

LEWIS COUNTY
COMPREHENSIVE FLOOD
HAZARD MANAGEMENT PLAN

Prepared for
Lewis County, Washington
January 2009

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LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

EXECUTIVE SUMMARY

This document is the 2008 Lewis County (County) Comprehensive Flood Hazard Management Plan (CFHMP). The County's last CFHMP was adopted in 1994, and updated in 2001. Recent concern over major flooding events, evolution of the Corps proposed flood control project in the Chehalis River Basin, and a lack of clearly articulated flood hazard management policies prompted the County to create this new CFHMP, rather than continue modifications to the older plan.

During plan development, the project team followed planning process guidelines from the Federal Emergency Management Agency (FEMA) and Ecology, including RCW Chapter 86.26 "State Participation in Flood Control Maintenance." A Project Advisory Committee (PAC) guided development of the CFHMP. The PAC included members from the County, Washington State Department of Ecology (Ecology), cities and utilities.

Recently, with the backing of state legislators, local elected officials resumed basin flood control discussions and formed the Chehalis River Basin Flood Authority (Flood Authority) through an interlocal agreement. The Flood Authority will help guide basin-wide flood hazard mitigation planning and projects until such time as a Flood Control District is formed.

The policies presented in Chapter 2 are one of the most significant components of this CFHMP. These policies were refined over numerous PAC meetings and through presentation to and discussion with County and local city elected bodies. Implementation of these new and updated policies will assist in minimizing the impacts of flooding. The policies are organized according to the following categories: hazard identification; education and outreach, planning, regulations and development standards, corrective/mitigation actions, infrastructure, and emergency services.

Mitigation strategies, proposed projects, and solutions are presented in the Chapter 2 recommended actions for policy implementation and in Chapter 3. The intent is for the County to proactively identify potential flood problems before they occur and take measures to mitigate the adverse impacts of development. The PAC identified and ranked fifteen projects. The initial five highest ranked projects include further channel migration zone mapping, updating hazard data sets and maps, headwaters flood warning and alleviation, alleviating flooding along Interstate 5, and creating regional floodplain storage and detention facilities.

Chapter 4 describes potential funding sources at the state and federal level. These sources include the National Flood Insurance Program and the Flood Control Accounts Assistance Program through Ecology among others. Washington State helps local jurisdictions coordinate with both of these programs.

The County can also reduce flood insurance costs for local policy holders by implementing activities related to the National Flood Insurance Program's Community Rating System. This is described in Chapter 5. Lewis County is currently ranked a Class 7 and residents therefore receive a 15 percent discount on flood insurance rates.

Chapters 6 and 7 contain flood-related background information such as flooding history, planning area descriptions, and existing conditions and policies. These chapters serve as background information for the policies, strategies, and recommended actions proposed in the earlier chapters. Most of the information in these chapters is based on data from the 2001 CFHMP updates.

VOLUME A

LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

1. INTRODUCTION

1.1 Purpose and Goals

A Comprehensive Flood Hazard Management Plan (CFHMP) is a planning document that presents information about existing streams, rivers, land uses, and regulations related to flood hazards; identifies goals for flood hazard reduction consistent with the needs of residents, businesses, and neighboring jurisdictions; and identifies flood hazards, evaluates alternative solutions, and recommends future projects or program modifications to address these hazards.

This CFHMP serves two primary purposes: 1) to provide a road map for flood control/alleviation activities and 2) to ensure Lewis County eligibility for flood hazard reduction funding. As part of the road map, this CFHMP contains a priority listing of flood control/alleviation activities and for the Chehalis, Nisqually, and Cowlitz river basins, with an emphasis on the more densely populated Chehalis and Centralia regions.

In order to achieve these overall objectives, the 2001 CFHMP amendment listed eight goals. The following eight goals were reviewed and agreed upon by the PAC members:

1. Reduce public safety impacts of flood hazards
2. Protect County emergency responders from flood-related hazards
3. Reduce flood damage to public and private properties
4. Reduce flood-related financial impacts to public and commerce
5. Reduce long-term flood control costs to Lewis County
6. Avoid the public subsidy of private developments
7. Avoid activities that cause flooding of downstream neighbors
8. Minimize adverse environmental or natural resource impacts of County flood-related activities

During the planning process, the PAC met with stakeholders to organize a means to reach their goals. These goals are to be accomplished through the following short-term objectives:

1. Define and adopt County flood policies consistent with a basin-wide approach
2. Work in concert with other land use regulations
3. Ensure new development results in no adverse impact to developed and undeveloped properties
4. Encourage voluntary efforts to restrict development within hazardous areas
5. Focus on non-structural measures
6. Improve coordination between public agencies, the public, and adjacent jurisdictions through the Flood Authority
7. Facilitate access to funding
8. Prioritize public education
9. Alert the public to critical areas and their functions
10. Improve understanding of flood hazard causes and impacts of decisions (e.g., land use)
11. Recognize that water quantity, quality, and in-stream habitat are related

12. Promote development and dissemination of better quality flood hazard data

Although individual municipalities may have their own policies and plans, this plan was created in cooperation with many of the cities in the County. The following cities plan on adopting this plan: Centralia, Chehalis, Morton, Mossyrock, Pe Ell, Toledo, Vader, and Winlock.

Lewis County has created similar plans in the past. Lewis County adopted a CFHMP in 1994, and updated it in 2001. However, major flooding events in 1996 and 2007, combined with population growth necessitated a complete revision. Up-to-date flood plans are a growing requirement for public funding. A Comprehensive Flood Hazard Management Plan is required for funding from the State of Washington. The State of Washington requires that each public entity desiring state financial assistance for flood control maintenance develop a CFHMP. Up to 75 percent of the funding for such plans is available through the Flood Control Assistance Account Program (FCAAP). FCAAP was established under the authority of the Revised Code of Washington (RCW) Chapter 86.26, "State Participation in Flood Control Maintenance." The Washington Department of Ecology (Ecology) is responsible for administering the program, as described in Washington Administrative Code (WAC) Chapter 173-145, "Administration of the Flood Control Assistance Account Program." Once this plan has been approved by Ecology, the County is eligible to apply for 50 percent grant funding from the state to implement activities and projects in its plan.

Other funding programs include the Federal Emergency Management Agency's (FEMA) Flood Mitigation Assistance (FMA), Hazard Mitigation Grant Program (HMGP), Repetitive Flood Claims (RFC) and Severe Repetitive Loss (SRL) programs and several flood control programs of the U.S. Army Corps of Engineers (USACE). FEMA's National Flood Insurance Program (NFIP) does not provide funding to implement local programs but it helps provide insurance and the state to provide technical assistance.

1.2 Plan Organization

This remainder of this Plan is organized into two volumes. Volume A consists of the following chapters:

- Chapter 2 presents the County's new floodplain management policies. Each policy includes a policy statement, a description of the problem the policy is intended to address, and recommended actions to implement the policy.
- Chapter 3 contains descriptions and initial rankings of proposed projects. This Section is formatted so that projects can be removed and added easily for plan updates.
- Chapter 4 identifies many of the potential funding sources. This list is not meant to be exhaustive but is intended to provide direction and information for County staff working to identify project funding sources.
- Chapter 5 describes the City's current Community Rating System (CRS) rating.

Volume B includes the following chapters:

- Chapter 6 provides an overview of previous flooding and flood hazards. This Chapter also describes previous flood reduction projects.
- Chapter 7 describes the current flood reduction and warning systems. Many of these systems and activities discussed here would be affected by the new policies presented in Section 2.
- Chapter 8 describes planning area characteristics such as land use, surface water, geology, and climate.

1.3 CFHMP Requirements

The requirements of a CFHMP, as defined in RCW Chapter 86.26, are to: 1) determine the need for flood control work, 2) consider alternatives to instream flood control work, 3) identify and consider potential

impacts of instream flood control work on the state's instream resources, and 4) identify the river's floodway. As long as these requirements are met, the entity preparing the plan has much leeway to individualize its plan to meet its individual needs. Each river basin in the state is unique, both in physical characteristics and in the management approach being applied to that basin, so solutions to flood problems can also be unique. Specific elements of the plan, as outlined in WAC Chapter 173 145, are as follows:

1. Determination of the need for flood control work
 - a. Description of the watershed
 - b. Identification of types of watershed flood problems
 - c. Location and identification of specific flood problem areas
 - d. Description of flood damage history
 - e. Description of potential flood damages
 - f. Short-term and long-term goals and objectives for the planning area
 - g. Descriptions of rules that apply within the watershed, including but not limited to local shoreline management master programs, and zoning, subdivision, and flood hazard ordinances
 - h. Determination that the instream flood control work is consistent with applicable policies and rules.
2. Alternative flood control work
 - a. Description of potential measures of instream flood control work
 - b. Description of alternatives to instream flood control work
3. Identification and consideration of potential impacts of instream flood control work on the following instream uses and resources:
 - a. Fish resources
 - b. Wildlife resources
 - c. Scenic, aesthetic, and historic resources
 - d. Navigation
 - e. Water quality
 - f. Hydrology
 - g. Existing recreation
 - h. Other resources
4. Area of coverage for the comprehensive plan shall include, at a minimum, the area of the 100-year floodplain within a reach of the watershed of sufficient length to ensure that a comprehensive evaluation can be made of the flood problems for a specific reach of the watershed. The plan may or may not include an entire watershed. Comprehensive plans shall also include flood hazards not subject to riverine flooding such as areas subject to coastal flooding, flash flooding, or flooding from inadequate drainage. Either the meander belt or floodway shall be identified on aerial photographs or maps that will be included with the plan.
5. Conclusion and proposed solution. The CFHMP must be finalized by the following actions from the appropriate local authority:
 - a. Evaluation of problems and needs

- b. Evaluation of alternative solutions
 - c. Recommended corrective actions with proposed impact resolution measures for resource losses
 - d. Corrective action priority
6. A certification from the state Department of Community, Trade, and Economic Development that the local emergency management organization is administering an acceptable comprehensive emergency action plan.

1.4 Planning Process

This plan was developed under the guidance of the Planning Advisory Committee. The PAC followed a standard 10-step process (Figure 1-1) based on guidance and requirements of FEMA and Ecology. The PAC was established in May 2005 and consists of a core group of permanent members from the County, Ecology, cities, residents, and other stakeholders. Table 1-1 includes a complete list of PAC members. They have an advisory role, without formal decision-making or approval responsibilities. The PAC meetings were advertised by email to the PAC members. The PAC met five times between June 2005 and March 2008. The dates, attendees and meeting minutes are included in Appendix 1.

Table 1-1. PAC Members	
Organization	Name
CEDS	Mark Cook
Chehalis River Council	Duwayne Rader
City of Centralia	Emil Pierson
City of Chehalis	Bob Nacht
City of Morton	James Gerwig
City of Pe Ell	Don Webster
City of Toledo	Charles Brown
City of Toledo	Don Cravens
City of Toledo	Jerry Pratt
Confederated Tribes of the Chehalis Reservation	Glen Connelly
Department of Ecology	Kevin Farrell
Friends of the Cowlitz	Dave Becker
LC Community Development	Fred Chapman
LC Emergency Mgmt	Gene Seiber
LC Public Works	Shirley Kook
Tacoma Power	Dean McLeod
USACE, Portland	Les Miller
USACE, Seattle	Eric L. Winters
USACE, Seattle	Cathie Desjardin
USACE, Seattle	Steve Wright
WSDOT	Richard Hawkins

The PAC was tasked with creating possible groups of policies and projects to be examined in this plan. The PAC met to discuss and create draft policies. The draft policies were then presented to many of the cities and entities for comments. Projects were derived from Lewis County complaint records and interviews with maintenance staff and municipalities. After review by Lewis County staff, this CFHMP was presented to the PAC.

In 2008, as this document was nearing completion, local elected officials resumed basin flood control discussions and formed the Chehalis River Basin Flood Authority (Flood Authority) through an interlocal agreement. Signatories to the interlocal agreement include Lewis, Thurston, and Grays Harbor counties, the cities of Aberdeen, Centralia, Chehalis, and Montesano, the towns of Bucoda and Pe Ell, and the Confederated Tribes of the Chehalis Reservation. The Flood Authority will help guide basin-wide flood hazard mitigation planning and projects until such time as a Flood Control District is formed.

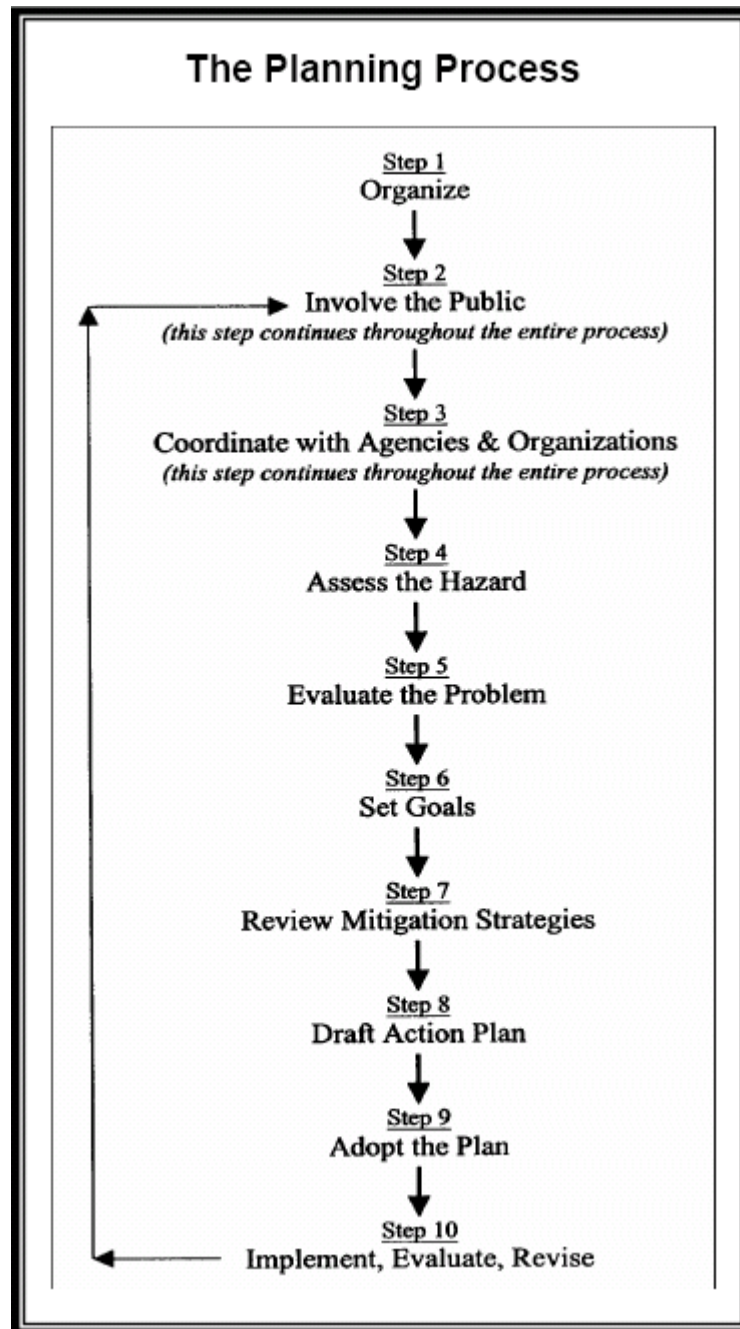


Figure 1-1. PAC Planning Process

While the PAC meetings were not open to the public, the public did have several opportunities to weigh in on the CFHPM during presentations to the city councils. Before this document is finalized the public will have an additional opportunity to comment.

1.5 Definitions and Acronyms

Definitions for frequently used terms and acronyms referenced in this report are provided below.

1.5.1 Definitions

Aggradation	The process of increasing elevation of the stream bed by sediment deposition.
Alluvium	Sediments deposited from water in river beds, on floodplains, and in lakes.
Area of shallow flooding	Designated AO or AH Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to 3 feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and velocity flow may be evident. AO is characterized by sheet flow and AH indicates ponding.
Backwater effect	A buildup of water caused either by forcing streamflow through a constriction, such as undersized culvert, or by damming the flow. Backwater effects can also be created in many tributary streams during some storm events when main stem channel flows reach sufficiently high elevations to prevent tributary flows from entering the main channel.
Base flood	The flood having a 1 percent chance of being equaled or exceeded in any given year. Also referred to as the “100-year flood.” Designation on maps always includes the letters A or V.
Channel migration	The lateral (side-to-side) movement of the channel.
Chehalis River Basin Flood Authority	See Flood Authority
Critical facility	A facility for which even a slight chance of flooding would be too great. Critical facilities include but are not limited to schools, hospitals, police, fire and emergency response installations, nursing homes, and installations that produce, use, or store hazardous materials or hazardous waste.
Designated floodway	Regulatory floodway which has been delineated on the Flood Insurance Rate Map or the flood boundary-floodway map of a community’s Flood Insurance Study and is included in the community’s flood damage prevention ordinance.
Development	Any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations located within the area of special flood hazard.
Drainage district	An active drainage district as provided in RCW Chapters 85.06 and 85.38.
Flood or flooding	A general and temporary condition of partial or complete inundation of normally dry land areas.
Flood Authority	A newly created group consisting of three counties, (Grays Harbor, Thurston, and Lewis), that work jointly at addressing flood issues basin wide.
Flood Insurance Rate Map	Official map on which the Federal Insurance Administration has delineated both the areas of special hazards and the risk premium zones applicable to the community.
Flood Insurance Study	The official report provided by the Federal Insurance Administration that includes flood profiles, the flood boundary-floodway map, and the water surface elevation of the base flood.
Flood protection elevation	One foot above the base flood elevation. This is a higher regulatory standard than federally mandated.

Floodway	The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than 1 foot.
Meander bends	Series of regular, loop-like bends in the course of a stream channel, typically occurring within the lower gradient of the stream. They end to migrate laterally across the width of the valley bottom and floodplain.
Mitigation	<p>The avoidance, minimization, or compensation for adverse critical area impacts:</p> <ul style="list-style-type: none"> • Avoid the impact altogether by not taking a certain action or parts of an action • Minimize impacts by limiting the degree or magnitude of the action and its implementation, using appropriate technology, or taking affirmative steps to avoid affirmative steps to avoid or reduce impacts • Rectify the impact by repairing, rehabilitating or restoring the affected environment • Reduce or eliminating the impact over time by preservation and maintenance operations during the life of the action • Compensate for the impact by replacing, enhancing, or providing substitute resources or environments • Monitor the impact and taking appropriate corrective measures. Mitigation for individual actions may include a combination of the above measures
New construction	Structures for which the “start of construction” commenced on or after the effective date of the ordinance codified in this chapter.
Public agency	Any agency, political subdivision, or unit of local government of this state including but not limited to municipal corporations, special purpose districts, and local service districts; any agency of the State of Washington, the U.S., or any state thereof; or any Indian tribe recognized as such by the federal government.
Public facilities	Buildings or uses of land, whether owned or leased, operated by a public agency for such purposes as providing places for public assembly and recreation, operating services of benefit to the public, or for the administration of public affairs.
Public services	Fire protection and suppression, law enforcement, public health, education, recreation, environmental protection, and other governmental services.
Public use	Any area, building, or structure held, used, or controlled exclusively for public purposes by any department or branch of any government, without reference to the ownership of the building or structure or of the land upon which it is situated.
Public utility	Business or service, either governmental or having appropriate approval from the state, which is engaged in regularly supplying the public with some commodity or service that is of public consequence and need such as electricity, gas, water, transportation, or communications.
Sediment	Solid material that is in suspension, is being transported, or has been moved from its site of origin.

Special flood hazard area	An area subject to a base of 100-year floods; areas of special flood hazard are shown on a flood hazard boundary map or Flood Insurance Rate Map as Zone A, AO, A1-30, AE, A99, AH, VO, V1-30, VE, V, or High Ground Water Flood Hazard Areas Resource Map on file with the Development Services Department.
Variance	A grant of relief from the requirements that would otherwise be prohibited.
Wellhead Protection Area, Designated	Surface and subsurface area surrounding a water well or well field, supplying a public water supply system with over 1,000 connections, through which contaminants are reasonably likely to move toward and reach such well or well field within 1, 5, and 10 years. A designated wellhead protection area is an area for which the water purveyor has adopted a wellhead protection plan and the plan has been approved by the Washington State Department of Health.

1.5.2 List of Acronyms and Abbreviations

ABFE	Advisory Base Flood Elevation
ASFPM	Association of State Floodplain Managers
BOCC	Board of County Commissioners
BFE	Base Flood Elevation
BNSF	Burlington Northern & Santa Fe Railway
BMP	Best Management Practices
CDR	Chehalis Development Regulations
CEMP	Comprehensive Emergency Management Plan
CFHMP	Comprehensive Flood Hazard Management Plan
cfs	cubic feet per second
CMC	Centralia Municipal Code
CMZ	Channel Migration Zone
CSODEM	County Sheriff's Office Division of Emergency Management
USACE	U.S. Army Corps of Engineers
CRS	Community Rating System
CTP	Cooperating Technical Partners
DEM	Department of Emergency Management
DFIRM	Digital Flood Insurance Rate Maps
DFW	Washington Department of Fish and Wildlife
DNR	Department of Natural Resources
EAS	Emergency Alert System

Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EOC	Emergency Operations Center
ESA	Endangered Species Act
FAC	Flood Action Council
FCAAP	Flood Control Assistance Account Program
FEMA	Federal Emergency Management Agency
FHZ	Flood Hazard Zone
FIS	Flood Insurance Study
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
GIS	Geographical Information System
GMA	Growth Management Act
HMGP	Hazard Mitigation Grant Program
HPA	Hydraulic Permit Approval
ICC	Increased Cost of Compliance
JARPA	Joint Aquatic Resources Permit Application
LAMIRD	Limited Area of More Intense Rural Development
LCC	Lewis County Code
LCFCD	Lewis County Flood Control District
LCPUD	Lewis County Public Utility District
LCWD	Lewis County Water Districts
LiDAR	Light Detection and Ranging
LOMA	Letter of Map Amendment
LOMR	Letter of Map Revision
MOU	Memorandum of Understanding
MPA	Migration Potential Area
NAI	No Adverse Impact
NAWAS	National Warning System
NGVD	National Geodetic Vertical Datum
NFIP	National Flood Insurance Program
NOAA	National Oceanic Atmospheric Agency

NWI	National Wetlands Inventory
NWS	National Weather Service
PAC	Planning Advisory Committee
PDM	Pre-Disaster Mitigation
PED	Preconstruction Engineering and Design
PHA	Probable Hazard Area
RCW	Revised Code of Washington
RFC	Repetitive Flood Claims
RL	Repetitive Loss
SCS	Soil Conservation Service
SEPA	State Environmental Policy Act
SMP	Shoreline Master Program
SRL	Severe Repetitive Loss
UBC	Uniform Building Code
UGA	Urban Growth Area
USACE	United States Army Corps of Engineers
USGS	United States Geological Service
USFS	U.S. Forest Service
WAC	Washington Administrative Code
WDFW	Washington State Department of Fish and Wildlife
WMA	Watershed Management Act
WRIA	Watershed Resource Inventory Area
WSDOT	Washington State Department of Transportation
WWTP	Wastewater Treatment Plant

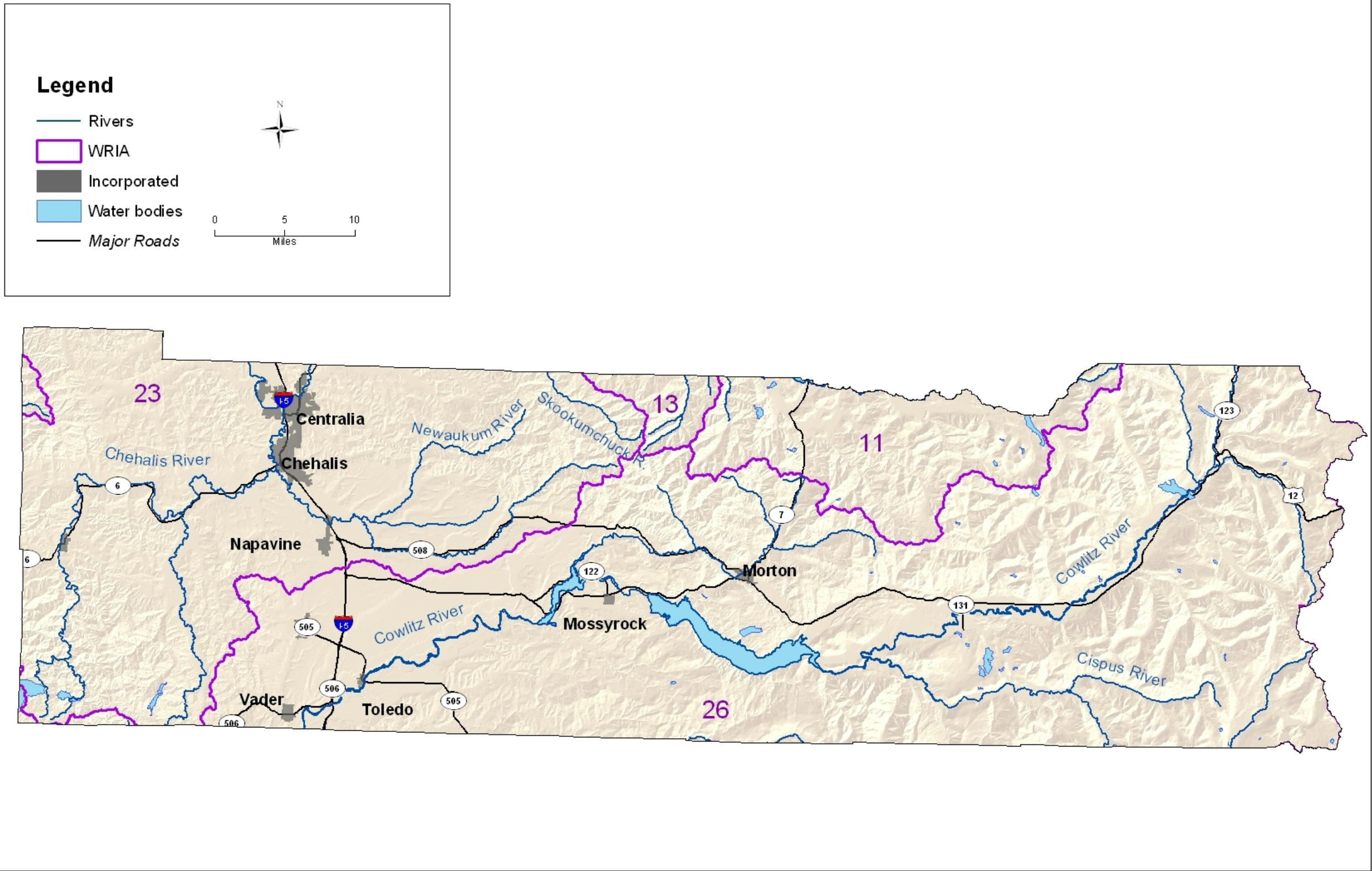


Figure 1-2. Lewis County Map

LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

2. POLICIES

2.1 Policy Introduction

New flood hazard management policies are needed to minimize future impacts of flooding to Lewis County communities. The policies presented in this Chapter are intended to reduce flooding in areas that have already been developed or will be developed in the future. These policies were developed based on County staff recommendations from the 2004 update to the 1994 CFHMP and recent interviews with the PAC and other stakeholders. The policies in this Plan will be updated over time to ensure consistency with recommendations from the newly created Flood Authority for addressing flood issues basin-wide.

2.2 Policy Structure

The policies are divided into seven categories:

- Hazard identification (HI)
- Education and outreach (EOT)
- Planning (PLN)
- Regulations and development standards (RDS)
- Corrective (mitigation) Actions/Repetitive Loss (CARL)
- Infrastructure (INF)
- Emergency services (ES)

The structure under each policy header is as follows:

- Policy statement: Description of policies the County established to reduce flood hazards
- Problem statement: Each policy is derived from a problem or a series of problems associated with flooding
- Recommended action(s): A description of how the County may implement the policies

2.3 Hazard Identification

Hazard identification includes mapping the locations of various hazard types.

2.3.1 Policy HI-1

Policy Statement

The County and participating communities should work with FEMA, via the Cooperating Technical Partners (CTP) Program to be a full participant in the Lewis County re-mapping initiative that is currently starting and to ensure that the entire County, including incorporated jurisdictions, is remapped in a digital environment

using new Light Detection and Ranging (LiDAR) generated terrain data. The County should establish a mapping update and maintenance program that includes mapping of other flood related hazards. The County should also work with other agencies (e.g. USGS and FEMA) to calculate and maintain up-to-date flood recurrence frequency information for key gage locations..

Problem Statement

The FEMA Flood Insurance Rate Maps (FIRM) for Lewis County and its incorporated cities contain outdated flood hazard data from old flood studies and were developed using manual cartographic techniques, limiting their utility in a digital geographic information systems (GIS) environment or access by multiple users. Furthermore, many areas in the County have developed properties in unmapped flood-prone areas. Since these areas have not been mapped, the County's options for regulating development and accessing financial assistance for mitigation activities are limited.

FEMA is in the process of modernizing its flood hazard maps by producing geo-referenced digital GIS-based flood maps over orthophoto base maps – Digital Flood Insurance Rate Maps (DFIRM). Lewis County should contribute to this program by providing digital topographic data that will be useful in redelineating existing floodplains. The cornerstone of FEMA's mapping program is the CTP initiative. The County's participation in the CTP initiative may help leverage federal dollars, encourage "ownership" in the end product, and provide buy-in on maintenance and ongoing improvements.

While creating the DFIRMs is a necessary step in hazard identification, the DFIRMs as produced by FEMA depict only flood inundation areas for the 100- and 500-year flood events. However, Lewis County has many other hazards related to riverine flooding, such as channel migration zones (CMZ), which are not adequately mapped. Also, in the developing urban growth areas (UGA), changes to flooding conditions due to increased impervious surfaces in the near future will be significant and ongoing. Additionally, there are unmapped areas behind levees and in dam breach inundation areas that are not shown as flood prone, resulting in a false sense of security and, in some cases, unwise development.

Recommended Actions

- The County and participating communities should work with FEMA and the Flood Authority to conduct a detailed needs assessment; supplement the needs assessment conducted by Ecology; and identify areas in need of first time studies, restudies, and where redelineation on better topographic data would be sufficient.
- The County will include CMZs and other critical areas as informational layers in the DFIRM database. Additionally, the mapping will incorporate new hydraulic analysis resulting from the proposed USACE flood control projects on the Chehalis River. The County and participating communities should work with FEMA to include dam and levee breach inundation areas as an informational layer in the DFIRM database
- The County should make the DFIRMs and other layers, along with all supporting data (e.g., flood recurrence frequencies), available to the public via its website. The County should serve as a clearing house for new flood data developed after the DFIRMs become effective. This would help with consistent and timely updates of the DFIRMs in the future.

2.4 Education, Outreach and Communication

Education, outreach, and communication include education of both County staff and residents, informing residents of hazards, and increased communication between residents, County staff, and other entities.

2.4.1 Policy EOT-1

Policy Statement

Lewis County and participating communities should develop a program of training for all floodplain management stakeholders through emergency management services, with support from FEMA, Ecology, and others. The County should further sponsor one or more County and city regulatory official to take training and to take the Certified Floodplain Manager (CFM) exam each year.

Problem Statement

The general public often misunderstands the NFIP and other flood loss reduction activities, and flood-prone residents are often not aware of available mitigation programs. It is difficult for residents to learn the facts because floodplain information is not in an accessible location and professional groups (for example surveyors, realtors, insurance agents, etc.) deal with the program infrequently and may provide misleading advice.

More information and trained human resources need to be available for residents and communities to understand and administer the regulations and to provide mitigation support (e.g., benefit/cost analysis for project applications). The need for training is recognized in the County's existing policies; however, the focus is on the need for public education. Public education is necessary, but an additional need is for County staff and participating communities to participate in regularly organized training.

Recommended Actions

- The County should encourage County and city staff that administer NFIP regulations and grant program to seek training at FEMA's Emergency Management Institute.
- The County should provide annual training and/or public educational materials for the public on flood hazards, risks of development in floodplains, NFIP regulations and flood mitigation programs.
- The County, through compliance with its CRS requirements, will continue annual mailings to flood-prone residents and placing flood information materials at local libraries.
- The County should create a floodplain management web page with enhanced flood warning information capabilities.

2.4.2 Policy EOT-2

Policy Statement

The County and participating communities will establish a regional multi-jurisdictional floodplain management organization for all incorporated jurisdictions to assist in administering floodplain management programs.

Problem Statement

Many small communities depend on the County and participating communities to provide significant assistance with enforcing their floodplain ordinances. The County lacks the human and financial resources to meet the demand for assistance, but has a desire to ensure that the ordinances are properly administered. Resources are currently prioritized on an as needed, as available basis.

Recommended Actions

The County has established a multi-jurisdictional floodplain management organization called the Chehalis River Basin Flood Authority. This organization shall help blend and direct policies and projects that are proposed within the boundary of the Flood Authority.

2.4.3 Policy EOT-3**Policy Statement**

The County should maintain a data inventory of properties located in the floodplain and the CMZ. This inventory should be made available to the public.

Problem Statement

Property owners and potential buyers require potential hazard information to support responsible decision making about real estate transactions and insurance purchase.

Recommended Action

The County will continue to maintain, and provide to the public as requested, an inventory of properties located in the floodplain and the CMZ, using DFIRMs and parcel data.

2.5 Planning and Linking Floodplain Management Programs to Other Plans

Planning and linking floodplain management programs to other plans includes incorporating planning efforts within the County and between entities to increase efficient use of resources and share information.

2.5.1 Policies PLN-1 and PLN-2**Policy Statement**

PLN-1. Future updates of the CFHMP shall consider the impact of UGA development on floodplain land use.

PLN-2. Lewis County, through the Flood Authority should seek to establish inter-local agreements with all cities to address floodplain development consistency.

Problem Statement

UGAs are generally established to prevent sprawl and protect natural resources and the rural character of the County. A sometimes unfortunate secondary affect is density of new development in hazard areas.

To compound the problem, there is inconsistent application of floodplain development regulations in the UGAs. For example, the County has an interlocal agreement with Centralia addressing floodplain development in the UGA. There are no such agreements with the other cities.

Existing policy focuses on the positives of UGAs and does not adequately address secondary negative impacts related to potential increases in flooding.

Recommended Actions

The County shall establish model guidance through the Flood Authority for rural and urban cities to incorporate similar provisions in their Comprehensive Plans.

2.5.2 Policy PLN-3**Policy Statement**

Lewis County and participating communities should develop and continuously maintain a web-based water resources database in connection with its existing web location for gauge data and road closures. The County should continue to identify opportunities to add gauges to tributaries and smaller rivers. As part of this approach, the County may enter into agreements with the incorporated municipalities to serve as the County clearinghouse for hydrologic and hydraulic data derived from development proposals, and should define data collection standards for the system.

Problem Statement

Collection of hydrologic data plays an important role in all of the County's floodplain management activities. It provides the basis of design criteria for capital improvement projects, provides thresholds for maintenance activities, and helps in mapping floodplains. In addition, real time rain gauge and stream flow gauges aid in flood forecasting and in making operational decisions during rainfall events. This information is also transmitted to the National Weather Service for tracking storms and to assist in the issuance of Special Weather Statements (e.g., flash flood watches and warnings). These data are also used by Emergency Management and Public Works to monitor and prepare for road closures. Rainfall and streamflow gauges do not adequately cover the entire County geographically. Data collection and monitoring on the smaller tributaries in the County are lacking, as is a means of capturing data consistently among jurisdictions.

Recommended Actions

- The County should create new gauges and update existing gauges with additional capabilities as funding becomes available. New gauges should be placed on other major tributaries within the Centralia-Chehalis area. The Newaukum gauge near Chehalis should be updated with telephone-linked capabilities. The County should ensure that the gauge at South Fork Chehalis is telephone-linked.
- The County should create a storage location for all of the new and old information.

2.5.3 Policy PLN-4**Policy Statement**

Lewis County, through the Flood Authority, should align with other interested counties and cities to investigate and pursue legislative solutions that would allow the County to coordinate with state regulatory agencies and industry to ensure that impacts to flooding conditions and water quality from natural resource extraction activities are minimized through best management practices (BMP). The basin planning process outlined in PLN-6 would provide a foundation of data for this legislative initiative by documenting where such impacts may be occurring.

Problem Statement

The County has no direct authority or control over industry activities on resource lands. Current policy does not address the need to work with these industries to ensure that flooding conditions to developed properties and water quality are not exacerbated due to their operations. There are no mechanisms in place for the

County to work with state agencies that do have regulatory oversight of activities on these lands to ensure that adverse impacts are minimized.

Recommended Actions

The County and participating communities should solicit the Washington State Association of Counties for assistance in exploring legislation to include County input to agency permit reviews for projects on resource lands.

2.5.4 Policy PLN-5

Policy Statement

The County will identify Channel Migration Zones, (CMZs) as critical areas in its 2009 Critical Areas Ordinance update. The County will also develop CMZ regulatory standards for inclusion in its floodplain management ordinance, or other suitable regulatory vehicle. Regulatory development will consider but not be limited to setbacks from CMZ areas, holding development in the areas to the same standards as floodway development, and the use of no-build areas within CMZs.

Problem Statement

The CMZ is the lateral extent of likely movement along a stream reach with evidence of active stream channel movement over the past 100 years. CMZs are also known as floodway fringe areas, and are generally considered to be spatially equivalent to the 100-year floodplain. Common tools used to assess flood hazards, such as FIRMs, do not characterize areas susceptible to channel erosion either within or outside of the areas prone to flooding. FIRMs have limited application in planning areas safe for development because they fall short in portraying the geomorphic hazards that bank erosion may pose to land and structures.

Recommended Actions

- The County will identify potential CMZs.
- The County will conduct preliminary studies to identify CMZ hazard potential.
- The County will include and regulate CMZs as critical areas in its 2009 Critical Areas Ordinance update.

2.5.5 Policies PLN-6 and PLN-7

Policy Statement

PLN-6. The County should use the next and subsequent updates to their Comprehensive Plan as a vehicle for formalizing ongoing surface water management and hazard mitigation planning mechanisms, including multi-objective basin planning, comprehensive flood hazard management planning, and hazard mitigation planning. As multi-objective basin plans and future updates to this CFHMP and the Multi-Jurisdictional Hazard Mitigation Plan are completed, the recommendations and findings of those plans should be incorporated into the Comprehensive Plan.

PLN-7. Lewis County should incorporate the policy recommendations of the 2004 Multi-Hazard Mitigation Plan and the latest revision to the CFHMP into the next update of the Comprehensive Plan, as a “Natural Hazards Sub-Element” and incorporate both plans in their entirety into the appendices of the document. By doing so, the more vague policy statements currently included in the plan would be accompanied by more focused policies and implementation activities that would be put through the public review process and supported by a broader stakeholder group.

Problem Statement

The Lewis County Comprehensive Plan is the overarching policy document from which regulations and programs are developed and decisions are made. Further, it is the planning document most familiar to the broadest audience of stakeholders. A land use element addressing critical areas and growth and preservation is required by the GMA. “Frequently Flooded Areas” are among those that GMA requires to be addressed in the plan. The current plan includes many flood-related policies, many of which are not currently implemented by code or regulation. As many of the rural areas of the County experience growth and development pressure, additional basin planning in many of the smaller basins may become necessary. The plan also weekly addresses the need for basin planning.

Recommended Actions

- The County should seek Board of County Commissioners (BOCC) approval to strengthen the existing hazard mitigation implementation committee to implement the recommendations of this CFHMP and the Multi-Jurisdictional Hazard Mitigation Plan.
- The County should consider readopting the Multi-Jurisdictional Hazard Mitigation Plan with this CFHMP as an incorporated appendix.
- When conducting basin planning, ensure that state stormwater management guidance for all new development is considered and enforced. Evaluate the feasibility of regional stormwater detention facilities to address increased stormwater runoff for development in the basins that occurred prior to implementation of site-specific stormwater management measures.
- Consider natural resource land activities (e.g., clear cutting) during the multi-objective basin planning process.

2.6 Corrective Mitigation Actions

Corrective mitigation actions include proactively planning implementation of programs to reduce future flood damages.

2.6.1 Policies CARL-1 and CARL-2

Policy Statement

CARL-1. Lewis County will establish an annual program for ranking, prioritizing, and selecting repetitive loss (RL) flood-prone properties for elevation in place, or acquisition and demolition. The voluntary program will be based on a set of fair selection criteria, including but not limited to benefit/cost analysis, public benefit, high FEMA claim history, and consistency with other local goals. The program will better position the County for procuring additional grant funding and will provide fair and equitable relief for RL property owners and for the County.

CARL-2. Lewis County will aggressively pursue state and federal grant funding to implement mitigation measures for the prioritized flood-prone properties on an annual basis. Implementation of CARL-1 will be dependent upon the successful procurement of grant funding.

Problem Statement

Lewis County has an active program to elevate or acquire RL properties with grant funding from FEMA. A more comprehensive approach is needed to formalize the process by which properties are prioritized for relief to ensure fairness. Furthermore, a more formalized program is necessary to ensure that access to available funding is maximized. Some properties in the County experience repetitive flooding, but are not

eligible for acquisition funding due to the lack of floodplain mapping in these areas and lack of flood insurance on the structures.

Existing policy recognizes the utility of this mitigation measure and states it as a goal; however, the frequency of flooding and the mapping issues compromises the County's ability to establish a cohesive program. Further, the same issues affect the ranking and prioritization of properties, accessing additional funding, or addressing unmapped properties, which are key to provide fair and equitable relief to repetitive loss property owners and for the County.

Recommended Actions

- The County will obtain FEMA training for at least two County staff. The County will also request that FEMA (potentially for free using disaster funding) provide training to the cities. The County will maintain at least two people with current FEMA training on the staff at all times.
- The County will establish ranking criteria, consistent with FEMA and state approval criteria, and produce a prioritized listing of properties for acquisition.
- The County will establish a procedure for updating the list annually or following a flood event as necessary.

2.6.2 Policy CARL-3

Policy Statement

Lewis County has established baseline data for all known properties that have experienced flooding. Following all future flooding events, the County will update the database during the damage assessment phase to track damages to all FEMA and non-FEMA repetitive loss properties.

Problem Statement

In order to implement the policy identified in CARL-1, it is necessary to identify, track, and maintain a database of RL properties meeting and not meeting FEMA's definition. FEMA defines RL properties as any building having two or more flood insurance claims of \$1000 or more in any consecutive 10-year period since 1978. There are many properties that do not meet FEMA's definition due to lack of coverage in a particular event or no coverage at all due to lack of mandatory purchase requirements in unmapped areas. Many of these properties are more vulnerable to flooding than those in the FEMA inventory. Detailed damage history is required in order to complete a solid Benefit Costs Analysis, which is required for grant funding. Not having damage data may preclude otherwise eligible properties from receiving federal funds. Currently there are no policies related to tracking RL properties.

Recommended Actions

- The County will create a program to catalog all of the known properties that have experienced flooding. This database will be updated after every future flood event that results in disaster declaration.
- The County should also develop a mechanism to inform any RL owners of the availability of funding/programs for elevation or acquisition after each future flooding event.

2.6.3 Policy CARL-4

Policy Statement

Lewis County and participating communities will monitor RL properties for substantial improvements and will complete RL verification forms to keep FEMA lists current. Lewis County will further monitor the performance of substantially improved buildings meeting current NFIP standards after floods.

Problem Statement

RL properties often undergo substantial improvements. It is the duty of the County and all cities participating in the NFIP to monitor all properties for substantial improvement and to require compliance with NFIP ordinances when the threshold is exceeded. Floodplain management regulations are administered inconsistently among the jurisdictions in the County. Properties identified as being RL need to be monitored very closely for substantial improvements, particularly when being repaired post-flood. There are no existing policies (that go beyond the regulatory requirements of the floodplain management ordinance) related to tracking substantial improvements to RL properties.

Recommended Actions

- The County will create a database to track all improvements of RL structures and their performance during storms.
- The County should establish criteria for being substantially approved and should update RL Verification sheets when RL properties meet these criteria.
- The County should maintain copies of improvement and performance spreadsheet in the permit file for each property.

2.6.4 Policy CARL-5

Policy Statement

Lewis County and participating communities should use the CFHMP development process as a vehicle to identify required structural flood control solutions. These projects would be identified and prioritized during the planning process and implemented through the County's annual Capital Improvement Program and coordinated with the Flood Authority. Structural flood control solutions should meet the following conditions:

- There are no feasible alternatives to a structural solution
- It has been demonstrated that all adverse flooding impacts, including those to downstream jurisdictions, have been mitigated
- The project is cost beneficial
- The project is in the public interest
- Endangered species and other environmental impacts have been addressed

Problem Statement

Due to the location of existing development in flood-prone areas, development pressure in UGAs, and the need for certain economic development in conflict with avoiding floodplain development, structural solutions will likely always be a required element of a balanced floodplain management program in Lewis County.

Structural solutions are currently evaluated on an as-needed or as-proposed basis. Existing policies do not address an ongoing Capital Improvement Program to prioritize, rank, and fund necessary flood control projects and do not adequately address possible structural solutions in the more rural areas and smaller cities.

Recommended Actions

- The County should annually examine and reprioritize, as appropriate, the projects listed in Chapter 3 of this CFHMP.
- The County should continue to support flood control projects of other entities such as the USACE , Washington State Department of Transportation (WSDOT), or cities with funds or personnel if deemed appropriate.

2.6.5 Policy CARL-6

Policy Statement

The County should inventory and review all previously installed flood control structures and similar devices designed and installed to protect private property. The screening should include an inspection of what assets are protected and whether the structure is part of a larger system of structures. The County should further determine those structures it has an obligation to maintain. The County should divest responsibility for those structures where there is no obligation on the County to provide maintenance. Where it is determined that there is an obligation, or where it is identified that maintenance is in the best interest of the public, the County should seek easements to access the structures and enter into agreements for their maintenance.

Problem Statement

It is in the County's interest to protect public health and safety, regional economic centers, public and private properties, and transportation corridors. However, some flood control structures protect both private and public property and the County must prioritize its limited funds on the structures that provide the most public benefit. The County must balance public benefit against private loss.

Recommended Actions

- The County should perform a field examination of all flood control devices and create a database of all of the information.
- The County should establish criteria to determine structures that it should be required to protect or maintain. For those structures it determines it should not protect or maintain, the County should contact their owners and provide official notification of its decision to divest.

2.7 Infrastructure

Infrastructure includes planning of placement of public infrastructure.

2.7.1 Policy INF-1

Policy Statement

When planning for and siting all new utility infrastructure, the flood risk to the property that would be serviced by the infrastructure should be considered. Where feasible, no new utilities should be constructed that would lead to increased development of flood-prone lands.

Problem Statement

Providing utility services (e.g., power, water supply, drainage, and sewer) to marginal or flood-prone lands increases the likelihood of development in these areas. This is a potential problem in both urban and rural growth areas.

Recommended Action

The County should consider flooding potential when siting new utility infrastructure.

2.8 Emergency Services

Emergency services include deployment, communication, and coordination during flood events.

2.8.1 Policies ES-1, ES-2, and ES-3

Policy Statement

ES-1. During flood fighting, Lewis County resources should be deployed to protect the following (in priority order):

- Human life and safety
- Public infrastructure and buildings
- Not-for-profit, essential service provider infrastructure
- Private property, when circumstances and resources allow

ES-2. Where there is an imminent threat to public infrastructure or human life and safety, the County may access private property to perform flood-fighting activities. For new development, on lands that contain waterways, the County may seek an easement for emergency situations (e.g., emergency stream clearing) during development permitting. Where the County does engage in flood fight or public safety/infrastructure protection activities on private property, it should either remove any temporary flood control improvements during the recovery phase or apply for project permitting.

ES-3. Distribution of a maintained inventory of sand bags should be prioritized for the protection of life and safety, public infrastructure, and public property. Use of those sand bags and County resources for their deployment should not be made available to the public until it is determined that all public properties have been protected to the extent feasible. The County Sheriff's Office Division of Emergency Management (CSODEM) will be responsible for that decision. The DEM should hold an annual outreach program to encourage the flood-prone public to stock and maintain sand bags in advance of the flooding season.

Problem Statement

Flood fighting is often necessary as a last prevention effort. Although the DEM is identified as the primary first responder, there are a variety of agencies and entities that are involved in the process of flood fighting. There are no clear policies in place to address prioritization of resources, how they should be deployed, and what assets should be prioritized for protection. Clear policies are needed to address the following issues:

- Prioritization of human resources and equipment for flood-fighting activities
- Distribution of sand bags
- Protection of public property versus private property
- Access to private property

Recommended Actions

- The County should develop a list of not-for-profit essential service providers and compile emergency contact information for use during disasters. Not-for-profit essential service providers should be encouraged to provide the County with facility information for use during disaster recovery operations.
- The County should develop criteria to assist emergency response personnel in determining what actions are appropriate when providing assistance to private property during the response and recovery phases.
- The County should provide an annual education program for flood-prone residents on proper use of sand bags.

2.8.2 Policy ES-4**Policy Statement**

During flood events, the use of two-way radios should be limited to critical matters pertaining to disaster response. Personal communications should be limited to land lines and cell phones. Communications necessary for the protection of life and safety should take precedence over communications related to the protection of property. Communications related to the protection of public infrastructure and property should take precedence over communication related to the protection of private property. Communication regarding recovery phase issues should be deferred until after the response phase. The DEM should serve as communications liaison between the Emergency Operations Center (EOC) and field responders.

Problem Statement

During flooding events there are a number of responders communicating via two-way radios, cellular phones, land lines, and other means. Communication systems often become overwhelmed and clogged with non-emergency communications.

Recommended Actions

The County should develop a communication protocol plan and provide training to all County and city responders on new protocol and system upgrades as funding becomes available.

2.8.3 Policy ES-5**Policy Statement**

Lewis County should document and inventory historic road flooding areas and detour routes and coordinate with the State of Washington Department of Transportation (WSDOT) to ensure that road closures are coordinated between agencies. These agencies should use a formalized and updated road closure database linked to the flood stage warning system.

Problem Statement

During flooding events the Public Works Department's Roads Maintenance Division is responsible for closing flooded or damaged County-owned or maintained roads. Road closures are generally initiated when one foot or more of water is covering passable surfaces. Closures are communicated via radio to the DEM, which posts closure information to the County web site. The DEM monitors river gauges and notifies the Public Works Department of water levels. WSDOT is responsible for closing state-owned roadways. The state and County use different means of notifying motorists of road closures and do not coordinate sufficiently to ensure that traffic detours resulting from the closure of one roadway system do not adversely impact local traffic management.

Recommended Actions

- The County should update and formalize a road closure database. Within this database the County should flag areas where road closures frequently occur.
- The County should map detour routes and share routes with WSDOT to assist in efficient detour planning.
- The County should train EOC staff from Roads Division to properly coordinate with state officials.
- The County should purchase dedicated road closure equipment compatible with that used by the state.

2.8.4 Policy ES-6**Policy Statement**

The Public Works Department should co-lead all damage assessment efforts with the DEM. A qualified engineer should accompany all damage assessment teams for the specific purpose of capturing damage data and identifying mitigation opportunities. The Public Works Department should co-lead all post-disaster grant application activities.

Problem Statement

Policy addressing roles and responsibilities in a flood event and post event recovery needs redefining. The DEM is the lead preparedness, response, recovery, and mitigation agency in the County. Post-disaster activities, however, are often better suited to the Public Works Department, which has more technical capability to address flood loss reduction solutions. During post-disaster damage assessment and recovery, there are often missed opportunities to incorporate mitigation into recovery/replacement designs for drainage infrastructure. There could also be missed opportunities for mitigation funding from the FEMA Stafford Act Section 406 mitigation assistance program. Post-event damage assessment procedures at the state and federal level change frequently without adequate training for County responders.

Recommended Actions

- The County should procure on-call service contracts to assist with demand for human resources following a disaster.
- The County should create a database of all known past problem areas. This database should be linked to GIS for easy visual examination.
- The County should update the database after each flood event to ensure that the information is captured for future mitigation grant opportunities.
- The County should assign a staff member to become familiar with the FEMA Stafford Act Section 406 mitigation assistance program and identify potential new mitigation funding opportunities.
- The County should annually send at least two staff members to attend on-line training for preliminary damage assessment training.

2.9 Regulation and Development Standards

Regulation and development standards include writing new regulations and standards as well as revising existing regulations and standards both within the Flood Authority and in the region.

2.9.1 Policy RDS-1

Policy Statement

RDS-1. Lewis County should minimize adverse impacts to conveyance and storage within the floodplain resulting from floodplain development impacts (e.g., relocation of flood paths) by requiring all development in the floodplain to be consistent with federal standards, or as identified and adopted by the Flood Authority.

Problem Statement

Development in the floodplain can affect both the natural habitat and other property owners. Increased development may pave over critical habitat or increase stormwater runoff that is harmful to the flora and fauna. Increased impervious surfaces can also exacerbate flooding and increase damage to other structures.

Recommended Action

The County should develop regulations requiring development in the floodplains to be consistent with federal standard or as adopted and approved through the flood authority.

2.9.2 Policy RDS-2

Policy Statement

Lewis County floodplain regulations as articulated in Ordinance 1145 Flood Hazard Reduction will be consistent with the federal one foot rise regulation and any modifications thereto coming from the Flood Authority. Policies should be reviewed at least annually and updated as needed.

Problem Statement

Losses of flood storage and changes in conveyance characteristics occur as a result of floodplain development. Both the County's and local jurisdictions' existing policy and planning documents meet federal development standards. The policy has existed for many years in local law or regulation.

Recommended Actions

- The County will incorporate any adopted regulation through the Flood Authority language into the next update of the County Floodplain Management Ordinance.
- The County will provide model ordinance language to all NFIP participating local jurisdictions in cooperation with the Flood Authority.
- The County will continue to require hydraulic analysis for all new commercial developments and developments where the impact has an adverse impact to the flood plain.

2.9.3 Policy RDS-3

Policy Statement

Land use regulation in areas identified by the USACE, FEMA, or as approved by Lewis County as critical flow paths should be regulated as floodways.

Problem Statement

Floodway means that portion of the floodplain that is effective in carrying flow, within which this carrying capacity must be preserved and where the flood hazard is generally highest (i.e., where water depths and velocities are the greatest). It is that area that provides for the discharge of the base flood so the cumulative increase in water surface elevation is no more than one foot.

Recommended Action

The County should update regulations to include critical flow paths as floodways.

2.9.4 Policy RDS-4

Policy Statement

Lewis County should update its Floodplain Management Ordinance to include the Increased Cost of Compliance (ICC) insurance provision, substantial damage definition, and other identified deficiencies.

Problem Statement

Once FEMA provides a community with the flood hazard information upon which floodplain management regulations are based, the community is required to adopt a floodplain management ordinance that meets or exceeds the minimum NFIP requirements. The overriding purpose of the floodplain management regulations is to ensure that participating communities take into account flood hazards, to the extent that they are known, in all official actions relating to land management and use. It is often in the interest of the County to create stricter policies than the FEMA standards.

The ICC is insurance coverage that every NFIP policy holder pays for, but which claims against are only available if a community meets certain standards. ICC covers costs, in addition to replacement or repair, that help substantially damaged building owners pay for the cost of complying with new standards. For example, a home receiving \$50,000 damage traditionally receives a claims payment of that amount minus a deductible allowing the owner to repair. Substantial damage is damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. If the cost necessary to fully repair the structure to its before-damage condition is equal to or greater than 50 percent of the structure's market value before damages, then the structure must be elevated (or flood-proofed if it is non-residential) to or above base flood elevation (BFE) and meet other applicable NFIP requirements. The amount of the claim payment doesn't account for that increased cost of making the building comply. ICC is an insurance rider that helps with that cost.

Recommended Action

The County should update its Floodplain Management Ordinance to include the ICC insurance provision, substantial damage definition, and other identified deficiencies.

2.9.5 Policy RDS-5

Policy Statement

Based on its updated ordinance, the County should develop a model floodplain ordinance for other County jurisdictions. These ordinances will comply with federal and state standards. The County should then hold a series of informational meetings with the incorporated jurisdictions and encourage them to adopt relevant sections of the model ordinance into their local ordinances for consistency. The County should solicit the assistance of Ecology in encouraging this consistency.

Problem Statement

The County and the cities within the County often have different ordinances concerning floodplain management and development. It is hard for the County to implement regulations when each entity has different requirements.

Recommended Actions

- The County should develop a model floodplain ordinance consistent with the recommendations of the Flood Authority and other County jurisdictions.
- The County should then hold a series of informational meetings with the incorporated jurisdictions and encourage them to adopt relevant sections of the model ordinance into their local ordinances.

2.9.6 Policy RDS-6

Policy Statement

During the update to the Floodplain Management Ordinance, Lewis County should incorporate standards to ensure that future siting of critical facilities to the extent possible requires dry access to the facility during a 100-year flood event. The County should also codify a process by which the CSODEM is involved in the permit review for critical facilities.

Problem Statement

Critical facilities are those structures critical to the operation of a community and the key installations of the economic sector. Examples are hospitals, roads and railways, air strips, fuel storage depots, food storage facilities, water supply systems, government administrative buildings, central data processing centers, and police stations. Critical facilities should be located outside the flood hazard zone, if at all possible. However if it must be sited within the flood hazard zone, dry access should allow for continued operations and escape routes.

Recommended Actions

- The County should update its Floodplain Management Ordinance.
- The County should codify a process to involve the DEM in permit review for critical facilities.

2.10 Local Ordinances

Adopting policies contained in this Comprehensive Flood Hazard Management Plan will likely impact existing land use regulations as managed by Lewis County. Each policy should be reviewed by appropriate County department managers and necessary ordinance revisions (as appropriate) prepared for decision-maker

review, editing, and adoption. Detailed information regarding existing land use ordinances can be obtained from the various adopting local agencies, either through their Public Works or Community Development/Building departments or by contacting the individual City Clerk's office. The resulting revisions will ensure consistency of enforcement application relative to County and City ordinances. Local ordinances carry the weight of law. Amending or adopting local ordinances is a legislative function of local government. Land use regulations reflect the desires of local communities and incorporate state mandates for land use development.

LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

3. FLOOD HAZARD MITIGATION STRATEGY, PROPOSED PROJECTS, AND SOLUTIONS

3.1 Introduction

To prevent flooding from worsening, Lewis County needs to be more proactive in identifying potential flood problems before they occur and taking measures to mitigate the adverse impacts of development. This CFHMP provides a “road map” for implementing a comprehensive program in Lewis County.

This Chapter identifies potential projects to help alleviate damages in future floods. The projects listed below are not currently funded (Chapter 4 includes a discussion of funding options) but due to the severity of recent flooding there is a high likelihood of finding a funding source for some of the projects.

Some types of structural projects examined in this report include new infrastructure and capital facilities. While Lewis County will continue to examine potential structural projects, it has also begun to focus more on non-structural opportunities and policies. An inherent limitation of non-structural recommendations to flood hazard management is the difficulty in addressing very specific flood problems. In general, non-structural recommendations are more procedural or policy-oriented and, therefore, do not always focus on a specific flood location. They also do not require any instream modifications and therefore have minimal, if any, environmental impacts. Some of the non-structural opportunities include mapping and database projects, maintenance programs, natural resource projects, and programmatic projects such as public awareness, regulations, and emergency preparedness.

3.2 Project Funding

There does not currently exist a source of dedicated funding for the capital projects identified in this Plan. The newly formed Flood Authority could potentially create a new funding mechanism, but in the interim Lewis County and participating jurisdictions will continue to seek out grant funding for projects. Funding sources (detailed in Chapter 4) will be identified and targeted annually when Lewis County meets with the Flood Authority and participating communities to prioritize projects. At these meetings new projects may be proposed, projects re-prioritized and specific jurisdictional responsibilities assigned for grant application preparation.

3.3 Ranking Criteria and Process

Ten criteria were developed to help rank the projects and policies and create the recommended actions. Each action is given a positive, negative, or neutral ranking (+1, -1, or 0). Each criterion was also weighted as low, medium, and high (1, 2, and 3 multiplier, respectively). The criteria and weightings are:

1. Action minimizes risk to loss of life.....high
2. Action minimizes risk to public infrastructure.....high
3. Action minimizes environmental degradation.....medium
4. Action minimizes ongoing maintenance obligation.....low
5. Action is ready to proceed, funded, or qualifies for grant funding.....medium
6. Action provides positive benefit-to-cost ratio.....medium

7. Action assists in reducing future floodplain insurance rateshigh
8. Action is proactive with benefits derivedlow
9. Action is multi-jurisdictional or has multiple partnersmedium
10. Action has regional impact/benefit.....high

While the actions with the highest numbers will become an initial list of the recommended actions, the project section of this document will be updated annually. Thus, the projects, priorities, and rankings might change often. The first ranking process was as follows:

- The project team worked together to define projects, estimate order of magnitude costs, and perform an initial screening
- Lewis County and the PAC members used this ranking procedure to help them prioritize the projects
- Projects and their ranks were adjusted to reflect recent information from the 2007 flooding event.

The County expects that these projects will become part of a greater compendium of project needs to be compiled by the Flood Authority.

3.4 Listing of Prioritized Projects with Planning Level Cost Estimates

Table 3.1 shows the initial project rankings.

Table 3-1. Project Rankings		
Project	Rank	Cost Estimate
CMZ Mapping	1	\$750,000
Update Hazards Databases and Maps	2	\$350,000
Headwaters Warning and Flood Alleviation	3	\$250,000 - \$600,000
Regional Flood Alleviation Project Along Interstate 5	4	N/A
Regional Floodplain Storage and Stormwater Detention Facilities	5	\$6,700,000
Upper Cowlitz Hydrologic Data Stations	6	\$620,000
Regional Stormwater Detention Facilities	7	\$3,600,000
Salzer Creek Backwater Control Project	8	\$6,100,000
USACE Flood Reduction	8	\$400,000
China Creek	10	\$550,000
Berwick Creek	11	\$500,000
Public Assistance – Bank Stabilization and/or Debris Removal	12	\$75,000/ \$75,000
Toledo WWTP Bank Protection	13	\$975,000
Isbell Road/ Mossyrock Wellhead Protection	14	\$450,000
City of Toledo Head Start Area	15	\$925,000

3.5 Recommended Action Descriptions with Planning-Level Cost Estimates

Fifteen projects and policies were selected by the PAC to be evaluated for costs, benefits, and proposed activities. These projects are summarized below (no particular order) and more detailed descriptions are provided on the following pages:

1. **Berwick Creek Drainage Basin Plan**—A comprehensive drainage basin plan will identify structural and non-structural actions that will minimize future peak flow increases to Berwick Creek.
2. **China Creek Drainage Basin Plan**—Develop a drainage plan for the China Creek basin in the Chehalis River watershed. The plan shall identify, prioritize, and scope applicable projects.
3. **Channel Migration Zone Mapping**—Continue CMZ mapping on the Cowlitz River. Begin and complete CMZ mapping for all Lewis County rivers.
4. **Update Hazards Data Sets/Maps, Identify Data Gaps and Collect Missing Data Sets**—Engage in data collection efforts to: 1) progressively compile information (i.e., aerial, topographical, and hydrologic); 2) map new hazard areas; and 3) update known hazard areas (e.g., CMZ, flooding, steep slopes, and alluvial hazards). Collected data should be in a format applicable to multiple departmental or program uses.
5. **Regional Flood Alleviation Project Along I-5 in Lewis County**—The project will likely consist of levee construction and implementation of flow control facilities that minimize impacts to downstream populations.
6. **Isbell Road/City of Mossyrock Wellhead Flooding**—Analyze, design, and construct measures to protect Isbell Road and the City of Mossyrock wellhead.
7. **Regional Flood Detention Facilities**—Regional floodplain detention facilities will be constructed to replace displaced system storage and to offer development of off-site mitigation opportunities.
8. **Regional Stormwater Detention Facilities**—Regional stormwater detention facilities will be constructed to replace displaced system storage and to offer development of off-site mitigation opportunities.
9. **Salzer Creek Backwater Control**—Analyze, design, and construct a flood alleviation project that eliminates or reduces backwater flooding from the Chehalis River.
10. **Public Assistance**—The County will, to the extent that funding allows, develop a technical assistance program for bank stabilization and/or debris removal.
11. **City of Toledo Head Start Area**—Analyze causes of erosion and develop protection strategies for the Cowlitz River bank in the vicinity of the City's Head Start, which has been eroding.
12. **City of Toledo Wastewater Treatment Plant**—Analyze, design, and construct flood protection for the existing City of Toledo Wastewater Treatment Plant.
13. **Upper Cowlitz Hydrologic Data Collection/Hydrologic Model Creation and FEMA FIRM Re-Mapping**—Evaluate various stream inputs to the Cispus and Cowlitz Rivers and select priority streams for data collection. Create a hydrologic and hydraulic model and initiate a request to FEMA for re-mapping.

14. **Headwaters Warning and Flood Alleviation**— Evaluate opportunities for flood warning systems or flood alleviation projects on the mainstem Chehalis, SF Chehalis, Newaukum, Cispus, or Upper Chehalis.
15. **USACE Flood Reduction**— Coordinate with USACE on their study of using Skookumchuck dam for flood control. Create flood district boundaries.

Project Title: Berwick Creek Drainage Basin Plan

The Berwick Creek area has growing problems and a comprehensive drainage basin plan should identify structural and non-structural actions that would minimize future peak flow increases to the creek. The main issue is that the peak flows in Berwick Creek are increasing. The increase is due to several factors:

- Development within the Port of Chehalis and within the City of Chehalis UGA may be contributing to increasing peak flows.
- A complex system of agricultural ditches discharge into Berwick Creek at numerous locations.
- Flow gradient in the lower watershed is minimal.

Increasing peak flows in the area introduce several issues:

- Economic development of Port of Chehalis property will be adversely impacted by increases in Berwick peak flows.
- Lewis County encountered several difficulties with peak flows during the recent roadway extension design of Rush Road.
- With increasing development resulting in increases to peak flows, current stormwater controls may not be sufficient. Some may be insufficient to handle existing peak flows.

The project would likely include gathering hydrologic and hydraulic data, modeling Berwick Creek, soliciting community involvement, and developing preferred project alternatives. Deliverables would include:

- Calibrated hydrologic and hydraulic model
- List of project alternatives
- Published drainage basin plan
- 30 percent design plan sets for prioritized structural actions

Estimated cost: \$500,000

Potential Project Sponsors and/or Stakeholders

- Lewis County

Project Title: China Creek Drainage Basin Plan

During flood events, China Creek inundates commercial and residential areas of Centralia. A drainage basin plan may help alleviate flood impacts by providing the science to fully understand failure mechanisms and identify actions expected to minimize flooding impacts. It is likely that no single project will be able to meet flood reduction performance expectations, making it probable that a suite of actions will be necessary.

The project would likely include gathering hydrologic and hydraulic data, modeling China Creek, soliciting community involvement, and developing preferred project alternatives (both structural and non-structural). Deliverables would include:

- Calibrated hydrologic and hydraulic model
- List of project alternatives and recommended actions
- Draft and final basin plan
- 30 percent design plan sets for prioritized structural actions

Estimated cost: \$550,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- City of Centralia

Project Title: Channel Migration Zone Mapping

Migrating rivers can cause increased flooding damages when located near developments; therefore, it is important to know critical areas where the active channel of a stream is prone to movement over time. These critical areas are called channel migration zones. The Upper Cowlitz River migrated significantly during flooding events in November 2006. This migration placed many homes at risk of being flooded. Mapping the channel migration zones along Lewis County's largest river systems will provide necessary data for the County to limit land use development in mapped channel migration zones.

The project would likely include gathering existing channel migration data, prioritizing areas for mapping, creating channel migration maps, and then incorporating the maps into land use legislature. Deliverables would include:

- Prioritized list of future channel migration zone maps
- Channel migration zone maps
- Recommended changes to land use regulations

Estimated cost: \$750,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- Washington State

Project Title: Update Hazards Data Sets/Maps, Identify Data Gaps, and Collect Missing Data Sets

Lewis County has a need for hazard data collection, management, and reporting within County departments and elected offices. Many different entities within the County collect hazard data; coordinating efforts is important for efficient use of funds and incorporation of the information into planning efforts. Lewis County is currently in the process of documenting hazards (flood, steep slopes, landslide areas, and others) for inclusion into various County planning efforts. At this time there are no data-sharing protocols between departments of the Board of County Commissioners and elected offices, and many data sets are poorly understood or documented. Using GIS to manage the data would give consistent information across departments and gives a control point for data integrity.

Tasks would generally include identifying all hazard data currently or previously collected and the responsible department/office, establishing recurrent frequencies for updating the various data sets, developing data formats and reporting standards, identifying additional hazard data sets, collecting data, and documenting efforts for inclusion in planning efforts.

The project would likely include gathering all existing hazard data sets, performing a gap analysis for what data sets are missing, creating a strategy for the hazard data collection program, and incorporating the data into County planning efforts. Deliverables would include:

- List of all collected hazard data (past and present)
- List of additional hazard data sets for information collection
- Protocol and programs for future hazard data collection
- Multi-jurisdictional, all hazards database
- Updates to hazard plans

Estimated cost: \$350,000

Potential Project Sponsors and/or Stakeholders

- Lewis County

Project Title: Regional Flood Alleviation Project Along I-5 in Lewis County

Lewis County supports flood control improvements in the I-5 corridor through the County because previous flood events of the Skookumchuck and Chehalis Rivers closed I-5 between Chehalis and Centralia and severely impacted local jurisdictions. Several projects have previously been proposed to reduce these impacts. One project is federally proposed and is called the Centralia Flood Reduction Project (CFRP). One obstacle to implementing this federal project is its dependency on acquiring the Skookumchuck Dam as the key element. New flood control projects to protect the I-5 corridor have potential to impact downstream areas and therefore any proposed projects for the I-5 corridor shall be reviewed and approved in cooperation with the Flood Authority.

Estimated cost: **No specific project at this time.**

Potential Project Sponsors and/or Stakeholders

- Lewis County
- Washington State

Project Title: Isbell Road/City of Mossyrock Wellhead Flooding

Klickitat Creek flooding can adversely impact the safety of nearby Isbell Road and the City of Mossyrock's water supply. The road is in danger of failure due to a local hard-rock mine seeking to expand operations, increased traffic loads, and continued inundation. The recurrent flooding is likely to impact the City's water supply due to the proximity of Mossyrock's wellhead (Grange). The creek's response to rainfall events is not well understood, so it is important to investigate the hydrology and hydraulics of the area to determine the best way to prevent these adverse impacts. Some possibilities for reducing the impacts of flooding are relocating the City wellhead and raising Isbell Road.

The project would likely include collecting hydrologic and hydraulic data, investigating alternative locations for the City's wellhead, exploring the possibility of raising Isbell Road, formulating structural and non-structural solutions, and designing and constructing the improvements. Deliverables would include:

- Preferred structural and non-structure alternatives with cost estimates
- Final plans, specifications, and estimates packages
- Constructed improvements

Estimated cost: \$450,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- City of Mossyrock

Project Title: Regional Flood Detention Facilities

Years of developing floodplain in the Chehalis-Centralia area have removed significant flood storage from the Chehalis and Skookumchuck River systems; however, to maintain economic viability, commercial development will continue to grow in the floodplain. In order to combat these losses, regional flood detention facilities could be developed. Regional facilities will replace displaced storage from existing development and provide additional mitigation storage for future floodplain development.

The project would likely include developing a list of suitable regional sites, identifying potential environmental concerns, creating planning-level cost estimates for the candidate sites, and providing final designs for the prioritized sites. Deliverables would include:

- List of suitable regional sites
- Planning-level cost estimates for candidate sites
- 60 percent design plan sets
- Final plans, specifications, and estimates packages

Estimated cost: \$6,700,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- Flood Control District 1
- Flood Control District 2

Project Title: Regional Stormwater Detention Facilities

Increased urban development runoff is contributing to regional flooding in the Centralia-Chehalis area. Increased impermeable land from historic municipal improvements is increasing the amount of stormwater runoff. To avoid this flooding and increased stormwater runoff, developments are required to devote more developable land to stormwater treatment and disposal facilities. In order to combat these losses, regional stormwater detention facilities could be developed. Regional stormwater detention facilities will replace displaced system storage and offer development offsite mitigation opportunities. Benefits to this project include economies of scale, increased economic viability for development, and decreased peak flow during flood events.

The project would likely include developing a list of suitable sites, identifying priority outfalls, creating scopes of work and planning-level cost estimates for the prioritized basins, collecting hydrologic and hydraulic data, modeling the prioritized basins, developing construction plans, and constructing the chosen alternative. Deliverables would include:

- List of suitable regional sites
- Planning-level cost estimates for candidate sites
- Calibrated hydrologic and hydraulic model
- 60 percent design plan sets
- Final plans, specifications, and estimates packages

Estimated cost: \$3,600,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- Flood Control District 1
- Flood Control District 2

Project Title: Salzer Creek Backwater Control

Flooding in the Chehalis River has backwater effects on Salzer Creek and causes significant flooding to portions of Chehalis. The Army Corps of Engineers has proposed a project to evaluate the potential for creating a storage/pump system to allow for off-peak contribution of Salzer Creek runoff. Using a flood gate at the Chehalis River, flows would be stored and metered back to the river during flood recession. This proposed project could potentially benefit flood reduction efforts along the I-5 corridor between Chehalis and Centralia and should be reexamined for implementation.

The project would likely include creating a technical subcommittee to review the viability of the previous Corps proposal, adjusting the project according to new information and models, formulating a new proposal, and planning and designing the proposed project. Deliverables would include:

- Compiled list of all previous efforts and study conclusions
- Calibrated hydrologic and hydraulic model
- Draft structural proposal
- Planning-level cost estimates for candidate sites
- 30 percent, 60 percent, and 90 percent design plan sets
- Final plans, specifications, and estimates packages
- Construction of Salzer Creek backwater flow prevention project

Estimated cost: \$6,100,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- Washington State
- Flood Control District 1

Project Title: Public Assistance Program

The general public is often unprepared to deal with all of the regulations and mobilization regarding the aftermath of flooding. This project is to set up systems so that Lewis County can best help the public. This project is broken up into two specific areas of concern: debris removal and bank stabilization.

Debris Removal

The December 2007 flooding in west Lewis County deposited massive amounts of large wood debris and sediment on private and public properties. Responsibility for removal of debris jams on large streams was unclear. Debris jams in streams on private property could potentially impact downstream or nearby public infrastructures (e.g., bridges, public water facilities, and roads). At one critical location of a public road, the County provided technical support to a private landowner to obtain the necessary environmental permitting for debris removal. The County also prepared a contract between the landowner and a debris removal contractor. This partnership was successful for all involved parties, and is one example of a formal public assistance program for flooding debris removal. The benefits of this project could be applied to other declared disasters. If other types of disasters are included in this program, then other county departments associated with the all-hazards mitigation plan would need to be involved in the coordination.

Bank Stabilization

Significant flooding events in recent years have damaged many of the revetments (constructed in the 1970s) along the banks of the Upper and Lower Cowlitz River. Many of the revetments were constructed on private property, with little or no nexus to public infrastructure protection, and are now difficult to repair. Also, in the past decade, bank stabilization strategies have begun to migrate away from “rock hardening” (like the revetments constructed in the 1970s) to bioengineering techniques.

Lewis County residents are generally poorly prepared to deal with the mass of local, state, and federal regulations governing activities in and around “water-bodies of the state;” therefore, lacking support from knowledgeable permitting specialists, residents sometimes engage in undesirable bank stabilization actions that are detrimental to stream health. It is in the best interest of the environment, County residents, state and federal regulatory agencies, and Lewis County government to help residents develop acceptable solutions to river bank stabilization. The County will, to the extent that funding allows, create a technical assistance program that provides permit assistance and technical consultations for County residents seeking to construct river bank stabilization projects.

The project would likely include developing the operational parameters for the technical assistance program, potentially assisting in finding funding for residents, developing a permitting database for residents, and developing a public outreach campaign. Deliverables would include:

- Summary of applicable practices and policies after analysis of appropriateness for Lewis County and with other state and federal assistance programs
- Operational parameters for the assistance program
- Review of previous assistance provided by Lewis County following the November 2006 and December 2007 floods
- Permitting database
- Screening and raking criteria
- Action plans
- Public outreach campaign

Estimated cost for bank stabilization assistance: \$75,000

Estimated cost for debris removal assistance: \$75,000

Potential Project Sponsors and/or Stakeholders

- Lewis County

Project Title: City of Toledo Head Start Area

During the past several years, the Cowlitz River bank in the vicinity of the City of Toledo's Head Start building has been eroding. The cause of this eroding is still unknown, but may be related to springs, a slip plane and/or changes in the hydraulics of the area. Some observers believe that river flows have recently increased in duration, creating long periods of near bank-full flow conditions. Since the failure mechanism is not well understood, the type of project required will depend on the results of study of geologic and hydraulic conditions.

The project would likely include collecting existing information (e.g., geologic and streamflow records, and resident interviews), conducting a geologic analysis, completing a hydrologic analysis if deemed necessary after the geologic analysis, and constructing the geologic stability project. After construction, the project would also likely include monitoring the river and surrounding area, creating a hydrologic model from the monitoring efforts, and creating a mitigation plan. Deliverables would include:

- Report detailing data collected
- Technical report detailing the results of the geologic investigation
- Geologic stabilization plan with conceptual designs
- Construction of geologic stabilization
- Annual monitoring reports for 3 years
- Calibrated land runoff and stream flow models
- Bank stabilization plan

Estimated cost: \$925,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- City of Toledo

Project Title: City of Toledo Wastewater Treatment Plant Flood Protection

During major flooding events the Cowlitz River has backwater flooding. The levee protecting the treatment lagoons at the City of Toledo Wastewater Treatment Plant (WWTP) does not provide adequate protection against the backwater flooding. The County is currently in discussions with the City to move the WWTP; however, if this is not feasible then changes will be necessary to the site. The existing levee should be extended westerly for increased protection. This should also stabilize bank erosion south of the WWTP and minimize the potential for river backwater flooding resulting from low frequency recurrent flows on the Lower Cowlitz.

The project would likely include collecting existing information (e.g., the current levee design, the extent of previous floods, and river bank erosion), conducting a geologic analysis, and designing and constructing the levee. Deliverables would include:

- Report detailing data collected
- Technical report detailing the results of the geologic investigation of the current levee material
- 60 percent and 90 percent design plan sets
- Final plans, specifications, and estimates packages
- Construction of levee extension and bank stabilization projects
- Participation in a regional utility system and relocation of the treatment plant

Estimated cost: \$975,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- City of Toledo

Project Title: Upper Cowlitz Hydrologic Data Collection/Hydrologic Model Creation and FEMA FIRM Re-mapping

Very few hydrologic data sets exist for the Upper Cowlitz basin. The response of the Cowlitz and Cispus Rivers to rainfall events is not well understood. Significant flooding during November 2006, resulting from a relatively low recurrence frequency event, suggests numerous forces at work in the upper basin. This project would collect data so that a report can be sent to FEMA to request re-mapping. The County may need to file a Letter of Map Revision (LOMR) specifically for this area.

The project would likely include evaluating stream inputs and selecting priority streams for data collection, deploying data collection stations, creating a hydrologic model, and preparing a modeling report to request a FEMA re-mapping. Deliverables would include:

- Identified data collection sites
- Calibrated hydrologic and hydraulic model
- Report requesting re-mapping

In the interim (i.e., until such mapping can be completed), the County will use recent actual channel erosion data (e.g., from 2007 flood) to support implementation of CMZ regulations.

Estimated cost: \$620,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- Washington State

Project Title: Headwaters Warning and Flood Alleviation Analyses

The November 2006 and December 2007 floods significantly damaged public infrastructure and private property. Two projects that would help prevent the extent of damage seen in recent floods are a flood warning system and flood alleviation strategies. These two projects are grouped together because both projects would require a similar data gathering efforts.

Flood Alleviation

Massive landslides in the upper watersheds of the Willapa Hills contributed huge amounts of bedload material to receiving waters. Numerous creeks left their banks and historic flow patterns may be permanently altered. Residents are concerned that future rainfalls will produce additional flooding due to loss of system storage in creeks and rivers.

Warning Systems

Warning systems require both river gauges and precipitation gauges to help warn authorities about fast rising water and high intensity or sustained rain. Several areas of the County are severely lacking these gauges. For example, there is only one river gauge in each area: the upper Chehalis River (Doty Gage), the South Fork Chehalis at Wildwood (South Fork Gauge), and near Adna (Adna). There is a lack of precipitation stations in these two upper headwaters. One precipitation gauge was supposedly maintained by a private commercial timber company, which recorded about 15”+ of rain. However, the gauge was destroyed by the flood and the gauge location is still unknown.

These two projects could be implemented in several areas of the County. Likely candidates include the following river systems: the mainstem Chehalis, South Fork Chehalis, Newaukum, Cispus, and Upper Cowlitz.

Tasks for both projects will include collecting data for pre and post December 2007 flood (e.g., land use, hydraulic, hydrologic, and existing warning systems) and hydrologic and hydraulic modeling. An additional task for the flood warning system would be to coordinate heavily with agencies and jurisdictions that have similar warning systems in place. Both the USGS and Snohomish County are working on a similar project, and the County could benefit from learning about their warning system. Some tasks that can be done at a local level include development of a coordination plan with the local fire districts to deal with flood and other hazards when power and phones are out. Additional tasks for flood alleviation project would be to examine, rank, and create preliminary cost estimates for different alternatives.

Deliverables would include:

- Existing conditions report
- Hydrologic and hydraulic model
- Operational parameters for the assistance program (warning project only)
- Establishment of precipitation and flow data system
- Flood forecasting model
- Operation plan outlining organization, authority and responsibility about issuance of warnings (warning project only).
- Assistance to residents about implementation of the warning system on a “neighborhood level” when power and phones are out (warning project only).
- Preliminary engineering estimates for selected alternatives (flood alleviation project only).

Estimated cost for flood warning system: \$200,000 plus (recommend checking with USGS on needs, cost sharing opportunities)

\$50,000 plus (to implement a local warning system)

Estimated cost for flood alleviation projects: \$350,000

Potential Project Sponsors and/or Stakeholders

- Lewis County

Project Title: USACE Centralia Flood Reduction Project

In 2007, the United States Congress passed the “Water Resources Development Act of 2007”, which authorized the Centralia Flood Reduction Project to proceed to preliminary engineering and construction. The project proposes to use the Skookumchuck Dam for additional flood storage and to construct levees in the Centralia-Chehalis area. During the Washington legislative session in late 2007, a bonding capacity of \$50,000,000 was approved for the local sponsor’s share of engineering and construction costs. Lewis County, as a likely local sponsor, desires technical support to establish a flood control zone district. The flood control zone district, or similar special district, is needed to provide long-term project operation and maintenance of the Army Corps of Engineers’ Centralia Flood Reduction Project.

Tasks would include: formulating a technical support team made up of County staff, potentially benefited jurisdictions, citizens, and engineering consultants; deriving benefit district boundaries; identifying district operation and maintenance costs; developing and evaluating several cost share models; developing a financial participation plan; and preparing an operation plan of a flood control zone district with its own commissioners. Additional tasks also include mitigation actions as needed according to the USACE Environmental Impact Study (EIS).

The project will also include working closely with the USACE, the BOCC, the County Engineer, official representatives of other benefited jurisdictions, the County Treasurer, the County Auditor, and the general public. Deliverables would include:

- Formulation of a Technical Support Team to Lewis County to support the start-up of the flood control zone district or special district and preliminary engineering through construction
- District boundaries
- Financial plan
- Interlocal agreements with all benefited jurisdictions within the flood control zone district
- District operation plan
- Mitigation actions according to the EIS and project requirements
- Formulation and appointment of a Lewis County Flood Control District for managing this project

Estimated cost: \$400,000

Potential Project Sponsors and/or Stakeholders

- Lewis County
- Washington State

LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

4. FLOODPLAIN FUNDING OPPORTUNITIES AND MANAGEMENT

4.1 Introduction

This section highlights some of the local, state, and federal programs that provide funding opportunities for flood risk reduction activities. This list should not be considered as inclusive and local governments and cities will need to further investigate funding opportunities upon approval of this plan.

4.2 Local Sources

Currently there is no local funding; however the newly created Flood Authority could potentially create a regional flood control district. This new flood control district would have to be approved by the public but could then create a new source of funds.

4.3 Federal Sources and Process

4.3.1 National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a federal program enabling property owners in participating communities to purchase insurance as protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages. Lewis County and the Cities of Chehalis and Centralia participate in the NFIP. Each of these jurisdictions administers its own program through its Building or Public Works Department. The Department of Ecology is the state agency in Washington responsible for coordinating the floodplain management regulation elements of the NFIP.

In order to join, a community must adopt a resolution of intent to participate and cooperate with FEMA. The community agrees to “maintain in force...adequate land use and control measures consistent with the [NFIP] criteria” and to:

1. Assist the Administrator in the delineation of the floodplain.
2. Provide information concerning present uses and occupancy of the floodplain.
3. Maintain for public inspection and furnish upon request, for the determination of applicable flood insurance risk premium rates within all areas having special flood hazards, elevation and flood-proofing records on new construction.
4. Cooperate with agencies and firms that undertake to study, survey, map, and identify floodplain areas, and cooperate with neighboring communities with respect to the management of adjoining floodplain areas in order to prevent aggravation of existing hazards.
5. Notify the Administrator whenever the boundaries of the community have been modified by annexation or the community has otherwise assumed or no longer has authority to adopt and enforce floodplain management regulations for a particular area.

The regulatory requirements set forth by FEMA are the minimum measures acceptable for NFIP participation. More stringent requirements adopted by the local community or state take precedence over the

minimum regulatory requirements established for flood insurance availability. Some of the minimum floodplain regulatory requirements include:

1. All development in the regulatory floodplain must have a permit from the community. “Development” is defined as any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or storage of materials.
2. The regulatory floodplain is the floodplain mapped on the Flood Insurance Rate Map plus areas subject to flooding that have at least a 1-square-mile drainage area or a storage volume of 0.75 acre-foot or more when inundated by the base flood.
3. Only “appropriate uses” are allowed in the floodway. The floodway is the channel of a river or other watercourse and the adjacent land areas that are needed to convey the base flood. Appropriate uses include flood control structures, recreational facilities, detached garages and accessory structures, flood-proofing activities, and other minor alterations. They do not include buildings, building additions, fences, or storage of materials. Larger projects in the floodway require a permit from the state in addition to a City permit. The result of this requirement is that vacant floodways will essentially remain as open space, free of insurable buildings or other obstructions. Where there is any construction in a regulatory floodway it must be demonstrated through hydrologic and hydraulic analysis that there will be no increase in water surface elevations in the floodway fringe.
4. New buildings may be built in the floodplain, but they must be protected from damage by the base flood. The lowest floor of residential buildings must be elevated 1 or more feet above the base flood elevation. Nonresidential buildings must be either elevated or flood-proofed.
5. A “substantially improved” building is treated as a new building. The regulations define “substantial improvement” as any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure (excluding land value) before the start of construction of the improvement. This requirement also applies to buildings that are substantially damaged.

The NFIP is founded on a mutual agreement between the federal government and a community. A participating community commits itself to the following activities:

- Issuing or denying floodplain development/building permits
- Inspecting all development to assure compliance with the local ordinance
- Maintaining records of floodplain development
- Assisting in the preparation and revision of floodplain maps
- Helping residents obtain information on flood hazards, floodplain map data, flood insurance, and proper construction measures

The states also have a role in the NFIP. Each governor has selected a state coordinating agency for the NFIP. While the role of this agency varies from state to state, it usually includes:

- Ensuring that communities have the legal authorities necessary to adopt and enforce floodplain management regulations
- Establishing minimum state regulatory requirements consistent with the NFIP
- Providing technical and specialized assistance to local governments

- Coordinating the activities of various state agencies that affect the NFIP

Most states participate in the Community Assistance Program (CAP). Under CAP, NFIP funds are available on a 75 percent/25 percent cost share to help the state coordinating agency provide technical assistance to communities and to monitor and evaluate their work.

4.3.1.1 Community Rating System

One of the goals of this CFHMP is to take the steps needed to allow the County to enter into FEMA's NFIP Community Rating System (CRS).

The CRS was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards requirements. Flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS:

- Reduce flood losses
- Facilitate accurate insurance rating
- Promote the awareness of flood insurance

If the City can successfully complete all the requirements, then flood insurance policy holders will see a reduction in their insurance premiums.

To be recognized in the insurance rating system, community floodplain management activities must be described, measured, and evaluated. The basic tool for this is the CRS Schedule, which sets forth the application procedures, creditable activities, and the credit points assigned to each activity. The schedule identifies 18 creditable activities, organized under four categories labeled Activities 300 through 600: 1) Public Information, 2) Mapping and Regulations, 3) Flood Damage Reduction, and 4) Flood Preparedness. A community receives a CRS classification based upon the total score for its activities. There are 10 CRS classes: Class 1 requires the most credit points and gives the greatest premium reduction; Class 10 receives no premium reduction (Table 4-1). A community that does not apply for the CRS or does not obtain the minimum number of credit points is a Class 10 community. Lewis County's current ranking is discussed in Section 5.1.

Credit points	Class	Special Flood Hazard Area (SFHA) premium discounts, percent	Non-SFHA, percent ^a
4,500+	1	45	10
4,000 – 4,499	2	40	10
3,500 – 3,999	3	35	10
3,000 – 3,499	4	30	10
2,500 – 2,999	5	25	10
2,000 – 2,499	6	20	10
1,500 – 1,999	7	15	5
1,000 – 1,499	8	10	5
500 – 999	9	5	5
0 – 499	10	0	0

^a Preferred risk policies are available only in B, C, and X zones for properties that are shown to have a minimal risk of flood damage. The preferred risk policy does not receive premium rate credits under the CRS because it already has a lower premium than other policies. Although they are in SFHA zones, AR and A99 are limited to a 5 percent discount. Premium reductions are subject to change.

Reduced flood insurance rates are only one of the rewards a community receives from participating in the CRS. Additional benefits include:

- CRS floodplain management activities provide enhanced public safety, a reduction in damage to property and public infrastructure, avoidance of economic disruption, reduction of human suffering, and protection of the environment.
- Technical assistance in designing and implementing some activities is available at no charge.
- Implementing some CRS activities helps projects covered under this plan qualify for other federal assistance programs such as the Flood Mitigation Assistance program, Hazard Mitigation Grant Program, and other technical support funding, some of which are discussed below.

4.3.2 FEMA Grants

FEMA offers several sources of grant funding: Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), Pre-Disaster Mitigation Grant Program (PDM), Repetitive Flood Claims (RFC), and Severe Repetitive Loss (SRL).

Hazard Mitigation Grant Program

The HMGP was created in November 1988, by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP assists states and local communities in implementing long-term mitigation measures following a Presidential disaster declaration.

To meet these objectives, FEMA can fund up to 75 percent of the eligible costs of each project. With the passage of the Hazard Mitigation and Relocation Assistance Act of 1993, federal funding under the HMGP is now based on 7.5 percent of the federal funds spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster. This amendment also encouraged the use of property acquisition and other non-structural flood mitigation measures.

The HMGP can be used to fund projects to protect either public or private property, so long as the projects in question fit within the state and local government's overall mitigation strategy for the disaster area, and comply with program guidelines. Examples of projects that may be funded include the acquisition or relocation of structures from hazard-prone areas, the retrofitting of existing structures to protect them from future damages; and the development of state or local standards designed to protect buildings from future damages.

Eligibility for funding under the HMGP is limited to state and local governments, certain private nonprofit organizations or institutions that serve a public function, Indian tribes and authorized tribal organizations. These organizations must apply for HMGP project funding on behalf of their citizens. In turn, applicants must work through their state, since the state is responsible for setting priorities for funding and administering the program.

Flood Mitigation Assistance

Unlike the HMGP, a post-disaster assistance program, the FMA is a pre-disaster mitigation program. The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). FEMA provides FMA funds to assist states and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP.

Three types of FMA grants are available:

- Planning Grants to prepare Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project grants.

- Project Grants to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties; these include structures with 2 or more losses each with a claim of at least \$1,000 within any ten-year period since 1978.
- Technical Assistance Grants for the state to help administer the FMA program and activities. Up to ten percent of Project grants may be awarded to states for Technical Assistance Grants.

FEMA's mitigation grants, including FMA, are provided to eligible applicant states/tribes/territories that, in turn, provide sub-grants to local governments. The applicant selects and prioritizes applications developed and submitted to them by local jurisdictions to submit to FEMA for grant funds.

Pre-Disaster Mitigation

The PDM program was created by Section 203 of the Stafford Act. The PDM makes funding available to state, local and Indian Tribal governments to implement cost-effective hazard mitigation activities that complement a comprehensive mitigation program. Funding may be awarded for the development of an all-hazards mitigation plan or for a cost-effective hazard mitigation project. Like the HMGP and FMA programs, applicants must be participating in the NFIP. After November 1, 2003, local and tribal governments applying for PDM funds through the states must have an approved local mitigation plan prior to the approval of local mitigation project grants. States are also required to have an approved Standard State mitigation plan in order to receive PDM funds for state or local mitigation projects after November 1, 2004.

Successful grants receive 75% federal funding to total project costs. The applicant is responsible for 25%. Small impoverished communities may receive federal funding of 90%.

Repetitive Flood Claims

The RFC grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108–264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). The long-term goal of RFC is to reduce or eliminate claims under the NFIP through mitigation activities that are in the best interest of the National Flood Insurance Fund (NFIF).

Up to \$10 million is available annually for FEMA to provide RFC funds to assist states and communities to reduce flood damages to insured properties that have had one or more claims to the NFIP. FEMA may contribute up to 100 percent of the total amount approved under the RFC grant award to implement approved activities, if the applicant has demonstrated that the proposed activities can not be funded under the FMA program due to lack of state or local capacity, which includes either inability to manage the subgrant or lack of 25% match. To be eligible for RFC grants, an eligible applicant must have a FEMA approved State Mitigation Plan in compliance with 44 C.F.R. §201. A local mitigation plan is not required to receive RFC funds. Property owners must have a flood insurance policy on the structure to be mitigated that is current at the time of application and maintained through award.

Eligible mitigation activities include:

- Acquisition of properties, and either demolition or relocation of flood-prone structures, where the property is deed restricted for open space uses in perpetuity
- Elevations
- Dry floodproofing of non-residential structures
- Minor localized flood control projects (funding limited to \$1M per project)

Properties appropriate for the application of other mitigation techniques should be submitted under one of FEMA's other mitigation grant programs

Applications will be accepted for any insured property that has one or more claim payments for flood damages and is located within a state or community that can not meet the requirements of the FMA program for either cost share or capacity to manage the activities stipulations. RFC awards will prioritize acquisition projects that create the greatest savings to the NFIF based on a benefit-cost analysis.

Severe Repetitive Loss

The SRL grant program was also authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of 1968 to provide funding to reduce or eliminate the long-term risk of flood damage to SRL structures insured under the NFIP. The purpose of the program is to reduce or eliminate claims under the NFIP through project activities that will result in the greatest savings to the NFIF. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and: (a) has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or (b) has at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. For both (a) and (b) at least two of the referenced claims must have occurred within any ten-year period, and must be greater than ten days apart.

Eligible flood mitigation project activities include:

- Acquisition and relocation of at risk structures and conversion of the property to open space
- Elevation of existing structures to at least the Base Flood Elevation (BFE) or an Advisory Base Flood Elevation (ABFE) or higher. For the SRL program only, mitigation reconstruction is permitted only when traditional elevation cannot be implemented
- Minor physical localized flood reduction projects
- Dry floodproofing (historic properties only)

Successful grants receive 75% federal funding to total project costs. The applicant is responsible for 25%. Small impoverished communities may receive federal funding of 90%. The SRL Program will provide funding assistance for eligible flood mitigation projects which will result in the greatest savings based FEMA's benefit-cost analysis.

The SRL Program is subject to the availability of federal funding, as well as any directive or restriction made with respect to such funds. The available state wide allocated amount for Federal Fiscal Year 2008 is expected to be about \$25,000,000. There are no award limits or project limits associated with grant requests for the SRL Program.

An eligible project must be located physically in a participating NFIP community, have an approved Local Mitigation Strategy, Flood Mitigation Plan, or a Community Rating System Floodplain Management Plan, and be in conformance with the local government's Community Rating System Program, if applicable.

4.4 State Sources and Process

4.4.1 Flood Control Accounts Assistance Program

Counties and other municipal corporations responsible for flood control maintenance may apply to Ecology for financial assistance to prepare comprehensive flood control management plans and flood control maintenance projects. To be eligible for Flood Control Assistance Account Program Planning assistance, the local jurisdiction is required to:

- Participate in and meet all the requirements of the NFIP (except special districts)
- Allow only flood-compatible uses in floodplain areas
- Be certified by the Washington State Department of Military, Emergency Management Division, that an acceptable local Emergency Management Plan is being administered.

To be eligible for FCAAP Flood Damage Reduction (Construction) Projects, the local jurisdiction is required to:

- Have a Comprehensive Flood Hazard Management Plan or be in the process of developing a plan with a viable prioritized list of flood hazard reduction projects
- Be compatible with the jurisdiction's CFHMP
- Have applied for all required permits

Ecology shall determine priorities and allocate available funds from the FCAAP among those counties applying for assistance, and shall adopt rules establishing the criteria by which those allocations must be made. The criteria must be based upon proposals that are likely to bring about public benefits commensurate with the amount of allocated state funds.

The project application process (WAC 173-145-060) for the eligible municipal corporations' applications begins with the applicant preparing the project application. A complete application should include a written description of the project, a detailed cost estimate identifying major project elements, construction plans, and a description of the project benefits. The County Engineer will prioritize the applications from within its borders on a Countywide basis and submit the prioritized list to Ecology. The applicant then must review the preliminary project proposal with the County Engineer, the Washington Department of Fish and Wildlife (DFW), the Department of Natural Resources (DNR), and any affected Indian tribes and submit a prioritized list of project applications.

In keeping with FCAAP goals, the project selection process has been simplified to meet the demand generated by the considerable number of grants to be evaluated. The FCAAP project approval process begins with Ecology reviewing all projects for compliance with the requirements under WAC 173-145-070 and chapter 86.26 RCW. Ecology consults with the DFW, DNR, affected Indian tribes, and other affected parties that may review and comment on the proposed project plans before their approval. After an evaluation is completed (evaluation criteria are discussed below), a tentative award list is developed and distributed to all applicants. The list is subject to a public hearing where applicants will have an opportunity to comment. After a public comment period, Ecology will prepare and finalize the written agreements with the counties. The applicant will then prepare the construction plans and specifications for approval by the County Engineer before submitting them to Ecology for review and approval of each project for compliance with all requirements. The applicant must also acquire the necessary federal, state, and local permits or authorizations along with any other permission required to complete the project.

Because requests exceed available funds, some proposals may not be funded or only certain tasks of a proposal may be funded. Each application is evaluated on factors established under Chapter 173-145-080 WAC:

1. The relationship of public benefits to total project costs
2. The priority that has already been established by each applicant
3. Intensity of local flood control management problems, including but not limited to their inter-relationships with:
 - (a) Population affected

- (b) Property and related development affected
 - (c) Land management and zoning
 - (d) Existing flood control management practices
4. Where the CFHMP is completed and adopted, the following will be considered:
 - (a) Consistency with the Plan or its recommendations
 - (b) Priority of the project as identified in the Plan
 - (c) Implementation of the Plan or its recommendations
 - (d) Potential impacts of instream uses and resources
 5. Where a CFHMP is being developed or has not been initiated, the following will be considered:
 - (a) Evidence of multi-jurisdictional cooperation necessary for development of a comprehensive county or multi-county CFHMP
 - (b) Availability of qualified personnel or resources for planning purposes
 - (c) Availability of qualified personnel or resources for project construction purposes
 - (d) Other planning efforts undertaken or proposed within the planning jurisdiction and their relationship to flood control management
 - (e) Ability to make rapid progress toward development of a CFHMP
 - (f) Existing and proposed participation of community groups, private industry, professional organizations, the general public, and others toward the development and implementation of the proposed CFHMP

The foremost concern of this grant program is the protection of human life and property from flood-related events. As such, work done through this grant program has a direct impact on riverine environments. In furthering Washington State's efforts toward recovery of its (ESA listed) fisheries resources, preference will be given to those proposals that can demonstrate a propensity for preservation, restoration, or enhancement of those resources through planning or flood damage reduction projects wherever possible.

As always, projects that implement measures identified in CFHMPs will be treated as a higher priority. The CFHMP is the technical foundation for flood hazard management recommendations and is generally required as a condition of receiving assistance for flood damage reduction projects. These plans identify viable priority projects to reduce flood hazards.

With new information and knowledge and/or critical issues, Ecology also sets foci for each of the grant periods. The following categories have priority for the 2007-2009 biennium:

- Comprehensive Floodplain Management Plans
 - New
 - Continuations
 - Revisions
- Flood Hazard Reduction Technical Studies
- Flood Damage Reduction Projects
- Acquisition Projects
- (Select) Mapping Projects, including Channel Migration Zone delineations
- Fish Habitat Protection/Enhancement Projects associated with flood damage reduction benefits
- Other, such as a flood warning system

The Washington State Legislature allocates funds under Chapter 86.26 RCW and 173-145 WAC to be administratively designated for flood control work by Ecology's Shorelands and Environmental Assistance Program. Typically, 45 percent of overall funding awarded is for CFHMPs, 25 percent for flood damage reduction projects, 10 percent for emergency projects, 15 percent for administration, and 5 percent for program contingencies. With the exception of emergency projects, the maximum allowable amount available in one county, including all jurisdictions within that county, is \$500,000 per biennium. It is important to note that funding for flood-related work under the FCAAP grant program is contingent on the availability of legislatively appropriated funds, which cannot be carried over from one biennium to another.

The remaining value of the grant must be made up of local jurisdiction match as in:

- Cash (such as paid staff salaries, consultant services, etc.).
- In-kind services (donated services such as citizen time volunteered on an advisory council, or donated equipment such as the donated use of a backhoe), and inter-local match (services/equipment/goods) contributed to the project by another governmental entity through a valid written agreement between the two local jurisdictions. These contributions must be approved by Ecology prior to a grant agreement and thoroughly documented on forms provided by the agency.
- Other awarded grant program funding such as the Hazard Mitigation, Shoreline Management, Centennial Clean Water Funds, Environmental Protection Agency, U.S. Fish and Wildlife, etc.

4.4.2 Washington State Floodplain Management

Washington has long been a leader among states in the realm of floodplain management. In 1935, the State Legislature enacted one of the first state floodplain management laws in the U.S., which began a program that gave the state authority to issue permits for construction in designated Flood Control Zones. In 1969, the state enacted a prohibition on construction of residential structures in floodways, which applied only to the State Flood Control Zones. Because few of these zones had floodways depicted on maps at the time, structures were built in what are now floodways, and permit issuance under the Flood Control Zones program was spotty and varied widely by region.

Ecology administers the FCAAP and, in addition, is the Governor's designated State Coordinating Agency for the NFIP. As the State Coordinating Agency, Ecology receives an annual grant from FEMA to perform a broad range of floodplain management activities throughout the state.

Washington State has full regulatory control over the navigable and non-navigable waters flowing or lying within the borders of the state, always subject to the federal control of navigation. Statewide floodplain management regulation shall be exercised through: (1) local governments' administration of the NFIP requirements, (2) the establishment of minimum state requirements for floodplain management that equal the minimum federal requirements for the NFIP, and (3) the issuance of regulatory orders.

Washington State's floodplain program (Chapter 86.16 RCW) seeks to integrate federal, state, and local regulatory programs in a comprehensive effort to reduce flood damages. The core of the state's program is the adoption by local jurisdictions of a flood damage prevention ordinance based upon federal standards contained in the NFIP. Property owners in flood-prone jurisdictions with such an ordinance are eligible for federal insurance.

Washington State has adopted the NFIP as the state minimum standard and has imposed other requirements upon local governments. These additional state requirements target the protection of health and safety and primarily address permitted types of development.

There are three principal interrelated Washington statutes (RCWs) that, along with their supporting administrative guidelines (WACs) address flood hazard management activities. Local engineers, planners, and administrators dealing with flood hazard management activities are strongly advised to refer to the RCW and

WAC chapters during the planning process. A discussion of the following laws is provided in the Comprehensive Planning for Flood Hazard Management guidebook:

- Chapter 86.12 RCW—Flood Control by Counties
- Chapter 86.16 RCW—Floodplain Management
- Chapter 86.26 RCW—State Participation in Flood Control Maintenance
- Chapter 173-145 WAC—Requirements for a Comprehensive Flood Control Management Plan.
(Chapter 173-145 WAC is in the process of being amended to meet requirements of HB 2851; see Chapter 86.26.100 RCW.)

LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

5. IMPLICATIONS TO COMMUNITY RATING SYSTEM FOR LEWIS COUNTY

The Community Rating System (CRS) class is important because participating in CRS can reduce the amount of money that residents pay for flood insurance. A lower score provides a higher percentage reduction.

5.1 Lewis County Current Rating

Each year, a community must recertify by October 1 that it is continuing to implement the activities for which it has earned credit. Recertification is done on the recertification worksheet, AW-214, which is prepared by ISO and sent to the community each August. The recertification worksheet lists community data and the activities and elements the community is implementing for CRS credit. Table 5-1 shows the activities for which Lewis County received points as of October 1, 2007. Lewis County is currently ranked a Class 7 (see Table 4-1), and residents receive a 15 percent discount on flood insurance rates. The County is currently in the midst of a 5-year CRS audit, and hopes to achieve a Class 5 ranking through the 2008 recertification process.

To calculate the number of points a municipality receives, a few term definitions are necessary:

- Series - The CRS activities are divided into four series: Public Information, Mapping and Regulation, Damage Reduction, and Flood Preparedness. Their titles are self-explanatory, and the credits within them follow the main objective of the titles.
- Activity - Each series has from three to six activities. Each activity has a title, such as “Additional Flood Data” or “Flood Warning Program.” The titles are mostly self-explanatory, but they may include components that are not specifically named in the title. At the end of the credit calculation process, the credits for all activities are added together to get the community’s total score.
- Elements - Within each activity, there are one or more elements. These are discrete pieces of a community’s floodplain management program, and each receives a certain number of credit points.

The first step is to review each activity proposed by the community for adequacy and completeness. Under each activity in the CRS Schedule is a section entitled “Credit Points.” Each element has a maximum number of credit points that can be earned if the element is being implemented to certain standards throughout the community or throughout the floodplain. A community will receive less than the maximum points if its program does not include all the elements listed in the Credit Points section.

Table 5-1. CRS Annual Certification

Activity Number	Activity Description
310	We are maintaining Elevation Certificates on all new and substantially improved buildings in our Special Flood Hazard Areas.
310	We continue to make copies of elevation certificates on newer properties available at our present office location.
320	We are providing Flood Insurance rate map information and information on the flood insurance purchase requirement to inquirers.
320	Attached is a copy of the document that told lenders, insurance agents, and real estate offices about the service this year.
320	Attached is a copy of one page of the log, letter, or other record that we kept on this service this year.
320	We are continuing to keep our FIRM updated and maintain old copies of our FIRM.
330	Attached is a copy of this year's outreach project to the community.
350	Our public library continues to maintain flood protection materials.
360	We continue to provide flood protection assistance to inquirers.
420	We continue to preserve our open space in the floodplain.
430	We continue to enforce floodplain management provisions of our zoning, subdivision, and building code ordinances.
430	We continue to enforce the stormwater management provisions of our zoning, subdivision, and building codes.
440	We continue to maintain our elevation reference marks.
450	We continue to enforce the requirement that all new buildings must be elevated above the street or otherwise protected from drainage problems.
503	Attached is a copy of this year's notice on property protection that we sent to our repetitive loss areas.
510	Attached is a copy of our floodplain management plan's annual progress report.
510	We have provided copies of this progress report to our governing board, local media, and the state NFIP Coordinating office.
520	We continue to implement our drainage system maintenance program.
540	Attached is a copy of a typical inspection report and a copy of the record that shows that any needed maintenance was performed.
540	We have maintained and tested our flood threat recognition system.
610	Attached is a report evaluating how our flood warning program worked during the flood we had this year.
610	We tested our warning dissemination equipment and procedures this year.
610	We conducted at least one exercise of our flood response plan this year.
610	We have completed our annual update of the names and telephone numbers of the operators of all critical facilities affected by flooding.

5.2 Future Rate Reductions

Implementing some of the new policies and projects will likely increase Lewis County's CRS rating. The ability to receive CRS points from a policy or project will be taken into account when deciding any future priority listing.

VOLUME B

LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

6. FLOOD HAZARD VULNERABILITY AND PLANNING HISTORY

The purpose of this chapter is to provide background information for the policies, strategies, and recommended actions proposed in previous chapters. This chapter also provides a description of the hazard vulnerability. In the following sections, we summarize previous planning efforts, historic flooding problems, federal efforts to reduce flooding, and current flood reduction activities. Information in this chapter is based on prior reports, particularly the 2001 update of the 1994 Lewis County CFHMP. If new data were available, information was updated. For the most part, though, this chapter is a summary of data from the 2001 CFHMP update.

6.1 Previous Plans

Lewis County's most recent CFHMP is from 2004. Lewis County developed and adopted a CFHMP in 1994 and then amended the document in 2001. The amendment included more information about the eastern end of the County, which had been lacking in the 1994 plan. The 2001 document included new information about Lewis County programs: federal, state, and county regulations, and information from a 2001 CFHMP amendment prepared by GeoEngineers concerning potential channel migration zones (CMZs). The 2001 version also included an update to flood damages, flood hazards, and probable hazard areas. The 2004 CFHMP was updated from the 2001 version and included revisions such as new ordinances and practices.

6.2 Flood Hazard Vulnerability

A detailed inventory of the flood hazard vulnerability can be found in the Lewis County Multi-Jurisdictional Hazard Mitigation Plan. This plan was written in 2005 and then revised and updated in 2006. The planning process identified mitigation strategies as well as programmatic elements that will be reviewed and adjusted as local conditions change over time. The flood hazard ranking in Table 6-1 is based on the judgment of steering committee members from the Lewis County Multi-Jurisdictional Hazard Mitigation Plan. Table 6-2 provides explanations for the rank numbers.

Table 6-1. Flood Hazard Ranking						
Jurisdiction	Extent of Impacted Area	Probability of Occurrence	Health and Safety	Amount of Property Affected	Environmental Impact	Economic Impact
Centralia	3	4	1	2	1	3
Chehalis	2	4	1	2	1	3
Lewis County Unincorporated	1	4	1	1	1	1
Morton	2	4	0	1	1	1
Mossyrock	0	4	0	0	0	0
Napavine	1	4	0	0	0	0
Pe Ell	1	4	0	0	1	1
Toledo	4	4	1	1	1	2
Vader	1	4	0	0	0	0
Winlock	1	4	1	1	1	2

Table 6-2. Ranking Descriptions	
Rank	Description
Impact	
0	No developed area impacted
1	Less than 25% of developed areas impacted
2	Less than 50% of developed areas impacted
3	Less than 75% of developed areas impacted
4	Over 75% of developed areas impacted
Probability of Occurrence	
1	Unknown but rare occurrence
2	Unknown but anticipate an occurrence
3	100 years or less occurrence
4	25 years or less occurrence
5	Once a year or more occurrence
Health and Safety	
0	No health and safety impact
1	Few injuries/illnesses
2	Few fatalities but many injuries/illnesses
3	Numerous fatalities
Property	
0	No property damage
1	Few properties destroyed, few properties damaged
2	Few destroyed, many damaged
2	Few damaged, many destroyed
3	Many destroyed and many damaged
Environmental Impact	
0	Little or no environmental damage
1	Resources damaged with short term recovery practical
2	Resources damaged with long term recovery practical
3	Resources destroyed beyond recovery
Economic Impact	
0	No economic impact
1	Low direct and/or low indirect costs
2	High direct and/or low indirect costs
2	Low direct and/or high indirect costs
3	High direct and/or high indirect costs

6.3 Repetitive Loss

One example of a detailed indicator that is rolled up into the more general categories described in the hazard vulnerability section is number of repetitive loss (RL) properties. FEMA defines an RL property as any

insurable building that has experienced two losses in a 10-year period in which each loss is \$1,000 or more. As a result of many natural and manmade hazards, repairs and reconstruction are often completed in a way that returns the structure to pre-disaster condition yet does little to prevent a reoccurrence of damage. Replication of the pre-disaster conditions allows for the repetitive cycle of property damage and reconstruction, and re-damage. Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction are analyzed, and sound, less vulnerable conditions are produced. Floodproofing RL properties can help break this cycle.

Unincorporated Lewis County had 44 RL properties, from a FEMA list dated April 30, 2006. Lewis County has submitted corrections for all but 14 of them. Although there are only 14 RL properties unincorporated Lewis County has 3,061 occupied parcels in the floodplain. "Occupied" parcels are ones that have a residential, commercial or mobile structure on the property.

6.4 Flood History

Flooding has been a historic problem in Lewis County, particularly with the Chehalis, Nisqually, and Cowlitz Rivers. In order to understand why the policies, strategies, and recommended actions stated in prior chapters are important, this section summarizes the flooding potential of the major rivers. This chapter also summarizes stream flow records, flood hazards, and previous damage from flooding.

6.4.1 Overview of Flood Hazards

Damage during a flood is typically caused by one of two river processes active during flooding. The first process is inundation, defined as floodwater and debris flowing through an area. Inundation occurs when the water in the river channel rises to the level where it flows over the riverbanks and onto the surrounding floodplain. The level of damage caused by inundation is determined by the velocity and depth of the water, the amount of debris in the water, and the level of development in the inundated area. Areas of flood inundation can be determined through hydrologic analysis and study of historical records. Inundation areas may vary from flood to flood because of the impact of different hydraulic responses from the river system or possible failures of flood control structures.

The second river process that causes damage during a flood is bank erosion. Bank erosion occurs when a river scours its banks, causing the channel to shift position. Sometimes the river will actually move to an entirely new channel during a flood. Bank erosion can also threaten structures high above the floodplain by undermining the bank near where the structure is located. Areas prone to bank erosion can be identified through mapping and hydrologic analysis, but the occurrence of channel migration and channel “jumps” cannot be predicted with confidence.

In the Centralia-Chehalis valley, flood hazard is mainly associated with inundation. Bank erosion presents a hazard in localized areas, such as along the Skookumchuck River in Centralia and on the South Fork Newaukum River near Onalaska. Areas that regularly become inundated along the mainstem Chehalis River—including backwater flooding on Coffee, China, Salzer, and Dillenbaugh Creeks—typically contain slow-moving water. Structural damage to buildings caused by high velocity flow in the inundated areas has not been a significant problem historically. Overbank flow along the Skookumchuck River does typically have higher velocities than the mainstem Chehalis, although extensive erosion or structural damage from the Skookumchuck River has not been reported during any historical flood.

Flooding in the Chehalis River system, including the Skookumchuck and Newaukum Rivers, is disruptive and potentially dangerous to residents of the area. Inundation by floodwaters disrupts transportation routes such as I-5, the main north south transportation route between Seattle and Portland; forces evacuation of homes and commercial establishments; and can temporarily put sewage treatment plants out of service. A main line of the Burlington Northern Railroad also crosses the floodplain from east to west on the Chehalis River near Chehalis. The tracks are subject to damage at various locations during large floods. The Chehalis-Centralia

airport is protected by a dike system, but the dikes were overtopped during the January 1990 flood event, closing the airport. Except for the urban areas of Centralia and Chehalis, only scattered developments exist in the floodplain. Most of the floodplain is devoted to agricultural or related purposes.

6.4.2 Chehalis River Valley Flood Characteristics

Flooding has been a familiar problem to residents in the Chehalis River valley, particularly in the urbanized areas of Centralia and Chehalis. Some of the major projects from the past are discussed in Section 6.3. The main flood season for the Chehalis River is in late autumn and winter. Most major floods result from heavy rains during this period. Some floods are augmented by melting snow, but because the Chehalis River originates in the Cascade foothills, it is influenced less by snowpack than many Cascade mountain range rivers. The distribution of flooding within the Chehalis River basin varies between flood events, depending on the response of major tributaries. Variations in the amount and timing of storm rainfall cause tributaries to peak at different times with each storm event. This unpredictability makes flood forecasting difficult for this region.

6.4.3 Summary of Flood Hazards in the Chehalis-Centralia Valley

Although the flood hazards in the Chehalis-Centralia valley are generalized in nature, it is possible to identify specific urgent problem areas where flooding is particularly troublesome or expensive to residents. The following list (from the 1994 CFHMP and 2001 update) of urgent problem areas was developed with input from the Lewis County Advisory Committee and the Cities of Centralia and Chehalis:

1. Salzer Creek/Fairgrounds area. Flooding in the lower portion of the Salzer Creek basin is exacerbated by backwater effects from the Chehalis River. During a flood event, backwater from the Chehalis River becomes trapped upstream from the I-5 roadway and Burlington Northern railroad embankments. A dike on the north side of Salzer Creek, upstream from the railroad embankment, was designed to protect the fairgrounds, immediately to the north, from backwater flooding. During the January 1990 flood, water entered the fairgrounds by overtopping and outflanking the dike. Once floodwater enters the fairgrounds, there is no outlet for it. Because the fairgrounds are significantly lower than Gold Street to the east, a greater depth of water is able to accumulate on the fairgrounds. A water depth of approximately 8 feet stood in the fairgrounds during the January 1990 flood.
2. Wastewater Treatment Plants For the City of Centralia, the Mellen Street plant is still subject to risk during flooding and may become inoperable. Centralia's new wastewater treatment plant on Goodrich Road is out of the 100-year floodplain and should remain operable through any floods up to and including the 100-year event.
3. Dillenbaugh Creek Industrial Park area. New industrial development is occurring along Dillenbaugh Creek, which collects much of Chehalis's storm runoff before it empties into the Chehalis River. The new industrial development will create more pressure to protect frequently flooded areas adjacent to Dillenbaugh Creek from flood damage, and will also create additional stormwater that will flow into Dillenbaugh Creek.
4. Coffee Creek. The lower end of the Coffee Creek drainage becomes inundated during floods, in some cases isolating residents upstream. Some of the floodwater comes by overland flow from the Skookumchuck River. The Zenkner Valley, where Coffee Creek flows, is naturally a very low gradient, poorly drained valley, and tends to collect standing water during the wet season.
5. Galvin The area surrounding the small community of Galvin becomes inundated during low level flooding. Floodwater from Lincoln Creek and the Chehalis River actually flows back upstream to rejoin the Chehalis River southeast of Galvin. This problem area resulted in an undermined highway during the January 1990 flood.

6. Centralia Business District. The Centralia Business District is vulnerable to flooding from the Skookumchuck River and China Creek. Overbank flow on the Skookumchuck River can have high velocities, resulting in damage to structures. Currently, much of the left bank (south side) of the river is leveed, but the levees do not meet current USACE standards. China Creek is confined to pipes and culverts throughout most of the Centralia downtown area. During major floods, the capacity of these structures is exceeded.
7. Hospital. During the January 1990 flood, the hospital located on Cooks Hill Road in Centralia was not flooded, but all access routes to the hospital were inundated, causing the facility to be inaccessible from the ground.

6.4.4 Nisqually River Basin Flood Problems

The focus of this CFHMP is the urbanized areas located along the Chehalis River and its major tributaries. The Nisqually River basins encompass less populated areas in Lewis County. Therefore these areas are, are less prone to damages associated with the flooding hazard. This section addresses areas within the Nisqually River basins that were identified to have historical flood problems, despite the generally lower vulnerability in this less populated area; however, it is not intended to completely define flood conditions. The subsections below describe typical historical flood problems in the drainage basins, and it is expected that similar types flooding problems will be encountered in the future.

The headwaters of the Nisqually River are located in the northeast portion of Lewis County. The Nisqually River originates from the Nisqually Glacier on Mount Rainier and flows westerly to form a section of the north Lewis County border before turning northeast into Pierce County. The upper Nisqually River is very active. Its steep slope, high water velocities, and alluvial river valley provide conditions for frequent bank erosion and channel migration. Observed flood damage areas are a direct result of these processes. Two flood-impacted sections of the Nisqually River were identified and are described in the following pages: Nisqually River near the Pierce County border and Highway 7, and Nisqually River near the Hidden Valley Subdivision.

The Nisqually River near the Pierce County Border and Highway 7 is located on Weyerhaeuser property near Mineral Mill Road. The river is actively cutting into its banks near a slight meander. The base of the meander appears to be a historical channel. There was concern that the river would erode the bank and eventually traverse into the old channel. County Highway 7 and residential homes are located just downstream of this area. Further bank erosion and possible channel migration would cause flooding damage to downstream residences and Highway 7. Bank stabilization has been performed to maintain the existing channel configuration. The County installed a trench fill/riprap revetment along this river reach (Photograph 6-1 in ENSR, 1994).

The Hidden Valley Subdivision is located east of the town of Ashford and north of State Highway 7 near the Lewis/Pierce County border. The subdivision was platted in the early 1960s and prior to the November 1990 flood, there were 12 full-time residences, about 20 to 25 summer cabins, and approximately 50 vacant lots. The subdivision was largely covered with a fairly mature stand of timber.

By 1984 the area was recognized as a flood hazard area. In 1986, a levee was built upstream of the Hidden Valley Subdivision in an attempt to confine the river to an old channel. During the 1990 floods, the old channel filled with an estimated 100,000 cubic yards of sediment and the river was redirected into a deserted channel near Wold Road and Wasson Way. The river traversed subdivision roads, carrying a wide variety of debris and depositing material throughout the subdivision (Photograph 6-2 in ENSR, 1994). Some homes were destroyed and road access was eliminated. The Supplemental Flood Hazard Mitigation Report recommended that re-occupancy of this area be prohibited. In 1997, Lewis County worked with the remaining homeowners to sell and relocate after the County Wold Road was destroyed. Buyout was the preferred alternative, but not all the owners wished to move; the County subsequently rebuilt the road closer to the hillside.

Shortly after the road was completed in 1998, the Nisqually River moved toward the hillside at the downstream end of the new road. After this experience, the County recommended utilizing all efforts to buy out properties in a hazardous area. Generally, condemnation of property is a last resort.

6.4.5 Cowlitz River Basin Flood Problems

The Cowlitz River basin also encompasses less populated areas in Lewis County and, therefore, is less prone to hazard associated with flooding. The Cowlitz River extends from the Cascade crest westward into the southwestern portion of Lewis County. The river flows west/southwest prior to turning south near the town of Vader, where it flows toward the Columbia River. The Cowlitz River basin encompasses a large part of the eastern and southern portions of Lewis County. Two dams are located on the Cowlitz River in central Lewis County: Mossyrock Dam, which forms Riffe Lake, and Mayfield Dam, located downstream of Mossyrock Dam. The dams provide flood control for the lower Cowlitz drainage; therefore, flood-prone areas within the Cowlitz basin tend to occur in the upper reaches near the towns of Randle and Packwood.

Flood-Prone Areas

Six flood-prone areas were identified on the Cowlitz River and its tributaries: Cowlitz River near High Valley Park #6, Cowlitz River near High Valley Park #8, Cowlitz River South of Purcell Creek, Butler Creek North of Packwood, Silver Creek near Randle, and Kiona Creek west of Randle. The flood problems are primarily associated with bank erosion and channel migration. Bank stabilization techniques have been applied to each of the areas. The examples described below are typical of flood problems exhibited throughout the Upper Cowlitz basin.

The Cowlitz River near High Valley Park #6 is a historically flood-prone area located north of Packwood near High Valley Park #6 Subdivision, at a sharp meander in the river. During a 1977 flood, the river overtopped the bank at this location and followed an adjacent County road into High Valley Park. The flood waters caused residential and road damage in addition to power outages. As a result, a riverbank levee was constructed to protect this area. The levee extends approximately 100 yards along the south river bank (Photograph 6-3 in ENSR, 1994). The levee has prevented any further flood damage to date.

The Cowlitz River near High Valley Park #8 is a flood-prone area located upstream of High Valley Park #6. The river exhibited bank erosion and channel migration to an extent that it was impinging upon residential homes and County roads. Riprap material was used to stabilize the bank after the 1977 floods (Photograph 6-4 in ENSR, 1994). Following the 1990 floods, the County performed additional riprap repairs throughout this area.

The Cowlitz River south of Purcell Creek is located approximately 1 mile downstream of the creek. The area has an overflow channel adjacent to a County road. During the 1990 floods, the river breached the banks of the overflow channel and consequently caused approximately \$80,000 in damage to the County road. To reduce further damage, the County constructed a flow-through dike across the overflow channel (Photograph 6-5 in ENSR, 1994). The dike restricts flow into the overflow channel. Two culverts allow adequate flow through the overflow channel for fish passage, with floodwaters conveyed by the main channel.

Butler Creek joins the Cowlitz River approximately 1.5 miles northeast of Packwood. The creek descends steeply from the Tatoosh Range. Historically, the reach immediately above the confluence with the Cowlitz experienced overbank flow during flood conditions. The flooding would inundate a nearby fire station and County road. To reduce flood damage, riverbank levees were constructed on each side of Butler Creek (Photograph 6-6 in ENSR, 1994). The levees were installed in 1978 and have reduced further flood damage. The County frequently performs riprap repair in this area due to Butler Creek's high water velocities.

On Butter Creek near its juncture with the Cowlitz River (approximately 1.5 miles northeast of Packwood) riverbank revetments were constructed in 1987 on each side of the creek. These were extended in 1998. At these sites, management related disturbances may trigger mass wasting in the form of large landslides

(Butter/Skate Creek drainages), hillslope erosion, simplification of stream channels (Butter/Skate Creek drainages), and road conditions (Willame/Skate Creek drainages) (USDA 1997a).

Silver Creek enters the Cowlitz River near the town of Randle. Silver Creek's steep gradient and alluvial valley provides conditions for active channel migration and bank erosion. In the early 1970s, the Soil Conservation Service (SCS) constructed a riverbank levee near the confluence with the Cowlitz River (Photograph 6-7 in ENSR, 1994). Prior to levee construction, Silver Creek would overtop its banks during flood conditions and impact the public school in Randle. The levee has prevented any further damage to the school. Lewis County maintains this levee and typically replaces riprap material following flood flows.

Kiona Creek west of Randle is a flood-prone area located slightly upstream from the intersection of Kiona Creek and State Highway 12. Channel modifications were made to limit flood damage at a County maintenance facility located downstream (Photograph 6-8 in ENSR, 1994). In 1992 the County widened the channel by excavating approximately 100,000 cubic yards of material from this reach of Kiona Creek. This work was performed to increase the conveyance capacity, reduce erosion potential, and realign the channel away from the County facility.

Rainey Creek is located about nine miles west of Randall. It has flooded during several rainfall events; the most recent event was in November 2006. This storm event caused major flooding in the upper Cowlitz system. In 2006 Rainey Creek flooded and triggered the closure of US Hwy 12 due to debris and water flowing over the road. Flood events in 1990 and 1996 also temporarily required closures of US Hwy 12.

6.4.5.1 Cowlitz River Basin Probable Hazard Areas and Channel Migration Zones

In 2001 an analysis was made of the upper Watershed Resource Inventory Area (WRIA 26) for probable hazard areas (PHAs) and channel migration zones. PHAs are reaches with a high probable degree of flooding and/or channel movement. The CMZ is the lateral extent of likely movement along a stream reach with evidence of active stream channel movement over the past 100 years. CMZs are also known as floodway fringe areas, and are generally considered to be spatially equivalent to the 100-year floodplain.

The rivers in WRIA 26 exhibit different characteristics from the Chehalis River and tributaries in WRIA 23. They are glacier and snow based, transport an ever-ready source of bedload, and have different channel features. As a first step, channel characteristics were developed to delineate specific river reaches. These characteristics include gradient, ravine/valley geometry, channel configuration, and discharge. Specific river reaches were then identified using available topographic maps dated 1986-87 and aerial photographs taken in 1996-97. PHAs have been identified in the Cowlitz, Tilton, and Cispus Rivers of WRIA 26.

The significant PHA characteristics in these basins that could potentially lead to damage were gravel accumulation, braiding, and channel migration. Potential consequences such as backwater flooding at the confluence of various creeks, channel widening, and bank erosion were also identified. PHA analysis is different from traditional flood inundation mapping. Traditional inundation mapping is based on the magnitude of floodflows, while PHA delineation accounts for riverine and basin responses due to flows, geomorphology, geology, topography, channel characteristics, sediment source, and land use.

PHAs are currently used as a planning tool in Lewis County's Public Works, Emergency Management, and Community Development departments. It is also used as a precursor to CMZ mapping. The identification of many PHAs in a waterbody flags potential bank hazards, and may justify the need for a more detailed CMZ analysis.

CMZ mapping was conducted for the Upper Cowlitz and Rainey Creek basins in WRIA 26. This mapping need was identified from the 2001 CFHMP amendment, where an alternative flood hazard management measure was made. PHAs were identified using topographic maps dated 1986-1987 and aerial photographs dated 1996-1997 to note observable channel migration movements over a 10-year period. These PHAs were further analyzed using state CMZ criteria before Lewis County further delineated migration potential areas

(MPAs) within the CMZ. Criteria for high, moderate, and low risk MPA were developed, and used to delineate the respective MPAs to optimize planning options.

The mapping was completed in June 2003 and is available through the Lewis County Dept of Public Works. Initially, the information will be used as a planning tool for road maintenance and construction in Public Works. Community Development intends to use it in their update of the Critical Areas Ordinance, which was required by December 2005; however, the date has now been extended until December 2008. Currently, it is used as a planning tool in the Building Division of Community Development when issuing building permits.

Additional CMZ mapping was also performed for a 5-mile reach of the Cispus River. The lands in the Cispus River basin are primarily managed by the U.S. Forest Service (USFS), but there is a small isolated area of County residences and roads west of the Cispus Learning Center. This area has been designated as a Limited Area of More Intense Rural Development (LAMIRD) in the County's Comprehensive Plan. The Cispus River is a very volatile river with a huge bed load and channel meandering movement. The river has taken down a USFS bridge and closed a campground. Complaints of severe bank erosion on private properties have been noted since 1996. Six specific erosion hazards areas within the CMZ were identified as currently exhibiting rapid rates of erosion or high vulnerability to channel avulsion. The geomorphic and ecological analyses for this study were limited, however, by the lack of high resolution topography (e.g., less than 5-foot contours, or a digital elevation model grid with data point spacing less than or equal to 6.6 feet).

For a more complete discussion, refer to the following:

- "CFHMP Amendment for the Upper Cowlitz River Basin," May 2001
- "Landslide Hazards Evaluation," GeoEngineers, Inc. for Lewis County Public Works, January 28, 2000
- "Geomorphic Evaluation and Channel Migration Zone Analysis," GeoEngineers, Inc. for Lewis County Public Works, June 2003

6.4.6 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 (NWS) and U.S. Geological Survey (USGS). The NWS stations record only water levels, while the USGS stations record water levels and flow.

The first records of river stage and discharge on the Chehalis River date from October 1928 when the USGS installed a staff gauge 1.5 miles southwest of Grand Mound. The staff gauge was replaced with a recording gauge in October 1934 and continuous records at this site are available since 1934 (Chehalis River near Grand Mound).

The first gaging on the Skookumchuck River was in 1950, when the NWS installed a staff gauge on Harrison Avenue bridge in Centralia. In 1964, a wire weight gauge and resistance gauge were installed at the Pearl Street bridge over the Skookumchuck River in Centralia. The Harrison Avenue gauge was discontinued, but the Pearl Street gauge continues to collect data seasonally. The resistance gauge permits remote readout in the City Engineer's office and the wire weight provides a calibration facility for the resistance gauge.

Table 6-3 lists 22 gaging stations that have relevance to local river conditions. Five stations are outside the County and 18 are within. Out of the 18 stations in the County:

- Four stations are NWS flood forecast stations. These four flood forecast stations are in WRIA 23 and are at Doty, Chehalis, Mellen Street, and Pearl Street.
- Two stations provide only flood elevations: Cowlitz River near Toledo, and Chehalis at the city WWTP.
- The County has an agreement with USGS for joint operation of 10 stream gauges.

Table 6-3. Gaging Stations

Stream	Location	Site Number	Drainage Area (mi ²)	Agency	Record Period
WRIA 11					
Nisqually River *	National	12082500	133	USGS	1942-
Mineral Creek	Mineral	12083000	75	USGS	1943-
WRIA 23					
Chehalis River	Doty	12020000	113	USGS/NWS	1939-
South Fork Chehalis River	Wildwood	12020800	27	USGS	1998-
Chehalis River	near Adna	12021800	340	USGS	1998-
South Fork Newaukum River	near Onalaska	12024000	42	USGS	1942-48, 1967-71, 1988-
North Fork Newaukum River	near Forest	12024400	30	USGS	1998-
Newaukum River	near Chehalis	12025000	155	USGS/NWS	1929-31, 1942-
Chehalis River	Chehalis WWTP	12025100	618	USGS	1998-
Chehalis River	Mellen Street, Centralia	12025500	653	NWS	1949-
Skookumchuck River	Pearl Street, Centralia	12026600	172	NWS	1964-
Skookumchuck River*	near Vail	12025700	40	USGS/NWS	1967-
Skookumchuck River*	Bloody Run Creek	12026150	66	USGS/NWS	1929-33, 1939-
Skookumchuck River*	Bucoda	12026400	112	USGS/NWS	1967-
Chehalis River*	Grand Mound	12027500	895	USGS/NWS	1928-
WRIA 26					
Cowlitz River	near Chehalis	14226500	287	USGS	1911-19, 1929-
Cowlitz River	near Forest	14231000	541	USGS	1910-11, 1933-
Cowlitz River		1423500	1,040	USGS	1947-
Tilton River		14236200	141	USGS	1956-
Cowlitz River		14237800	1,392	USGS	1962-
Cowlitz River		14238000	1,400	USGS	1910-11, 1934-
Cowlitz River		14234800	1,154	USGS	1968-

* Outside County boundaries

Streamflow data are summarized in Table 6-4 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 ENSR, 1994). The largest monthly flows occur in December through February, with this 3-month 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 6-4. Summary of Mean Monthly Flows									
	Chehalis River Near Grand Mound			Newaukum River Near Chehalis			Skookumchuck River Near Bucoda		
Period of record	1928-2007			1929- 2007			1967- 2007		
Drainage Area (mi ²)	895			155			112		
Month	Flow (cfs)	Percentage of Annual Flow (%)	Flow per Unit Area (cfs/mi ²)	Flow (cfs)	Percentage of Annual Flow (%)	Flow per Unit Area (cfs/mi ²)	Flow (cfs)	Percentage of Annual Flow (%)	Flow per Unit Area (cfs/mi ²)
January	6,428	19	7.1	1,110	18	6.9	783	18	7.0
February	5,769	17	6.5	970	16	6.4	670	16	6.1
March	4,501	13	5.1	768	13	5.0	542	13	5.0
April	2,929	9	3.3	540	9	3.5	395	9	3.7
May	1,382	4	1.5	294	5	1.8	219	5	1.9
June	810	2	0.9	183	3	1.2	151	4	1.4
July	378	1	0.4	89	1	0.6	95	2	0.9
August	243	1	0.3	56	1	0.3	79	2	0.7
September	340	1	0.4	71	1	0.5	120	3	1.1
October	918	3	1.0	181	3	1.2	141	3	1.3
November	3,862	11	4.3	748	12	1.5	346	8	3.1
December	6,389	19	6.8	1,070	18	6.5	717	17	6.0
Annual Average	2,829	100	3.1	507	100	3.2	355	100	3.2

Peak annual flood data are summarized in Table 6-5.

Table 6-5. Summary of Peak Annual Floods								
Chehalis River near Grand Mound			Newaukum River near Chehalis			Skookumchuck River near Bucoda		
1929- 2007			1929- 2007			1968- 2007		
Year	Date	Maximum Flow (cfs)	Year	Date	Maximum Flow (cfs)	Year	Date	Maximum Flow (cfs)
1996	Feb. 09, 1996	74,800	1996	Feb. 08, 1996	13,300	1996	Feb. 08, 1996	11,300
1990	Jan. 10, 1990	68,700	1987	Nov. 24, 1986	10,700	1990	Jan. 10, 1990	8,540
2007	Dec. 4, 2007	61,900	1990	Jan. 09, 1990	10,400	1991	Nov. 25, 1990	8,400
1987	Nov. 25, 1986	51,600	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
1971	Jan. 26, 1971	40,800	2003	Jan. 31, 2003	8,940	1976	Dec. 04, 1975	6,110
1997	Dec. 30, 1996	38,700	2006	Jan. 30, 2006	8,720	2002	Dec. 17, 2001	6,060
1935	Jan. 23, 1935	38,000	1974	Jan. 15, 1974	8,440	2003	Feb. 01, 2003	5,990
1951	Feb. 10, 1951	38,000	1971	Jan. 26, 1971	8,390	1974	Jan. 16, 1974	5,950
2006	Jan. 31, 2006	37,900	2000	Dec. 16, 1999	8,100	1982	Jan. 24, 1982	5,250
1974	Jan. 17, 1974	37,400	1976	Dec. 04, 1975	8,020	2000	Dec. 16, 1999	5,150

Table 6-5. Summary of Peak Annual Floods								
Chehalis River near Grand Mound			Newaukum River near Chehalis			Skookumchuck River near Bucoda		
1929- 2007			1929- 2007			1968- 2007		
Year	Date	Maximum Flow (cfs)	Year	Date	Maximum Flow (cfs)	Year	Date	Maximum Flow (cfs)
1949	Feb. 18, 1949	36,500	1964	Jan. 25, 1964	7,970	1999	Dec. 28, 1998	5,010
1978	Dec. 03, 1977	36,500	1986	Feb. 23, 1986	7,960	2005	Jan. 18, 2005	5,000
1999	Nov. 26, 1998	36,500	2002	Dec. 17, 2001	7,920	1968	Feb. 04, 1968	4,850
1936	Jan. 15, 1936	36,300	1954	Dec. 09, 1953	7,880	1986	Feb. 24, 1986	4,650
1995	Dec. 21, 1994	35,900	1983	Dec. 04, 1982	7,820	1975	Jan. 14, 1975	4,610
1964	Jan. 26, 1964	35,700	2005	Jan. 18, 2005	7,740	1983	Jan. 05, 1983	4,570
1956	Dec. 22, 1955	35,100	2004	Jan. 30, 2004	7,460	1998	Jan. 15, 1998	4,340
1954	Jan. 06, 1954	34,700	1975	Jan. 14, 1975	7,400	1995	Feb. 20, 1995	4,100
1967	Dec. 14, 1966	34,400	1979	Feb. 07, 1979	7,280	1981	Dec. 26, 1980	3,980
1986	Jan. 20, 1986	32,100	1956	Dec. 12, 1955	7,200	2004	Jan. 30, 2004	3,900
2002	Dec. 18, 2001	31,900	1963	Nov. 20, 1962	6,960	1970	Jan. 14, 1970	3,810
2000	Dec. 17, 1999	31,000	1949	Feb. 17, 1949	6,950	1969	Dec. 04, 1968	3,680
1963	Nov. 21, 1962	29,800	1984	Jan. 25, 1984	6,760	1984	Nov. 18, 1983	3,260
1982	Jan. 25, 1982	27,300	1931	Apr. 01, 1931	6,750	1988	Mar. 27, 1988	2,820
1945	Feb. 09, 1945	27,000	1998	Jan. 14, 1998	6,580	2007	Dec. 5, 2007	2,810
1961	Feb. 22, 1961	27,000	1965	Dec. 23, 1964	6,500	1994	Mar. 03, 1994	2,770
1942	Dec. 20, 1941	26,900	1961	Nov. 20, 1960	6,460	1980	Dec. 18, 1979	2,740
1975	Jan. 15, 1975	26,900	1947	Dec. 11, 1946	6,350	1992	Jan. 29, 1992	2,620
1950	Feb. 26, 1950	26,300	1973	Dec. 21, 1972	6,330	1979	Feb. 07, 1979	2,000
1965	Dec. 24, 1964	26,200	1959	Nov. 12, 1958	6,290	1973	Dec. 21, 1972	1,770
1983	Dec. 05, 1982	25,600	1945	Feb. 08, 1945	6,080	1993	Apr. 11, 1993	1,760
1933	Dec. 03, 1932	24,900	1995	Dec. 27, 1994	6,040	1985	Nov. 29, 1984	1,620
1939	Feb. 16, 1939	24,800	1960	Nov. 21, 1959	5,950	1989	Mar. 13, 1989	1,550
1968	Feb. 05, 1968	24,800	1946	Feb. 06, 1946	5,900	2001	May 2, 2001	905
1960	Nov. 24, 1959	24,700	1950	Feb. 24, 1950	5,720	1977	Mar. 09, 1977	764
1937	Apr. 15, 1937	24,300	1948	Mar. 22, 1948	5,630			
1947	Jan. 26, 1947	24,200	1988	Dec. 10, 1987	5,500			
1981	Dec. 27, 1980	24,000	1981	Dec. 26, 1980	5,490			
1932	Feb. 27, 1932	23,500	1967	Jan. 20, 1967	5,450			
1970	Jan. 28, 1970	23,300	1970	Jan. 14, 1970	5,300			
1946	Dec. 30, 1945	23,100	1951	Feb. 09, 1951	5,240			
2003	Feb. 01, 2003	23,100	1980	Jan. 12, 1980	5,020			
1940	Dec. 17, 1939	22,700	1943	Nov. 23, 1942	4,990			
1959	Nov. 13, 1958	22,500	1968	Feb. 19, 1968	4,810			
1966	Jan. 07, 1966	21,900	1955	Feb. 08, 1955	4,780			
1973	Dec. 28, 1972	21,900	1953	Jan. 23, 1953	4,540			
1998	Jan. 15, 1998	21,400	1966	Jan. 06, 1966	4,520			
1957	Feb. 27, 1957	20,900	1944	Dec. 03, 1943	4,500			
2005	Jan. 19, 2005	20,700	1957	Dec. 10, 1956	4,300			
1953	Jan. 10, 1953	20,500	1969	Dec. 04, 1968	4,300			
2004	Jan. 31, 2004	20,400	1992	Jan. 28, 1992	3,990			

Table 6-5. Summary of Peak Annual Floods								
Chehalis River near Grand Mound			Newaukum River near Chehalis			Skookumchuck River near Bucoda		
1929- 2007			1929- 2007			1968- 2007		
Year	Date	Maximum Flow (cfs)	Year	Date	Maximum Flow (cfs)	Year	Date	Maximum Flow (cfs)
1943	Feb. 07, 1943	20,200	1952	Feb. 04, 1952	3,980			
1948	Jan. 03, 1948	20,000	1962	Dec. 24, 1961	3,820			
1992	Jan. 30, 1992	19,600	1993	Apr. 11, 1993	3,730			
1931	Apr. 01, 1931	19,400	1985	Nov. 04, 1984	3,630			
1984	Jan. 26, 1984	19,200	1958	Dec. 26, 1957	3,590			
1980	Jan. 13, 1980	19,000	1989	Dec. 30, 1988	3,570			
1941	Jan. 19, 1941	18,800	1994	Jan. 05, 1994	3,170			
1952	Feb. 05, 1952	18,800	1929	Mar. 27, 1929	3,090			
1958	Dec. 27, 1957	18,500	1930	Mar. 24, 1930	16-Jun			
1979	Feb. 08, 1979	18,300	1977	Mar. 09, 1977	13-Jan			
1955	Feb. 09, 1955	18,100	2001	Apr. 11, 2001	22-Jul			
1985	Nov. 29, 1984	18,000						
1969	Feb. 12, 1969	17,500						
1944	Dec. 04, 1943	16,400						
1988	Dec. 11, 1987	16,400						
1962	Dec. 21, 1961	15,900						
1977	Mar. 09, 1977	15,200						
1989	Dec. 31, 1988	14,400						
1929	Mar. 27, 1929	13,700						
1994	Mar. 04, 1994	13,100						
1930	Feb. 08, 1930	12,200						
1993	Apr. 12, 1993	10,400						
2001	Feb. 05, 2001	5,750						

Flood data in Table 6-5 show that almost all annual floods occurred during the fall/winter period from November through February. For the this period of record on the Chehalis River near Grand Mound, only five of the peak annual floods occurred outside of this period. Of the remaining four, two occurred in March and two in April. Similarly, most peak annual floods on the Newaukum and Skookumchuck Rivers also occurred during the November through February period.

Examination of the flood data in Table 6-5 reveals some interesting trends. First, recent years have experienced some of the largest floods on record. For example, the 1980, 1990 and 1986 floods rank in the top five all on three rivers. 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 to occur during the past 63 years.

Table 6-6 is a summary and ranking of the top 10 peak flows in WRIA 23, 26, and 11. 2007 flow data was only available for Chehalis near Grand Mound. The 2007 may likely be the new flood of record though the USGS has not yet made these determinations. The February 1996 flood was the flood of record in WRIA 23, the upper Chehalis basin. Recorded flows in WRIA 23 show numerous peak flows from the period 1971 to 1996.

Table 6-6. Summary of Ten Peak Annual Flows

WRIA 11 Nisqually at National		WRIA 23 Chehalis Near Grand Mound		WRIA 23 Newaukum at Chehalis		WRIA 26 Cowlitz at Packwood ¹		WRIA 26 Cowlitz below Mayfield Dam ¹	
Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)
Feb-96	21,200	Feb-96	74,800	Feb-96	13,300	Dec-33	36,600	Nov-95	68,400
Dec-77	17,100	Jan-90	68,700	Nov-86	10,700	Dec-77	36,200	Dec-46	67,000
Jan-74	15,000	Dec-07	62,700	Jan-90	10,400	Nov-59	34,300	Jan-65	64,700
Jan-90	14,500	Nov-86	51,600	Dec-77	10,300	Feb-96	32,900	Dec-75	64,700
Dec-75	13,200	Jan-72	49,200	Nov-90	10,300	Nov-62	32,100	Nov-59	60,800
Dec-80	11,600	Dec-37	48,400	Nov-98	10,000	Dec-75	30,600	Dec-77	55,200
Jan-75	11,000	Nov-90	48,000	Jan-72	9,770	Dec-80	30,600	Feb-51	51,200
Nov-90	11,000	Dec-33	45,700	Dec-96	9,700	Dec-17	28,800	Dec-55	49,900
Nov-59	10,900	Dec-75	44,800	Jan-03	8,940	Nov-90	28,700	Nov-62	49,500
Jan-03	10,800	Jan-71	40,800	Jan-06	8,720	Nov-34	26,500	Dec-53	47,600

¹ Flows after 1963 are affected by diversion

The records show that the severity varies between and within river basins. For example, note the different ranking of flow events in the Chehalis River near Grand Mound and the Newaukum River near Chehalis. This is reasonable because topography, soils, channel features, land uses, and localized climate conditions affect the magnitude and conveyance of flows.

As part of a Flood Insurance Study, FEMA (1981) estimated flood magnitudes at various locations in the Chehalis River basin for return periods ranging from 10 to 500 years. These flood estimates are summarized in Table 6-7. The extreme flood event in January 1990, the USGS (Hubbard, 1991) estimated the return period of the peak flow on the Chehalis River near Grand Mound to be about 100 years; in layman terms, this storm has a 1 percent chance of occurring in any given year. The return periods of the peak floods on major tributaries were less, estimated to be 30 years (3.3 percent probability) on the Newaukum River and 45 years (2.2 percent probability) on the Skookumchuck River. The USGS is expected to create new flood frequency returns in 2008 in response to the December 2007 flood event.

Table 6-7. Magnitude and Frequency of Floods within the Chehalis River Basin

Location		Drainage area (mi ²)	Peak flood (cfs)			
			10-year	50-year	100-year	500-year
Chehalis River						
Chehalis River mainstem	at Grand Mound	895	38,700	51,600	56,000	70,000
	downstream of confluence with Skookumchuck River	834	38,600	51,600	55,780	70,000
	upstream of confluence with Skookumchuck River	653	32,500	42,000	45,000	59,200
	downstream of confluence with Newaukum River	593	32,100	38,500	42,500	58,700
	downstream of confluence with South Fork Chehalis River	332	24,600	32,000	35,220	43,800
	at Pe Ell	95	15,200	20,000	23,000	28,000
Tributaries to Chehalis River						
Skookumchuck River	at confluence with Chehalis River	181	8,750	11,000	13,000	17,900
	Coffee Creek at confluence with Skookumchuck River	7	150	275	234	510
	Hanaford Creek at confluence with Skookumchuck River	58	2,100	3,150	3,700	4,800
China Creek	at confluence with Chehalis River	6	120	220	290	*1
Salzer Creek	at confluence with Chehalis River	25	600	1,070	1,360	
	Coal Creek at confluence with Salzer Creek	9	230	420	530	790
	South Fork Salzer Creek at confluence with Salzer Creek	8	250	450	580	*1
	Middle Fork Salzer Creek at confluence with Salzer Creek	2	190	340	440	*1
	North Fork Salzer Creek at confluence with Middle Fork Salzer Creek	3	180	320	410	*1
Dillenbaugh Creek	at confluence with Chehalis River	12	440	560	630	800
	Berwick Creek at confluence with Dillenbaugh Creek	5	130	180	220	280
Newaukum River	at confluence with Chehalis River	155	7,860	10,750	11,500	13,640
South Fork Newaukum River	North Fork Newaukum River at confluence with Newaukum River	69	4,400	6,350	7,400	9,400
	Middle Fork Newaukum River at confluence with North Fork Newaukum River	19	660	1,000	1,250	1,700
South Fork Chehalis	at confluence with Chehalis River	123	9,300	12,860	14,800	18,600

¹Data not available

Source: FEMA 1981

The USACE has investigated flood damages in the Centralia-Chehalis valley and, based on historical records, has identified water levels at selected gauges that cause zero damage and major damage in the valley. These gauge heights provide a reference for quickly assessing the severity of anticipated floods and triggering initiation of emergency flood response operations in Lewis County (USACE, 1991).

6.4.7 February 1996 Flood

The February 1996 flood is the flood of record on all major drainages in WRIA 23. The USACE updated its flood frequency curves for the Chehalis River in 1997. The USACE had published flood frequency curves for a 1980 FEMA report, and made revisions in 1989. USACE's flood recurrence intervals are significantly higher than those published in 1980 and 1989, as shown in Table 6-8. This was also the greatest flood discharge on the Cowlitz River (WRIA 26) and on the Nisqually River (WRIA 11).

Table 6-8. Comparison of Flood Recurrence Intervals in WRIA 23

Date	Maximum flow at Grand Mound gauge (cfs)	USACE 1998 update	USACE 1989 update	FEMA 1980
February 6, 1996	73,900	100	400	600
November 25, 1990	48,000	15	30	35
January 10, 1990	68,700	70	250	400
November 25, 1986	51,600	20	40	50
January 21, 1972	49,200	15	30	35

Several antecedent conditions were in place before the February 6, 1996, flood of record. The ground throughout the basin was at or near saturation. Recent snowfall as low as 500 feet above sea level had occurred. 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. 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.

6.4.8 December 2007 Flood

The December 2007 flood was caused by a series of strong storms. On November 29, 2007, a strong low pressure system formed in the central Pacific Ocean and was carried via the Pineapple Express to the Pacific Northwest. The first of the three separate storms arrived on December 1, accompanying frigid temperatures across much of Washington which resulted in many areas across Washington receiving up to 14 inches of snowfall. On December 2, the second storm, which provided considerable amounts of rainfall, yet still packing cold temperatures, dumped even more snow across parts of the state.

The second storm made landfall on December 2 on the Oregon coast with the hurricane-force winds that were forecast, along with tropically-affected temperatures. In as little as two hours, temperatures across the region jumped from near freezing to above 60 degrees in areas just as the first bands of the heavy rain were hitting. The storm moved northward through Oregon and Washington with strong rain accompanying the wind. The rapid rise in temperature caused the recent snow to melt quickly, indicating that record flooding was imminent across much of the region. By the morning of December 3, extreme wind speeds by the third and most powerful Pacific storm began hitting much of the WA and OR coasts.

Across the area torrents of water gouged hillsides, broke levees and overtopped dikes as flood gauges reached record highs and some blew out altogether. Late in the afternoon on December 3, the 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 ten to fifteen feet of water in locations. The floodwaters did not start receding until December 5. Late in the evening on December 6, the Washington State Dept. 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 roughly four million dollars a day.

On December 3, citing rains, flooding, landslides, road closures, and extensive property damage, Governor Chris Gregoire, declared a state of emergency for the entire state on December 3.

As of December 22, 2007, Lewis County, along with Clallam, Grays Harbor, King, Kitsap, Mason, Pacific, Snohomish, and Thurston Counties were eligible for federal disaster aid.

At the height of the storm, at least 75,000 customers in Washington lost electric service. Many remained without power since the start of the storms. Near downtown Centralia, twenty square blocks had been flooded. The December 2007 Pacific Northwest storms and flood were blamed for at least eight deaths and billions of dollars of damage to the area.

This flood was far more damaging than the one in 1996. The water rose faster, and it flooded places that no one remembers being inundated before. Floodwater high up the Chehalis River stripped gargantuan loads of silt and timber off the hills, and dumped it along with the water that swamped homes, garages and barns to depths of up to 12 feet in some upriver communities. In some areas, log jams may have acted like small dams, temporarily holding back water until they toppled over or breached.

6.4.9 Lewis County 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.

Flood damage information was obtained by the USACE 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 6-9 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 6-7. These damage costs are approximate, and of primary and significant structures and businesses. Information about damages is collected by different agencies, and does not include unreported damages. The information is further confused when initial estimates of damage are refined. This can either result in a higher or lower value. At best, the primary damage was erosion of public infrastructures (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.

Table 6-9. Presidential Declared Disasters			
Federal Declaration No.	Date	River/Area	Reported Public Damages (\$)
DR-1734	Dec-07	Chehalis	*
DR-1172	Mar-97	Cowlitz	9,400,000**
DR-1159	Dec 96 – Jan 97	Chehalis, Cowlitz	3,255,900
DR-1100	Feb-96	Chehalis, Cowlitz	30,000,000
DR-1079	Nov-Dec 1995	Cowlitz	12,000,000
-	Dec-94	Chehalis	40,000
DR-0883	Dec-90	Nisqually	700,000
DR-0883	Nov-90	Chehalis	1,050,000
-	Feb-90	Chehalis	200,000
DR-0852	Jan-90	Chehalis	1,439,380
DR-784	Nov-86	Chehalis	3,926,250
DR-545	Dec-77	Cowlitz	1,359,800

Table 6-9. Presidential Declared Disasters			
Federal Declaration No.	Date	River/Area	Reported Public Damages (\$)
DR-1079	Dec-75	Cowlitz	50,200,000
DR-414	Jan-74	-	-
DR-322	Jan-72	Chehalis	2,060,250
-	Jan-71	Chehalis	446,570

*Information pending.

** Amount of Stafford Act and Small Business Administration disaster loans approved

Precise information on private property damage is, for the most part, unavailable. FEMA collects several types of data for private property: human resources claims, and requests for short-term assistance and claims through the 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 due to lapsed flood insurance policies, or to fear of increased rates. Unfortunately, this is a common misconception; rates do not automatically increase based on submission of claims. In any case, the actual damages are likely understated and do not reflect the true magnitude of problems.

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 flood event was the most severe and it affected interstate travel, thus making the associated damage costs (estimated up to \$100 million) the highest to date. The \$30 million estimate given in Table 6-9 represents damage costs to public structures incurred within the County.

6.5 Historical Flood Reduction Efforts

Flooding has been a problem in Lewis County for a long time. Many different entities—including the USACE, FEMA, U.S. Department of Agriculture (formerly SCS), and the U.S. Bureau of Reclamation (USBR)—have undertaken flood-reduction studies and projects. Some of these efforts are described in more detail below.

6.5.1 U.S. Army Corps of Engineers

The USACE has studied implementing flood control projects on the Chehalis River and its tributaries since the early 1930s. However, the cost of flood-reduction projects has not justified the expense when benefit cost analyses have been completed. In December 2005, I-5 near Chehalis was closed for 5 days in both directions due to extensive flooding. It was again closed for several days in December 2007 due to flooding. These closures have restricted commercial transport on a major Canada to Mexico artery. As a result, the business cost analysis may change to justify future flood control projects.

6.5.1.1 USACE Activities, 1930-1976

The Army Corps of Engineers has been active in the Chehalis River drainage for many years. In 1931 the agency 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 USACE of flood control for the Chehalis River concluded that a flood control reservoir or channel improvements at Centralia Galvin, Oakville, Malone, and Potter were not economically justified.

The 1944 House Document 494, 78th Congress, 2nd Session, discussed a preliminary examination and survey for flood control on the Chehalis River and its tributaries. This document considered construction of a levee system to protect Aberdeen, Cosmopolis, and Hoquiam. The USACE 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. The authorization expired in 1952.

Between 1946 and 1949, the USACE analyzed the concept of multiple reservoirs on the upper Chehalis River, but determined that they were not feasible at that time. Later, the USACE 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, Coffee Creek Channel Excavation and Debris Removal under Section 208 of 1954 Flood Control Act, was completed in March 1966.

Between 1966 and 1971, USACE 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 to not be economically justified. A much larger dam would have been necessary to allow flood control storage and water supply.

In 1968 two informational documents were published by the USACE. The report *Flood Plain Information--Skookumchuck River, Bucoda, Washington* (USACEa, 1968) 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* (USACEb, 1968) 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* (USACE, 1974), delineated the suggested hydraulic floodway for the area covered by the 1968 floodplain information report. The USACE 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 I-5 bridge.

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

During the period 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. 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 to not 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 USACE review the potential for modifying the private Skookumchuck Dam to provide flood control. Based on its subsequent analysis, the USACE 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* (USACE, 1982).

The USACE prepared basic hydrologic, hydraulic, and economic studies that were updated from the previous reports and preliminary spillway design layouts and cost estimates. The USACE suspended design work after studies indicated that the recommended plan lacked economic justification.

Preferred Alternative: Modification of Skookumchuck Dam

Prompted by the City of Centralia's 1980 request, the USACE initiated feasibility studies for modifying the existing private water supply dam on the Skookumchuck River, about 20 miles upstream from Centralia. USACE's study results indicated that it would be a better solution, both economically and environmentally, than an urban levee system. Although a 1968 USACE analysis had shown that using the dam for flood control was not feasible, subsequent coordination with the dam owner, Pacific Power & Light (PP&L), indicated that flood control could be feasible. Based on the experience it had gained in a decade of dam operation, PP&L 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 USACE 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 requirements would also be maintained.

The Centralia, Washington, *Flood Damage Reduction Interim Feasibility Report and Environmental Impact Statement* (USACE, 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 \$2,506,000 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. Structural modifications to the dam would have been performed by the USACE and included gating of the existing spillway along with constructing a 12-foot-diameter flood control tunnel with related intake and exit structures.

Once modifications were complete, PP&L 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 USACE 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.

6.5.1.3 Recent USACE Activities in the Chehalis River Basin

In response to the flooding on the Chehalis River in the 1990s, the USACE initiated several flood damage reduction studies. While no action occurred as a result of these analyses, severe flooding in 2007 has refocused the attention of regional stakeholders on appropriate structural solutions. As a result, it is likely that some elements of the USACE projects will receive new consideration by the Flood Authority.

6.5.1.3.1 Follow-up Evaluations of the Skookumchuck Dam Modifications

In May of 1990, USACE 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 of 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 USACE sent a negative report to the Division Office in September; the report recommended cessation of further study of Skookumchuck Dam modification by the USACE.

6.5.1.3.2 Centralia Flood Damage Reduction Project

After the 1996 flood event, the Flood Action Council (FAC)—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 Board of County Commissioners (BOCC) because it did not meet the legal criteria for creation.

The BOCC 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 USACE conduct Preconstruction Engineering and Design (PED) work from February 1988 through August 1990. Prior to the PED, WSDOT had plans to widen and raise segments of I-5 near Centralia and Chehalis. These post-1996 local flood studies were made to also develop a flood hazard management alternative for flood relief other than raising Interstate 5 (I-5).

Lewis County asked that the USACE resume work on its PED 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. USACE 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 USACE began the scoping process for the Environmental Impact Study (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 USACE conducted a Post Authorization Study, the Chehalis River General Reevaluation Study (GRS). This study is a re-analysis of a previously completed and authorized study using current planning criteria and policies, which is required due to 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 GRS is summarized in the “Draft EIS, Centralia Flood Damage Reduction Project” by the USACE dated July 2002.

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, to occur during the project design process. The project has not yet been implemented. In 2008 the Flood Authority authorized Northwest Hydraulic Consultants to re-investigate alternatives proposed under the original usage study. The Flood Authority will present findings and recommendations to the local communities after the proposed projects have been prioritized, evaluated and funded.

6.5.1.3.3 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 USACE conducted a reconnaissance study under authority of Section 205 of the 1948 Flood Control Act. This project area was eligible for federal participation in flood protection under ER 1165 2 21 because the 10-year discharge at the mouth of Salzer Creek is estimated to be 1,030 cfs, which is greater than the 800 cfs minimum flow requirement.

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 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 I-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 USACE to analyze the effect of overland flow from the Skookumchuck River in this level of investigation.

The USACE 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. Additional features of the plan would include improvements to the Salzer Creek channel upstream of the closure structure, improvement of the existing levee which protects the Centralia-Chehalis airport, and the retention of wetlands within the Salzer Creek basin. The project would protect not only improvements along Salzer Creek, but also a portion of I-5 that is subject to flooding and the Centralia-Chehalis airport.

The project would consist of the following main elements:

- A short levee segment and a closure structure with a pump plant across lower Salzer Creek just west (downstream) of the I-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 vary from 8 to 16 feet in height. 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.
- Two new short levee segments to tie the airport dike to the I-5 embankment.
- Designation of 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 ever 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. Therefore, the Salzer Creek Pump Station is no longer being considered.

6.5.1.3.4 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 USACE 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 (BNRR) 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, and is surrounded by low-lying hills having 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 BNRR.

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 Skookumchuck River entering China Creek near the BNRR 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—including levees, flood-proofing, channel modification, detention storage, and diversion—were identified for flood damage reduction. 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 BNRR 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 under ER 1165 2 21 criteria 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 USACE 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.

6.5.1.3.5 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 USACE 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 USACE completed a reconnaissance report in August 1990 that indicated that substantial flood damage reduction and safety benefits could accrue from improving flood warnings, the public's awareness of the flood problem, and the government's flood response plan. In early 1991 the Seattle District USACE 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 USACE has investigated flood damages in the Centralia-Chehalis valley and based on historical records, 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 USACE 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.

6.5.1.3.6 Newaukum River at Chehalis Flood Reduction Study

In 1989, under USACE Section 205 authority, the Seattle District USACE investigated flood solutions to the flooding problem centered on the Chehalis Avenue Apartments in Chehalis. The solution proposed by the USACE 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 USACE.

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

1. 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.
2. The federal government should aid the local governments and individuals in improving their flood warning and flood response system.
3. All potentially feasible structural projects should be investigated and their costs, benefits, and impacts thoroughly researched.
 - a. The USACE was studying flooding problems along the lower Salzer Creek.
 - b. The USACE was studying flooding problems along the Skookumchuck River.
 - c. The City of Centralia should address the China Creek flooding problem.

6.5.3 Natural Resource Conservation Service

Flood hazard analyses by the Natural Resource Conservation Service, formerly known as the SCS, are conducted according to recommendations in a report by the Task Force on Federal Flood Control Policy, House Document No. 465 (89th Congress; ordered and printed August 10, 1966), especially recommendation 9(c), "Regulation of Land Use," which 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.

6.5.3.1 Flood Hazard Analysis of Coffee Creek, February 1978

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. Stream gradient is low in the lower 4 miles of the watershed. The watershed encompasses 7.3 square-miles of moderately sloping hills (15 to 40 percent) of silty clay loam. The higher valley floors are silty clay alluvial floodplains. The lower valley floors are peat and muck, both over dense clay. Watershed elevations range from 186 feet at the confluence with the Skookumchuck River to 645 feet at the northern tip of the watershed. The SCS report addresses the lower 3.4 miles of the watershed.

Development in the Coffee Creek basin trends toward higher residential and commercial densities. Approximately 10 percent of the watershed lies within the city limits of Centralia. Forty percent of the remainder is in forest under active timber harvesting, and 50 percent in agriculture--mostly pasture with related grasses and legumes.

Because Coffee Creek floods are usually caused by large rainstorms in the region, flooding in Coffee Creek will usually be associated with flooding in adjacent basins. Thus, the 100-year frequency flood on Coffee Creek would be associated with high backwater of the Skookumchuck River. Local problems are due to overland sheet or shallow flooding, with ponding in topographic areas associated with old stream channels and natural depressions. Historically, major floods have occurred in winter months and damages are to urban structures rather than agricultural areas. No flow data are available for Coffee Creek.

Two types of major flooding potential in the Coffee Creek area are apt to be found together in any one flood. The lower area of the watershed is bounded on the east and the south by the Skookumchuck River. The point where Coffee Creek enters the Skookumchuck River is only 1.6 miles from the confluence of the Skookumchuck with the Chehalis River. Flooding of the two rivers affects this area greatly.

The second type of flooding has to do with Coffee Creek alone. Lower reaches of the creek have been moved from the floodplain to a higher location near the toe of the hills on the west side. The lower areas in the old creek alignment provide an excellent area for collecting surface waters. The current conveyance system is not regularly maintained to keep the channel clear of obstructions such as bridges, fences, pipes, and vegetative growth, which increase the potential for Coffee Creek to seek new channels.

The SCS 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. Flood potential should be rechecked on the SCS model when significant land use changes are proposed in the future. It is also important to note that this study did not address flooding in the Coffee Creek basin caused by overland flow from the Skookumchuck River.

6.5.3.2 Flood Hazard Analysis of China Creek, March 1977

An analysis of flooding on China Creek was requested by the City of Centralia on January 30, 1974. The objective was to conduct a detailed flood hazard analysis of the China Creek floodplain in and adjacent to Centralia. China Creek is a relatively small, short stream that flows through the City of Centralia to the Chehalis River. The watershed extends about 5 miles to the east of the Chehalis River at Centralia. It encompasses approximately 3,802 acres, or approximately 6 square-miles. The watershed ranges in elevation from 180 feet to 570 feet. Much of the land is moderately steep, with 15 to 30 percent slopes, and the soils are predominantly silty clay loam with moderate water-holding capacity.

A large urban buildup area is concentrated at the confluence of China Creek with the Chehalis River (River Mile 67.28). The last 2 miles of the creek are contained in a series of bridges, long culverts, rock and concrete lined channels, and densely vegetated banks. The creek provides an opportunity for surface water to enter as well as leave the channel in and around the City of Centralia. High flows in the channel are controlled by the bridges and culverts, the most critical being on the east side of the city, approximately 2 miles upstream, where China Creek passes beneath the Burlington Northern Railroad and Railroad Avenue bridges.

There are no stream gauge data on China Creek. Flooding typically occurs whenever there is flooding on the Chehalis River. Thus, the 100-year frequency flood on Coffee Creek would be associated with high backwater of the Chehalis River.

Two sources of floodwater impact the China Creek Basin. The first is the backwater effect of the Chehalis River on China Creek during high floodflows. The Chehalis River dominates the elevations in the lower reaches of China Creek up to Ash Street. Flood damages have occurred both to the south and west of Centralia by backwater, with China Creek being only a minor contributor. The SCS estimated that nearly 100 single- to four-family residential units, 30 small businesses, and 5 public buildings may be affected by this type

of flooding. It is also probable that the river will cause water to enter the southwest end of the City of Centralia at elevations higher than those generated by China Creek.

Shallow surface flooding (less than 1 foot average depth) can occur in and around the creek when storm drains are plugged and the surface water entrances to the creek are blocked, as reported in the storm of December 1933.

A man-made constriction exists in the floodplain at the crossing of the BNRR embankment just northwest of Railroad Avenue, about 2 miles upstream from the confluence with the Chehalis River. Above this location, the floodplain is used for agricultural purposes, with large areas subject to shallow flooding. Below this restriction the channel collects, as well as contributes to, the sheetflow or shallow flooding in and around streets and gutters of the urban areas of the city.

The SCS 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 SCS did, however, recommend that clearing the bridges and channels of sediment and 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. The SCS results indicated that it was realistic to expect a ½- to 1-foot rise in the current predicted flood elevations within the 10 to 15 years following the study. In the lower floodplain, the area flooded would increase by 25 percent.

6.5.3.3 Flood Hazard Analysis, Salzer-Coal Creeks, May 1975

An analysis of flood hazard for Salzer-Coal Creeks was requested by the Lewis County Commissioners on May 1, 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. Salzer and Coal Creeks drain 24.5 square-miles of relatively steep terrain, carrying alluvium to the Chehalis River on the Puget Willamette lowland. The elevations in the watershed range from 170 feet at the outlet to near 800 feet at the upper reaches. The study area covered by this report is the lower 8 miles of Salzer Creek and 3 miles of Coal Creek.

Only a short stream gauge record exists for Salzer Creek (1968-70). The most damaging flooding occurs during Chehalis River floods. The 100-year frequency flood on Salzer-Coal Creeks would be associated with high backwater of the Chehalis River. The backwater effect of the Chehalis River dominates the flow of Salzer Creek up to approximately the Pacific Avenue bridge during the 100-year event. On Coal Creek this influence continues upstream to about 1,200 feet downstream from the National Avenue Bridge. The water surface profiles also show significant changes under the bridges crossing the streams. This is an indication that the roads are acting as effective dams (i.e., the bridges lack the conveyance to pass the 100-year event) and impoundment areas exist upstream from each of these bridges.

At the time of the SCS study, trends for flood protection of a home or industry built on the Salzer-Coal Creek floodplain were to require landfills on the floodplains to the level of an infrequent flood event (i.e., 100-year frequency flood). This practice not only destroys wildlife and migratory bird habitat, but reduces water storage areas and causes higher flood elevations in future floods. The elevation of future floods depends upon the level of the Chehalis River at the peak discharge on Salzer-Coal Creek, the amount of land fill, and the conditions in the channel.

The SCS identified several bridges in the study area that lacked the capacity to convey the 100-year flow, or have restrictions (i.e., pipes, cables) that would tend to collect debris during high flows. An example is the Coal Creek bridge on National Avenue, with a water main, sewer main, and gas main below the bridge clogging the channel.

Based on Lewis County Regional Planning Commission forecasts of future development in the watershed, an SCS computer model (TR 20 and WSP 2) was programmed to forecast future peak flows. The model assumed intensive industrial or urban land use in the lowlands below Alvord Road on Salzer Creek and below the first crossing of the Coal Creek Road on Coal Creek. It was assumed there would be only slight changes of land use in the lowlands of the upper watershed. The highland area and the steep slopes of the watershed were assumed to be maintained in timber production. The channels were assumed to remain as unimproved channels with no changes in the present bridges or overland storage. The results of the forecast changes in land use show an 11 percent increase in peak flow for the 100-year event near the bus station; however, increase in flow would cause only minor changes in floodwater surface elevations. This is because the floodplain is wide, flat, and contains overland storage water. If the overland storage were reduced by encroachment and/or structural changes in the channel, large differences in the water surface profile could result.

Aggressive two-zone (floodway and floodway fringe) land use planning and development was recommended for the lower basin. Under the two-zone approach, flood protected and elevated construction would be allowed in the outer fringe of the floodplain, and development would be severely restricted in the inner floodway area. Homes or apartments and commercial buildings may be allowed in the fringe provided they are protected by adequate flood-proofing. In the floodway, more open-space land uses compatible with periodic flooding (i.e., agriculture, golf courses, parking lots, etc.) should be permitted.

6.5.4 U.S. Bureau of Reclamation

In its publication *Upper Chehalis River Basin Reconnaissance Report* (USBR, 1965), the U.S. Bureau of 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 the USBR in 1960 and 1961 covered a total of 282,000 acres. The USBR 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:

1. Storage at the Doty site on Elk Creek to serve lands in the Adna area, and at the Alpha site on South Fork of Newaukum River to serve lands in the Newaukum area
2. 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
3. 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. Alternative 2 storage sites 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.

Reservoir operation for flood control was provided for in the development plan to the extent feasible. It was projected that flood damages could be reduced by the project primarily below the confluence of the Newaukum and Chehalis Rivers.

LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

7. CURRENT FLOOD REDUCTION AND FLOOD WARNING SYSTEMS

The existing floodplain management activities include actions such as flood warning and emergency response, public education, and flood forecasting. An effective flood warning and emergency response system can greatly reduce the costs associated with flooding. The goal of a flood warning and emergency response system is to provide timely information to floodplain residents so that they may take appropriate measures to limit flood damage. Lewis County has developed a flood warning and emergency response system to assist in reducing flood damages. Each element of Lewis County's flood warning and emergency response system is described below.

7.1 Public Education/Information

Education is an important and low-cost method of reducing flood damage. Having easily accessible flood information can greatly increase public awareness of flooding risks and encourage flood damage reduction measures. Citizens become frustrated when they cannot easily obtain information they need. Easily accessible public flood information is available to citizens of Lewis County. Public flood information includes flood hazard brochures, a flood hazard video, and an informational pre-flood season newspaper advertisement. These information sources furnish public instruction on locations of Flood Hazard Areas; actions to be taken before, during, and following a flood; and phone numbers to contact if additional flood information is needed.

The informational brochures are available from DEM and distributed annually at the Southwest Washington Fair. An educational video can be checked out from DEM. The local newspaper, The Chronicle, runs a full-page flood information advertisement each year prior to the flood season. These three sources provide citizens with flood damage prevention checklists so they can evaluate how well they are prepared for future flood events.

In addition to the flood information video and brochures, Lewis County has participated in a project with the USACE for the development of a flood warning map. This map graphically displays various flood phases relative to river gauge heights. This map is available at DEM and was reproduced in the local newspaper in association with pre-flood season information.

The flood warning map associates specific flood phases with probable road closures. In conjunction with this, Lewis County has begun to compile a database itemizing road closures with specific flood events. A chronological record is kept of hazardous road conditions as they occur during a flood. This road closure record provides historical information to predict future flood-related road hazards.

DEM conducts several annual public education campaigns including Disaster Preparedness Campaign in April, Sheriff's Family Emergency Services Day in July, NOAA Weather Radio Month in September, and Flood Preparedness and Flood Insurance Campaign in November. A two-page newspaper insert is prepared for flood preparedness every fall.

Citizens residing in flood-prone areas should be made aware of flood-proofing techniques (discussed below) if they desire to flood-proof their homes. The County distributes flood-proofing references and technique fact sheets annually, including the owners of repetitive loss properties. The cities distribute their information annually to everyone in their flood-prone areas.

7.2 Flood Forecasting System

The NWS is the only nationally approved flood warning agency. Regional and local media broadcast NWS advisories, watches, and warnings as soon as they are issued. Lewis County relies on the hazard warning capabilities of the federal and state government, industry, and the media. Each floodplain resident is responsible for being aware when a threatening situation is developing or exists, and keeping informed through media reports.

Local agencies may also have area specific information that is distributed in local media news releases. Local area information is based upon predictions, river gauge monitoring, modeling, historic records, and data analysis. All river gauges are linked to the internet and to the County's website. If additional evaluation information is needed, it is often provided by the NWS, USACE, Public Works Engineering staff, and/or community weather spotters.

The Lewis County response agencies use the flood stage forecast map to determine what areas the predicted flood will affect. The floodplain map is incorporated into a CD GIS ArcExplorer computer program with a floodplain overlay. Copies of this program have been distributed to all response agencies.

It is recommended that the City of Chehalis and the County Engineer coordinate flood forecasting efforts. Interlocal communication and coordination would focus flood forecasting into a consistent and compatible methodology. Working together will provide a means of evaluating techniques and developing new methodologies that can provide better predictive capabilities. The City of Chehalis is involved in a program that collects flood levels at seven locations during a flood event. The goal of the program is to collect real-time flood information as it relates to the greater Chehalis area, and the Chehalis River gauge at Mellen Street in Centralia. The correlation or consistent phase relationship between the stations and the Chehalis River is used as a predictive tool.

7.3 Emergency Response Procedures

DEM is responsible for carrying out the emergency response program in the County. DEM coordinates disaster preparedness, mitigation, response, and recovery efforts of County agencies and departments. In the event of a flood emergency, DEM will fully activate the EOC, if necessary, to coordinate flood emergency response activities of all Lewis County agencies, including those for the Cities of Centralia and Chehalis. City, County, and state emergency representatives base their operations at the EOC. The EOC maintains and provides updated flood information and responds to sandbag operations or evacuations as needed. The EOC does not have jurisdiction over other incorporated cities in the County.

Each emergency response agency has assigned disaster responsibilities based upon its mandated functions and capabilities. Coordination of these responsibilities is through the EOC. Table 7-1 is a list of cooperating agencies with a brief summary of each agency's responsibilities. Lewis County has developed a Comprehensive Disaster Preparedness Plan that outlines the specific emergency response procedures and responsibilities.

Table 7-1. Responsibilities of Emergency Response Agencies	
Agency	Responsibilities
Division of Emergency Services	Activate EOC; coordinate local emergency service organizations; coordinate and assist State Department of Emergency Services; provide information to the public; register Emergency Services workers
Board of Commissioners	Sign proclamations of local emergency; make fiscal decisions such as emergency appropriations
Assessor	Provide damage assessment personnel; provide public information on tax loss claims; appraise land and buildings; compile private property information for State Disaster Analysis Reports; provide manpower and vehicles to assist in emergency operations

Table 7-1. Responsibilities of Emergency Response Agencies	
Agency	Responsibilities
Auditor	Ensure that disaster-related expenditures are made in accordance with all applicable laws/regulations; provide supplementary staff as needed to assist in emergency operations
Public Works	Coordinate public works and engineering services; inspect roads and bridges; remove debris from roads and bridges; provide heavy engineering equipment for flood control operations; assist with traffic control; provide structural inspection of buildings; provide sand/dirt for diking, sandbagging, etc.; local contact for Damage Survey Report Team
Sheriff's Department	Provide coordination of law enforcement operations; assist with warning process; provide educational assistance; provide search and rescue assistance; provide emergency transportation; provide access control at disaster site; provide looting control; provide emergency traffic control
Fire Services departments	Suppress and control fires; provide manpower and equipment in support of rescue operations; provide assistance to law enforcement; assist with emergency medical services; assist with warning process; assist with sandbagging operations
Extension Service	Assist State Department of Agriculture with inspections
Coroner	Examine, identify, and determine cause of death of disaster victims; coordinate with law enforcement agencies; perform death notifications
Parks and Recreation Department	Provide assemble areas for emergency operations; provide supplementary manpower and equipment to assist in emergency operations
Weed Department	Provide supplementary manpower and vehicles to assist in emergency operations
Prosecutor's Office	Provide legal assistance and advice to Emergency Services Director, County Commissioners, and Sheriff's Department
Department of Communications	Provide communication system to support emergency operations; provide support for search and rescue operations
Radio Amateur Civil Emergency Services	Provide radio communication to augment existing local government systems

In accordance with RCW 38.52.110 (1), in responding to a disaster or the threat of a disaster, the BOCC is directed to utilize the services, equipment, supplies, and facilities of existing departments, offices, and agencies of the state, political subdivisions, and all other municipal corporations to respond to such a disaster. The DEM is responsible for coordinating the mitigation, preparation, response, and recovery efforts pertaining to flood events.

DEM contracts with all incorporated and unincorporated areas within the floodplain to establish and maintain a Countywide warning system, monitor flood predictions services, disseminate warning information, and provide public education to the citizens of the County. The Comprehensive Emergency Management Plan (CEMP), Flood Phase Guidelines Manual, Lewis County Emergency Warning Notification Plan, and NWS notification collectively provide the guidelines for the warning system. DEM has policies and procedures in place to disseminate flood warning information to first responders, County and city officials, and the general public.

When a flooding event is possible, the NWS issues media advisories, watches and warnings based on forecasts or model indications that rivers may approach flood stage. When additional local information is available, it is added to the NWS bulletins and distributed to the public as necessary. The warning system often begins with the transmission of NWS bulletins by National Warning System (NAWAS), A Centralized Computerized Enforcement Service System (ACCESS) transmission, NWS fax, or Emergency Alert System (EAS) messages. Once, received, the message is evaluated, confirmed, and then disseminated to first responders, city and County officials, and the general public.

The County website posts information on river and road conditions reports, event bulletins, and road closures.

7.4 Flood Warning Communications Network

Emergency public information is disseminated according to the type of information being released and the existing disaster conditions. Event information can be received and distributed by media, EAS, fax, pager, recorded telephone message, mobile broadcast speakers, telephone, NOAA Weather radio, other public radios, website, ham radio operations, or door-to-door contacts as the situation requires. Redundant systems are set up to include direct first responder and volunteer contacts.

The messages include the type of alert, location of incident, description of hazard conditions, time of arrival, severity, future predictions, recommended actions, and safety information.

In addition to the notifications above, the dissemination of emergency warning information includes posting on the County's website, a recorded telephone message, call centers at the Emergency Coordination Center, and E911 Communications. Information posted on the County website includes river and road condition reports as well as event bulletins.

DEM maintains a responder agency and critical facilities Notification Warning Plan. It includes telephone numbers, pagers, cell phones, faxes, and radios for broadcasting notifications to these agencies as well as the general public.

Flood warning and emergency response activities are reported annually to the CRS program.

7.5 Flood-Proofing

Flood-proofing is defined by the USACE as "Any additions, changes, or adjustments to properties and structures which reduce or eliminate flood damage to lands, water and sanitary facilities, structures, and contents of buildings". Flood-proofing actions can be required for future floodplain development or implemented on existing development.

While flood-proofing does not provide complete protection during an extreme flood event, it is one device that can be applied with other flood control measures to reduce flood damage. Flood-proofing can allow a building to function during flood periods. Flood-proofing also increases the protection provided by other partial protection flood control projects, improves the availability of flood insurance, and, if properly understood, can heighten the awareness of flood risk.

Flood-proofing techniques are classified according to the type of protection they provide. Permanent flood-proofing techniques are always in place and require no action if flooding occurs (e.g., floodwalls and levees, closures and sealants, elevation, relocation); contingent flood-proofing techniques require installation prior to flood occurrence (e.g., flood shields, watertight doors, movable floodwalls); and emergency flood-proofing techniques are improvised when flooding occurs (e.g., sandbag dikes, earth-filled retaining walls). The most common flood-proofing practices are described below. These practices can be applied to existing or future structures prone to flood hazards. Other techniques are available and it is important that all flood, site, structure, and cost characteristics are considered prior to implementing any flood-proofing method.

Because flood-proofing can be applied by individuals to properties experiencing flood risk, this flood damage reduction measure can be very inexpensive to implement. Flood-proofing needs little community involvement to be successful, but success is greatly increased if a public agency provides technical assistance and guidance. The following recommendations are made for increasing public assistance.

Elevation

Elevation is one common technique to flood-proof a structure. It is a permanent technique that involves raising structures to an elevation above the flood hazard. It is often feasible for new construction and selected existing structures. Structures may be elevated on columns, fill material, foundation walls, or other foundation types. This type of flood-proofing is a permanent measure and will usually require little action

when preparing for a flood. If performed correctly, elevating a structure can eliminate flood damage in all but the most severe floods.

The advantages of using elevation and relocation as an alternative in Lewis County include:

- No maintenance commitment
- Reduction of expenditures for flood insurance claims
- Reduction of expenditures for repair of existing flood and erosion controls
- Increased flood storage and conveyance
- Increased river access and preservation of wildlife habitat
- Lower flood insurance rates for property owners

Since participation into the CRS, the County and cities have approved many home elevation and flood-proofing projects. Table 7-2 lists the number of home elevation and floodplain removal/buyout projects from 1994 to 2004. After the February 1996 flood, the County applied for grant funding to elevate 17 homes in Galvin. Since 1994, Centralia has received approximately \$4,210,000 to elevate homes in the floodplain.

Table 7-2. Structures Elevated and Removed by Jurisdiction			
Jurisdiction	# of Elevations	# of Removals	Total
Lewis County	77	39	28
Centralia	150	7	157
Chehalis	3	15	18

Floodwalls and Levees

Floodwalls and levees are another technique for flood-proofing structures. Traditionally, these flood-proofing methods have been considered structural alternatives to protect large areas or numerous structures. However, these methods can be applied to existing and future single structures within flood-prone areas.

Basically, floodwalls and levees act as barriers to keep floodwaters away from structures. Floodwalls are generally concrete or masonry walls of various configurations that may encircle entire structures, protect only the lower elevations of the structure, or be built only around threatened openings of structures. Levees are earth filled embankments with gently to moderately sloped sides. Levees require a greater amount of space and typically require greater maintenance. Floodwalls and levees can be used to protect any type of structure and require no alterations to the structure.

Closures and Sealants

Closures are permanent or temporary flood-proofing measures that cover openings to prevent water from entering a structure. They can be as simple as temporarily placing panels over a door or as extensive as filling an opening with some form of water resistant material such as concrete. Temporary closures require sufficient warning time so they can be properly installed prior to experiencing flooding. Closure systems are most effective when there is a limited amount of openings. Having closures on many openings may result in excessive leakage.

Leakage can be reduced by using sealants or gaskets concurrently with closures to ensure water tightness. Sealants are waterproof coatings applied to any type of closure in order to reduce permeability. The coating is generally a compound painted or sprayed onto walls or closures. They are typically applied to buildings displaying good structural integrity because the building must withstand the significant hydrostatic pressures produced by the floodwaters.

Sandbag Dikes

Sandbag dikes are an emergency flood-proofing measure that can be quickly initiated using stored materials. Sandbag dikes act as a temporary barrier to keep floodwaters away from structures. A sandbag dike is a low-cost method, but requires extensive labor. This method also requires advance warning to mobilize personnel to install the sandbags. It is important that the materials are prepared prior to flooding and maintained during the flood event.

NFIP Standards

Lewis County regulations have adopted flood-proofing measures from the model NFIP ordinance for habitable and non-residential structures. These measures are in Chapter 15.35 LCC. The aforementioned requirements for habitable and non-residential structures have also been adopted for the Cities of Centralia and Chehalis.

Chapter 15.35 includes guidelines such as:

- Residential construction-
 - New construction, additions, and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to the flood protection elevation.
 - Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls.
- Nonresidential construction.
 - New construction, additions, and substantial improvement of any commercial, industrial, or other nonresidential structure shall either have the lowest floor, including basement, elevated to the flood protection elevation, or, together with attendant utility and sanitary facilities, shall:
 - Be flood-proofed so that below the flood protection elevation the structure is watertight with walls substantially impermeable to the passage of water
 - Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy
 - Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection
 - Nonresidential structures that are elevated but not flood-proofed must meet the same standards for space below the lowest floor
 - Applicants flood-proofing nonresidential buildings shall be notified that flood insurance premiums will be based on rates that are 1 foot below the flood proofed level (e.g., a building constructed to the base flood level will be rated as 1 foot below that level)
- Critical facilities.
 - Critical facilities should be afforded additional flood protection due to their nature. Construction of new critical facilities shall be, to the extent possible, located outside the limits of the 100-year floodplain as identified on the community's FIRM.

LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

8. PLANNING CHARACTERISTICS

This chapter focuses on the cultural and physical characteristics of the watershed in Lewis County. Describing the political boundaries, the land use, and the topographic and hydrologic characteristics are helpful in understanding how to best improve the hazards from flooding.

8.1 Cultural Planning Area Characteristics

This section focuses on the cultural and political characteristics of Lewis County's watersheds.

8.1.1 Boundaries

Lewis County covers from the summit of the Cascade Range in the east to the Chehalis River valley in the west. Following the path of the Cowlitz River, U.S. Highway 12, a scenic byway, is one of the four major year-round highways connecting western and eastern Washington. In the west, the county is traversed by I-5.

8.1.2 Existing and Future Population

Population growth in Lewis County was rapid in the 1970s, but has slowed since 1980. The population grew by 23.2 percent between 1970 and 1980 (2.32 percent annually). During the next 5 years, the population growth rate increased by only 0.8 percent (0.16 percent annually). The slowdown in growth is believed to be the result of a 1981-1982 economic recession. For the entire 10-year period between 1980 and 1990, the population grew by 5.9 percent (0.59 percent annually). Population growth in the 1990s increased back to 15 percent (1.5 percent annually), but current estimates show that it has slowed some from 2000 to 2006 to only 7.3 percent (1.2 percent annually).

The factors determining population size and composition are not only influenced by a natural element, but also by changes in social and economic trends. Projections do not consider variables such as land availability, employment levels, incoming industries, and other factors that may restrict or promote additional growth. The projections from the 2002 Comprehensive Plan predict the population to grow to 86, 249 people, or 1.7 percent annually, from the year 2000.

Racially, Lewis County is one of the least diverse counties in the state. Washington state is 87 percent white; Lewis County is 94.7 percent white. However, according to the Census Bureau of Statistics, the non-white population increased at a 28 percent rate in the 1980s, while the white population increased by only 7 percent.

As the population of the County changes, so does the age structure of the population. The age structure has significant bearing on the future population of the County. Most public services and facilities are designed for a specific age group. For this reason, it is important to examine changes in the age structure as they relate to future needs. The median age has been rising and this trend is expected to continue.

Along with the rest of the country, Lewis County is experiencing a decrease in average household size. People are living longer, parents are having fewer children, and there is a rise in single-parent households. These trends are expected to continue in Lewis County.

Population characteristics based on 2000 census information are shown in Table 8-1.

Table 8-1. Census Population Characteristics		
Characteristics	Estimate 2005	Percent
Total Population	71,430	
White	67,609	94.7
Black or African American		0.2
American Indian and Alaska Native	112	1.3
Asian	906	0.7
Native Hawaiian and Other Pacific Islander	526	0.1
Some other race	68	1.4
Two or more races	994	1.7
Hispanic or Latino	1,215	6.5
Average housing units	4,616	N/A
Total Housing Units	3	N/A
Occupied housing units	30,685	89
In labor force (population 16 years and over)	27,321	58
Median household income	33,019	N/A
Median family income	41,712	N/A
Per capita income	48,724	N/A
Individuals below poverty level	19,938	16.8

8.1.3 Existing and Future Land Use

Lewis County lies in southwestern Washington with a total landmass of 2,452 square-miles, and measures about 90 miles (east to west) by 25 miles (north to south). In 1999, Lewis County adopted a comprehensive plan and land use regulations in compliance with the Growth Management Act (GMA). The original comprehensive plan was amended in 2000 and 2002. As a result of these regulations, all unincorporated areas of the County were zoned. Prior to that time the County had been largely unzoned. Incorporated cities within the County likewise have adopted comprehensive plans and development regulations, designating and controlling land use within their boundaries.

Incorporated and unincorporated urban growth areas are designated and zoned for urban levels of development. Incorporated cities plan for and designate land uses within their corporate boundaries consistent with adopted comprehensive plans and development regulations. Unincorporated UGAs, areas adjacent to incorporated cities, were designated consistent with the GMA and are intended for urban development. UGAs represent about 0.7 percent of the County. Such areas are expected to develop at higher intensities and eventually be annexed into the cities and zoned for residential, commercial, and industrial uses. For a full discussion of land use within incorporated cities, refer to each city's comprehensive plan.

Unincorporated Lewis County land use is regulated consistent with historic and traditional land use patterns and at intensities consistent with rural levels of public services. For example, approximately three-quarters of the 2,452 square-miles of Lewis County is devoted to long-term natural resource use—timber, agriculture, or mineral. Less than one-quarter of the land is designated for rural, non-resource uses, including rural residential, commercial, and industrial uses.

Under current zoning, unincorporated areas of Lewis County are classified into the following land use categories:

1. Resource Land of Long-term Commercial Significance
 - a. Forest Resource Land – commercial forestry activities
 - b. Agricultural Resource Land – commercial farming activities
 - c. Mineral Resource Land – commercial mineral extraction
2. Rural Development Districts – rural uses including residential, limited commercial
 - a. One Dwelling per 5 Acres
 - b. One Dwelling per 10 Acres
 - c. One Dwelling per 20 Acres
3. Limited Areas of More Intense Rural Development
 - a. Small Towns – high intensity rural settlements
 - b. Crossroad Commercial – high intensity commercial activities
 - c. Freeway Commercial – rural interchange activities
 - d. Rural Residential Centers – high density residential subdivisions
 - e. Rural Area Industrial – high intensity industrial activities
 - f. Public Tourist Service Areas – public recreational areas

Open space land is designated in the County Comprehensive Plan and includes parks, wilderness areas, resource lands, and corridors. The open space designation overlays other zoning and makes up about 75 percent of the County. Open space corridors follow stream and river valleys and are comprised of steep slopes, agricultural resource land, and flood hazard areas. Unlike park and recreation areas, open space lands may be either public or private ownership and are often not available to public access. Privately owned lands in flood hazard areas (over 40,000 acres) and lands currently managed by Tacoma City Light under conservation easements (over 15,000 acres) are part of this later category. Table 8-2 summarizes the land uses in the County.

Table 8-2. Lewis County Land Uses		
Land Use Type	Acres	Percent
Undeveloped	194,418	12.5
Transportation and Utility	16,825	1.1
Residential	68,456	4.4
Public	10,073	0.6
Parks and Wilderness	145,883	9.4
Industrial	1,263	0.1
Commercial	1,634	0.1
Institutional	1,058	0.1
Forestry and Mining	583,771	37.5
Agricultural	99,589	6.4
Water	21,733	1.4
Other	413,489	26.5
Total	1,558,739	100.0

For a more complete discussion of existing and future land uses within Lewis County, refer to the following:

- “Lewis County Comprehensive Plan,” Amended April 2002
- “City of Centralia Comprehensive Plan”, November 1998
 - Land use element goals and policies update, 2006
- “City of Chehalis Comprehensive Plan,” July 1999
- “City of Morton Comprehensive Plan,” June 23, 1997
- “City of Mossyrock Growth Management Directory”, 1996
- “City of Napavine Comprehensive Plan,” May 1997
- “City of Pe Ell Comprehensive Plan,” June 1997
- “City of Toledo Comprehensive Plan,” February 13, 1997
- “City of Vader Comprehensive Plan,” June 16, 1996
- “City of Winlock Comprehensive Plan,” June 30, 1998
- Growth Management Act, Chapter 36.70A RCW

8.1.4 Scenic, Aesthetic, and Historical Cultural Resources

Lewis County is an area abundant with scenic, aesthetic, and historical resources. The gateway to the spectacular Mount St. Helens National Volcanic Monument is located on U.S. Highway 12 in southern Lewis County. The monument was designated in 1986 after eruptions of the volcano ceased. The Centralia-Chehalis area, also known as the Twin Cities, is rich with historical sites. The downtown areas of both cities have been renovated to focus on the history of the towns. Walking tours are given of the 21 historical outdoor murals painted on the downtown buildings of Centralia. Several other historical and scenic sites are located in the area including Claquato Church, Lewis County Historical Museum, Borst Homestead, and Rainbow Falls. During the summer months, the Centralia/Chehalis Railroad Association gives rides to tourists on its antique steam train.

8.1.5 Transportation and Navigation

Transportation in Lewis County includes roads, air, and railway. The road system in the County is made up of local public and private roads, interstate, U.S. highways, and state routes. There are over 1,888 miles of public and private roads within the County. The County maintains 1,065 miles of roadways, 196 bridges, and 5,110 culverts. The nine cities (Centralia, Chehalis, Morton, Mossyrock, Napavine, Pe Ell, Toledo, Vader, and Winlock) are responsible for their own roadways within their city limits. Unless there is an agreement between the County and the cities, the County currently maintains the roadways in the unincorporated UGAs. In addition, there are 165 miles of recorded private roadways and 215 miles of primary and secondary forest access roads.

The primary north-south transportation corridor passing through Lewis County and the Cities of Centralia and Chehalis is Interstate 5. The Chehalis-Centralia area lays 85 miles midway between the metropolitan areas of Seattle, Washington, and Portland, Oregon. U.S. Highway 12 traverses Lewis County from east to west and crosses the Cascade Mountains at White Pass. White Pass is the only major all-season route south of Seattle and north of the Columbia River allowing access to eastern Washington. State Route (SR) 7, SR 508, and U.S. Highway 12 all intersect in Morton, which is located 32 miles east of I-5. Scenic and recreation highways total over 212 miles within Lewis County.

There are 4 public airports and 19 private airstrips located in Lewis County. The Chehalis-Centralia airport is located within the city limits of Chehalis and has a current operating 5,000-foot runway. Other publicly owned airports are: Strom Field (at Morton), Packwood County (at Packwood), and South Lewis County/Ed Carlson Memorial Field (at Toledo).

Commercial transport is available by rail or truck in Lewis County. Burlington Northern & Santa Fe Railway (BNSF) owns and operates this main rail line in the County. Amtrak provides passenger railway service to Centralia along the BNSF rail line. Several trucking companies are located within the County, for both inter- and intra-state freight hauling, for most general commodities, and cargos such as wood products and heavy equipment. Because of the inland location of Lewis County, no commercially navigable waterways exist within the County and, therefore, no shipping or barging facilities are available. The nearest shipping port is the Port of Longview in Cowlitz County. The Port of Centralia and Port of Chehalis are two regional business parks located in Lewis County and lease space to distribution centers that traverse up and down I-5.

For a more complete discussion of transportation systems within Lewis County, refer to the following:

- Chapter 6, “Lewis County Comprehensive Plan,” Dept of Community Development, Amended April 2002
- “Six Year Transportation Improvement Program 2003-2008”, Dept of Public Works, November 18, 2002

8.1.6 Utilities

Utilities provided in Lewis County include water, sewer, and electricity.

The larger municipalities of Lewis County, such as Centralia, Chehalis, and Morton, have city-provided water systems. The main sources of drinking water for the Centralia-Chehalis area are the Chehalis and Newaukum Rivers. Domestic water supply for the City of Chehalis is from the north fork of the Newaukum River and Chehalis River. Centralia also draws from several groundwater wells. During times of drought, Centralia can withdraw from the Newaukum River. The City of Morton has an intake at the Tilton River. The Town of Pe Ell obtains its municipal water from Lester, Grim, and Mahaffey Creeks, which are tributaries of the Chehalis River on Weyerhaeuser timber holdings. Additional water services in the County are provided by three public systems: Lewis County Water Districts (LCWD), Boistfort Water (a community, non-profit water distribution system) that uses Stillman Creek as its source, and Thurston PUD (a private owner and manager of 33 small water systems in the County).

The Cities of Chehalis, Centralia, Morton, Mossyrock, and Napavine have sewer service. With the exception of Napavine, secondary sewage treatment is provided by each municipal facility. The City of Chehalis also treats sewage from both the City of Napavine and Lewis County Water and Sewer District #1 (LCWSD#1). The Town of Pe Ell has a sewage facility that serves 320 customers inside its town limits and 3 customers outside the town limits. The facility is located at the northwest corner of the town limits along the Chehalis River. The remaining population of Lewis County relies on individual septic systems and leaching fields for sewage treatment.

The main supplier of electricity to the County, with the exception of the City of Centralia, is the Lewis County Public Utility District (LCPUD). Centralia City Light supplies power to the City of Centralia and some adjacent areas (i.e., Cooks Hill, Seminary Hill, Salzer Valley, and the Johnson Creek areas). Trans Alta owns and operates the Centralia Steam Electric Plant's two units, which produce a rated output of 1.4 million kilowatts of electricity.

Downstream of Randle and upstream of Mossyrock Dam, LCPUD owns and operates the Cowlitz Falls Dam. The dam impounds Lake Scanewa, which is an impoundment of the Cowlitz River for a distance of about 11 miles and the Cispus River for about 1.5 miles. The dam was built in the early 1990s and is operated as a run-of-the-river dam with very little regulation or storage in Lake Scanewa. The operating license requires the LCPUD to draw down Lake Scanewa and operate the reservoir as a free-flowing reach of river during floods. The LCPUD also monitors sediment accumulations in the lake to ensure flood levels will not increase in the Randle valley area of the Cowlitz River (River Mile 94 to 103).

There are electricity generating facilities located in Lewis County that do not directly provide local service. These facilities are:

- Tacoma Power public utility dams in the Cowlitz and Nisqually Rivers
- Chehalis Power in the Port of Chehalis Industrial Park

In WRIA 26, the City of Tacoma owns and operates Mayfield and Mossyrock Dams, built in 1963 and 1968, respectively for hydropower. The City also owns and operates another dam in the Nisqually River: Alder Dam located in neighboring Thurston County. Chehalis Power is a natural gas-fired-combined-cycle facility. The facility obtains water from the City of Chehalis and industrial wastewater is discharged and treated at the same local wastewater treatment plant. Electrical power produced is transmitted to the Bonneville Power Administration. Construction began in May 2001, with commercial operations starting in October 2003.

8.1.7 Recreation

The central location of Lewis County in western Washington and its mild climate make for a diverse area abundant with recreational opportunities.

Numerous snow-related activities can be enjoyed in Lewis County. White Pass Ski Area, located on U.S. Highway 12 at the eastern boundary of the County, offers both downhill and cross-country skiing along with various other snow-related activities such as snow shoeing, snowmobiling, and sledding. Several other major ski areas of the Cascade Mountain Range are located within a short driving distance of the County.

Lewis County has approximately 3,800 public and private camp sites in its many national, state, and county parks and camping areas. There are also numerous city parks and private resort areas. Five Washington State parks are found in Lewis County: Lewis and Clark State Park, Rainbow Falls State Park, Ike Kinswa State Park, Matilda Jackson State Park, and Carlisle State Park. Combined, the state parks have a total of 172 camp sites on 1,128 acres. Portions of the Mount Rainier National Park and Mount Saint Helens National Volcanic Monument are located in the County, and both are excellent places to enjoy hiking, camping, and picnicking. Mount Rainier, the highest point in Washington State at 14,410 feet, is frequented by mountain climbers. The Seminary Hill wilderness area, east of Centralia, provides many hiking trails and abundant wildlife.

Fishing is a very popular recreational activity in the Pacific Northwest and Lewis County is no exception. Lewis County contains many popular sport fishing lakes, rivers, and streams. The Chehalis, Cowlitz, and Nooksack Rivers all have runs of salmon, steelhead, and sea-run cutthroat trout, and all are open to sport fishing. The most popular trout lakes in the county are the Swift and Riffe Reservoirs, Carlisle Lake, and Mayfield Lake. Washington State record fish have been caught in Mayfield Lake (7.26-lb. Tiger Muskie Pike, 1991) and Wobbly Lake (9-lb. Eastern Brook Trout, 1988).

Boating is another popular recreational activity in Lewis County. Several boat launches are available at various private, state, and County parks, campgrounds, and resorts in the area. Two boat launches are provided by Tacoma City Light at Riffe Lake, one of the County's most popular lakes. A boat launch at Ike Kinswa State Park also allows access to Riffe Lake. Although no commercially navigable waters exist in Lewis County due to its inland location, plenty of opportunities are available for boaters with small recreational water craft to enjoy the County's abundant lakes and rivers.

One of the most popular local events in Lewis County is the Southwest Washington Fair. Attendance for 1991 reached well over 100,000, with nearly 2,000 exhibitors and over 9,500 individual fair exhibits. The Fair Association also sponsors numerous fair interim events. One of the most popular of these events is the Spring Youth Fair. This smaller version of the Southwest Washington Fair focuses on children, and is open to exhibits by youth under the age of 18. Both of the events bring a large number of attendees and exhibitors from outside the County, including eastern Washington and Canada. Other popular events sponsored by the Fair Association are the Lewis County Rodeo, Timberland Valley Dog Show, and Summerfest, a Fourth of July celebration. A popular summertime event held in Morton is the world renowned Loggers Jubilee. The Jubilee celebrates the old and new methods used in the art of logging, one of the county's principal economic activities. Jubilee events include contests such as log rolling and pole climbing, various demonstrations of

logging techniques, an arts and crafts fair, parades, and the famous lawnmower races. Between 5,000 and 8,000 tourists are estimated to attend the 3-day event each summer.

8.2 Description of Physical Planning Area and Watershed Characteristics

As discussed in prior chapters, there are four watersheds, also known as Watershed Resource Inventory Areas, in Lewis County. These are the Chehalis River or WRIA 23, Cowlitz River or WRIA 26, Nisqually River or WRIA 11, and Deschutes River or WRIA 13. The upper headwaters of the Deschutes River watershed in Lewis County are under one ownership for timber management. For this reason, WRIA 13 is not included in our project area. Figure 1 shows the WRIA boundaries. Lewis County is dominated by three major watersheds, the Nisqually, Chehalis, and Cowlitz River basins. The Chehalis River has its headwaters in the foothills of the Cascade Mountains of Lewis County, and drains into the Pacific Ocean near Aberdeen. The Cowlitz River originates in the Cascade Mountains, exits Lewis County near the town of Vader, and empties into the Columbia River near Kelso. The Nisqually River's headwaters are in Lewis County, but the river exits the County near Elbe and eventually flows into Puget Sound northeast of Olympia. This chapter describes the climate, precipitation, temperature, topography, soils, geology, surface water, groundwater, water quality, and biological resources of these watersheds.

8.2.1 Climate

The climate of a given region is the average weather conditions over an extended period of time. Climate takes into consideration temperature, atmospheric pressure, humidity, clouds, precipitation (including snowfall), visibility, and wind.

On average, Lewis County has the same climate as that of the rest of the greater Puget Sound region since there are no significant natural topographic barriers sheltering Lewis County from the rest of the Sound. Most of the region's rainfall occurs during the colder months, between October and April, in conjunction with the frequent passage of low pressure systems (storm systems) through the area. The warmer months, May through September, experience significantly less rainfall because the main jet stream that prevails over the Pacific Northwest during the colder months shifts its position to the north, and takes much of the precipitation along with it. The influx of storm systems during the fall and winter months also presents the area with significantly higher winds due to the intense nature of low pressure systems. The region's highest occurrence of cloud cover is also during the fall and winter months because of the increased number of low pressure systems and precipitation activity.

Climatic statistics for City of Centralia and Lewis County weather stations are summarized in Tables 8-3 and 8-4.

Table 8-3. Climate Statistics for the City of Centralia Weather Station

Temperature	Average number of days
Below 32 degrees F	2
Above 90 degrees F	7
Growing season	180
Precipitation	Average number of inches
Snowfall, sleet, hail	9
Rain	47
Heating and cooling degree days	Average number of degrees
Heating degree day normals	5,081
Cooling degree day normals	172
(65-degree F base, 1951-1980)	

Table 8-4. Climate data for Lewis County Weather Stations

Station	Elevation	Average annual precipitation (in.)	Average monthly temperatures	Average monthly temperatures	Average annual snowfall (in.)
			January	July	
Centralia	185	46.7	39	64.8	9.9
Kosmos	775	62.0	35.8	64	20.3

8.2.2 Precipitation

The greatest amount of rainfall occurs between the months of October and March. The abundance of rainfall during this period is due to the frequent storm systems that pass over western Washington. In Centralia, monthly rainfall totals for this time of year typically range between 5 and 8 inches. For the rest of the year, average monthly totals range only between 0.8 and 2 inches. The month with the highest average rainfall is November, with an average of 7.8 inches. The month with the lowest average is July, with only 0.8 inch. Daily rainfall amounts have been known to reach as high as 3.9 inches. On the average, annual precipitation is 46.7 inches, with annual records showing a range from a low of 28 inches to a high of 60 inches.

On average, snowfall in the region is not heavy, but the potential exists for extremely large amounts on occasion. The average annual snowfall is approximately 9 inches, with recorded extreme annual maximums at 45 inches. Most of the snowfall occurs in the month of January, with the monthly average at about 4.5 inches.

8.2.3 Temperature

Temperature for Lewis County conforms to that of the rest of the Puget Sound region, both on an average and extreme basis. The warmest month of the year is typically July or August, when the monthly mean temperature hovers around 65° F. The coldest month of the year is January, when average monthly temperatures usually reach 39° F. The average annual temperature for the region ranges between 50° and 53° F. The annual distribution of temperature ranges for the City of Centralia weather station is tabulated in Table 8-5.

Maximum and minimum temperatures occur during the months of July and January, respectively. Typical maximum temperatures during the month of July reach around 79° F, with record high temperatures being

recorded at over 100 ° F. Minimum temperatures during the month of January are usually around 33 ° F, but record temperatures have been recorded as low as -16° F.

Table 8-5. Temperature Range for City of Centralia Weather Station			
Month	Minimum Temperature (° F)	Maximum Temperature (° F)	Mean Temperature (° F)
January	33.1°	44.7°	39.0°
February	35.1	50.1	42.6
March	35.5	53.6	44.6
April	38.5	60.3	49.4
May	43.4	67.4	55.4
June	48.6	72.1	60.4
July	51.5	78	64.8
August	51.6	76.8	64.3
September	48.3	72.1	60.2
October	42.7	61.7	52.3
November	37.6	51.2	44.4
December	35.3	46.1	40.7
Annual	41.8	61.2	51.5

8.2.4 Topography

Lewis County is bounded on the east by the crest of the Cascade Mountain Range, and extends west to the Willapa and Doty Hills. The County crosses three physiographic provinces: the Cascade Range, the Puget-Willamette Lowlands, and the Pacific Coast Range. The Chehalis River valley occupies most of the northern, northwestern, and western parts of the County, and the Cowlitz River valley occupies most of the southern, central, and eastern parts. The uplands of the eastern County are composed of rugged mountainous and alpine topography, modified by glacial activity and drained by rivers that flow generally westward. The landscape is characterized by long, steep slopes and relatively straight, parallel drainages. Ridge tops have an average elevation of approximately 4,000 feet.

8.2.5 Soils

Soil is formed through the processes of physical and chemical weathering of geological material over time. The characteristics and properties of the soil at any given place are determined by the interaction of the following five factors:

1. Physical and mineralogical composition of the parent material
2. Climate under which the soil material has accumulated and has existed since accumulation
3. Plant and animal life in the soil and on the surface of the soil
4. Topography, or the lay of the land
5. Age of the soil, or the length of time the forces of soil formation have acted on the parent material

Lewis County soils have been mapped by the U.S. Department of Agriculture, Natural Resource Conservation Service (formerly SCS) (United States Department of Agricultural Soil Conservation Service, 1987). The major soil types in Lewis County are described in Table 8-6.

Table 8-6. Lewis County Major Soil Groups

Location	Map Units	Characteristics
Floodplains and terraces	Reed-Chehalis	Very deep, poorly drained and well-drained, level and nearly level soils that formed in mixed alluvium, on floodplains and terraces.
	Ledow-Cloquato	Very deep, somewhat excessively drained and well-drained, level and nearly level soils that formed in mixed alluvium, on floodplains and terraces.
	Siler-Schooley-Greenwater	Very deep, well-drained, poorly drained, and somewhat excessively drained, level and nearly level soils that formed in alluvium, volcanic ash, and pumice, on floodplains and terraces.
Plains, terraces, uplands, and bottom lands	Winston-Olequa	Very deep, well-drained, level to moderately steep soils; on high terraces and terrace escarpments.
	Spanaway	Very deep, somewhat excessively drained, level and nearly level soils; on outwash terraces and plains.
	Salkum-Prather-Lacamas	Very deep, well-drained, moderately well-drained, and poorly drained, level to steep soils; on plains, high terraces, hillsides, ridgetops, and bottom lands.
Uplands, mountains, and high terraces	Lytell-Zenker-Astoria	Deep and very deep, well-drained, level to steep soils; on benches, hillsides, and ridgetops.
	Katula-Bunker	Moderately deep and deep, well-drained, moderately sloping to very steep soils; on benches, mountainsides, and ridgetops.
	Melbourne-Buckpeak-Centralia	Very deep, well-drained, level to steep soils; on benches, hillsides, mountainsides, and ridgetops.
	Baumgard-Schneider-Olympic	Deep and very deep, well-drained, level to steep soils; on benches, hillsides, mountainsides, and ridgetops.
	Cinebar-Newakum	Very deep, well-drained, level to steep soils; on high terraces, hillsides, mountainsides, and ridgetops.
	Cispis-Nevat	Deep and very deep, well-drained and somewhat excessively drained, level to very steep soils; on benches, hillsides, mountainsides, ridgetops, and foot slopes.
Cool uplands and mountains	Pheeney-Jonas	Moderately deep and very deep, well-drained and moderately well-drained, moderately sloping to very steep soils; on benches, mountainsides, and ridgetops.
	Vailton-Mal	Deep and very deep, well-drained and moderately well-drained, moderately sloping to very steep soils; on benches, mountainsides, and ridgetops.
	Zynbar-Domell	Very deep, well-drained, level to steep soils; on benches, mountainsides, and ridgetops.
	Bellicum-Bromo	Deep and very deep, well-drained, level to steep soils; on benches, mountainsides, and ridgetops.
Cold mountains	Stahl-Reichel	Moderately deep and deep, well-drained, level to steep soils; on mountainsides, and ridgetops.
	Cattcreek-Cotteral	Deep and very deep, well-drained, level to very steep soils; on benches, mountainsides, and ridgetops.

Soils in the valley bottoms of all three drainage basins are derived from alluvium. These soils tend to be very deep (greater than 60 inches deep), and range from poor to excellent in drainage characteristics. In the Upper Cowlitz and Nisqually drainages, the valley floor alluvium contains pumice and volcanic ash, which make these soils excessively drained in places. The drainage characteristics of upland soils in all the river basins vary based on slope and parent material. Glacial till and fine-grained bedrock parent material weathers to a poorer drained soil than soil derived from outwash sand and gravel, alluvium, or coarse-grained bedrock. Cool upland and cold mountain soils are present only in the very uppermost portions of each of the three drainages.

The Natural Resources Conservation Service (NRCS) (originally called the Soil Conservation service) map is not detailed enough for local land use planning, but a few general observations can be made about some of the map units (SCS, 1987). Reed Chehalis, Ledow Cloquato, and Spanaway soils are most often used for urban development. Siler Schooley Greenwater and Salkum Prather Lacamas soils are also appropriate for urban areas, but because these soil classifications are poorly drained and are subject to seasonal flooding adequate drainage systems, land surface sculpting and diking are required. Spanaway soils, upon which much of Centralia was built, have good potential for light urban development. Indianola, Nisqually, and Spanaway soils have limited potential for on-site sewage disposal systems because of the high permeabilities. Salkum Prather Lacamas soils are not suitable for dense urban use because of their low permeabilities. Winston-Olequa and Melbourne Buckpeak Centralia soils have a fair potential for urban and homesite development, except where sloping. They are primarily used for light development, such as homes and small rural businesses. The Buckpeak, Schneider, and Baumgard soils are poorly suited to urban and homesite development because of the slope, which is typically underlain by bedrock or unstable, colluvial soil material. Cinebar Newaukum soils have good potential for urban development and can be found near large population centers and recreational areas.

Numerous soil groups are suitable for agriculture. Winston-Olequa, Salkum Prather Lacamas, Melbourne Buckpeak Centralia, Baumgard Schneider Olympic, Cinebar Newaukum, and Cispus Nevat soil groups are the most suitable for crops because of their warm, moderate to well drained, and fairly level nature. Reed Chehalis, Ledow Cloquato, and Siler Schooley Greenwater soils have good potential for cultivated crops, hay, and pasture, but are commonly limited by seasonal wetness. Reed Chehalis, Ledow Cloquato, and Cinebar Newaukum soils can also be appropriate for specialty crops and vegetables because they are organic matter rich, moderately permeable, and well drained. The sandy, somewhat excessively drained Indianola and Nisqually soils, which are part of the Spanaway soils group, and the well-drained soils in the Reed Chehalis and Ledow Cloquato map units are well suited to tree nurseries. These coarse- to medium-textured soils provide adequate root aeration and drainage for seedlings. Most soils in the County have good or fair potential for timber production except Stahl Reichel, Cattcreek Cotteral, Reed Chehalis, Siler Schooley Greenwater, and Salkum Prather Lacamas.

8.2.6 Geology

The geology of Lewis County is composed primarily of igneous and sedimentary bedrock of the Tertiary Period, and unconsolidated glacial sediments of the Pleistocene Epoch. Subsequent to formation of the bedrock, between 7 and 55 million years ago, the surface of the area underwent geologic uplift, raising the volcanic and sedimentary rocks above sea level. Deformation, in the form of faulting and folding, accompanied the uplift. Landslides and erosion followed in the western part of the County; glaciation, glaciofluvial deposition, erosion, and recent volcanic activity followed in the eastern half of the County. All of these events shaped the present day physiography and relief of Lewis County.

8.2.6.1 Bedrock Geology

The oldest rocks in Lewis County are the basalt and basaltic breccia flows of the Doty Hills, in the western part of the County. The flows consist of augite basalt that is generally structureless, although pillow and columnar structures are commonly observed. This rock is of middle to late Eocene age, or about 40 to 55 million years old. It is submarine in origin, having poured out from fissures in the ocean floor.

Much of the area west of the Cascades was covered by the ocean and had a shallow, fluctuating coastline during the late Eocene and Oligocene Epochs (27 to 40 million years ago). Alluvial sand and silt of the eroding, older Cascade area mountains were being deposited into this shallow water. These alluvial deposits were compressed and hardened over time, and became sedimentary rock. Closer to the older Cascade core, the sediment, in some areas, was deposited in freshwater, and is characterized by thin beds of carbonaceous shale and coal, such as those in Hanaford Creek and along the Tilton River, north of Morton.

As the erosion of the older part of the Cascades was occurring during the middle to late Eocene and into the Oligocene, new volcanic eruptions were emitting flows of molten rock that would eventually rebuild the foothills and mountains of the present day Cascades. The most prominent flows occurred during the late Eocene and are composed of extrusive basic igneous rock, mainly andesite, andesitic volcanic breccia, and, to a lesser extent, basalt. Slightly older, nonmarine siltstone and sandstone are interbedded with the volcanics in a few areas. Massive volcanic flows continued throughout the Oligocene and into the Miocene, depositing andesite and andesitic breccia that are in evidence today in the mountainous areas north of Randle.

Dikes of acid igneous rock, primarily diorite, granodiorite, quartz monzonite, and some granite, later penetrated the existing geologic formations in the eastern part of Lewis County. These structures are common in the southeastern corner of the County, at Tumwater Mountain and Vanson Peak.

Erosion from the Cascades during the Miocene Epoch (7 to 27 million years ago) deposited alluvium in broad, shallow basins of stagnant water. This material was eventually consolidated and became the very soft, or weak, siltstone bedrock found in the Wilkes Hills, southeast of Toledo. The siltstone is characterized by interbedded coal, preserved organic matter, and leaf impressions.

8.2.6.2 Glacial Geology

The Pleistocene Epoch (2 million to 10,000 years ago) in Lewis County was marked by several episodes of erosion and sculpting of existing landforms, and deposition of glaciofluvial sand and gravel, and glacial till. The oldest glacial sediments in Lewis County are the glaciofluvial deposits of the Logan Hill Formation. The Logan Hill Formation is composed of highly weathered sand, gravel, silt, and clay, approximately 1 million years old, derived from the Tertiary rocks of the Cascades. The outwash was deposited from the massive glacier, flowing westward from the crest of the Cascades, that carved out the Cowlitz and Tilton River valley troughs. Streams flowing from the melting glacial ice transported, sorted, and deposited the material in a fan shaped, broad plain at the front of the foothills. The extent or perimeter of this plain is roughly defined by the communities of Salkum (east), Chehalis (northwest), Napavine and Winlock (west), and Vader (southwest) (Figure 2 1).

Younger glacial till deposits of the Hayden Creek Formation make up the terraces or plains of the upper Nisqually River valley. These deposits are the result of glaciation of the upper Nisqually. Till and outwash of the Hayden Creek Formation also occupy the large U-shaped valley of the Cowlitz River and its tributaries, and the surrounding glacially smoothed uplands. These deposits are visible in roadcuts between Salkum and Morton on U.S. Highway 12 and between Onalaska and Morton on State Highway 508. Typically, they are covered by a thick layer of highly weathered volcanic ash. This ash was apparently aerially deposited on the ice of the valley glaciers during the late Pleistocene, then later laid down like a blanket over the underlying till and outwash when the ice receded.

Small cirque glaciers developed in the Cascades during the late Pleistocene at elevations above 2,500 feet. These glaciers formed primarily on the north slopes of ridges and extended down drainages to the north and

northeast, sculpting out bow shaped cirques, hanging valleys, rocky ridgecrests, aretes, and U-shaped valleys. Thin till deposits from this event remain near the heads of alpine drainages and adjacent side slopes.

Ice recessional sand and gravel were deposited near the end of the Pleistocene (approximately 12,000 years ago) as ice was making its final retreat. Coarse glacial outwash was deposited as terraces in both the Cowlitz and Nisqually River valleys. The outwash deposits in these two valleys were derived from glaciers occupying them. Coarse outwash sand and gravel were also deposited in the Chehalis River valley at and surrounding the City of Centralia. These deposits were derived from the Puget Lobe of the Cordilleran Ice Sheet, which originated in British Columbia, covered all of the Puget Lowland, and terminated just north of Lewis County. As the ice sheet receded, meltwater, flowing from the ice, filled part of the Chehalis River Valley with clean quartzitic sand and hard, rounded pebbles, cobbles, and stones.

In addition to the dramatic eruptions of Mt. St. Helens during the 1980s, Lewis County has experienced many eruptions of Cascade volcanoes. Mazama ash, from the 6,600-year-old event that resulted in the formation of Crater Lake in southern Oregon, can be found in most upland soils in the western part of the County. Ash layers from Mount Rainier and numerous Mt. St. Helens eruptions, in addition to Mazama ash, are present in upland soils of the central and eastern parts of the County.

The dominant geologic process that has operated within the last 10,000 years in Lewis County is erosion. Erosion of bedrock, glacial, and tephra deposits has resulted in the deposition of alluvium in the valley or lowland areas of Lewis County. Along the Nisqually River and in the Cowlitz River valley, the alluvium is derived primarily from coarse-textured glacial outwash, volcanic ash, and pumice. As a result, the alluvium in those valleys is coarse and noncohesive in nature. Fresh alluvium is deposited adjacent to the Cowlitz and Nisqually Rivers by seasonal floods. The Chehalis River and its tributaries drain dominantly older, rounded, lower relief hills of the west half of the County. These hills—composed of softer, more highly weathered, and finer-grained rock—supply alluvium to the Chehalis River that is finer in texture than that of the Nisqually and Cowlitz River valleys.

8.2.7 Surface Water

The three largest rivers in the County are the Chehalis, the Cowlitz, and the Nisqually. These major watersheds and their larger tributaries are described below.

8.2.7.1 Chehalis River

The Chehalis River originates in the Cascade foothills surrounding the cities of Centralia and Chehalis, and eventually flows into Grays Harbor at Aberdeen. The river basin, located at the southern end of the Puget Trough, has a total drainage area, including tributaries, of approximately 2,114 square-miles. The valley is characterized by a broad, well-developed floodplain, and low terraces surrounded by highly dissected uplands of low to moderate relief, that have broad, rounded ridges. Many perennial streams drain these ridges. Elevations within the basin range from 170 feet at Chehalis to over 5,000 feet at the headwaters. Most uplands in the basin average 300 to 600 feet in elevation. A low divide occurs between the Chehalis River basin and the Cowlitz watershed to the south a few miles south of Chehalis, between the communities of Napavine and Winlock. At their closest point, the Chehalis and Cowlitz Rivers, the two largest rivers in southwestern Washington, are only 16 miles apart.

The Chehalis River valley is characterized by the Willapa Hills in the west and by the Cascade foothills in the east, with broad, developed floodplains downstream of its confluence with the south fork of the Chehalis River. The river gradient from its source to the floodplain is steep with an average gradient of 16 feet per mile.

The Chehalis River uplands are undergoing tectonic uplifting. This lowering and lifting of the Chehalis River valley changes the gradients of streams and other waterbodies. The tectonic action, along with the heavier precipitation and sedimentary rock in the Chehalis-Centralia floodplain, generates bed load material that must

be moved from the river channel. Sedimentary rock is usually weaker and easier to erode, and this process is hastened by high peak flows. A river channel with a low gradient tends to form meanders as a way to remove heavy bed material. The change in channel gradient from tectonic activity can compound this meandering action.

The Chehalis River, in the Centralia-Chehalis valley, has a meandering channel that occupies a fairly uniform floodplain averaging over 1 mile wide. Most of the valley is inundated during a severe flood such as the January 1990 flood.

Tributaries to the Chehalis River in the Chehalis-Centralia valley include Dillenbaugh Creek, Newaukum River, Salzer Creek, Cola Creek, China Creek, Skookumchuck River, and Coffee Creek (Figure 3-2).

8.2.7.2 Skookumchuck River

The Skookumchuck River, one of the major Chehalis River tributaries, originates in the Snoqualmie National Forest northeast of Centralia and empties into the Chehalis River at Centralia. The total drainage area for the Skookumchuck River is 181 square-miles. Elevations within the basin range from 150 feet at the mouth to over 3,000 feet at the headwaters. The slope of the Skookumchuck River from its source to the Town of Bucoda is steep, falling an average of 19 feet per mile. Except for the uppermost portion, the Skookumchuck River flows as a meandering channel in a floodplain, varying in width from a few hundred feet to 0.5 mile. The Skookumchuck River has several tributary creeks. The largest tributary, Hanaford Creek, has a drainage area of 58.4 square-miles.

Three development activities are notable within the Skookumchuck River system. The first is the City of Centralia, which occupies several square-miles at the lower end of the basin. The second development activity is Skookumchuck Dam, located about 20 miles upstream from Centralia and operated by Puget Sound Power and Light. Skookumchuck Dam was completed in 1971 and has been considered several times for flood control use. Another development activity of note in the Skookumchuck basin is the Centralia Steam Generating Plant on Hanaford Creek. This coal-fired facility has the authority to divert up to 54 cfs of water from the Skookumchuck River.

8.2.7.3 Newaukum River

The Newaukum River is the second major tributary to the Chehalis River in Lewis County. The Newaukum River's headwaters are in the Cascade foothills southeast of the City of Chehalis. At the USGS gauge near Chehalis, where it flows into the Chehalis River, the Newaukum River has a drainage area of 155 square-miles. Elevations in the Newaukum River basin range from approximately 180 feet near the confluence with the Chehalis River to 3,200 feet in the upper basin. The Newaukum River is made up of three forks, the north, middle, and south forks. Upstream sections on both the north and middle forks, above Forest, have slopes of 83 feet per mile; the south fork has a slope of 188 feet per mile above Onalaska. The average channel slope for the entire drainage is 35 feet per mile.

8.2.7.4 Dillenbaugh Creek

Dillenbaugh Creek flows into the Chehalis River, from the east at Chehalis. It originates in the steep foothills southeast of Chehalis and has a drainage area of approximately 15 square-miles. The gradient of Dillenbaugh Creek in the upper reaches is approximately 70 feet per mile. After it flows out onto the Newaukum River floodplain, the gradient drops as Dillenbaugh Creek parallels the Newaukum and Chehalis Rivers for nearly 3 miles before finally flowing into the Chehalis River. Dillenbaugh Creek collects much of the City of Chehalis' storm drainage in the lower reach.

8.2.7.5 Salzer Creek

Salzer Creek flows into the Chehalis River, from the east just south of the Centralia city limits, and drains 24.5 square-miles. The basin originates in the low-lying hills east of Centralia-Chehalis, and has a maximum

elevation of about 800 feet. The stream gradient of Salzer Creek is relatively flat. Coal Creek, a major tributary of Salzer Creek, has a drainage area of 6.4 square-miles and has a steeper slope.

8.2.7.6 China Creek

China Creek is a relatively small, short stream that flows through the City of Centralia to the Chehalis River. The watershed extends about 5 miles east of the Chehalis River at Centralia. It encompasses approximately 6 square-miles, ranging in elevation from 180 to 570 feet. Much of the land is moderately steep. Most of the channel consists of pipes and culverts through Centralia.

8.2.7.7 Coffee Creek

Coffee Creek is a tributary of the Skookumchuck River. With headwaters in Thurston County, Coffee Creek flows south through the Zenkner Valley to the Skookumchuck River north of Centralia. The watershed encompasses 7.3 square-miles of moderately sloping hills. Watershed elevations range from 186 feet at the confluence with the Skookumchuck River to 645 feet at the northern tip of the watershed. Stream gradient is low in the lower 4 miles of the watershed. Coffee Creek has been moved from its natural location to a periphery channel bordering the edge of adjacent hills and valley floor.

8.2.7.8 Coal Creek

Coal Creek is a small tributary of Salzer Creek that flows west and northwest for approximately 20.5 miles. The drainage area is 6.4 square-miles, with steep channel slopes east of I-5.

8.2.7.9 Cowlitz River

The Cowlitz valley extends from the Cascade crest westward about 80 miles into the southwestern part of Lewis County. The eastern part of the valley is characterized by a deeply cut trough and flat bottom lands, and the western part is characterized by bottom lands, terraces, and broad plains that are surrounded by glacially smoothed uplands of moderate relief. The western part, or lower end, of the Cowlitz valley lies within the northern end of the Willamette Lowlands physiographic province. The major bottom lands have an elevation of 50 to 800 feet in the western part of the Cowlitz valley, and 800 to 1,200 feet in the eastern part.

The eastern half of the County consists primarily of upland and mountainous terrain incised deeply by the main stem and tributary channels of the Tilton and Cispus Rivers. The highest relief areas, which reach elevations of 6,000 to 7,000 feet, are represented by the southern slope of Mount Rainier and the Tatoosh and Sawtooth Ranges in the north, and by the Goat Rocks Wilderness area in the east. The central and southern portion of the Cowlitz River is primarily moderate to high relief uplands, with peaks and buttes ranging from 4,000 to 5,000 feet. The elevation of the Cowlitz River decreases westward from peaks in the east and northeast to the bottom lands at the County boundary near the Town of Vader.

The Cowlitz River watershed also includes the Tilton and Cispus Rivers. Other major tributary creeks are: Rainey, Skate, Butter, Johnson, Silver, Winston, Mill, Salmon, Foster, and Olequa.

8.2.7.10 Cispus River and Yellowjacket Creek

The Cispus watershed drains the extreme southeastern portion of Lewis County, and the northern edge of Skamania County. The basin is a single, linear basin drained by tributary streams, similar to that of the Upper Cowlitz basin. The Cispus River extends from the western edge of the Goat Rocks Wilderness to Lake Scanewa, formerly the confluence of the Cowlitz and Cispus Rivers. Most of the land within the basin is in the Gifford Pinchot National Forest, and managed for forest products, recreation, and wildlife.

Streamflow in the basin is derived from precipitation and snowmelt. The upper reach of the river includes the mainstem, North Fork Cispus, and Yellowjacket Creek. These tributaries contribute large sediment volumes. The reach consists of a wide valley with low to moderate channel gradients, and broad floodplain

terraces bounded by steep valley walls. The channels are primarily low to high sinuosity meander bends with occasional sections of braid bars.

Further downstream, the channel gradient increases, valley width decreases, and sediment deposition decreases. No floodplain terraces are present downstream of its confluence with Yellowjacket Creek. Smaller tributaries enter the Cispus, but any sediment entering this reach is transported through it.

Just before the Cispus flows into Lake Scanewa, the channel enters a wide valley with low to moderate channel gradients, and broad floodplains bounded by sloping to steep valley walls. Meander bends with increasing sinuosity were noted in the 2001 analysis. Several large tributaries capable of large sediment volumes enter this lower reach. Significant volumes appear to have accumulated at the Cispus confluence with Lake Scanewa, resulting in widened channels, bank erosion, and upstream intrusion of the lake.

8.2.7.11 Nisqually River

The Nisqually River originates on Mount Rainier. It is fed by the Nisqually Glacier and forms part of the boundary between Lewis County and Pierce County to the north, before emptying into Puget Sound between Olympia and Tacoma. Several large tributaries of the Nisqually River, including the Little Nisqually River and Mineral and Catt Creeks, drain the mountainous northeastern part of Lewis County.

8.2.8 Groundwater

The primary drinking water supply for Lewis County residents is groundwater. Groundwater in Lewis County is derived from the following three aquifer systems: bedrock aquifers of Tertiary rocks, glaciofluvial deposits of the Pleistocene Epoch, and recent alluvial deposits. Glaciofluvial deposits, the most important source of groundwater, include the Logan Hill Formation, the Lacamas Creek unit, the Newaukum terrace unit, the Layton Prairie unit, undifferentiated terrace deposits, and glacial outwash. The bedrock aquifer is composed of basalt, shale, and other sedimentary rocks. Well yields in this aquifer are typically low, except in the north and south fork Newaukum River area. Recent alluvial deposits in the Cowlitz, Chehalis, and Newaukum River valleys compose the third general category of water-bearing materials in Lewis County. As an aquifer, these deposits are not as productive as the glaciofluvial deposits.

Groundwater occurrence is variable in WRIA 23. One exception is the Newaukum artesian basin, where yields of several hundred gallons per minute are common. This artesian basin has an area of about 25 square miles, and is charged from precipitation that occurs on adjacent uplands.

8.2.9 Water Quality Parameters

The surface waters in Lewis County support a wide variety of beneficial uses, including irrigation, fisheries production, livestock watering, wildlife habitat, and recreation. Each beneficial use entails certain minimum water quality requirements. To protect these beneficial uses, Ecology has established water quality standards for all surface waters in the state. The state water quality standards and index values are described below, followed by specific water quality conditions associated with the Chehalis River.

Each river, lake, and stream has a designated water quality classification based on the present and potential use of the water, as well as any natural limitations on water quality. Ecology has developed four major water quality classes: Class AA (extraordinary), Class A (excellent), Class B (good), and Class C (fair). Each class has been assigned specific water quality standards for physical, chemical, biological, and aesthetic parameters.

To assess and characterize surface waters and ensure compliance with the applicable water quality standards, Ecology monitors surface water quality at numerous locations throughout the state, including Lewis County. Four ambient water quality monitoring stations are established on the Chehalis River (Chehalis River near Montesano, Chehalis River at Porter, Chehalis River at Centralia, and Chehalis River at Dryad). Water quality measurements of temperature, dissolved oxygen, fecal coliform bacteria, pH, turbidity, suspended sediment,

and nutrients are periodically taken at each of the monitoring stations. The significance of each water quality parameter is described below.

Ecology has developed a water quality index system designed to facilitate the interpretation of water quality results. An index value is calculated for each water quality parameter listed above in addition to an overall water quality index. The indices are based on measurements recorded at the monitoring station. The higher the water quality index number, the lower the water quality. An index value below 20 for temperature, dissolved oxygen, fecal coliform bacteria, or pH indicates that the water segment meets state standards for Class A waters. Index values between 20 and 60 are indicative of marginal water quality, while values above 60 are indicative of poor water quality (Ecology, 1988).

Temperature

Temperature changes in water bodies can alter the aquatic community. Increased temperatures can result in a change from a cold water fishery to a warm water fishery because high water temperatures may be directly lethal to salmonids and other cold water fish species. High temperatures also can limit reproduction of cold water fish, and may alter important habitat components such as aquatic plants and insects (EPA, 1986). Moreover, the ability of water to absorb oxygen decreases with increasing water temperature.

Elevated water temperatures may result from eradication of the riparian vegetation that shades the water body. Higher water temperatures also may be associated with decreased streamflow due to diversions, industrial cooling water return flows, and/or irrigation water return flows. Temperature may also be related to increased sedimentation resulting in channel changes (width-to-depth ratios).

To protect cold water fisheries, Ecology has established standards for maximum allowable water temperature. The Class AA standard is 16°C and the Class A standard is 18°C.

Dissolved Oxygen

Inadequate dissolved oxygen can be lethal to cold water fish species such as trout and salmon. During their early life stages, cold water fish generally require at least 8 milligrams per liter (mg/L), equivalent to parts per million (ppm), of dissolved oxygen. Adults can tolerate as little as 4 mg/L for 1 day, but the average dissolved oxygen concentration over any 30-day period should not fall below 6.5 mg/L (EPA, 1986). The primary causes for low dissolved oxygen are livestock waste and urban stormwater.

Dissolved oxygen concentrations can be depressed through addition of organic materials to the water body. The decomposition of these materials removes dissolved oxygen from the water column. The inorganic plant nutrients nitrogen and phosphorus can indirectly cause depletion of dissolved oxygen levels. These nutrients can stimulate blooms of algae and other aquatic plants that can cause wide diurnal fluctuations in dissolved oxygen content, with oxygen supersaturation during the day and depletion at night. The death and decay of these plants can remove dissolved oxygen from the water.

Ecology has established standards for minimum allowable dissolved oxygen concentrations. The Class AA standard requires a minimum of 9.5 mg/L. The Class A standard is 8 mg/L.

Fecal Coliform Bacteria

Fecal coliform bacteria propagate only in the intestines of humans and other mammals. Hence, their presence in surface water bodies indicates that fecal contamination has occurred. The microorganisms responsible for salmonella, cholera, typhoid, hepatitis, tuberculosis, and other diseases may be present in feces (Geldreich, 1972). While fecal coliforms themselves are not pathogenic (i.e., disease causing), they provide an index as to the potential presence of pathogenic viruses and bacteria. For example, when fecal coliform densities exceed 200 organisms/100 milliliters (mL), the incidence of pathogenic salmonella increases sharply (EPA, 1976).

High fecal coliform concentrations do not necessarily mean that a water-borne disease epidemic is imminent. Whether or not pathogens are present in sufficient doses to cause human diseases is dependent on the number of disease carriers (if any) in the human or animal population responsible for the fecal contamination. The specific use(s) of the water (e.g., irrigation, recreation, domestic use) and the amount of water that must be ingested to constitute an infectious dose are also important factors. The source of the fecal contamination, human or animal, is very important. Humans are the sole reservoir of typhoid, cholera, dysentery, and several other diseases. Animals play no part in the propagation of these purely human diseases. On the other hand, animal feces may contain certain organisms that are pathogenic to humans and to other animals as well. Fecal coliform and other enteric microorganisms do not persist indefinitely in the aquatic environment. Thus, concentrations will decrease with time.

The Class AA standard requires that fecal coliform bacteria shall not exceed a geometric mean of 50 organisms/100 mL, with not more than 10 percent of the samples exceeding 43 organisms/100 mL. The Class A standard calls for a maximum geometric mean of 100 organisms/100 mL, with not more than 10 percent of the samples exceeding 200 organisms/100 mL.

pH

pH is a measure of the acidity or alkalinity of the water. The pH of pure water is 7.0 (neutral). It is an important factor in the chemical and biological systems of natural water. The solubility and toxicity of heavy metals and certain other pollutants is directly related to pH. pH also affects the corrosivity of the water.

The pH of natural waters can be affected through contamination with acids (e.g., sulfuric acid) or bases (e.g., cement and sodium hydroxide). Heavy algal blooms can cause wide diurnal fluctuations in pH.

The state standards specify a pH range of 6.5 to 8.5 for both Class AA and Class A waters.

Turbidity

Turbidity is caused by suspended or colloidal organic and/or inorganic matter in the water column. Turbidity decreases water clarity and light penetration, which may lead to decreased photosynthesis by aquatic plants. This can reduce the amount of cover and food available for aquatic insects and fish. Turbidity also makes it more difficult for fish to find food. Very high turbidities can kill fish by clogging the gills.

Turbidity can arise from natural as well as man-made sources. Glacial silt and volcanic ash are examples of the former; erosion from croplands and construction sites is an example of the latter.

In recognition of the role of natural sources of turbidity, the state standards for Class AA and Class A waters require that turbidity should not exceed five units, or 10 percent, over background (natural) turbidity.

Suspended Solids

Suspended solids consist of sand, silt, and/or organic particles that are carried in the water column in an undissolved state. When the velocity of the water decreases, the material carried in suspension begins to drop out of the water column. The larger, heavier particles tend to drop out first. The smallest particles may remain in suspension until the water is virtually stationary (e.g., in a lake or reservoir).

Suspended solids contribute to increased turbidity, as discussed above. Suspended solids may also cause abrasive injuries and clog the gills of fish. Spawning beds may be destroyed when suspended materials settle out and coat the bottom of the channel. The State of Washington does not have standards for suspended solids.

Nutrients

Nitrogen and phosphorus can lead to excessive growth of algae and other aquatic plants. Algal blooms can cause taste, odor, and aesthetic problems. They prevent sunlight from penetrating to lower depths, thereby inhibiting the productivity of other plant species. Some species produce toxic substances. In “soft” waters, the intense photosynthesis associated with algal blooms can lead to wide diurnal fluctuations in pH. Decomposition of aquatic plants can deplete the dissolved oxygen supply in the water column and create toxic anaerobic conditions in the bottom sediments. There are no state water quality standards for nitrogen and phosphorus.

8.2.10 Biological Resources, Fish, and Wildlife

Fisheries

Fisheries constitute an important resource in Lewis County. Fisheries vary according to type and quality of the aquatic habitats, which are related to several factors. Streamflow levels, water depth, water quality, and physical characteristics, such as the type of material forming the channel bed and banks and the presence of logs and other debris, are important factors affecting habitat quality.

The Chehalis River hosts many fish species, including trout and salmon as well as bass, perch, crappie, bullhead, and sunfish. Although warm water species are found in the rivers within Lewis County, none are considered to be of sporting or commercial importance. A complete listing of the fish species identified in Lewis County is provided in Table 8-7. One major impediment to assess the fish distribution and habitat conditions in this area is the tremendous lack of detailed field information. While the Chehalis drainage is the second largest in Washington state (second only to the Columbia), only eight watershed analyses have been completed, and of those, two are in areas upstream of most anadromous salmonid populations. Without proper assessment of fish presence and abundance, it will be difficult to define impacts and recovery success. A technical advisory group used the limited fish data to prioritize subbasins in WRIAs 22 and 23. High priority subbasins included the mainstem Chehalis, Skookumchuck, and Newaukum Rivers. Low priority subbasins include Dillenbaugh and Salzer Creeks.

Table 8-7. Lewis County Fish Species

Name	Name
Chinook salmon	Rainbow trout
Crappie	Redside shiner
Cutthroat trout	Rockbass
Dace	Sculpins
Largemouth bass	Silver or Coho salmon
Largescale sucker	Threespine stickleback
Mountain whitefish	Warmouth
Northern squawfish	Western brook lamprey
Olympic mudminnow	Yellow bullhead
Pacific lamprey	Yellow perch
Peamouth	

The upper Chehalis River provides habitats supporting Chinook and Coho (silver) salmon, steelhead, and sea run cutthroat trout. In addition, native cutthroat and rainbow trout reside in the Upper Chehalis River. The Skookumchuck hatchery releases Coho salmon fingerlings supplied by in the upper Chehalis River.

The mainstem of the Chehalis River from the Skookumchuck River to the Newaukum River provides water for migration of fall and spring Chinook, Coho, and chum. Limited rearing and spawning is expected to occur in this reach. This may be attributed to high water temperatures during the summer months and urban and agriculture non-point pollution reducing river oxygen levels. The entire mainstem of the Chehalis River and 31 linear miles of tributaries are utilized by salmon (Washington State Department of Fisheries, 1975).

The Skookumchuck and Newaukum Rivers, primary tributaries to the Chehalis, also provide spawning and rearing waters for Coho, spring Chinook, and fall Chinook salmon. In addition, chum have been located on the North Fork of the Newaukum River. Spawning and rearing of these fish occur on the Skookumchuck River between the Skookumchuck Dam and the confluence with the Chehalis River. Above the Skookumchuck Dam, salmon use is limited due to salmon migration barriers at dam locations. All of the Skookumchuck mainstem and 41 linear miles of tributary streams are believed to currently provide salmon production (Washington State Department of Fisheries, 1975).

The Newaukum River watershed has four river reaches supporting vital fish habitat. All of the mainstem, 17 miles of the North Fork, and all of the South Fork are utilized for salmon production. In addition, 4 linear miles of the Newaukum mainstem tributaries, 41 linear miles of the north fork tributaries, and 17 miles of the south fork tributaries are used for salmon production. These streams furnish cold water temperatures and deep pools suited for maturation of adult spring Chinook. Chinook spawning within the north fork of the Newaukum River is generally restricted to the lower 10 miles because of stream diversions. The south fork of the Newaukum River below Kearney Creek generally provides the best rearing habitats for juvenile Coho and spring Chinook within the Newaukum River watershed (Washington State Department of Fisheries, 1975).

Wildlife

Lewis County encompasses many different ecosystems, from evergreen coniferous forest to lowland marshes. The variety of habitats available in the County has made it ideal for numerous types of wildlife. The riparian corridors adjacent to the rivers in Lewis County are especially important to birds and small mammals because riparian areas tend to have highly diverse vegetation as well as protected access to water; many species of wildlife are dependent upon them. Passerine and water birds, in particular, rely on the riparian corridors for food and nest sites. Of the 53 bird species commonly found in Lewis County, 42 (or 79 percent) are dependent upon the riparian and wetland habitats typically associated with river systems.

There are four primary categories of wildlife within the Chehalis River watershed: big game, upland wildlife, fur-bearers, and waterfowl. Lists of birds and mammals in Lewis County are in Tables 8-8 and 8-9, respectively. Upland wildlife account for the greatest number of species in the basin. The upper Chehalis River, above the confluence with the Newaukum River, provides habitat for big game (black tailed deer, black bear, and elk), game birds (pheasant, grouse, and pigeons), and fur-bearers (beavers, minks, muskrats, and river otters). Seasonal flooded areas along the upper Chehalis River and its tributaries create habitats for various waterfowl. The upper Chehalis River is within the Pacific Flyway for migratory birds. The Chehalis River segment above Grand Mound also supports a diversity of wildlife. Forested areas support cover for big game species such as deer, bear, and elk as well as many upland bird species. Fur-bearing animals and waterfowl found in the upper Chehalis River are also found upstream of Grand Mound (Lewis County Conservation District, 1992).

Table 8-8. Lewis County Bird Species	
Name	Habitat
Horned grebe	riparian
Western grebe	riparian
Pied-Billed grebe	riparian
Great blue heron	riparian, wetland

Table 8-8. Lewis County Bird Species

Name	Habitat
American bittern	riparian, wetland
Mallard	riparian, wetland, agriculture
Gadwell	riparian, wetland
American widgeon	riparian,
Green-winged teal	riparian, wetland
Wood duck	riparian, wetland
Bufflehead	riparian, wetland
Harlequin duck	riparian, wetland
Hooded merganser	riparian, wetland
Common merganser	riparian, wetland
Cooper's hawk	coniferous forests
Red-tailed hawk	mixed wood, clearcuts, agriculture
Bald eagle	riparian
Osprey	riparian
Blue grouse	coniferous forests, wetlands
Ruffed grouse	riparian, deciduous woods, successional shrub
Virginia rail	riparian, wetland
Sora	riparian, wetland
American coot	riparian, wetland
Common snipe	wetland
Saw-whet owl	coniferous forest
Belted kingfisher	riparian
Hairy woodpecker	coniferous forest, burns
Downy woodpecker	deciduous forests, orchards, residential, agriculture
Willow flycatcher	riparian, deciduous
Hammond's flycatcher	riparian, coniferous
Black-capped chickadee	riparian
Chestnut-backed chickadee	riparian
Dipper	riparian
House wren	riparian, open woodlands, residential
Bewick's wren	riparian, open woodlands, residential
Long-billed marsh wren	riparian, wetlands
Swainson's thrush	coniferous forest, riparian
Golden-crowned kinglet	coniferous forest
Ruby-crowned kinglet	coniferous forest
Water pipit	riparian grassland, agriculture
Cedar waxwing	woodland edges, residential
Northern shrike	agriculture
Red-eyed vireo	riparian
Warbling vireo	riparian, deciduous, and mixed woods
Common yellowthroat	riparian, wetland
Red-winged blackbird	agriculture, wetlands
Northern oriole	riparian, deciduous

Table 8-8. Lewis County Bird Species

Name	Habitat
Purple finch	open woods
Rufous-sided towhee	riparian, deciduous, thickets, agriculture, residential
Golden-crowned sparrow	riparian, residential,
Fox sparrow	thickets, wetlands, agriculture
Song sparrow	riparian, residential, open woods

Table 8-9. Lewis County Mammal Species

Name	Habitat
Virginia opossum	riparian, agriculture, deciduous forest, grassland
Masked shrew	open country, moist forests
Vagrant shrew	wetlands, riparian forest
Trowbridge's shrew	coniferous forest
Dusky shrew	wetland, coniferous forest
Water shrews	riparian
Pacific water shrew	riparian
Shrew Mole	riparian, wetland, agriculture, coniferous, residential
Townsend's mole	residential
Coast mole	deciduous forest, successional shrub
Little brown myotis	riparian, wetlands
Keen's myotis	open and riparian forests
California myotis	riparian forest, wetland
Big brown bat	riparian forest, agriculture
Snowshoe hare	coniferous forest, riparian forest, wetlands, successional shrub
Eastern cottontail	riparian shrub, agriculture, heavy bush
Mountain beaver	riparian forest, open coniferous forest
Townsend's chipmunk	successional shrub, coniferous forest
Douglas's squirrel	coniferous forest
Beaver	riparian, wetlands,
Deer mouse	all habitats
Gapper's red-backed mouse	damp forests
Townsend's vole	riparian grassland, wetlands, grasslands
Long-tailed vole	riparian, successional shrub, grassland
Creeping vole	forest, successional shrub
Water vole	riparian, wetland
Muskrat	riparian, wetland
Black bear	Douglas fir forests
raccoon	riparian, wetland, forest edge
Marten	coniferous forest
Fisher	coniferous forest
Ermine	riparian forest
Long-tailed weasel	all habitats near water
Mink	riparian, wetland

Table 8-9. Lewis County Mammal Species	
Name	Habitat
River otter	riparian, wetland
Western spotted skunk	open forests, riparian, wetland
Striped skunk	mixed and open forest
Coyote	all habitats
Mountain lion	forest, swamp
Bobcat	all habitats
Roosevelt elk	semi-open forest, valleys, riparian
Black-tailed deer	coniferous forest, successional shrub, deciduous forest, riparian
Pacific giant salamander	humid forests, riparian
Northwestern salamander	grassland, forests, dense humid forests
Long-toed salamander	riparian, wetland
Olympic salamander	riparian
Rough-skinned newt	riparian, wetland, forest floor, grassland
Western red-backed salamander	forests
Oregon Salamander	forests
Tailed frog	riparian
Western toad	riparian, wetlands, grassland, urban gardens
Pacific tree frog	riparian, wetlands, grassland
Red-legged frog	riparian, wetlands, grassland
Cascades frog	riparian, wetland
Bullfrog	riparian, wetland
Western pond turtle	riparian, wetland
Painted turtle	riparian, wetland
Rubber boa	coniferous forest, meadows
Common garter snake	grassland, residential, riparian, wetland
Western terrestrial garter snake	agriculture, grassland, forests, riparian, wetlands
Northwestern garter snake	open clearings near riparian forests, successional shrub, agriculture

The Newaukum River basin also provides habitats for diverse wildlife. Big game includes black tailed deer, black bears, and cougar. Upland species of native blue and ruffed grouse, ring necked pheasant, mountain quail, cottontail rabbit, mourning dove, and band tailed pigeon are found in the agricultural or forested areas. Fur-bearers consist of beaver, muskrat, mink, raccoon, weasel, river otter, skunk, red fox, coyote, and possum. Waterfowl include mallard, pintail, wood duck, coot, Canada goose, and blue heron. In addition, ground squirrels, forest rodents, and amphibians and reptiles are found to reside in the Newaukum River basin (Lewis County Conservation District, 1992).

Protected species of songbirds, birds of prey, and Northern spotted owl also inhabit the Chehalis River basin. Recent studies indicate that bald eagles and ospreys use all of the major rivers in Lewis County, especially in the winter months. Bald eagles have been listed as threatened and endangered species by the U.S. Fish and Wildlife Service and the Washington State Department of Wildlife (WDW), respectively. In addition, the osprey has been listed by WDW as a threatened species throughout the state. Both bald eagles and ospreys are dependent upon the riparian and shoreline habitats associated with the rivers in Lewis County for food and nest sites. The 1989 Midwinter Bald Eagle Survey reported that 14 adult and 6 immature bald eagles were identified in Lewis County (Dick Taylor, date unknown. Table 8-10 shows the threatened, endangered, and candidate species known to be within or near the Chehalis River watershed.

Table 8-10. Threatened, Endangered, and Candidate Species	
Name	
Bald Eagle	Olive-Sided Flycatcher
Band-Tailed Pigeon	Olympic Mud Minnow
Bufflehead	Oregon Spotted Frog
California Wolverine	Osprey
Canada Lynx	Pacific Fisher
Cascades Frog	Pacific Lamprey
Coastal/Puget Sound Bull Trout	Pacific Townsend Big-Eared Bat
Columbia Torrent Salamander	Peregrine Falcon
Ferruginous Hawk	Red legged Frog
Giant Olympic Salamander	River Lamprey
Gray Wolf	Tailed Frog
Great Blue Heron	Valley Silverspot
Grizzly Bear	Van Dyke's Salamander
Larch Mountain Salamander	Western Gray Squirrel
Long-Eared Myotis	Western Pocket Gopher
Long-Legged Myotis	Western Pond Turtle
Marbled Murrelet	Western Toad
Mardon Skipper	Whulge's Checkspot
Northern Goshawk	Wood Duck
Northern Spotted Owl	

8.2.11 Wetlands

Wetlands and riparian plant communities are found throughout Lewis County. Riparian plant communities form bands of varying widths along streams and rivers. Wetlands are found within the riparian areas and also in areas away from streams. The primary distinction between riparian communities and wetlands is that the former may encompass vegetation that is not dependent on periodic inundation, while the latter always contain hydrophytic vegetation and/or soils.

Riparian communities often constitute important wildlife habitats, providing food, shelter, and protected access to water for a wide variety of birds and mammals. Aquatic habitats also are enhanced by riparian vegetation. Riparian vegetation shades the stream, which helps to prevent excessive water temperatures. Plant materials and insects fall from the vegetation into the water, providing food for fish and other aquatic organisms. Trees and shrubs that fall into the water provide cover for fish. Moreover, riparian vegetation may reduce water quality degradation associated with bank erosion.

Wetlands are dynamic systems that provide wildlife habitat, storm runoff and flood storage, water filtration and purification, groundwater recharge, shoreline protection, sediment and pollution containment, and nutrient cycling. In addition, wetlands typically are productive ecosystems that support large, diverse populations of plants and animals. The water storage function of wetlands can help to reduce downstream flooding by detaining runoff during high flow events. Many vegetated wetlands also function as natural water filters. Filtration occurs in these systems where water flow velocities are slowed by wetland plants, causing suspended sediments to fall out of the water column. Further water quality enhancement is achieved through microbial activity and plant uptake, which act to decompose and absorb nutrients and chemical pollutants.

In recognition of the ecological significance of wetlands, federal and state laws have been promulgated to protect wetland resources from adverse impacts associated with dredging, agricultural and urban

development, and other activities. Under the current government regulations, activities that affect wetlands must obtain permits and may be required to provide mitigation measures. These measures could include habitat restoration, wetlands enhancement, and creation of artificial wetlands.

Wetland Inventory

A Lewis County Wetland Inventory was conducted around the Cities of Centralia and Chehalis by Applied Environmental Services Incorporated (AES). Numerous tributaries and creeks drain into the Chehalis River valley from both the east and west. This wetland inventory primarily focused upon the watershed drainage areas east of Centralia-Chehalis. Specifically, Dillenbaugh, Salzer, and China Creek watersheds contribute significantly to the urban area flooding problems associated with this valley.

A wetlands inventory is a required component of this CFHMP. Steps taken to address flood control issues include identification and consideration of potential impacts of flood control work on aquatic resources that include wetlands. The wetland inventory is only one of the many facets analyzed to address the flood issues. The Centralia-Chehalis valley wetland inventory was prepared to conform to the guidelines specified in the FCAAP guidelines. The guidelines outline the tasks necessary to collect wetlands data and to complete a reconnaissance-level wetlands field inventory within the study area.

Information collected in this study was used to assess the role of wetlands in flood hazard management during the development of the CFHMP. The wetlands inventory study area extends from approximately Maurin Road, where Dillenbaugh Creek reaches the valley floor, to China Creek east of Centralia. It is important to note that wetland inventory maps are not 100 percent inclusive; wetland boundaries are approximate.

Several wetland definitions have been used by federal and state agencies for various laws, regulations, and programs; however, for the purposes of this wetlands inventory, the presence of any one of the three wetland parameters (vegetation, hydrology, or soils) is enough to be noted on the inventory map. This differs from jurisdictional wetlands delineation, where all three wetland parameters must be confirmed prior to defining the area as wetland. So, by definition, an inventory typically encompasses more acreage than a formal delineation. However, the National Wetlands Inventory (NWI) and the field reconnaissance used in this flood control plan may not have identified or included all of the wetlands that could be affected by federal and state wetland regulations.

Guidelines of FCAAP specify that wetlands data be part of all CFHMPs. If a large-scale inventory has not been completed, a preliminary map of wetlands that augments the NWI by mapping potential wetlands should be produced. However, if the existing wetlands inventory is adequate, field verification may be omitted. It was determined that to produce the most accurate inventory map possible, field verification of selected wetlands was necessary to assure that previous wetland work was still valid.

The expansiveness of the Centralia-Chehalis floodplain and the number of different, yet connected wetlands made it necessary to focus on defined problem areas within the inventory study site. The three main targeted areas included the lower Dillenbaugh Creek watershed, the Fairgrounds portion of the Coal/Salzer Creeks watershed, and a portion of the China Creek watershed slightly upstream of Centralia. In addition, a number of additional spot verifications were performed.

Areas that had been identified as wetlands during the paper inventory phase were verified. A general reconnaissance of the Chehalis valley was conducted to locate previously unidentified wetlands. Field investigators visited several wetlands in each of the targeted areas. All wetlands visited were evaluated based on the USFWS wetland definition.

Each site determined to be a wetland was roughly categorized following the Ecology (1990) Washington State Four Tiered Wetlands Rating System and classified using Cowardin et al., (1979). The Ecology 1990 rating system was used instead of the newer Ecology (1992) rating form for the quick field estimates used in this

inventory. The results of the field investigation represent only the verification of a selected portion of the wetland inventory, not a jurisdictional wetland delineation.

Results

A wetland map was produced for this project. It is a compilation of the hydric soils, based upon the soils survey of Lewis County (SCS, 1987) and the NWI maps of the Centralia-Chehalis floodplain.

Wetlands within the Centralia-Chehalis valley generally appear to fit into the following categories:

- Forested wetland bordered by river or creek
- Scrub/shrub wetland
- Emergent wetlands

The scope of an inventory of this type is broad, and as such presents a useful overall picture of the wetland resources to be incorporated into flood control planning. Wetland boundaries on the wetland inventory map are approximate. Precise boundaries of individual wetlands can be obtained through a formal delineation (Federal Interagency Committee for Wetland Delineation, 1989), followed by a survey of the wetland boundary by a licensed land survey.

LEWIS COUNTY COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

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APPENDIX 1: PAC MEETINGS

CFHMP Project Advisory Committee Meeting**June 29, 2005****SIGN-IN SHEET**

Name	Organization
Scott Choquette	Dewberry & Davis LLC
Steve Anderson	Brown and Caldwell
Colleen Doten	Brown and Caldwell
Gene Seiber	Lewis County Sheriff's Office
Eric Winters	Seattle District Corps of Engineers
Cathie DesJardin	Seattle District Corps of Engineers
Steve Wright	Seattle District Corps of Engineers
Duwayne Rader	Chehalis River Council
Kevin Farrell	Department of Ecology
Mark Cook	Lewis County
Richard Hawkins	WSDOT
Bob Nacht	City of Chehalis
Fred Chapman	Lewis County
Dave Becker	FOC
Dean McLeod	Tacoma Power
Shirley Kook	Lewis County

MEMORANDUM

TO: LEWIS COUNTY PROJECT FILE - Revised CFHMP

FROM: SHIRLEY KOOK, Senior Engineer

DATE: June 29, 2005

SUBJECT: Project Advisory Committee Meeting #1 - Notes

Introduction - by Shirley

Attendees - See attached sign-in sheet.

Project Overview - by Shirley per Power Point

Flooding Issues & Activities to Date - by Colleen per Power Point

Mark hopes the PAC will discuss:

- Flood fighting or involvement by Public Works for properties with no legal access (i.e., Cispus area with USFWS road)
- Beaver dam removal and work outside of county R/W (i.e., BOCC had to declare a local emergency to remove beaver dams outside of Wills Rd R/W)
- Criteria for property acquisition when property acquisition is considered as a management/maintenance option
- Develop list of local flood management/control projects. We won't rehash the Corps Centralia Flood Reduction project, but will fold Corps projects into CFHMP

Current floodplain management programs include diking and flood control districts. These districts need to participate in the CFHMP. The 2004 CFHMP Update identifies these districts' existence.

Flood Plain Management: Chronology and Current Activities - by Steve and Scott per Power Point

One new development regulation item is compensatory storage. One commitment made in the Lewis County All Hazards Plan is to include compensatory storage.

A programmatic issue for existing development is repetitive loss properties. The National Flood Insurance Program (NFIP) defines **repetitive loss** as two or more flood losses exceeding \$10,000 of damage within a ten year period. About 50% of the national claims are for about 5%

of the insured. NFIP is a self insured program. Thus, the aggressive stance taken on repetitive loss properties.

Repetitive loss properties can be in unmapped FIRM areas. Once the areas are mapped, these properties can be brought into the NFIP. The weak link is inconsistent tracking of these properties.

FEMA has a standard language about Increased Cost of Compliance (ICC). ICC states that if the damage is greater than 50% of the valued property, then it is approved for the claim amount and up to \$30,000 to improve the structure to current floodproofing standards. In order to provide this for the community, the ICC provision must be in the local flood hazards regulations and the community must be able to track cumulative flood damages on that specific property.

LCC 15.35 has language close to the ICC--needs some tweaking. Cities (Chehalis, Centralia) don't have this language in their local flood regulations.

Another programmatic issue is consideration of emergency access for land development and building approvals. Gene Seiber voiced this concern when interviewed by Brown & Caldwell (B&C) for county programs and regulations.

Post disaster recovery is another programmatic issue. Opportunities are missed when requests focus on repair. One could fold mitigation efforts, strategy, and costs into damage documentation. Under Section 406 of the Stafford Act, one could seek funding to design a solution or upgrade facility rather than just repair. This approach requires that proposed solutions must already be identified.

There are two types of post disaster assistance: private and public. Public assistance is addressed in Section 406 of the Stafford Act. Unlike grants, mitigation efforts for public assistance funding do not have to be applied, but it must be identified at the time of the request for assistance. Is there a cap for the mitigation funding? If so, how is it established?

Only one representative of a city is here. All cities were contacted by the BOCC for the advisory committee in 2004. Problem is that many of the smaller cities lack professional staff, making it difficult for CFHMP participation and flood regulation implementation.

As for the latter issue of implementing flood regulations (i.e., floodproofing certifications, approval of technical analyses), Fred Chapman said a directive/policy about county assistance to these smaller cities is needed.

Poll Attendees for Special Concerns

Steve asked each attendee to state their special concern.

No specific issues from Tacoma Power. Have representation to provide planning assistance to CFHMP.

1. Participation by local jurisdictions.

Ecology wants local jurisdictions to adopt the county CFHMP, or at least be in the loop as participants. If they want to adopt the county CFHMP, then they need to participate in the planning process. Public Works will contact the cities again for participation. Mark thinks a roadshow to the jurisdiction is needed.

County may need to do a roadshow to bring cities in. Mark/Public Works will tackle this. Eric Winters, Corps, said cities can be liable if they approve projects that impact flood damages.

Fred said many of the smaller cities lack professional staff. For example, he gets the City Clerk and they don't know. Can these smaller cities delegate their participation to Lewis County?

2. Countywide monitoring plan

Mark asked PAC to consider interest in a countywide monitoring plan to collect data in smaller tributaries. There is a countywide flood control district, and monitoring could be included. For example, monitoring along Salmon Creek for bank erosion and avulsion was done last winter where Tacoma Power data was used. There are a lot of local inflows that affect the peak discharge downstream of the dam, so the dam data may not be wholly representative. Fortunately, the dam data gave a close approximation.

3. Follow WAC 173-145 when developing CFHMP

Kevin stated that CFHMP should be developed per WAC such as in authorized approvals (Ecology, WDFW, Lewis County).

4. Identify appropriate development

We have increasing development along I-5 corridor and behind Airport dike (i.e., WalMart, Big 5, Home Depot). Are these developments appropriate and how do they impact flood storage?

5. Ensure WSDOT facilities are not impacted

6. Distinguish between rural and urban areas as we develop/discuss policies.

Bob Nacht stated that there may be land constraints in urban and UGAs. Consider locating appropriate places for compensatory storage. Pacific International Engineering said fill in the WalMart area was insignificant. Not requiring compensatory storage now becomes an equality issue as we comprehensively deal with future fill projects.

7. Regional flood storage areas

Mark suggested regional compensatory storage or areas as urbanization occurs. This could come about through basin plans.

8. Use science in development regulations

CMZs are done using scientific data: would like to see local CMZ regulations.

Fred wants to see regional approach in flood control projects in the Chehalis basin. The analysis should extend to Grays Harbor. Downstream and adjacent neighbors could pose legal challenges if there are impacts. Environmental groups are using ESA to challenge development.

9. Regional analysis of solutions

There are numerous cases of "today's solutions becoming tomorrow's problems". Duwayne doesn't want to see patchwork solutions, and a regional approach to solutions should be used. Scott stated that FEMA has a "no adverse impact" policy.

10. Update FEMA floodplain boundaries

11. Protect floodways, and leave room for CMZ/avulsion within the floodplain as these natural processes benefit fish

12. More County/city participation in the latest Tacoma Power relicensing effort

Dave felt some flood protection benefits of the dam were lost in the latest relicensing effort. It was small, but significant given the losses from the 1996 event. Stronger participation from the county/cities was wished.

Dean responded that counties and cities did participate in the latest relicensing effort. Tacoma Power needs to retain adequate water for power generation and summer time fish flows. Mark interjected that he hoped PAC will discuss and understand Tacoma Power's (power) needs versus flood protection.

13. Levee maintenance is important

Steve Wright, COE, felt levee maintenance is important in flood fighting. Appreciates openness of today's participation.

14. Establish a conservation corps to maintain a drainage management plan

Mark wants to explore interest in establishing a drainage management plan for the smaller drainages. Other than local drainage districts, there is no comprehensive mechanism and guidance for private parties.

15. Local jurisdictions are responsible for cleanup and permitting after COE flood fighting efforts

PLA-99 authorizes the COE to protect life and property. Once they respond to a local request for flood fighting assistance, it could include taking over dam management, doling sandbags, and providing heavy equipment. After they leave, it is the locals' responsibility to obtain permits, remove emergency construction, and to do cleanup.

How does the COE emergency actions address conflicts with ESA? Cathy gave an example of repairs to a damaged levee. ESA permitting was required, but PLA-99 authorizes waiving the 404 permit to do certain levee maintenance activities. This applies on flood fighting activities at any levee during the flood event.

16. Identify flood fighting resources

Kevin wants the CFHMP to identify flood fighting resources (i.e., Washington State Conservation Corps, National Guard, COE) available for flood fighting.

Project Goals & Objectives - by Steve per Power Point

The draft Goals are:

1. Reduce public safety impacts of flood hazards
2. Protect County emergency responders from flood related hazards
3. Reduce flood damage to public and private properties
4. Reduce flood-related financial impacts to public and commerce
5. Reduce long-term flood control costs to Lewis County
6. Avoid the public subsidy of private developments

7. Avoid activities that cause flooding of downstream neighbors
8. Minimize adverse environmental or natural resource impacts of County flood-related activities

The draft Objectives are:

1. Define and adopt County flood policies
2. Work in concert with other land use regulations
3. Ensure new development results in no adverse impacts to developed and undeveloped properties
4. Encourage voluntary efforts to restrict development within hazardous areas
5. Focus on non-structural measures
6. Improve coordination between public agencies, the public, and adjacent jurisdictions
7. Facilitate access to funding
8. Prioritize public education
9. Alert the public to critical areas
10. Improve understanding of flood hazard causes and impacts of decisions (e.g., land use)
11. Recognize that water quantity, quality, and in-stream habitat are related
12. Promote development and dissemination of better quality flood hazard data

Mark stated that there are resource lands that are outside of county's purview, such as private and State timber harvest lands. Any large scale harvesting will affect the hydrologic response of the basin. **We want discussion of these resource areas outside the influence of Lewis County.**

CFHMP should serve as a financial plan for flood management activities, and should include a list of all projects, even within the incorporated areas. Kevin emphasized that if flood funding is sought, then that activity/project, including those in the incorporated areas, needs to be in the local CFHMP.

Next Steps & Future Meetings

ACTION ITEM: Everyone is to review draft goals and objectives, and email comments to Shirley by July 29, 2005. Some of the draft goals can be consolidated or re-phrased to remove redundancy.

B&C will contact and interview PAC members in the next couple weeks.

For more information about FEMA's "no adverse impact" policy, Scott referenced site at www.floods.org. Some case studies (pdf files) are also available at this site.

Next meeting is on August 17, 2005 from 10:00 to 12:00, at the same location.

CFHMP Project Advisory Committee Meeting**October 4, 2005****SIGN-IN SHEET**

Name	Organization
Shirley Kook	Lewis County
Scott Choquette	Dewberry and Davis
Brett Martin	City of Toledo
Steve Anderson	Brown and Caldwell
Charles Brown	City of Toledo
Catherine DesJardin	US Army Corps of Engineers
Richard Hawkins	WSDOT
Mark Cook	Lewis County
Kevin Farrell	Department of Ecology
Eric Winters	US Army Corps of Engineers
Glen Connelly	Chehalis Tribe
Bob Nacht	City of Chehalis
Duwayne Rader	Chehalis River Council
Fred Chapman	Lewis County

MEMORANDUM

TO: LEWIS COUNTY PROJECT FILE - Revised CFHMP

FROM: SHIRLEY KOOK, Senior Engineer

DATE: October 5, 2005

SUBJECT: Project Advisory Committee Meeting #2 - Notes

Introductions & Attendees - See attached sign-in sheet.

CFHMP Goals & Objectives - Stephen Anderson (SA) stated these were addressed at our last meeting. Send comments to Shirley.

Policies Discussion - Mark Cook (MC) stated that today's focus is on policy gaps. Our consultants have reviewed county and local plans, and identified policies to address these gaps. Some will be controversial, but we need to hold informal discussion. Participating jurisdiction representatives can advise your respective governing body, and choose to either adopt with or without modification.

Scott Choquette (SC) went over the No Adverse Impact (NAI) focus on floodplain management policies vs. current national policies. Current national policy:

- Promotes intensification in risk areas
- Ignores changing conditions
- Ignores adverse impacts to existing properties
- Undervalues natural floodplain functions

Current approaches (i.e., FIS) deal primarily with how to build in a floodplain vs. how to minimize future damages.

NAI is a concept/policy/strategy that broadens one's focus from the built environment to include how changes to the built environment potentially impact other properties.

NAI broadens property rights by protecting the property rights of others that would be adversely impacted by the actions of others.

We want to draft local policies using the NAI buildings blocks. (See www.floods.org for more info.)

1. Hazard Identification
2. Education, Outreach, and Communication
3. Planning
4. Mitigation Actions

5. Infrastructure
6. Emergency Services
7. Regulations and Development Standards

MC: How does NAI help local CRS and FIS? SC said NAI introduces broader and additional measures than traditional WAC and FIS approaches, which sometimes focus on how to build in the floodplain. Kevin Farrell, Ecology, said state CFHMP guidelines encourage NAI process.

Discussion ensued using the “Review Draft, NAI Flood Loss Reduction Policies, October 4, 2005”.

HI-1. Lewis County will work with FEMA via the Cooperating Technical Partners Program to be a full participant in the Lewis County re-mapping initiative that is currently starting and to ensure that the entire County, including incorporated jurisdictions, is remapped in a digital environment using new LiDAR generated terrain data. The County will establish a mapping update and maintenance program that will include mapping of other flood related hazards.

SC: This policy is already underway in Lewis County as evident in their Cooperating Technical Partners (CTP) mapping project with FEMA.

Eric Winters, COE: Need to guard against rapid construction occurring in areas where anticipated floodway and floodplain mapping will remove these areas as hazardous areas. Case example is in Idaho.

EOT-1. Lewis County should develop an annual program of training for all floodplain management stakeholders on a rotating basis, with support from FEMA, DOE and others. The County will further sponsor one or more County and city regulatory officials to take the Certified Floodplain Manager (CFM) exam each year.

EOT-2. The County has established a regional multi-jurisdictional floodplain management organization for all incorporated jurisdictions and counties (Grays Harbor, Thurston and Lewis) to assist in administering floodplain management programs. The organization will be funded by the contributions of participating jurisdictions and the County will only provide services that are covered by the fees.

Fred Chapman said he had estimated disclosures/deed recordings will cost \$55,000 or \$20 per recording. SC clarified that this proposed disclosure would apply toward properties identified by issuance of a building permit. Land development activities are already addressed in current county regulations.

Fred: FEMA has regulations about activities to devalue property. The responses from SC, SA, and Richard Hawkins, WSDOT, were that property disclosures address this by

asking “Has the property ever flooded?” Owners get around the flooding disclosure by raising the structure.

PLN-1. Future updates of the comprehensive plan will evaluate the impact of UGA development on floodplain land use. All future expansions (or redefinitions) of UGAs will be made to steer development away from floodplains to the extent feasible and will seek to limit the use of fill behind levees.

This policy addresses the concern that increased developments/densities could occur in floodplain areas with critical flow paths. MC clarified that this policy would not ban development in the floodplain: mitigation would have to be made. There are subsequent policies dealing with mitigation if the jurisdictions approve floodplain development projects.

FC had issue with “use of fill behind levees” as the levees would provide protection. Discussion ensued about inadequate levees that offer decreasing levels of designed flood protection. SA recommended text, “use of fill behind certified levees”. Corps has specific criteria for certified levees. SC noted that this modification will address Eric Winter’s comment about how the new floodplain and floodway mapping is discounting protection by non-certified levees. These areas are now floodplains with no levee protection.

PLN-2. Lewis County should establish inter-local agreements with all cities to address floodplain development consistency.

PLN-3. Lewis County will develop and continuously maintain a web based countywide water resources database in connection with its existing web location for gauge data and road closures. The County will continue to identify opportunities to add gauges to tributaries and smaller rivers. As part of this approach, the County will enter into agreements with the incorporated municipalities to serve as the County clearinghouse for hydrologic and hydraulic data derived from development proposals and will define data collection standards for the system.

SA: Generally, projects (for warning, response plans, hazard mapping) are more easily implemented and favorably funded than ongoing data collection activities. MC: Data from these tributary streams could also support new or remapping requests.

PLN-4. Regional stormwater detention should be considered during the next update of the Critical Areas element of the Comprehensive plan as one means of protecting concentrated growth areas and existing densely developed areas.

This policy initially referenced historic urban development, but discussion evolved to broaden regional detention to address large upstream changes (i.e., deforestation) impacts typical of rural areas. Lewis County has large and multiple tracts of private timber lands. A policy with a legislative approach is needed about protection from

hydrologic impacts from activities exempt from local permitting regulations and planning requirements. MC cited the Green Cove Basin Plan in Thurston County, which identified buying trees or preserving effective canopy via acquisition of conservation easements and land.

PLN-5. During the next update to the Natural Resource Lands Sub-Element of the Comprehensive Plan, the County will define and adopt mechanisms to coordinate with State regulatory agencies to provide input to permitting decisions on resource lands and to contribute to the successful implementation of State identified Best Management Practices (BMPs).

Add something about action at the legislative level to ensure level playing fields. MC cited an example of using project money to acquire high habitat valued property. Purchase of this property will enable Lewis County to close road because we won't need to make repairs to keep road accessible. We would purchase in a heartbeat if we knew the purchase could meet other mitigation credits. Richard Hawkins said WSDOT is looking at mitigation away from State ROW.

PLN-6. Lewis County will incorporate the policy recommendations of the 2004 Multi-Hazard Mitigation Plan and the 2005 revision to the CFHMP into the next update of the Comprehensive Plan as a "Natural Hazards Sub-Element" and incorporate both plans in their entirety into the appendices of the document. By doing so, the more vague policy statements currently included in the plan will be accompanied by more focused policies and implementation activities which will be put through the public review process and supported by a broader stakeholder group.

SC: Cited supporting research by the Institute for Business and Home Safety that found decent correlation between incorporating natural hazards into comprehensive plans and reducing damages.

CARL-1. Lewis County should establish an annual program for ranking, prioritizing, and selecting Repetitive Loss (RL) flood prone properties for elevation in place, or acquisition and demolition. The voluntary program will be based on a set of fair selection criteria, including but not limited to Benefit/Cost analysis, public benefit, and consistency with other County/city goals. The program will better position the County for procuring additional grant funding and will provide fair and equitable relief for RL property owners and for the County.

A list of ranked projects can be used to readily apply for funding. Some funding programs are: Hazard Mitigation (post disaster); FEMA pre-disaster; and FCAAP. Although the policy/proposed annual program is dependent upon available funding, it offers resolution for homeowners.

CARL-2. Lewis County will establish, to the extent possible, baseline data for all known properties that have experienced flooding. Following all future flooding

events, during the damage assessment phase, the County will update the database to track damages to all FEMA and non-FEMA RL properties.

FEMA defines RL as two claims exceeding \$1000 within a 10-year period. FEMA follows their RL properties well as claims are paid out of a collective pool of insurees. There's no formal process to track RL properties that are not in FIS mapped areas. FC noted that there are 35 RL properties of which some are not in FIS mapped areas.

Next Meeting - The committee was asked if we wanted to continue meeting as a group to review the draft policies in two week's time; or if we wanted to review individually and send comments. Decision was the former--group discussion was most educational.

SC may not be able to fly out for the next meeting so we may consider telephone conference. We meet in two weeks, 10 AM to noon. Details will be forthcoming.

CFHMP Project Advisory Committee Meeting**October 19, 2005****SIGN-IN SHEET**

Name	Organization
Charles Brown	City of Toledo
Brett Martin	City of Toledo
Richard Berdan	City of Tacoma
Richard Hawkins	WSDOT
Mark Cook	Lewis County
Shirley Kook	Lewis County
Steve Anderson	Brown and Caldwell

MEMORANDUM

TO: LEWIS COUNTY PROJECT FILE - Revised CFHMP

FROM: SHIRLEY KOOK, Senior Engineer

DATE: October 23, 2005

SUBJECT: Project Advisory Committee Meeting #3 - Notes

Attendees - Charles Brown, City of Toledo
Richard Berdan, City of Tacoma
Mark Cook, LC Public Works
Steve Anderson, B&C

Brett Martin, City of Toledo
Richard Hawkins, WSDOT
Shirley Kook, LC Public Works

Our meeting was held October 19, 2005 from 10:00 AM to noon at the Chehalis WSDOT office. Shirley distributed copies of a revised draft policy document that had revisions from our PAC#2 discussion, and from a phone conference held on October 11, 2005. That phone conference was between Steve, Scott, Mark, and Shirley to discuss compensatory storage and regional storage issues that surfaced in our PAC#2 meeting and in our interview with Bob Nacht, City of Chehalis, on October 5, 2005.

We called in to Scott Choquette and continued our review of the draft policies. Discussion ensued using the “Review Draft, NAI Flood Loss Reduction Policies, October 19, 2005”.

Mark suggested using font size 12 for future documents.

For clarity of our meeting notes, new policy text is underlined.

HI-1. Lewis County will work with FEMA via the Cooperating Technical Partners Program to be a full participant in the Lewis County re-mapping initiative that is currently starting and to ensure that the entire County, including incorporated jurisdictions, is remapped in a digital environment using new LiDAR generated terrain data. The County will establish a mapping update and maintenance program that will include mapping of other flood related hazards.

SA: No change to the policy, but clarification was added to the first bullet item of section, Possible Implementation Activities. “The County will work with FEMA and the cities to conduct a detailed needs assessment, to supplement the needs assessment conducted by DOE, to identify area in need of first time studies, areas in need of restudies and areas where redelineation on better topographic data would be sufficient.

PLN-1. Future updates of the comprehensive plan will evaluate the impact of UGA development on floodplain land use. All future expansions (or redefinitions) of UGAs will be made to steer development away from floodplains to the extent feasible and will seek to limit the use of fill behind levees not certified by FEMA. Should there be no feasible alternatives to development on fill, new development shall be constructed with compensatory storage and equal conveyance as outlined in policy RDS-1, below.

New text addresses: non-certified levees; and required mitigations if development is permitted in the floodplain. These clarifications were raised in PAC#2.

PLN-3. Should the Centralia Flood Damage Reduction Project, proposed by the U.S. Army Corps of Engineers (USACE), be constructed, land use regulations in areas identified by USACE as critical flow paths will be regulated as floodways. Flow paths are naturally occurring swales, which are normally dry, but which historically conveyed significant amounts of flowing water during flood stage. (*May belong in the regulatory section.)

SA: This is a new policy. The old PLN-4, which dealt with regional flood storage was removed. A distinction between regional flood storage and regional stormwater storage needs to be made. Basin plans will address regional stormwater storage, which will be addressed in the basin planning policy. This policy ensures critical flow paths are retained as part of the multi-jurisdictional USACE project.

PLN-4. Lewis County will develop and continuously maintain a web based Countywide water resources database...

This policy was formerly listed as PLN-3. The only change is to renumber it as PLN-4.

A note was made to see if the 2nd and 3rd bullet items in section, Possible Implementation Actions, have been done.

PLN-5. Lewis County will align with other interested counties to investigate and pursue legislative solutions that will allow the County to coordinate with the State regulatory agencies and the industry to ensure that impacts to flooding conditions and water quality are minimized through Best Management Practices (BMPs). In March/April 2008, Lewis County, Grays Harbor County, and Thurston County formed the Chehalis River Basin Flood Authority (Flood Authority). The CRFBA also includes the cities of Centralia and Chehalis.

This is a refinement of old PLN-5. We added implementation action with other jurisdictions to have the discussion to address practices and actions regulated by State agencies that will impact the local watershed.

Some changes were also made in the section, Possible Implementation Actions; and a comment to cross reference this policy with PLN-7.

PLN-7. The County will use the next and subsequent updates to the Comp Plan as a vehicle for further identifying needs for multi-objective basin planning as the more rural watersheds grow. As multi-objective basin plans are completed, the recommendations and findings of those plans will be incorporated into the Comprehensive Plan.

This is a new policy recognizing that basin plans, CFHMP, local Capital Improvement Program (CIP), local regulations, and other local plans should feed into the Comp Plan.

New items were added in the section, Possible Implementation Actions, to accomplish the inclusion of basin plans, multi-hazard plan, and CFHMP into the Comp Plan.

CARL-2. Lewis County will aggressively pursue State and Federal grant funding to implement mitigation measures for the prioritized flood prone areas on an annual basis. Implementation of CARL-1 will be dependent upon the successful procurement of grant funding.

This is a new policy to augment CARL-1 to ultimately decrease Repetitive Loss (RL) properties countywide.

CARL-3. Same as the old CARL-2, now renumbered to CARL-3.

We now continue with new policies. At our PAC#2 meeting, we had finished CARL-2.

CARL-4. Same as the old CARL-3, now renumbered to CARL-4.

CARL-5. Through the annual ~~Capital~~ Capital Improvement Program, Lewis County addresses and funds an ongoing and prioritized list of structural flood solutions throughout the County when the following conditions are met:

- ***There are no feasible alternatives to a structural solution;***
- ***It is proven that all adverse flooding impacts have been addressed on and off site;***
- ***It has been proven that there will be no adverse impacts downstream to other jurisdictions;***
- ***The project is cost beneficial;***
- ***The project is in the public interest; and***
- ***Endangered species and other environmental impacts have been addressed.***

This is a new policy, which specifies how structural flood solutions will be considered and implemented as a county CIP project. A new page was developed for this policy.

B&C shall verify wording and spelling with the above version of CARL-5.

INF-1. When planning for and siting all new utility infrastructure, the flood risk to the property that would be serviced by the infrastructure will be considered. Where feasible, no new utilities will be constructed which will lead to increased development of flood prone lands.

An example was cited: planned development in flood prone areas by the Cities of Centralia and Chehalis.

ES-1. During flood fighting, Lewis County resources will be deployed with the following order of priorities:

- 1. Protecting human life and safety;**
- 2. Protecting public infrastructure and buildings;**
- 3. Protecting the natural environment; and**
- 4. Protecting private property.**

Is it a government function to protect private property? SC said our stance is dealt in ES-3.

ES-2. Lewis County will seek to obtain voluntary right of ways to access known risk areas on private property during flooding events for those areas known to have historical flooding problems. For new development on lands that contain waterways, the County will seek right of ways for emergency situations (e.g., emergency stream clearing) during development permitting. During flood events, in the absence of a right of way, or consenting property owner on premise, the County will not engage in activities on private property to protect private property. In those cases where there is an imminent threat to public infrastructure, properties, or life and safety, the County will access private property to perform flood fighting activities.

Clarification is needed that Lewis County will determine whether to engage in private flood fight that would affect a public infrastructure. This policy as written focuses on access permission, and there is some ambiguity that County will engage in flood fighting on all prior approved access properties.

ES-3. Distribution of a pre-prepared and maintained inventory of sand bags will be prioritized for the protection of life and safety, and public infrastructure and property. Use of those sand bags and County resources for their deployment will not be made available to the public until it is determined that all public properties have been protected to the extent feasible. The County Sheriff's Office Division of Emergency Management ~~Department of Emergency Services~~ will be responsible for that decision. Public access sandbag distribution locations will be established throughout the County with materials and equipment provided for self-service preparation and use. The Public Works Department will hold annual outreach and solicit the support of the flood prone public each year in advance of flooding season to stock and maintain sand bags. During flood events, residents will have controlled access to the public sandbag distribution locations, but will

not have access to County locations and resources until public property and infrastructure has been protected to the extent feasible.

MC: Additional text is still needed in ES-2 such as listing criteria as to when the County will engage in flood fighting on private property.

SC: May want to combine ES-1 and ES-3 to address MC's concerns; or create new ES-3 outlining criteria for flood fighting on private property with sandbag distribution as an implementation of a revised ES-3 policy.

SA: Some additional text to ES-2 to address public response issues such as private property access is not needed for 911 responses.

ES-4. During flood events, the use of two-way radios will be limited to critical matters pertaining to disaster response. Personal communications are limited to land lines and cell phones. Communications necessary for the protection of life and safety will take precedence over communications related to the protection of property. Communications related to the protection of public infrastructure and property will take precedence over communication related to the protection of private property. Matters involving recovery will be deferred until after the response phase in order to allow County responders to focus on the task at hand. The County Sheriff's Office Division Department of Emergency Management will serve as communications liaison between the EOC and field responders. Lewis County will explore procuring and establishing a dedicated emergency management communications network as a long-term solution.

MC: Additional text about designating specific departments if there is insufficient funding to establish a dedicated emergency management communications network. Some guidelines about prioritizing criteria are needed.

Last week, BOCC endorsed the 211 nationwide emergency response network. We may want to verify with Emergency Management about the status of LC and nationwide network, and tie this into the CFHMP.

SA: The local Emergency Management Plan (EMP) seems only accessible to the Sheriff's Office. Does everyone know their roles and responsibilities in the EMP? Some of the information in the EMP or a reference to the EMP needs to be made in the CFHMP.

SA and SC will talk to Gene Seiber, Division of Emergency Management, about the EMP. MC will check on the status of the nationwide network and LC.

ES-5. Lewis County will document and inventory historic road flooding areas and detour routes, and coordinate with the State DOT to ensure that road closures are coordinated between agencies, utilizing a formalized and updated road closure database linked to flood stage warning system.

This is informally done with each Area Road Supervisory calling into PW Administration, and it gets on the LC web. How is it coordinated with Division of Emergency Management and WSDOT?

SC: His understanding is the EMP details detour routes. That kind of detailed information is subject to changes/updates so it's best if the EMP is referenced in the CFHMP.

ES-6. Public Works will co-lead all damage assessment efforts with DEM. A qualified engineer will accompany all damage assessment teams for the specific purpose of capturing damage data and identifying mitigation opportunities. Public Works will co-lead all post disaster grant application activities.

MC: May want to solicit comment from Sheriff's Office as they are the lead in post damage assessment. SA will review with Gene Sieber, LC Sheriff's Office.

Add date of the cited supporting information document, "Santa Barbara Multi-Hazard Mitigation Plan". The Santa Barbara plan cites that an engineer reviews their assessment documents. SA and SC to go over the EMP to address their inserted comment about identifying responsible agencies for discrete post disaster activities.

RDS-1. Lewis County will protect the habitat, downstream impacts, and property rights of its citizens by prohibiting all development in the floodplains unless it can be demonstrated that no adverse impacts to neighboring properties will result, or that any such impacts will be fully mitigated.

CFHMP Project Advisory Committee Meeting**February 15, 2007****SIGN-IN SHEET**

Name	Organization
Shirley Kook	Lewis County
Mike Prett	Brown and Caldwell
Steve Anderson	Brown and Caldwell
Les Miller	Portland District Corps of Engineers
Eric Winters	Seattle District Corps of Engineers
Bob Nacht	City of Chehalis
Don Webster	PeEll
Dean McLeod	Silver Creek Tacoma Power
Glen Connelly	Chehalis Tribe
Kevin Farrell	Department of Ecology
Bob Berg	City of Centralia
Emil Pierson	City of Centralia

MEMORANDUM

TO: LEWIS COUNTY PROJECT FILE - Revised CFHMP

FROM: SHIRLEY KOOK, Senior Engineer

DATE: March 7, 2007

SUBJECT: Project Advisory Committee Meeting #4 - Notes

Introductions & Attendees - See attached sign-in sheet. Stephen Anderson (SA) introduced Mike Prett, Brown & Caldwell, who will be assisting on the CFHMP project.

Les Miller (Corps of Engineers, Portland) said their office has a pilot project to survey federal revetment projects. The national inventory will map and develop database for physical characteristics of the levee (length, side slopes, cross culverts, elevations). The information for the revetment projects in Lewis County may supplement our Revetment Inventory data for Kirkendall and Holden Revetments.

SA summarized project objective and past advisory committee meetings.

Recent Events - Shirley Kook (SK) said there was a major channel avulsion of the Muddy Fork upstream of its confluence with the Ohanapecosh River in November 2006. This occurred within the mapped CMZ, and LC wants to look at the impact on the existing CMZ. A scope of consultant services for this work is underway.

One impetus for a revised CFHMP was to include the mitigations in the COE Centralia-Chehalis Flood Reduction project EIS into the local CFHMP. However, in November 2006, Centralia and Chehalis decided to opt out of the COE project. This doesn't affect the importance of the CFHMP for flood management policies and list of projects. If anything, the need is greater for local flood management programs and projects.

After our last meeting of 10/19/05, the draft policies were discussed with the County Board of County Commissioners (BOCC). The BOCC directed county staff to present the draft policies and solicit a list of potential projects from each of the nine cities and towns in Lewis County. Mark Cook (MC) and SA made presentations to Centralia and Chehalis last summer; and MC made presentations to the remaining seven jurisdictions throughout 2006.

Our project scope is to review the draft policies, get review comments to SK within a few weeks, schedule another advisory committee meeting depending upon the degree of the review comments, hold two public hearings (in east and west county), and schedule for approval in June 2007.

SK distributed copies of a summary of draft floodplain policies. These are the same policies discussed with the BOCC and various cities in 2006. SA proceeded to review each policy.

PLN-1. Emil Pierson, Centralia, said this could be broken into two policies: 1) evaluate and steer impact of UGA delineation away from floodplains, and 2) limit fill behind levees not certified by FEMA. Clarify “feasible”.

Bob Berg remarked on the distinction between FEMA certified and COE certified levees. Les Miller remarked that if it is COE certified, then it is eligible for PL 3499 funds.

Chehalis has several new council members in 2007 who need to be apprised of the draft floodplain policies. Bob Nacht will discuss with the new councilmembers, and get back to SK.

PLN-5. Centralia is concerned about regulating development in Chehalis River CMZ. City is built on a river terrace so will this limit re-development? Under GMA, the goal is to site new development close to existing infrastructures so we need to balance that with regulating CMZ areas.

PLN-6. Make sure CFHMP is included into the current County Comprehensive Plan Update effort that is managed by Phil Rupp, Lewis County.

ES-1. Why include private property? How does one decide whether to protect one private property versus another private property? Project Advisory Committee (PAC) recommend deleting “protecting private property” as it could create potential liability issues.

ES-2. Discussion arose about removal of temporary flood control improvements that have been erected on private property after a flood fight. For example, sandbags. Usually after a flood fight, sandbags are left in place. How does one justify using public funds/resources on private property? One recommendation was “Where the county does **attempt to** engage in flood fight or public safety/infrastructure protection activities on private property it will remove any temporary flood control improvements during the recovery phase.”

ES-3. Reconsider the text about “Public access sandbag...” in regards to any potential liability and having the facility be staffed. One could have special events for the public. If so, say “Public access sandbag distribution locations will be established ~~at existing public works facilities throughout the county~~ ~~County with materials and equipment provided for self service preparation and use.~~”

Eric Winters, Seattle COE, said sandbags were offered to Lewis County. These sandbags become “free” for presidentially declared disasters, otherwise, jurisdictions have to pay or send back.

RDS-1. The word, *habitat*, in “Lewis County will protect habitat from floodplain development impacts...fully mitigated.” needs to be more specific and defined. As it is, it is too broad and could result in excessive mitigation efforts. Some members made the argument that “there are habitats everywhere”. Other words that need definition or rewording are: “fully mitigated”, “no adverse impacts”, and “neighboring properties”.

RDS-1 and RDS-2. Reconsider the intentions of these two policies.

RDS-1 through RDS-3. Centralia asked if these policies exceed the requirements of the national CRS program.

RDS-3. Centralia is not averse to a different compensatory ratio. Bob and Emil will discuss the issue of compensatory storage replacement ratio with their Council, and send written comments to County by end of the month.

RDS-5. This could be broken into two policies: 1) Lewis County will update its floodplain ordinance to include the ICC insurance provision, substantial damage definition, and other identified deficiencies; and 2) Lewis County will develop a model floodplain ordinance.

General Items.

Eric asked if a letter about the County’s interest in the Centralia-Chehalis Flood Reduction project (with news of the two cities’ opt out) was written to the COE. If so, could he get a copy? Other counties (Pierce, King, Whatcom) are making preventive and immediate (after damaging events) efforts to keep existing levees intact. Not much funding available for this area in the next 25 years. Most damages are from smaller storms/events.

Les Miller suggested adding text into the policies about the CRS benefits.

Forward additional review comments to SK by end of the month. We anticipate the next meeting in late March.

CFHMP Project Advisory Committee Meeting**March 19, 2008****SIGN-IN SHEET**

Name	Organization
Jon Cravens	City of Toledo
Dean McLeod	Tacoma Power
Bob Nacht	Chehalis
Emil Pierson	Centralia
Mark Cook	CEDS
Shirley Kook	Lewis County PW
Steve Anderson	Brown and Caldwell
Liz Korb	Brown and Caldwell
Dwayne Rader	Chehalis River Council
Fred Chapman	Lewis County DCD
Linda Ryan	ISO

MEMORANDUM

TO: LEWIS COUNTY PROJECT FILE - Revised CFHMP

FROM: SHIRLEY KOOK, Utility Engineer

DATE: April 25, 2008

SUBJECT: Project Advisory Committee Meeting #5 - Notes

Introductions & Attendees - See attached sign-in sheet.

The focus of the meeting was to discuss the Draft Plan. Stephen Anderson (SA) gave an overview of the project to date. SA also went over all of the policies that had been finalized in previous PAC meetings. There was a group discussion about the time that has elapsed from the County's initial presentation of the policies to the present.

Steve Anderson then discussed general plan organization. SA and Mark Cook (MC) then presented the proposed projects, ranking criteria and process.

Emil Pierson from Centralia expressed Centralia's concerns with compensatory storage. Centralia is working on their own policies currently and want to ensure it coincides with the County Plan. Pierson also discussed the increased cooperation between Chehalis and Centralia after this winter's flood.

MC stated that we need to get the CFHMP in front of the public as soon as possible. The Plan must be adopted for project funding eligibility.

The PAC discussed that small cities need to be involved in this process because the regulations will also affect them. It was also agreed that the policies will never make all the people in the County happy, but the PAC needs to move forward with the process.

It was agreed that the public should be educated about the proposed projects as early as possible. To increase public involvement, hold public workshops before public comment period.

Many agreed that the 2007 Flood validated many projects and policies.

Several people agreed that in light of the December 2007 Flood, there are additional projects. The US Army Corps (Corps) Centralia Flood Reduction Project was originally not included because the cities could not agree and had opted out.

Another project to add would be the West County project. This project would include flood warning, data collecting, flood attenuation, sediment management, and slope stabilization.

Some thought that a resource management project and not just a policy should be added. The resource center would be a website with numerous educational and informational links.

It was agreed that an early warning system should not be included as a new project. Dean McLeod thought that people should have individual responsibility and there should be an information repository for people to find early warning information if they want.

Linda Ryan (LR), the field representative for Region 10 CRS, and Fred Chapman, Lewis County Building Official, arrived. LR said her agency would review the draft plan for CRS applicability.

To summarize, MC will provide general scopes and cost estimates for the four new projects. Shirley Kook (SK) will review, and with Brown & Caldwell, write up in as similar format with the other projects. SK will then send out to PAC members to complete project ranking using the procedure as discussed today.

Following the projects discussion, the group was solicited for thoughts about adoption dates. There was a brief discussion regarding individual plan adoption by the cities of Centralia and Chehalis.

After the public draft version is released, it was agreed that Lewis County should schedule workshops open to the public and include Chehalis, Centralia, and the Board of County Commissioners (BOCC). This joint workshop between city and county decision-makers would be very helpful in “refreshing” thoughts about key policies. It was pointed out that previous policy presentations did not advise any specifics about the Plan’s identified projects. There was general consensus that the workshop should focus on identified projects while providing a venue for some policy discussion.

APPENDIX 2: PUBLIC MEETING NOTES

Meeting Notes from Lewis County Planning Commission**Public Meeting****July 22, 2008 – 7:00PM****Lewis County Courthouse****351 NW North St.****Chehalis, WA 98532**

Planning Commissioners Present: Bob Guenther, Mike Mahoney, Bill Russell, Rachael Jennings, Arny Davis

Planning Commissioners Excused: Larry Hewitt, Richard Tausch

County Commissioners Present: Ron Averill

Staff Present: Phil Rupp, Fred Chapman, Glenn Carter, Pat Anderson

Public Present: Please see sign-in sheet

Handouts/Materials Used:

- Agenda
- Meeting Notes from July 8, 2008
- Comprehensive Flood Hazard Management Plan

I. Call to Order

Chairman Guenther called the meeting to order. The Commissioners introduced themselves.

II. Old Business

A. The Chair entertained a motion to approve the meeting notes. Commissioner Mahoney moved to approve with corrections; seconded by Commissioner Jennings. Commissioner Russell stated there appeared to be no “A” under Old Business. Motion carried.

III. New Business

A. Workshop: Comprehensive Flood Hazard Management Plan.

Mr. Rupp stated Mr. Fred Chapman, Lewis County Building Official, would present the Plan.

Mr. Chapman stated the Comprehensive Flood Hazard Management Plan was begun about four years ago by 25 members of the PAC. Comments and testimony are still being accepted from other communities that will be adopting the document. The first workshop on the draft was held on July 21 with the City of Chehalis and the City of Centralia is holding a workshop tonight.

There will be at least two workshops on the draft, followed by a public hearing through the Planning Commission with a recommendation to the BOCC for adoption. Proposed adoption date is October 1, 2008.

Mr. Chapman asked for questions or comments. He suggested the Commissioners highlight proposed changes and send those changes back to him.

Commissioner Russell stated some of the dramatization is not totally accurate, particularly referring to the Cispus Valley.

Mr. Chapman stated he would like everyone to note that one of the major items was that the compensatory storage element was dropped. Inserted instead is the actual formation and promotion of the Flood Authority. After this document is adopted, the Flood Authority will have the authority to review and approve major projects that will have an effect on the system.

Commissioner Mahoney stated the document does not recommend any specific actions.

Mr. Chapman stated no, it does not at this time. It identifies projects and contains policy on the management of the system. This document brings projects to light and explains the impact and perceived impacts. Once this document is adopted, it will be a tool like any other comprehensive plan. It identifies areas that need to be looked at using best scientific information available to determine what the course of action should be, and it follows the federal standards for use.

Commissioner Mahoney stated the document appears to deal with reaction to floods to protect life and property as the flood occurs; it is not about flood prevention. It is his opinion that the flooding issue requires flood management not just flood mitigation.

Mr. Chapman stated Section 3, Flood Hazard Proposed Mitigation and Solutions starts addressing some of the elements Commissioner Mahoney mentioned. It identifies not just mitigation strategies but proposed projects and solutions to some of these issues. Mr. Chapman believes the management of the system will be a combination of multiple solutions. As science develops, more solutions will be possible. This document can be updated as needed to allow projects to move forward.

Commissioner Mahoney states the document identifies the Channel Migration hazard. He has not seen any evidence of what it will take to keep the channel from migrating. It will require dredging and whenever that word is mentioned, it is not considered as a possibility.

Commissioner Russell stated the Forest Service is not listed as a participant of this document. He asked if that is an omission or if only the Corps of Engineers was invited.

Mr. Chapman stated he did not have an answer to that; he would need to check the original solicitations. He will ensure the Forest Service gets a copy of the draft for comment.

Chairman Guenther stated there has been discussion regarding new infrastructure in areas that are prone to flooding. In the Utilities section, the document mentions not putting utilities in those areas, thereby limiting development in those areas. If that is done prior to mitigation of the system, then after discovering the causes and taking appropriate action, is there a way to go back to the areas that have been denied development.

Mr. Chapman stated he believes there is a way to do that. The section Chairman Guenther referenced is talking about infrastructure that is at risk in those areas. The key to reducing loss during floods is to expose less to the floods: avoidance is the best tool. That does not mean that under the right circumstances certain areas are not developable. Rather, the best management practices must be used, to ensure when development occurs in those areas it is safe and will not be destroyed by the floods.

Chairman Guenther asked for other comments.

Mr. Chapman stated he believes the public process for this draft is two workshops and at least one public hearing at the Planning Commission level and a workshop and public hearing before the Board.

Mr. Rupp stated after the document has been reviewed by all jurisdictions, it will be brought to another workshop with the revisions.

Mr. Chapman stated the cities will adopt this document and other meetings will be held simultaneously to consider changes to the draft. Substantial changes will be reviewed and voted on by the PAC; minor changes will not need a vote.

Commissioner Russell confirmed that any changes the Commission recommends should be noted and returned to Mr. Chapman.

IV. Calendar

August 12 will be a public hearing for UGA amendments, the Housing Element of the Comprehensive Plan, and Birchfield Development Regulations and Monitoring Agreement.

Mr. Rupp stated he will be meeting with consultants and attorneys regarding the ARL compliance. Special meetings with the Planning Commission will be required in order to meet the deadline of February 6, 2009. These meetings will be October 29, a Wednesday, and November 19, also a Wednesday. These meetings will be devoted just to ARLs. He asked the Commissioners to check their calendars and each will be polled before the scheduled meetings.

It is possible this schedule can be moved back depending on the scope of work set by the consultants, which will be known on Friday, July 25.

Commissioner Davis asked if the public hearings on August 12 could be commenced at 6:00PM rather than at 7:00PM.

Mr. Rupp stated the legal notice will not be published until next week and the time can be changed.

Chairman Guenther asked for a consensus from the Commission. It was agreed to begin at 6:00 PM.

Commissioner Russell asked that staff notify the absent Commissioners of the early start time.

Mr. Chapman stated the Flood Hazard Management Plan also needs to be worked into the Planning Commission's schedule, as FEMA would like it to be adopted on October 1 by the BOCC.

V. Good of the Order

Mr. Bob Nacht, Chehalis Community Development Director, stated the City of Chehalis had a workshop on the proposed Flood Hazard Management Plan. The Council recognizes there will be some changes to the plan, and it recognizes the differences between rural flood plain development and urban flood plain development. The City has indicated its support for the concept and the plan as revised by Mr. Chapman and will be adopting the plan at about the same time as the County adopts it. The City feels it is an appropriate approach to planning in the flood plain, and that it is appropriate to have the newly formed Flood Authority as the forum for addressing flood management policies and flood reduction projects.

VI. Adjourn

A motion was made and seconded to adjourn. The meeting adjourned at 7:34 PM.

APPENDIX 3: BOARD OF COUNTY COMMISSIONER MEETING NOTES

BOARD OF COUNTY COMMISSIONERS
LEWIS COUNTY, WASHINGTON
BOARD MEETING MINUTES

September 22, 2008

The Board of County Commissioners for Lewis County, Washington met in regular session on Monday, September 22, 2008, at 10:00 a.m.

COMMISSIONERS RON AVERILL, and F. LEE GROSE were in attendance. Commissioner Graham was absent. **Chairman Averill** determined a quorum, called the meeting to order, and proceeded with the flag salute. **Commissioner Grose** moved to approve the minutes from the 10:00 a.m., meeting held on Monday, September 15, 2008. **Commissioner Averill** seconded the motion.

Motion carried 2-0

Public Comment

Ira Graham, Randle, WA expressed concerns on funding for veterans program. Worried that budget cuts will affect the veterans funding. Questions and concerns about the Veteran's van.

Chairman Averill Van was purchased by the County and then transferred to the State VA. The State VA owns the van and provides the insurance and up keep on the van. It no longer belongs to the County.

Mr. Graham Is it the Commissioners intentions to cut funds for the veterans?

Chairman Averill It is not the intention to cut the indigent fund. That fund is mandated by the state and is funded at the state rate.

Mr. Graham The van has 173,000 miles on it and we need to get another one. Van sit not used because we do not have enough drivers. It is his understanding that when the veterans got van the County wrote a check for \$8,000. That was an incentive to get drivers.

Chairman Averill is not aware of what the procedure is but does know that the van belongs to the State VA.

Mr. Graham Is there any plans to getting another van?

Chairman Averill not aware of any plans for a new van. In order to use the funds to purchase a new van the Veteran's Board would have to make that recommendation to us. But keep in mind, there is only so much money in that fund. If the funds are used to purchase a vehicle then there would be less money to help indigent veterans.

Commissioner Grose We have expanded services to a number of Veterans. If we are spending more on the individual veterans it takes the money away from being able to purchase the van.

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Chairman Averill is a member of American Legion, VFW, and the DAV. There are programs that are sponsored by those three and other Veterans organization that are funded or meant to be funded by indigent money's. Those programs are responsible by their own organization. Their state offices get money from VA and there is no intention to intermix the VSO's out of those agencies out of those funds. The indigent funds are for Indigent Veteran's only

Mr. Graham If there is money left over in the fund is that money transferred to general fund?

Chairman Averill No, it stays in a fund for veterans. Might want to talk to Tom Meade in Mossyrock about this.

CONSENT

Commissioner Grose moved to approve Consent Items one and two **Chairman Averill** seconded the motion. Candace Hallom, Interim Clerk of the Board, read the items into the record.

1. **Resolution No. 08-282 Approving a contract with Providence Addiction Recovery Center for chemical dependency treatment services.**
2. **Resolution No. 08-283 Cancellation of warrants.**

Commissioner Averill made the following comments:

Resolution 08-282: The DSHS Division of Alcohol and Substance Abuse (DASA) contracts with Lewis County to coordinate, subcontract, and monitor treatment programs for alcohol, tobacco, and other drug addictions at the local level. Lewis County contracts with Providence Addiction Recovery Center (PARC) to provide these treatments under DASA implementation guidelines. This resolution approves the funding, paid on a fee for services basis, at \$327,512. for the 2007-2008 contract; and, \$403,755 for 2008-2009 contract, on the State Fiscal Year of 1 July through 30 June. PARC's share is \$67,147. The Director of Health and Social Services is authorized to sign for the Board

Resolution 08-283: The Lewis County Auditor has notified the Board that a warrant dated 24 September 2007 for \$1,287 has been lost or destroyed and needs to be cancelled and reissued; and, two warrants from July and August 2008 totaling \$2,021.33 are duplicate payments and need to be cancelled. This resolution approves the cancellation of the warrants.

Motion carried 2-0

Hearing

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Hearing**LC Comprehensive Flood Hazard
Management Plan**

Chairman Averill announced the hearing and asked for a staff report.

Fred Chapman, LC Building Official/Flood Plan Manager was in attendance. Comprehensive Flood Hazard Management plan is a policy document that staff have been working on for over four years. Fred explained the history of the National Flood Insurance Program (NFIP) plan and Federal Regulatory Insurance Maps (FIRM).

Chairman Averill confirmed that there are 3 river basins; Cowlitz, Chehalis, and Nisqually.

Mr. Chapman In 2006 Cowlitz River experienced major flooding and in 2007 the Chehalis experienced major flooding. The NFIP through FEMA provides underwriting authority to set the rates for flood insurance. If the feds didn't subsidize the program then homeowners and business owner would have a hard time affording the insurance. As part of NFIP Lewis County became a Community Rating System (CRS) member. This gives the community a reduction in the premium cost based off the regulation in place and how they are managed through the program. In 1999 Lewis County was rated at a 10 then a 7 and is currently being audited for hopes of a better rating. That is what the Lewis County Comprehensive Plan is. It is a policy document to give guidance to help the County identify long range elements of flood plan management. The PAC committee was formed as a public review process. This process has been going on for four years. The plan before you is a result of all public hearing, process through the review, state and feds have reviewed this. The LC Comprehensive Flood Hazard Management Plan before you is the final document with the exception of the final comments from ISO how is David Stroud.

Commissioner Grose Does this plan incorporate legislation of the Federal Flood Policy?

Mr. Chapman We are adopting the International Codes and are more restrictive than Federal requirements.

Chairman Averill Fred you said Mr. Stroud has not yet provided his approval but you do have a message from him indicating five areas he wanted to have changed. Will you please go through each of those and tell us where in this document those have been addressed and how.

Mr. Chapman Mr. Stroud document dated July 1.

#1 The plan should be more specific about what incorporated municipalities are included in the plan.

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Is corrected and identified in section 1.1 and the municipalities that are participating in this. We added language under the definitions and abbreviations. It was originally the County would represent all the Community ICSW. We actually changed that by incorporating local cities.

#2 I can find no where in the plan where goals are mentions?

The answer is in section 1.1 and we also added corrections to that where he wanted values and amount and where potential funding would be coming from.

Chairman Averill looks like there are about 18-19 goals that are in there now that weren't in there before.

Mr. Chapman

3 The action plan should be clear as to what community whether it is the County, or any city is responsible for implementing a mitigation measure.

Addressed in section 3.2

Chairman Averill actually it is spread out in 3.2 project funding, 3.3 ranking criteria and process and 3.4 listing of prioritized projects with planning little cost estimates

Mr. Chapman

4 The planning process section should be increased to provide detail about how many meetings were held.

The record will show there has been multiple PAC meetings, Planning Commission meetings, as well as this meeting. The final document will contain all testimony, public comments, and documentation from this process.

Chairman Averill City of Centralia meeting are televised on channel 3 so public has opportunity to see what is going on. This document has been through Planning Commission. Planning Commission are citizens from all three districts who are unpaid and provide citizen input to the planning process. We might not have a lot of public come out but the intent of the Planning Commission is to make sure there is not just government input to process but citizen input as well. Let's point out that this information is in section 1.1 where you spell out the PAC which is the group that helps put this plan together.

Mr. Chapman

#5 I also don't find in the plan where there is a discussion of the number and type of structures subject to flooding in the county and in the incorporated municipalities.

Through the County's Repetitive Loss (RL) program we manage and maintain the RL program. Lewis County in 2006 had 43 structures in the RL and now we

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are down below 15 structures. Lewis County has 3,064 structures located in the flood plain. In David's letter he asked that we identify potential funding sources. We have looked at hazard mitigation, grant program, and FFCAP program. We have made every attempted to address these issues.

Chairman Averill did the committee look at the current standard out of the 2001 program? Did they look at changing that?

Mr. Chapman Made recommendation to increase the freeboard standard and then backed away from it. Don't know enough about the flood plain and how all of this is responding to start requiring greater heights. His recommendation was an extra foot.

Chairman Averill Why did we stay with the federal standard?

Mr. Chapman Met and spoke with various people. Talk about the thought about zero rise and compensatory storage. You have to have an in depth understanding of the system.

Chairman Averill asked what the current flood standards in Thurston and Grays Harbor County.

Mr. Chapman Thurston County plan is less restrictive then ours. Grays Harbor is not a CRS member and they meet minimum state regulations.

Chairman Averill Had a meeting with Flood Authority last Thursday. Named flood authority members. Purpose of the Flood Authority is to look at long term flood mitigation. They are just now starting at identifying the problems in the basin and looking at terms of mitigation. Expect in the course of going through the basin wide study move on to having something that puts us all in equity and on the same sheet of music for flood mitigation in the basin.

Mr. Chapman encourages that we adopt this document.

Chairman Averill What is purpose of this document? Does this document mandate that what is in it must be followed? Or is that done in other ways?

Mr. Chapman Policy document for policy and guidance it is not a regulatory document. Document will fill the requirement for the CRS and keeps us in compliance. The Feds demand every community that belongs to NFIP and CRS program continue to work on a basis to address flood hazard and reduction.

Commissioner Grose asked if this is and updated version or a new document.

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Mr. Chapman this is a new version

Commissioner Grose Seems heavily waited in the flood authority in the Chehalis Basin. Does it address the two other hazard areas Nisqually and Cowlitz. To date FEMA has been reluctant to grant any buyouts purchases and properties. Do you know something about the buyouts?

Mr. Chapman The buyouts program, we have nine structures eligible for buyout. As part of the Repetitive Loss program there are 57 structures going up. The federal program used to get them elevated is the ICC program. The hazard mitigation grant funding that comes through the feds to the state is open and competitive. Going after 09 funding later this year. Problem with going after those funds is there are strings attached.

Commissioner Grose in East County where we had road damage and people couldn't get to their homes. Unless the homes is severely damage and not reparable then the homeowner is not eligible for a FEMA buyout. It doesn't matter if they can get to there home to make it habitable.

Commissioner Grose So he can expect a discount in his insurance rates?

Mr. Chapman Thinks we could be a 6 or a 7. Everybody rates are as low right now as they can be.

Chairman Averill What documents set the mandates.

Mr. Chapman The County's current Flood Hazard Reduction Ordinance 1157.

Chairman Averill That ordinance is currently under review. There is going to be public hearings this week in Morton on Tuesday and here on Wednesday. Asked for public questions.

Mark Miller, Centralia Will this policy have any effect on completely removing any movement on no adverse impact?

Mr. Chapman We currently meet the federal standard and regulations.

Mr. Miller What is the cumulative rise, due to all the filling regulations?

Mr. Chapman Would take 44 million cubic yard of material to raise the area 1 foot.

Mr. Miller nobody is keeping track of that. Correct?

Mr. Chapman went back a couple years ago and tried to get a handle on all the material that was permitted. Up until 1998 LC processed fill and grade by SEPA based off of value. There was no fill and grade permit's required. It doesn't represent 5% of the material it would take. Again you could put several million cubic yard of material and not have an adverse impact and you could put 1 million in the wrong location and it could cause kayos. We don't know enough about the system to require mandates.

Chairman Averill This it is problematic when you are talking a basin that crosses not only three Counties' but crosses different jurisdiction that coordination with each other hasn't always been the best in the past. It will be an issue we will want to look at.

Glenn Conley, Chehalis Tribe Asked questions with changes from current plan delegates some responsibility to flood authority.

Chairman Averill Flood Authority has no regulatory capability it can make recommendations to jurisdiction that they do something but it is the jurisdictions responsibility to adopt it.

Mr. Conley asked as flood authority make recommendations how quickly is the County going to look at there recommendations.

Mr. Chapman the text allows an update to be done once a year if needed. If something is going to have a positive influence to this document and the county, it should be something that is adopted immediately.

Mr. Conley under section 2.92 the county will continue to require hydraulic analysis for all new commercial developments and development where there may be and adverse impact to the flood plain.

What criteria will be used to decide if a project will have an adverse impact?

Mr. Chapman what we are currently using is SEPA. SEPA requires an environmental review.

Mr. Conley so that would require hydraulic modeling?

Mr. Chapman Yes.

Chairman Averill closed question period and opened the formal hearing.

Mr. Chapman asked that his previous comments be adopted as part of his testimony for the record.

Chairman Averill opened hearing for testimony and asked for any public comment.

Mark Miller, Centralia Concerned with removing flood plain management controls in the interim period. Concerned Chehalis and Centralia will continue to fill and don't track the cumulative fill.

Glenn Conley, Chehalis Tribe does appreciation the County involving the tribe. Tribe is concerned impacts do to being downstream from the County. Tribe is in process of creating a Flood Management Plan. Modeling shows that they end up as a buffer for flooding. Increase in the flashiness of the flooding. Concerned why it is coming faster. Concerned that efforts are made to reduce the impact of the flooding. Would like to see the compensatory storage be contained in the plan. Concerned that there is poor modeling going on and would like to see quality modeling.

Chairman Averill Asked for further public comments.

Commissioner Grose Is there a chance to review Mr. Conley concerns and make changes still if we adopt this document today.

Chairman Averill While we adopt the federal standard we also leave the prospective that any development might look at more restrictive procedures that would provide greater protection. Policy would allow that in areas where it is necessary.

Commissioner Grose correct procedure is when projects come forward and they go through SEPA process it is at the SEPA hearing is where the issues should be addressed.

Mr. Chapman This is a Policy document which makes us compliant with FEMA. We could suffer a set-back if it is not adopted by October 1st.

Chairman Averill stated he is fully sympathetic to the comments. This is a necessary process for the public to get involved early. Has reservation about adopting a standard that he does not know allot about. As Fred and him exchanged question back and forth it was driving at the issue does a zero rise or 150 displacement provide the amount of protection that they expect. What he is hearing is it depends. The thing in horizon that provides hope that we will move toward better cooperation throughout the basin and coming up with real mitigation rather than just talking about it is the flood authority or the eventual establishment of flood control district. We need to work very closely together in

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that process and that the flood authority needs to make recommendation to all of the communities. This is a policy document. The Critical Area Ordinance that is under review needs your participation as well to look at that.

Chairman Averill Closed the hearing and opened work session & stated First element is the changes made to the plan to incorporate Mr. Stroud's concerns. Read Mr. Stroud's comments.

Commissioner Grose moved to adopt Mr. Stroud's changes and comments into the document **Chairman Averill** seconded the motion.

Motion carried 2-0

Commissioner Grose moved to adopt resolution #08-284 **Chairman Averill** seconded the motion. Candace Hallom, Interim Clerk of the Board, read the items into the record.

Motion carried 2-0

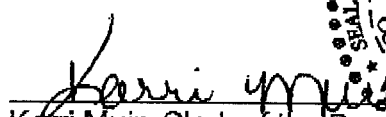
There being no further business, the Commissioners' public meeting adjourned at 11:25 a.m., on September 22, 2008. The next public meeting will be Monday, October 6, 2008 at 10:00 a.m.

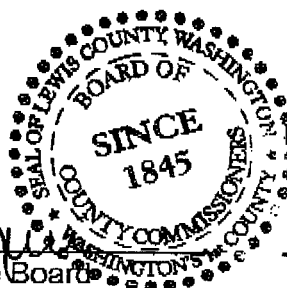
Please note that minutes from the Board of County Commissioners' meeting are not verbatim. A recording of the meeting may be purchased at the Commissioners Office.

BOARD OF COUNTY COMMISSIONERS


LEWIS COUNTY WASHINGTON

ATTEST:


Karri Muir, Clerk of the Board
Lewis County Commissioners




Ron Averill, Chairman,


Richard Graham, Commissioner


F. Lee Grose, Commissioner

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APPENDIX 4: QUESTIONS AND COMMENTS



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

August 8, 2008

Mr. Fred Chapman
Building Official
Lewis County DCD
2025 NE Kresky Ave
Chehalis, WA 98532

Dear Mr. Chapman:

The Department of Ecology, as well as other state and federal resource agencies, recently received a copy of the Draft Lewis County Comprehensive Flood Hazard Management Plan (CFHMP). I would like to personally thank you for your hard work and dedication in moving this important plan forward.

In an effort to provide a single State response to the Draft CFHMP, we have requested, and received comments from the Department's of Fish and Wildlife, Transportation, and Community Trade and Economic Development. We did not receive comments from the Department of Natural Resources. Comments have been summarized, below, for your convenience.

Department of Ecology Comments:

PLN-2: The Department of Ecology strongly supports Lewis County's desire to initiate direct inter-local negotiations, with regard to floodplain development consistency, through the recently established Flood Authority. We believe this multi-jurisdictional group provides an ideal venue for negotiation of development standards which are consistent across geo-political boundaries.

PLN-3: The Department of Ecology agrees with the stated need for additional "real time", web-based, stream gauge data. A network of web-based gauge data will enhance flood planning efforts and afford the general public additional advance notice of impending flood threats at the reach scale. To expedite the placement of stream gauges, we would like the County to consider pre-identifying the locations of proposed gauges, and incorporate these locations into a GIS database. Additionally, it will be important to identify the need for, and mechanism for, long-term maintenance and routine inspection of the gauges would be prudent.

PLN-5: The Department of Ecology would like the County to draft, and include within the CFHMP, draft language for Channel Migration Zone (CMZ) regulatory standards per the Scope of Work identified in FCAAP Grant No. G0800216. By including draft language, the County will not need to revisit the CFHMP, in the near future, to address this topic. Additionally,

“adoption of CMZ regulatory language” should be an identified task in PLN-5.

RDS-5: Under “recommended actions”, the County should site the requirement that the use of any locally developed model floodplain ordinance must comply with the minimum federal and state standards as established in the Code of Federal Regulations, and the Revised Code of Washington, respectively.

Additionally, the Department of Ecology would like to suggest the following:

- 1) The CFHMP should describe the need for a basin wide risk analysis to identify, and restrict floodplain fill and/or development in the highest risk zones. This risk assessment should be referenced in the CFHMP.
- 2) SMP language concerning development in the Channel Migration Zone (CMZ) should be incorporated into the CFHMP. Doing so will assist the County during updates to the SMP.
- 3) The County should consult with both USGS and FEMA with regard to the December 2007 flood recurrence calculations for various locations throughout the Basin. Specific frequency curves should be identified for each reach, where available.

Department of Fish and Wildlife Comments:

PLN-1: Currently, the Lewis County planning commission is considering a comprehensive plan amendment to allow expansion of the City of Centralia UGA to include an 80 acre parcel owned by the Port of Centralia. According to Lewis County staff, the entire parcel lies within the Chehalis River floodplain, and over 90% of the parcel is in the floodway. Lewis County could immediately improve the problem of urban development in floodplains by ceasing to allow expansions of its UGAs in active floodplains. This policy statement should be strengthened so as to “require” the impact of UGA development of flooding.

PLN-5: The County should not delay implementation of CMZ protections. The CFHMP and Critical Areas Ordinance (CAO) can outline protection standards for CMZs and rely on development-by-development field identification of CMZ indicators – the need for which would be triggered for any development activity occurring within the FEMA identified floodplains. The resource agencies recommend that Lewis County consider CMZ policies outlined in CTED’s CAO model ordinance available online at:

<http://www.cted.wa.gov/DesktopModules/CTEDPublications/CTEDPublicationsView.aspx?tabID=0&ItemID=958&MId=944&wversion=Staging>

HI-1 (Recommended Actions): The Department of Ecology has previously developed methodology for delineating Channel Migration Zones (2003 – Rapp/Abbe). The CFHMP should reference this document and delete reference to “developing methodology”.

HI-1 (Recommended Actions): WDFW suggest adding a bullet to this section with the following text.

“With assistance from the Department of Ecology, and others, the County should initiate mapping of CMZs in the Chehalis River and its principal tributaries to complement updated FEMA DFIRM mapping updates. This effort would utilize the 2003 Ecology CMZ delineation framework, orthophotography, and LIDAR-derived digital topographic data. This data would support implementation of the County’s critical areas ordinance, serve an important education tool for private landowners, and improve protections for public safety and aquatic resources (e.g.

salmon habitat)".

Section 2.4, Education, Outreach, and Coordination: The County should conduct an active, targeted public outreach campaign to educate property owners residing within, and outside, the floodplain, about the hazards and risks of development activities in the active floodplain. Specific outreach strategies should be identified in the CFHMP (i.e. booths at fairs, farmers markets etc).

Section 3.4 (10), Public Assistance: In addition to debris removal the county and landowners could save money in future flood events by installing flood fences and restoring riparian habitat in places where the natural sieve of floodplain riparian vegetation is absent or inadequate to prevent it from moving far inland.

Section 3.4 (11), City of Toledo Head Start Area: WDFW is not convinced that the erosion is due to river erosion. It may be due to springs, a slip plane and/or changes in the hydraulics such as moving Bill Creek, impervious surfaces etc. The trigger mechanism remains unknown.

Section 3.4 (12), City of Toledo Wastewater Treatment Plant: Bank protection will not prevent flooding of the wastewater plant. This is a problem of inundation rather than erosion.

Section 3.4 (7), Regional Flood Detention (facilities): The term "regional flood detention facilities" conjures up structural controls with lots of maintenance needs over time. Floodplain restoration is one key element in the Chehalis Partnerships salmon recovery strategy and should be highlighted as an opportunity for win-win solutions. Please provide a more detailed, concise, description of potential projects (dike setback, wetland restoration etc) projects and their locations.

Section 6.3.5: Flood-Prone Areas: Butter Creek is a canal. There is a large delta forming at the confluence of Butter Creek and the Cowlitz River. This bulge in the river may contribute to lateral erosion. It's likely that the lack of stabilizing influences in the canal no longer meter the rate of deposition at the confluence.

Additionally, the Department of Fish & Wildlife would like to suggest the following:

- 1) The County should add some language about the Chehalis Basin Partnership Salmon Restoration Plan. The Chehalis Basin Partnership salmon habitat restoration and preservation plan provides an excellent overview of flooding-related factors for decline of salmon and steelhead in the Chehalis Basin.

Department of Community, Trade and Economic Development Comments:

Policy PLN-4: This policy references the Growth Management Act (GMA) goal regarding preserving natural resource lands. However, the problem statement and recommended action appear to be more directed toward the County's lack of authority to control private industry forestry practices that may contribute to flooding. Because the GMA goal does not affect the County's authority in this area, please consider removing the reference to the GMA to clarify this policy and its intent.

Policy PLN-5: This policy commits the county to mapping Channel Migration Zones (CMZs) as critical areas in the next update of the County critical areas ordinance. The County currently has a critical areas ordinance update underway, with the next one due in 2013 per RCW 36.70A.130. It is not clear which update would include the CMZ mapping. The policy also

commits the County to developing CMZ regulatory standards for development, but includes no planned timeline for this to occur.

Policy RDS-2: This policy appears to commit the County to implement in its floodplain management ordinances any modifications recommended by the Regional Flood Authority. However, there is conflicting language between the policy statement and the recommended action in using the terms "will" and "should".

Section 2.10: This section recognizes that the recommended policies in the Comprehensive Flood Hazard Management Plan will likely impact existing land use regulations, and department managers should review this document for potential ordinance revisions that may be needed, however, no policy statements are made to ensure that amendments to land use regulations will be drafted for consideration by the County elected officials. Please consider adding a specific policy, such as appears elsewhere in the document, to identify how and when amendments to land use regulations will be considered so they are consistent with this plan's policies.

Department of Transportation Comments:

Page 3-3 (5), Volume A: We recommend removing the word Transportation from the title.

Page 3-13, Volume A: We recommend deleting the second sentence "Two projects have been proposed to prevent this intolerable closure in the future." and delete everything after the sentence that ends "Skookumchuck Dam as the key element;" We do not believe this information is correct, we would be willing to review a revised copy or discuss with the County.

Page 6-20, Volume B: We recommend deleting the entire paragraph after the fourth bullet that reads " Grouting of the existing... ..overtops the right-of-way". This is not something that would really work well, nor would it keep I-5 NB open since the December flood had several feet of water above I-5 at Mellen St.

In closing, the Washington State resource based agencies would like to thank Lewis County for providing us with the opportunity to make technical comments on the draft CFHMP. We look forward to working with the County, and local governments, to collaboratively implement the strategies, and specific projects, identified in this plan.

If you have any questions or would like further clarification on our comments, please don't hesitate to contact me at (360) 407-7253.

Sincerely,

Kevin B. Farrell
Floodplain Management Specialist
Washington Department of Ecology – SWRO

Shirley Kook (Lewis County Solid Waste Engineer) Comments

1. Table 1-1. Title is "Solid Waste Utility Engineer".
2. Section 1.4, page 1-5. Add Oakville to the list of towns in the Flood Authority.
3. Section 1.5.2, page 1-8. Remove USACE after CSODEM. This abbreviation is listed twice.

I noticed that policies have been changed from "will" to "should"; and compensatory storage policy is gone.

The Executive Summary and Chapter 1 sections are better.

David Stroud (ISO) Comments

John:

I have reviewed the draft plan attached to this e-mail which is different than the draft plan that Linda sent to me for review (They have added and changed things since.)

Here are my concerns with the plan:

1. The plan should be more specific about what incorporated municipalities are included in the plan for example it should be clear that Centralia and Chehalis are a part of the plan along with any other incorporated community. I saw from the attached minutes where Centralia and Chehalis did attend the PAC Meetings.

2. I can find no where in the plan where Goals are mentioned. I did find in the minutes where draft Goals were developed but did not see them clearly and prominently listed in the plan document.

3. The Action Plan should be clear as to what community whether it is the County, or any city is responsible for implementing a mitigation measure, when that measure will be implemented, who or what agency in that community will implement the measure, and how will that measure be financed. I don't find any of this in the plan other than the plan saying the "County" will do this.

4. The Planning Process section should be increased to provide detail about how many meetings were held, when they were held, and how were they advertised. There should be a clear chart showing who served on the PAC Committee, their title and affiliation.

5. I also don't find in the plan where there is a discussion of the number and type of structures subject to flooding in the county and in the incorporated municipalities. This should be part of the hazard vulnerability section.

These are easy fixes and should be incorporated into the final version of the plan. Each jurisdiction must adopt the plan either by resolution or ordinance. I will need a final approved copy which includes these changes.

Thanks!

...David

APPENDIX 5: CRS RESULTS



INSURANCE SERVICES OFFICE, INC.

270 BLUEBIRD LANE, TILLAMOOK, OR 97141 lryan@iso.com

PHONE: (503) 842-0029

December 22, 2008

Mr. Fred Chapman
Building Official
Lewis County
2025 NE Kresky
Chehalis, WA 98532

Dear Mr. Chapman:

Enclosed are the results regarding credits for your Community Rating System (CRS) cycle application.

At the present time, I have verified 1949 credit points for Lewis County. This results in a CRS Classification of 7. Attached is a verification report and a credit calculation worksheet AW-720 which contains an overall point summary. The information provided is subject to further review and acceptance by DHS/FEMA.

Thank you for your cooperation during my visit. I am certain you may have questions so please don't hesitate to contact me.

Yours very truly,

Linda L. Ryan, CFM
ISO/CRS Specialist

Cc Mr. Dan Sokol, State NFIP Coordinator
Mr. Jeffrey Woodward, DHS/FEMA Region X
Mr. David Stroud, Insurance Services Office, Inc. Technical Coordinator



COMMUNITY
RATING
SYSTEM

VERIFICATION
REPORT

Lewis County, WA

Verified Class 7

NFIP Number: 530102

Cycle

Date of Verification Visit: March 19, 2008

This Verification Report is provided to explain the recommendations of Insurance Services Office, Inc. (ISO) to DHS/FEMA concerning credits under the Community Rating System (CRS) for the above named community.

A total of 1949 credit points are verified which results in a recommendation that the community remain classified as a CRS Class 7. The community has met the Class 7 prerequisite with a Building Code Effectiveness Grading Schedule (BCEGS) Classification of 3/3. The following is a summary of our findings with the total CRS credit points for each activity listed in parenthesis:

Activity 310 – Elevation Certificates: The Building Department maintains Elevation Certificates for new and substantially improved buildings. Copies of Elevation Certificates are made available upon request. Elevation Certificates are also kept for post-FIRM buildings. (67 points)

Activity 320 – Map Information Service: Credit is provided for furnishing inquirers with flood zone information from the community's latest Flood Insurance Rate Map (FIRM), publicizing the service annually and maintaining records. (140 points)

Activity 330 – Outreach Projects: An outreach brochure is mailed annually to all properties in the community's Special Flood Hazard Area (SFHA). (93 points)

Activity 340 – Hazard Disclosure: Credit is provided for state and community regulations requiring disclosure of flood hazards. (10 points)

Activity 350 – Flood Protection Information: Documents relating to floodplain management are available in the reference section of the Lewis County Public Library. (30 points)

Activity 360 – Flood Protection Assistance: The community provides technical advice and assistance to interested property owners and annually publicizes the service. (59 points)

Activity 420 – Open Space Preservation: Credit is provided for preserving approximately 22,201 acres in the Special Flood Hazard Area (SFHA) as open space. Credit is also provided for open space land that is deed restricted. (328 points)

Activity 430 – Higher Regulatory Standards: Credit is provided for other higher regulatory standards, and land development criteria and state mandated regulatory standards. Credit is also provided for a Building Code Effectiveness Grading Schedule (BCEGS) Classification of 3/3. (391 points)

Activity 440 – Flood Data Maintenance: Credit is provided for maintaining and using digitized maps in the day to day management of the floodplain. (61 points)

Activity 450 – Stormwater Management: The community enforces regulations for stormwater management, freeboard in non-SFHA zones, soil and erosion control, and water quality. Credit is also provided for stormwater management master planning. (369 points)

Activity 510 – Floodplain Management Planning: Based on the updates made to the NFIP Report of Repetitive Losses as of June 30, 2008, Lewis County has 34 repetitive loss properties and is a Category C community for CRS purposes. All requirements for the 2008 cycle have been met. The present credit is based on an existing plan that must be revised or replaced to meet the current CRS planning criteria. **A revised and adopted existing plan (per current CRS criteria) or a new, adopted Floodplain Management Plan is required to be submitted on or before October 1, 2008.** (44 points)

Activity 520 – Acquisition and Relocation: Credit is provided for acquiring and relocating 20 buildings from the community's flood hazard area. (100 points)

Activity 530 – Flood Protection: Credit is provided for buildings that have been flood proofed, elevated or otherwise modified to protect them from flood damage. (42 points)

Activity 540 – Drainage System Maintenance: A portion of the community's drainage system is inspected regularly throughout the year and maintenance is performed as needed by Lewis County Public Works Department. Records are being maintained for both inspections and required maintenance. (126 points)

Activity 610 – Flood Warning Program: Credit is provided for a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities. (21 points)

Activity 630 – Dam Safety: All Washington communities currently receive CRS credit for the state's dam safety program. (63 points)

Attached is the Community Calculations Worksheet that lists the verified credit points for the Community Rating System.

CEO Name / Address:

Ron Averill
Chairman, Lewis County Commissioners
351 NW North Street
Chehalis, Washington 98532

CRS Coordinator Name / Address:

Fred Chapman
Building Official
2025 NE Kresky
Chehalis, Washington 98532
(360) 740-1123

Date Report Prepared: December 22, 2008

Community : Lewis County, WA

NFIP Number : 530102

720 COMMUNITY CREDIT CALCULATIONS (Cycle):

CALCULATION SECTION :

Verified Activity Calculations:				Credit
c310	67			67
c320	140			140
c330	93			93
c340	10			10
c350	30			30
c360	59			59
c410		x CGA	=	
c420	298	x CGA	1.10 =	328
c430	355	x CGA	1.10 =	391
c440	55	x CGA	1.10 =	61
c450	340	x CGA	1.10 =	374
c510	44			44
c520	100			100
c530	42			42
c540	126			126
c610	21			21
c620				
c630	63			63

722 Community Classification Calculation:

cT = total of above

cT = 1949

Community Classification (from Appendix C):

Class = 7

CEO Name/Address:

Ron Averill, Chairman
Lewis County Commissioners
351 NW North Street
Chehalis, Washington 98532

CRS Coordinator Name/Address:

Fred Chapman
Building Official
2025 NE Kresky
Chehalis, Washington 98532
(360) 740-1123

Date Report Prepared: December 22, 2008

APPENDIX 6: BOARD OF COUNTY COMMISSIONERS RESOLUTION

**BEFORE THE BOARD OF COUNTY COMMISSIONERS
OF LEWIS COUNTY, WASHINGTON**

IN RE:

APPROVING AND ADOPTING THE
2008 LEWIS COUNTY COMPREHENSIVE
FLOOD HAZARD MANAGEMENT PLAN

)
) RESOLUTION NO. 08- 284
)

WHEREAS, the national Community Rating System (CRS) program notified Lewis County that the 1994 Comprehensive Flood Hazard Management Plan, amended in September 2004, needed to be revised and updated and approved before October 1, 2008 in order to maintain eligibility ; and

WHEREAS, the 2008 Lewis County Comprehensive Flood Hazard Management Plan (CFHMP) was prepared by a committee comprised of staff from Public Works, Emergency Management, Community Development, and representatives of the incorporated towns and cities of Lewis County to meet the requirements and needs of the CRS and the local community; and

WHEREAS, the Plan was distributed to CRS, Washington State Department of Ecology, Federal Emergency Management Agency Region 10, and Washington State Emergency Management and to the general public in compliance with WAC 173-26-221 for review and comment; and

WHEREAS, the Plan has been reviewed and favorably received; and

WHEREAS, it appears to be in the best public interest to approve and adopt the Plan; NOW, THEREFORE

BE IT RESOLVED that the Board of County Commissioners officially approves and adopts the "Lewis County Comprehensive Flood Hazard Management Plan, Prepared for Lewis County, Washington" dated July, 2008.

DONE IN OPEN SESSION this 22nd day of September, 2008.

APPROVED AS TO FORM:
Michael Golden, Prosecuting Attorney

By: [Signature]
Deputy Prosecuting Attorney

ATTEST: [Signature] for
Karri Muir, Clerk of the Board



BOARD OF COMMISSIONERS
LEWIS COUNTY, WASHINGTON

[Signature]
Chairman

[Signature]
Member

Member