0.3 to 0.5 standard pH units). The cause for this phenomenon is not known, although it may partly be the result of a change in the pH instrument used at the water filtration plant and the analytical variability that occurs when measuring pH in poorly buffered surface waters with different instruments or ISE electrodes.

The cause of the increased density and duration of filter clogging *Holopedium gibberum* in Lake Chaplain Reservoir is not known, but is currently being studied. Current studies (2006) are aimed at providing a definitive conclusion as to whether this organism is the source of the problem; assessing the vertical distribution of *H. gibberum* in the water column; and developing an understanding of mechanisms of movement within the water column, especially through the diurnal cycle. Once these studies have been completed, the City will assess options for management of this issue.

During the period from 1995-2005, the levels of most other monitoring parameters for which data is available have remained unchanged, or vary within the limits of the errors associated with the frequency of monitoring and the method used for analysis.

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Turbidity	MAXIMUM	4.9	1.9	1.2	1.7	1.5	0.8	1.9	6.1	6.0	3.4
	MINIMUM	0.4	0.4	0.5	0.3	0.3	0.3	0.4	0.3	0.5	0.5
	AVERAGE	1.9	1.0	0.9	0.9	0.7	0.6	0.9	1.5	2.1	1.5
Temperature	MAXIMUM	18	19	19	16	18	17	18.0	19.0	19.0	19.0
	MINIMUM	6	6	7	7	7	7	6.0	8.0	7.0	7.8
	AVERAGE	12	12	12	11	12	12	11.6	12.1	12.4	13.0
pH	MAXIMUM	7.0	7.0	7.0	7.0	6.9	6.9	6.9	6.5	6.5	6.4
	MINIMUM	6.8	6.7	6.7	6.5	6.5	6.7	6.4	6.1	6.3	6.3
	AVERAGE	6.8	6.9	6.8	6.8	6.8	6.8	6.6	6.3	6.4	6.4
Fecal Coliform	MAXIMUM	4	2	6	2	2	1	2	2	9	2
	MINIMUM	<2	<2	<1	<2	<2	<1	<1	<1	<1	<1
	AVERAGE	0.3	0.1	0.4	0.2	0.0	0.1	0.1	0.1	0.4	0.1
Total Coliform	MAXIMUM	70	200	20	12	11	34	7	7	10	17
	MINIMUM	<2	<2	<1	<2	<2	<1	<1	<1	<1	<1
	AVERAGE	6.0	7.5	2.8	2.3	2.0	2.2	1.3	2.2	1.6	1.7

Averages are calculated setting all < values equal to zero  
(1) Monitoring Stations PLNTINFSP1 and PLNTINSIPH

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Turbidity	MAXIMUM	19.5	10.2	8.1	41.0	No Data	No Data	13.4	53.0	27.5	18.2
	MINIMUM	0.6	0.7	0.5	0.1	No Data	No Data	0.4	0.3	0.5	0.7
	AVERAGE	5.8	3.7	2.3	3.9	No Data	No Data	2.9	7.3	5.5	4.2
Temperature	MAXIMUM	No Data	16.3	17.7	17.1	17.5					
	MINIMUM	No Data	8.3	5.9	4.8	6.0					
	AVERAGE	No Data	11.9	10.6	10.5	10.9					
pH	MAXIMUM	7.1	7.2	7.4	7.3	No Data	No Data	6.5	6.5	6.6	6.7
	MINIMUM	6.5	5.9	6.5	3.8	No Data	No Data	6.2	5.9	6.1	6.1
	AVERAGE	6.8	6.8	6.8	6.7	No Data	No Data	6.3	6.2	6.3	6.3
Fecal Coliform	MAXIMUM	8	6	6	10	8	1	1	8	18	8
	MINIMUM	>2	>2	>1	>2	>2	>1	>1	>1	>1	>1
	AVERAGE	0.6	0.4	0.4	0.5	0.5	0.1	0.0	0.8	1.0	0.3
Total Coliform	MAXIMUM	280	144	60	42	22	33	13	33	17	41
	MINIMUM	>2	>2	>2	>2	>2	>1	>1	>1	>1	>1
	AVERAGE	15.3	16.8	5.2	5.4	2.5	4.7	3.3	4.7	4.2	4.1

Averages are calculated setting all < values equal to zero  
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