

**Final Vancouver Lake and Flushing
Channel
Preliminary Assessment
(Revised)
Vancouver, Washington**

TDD: 07-11-0004

**Region 10
START-3**

Superfund Technical Assessment and Response Team

June 2008

**Prepared for:
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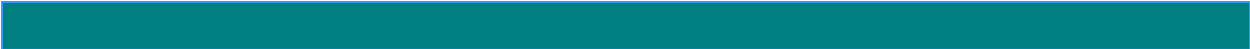



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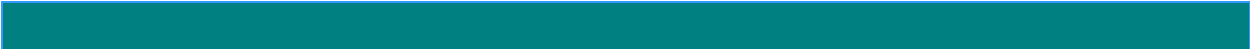


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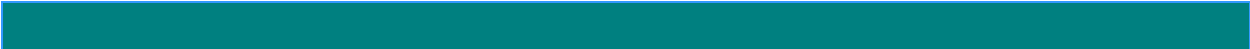


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List of Abbreviations and Acronyms

<u>Acronym</u>	<u>Description</u>
ALCOA	Aluminum Company of America
BPA	Bonneville Power Administration
cfs	cubic feet per second
E & E	Ecology & Environment Inc.
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ESU	Evolutionary Significant Unit
NPL	National Priorities List
NTR	National Toxics Rule
PA	Preliminary Assessment
PCBs	Polychlorinated biphenyls
PPE	Probable Point of Entry
PRP	Potentially Responsible Parties
START	Superfund Technical Assessment and Response Team
STR	Stevens, Thompson, and Runyan, Inc.
TDL	Target Distance Limit

1

Introduction

Ecology and Environment, Inc., (E & E) was tasked by the United States Environmental Protection Agency (EPA) to provide technical support for completion of a Preliminary Assessment (PA) at the Vancouver Lake and Flushing Channel site in Vancouver, Washington. E & E completed PA activities under Technical Direction Document Number 07-11-0004, issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START)-3 Contract No. EP-S7-06-02.

The specific goals for the Vancouver Lake and Flushing Channel PA, identified by the EPA, are:

- Determine the potential threat to public health or the environment posed by the site;
- Determine the potential for a release of hazardous constituents into the environment; and
- Determine the potential for placement of the site on the National Priorities List (NPL).

Completion of the PA included reviewing existing site information, collecting receptor information within the range of site influence, determining regional characteristics, and conducting a site visit. This document includes a discussion of background site information (Section 2), a discussion of surface water migration pathway and potential receptors (targets; Section 3), and a list of pertinent references (Section 4).

2

Site Background

2.1 Site Location

Site Name:	Vancouver Lake and Flushing Channel
CERCLIS ID Number:	WAN001002726
Site Address:	6801 Northwest Lower River Road Vancouver, Washington 98660
Latitude:	45° 40' 38.63" North
Longitude:	122° 43' 4.63 West
Legal Description:	Township 2 North, Range 1 West, Section 40
County:	Clark
Congressional District:	3
Site Owners:	<p>Vancouver Lake: Clark County Public Works P.O. Box 9810, Vancouver, WA 98666</p> <p>Washington State Department of Natural Resources, Pacific Cascade Region Aquatics Program P.O. Box 280, Castle Rock, WA 98611</p> <p>Flushing Channel: Port of Vancouver 3103 Northwest Lower River Road Vancouver, Washington 98660</p>
Site Contacts:	<p>Clark County Public Works Ron Wierenga 1300 Franklin Street Vancouver, Washington 98660 (360) 397-6118</p> <p>Washington State Department of Ecology Paul Skyllingstad 300 Desmond Drive Lacey, Washington 98503 (360) 397-6178</p> <p>Port of Vancouver Patty Boyden 3103 Northwest Lower River Road Vancouver, Washington 98660 (360) 992-1126</p>

Site Name:	Vancouver Lake and Flushing Channel
	Washington State Department of Natural Resources, Pacific Cascade Region Todd Welker Aquatics Program P.O. Box 280, Castle Rock, WA 98611 360-740-6812
	Rosemere Neighborhood Association Dvija Michael Bertish PO Box 61471 Vancouver, Washington 98666 (360) 281-4747

2.2 Site Description

The Vancouver Lake and Flushing Channel is located in Vancouver, Clark County, Washington. Figure 2-1 illustrates the site and surrounding features. The lake is roughly 3 miles long, 2.5 miles wide, and encompasses 2,414 acres. The average depth of the lake is approximately 5 feet. The site is bordered by Vancouver Lake Wildlife Area to the south, Shillapoo Wildlife Area to the west, and the City of Vancouver to the east. The flushing channel is located southwest of the lake. Water flows into the lake via the Burnt Bridge Creek, the flushing channel, and at times, the Lake River. The Lake River is tidally influenced by the nearby Columbia River. Due to the tidal influence, Lake River may reverse course and flow into the lake. The lake is bordered by wetland vegetation.

2.3 Ownership History

Vancouver Lake has been owned by multiple municipal organizations associated with either the City of Vancouver, Washington or. The Flushing Channel is owned by the Port of Vancouver. For regulatory purposes, the lake is under the jurisdiction of the Washington State Department of Natural Resources and the Washington State Department of Ecology (Ecology) for environmental issues.

2.4 Operations and Sources

Vancouver Lake has been the source of great public interest and involvement regarding water quality and use. Based on information compiled by the Vancouver Lake Watershed Partnership, interest in water quality from local residents has been ongoing since the early 1900s. Although a number of studies have been conducted that discuss the quality of the water, potential uses of the lake and surrounding area, no information could be located that could pinpoint the source of the contaminated sediments. Some of the nearby facilities that could be contributors to contamination in the lake are discussed below.

The Aluminum Company of America (ALCOA) began operating a smelter in Vancouver in 1940. Portions of the facility are still in operation; however,

ownership of the smelting operations has changed hands over the years. The ALCOA Vancouver site (also known as Evergreen Aluminum LLC) is located approximately two mile upstream of the flushing channel. This site consists of several contaminated areas that are undergoing, or have undergone, remediation, also known as operable units.

One of these operable units was listed on the NPL in 1990. This area was contaminated with fluoride and cyanide. Work has been conducted by ALCOA under a Consent Decree agreement with the Ecology which included the removal of 50,000 tons of material, covering contaminated soils, fencing the facility, and monitoring groundwater and surface water in the Columbia River. The site was deleted from the NPL in 1996.

Ecology continues to oversee the clean up of other parts of the site. These include the smelter area and PCB contaminated sediments in the Columbia River adjacent to the site. Plans are currently under review for the removal of the PCB-contaminated sediments. (Ecology 2008)

The Bonneville Power Administration (BPA) Ross Complex, also a deleted NPL site, is located approximately 1.5 miles upstream of Vancouver Lake along Burnt Bridge Creek. The site was listed on the NPL in 1989. Cleanup actions included the removal of contaminated soil. Cleanup activities were completed by BPA in 1995 and the site was deleted from the NPL in 1996. (EPA 2008)

The Vancouver Lake and Flushing Channel source consists of contaminated sediment in Vancouver Lake and the Flushing Channel. The original deposition of the contaminants nor the source of the contaminants is known at this time.

2.5 Previous Investigations

In 1966, a study was initiated by the Clark County Vancouver Regional Planning Commission to develop a master plan for the Vancouver Lake Complex; the study was completed in 1967. The Vancouver Lake Complex includes Vancouver Lake and a 12-mile stretch of the Columbia River (which begins approximately 4.7 miles upstream of the Flushing Channel). Recommendations included flood control programs and encouraged that response programs should be flexible to meet the demands of the area. (STR 1973)

In 1967 Washington State University College of Engineering, conducted a study to determine alternatives for the reclamation of Vancouver Lake. Results of this study confirmed that Vancouver Lake was “dying” and would require action in order to be revitalized. Three proposals were offered to revitalize the lake and make it useable for recreational activities:

1. Reduce septic tank inflow;
2. Introduce additional water to the lake from a fresh source, and/or
3. Dredge the lake to remove the sediments and provide easier tidal flow.

Based on this investigation, the Port of Vancouver contracted Stevens, Thompson, and Runyan, Inc. (STR; an engineering/planning company) to conduct an investigation into the feasibility of conducting the flushing channel. STR determined that the introduction of water from a fresh water source into the lake would reduce the rate of nutrient buildup. Additionally, STR determined that dredging the lake was essential for the removal of the sediments which were supporting the unhealthy algae blooms (STR 1973). The lake was dredged during the construction of the Flushing Channel. The Flushing Channel was completed in 1983 (VLWP 2008).

In 1984, a fish monitoring program was implemented due to concern that migrating salmonid species would travel up the flushing channel and enter Vancouver Lake where they would become disoriented and incur increased mortality from predation or adverse water quality or both (Envirosphere 1985). As this was a baseline study, no conclusions were drawn from the numbers of fish caught.

In 1995, Ecology conducted fish tissue sampling at Vancouver Lake. During this investigation, three species of edible fish were sampled from Vancouver Lake and the Lake River. Results of the sampling event indicated that total polychlorinated biphenyls (PCBs) exceeded the National Toxics Rule (NTR) human health criteria and recommended Vancouver Lake for placement on the 303(d) listing of contaminated water bodies. (Ecology 1995)

A warm water fish survey was conducted by the Washington State Department of Fish and Wildlife Fish Program in 1998. The purpose of the survey was to determine the types and frequency of fish species in Vancouver Lake. During the survey the species were encountered included: brown bullhead, channel catfish, white crappie, black crappie, largemouth bass, bluegill, pumpkinseed, yellow perch, goldfish, common carp, northern pike-minnow, American shad, mosquito fish, largescale sucker, sculpin, starry flounder, and white sturgeon. No conclusions were reached based on this report. (WDFW 2000)

In 2003, core sediment samples were collected from the Flushing Channel by Hart Crowser, Inc. The samples were collected to characterize sediments proposed for dredging in the channel. The results of the sediment samples indicated that the material could be used as clean fill. (Hart Crowser 2003).

In 2002, Ecology conducted a fish tissue sampling event from eight Washington State water bodies. Large mouth bass were sampled from Vancouver Lake. The sample results indicated the presence of PCBs at concentrations that exceeded NTR criteria and mercury at concentrations that exceeded the EPA screening value for subsistence fisheries. The study recommended that Vancouver Lake be placed on the state's 303(d) list for PCBs in largemouth bass. (Ecology 2004)

Fish tissue sampling was again conducted in Vancouver Lake, Lake River, and Burnt Bridge Creek in December 2005. During this investigation, three

composite samples from five fish each from Vancouver Lake and the Lake River were collected. The samples were analyzed PCBs by EPA Method 8081/8082 and dioxins/furans by EPA Method 1613b. Five sediment samples from the Lake, the flushing channel, Lake River, and Burnt Bridge Creek were collected. The samples were analyzed for PCBs by EPA Method 8081/8082. Again, the sample results indicated the presence of PCBs and dioxins that exceeded the NTR criteria. Based on the results of this study, a surface water quality study for PCBs and chlorinated pesticides of Vancouver Lake, the flushing channel, Burnt Bridge Creek, and the Lake River was recommended. As of the date of this report, this additional investigation has not been conducted. (Ecology 2007)

Finally, in November 2007, the citizens group The Columbia Riverkeeper, collected clam samples from the flushing channel. The sample was analyzed for PCBs by EPA Method 8082. The results of the sample indicated the presence of Aroclor 1248 and Aroclor 1254 at concentrations that exceeded screening criteria. A report for this study is pending. (Bertish 2008)

2.6 START Site Visit

A site visit was conducted on March 3, 2008. The site visit was conducted by the EPA Task Monitor and two START personnel. Accompanying the EPA and the START was a member of the Rosemere Neighborhood Association, Mr. Dvija Bertish. Mr. Bertish escorted the EPA and the START to the flushing channel and described where clam harvesting was occurring and discussing the flow of the channel. Mr. Bertish also accompanied the EPA and the START to a popular swimming and fishing location. Finally, Mr. Bertish accompanied the EPA and the START to an area near the confluence of Vancouver Lake and the Lake River. Photographic documentation of the site visit is presented in Attachment A.



VANCOUVER LAKE & FLUSHING CHANNEL
PRELIMINARY ASSESSMENT

 Vancouver, Washington

FIGURE 2-1 Site Map	
Job Id: 002233.0272.01SA	
Date: 3/27/2008	GIS Analyst: amm
Map Source Information: 2006 Digital Globe	

\\START 3\Vancouver Lake\GIS\Figure2-1\SiteMap.mxd

3

Surface Water Migration Pathway

3.1 Surface Water Migration Pathway

The surface water migration pathway target distance limit (TDL) begins at the most upstream probable point of entry (PPE) of surface water runoff from the site to a surface water body to the most downstream PPE and extends downstream for 15 miles. Figure 3-1 depicts the surface water TDL. Three PPEs are present at the site. PPE 1 is the confluence of Vancouver Lake and the Flushing Channel, PPE 2 is the confluence of Vancouver Lake and Buckmire Slough, and PPE 3 is the confluence of Vancouver Lake and the Lake River. PPE 1 extends 0.89 mile in the flushing channel to the confluence with the Columbia River then flows 14.11 miles on the Columbia River. PPE 2 extends 6.06 mile on Buckmire Slough to the confluence with the Columbia River then flows 8.94 miles on the Columbia River. Finally, PPE 3 extends 10.76 miles on Lake River to the confluence with the Columbia River, and then flows 4.24 miles on the Columbia River. The distance from the confluence of the flushing channel with the Columbia River to the conclusion of the most downstream TDL (associated with PPE3) is 18.03 miles.

The flow rates of Buckmire Slough and the Lake River are not documented. The START estimates the flow of Buckmire Slough to be from 10 to 100 cubic feet per second (cfs). Based on visual observation during the site visit, the START estimates the flow of the Lake River to be greater than 100 to 1,000 cfs. The average annual flow rate of the Flushing Channel is 101.2 cfs. The Columbia River has a documented average annual flow rate of 201,800 cfs (USGS 2007). The Columbia River is subject to tidal influence in the area of the site. This influence is strong enough to affect flow direction to force water from the Columbia River into Lake River and the Flushing Channel.

Soils at the site consist of Sauvie silt loam, 0 to 3 percent slopes and Sauvie silt loam, 3 to 8 percent slopes. These soils are on the broad tops of old natural levees on the bottom lands along the Columbia River, and in many of the depressional areas. The soils are moderately well drained, and surface runoff is very slow, and the hazard of erosion is slight. (USDA 1972)

The 2-year 24-hour rainfall event is 2.5 inches (NOAA 1973). The average annual perception 39.36 inches (WRCC 2008). This site is located in a 100 year floodplain (FEMA 1986).

3.1.1 Drinking Water Targets

No surface water intakes are present within the TDL. The Columbia River is a major water recreation area.

3.1.2 Human Food Chain Targets

Subsistence, sport, and commercial fishing are known to occur within the TDL. Asian bivalve clams are collected for consumption at the confluence of the Flushing Channel to the Columbia River (Bertish 2008). The amount of harvested shellfish is unknown; therefore, the START assumes greater than 0 to 100 pounds of clams are harvested annually.

The most current sport catch data is from 2000 to 2001 (WDFW 2005). The sample area within the TDL for sport catch is the Bonneville Dam to the Pacific Ocean. Approximately 4.26% of the reporting zone is within the TDL. A total of 27,176.69 pounds of fish are caught within the TDL (WDFW 2005; Wydoski and Whitney 2003). Sport catch data is presented in Table 3-1.

Commercial catch data for 2007 is reported for the lower Columbia River zone. Approximately 4.26% of the reporting zone is in the TDL. The total commercial fish catch for this zone is 2,258,624 pounds, based on this percentage the commercial catch within the site's TDL is 96,217.38 pounds of fish (ODFW 2007). Commercial catch data is presented in Table 3-2.

3.1.4 Environmental Targets

The Federal-listed threatened Lower Columbia River Evolutionarily Significant Unit (ESU) Chum Salmon (*Oncorhynchus keta*), Lower Columbia River ESU Coho Salmon (*Oncorhynchus kitsutch*), Lower Columbia River ESU Chinook Salmon (*Oncorhynchus tshawytscha*), the Lower Columbia River ESU steelhead trout (*Oncorhynchus mykiss*), and the Stellar Sea Lion (*Eumetopias jubatus*) are known to be present on the Columbia River within the TDL (Rymer 2008). The Columbia River has been designated as critical habitat for the Chinook salmon, the Chum salmon, and the steelhead trout (NOAA 2008). The State-listed threatened Sandhill crane (*Grus canadensis*) and the Bald eagle (*Haliaeetus leucocephalus*) are known to occur within the nearby State-designated Wildlife Refuges. The State-designated Wildlife Refuges, Shillapoo State Wildlife Area and Vancouver Lake Wildlife Area are located on Vancouver Lake and Lake River within the TDL (WDFW 2008).

A total of 24.04 miles of wetland frontage are present along the TDL. Wetlands frontage by water body are as follows: Vancouver Lake approximately 11.03 miles, Flushing Channel approximately 0.06 miles, Buckmire Slough approximately 2.53 miles, Lake River approximately 3.76 miles, and the Columbia River approximately 6.66 miles along the 15 mile TDL.

3. Migration/Exposure Pathways

Table 3-1 Sport Catch Data

Species	Number Harvested	Average Pound per Fish	Pounds Harvested
Sport Catch			
Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	17,160 * 4.26% = 731.02	22	16,082.35
Coho salmon (<i>Oncorhynchus kisutch</i>)	2,501 * 4.26% = 106.54	10	1,065.43
White Sturgeon (<i>Acipenser transmontanus</i>)	2,934 * 4.26% = 124.99	67 ^a	8,374.22
Steelhead trout (<i>Oncorhynchus mykiss</i>)	5,179 * 4.26% = 220.63	7.5	1,654.69
Total			27,176.69

Source: Coast Angler 2008, Wydoski 2003, WDFW 2005.

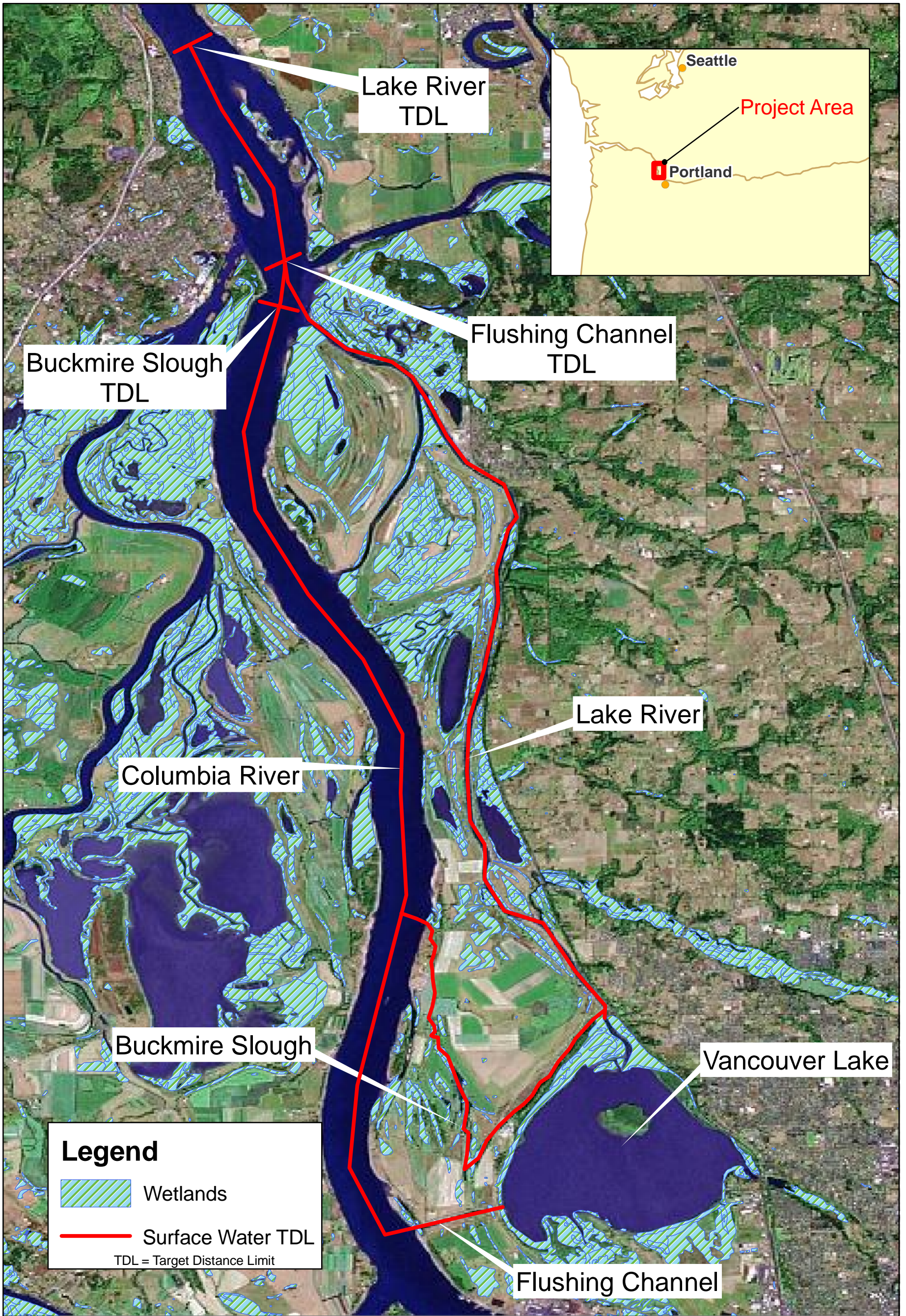
^a Average weight of Sturgeon is calculated assuming an average catch length of 5'1".

Table 3-2 Commercial Catch

Species	Pounds Harvested	Percentage of Zone in TDL	Pounds Harvested within TDL
Commercial Harvest			
Coho salmon (<i>Oncorhynchus kisutch</i>)	832,217	4.26%	35,452.44
White Sturgeon (<i>Acipenser transmontanus</i>)	407,973	4.26%	17,379.65
Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	925,958	4.26%	39,445.81
Chum salmon (<i>Oncorhynchis keta</i>)	500	4.26%	21.30
Shad (<i>Alosa sapidissima</i>)	76,278	4.26%	3,249.44
Smelt (<i>Spirinchus thaleichthys</i>)	15,698	4.26%	668.73
Total			96,217.38

Source: Coast Angler 2008, WDFW 2005, ODFW 2007.

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3-5

	<p align="center">VANCOUVER LAKE AND FLUSHING CHANNEL PRELIMINARY ASSESSMENT</p>	<p align="center">FIGURE 3-1 Surface Water TDL and Wetlands Map</p>	
<p>0 0.5 1 2 Miles</p>		<p>Map Reference: MDA EarthSat</p>	
	<p align="center">Vancouver, Washington</p>	<p>Job Number: 002233.0272.01SA</p> <p>File Location: R:\3START3\Vancouver Lake</p>	<p>Date: 4/16/2008</p> <p>Prepared by: amm</p>

4

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A

Photographic Documentation

VANCOUVER LAKE AND FLUSHING CHANNEL
Vancouver, Washington

TDD Number: 07-11-0004
Photographed by: Bryce Robbert



Photo 1 Confluence of Columbia River and Flushing Channel.

Direction: Southeast Date: 3/3/2008 Time: 15:37



Photo 2 Flushing Channel.

Direction: North Date: 3/3/2008 Time: 15:38



Photo 3 Columbia/Willamette River.

Direction: East Date: 3/3/2008 Time: 15:41



Photo 4 Flushing Channel.

Direction: Northeast Date: 3/3/2008 Time: 15:53

VANCOUVER LAKE AND FLUSHING CHANNEL
Vancouver, Washington

TDD Number: 07-11-0004
Photographed by: Bryce Robbert



Photo 5 Water flushing into Vancouver Lake.

Direction: North-Northeast Date: 3/3/2008 Time: 15:59



Photo 6 Flushing Channel inlet.

Direction: Down Date: 3/3/2008 Time: 16:11



Photo 7 Pipe of unknown use.

Direction: Southeast *Date: 3/3/2008* *Time: 16:11*



Photo 8 Burnt Bridge Creek.

Direction: Northeast *Date: 3/3/2008* *Time: 16:12*



Photo 9 Wetland west of swimming area.

Direction: West *Date: 3/3/2008* *Time: 16:29*

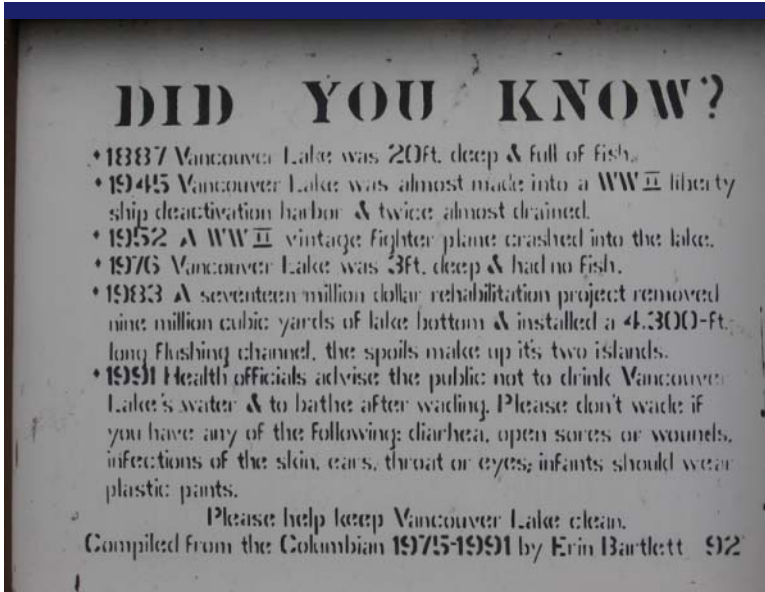


Photo 10 Vancouver Park sign.

Direction: North

Date: 3/3/2008

Time: 16:34



Photo 12 Fallen moorage on Lake River.

Direction: East

Date: 3/3/2008

Time: 17:38



Photo 11 Vancouver Park sign.

Direction: North

Date: 3/3/2008

Time: 16:34



Photo 13 Lake River.

Direction: South

Date: 3/3/2008

Time: 17:39



Photo 14 House boats on Lake River.

Direction: North

Date: 3/3/2008

Time: 17:40