

# Chehalis River Basin

## Comprehensive Flood Hazard Management Plan

June 2010

Prepared for:  
Chehalis River Basin Flood Authority





## **ACRONYMS**

AF	acre feet
BA	Biological Assessment
BE	Biological Evaluation
BMC	Bucoda Municipal Code
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFHMP	Comprehensive Flood Hazard Management Plan
CFR	Code of Federal Regulations
CFRP	Centralia Flood Reduction Project
cfs	cubic feet per second
CMC	Chehalis Municipal Code
COE	U.S. Army Corps of Engineers
Corps	U.S. Army Corps of Engineers
CMZ	Channel Migration Zone
CRS	Community Rating System
CTED	Community, Trade, and Economic Development
CWA	Clean Water Act
CWPO	Closed Without Payment
DOE	Department of Ecology
DST	Decision Support Tool
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ER	Emergency Response
ESA	Endangered Species Act
ESSB	Engrossed Substitute Senate Bill
FCAAP	Flood Control Assistance Account Program
FEMA	Federal Emergency Management Association
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIA	Federal Insurance Administration
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistant grant program
FONSI	Finding of No Significant Impact
GI	General Investigation
GIS	Geographic Information System
GMA	Growth Management Act
GO	General Obligation
HEC-RAS	Hydrologic Engineering Centers River Analysis System
HHS	Human Health & Safety
HPA	Hydraulic Project Approval
LCC	Lewis County Code

LID	local improvement district
LiDAR	Light Detection and Ranging
LLC	Limited Liability Company
LWD	large woody debris
MI	Major Infrastructure
NEPA	National Environmental Policy Act
NF	North Fork
NFIP	National Flood Insurance Program
<b>nhc</b>	Northwest Hydraulics Consultants
NHMP	Natural Hazards Mitigation Plan
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NSIP	National Streamflow Information Program
NWS	National Weather Service
O&M	operation and maintenance
OHWM	ordinary high water mark
OMC	Oakville Municipal Code
PCB	polychlorinated biphenyl
PL	Public Law
PUD	Lewis County Public Utility District
RCW	Revised Code of Washington
RM	River Mile
SaSI	Salmonid Stock Inventory
SBA	Small Business Administration
SEPA	State Environmental Policy Act
SFHA	Special Flood Hazard Area
SMA	Shoreline Management Act
SMP	Shoreline Master Program
SR	State Route
SRF	State Revolving Fund
TCC	Thurston County Code
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFSW	U.S. Fish and Wildlife Services
USGS	United States Geological Survey
WDFW	Washington Department of Fish and Wildlife
WRDA	Water Resources Development Act
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation
WWTP	Wastewater Treatment Plant

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## **CHAPTER 1 INTRODUCTION AND GOALS**

### **Background**

The Chehalis River Basin Flood Authority (Flood Authority) has prepared this Comprehensive Flood Hazard Management Plan (CFHMP) for the Chehalis River basin to define flood problems in the basin and to propose solutions for those problems. The CFHMP will remain a work in progress and will be revised as the Flood Authority or a Flood District in the future continues to develop solutions to flooding problems.

### ***Major Flooding Issues in the Basin***

Flooding is a common, historical occurrence in the Chehalis River basin. Major flood events on the Chehalis River have affected Lewis, Thurston, and Grays Harbor Counties in the years 1972, 1975, 1986, 1990, 1996, 2007, and 2009. Flooding has caused millions of dollars of flood damage and the disruption of lives and commerce. Flooding closed Interstate 5 through Chehalis and Centralia for multiple days during the 1996, 2007, and 2009 floods.

### ***Authority and Scope for the Chehalis River Basin CFHMP***

The Flood Authority was formed in response to the 2007 flooding event throughout Lewis, Grays Harbor, and Thurston Counties and on the Chehalis Reservation. The Flood Authority was formed by an Interlocal Agreement between 11 jurisdictions in the river basin in April 2008, to evaluate flooding issues throughout the basin. Through House Bills 3374 and 3375, the Legislature appropriated \$2.5 million for the Flood Authority to develop or participate in the development of flood hazard mitigation measures throughout the basin. The House Bills appropriated an additional \$47.5 million in state general obligation bonds to the Office of Financial Management, working with and through other state agencies, the Flood Authority, and other local governments, to participate in flood hazard mitigation projects for the Chehalis River basin.

The Flood Authority consists of 11 jurisdictions: Grays Harbor, Lewis, and Thurston Counties; the Confederated Tribes of the Chehalis Reservation; the cities of Aberdeen, Centralia, Chehalis, Montesano, and Oakville; and the towns of Bucoda and Pe Ell.

The purpose of the Flood Authority, according to the Interlocal Agreement, is to develop and participate in the development of flood hazard mitigation measures throughout the basin, and provide a formal and organized process to ensure:

- That flood control projects are identified and implemented that address the flood problems in the basin;
- That good public policy supports environmentally sensitive responses to protect communities and their residents from flooding, if the responses provide benefits which exceed costs, including costs associated with a no action response;
- That state and federal funding sources are well-informed of Basin Government options and needs;

- That the design for basin flood control projects incorporates options, features and betterments that may benefit the basin communities and the basin governments; and
- That the Flood Authority will oversee moving current and future Chehalis River basin flood reduction projects forward until such time as a Flood Control District is formed and adopted by the stakeholders' legislative authorities.

The Flood Authority also agreed to the following goals in the Interlocal Agreement:

- To create a Basin Flood Control District as soon as is practicable.
- To inform state and federal funding sources of project options and the needs of the basin communities.
- To work with the State of Washington to develop appropriate policy for a basin-wide flood control project.
- To seek adequate funding for the Basin Governments to identify, study and permit projects for localized problems.
- To disseminate information to residents about options and alternatives.
- To coordinate flood control activities, actions and responses.

The Flood Authority decided in November 2008 to develop a basin-wide CFHMP as a means to document flood conditions in the basin and to identify projects for funding in the future.

## **Plan Development Process**

The Flood Authority began preparing the CFHMP in January 2009. Existing CFHMPs for basin jurisdictions formed the basis for the CFHMP. The Flood Authority also conducted a monthly series of work sessions from January through June 2009 to develop the plan.

This CFHMP follows the guidelines of the State of Washington Flood Control Assistance Account Program (FCAAP) and the Federal Emergency Management Agency's Community Rating System (CRS).

### ***Summary of Public Involvement and Agency Coordination***

The Flood Authority held two public workshops in February 2009, one in Chehalis on February 11 and one in Montesano on February 12. Approximately 200 people attended the workshop in Chehalis and approximately 40 people attended in Montesano. At the workshops, the Flood Authority introduced the planning process to members of the public then asked for feedback specifically on goals, flood problem areas, and recommended actions.

In March 2009, the Flood Authority commissioned Stuart Elway of Elway Research to perform a public values telephone survey of basin residents. The Flood Authority used the results of the survey to revise its goals at its work session on April 2, 2009.

In April 2010, the Flood Authority held three public workshops on the Draft CFHMP. The workshops were in Rochester on April 5, Montesano on April 6, and Chehalis on April 7. Approximately 25 citizens attended the meeting in Rochester, 25 in Montesano, and 50 in Chehalis. The Flood Authority presented a summary of the Draft CFHMP and then requested comments on it for inclusion in this revision of the CFHMP. The majority of comments related to the two major projects the Flood Authority has been involved with—the Corps of Engineers Twin Cities Project and the Lewis County Public Utility District’s upstream storage study. All of the comments from the meetings and those submitted after the meetings are included as Appendix A of this document.

Several comments were relevant to specific sections of the CFHMP and have been incorporated as revisions. Those include:

- A “Next Steps” section has been added to Chapter 1 describing how the Flood Authority will approve the CFHMP and recommendations for local jurisdictions’ adoption of the CFHMP, including suggestions for compliance with the State Environmental Policy Act (SEPA).
- Updated information on the 2007 and 2009 floods was added to Chapter 5.
- Additional project suggestions were added to Chapter 9, Table 9-1.

## **Defining Goals**

The Flood Authority began its CFHMP process with a workshop on goals held on January 15, 2009. For the purpose of the workshop, the Flood Authority agreed to the following definitions of “goal,” “objective,” and “task”:

- **Goal** – A statement that provides clear direction and purpose but may not be fully attainable
- **Objective** – A product or effort that moves toward the goal, is attainable and is measurable, and has various discrete products
- **Task** – A discrete product or effort that is possible, measurable, and contributes to the objective

At the January 15 workshop, the Flood Authority agreed upon eight initial goals. After the workshop, the Board Advisory Committee further developed the language of the goals. In February 2009 the Flood Authority conducted public workshops to gather citizen feedback on goals. In March 2009 the Flood Authority conducted a public values telephone survey. The Flood Authority held a goal revision workshop on April 2, 2009, to reconsider its goals in light of public feedback from the public workshops and the survey. The Flood Authority agreed to revise one existing goal and add a new goal.

The nine goals adopted by the Flood Authority are:

- Protect life and property basin-wide, including tributaries, by developing a mix of strategies that reduce flood damage.
- Promote the wise use of public and private resources.
- Enhance understanding of the hydrologic processes in the Chehalis River system.

- Ensure that land use plans and regulations protect floodplain functions.
- Ensure that flood reduction strategies protect, or enhance, the basin’s natural resources.
- Increase public awareness and understanding of flooding.
- Assure that there are mechanisms in place to implement the recommendations in this plan.
- Protect the communities’ interest in growth and economic sustainability.
- Protect property rights.

## **Related Plans**

This CFHMP is based on existing CFHMPs developed by jurisdictions within the Chehalis River basin. Table 1-1 lists the existing CFHMPs that were used.

**Table 1-1. Existing Comprehensive Flood Hazard Management Plans**

<b>Jurisdiction</b>	<b>Title</b>	<b>Year</b>	<b>Notes</b>
Bucoda	Town of Bucoda Comprehensive Flood Hazard Management Plan	2009	Plan prepared as an “Annex” to the Thurston County plan.
Centralia	City of Centralia Comprehensive Flood Management and Natural Hazards Mitigation Plan	2008	Flooding issues are the same as presented in the Lewis County CFHMP.
Chehalis Tribe	Comprehensive Flood Hazard Management Plan for Confederated Tribes of the Chehalis Reservation	2009	
Montesano	All Hazard Mitigation Plan Addendum 2	2007	Addendum to Natural Hazards Mitigation Plan for the Grays Harbor Region
Lewis County	Lewis County Comprehensive Flood Hazard Management Plan	2008	
Grays Harbor County	Grays Harbor County Comprehensive Flood Hazard Management Plan	2001	
Thurston County	Natural Hazards Mitigation Plan for the Thurston Region	2009	

## **Next Steps**

### ***CFHMP Adoption***

The Flood Authority will approve the CFHMP at its June 2010 meeting. Adoption of a CFHMP is an important step in the process of establishing a Flood District. Member jurisdictions, especially the three member counties, need to adopt the CFHMP before a Flood District can be formed. Therefore, the Flood Authority recommends that individual member jurisdictions adopt this CFHMP as part of their individual CFHMPs.

There are a number of ways this CFHMP could be adopted by jurisdictions. It could be adopted in place of an existing individual CFHMP. This would be appropriate if the existing CFHMP is old and contains little detail about proposed projects. This CFHMP could also be adopted as an amendment or addendum to an existing individual CFHMP. This would be appropriate if the jurisdiction's CFHMP has been recently revised. Adoption of this CFHMP should be conducted in accordance with local jurisdictions' regulations.

### ***SEPA Review***

The adoption of a comprehensive plan, such as a CFHMP, requires review under SEPA as a non-project action (WAC 197-11-704(2)(b)). Because the Flood Authority is not adopting this CFHMP, but only approving it for adoption by member jurisdictions and because the Flood Authority is not a SEPA responsible agency, it has not conducted a SEPA review. Therefore, individual jurisdictions will be required to conduct SEPA review as part of the adoption process. Preparation of a SEPA Checklist, including Part D, Supplemental Sheet for Nonproject Activities, and the preparation of a Determination of Nonsignificance would be the most appropriate form of SEPA review. The SEPA review should be conducted in accordance with local jurisdictions' regulations. No specific actions are recommended in this CFHMP. Any project selected for action in the future would require additional environmental review under SEPA and/or the National Environmental Policy Act (NEPA).



## **CHAPTER 2 STUDY AREA CHARACTERISTICS**

The study area for the Draft Comprehensive Flood Hazard Management Plan (CFHMP) includes the entire Chehalis River basin (Figure 2-1). The basin is located in western Washington, mostly in Grays Harbor, Lewis, and Thurston Counties. Small portions of the basin are located in Cowlitz, Jefferson, Mason, Pacific, and Wahkiakum Counties. The headwaters of the Chehalis River are in the southwest corner of the basin. The river flows generally north-northwest, discharging into the Pacific Ocean through Grays Harbor.

This chapter provides a general description of the physical, land use, and population characteristics of the Chehalis River basin.

### **Study Area Description**

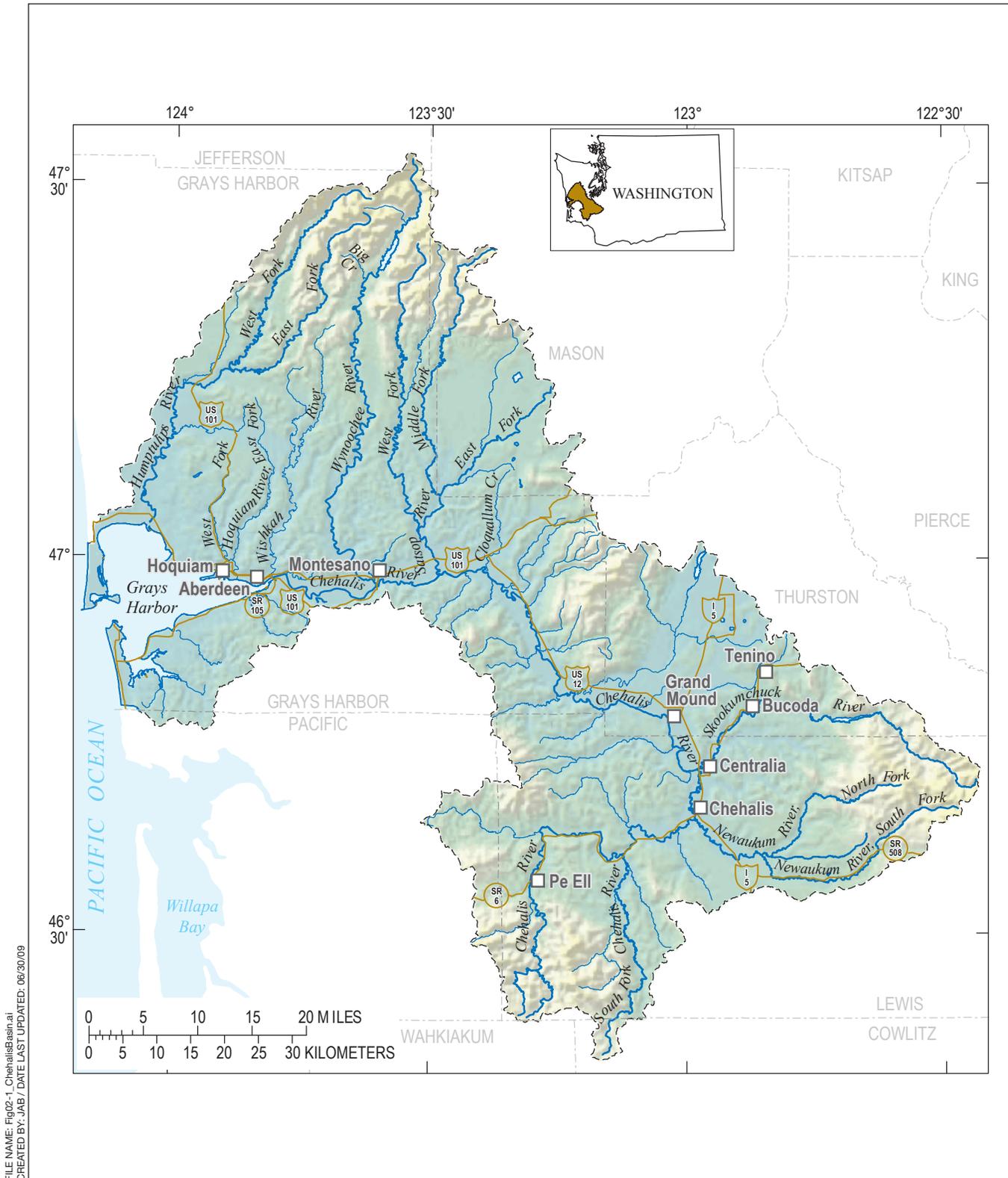
The mainstem Chehalis River and its tributaries form the Chehalis River basin, which drains approximately 2,700 square miles. The basin is bounded by the Pacific Ocean to the west, the Deschutes River basin to the east, the Olympic Mountains to the north, and the Willapa Hills and Cowlitz River basin to the south. Elevations within the basin range from sea level at Grays Harbor to over 3,000 feet in the Coast Range.

Four population centers are located within the basin—Chehalis, Centralia, Aberdeen, and Hoquiam. The Confederated Tribes of the Chehalis Reservation is located within the basin. In the year 2000, total population in the Chehalis River basin was approximately 141,000 (U.S. Census, 2000). The river is paralleled by major transportation routes including State Route (SR) 6 from Pe Ell to Chehalis, Interstate 5 from Chehalis to north of Centralia, Highway 12 from Interstate 5 to near Elma, and U.S. Highway 101 from Elma to the river mouth.

The Chehalis River basin is the second largest basin by area in Washington, next to the Columbia River basin. The basin is divided into two Water Resource Inventory Areas (WRIAs). WRIA 22 contains the upper Chehalis basin upstream from the town of Porter. The lower Chehalis basin is located in WRIA 23 and is downstream from the town of Porter. In 2004, the Chehalis Basin Partnership completed a Watershed Management Plan for the basin under the authority of the state Watershed Management Act (RCW 90.82) (Chehalis Basin Partnership, 2004). That plan and its supporting documents provided much of the information used in this chapter.

Forest and shrub cover dominate the Chehalis River basin. Other land use includes agriculture, urban and industrial uses. The Chehalis River basin contains 180 lakes, ponds, and reservoirs and covers approximately 3,350 linear stream miles. A variety of fish and wildlife species are supported by streams, lakes, ponds, and reservoirs in the basin (Envirovision, 2000).





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SOURCE: USGS, 2008; ESRI, 2008; National Weather Service (NWS), 2008; WA Dept. of Ecology, 2000; WDNR, 2008.

Chehalis River Basin Facilitation . 208379

**Figure 2-1**  
 Chehalis River Basin  
 Washington



The Chehalis River flows for approximately 125 miles north-northwest through the Chehalis River basin and discharges into the Grays Harbor Estuary. The river originates in the Coast range in the southwest corner of the basin and flows east to Chehalis, north to Grand Mound, and west to its mouth. Several tributaries drain into the Chehalis River in the study area. The main tributary rivers starting upstream are the Newaukum River, Skookumchuck River, Black River, Satsop River, Wishkah River, and Wynoochee River. In addition, the Hoquiam and Humptulips Rivers flow directly into Grays Harbor. A number of creeks also contribute to the Chehalis River. The major creeks include Salzer Creek, Dillenbaugh Creek, China Creek, Scatter Creek, Porter Creek, and Cloquallum Creek.

## **Physical Characteristics**

### ***Climate***

The climate in the Chehalis River basin is temperate throughout the year, with wet winter and dry summer months. Most precipitation occurs in the fall and winter when frequent passage of low pressure systems pass through the area (Lewis County, 2008). High pressure systems dominate the area in warmer months which have significantly less rainfall. In addition to seasonal fluctuations, climate in the Chehalis basin is influenced by mountain range and proximity to the Pacific Ocean. Temperatures are more moderate near the coast than in the interior and more precipitation occurs on the windward side of mountain ranges.

The majority of precipitation within the basin falls as rain. The surrounding mountain ranges receive snow accumulation during winter months, although snow generally does not accumulate for long periods. Most precipitation accumulates between the months of October and May. Peak river discharges generally occur between December and March. The highest precipitation in the basin is received in the headwaters of the Wynoochee River in the Olympic Mountains with an annual average of 220 inches.

Table 2-1 summarizes temperature and precipitation averages for Aberdeen near the coast and Centralia in the interior.

**Table 2-1. Precipitation and Temperature Recordings for Aberdeen and Centralia**

	<b>January Temperature Range</b>	<b>July Temperature Range</b>	<b>October to March Precipitation Range</b>	<b>July Average Precipitation</b>	<b>Annual Precipitation</b>
Aberdeen	35-46°	52-69°	5- 8 inches	1.35 inches	83.7 inches
Centralia	35-47°	54-79°	7-13 inches	0.8 inches	47.4 inches

Source: CityTownInfo.com, 2010

The warmest temperatures in the basin occur during July and the coldest during January. The average frost-free period ranges from 163 days to more than 190 days (Envirovision, 2000).

## **Geology**

The Chehalis Basin has several distinct geologic regions with unique geologic history. For example, the headwaters arise out of the Willapa Hills, which are primarily comprised of marine volcanic and sedimentary rocks, while some other regions are primarily glacially influenced (Envirovision, 2000). Much of the basin is underlain by old ocean floor that was dragged up when the Olympic Mountains were uplifted. The hills and valleys were carved into these slabs of oceanic rock by erosion, resulting in low rounded hills and ravines. At the end of the ice ages, meltwater from the Puget Sound glaciers flowed down the Black River and lower Chehalis River. After the ice ages ended, sea levels rose by several hundred feet and flooded the mouth of the Chehalis. This created Grays Harbor, and caused the river valleys to fill in with sediment.

The complex geologic history of the Chehalis River basin dictates to a large degree the distribution, quantity, and movement of groundwater. Primary geologic units include bedrock of volcanic and sedimentary origin, as well as glacial deposits and alluvial material. Volcanic rocks (primarily basalt flows) underlie most of the basin, but have been overlain by sedimentary deposits of marine and non-marine origin or glacial material. Near surface volcanic deposits dominate the Black Hills west of the Black River, as well as the southern Olympic Mountains. Scattered volcanics occur throughout the remainder of the Chehalis River basin.

Sedimentary rocks include those of the Eocene/Oligocene epoch (55 to 24 million years ago) and younger rocks of the Miocene epoch (24 to 5 million years ago). The older sedimentary rocks dominate the Lincoln Creek and South Fork Chehalis basins, in addition to terraces along the mainstem Chehalis River. The younger rocks are found primarily between the Satsop and Wynoochee River valleys.

Much of the basin possesses glacial deposits from at least four different glaciations. The Black River/Scatter Creek area is underlain by approximately 100 feet of deposits from the southern terminus of the Vashon stade of the Fraser glaciation (21,000 to 19,000 years ago), which inundated Puget Sound. In addition, alpine glaciers have flowed south from the Olympic Mountains, shaping the surface features of much of the lower Chehalis Basin. Finally, the major river valleys contain significant deposits of alluvial material. This material is often mixed with glacial deposits, forming a complex mosaic of unsorted material (Envirovision, 2000).

## **Topography**

The Chehalis River originates in the Willapa Hills, part of the Coastal Range. Elevations range from below 2,400 feet to 3,110 feet. The mainstem Chehalis River flattens into an open river valley below Pe Ell. The South Fork Chehalis River opens to a low-gradient river valley at the Lewis County/Cowlitz County line.

The middle portion of the Chehalis River meanders through a flat river valley. The west side of the river is used primarily for agricultural purposes. The east side of the river has been developed into the Centralia and Chehalis urban areas. The river channel narrows to approximately 150 feet wide and flows through a channel dominated by pool habitat with occasional riffle habitat. South of Grand Mound, the river flows through the coastal hills, and the river valley separates the Doty and Willapa Hills to the south from the Black Hills located to the north. Elevations range from approximately 100 feet to 2,700 feet at Larch Mountain, the tallest of the Black Hills.

Areas located north of the lower Chehalis River are characterized by open river valley. The south side of the river contains steeply rising hills. A portion of the open river valley to the north transitions into tributary river valleys; other areas transition into sloping hillsides.

### **Soils**

The Chehalis River basin floodplain contains five major soil associations (Table 2-2) (Envirovision, 2000). These soils occur in flat or gently sloping terrain and include the major tributary systems within the basin. In floodplain fringes, cropland, and pasture areas, dominant vegetation includes western red cedar, red alder, black cottonwood, and willow species. Areas of moderate to well-drained soils contain some Douglas-fir trees.

**Table 2-2. Major Soil Groups in the Chehalis River Basin**

<b>Soil Group</b>	<b>Percent Land</b>	<b>Location</b>	<b>Geographic Description</b>
<b>Group A</b>	6	Southern Olympic slope in the northern basin	Steep and very steep well-drained soils
<b>Group B</b>	1	Coast from Grayland-Westport and north beach area; Copalis	Deep sandy, poorly-drained deposits; tidal estuaries
<b>Group C</b>	27	Eastern third of the basin, Chehalis-Centralia urban area	Steep glacial plains and rolling grassy prairie terrain
<b>Group D</b>	19	Chehalis floodplain and major tributaries	Level and gently sloping alluvial soils
<b>Group E</b>	47	Western two-thirds of the basin between Thurston County line and coast	Forested foothills and steep slopes

Source: Envirovision, 2000

### **Hydrology**

#### **Groundwater Hydrology**

Groundwater movement in the Chehalis River basin is determined by the complex geologic formations that shape the basin (Ecology, 1998a). The primary surficial aquifers within the basin are contained in the unconsolidated glacial and alluvial deposits, located in the river valleys and upland prairies. Bedrock formations provide low yields

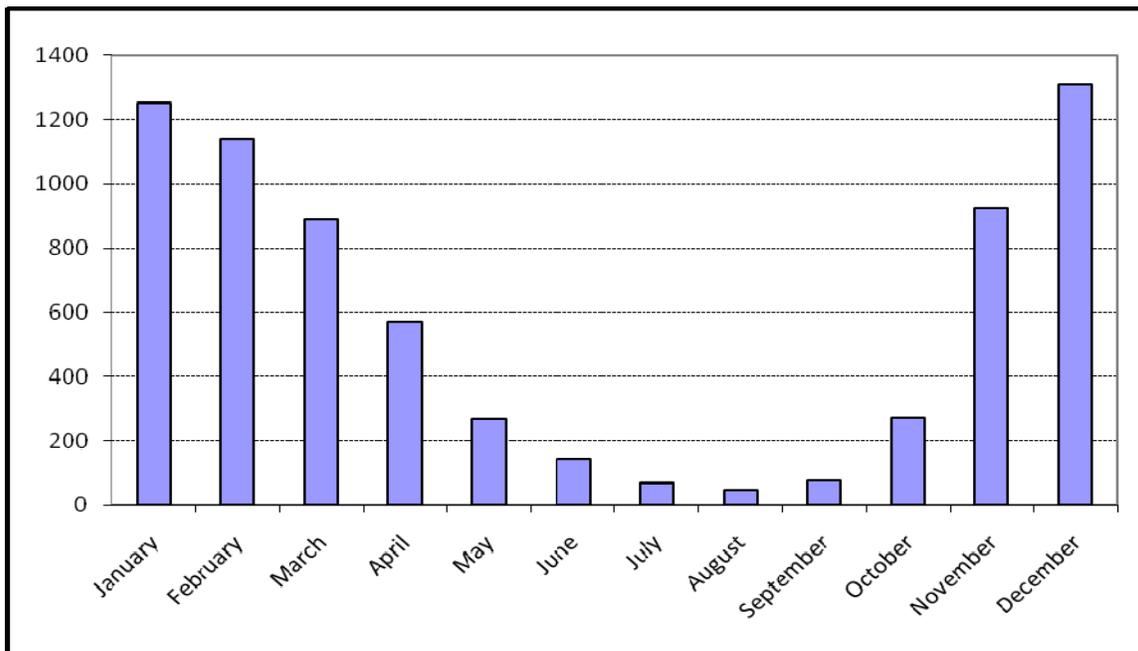
of local groundwater and are not generally associated with surficial aquifers within the basin. Surficial aquifers generally occur between several feet below ground surface and can extend to approximately 100 feet deep. Wells associated with the primary surficial aquifers can generate between 200 gallons and 3,000 gallons per minute. Groundwater flow generally spreads from upland recharge areas along aquifer perimeters toward natural discharge points along streams and tributaries. Groundwater movement also occurs downward in elevation to recharge regional aquifers.

Alluvial aquifers in the tributary system of the Chehalis River are much shallower, with a depth generally occurring within 20 feet of the ground surface (Ecology, 1998a). These aquifers provide a local water source for farms, private residences, and public water systems. Because of the shallow water table and hydraulic connection to other waterbodies, these aquifers are susceptible to groundwater contamination.

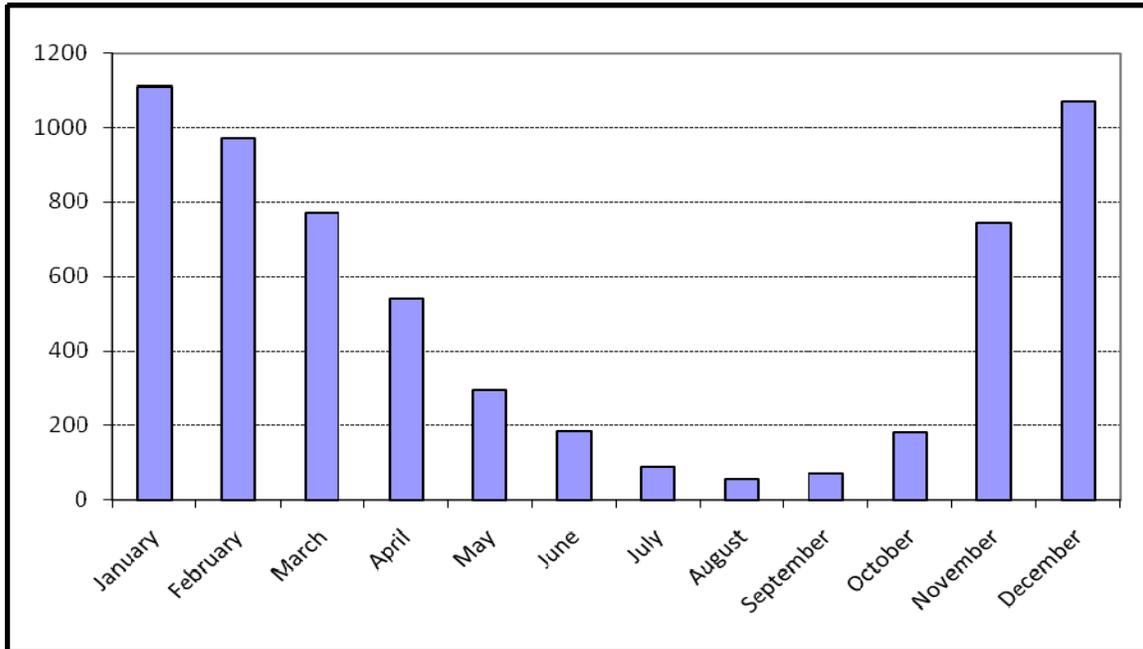
### **Surface Water Hydrology**

Rainfall is a primary water source for the Chehalis River basin. The majority of precipitation in the basin accumulates as rain. The surrounding mountains also receive snow accumulations during winter months. Discharge levels within the basin peak between December and March. Average annual discharge within the basin is approximately 11,210 cfs. Delayed runoff from snowmelt primarily impacts the Wynoochee and Satsop Rivers. Tables 2-3 through 2-7 illustrate average flow patterns at the main gauges on the Chehalis River and on the Newaukum and Skookumchuck Rivers. Flood flows are described in Chapter 5.

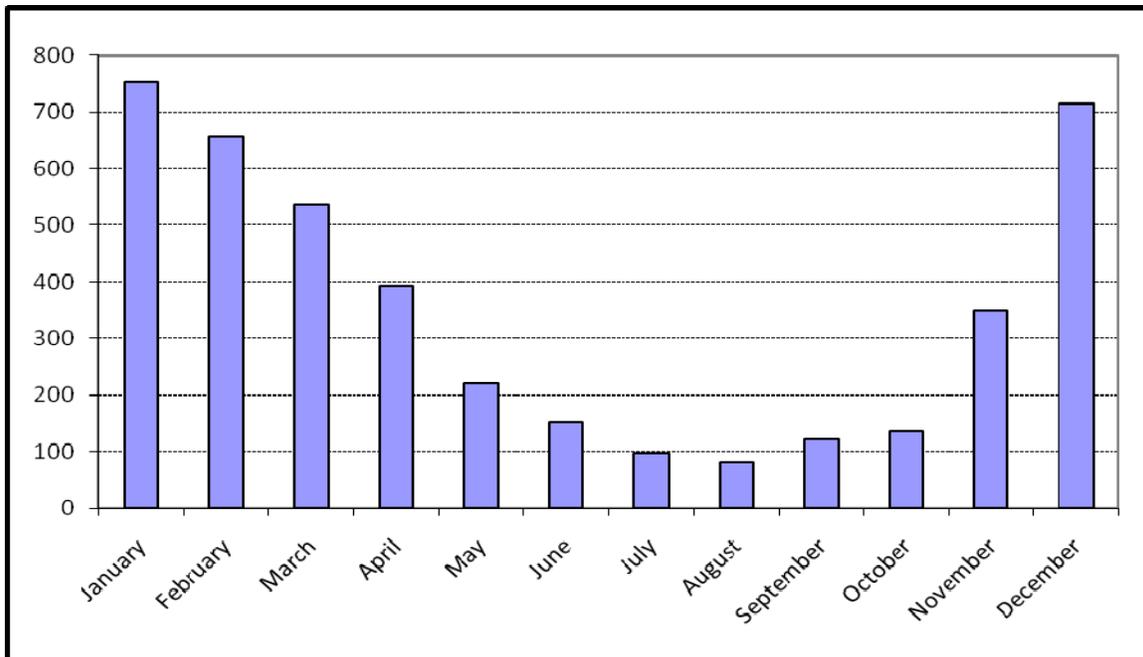
**Table 2-3. Average flow at Chehalis River near Doty, WA (cfs).**



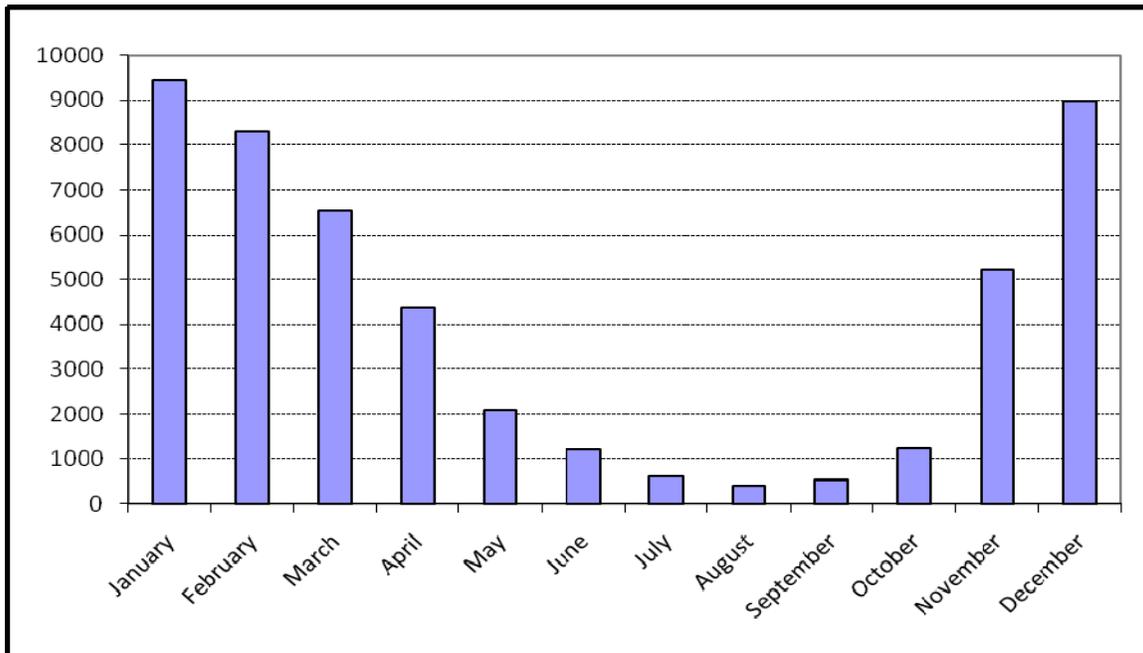
**Table 2-4. Average flow at Newaukum River near Chehalis, WA (cfs).**



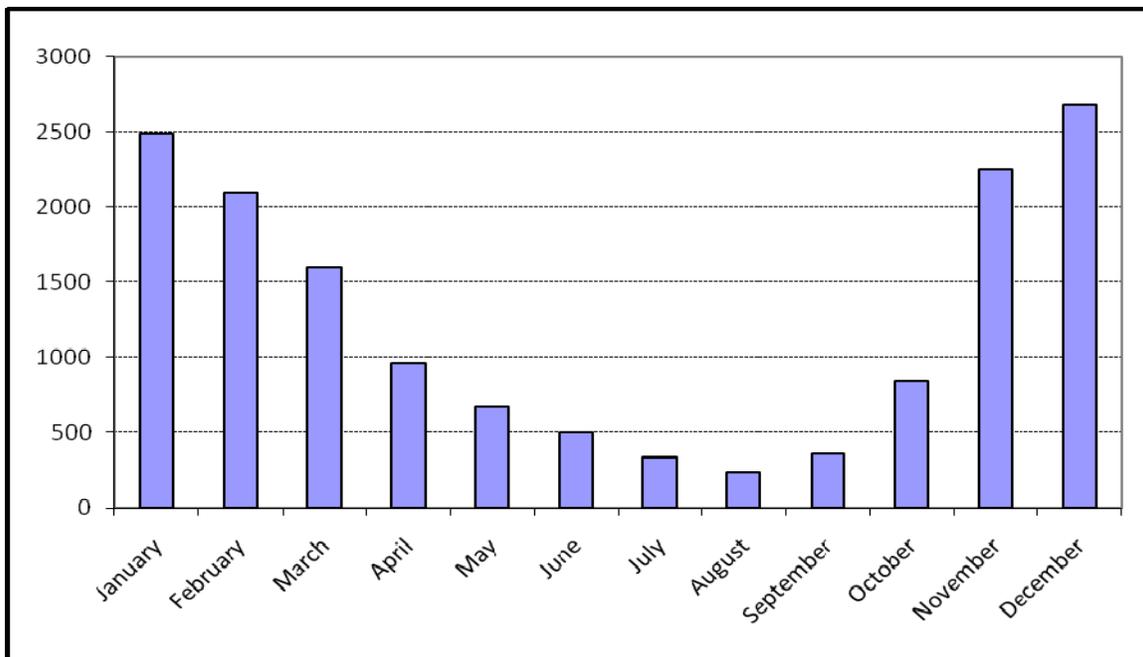
**Table 2-5. Average flow at Skookumchuck River near Bucoda, WA (cfs).**



**Table 2-6. Average flow at Chehalis River at Porter, WA (cfs).**



**Table 2-7. Average flow at Wynooche River above Black Creek near Montesano, WA (cfs).**



Few dams or diversion structures are located in the basin. The only reservoir in the basin with the authorized purpose of flood control is Wynoochee Dam. Diversion structures are located on the Hoquiam and Wishkah Rivers to provide municipal and industrial water to the Hoquiam/Aberdeen area. These structures consistently divert approximately 2.5 cfs from the Hoquiam River and 10 cfs from the Wishkah River. The Wynoochee Dam, located on the Wynoochee River, provides a variety of opportunities for the City of Aberdeen. These include fish and wildlife habitat, irrigation, recreation, flood control, and a municipal and industrial water supply. Wynoochee Lake, which serves as the reservoir for the dam, has a maximum capacity of 70,000 acre-feet. The Skookumchuck Dam is located on the Skookumchuck River, just upstream of Bloody Run Creek, and primarily serves the Centralia Steam Electric Plant, with a maximum discharge of 54 cfs. The reservoir has provided limited flood storage in the past, especially in the 2007 flood. The North Fork of the Newaukum River is dammed to provide up to 7 cfs of municipal and industrial water supply to the nearby cities of Centralia and Chehalis. Several other, small dams are interspersed throughout the basin. These provide local water sources to rural areas.

### **Stream Gauges**

Figure 2-2 illustrates the location of precipitation and stream gauges in the Chehalis River basin. These gauges are managed by a variety of agencies as indicated in Tables 2-8 and 2-9. There are 37 active stream gauges in the Chehalis River basin. The U.S. Geological Survey manages 21 gauges; the National Weather Service manages 2 gauges; and Ecology manages 14 gauges in the basin. Data from all of the gauges managed by the USGS are reported in realtime and included in the USGS Flood Watch system. The National Weather Service reports some data in near realtime at the Newaukum River near Chehalis, the Chehalis River at Centralia, and the Skookumchuck River near Chehalis. All but three of the Ecology gauges are manual staff height gauges and are not appropriate for flood monitoring. The Ecology gauges that provide telemetry data are located at the Black River at Highway 12, Bingham Creek at Hatchery, and Wishkah River near Nisson.







**Table 2-8. Chehalis River Basin Stream Gauges**

<b>Gauge Number</b>	<b>Location</b>	<b>River Mile</b>	<b>Drainage Area (square miles)</b>	<b>Date of Record</b>	<b>Managing/Funding Agency</b>	<b>Notes</b>
12020000	Chehalis River near Doty	101.8	113	1939-present	USGS/Lewis County Public Works Department	Realtime data
12020525	Elk Creek below Deer Creek near Doty	Not available	58	2010-present	USGS/Army Corps of Engineers	Realtime data
12020800	South Fork Chehalis River near Wildwood	16.2	27	1998-present	USGS/Lewis County Public Works Department	Seasonal gage Realtime data
12021800	Chehalis River near Adna	86	340	1998-present	USGS/Lewis County Public Works Department	Seasonal gage Elevation/stage only station Realtime data
12024000	South Fork Newaukum River near Onalaska	22.8	42.4	1944-present	USGS/Lewis County Public Works Department	Seasonal gage Realtime data
12024400	NF Newaukum River above Bear Creek	7.7	29.6	1998-present	USGS/Lewis County Public Works Department	Seasonal gage Realtime data
12025000	Newaukum River near Chehalis	4.1	155	1929-present	USGS/Lewis County Public Works Department	Realtime data
12025100	Chehalis River at WWTP at Chehalis	74.3	618	2000-present	USGS/Lewis County Public Works Department	Realtime data Seasonal gage Elevation/stage only station
12025310	Salzer Creek at Centralia Alpha Road near Centralia	Not available	58	2010-present	USGS/Army Corps of Engineers	Realtime data
12025500	Chehalis River at Centralia	67.5	653	Pre-2000-present	National Weather Service	Realtime data
12025700	Skookumchuck River near Vail	28.8	40.0	1967-present	USGS/Skookumchuck Dam, LLC.	Realtime data
12026150	Skookumchuck River at Bloody Run Creek near Centralia	20.7	65.9	1969-present	USGS/Skookumchuck Dam, LLC.	Realtime data

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Comprehensive Flood Hazard Management Plan*

<b>Gauge Number</b>	<b>Location</b>	<b>River Mile</b>	<b>Drainage Area (square miles)</b>	<b>Date of Record</b>	<b>Managing/Funding Agency</b>	<b>Notes</b>
12026400	Skookumchuck River near Bucoda	6.4	112	1967-present	USGS/Skookumchuck Dam, LLC. and Thurston County	Realtime data
12026600	Skookumchuck River at Centralia	2.5	170	Pre-2000-present	National Weather Service	Realtime data
12027500	Chehalis River near Grand Mound	59.9	895	1928-present	USGS/Ecology	Realtime data
12031000	Chehalis River at Porter	33.3	1,294	1952-present	USGS/Ecology	Realtime data
12035000	Satsop River near Satsop	2.3	299	1929-present	USGS/Ecology and USGS NSIP	Realtime data
12035002	Chehalis River near Satsop	18	1,760	1979-present	USGS/Energy Northwest	Realtime data Stage velocity readings Affected by tides and debris
12035100	Chehalis River near Montesano	13.2	1,780	2001-present	USGS/USGS NSIP	Realtime data Affected by tides
12035400	Wynoochee River near Gridale	51.3	41.3	1965-present	USGS/City of Tacoma, Tacoma Public Utilities	Realtime data
12036000	Wynoochee River above Save Creek near Aberdeen	40.6	71.4	1925-present	USGS/City of Tacoma, Tacoma Public Utilities	Realtime data
12037400	Wynoochee River above Black Creek near Montesano	5.9	155.2	1956-present	USGS/City of Tacoma, Tacoma Public Utilities	Realtime data
12039005	Humtulpis River below Highway 101 bridge near Humtulpis	22.9	132	1933-present (most 2002-present)	USGS/Grays Harbor County	Realtime data
22R050	North Fork Satsop River at the Mouth	0.3	Not available	2005 to present	Ecology	Manual staff height
22D110	Wishkah River near Nisson	15.3	Not available	2005-present	Ecology	Telemetry

*Chehalis River Basin  
Comprehensive Flood Hazard Management Plan*

<b>Gauge Number</b>	<b>Location</b>	<b>River Mile</b>	<b>Drainage Area (square miles)</b>	<b>Date of Record</b>	<b>Managing/Funding Agency</b>	<b>Notes</b>
22K070	Bingham Creek at Hatchery	0.1	Not available	2000-present	Ecology	Telemetry
22L070	Johns River at Western	5.5	Not available	2005-present	Ecology	Manual staff height
22M070	Newskah Creek below Falls	4.1	Not available	2005-present	Ecology	Manual staff height
22N070	Middle Fork Hoquiam River near New London	Not available	Not available	2005-present	Ecology	Manual staff height
22P080	East Fork Hoquiam River near Nisson	10.0	Not available	2005-present	Ecology	Manual staff height
22Q060	East Fork Wishkah River near mouth	0.9	Not available	2005-present	Ecology	Manual staff height
22S050	Decker Creek at mouth	0.1	Not available	2005-present	Ecology	Manual staff height
23A130	Chehalis River at Claquato	77.7	Not available	2005-present	Ecology	Manual staff height
23A160	Chehalis River at Dryad	96.9	Not available	1996-present	Ecology	Manual staff height
23E060	Black River at Highway 12	2.0	Not available	2005-present	Ecology	Telemetry
23G060	South Fork Chehalis River near mouth	0.6	Not available	2005-present	Ecology	Manual staff height
23H 070	Cedar Creek at Highway 12	1.3	Not available	2005-present	Ecology	Manual staff height
None	Black River at 128th Avenue Littlerock	Not available	Not available	1992-1999, 2006-present	Thurston County	
None	Scatter Creek at James Road	Not available	Not available	1995-1998, 2007-present	Thurston County	

**Table 2-9. Precipitation Gauges in the Chehalis River basin**

<b>Gauge Name/Location</b>	<b>Managing Agency</b>	<b>Notes</b>
Huckleberry Ridge	RAWS	Does not operate during the winter at this time
Chehalis	RAWS	
Chehalis-Centralia Airport	National Weather Service	
Francis	LARC National Weather Service	Near the Chehalis River basin
Boisfort Peak	ALERT	
South Fork Chehalis River near Wildwood	USGS	
Cinebar	LARC National Weather Service	
South Fork Newaukum River near Onalaska	USGS	
North Fork Newaukum River near Forest	USGS	
Olympia Airport	National Weather Service	Near the Chehalis River basin
Wynoochee Lake		
Elk Meadows		
Wishkah Headworks	Corps of Engineers	
Citizen Weather Observer station Napavine <sup>1</sup>	APRS/CWOP <sup>2</sup>	
Citizen Weather Observer station Centralia <sup>1</sup>	APRS/CWOP <sup>2</sup>	
Hydrologic Remote Sensing Center Centralia <sup>1</sup>	USGS	At the Centralia stream gauge 12025500
WDFW Skookumchuck Dam Hatchery <sup>1</sup>	Thurston County	Under construction
Black River at 128th Ave, Littlerock <sup>1</sup>	Thurston County	At the Black River stream gauge (1989-present)
Scatter Creek at James Road <sup>1</sup>	Thurston County	At the Scatter Creek stream gauge (2006-present)

<sup>1</sup> Not used by the National Weather Service for forecasting

<sup>2</sup> Automated Position Reporting System/Citizen Weather Observer Position

### **Wetlands**

Wetlands, as defined in RCW 36.070A.030, are those areas inundated or saturated by surface water or groundwater at a frequency and duration to support vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands are important to flood hazard management because they provide natural retention and detention functions. They store water above

and below the ground surface, reducing the volume and velocity of floodwaters downstream and thus decreasing downstream erosion. Wetlands also improve water quality and provide habitat for a wide range of plants and animals.

The Chehalis River basin contains a diverse wetland mosaic. Estuarine and tidal wetlands combine with forested, scrub-shrub, emergent, and riverine wetlands to create a complex wetland ecosystem at the mouth of the river in Grays Harbor. Although the Grays Harbor area still contains an extensive wetland system, approximately one-third of the historic wetlands in this area have been lost to development and agricultural activities. Between Montesano and Porter, most wetlands are restricted to the riparian areas and floodplain between the river and U.S. Highway 12 to the north. These also include a variety of emergent, forested, and scrub-shrub wetlands. At Porter, floodplain wetlands generally shift to the south and west side of the riverbed. These include forested, scrub-shrub, emergent, and riparian wetlands. Upstream from Porter to the headwaters, the floodplain is laced with forested, emergent, scrub-shrub, and riparian wetlands. These wetlands range from temporarily flooded to seasonally and permanently flooded. Most of the wetland vegetation is considered broad-leaved deciduous.

### ***Fish and Wildlife***

Fish and wildlife presence in the Chehalis River basin has been addressed in recent watershed planning documents (Chehalis Basin Partnership, 2008; Washington State Conservation Commission, 2001; Washington Department of Fish and Wildlife, 2008). These issues have recently focused on the health of fish species that inhabit the river basin, due to their cultural, recreational, and economic importance.

The water bodies in the Chehalis River basin provide a variety of habitats for fish species. Upland tributaries are generally cold, high-elevation, and high-velocity streams. These waterbodies transition into warmer, low-elevation streams that meander through river valleys. The basin is host to significant tribal, sport, and commercial fisheries. Documented salmonid species in the basin include fall, spring, and summer Chinook; coho; fall chum; cutthroat trout; and summer and winter steelhead. Bull trout/Dolly Varden presence is documented from the mouth of the Chehalis River downstream of Centralia. Historic presence is documented on tributaries near the mouth of the river (Envirovision, 2000).

Cutthroat trout presence is documented in most perennial tributaries and mainstem reaches of the Chehalis River basin in one or more life history forms. Anadromous and fluvial cutthroat trout inhabit mainstem and accessible tributary reaches, and the resident form is found above and below anadromous barriers. In areas below fish barriers, this species mixes with anadromous fish. Adfluvial cutthroat trout (fish that live in lakes and migrate into rivers or streams to spawn) inhabit many lakes in the Chehalis River system. Current status is unknown, but cutthroat trout are considered abundant and widely distributed throughout the basin.

Table 2-10 summarizes salmonid fish populations in the Chehalis River basin. Table 2-11 summarizes the non-salmonid fish that occur in the basin.

**Table 2-10. Stock origins, status and production type for anadromous fish in the Chehalis River basin**

<b>Stock Name</b>	<b>Stock Origin</b>	<b>Production Type</b>	<b>Stock Status</b>	<b>Population Trend</b>
<b>Spring Chinook</b>				
Chehalis	Native	Wild	Healthy	Stable or positive
Wynoochee	Native	Wild	Disputed	Unknown
<b>Summer Chinook</b>				
Satsop	Mixed	Wild	Depressed	Negative
<b>Fall Chinook</b>				
Humtulpis	Mixed	Wild	Healthy	Positive
Hoquiam	Native	Wild	Healthy	
Wishkah	Native	Composite	Healthy	
Wynoochee	Native	Wild	Healthy	
Satsop	Mixed	Composite	Healthy	
Chehalis	Mixed	Wild	Healthy	
Johns/Elk and South Bay tributaries	Mixed	Wild	Unknown	Unknown
<b>Fall Chum</b>				
Humtulpis	Native	Wild	Healthy	
Chehalis	Native	Wild	Health	
<b>Coho</b>				
Humtulpis	Mixed	Composite	Healthy	
Hoquiam	Mixed	Composite	Healthy	
Wishkah	Mixed	Composite	Healthy	
Wynoochee	Mixed	Composite	Healthy	
Satsop	Mixed	Composite	Healthy	
Chehalis	Mixed	Composite	Healthy	
Johns/Elk and South Bay tributaries	Mixed	Composite	Healthy	
<b>Summer Steelhead</b>				
Humtulpis	Native	Wild	Unknown	Unknown
Chehalis	Unknown	Wild	Unknown	Unknown
<b>Winter Steelhead</b>				
Humtulpis	Native	Wild	Healthy	
Hoquiam	Native	Wild	Healthy	
Wishkah	Native	Wild	Healthy	
Wynoochee	Mixed	Composite	Healthy	
Satsop	Native	Wild	Depressed	Negative
Chehalis	Native	Wild	Healthy	

<b>Stock Name</b>	<b>Stock Origin</b>	<b>Production Type</b>	<b>Stock Status</b>	<b>Population Trend</b>
Skookumchuck/Newaukum	Mixed	Composite	Depressed	Negative
South Harbor	Native	Wild	Unknown	Unknown
<b>Bull trout / Dolly Varden</b>				
Chehalis / Grays Harbor	Native	Wild	Unknown	Unknown
<b>Coastal Cutthroat Trout</b>				
Humptulips	Native	Wild	Unknown	Unknown
Chehalis	Native	Wild	Unknown	Unknown

Source: Envirovision, 2000.

**Table 2-11. Non-salmonid fish species known or suspected to be present in the Chehalis River basin**

<b>Native Fish Species</b>	<b>Introduced Fish Species</b>
White sturgeon	Brook trout
Green sturgeon	Rainbow trout
American shad	Largemouth bass
Northern pikeminnow	
Largescale sucker	
Redside shiner	
Whitefish	
Reticulate sculpin	
Coast range sculpin	
Torrent sculpin	
Riffle sculpin	
Prickly sculpin	
Pacific lamprey	
River lamprey	
Western brook lamprey	
Longnose dace	
Speckled dace	
Redside shiner	
Olympic mudminnow	

Source: Envirovision, 2000.

The varied habitats in the Chehalis River basin support a wide range of wildlife. Higher elevation and forested areas support big game such as deer, elk, and black bear and upland birds such as grouse and quail. Seasonally flooded areas along the Chehalis River and its tributaries provide winter habitat for waterfowl. The Chehalis River basin is along the Pacific Flyway migratory bird corridor. The Grays Harbor Estuary is a noted

stopover on that corridor for shorebirds. Riparian areas on the Chehalis River and its tributaries provide important habitat for a variety of birds and small mammals.

### ***Endangered Species Act Issues***

Bull trout/Dolly Varden is the only listed fish species under the Endangered Species Act in WRIs 22 and 23. The Olympic Peninsula bull trout/Dolly Varden population was listed as federally threatened by the U.S. Fish and Wildlife Service (USFWS) in November 1999.

Analysis of the limiting factors affecting bull trout has been performed for the Chehalis River and the four major subbasins (Chehalis Basin Partnership Habitat Working Group, 2008). Grays Harbor, the Chehalis River upstream to and including the Satsop River, and portions of the Wishkah, Wynoochee, and Humptulips Rivers have been identified as current or potential habitat for bull trout foraging, migration, and overwintering. This habitat is important for bull trout recovery in the Olympic Peninsula. Limiting factors identified within the basin include:

- degraded riparian conditions;
- degraded water quality;
- reduced stream flow;
- elevated water temperature; and
- low dissolved oxygen levels.

Non-fish federally listed species in the basin are the loggerhead sea turtle, marbled murrelet, northern spotted owl, western snowy plover, and golden paintbrush. Most of these species are unlikely to be found in the floodplain area.

### ***Water Quality***

Section 303(d) of the CWA requires Ecology to identify the state's polluted waterbodies and submit a list of these waterbodies to Environmental Protection Agency every two years. The list is known as the 303(d) list. For each of those water bodies, the law requires states to develop Water Quality Improvement Projects or Total Maximum Daily Loads (TMDLs). A TMDL is the maximum amount of pollutant loading that can occur in a given waterbody without impairing beneficial uses and still meet water quality standards. The 2008 303(d) list, Washington's most recent list, was approved in January 2009.

Water quality impairment in the Chehalis River and its tributaries has been recognized in studies since the early 1980s (Envirovision, 2000). The most common water quality issues are temperature, water quality, and fecal coliform exceedances of water quality standards. The major causes of these water quality problems are degraded riparian conditions including lack of riparian vegetation, livestock waste, failing septic systems, urban stormwater runoff, and sewage discharge. Total Maximum Dissolved Loads (TMDLs) have been developed to address these problems in the mainstem Chehalis River

and its tributaries. The Chehalis Basin Partnership is responsible for developing the details of implementing projects such as those for temperature reduction.

A number of stream segments and lakes in the Chehalis River basin do not meet Washington State surface water quality standards. These are summarized in Table 2-12. A complete listing can be found on Ecology’s web site at <http://www.ecy.wa.gov/programs/wq/303d/2008/index.html>.

**Table 2-12. Waterbody segments not meeting water quality standards**

Waterbody Name	Parameter Exceeding Standards
Chehalis River	mercury, PCB <sup>1</sup> , dioxin
Black Creek	temperature
Humptulips River	pH, dissolved oxygen
Black Lake	total phosphorous
Carlisle Lake	total phosphorous, fecal coliform
Stillman Creek	temperature
Mill Creek	temperature
Dillenbaugh Creek	dioxin
Newaukum River (Middle Fork)	dissolved oxygen
Elk Creek	dissolved oxygen

<sup>1</sup>Polychlorinated biphenyl, a toxic organic compound banned in the United States since 1979

## Land Use Characteristics

The majority of land in the Chehalis basin (87 percent) is forestland (Chehalis Basin Partnership, 2004). Most forested acres are both private and government-owned lands. Government-owned lands include the Capital State Forest and portions of the Mt. Baker-Snoqualmie National Forest and Olympic National Forest.

Agriculture makes up 7 percent of land use in the basin. Dairy, livestock, and crop farms are located mainly in the low-lying valleys adjacent to the Chehalis River and its major tributaries. Most common crops include hay and silage, vegetables and small grains, as well as pasture (Chehalis Basin Partnership, 2004).

Development is primarily clustered within floodplains and valleys. Only 11 percent of the basin as a whole is in agricultural, urban, or industrial uses. However, for the land within 1 mile of major rivers in the basin, 42 percent of the land is in agricultural, urban, or industrial use. Industrial development is focused around the Chehalis/Centralia and Aberdeen/Hoquiam areas as well as the coal mine/power plant site south of Bucoda. The

main use of industrial water is in the manufacturing of wood, pulp, and paper (Chehalis Basin Partnership, 2004).

## **Population**

The most populated portions of the basin are located in the lower Chehalis River basin. Major population centers are Chehalis and Centralia in the upper basin and Aberdeen and Hoquiam near the mouth of the river. Table 2-13 summarizes the population of jurisdictions within the Chehalis River basin. It shows population from the 2000 U.S. Census and 2009 population estimates provided by the Washington Office of Financial Management (OFM). The table does not include population numbers for the three counties in the basin because portions of counties are outside the Chehalis River basin and no accurate estimate of county populations within the basin exists.

**Table 2-13. Population of Basin Jurisdictions**

<b>Jurisdiction</b>	<b>2000 Census</b>	<b>2009 OFM Estimate</b>
<b>Grays Harbor Communities</b>		
Aberdeen	16,461	16,440
Cosmopolis	1,595	1,640
Elma	3,049	3,110
Hoquiam	9,097	8,765
McCleary	1,484	1,555
Montesano	3,312	3,565
Oakville	675	715
Ocean Shores	3,836	4,860
Westport	2,137	2,345
<b>Lewis County Communities</b>		
Centralia	14,742	15,570
Chehalis	7,057	7,185
Napavine	1,383	1,690
Pe Ell	657	670
<b>Thurston County Communities</b>		
Bucoda	628	665
Tenino	1,447	1,535

Sources: Office of Financial Management, 2010

## **CHAPTER 3 REGULATORY OVERVIEW**

This chapter provides an overview of existing federal, state, and local regulatory and permitting requirements that relate to flood hazard management, surface water management, water quality, and wetlands protection.

### **Summary of Existing Regulations**

Many laws that directly or indirectly address flood hazard management have been enacted at the federal, state, and local levels. Table 3-1 lists federal and state laws in the categories of flood hazard management, stormwater management, and sensitive areas.

Most federal laws are implemented at the state and local levels. For example, the federal Clean Water Act regulates stormwater discharge, but the U.S. Environmental Protection Agency (EPA) has delegated the responsibility of administering the program to the Washington State Department of Ecology (Ecology). The National Flood Insurance Program, which offers affordable flood insurance to private property owners, is a national program administered by the Federal Emergency Management Agency (FEMA), but it requires cities and counties to adopt floodplain regulations.

With the exception of the National Flood Insurance Program and the Endangered Species Act, the laws most relevant to flood hazard management originate at the state level. Most of these begin with state legislation that enables local governments to adopt regulations promoting public health, safety, and general welfare. Environmental laws that affect flood hazard management through habitat, shoreline, and other critical-area protection measures also exist at the state level, but enforcement is increasingly becoming the responsibility of local governments. State growth management requirements contain additional recommendations regarding land use and development near wetlands and in frequently flooded areas, with regulatory implementation largely in the hands of local jurisdictions.

### **Key Federal Regulations**

#### ***National Flood Insurance Program***

In 1968, the U.S. Congress initiated the National Flood Insurance Program (NFIP) (Chapter 44 CFR) under the National Flood Insurance Act to relieve the burden of disaster relief on the national treasury, state and local tax bases. The NFIP is administered by the Federal Insurance Administration (FIA), which is part of FEMA. The NFIP makes available affordable flood insurance to communities that adopt approved community-wide floodplain management regulations. Communities that do not participate in the NFIP do not qualify for certain flood disaster relief.



**Table 3-1. Overview of Major Federal and State Surface Water Management Regulations**

Regulation	Implementing Agency	Purpose	Jurisdiction	Required Approval, Permit, or Plan	Applicability to Flood Hazard Management
<b>FEDERAL</b>					
Clean Water Act, Section 401	State agencies empowered by EPA (i.e., Ecology)	Ensures that federally permitted activities comply with the Clean Water Act, state water quality laws, discharge limitations, and other state regulations	Waters of the U.S.	Water Quality Certification or Modification	Structural measures affecting surface water will require Water Quality Certification or Modification
Clean Water Act, Section 402	State agencies empowered by EPA (i.e., Ecology)	Establishes permit application requirements for stormwater discharges under National Pollutant Discharge Elimination System (NPDES)	All stormwater discharge associated with industrial activity and from municipal storm sewer systems	Stormwater Discharge Permits	NPDES stormwater permit is required for jurisdictions applying for an individual NPDES permit
Clean Water Act, 404	COE	Regulates the discharge of dredged or fill material in rivers, streams, and wetlands	Waters of the U.S. including wetlands	Individual or Nationwide Permits	Dredging or filling in wetlands or the Yakima River will require permit
National Flood Insurance Act	FEMA	Offers affordable flood insurance to communities that adopt approved floodplain management regulations	Floodplains of the U.S.	Flood Insurance Study and approval letter from FEMA	Participation in NFIP requires minimum floodplain management regulations
Flood Disaster Protection Act	FEMA	Provides incentive to communities to join the NFIP by increasing amounts of flood insurance available and providing penalties for communities and individuals that do not join the NFIP and are subsequently flooded	Floodplains of the U.S.	Approval by FEMA	Requires purchase of flood insurance for funding by federally backed lending institutions for purchase of property in floodplains
National Environmental Policy Act	Varies (usually the federal agency issuing the permit)	Requires full disclosure of potential impacts associated with proposed actions and mitigative measures	All federal actions	Environmental Assessment and EIS	Regulates actions that may result in significant adverse environmental impacts
River and Harbor Act, Section 10	COE	Preserves the navigability of the nation's waterways	U.S. navigable waters	Section 10 permit	Regulates activities within the ordinary high water mark (OHWM) on navigable waters
Executive Order 11988	Federal Agencies	Protects floodplain from development by federal agencies	Federal projects	None	Enhances existing floodplain management regulations
Endangered Species Act	Federal Agencies	Protection of fish and wildlife habitat and evaluation of species health	Nationwide	Approval	Regulates activities in endangered species habitat
Executive Order 11990	Federal Agencies	Protects wetlands and evaluates impacts of proposed actions on wetlands	Federal projects, federally funded activities, or other activities licensed or regulated by federal agencies	None	Enhances existing wetland protection regulations
<b>STATE</b>					
SEPA	Varies (usually the local agency issuing the permit); circulation to state and federal agencies for review	Requires full disclosure of the likely significant adverse impacts associated with a proposed action and identification of mitigative measures	All proposed actions that require permits	Environmental Checklist or EIS	Requires environmental review of any project with potential adverse environmental impacts
Shoreline Management Act	Ecology; local jurisdictions when state approved	Manages uses of the shorelines of the state for protection of public interests and natural environment	All shorelines of the state (including all marine waters, lakes >20 acres, reservoirs, streams and rivers >20 cfs mean annual flow, and associated wetlands)	State or state-approved local shoreline permit	Applies to activities within the Chehalis River system, adjacent lands within 200 feet of the floodway or within the 100-year floodplain (whichever is less) and all associated wetlands
Senate Bill 5411 (ESSB 5411); Flood Control by Counties (RCW 86.12)	Counties	RCW 86.12 gives county governments the power to levy taxes, exercise eminent domain and take action to control and prevent flood damage. ESSB 5411 provides a greatly expanded role for counties in formulating and adopting drainage basin plans to address flooding and land use regulations	All drainage basins located wholly or partially within the County	Comprehensive Flood Hazard Management Plan	Allows for development of CFHMPs
Floodplain Management Program (RCW 86.16)	Ecology	Reduces flood damages and protects human health and safety. Department oversees local implementation of floodplain regulations required for participation in the NFIP.	All floodplains within the state	State approval of floodplain management programs and regulations	Provides eligibility for national flood insurance and for state matching funds to construct flood control facilities
State Participation in Flood Control Maintenance	Ecology	Assists local jurisdictions in comprehensive planning and flood control maintenance efforts	All flood hazard management activities of local jurisdictions as approved by Ecology	FCAAP grant application, approved CFHMP for maintenance grants	FCAAP funds available for preparation of CFHMPs, flood control maintenance projects, and emergency flood control projects
Water Pollution Control Act	Ecology	Empowers the state to develop, maintain, and administer the federal statutes and programs required by the federal Clean Water Act	All receiving waters of the state	Water Quality Certification/Modification	Regulates activities that violate state water quality standards per the Clean Water Act
Hydraulic Code	WDFW	Protects fish, fish habitat, and wildlife habitat from damage by construction and other activities	All marine and fresh waters of the state and drainage corridors	Hydraulic Project Approval (HPA)	HPA is required for all activities within the OHWM of streams and along natural drainage corridors
Growth Management Act (GMA) (RCW 36.70A)	Commerce	Requires comprehensive plans to include surface water considerations and facilities (quantity and quality).	Selected high-growth counties and their cities.	Comprehensive Plan	Requires adoption of development regulations and comprehensive plans
		Requires designation and regulation of critical areas, including wetlands and frequently flooded areas.	All Washington counties and cities.	Critical areas and resource lands designation.	Requires adoption of critical areas and resource lands ordinances regulating development in designated areas
Executive Order 90-04, Protection of Wetlands/Model Wetlands Protection Ordinance	Ecology	Provides guidance to local governments to achieve no net loss of wetland functions and values	State wetland buffers	None	Provides voluntary technical assistance to the local jurisdiction to regulate activities that affect wetlands



Congress added several provisions to the NFIP under the Flood Disaster Protection Act of 1973 in order to strengthen the program. The 1973 act provided additional incentives to communities to join the NFIP by substantially increasing the amount of flood insurance coverage available and providing penalties for communities and individuals that choose not to join the NFIP. Specific new requirements include the following:

- Any acquisition or construction undertaken in identified special flood hazard areas requires purchase of federal flood insurance, if available.
- Purchase of properties in the floodplain to be secured under mortgages from a federally related lender requires purchase of federal flood insurance, if available.
- Communities identified by FEMA as flood-prone have one year from the time of designation to enroll in the NFIP; otherwise disaster-assistance funds and federal financial assistance for acquisition or construction of property in flood hazard areas will be denied.

A community enters the regular NFIP program upon adoption of an ordinance approved by FEMA. A detailed flood insurance study that involves hydrologic and hydraulic analyses is normally performed and is referenced in the ordinance as the basis for the regulatory program. The products of the study are the Flood Insurance Rate Map (FIRM) and the Flood Insurance Study.

The Flood Insurance Study provides data on the width of the floodway and floodplain, the cross-sectional area, and the floodwater velocity at given points in the stream. FIRMs delineate areas adjacent to rivers and coastlines that are subjected to flood risks, and an insurance rate is determined for each area. New FIRMs delineate flood insurance rate zones, as well as limits of the 100-year floodway, 100-year floodplain, and 500-year floodplain. FIRMS also delineate areas of coastline flooding. FIRMs and associated insurance studies are available online and from FEMA.

The 100-year flood determines the geographic jurisdiction of NFIP-related programs. The 100-year flood is frequently called the “base flood” and is defined as the discharge that has a 1 percent chance of occurring or being exceeded in a given year. The 100-year floodplain is the area that would become inundated by water during the 100-year flood.

The floodway is an engineering concept incorporated into the NFIP floodplain management criteria. A floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to convey the base flood without cumulatively increasing the water surface elevation more than a certain amount (1 foot for NFIP). Floodways are calculated by FEMA for the 100-year base flood for major rivers and streams as part of the flood insurance study undertaken for a community.

Since 1990, communities that have adopted programs or regulations to reduce flood-related damages have been eligible to receive reduced insurance rates under the Community Rating System (CRS). The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the

minimum NFIP requirements. Communities must apply to FEMA to be certified for a rate reduction before policy holders within the community can receive a rate reduction. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions.

For CRS participating communities, flood insurance premium rates are discounted in increments of 5 percent. A Class 1 community would receive a 45 percent premium discount, while a Class 9 community would receive a 5 percent discount (a Class 10 is not participating in the CRS and receives no discount). The CRS classes for local communities are based on 18 creditable activities, organized under four categories:

- Public Information,
- Mapping and Regulations,
- Flood Damage Reduction, and
- Flood Preparedness.

Currently, Centralia, Centralia and Lewis and Thurston Counties participate in the CRS program. Table 3-2 summarizes the status of those jurisdictions. Centralia and Thurston County are in the process of having their status reviewed and anticipate receiving a reduced class.

**Table 3-2. Current CRS Status of Participating Jurisdictions**

	<b>CRS Entry Date</b>	<b>Current Effective Date</b>	<b>Current Class</b>
Centralia	10/1/94	10/1/99	7
Chehalis	10/1/94	5/1/04	6
Lewis County	10/1/94	10/1/99	8
Thurston County	10/1/00	10/1/00	5

### ***Clean Water Act***

The Clean Water Act (CWA) of 1977 and the Water Quality Act of 1987 (amendments to the Federal Water Pollution Control Act) provide the backbone for national water quality policy and action. The goal is to eliminate pollutant discharges into “waters of the United States”. Sections 401, 402, and 404 of the CWA (33 USC 1251 et seq., as amended by Public Law 92-500) are pertinent to surface water management activities.

#### **CWA Section 401 - Water Quality Certification**

Section 401 (40 CFR 121) ensures that activities requiring a federal permit (such as a U.S. Army Corps of Engineers Section 404 permit for filling of a wetland) comply with

the CWA, state water quality laws, and other appropriate state regulations (e.g., the Hydraulic Code, Water Pollution Act). Compliance with Section 401 is required for any structural measures resulting in a discharge of dredge or fill material to all waters of the U.S. or non-isolated wetlands.

Section 401 is implemented through a certification process implemented by each state and some approved Native American tribes, including the Chehalis Tribe. Section 401 approvals are granted through a Water Quality Certification issued by a state agency. The certification ensures that federally permitted activities comply with water quality standards and discharge limitations. The implementing state agency has final authority on approval, denial, or development of special conditions for certification. The certification is similar to a permit and is a prerequisite requirement for obtaining a Corps permit, a Federal Energy Regulatory Commission (FERC) license, or other federal permit.

### **CWA Section 402 - National Pollutant Discharge Elimination System**

Section 402 of the CWA established the system for permitting wastewater discharges, known as the National Pollutant Discharge Elimination System (NPDES). Under NPDES, all facilities which discharge pollutants from any point source into waters of the United States are required to obtain a permit. NPDES permits are issued by states that have obtained EPA approval to issue permits or by EPA Regions in states without such approval. The Water Quality Act of 1987 amended Section 402 with a new subsection regulating stormwater discharges. In Washington, Ecology issues NPDES permits.

There are two basic types of NPDES permits, individual and general permits. An individual permit is specifically tailored to an individual facility. Once a facility submits the appropriate application(s), the permitting authority develops a permit for that particular facility based on the information contained in the permit application (e.g., type of activity, nature of discharge, receiving water quality). The authority issues the permit to the facility for a specific time period (not to exceed five years) with a requirement that the facility reapply prior to the expiration date.

A general permit covers multiple facilities within a specific category. A general NPDES stormwater permit is called a municipal permit. Under the 1987 revisions, NPDES permits were required for municipal stormwater discharges to surface waters. EPA developed rules to implement the new stormwater requirements in two phases. In Phase I, NPDES permits were required for stormwater discharges from cities and counties with populations greater than 100,000. In Phase II, communities with populations of at least 10,000 or designated as an “urbanized area” by the U.S. Census Bureau are also required to obtain permits.

For both Phase I and Phase II jurisdictions, the EPA rules require operators of municipal separate storm sewer systems to develop and implement a stormwater management program that: (1) reduces the discharge of pollutants to the “maximum extent

practicable”; (2) protects water quality; and (3) satisfies appropriate requirements of the CWA.

EPA’s rules identify six minimum control measures which must be included in a Phase II stormwater program to protect water quality:

1. Public Education and Outreach;
2. Public Participation/Involvement;
3. Illicit Discharge Detection and Elimination;
4. Construction Site Runoff Control;
5. Post-Construction Runoff Control; and
6. Pollution Prevention/Good Housekeeping.

The federal rules identify two additional standards with which an operator of a regulated municipal separate storm sewer system must comply:

7. Fulfillment of requirements of an approved TMDL (water-cleanup plan), and
8. Record keeping, evaluation and reporting the progress of the program.

#### **CWA Section 404 - Dredge and Fill Requirements**

Section 404 of the CWA (USC 1394) regulates the discharge of dredged or fill material into waters of the United States. Any project that proposes discharging dredged or fill material into the waters of the United States, including special aquatic sites such as wetlands (non-isolated), must get a Section 404 permit. The U.S. Army Corps of Engineers (Corps) can authorize activities through an Individual Permit, Letter of Permission, Nationwide Permit, or Regional General Permit. The Corps determines what type of permit is needed.

Nationwide Permits are a type of general permit issued by the Corps on a nationwide basis for smaller projects or activities that will have minimal impacts. The Nationwide Permits authorize specific categories of work, such as stormwater management facilities, bank stabilizations, mooring buoys, or maintenance of flood control facilities. An activity may be authorized under a Nationwide Permit only if it satisfies all of the Nationwide Permit terms and conditions. If the Corps finds that the proposed activity would have more than minimal individual or cumulative net adverse impacts on the environment, or may be contrary to the public interest, an applicant will be required to modify the proposal or apply for an Individual Permit.

Individual Permits are required for proposals that do not fit within the specific criteria of a Nationwide Permit. The Individual Permit review process includes an analysis by the Corps of whether the project’s benefits outweigh predicted environmental impact. Completion of an Environmental Impact Statement (EIS) may be necessary for some projects. In addition, there is a 30-day period during which the proposal is available for review by federal, state, and local agencies, Native American groups, interest groups, and the general public. On average, Individual Permit decisions are made within two to six months from receipt of a completed application. Applications requiring an EIS (less than

1 percent) average about three years to process. In emergencies, decisions can be made in a matter of hours.

Letters of Permission are a type of permit normally used for activities in navigable waters where objections are unlikely, and the activity does not qualify for a Nationwide Permit. The letters are issued through an abbreviated processing procedure that includes coordination with federal and state environmental agencies and a public interest evaluation. They do not require the publishing of an individual public notice.

Regional General Permits are issued on a regional basis (limited geographic scope) for a category of activities that are substantially similar in nature and cause only minimal individual and cumulative impacts on the aquatic environment. Each Regional General Permit has a number of terms and conditions that must be met.

Proposed wetland activities may be subject to other laws in addition to or in association with a Section 404 permit. For example, in Washington, Ecology has the right to place conditions on or request denial of a Section 404 permit if a proposed project does not comply with state water quality laws. The Corps cannot issue a Section 404 permit if the state has denied water quality certification. Furthermore, if any local agency permit is denied, the Corps will deny the 404 permit.

### ***Rivers and Harbors Act, Section 10***

The Rivers and Harbors Act was enacted in 1899 to preserve the navigability of the nation's waterways. Section 10 (33 USC 403) prohibits the unauthorized obstruction or alteration of any navigable water of the United States. Section 10 requires approval prior to any work in, over, under or near waters of the United States or special aquatic sites, including wetlands. Typical activities requiring Section 10 permits are:

- Construction or installation of piers, wharves, bulkheads, dolphins, marinas, ramps, floats, overhanging decks, buoys, boat lifts, jet ski lifts, intake structures, outfall pipes, marine waterways, overhead transmission lines, and cable or pipeline crossings, etc.; or
- Dredging and excavation.

Provisions of Section 10 are implemented by the Corps through a permit process that includes consideration of navigation, flood control, fish and wildlife management, and environmental impact. Compliance with the National Environmental Policy Act (NEPA) is required. Section 10 reviews often occur simultaneously with Section 404 permit processing. Under Section 10, activities receive an Individual Permit, a Letter of Permission, a Nationwide Permit, or a Regional General Permit.

### ***Executive Order 11988 - Floodplains***

Executive Order 11988, issued in 1977, directs federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and

modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. The Order directs each agency to “provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.”

The guidelines address an eight-step process that agencies should carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. The eight steps, which are summarized below, reflect the decision-making process required in Section 2(a) of the Order:

1. Determine if a proposed action is in the base floodplain (that area which has a 1 percent or greater chance of flooding in any given year).
2. Conduct early public review, including public notice.
3. Identify and evaluate practicable alternatives to locating in the base floodplain, including alternative sites outside of the floodplain.
4. Identify impacts of the proposed action.
5. If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate.
6. Reevaluate alternatives.
7. Present the findings and a public explanation.
8. Implement the action.

### ***Executive Order 11990 - Wetlands***

In 1977, Executive Order 11990 directed federal agencies to avoid the unnecessary alteration or destruction of wetlands. The purpose of Executive Order 11990 is to “minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.” To meet these objectives, the Order requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. The Order applies to:

- Acquisition, management, and disposition of federal lands and facilities construction and improvement projects which are undertaken, financed or assisted by federal agencies; and
- Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities.

Each federal agency is responsible for preparing and implementing procedures for carrying out the provisions of the Order. The Order requires federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands

affected by any federal project or project that receives federal funding. Federal agencies must also address and mitigate any unavoidable wetland impact. The Order establishes wetland protection as the official policy of all federal agencies.

While the Order does not regulate wetlands per se, it does establish wetland protection as the official policy of all federal agencies. Many state policies and regulations reflect this federal policy.

### ***Endangered Species Act***

The Endangered Species Act (ESA), passed in 1973, provides for the conservation of species that are endangered or threatened and the conservation of the ecosystems on which they depend. A species is considered endangered if it is in danger of extinction throughout all or a significant portion of its range. A species is considered threatened if it is likely to become an endangered species within the foreseeable future. There are approximately 1,880 species listed under the ESA.

All projects that have the potential to directly or indirectly impact wildlife species listed as endangered or threatened under ESA are subject to environmental review by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS). The USFWS oversees terrestrial and freshwater fish species, and NMFS oversees marine and anadromous species. These agencies review projects to determine the extent of the impacts and the proper mitigation and conservation measures to be implemented to eliminate or limit these impacts. The ESA applies to all projects that meet any of the following criteria:

- Projects requiring a permit from a federal agency;
- Projects on federal lands;
- Federally funded projects; or
- Projects that may cause either direct injury to the listed species, alteration of habitat, or significant disturbance to the habitat.

The first three types of projects listed above are covered under Section 7 of the ESA, which requires agency consultation. The last category is covered under Section 9, which defines prohibited acts. Under both categories, applicants must show either that the project would have negligible impact on any listed species, or that the project includes mitigation or conservation measures to sufficiently negate any potential impacts.

Agency consultation involves working with the federal authority (USFWS or NMFS) to determine which species reside in the project area and the probable extent of the impact. If the impacts are determined to be negligible, then the federal agency issues a letter or notification of “no effect” and the project may proceed without additional permitting from USFWS or NMFS. If potential significant impacts on the listed species or its habitat are identified, a Biological Assessment is prepared and submitted to the federal agency, along with a request for a formal consultation. The Biological Assessment will

result in one of two determinations—“may affect, not likely to adversely affect” or “may affect, likely to adversely affect.” If the determination is “may affect, not likely to adversely affect,” the project can proceed as long as it complies with mitigation measures outlined in the Biological Assessment. If a project is determined to “may affect, likely to adversely affect,” triggers formal consultation and the federal agency must prepare a Biological Opinion. The Biological Opinion states the opinion of the federal agency on whether the project will result in adverse impact to a listed species.

Another way that the Section 7 ESA consultation may be triggered in the future is if a recent Biological Opinion regarding the NFIP is extended outside of the Puget Sound to include the Chehalis basin. In September 2008, NMFS released a Biological Opinion that found that the NFIP in Puget Sound is likely to jeopardize the continued existence of federally listed salmon species and Southern Resident killer whales. One outcome of this Biological Opinion is that a Section 7 consultation will be required if a floodplain development permit is issued by one of FEMA’s partner communities or if a map revision is requested. FEMA is currently adjusting policy guidance, and providing partner communities within the Puget Sound with regulatory mechanisms that comply with the Biological Opinion. These mechanisms focus on the community adopting specific elements in their local floodplain ordinance to qualify for a programmatic approval under the NFIP. These mechanisms include a Model Ordinance that communities can adopt or adapt, and a checklist that communities can use to assess their existing ordinance.

### ***National Environmental Policy Act***

The National Environmental Policy Act (NEPA) (42 USC 4321 et seq.) requires federal agencies to review the potential environmental impact of all federal actions (including agency-sponsored development projects and agency decisions on permits and approvals for privately-sponsored development projects). The NEPA process requires evaluation of probable environmental consequences of a proposal before decisions are made by a federal agency. NEPA also requires identification of alternatives and mitigation that avoids or minimizes environmental impacts.

Guidance for implementation of NEPA is provided by the Council on Environmental Quality (CEQ). The CEQ Regulations (40 CFR 1500-1508) place significant emphasis on the consideration of alternatives, including ways to mitigate harmful environmental effects. Most federal agencies have adopted their own regulations for implementing NEPA requirements.

NEPA requires the preparation of an environmental impact statement (EIS) for any federal action that would have significant adverse environmental impact. The EIS must thoroughly evaluate any adverse environmental impact of the proposed action and its alternatives. Permits issued by a federal agency (such as Section 404 permits) are among the federal actions that may require an EIS.

To determine whether a proposal would have significant adverse environmental impact, the agency may prepare an environmental assessment (EA). A permit applicant often provides much of the information and analysis used to prepare the EA. The EA contains sufficient evidence and analysis to determine whether an EIS is required. If an EIS is not required, a Finding of No Significant Impact (FONSI) document is prepared by the federal agency to explain why an EIS is not required. Compliance with NEPA is achieved upon completion of the FONSI or EIS.

## **Key State Regulations**

### ***Floodplain Management Program***

Washington State's Floodplain Management Program (RCW 86.16) requires that local flood-prone jurisdictions adopt a flood damage prevention ordinance based on federal standards contained in the NFIP. However, state regulations go beyond federal standards in prohibiting new or substantially improved residential construction in designated floodways.

The state Floodplain Management Program also provides technical and financial assistance to local communities. The CFHMPs for Thurston County and for the Chehalis Tribe were partially funded by the State Floodplain Management Program through the Flood Control Assistance Account Program (FCAAP).

### ***Hydraulic Code***

The Washington State Hydraulic Code (RCW 75.20.100-140) regulates activities affecting the state's salt and fresh waters. The purpose of the Hydraulic Code is to reserve fish and wildlife habitat in and around the waters of the state. The Washington State Department of Fish and Wildlife (WDFW) administers the Hydraulic Code.

Any work that falls within the definition of a hydraulic project requires a Hydraulic Project Approval (HPA) from WDFW. Hydraulic projects are defined as work that will use, divert, obstruct, or change the natural flow or bed of any waters of the state. Most structural flood hazard reduction projects require an HPA.

### ***Other State Programs Implemented at the Local level***

The following state laws relevant to flood hazard management are implemented at the county or city level:

- Shoreline Management Act (SMA),
- Growth Management Act (GMA), and
- State Environmental Policy Act (SEPA).

State involvement in these programs is limited to oversight and technical assistance.

The Shoreline Management Act requires local jurisdictions to develop Shoreline Master Programs to regulate activities in the shoreline zone (within 200 feet) of streams or rivers with flows greater than 20 cfs and lakes greater than 20 acres. The Shoreline Master Program regulations are intended to protect the shoreline by limiting what can be constructed on the shoreline and in the shoreline zone. Regulations typically cover shoreline armoring, docks, vegetation removal, construction of roads and structures, and utility installation. The Shoreline Management Act is also intended to provide public access to areas of the shoreline. The Shoreline Management Act has no specific flood protection role, but indirectly helps reduce flood damages by regulating what can be constructed within the shoreline zone.

The Growth Management Act regulates development in cities and counties of the state. The Growth Management Act includes a requirement for jurisdictions to adopt critical (or sensitive) areas regulations to protect wetlands, fish and wildlife habitat, geologic hazard areas, critical aquifer recharge areas, and flood hazard areas. In addition to the direct flood regulations in flood hazard areas, protection of wetlands and streams helps protect the floodplain. The general protection mechanism is the requirement for buffers around wetlands (often located in the floodplain) and streams. These buffers restrict construction in those areas.

The State Environmental Policy Act does not include any specific regulations, but is a procedural requirement that jurisdictions conduct an environmental analysis of the potential impacts of developments that meet certain requirements. The environmental analysis can help identify potential impacts of developing in a floodplain and can identify ways to mitigate development.

### **Flood Authority Regulatory Summary**

All of the member jurisdictions of the Chehalis River Basin Flood Authority have adopted floodplain regulations that have been approved by the state. Although all the regulations meet the state's minimum requirements, there is no standard regulation. There is considerable variability between jurisdictions in the level of protection provided.

Most jurisdictions in the Chehalis River basin have adopted critical or sensitive areas regulations, although some are still in the process of adoption. Although there is some variability in the regulations, most provide sizable buffers around wetlands and streams. Jurisdictions in the Chehalis River basin adopted their Shoreline Master Programs in the 1970s shortly after the Shoreline Management Act passed. Those programs have not been updated since the 1970s, but will be required to be revised within the next five years under amendments to the Shoreline Management Act.

## **CHAPTER 4 PREVIOUS STUDIES**

Many different entities have studied flood problems in the Chehalis River basin. These include the U.S. Army Corps of Engineers (Corps), Federal Emergency Management Agency (FEMA), Natural Resources Conservation Service (formerly Soil Conservation Service), and the U.S. Bureau of Reclamation (Reclamation). The Corps has been conducting studies of the basin intermittently since the 1930s. The early studies did not identify projects that justified the expense of flood improvements under benefit-cost analysis guidelines. The Corps is currently conducting new studies in response to recent flood events. Reclamation investigated multipurpose land and water resource development potentials of the upper Chehalis River basin in the 1960s. The Natural Resources Conservation Service (NRCS) conducted flood analyses for tributaries in the basin in the 1970s.

These projects are described in more detail below. This chapter also includes a brief description of the existing flood hazard management plans developed by jurisdictions in the Chehalis River basin and the Chehalis Watershed Management Plan.

### **U.S. Army Corps of Engineers Activities**

This section describes projects undertaken by the Corps since the early 1930s as well as the current Corps projects. This section is based largely on information provided in the 2008 Lewis County Comprehensive Flood Hazard Management Plan (CFHMP) and therefore, focuses on activities in Lewis County. Detailed information on studies in other parts of the basin is not readily available.

#### **1930-1976**

- In 1931, the Corps investigated improvements on the Chehalis River for navigation, flood control, power development, and irrigation, but concluded that no improvements were justified at that time.
- In 1935, a Preliminary Examination (not published as a congressional document) by the Corps concluded that a flood control reservoir or channel improvements at Centralia, Galvin, Oakville, Malone, and Porter were not economically justified.
- In 1944 House Document 494 discussed a Preliminary Examination and survey for flood control on the Chehalis River and its tributaries. The Corps considered construction of a levee system to protect Aberdeen, Cosmopolis, and Hoquiam, but concluded that any additional flood control in the basin was not economically feasible. Despite this conclusion, a levee system was subsequently authorized by Congress in 1944. However, the authorization expired in 1952 and no levees have been constructed.
- Between 1946 and 1949, the Corps analyzed the concept of multiple reservoirs on the upper Chehalis River, but determined that they were not feasible at that time. Later, the Corps conducted a more localized evaluation of the flood problems along Lum Road in Centralia and recommended channel clearing on 1,660 feet of Coffee Creek. This evaluation was completed in March 1966.

- Between 1966 and 1971, the Corps study efforts concentrated on identifying flood problem areas and possible solutions. Flood damage was occurring in the urban areas of the Aberdeen/ Hoquiam/ Cosmopolis region, Oakville, and Centralia-Chehalis region, and in rural areas along the Chehalis, Skookumchuck, and Newaukum Rivers. These studies indicated that large multiple-purpose storage projects in the Chehalis River basin were not economically justified and that levee and/or channel modifications, along with small headwater dams, should be studied further. Enlargement of Skookumchuck Dam to provide flood control storage was considered and found not to be economically justified at that time.
- In 1968, the Corps published two informational documents.
  - *Flood Plain Information-- Skookumchuck River, Bucoda, Washington* (Corps, 1968a) delineated the floodplain along the Skookumchuck River, from the Lewis/Thurston County line to about 1 mile upstream of Bucoda.
  - *Flood Plain Information-- Chehalis and Skookumchuck Rivers, Centralia Chehalis, Washington* (Corps, 1968b) delineated the floodplain along the Chehalis River from the Lewis/Thurston County line to Chehalis and along the Skookumchuck River from the mouth to the Lewis/Thurston County line.
- A 1974 report, *Special Study, Suggested Hydraulic Floodway-- Chehalis and Skookumchuck Rivers* (Corps, 1974), delineated the suggested hydraulic floodway for the area covered by the 1968 floodplain information report. The Corps published another report in this series in 1976, *Special Study-- Suggested Hydraulic Floodway, Chehalis and Newaukum Rivers*, that delineated the floodplain and suggested a hydraulic floodway for the Chehalis River from Chehalis to Adna, and for the Newaukum River from its mouth to the Interstate 5 bridge.

### **1972-1982**

During the period from 1972 to 1982, the basin study was divided into four interim reports, each covering a specific area. These areas included the following locations on the Chehalis River: (1) at South Aberdeen and Cosmopolis; (2) near Centralia; (3) at the Wynoochee Hydropower/Fish Hatchery facility; and (4) surrounding Aberdeen and Hoquiam.

#### **Centralia, Washington, Flood Damage Reduction Interim Feasibility Report and Environmental Impact Statement**

The objective of the planning effort in Lewis County was to reduce flood damages within both the flood problem area near the Cities of Centralia and Chehalis and throughout the planning area covering the Skookumchuck valley. Preliminary evaluation of potential flood damage reduction measures considered multiple-purpose storage dams, small headwater dams, watershed management, channel clearing, channel excavation, urban levees, and non-structural measures. The urban levee system was the only alternative that initially appeared to be economically justified.

Subsequent feasibility studies focused on the urban levee alternative. These studies resulted in a tentative recommendation for a levee system providing a 200-year level of protection for 2,080 acres in Centralia. Levees to protect Fords Prairie, Galvin, and Chehalis were determined not to be economically justified. On August 5, 1980, Centralia expressed support for the levee system and agreed to serve as local sponsor, but recommended that prior to proceeding with the levee, the Corps review the potential for modifying the private Skookumchuck Dam to provide flood control. Based on its subsequent analysis, the Corps recommended modification of Skookumchuck Dam as the preferred flood control alternative in the *Centralia, Washington, Flood Damage Reduction Interim Feasibility Report and Environmental Impact Statement* (Corps, 1982). The Corps prepared basic hydrologic, hydraulic, and economic studies that were updated from the previous reports and preliminary spillway design layouts and cost estimates. The Corps suspended design work after studies indicated that the recommended plan lacked economic justification.

### **Modification of Skookumchuck Dam, 1982**

Prompted by the City of Centralia's 1980 request, the Corps initiated feasibility studies for modifying the existing private water supply dam on the Skookumchuck River, about 20 miles upstream from Centralia. The Corps' study results indicated that it would be a better solution, both economically and environmentally, than an urban levee system. Although a 1968 Corps analysis had shown that using the dam for flood control was not feasible, subsequent coordination with the dam owner, Pacific Power and Light, indicated that flood control could be feasible. Based on the experience it had gained in a decade of dam operation, Pacific Power and Light believed that it would be possible to use part of its existing water supply storage for flood control storage during winter months. Hydrologic studies by the Corps showed that 17,000 acre-feet of flood control storage could be provided at the dam. This storage would reduce the 100-year flood on the Skookumchuck River in Centralia from 13,300 to 6,700 cubic feet per second (cfs), a reduction of 2 to 5 feet in flood height. The reliability of the existing and future water supply would also be maintained.

The *Centralia, Washington, Flood Damage Reduction Interim Feasibility Report and Environmental Impact Statement* (Corps, 1982) recommended modifying the dam to provide a low level flood control outlet (12-foot-diameter tunnel) and to raise the controlled reservoir (15-foot-high spillway gate) to provide flood control storage during winter months. The project would reduce flooding on 4,600 acres in the Skookumchuck River valley and on 17,500 acres in the Chehalis River valley. Total cost for this project was projected at \$18.2 million (October 1982 prices) and would result in annual average flood damage reduction benefits of \$2.5 million in the Skookumchuck and Chehalis River valleys, primarily in the Centralia urban area. The average annual costs were estimated to be \$1,654,000 and the benefit to cost ratio for this plan was 1.5 to 1. The Corps would make structural modifications to the dam including gating of the existing spillway and constructing a 12-foot-diameter flood control tunnel with related intake and exit structures.

Once modifications were complete, Pacific Power and Light would continue to operate the dam. Operational changes would involve maintaining a lower reservoir pool level

during the early winter, to provide floodwater storage, with a programmed refill period between January 1 and March 1 to return the reservoir to the spillway crest (elevation 477 feet) before the summer dry season.

The Corps believed that, with planned mitigation features, adverse environmental impacts associated with the plan would not be major. Principal anticipated adverse impacts included alteration of wetland and riparian areas associated with the Skookumchuck River, with reductions in habitat values and impacts to dependent wildlife populations; reduction in available waterfowl habitat in the reservoir; and loss of a small number of fur-bearers (beavers and muskrats) in the Skookumchuck Reservoir. Beneficial impacts included significant flood damage reduction for the Skookumchuck River valley and the communities of Centralia and Bucoda, a minor amount of flood damage reduction for the Chehalis River floodplain downstream of Centralia, and an anticipated improvement of spawning conditions for anadromous fish in the Skookumchuck River.

### **1990s-Present**

In response to flooding on the Chehalis River in the 1990s, the Corps initiated several flood damage reduction studies. While no action occurred as a result of these analyses, severe flooding in 2007 refocused the attention of regional stakeholders on appropriate structural solutions.

#### **1990-Follow-up Evaluations of the Skookumchuck Dam Modifications**

In May 1990, the Corps studies resulted in reduction of construction cost estimates for the Skookumchuck Dam modification from \$24.8 million to \$15.8 million. However, the new economic analysis also reduced the estimate of average annual flood damages. The new damage estimate appeared sufficient to justify only a \$6 to \$8 million project. In September 1990, further analysis of costs and benefits raised the benefit to cost ratio to 0.69 to 1, which was still well below economic feasibility. The Corps sent a negative report to the Division Office in September; the report recommended cessation of further study of Skookumchuck Dam modification by the Corps.

#### **1998-Centralia Flood Damage Reduction Project**

After the 1996 flood event, the Flood Action Council, a group of economic development, business activist, and commercial interests, developed a preliminary plan of modifying the Skookumchuck Dam and providing additional flood storage with overbank excavation of the Chehalis River (called the Centralia Flood Damage Reduction Project). A special flood control district was proposed to implement this plan, but it was rejected by the Lewis County Board of Commissioners because it did not meet the legal criteria for creation.

The Lewis County Board of Commissioners took the lead by establishing a countywide flood control district zone, and used local and state funding to study modifications to the 1984 Authorized Project (Skookumchuck Dam). The Skookumchuck Dam project had evolved to the point of having the Corps conduct Preconstruction Engineering and Design work from February 1988 through August 1990. Prior to the Preconstruction Engineering and Design, the Washington State Department of Transportation had plans to

widen and raise segments of Interstate 5 near Centralia and Chehalis. These post-1996 local flood studies also supported development of a flood hazard management alternative other than raising Interstate 5.

Lewis County asked that the Corps resume its Preconstruction Engineering and Design work on July 7, 1998, and to consider additional measures with the authorized dam modification element for a flood hazard reduction plan for the Centralia-Chehalis urban area. Although the City of Centralia was the project sponsor through the feasibility phase, Lewis County assumed sponsor responsibilities for project construction and to provide the appropriate cost sharing. The Corps resumed work in July 1998.

The study area for the authorized project includes the mainstem Chehalis River, its floodplain and tributaries from the South Fork Chehalis River confluence to Grand Mound, the Cities of Centralia and Chehalis, surrounding areas in Lewis and Thurston Counties, the Town of Bucoda, and along the Skookumchuck River to a point above the Skookumchuck Dam. Tributaries in the study area include the Skookumchuck and Newaukum Rivers, and several smaller creeks (Hanaford, China, Salzer, Coal, Dillenbaugh, and Berwick).

The Corps began the scoping process for the Environmental Impact Statement (EIS) by holding two public meetings on September 28 and 29, 1999, in Chehalis and Rochester, respectively. Supplemental studies were completed to address concerns raised during the scoping and project development processes. The Corps conducted a Post-Authorization Study, the Chehalis River General Reevaluation Study. This type of study is a reanalysis of a previously completed and authorized study using current planning criteria and policies, which is required because of changed conditions/assumptions. The results may affirm the prior study, reformulate or modify it, or find that no plan is currently justified. The results for this General Reevaluation Study are summarized in the Corps July 2002 *Draft EIS, Centralia Flood Damage Reduction Project*.

The EIS evaluated seven alternatives. The preferred alternative is a series of setback levees with modifications to the Skookumchuck Dam to increase flood storage, and non-structural features to be included in the local sponsor's revised floodplain management plan. The new plan for the project is to be in compliance with Executive Order 11988, which directs federal agencies to avoid impacts associated with floodplain development (see Chapter 3 for additional information on Executive Order 11988). The project has not yet been implemented.

### **1988-Salzer Creek Flood Damage Reduction Study**

In response to a March 1988 request by the City of Centralia for assistance with flooding along Salzer Creek, the Corps conducted a reconnaissance study under authority of Section 205 of the 1948 Flood Control Act.

Flooding in the lower Salzer Creek basin causes damage within the Cities of Centralia and Chehalis, and in unincorporated Lewis County. Flooding within the Salzer Creek basin can occur from two different sources: high flows in the Chehalis River that back up water in Salzer Creek, or high flows on Salzer Creek itself. The most serious floods occur with backwater flooding. For most events, Salzer Creek can be expected to peak

about 6 to 8 hours before the Chehalis River. Studies indicate that when Salzer Creek experiences a 100-year flood, the Chehalis River would approximate the 75-year flood level. In addition to creating a backwater effect on Salzer Creek, water surface elevations on the Chehalis River with discharges in excess of about a 25-year frequency event overtop Interstate 5 both upstream and downstream from the Salzer Creek confluence, resulting in flooding conditions in both Chehalis and Centralia. The Skookumchuck River overflow may also contribute to the flooding near the mouth of Salzer Creek. No attempt was made by the Corps to analyze the effect of overland flow from the Skookumchuck River in this level of investigation.

The Corps determined the most feasible flood damage reduction alternative to be a closure structure and small levee across Salzer Creek in the vicinity of I-5 to prevent backwater flooding from the Chehalis River, and a pump (or pumps) to convey ponded Salzer Creek water across the closure structure. The project would protect not only improvements along Salzer Creek, but also a portion of Interstate 5 that is subject to flooding and the Centralia-Chehalis airport.

The project would consist of the following main elements:

- Constructing a short levee segment and a closure structure with a pump plant across lower Salzer Creek just west (downstream) of the Interstate 5 bridge over the creek. The levee would stretch from I-5 east to high ground and would protect the right bank only. It would have 3:1 (horizontal: vertical) side slopes, a 12-foot top width, and a height of 8 to 16 feet. The levee would be designed with a top elevation that allows 3 feet of freeboard over the 100-year water surface elevation.
- Raising and improving the airport dike to provide appropriate flood protection.
- Building two new short levee segments to tie the airport dike to the I-5 embankment.
- Designating a ponding area and channel improvement along Salzer Creek to improve conveyance.

The City of Centralia signed the Feasibility Cost Sharing Agreement in September 1990, and has been seeking cost sharing funds since that time. The estimated feasibility study cost is \$650,000 (sponsor to pay half of this), and estimated construction cost is \$3 million (sponsor to pay roughly one-quarter). The City of Centralia is the main sponsor. Participating sponsors are the City of Chehalis and Lewis County. In April 1993, affected property owners in the Salzer Creek basin did not approve the formation of a special district to fund this project. Instead, they approved construction of a levee that would provide a 45-year design level of protection. This project is called the “Long Road Levee” and was completed in September 2000. The levee is maintained and funded by the Lewis County Flood Control District No. 2, which was formed in 1991.

### **1988-Section 205 Initial Reconnaissance Report on China Creek at Centralia**

In response to a March 1988 request by the City of Centralia for help with flooding along China Creek, the Corps conducted an initial reconnaissance study under authority of Section 205 of the 1948 Flood Control Act.

China Creek is a tributary to the Chehalis River and has a drainage area of 5.32 square miles at its mouth. The lower reach of the basin, below the Burlington Northern Railroad crossings (drainage area 0.87 square mile), is well developed and highly channelized with numerous constricted and covered sections. The upper portion of the basin is relatively undeveloped and wooded, surrounded by low-lying hills with a maximum elevation of about 600 feet. Stream gradients are mild to relatively flat from the confluence with the Chehalis River to 1 to 2 miles upstream of the Burlington Northern Railroad tracks.

Flood-producing streamflows occur from October through March and are generated primarily from maritime rainstorms with little or no snowmelt. Flooding near the mouth of China Creek is affected by backwater from the Chehalis River. Flooding in the project area can also result from overflows from the Skookumchuck River entering China Creek near the Burlington Northern Railroad during periods of high discharge. No streamflow records are available for China Creek. The 10- and 100-year frequency floods on China Creek are estimated to be 235 and 480 cfs, respectively.

Alternatives were identified for flood damage reduction, including levees, flood-proofing, channel modification, detention storage, and diversion. Extensive development around and over the channel eliminated most of these alternatives, including levees and channel modification. An alternative that provides detention storage and diversion of floodwaters upstream from the Burlington Northern Railroad may be the most effective solution to reducing flood damages from China Creek. A program of periodic channel maintenance by Centralia would also help reduce the potential for flood damage.

The recommended alternatives are not eligible for federal participation because the 10-year discharge on China Creek in the project area is estimated to be only 235 cfs. Federal participation criteria require the 10-year flood to be greater than 800 cfs. The Corps recommended that no further studies of the flood problems from China Creek at Centralia be undertaken using the authority of Section 205 of the 1948 Flood Control Act, as amended.

### **1990-Centralia-Chehalis Flood Warning and Flood Response Study**

In January 1990, the Chehalis River at Centralia experienced a 100-year flood, and the greater Centralia-Chehalis area found it difficult to respond to this disaster. Property damage was estimated at \$15 million, and three lives were lost. In March 1990, Lewis County asked the Corps to perform a non-structural study, and to work with the county and the Cities of Centralia and Chehalis to improve their flood warning and flood response plan. The Corps completed a reconnaissance report in August 1990 that indicated that substantial flood damage reduction and safety benefits could accrue from improving flood warnings, public awareness of the flood problem, and the government's flood response plan. In early 1991 the Seattle District Corps received \$40,000 to complete the non-cost-shared feasibility phase.

During the feasibility phase, the following products were completed: (1) a public brochure that advises Centralia and Chehalis citizens what to do before, during, or after the flood; (2) a flood warning map that predicts what areas of Centralia and Chehalis would be flooded based on information received from upstream river gauges; and (3) a flood warning checklist that alerts city and county officials which of their facilities may

be threatened during a flood. No construction project was identified in the feasibility phase.

The Corps has investigated flood damages in the Centralia-Chehalis valley. Based on historical records, the Corps has identified water levels at selected gauges that cause both zero damage and major damage in the valley. These gauge heights provide a reference for quickly assessing the severity of anticipated floods, and triggering emergency flood response operations in Lewis County.

The Corps developed a Flood Phases Guidelines Manual in 1993 that includes the flood phase warning map for the Centralia-Chehalis valley. This map was developed prior to the 1996 flood of record, but the four flood phases in the flood warning map are still accurate and used for local alerts and flood emergency preparedness. Reproductions of the map are inserted annually in the local newspapers. Large wall maps are posted in county and city offices along with a graphic and narrative description of each of the four flood phases.

### **1989-Newaukum River at Chehalis Flood Reduction Study**

In 1989, under Corps Section 205 authority, the Seattle District Corps investigated flood solutions to the flooding problem centered on the Chehalis Avenue Apartments in Chehalis. The solution proposed by the Corps was an approximately 1,000-foot-long levee and pump plant to the south of the apartments. The potential project had a benefit to cost ratio of only 0.2 to 1, and further consideration of the project ceased in November 1989. Flood-proofing by home, apartment, and business owners was encouraged by the Corps.

### **2007 Project Authorization**

The Centralia Flood Damage Reduction General Reevaluation Report and EIS were completed in April 2004. A Record of Decision was issued in January 2006 and project authorization was received in Section 1001(46) of the Water Resources Development Act of 2007. The 2007 Water Resources Development Act authorized the Corps, in cooperation with the non-federal sponsor, to pursue three options—Water Resources Development Act 2007 Approved Plan, National Economic Development Plan, and Locally Preferred Plan. These are described below:

#### **Water Resources Development Act 2007 Approved Plan:**

- Construction of a 100-year level of protection levee system along the Chehalis River from approximately river mile (RM) 75 to RM 64 and along most of the lower 2 miles of both Dillenbaugh Creek and Salzer Creek;
- Construction of a levee along the lower approximately 2 miles of the Skookumchuck River to the confluence with Coffee Creek that would provide 100-year level of protection;
- Raising approximately eight structures that would incur damages from increased inundation as a result of the project;

- Modification of Skookumchuck Dam to allow 11,000 acre-feet of flood control storage.

National Economic Development Plan:

- Construction of a 100-year level of protection levee system along the Chehalis River from approximately RM 75 to RM 64 and along most of the lower 2 miles of both Dillenbaugh Creek and Salzer Creek;
- Construction of a levee 2 feet below the 100-year water surface elevation along the lower approximately 2 miles of Skookumchuck River to the confluence with Coffee Creek;
- Raising approximately eight structures that would incur damages from increased inundation as a result of the project;
- Modification of Skookumchuck Dam to allow 11,000 acre-feet of flood control storage.

Locally Preferred Plan:

- Construction of a 100-year level of protection levee system along the Chehalis River from approximately RM 75 to RM 64 and along most of the lower 2 miles of both Dillenbaugh Creek and Salzer Creek;
- Construction of a levee along the lower approximately 2 miles of Skookumchuck River to the confluence with Coffee Creek that would provide 100-year level of protection (based on 20,000 acre-feet of storage at Skookumchuck Dam);
- Raising approximately eight structures that would incur damages from increased inundation as a result of the project;
- Requires further federal evaluation.

***Corps Twin Cities Flood Damage Reduction Project***

The Corps and the State of Washington, the local sponsor, are conducting an evaluation of flood damage reduction projects in the Chehalis-Centralia area. These projects include the levee system along the Chehalis River, a control structure on Salzer Creek, and modifications to Skookumchuck Dam as well as other local improvements. The project is being conducted in two parts. Part 1 is an evaluation and update of the existing design based on the 2007 flood. Part 2 will be the design phase. The Corps anticipates beginning construction in 2014.

***2009-Chehalis River Basin General Investigation***

In 1999, the Corps initiated a General Investigation for the entire Chehalis River basin. The investigation is currently in the feasibility phase. The feasibility study phase began in 2000 as a single-purpose ecosystem restoration study with incidental flood damage reduction benefits. In 2009, flood risk management was added as an equal project purpose, bringing on the need for a fully-updated Project Management Plan. The Flood Authority is collaborating with Grays Harbor County, the local sponsor for the

investigation. The Project Management Plan has been drafted and is expected to be approved in May 2010.

## **FEMA Region X Interagency Hazard Mitigation Team**

The FEMA Region X Interagency Hazard Mitigation Team is composed of numerous federal, state, and local agencies. The Supplemental Flood Hazard Mitigation Report (FEMA, 1991), prepared by the Region X Interagency Hazard Mitigation Team after the November 1990 floods, made recommendations concerning the recurring flooding in the Centralia-Chehalis area. Current flood control structural proposals identified in the area included: (1) a dam on the Skookumchuck River that would provide incidental flood control benefits for Centralia; (2) a levee segment on the Skookumchuck River that would protect a portion of Centralia; and (3) a levee that would protect the Chehalis-Centralia airport.

The following recommendations made by the Interagency Hazard Mitigation Team (FEMA, 1991) were identified as being interdependent and best implemented simultaneously:

- State government, with FEMA support, should provide leadership to encourage all home and business owners who receive flood damage to flood-proof their homes and businesses. Flood audits should be performed on selected structures.
- The federal government should aid the local governments and individuals in improving their flood warning and flood response systems.
- All potentially feasible structural projects should be investigated and their costs, benefits, and impacts thoroughly researched.

## **Natural Resources Conservation Service**

The Soil Conservation Service (now Natural Resources Conservation Service or NRCS) conducted a series of flood hazard analyses for tributaries of the Chehalis River in the 1970s. Flood hazard analyses by the NRCS are conducted according to recommendations in a report by the 1966 Task Force on Federal Flood Control Policy, especially recommendation 9(c), "Regulation of Land Use." It requires that preliminary reports be issued where guidance may be needed before a complete flood hazard information report can be prepared, or when a full report is not scheduled.

### ***1978-Flood Hazard Analysis of Coffee Creek***

This study was requested by the City of Centralia. The objective was to conduct a detailed flood hazard analysis of the Coffee Creek floodplain in and adjacent to the north portion of Centralia. Coffee Creek is a tributary of the Skookumchuck River, with headwaters in Thurston County, flowing south through Zenkner valley to the Skookumchuck River just north of Centralia. The NRCS report addressed the lower 3.4 miles of the watershed.

The NRCS flood hazard study developed information needed to show portions of the Coffee Creek floodplain subject to inundation by select frequency floods. A total of 395 acres is subject to inundation by the 100-year flood in the study area. The study did not

address flooding in the Coffee Creek basin caused by overland flow from the Skookumchuck River. Additional information on the Coffee Creek Flood Hazard Analysis can be found in the 2008 Lewis County CFHMP.

### **1977-Flood Hazard Analysis of China Creek**

An analysis of flooding on China Creek was requested by the City of Centralia in 1974. The objective was to conduct a detailed flood hazard analysis of the China Creek floodplain in and adjacent to Centralia.

The NRCS study provided peak discharges, water surface elevations and profiles, and flood boundary and floodway information for select frequency floods. The study did not consider any structural changes on the streams. The results of this study were presented as a base from which Lewis County and the City of Centralia may compare the effects of future alternatives for development. The NRCS did, however, recommend that clearing the bridges and channels of sediment, debris, and heavy vegetation would reduce floodwater elevations, especially for smaller floods. The study also emphasized that land use and development trends within the watershed, coupled with the outside influence of the Chehalis and Skookumchuck drainages, have a direct effect on future flooding potential. Additional information on the China Creek Flood Hazard Analysis can be found in the 2008 Lewis County CFHMP.

### **1975-Flood Hazard Analysis, Salzer-Coal Creeks**

An analysis of flood hazard for Salzer-Coal Creeks was requested by the Lewis County Commissioners in 1973. The objective of this study was to conduct a detailed flood hazard analysis of the Salzer-Coal Creek floodplain in and adjacent to Centralia. Information on the Salzer-Coal Creeks Flood Hazard Analysis can be found in the 2008 Lewis County CFHMP.

## **U.S. Bureau of Reclamation**

In its publication *Upper Chehalis River Basin Reconnaissance Report* (Reclamation, 1965), Reclamation investigated the multipurpose land and water resource development potentials of the upper Chehalis River basin. Multipurpose development considered in this report included irrigation, flood control, fish and wildlife, and recreation. Water quality control, municipal and industrial water, navigation, and power generation were evaluated, but would not be involved in a development plan. The study area included only the upper part of the Chehalis River basin, which was defined as that portion of the basin lying upstream from the confluence of the Chehalis and Black Rivers in Grays Harbor County near Oakville.

A reconnaissance land classification survey made by Reclamation in 1960 and 1961 covered a total of 282,000 acres. Reclamation determined that the upper Chehalis River basin contains about 120,000 acres of arable land, of which about 85,000 acres, or 70 percent, are suitable for irrigation under long-range development plans.

The following plans for irrigation development in the Chehalis River basin were analyzed:

- Storage at the Doty site on Elk Creek to serve lands in the Adna area, and at the Alpha site on the South Fork Newaukum River to serve lands in the Newaukum area.
- Alternatives to Doty storage at the Pe Ell, Dryad, Meskill, and Ruth sites on the Chehalis River, Boistfort and Point Hill sites on the South Fork Chehalis River, and alternatives to Alpha storage at the Logan Hill, Middle Fork, and Bear Creek sites on the North Fork Newaukum River and Onalaska site on the South Fork Newaukum River.
- Bloody Run site on the Skookumchuck River.

The first plan was superior in providing storage and facilities within the range of requirements for multiple purposes considered in the plan formulation. Storage sites in the second plan were eliminated for cost or geologic reasons.

The plan was presented as having an engineering feasibility and a benefit-cost ratio of 1.22 to 1. Financial assistance to the water users would be necessary. The plan would provide full-scale irrigation development for an almost solid area or block of land.

The development plan provided for reservoir operation for flood control to the extent feasible. It was projected that the project could reduce flood damages primarily below the confluence of the Newaukum and Chehalis Rivers.

No further work was done on this project.

## **Existing Comprehensive Flood Hazard Management Plans**

Several jurisdictions in the Chehalis River basin have developed CFHMPs. These plans have provided background information for the development of this basin-wide CFHMP.

### ***2009-Chehalis Tribe Comprehensive Flood Hazard Management Plan***

The Chehalis Tribe completed its CFHMP for the Chehalis Reservation in March 2009. Approximately 75 percent of the Reservation is in the active floodplain, and portions of the Reservation are isolated by floods for several days. The long-term goals of the Chehalis Tribe CFHMP are:

- Protect and preserve the lives, health, safety and well-being of the people living on the Chehalis Reservation.
- Reduce repetitive damages and costs associated with flooding.
- Protect the Reservation from negative impacts of upstream floodplain development.

Short-term goals of the CFHMP are intended to address the previous lack of (1) a science-based 100-year recurrence interval flood map for the entire Chehalis Reservation (update the 1977 USGS flood map), and (2) written record of hazard areas associated with flooding, and flood-related processes such as channel migration, within and adjacent to the Chehalis Reservation. The product of this short-term goal will be the 100-year

flood inundation surface map with hazard areas indicated. The flood map will be used as a tool for planning and permitting by the Chehalis Tribe.

The CFHMP includes a number of structural and non-structural mitigation measures that were evaluated and prioritized for the CFHMP. The structural measures include culvert and bridge improvements to reduce access limitations during flooding events. The non-structural measures include emergency response and preparedness measures, as well as elevating or removing structures from the floodplain. The Chehalis CFHMP also identifies studies needed to implement the mitigation measures and meet the CFHMP goals.

### **2001-Grays Harbor County Comprehensive Flood Hazard Management Plan**

Grays Harbor County received funding for comprehensive flood hazard management planning from Ecology's Flood Control Assistance Account Program (FCAAP) grant program and FEMA's flood mitigation assistant (FMA) grant program administered by the State Emergency Management Department. The Grays Harbor County CFHMP covers a large portion of Grays Harbor County, with special focus on the Humptulips, Wynoochee, and Satsop Rivers. The plan addresses the watersheds contributing to Grays Harbor County and evaluates the potential for flooding and its impacts. It also proposes possible structural and alternative management solutions to reduce flood hazards.

The short- and long-term goals of the Grays Harbor County CFHMP include:

- Improve the protection of public health and safety from flooding events.
- Provide practical, cost-effective solutions that will result in measurable reductions in flood frequency, flood duration, and the amount of damage that occurs in frequently flooded areas.
- Identify and assess county-wide problem areas through public meetings and existing FEMA mapping.
- Develop a community-driven plan with positive working relationships among the community and governmental agencies.
- Ensure that all parties are aware of the issues, processes, and implications of a CFHMP.
- Reach public and agency consensus on solutions and funding.
- Document recommendations consistent with Ecology's FCAAP to permit further grant funding opportunities for plan implementation.
- Develop a plan consistent with FEMA Flood Hazard Mitigation Planning so that the county can be eligible for flood hazard mitigation assistance for the projects detailed in the plan.

Instrumental in implementation of this CFHMP goals and objectives, the FCAAP, administered by Ecology's shoreland and coastal zone management program, promotes a watershed approach to minimizing flood hazards. To be eligible for funding, jurisdictions must participate in the National Flood Insurance Program (NFIP).

Flood hazard management measures recommended in the CFHMP are categorized as non-structural or structural. Key non-structural approaches to flood hazard management include the following: land use regulations/permitting, accurate floodplain mapping, inter-jurisdictional coordination, floodplain conservation easements, educational materials on flood hazard management, flood warning system, new standards for design, construction, and maintenance, and a NFIP community rating program. Non-structural alternatives also include measures that homeowners can take to protect their homes from flood damage such as floodproofing, elevation, relocation, or buyout and demolition of affected structures. Structural management measures include levees, setback levees, floodplain excavation, flood control reservoir, overflow culverts and channels, onsite detention and retention, and biostabilization and other engineered solutions.

### ***2008-Lewis County Comprehensive Flood Hazard Management Plan***

A Project Advisory Committee guided development of the Lewis County CFHMP, and included members from the county, Ecology, cities and utilities. The policies laid out in the CFHMP include hazard identification, education and outreach, planning, regulations and development standards, corrective/mitigation actions, infrastructure, and emergency services. To address flood control issues in Lewis County, the CFHMP recommends drainage basin plans for Berwick and China Creek to identify structural and non-structural actions that will minimize peak flow increases, map channel migration zones, update hazards data sets and maps, and identify and collect missing data sets. Other recommended projects in the CFHMP are the Regional Flood Alleviation Project along I-5 consisting of levee construction and implementation of flow control facilities that minimize impacts to downstream populations, regional flood detention facilities, regional stormwater detention facilities, Salzer Creek backwater control, and a technical assistance program for bank stabilization and debris removal. The CFHMP also identifies coordinating with the Corps on its study of using the Skookumchuck Dam for flood control and creating flood district boundaries.

The Lewis County CFHMP recommends new flood hazard management policies to minimize future impacts of flooding. The policies are divided into seven categories:

- Hazard identification,
- Education and outreach,
- Planning,
- Regulations and development standards,
- Correction (mitigation) actions/repetitive loss,
- Infrastructure, and
- Emergency services.

The plan includes policy statements and recommended actions for each category.

Lewis County is currently in the process of developing a Multijurisdictional Hazard Mitigation Plan. A draft of the plan was released in November 2009.

### **2009-Natural Hazards Mitigation Plan for the Thurston Region**

Thurston County completed a CFHMP in 1999. The County completed the majority of the projects and other recommendations in the plan. In September 2009, the County adopted a Natural Hazards Mitigation Plan for the Thurston Region.

The Natural Hazards Mitigation Plan includes a risk assessment, hazards profile, and mitigation goals and initiatives for earthquakes, storms, floods, landslides, wildland fire, and volcanic activity. It includes climate change projects.

The flood hazards profile in the plan includes the Skookumchuck, Chehalis, and Black Rivers which are in the Chehalis River basin. The assessment concludes that the probability of occurrence of flood events in the Thurston Region is high with the Chehalis and Skookumchuck Rivers expected to experience a major flood every 4 to 4.5 years. The plan also discusses groundwater flooding which occurs in the Scatter Creek and lower Black River portions of the Chehalis basin.

The plan includes the following mitigation priorities that relate to flooding:

- Create a lifeline transportation route GIS map for the Thurston region and integrate the data into the Thurston County emergency Operations Plan and other local planning needs.
- Develop inter-jurisdictional capabilities to share critical resources during emergencies and natural disasters.
- Improve the capabilities of managing debris from severe winter storm events.
- Obtain digital data and create GIS maps of the flood inundation from possible dam failures of the Skookumchuck Dam on the Skookumchuck Dam and the Alder and La Grande Dams on the Nisqually River, develop emergency evacuation routes, and update affected agencies comprehensive Emergency Management Plans.
- Develop public information and outreach website portal and complementary printed materials to increase the awareness and participation in natural hazards mitigation planning among the region's major employers, small businesses, and residents.
- Continue to refine the list of the region's critical facilities and jurisdictional asset data, geocode these locations, and update their financial value.
- Strengthen the capabilities of the Disaster Medical Coordination Center (DMCC) Hospital.

**1999-Bucoda Comprehensive Flood Hazard Management Plan and 2009-Tow of Bucoda Annex to the Natural Hazards Mitigation Plan for the Thurston Region**

The Town of Bucoda prepared its CFHMP in 1999 under a grant from Ecology's FCAAP. Bucoda is periodically inundated by floodwaters from the Skookumchuck River which result largely from upstream activities. Plan goals include prevention of harm to life and property, preservation of water quality, protection of fish and wildlife habitat, and minimization of cost.

The Bucoda CFHMP included structural and non-structural actions. Structural projects include building an overtopping levee at the north end of town, and installing a twin 18-inch culvert under Main Street at 11th Avenue to allow areas of town to drain rapidly following floods. Other structural recommendations are streambank stabilization with habitat rehabilitation, house raising, and regrading Market Street. Non-structural projects listed are overall cooperation with the flood control program on the Chehalis River, largely focused upon retrofit of the Skookumchuck Dam, improvement of the flood notification and response program, and adoption of an ordinance to restrict filling within the secondary overflow boundary.

The Town of Bucoda participated in the development of the Natural Hazards Mitigation Plan for the Thurston Region and its Natural Hazards Mitigation Plan is an Annex of the Thurston Region plan. The Town had not yet adopted this plan as of mid March 2010.

The Natural Hazards Mitigation Plan determined that flooding from the Skookumchuck River is the most prevalent natural hazard for Bucoda. The Skookumchuck River reaches flood stage at the Bucoda gage approximately once every four years with a 24 percent annual recurrence rate. Major flooding forces many people in the town to evacuate their houses and can isolate the town when SR 207 floods.

**2008-City of Centralia Comprehensive Flood Hazard Management and Natural Hazards Management Plan**

The City of Centralia adopted its Comprehensive Flood Hazard Management and Natural Hazards Management Plan in December 2008. Concern over major flooding events, evolution of the U.S. Army Corps of Engineers' proposed flood control project in the Chehalis River basin, and a lack of clearly articulated flood hazard management policies prompted the city to develop this new plan. The Action Plan section lists activities appropriate to the community's resources, hazards, and vulnerable properties. The Action Plan identifies who does what, when it will be done, and how it will be financed.

Proposed actions include preventative activities such as zoning, stormwater management regulations, building codes, preservation of open space, and an evaluation of the effectiveness of current regulatory and preventative standards and programs. The Plan lists property protection actions such as acquisition, retrofitting, and insurance, as well as activities to protect the natural and beneficial functions of the floodplain, such as wetlands protection. Also listed are the development and maintenance of a specific flood

warning and evacuation program for the city, retrofitting and updating of current infrastructure and emergency services, and structural projects such as reservoirs and channel modifications. The China Creek Drainage Basin Plan, Centralia Flood Reduction Project (CFRP), construction of regional stormwater and flood detention facilities, Salzer Creek Backwater Control, and construction of a levee system along the Chehalis River in the City of Centralia are all specific actions listed in the Plan.

### **2007-City of Montesano All Hazard Mitigation Plan: Addendum 2**

In response to the Grays Harbor County Natural Hazards Mitigation planning process, the City of Montesano developed and integrated its own Natural Hazards Mitigation Plan (NHMP) with that of the county. The NHMP identifies vulnerabilities for future disasters and proposes the mitigation initiatives necessary to avoid or minimize those vulnerabilities. The NHMP outlines specific mitigation initiatives for the city that are expected to be implemented by the year 2025.

A risk assessment was performed for several hazard events including earthquake, storm, flood, landslide, tsunami, wildlife, volcano ash fallout, and hazardous materials releases. The assessment concluded the city is vulnerable to all of the hazards outlined in the plan. The NHMP makes the following mitigation recommendations: installation of a city-owned natural gas/propane generator at City Hall to avoid disruption to the Emergency Operations Center, and construction of a 750,000-gallon reservoir on city property as backup to the city's vulnerable primary water source. Additionally, long-term bank stabilization on the Wynoochee River is recommended to repair bank erosion which endangers the integrity of the city's sewage treatment plant and holding lagoons.

### **2004-Chehalis Basin Watershed Management Plan**

The Chehalis Basin Watershed Management Plan provides the collective vision of citizens, utilities, federal, state, tribal, and local governments within the Chehalis Basin Partnership. The Plan is a framework for water resource management, examining water quantity, water quality, instream flow, habitat, and water rights issues in the basin.

In order to address water quantity, the Partnership recommends conducting a groundwater study that provides necessary information to decision-makers to address hydraulic continuity and better evaluate whether an individual water right application would impact stream flows. They also recommend creating a "tool box" of alternative approaches for those seeking water supply, water rights and tracking, and enforcement. Exempt wells should be evaluated to assess their real cumulative impact in the Chehalis River basin and its subbasins. The Partnership also makes various general and specific recommendations for water conservation. In order to address water quality, the Partnership recommends a basin-wide water quality monitoring program, and exploration of a range of approaches to improve communication, coordination and consolidation of all habitat efforts in the Chehalis River basin. The Partnership also recommends reevaluating minimum instream flows established in 1976 at sites within the basin using updated scientific information.



## **CHAPTER 5 BASIN FLOOD CHARACTERISTICS**

Flooding is a common, historical occurrence in the Chehalis River basin. Major flood events on the Chehalis River and its tributaries have affected Lewis, Thurston, and Grays Harbor Counties in the years 1972, 1975, 1986, 1990, 1996, 2007, and 2009. This chapter reviews historical information on previous flood events, including flood damage reports and historical flood flows, and focuses on key physical factors that affect flooding in the Chehalis River basin.

The information presented in this chapter is based on flood history sections of existing Comprehensive Flood Hazard Management Plans (CFHMPs) in the Chehalis River basin, especially the Lewis County CFHMP (2008). Because the most current information is available from the Lewis County plan, the information presented here focuses primarily on the Lewis County portion of the basin. As information is collected for the lower basin, it will be added to future iterations of this plan.

Other primary sources of information included: CFHMPs developed by the Chehalis Tribe (2009) and Grays Harbor County (2001), meteorologic and hydrologic data collected by the National Weather Service and the U.S. Geological Survey (USGS), Lewis County 2007 Flood Disaster Recovery Strategy prepared by Cowlitz-Wahkiakum Council of Governments (CWCOG, 2009), and the U.S. Army Corps of Engineers General Reevaluation Study for the Centralia Flood Control Project (2003).

### **Factors Affecting Flooding**

The extent and severity of flood damage in the Chehalis River basin is determined by several factors, including time of year, flood magnitude and duration, sediment transport and deposition, the amount and type of development in the floodplain, and obstructions in the channel.

#### ***Seasonal Conditions***

Flooding in the Chehalis River basin typically occurs during the fall and early winter months. Heavy rainfall, rapidly melting snowpack, or a combination of these factors can result in river and stream flood conditions. Recent major floods have occurred between November and March.

#### ***Flood Magnitude and Duration***

The Chehalis River basin is a large, relatively low-elevation area with a relatively high drainage density. Flooding is largely the result of heavy rain events, and to a lesser degree to rain-on-snow events. The magnitude and duration of these types of floods can vary significantly depending on the type, spatial extent, and duration of storm events.

Flows within the mainstem of the Chehalis River respond to contributions from the major tributary channels. This response can be additive if the timing and spatial extent of

precipitation is similar over the watershed. The response in the mainstem can also be driven by a limited number of tributaries, as seen in the 2007 event, when intense rain in the Willapa Hills resulted in very high flows in the upper mainstem and South Fork of the Chehalis River and flood flows downstream to the mouth.

All flow from the upper tributaries is routed through the lower valley, including a narrow portion of the valley downstream of Grand Mound. These flows can then combine with flows from the lower tributaries such as the Satsop, Wynoochee, and Wishkah Rivers. The lower valley is typically wider than the upper valley, with less structural modification (e.g., levees, bridges) than in the Chehalis and Centralia (Twin Cities) area. In past events, storms appear to have been more significant in either the upper or the lower basin. According to flood peak data maintained by the National Weather Service, the ranking of flood peaks in the lower basin is different than in the upper basin. For example, the 2007 event is ranked number eight on the list for the Satsop River, and is not in the top 10 peak flows for the Wynoochee River.

In the lower basin, flood stage becomes increasingly influenced by tides as the river approaches its mouth at Grays Harbor. Flood peaks below Elma are likely modified by tide stage, but there are no studies that detail this process.

In general, precipitation-driven flooding has distinct peaks associated with specific storm events, which limits the overall duration of flooding. The 1996, 2007 and 2009 flood events in the upper basin occurred in a timeframe of a week or less, according to data from the Grand Mound USGS gauge. The duration of flooding will be influenced by soil saturation and other conditions prior to the storm event, as well as the length of the storm event itself.

### ***Sediment Transport and Deposition***

The generation, transport, and storage of sediment are major functions of the Chehalis River and its tributaries. Sediment sources in the upper watershed include weathered bedrock, glacial sediments, and alluvial deposits (Chehalis Tribe, 2009). These sources can deliver sediment continuously or episodically as a result of landslides or significant channel changes. Channel migration will also result in localized erosion and deposition of sediments.

Sediment processes can influence flooding in a number of ways. Increasing sediment loads can result in deposition within active channels, reducing conveyance capacity. Discrete events, such as landslides, can block channels and divert flow. Deposition on the floodplain can also influence flood flows. This deposition typically includes sand or finer materials, since the transport capacity of flows on the floodplain is typically lower than in the channel.

There is limited recent information available regarding sediment transport processes within the Chehalis River basin. The USGS performed a study that investigated sediment transport within the Chehalis River basin for the water years 1961 to 1965 (Glancy, 1971). This study identified the Wynoochee River and the Middle and West Forks of the

Satsop River as having the highest unit yields of sediment production and transport. Within the upper basin above Porter, the streams that drain the Willapa Hills to the west were found to have larger sediment yields than the streams that drain the eastern portion of the contributing basin. The upper mainstem had the highest sediment yield and the Black River had the lowest (Glancy, 1971).

### ***Land Use and Development***

The land use and development in the Chehalis River basin affects flood flows and sediment transport. Forestry practices (deforestation and roads), agricultural practices (land clearing and cultivation), impervious surfaces (development), and loss of vegetation (wetland and riparian corridor) can contribute to a more rapid accumulation of flow and higher total volumes and peak flows during flood events. Structures and fill placed in the floodplain can alter flood flows locally, as well as both upstream and downstream of the structures and fill.

### ***Obstructions***

Obstructions to flood flows can be structural elements (e.g., levees, bridges, roads), or they can form during the flood as debris collects. During flood events in the Chehalis River basin, downed trees and other debris can deposit and form blockages that can divert significant volumes of flow. These obstructions can also hold back volumes of water until they break, sending a wave downstream.

There are structural elements that could impact flood flows throughout the Chehalis River basin. In the upper basin, there are at least 21 bridge crossings (Corps, 2003). In the lower basin, there are similar crossings. The Sickman-Ford Bridge on the Chehalis Reservation and associated approaches reduce the floodplain width, resulting in a backwater condition during high flows (Chehalis Tribe, 2009). The airport levee near Chehalis was observed to trap overbank flows during the 2007 event. Newspaper reports during the flooding indicate that the airport levee was breached during the event, to hasten the recession of water from over major roads. Other bridges and obstructions that exist in the Chehalis River basin are not discussed in detail in this chapter.

### **Flood Damages**

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. Flood damage costs are a way to compare the impacts of different size floods. This flood damage summary is taken from Lewis County's 2008 CFHMP and Lewis County 2007 Flood Disaster Recovery Strategy (Lewis County 2008; CWCOG, 2009).

Flood damage information was obtained by the Corps of Engineers (Corps) from field investigations, damage survey reports, and personal interviews with homeowners, farmers, businessmen, and federal, state, county, city, and public utility officials. Eyewitness accounts of flooding and reports of damage in local newspapers were also used in identifying and quantifying flood damages.

In the past 30 years Lewis County has experienced 16 federally declared disasters. Of these, 13 were either caused or exacerbated by flooding. Table 5-1 is from the Lewis County Hazard Identification and Vulnerability Analysis and lists floods that resulted in a Presidential Declaration of Disaster. Care should be used in viewing the damage costs listed in Table 5-1. This table represents damages in Lewis County only and includes some damages from the Cowlitz River, outside the Chehalis River basin. These damage costs are approximate, and for primary and significant structures and businesses. Information about damages is collected by different agencies and does not include all damages. The information is further confused when initial estimates of damage are refined. This can result in a higher or lower value. At best, the primary damage was erosion of public infrastructure (riverbanks, roads, bridges, and revetments). Costs for public damages are based on actual costs or cost estimates reviewed by FEMA. Private costs are based on information provided by victims, Red Cross, and FEMA, and do not include any reduction in property values. Lewis County Long Term Recovery Organization, a coalition of Lewis County churches, estimated the total damages to homes, businesses, and public structures that resulted from the December 2007 flooding of the Chehalis River.

**Table 5-1. Estimated Public Flood Damages in Lewis County<sup>1</sup>**

<b>Federal Declaration No.</b>	<b>Date</b>	<b>River/Area</b>	<b>Reported Public Damages (\$)</b>
DR-1734	December 2007	Chehalis	45,046,700
DR-1172	March 1997	Cowlitz	9,400,000 <sup>2</sup>
DR-1159	December 1996 – January 1997	Chehalis, Cowlitz	3,255,900
DR-1100	February 1996	Chehalis, Cowlitz	30,000,000
-	December 1994	Chehalis	40,000
DR-0883	November 1990	Chehalis	1,050,000
-	February 1990	Chehalis	200,000
DR-0852	January 1990	Chehalis	1,439,380
DR-784	November 1986	Chehalis	3,926,250
DR-322	January 1972	Chehalis	2,060,250
-	January 1971	Chehalis	446,570

<sup>1</sup> Information for the 2009 flood is not yet available.

<sup>2</sup> Amount of Stafford Act and Small Business Administration disaster loans approved.

Sources: Lewis County Comprehensive Flood Hazard Management Plan (2008), Lewis County 2007 Flood Disaster Recovery Strategy (2009)

Precise information on private property damage is, for the most part, unavailable. FEMA collects several types of data for private property, including human resources claims and requests for short-term assistance and claims through the National Flood Insurance Program (NFIP) and the Small Business Administration (SBA). Human resource claims data and the damage reported in the newspapers are not necessarily alike. Human

resource data are aggregated by zip code to protect the privacy of applicants, which makes it difficult to identify localized flood problems, trends, and causes.

Another factor to consider is the unreported private property damages. Flood insurance claims were either not filed because of lapsed flood insurance policies, or fear of increased rates. This is a common misconception; however, rates do not increase because a claim may have been submitted. In any case, the actual damages are likely understated and do not reflect the true magnitude of the problem.

The scope of the flood damages is related to the magnitude of the flood and location. Low-lying areas, especially river valleys, have flooded regularly for hundreds of years. The 1996 and 2007 flood event were the most severe and both affected interstate travel. The damage costs associated with the 1996 flood are estimated up to \$100 million (Lewis County, 2008). The total damage costs associated with the 2007 flood are estimated up to \$500 million (CWCOG, 2009).

Table 5-2 shows NFIP loss statistics for jurisdictions in the Chehalis River basin between January 1, 1978 and December 31, 2009. This information is based on data from FEMA (FEMA, 2009).

**Table 5-2. NFIP Loss Statistics from January 1, 1978 to December 31, 2009**

	<b>Total Losses</b>	<b>Closed Losses</b>	<b>Open losses</b>	<b>CWPO<sup>1</sup> Losses</b>	<b>Total Payments</b>
Grays Harbor County <sup>2</sup>	203	180	3	20	\$4,314,386.81
Lewis County <sup>2</sup>	726	630	11	85	\$22,432,705.49
Thurston County <sup>2</sup>	216	172	2	42	\$3,086,335.82
Aberdeen	220	144	0	74	\$686,941.00
Bucoda	43	38	0	5	\$257,010.48
Centralia	717	662	7	48	\$25,202,553.92
Chehalis	508	442	7	59	\$27,881,498.57
Montesano	15	14	0	1	\$195,095.97
Oakville	8	8	1	0	\$231,456.51
Pe Ell	1	1	0	0	\$37,770.81
<b>Total</b>	<b>2,657</b>	<b>2,291</b>	<b>31</b>	<b>334</b>	<b>\$84,325,755.38</b>

<sup>1</sup>Closed Without Payment

<sup>2</sup>Includes all losses in the counties, not just in the Chehalis River basin

Source: FEMA, 2009

## Historical Flow Records

Flow data have been collected on the Chehalis River and two of its major tributaries, the Newaukum and Skookumchuck Rivers, by the National Weather Service and USGS. The National Weather Service stations record only water levels, while the USGS stations

record water levels and flow. The stream gauging network in the Chehalis River basin is described in Chapter 2. This historical flow record summary is taken from Lewis County’s 2008 CFHMP and the USGS Washington Water Science Center website (USGS, 2010). Similar historical flow record summaries are not available for other tributaries in the Chehalis River basin.

Streamflow data are summarized in Table 5-3 for three USGS stations: the Chehalis River near Grand Mound, approximately 7 miles downstream from the Skookumchuck River confluence; the Newaukum River near Chehalis; and the Skookumchuck River near Bucoda. The data show that the monthly distribution of flow is similar for the mainstem of the Chehalis River and two major tributaries flowing through the Centralia-Chehalis valley (Figure 6-1 in Lewis County, 1994). The largest monthly flows occur from December through February, with this period accounting for over half of the annual runoff volume. The smallest mean monthly flows occur from July through September, when monthly flows range from only 1 to 3 percent of the annual runoff.

**Table 5-3. Mean Monthly Flows for three USGS Stations in the Chehalis Basin**

	<b>Chehalis River Near Grand Mound</b>			<b>Newaukum River Near Chehalis</b>			<b>Skookumchuck River Near Bucoda</b>		
<b>Period of record</b>	<b>1928-2009</b>			<b>1929- 2009</b>			<b>1967- 2009</b>		
<b>Drainage Area (mi<sup>2</sup>)</b>	<b>895</b>			<b>155</b>			<b>112</b>		
<b>Month</b>	<b>Flow (cfs)</b>	<b>% Annual Flow</b>	<b>Flow per Unit Area (cfs/mi<sup>2</sup>)</b>	<b>Flow (cfs)</b>	<b>% Annual Flow</b>	<b>Flow per Unit Area (cfs/mi<sup>2</sup>)</b>	<b>Flow (cfs)</b>	<b>% Annual Flow</b>	<b>Flow per Unit Area (cfs/mi<sup>2</sup>)</b>
January	6,450	19	7.2	1,120	18	7.2	764	18	6.8
February	5,710	17	6.4	961	16	6.2	647	16	5.8
March	4,480	13	5.0	767	13	4.9	531	13	4.7
April	2,930	9	3.3	541	9	3.5	394	9	3.5
May	1,400	4	1.6	297	5	1.9	225	5	2.0
June	811	2	0.9	184	3	1.2	153	4	1.4
July	378	1	0.4	89	1	0.6	97	2	0.9
August	244	1	0.3	56	1	0.4	80	2	0.7
September	339	1	0.4	70	1	0.5	122	3	1.1
October	907	3	1.0	180	3	1.2	136	3	1.2
November	3,810	11	4.3	738	12	4.8	346	8	3.1
December	6,280	19	7.0	1,070	18	6.9	705	17	6.3
Annual Average	2,812	100	3.1	506	100	3.3	350	100	3.1

Source: Lewis County Comprehensive Flood Hazard Management Plan (2008), USGS (2010)

The top ten peak annual flow data are summarized from greatest to lowest in Table 5-4. Flow data in Table 5-4 show that the largest floods occurred during the fall/winter period from November through February at the Chehalis River, Newaukum River, and Skookumchuck River USGS flow gauges. Recent years have experienced some of the largest floods on record. For example, the 1990, 1996, and 2009 maximum annual flows

rank in the top five at all three stations. These flood data support the perception that flooding has been worse in recent years. In fact, floods in recent years have been some of the largest recorded floods.

**Table 5-4. Maximum Annual Flows for three USGS Stations in the Chehalis Basin**

Chehalis River near Grand Mound			Newaukum River near Chehalis			Skookumchuck River near Bucoda		
Year	Date	Maximum Flow (cfs)	Year	Date	Maximum Flow (cfs)	Year	Date	Maximum Flow (cfs)
2007	Dec. 4, 2007	79,100	1996	Feb. 08, 1996	13,300	1996	Feb. 08, 1996	11,300
1996	Feb. 09, 1996	74,800	2009	Jan. 8, 2009	13,000	2009	Jan. 08, 2009	10,500
1990	Jan. 10, 1990	68,700	1987	Nov. 24, 1986	10,700	1990	Jan. 10, 1990	8,540
1987	Nov. 25, 1986	51,600	1990	Jan. 09, 1990	10,400	1991	Nov. 25, 1990	8,400
2009	Jan. 9, 2009	50,700	2007	Dec. 3, 2007	10,300	1997	Dec. 30, 1996	8,380
1972	Jan. 21, 1972	49,200	1978	Dec. 02, 1977	10,300	1972	Jan. 21, 1972	8,190
1938	Dec. 29, 1937	48,400	1991	Nov. 24, 1990	10,300	1978	Dec. 02, 1977	7,170
1991	Nov. 25, 1990	48,000	1999	Nov. 26, 1998	10,000	2006	Jan. 30, 2006	6,640
1934	Dec. 21, 1933	45,700	1972	Jan. 21, 1972	9,770	1971	Jan. 26, 1971	6,630
1976	Dec. 05, 1975	44,800	1997	Dec. 29, 1996	9,700	1987	Feb. 01, 1987	6,470

Source: Lewis County Comprehensive Flood Hazard Management Plan (2008), USGS (2010)

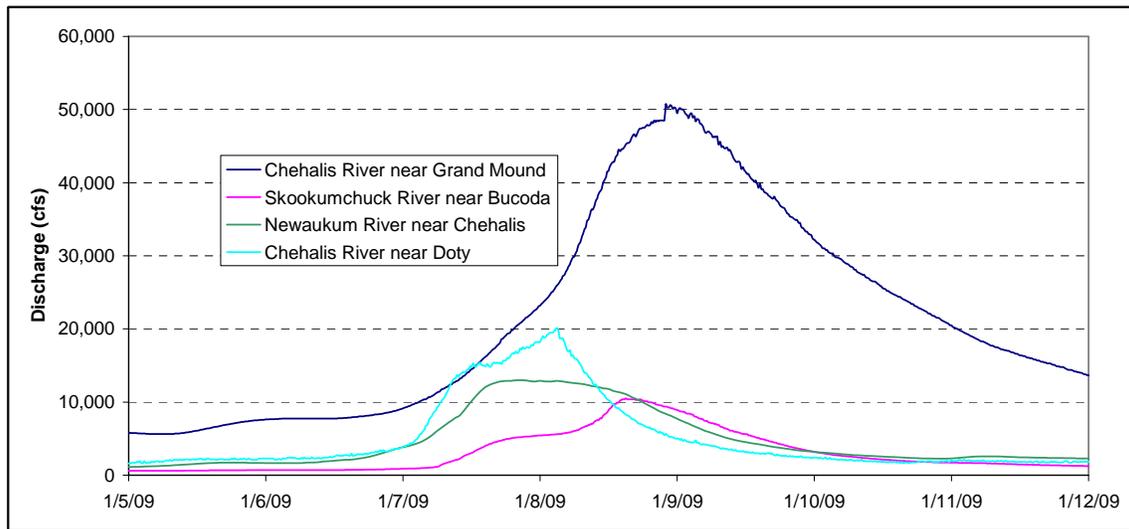
As part of a Flood Insurance Study (FIS) that was adopted in 1981, FEMA estimated flood magnitudes at various locations in the Chehalis River basin for return periods ranging from 10 to 500 years. The 1981 study does not accurately reflect the flood footprints from the 1996 and 2007 floods (CWCOG, 2009). FEMA has contracted with Northwest Hydraulic Consultants (nhc) to update the Lewis County Chehalis River FIS. The new study includes performing hydrologic analyses that takes into account the 1996 and 2007 events, hydraulic modeling, and floodplain mapping of the 100-year and 500-year flood events.

## Recent Significant Flood Events

### January 2009

The Chehalis River was above the National Weather Service flood stage at the USGS gauge at Grand Mound between January 7 and January 10, 2009. This event resulted in a two-day closure of Interstate 5 through Centralia-Chehalis. The peak discharge at Grand Mound was 50,700 cfs (Figure 5-1). The January 2009 event was generated by significant precipitation (6 to 15 inches over the preceding week) over snow at low elevations (USGS, 2009).

**Figure 5-1. Hydrographs of the January 2009 Flood Event**



Source: USGS (2010)

The peak flow crests for the January 2009 event were within the top five of measured events at the Chehalis River at Porter, the Chehalis River at Centralia, Chehalis River at Grand Mound, Chehalis River at Doty, Newaukum River near Chehalis, and the Skookumchuck River near Bucoda USGS gauges. The 2009 flood event appears to have been a result of more evenly-distributed precipitation, compared to the 2007 event (National Weather Service data from the Advanced Hydrologic Prediction System).

There is evidence that storage available behind the Skookumchuck Dam may have played a role in reducing the downstream flood peak. The Skookumchuck Dam had been drawn down, and the reservoir had more available storage volume than would typically be the case.

### December 2007

The most significant recent flooding in the Chehalis River basin occurred in December 2007. This event resulted in substantial flooding throughout the basin, including a four-day closure of a 20-mile section of Interstate 5 at Chehalis.

The December 2007 flooding occurred after substantial precipitation associated with a climatic event known as an atmospheric river. An atmospheric river forms when atmospheric conditions allow for a significant movement of subtropical moist air to northern latitudes. This type of event is often referred to as a “pineapple express,” because the moist subtropical air often passes Hawaii on the way to the West Coast. The December 2007 event had a disproportionate effect on the upper Chehalis River basin, resulting in significant precipitation over the Willapa Hills that feed the upper mainstem Chehalis and South Fork Chehalis Rivers. Rainfall data summarized by the Office of Washington State Climatologist suggest that the December 1 to 4, 2007 rainfall totals for the upper portion of the Willapa Hills exceeded 14 inches, while the surrounding area received between 3 and 8 inches during the same time period (Mote et al., 2008). Heavy precipitation in the southwestern portion of the basin (the Willapa Hills) resulted in the flood of record at the USGS stream gauge at Doty. The gauge telemetry system transmitted an instantaneous discharge of 51,100 cfs with the flows still rising when the gauge was destroyed. Post-event measurements using high water marks were used by the USGS to estimate that the peak flow reached 63,100 cfs at the Doty gauge. These flows are substantially larger than the previous record flow of 28,900 cfs measured during the 1996 flood event (USGS, 2008).

The USGS gauge at Grand Mound also recorded the record peak for the 2008 water year. The December 2007 instantaneous maximum discharge at Grand Mound was about 79,000 cfs, exceeding the past peak of 74,800 cfs recorded in 1996. The daily average discharge for the 2007 event was lower than the 1996 event, indicating that the 2007 event had a more distinct peak (Mote et al., 2008).

The storm resulted in widespread damages across the Chehalis River basin (Lewis County, 2008). Numerous landslides occurred, levees broke, and dikes were overtopped. Late in the afternoon on December 3, flooding of the Chehalis River forced the closure of Interstate 5 in the Chambers Way area, and by the next day a 20-mile stretch of the freeway was covered by as much as 10 to 15 feet of water in some locations. The floodwaters did not start receding until December 5. Late in the evening on December 6, the Washington State Department of Transportation reopened one lane for commercial truck traffic, followed the next day by the reopening of all lanes of traffic. The economic cost of the Interstate 5 closure was estimated at approximately \$4 million per day (City of Centralia, 2009).

On December 3, Governor Chris Gregoire declared a state of emergency for the entire state, citing rains, flooding, landslides, road closures, and extensive property damage. Grays Harbor, Lewis, and Thurston Counties were part of a federal disaster declaration made on December 8, 2007.

Anecdotal accounts indicate this flood was more damaging than the one in 1996. The water rose faster, and it flooded places that no one remembered being inundated before. Floodwater high up the Chehalis River caused landslides and loads of silt and timber were deposited in streams. In some areas, log jams may have acted like small dams, temporarily holding back water until they toppled over or breached. Water swamped

homes, garages and barns to depths of up to 12 feet in some upriver communities. Near downtown Centralia, 20 square blocks were flooded.

Damage to the Chehalis Reservation from the December 2007 flood has been documented in the Chehalis Tribe's CFHMP (Chehalis Tribe, 2009). During the flood, homes in the central area of the Chehalis Reservation were inundated with up to 4 feet of water. The water moved swiftly and covered the reservation to record water depths within 24 hours of notification of flooding. At the east end of the Chehalis Reservation, water overtopped Anderson Road. Up to 2 feet of water overtopped U.S. Highway 12 and flowed into the Black River east of Anderson Road. Southeast of the reservation, Independence Road was overtopped near the bridge and a section of the Chehalis River channel migrated south and eroded a portion of the abandoned railroad grade. The central portion of the Chehalis Reservation, at the confluence of the Chehalis and Black Rivers, was flooded from U.S. Highway 12 south to the abandoned railroad grade. Floodwater ponded upstream of the western glacial terrace and rose high enough to overtop Blockhouse Road and flow down Harris Creek. Between the glacial terrace and Oakville, bridges and culverts were overtopped, road pavement was damaged, and houses were flooded. At the west end of the reservation, portions of Balch Road were damaged and the east approach to the Sickman-Ford Bridge was overtopped and damaged. Elsewhere within the Chehalis Reservation, gravel driveways and rural roads were scoured clean of gravel. Wells and septic systems were swamped and well heads were overtopped.

### ***December 1999***

Significant flooding occurred throughout the lower basin, including the Wynoochee and Satsop River basins, during December 1999. This event was not a federally-declared disaster, but did result in approximately \$1.3 million of reported losses in Grays Harbor County (Grays Harbor County, 2001).

### ***March 1997***

Heavy rainfall and low-elevation mountain snowmelt caused flooding in Grays Harbor County. The recorded peak flow on the Wynoochee River above Black Creek (USGS gauge 12037400) was 25,600 cfs, which is the highest recorded flow at this gauge since the Wynoochee Dam was completed in 1973. Similarly for the Satsop River, the peak flow in 1997 was 63,600 cfs, rated as a greater than 100-year recurrence interval event (Grays Harbor County, 2001).

### ***December 1996 – January 1997***

Saturated ground combined with snow, freezing rain, rain, rapid warming and high winds within a 5-day period were the causes of flooding in Grays Harbor, Lewis, and Thurston Counties. The recurrence intervals of the Chehalis River in Grays Harbor County and the Skookumchuck River in Lewis County were projected at 10 years. The recurrence level of the Newaukum River in Lewis County was projected at 100 years (Washington State Military Department Emergency Management Division, 2007).

## **February 1996**

The February 1996 flood is the flood of record on many major drainages in WRIA 23 (Lewis County, 2008). Heavy rainfall, mild temperatures and low-elevation snowmelt caused flooding in many Washington counties, including Grays Harbor, Lewis, and Thurston. Record floods occurred on the Chehalis and Skookumchuck Rivers. The recurrence interval of the Newaukum River in Lewis County is projected at 90 years. The recurrence interval of the Chehalis River in Thurston and Lewis Counties is projected at 90 to 100 years. The maximum flow recorded at the Grand Mound gauge was 73,900 cfs on February 6 (Washington State Military Department Emergency Management Division, 2007).

Several antecedent conditions were in place before the February 6, 1996 flood. The ground throughout the basin was at or near saturation. Recent snowfall had occurred as low as 500 feet above sea level. Warm, moist subtropical air was transported from the Pacific Ocean into the Pacific Northwest with a freezing level above 8,000 feet. There was also a strong polar jet stream with maximum core wind speeds in excess of 150 knots (172.6 miles per hour). Storms fed upon the jet stream, and this powerful jet stream sustained and strengthened the storms as they moved in off the eastern Pacific Ocean. Local atmospheric conditions had set up a blocking pattern, which meant the major troughs and ridges around the Northern Hemisphere were stationary. There was a major trough to the west of the Pacific Northwest and a major ridge to the east. This pattern makes ideal conditions for weather systems to be at maximum strength. The atmosphere remained in this pattern for at least 96 hours, maximizing precipitation amounts. Large quantities of water were released from the heavy amounts of rain and snowmelt (Lewis County, 2008).

The 1996 flood covered 75 percent of the Chehalis Reservation with measured flood depths up to 10 feet. All access routes, including Howanut Road, Anderson Road, and Moon Road, were under 1 to 4 feet of fast-moving water. U.S. Highway 12, which provides access to many secondary roads, also was flooded, and Interstate 5 was flooded and closed for several days. (Chehalis Tribe, 2009)

## **January 1990**

Flooding occurred on the Chehalis and Skookumchuck Rivers as heavy rainfall and severe storms affected Grays Harbor, Lewis, and Thurston Counties. Maximum flow at the Grand Mound gauge was 68,700 cfs recorded on January 10, 1990. The recurrence interval was projected at 70 years (Washington State Military Department Emergency Management Division, 2007).

Floodwater affected Centralia, Chehalis, Montesano, Elma, Bucoda, and Oakville (Lewis County, 1994). Hundreds of people were evacuated and several hundred homes and businesses were damaged or destroyed. The Chehalis hospital was isolated by floodwaters and several nursing homes were evacuated. Interstate 5 in Chehalis closed for several days, covered by 3 to 5 feet of water (Washington State Military Department Emergency Management Division, 2007). The dikes around the Chehalis-Centralia

Airport and Lewis County Fairgrounds failed or were overtopped. Wastewater treatment plants in Chehalis and Centralia were out of service and the Centralia landfill was inundated. Approximately 10,000 acres of agricultural land was flooded and cattle and chickens were killed.

The flood was caused by a stalled, southwesterly weather system over the region (Lewis County, 1994). The two-day storm rainfall was about 5.3 inches on average with the average basin runoff at 5.1 inches. Ground conditions were saturated, resulting in minimal infiltration and high runoff.

### **November 1986**

Heavy rainfall, mild temperatures, and low-elevation snowmelt generated major floods on the Chehalis and Skookumchuck Rivers. Less severe flooding occurred on the Satsop River. Two-hundred eighty homes and businesses flooded in Lewis County. Impacts included a major hazardous materials spill (pentachlorophenol) from an underground storage tank. The Lewis County Fairgrounds was under 9 feet of water. Numerous levees overtopped and were damaged throughout flooded counties. The recurrence interval of the Chehalis River in Grays Harbor County was projected at 45 to 50 years. At Grand Mound the maximum flow was 51,600 cfs. The recurrence interval of the Chehalis River at Grand Mound was projected at 20 years (Washington State Military Department Emergency Management Division, 2007).

### **Other Floods**

Other significant floods occurred in the Chehalis River basin in 1975 and 1972. The maximum flow at Grand Mound during the 1972 flooding event was 49,200 cfs. The flood recurrence interval at Grand Mound was projected at 15 years (Washington State Military Department Emergency Management Division, 2007). No other information is readily available for these floods.

## **CHAPTER 6 FLOOD PROBLEM AREAS**

### **Problem Identification**

Flood problem areas are located throughout the Chehalis River basin. As discussed in previous chapters, flooding occurs to some extent in most years and can be dramatically different in the upper or lower basins. To frame a discussion of flood problem areas, general flooding problems are presented, followed by a partial listing of specific flood problem areas throughout the Flood Authority's study area. The specific flood problem areas were developed by reviewing existing Comprehensive Flood Hazard Management Plans for jurisdictions in the area, soliciting comments from the public at the Flood Authority's public meetings in February 2009, reviewing recent detailed hydraulic modeling, and analyzing Geographic Information System (GIS) data.

This discussion is intended to support the development of solutions to these known flooding problems. In the Flood Authority's previous deliberations, several overarching problems have been identified, and initial steps (known as "ripe and ready" projects) have been identified and targeted for support. These projects are identified throughout this chapter as appropriate.

### **General Flooding Issues**

General flooding issues in the Chehalis River basin include understanding the sources, potential extent, and potential consequences of flooding; communicating flood hazard information; responding to flood events; and impacts of flood waters. These general flooding issues are described in the following sections.

#### ***Understanding the Sources, Potential Extent, and Potential Consequences of Flooding***

Initial scientific and engineering hydrologic and hydraulic investigations are an essential element of planning for flood events. These studies can help show the potential extent of flooding, and can suggest the consequences of flooding outside the inundated area. For the Chehalis River basin, initial flood studies have been completed along most of the major channels. The resolution of these studies varies significantly throughout the study area, with more detailed models available in the upper basin (generally upstream of Grand Mound) and less detailed models available for the lower basin.

The Flood Authority is addressing the variable level of detail of the studies through the authorization, in April 2009, of funding for several ripe and ready projects. Those projects include:

- Extending LiDAR<sup>1</sup> coverage throughout the entire study area to establish a consistent, high quality representation of floodplain surface topography;

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<sup>1</sup> LIDAR = Light Detection and Ranging – a remote sensing technology that measures properties of scattered light to find range and/or other information of a distant target.

- Developing an unsteady HEC-RAS<sup>2</sup> model for the lower basin, to match the resolution of the existing model in the upper basin; and
- Augmenting the existing precipitation and stream gauge network.

### ***Communicating Flood Hazard Information***

Information about flood hazards needs to be conveyed to all residents of the Chehalis River basin. Flood hazard information is available in three phases: prior to flood events, during flood events, and post-event. Prior to flood events, it is important that the public understand that floods can and will occur, both to support decisions about property acquisition, insurance, and development, and to prepare for future events. Challenges with communicating flood hazards include:

- Lack of public understanding of river system behavior and flood hazards;
- The real-time nature of these events; and
- Highly variable levels of understanding of, and tolerance for, risk.

Communication is vital during flood events to ensure that information is disseminated to all affected residents in a way that provides adequate warning. Post-event communication focuses on informing and reminding people of proper cleanup and sanitary measures.

A flood warning system exists for the Chehalis River basin, based primarily on the National Weather Service's Advanced Hydrologic Prediction System. This system is available on the web and provides measured and predicted hydrographs at established USGS stream gauges. This system provided advance warning of flooding in both 2007 and 2009, and provided a reasonable level of accuracy for both events.

Public comments at public workshops suggest that this system may not provide the level of detail necessary to achieve the overall goal of providing clear warning to residents throughout the basin. The National Weather Service information is often interpreted through media outlets, which can influence the impact of the information.

To address this potential gap, the Flood Authority authorized funding for an Early Warning System project to evaluate the adequacy of the existing warning system and make recommendations for augmenting existing systems and improving communication tools. The needs assessment portion of that project will be presented to the Flood Authority at its March 2010 meeting.

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<sup>2</sup> HEC-RAS = Hydrologic Engineering Centers River Analysis System – a hydraulic model of water flow through rivers and other channels developed by the Corps of Engineers.

### ***Responding to Flood Events - Emergency Management***

The quality of response to flood events is tied to advance planning, preparation of materials, and broad understanding of plan implementation. Key factors for emergency management include:

- Adequate warning of flood events;
- Established circulation/access routes;
- Established coordination protocols;
- Access to flood fighting materials; and
- Access to hospitals and emergency headquarters.

Specific emergency response issues have included the lack of access from one side of the flooded valley to the other, loss of local radio stations, and impaired access to a major hospital. The Early Warning System project authorized by the Flood Authority will include recommendations for improvements for emergency management.

### ***Impacts of Flood Waters***

The direct impacts of flood waters extend across the floodplain, and include temporary and long-term impacts. These impacts include:

- Inundation during the flood event;
- Risk to human safety;
- Loss of property due to bank erosion and channel migration;
- Sedimentation;
- Water quality impacts, including domestic well contamination;
- Damage to buildings, machinery, or roads;
- Risks to livestock and crops; and
- Compromised vital infrastructure, including wastewater treatment plants.

### ***Summary***

Table 6-1 summarizes the flooding issues in the basin and identifies ripe and ready projects that the Flood Authority has authorized to further evaluate the issues.

**Table 6-1. General Flooding Issues**

Issue	Ripe and Ready Project(s)
<b>Understanding the Sources, Potential Extent, and Potential Consequences of Flooding</b>	<ul style="list-style-type: none"> <li>• LiDAR</li> <li>• Unsteady HEC-RAS model</li> <li>• Stream and rain gauge program</li> <li>• Study of ecosystem services</li> </ul>
<b>Communicating Flood Hazards</b> <ul style="list-style-type: none"> <li>• Lack of public understanding of river system behavior and flood hazards</li> <li>• The real-time nature of these events</li> <li>• Highly variable levels of understanding of, and tolerance for, risk</li> </ul>	<ul style="list-style-type: none"> <li>• Early Warning System</li> </ul>
<b>Response to Flood Events – Emergency Management</b> <ul style="list-style-type: none"> <li>• Adequate warning of flood events</li> <li>• Established circulation/access routes</li> <li>• Established coordination protocols</li> <li>• Access to flood fighting materials</li> <li>• Access to hospitals and emergency headquarters</li> </ul>	<ul style="list-style-type: none"> <li>• Early Warning System</li> </ul>
<b>Impacts of Flood Waters</b> <ul style="list-style-type: none"> <li>• Inundation during the event</li> <li>• Loss of property due to bank erosion and channel migration</li> <li>• Sedimentation</li> <li>• Water quality impacts, including domestic well contamination</li> <li>• Damage to buildings, machinery, or roads</li> <li>• Compromised vital infrastructure, including wastewater treatment plants</li> </ul>	<ul style="list-style-type: none"> <li>• Early Warning System</li> <li>• Unsteady HEC-RAS model</li> <li>• PUD Storage Study</li> </ul>

## Site-Specific Flood Issues

The following sources were used to develop a list of site-specific flooding issues:

- Existing Comprehensive Flood Hazard Management Plans for jurisdictions in the Chehalis River basin;
- Public comments solicited at public meetings held on February 11, 2009, in Chehalis and February 12, 2009, in Montesano;
- Contacts with floodplain and emergency managers at member communities; and
- A general mapping analysis of the basin comparing major transportation infrastructure to mapped special flood hazard zones.

The existing CFHMPs are described in Chapter 4. These plans provided the basis for identifying flood problem areas in the basin.

The Flood Authority conducted public meetings in Chehalis on February 11, 2009, and Montesano on February 12, 2009. At the meetings, the Flood Authority solicited public input on flood-related problems, potential solutions, and recommended goals for the Authority. The problems identified by members of the public are listed below. The

problems are presented as a list of actual comments made by the public, and no attempt has been made to edit or categorize them.

***Problems identified by the public at the public meeting in Chehalis on February 11:***

- Restricted flow of the Chehalis River at Galvin Road
- Water built up at Mellen Street, goes into Chehalis and Centralia
- Water backing up over Highway 6 / Closure of Highway 6
- Residential flooding along Highway 6
- Flooding in West Adna
- Residential flooding 3 to 4 miles up Salzer Creek
- Bridges washed out
  - Dryad
  - Meskill
  - Rainbow Falls State Park
- Extensive flooding on Bunker Creek – loss of livestock and feed, major property damage, river changed course
- Flooding on Scheuber Road – across from Airport
- Flood on Newaukum, Rice Road area
- Flooding on Sylvenus Street – across from Riverside
- Lack of forest duff causes faster runoff
- Flooding in homes near Veteran’s Memorial Museum in Chehalis
- Lack of flood prediction and gauges near Veteran’s Memorial Museum
- South Street area of Chehalis, by Salzer Valley Creek, floods between the landfill and the tracks
- Emotional trauma related to flooding of homes
- Flooding along River Street in Chehalis
- Long Road dike area
- Long Road dike breach (2007), impact on houses
- Residential flooding in Curtis
- Flooding in China Creek
- Retail business losses due to flooding
- Debris and mud flow contributing to property damage
- Inability to travel

- Inability to develop
- Stalled process
- Lack of responsiveness from Corps
- Levees push water into houses
- Consequences of filling runoff spots (wetlands)
- Communications break down in 2007 flood
- Not enough stormwater drains, or they back up (near Veteran's Memorial Museum)
- Poor predictions
- "Best" practices that are not
- River does not have enough capacity
- Roads acting as a dike or levee, particularly as a result of road repairs
- Projects that contribute to what they are supposed to fix
- Bureaucracy
- Waiting too long for solutions
- Steep-slope clear-cutting / logging practice - rotation lengths that are too short
- Unclear rules on rebuilding permits
- State sales tax on rebuilding
- Impacts on business/commerce
- Need better flood notification to neighborhoods
- Need for better flood cleanup, should involve community
- Environmentalists in the way
- Some folks are trapped
- Difficulty with government processes – billing, requirements, permitting
- Corps cannot be trusted
- Inadequate flood fighting
- Water super tunnels
- Levee failure / levees get overtopped often
- Inadequate levee repair
- Levees displace people

***Problems identified by the public at the public meeting in Montesano on February 12:***

- Mismanagement of the lake level on the Wynoochee Dam
- Log jams in the rivers
- Erosion of farm lands – mile long stretches
- Flooding of Oakville
- Water from Capital Forest
- Loggers and property owners cut down trees before they get to 30 inches and that causes more water runoff and more soil erosion in a flood
- Lost livestock
- Loss of three dairies – each dairy loses \$1 million a year during floods
- Bank erosion on the lower Satsop – there are 250,000 cubic yards of dirt that went into the river
- Barometric pressure of water coming out of the ground
- Difficulty for citizens to predict flooding on their property from available information
- Anderson Road (Chehalis Reservation) acts as dam
- Black River Bridge acts as a dam
- Highway 12 acts as a dam
- Moon Road (Chehalis Reservation) gets closed every flood
- Levees just cause someone else to get flooded
- 100-year floods happen more often than every 100 years
- Dams only work during unique situations planned for by hydrologists
- Erosion in Boistfort – soils end up downstream

A general GIS analysis was performed to identify other potential flood problem areas not identified in existing CFHMPs or by public comment. The analysis used the Washington State Department of Transportation (WSDOT) “major roads” layer and the mapped 1 percent annual chance flood. The 1 percent annual chance flood mapping used was the FEMA Q3 data for Lewis and Grays Harbor Counties, and a data layer developed by Thurston County in that area. The major roads layer and the 1 percent annual chance flood area were overlaid to identify infrastructure at risk for flooding. The results were then evaluated to identify long stretches of major road that have the potential to be overtopped in a major flood. If these areas provided what appeared to be regionally-important access (e.g., connecting a more rural portion of the area to an urban center), they were included in the mapping. This analysis was a mapping exercise only and has not been verified through field work.

More recent flood mapping developed by Northwest Hydraulics Consultants (nhc) for the Lewis County prosecutor’s office was also inspected to identify areas with significant flooding. This mapping is based on an unsteady HEC-RAS model that has been developed to show the approximate extent of the 2007 flood event. While the general flood mapping is similar to the FEMA Q3 mapping described above, the Northwest Hydraulics Consultants mapping is more detailed in many areas, and also is set up to depict the depth of flooding.

To simplify the discussion of site-specific flood issues, the issues were categorized into three areas:

- Major Infrastructure (MI),
- Human Health and Safety (HHS), or
- Emergency Response (ER).

Major Infrastructure issues include major items such as interstate highways and wastewater treatment plants that are threatened by flood events. Human Health and Safety includes flooding of private property, secondary roads, and other public infrastructure. The Emergency Response category is intended to capture key elements of the emergency response network that have been damaged or cut off during floods, when they are needed most. Table 6-2 lists the identified flood issues. All site-specific flood issues are mapped in Figures 6-1 (upper basin) and 6-2 (lower basin).

**Table 6-2. Site-Specific Flood Issues**

<b>Location</b>	<b>Type<sup>1</sup></b>	<b>Information Source</b>	<b>Flooding Source(s)</b>
I-5 at Dillenbaugh Creek Confluence	MI	GIS	Mainstem Chehalis and Dillenbaugh Creek
Highway 6	MI	GIS and Public Comment	Mainstem Chehalis and Newuakum
I-5 at Chehalis	MI	GIS, nhc map	Mainstem Chehalis
Mellen Street Wastewater Treatment Plant	MI	Lewis County CFHMP	Mainstem Chehalis
Centralia Central Business District at China Creek	MI	Lewis County CFHMP	Mainstem Chehalis, China Creek, Skookumchuck River
Montesano Wastewater Treatment Plant Lagoons	MI	Montesano Hazard Plan	Mainstem Chehalis, Tidal Action
Highways 105 and 107 at Montesano	MI	GIS	Mainstem Chehalis
US Highway 12 at Elma	MI	GIS	Mainstem Chehalis
Chehalis River at Aberdeen	MI	GIS	Mainstem Chehalis, Tidal Action
Long Road	HHS	GIS and Public Comment	Mainstem Chehalis
Stearns Creek Confluence	HHS	nhc mapping	Stearns Creek, Mainstem Chehalis
SF – Mainstem Confluence	HHS	nhc mapping	South Fork, Mainstem Chehalis
Salzer Creek/Fairgrounds	HHS	Lewis County CFHMP	Salzer Creek,

<b>Location</b>	<b>Type<sup>1</sup></b>	<b>Information Source</b>	<b>Flooding Source(s)</b>
Dillenbaugh Creek Industrial Area	HHS	Lewis County CFHMP	Dillenbaugh Creek, Mainstem Chehalis
Lower Coffee Creek	HHS	Lewis County CFHMP	Coffee Creek, Skookumchuck River
Galvin	HHS	Lewis County CFHMP	Mainstem Chehalis, Lincoln Creek
Bucoda	HHS	Bucoda CFHMP	Skookumchuck River
Adna	HHS	Public Comment	Mainstem Chehalis
Residential flooding on Salzer Creek	HHS	Public Comment	Salzer Creek
Newaukum at Rice Road	HHS	Public Comment	Newaukum River
Curtis	HHS	Public Comment	South Fork Chehalis
Bridge failures at Dryad and Rainbow Falls State Park	HHS	Public Comment	Mainstem Chehalis
Bridge failure at Meskill	HHS	Public Comment	Mainstem Chehalis
Highway 507	HHS	GIS	Skookumchuck, China Creek
Wakefield Road near Elma	HHS	GIS	Mainstem Chehalis
Oakville	HHS	Chehalis Tribe CFHMP	Mainstem Chehalis
Sickman Ford Bridge Approach	HHS	Chehalis Tribe CFHMP	Mainstem Chehalis
Upper Falls Creek	HHS	Grays Harbor CFHMP	Upper Falls Creek
Elma	HHS	Grays Harbor CFHMP	Mainstem Chehalis
Road near Satsop – Chehalis Confluence	HHS	Grays Harbor CFHMP	Mainstem Chehalis, Satsop River
Chehalis downstream of Satsop-Chehalis Confluence	HHS	Grays Harbor CFHMP	Mainstem Chehalis, Satsop River
Chehalis near Arland Road	HHS	Grays Harbor CFHMP	Mainstem Chehalis
Wynoochee River near Montesano	HHS	Grays Harbor CFHMP	Wynoochee, Mainstem Chehalis
Hospital on Crooks Hill Road	ER	Lewis County CFHMP	Mainstem Chehalis
Moon Road at Chehalis Tribe	ER	Chehalis Tribe CFHMP	Mainstem Chehalis, Black River
Anderson Road at Chehalis Tribe	ER	Chehalis Tribe CFHMP	Mainstem Chehalis
Howanut Road	ER	Chehalis Tribe CFHMP	Mainstem Chehalis, Black River

<sup>1</sup> MI = Major Infrastructure, HHS = Human Health and Safety, ER = Emergency Response



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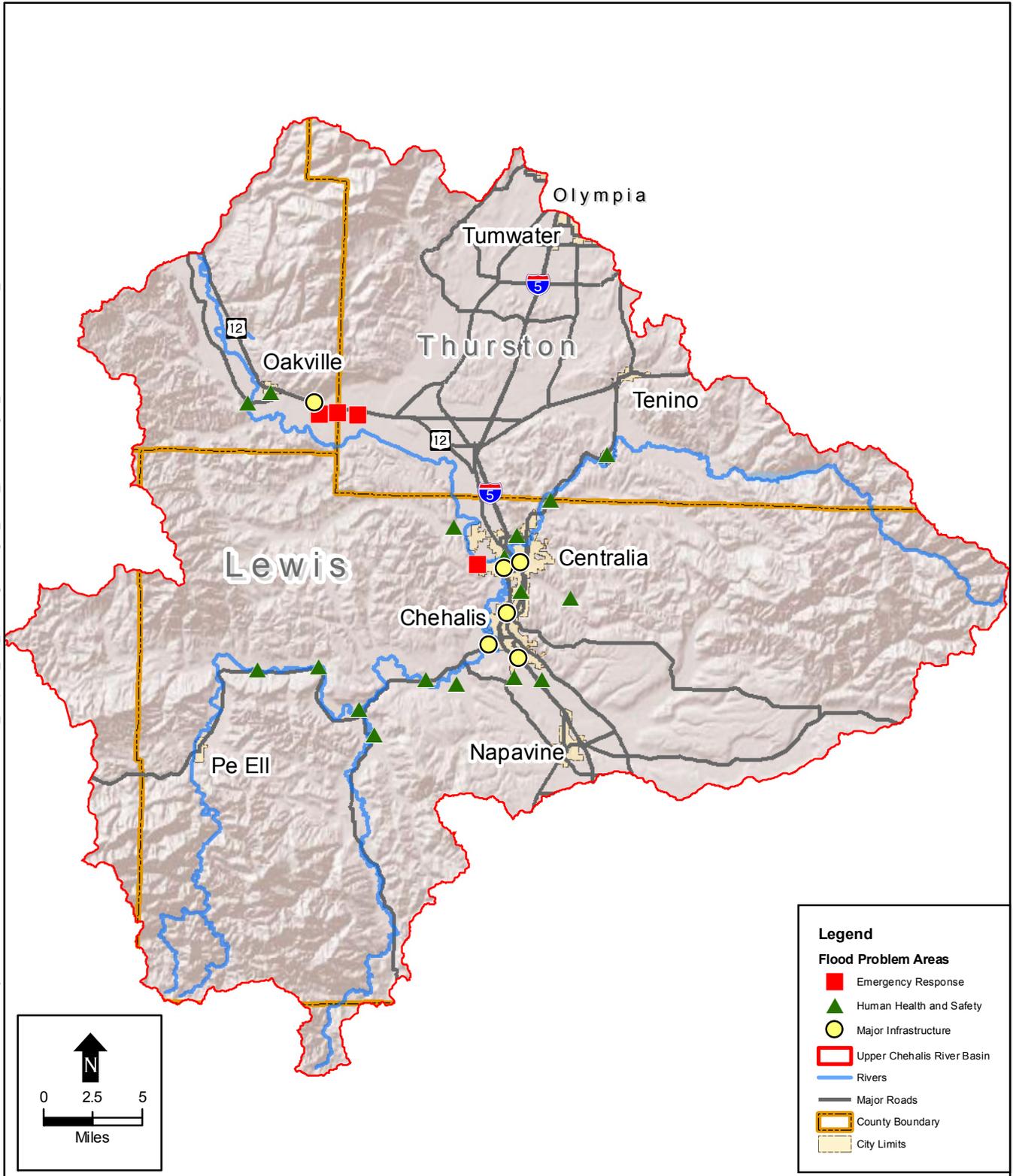
SOURCE: ESRI, 2008; Regional CFMHPs, 2007; WSDOT, 2008, Department of Ecology, 2007

Chehalis River Basin Facilitation . 208379

**Figure 6-1**  
Lower Chehalis River Basin  
Flood Problem Areas



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SOURCE: ESRI, 2008; Regional CFMHPs, 2007; WSDOT, 2008, Department of Ecology, 2007

Chehalis River Basin Facilitation . 208379

**Figure 6-2**  
Upper Chehalis River Basin  
Flood Problem Areas



## **FEMA Mapping**

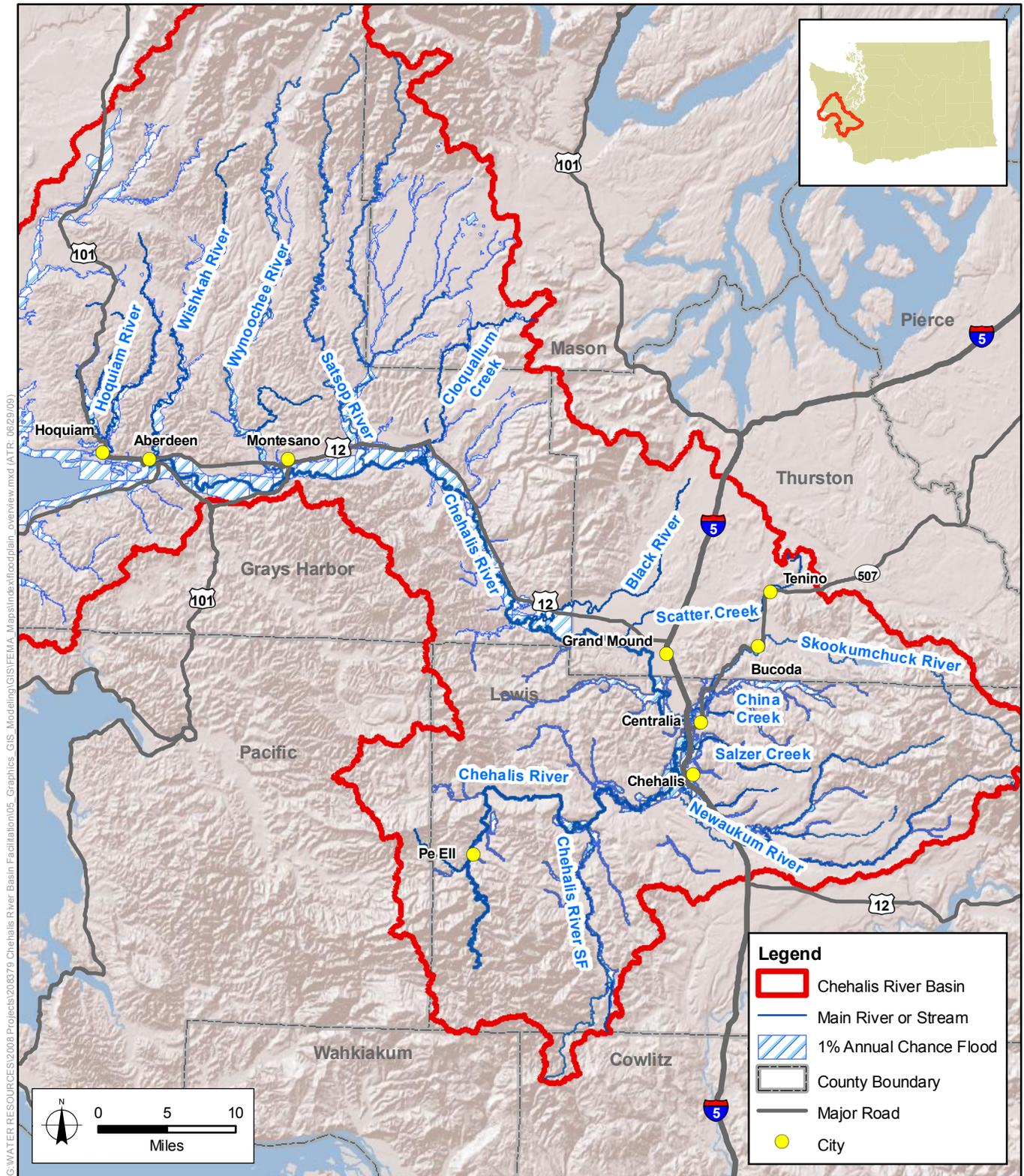
FEMA has mapped most of the floodplain in the Chehalis River basin. The Chehalis Reservation has not been officially mapped by FEMA. FEMA is currently updating floodplain mapping for portions of the basin, but those maps have not been finalized.

This CFHMP includes a Map Folio of the floodplain maps as a CD attachment. The coverage of the floodplain mapping is illustrated in Figure 6-3. The Map Folio in the attached CD includes a detailed map for areas of floodplain mapping shown on Figure 6-3. The detailed floodplain maps are overlain on aerial photograph of the basin.

The Chehalis River Basin Map Folio maps the approximation of the 1 percent annual chance flood extent for the Chehalis River and its main tributaries. The source for the 1 percent annual chance flood dataset is the FEMA Digital Q3 library. The Q3 flood data represent FEMA's most current floodplain data. The aerial imagery is provided by ESRI, the GIS software company, and dates from 2006.

The Map Folio in the attached CD is organized by major river and/or tributary. It includes index maps and accompanying internal links to aid users as they navigate and locate maps associated with certain geographic areas. The maps are presented at one of three scales (from larger to smaller): 1:5,280; 1:7,920; and 1:15,840. The scale used for a given map is dependent upon the relative density of development. In general, more urbanized and developed areas are mapped at larger scales (more detail) while more natural and less developed areas are mapped at smaller scales (less detail).





G:\WATER\_RESOURCES\2008\Projects\208379\Chehalis River Basin Facilitation\05\_Graphics\_GIS\_Modeling\GIS\FEMA\_MapIndex\Floodplain\_Overview.mxd (ATR: 06/29/09)

SOURCE: ESRI, 2005, 2008; FEMA (Q3 Flood); WDNR, 2008

Chehalis River Basin Facilitation . 208379.01

**Figure 6-3**  
Floodplain Mapping Coverage  
Chehalis River Basin, Washington



## CHAPTER 7 DEVELOPMENT OF MITIGATION ALTERNATIVES

Options for addressing flooding concerns include infrastructure and capital projects, public information programs, regulations, planning measures, and environmental protection and enhancement measures. Comprehensive flood hazard management emphasizes selecting a mix of approaches to minimize flooding impacts. This chapter presents and defines the general types of alternatives commonly used in floodplain management.

### General Categories of Solutions

Flood hazard management measures are commonly classified as structural or non-structural. Structural measures involve physical activities in or near the stream such as storage facilities, levees, placement of bank protection materials, and other engineering and construction activities. Non-structural measures include stormwater and land use regulations, flood preparedness programs, public awareness programs, floodproofing, and maintenance programs. The federal government encourages the use of cost-effective, long-term non-structural alternatives. Tables 7-1 and 7-2 summarize typical non-structural and structural solutions, respectively.

**Table 7-1. Typical Non-structural Flood Hazard Management Solutions**

Measure	Description	Typical Activities
Public Information	Public information activities to advise people of the risks associated with flood hazards, about flood insurance, and ways to reduce flood damage	<ul style="list-style-type: none"> <li>• Public outreach projects</li> <li>• Flood protection library</li> <li>• Flood preparedness programs</li> <li>• Elevation certification</li> <li>• Hazard disclosure</li> <li>• Public workshops or meetings</li> </ul>
Regulation	Regulatory measures to provide protection for existing structures and new development through land use regulation	<ul style="list-style-type: none"> <li>• High regulatory standards</li> <li>• Low-density zoning</li> <li>• Open space preservation</li> <li>• Regulatory consistency</li> <li>• Building codes</li> <li>• Stormwater management</li> </ul>
Planning and Data Collection	Activities to develop accurate floodplain information and flood data and increase the understanding of the river's flood characteristics	<ul style="list-style-type: none"> <li>• Floodplain and channel meander zone (CMZ) mapping</li> <li>• Flood data maintenance (GIS, databases)</li> <li>• Engineering studies</li> <li>• Modeling</li> </ul>
Reduce Damage to Existing Structures	Measures addressing flood damage to existing structures (buildings, roads, bridges, levees, etc.)	<ul style="list-style-type: none"> <li>• Acquiring or relocating floodprone structures</li> <li>• Floodproofing</li> <li>• Developing repetitive loss plans</li> <li>• Elevating buildings and roadways</li> <li>• Flood insurance</li> </ul>

<b>Measure</b>	<b>Description</b>	<b>Typical Activities</b>
Emergency Response and Preparedness	Actions to minimize the effects of flooding on people, property, and the contents of buildings	<ul style="list-style-type: none"> <li>• Individual action plans</li> <li>• Comprehensive planning</li> <li>• Flood warning systems</li> <li>• Stream and precipitation gauge monitoring</li> <li>• Flood facility maintenance programs</li> <li>• Emergency response plans</li> <li>• Critical facilities protection</li> <li>• Post-distaster mitigation</li> </ul>
Natural Resource Protection Projects	Measures to preserve or restore natural areas or the natural functions of floodplain and watershed areas	<ul style="list-style-type: none"> <li>• Wetland protection</li> <li>• Habitat protection</li> <li>• Erosion and sediment control</li> <li>• Forestry practices</li> </ul>

**Table 7-2. Typical Structural Flood Hazard Management Solutions**

<b>Measure</b>	<b>Description</b>	<b>Typical Activities</b>
Floodplain Protection	Measures that reduce flood hazards for property, structures and occupants in the floodplain. Protection from inundation, floating debris, sediments, and the force of water flowing in the floodplain	<ul style="list-style-type: none"> <li>• Setback levees</li> <li>• Dikes</li> <li>• Elevating roads</li> <li>• Redesigning and replacing bridges</li> <li>• Constructing/expanding storage reservoirs</li> </ul>
Bank Protection	Measures designed to produce a stable, durable streambank that can withstand flood waters	<ul style="list-style-type: none"> <li>• Reestablishing riparian vegetation</li> <li>• Constructing approach dikes</li> <li>• Installing gabions (wire cages filled with rocks to stabilize the bank)</li> <li>• Constructing windrow revetments (a line of stone placed on the edge of a bank)</li> <li>• Reducing bank slope</li> <li>• Riprap</li> </ul>
Conveyance Capacity	Increasing channel bed slope or cross-sectional area or decreasing channel roughness in order to increase the amount of flow that a stream can carry; increasing off-channel storage or floodplain storage	<ul style="list-style-type: none"> <li>• Constructing overflow/secondary channels</li> <li>• Removing vegetation and debris</li> <li>• Widening or deepening the channel</li> <li>• Controlling growth of vegetation in the channel</li> <li>• Increasing floodplain storage by removing levees or moving roads</li> </ul>

## CHAPTER 8 FUNDING OPTIONS

### Background

The Chehalis River Basin Flood Authority is a unique institution for flood control. It is composed of 11 separate jurisdictions—one Native American Tribe, three counties, five cities, and two towns. The Legislature created the Flood Authority to evaluate flooding issues throughout the basin. The Legislature also provided funding to serve as local match for a basin-wide solution to flooding problems, a solution to be agreed to by the Flood Authority. Currently, the Flood Authority has no funding mechanism other than funds appropriated by the State Legislature.

This chapter outlines funding options available to individual jurisdictions in the basin, especially the counties, to complete the smaller projects identified in this plan. These include internal funding options (which Counties and other local governments can implement) and external funding options (grants and loans). This chapter also discusses two basin-wide options (Flood Control District and Flood Control Zone District). The chapter ends with an evaluation of the funding options presented.

### Options of Individual Jurisdictions

A variety of funding options exist for counties and cities to fund flood hazard reduction projects. A summary of funding options is displayed in Table 8-1.

**Table 8-1. Funding Options for Individual Jurisdictions**

Internal Funding Options	External Funding Options
Developer Contributions	FEMA
- Drainage Development Fees	- Reigle Community Development & Regulatory Improvement Act
- Construction in Lieu of Fees	- Robert T. Stafford Disaster Relief and Emergency Assistance Act
River Improvement Fund	- Disaster Mitigation Act of 2000
Drainage Districts	Corps of Engineers
Local Improvement Districts	- Small Flood Control Projects
Surface Water Utility	- Emergency Bank Protection
County Revenues	- Floodplain Management Services
- Current Expense Fund	- Planning Assistance to the States
- Road Fund	- Habitat Restoration
- Real Estate Excise Tax	NRCS
- Debt Financing	- Watershed Protection and Flood Protection Act
	USDA
	- Farm Program
	Ecology
	- Flood Control Assistance Account Program
	- Centennial Clean Water Fund
	- State Water Pollution Control Revolving Fund
	Emergency Management Department
	- State Hazard Mitigation Grant Program
	Department of Commerce
	- Public Works Trust Fund
	WSDOT/FHWA
	- Emergency Relief Funds

## **Internal Funding Sources**

### **Developer Contributions**

Developing land increases the amount and rate of surface water runoff and the need for drainage facilities to handle it. Thus, development creates the need for additional drainage facilities. Developer contributions are a means of recovering a share of the cost of drainage facilities constructed downstream to handle the increased runoff.

Regional drainage facilities may be constructed to handle the runoff from private property within a drainage basin. A comprehensive plan identifies the regional drainage improvements needed to accommodate a projected level of development – usually the maximum development allowable under the comprehensive land use plan or current zoning for the properties within the basin.

The comprehensive plan or development standards may assume that property owners are responsible for limiting runoff from their property to a specified rate or level of flow. If regional facilities are needed, the plan identifies the type and cost of such facilities.

Developers' contributions are frequently used to help fund regional drainage capital improvements but provide no mechanism to operate and maintain improvements or other elements of a comprehensive surface water program. Developer contributions most commonly involve drainage development fees and/or construction in lieu of fees.

### *Drainage Development Fees*

Drainage development fees are collected from a developer at the time the runoff from the property is increased (when the property is developed). The cost of drainage improvements can be allocated among undeveloped properties in the basin based on the total area of land in each zoning classification and the estimated contribution to runoff potentially generated by all land at full development. This determines the share of the capital system costs that should be paid by each land use classification. That value is divided by the undeveloped area in each classification to determine the fee per square foot for developing properties in that classification.

The development fees are collected as each parcel is developed. This method works well in drainage basins with undeveloped property that will need downstream improvements off-site as the land is developed.

The following are the key advantages of drainage development fees:

- An equitable fee for each parcel can be calculated that is determined by the size of the parcel and applicable zoning. This calculation is easy for developers to understand and for the county to administer.
- Fees are based on the estimated cost of constructing off-site improvements.
- New drainage improvements can be scheduled by the county as they are needed. The need is determined by the level of development in each basin.
- Fees are assessed equitably because those collected from property in any drainage basin are used to pay for improvements in that basin only.

The key disadvantages of drainage development fees are as follows:

- The county incurs a liability to provide needed improvements upon receiving the fees.
- Basin plans with capital-cost estimates must be in place before the fee can be calculated.
- Significant changes in zoning, particularly down-zoning, may result in inadequate revenue to fund the facilities.
- Significant increases in construction costs over estimates used in the basin plan may result in insufficient revenue recovery.
- Patterns of development may require construction of more improvements than money is available for.
- Flexibility is limited because funds must be used for improvements in the basin from which they were collected. This requires an accurate accounting record.
- New developers may perceive an unfair burden if most land in the basin is already developed and development fees have not been charged historically.
- Fees pay for capital improvements only.

#### *Construction in Lieu of Fees*

This method assumes that the developer will construct or contribute directly to the construction of needed regional improvements in return for the ability to develop the land. This method tends to be used in developed areas with drainage facilities already in place that cannot accommodate increased runoff created by the additional development, or in areas that are experiencing development pressure where facilities are needed before development can take place.

The maintenance responsibility for drainage facilities constructed by developers needs to be defined. If the county is granted ownership or control of the facilities, the county will be able to ensure that the facilities are maintained to an acceptable level.

Key advantages of construction in lieu of fees are as follows:

- Facilities are constructed before the new development occurs.
- The county does not have to administer design and construction.
- The development creating the need for the new improvements will pay for the cost of the improvements.
- The new facilities will often benefit the county and other properties in addition to the new development.
- The county does not have to fund the costs of improvements or may fund only a portion of the costs.
- The county and the developer do not have to wait for the needed improvements to be scheduled into the annual budgeting cycle before the land can be developed.

Key disadvantages of construction in lieu of fees are as follows:

- New development may pay more than its equitable share of the cost of the system. This can be recovered by the initial developer through a “reimbursement agreement” using future development fees.
- Private developers may be financing facilities that serve public needs.
- This method deals only with capital improvements, not with ongoing operation and maintenance (O&M) costs.

### **River Improvement Fund**

The River Improvement Fund, created under the taxing authority established by RCW 86.12, has been a source for financing of flood control maintenance for some counties. The fund was created for counties to finance the construction and repair of flood control facilities.

A River Improvement Fund would be generated from a county-wide levy of up to \$0.25 per \$1,000 assessed value, subject to statutory limitations on rate and amount. The levy rate must be consistent throughout the county, but the revenue appropriation can vary among basins. The funds can be used as a match for flood control costs with the state Flood Control Assistance Account Program (FCAAP). The levy is subject to the following limitations:

- It may not exceed \$0.25 per \$1,000 assessed value.
- Increases in the levy may not force the overall county assessment to exceed statutory limits.

Because this funding strategy is considered a senior taxing district, it is included when calculating the local tax lid set by Initiative 747 (2001). This means the tax for a River Improvement Fund has the same status as mandatory and essential services such as police, public health, courts and other criminal justice services. If a county has reached the local tax lid, increasing the River Improvement Fund levy would require either a reduction in funding for mandatory and essential services, or a majority vote by county citizens.

### **Drainage Districts**

Creating a drainage district is a method of financing drainage capital improvements and ongoing O&M. The processes of creating a drainage district and setting assessments are specified in RCW 85.06, Drainage District, and RCW 85.38, Special District Creation and Operation. These laws apply specifically to counties and provide a method of financing and operating facilities to serve specific areas of land. A city may operate as a drainage district; however, the creation and assessment process is specifically tied to the legislative authority of the county in which the drainage district is located.

Creation of a drainage district involves a vote by landowners and the election of a board of commissioners. Election of the board reduces the active involvement of the county in the operation and management of the district.

State law also specifies the method of assessing property within a district. Assessment zones must reflect the relative benefit or use each property will receive from district

operations and facilities. The assessment zones determine the dollar value of benefit per acre.

A budget must be adopted each year and must demonstrate that the assessments are sufficient to cover annual expenses. The cost of improvements is not included in the special assessment until the year after the improvements are constructed.

Advantages of drainage districts include the following:

- They provide funding for both O&M and capital improvements.
- Assessments are billed on property tax statements and collected with property taxes.
- Costs are equitably allocated to property owners in the district based on benefit or use received on a district-wide basis.

Disadvantages of drainage districts include the following:

- Involvement of the county in the management and operation of the district is limited. The county has a legislative role in creation, but a separately elected board of commissioners manages the district.
- Property owners must approve by vote the creation of a district.
- Funds for capital improvements cannot be collected until after the improvements are completed.
- District creation and benefit-assessment processes defined by statute are very complicated.
- The county's flexibility in working with developers is limited.
- Assessments may be limited by the property tax lid.

### **Local Improvement Districts**

Local improvement districts (LIDs) allow the county to issue bonds for the cost of improvements and to recover the cost through assessments based on "specially benefiting" property. Special benefit is defined by the increased property value that results from the improvements.

For water and sewer improvements, properties are considered specially benefiting when they are physically connected to, or have the ability to physically connect to, the sewer or water system. For drainage improvements, it is often difficult to demonstrate special benefit because there is generally no physical connection, and property value often is not directly affected by the existence of a drainage system, except where flooding is frequent. Moreover, property at the top of a hill does not specially benefit from drainage improvements, but it does contribute to the surface water problems. Property at the bottom of the hill sees a more positive effect from the drainage improvements, even though it contributes only a portion of the runoff.

LIDs have been used to finance water supply, sanitary sewers, and storm drains when all three utilities are needed in an area. An LID might be appropriate for construction of a facility to serve several properties where the runoff contribution and benefit are similar.

## **Surface Water Utility**

The underlying concept of a surface water utility is that all properties contribute surface water runoff to the drainage system and therefore should pay an equitable share of the system's O&M and capital costs.

RCW 36.89 gives the county authority to generate revenue by charging those who contribute to an increase in surface water runoff or who benefit from any stormwater control facility the county provides. Schools, churches, and other tax-exempt properties, as well as public entities and public property, are subject to the same rates and charges as private properties.

The formation of a surface water utility would give jurisdictions in the basin a continuous and reliable funding source to pay for both capital improvements and ongoing O&M costs. The county would have direct control over rates and charges, rather than being limited to the prescribed methods set forth by statute for a drainage district.

A reliable source of funding is a key element in developing and continuing a successful, well managed surface water management system or a comprehensive flood hazard management plan. The county can create a county-wide utility that is implemented on a basin-by-basin approach using variable rates. The fees can be included with property tax statements; a new billing system is not needed.

The primary disadvantage to establishing a drainage utility is the public perception that a new charge is being imposed for a service already being provided.

## **County Revenues**

A number of county funding sources can be used in a discretionary manner to finance storm drainage and flood control. They include the current expense fund, the road fund, the real estate excise tax, and debt financing.

### *Current Expense Fund*

The current expense fund provides the general revenue used for county operations and services. It is derived from sources including property and sales taxes, fees, licenses, fines, investment interest, and contributions for services from other governments. Taxes are the most significant source of revenue for the current expense fund. Of the amount derived from taxes, property taxes provide the largest percentage. Taxes are levied on all taxable real and personal property. Only a portion of the levy goes into the current expense fund. Dedicated levy amounts are deposited in other funds, such as the River Improvement Fund discussed previously.

The property tax is based on the assessed value of property and the levy rate per \$1,000 assessed value. The county commission or board sets the levy rate, which is subject to two statutory restrictions. RCW 84.52.043 sets the maximum levy rate for the all-county levy at \$1.80 per \$1,000 assessed value. In addition, RCW 84.55.010 restricts the amount of taxes levied to 106 percent of the highest of the three prior years' levy amounts plus an additional amount derived from taxing the assessed valuation of new construction. The latter restriction, called the 106 percent lid, has historically held the maximum levy rate below the \$1.80 per \$1,000 assessed value level.

State law also provides full or partial exemptions to certain types of property and classes of ownership. Some non-profit organizations, such as churches and government, are totally exempt from property taxes, while partial exemptions are given to low-income or senior and handicapped citizens. Also, farm, open space, and timber land is generally valued at less than fair market value.

#### *Road Fund*

The road fund is generated by sources including a county road levy, gasoline sales tax, and federal and state grants. A portion of the road fund is used to pay for drainage activities associated with county roads. The county road levy is limited to a maximum rate of \$2.25 per \$1,000 assessed value and is restricted by the 106 percent lid.

Road funds cannot be used for activities unrelated to roads without jeopardizing the county's eligibility for state financial programs including the Rural Arterial Program.

#### *Real Estate Excise Tax*

RCW 82.46 allows counties and cities to levy an excise tax equivalent to 0.25 percent of the sale of real property. These funds are used explicitly for capital facilities on the premise that revenues generated through property sales reduce the burden on the general public of the problems created by growth and development.

#### *Debt Financing*

Capital bond financing is an alternative to funding the acquisition, design, construction, mitigation, permit compliance, or other activities such as technical studies needed to achieve a specific "fixed" tangible capital asset such as a levee, revetment or pump station.

The sale of bonds is an option, but financing capital projects without establishing an additional revenue stream to pay for the debt service cost will create additional financial strain on current funds. Options for debt financing include the following:

- General Obligation Bonds are bonds for which the full faith and credit of the issuing government is pledged. The bonds are secured by an unconditional pledge of the issuing government to levy unlimited taxes to retire the bonds. General Obligation Bonds require voter approval and may create a need to raise taxes to service the debt. To approve these bonds requires 60 percent voter approval and 40 percent voter turnout from the last general election. Interest rates are generally the lowest available.
- Revenue Bonds are bonds whose principal and interest are payable exclusively from earnings of an Enterprise Fund (such as a surface water utility), and therefore may be more equitable than General Obligation Bonds. The Revenue Bonds generally carry higher interest rates and a reserve is required. Bonds usually contain restricted operations and the market is not as broad as for General Obligation Bonds. Usually there is no need for voter approval and limits are often not subject to a debt ceiling.

### **External Funding Sources**

Table 8-2 lists potential funding sources from state and federal grant and loan programs that should be explored for financing flood hazard management projects in the Chehalis River Basin. This Flood Plan specifies projects that are non-emergency in nature. Most of the funding sources listed here are designed for preventative flood mitigation projects and could address the projects listed in this plan. Other funding sources are available for recovery efforts after a flood disaster is declared. The following external funding sources are sorted by whether they relate to flood prevention or recovery.

**Table 8-2. External Grant and Loan Funding Sources**

<b>Funding Source</b>	<b>Agency</b>	<b>Grant/ Loan</b>	<b>Eligible Projects</b>	<b>Funding Amounts</b>	<b>Local Match</b>
<b>PREVENTION</b>					
Reigle Act	FEMA	Grant	Flood hazard mitigation	Variable	25%
Disaster Mitigation Act	FEMA	Grant	Flood hazard mitigation and planning	Variable	25%
Small Flood Control Projects	Corps	Grant	Flood control	\$7 million	0% - reconnaissance 25-50% - construction 100% - maintenance
Emergency Bank Protection	Corps	Grant	Streambank protection	\$1 million	35%
Floodplain Management Services	Corps		Technical assistance and planning guidance	\$7.6 million (Corps-wide)	0%
Planning Assistance to States	Corps	Grant	Preparation of plans and studies relating to flood control	Limited to \$500,000 per state annually	50%
Habitat Restoration	Corps	Grant	COE project for habitat restoration	Unknown	25%
Watershed Protection and Flood Prevention Act	NRCS	Grant	Improvements to small watersheds	Unknown	0% - construction
Flood Control Assistance Account Program	Ecology	Grant	Projects and plans related to flood hazard management	\$500,000	25% - comprehensive plans 50% - projects 20% - emergency projects
Centennial Clean Water Fund	Ecology	Both	Projects and activities that result in water quality benefits	\$2.5 million – facilities \$250,000 – activities	50% - facilities 25% - activities
Water Pollution Control Revolving Fund	Ecology	Loan	Projects and activities that result in water quality benefits	Unknown	Not applicable
<b>RECOVERY</b>					
Stafford Act	FEMA	Grant	Flood disaster relief and emergency assistance	Variable	25%
Farm Program	USDA	Loan	Emergency assistance to farms and ranches	\$500,000 per disaster	Loan limited to 80% of loss
Hazard Mitigation Grant Program	Commerce	Grant	Flood hazard mitigation	Variable	25%
Public Works Trust Fund	Commerce	Loan	Public works projects	Variable	100% local
Emergency Relief Funds	WSDOT/ FHA	Grant	Flood-damaged roadways	Variable	0% - restoration before 180 days 12.5% - restoration after 180 days

## **Prevention**

### *Reigle Community Development and Regulatory Improvement Act (PL103-325) - FEMA*

Title V of the Reigle Community Development and Regulatory Improvement Act of 1994 (PL 103-325) is referred to as the National Flood Insurance Reform Act of 1994. The Act establishes a program to provide financial assistance to states and communities for planning and implementation of flood mitigation activities.

A new National Flood Mitigation Fund is set up through the Act to fund flood mitigation planning and implementation activities (referred to as FMA- Flood Mitigation Assistance). Money for this fund comes from the National Flood Insurance Fund. The total amount to be credited to the new mitigation fund is \$20,000,000 in each fiscal year.

## **Conditions**

The following conditions for participation in the program are described in the Act:

- Community is defined as a political subdivision that has building code and zoning code jurisdiction over the flood hazard area, and is participating in the flood insurance program.
- To be eligible for funding, the state or community must have a flood risk mitigation plan that:
  - Describes the activities to be funded;
  - Is consistent with specific criteria contained in section 1361 of the National Flood Insurance Act of 1968 (“Criteria for Land Management and Use”);
  - Provides protection to structures that are covered by an existing flood insurance policy;
  - Is approved by the Director;
  - Includes a comprehensive strategy for mitigation activities for areas affected by the plan;
  - Has been adopted by the state or the community following a public hearing.
- The Director (FEMA) has 120 days in which to review submitted mitigation plans and notify the state or community that the plan has been approved or disapproved.
- Funding can be used only for activities included in the approved plan. Activities must be technically feasible, cost-effective, and cost-beneficial to the National Mitigation Fund. Mitigation activities for repetitive loss structures and structures that have incurred substantial damage will receive higher priority.

## **Funding**

Planning and implementation activities have different funding limits under the Act. Both categories of grants are provided on a 75 percent to 25 percent federal to local cost-share basis. The funding limits are described as follows:

- Planning Activities
  - The total amount available for mitigation planning will be \$1,500,000 per year. Single grants to states and communities cannot exceed \$150,000 and \$50,000, respectively. The total amount of grants to any one state and all communities in that state in a fiscal year may not exceed \$300,000.
  - Grants for mitigation planning to states or communities cannot be awarded more than once every 5 years, and each grant may cover a period of 1 to 3 years.
- Implementation Activities
  - Grants for mitigation activities during any 5-year period may not exceed \$10,000,000 to any state or \$3,300,000 to any community. The sum of the amounts of mitigation grants that can be made during any 5-year period to any one state and all communities in that State is limited to \$20,000,000.
  - The limits on grants for mitigation activities described above can be waived for any 5-year period during which a major disaster or emergency is declared by the President as a result of flood conditions in the state or community.

### **Eligible Activities**

The Act lists specific activities that are eligible for funding, as follows:

- Demolition or relocation of any structure located along the shore of a lake or other body of water and certified by an appropriate state or local land use authority to be subject to imminent collapse or subsidence as a result of erosion or flooding;
- Elevation, relocation, demolition, or flood proofing of structures (including public structures) located in areas having special flood hazards or in other areas of flood risk;
- Acquisition for public use by states and communities of property (including public property) located in areas having special flood hazards or in other areas of flood risk and properties substantially damaged by flood;
- Minor physical mitigation efforts that do not duplicate the flood prevention activities of other federal agencies and that lessen the frequency and severity of flooding and decrease predicted flood damages, not including major flood control projects such as dikes, levees, seawalls, groins, and jetties unless the Director specifically determines in approving a mitigation plan that such activities are the most cost-effective mitigation activities for the National Flood Mitigation Fund;
- Beach nourishment activities;
- The provision by states of technical assistance to communities and individuals to conduct eligible mitigation activities;
- Other activities the Director considers appropriate and specifies in regulation;
- Other mitigation activities not described above that are described in the mitigation plan of a state or community.

### *Disaster Mitigation Act of 2000 (P.L. 106-390) - FEMA*

The Disaster Mitigation Act of 2000 (P.L. 106-390) provides an opportunity for states, Tribes and local governments to take a new and revitalized approach to mitigation planning. Disaster Mitigation Act 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Stafford Act) by repealing the previous mitigation planning provisions (Section 409) and replacing them with a new set of mitigation plan requirements (Section 322). This new section emphasizes the need for state, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts.

The Pre-Disaster Mitigation Program was authorized and created when the Disaster Mitigation Act 2000 amended the Stafford Act to provide a funding mechanism that is not dependent on a federal disaster declaration. Funding for the program is provided through the National Pre-Disaster Mitigation Fund to assist states, local governments and Native American tribal governments in implementing cost-effective hazard mitigation activities that complement a comprehensive mitigation program. This is an annual grant program with funding limits established by congressional appropriation. Since this program is a pre-disaster program, a national competitive process has been established by FEMA that evaluates and ranks project applications, with an emphasis on overall project benefits versus costs. Like the Hazard Mitigation Program, project eligibility is limited based on program requirements. States and Native American governments applying for Pre-Disaster Mitigation must have an approved mitigation plan to be eligible to receive project grant funding.

### *Small Flood Control Projects – Corps of Engineers*

Section 205 of the 1948 Flood Control Act authorizes construction of small flood control projects, including levees, channel enlargement, realignments, obstruction removal, and bank stabilization. Non-structural alternatives may include flood warning systems, raising or flood-proofing of structures, and relocation of floodprone infrastructure. An important proviso attached to this assistance is that each project must be a complete solution to the problem and must not commit the federal government to additional improvements to insure effective operation.

Local government is responsible for 25 to 50 percent of the costs of the project and 100 percent of all future O&M costs. The federal share may not exceed \$7 million for each project under existing authorities.

### *Emergency Bank Protection – Corps of Engineers*

Section 14 of the 1946 Flood Control Act provides for emergency streambank protection to prevent damage to highways, bridge approaches, municipal water supply systems, sewage disposal plants, and other essential public works facilities. Churches, hospitals, schools, and nonprofit public facilities may also benefit from work done under this program. Projects cannot be used solely to protect privately owned properties or structures. Again, each project must constitute a complete solution to the problem and must not commit the federal government to additional improvements to insure effective project operation.

Local government is responsible for 35 percent of the project cost. The maximum amount that the Corps can spend on a single project is \$1 million.

*Floodplain Management Services – Corps of Engineers*

Section 206 of the Flood Control Act of 1960 authorizes the Corps to provide information, technical assistance, and guidance to city, county, state and federal agencies. Examples of the types of informational assistance provided through this program are data on flood sources and types, obstructions to flood flows, flood depths or stages, flood water velocities, flood warning and preparedness, flood damage reduction studies and audits, and floodproofing.

While the Corps provides study findings and pamphlets to its customers free of charge, all costs for services must be reimbursed according to a set fee schedule. Other grant funds may be used to pay for these services wholly or in part.

*Planning Assistance to the States – Corps of Engineers*

Section 22 of the Water Resources Development Act allows the Corps to assist local governments in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources. This program may encompass many types of studies, including water quality, habitat improvement, hydropower development, flood control, erosion, and navigation. Studies are typically at a planning level and do not include design for project construction.

Costs for projects undertaken under this program require a 50 percent local match. The local match can be met either wholly or in part with other non-federal grant funds. Allotments for each state or Tribe are limited to \$500,000 annually, but typically are much less.

*Habitat Restoration – Corps of Engineers*

Assistance is available under Section 1135 of the Water Resources Development Act (PL 99-662) to provide funding to modify Corps project structures to restore fish and wildlife habitat.

Fish and wildlife benefits must be associated with past Corps projects. Planning studies, detailed design, and construction are funded with a 75 percent federal cost-share. The program requires a non-federal sponsor to contribute the remaining 25 percent funding match. The potential sponsor requests by letter that the Corps initiate a feasibility study. Following receipt of the letter of intent, the Corps will request study funds.

*Watershed Protection and Flood Prevention Act (PL 83-566) - NRCS*

The Small Watershed Program of PL 83-566 provides federal funding for watershed protection, flood prevention, and agricultural water management. Funds from PL 83-566 can be used to prepare studies and construct flood control projects, both structural and non-structural. PL 83-566 was modified in 1990 to authorize cost-share assistance to project sponsors for acquisition of wetland and floodplain easements to maintain or enhance the floodplain's ability to retain excess floodwaters, improve water quality and quantity, and provide habitat for fish and wildlife. PL 83-566 is a cost-sharing program that requires matching funds from a local sponsor.

This program was modified as a result of the 1993 flooding on the Mississippi River. The types of eligible projects have been expanded and for some projects the federal cost is shared.

#### *Flood Control Assistance Account Program (FCAAP) - Ecology*

The FCAAP program was established by the State Legislature in 1984 to assist local jurisdictions in comprehensive planning and maintenance efforts to reduce flood damages. To be eligible, a community must receive Ecology's approval of its floodplain management activities. Additionally, the county has to meet the requirements of the National Flood Insurance Program (NFIP). Every 2 years, \$500,000 in non-emergency grant funds are available within any one county, but only approximately \$4 million is available statewide, depending on the amount appropriated by the State Legislature. The application period is during the winter, with a deadline in the spring. Ecology evaluates and releases a priority list for funding in July. Non-emergency grants may be effective for work 6 months after funding and negotiations are complete.

Eligible projects include acquisitions; flood protection facility retrofits, setbacks and removals; floodplain and channel migration zone mapping studies; comprehensive flood hazard management planning; and flood emergency warning services.

Distribution of FCAAP grant money is based on eligibility of the applicant and the proposed project. Conditions for funding include the following:

- Grants are limited to 50 percent of the total cost of non-emergency projects.
- Emergency funds of up to \$150,000 per county per biennium are available on a first-come/first-served basis; the state will fund up to 80 percent of the cost of emergency projects.
- Unused emergency funds (\$500,000 to emergency fund) can be disbursed on a discretionary basis by Ecology.
- The state can fund 75 percent of the cost for comprehensive flood hazard management plans.

#### *Centennial Clean Water Fund - Ecology*

The Centennial Clean Water Fund is both a grant and a loan program. Centennial Clean Water Fund-approved projects must be for the planning, design, acquisition, construction, and improvement of water pollution control facilities and activities. Flood control projects are typically not eligible for Centennial Clean Water Fund funds. However, if a water quality benefit can be demonstrated as a result of a flood control project, Centennial Clean Water Fund funds can be made available. A total of \$2.5 million is available per funding cycle for facilities, with \$250,000 available for activities under the Centennial Clean Water Fund.

The Centennial Clean Water Fund grants program will fund a maximum of five projects per year, no more than two of which can be for facilities. The Centennial Clean Water Fund requires a 50 percent local match for facilities and a 75 percent local match for activities. The local share may come from any combination of cash, other grants, or loans. In-kind contributions may be used for activities projects only.

The Centennial Clean Water Fund loan program will issue loans at the following interest rates: 0 to 5 years, 0 percent interest; 6 to 14 years, 60 percent of market rates; 15 to 20 years, 75 percent of market rates.

#### *State Water Pollution Control Revolving Fund - Ecology*

Like the Centennial Clean Water Fund, the State Revolving Fund finances planning, design and construction of facilities and the planning and implementation of activities that address water quality problems or water pollution prevention. While the State Revolving Fund is designed to provide assistance for water pollution control efforts, some flood control projects that will result in water quality benefits may be considered.

SRF loans may be used for up to 100 percent of a project's cost. SRF loans may also be used to provide a match for State Revolving Fund grants, with some restrictions.

The following interest rates apply to State Revolving Fund loans: 0 to 5 years, discretion of Ecology; 6 to 14 years, 60 percent of the bond buyer's index for municipal bonds; 15 to 20 years, 75 percent of the bond buyer's index for municipal bonds.

#### **Recovery**

##### *Robert T. Stafford Disaster Relief and Emergency Assistance Act (PL 93-288) - FEMA*

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Stafford Act) provides assistance following Presidential declarations of major disasters. Title IV presents details on major disaster assistance programs, including provisions for property acquisition and relocation assistance. Cost-sharing is available for up to 75 percent of the cost of any hazard mitigation measures that the President has determined are cost-effective and which substantially reduce the risk of future damage, hardship, loss, or suffering in any area affected by a major disaster. However, the total amount of mitigation funding under any disaster declaration cannot exceed 15 percent of the total grant funds provided for the disaster.

The specific terms and conditions used to determine if an acquisition or relocation project is eligible to receive federal funding under the Stafford Act are as follows:

- Acquisition and relocation projects funded under this Act must be cost-effective and substantially reduce the risk of future damage, hardship, loss, or suffering in any area affected by a major disaster;
- Acquisition and relocation projects and all other mitigation measures must be identified based on an evaluation of natural hazards;
- The applicant (the county or state) must complete an agreement stating that:
  - The property will be dedicated and maintained in perpetuity for a use that is compatible with open space, recreational, or wetlands management practices;
  - The only new structures erected on the property will be public facilities open on all sides and functionally related to a designated open space, rest rooms, or structures approved by the Director in writing before the start of construction;

- No application will be made for additional disaster assistance for projects relating to the property and no federal funding will be granted for such projects.

For more details on state implementation of the mitigation section of this federal act, see “State Hazard Mitigation Grant Program” later in this chapter.

#### *Farm Service Agency Farm Program - USDA*

The Farm Service Agency provides emergency loans to help cover production and physical losses in counties declared as federal disaster areas. Emergency loans may be used to replace essential property, pay production costs associated with the disaster year, pay living expenses, reorganize the farming operation, and refinance debt. To be eligible for Farm Program loans, the applicant must fulfill the following requirements:

- Be an established family farm operator;
- Be a citizen or permanent resident of the United States;
- Have the ability, training, or experience necessary to repay the loan;
- Have suffered a qualifying physical loss, or a production loss of at least 30 percent in any essential farm or ranch enterprise;
- Be unable to obtain commercial credit;
- Be able to provide collateral to secure the loan;
- Have multi-peril crop insurance, if available.

The loan limit is up to 80 percent of actual loss with a maximum of \$500,000 per disaster; special loan requirements and terms apply. Application for emergency loans must be received within 8 months of the disaster designation date.

#### *State Hazard Mitigation Grant Program – Washington Emergency Management Department*

The Emergency Management Division of the Washington Military Department coordinates state disaster mitigation, preparedness, response, and recovery activities. Under this mandate, the agency administers the State Hazard Mitigation Grant Program (also called the “404 program” after the section of the Stafford Act dealing with hazard mitigation). The Hazard Mitigation Grant Program is authorized and partially funded under the Stafford Act. State Hazard Mitigation Grants are made to local governments on a cost-share basis, with the federal, state, and local percentage matches set at 75, 12.5, and 12.5 percent, respectively. Federal funding for this program is contingent on a Presidential disaster declaration. Activities that may be funded through this program include:

- Elevating flood-prone homes or businesses;
- Acquiring (and either demolishing or relocating) flood-prone homes from willing owners and returning the property to open space;
- Retrofitting buildings to minimize damage from high winds, flooding, earthquakes, and other hazards; and

- Implementing minor flood control projects to protect critical facilities.

From the program's inception through August 2006, a total of \$82 million was allocated for these grants in Washington State. Even with this apparently high level of mitigation funding, total requests for grants have consistently exceeded the funds available. Therefore, the state has established a competitive procedure for funding. Applications are reviewed by a panel of state and local officials and scored based on how well they meet the specific terms and conditions required by the Stafford Act (see description above). This process is administered by the Emergency Management Division and selected applications are then sent to FEMA for approval.

#### *Public Works Trust Fund – Department of Commerce*

This state fund offers low-interest loans for rehabilitation and repair of public works infrastructure, including surface water facilities. Local governments, such as counties, cities, and special purpose districts, are eligible for these loans. Loans are paid back using revenue from sources such as local utility and sales taxes on local water, sewer, and garbage collection, and from a 0.24 percent real estate excise tax. Applications are accepted annually between April and July.

#### *Emergency Relief Funds—WSDOT and FHWA Title 23*

WSDOT serves as the clearinghouse for emergency road repair grants for damage associated with declared federal disaster areas. These grants can provide technical assistance and construction funds to the county from state (Rural Arterial Program) and federal (Federal Highway Administration) sources for temporary or permanent restoration of flood-damaged roadways. Title 23 Emergency Relief Funds are a major source of these funds. Permanent repairs can often incorporate designs that help prevent future damage. The local jurisdiction can also contribute additional funds, beyond that allocated for the emergency relief permanent restoration, to incorporate additional mitigation features into the project.

## **Basin-Wide Funding Options**

The Flood Authority is interested in setting up a basin-wide governance and financing structure. Revised Code of Washington allows for two types of flood-related districts that could serve the basin as a whole: the Flood Control District (RCW 86.09) and the Flood Control Zone District (RCW 86.15).

### ***Flood Control District***

The formation of a Flood Control District, authorized by RCW 86.09, may be initiated by a petition of at least 10 property owners or a county legislative authority resolution. The district is established by the registered voters within the district boundaries, which are determined by county engineers. A Flood Control District is governed by an elected board of directors.

The purpose of a Flood Control District is the investigation, planning, construction, improvement, replacement, repair or acquisition of dams, dikes, levees, ditches, channels, canals, banks, revetments and other works, appliances, machinery and equipment and

property and rights connected therewith or incidental thereto, convenient and necessary to control floods and lessen their danger and damages. Certain powers and rights are governed by RCW 85.38 (Special Districts).

This type of district has the authority to use several different funding mechanisms, including the following:

- Rates and charges (RCW 85.38.145),
- Furnish water for a toll (RCW 86.09.154),
- Special assessments (RCW 85.38.150-.170),
- Special benefit assessments on farm and agricultural land exempted (RCW 86.09.152),
- Special assessment bonds and notes (RCW 85.38.230),
- Special assessment bonds/notes as per RCW 86.09.157 and RCW 85.38.140-170,
- Utility revenue bonds (RCW 86.09.592-.616), and
- All governmental entities benefited by improvements are assessed (RCW 86.09.523 -.529).

### ***Flood Control Zone District***

Flood Control Zone Districts, authorized by RCW 86.15, may be established by either a petition signed by 25 percent of the voters in the proposed district, or by action of the county commission or board. A Flood Control Zone District is governed by a board of supervisors, typically the county commissioners or board.

The purpose of a Flood Control Zone District is to undertake, operate, or maintain flood control projects or stormwater control projects or groups of projects that are of special benefit to specified areas of the county (RCW 86.15.020).

This type of district has the authority to use several different funding mechanisms, including the following:

- A regular levy requiring authorization by the supervisors. The maximum amount that can be levied is 50 cents per \$1,000 of assessed valuation (RCW 86.15.160).
- An excess levy as a property tax requiring annual voter approval. This type of levy does not fall under the constitutional and statutory limitations of regular levies. An excess levy is based on property value and would not affect existing county revenues. The levy, if approved annually by voters, can generate substantial revenue for overall surface water management or flood control. However, considerable cost is involved in making voters familiar with the issues on an annual basis, and there is no certainty of funds from year to year (RCW 86.15.160).
- Assessments (RCW 86.15.160).
- Service charges including public entities (RCW 86.15.176).

- Local improvement districts (LIDs) (RCW 86.15.160).
- Subzones which are operated as flood control zones (RCW 86.15.025).
- Revenue and GO Bonds (RCW 86.15.178 and RCW 86.15.170 respectively).
- Stormwater fee charges, including public property (RCW 86.15.160).
- Voluntary assessments for flood or stormwater control (RCW 86.15.165).

Washington has a regular property tax limitation of 1 percent of a parcel's fair and true value. Flood Control Zone Districts are considered to be junior taxing authorities, so their levies are reduced if more senior authorities bring property taxes up to the maximum allowed. Whenever a portion of the county tax levy has reached this maximum, taxes collected for the Flood Control Zone District have to be refunded annually to the more senior taxing authority.

A Flood Control Zone District must be within a county, but a basin-wide entity could be formed by the three counties each forming their own Flood Control Zone District and the Chehalis Tribe forming a similar district. The zone could be county-wide or cover only the portion of the county affected by Chehalis River flooding. The districts could then be governed by an interlocal agreement between the three counties and the Tribe. The interlocal agreement would define governance, cost share, and coordination between the entities. Another model for coordinating the different Flood Control Zone Districts would be to form a new entity under the interlocal agreement using the authority of the Watershed Management Partnership law (RCW 39.34.200).

The purpose of a watershed management partnership would be to implement a watershed management plan. This CFHMP may meet the requirements of a watershed management plan. The watershed management partnership would have the authority to incur debt and to issue bonds (RCW 39.34.210).

## **Funding Source Evaluation**

### ***Evaluation Criteria***

As the Flood Authority seeks a governance and financing structure, it will need to evaluate the different structures that are available. The following criteria can be used to compare the options listed in this chapter.

- **Equity**—Does the funding source collect revenue equitably from those who contribute to drainage problems and those who will benefit from improvements?
- **Stability**—Are revenues from this source reliable and predictable? Can the county plan on them over the long run?
- **Control**—Can basin jurisdictions control the revenue, increasing it or decreasing it as required to fund programs?
- **Adequacy**—Does this source generate sufficient revenue to fund the desired program?

- **Relatedness**—Is this source of funding related to the problem that the revenue will be used to address?
- **Ease of Implementation**—Can this revenue source be activated quickly enough to fund a program?
- **Restrictions**—What are the restrictions on using this funding source? Will it fund capital operations? Work on private property? What other restrictions are there?
- **Acceptability**—Is this source likely to be acceptable to the citizens of the basin and its elected officials?
- **Legality**—What are the legal restrictions and requirements for implementing or using this source?
- **Basin-Wide Applicability**—Can this approach be used to fund basin-wide projects across jurisdictional boundaries?

### ***Programs to be Funded***

When determining the adequacy of a funding source, it is important to consider the types of programs and projects to be funded. Few funding sources can by themselves meet all the financial needs of hazard mitigation. Therefore, the selected funding mix should be adequate to fund each program element. Basic program elements to be funded include the following:

- Operations and maintenance (O&M),
- Capital improvements,
- Implementation and management of the flood hazard management program, and
- Billing, collection and administering revenue generation.

How each of the internal funding options described above meets these funding use requirements is shown in Table 8-3.

**Table 8-3. Adequacy of Internal Funding Sources for Various Uses**

<b>Option</b>	<b>O&amp;M</b>	<b>Capital Improvements</b>	<b>Management Programs</b>	<b>Billing and Administration</b>
Developer Contributions		X		
Drainage District	X	X		X
River Improvement Fund	X	X		X
Local Improvement District	X	X		X
Surface Water Utility	X	X	X	X
County Revenues	X	X	X	X
Flood Control Zone District	X	X	X	X
Flood Control District	X	X	X	X

A preliminary evaluation of each of the internal funding sources was performed against the criteria listed above. The results are shown in Table 8-4. Ratings are on a scale of 1 to 10, with 10 being the highest rating.

**Table 8-4. Evaluation of Funding Methods**

<b>Evaluation Criteria</b>	<b>River Improvement Fund</b>	<b>Other Districts</b>	<b>Surface Water Utility</b>	<b>County Revenues</b>	<b>Developer Contributions</b>	<b>Flood Control Zone District</b>	<b>Flood Control District</b>
Equity	7	7	8	3	6	8	8
Stability	6	6	9	4	3	9	9
Control	7	4	7	8	4	7	7
Adequacy	8	8	9	6	3	8	8
Relatedness	9	7	9	4	8	9	9
Ease of Implementation	4	2	3	5	5	4	1*
Restrictions	4	6	8	6	4	8	4**
Acceptability	7	7	5	3	8	8	8
Legality	5	5	5	5	4	5	5
Basin-Wide Applicability	1	1	1	1	1	9	10
<b>Total</b>	<b>58</b>	<b>53</b>	<b>64</b>	<b>45</b>	<b>46</b>	<b>75</b>	<b>69</b>
<b>Overall Ranking</b>	<b>4</b>	<b>5</b>	<b>3</b>	<b>6</b>	<b>7</b>	<b>1</b>	<b>2</b>

\* A Flood Control District requires a public vote, making it significantly more difficult to implement than a Flood Control Zone District.

\*\* A Flood Control District is limited to certain types of projects that are fully engineered before the district is set up. Therefore, it has greater restrictions than a Flood Control Zone District.

### ***Project Funding Strategy***

Most internal and external funding sources listed in this chapter are only appropriate for projects within a single jurisdiction. However, larger projects that will be part of a basin-wide package will require a basin-wide funding mechanism such as a Flood Control District or a Flood Control Zone District. A policy decision between the two types of districts will need to be made by the Flood Authority.



## **CHAPTER 9 RECOMMENDED ACTIONS AND ALTERNATIVE ANALYSIS**

### **Introduction**

The Chehalis River Basin Flood Authority has limited funding to implement flood mitigation projects. The majority of the funding appropriated by the Legislature for the Flood Authority is set aside as matching funds for the U.S. Army Corps of Engineers flood hazard mitigation projects for the Chehalis river basin area. The Flood Authority determined that the best use of its limited funds would be to fund projects they have called Ripe and Ready Projects and to gather project ideas that could be implemented in the future when a governance structure, such as a flood district, is in place and funding is available. In addition, the Flood Authority has funded and/or supported the study of two major capital projects for the basin—the Corps Twin Cities Project and Lewis County PUD’s Upstream Storage Project. The Flood Authority also developed a selection criteria process for evaluating proposed projects.

This chapter describes the two major capital projects being evaluated for the basin, the Ripe and Ready Projects that the Flood Authority has undertaken, and the Regulatory Review Project. It also presents lists of project ideas that have been proposed by jurisdictions and individuals in the basin. At the end of the chapter is a description of selection criteria that can be used in the future.

### **Existing Flood Mitigation Actions**

#### ***Major Regional Capital Projects***

Major regional capital projects address flood issues on a broad or regional basis. These include projects such as levee construction, flood storage, and dam modifications. The Flood Authority is currently supporting two such projects.

The Twin Cities Project is being undertaken by the Corps of Engineers. It consists of a series of levees along the Chehalis River in Centralia and Chehalis. The project is intended to alleviate flooding of Interstate 5 near Chehalis and will also mitigate local flooding in the vicinity. The project also includes evaluation of modifications to Skookumchuck Dam to allow the reservoir to be used for flood storage. The design of the project is scheduled to be complete in May 2013 with construction extending from 2015 to 2020. The project is authorized by Congress through the Water Resource Development Act and requires a local match. The state authorization of the Flood Authority includes the matching funds.

Lewis County PUD is studying the feasibility of two upstream storage facilities, one on the Upper Chehalis River and one on the South Fork Chehalis. These facilities are intended to provide flood Mitigation, hydropower production, and instream flow benefits. The PUD is currently studying the feasibility of the facilities.

Neither of these projects is ready to be implemented. To support decision-making on these major regional projects, the Flood Authority decided to undertake the Ripe and Ready projects described below.

### ***Ripe and Ready Projects***

An early interest of the Flood Authority was to implement some flood risk reduction projects as soon as possible. These projects were identified as ones that could provide an immediate benefit, would not adversely affect others, and would not preclude any future actions. These have been referred to as “Ripe and Ready” projects. Under the category of Ripe and Ready studies, the Flood Authority has chosen to support a number of studies that would support decision-making on major capital projects in the basin. The Ripe and Ready projects also included two nonstructural projects—an evaluation of regulatory programs in the basin and the design of an early warning system for the basin.

The Flood Authority has funded or provided support for studies that will be useful in evaluating future flood mitigation projects.

- **Seamless LiDAR.** This project would acquire Light Detection and Ranging (LiDAR) data for the entire Chehalis River mainstem and major tributaries. The project would provide a consistent topographic dataset throughout the area that could be used with hydraulic models to improve the evaluating of flood impacts and the effectiveness of flood mitigation projects.
- **Lower-basin Hydraulic Model.** This project would produce a calibrated 1D hydraulic model for the lower basin, similar to the existing unsteady HEC-RAS model used by Northwest Hydraulic Consultants (**nhc**) and the Corps for the upper basin. This model would allow for evaluation of downstream impacts and benefits of potential flood mitigation projects.
- **Ecosystem Services.** This project includes an economic analysis to value flood protection and other ecosystem services in the basin. It can be used as a tool to select flood mitigation projects.
- **Lewis County PUD Upstream Storage Phase 2 Studies.** These studies are evaluating the feasibility of constructing the two storage facilities in the upper Chehalis basin proposed by the PUD.
- **Coordinated Study.** This project will develop timely, comparable data on the Twin Cities Project and an upstream storage facility designed solely for flood mitigation and to determine if there is an economically feasible combination of the two projects.
- **Early Warning Program.** This project is evaluating the need for improved flood warning and emergency management systems in the basin. An improved system will be designed and implemented.

- Evaluation of Regulatory Approaches. This project evaluated existing flood regulations of jurisdictions in the basin and made recommendations for improved regulations that could be adopted by those jurisdictions. Additional information on the recommendations is presented below.

In addition to the studies listed, the Flood Authority also considered involvement in the Skookumchuck Dam Modification Feasibility and Decision Support Tool projects. The Skookumchuck Dam feasibility study is evaluating alternatives for modifying the discharge system of the dam to allow more effective use for flood control. TransAlta has determined that the best approach to modification of the Skookumchuck Dam is to work with the Corps of Engineers as part of the Twin Cities project. The USGS Decision Support Tool is a rainfall-runoff model that could improve flood prediction. The USGS and Corps are developing a scope of work for the project and it appears the Flood Authority will not be involved at this time.

### ***Regulatory Program Recommendations***

In response to concerns and questions about development impacts on flooding and the adequacy of existing local regulations, the Flood Authority agreed to evaluate existing regulations in the basin. The Flood Authority authorized an approach to considering regulatory programs in June 2009.

The purpose of the project was to make recommendations for improvements to regulatory programs in the basin. The project consisted of an evaluation of existing flood regulations of member jurisdictions and development of recommendations for improved regulations. The evaluation and development of recommendations was conducted by a Regulatory Work Group consisting of Board Advisory Committee members and representatives from the basin jurisdictions planning and building departments.

The Work Group determined that all jurisdictions in the Flood Authority meet state flood regulations requirements as well as the minimum requirements of the National Flood Insurance Program. The Work Group developed recommendations to improve regulations beyond those standards using concepts presented in FEMA's Community Rating System (CRS). The CRS gives discounts on flood insurance to citizens of communities that implement regulations that go beyond the minimum National Flood Insurance Program (NFIP) requirements.

In addition to using the CRS guidelines, the Work Group evaluated regulatory approaches to development in the floodplain from the perspective of:

- Risk to proposed structures,
- Risk to existing structures and properties,
- Ecological risks (including habitat, water quality, and wetland impacts), and
- Emergency management costs.

The recommendations are listed below. Additional details on the recommendations are included in Appendix A.

## **Basic Recommendations**

The Work Group decided to present its recommendations in two categories. Basic recommendations are those that the work group felt all jurisdictions in the basin should adopt.

**Recommendation 1** - Require that all new residential structures in the floodplain (Special Flood Hazard Area) be built 2 feet above the base flood elevation (freeboard).

**Recommendation 2** - Require that all new commercial or industrial structures in the floodplain be built 1 foot or more above the base flood elevation (BFE) or be floodproofed so that areas located 1 foot above the BFE or lower are watertight.

**Recommendation 3** - Require that buildings in the floodplain have an approved foundation (per the requirements of NFIP Technical Bulletin 11-01).

**Recommendation 4** - Adopt regulations that limit enclosures below the BFE to discourage finishing elevated areas.

**Recommendation 5** - Require a lower threshold for substantial improvements.

**Recommendation 6** - Require that substantial improvements be counted cumulatively within a specific time period such as 10 years.

**Recommendation 7** – Place limitations on critical facilities in the floodplain.

**Recommendation 8** - Adopt subdivision and development regulations that avoid or minimize development in floodplains.

**Recommendation 9** - Adopt low density zoning in the floodplain.

**Recommendation 10** - Adopt the current version of the Department of Ecology's Stormwater Manual.

**Recommendation 11** - Include floodplain protection in the Critical Areas Regulations or adopt floodplain regulations as part of the Critical Areas Regulations.

**Recommendation 12** - Adopt wetland and stream buffers that protect the natural and beneficial functions of wetlands and streams.

**Recommendation 13** - Restrict activities allowed in wetland and stream buffers to those that do not increase impervious surfaces.

**Recommendation 14** - When Shoreline Management Programs are updated, incorporate Shoreline Management Program guidelines for flood hazards.

**Recommendation 15** - Include “associated wetlands” as part of the shoreline management zone.

In addition, at its January work session, the Flood Authority decided to add an additional recommendation:

**Recommendation 16** – All jurisdictions should participate in the NFIP CRS program.

### **Ideal Recommendations**

The Work Group also developed “ideal” recommendations. These are recommendations that the Work Group thinks all jurisdictions in the basin should consider and work towards if practical for the conditions in their jurisdictions

**“Ideal” Recommendation 1** - Require compensatory storage for fill in the floodplain. Consider a 1:1 or 1.5:1 requirement for storage.

**“Ideal” Recommendation 2** - Adopt a zero-rise policy in the floodplain.

**“Ideal” Recommendation 3** - Restrict development in the floodplain, requiring all development proposals to acquire a special permit or reasonable use exception.

**“Ideal” Recommendation 4** - Require new streets in the floodplain to be at or above base flood elevation

**“Ideal” Recommendation 5** - Prohibit the storage of hazardous materials in the floodplain or require that such materials be stored above the flood protection elevation for residential structures.

### **Flood Mitigation Alternative Actions**

The Flood Authority solicited input on structural and non-structural alternatives to reduce flooding impacts in the Chehalis River basin. The Flood Authority identified these mitigation alternatives in a number of ways. First, project lists were compiled from existing Comprehensive Flood Hazard Management Plans (CFHMPs) for jurisdictions within the Chehalis River basin. Second, the public was asked to recommend projects at the public workshops held in February 2009. The Flood Authority also requested project recommendations from member jurisdictions and the public.

These projects have not been developed or designed to a level adequate to evaluate their potential feasibility or effectiveness. The Flood Authority presents these projects as a list of identified projects that could be further evaluated in the future and possibly be implemented under a flood district.

The identified projects are presented in Table 9-1. The projects are classified using the categories described in Chapter 7. Both structural and nonstructural measures are presented. Many of the projects identified are Planning and Data Collection efforts to support the development of projects in the future.

**Table 9-1. Identified Flood Mitigation Alternatives in the Chehalis River Basin**

<b>Project</b>	<b>Location</b>
<b>Floodplain Protection</b>	
Salzer Creek backwater control	On Salzer Creek in Lewis County
Increased on-site detention and retention	Grays Harbor County
Overtopping levee on the north end of town	Bucoda
Twin culverts under Main Street at 11 <sup>th</sup>	Bucoda
Relief culvert for north side runoff	Oakville
Harris Creek fish enhancement	Oakville
Sickman-Ford Bridge culvert	Oakville
Open old migration channels to allow river braiding	Wynoochee and Satsop Rivers
Culvert projects on Hiram Hill	Grays Harbor County
Montesano WWTP protection	Montesano
Adna levee improvement	Adna
Wastewater outfall protection	Basin-wide
Weelhead and water treatment protection	Montesano
Tilley Road culvert replacement	Thurston County
<b>Bank Protection</b>	
Bank stabilization and debris removal program	Basin-wide
Biostabilization	Basin-wide
Wynoochee River bank stabilization	Montesano
Streambank stabilization	Bucoda
Mary's River Lumber bank protection	Montesano
Independence Road bank protection	Thurston County
<b>Conveyance Capacity</b>	
Open migration zone of the Satsop	Satsop River
Dredge Lake Sylvia	Montesano
Open relic channel at Marys River oxbow	Grays Harbor County
<b>Regulatory Programs</b>	
Floodplain conservation easement program	Basin-wide
Improve floodplain regulations	Basin-wide
Tax breaks for removing structures from floodplain	Basin-wide
Penalization for building in the floodplain	Basin-wide
<b>Planning and Data Collection</b>	
Remap high groundwater areas	Thurston County
Channel migration zone mapping	Basin-wide
Channel migration analysis	City of Chehalis to Grays Harbor County
Augment Chehalis Tribe Flood Plan with 2-, 5-, and 10-year recurrence interval maps	Chehalis Reservation
Survey of river cross-sections	Basin-wide
Remap floodplains	Thurston County
Berwick Creek Drainage Plan	Chehalis and Lewis County
China Creek Drainage Plan	Lewis County and Chehalis
Rochester Stormwater Plan	Rochester
Reevaluate land uses and zoning based on new mapping	Thurston County
Study of woody debris and aggregates	Basin-wide
Evaluate channel response to sediment	Basin-wide
Study of failed riprap	Basin-wide
Conduct studies needed to design proposed mitigation strategies	Chehalis Reservation
Investigate conditions near Wickett levee	Chehalis Reservation
Determine cause of water backup over Highway 6	Highway 6

<b>Project</b>	<b>Location</b>
Study of fill adjacent to Harris Creek to determine if it should be removed	Harris Creek, Chehalis Reservation
Independence Road Bank Realignment Feasibility Study	Thurston County
Skookumchuck River scour potential study	Skookumchuck River
Develop dynamic model of middle basin to assess effects of future development	Middle basin
Construct a 2-D flow model	Chehalis Reservation specifically and basin-wide
Model effects of removing/modifying the Sickman-Ford Bridge Approach	Sickman-Ford Bridge
Cumulative downstream flood impact analysis	Lower basin
Monitoring program on channel conditions	Basin-wide
Study of impact of recent development of trucking and warehouse facilities	Basin-wide
Evaluate how groundwater impacts flooding events	Basin-wide
Riparian habitat inventory	Basin-wide
Develop a floodplain property acquisition program	Basin-wide
<b>Education and Public Information</b>	
Provide educational materials on flood hazard management	Basin-wide
Provide floodproofing guidance to residents	Basin-wide
Establish a Flood Awareness Week	Basin-wide
<b>Governance and Management</b>	
Form a flood district	Basin-wide
<b>Emergency Response and Preparedness</b>	
Evaluate opportunities for flood warning systems	Lewis County
Flood Hazard Warning Policies	Grays Harbor County
Improve gauge system in Grays Harbor County	Grays Harbor County
Acquire generator for City Hall	Montesano
Construct drinking water reservoir	Montesano
Improve flood notification and response program	Bucoda
Develop and maintain a specific flood warning program	Centralia
Manage Wynoochee and Skookumchuck dams for flood control	Skookumchuck and Wynoochee dams
Install generator at Grays Harbor Fairgrounds	Grays Harbor Fairgrounds
Address loss of power and cell phone coverage	Basin-wide
Establish critter pads to reduce livestock loss	Basin-wide
<b>Reduction of Damage to Existing Structures</b>	
Join the NFIP Community Rating System	Basin-wide
Develop a home elevation and buyout program	Basin-wide
Regrade Main Street	Bucoda
Raise elevation of Moon Road/Easton 188 <sup>th</sup> Roadway	Thurston County
Lincoln Creek floodplain purchase	Lincoln Creek Road area in Lewis County
Protect access to Satsop Development Park	Grays Harbor County
<b>Natural Resource Protection</b>	
Protect and restore critical areas	Basin-wide
Provide habitat for wildlife and fish	Basin-wide
Camp Creek drainage improvements	Grays Harbor County
Encourage longer rotations between tree cutting in forests	Basin-wide
Encourage improvement of forest management practices	Basin-wide

## **Selection Criteria**

The Flood Authority has developed a process for evaluating recommended actions. The process includes a list of project considerations and a set of project criteria. The criteria has not yet been applied to proposed projects because the projects have to be sufficiently defined and scoped before the criteria can be applied successfully. None of the projects proposed for the Chehalis River basin have been adequately defined at this time.

### ***Project Considerations***

The Flood Authority reviewed and commented on draft considerations for evaluating projects at the May 2009 work session. Those considerations have been revised and are presented here.

- **Definition of the Project.** Has the project been sufficiently defined and scoped to be considered and evaluated as a potential project by the Flood Authority? What is the intent of the project? Who will benefit?
- **Implementing Agency.** Is there an identified agency or jurisdiction who will take the lead on the project? Is there an identified agency or jurisdiction that will be in charge of maintenance on the project?
- **Ability to Meet Goals.** Does the project meet the goals outlined in the Chehalis River Basin CFHMP?
- **Effectiveness of Mitigation.** What flood hazard problems does the project solve? Is it a permanent or temporary solution? Is it a complete or partial solution? How much of the basin would be affected? Has the project been evaluated for downstream and upstream impacts (both positive and negative)?
- **Feasibility.** Are there technical obstacles that would prevent the project being constructed?
- **Cost and Funding Sources.** How expensive is the project and who will bear the cost? Are funding sources available, both in the short-term and long-term?
- **Cost-effectiveness.** How much benefit does the project deliver per dollar invested?
- **Environmental Impacts.** Does the project have significant environmental impacts or can adverse impacts be mitigated?
- **Permitting Ease.** What approvals or permits will be required? Are those approvals or permits likely to be granted?
- **Timeliness.** How long will it take to implement the project? Are there other projects that must be completed before this project can begin?
- **Acceptability.** Is the project acceptable to the stakeholders in the Chehalis basin?

### ***Project Criteria***

The Flood Authority has translated the project considerations into criteria that can be used in numerical ranking system. These rankings will serve as one consideration used by the Flood Authority in determining which projects to support and fund.

Three of the project considerations are framed as yes or no questions. The answer to all three questions needs to be yes, or the project is not ready to rank. The three questions are:

- Is the project sufficiently defined?
- Is there an identified implementing agency or agencies?
- Is the timeline of the project acceptable to the Flood Authority?

The other considerations are framed as criteria for which each project can be ranked high, medium, or low. These are shown in Table 9-2.

**Table 9-2. Project Criteria**

Criteria	Prioritization Ranking		
	LOW	MEDIUM	HIGH
Goals	Meets no/few goals	Sufficiently meets multiple goals	Meets most goals very well
Effectiveness of Mitigation	Not effective	Moderately effective	Very effective
Upstream and Downstream Impacts on People and Structures	Significant negative impact	Neither positive or negative impact	Positive impact
Technical Feasibility	Difficult to implement	Moderately able to implement	Easy to implement
Funding	Unlikely to be funded	Potential to be funded	Likely to be funded
Cost-Effectiveness	Benefits do not meet costs	Benefits meet or somewhat outweigh costs	Benefits significantly outweigh costs
Environmental Impact	Significant negative impact	Neither positive or negative impact	Positive impact
Permitting	Unlikely to be permitted	Unclear how likely to be permitted	Likely to be permitted
Acceptability	Unpopular/affects few	Not popular with some groups	Popular/affects many



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**Appendix A**

**April 2010 Meeting Report**





## Public Meeting Report

**Date:** April 27, 2010

Over the past year and a half, the Flood Authority has been developing a basin-wide Comprehensive Flood Hazard Management Plan. The Plan is currently in draft form but the Flood Authority is expected to approve it in June. The Flood Authority asked their consultants, ESA Adolfson, to hold three public meetings on the Flood Plan in early April to gather public comments on the plan.

The Flood Plan was made available on the Flood Authority website and public meetings were held April 5 in Rochester, April 6 in Montesano, and April 7 in Chehalis. Approximately 25 citizens each attended the Rochester and Montesano meetings, while approximately 50 citizens attended the meeting in Chehalis.

This report compiles all the comments received during or after the meetings. Not all comments relate to the Flood Plan, but all comments relate to the work of the Flood Authority. The comments will also be included in an appendix to the Flood Plan. Comments relevant to the Flood Plan will be used to revise the plan.

ESA Adolfson has prepared detailed meeting notes from all three meetings. The notes from the Rochester meeting on April 5 are Attachment 1, the notes from the Montesano meeting on April 6 are Attachment 2, and the notes from the Chehalis meeting on April 7 are Attachment 3. Comments were left on flip charts at the Rochester and Montesano meetings, and those comments are included in Attachment 4. Additionally, citizens were encouraged to write comments on comment forms at the meetings or send written comments by mail or email. All written comments received are included in Attachment 5.

**Attachment 1  
Meeting Notes  
Swede Hall  
Rochester, WA  
April 5, 2010 – 6:00 PM**

Commissioner Terry Willis brought the meeting to order at 6:08 PM. She thanked the public coming to the meeting. She introduced herself as a citizen of Montesano, a Grays Harbor County Commissioner, and the Chair of the Chehalis River Basin Flood Authority. She introduced Flood Authority members Brandon Atoch, mayor of Oakville, and Bill Bates, City of Centralia Council. Commissioner Willis introduced other elected officials from Flood Authority jurisdictions who were present: Bill Schulte, Lewis County Commissioner; and Edna Fund, City of Centralia Council.

Commissioner Willis also introduced staff of various jurisdictions and agencies who work with the Flood Authority and were present: Glen Connelly, Environmental Program Specialist for the Chehalis Tribe; Bob Johnson, Lewis County Community Development; Lee Napier, Grays Harbor County Community Development; Mark Swartout, Thurston County Natural Resources Program Manager; Chris Hempleman, Department of Ecology; and Andrea Takash with the Corps of Engineers. These are people who are very important to the process, who come to our meetings and workshops on a regular basis, and who helped put this plan together. Commissioner Willis also introduced staff from ESA Adolfson, consultants to the Flood Authority: Bruce Mackey, Ann Root, and Spencer Easton.

Commissioner Willis said the purpose of the meeting tonight is the Flood Authority's Comprehensive Flood Hazard Management Plan. This is a document put together by a variety of people, including the Flood Authority and its staff members. It is now out in draft form for the public to see, analyze, tear apart, and give feedback on. Commissioner Willis said she hopes everyone will take the time to read through the document and give feedback. We're not doing you a favor, you're doing us a favor. This document will be implemented in your area and this is your chance to have feedback. It's an important step in making the document work.

There are three ways that citizens can comment on the document at this meeting. There will be an open question and answer period to talk with and to us. There will also be listening posts for small group or individual input so citizens can have conversations with Authority members and agency staff. There are also comment forms on the back table for additional questions or comments on the document.

The intent is to put the plan out for comment, receive comments, incorporate them into the document, and have a new draft out in June for the Authority to approve. Commissioner Willis asked if there were any questions about tonight's meeting.

Q – Can I find a copy to take home?

Commissioner Willis said the Flood Plan can be found on the Authority's webpage. Google the Chehalis River Basin Flood Authority and you will find the page.

Q – What is the deadline for comments?

Ann Root said the deadline is April 23<sup>rd</sup>.

Q – Since the comment period is so short, it's not really a draft document. It's a final document. If we only have two weeks to review it, we don't have enough time.

Commissioner Willis asked how long the commenter would like to have. He requested a due date of May 30<sup>th</sup>. Ms. Root suggested a full 30-day comment period, until the middle of May. Commissioner Willis requested that comments still be sent in even past the due date. The important thing is to get comments.

Q – Are there two plans? Is this plan only for the proposed levee system, or is it for the dams?

Ms. Root said it was about neither project. It's a general plan for the basin.

Commissioner Willis introduced Karen Valenzuela, Thurston County Commissioner and Flood Authority member. Commissioner Willis turned the meeting over to Ann Root and said there would be time for additional questions after Ms. Root's presentation.

Ms. Root said she would give a brief rundown of the Authority and then explain the Flood Plan. The Flood Authority is an organization authorized by the State legislature in Spring 2008 in response to the 2007 flood and the long history of flooding in the basin. The Authority was established by an interlocal agreement to participate in the development of flood hazard mitigation efforts in the basin. The emphasis is basin-wide. The Flood Authority members are Grays Harbor, Lewis, and Thurston Counties; the Confederated Tribes of the Chehalis Reservation; the cities of Aberdeen, Centralia, Chehalis, Montesano, and Oakville; and the towns of Bucoda and Pe Ell. The Authority has been working since 2008 to identify measures to help mitigate flood damage in the basin. They have funded a number of studies and projects, including evaluating the upstream storage facilities proposed by Lewis County PUD, developing LiDAR digital

elevation models so hi-tech aerial photography can be used to help model flooding, developing a hydraulic model for the lower basin, and conducting an economic analysis for flood protection and ecosystem services.

The Flood Authority has also evaluated floodplain regulations in the basin, funded an assessment of a flood warning system, and coordinated with the Corps of Engineers on the Twin Cities levee project and a basin-wide General Investigation to look at both ecosystem restoration and flood management.

The next step for the Authority is to develop a flood district to take over the role of the Authority and to establish funding for flood mitigation in the basin. One step in that process is developing and adopting the flood plan.

The future plans of the Flood Authority include continuing to fund existing projects and studies, funding the development of an early warning system, adopting the Draft Comprehensive Flood Hazard Management Plan, and forming a flood district. The flood plan is a key part of establishing a flood district.

A flood plan is an examination of the cause and effect of flood related problems, leading to the development and implementation of feasible solutions. That's out of FEMA's language and it's a requirement for funding. A flood plan focuses on managing the hazards of flooding. It considers both structural and nonstructural alternatives.

The Authority developed a flood plan in order to consider problems basin-wide and compile a list of projects to address those problems. The key to the plan is that it's basin-wide. It was used to develop basin-wide goals and criteria for use by either the Flood Authority or a future Flood District. The plan identifies a range of projects and includes strategies for funding future projects and establishing a flood district.

The plan was developed using existing flood plans that individual jurisdictions in the basin already had prepared. The existing plans served as the basis for the basin-wide plan with a basin-wide perspective. We sought input from Authority members and jurisdiction staff to update the plan and make it more useful. We had public meetings a year ago in Chehalis and Montesano where we discussed goals and problem areas with the public.

The flood plan includes goals, general basin characteristics, and a summary of previous studies that have been done, both by federal agencies and local jurisdictions. There is an overview of regulations, federal to local. There is also an evaluation of basin flood characteristics, including historical knowledge of flooding and more recent flood information. Flood problem areas were identified using public input and bringing together existing information about flood damage. The plan also presents mitigation alternatives that can be used to solve flood problems. It summarizes funding options and presents options for forming a flood

district on a basin-wide level and it includes specific recommended actions the Authority has looked at. If you pick up any flood plan, the table of contents will look similar to this because it's required by the federal and state government.

At tonight's meeting, we will focus on two pieces of the plan – where flood problem areas are and what projects are being proposed. Ms. Root showed a map of the lower basin that shows a quick overview of major flood problems. The map showed human health and safety issues along the river. These are places where flooding impacted people's homes and caused damage to people and their property. The map also showed major infrastructure in Montesano and Aberdeen that has been impacted. Ms. Root showed a similar map of the upper basin. This map showed emergency response issues such as access to the hospital. Again, the map showed human health and safety issues along the river and major infrastructure in Chehalis, Centralia, and Oakville. Ms. Root clarified that these maps don't attempt to identify all flood problems, but show major issues throughout the basin.

The plan recommends a variety of mitigation action, including nonstructural measures. Nonstructural measures include: public information, such as providing educational materials on flooding, where it floods, and floodproofing; improving floodplain regulations; planning and data collection, such as modeling the lower basin or doing a study on woody debris and stream gravel; reducing damage to existing structures by doing things such as elevating houses, buying out houses that are repeatedly flooded, and raising road levels so access is maintained during floods; emergency response and preparedness, which includes the early warning system designed by the Flood Authority; and natural resource protection projects, such as restoring natural wetlands.

The other set of mitigation measures are the structural mitigation measures. These involve building something to keep flood waters away from structures. The first category is floodplain protection. Two major projects pursued by the Flood Authority under this category are the Twin Cities project and the PUD upstream storage facilities project. Another category of structural measures is bank protection, which includes stabilizing and providing protection to river banks to keep them from eroding. The third category of structural measure is conveyance capacity. This measure can involve dredging or opening channel migration zones, which are old channels where the river used to flow.

The Flood Authority intends to use the flood plan to bring together all the projects and recommended actions proposed in the basin. It provides a start list of projects for a future flood district. Once a district is established this is a list of projects that can be pursued. Another advantage is that the recommended actions in the plan can be incorporated as part of the General Investigation study being done by the Corps of Engineers. Since this plan was developed using state and federal guidelines, the projects could be eligible for state and federal funding options.

The next step is to solicit comments tonight and over the next few weeks. We did incorporate recommendations from the meetings a year ago. The Authority plans to approve the plan in June. The Authority will recommend that the member jurisdictions adopt the Flood Plan as part of their plans. Once a basin-wide flood district is established, the Flood Plan will serve as the district's plan.

We planned this public meeting in order to ask for comments on flood problem areas and recommended actions. We also welcome comments on any other part of the plan. We will open up this meeting for public comment, then later we will set up stations around the room so you can talk to us at easels. There are comment forms on the back table and a box for comments. There is also an address on the back so you can mail in comment forms. You can also email comments to us. The flood plan, comment form, and information on how to submit comments are all available on the Flood Authority's website, which is maintained by Lewis County.

Ms. Root opened up the meeting to public comment and questions.

Q – I have not read the flood plan, but why is Lewis County PUD interested in dams?

Bill Schulte said the PUD looked into dams to see if it's possible to get hydropower. It appears that the PUD can be involved in less than 10% of the project because most of the capacity of the dam is to hold rain runoff. Unless they make the dam very large, it won't generate power. If the dam doesn't have hydropower, it won't be the PUD's dam. There are actually three parts to the dam project. One part is for flood control. If they make the dam bigger, it could provide instream flows, and if they make it a lot bigger it could provide hydropower. I don't think we can afford hydropower. Once that decision is made the PUD will no longer participate.

Q – I have several questions. The first relates to the levees in Centralia and Chehalis. People here in Rochester and Oakville are worried about the effects to save I-5 and downtown Chehalis and the affect that will have on us downriver. What exactly is the Authority's relationship with the Corps? Who has the authority to say that the project will happen and that these comments will make a difference and be incorporated into actions? To what degree will the Corps make their own decisions about the protection of I-5?

Andrea Takash said the Corps has a policy that it will not build a project if it negatively impacts citizens downstream. If the Corps can't mitigate in some way, they won't build the project. The Corps is currently updating the project to see what the new design will look like based on 2007 and 2009 floods. As to the second question, the State is the local sponsor and, according to the House Bill

that makes them the sponsor, they will not proceed to construction unless they have local buy-in. The Corps won't proceed until the state has that local buy-in.

Q – A lot of the comments on the Flood Plan will relate to the impacts of the Twin Cities project. Will those comments be shared with the Corps?

Ms. Root said the comments will be shared. Ms. Takash said that the Corps works closely with the Authority and attends all their meetings. It isn't the Corps' project, it's the Community's project. Ms. Root said the role of the Authority is to cooperate with the Corps, but it's a State and Corps project, not an Authority project. Ms. Takash said the State is representing the local interest.

Q – How many thousand acre-feet of water are going to come down the river? Also, is there any plan to change the channel at the Mellen Street bridge? Will it be made wider? My third question relates to scouring of fields. The local farmers and many others down here are seeing a higher velocity of flood water that is scouring fields. We plant our crops in September and November and we are getting a severe amount of river speed going across the floodplains that hasn't happened before. Before 1990-1996, it used to be standing water and now it scours.

Ms. Root clarified that the first question relates to water displaced by the levee project. Ms. Takash did not know the answer but offered to consult with a Corps hydrologist and get back to him.

Q – I was born and raised in the floodplain or close to it. Luckily my house doesn't get flooded, but my property, Ford, and horses have flooded. I don't hear anything about WSDOT. It seems like the easiest thing for them to do would be to raise the freeway and not displace water. They should have built I-5 on concrete piling to let the water flow in and out. Instead it holds water. I don't think government can solve everything. There are not many normal citizens not involved in government at this meeting. So is there a vested interest in growing government, or in doing something about the problems we have? I'm not sure why WSDOT isn't involved.

Ms. Root said WSDOT is involved in the Twin Cities project as one of the state agencies cooperating with the Corps.

Chris Hempleman said that WSDOT is the lead for the State in this process.

Q – You mentioned restoration of riparian areas and wetlands. What about reforestation in the upper watershed?

Ms. Root said that, as a general measure, reforestation is outside the jurisdiction of the Authority members. However, that's part of the ecosystem analysis that's

being done. Reforestation is a type of measure but nothing specifically is being proposed right now.

Q – I am curious about the funding for the Flood Authority that's been babbled around in the legislature. What is the status of that?

Ms. Root said that we don't know, and it's still being discussed by the legislature.

Q – On the issue of reforestation, has anyone thought to talk to timber owners in the upper watershed about what they could do?

Ms. Root said it isn't in the current plan because it's outside the Flood Authority's jurisdiction.

Q – Is the flood plan different from the flood maps proposed for Centralia and Chehalis?

Ms. Root said it's completely different. Those maps are being done by FEMA.

Q – The conclusions of that mapping project will impact the plan and what the Corps can and can't do.

Commissioner Schulte said to ask the Corps what impacts the maps will have.

Ms. Takash said that FEMA has announced that they have delayed the maps until August. FEMA does their own maps and the Corps is not responsible for the maps. When the Twin Cities project is at 50% construction, FEMA will redraw the maps based on the levees being in place.

Ms. Root said that the FEMA maps won't affect the plan itself, but it would affect where the line on the map detailing the floodplain is. This impacts what is regulated as floodplain. Some measures may cover a different area than they would have before FEMA updated their maps.

Q – As for reforestation, if the land is in Lewis County, Grays Harbor County, and other jurisdictions in the Flood Authority, why is that not under the Authority's jurisdiction?

Commissioner Willis said it has come up in conversations about what the Flood Authority can look at. In the ecosystem management style, it's better to prevent something from happening than build something later to handle what already happened. One thing to look at is size and location of trees and what affect they would have on a massive rainfall. The Flood Authority doesn't have the authority to walk in to a forested area and put a rule into place.

Ms. Root said that forest management is regulated by the Department of Natural Resources.

Q – The City of Chehalis is one of the members of the Authority. Has there been a conversation about their permitting of commercial development with huge quantities of fill in the floodplain?

Commissioner Schulte said the fill isn't in Centralia, it's in Chehalis. That development is behind a levee, so it isn't in the floodplain. The fill is behind the airport levee which was built by the Corps in 1943-1948. They are allowed to fill behind levees.

Q – I hear a lot about building levees but nothing about dredging. If you get the river bottomed out so there's room to flow, you won't have the problem you have now.

Ms. Root said that falls under the category of conveyance capacity and there are suggestions to do that.

Q – I think Lewis County should be able to build in the floodplain, but they should either build ground level and let the building flood or put the building on pilings so water can go underneath. That way we won't have this argument. Let them build at ground level, and if they know it's going to flood, open up the windows.

Q – In the Great Depression, I lived in South Aberdeen, and if you want to know where water is go to South Aberdeen when the tide is up. Us kids were happy as larks, we floated around on boardwalks and rafts. Our parents didn't complain because the basement was three feet off the ground and the first floor was 13 feet off the ground. Our ancestors had common sense. Now people build in the floodplain and they want us to come rebuild it or buy it out. I think evolution must be true because everyone seems to be getting more stupid. How are you going to control mother nature? That's my observation.

Q – When you talk about areas that are behind a levee, does that include the whole mess between Kresky and I-5?

Commissioner Schulte said that area is in the holes where the levees are and will be. Those are called sacrifice or storage areas. The levee goes from one side of the airport to I-5, but not the other side. Those areas flood consistently and they will continue to flood with the new Corps plan.

Q – The reason I ask is that, to the people who live in Rochester, a lot of the problem seems to be because of basic silly decisions like the building of Yardbirds and the filling in of the floodplain. Every time I drive by and see that big black bird, I say it's an albatross. That area has seen the worst of those problem. It's still a marsh, there are still cattails peeping up. It seems the

cheapest thing to do would be to buy up that property and those places that are falling down and being demolished. If you bought that out you'd have a nice wetland and hiking area. Instead you get proposals to fill in the plain, do stupid things, and build wherever people want. It seems that if you're going to have the Fairgrounds in the floodplain when people told you 75 years ago to get it out of there, and if you're going to keep building buildings in the wrong places, they're going to flood.

Commissioner Schulte says he agrees. Whoever decided to put I-5 where it is should be committed. The freeway attracts business and people started building up on either side. Whoever decided to put the freeway there wasn't thinking ahead, but it's there now. WSDOT has said that to raise the freeway would cost \$100 million, and that doesn't have anything to do with Centralia, Chehalis, or Lewis County. If you've allowed people to build in the past, you'll have to buy them out. It's a very expensive proposal. If it's less expensive than other options, let's do that, but it doesn't appear to be. That's what the plan is, a way to look at all the options and find the lowest cost way. It may not be levees. By the way, in 1972 the Corps said the quickest way to solve the problem was to open Mellen Street, and it may have helped Lewis County but it wouldn't have solved anything downstream. The question is how to come up with a basin-wide solution. If we put a dam between Chehalis and Rochester, Chehalis won't be happy. If the solution is to put in levees and dump water on lower parts of the river, that's not a legitimate solution either. We need to come up with a basin-wide solution.

Q – It seems most of the efforts are with the upper basin. What are the impacts on the lower basin?

Ms. Root said the plan includes projects throughout the basin. There are a variety of projects listed in the plan addressing localized flooding issues in the lower basin. Projects include raising bridges and approaches to bridges.

Q – Does the Flood Plan address how much water comes down the Skookumchuck River, Salzer Creek, Coal Creek, and the Dillenbaugh? If we build levees, Chehalis water can't flow into the usual ponding area, but you will still have a volume of water from the tributaries. If that volume is equivalent to what you got from the Chehalis, you don't have any basic improvement.

Ms. Root said the Corps will be looking at those tributary streams and how they relate to the levees. Ms. Takash said if the levees impact other areas, the Corps will put in pumps. The Corps is also looking at other, smaller potential projects to address tributaries that can be done sooner with less cost. Ms. Root said another piece of the Twin Cities plan is to increase capacity at the Skookumchuck dam. Ms. Takash said the plan calls for an 11,000 acre-foot increase in capacity at the dam.

Q – When you look at the tributaries, if the levee is built to 8 feet but the water comes up 11 feet, would the additional water go over the levee and come downstream?

Ms. Takash said design of the Twin Cities project is not at that point yet. Ms. Root said studies are going on or proposed for the tributaries. The problem is recognized.

Bill Bates said the City of Centralia is looking at putting a weir on Salzer Creek and China Creek to restrict flow into the Skookumchuck and Chehalis rivers. Research is being done. The city is trying to restrict that water and hold it back until it can be released at a safer time. It's a matter of holding water back until it can be released. The City is considering raising Centralia Alpha Road to make a weir and provide a storage facility for high water.

Q – With all the talk of raising I-5, are there any images of how it would be done? Would it be built up on fill, or would it be like a bridge?

Ms. Root said raising I-5 is a concept, but it's not part of any project. Ms. Takash said there's nothing in the works to raise I-5.

Q – So it's way down the road?

Ms. Root said it's not a proposal at this time. Ms. Hempleman said the State is working with the Corps and local jurisdictions to find a plan everyone agrees on. Raising I-5 could potentially happen at some point, but that's not a position the State is in right now.

Q – Raising I-5 is being thrown out as a threat.

Ms. Hempleman said that it is not being used by the State.

Q – I used to work for the Port of Portland. Everything you've done is backwards to what will work. You won't get anything in place. In Fargo, ND they kept raising dikes, and water went up over the dikes. What went on is still going on. In Winnipeg, they built a mile-wide waterway to let water go around. In Grand Forks they had 20 feet of water in town, the gas mains broke, and all the buildings downtown burned.

Q – A lot of people along this part of the Chehalis look with a critical eye upriver to Chehalis and Centralia and to privately owned forests. We're worried about getting the brunt of any flood projects. I live in the town of Oakville. During these flood events Oakville is completely cut off. There is an evacuation route up the hill, but it doesn't lead anywhere. In the 2007 and 2009 events, we had a fairly large window of opportunity to pack and leave. I left in 2007 because of the

power outage but I stayed in 2009. I have two concerns. One is that our window of opportunity to evacuate will get smaller. The other is that water levels will rise. Everyone in Oakville probably has the aerial shot of Oakville at the peak of the flood. The two blocks around my house were an island. The road isn't quite level and it's hard to estimate, but I think it was about 12 vertical inches between the peak elevation of the flood and flood waters at my floorboards. Twelve inches at the peak of the flood requires a lot of water, but a road just northeast of us was flooding with 6, 8, 10 feet of water. You can see places that were flooded with 14 feet of water from the Black River. The other direction, you have the Sickman-Ford bridge. When I came back five days after the 2007 flood, waters were still only a foot below the bridge. When you look down over the bridge when it isn't flooding, it's a long way down. In one direction you have 30 some feet of floodwaters and the other direction you have 14. I'm only 12 inches away from flooding. It's not reassuring. My neighbor across the street had water in her backyard. Oakville is pretty level. We're talking about small differences here and it wouldn't take much. Even with consideration taken of downstream impacts, you can impact huge areas with only a small difference. It worries me.

Commissioner Willis said she understands that issue. She lives at the confluence of the Chehalis and Satsop Rivers. It floods at her house on a regular basis. The extremes can be phenomenal. One thing the Authority is looking at is early notice of flood events. A basin-wide early warning system is high up on our agenda. We need something to tell us that waters are coming and how they relate to floods we've already seen. There are a series of gauges, and we determined how many there are and where they are, and we put a few more in. We're developing a system where you can look on the internet as water comes toward you and determine if it's a typical flood or something more. One thing we've said to the legislators is that the early warning system is a priority and we want it now because it will have a big impact. We saw the difference between how people reacted in 2007 and 2009. The 2007 flood was devastating, and in 2009 people remembered it and we were able to get good information out and help people alleviate damages.

The Flood Authority understands that any deviation in flooding may make the difference between serious damage or none. If we can develop a project that takes away 6 inches of floodwaters, that makes a difference. We're measuring water as it goes clear through the system, not just through Lewis County. We're looking at how the tide affects things. Maybe in Oakville you have one event, but it's another event downstream of the Satsop with tidal influence. The early warning system is one thing we're looking at so people can do their own analysis.

Ms. Root adjourned the open public comment portion of the meeting in the interest of time. Citizens were given the opportunity to give comment and ask questions at individual listening posts or fill out comment forms.

**Attachment 2  
Meeting Notes  
Montesano City Hall  
Montesano, WA  
April 6, 2010 – 6:00 PM**

Mayor Ron Schillinger brought the meeting to order at 6:02 PM. He introduced himself as the Mayor of Montesano. He welcomed everyone to the meeting and said public input on the process to develop a good flood plan has been strong and well received. The comments from the initial meetings last February are included in the current plan. He introduced Commissioner Terry Willis.

Commissioner Willis thanked Mayor Schillinger for setting up the meeting. She introduced herself as a Grays Harbor County Commissioner and the Chair of the Flood Authority. She introduced Flood Authority members who were present: Ron Averill, Lewis County Commissioner; Karen Valenzuela, Thurston County Commissioner; Jim Cook, Aberdeen City Council member; and Brandon Atoch, Mayor of Oakville. Commissioner Willis also introduced other people in attendance who have worked diligently with the Flood Authority: Andrea Takash, Corps of Engineers; Chris Hempleman, Department of Ecology; Edna Fund, Centralia City Council; Vickie Raines, Mayor of Cosmopolis; Bob Johnson, Director of Community Development for Lewis County; Mark Swartout, Natural Resource Program Manager for Thurston County; Lee Napier, Grays Harbor County Deputy Director of Community Development; and Antonio Ginatta from the Governor's Executive Policy Office.

Commissioner Willis introduced the Flood Authority's consulting team: Bruce Mackey, Ann Root, and Spencer Easton, of ESA Adolfsen. The Flood Authority held a public meeting at Swede Hall in Rochester last night and there was a good turnout and discussion with the public, who asked questions and voiced their concerns. We hope you will do the same tonight. The Authority has been in existence since May of 2008, so it's important for us to have feedback from citizens. Tonight we will present information about the plan, then we will have a brief Q&A period to ask questions and give comments. After that, we will have listening posts to capture things you have to say. You can walk around, pick up pamphlets, and talk to us as individuals. There are also comment forms on the table if you want to put comments in writing.

The plan is due to be approved in June, so we have a time table. We are holding three public meetings this week and we hope to receive input in the next few weeks. We had a target date of two weeks, but someone asked at last night's meeting for more time. If you provide comment past the due date, we will still do our best to incorporate it into the plan.

Commissioner Willis introduced Ann Root. Ms. Root gave a presentation on the work on the Flood Authority, focusing on the Flood Plan.

[For a detailed report of Ms. Root's presentation, please see the notes from the April 5 meeting in Rochester.]

Ms. Root asked if there were questions or comments.

Q – To clarify, was this just a general overview of the flood plan?

Ms. Root said yes, this was just a summary. The plan lists possible actions but doesn't say what will actually be completed. The levee project is being done by the Corps of Engineers and they have more detailed information about that. The upstream storage dams are being studied by the Lewis County PUD. There isn't detailed information in the plan about either of those two projects, there is only a summary.

Q – So the levee project is part of a Corps plan?

Ms. Root said yes.

Q – When will that come to a head? Will it be approved before the public has a chance to comment on it?

Ms. Root said this is a plan for the entire basin. It includes a list of projects that could be undertaken in the future by the Authority, a flood district, or individual jurisdictions. But those two projects are being pursued separately. At some point they may come together. We don't know exactly when that will be.

Q – I'm confused. You're the Flood Authority, but the Corps has their own authority and the PUD has its own authority to do what they want on the river.

Ms. Root said the Authority has been cooperating with both entities, funding the PUD studies, and cooperating with the Corps. Both projects are included in the plan as possible future options but they are being studied separately.

Q – So you aren't here to tell us specifics?

Ms. Root said that the Flood Authority doesn't have specific information on those two projects.

Commissioner Ron Averill said that this is an overall flood plan which is rather broad. What would happen is that at the point we form a flood district for the basin, this will be their plan. In the meantime it has to be done by individual jurisdictions. The Corps project actually dates back to 2003 and it was at 35%. It has gone to Congress and been authorized. It won't start construction until 2016. Planning is a moving target. Those of us in the Authority have been working with

the Corps and we know what they've proposed, but that's only one project in the basin and it only covers five miles, so there are a lot of other projects.

Q – Up to this point the Chehalis is a natural entity. All these proposed projects are very profound. It's kind of shocking to talk about dredging and opening channels. What about the natural area preserved down at the mouth of the river? How is this controlled flooding going to affect that natural area preserve? This is profound.

Ms. Root said that dredging is one idea in the plan. It doesn't involve dredging the whole river, it's probably just clearing out clogs. That option hasn't been well studied yet. This plan is the list of all the ideas people have had for dealing with flood problems in the area. None of the projects are necessarily happening.

Q – But you said the Flood Plan will be approved.

Commissioner Averill said it's a list of potential projects. Each of them will have to go through an individual approval process. Another project we're working with the Corps on is a basin-wide general investigation study which has been going on since 2000 in Grays Harbor County. We're adding flood mitigation as a purpose of that project. The Corps is working with us on how that plan will move forward. We won't do projects until studies have been completed and we know if there needs to be mitigation. That's all part of the Corps study. This is the conceptual phase of planning, identifying things we might look at. It doesn't tie us to anything.

Commissioner Willis said that one study being done by Earth Economics studies natural things within the system and gives them a value. It looks at possible projects like opening up wetlands or the floodplain. An example of this is the Satsop diking project. If it were removed so more floodplain could be opened up, it might prevent some damage within the system. This plan is a comprehensive list of all the things we could do.

Q – With all due respect, whenever you try to control river systems, there's going to be a loser. I have property on the river and I'm wondering how levees, dams, and dredging will affect us downriver. How will what's going on in Lewis County affect what happens in Grays Harbor? There's no answer yet.

Jim Cook said that the Authority approving the plan wouldn't be an edict. The Authority is composed of 11 jurisdictions and each one has created their own plan. The point of the Authority is gathering information, and that's the point of this meeting tonight. We're getting information about how to make better informed decisions about what direction to go. The Authority doesn't have the authority to say what will be done. It's an advisory group. Any of the 11 jurisdictions can say they don't like the plan and won't adopt it. That's why we're trying to get input from all entities.

Q – I'm associated with the Skokomish Tribe, and everyone here realizes that the Skokomish does flood constantly. The Corps is working on a General Investigation and the Skokomish Tribe is associated. What we have found is that the restoration projects we've been associated with, removing roads and bridges and bringing back wetland functions, have improved flooding. We had the seventh highest flood on record this last year, but the movement of the water out of the system was very fast. Reducing levees helps. We think restoration projects, the removal of dikes, the connection of floodplains, and removal of constrictions is the key elements to have flood waters move out of the system in a natural way. World wide, levees don't work, and we found that to be true in the Skokomish. I was a conservation lead in Oregon and we would have meetings about flooding on the Tillamook. We could look up at dikes and see trees floating above our heads, and if the dike ever broke we would be hammered. If you want to save I-5, then build a span there to allow flood waters to go through and stop building up areas with big business by the roadside. You'll never win the battle by constricting the floodplain.

Q – The planning director for Lewis County says there's no impact from filling in the floodplain. Flood water isn't increased even though they constricted the valley. The City Manager for Chehalis says there's vast potential for commercial development in the floodplain. When we look at this flood study, if anything comes to pass to elevate I-5 or put in levees, will there be no more filling in the floodplain? Or will people still say there's no impact? What would this inhibit or prohibit?

Commissioner Averill said that in the last session, the legislature said that jurisdictions can no longer expand an urban growth area into a floodplain. With the Corps project, once that project comes to 95% design, there will be an area designed to hold water during heavy flooding and there will be no building allowed in that area. The project itself will set restrictions on buildings. Centralia already has changed its flood plan and no longer allows large stores or objects built into the floodplain. The City of Chehalis is talking about areas that are already behind levees when they talk about expanding in floodplains. Unfortunately those are 50-year levees, not 100-year levees. The Corps plan would raise them to 100-year levees. The Corps plan has the assumption that there will be no impact downstream. If there aren't mitigation measures to prevent impacts downstream, they won't build the project.

Ms. Root said that the flood plan is very specific with recommendations for strengthening regulations throughout the basin. Commissioner Averill said that the Twin Cities project includes modification to the existing dam on the Skookumchuck River, which provides protection to Bucoda and Centralia. The project would increase the dam's capacity by another 11,000 acre-feet. That's part of how mitigation will be done for levees.

Q – How were the member jurisdictions of the Flood Authority determined?

Commissioner Averill said that when the Corps project was started in 1997, we had a committee called the Chehalis River Flood Reduction Executive Committee. It included Lewis, Thurston, and Grays Harbor Counties, the Chehalis Tribe, Centralia, and Chehalis. At the time, the project was intended to protect I-5, Centralia, and Chehalis. It was not intended to have any impact up- or downriver. When we had the 2007 flood, the upper river got hammered for the first time in over 100 years and we lost about 1800 head of cattle. Upstream folks are now asking what the project does for them, and the answer is nothing. That is why water retention came into existence. There was \$166 million of damage in Lewis County during the 2007 floods. As a result, we were the ones who proposed that you can't look at anything in this river as isolated to one jurisdiction. It starts at the headwaters and goes to the mouth. It will get there, it's just a matter of when and how fast. We proposed a basin-wide solution to the legislature. In 2008 they passed House Bills 3374 and 3375 which funded the nonfederal share of the Twin Cities project and set up money to look at other provisions in the basin as a whole. We created the Flood Authority out of the old Executive Committee and added other jurisdictions. In Lewis County, the only other incorporated area was Pe Ell. Thurston County had Bucoda, so they were added. The Grays Harbor County commissioner at the time chose Aberdeen and Montesano to be added. Oakville also asked to join. Cosmopolis, Elma, and other jurisdictions are on the river as well, but Bob Beerbower, the Commissioner at the time, said the County would represent them. We were concerned at one point that we'd have 25 people in the Authority and we wouldn't be able to make progress. We said we'd stick with 11 and fix the problem when we go to a district.

Q – The entire length of Cosmopolis runs adjacent to the river. I'm lost that there wasn't more inclusion there.

Commissioner Averill said it wasn't intended for the Authority to last. We only chose the word "Authority" because the legislation called it that. It's not really an authority, it's a cooperative agreement between 11 jurisdictions. The charter out of the legislation was to move toward a flood district, and in the current session of the legislature the bill should provide money to form the district. Quite frankly the Authority would prefer to go away and have a district pick up the job and represent everyone.

Q – On the proposed projects already out there, have you reviewed them to know if there's duplication and if they are going to work together?

Commissioner Averill said the Corps plan is only at 35% design. It's going to finish 35% design in September and at that point we'll have more idea of what the project is going to look like. For the PUD study, we've been working with the Corps to make sure we're using the same formulas and looking at the same things. A biological study needs to be done and we're trying to get funding for it.

We're also looking at wording that the PUD study will work with the Corps to be consistent. If we do show that it's feasible and we can mitigate for the environmental impacts, the project will go to the Corps anyway because they run dams. So we are coordinating.

Q – In this day and age you can't build dams on anadromous streams.

Commissioner Averill said you can if the dam only holds water for 30 days.

Q – The PUD is proposing a project responding to a 100-year event. The storm track of the 2007 event dumped 14 inches of rain in 24 hours in a small area. It doesn't make sense. Storm tracks don't come in the same places.

Commissioner Averill said the mainstem eventually gets all the water. The environmental look will be very heavily studied before we go in this direction. If the study says we can't correct for it, the Chehalis Tribe will make sure we don't do it.

Q – Would the dam provide power?

Commissioner Averill said that when the PUD started the study they wanted it to have a power source, but the PUD is no longer paying for it and the Authority is. We don't care if there is power generation or not, we want to provide protection for those on the river.

Q – That's a bunch of garbage. Have you done anything in the plan to address slides? If those dams were there in 2007, they'd be filled in with sediment. I don't want to live downstream of the dam in that situation.

Commissioner Averill said that's your opinion and it's being studied by geologists.

Q – I read the report. There are fault zones, and they're going to build on seeps. It's a crock of garbage. I don't want to live downstream of this. Dam building is ridiculous. It's not going to solve the problems.

Commissioner Willis said the point is to do more studies and develop a better understanding of what can be done.

Q – Have you seen the slides? I flew the basin and it was disgusting.

Commissioner Willis said that she and Commissioner Valenzuela will fly the basin in a couple of weeks. The Aberdeen World is coming. We're going to go up and look at the whole watershed, including the upper reaches and the Skookumchuck, to see the environment. Some of these same comments were made last night. People want us to look at forestry activities and change what we're doing now.

Q – Why don't you put in the study the amount of damage done by floods in Lewis County?

Commissioner Averill said it was \$166 million.

Q – That would be a good payment for a span over I-5. DOT gave Chehalis an opportunity to build a span but there would have to be taxpayer money put in the pot and Chehalis refused.

Commissioner Willis said there has to be local match with any project, Corps or otherwise. Either the State or local jurisdictions have to serve as a sponsor.

Q – As discussed at last night's meeting, this plan doesn't address upper watershed forest management. There's no discussion of upper watershed logging or anything like that. Also last night it was touched on that raising I-5 is off the table, they're relying on this plan.

Commissioner Averill said that the State is relying on the Corps plan.

Ms. Root said that management of forest practices in the upper watershed is in the hands of the Department of Natural Resources, not member jurisdictions. It has been addressed by the Authority, but it's out of their hands.

Q – We understand the issue with DNR. We also know what happened in 2007 and we know that damage, so that's what the concern is. What would happen with dams in that situation? I would like to have a discussion on the details about the dams. I've heard of proposals on the Newaukum and South Fork and different sizes on the Upper Chehalis. I'd also like to hear speculation on the levee project.

Ms. Root said the levee project is the Corps project and Ms. Takash can give you details. The PUD studies are being done by the PUD. It's summarized in the plan because the Authority is cooperating. You should contact the PUD for more information. Some of the PUD studies the Authority funded are on the Authority's website.

Ms. Takash offered to answer specific questions on the Corps project.

Q – What is it?

Ms. Takash said the Twin Cities project, often referred to as the levee project, includes 11 miles of levees in and around Centralia and Chehalis. It also includes modifications to the Skookumchuck dam to allow for extra storage. 35% design was completed in 2003 and approved by Congress in 2007. We're updating 35% with information from the 2007 and 2009 floods. We anticipate

35% design to be finished in September and it will be unveiled to the public then. We'll have a better sense of what the update has done to the levees then. Another project we have, with Grays Harbor County as local sponsor, is a general investigation looking at the entire basin for flood risk management and ecosystem restoration. That study is in its infancy and it's a great study. There are a lot of ideas we can look at here. We are working on a project management plan to finalize with local jurisdictions.

Q – Are you familiar with the natural preserve set aside in Grays Harbor County? It's a unique estuary. The tide comes in up to the Satsop. It's a unique area. Are you working in concert with DNR and the natural preserve? It almost seems that you're repeating a study that has already been done by DNR.

Ms. Takash said the Chehalis Basin Partnership has done studies. The Corps is taking studies done by the Chehalis Basin Partnership and the Authority into account and seeing what the federal government can bring to those studies. An important point is that the 11 miles of levees are setback levees, which are more environmentally friendly. The project went through a thorough Environmental Impact Statement process.

Q – Will the dam be an open dam? How will fish be able to get up that?

Mr. Cook said that the studies that the Lewis County PUD have done are an initial assessment to determine if there are locations a dam could be placed. They have done a geological study and identified two feasible sites. The article put out by the Daily World said that we will build two dams. These studies are in their infancy and we're developing information to determine if one site would be better than the other and determine what is the best basin-wide solution.

Q – Basin-wide is the key word and that's my biggest concern. I keep hearing about Lewis County. They shouldn't have built Walmart. Any reasonable person, when putting levees for 11 miles that contain the water, asks what happens when the water gets to the end of the levees, where will it go, and will it spread out? If your street is only 75 feet from the river, that's a concern. This plan just says hydraulic modeling. The river will do what it wants to do. The Authority should go talk to the Soviet Union about the rivers they tried to control.

Q – I work in Oakville. I've been through four floods and none have been the same. The 2007 flood was terrible, but if the rainfall had happened in the forest, in Tenino, or on the Newaukum, the dams wouldn't have done a thing. Dams won't solve the problem. The storm track isn't repeatable. We had snow in Montesano last weekend but not in Oakville. Weather systems are different. You can't build dams to protect the whole watershed. If anything came down Highway 12 from I-5, it would encounter a big mound of dirt in the floodplain from our friends at the Chehalis Tribe. They don't have to respond to what I say. We tried to stop the raising of Anderson Road, it cost us \$5,000, it cost them \$10,000 and

we lost, but the floods continue. Those are my comments. I think we're putting grease on a squeaky wheel. It won't exist next time but we'll still have a flood.

Q – I have a dairy farm downstream, and I represent the dairy producers that suffer from flooding. There are three points as it relates to dams that need to be answered first and we're still waiting on some answers. Question one, if you built a dam in the upper basin would it stand up to an earthquake? Two, would it lower the water at Chehalis four feet and Porter two feet and provide a solution for the whole basin? Three, does it have a net positive benefit for salmon in the river? Levees don't provide additional water. If these dams are to mitigate for the loss of upstream habitat, they need to provide better summer flows. This summer we lost virtually all salmon when the river hit 79 degrees. We have no way to fix that right now. An issue I've brought up a number of times is that we have a marbled murrelet designation in this State. The study doesn't look at uplands and logging. Within 35 miles of the coast, you have a de facto law that says that if your timber is 30 inches or wider you need a marbled murrelet study. No one will let them get that big. Our rotation is 37.5 years. If we extended rotation by removing the threat of losing timber, there would be an impact of Weyerhaeuser being allowed to log when the market is good and not when it isn't. Why wouldn't the federal government work with DNR to remove a lose-lose-lose scenario so we can have responsible forest management instead of threatening people with another ESA provision?

Q – To speak in defense of forest land management, the landslides in the 2007 event happened because 175% of normal rainfall happened in 24 hours on the landscape. If that happened in Grays Harbor County along the Wynoochee, the slides would have been up there. If you look in the air, you see slides where they clearcut, where forest land is 35 years old, and where it's 65 years old. When you dump 14 inches of rain, the land starts to move. That's just the way it is.

Q – Are you saying that heavily forested land would be just as likely to slide?

Ron Schillinger said absolutely. Mount Rainier had 14 inches of rain and was heavily forested, and they had slides.

Q – Deforestation is a direct cause of slides, everyone knows that.

Q – You can look at this data and see if slides were on clearcut or mature lands.

Q – Several people have asked about the levees and their impact downriver and I don't think we got an answer.

Ms. Takash said she doesn't know the specifics since we're at 35% design. Mayor Schillinger said that's one of the reasons why Montesano wanted to be at the table. There are two parts to the levee discussion. The first is that we are concerned it would shoot water down to us in a greater volume and faster. The

other is that we believe it would have a negative impact. I was told that the model only goes to Porter, and the maximum flow as a result of the levees could only be increased one inch at Porter.

Ms. Takash agreed that the project stops at the Porter gauge. Because of the 2007 and 2009 floods the hydrologists are updating the model to see how the new flood elevations affect levees and see the impacts downstream and upstream. Once that is completed, we'll have a better answer. We have a policy that we can't build a project if it negatively impacts other areas. We try to mitigate for negative impacts and if we can't we won't build a project.

Q – What does mitigation mean?

Ms. Takash said it can mean several things, including pumps on the levees, raising structures that are impacted, and buying out impacted structures.

Q – If you only take the model a certain distance down the river, are you just assuming it won't affect anyone further downstream? How do you know? The tide comes up to Montesano. Heavy rains, high tides, and wind affect the level of the river too. You have to take the study down further.

Ms. Takash said they look at everything. The levees stop around the Porter gauge, but the study looks at the entire basin clear to the mouth of the river.

Q – But you don't have the answer yet.

Ms. Takash said that we don't. The basin-wide General Investigation will look at projects that will help the entire basin for both flood risk and ecosystem restoration. The Twin Cities project was designed to protect Centralia and Chehalis. We determined that 85% of the benefits of the project are to Centralia and Chehalis and 15% of the benefits are to I-5.

Q – If you build levees higher, water can't access its usual ponding areas so it must be higher on the river side of the levee. It must back up some distance because the levee is there, but it also must mean that more water comes down the river earlier, faster, and in greater volumes because it isn't ponding in Centralia, Chehalis, and Lewis County, unless you put it in a bucket and put it on your back porch.

Ms. Takash said she doesn't have the answer to that question and will ask a hydrologist and get back to anyone who gives her their contact information.

Q – The practical thing the Skokomish Tribe has found over the past few years is that opening the floodplain and allowing water to diffuse instead of backing up causes flooding to be less significant. For the first time, the reservation has not been flooded.

Q – How high will the levees be?

Ms. Takash said that the levees will provide 100-year flood protection. There won't be a standard height, it will vary by flood elevation.

Q – I heard there were 8 feet of water over the airport dike.

Ms. Takash said that she doesn't know specific heights.

Commissioner Averill said we will know specific heights at 35% design. We're thinking 10 feet but it's just a guess for now.

Q – I also heard that if the levee goes in place, they're allowed to fill on the other side.

Commissioner Averill said this is true by FEMA standards.

Q – Then if it does go over the top more water will go somewhere else. If you raise it 10 feet does that allow them to fill more?

Commissioner Averill said it's a question for FEMA when the levees go in. Unfortunately there are many questions that can't be answered. There's no assurance the levees will be considered on the FEMA maps. FEMA told us that on their new flood maps, they didn't consider existing levees because they're only 50-year levees. As a result, those levees don't provide any insurance protection. If they are built to 100-year standards then they will give 100-year protection on the non-water side of the levee. I must admit some frustration. We did not build in the floodplain yesterday, we have been doing so since 1843. When settlers first came in, they put their buildings on the hills. They didn't go into the valley until the railroad came. The railroad came into the valley and people followed. We didn't choose for I-5 to go through the middle of the floodplain but we live with that. We have Chehalis, which has 8,000 residents, and Centralia, which has 15,000, and they do flood and there's huge damage. We have homes that still haven't been repaired from the 2007 flood.

Q – When this work is turned over to a flood district, will they be required to use the plan or will they be able to start over?

Ms. Root said the intention is that the flood plan will become their plan. The Authority will adopt it.

Q – There's absolutely no requirement that they do that?

Ms. Root said there is no requirement.

Q – There have been studies and studies and studies. We've heard about Corps studies, PUD studies, you're doing something, and maybe the new organization will pay for the study again. It's frustrating, especially as losses continue.

Mayor Schillinger said the comment is well taken. The Flood Authority received information about flood mitigation efforts on the Skagit River. They've been going through this and we're following the pattern. You can create a district and do a plan, but it all comes down to dollars and money. If you don't have the money, nothing happens. Whose money will it be? The problem with a district is that when it's formed, will people be happy to be ratepayers

Q – The whole thing is frightening, because all these questions have been asked and there are all these generalities, but the questions really haven't been answered about how this affects anybody. It sounds like it's a given that the levees will be built. If you screw around with the natural systems, you only make it worse.

At 7:32 PM, Ms. Root thanked the audience for their comments and adjourned the meeting to listening posts.

**Attachment 3  
Public Meeting  
Veterans Memorial Museum  
Chehalis, WA  
April 7, 2010 – 6:00 PM**

Commissioner Ron Averill called the meeting to order at 6:05 PM. He introduced himself as a County Commissioner for District 1 of Lewis County and the Vice Chair of the Chehalis River Basin Flood Authority. He introduced Terry Willis, Grays Harbor County Commissioner, as the Chair of the Authority

Commissioner Willis thanked Commissioner Averill and said that this is the Authority's third night in a row of public meetings. We met in Montesano last night and Rochester the night before. Commissioner Willis introduced other Flood Authority members who are present: Thurston County Commissioner Karen Valenzuela; Mayor of Oakville Brandon Atoch; Pe Ell Council member Dolores Lee; and Mayor of Montesano Ron Schillinger. Commissioner Willis introduced other attendees who work for and with the Flood Authority: Bob Johnson, Community Development Director for Lewis County; Bob Nacht, City of Chehalis; Mark Swartout, Thurston County; Lee Napier, Grays Harbor County; Kahle Jennings, City of Centralia; Rachel Mescow, Kristin Kerns, and Andrea Takash, Corps of Engineers; Dave Muller, Director of Lewis County PUD; Bob Burkle, Washington Department of Fish and Wildlife; and Chris Hempleman, Department of Ecology. Commissioner Willis also introduced other elected officials, including: Harlan Thompson, Mayor of Centralia; Bonnie Canaday, Mayor Pro Tem of Centralia and Chair of the Chehalis Basin Partnership; Edna Fund, Centralia City Council; Matt Trent, Centralia City Council; and Chuck TenPas, Lewis County PUD Commissioner. The Authority has met regularly once a month since May 2008.

Commissioner Averill said the plan tonight is not to show the Corps Twin Cities project and where the levees are going. Nor is it to give you the Lewis County PUD water retention project. The Authority has looked at those two projects in terms of an overall Flood Hazard Management Plan for the basin. The Authority was formed after the 2007 flood. Previous to that point there had been a committee of cooperation between Lewis, Thurston, and Grays Harbor Counties, the Confederated Tribes of the Chehalis Reservation, and the Cities of Centralia and Chehalis, and it developed out of a study done in 1997 by Pacific International Engineers. That study led to a 2003 plan called the Chehalis River Flood Damage Reduction Plan. In fact the committee was called the Chehalis River Flood Reduction Committee. The plan was written in 2003 and submitted by the Corps. Congress was going to move that plan forward in a congressional bill known as the WRDA, Water Resources Development Act, and from that it would move on and become a project.

Unfortunately, the 2003 bill was vetoed, the 2004 bill was vetoed, Katrina happened in 2005, and the 2006 bill was vetoed. In 2007 it finally got authorized in the WRDA act and it was vetoed but the veto was overridden by Congress. That particular plan is now on the books and there are two steps in Congress to get a project going: authorization and then the appropriation of money. The first appropriation came in 2009 and there was another in 2010. There will probably be another appropriation in 2011. The design phase is in process. All of this was done before the 2007 flood, even the authorization of the project. You need to understand that in those days we were looking at the I-5 corridor and the cities of Centralia and Chehalis. When the committee looked at what to do upriver we hadn't had a storm up there in 100 years. No one up there was interested. The project was oriented to the corridor. The 2007 flood came along and the upper river got lambasted. I don't have to tell you how bad that was. We looked at the Twin Cities project and asked what it will do in the upper basin. That's one thing the Corps is now taking a look at.

Levees are predominantly designed to have the direction of water move so that it prevents damages to certain areas. So we had a study take place in Lewis County sponsored by the PUD and the concept was to look for another alternative that will provide us with protection for the upper basin but also the whole river from the headwaters to the mouth. When you get heavy waters in the headwaters they will eventually make it to the mouth. How fast it gets there is what you can control. There are other things the Flood Authority is looking at and other things being looked at by One Voice. The Flood Authority has funded phase 2A by the PUD which is complete and just last month we funded phase 2B which will look at the economics and benefit-cost ratio and also some engineering. What we're seeing is encouraging.

The other thing that occurred is that in the 2008 legislature, two bills were passed, House Bills 3374 and 3375. They authorized \$50 million in bonding authority for the state and set aside money to fund the local share of any project that might happen in the basin. The bills also put about \$2.5 million aside to look at a basin-wide solution because the Corps project covers about five miles on the corridor. We have been in the process with the Corps and actually Congress has given us some money from the federal side to help start work on a project called the General Investigation study. That study has been funded by Congress and will allow us to look at flood mitigation along the whole basin. We already had a Corps General Investigation in Grays Harbor County to look at ecosystem restoration that the Corps has been working on since 2000 and we are adding flood mitigation to it so we can look at what we can do for the rest of the basin. In the meantime we're looking at how things might fit together.

The Flood Authority stems out of the original executive committee and was extended with additional members. The bill provided money for the Flood Authority to look at mitigation on the whole river and said that money would initially go to a Flood Authority and eventually to a flood district. A flood district is

a municipal corporation whose function is to look at mitigation, operation, and function of mitigation on the river. The Authority has been operating as an interim body until such time as we can start that flood district.

In the Flood Authority we're all elected officials. There's only so much time we can spend on this and we believe a flood district is the way to go. One thing we've done is we've taken a number of projects we've funded to get initial studies going. We gave the PUD \$480,000, we've also done some gauge repairs, and we're working with a company on emergency management notification through the whole basin top to bottom. We've done some mapping, particularly in the lower basin where they didn't have the mapping we had in the upper basin. We're looking at some hydrology in the lower. There are a couple of other projects to be shown to you in this plan.

One of the main things we needed to do was look at a flood plan. Every jurisdiction is required to have this plan. All three counties have one and all of the incorporated cities have one. You have to have a plan to get insurance rates and a number of other things that are required by the federal government when you have disasters. The problem is we looked at these 11 jurisdictions that are part of the Authority but the plans vary widely. Some things fit together but other things didn't. Some things complemented but other things work at opposite ends. We thought the district needed a model plan. We've had our consultant work on this the past two years. The Authority has looked at this chapter by chapter. We've made some changes and we're going to give you the scope of it tonight. We're looking for comments you might have on things that we missed or comments on other ideas you think need to be addressed. Then we will take these comments and we'll come up with a final draft of the plan that we hope will be handed over eventually to the flood district. We will also give it back to the jurisdictions so they can integrate the model plan into the local plans. They will also have to hold hearings and go through the process we're going through tonight. That's what we're doing here. If you're hoping to see specifics of projects tonight, that's not what we're doing.

Ms. Root thanked Commissioner Averill and introduced herself as being from ESA Adolfson. She gave a presentation on the work on the Flood Authority, focusing on the flood plan.

[For a detailed report of Ms. Root's presentation, please see the notes from the April 5 meeting in Rochester.]

Ms. Root introduced Bruce Mackey of ESA Adolfson, who will run the question and comment period of the meeting. Mr. Mackey said we've been asked to put copies of the flood plan in the Timberland libraries, and we will do so. We will be accepting comments for a month. Mr. Mackey asked if there were any questions.

John Hendricksen introduced himself as the chair of One Voice. He said that the presentation tonight was interesting but that the plan seems to be missing an emphasis on flood reduction. People here are not interested in living with flooding. There has been a groundswell of opinion from jurisdictions up and down the basin. So far 11 jurisdictions have passed resolutions emphasizing flood reduction with a primary emphasis on retention. When retention is spoken of, some of you are biting your cheek to keep from laughing. One Voice would like to expand what comes to mind when we say retention. What we're really after is flow volume reduction. That can be done and it is called retention. According to our research and the engineers who are our consultants, it can be done in three ways.

The first is a permanent facility with a water reservoir behind it. The second is to install or produce retention facilities that are open gate facilities. Under that project, you would have a retention facility that would allow the river to flow freely 99.9% of the time until an event starts to build to where the flow rate is above 49,000 cfs. At that point you would start to close the flood gates to maintain flow at 49,000 cfs. As the event wanes you release the waters that have backed up behind the facility at a rate of 49,000 cfs. This is very effective and has been used throughout the nation. The third method is used in Europe and it consists of a series of baffles. This method would use a series of open gate retention facilities built to a predetermined height. When an event starts you close the upper gate. The water rises to a predetermined level that everyone can live with. The second gate is closed when you overflow the first gate, and so on. You reverse the order and open the gates as the event wanes.

There is more than one way to reduce flood events while still having some flow. One Voice is not interested in redirecting the water. All kinds of things can be done. You can have retention at the headwaters of China Creek or Salzer Creek. Upstream storage dams may be the solution, but they may not. There are more ways that might be more acceptable environmentally that will give you the same result. This is where One Voice is trying to head. We don't want to narrow the process to the point where we shoot ourselves in the foot. We want the Corps and the Authority to know that. We aren't going to back down and settle on any solution other than flood reduction. Levees are great and will help, but this flood plan shows that what we have talked about all along is going to work. It gives the levels of water we've had in the last four major events. In 2009 the flow was 49,000 cfs, and the major damage we had in 2007 did not occur. The levees we have in Centralia and elsewhere, the Miracle Mile, and Sunbirds didn't flood. We have proof that our engineers were right, we can hold flow down to a certain level and we'll be in good shape. Whatever you want to add to that is fine, but nothing short of flood reduction is what One Voice is looking for.

Mr. Mackey said it's important to point out that in the planning process we're open to looking at alternatives. In the plan, we're looking at having a permanent form of governance and finance. As Dr. Hendricksen said, this isn't all going to

happen tomorrow. It happens with good planning, information, and some consistency in governance and funding. This plan is a way to look at all of those things. A structural change is one that changes the direction of the water. A nonstructural measure doesn't change the direction of the water but does add some relief. Raising a house, buying out land, all of those things make a difference. The plan is open to looking at that and trying to address things that help human safety and access to business and hospitals in the short term as well as look at alternative methods. All of us have the same goal of reducing hazards and damage of floods in the basin. We want to hear comments about the planning process and things we should be looking at.

Ron Schillinger said that he wanted to follow up on what Dr. Hendricksen said. In Montesano, Centralia and Chehalis are the headwaters. You need to understand that we're very alarmed at Centralia and Chehalis and Lewis County in general because we see you filling in the floodplain. You're filling in our storage dam and diminishing the storage capacity in the headwaters for us downstream. We're not engineers and scientists, we're operations folk and we know that if we have a bathtub of water and you put something in the bathtub the level goes up and where is that water going to go?

Q – Ron said what I was thinking of. When you build in low areas to increase the tax base, you'll suffer the consequence. That's what's happened the last 10 years in Chehalis. There's nowhere for water to go so we have floods. The smaller tributaries contribute to flooding. In the 2009 flood, at the museum, the water was running south to north because the Newaukum was flooding into the Chehalis and increasing the height of the water. There's a lot more to be considered.

Q – I still haven't seen any numbers. People talk about filling the floodplain. It still seems to me like even the Town Center development is a drop in the bucket if you look at the entire floodplain. All the dirt is nothing compared to the water needed to create the 2007 flood. But I haven't seen numbers.

Dr. Hendricksen said Northwest Hydraulics provided the numbers. He asked Dave Muller if he remembered the numbers. Mr. Muller said he didn't remember, but if you fill ten acres a foot deep, you've filled ten acre-feet and we're talking about retention storage at 100,000 acre-feet. Clearly if you build levees you decrease the size of the floodplain much more than you have with fill. Commissioner Averill said that the Water Resources Inventory Area (WRIA), which is the basis of drainage for the river, is 2,600 square miles. It's a lot of land.

Q – I'm a life long resident here. I see the development I was leaning toward what Ron Schillinger said until it was pointed out to me that most of the fill people see is behind the Airport levee. That section was already taken out of the floodplain. There hasn't been a lot of fill in the floodplain outside that levee in my

lifetime. The dirt there is higher than the levees, which I disagree with, but if you look at the amount of water in the last 20 years, the amount of water is contributing more to flooding than the filling. My problem with levees is that they redirect water.

Q – Have you studied why in 2007 it flooded very bad? There was a lot of water, but wasn't there also a lot of debris? Why did we have all the logs, trash, and other things in the river when it came down from Pe Ell? Why were they laying there, what was the cause of that?

Mr. Mackey said there's a lot of history and study of that particular event, but a couple things happened. There was a major snow event first. This isn't a rain on snow basin like the east side of the state. On top of that you had a concentrated rain cell with up to 20 or 24 inches in some places. When you have that much rain on top of the moisture in snow, you supersaturate that ground. There were big torrents that brought down trees and you had such a massive volume of water that things in the river itself were picked up. Logs came down and created log jams at narrow places or bridges. When the water hit, the bridges held it back and it flooded upstream until it hit tremendous pressure. It's a very unique event. Some say it was a 500-year event, others say an 800-year event.

Q – I know we have environmental and fish studies. My family was around here in the 1910s. I have uncles who told me about the flood of 1930, but they had a different way of clearing trash. People cleaned up around the river. When I grew up we called it high water not flooding, because it didn't take out houses. Why would we insist on laying logs along the river? I know we have fish habitat, but we used to anyway. Why do we have stuff laying all over the place? Almost every year it goes over the bank someplace. Why do we insist on not cleaning up the river?

Commissioner Willis showed a document we received last night from a citizen. It indicates that the landslides that happened during the flood in the headwaters happened with a variety of trees with all different sizes and growth patterns. There was no continuity.

Bob Burkle said that document came out of a DNR study released this week. A DNR geologist studied the flood and the landslides generated. Many were generated in clearcuts and logging roads. Commissioner Willis said that she and Commissioner Valenzuela will have a chance in several weeks to fly the basin, including the headwaters and the Skookumchuck, to look at these areas.

Q – I heard that the landslides came from logging operations.

Mr. Mackey said you can find the DNR report on their website. DNR flew the area and assessed the kind of tree cover and the number of landslides that occurred. They occurred because of the tremendous amount of rain that hit.

Q – They were also caused by the 100 mph winds that day.

Mr. Mackey said yes, there were really two storms. Tremendous rain and tremendous winds. DNR's wind gauge broke at 140 mph. He went up in a helicopter after that event it looked like a tornado had gone through the area. It was an amazing event.

Q – Landslides weren't just along logging operations. I flew DNR employees as soon as we could get a plane in the air and we mapped landslides for 5 or 6 hours.

Q – It was such an unusual event. Can you prevent it from happening again? I'm not against dams and water retention, but how would you prevent that from happening. Why do we never talk about dredging the river? I saw the river filling in like a bathtub, flowing ways I've never seen it coming. I've never seen it come so fast. How are we going to keep it from happening again?

Mr. Mackey said one thing the Authority has done is to start looking at various ways to understand the basin better and come up with solutions. This is the second largest basin in the state. It has not only 125 miles or so of the mainstem, but also 2,500 miles of tributaries. Our first step is to understand the hydrology, gather LiDAR data, and develop hydraulic models so we can anticipate floods and figure out how to think about this and see how events occur.

Dr. Hendricksen said he's not for or against dredging, but when One Voice met with Northwest Hydraulics, who work with the Corps and are the gold standard in hydraulics, we asked them if we could have a positive impact by dredging. They said it would be minimal simply because of the elevation drop of the river. It's a unique basin. There's not enough of a drop for dredging to do a lot of good, especially since tidal flow backs up almost to Porter.

Q – I can remember all the floods from 1930 up, and I've talked to people who were here long before that. They said that many years ago they expected and looked forward to high water. They kept a line tied to a big stump and they'd pick the cleanest old growth tree coming down the river, tie a line around it, and that would be their summer wood. They would move things onto high ground and they always expected the river. Old cougar hunters in the 1890s would meet at the top of slides. They've been there for years. When you put 20 inches of rain on this ground it will find its level. 12,000 years ago, down by Vader the earth moved 200 feet up and down in one big movement and we can expect that again some day. The river has been there all these years and its going to flood. When Mother Nature puts on Sunday clothes no one's gonna stop her. Individual storms hit individual areas. You'll have a storm you won't be able to foresee. I'm not in favor of or opposed to dams. We haven't looked into the cost. I built on the hill because I didn't want to have a flood. Do you want me to pay for people who

built in a floodplain? Why should I pay for that when I built on a hill? I can raise grass and the best Doug firs, but I can't raise real crops like you can grow in the valley. If you build a dam, will it make my electricity cheaper? Someone will have to pay for that dam. As you go along with this program you have to introduce and bring along the fact of who's going to pay for it. I don't want my taxes to pay for it because I didn't do it. I live on a hill. Funds were only mentioned twice in this presentation. You have to make that a viable part of any program to make it really worthwhile.

Q – One time, the ice broke up in the Columbia River and piled up on Interstate Bridge in Vancouver. They had to blast it to keep the bridge from going out. When the water dropped because it wasn't coming down the river, all this ice was hanging in the air. It came down to Interstate Bridge and just about took it out. You'll have another ice deal at some point. From 1925 to 1934 there were cold winters. Ice piled up in town 3-4 feet deep and everything froze out. It would take out the Mellen Street bridge. It's a wonder that's still standing.

Q – Floods today are different than they were before. You have acres of roofs and blacktop that let water off fast. There are highways and byways where we used to have gravel roads.

Q – We can point blame all over the place on what causes floods, but we have to worry about what happens when it floods. If everyone built roads to get to hillsides, the hillsides that used to be trees are roofs and blacktop. Not too many people can say they never contributed to a flood. Runoff, logging, and paving all contribute.

Q – The problem is there are too many people.

Q – I live in Boistfort. I survived the flood and the house I was in had nine feet of water. I contemplated death by drowning and I didn't like the idea. It seems to me that you and the Authority have shouted long and loud about having basin-wide solutions, and yet here we are talking about localized problems. Sure those problems lead to what could be an area-wide issue, but I think if you're serious about basin-wide solutions you can't have one person from Montesano saying that we can't build in Chehalis. You have to deal with the whole basin. If we took care of things at our end, he'd be okay. If that's true, then think in terms of the whole area as you have said you want to do. That being said, the only area-wide solution that I see so far is the proposal put forth by the PUD. It will deal with the whole area. And from what I have read of the Corps material, that will not. None of that will. So I would ask you to get back on track and let's get something done.

Q – Another point I forgot, when the ice came down the river, there used to be thousands of houseboats on the Willamette. The ice took out the docks in Portland. Steamwheelers and paddleboats are helpless in the ice. That ice took everything out, there's probably nothing you can do. It will take out bridges.

Q – I would ask that the Authority please get the public's interest in water retention into their plans. It seems like it's been evaded or omitted or left out but the public has been very clear that water retention is the first priority in looking at studies for flood control and the Authority is supposed to be for flood control. I just want to express my wish that they would listen to what the public wants and weave water retention into the plan and make it a priority.

Q – We're discussing flooding in Portland here, I'm not sure why. But we just went by the dam at the headwaters of the Willamette. They don't seem to have a problem in Portland anymore. There are dams on the Columbia and they don't seem to have problems there.

Q – How well does the Wynoochee dam work?

Commissioner Willis said that some days it works really well and other days it doesn't.

Q – Is it a flood control dam or a power dam?

Commissioner Willis said it started as flood control with a power element. As they ran the power element of the dam, they had to keep more water behind the dam. So when we got a flood there wasn't enough room to store it, or they were able to store it for a while but had to dump it during the flood. In one major flood they wiped out most of the homes up against the freeway at the bottom of the Wynoochee. The dam was eventually bought by the Corps. Now it seems to be under slightly different control and we haven't had too many issues.

Q – The key component is that it was managed for flood control, not power generation. The focus of the PUD plan is flood control, not power generation. There are flood control dams everywhere and they work.

Bob Burkle said that one of the structures talked about earlier by One Voice is like the Mud Mountain dam on White River. They have a real problem because they have a hole in the river that they didn't originally. Mud Mountain operates well most of the time but the last few years the same thing happened that is going on here. Glaciers have retreated 30% so there is more area in Mt. Rainier for rain to hit and the last couple of times it flooded there they had to dump water out of Mud Mountain quickly. Pacific flooded badly. The point is that flood control sounds really good but it doesn't work all the time. There are cases where control will come and bite you. You have to be careful.

Ms. Takash clarified the issue of Mud Mountain dam and flooding in Pacific. In January 2009, we released flows to make room in the reservoir behind Mud Mountain Dam for an upcoming forecasted storm. We had released the same flows in 2006 without these impacts. When we found out about the flooding in

Pacific, we slowed the flow out of Mud Mountain Dam. The apparent cause of the increased flooding is a substantial change in channel capacity. The White River is a very dynamic river system. It's different from the Chehalis.

Q – Everyone dwells on the one time flood control doesn't work, but think about how many floods have been stopped. Look at how much money has been made in the Kent area since farmland has been filled. They're making millions of dollars because they have the Howard Hanson dam. Think of how many floods they've been safe from.

Q – We want a perfect solution but we'll settle for any solution.

Q – Think about what we've discussed this evening. We were told we were here to discuss their plan. We're actually discussing what we've been trying to discuss for two years. That's flood control. That's what we've asked them to do. It has been done in this bureaucratic plan. What people here are saying to the Authority is that they're interested in preventing and controlling floods. It was mentioned, but you may not have heard it, that the legislation called for a flood control authority but when it was formed it became just a Flood Authority. We said we wanted a way to control flooding. Most of you have been asking this same thing. I have no idea how this information will end up being a comment on the plan, but as best I can tell most of the people here are not commenting on your plan, they're saying again what was said two years which is that we would like you to emphasize flood control.

Mr. Mackey said that the plan is only part of what has been done. The Authority was charged with doing exactly what you're suggested. They've sponsored \$500,000 to study and support water retention. They have also spent money on hydraulic modeling and LiDAR which are important to moving water retention forward. They have also looked at other options. We need to be careful before saying the flood plan is all the Authority has done. They're interested in the same things you are. They're putting together an organization and funding work to find the answers you're looking for. They've funded the PUD study more than any other money that has been provided.

Q – The things you've discussed and spent the most time on will all change if you put in water retention.

Commissioner Averill said water retention is exactly what we're studying.

Q – This is an interesting irony in that you're asking us to comment on a plan that no one has seen. What you're telling us is that you don't care to have comments on the plan. You're holding meetings for the sake of looking good.

Mayor Schillinger said that the Schillinger family has been to Germany. You can go all the way up the Rhine River on both sides. It doesn't flood because they

have water retention. They pay big taxes, they have no property rights, and they do whatever the government says to do. Here we try to work from the bottom up. Here we do have property rights. We have other concerns and everybody, even those from Montesano, get to have a say in the process. It's a truly bureaucratic process and it's costly. There have been things that I didn't like. But it's still awfully good in the long run to do this. This process weighs all the considerations. Last night, Commissioner Averill got uncivilly chastised and criticized by the lower basin for the fact that filling in the floodplain is even allowed up here because that's a no-no downstream. Having these discussions and considering environmental, fish, and power impacts to storage is an important part of the overall discussion.

Q – My question is when do the studies end and something actually begin to happen? The studies have been going on for 100 years. They had studies on flood control and nothing is happening. When do the studies end and the action start going? We should let the PUD do it and get this problem solved.

Commissioner Averill said if he had \$330 million he'd build the dams tomorrow. He believes in water retention. But even if he had the money he couldn't build the dam because some people don't believe it's the solution. They claim it will hurt the fish and the environment and it won't be stable. The only way we can prove them wrong is to do the studies. Unfortunately it takes time. The Authority has funded two projects already and we're trying to get money to fund the really essential study the Tribe wants to see, which covers the biological and environmental impacts of dams. We believe that those studies will show that we're right and we should go ahead. But I don't want to leave anyone with the impression that we don't have to do the studies. We have to have them so we can get the approvals. It's not me building the dam. The Department of Ecology will have a say. WDFW will have a say. We're trying to help out. We're not against water retention. We've already started to fund it. But I can't promise I'll start building it tomorrow because we have to prove that we can do it.

Also, this is a huge basin. What I've got in the upper river is different from the middle river and the bottom of the river. We know what the problem is with the Willapas and water coming down the tributaries from the West. We also know that we have storms in the East basin that have created a different problem. The 2007 and 2009 floods proved that to us indubitably. We have to look at China Creek, the Newaukum, Coal Creek, and Salzer Creek. I have seen the Corps plan I'm not happy yet with the Salzer solution.

Ms. Takash said the Salzer Creek portion of the Corps plan is not finalized.

Commissioner Averill said we have to think about our friends in the rest of the basin. What is Bucoda going to do if we don't fix the Skookumchuck problem? What is the Tribe going to do if we don't fix the problem of the flow coming from the Chehalis and Black Rivers? We have different problems throughout the

basin. We can't solve them all at the same time. We agree that retention is a first step to look at and work for. It reduces flow from the top of the river to the bottom. We've had a sit down session with the Colonel from the Corps and we showed the two dams that we're proposing on the mainstem and the South Fork of the Chehalis and we looked at the Skookumchuck and Wynoochee dams. The Colonel said that if he had all those dams, he could provide good control on the river system. There might be other things we can do. We know you need project. We've been trying to do projects since the 30s. We're trying to put something together so we can get there and actually do something. We're working really hard on your part that saves the upper basin but we also have to look at the bottom of the basin and what we're going to do to help them. Those projects will come later. It's going to be a long term project. The Authority was not meant to last this long. We thought we'd have a district by now. Our next chore is to move to a district so people in the business of solving flooding are in control of this instead of part-time politicians.

Q – I have a property I own next to Kmart in the Town Center area. I also have friends downriver. I wonder how many people downstream drive on the freeway and think the fill material brought in there has been a big detriment to them downriver. I say that because it took me a long time to realize that the dike between us and the river makes filling on the freeway side, where Town Center is, a nonevent to downriver people. I have friends who run the building departments and I know when I put a house in the floodplain I have all these regulations. I have to let water run right through and we have to put trap doors into foundations. I wonder just how much there is that people downriver think we're doing wrong because I don't see it. I don't see where we're putting in all this fill currently. From a self serving standpoint, for the Corps to build up dikes to a higher level, that works pretty good for me. It could make my property at Town Center pretty good, but it doesn't help my friend Julie who lives on the other side. I'm a fan of trying to figure out how to do retention so we can control the flow. It seems like that's the only one that can do anything for all of us.

Q – I've been involved since the Authority was formed. There are a lot of good people on the Authority who work hard. As a citizen looking in I've been there and seen the public comment. When we first brought up water retention, it was several months before we got the money and we only got a little bit so we couldn't do all the studies at the same time. We had to wait four or five more months to get more money. Now it will be another big holdup because we don't know if we will get more money. That's where the citizens are getting frustrated. I see both sides of the story. When we say let's get this done, let's dedicate ourselves to getting it done and stop piecemealing it.

Mr. Mackey said that it is time to adjourn the meeting to listening posts so people have a chance to speak one on one. He adjourned the meeting at 7:44 PM.

## **Attachment 4 Flip Chart Comments**

### **Rochester – April 5, 2010**

- Reforestation – tree farms store water.
- Stop building in the floodplain. Chehalis, Centralia, & Tribe.
- DOT plans to resurface SR 12. This will increase flooding, Rochester – Oakville communities. It will raise SR 12 3". Will there be mitigation?
- Early warnings should tell people flood water is really sewage water.
- Lots of small fires to put out for CRBFA plan, more community support?

### **Montesano – April 6, 2010**

- Programmatic environmental review is needed.
- Dredging in flood times is not the answer.
- Floodplain management is critical and floodplain outside the levee system needs to be left as floodplain. Is filling on I-5 on the protected side or the river side?
- Filling the floodplain takes away downstream capacity.
- Centralia and Chehalis should move development up the hill.
- 205 project at Cosmopolis for replacement of damaged dam.
- Has the Authority worked with DNR?
- How would an increase in harvest age impact water runoff? Can we take a basin-wide approach on forested land?
- Can we remove the incentives to log early?
- What would happen if we start at the bottom of the basin and open up bridges and roads to let more flow go downriver?
- China coal burning seeded clouds in 2008 – study by UW.
- Need to look at gravel management. Can we remove gravel bar centers?
- Manage current dams to time release of water to minimize flooding on the mainstem.
- Agricultural practices can help keep topsoil from getting washed away.
- “Man will never reach his full potential because of meetings”
- Tax breaks for farmers that do not build in their farms.

## **Attachment 5 Written Comments**

### Written comment – Montesano meeting:

- 1) According to USGS data on the Chehalis River, only 5% of the river flow at Grand Mound comes from the Upper South Fork of the Chehalis. How will construction of a dam on the South Fork of the Chehalis provide a significant tool for flood control down stream?
  - While the South Fork Dam would provide effective flood control for the small handful of farmers in the Upper Boistfort valley, what is the cost to the overall public for the good of a very few farmers who farm in the flood plain?
  
- 2) The forested portion of the South Fork of the Chehalis River has a regulatory requirement to leave 200' of timber on each side of the stream to provide shade and cool water temperatures. It is classed a "shoreline of statewide significance". The forested portion of the river has cobble/gravel type stream beds that are good spawning habitat. This is the area that would be inundated by the South Fork of the Chehalis project. Just below the proposed South Fork Dam site the river flows into Ag lands with little or no forested buffer and largely mud bottom river channel.
  - How can this project be good for fish?
  - Will there be a fish ladder placed on the proposed dam so anadromous fish can get to the upper South Fork spawning beds? If not where will the Salmon and Steelhead spawn? What percentage of the spawning beds in the Chehalis System would be cut off or inundated by the water retention projects?
  - Does it make sense to dam the good part of the river so that some of its cool water can be dumped to the bad (lower) part of the river in the summer? Isn't this just making both parts of the river bad?

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### Comment form – Chehalis meeting:

You should be embarrassed about the money spent on consultants. Nothing personal to ESA Adolfson. You're just milking the cow while she stands there!

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### Written comment – Chehalis meeting:

Here are some questions that need to be answered in development of your comprehensive plan:

- From what I can tell (there is zero data in this study to indicate the total area and flow of the entire Chehalis River system, just the ac-ft and flows for the two proposed dams), the avoided flow from these two dams is miniscule (less than 2%?) of the total flow – how can that reduce the flood levels by 2-3 feet at Grand Mound? Nonsensical...
- Doesn't the list of assumptions for reduced flooding potential also **assume** that the levees hold? Have you analyzed the "benefits" from these dams if the levees fail anyway – what is the B/C ratio if this happens? This proposal implies that these dams are "in lieu" of raising I-5 but that is not a solid assumption, as the freeway could still be under water once the dams are built if we get a 2007 storm and/or the levees do not hold, regardless of the piddly 40,000 ac-ft. that the So. Chehalis dam might hold back?
- Entire economic analysis assumes trends in "benefits" to continue an accelerating curve based on economic numbers from the 90's and early 2000's. We have undergone a serious economic drop since 2008 and it is ridiculous to just continue the optimistic trend lines from 2000 on upward when we know that home prices and employment have not climbed since 2008 but declined sharply.
- Throughout our region/country there has been a call to "tear down dams" in order to benefit fish habitat—yet, this study shows a very optimistic **benefit** to fish by constructing these dams and no cost for loss of fish habitat on the 80+ miles of streams above the dams that is now blocked from upstream passage – who is right, you can't have it both ways.

The bottom line is "how can you recommend a comprehensive plan without accurate scientific data to support the costs and environment impacts?" This SHOULD not be a process in which a plan is suggested WITHOUT detailed environmental information. The information provided in the PUD study is not accurate and misleads our community of the "benefits" without scratching the surface of the environmental impacts. Do not lead our community to believe the options in the Plan will work unless you know that it will. Making broad suggestions based on inaccurate information only hinders the process of finding scientific solutions to flooding and neither the 35% completed Corps levee study NOR the PUD Study can be considered viable options at this point...we are wasting valuable resources and confusing our community.

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Written comment – Chehalis meeting:

1. The cause of flooding in the Centralia/Chehalis I-5 corridor is a combination of nature and the stupidity and greed of our county and city officials whom have designed and authorized the filling of low land areas to increase the number of businesses which in turn increases the tax base.

2. Water, like man, will take the path of least resistance. It is time for man to correct the actions that increased the probability of catastrophic floods in the future.
  3. If the powers in place at the local and state level hope to keep the potential of the twin cities economy prospering, sacrifices will be required.
    - a. Restrict all and any future building in the designated flood zone.
    - b. Consider the areas south of I-5 exit 71 and north of I-5 exit 82 for future expansion.
  4. Give serious consideration to controlling the rivers by dredging the Chehalis, Newaukum and other rivers that empty into the Chehalis River. Use the dredged material to build up the banks of the rivers and use the banks as walking and bicycle trails. The environmentalists can go climb a cactus. I do not see any of their tax dollars coming into Lewis County. As for the fish, they can be replanted and probably would recover and increase on their own within a few years.
  5. Water retention by the use of Dams has been used to control flooding for hundreds of years. The benefits of flood control, irrigation and the possibility of Hydro Electric power derived from dams would be a plus for generations to come.
  6. The proposed system of dikes to protect the properties in the flood zone along with the I-5 corridor does nothing for all the other flood zones along the Chehalis River. Get it done the right way, all the way the first time.
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Emailed comment – received April 5:

Flood control dams only moderate average high waters. When it's really flooding they fill up rapidly then release the same flows as enter. Dams require complicated and expensive fish passage structures while flooding critical areas for spawning. The proposed dams would have a serious negative influence on salmonid populations.

The first "riffle" downstream of the Centralia flood zone controls the upstream water elevation for over ten river miles. It is this natural bedrock formation that does not allow the river to erode downwards, causing the Centralia/Chehalis area to puddle badly. The location is about 0.5 miles below the mouth of the Skookumchuck, near Chehalis River Mile 66.

This single riffle could be removed and would lower the Chehalis River by three feet in the severe flood zone. My spawner surveys have not shown use by salmonids at this location.

The lower Chehalis has massive inflows during floods from the Wynoochee and Satsop Rivers. Low gradients and high tides back waters up for miles. Dams and dikes upstream will do little for that situation.

I did not see any details as to the proposed Dam locations or exact storage volumes to be able to evaluate their potential effectiveness.

Thank you for reviewing these comments. I was reviewing HPA's & FPA's in this basin from the early 1970's and have been the WDF, WDG, WDW, WDFW fish bio in this basin for over 20 years.

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Emailed comment – received April 7:

I attended the Flood Authority's public meeting in Montesano on April 6, 2010. I spoke briefly with the consultant making the presentation after the group ended the main part of the meeting. My question was about environmental review of the plan under the State Environmental Policy Act (SEPA).

First, I am asking whether there has been a determination that the plan is categorically exempt from SEPA, and if so, where that statement can be found.

Second, I am asking when there will be a non-project environmental review done under SEPA, of the entire river basin plan. There was some discussion from staff at the meeting last night, that individual jurisdictions would be responsible for environmental review of individual projects when and as they are undertaken. That is not my question. The SEPA statute, as the following excerpted language from state Ecology's SEPA handbook sets forth in the postscript, contemplates that large connected actions are to be reviewed under SEPA at the non-project stage, so that the impacts upon the entire affected area can be considered before individual projects are commenced. I believe that a great deal of the questions that were posed last night, went to this issue of questions about potential environmental impacts within the entire basin.

Many of the elements of a nonproject SEPA review have already been accomplished as part of the draft plan preparation. What appears to be lacking however, is any discussion of environmental impacts of the various alternative actions, or groups of actions, included in the plan.

I suggest that the final plan include a statement of SEPA compliance (or categorical exemption) drafted by DOE, and a further discussion of procedural compliance for non-project SEPA review in future if it does not occur at the stage of adoption of this plan. Individual jurisdictions adopting this plan subsequently will have neither the ability, nor the responsibility, to look at SEPA implications for the entire basinwide plan. If this nonproject SEPA review will be the responsibility of any future flood district authority, then that statement should be included in this plan so that the public understands when and how basinwide nonproject environmental issues will be addressed.

Thank you for the opportunity to comment.

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Emailed comment – received April 20:

Please consider the following:

Your report indicates that the Legislature appropriated \$2.5 million for your work to study flood-control options. Yet, only \$ ½ million has been spent on engineering studies. What portion is that of total expenditures? It is my understanding that expenses now have reached the neighborhood of \$3 million. If that is true, then “necessary” engineering expenditures represent only 16 and 2/3rds % of the total. This is simply unacceptable.

The “flood group” has indicated it wants a “basin-wide” approach to dealing with flooding issues. Yet, this is not possible, because there are no members who represent the total area. Each member represents only those constituents who elected each; i.e., city councilors represent only those who elected them, county commissioners also. Thus, you simply MUST move rapidly toward the formation of a body that does represent the total flood basin, and that body must also have taxing authority, which the current group does not have.

Your proposed Flood Hazard Management Plan is far too broad in scope and language, particularly the nine goals listed on page 11. There is nothing in the language here to suggest specifically how any of the goals would be accomplished. Thus, your plan is more of an academic exercise than a practical plan for flood mitigation. Let’s get back to solving the real problem – that’s mostly an engineering problem and it needs to be “solved” mostly by engineers, not by politicians or by politically-motivated environmentalists.

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Mailed comment – received April 22:

Dear Ms. Willis:

The following comments are being submitted to the Chehalis River Basin Flood Control Authority on behalf of the grass roots public group One Voice, representing over 500 people, businesses and community leaders in Lewis, Thurston, and Grays Harbor counties.

As you are aware One Voice supports a basin wide flood control solution that protects citizens from Pe Ell to Hoquiam. Our comments focus on three main areas; 1) One Voice position on basin wide flood control plan, 2) clarification and additional information relating to public comments at the Flood Authority public meeting April 7, 2010, and 3) comments on the Draft Chehalis River Basin comprehensive Flood Hazard Management Plan.

## Basin Wide Solution

One Voice supports a basin wide flood control solution that protects citizens from Pe Ell to Hoquiam. Currently there are fundamentally on two projects being considered that will provide meaningful flood control; 1) the Corps Twin Cities Project, and 2) the Water Retention Plan for two dams on the upper Chehalis River.

One Voice supports timely and complete study of the Water Retention Plan as it provides the only basin wide solution. One Voice supports reauthorization of a significantly different Corps of Engineers Twin Cities project with retention as the primary element and levees as a secondary element. Making water retention the primary focus for flood control on the Chehalis River is now the preferred solution supported by Resolutions passed by the City of Chehalis, Lewis County Board of Commissioners, Centralia-Chehalis Chamber of Commerce, Fire District #13, Pamona Grange, City of Pe Ell, Airport Board, Port of Chehalis, Port of Centralia, and Lewis County Economic Development Council. There is a clear consensus that flood control should be basin-wide, having water retention as its principal component.

Water retention could take the form of a multipurpose project as has been proposed by Lewis County PUD, which would provide large structures to capture flood waters during winter months and also store water in late winter and spring for summer flow enhancement and hydroelectric generation. An alternative would be to construct flood control dams that would be designed with a normally open gate feature that could be closed during flood events. This would provide flood control but would not provide summer flow enhancement or hydroelectric generation. This latter approach would presumably have less environmental and fisheries impact but would also not provide for summer flows enhancement that could improve fish habitat and water quality.

## Comments at April 7, 2010 FA Public Meeting

There were many comments made at the public meeting on Wednesday April 7, 2010 at the Chehalis Veterans Museum. One Voice submits the following to clarify and to supplement public comment and information that was noted at the meeting related to three statements; 1) slides in the upper water shed occurred primarily in clear cuts and along roads, 2) dams do not always provide flood protection, and 3) tax burden.

In response to public concern of why logs and debris can't be removed from stream beds as was historically done, a representative of the Washington Department of Fish and Wildlife commented that the slides in the upper basin during the 2007 flood were primarily on clear cuts and along logging roads. A member of the public countered by indicating that he had flown the upper basin after the 2007 flood and that the slide areas were distributed over multiple types

and ages of forest. One Voice notes that in a related event, November 2006, over 13 inches (less than the 20 inches in the Willapa Hills in December 2007) of rain was reported in the upper Nisqually and the upper Cowlitz, and there were significant slides and flood damage downstream. The pertinent observation here is that there is no logging in either drainage as both areas are federal National Park properties. Furthermore, clear cuts were much more prevalent and widespread 50 and 60 years ago in the upper Chehalis than today. One Voice encourages that the whole story be reviewed and taken into consideration and that particular elements or unsubstantiated statements not be given undue weight.

A second opinion that was expressed (including by the Washington Department of Fish and Wildlife representative) was that water retention dams work sometimes (but not all the time) indicating that there has been flooding on the Wynoochee with the flood control dam and on the Puyallup with the Mud Mountain dam. Again this is only part of the story. The pertinent question here is how much were these flood events reduced because of the presence of the flood control dams and how many times since the construction of the dams have the basins downstream been saved from flooding. There was also discussion about the flood events on the Chehalis in the 1930's, 40's and 50's and how people were able to cope with those floods. The important distinction here and with the noted flood control dams is that prior to 1987 the largest flood of record on the Chehalis was in 1972 with 49,000 cfs at Grand Mound. Since 1986 there have been four flood events over 50,000 cfs, 1986, 1990, 1996, and 2007, at 51,600, 68,700, 74,800, and 79,000 cfs respectively.

We note that while the upper Nisqually and Upper Cowlitz flooded severely in November 2006, both basins downstream of the dams had less damage than would have occurred had the dams not been present. In addition to the Cowlitz and Nisqually Rivers there are multiple river basins that are protected from flooding with water retention dams, for example; 1) the Columbia River has had no significant flooding in Portland since 1949, 2) the Kent Green River Valley since the construction of Howard Hanson Dam, and 3) the Sacramento Valley since construction of series of dams including Shasta dam.

### Taxation

Finally, there were some expressions of concern as to tax burden to be borne by people not affected by flooding. One Voice believes that the Authority has provided little or no information to the general public regarding the effect of flooding on all citizens in Lewis, Thurston, and Grays Harbor Counties. The disruptions caused by flooding regularly affect the economic activity of each of the counties, although to a lesser degree in Thurston than in Lewis and Grays Harbor. Recently FEMA has been active in flood prone areas, such as Skagit and Lewis County by redrawing 100 year flood maps, which significantly increase both the floodplains and the floodways. These FEMA maps may result in

extraordinary reductions in property values within the floodways, shifting significant tax burdens on remaining tax payers. The Authority should be making clear to all the residents of Grays Harbor and Lewis Counties that each tax payer has an economic stake in flood control.

#### Draft Chehalis River Basin Comprehensive Flood Hazard Management Plan

Generally One Voice believes the development of the Comprehensive Plan has been an unnecessary and costly effort that has not materially moved the Flood Authority toward development of a basin wide flood control plan. Unfortunately, the Flood Authority has not acted in accordance with its original purpose of developing flood **control**. Instead, it spent most of its money **reacting** to flood events. As we noted above, there are only two meaningful flood control projects being considered by the Flood Authority at this time, the Corps Twin Cities Project and the Water Retention Dams on the upper Chehalis and the Comp Plan has done little to assist in development of a basin wide solution.

The Flood Authority has spent two years and \$2.5 million and has very little to show for this time and money. Early warning systems are nice and can help with emergency warning and notification, however, they do nothing to prevent or control flooding. Ecosystem models also are nice but again do little to further the flood control plan for the basin. In the mean time, citizens in the basin continue to put up with the threat of flooding which on average has historically occurred once every five years. The Flood Authority has haltingly spent approximately 20% of its funds on water retention studies. Instead of decisive action, vacillation and delay have plagued the Authority. One Voice requests that the Flood Authority move forward expeditiously with funding for the Phase III Fisheries and Environmental studies at the earliest possible date and not delay approval for months at a time like occurred with approval of funding for both Phase IIA and Phase IIB. Time is of the essence.

In addition to the responsibility of the Flood Authority to develop a basin wide flood control plan, it was tasked with the responsibility to form a Flood Control District. One Voice does not believe this to be a monumental task. Lewis County has a Flood Control Zone District for the Chehalis River Basin. Grays Harbor and Thurston County can also form Flood Control Zone Districts and the three counties can then develop an interlocal agreement for governance of a Chehalis River three county Flood Control Zone District. This should not take 6 to 12 months and more than one million dollars to accomplish.

Following are specific comments on the Comprehensive Plan.

#### Section 4: Previous Studies

1972-82 Corps: Levee in Centralia and Chehalis and along Skookumchuck River. The Comp Plan refers to support for the Corps levee plan by the City of

Centralia, however it does not note that a public meeting in 1980 in Centralia resulted in local public opposition to the levees and the formation of Friends of the Skookumchuck committee to oppose the levee plan for property rights, aesthetics, river access, and environmental reasons.

2007 Corps Twin Cities Project: The Comp Plan indicates the Corps beginning construction in 2014, however does not indicate when construction will be completed. Furthermore, Corps representatives noted at the recent public meetings that construction will not begin until 2016 with completion sometime in 2023 or 2024. This date should be updated and the Corps should provide information on the reason for the delay.

### Section 5: Basin Flood Characteristics

Flood Damages: This section of the Comp Plan appears to be incomplete. The costs appear to not include many major cost items; such as transportation corridor closures, private property damages, emergency service response costs, or public property damages. One Voice believes that there is much information available from the 2007 flood and these figures should be included in the report. Lewis County alone tabulated costs at over \$165 million and one Chronicle newspaper article indicated an estimate of total damages at nearly \$500 million. We suggest review and inclusion of all costs tabulated by local jurisdictions and other reports that have been prepared on this topic, like the Lewis County, 2007 Flood Disaster Recovery Strategy dated April 2009, that was prepared by the Seattle Region X office of the Economic Development Administration.

The historical flood flow Table 5-6 shows the 100 yr flood event at 56,000 cfs at Grand Mound, source 1981 FEMA. Table 5-3 shows the 1990, 1996, and 2007 flood flows at Grand Mound far in excess of the FEMA 100 year event. Clarification is needed.

### Section 6: Flood Problem Areas

The Comp Plan lists Problems Identified by the public at the meeting, February 11, 2009 in Chehalis: This list includes a number of issues identified by the public ranging from road obstructions to debris and mud flow. However, a recurring comment/theme made by several members of the public was the concern that there are too many meetings, committees, and studies, and no substantive progress on a basin wide solution. The Flood Authority was encouraged to move forward with a meaningful basin wide plan and not repeat the practice and process of all committees and the Corps in the past with years of study and no action. The public in February 2009 asked for action and they are asking again over a year later. It is time to move ahead with water retention and solutions not just more meetings and talk. At the Chehalis meeting the public expressed disdain for years of no action and this comment is not included.

The Authority appears to have a degree of deafness when it comes to water retention. Clearly water retention is disfavored by at least two of the Authority members. As a result, it appears that the Authority finds it easier to prepare bureaucratic plans, rather than tackle flood control. If, as it appears, the Authority is unable to pursue flood control, the Authority can never reach the goal set for it by the Legislature. The Resolutions passed by numerous public and private entities request water retention. The Authority does not appear to be following the public's direction. One Voice is concerned that the Authority is pursuing a "we know what's good for you" approach. If so, the Authority is doomed to the same failure which has met each previous attempt at flood control on the Chehalis river.

### Section 9: Recommended Actions

The Plan includes a list, table 9-1, of recommended actions from local jurisdictions and from public input. The public has repeatedly expressed interest in the full investigation of water retention dams for flood control for the basin wide flood control solution and this item is not on the list. Not only should water retention be added to the list, it should be at the top of the list because it provides protection for the entire Chehalis River Basin.

One Voice appreciates the opportunity to comment on the Comprehensive Plan and on the activities of the Flood Authority. We are available to discuss these comments and any other questions you may have.

Sincerely,  
John Hendricksen  
One Voice, Chairman

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### Emailed comment – received April 23:

Thank you for this opportunity to comment on the above referenced flood plans.

FOGH is a broad-based 100% volunteer tax-exempt 501(c)(3) citizens group made up of crabbers, fishers, oyster growers and caring citizens. The mission of FOGH is to foster and promote the economic, biological, and social uniqueness of Washington's estuaries and ocean coastal environments. The goal of FOGH is to protect the natural environment, human health and safety in Grays Harbor and vicinity through science, advocacy, law, activism and empowerment.

While we understand and sympathize with the citizens of Centralia, Chehalis and surrounds and the travelers of I-5 as they pass through the area, we are very concerned about the downstream effects of the proposed modifications. Since all activities in the upper reaches of the Chehalis River Watershed, ultimately affect the waters "downhill", we are concerned about the impacts to our

riverbanks, estuaries, water quality and quantity and ultimately our ocean beaches and marine resources.

We are concerned that there doesn't seem to be a clear discussion of the effects of sea level rise and how it might impact some of the water levels downstream. The Intergovernmental Panel on Climate Change (IPCC) looked at sea-level rise scenarios which ranged from a 3" rise in global average sea level by 2025 to a 27.3" inch rise by 2100. The life of the proposed projects are approximately 35 - 50 years. Assuming a 2" sea level rise in the lower WRIA what would be the effect of the levees and/or dams as proposed? What would be the potential shift in the extent and diversity of the coastal marshes, swamps, beaches and other habitats? To what extent would the proposed projects exacerbate the loss of tidal flats, inland fresh marsh, salt-water inundation of tidal swamps and inland aquifers?

How will the proposed projects move or remove water from the natural cycle? What changes to instream base flow and drought conditions have been studied? What impact would a change in the upper WRIA have on the lower WRIA? How will the life cycles of certain fish and mammals be affected by the change of water regime? How will this affect Tribal concerns and treaty rights? There are two major native populations that will be affected by these proposals, what are the concerns of the Quinault Nation and the Confederated Tribes of the Chehalis and how will they be met? What will be the effect of these proposals on local and downstream aquifers?

The loss of wetlands and building in the floodplain has long been understood to have considerable impact on the quantity and quality of water. What present zoning and building ordinances are in place to prevent and/or minimize the loss of these assets? What plans have been made to inventory the remaining wetlands in the study area? What plans are in place to mitigate for the loss of wetlands future and past?

In addition, we are concerned about the timing of waters that may be "fast-tracked" out of the upper WRIA reaching the cresting streams of the lower WRIA. What would be the flooding potential to those properties on the lower WRIA?

This is a very complicated process that is being proposed and it is important that the solutions for one don't negatively impact others. We look forward to hearing back from you about these concerns.

Sincerely,

R.D.

Arthur (R.D.) Grunbaum  
FOGH (Friends of Grays Harbor)

**Appendix B**

**Regulatory Staff Report**





## Regulatory Work Group Staff Report

**Date:** January 14, 2010

**Subject:** Recommendations of the Regulatory Work Group

### Background

At its June 18, 2009 meeting, the Flood Authority authorized a work group consisting of the Board Advisory Committee and representatives from the Basin jurisdictions' planning and building departments. The work group was tasked to develop findings and options for building and land use regulations to achieve flood damage reduction. The work group was asked to undertake the following steps:

1. Evaluate regulatory approaches to development in the floodplain from the perspective of:
  - a. Risk to proposed structures,
  - b. Risk to existing structures and properties,
  - c. Ecological risks (including habitat, water quality, and wetland impacts), and
  - d. Emergency management costs.
2. Review local jurisdictions' options for credit from the Community Rating System (CRS)<sup>1</sup> to reduce flood insurance premiums under Activity 430, Higher Regulatory Standards.
3. Develop findings and options for presentation to the Flood Authority, including:
  - a. Best management practices and/or model regulations for local jurisdictions to consider, and

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<sup>1</sup> Acronyms used in this document are explained on the last page.

b. Pros and cons of various practices and approaches.

Ann Root of ESA Adolfson facilitated three meetings of the Regulatory Work Group.

The first meeting was held on September 2, 2009 and was attended by: Brian Shea, Ryan Harriman, and Mike Ferry, Grays Harbor County; Bob Johnson and Fred Chapman, Lewis County; Mike Kain, Thurston County; Don Terry, Chehalis Tribe and the City of Oakville; LG Nelson, City of Centralia; Bob Nacht, City of Chehalis; Loren Hiner, City of Montesano; and Chris Hempelman, Department of Ecology. The work group discussed regulations that impact flooding, brainstormed possible recommendations, and developed the inventory of existing regulations in the basin.

The second meeting was held on October 26, 2009 and was attended by: Mike Ferry, Grays Harbor County; Bob Johnson, Lewis County; Mark Swartout, Thurston County; Glen Connelly, Chehalis Tribe; Don Terry, Chehalis Tribe and City of Oakville; LG Nelson, City of Centralia; Bob Nacht, City of Chehalis; Loren Hiner, City of Montesano; and Chris Hempelman, Department of Ecology. The work group discussed a draft list of recommended regulations.

The third meeting was held on November 17, 2009 and was attended by: Mike Ferry, Brian Shea, and Ryan Harriman, Grays Harbor County; Bob Johnson and Fred Chapman, Lewis County; Tim Rubert, Thurston County; Glen Connelly, Chehalis Tribe; Don Terry, Chehalis Tribe and City of Oakville; LG Nelson, City of Centralia; Bob Nacht, City of Chehalis; and Loren Hiner, City of Montesano. The work group reviewed and finalized their recommendations and findings.

## **Approach**

The work group determined that all jurisdictions in the Flood Authority meet state flood regulation requirements as well as the minimum requirements of the National Flood Insurance Program (NFIP). Thus, the work group focused on developing recommendations that basin jurisdictions could use to improve their regulations beyond minimum state and national requirements.

The work group based their recommendations on concepts presented in FEMA's Community Rating System (CRS). The CRS gives discounts on flood insurance to citizens of communities that implement regulations that go beyond the minimum NFIP requirements. Lewis County, Thurston County, Centralia, and Chehalis are members of the CRS and currently receive credit for higher regulatory standards. They may receive greater discounts by implementing the recommendations contained herein. Every 500 points a community earns can result in up to a 5 percent reduction in annual premiums. Other communities in the basin are not members of the CRS but would provide greater protection to citizens and structures in the floodplain by adopting these recommendations. Those jurisdictions not already participating in the CRS program could become members to provide their constituents lower insurance premiums. The work group also used the No Adverse Impacts guide book developed by the Association of State Floodplain Managers and their own ideas to develop recommendations.

The work group discussed whether the recommendations should be presented as a model ordinance to be adopted by member jurisdictions or whether they should be

presented as best management practices or guidelines. The term “model” ordinance implied to work group members that the provisions of the ordinance are minimum requirements that must be adopted by all jurisdictions. Model ordinance was also considered to imply that any jurisdiction not adopting the ordinance exactly as written would not be in compliance. The recommendations presented here are steps beyond the minimum requirements and are intended to provide more protection for life and property than the existing flood related regulations.

The work group decided to present their recommendations as best management practices or guidelines to allow each community the opportunity to select recommendations suited to their jurisdictions and to fit the modifications into their existing ordinances in a manner they feel is most appropriate. The work group divided the recommendations into two categories—basic and “ideal”. The basic recommendations are those that the work group feels all jurisdictions in the basin should adopt. The “ideal” recommendations are those that the work group thinks all jurisdictions in the basin should consider and work towards if practical for the conditions in their jurisdictions.

## **Basic Recommendations**

The work group identified 16 basic recommendations. Each addresses certain risks, and has advantages and disadvantages to its implementation.

### Recommendation 1 - Require that all new residential structures in the floodplain (Special Flood Hazard Area) be built 2 feet above the base flood elevation (freeboard).

Currently, regulations in the basin allow residential structures in the floodplain to be built anywhere from base flood elevation (BFE) (the minimum NFIP requirement) to 2 feet above BFE. Requiring all new residential structures in the floodplain to be built 2 feet above the BFE would address risk to new structures by adding a margin of safety against risks that are not yet known and possible future changes in flood elevations due to increased peak flood flows caused by changes in land use or climate.

Risks addressed:

- Risk to new structures
- Emergency management costs

Advantages to implementing this recommendation include a reduction of flood damages, provision of a measure of safety against future changes to the BFE, and lower flood insurance rates for property owners. The disadvantage is that additional material and building costs, though minimal, would be required.

Jurisdictions that adopt this recommendation would receive CRS credit up to 200 points.

### Recommendation 2 - Require that all new commercial or industrial structures in the floodplain be built 1 foot or more above the BFE or be floodproofed so that areas located 1 foot above the BFE or lower are watertight.

Requiring all commercial or industrial structures in the floodplain to be built 1 foot above BFE or be floodproofed would address risk to new structures by adding a margin of

safety against risks that are not yet known and possible future flood increases. To be considered floodproofed, a structure must be built so that all areas located 1 foot above BFE or lower are watertight (NFIP Technical Bulletin 3).

Risks addressed:

- Risk to new structures
- Emergency management costs

As with recommendation 1, advantages include a reduction of flood damages, the minimal cost of elevating new structures an additional foot, a measure of safety against uncertain future changes to BFE, and lower flood insurance rates for property owners. The disadvantage is that additional material and building costs, though minimal, would be required.

Jurisdictions that adopt this recommendation would receive CRS credit up to 100 points.

Recommendation 3 - Require that buildings in the floodplain have an approved foundation (per the requirements of NFIP Technical Bulletin 11-01).

Requiring that foundations be approved would address risk to new structures by ensuring that parts of the building likely to flood would sustain minimal damage in a flood event.

Risk addressed:

- Risk to new structures

This change would reduce flood damages, but would require additional material and building cost for new construction.

Jurisdictions that adopt this recommendation would receive CRS credit up to 35 points.

Recommendation 4 - Adopt regulations that limit enclosures below the BFE to discourage finishing elevated areas.

Prohibiting first floor enclosures in the floodplain would discourage finishing areas below the BFE and storing valuables and hazardous materials below BFE. This would address risk to new structures and elevated structures by ensuring that parts of the building likely to flood would sustain minimal damage in a flood event. It would also address ecological risk by limiting hazardous materials in potentially flooded areas

Risk addressed:

- Risk to new structures
- Ecological risk

This change would reduce flood damages, but would require enforcement to insure that an elevated area is not enclosed in the future.

Jurisdictions that adopt this recommendation would receive CRS credit up to 300 points.

Recommendation 5 - Require a lower threshold for substantial improvements.

When improvements or damage repair on an existing structure hit a certain threshold (usually 50 percent), it is considered a substantial improvement. After passing this threshold, the structure must comply with current regulatory standards. Lowering the threshold at which a structure triggers this regulation would address risk of flood damage to existing structures that have been damaged by flooding in the past.

Risk addressed:

- Risk to existing structures and property

This approach would lead to reduced flood damages by bring buildings up to code sooner and would allow property owners access to insurance money to be used as match for a grant to comply with code requirements. However, this recommendation would require additional permit review effort. In the past, lowering the threshold below 50 percent would have conflicted with FEMA's Increased Cost of Compliance criteria. However, recent changes in CRS Requirements and FEMA's interpretation of the Increased Cost of Compliance criteria allow a lower threshold provided the ordinance applies the rule to all damages regardless of cause (i.e., fire, wind, earthquake, as well as flood).

Jurisdictions that adopt this recommendation would receive CRS credit up to 90 points.

Recommendation 6 - Require that substantial improvements be counted cumulatively within a specific time period such as 10 years.

Jurisdictions could also count improvements (recommendation 5) cumulatively. More structures would trigger the regulation and be updated to meet current regulatory standards. The regulatory work group recommends a time period of 10 years. Another option, in use by Grays Harbor County, counts cumulative improvements from the adoption of the regulation.

Risk addressed:

- Risk to existing structures and property

This approach would lead to reduced flood damages, but would require additional permit review effort and record keeping.

Jurisdictions that adopt this recommendation would receive CRS credit up to 110 points.

### Recommendation 7 – Limitations on critical facilities in the floodplain.

A critical facility is any property that, if flooded, would result in severe consequences to public health and safety. Critical facilities include: structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, or water-reactive materials; hospitals, nursing homes, and housing that contains occupants who may not be sufficiently mobile to avoid death or injury during a flood; police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for flood response activities before, during and after a flood; and public and private utility facilities that are vital to maintaining or restoring normal services to flooded areas before, during, and after a flood.

The work group recommends that basin jurisdictions require that new critical facilities be located outside the floodplain, OR where there is no feasible alternative, require that:

- The lowest floor be elevated 3 feet or more above the BFE,
- The foundation be floodproofed,
- No toxic substance will be displaced or released into floodwaters,
- Access routes be elevated to or above the BFE.

Risks addressed:

- Risk to new structures
- Risk to existing structures and property
- Risk to health and safety
- Ecological risks
- Emergency management costs

This recommendation would reduce damage to vital public facilities, improve emergency response, ensure facilities will be operable during and after flood emergencies, and reduce pollution of floodwaters by hazardous substances. Disadvantages of this recommendation include a need for additional design and construction costs and a possible need for additional area for critical facilities.

Jurisdictions that adopt this recommendation would receive CRS credit up to 100 points

### Recommendation 8 - Adopt subdivision and development regulations that avoid or minimize development in floodplains.

The work group recommends that basin jurisdictions adopt subdivision and development regulations that avoid or minimize development in floodplains. Examples include:

- Density transfers,
- Transfers of development rights,
- Bonuses for avoiding the floodplain,
- Open space subdivision design,
- Planned unit developments,
- Cluster development,
- Greenway and setback rules,
- Open space ratio credits for open space in the floodplain.

Risks addressed:

- Risk to new structures

- Risk to existing structures and property
- Ecological risks

The advantage of this recommendation is that it reduces impact to existing developments and the ecosystem. Disadvantages include land use implications and potentially reduced tax revenue because open space areas are taxed at a lower level if the total value of improvement is reduced.

Jurisdictions that adopt this recommendation would receive CRS credit between 100 and 700 points.

#### Recommendation 9 - Adopt low density zoning in the floodplain.

Adopting low density zoning in the floodplain reduces the number of structures in the floodplain and maintains flood storage capacity.

Risk addressed:

- Risk to new structures

This approach would reduce flood damage, maintain flood storage capacity, and protect natural and beneficial floodplain functions. Disadvantages include potential changes to existing land use patterns and problems with compliance with GMA requirements.

Jurisdictions that adopt this recommendation would receive CRS credit based on the number of residences allowed per acre, up to 600 points.

#### Recommendation 10 - Adopt the current version of the Department of Ecology's Stormwater Manual.

In adopting the current version of the Department of Ecology's Stormwater Manual, codes should specify the current version of the manual as opposed to a specific date to allow an automatic update when new manuals are issued.

Risks addressed:

- Risk to existing structures and property
- Risk to new structures
- Ecological risks

Advantages include reduction in downstream storm peaks, slower surface water runoff and reduced downstream storm peaks, reduced pollution of flood water, and reduced public costs from flooding. However, this potentially would require larger detention and treatment facilities.

Jurisdictions that adopt this recommendation would receive CRS credit up to 115 points.

#### Recommendation 11 - Include floodplain protection in the Critical Areas Regulations or adopt floodplain regulations as part of the Critical Areas Regulations.

Risk addressed:

- Ecological risks

This approach recognizes that floodplains provide natural and beneficial functions. If regulation of floodplains falls under Critical Area Regulations, reasonable use exemptions and permits will apply. This approach would have land use implications.

Jurisdictions that adopt this recommendation may receive CRS credit up to 40 points.

Recommendation 12 - Adopt wetland and stream buffers that protect the natural and beneficial functions of wetlands and streams.

Buffer widths should be based on best available science and the type and intensity of human activity in the area and be consistent with the recommendations of the Departments of Ecology and Fish and Wildlife.

Risks addressed:

- Ecological risks
- Risk to new structures
- Risk to existing structures and property

This approach would reduce flood damage, maintain flood storage capacity, and provide natural and beneficial functions. It would have land use implications. This regulation is already required by the Growth Management Act.

Jurisdictions that adopt this recommendation may receive CRS credit up to 40 points.

Recommendation 13 - Restrict activities allowed in wetland and stream buffers to those that do not increase impervious surfaces.

Risks addressed:

- Risk to new structures
- Risk to existing structures and property
- Ecological risk

Advantages to this approach are that it would reduce flood damage, minimize the increase in runoff/flood peaks, maintain flood storage capacity, and protect natural and beneficial functions. The disadvantage is that it would have land use implications.

Recommendation 14 - When Shoreline Management Programs are updated, incorporate Shoreline Management Program guidelines for flood hazards.

Risks addressed:

- Risk to new structures
- Risk to existing structures and property
- Ecological risks

This approach would provide natural and beneficial functions and maintain flood storage capacity.

Recommendation 15 - Include “associated wetlands” as part of the shoreline management zone.

Associated wetlands are those wetlands that are in proximity to rivers or streams that are subject to the Shoreline Management Act and either influence or are influenced by such waters. Factors used to determine proximity and influence include but are not limited to: location contiguous to a shoreline waterbody, presence of a surface connection including through a culvert, location in part or whole within the 100 year floodplain of a shoreline, periodic inundation, and/or hydraulic continuity.

Including associated wetlands as part of the shoreline management zone would address ecological risk by protect natural and beneficial functions and maintaining flood storage capacity.

Risk addressed:

- Ecological risks

This approach would have land use implications.

Jurisdictions should be eligible for more CRS credits for open space, buffers, etc.

**“Ideal” Recommendations**

The regulatory work group has identified five recommendations that would provide greater benefits to citizens and structures in the basin, but that may not be acceptable for some jurisdictions. The work group still recommends these regulatory changes, but acknowledges that they are ideals. “Ideal” recommendations may be implemented in some jurisdictions but not in others. Jurisdictions could also take smaller steps toward these recommendations over time.

“Ideal” Recommendation 1 - Require compensatory storage for fill in the floodplain. Consider a 1:1 or 1.5:1 requirement for storage.

Risks addressed:

- Risk to new structures
- Risk to existing structures and property

This approach would offset the loss of flood storage capacity and reduce downstream impacts. However, it would require additional design and construction costs as well as additional land area to implement. Compensatory storage may be effective in all situations, but may work on specific sites.

The City of Centralia has included this requirement in its latest floodplain management regulations.

Jurisdictions that adopt this recommendation would receive CRS credit up to 80 points.

“Ideal” Recommendation 2 - Adopt a zero-rise policy in the floodplain.

A zero-rise policy would mandate that development proposals and alterations shall not reduce the effective base flood storage volume or conveyance capacity of the floodplain.

Risks addressed:

- Risk to new structures
- Risk to existing structures and property

This approach would reduce the impacts of lost conveyance capacity on structures upstream of a project and would reduce downstream impacts by requiring the mitigation of lost floodplain storage. However, it would require additional design and construction costs as well as additional land area to implement. It would also require additional regulatory review.

No jurisdictions in the Chehalis River basin have adopted this requirement. King County includes this in its floodplain regulations as a conveyance standard.

Jurisdictions that adopt this recommendation would receive CRS credit up to 200 points.

“Ideal” Recommendation 3 - Restrict development in the floodplain, requiring all development proposals to acquire a special permit or reasonable use exception.

Risks addressed:

- Risk to new structures
- Risk to existing structures and property
- Ecological risk

The review associated with a special permit or reasonable use exemption allows jurisdictions to more specifically regulate the type and location of development in the floodplain. This approach would maintain flood storage capacity, but would require additional regulatory review and additional cost to developers.

Thurston County and the Chehalis Tribe use this approach to managing development in the floodplain.

“Ideal” Recommendation 4 - Require new streets in the floodplain to be at or above base flood elevation

Risks addressed:

- Health and safety
- Emergency management costs
- Reduced risk to utilities located within the public right-of-way

It would allow emergency vehicle access during flood events. Disadvantages include additional construction costs and the possibility that roads could act as dikes unless properly designed to allow water to pass through. This recommendation may be less feasible in rural areas.

Jurisdictions that adopt this recommendation would receive CRS credit up to 100 points.

“Ideal” Recommendation 5 - Prohibit the storage of hazardous materials in the floodplain or require that such materials be stored above the flood protection elevation for residential structures.

Risks addressed:

- Health and safety
- Ecological risk
- Emergency management costs

The advantage this approach provides is reduction of pollution of floodwaters. The disadvantage is that it would be difficult to enforce.

Lewis County prohibits storage of hazardous materials in the floodplain and Thurston County requires that they be stored 2 feet above BFE.

### **Next Steps**

The regulatory work group will present these recommendations at the January 21, 2010 work session for Flood Authority review and discussion. The recommendations will then become part of the revised Comprehensive Flood Hazard Management Plan.

The Flood Authority can recommend these regulatory changes to its member jurisdictions. Member jurisdictions should carefully consider these changes when they update their regulations. When a sustainable governance structure, such as a Flood Control District or Flood Control Zone District, is formed, it will have a greater ability to encourage member jurisdictions to adopt recommended regulations.

### **Acronyms**

The following acronyms were used in this document.

BFE	base flood elevation
CRS	Community Rating System
FEMA	Federal Emergency Management Agency
NFIP	National Flood Insurance Program