

# **Chehalis Reservation Natural Hazards Mitigation Plan 2009**

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**CONFEDERATED TRIBES of**



**the CHEHALIS RESERVATION**



# CONFEDERATED TRIBES of the CHEHALIS RESERVATION

Resolution No. 2010-30

## Of the Confederated Tribes of the Chehalis Reservation

**RE:** Adoption of the Chehalis Reservation Natural Hazards Mitigation Plan

**Whereas:** The Business Committee of the Confederated Tribes of the Chehalis Reservation is the duly constituted governing body of the Chehalis Indian Tribe, in accordance with the Constitution and By-laws adopted by voting members of the Tribe and approved by the Commissioner of Indian Affairs; and

**Whereas:** The Business Committee is responsible for protecting and enhancing the social, health, educational and economic well-being of Tribal Members; and

**Whereas:** 44 CFR 201.7 Emergency Management and Assistance, Chapter I – Federal Emergency Management Agency, Department of Homeland Security, Subchapter D – Disaster Assistance, Part 201 – Mitigation Planning, Tribal Mitigation Plans requires Indian tribal governments applying to FEMA as a grantee to have an approved Tribal Mitigation Plan meeting the requirements of this section as a condition of receiving non-emergency Stafford Act assistance and FEMA mitigation grants; and

**Whereas:** The Chehalis Tribe Natural Hazards Mitigation Plan is the representation of the Chehalis tribal government's commitment to reduce risks to the Chehalis people, reservation community and property from natural hazards and will serve as a guide in the commitment of resources to reduce the effects of natural hazards; and

**Now Therefore Let It Be Resolved:** That the Business Committee of the Chehalis Indian Tribe does hereby approve and adopt the 2009 Natural Hazards Mitigation Plan for the Chehalis Reservation as revised February 2010; and

**Be It Further Resolved:** The Chehalis Business Committee hereby assures that the Chehalis tribal government will comply with all applicable Federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c), and will amend its plan whenever necessary to reflect changes in Tribal or Federal laws and statutes as required in 44 CFR 13.11 9d).

**Certification:** This Resolution, Number 2010-30, was duly considered and approved at a regularly scheduled meeting of the Chehalis Business Committee held on March 9, 2010, at which a quorum was present. The vote being 4 For, 0 Against, with 0 Abstentions and with the Chairman not voting.

Signed:

David Burnett,  
Chairman

Attested:

Cheryl Starr,  
Secretary



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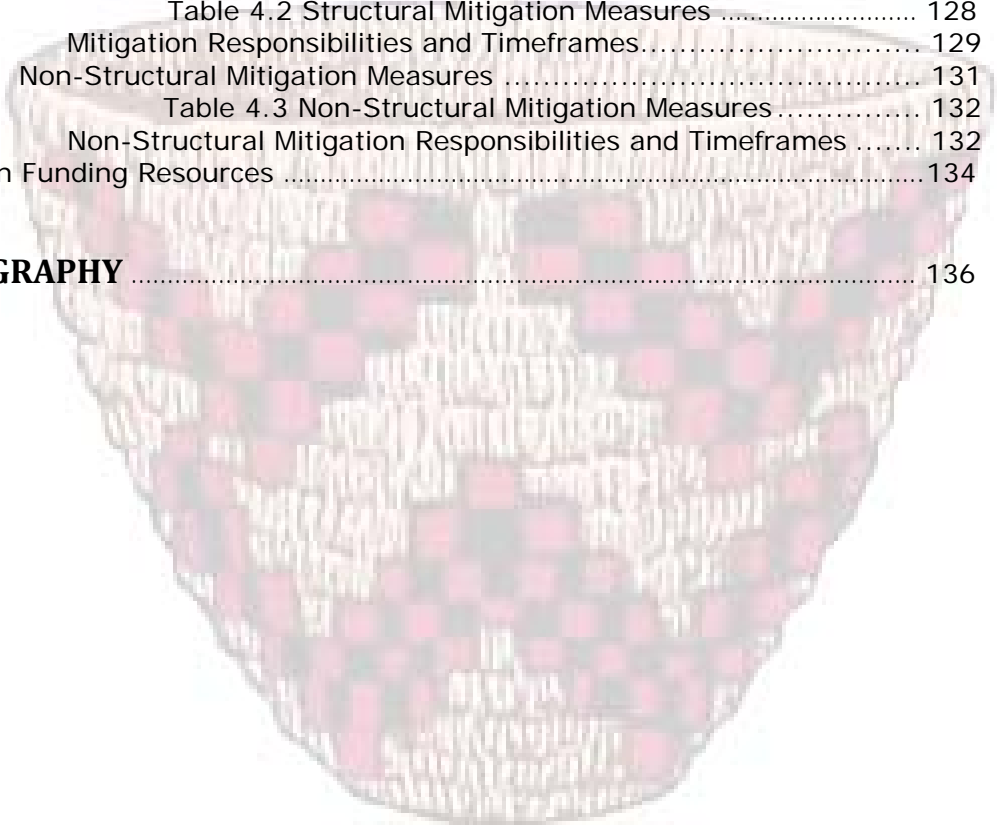
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## **Chapter 1: INTRODUCTION**

The Confederated Tribes of the Chehalis Reservation (Chehalis Tribe or the Tribe) developed this Natural Hazards Mitigation Plan (NHMP) in accordance with the requirements of 44 CFR Part 201 and Section 322 of the DMA 2000, Federal Emergency Management Agency (FEMA). In addition, the Tribe has consulted technical guidance documents provided by FEMA and other agencies in the preparation of our NHMP.

This plan is an update. The Chehalis Tribe previously participated in the 2004 Natural Hazards Mitigation Plan, Thurston Region. In this updated plan, the Chehalis Tribe sets forth specific analysis, identification and mitigation of hazards for the Chehalis Indian Reservation.

Funding for the development of this plan was provided by the Chehalis Tribe and the Bureau of Indian Affairs, Indian Reservation Roads, Transportation Planning.

The Chehalis NHMP was created to assist the Chehalis General Council and Business Committee, Tribal staff and Tribal community members plan for and reduce the human and economic losses and costs of flooding and other natural hazards and disasters.

The Chehalis Reservation is located within a large floodplain and subject to minor flooding events up to five times annually. Flooding sufficient to limit access to the reservation, covering one or more reservation access roads, occur with a frequency of about every 2.6 years. Flood events up to and above 15 year frequency cover 75 percent of the reservation lands, with incremental encroachment on roads and homes.

The development of a tribal NHMP is essentially to guide future efforts to effectively mitigate flooding and other natural hazards on the Chehalis Indian Reservation and, in coordination with other jurisdiction as appropriate, to mitigate and respond to natural hazards generated and adjacent to the Reservation or those that cross Reservation boundaries.

The Comprehensive Emergency Management Plan (CEMP) is the ONLY governing document pertaining to governmental operations during Emergencies/Disasters; effective as of the end of March 2007, with the passing of Confederated Tribes of the Chehalis Reservation Resolution (CEMP; Appendix B; pg. 40.). All additional revisions will become effective once the Business Committee reviews and approves the revisions. This is the primary document for managing emergencies/disasters.



For the Glossary of Terms, Comprehensive Emergency Management Plan (CEMP)  
See Chehalis CEMP, Appendix A, page 31.

The Natural Hazards Mitigation Plan (NHMP) is a supporting document to the Tribal Comprehensive Emergency Management Plan (CEMP), will comply with all standards and guidelines established within, for example:

1. Authority to Execute
1. Plan Maintenance
2. Review of the Base Document
3. Appendices Change Process

**NOTE:** The following PDM areas are classified as Appendices to this plan, and will comply with all criteria outlined with the Tribal CEMP pertaining to Appendices:

A: Tribal Capability Assessment

B: Mitigation Strategy  
1-Tribal Capacity  
2-Tribal funding

C: Tribal Mitigation Actions

D: Implementation of Tribal Mitigation Actions

# Chehalis Reservation Natural Hazard Mitigation Plan

## **Chapter 2: PLANNING PROCESS**

This section describes how the plan was prepared, who was involved in the process, and how the public was involved.

The *Natural Hazard Mitigation Plan for the Thurston Region (2004)* established multi-jurisdictional hazards for the region, including the Chehalis Indian Reservation.

When the first plan was written, 44 CFR did not accommodate for Indian Tribe jurisdiction plans. With the amending of the CFR to include Indian tribal government plans, 207.1, the Confederated Tribes of the Chehalis Reservation (Chehalis Tribe or Tribe) declared their intention to develop a specific hazard plan for the Chehalis Indian Reservation.

In May 2008, the Emergency Management Council of Thurston County sent a letter to 39 local stake holders to participate in the update of the Natural Hazards Mitigation Plan for the Thurston Region. A total of 26 jurisdictions actively participated in the plan update process including 18 of the original plan partners plus eight new participating jurisdictions.

In Feb 2008, the Chehalis Tribe became aware of the 207.1 amendment to 44 CFR, allowing for Indian tribal government plans and made the decision to pursue development of a Reservation specific hazard plan under the individual tribal jurisdiction. Thurston Regional Planning Council, coordinator of the Thurston Regional Planning Process, was informed of the Tribe's decision.

The following table comprises the Hazard Mitigation Planning workgroup for the 2004 Natural Hazard Mitigation Plan.

**Table 1.1 Jurisdiction Adoption and Approval Dates of the 2003-2008 Natural Hazard Mitigation Plan for the Thurston Region**

<b>Jurisdiction</b>	<b>Adoption</b>	<b>Approval</b>
Thurston County	August 4, 2003	October 3 2003
Town of Bucoda	May 24, 2005	August 17, 2005
Town of Lacey	September 11, 2003	October 6, 2003
City of Olympia	December 9, 2003	October 6, 2003
City of Rainier	March 2, 2005	April 6, 2005
City of Tenino	July 22, 2003	October 6, 2003
City of Tumwater	July 15, 2003	October 6, 2003
City of Yelm	August 13, 2003	October 6, 2003
Confederated Tribes Of the Chehalis Reservation	July 19, 2003	October 6, 2003
Fire District 4- Rainier	August 12, 2003	October 6, 2003

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Fire District 9- McLane	August 14, 2003	October 6, 2003
Fire District 13- Griffin	August 14, 2003	October 6, 2003
Intercity Transit	June 2, 2004	October 6, 2003
Providence St. Peter Hospital	May 6, 2004	August 25, 2004
School District, North Thurston Public Schools	January 18, 2005	February 28, 2005
School District, Olympia	August 9, 2004	October 6, 2003
School District, Rainier		October 6, 2003
School District, Tumwater	June 12, 2003	October 6, 2003
School District, Yelm Community Schools	November 28, 2004	December 23, 2004
The Evergreen State College	July 9, 2003	October 6, 2003

Chehalis Tribe representatives for the 2004 workgroup were David Burnett, Tribal Chairman; Lennea Magnus, Planning Director and Ralph Wyman, Public Safety Director. This group also served as workgroup participants between 2003 and 2008.

In March 2008, the Tribe recruited additional workgroup members to initiate the process of updating the plan and developing a Natural Hazards Mitigation Plan (NHMP) of specific to Confederated Tribes of the Chehalis Indian Reservation.

**Table 1.2 2008-2009 Hazard Mitigation Planning Workgroup for the Confederated Tribes of the Chehalis Reservation**

<b>Name</b>	<b>Position</b>	<b>Jurisdiction/Agency</b>
<b>David Burnett</b>	Chairman	Confederated Tribes of the Chehalis Reservation
<b>Lennea Magnus</b>	Planning Director	Confederated Tribes of the Chehalis Reservation
<b>Amy Loudermilk</b>	Transportation Planner	Confederated Tribes of the Chehalis Reservation
<b>Ralph Wyman</b>	Public Safety Director, Chief of Police, Emergency Services Coordinator	Confederated Tribes of the Chehalis Reservation
<b>Mark White</b>	Natural Resources Director	Confederated Tribes of the Chehalis Reservation
<b>Dan Penn</b>	Language Program Coordinator	Confederated Tribes of the Chehalis Reservation
<b>Fred Shortman</b>	Communications, Newsletter Editor	Confederated Tribes of the Chehalis Reservation
<b>Catherine Barr</b>	Tribal Elder	Confederated Tribes of the Chehalis Reservation
<b>Jill Kangus</b>	Emergency Manager	Lewis County
<b>Anne Sullivan</b>	Emergency Manager	Grays Harbor County
<b>Mark Stewart</b>	WA State Hazard Mitigation Officer	WA State

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<b>Diana Coho</b>	CFM, DHS-FEMA Mitigation	FEMA
<b>Kelly D. Cox</b>	Hazard Mitigation Officer	FEMA
<b>Sophi Beym</b>	VP Planning and Technology	Tribal Emergency Management Systems, LLC

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## **PLAN UPDATE 2008-2009**

The Regional Plan contained a large volume of material that was not specific to the Reservation culture, community or geography as it was a multi-jurisdictional plan covering a much larger region. The decision was made to rewrite the plan utilizing information very specific to the tribal culture and geographical location of the Chehalis Indian Reservation.

The Committee's role was to: participate in all aspects of the plan update process, meets as needed at the workgroup or within their department/agency to review, update and amend sections of the plan and coordinate comments from their department/agency, review, edit and/or commend on all elements of the draft and final plan.

**Chapter 1: Introduction** was rewritten to clarify governing emergency documents for the Chehalis Tribe.

**Chapter 2: Planning Process** was rewritten to update the material to reflect our current planning process and participants.

**Chapter 3: Thurston County Profile** contained an overview of the greater Thurston County Region. Similar information providing an overview of tribal government, demographic and geography is now found in the Chapter 3 Chehalis Reservation Profile.

**Chapter 4: Risk Assessment** consolidates the risk assessment and the hazard profiles into a single section. The four original hazard profiles included earthquake, flood, storm, and landslide. The Thurston County update contains flood, earthquake, severe storm, volcano and wildfire. In its update, Chehalis Tribe also added wildfire and volcano to its update. Landslide, however, was not included as the Chehalis Reservation is relatively flat, with no mountainous formations, hills, buttes or other threat of landslide. Analysis of structures, including transportation facilities, on the Chehalis Reservation was greatly increased and detailed.

# Chehalis Reservation Natural Hazard Mitigation Plan

**Chapter 5: Mitigation Initiatives** were substantially modified in the update to the Chapter 5, titled MITIGATION STRATEGY-IDENTIFICATION AND ANALYSIS OF TRIBAL MITIGATION ACTIONS. Specific discussion of Thurston County staff processes, broad statements regarding regional and multi-jurisdictional activities were eliminated to reflect the mitigation planning and strategies specific to the Chehalis Indian Reservation. Discussion of abbreviations and formatting of the plan charts were also eliminated. The number and detail of mitigation strategies specific to the Chehalis Indian Reservation were greatly increased.

**Chapter 6: Monitoring, Implementation and Maintenance** was also revised to reflect the plan's focus on the Reservation community and to align with tribal procedures and protocols and were also revised to reflect current federal planning requirements.

**Annexes** – The updated plan deleted the sections for multiple jurisdictions outside the Chehalis Reservation.

**Appendices** were revised to serve the needs of the plan update.

## **Chehalis Reservation Community Process**

The type and outcome of public meetings are as follows. Lennea Magnus, Planning Director for the Confederated Tribes of the Chehalis Reservation, hosted two community open forums. Seven hundred (700) advance notices were mailed out prior to the forums. The mailing list included all enrolled tribal members and non-Indian reservation households.

During the public meetings participants were also interviewed one-on-one and were asked to complete a survey (below) identifying the most important natural hazards facing the community. They were also asked to comment on what the Tribe does right, when responding to emergency events, and what could be improved upon.

Tribal members and residents had the following opportunities to comment prior to final approval. On June 4, 2008, two open public meetings were held, focused upon the primary natural hazard concerns of the community. Twelve Tribal members and reservation residents attended the first meeting and the second meeting was attended by (16) sixteen Tribal members and reservation residents. The residents were interviewed one-on-one focusing upon the most critical hazards facing the community. The community members commented on the tribal government response to emergency incidents and were asked for their opinion on emergency response improvements. In addition, tribal employees were encouraged to comment and share opinions.

Next, research methods based upon guidelines from C.F.R. 44, 201.7 – Tribal Mitigation Plan directed the planning methodology. Comprehensive research conducted online and at the Learning Resource Center at the National Emergency Training Center in Emmitsburg, MD created the opportunity to gather additional resources in data, maps and journal articles. Input gathered from the Chehalis community meetings directed the selections for areas of interest. Each hazard or

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risk identified during the community meeting determined the mitigation priorities. The timeline to complete the plan is as follows: The Hazard Mitigation Plan was initiated in February of 2008 by the Chehalis Business Committee. They, in turn, directed the Tribal planning department to implement the project with a completion date of October 2008.

The type and outcome of public meetings are as follows. Lennea Magnus, Planning Director for the Confederated Tribes of the Chehalis Reservation, hosted two community open forums. Seven hundred (700) advance notices were mailed out prior to the forums. The mailing list included all enrolled tribal members and non-Indian reservation households.

During the public meetings participants were interviewed one-on-one and were asked to identify the most important natural hazards facing the community. They were also asked to comment on what the Tribe does right, when responding to emergency events, and what could be improved upon.

Tribal members were involved in the planning process by using the Chehalis Tribal newsletter as the primary method of communication and were given the opportunity to review the plan in draft. Tribal residents received copies of the draft plan before the formal review team. They were encouraged to review the plan, and submit their comments to a local phone number. All comments by tribal members were included in the plan.

The planning team initiated the process, developed the goals, objectives and timeline, assigned the lead agency and completed the introduction. They provided data to support the reservation profile; geography; and population demographics including languages, culture, history, household size, household characteristics, number of housing units, employment, median income, household income, poverty level, families below poverty, and education. Their contribution also included an overview of the tribal government structure and a comprehensive list of Tribal Land Use and Community Development Ordinances and Plans (1997 – 2008). This list consists of: (8) eight ordinances; (6) phases of the Facilities Master Plan; (1) one culture/historic report and (6) studies and plans for waste water, ground water assessment and long range transportation plans. Each person took personal responsibility to initiate the Natural Hazard Mitigation Plan, review the draft and actively provide comment(s) for accuracy and attention to detail.

In addition, outreach to other entities was in the form of telephone conversations requesting a review of the draft. Technical research references Mitigation Plans from other counties; portions of those plans are included. The local county Emergency Managers were given notice of the upcoming document, expectations and due date. Outreach to U.S. Department of Homeland Security (DHS) - Federal Emergency Management Agency (FEMA) officials included telephone conversations to Kelly Cox, Hazard Mitigation Officer – Alaska, and email conversations with Diana Coho, FEMA, Certified Flood Manager (CFM) requesting preliminary review of

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the NHMP. Stakeholders had the opportunity to review, comment and guide the development of the plan.

In addition to the public meetings, a community questionnaire was distributed with a response of 30 completed surveys.

# Chehalis Reservation Natural Hazard Mitigation Plan

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## NATURAL HAZARDS PREPARNESS QUESTIONNAIRE RESULTS

Total number of surveys = 30

Numbers highlighted in blue depict number of people answering.

1. In the past ten years have you or someone in your household experienced a natural disaster such as earthquake, severe winter storm or wind storm, flood, wildfire, or other type of natural disaster?

Yes	25	83%	No	0	0%
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- 1.1 If "Yes", what type of natural disaster has you or someone in your household experienced?

Coastal Erosion	0	0%	Household Fire	9	30%
Drought	1	3%	Tsunami	0	0%
Dust Storm	0	0%	Volcanic Eruption	2	7%
Earthquake	16	53%	Windstorm	21	70%
Flood	26	87%	Winter Storm	18	60%
Landslide	4	13%	Other	0	0%
Wildfire	0	0%			

2. How concerned are you personally about each of the following natural disasters affecting the Chehalis Reservation? (1-very concerned, 5-not concerned)

	#1	%	#2	%	#3	%	#4	%	#5	%
Drought	0	0%	0	0%	3	10%	9	30%	15	50%
Dust Storm	0	0%	0	0%	0	0%	0	0%	30	0%
Earthquake	2	7%	5	17%	12	40%	8	27%	0	0%
Flood	11	37%	9	30%	5	17%	2	7%	0	0%
Wildfire	0	0%	4	13%	9	30%	8	27%	8	27%
House Fire	2	7%	6	20%	8	27%	8	27%	4	13%
Volcanic	0	0%	3	10%	1	3%	8	27%	16	53%
Wind Storm	1	3%	11	37%	8	27%	5	17%	3	10%
Winter Storm	0	0%	13	43%	9	30%	5	17%	1	3%
Other	1	3%								

3. Have you ever received information about how to make your family and home safer from natural disasters?



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Yes 13 43% No 12 40%

3.1 If "Yes", how recently"

Last 6 mo	5	17%	6-12 mo	6	20%	1-2 yr	4	13%
2-5 yr	0	0%	5-more	0	0%			

3.2 From whom did you last receive information about how to make your family and home safer from natural disasters?

News media	8	27%	Govt/Tribal	2	7%	Insurance	1	3%
Utility Co	0	0%	Red Cross	2	7%	Non-profit	0	0%
Not sure	1	3%	Other	1	3%			

4. Who would you most trust to provide you with information about how to make your family and home safer from natural disasters?

News Media	9	30%	Govt/Tribal Agency	19	63%
Insurance	4	13%	Utility	7	23%
University	5	17%	Red Cross	16	53%
Non-Profit	1	3%	Not Sure	2	7%
Other	1	3%			

5. What is the most effective way for you to receive information about how to make your home and family safer from natural disasters?

Newspaper	12	40%	Television	9	30%
Radio	7	23%	Other	22	73%

6. To help in communicating information to others about how to better prepare for a natural disaster, which phrase best describes how to prepare for a disaster?

Natural Disaster Readiness	10	33%	Disaster Preparedness	7	23%
Emergency Preparedness	9	30%	Natural Hazards Risk Readiness	1	3%

7& In the following list, please check those activities that you HAVE DONE in your

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- 8 household, PLAN TO DO in the near future, HAVE NOT DONE, or are UNABLE TO DO.

- A) Attended meetings or received written information on natural disaster or emergency preparedness.
- B) Talked with members in your household about what to do in case of a natural disaster or emergency?
- C) Developed a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a household emergency?
- D) Prepared a "Disaster Supply Kit" (stored extra food, water, batteries, or other emergency supplies)?
- E) In the last year, has anyone in your household train in the first aid or Cardio-Pulmonary Resuscitation (CPR)?

	Have Done	%	Plan to do	%	Not Done	%	Unable To Do	%
8A	7	23%	4	36%	17	57%	0	0%
B	10	33%	10	33%	8	27%	0	0%
C	4	13%	11	37%	14	47%	0	0%
D	5	17%	12	40%	10	33%	0	0%
E	17	57%	4	13%	7	23%	0	0%

9. Building a disaster supply kit, receiving first aid training and developing a household/family emergency plan are inexpensive activities that require a personal time commitment. How much time (per year) are you willing to spend on preparing your household for a natural disaster or emergency event?

0-1 hr	4	13%	2-3 hr	4	13%	4-7 hr	3	10%
8-15 hr	8	27%	16+	1	3%	Other	3	10%

10. What steps, if any, have your or someone in your household take to prepare for a natural disaster?

Food	12	40%	Water	14	47%
Flashlight	19	63%	Batteries	15	50%
Battery Radio	10	33%	First Aid Kit	16	53%
Smoke Det.	21	70%	Disaster Kit	4	13%
First Aid/CPR	16	53%	Fire Escape	3	10%
Comm. Plan	4	13%	Utility Shut Off	4	13%
Other	2	7%			

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11. Does your household have insurance coverage for earthquake events?

Yes	6	20%	
Don't Know	10	33%	

	No	11	37%
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12. Did you consider the possible occurrence of a natural hazard when you bought/moved into your current home?

Yes	16	53%				No	13	43%
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13. Would you be willing to spend more money on a home that had features that made it more disaster resistant?

Yes	17	57%
N/A	2	7%

	No	8	27%
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14. How much money are you willing to spend to better protect your family and home from natural disasters?

\$5000 = 1	3%	\$2500-4999 = 2	7%	\$1000-2499 = 3	10%	\$500-999 = 2	7%
\$100-499 = 2	7%	\$100-1 = 3	10%	Nothing = 2	7%	Don't Know = 12	40%
Other = 1	3%						

15. What nonstructural or structural modifications for earthquake have you made to your home?

Anchor	4	13%			Secure Heater	6	20%
Latches	4	13%			Flex. Conn.	1	3%
Sec. Propane	2	7%			None	15	50%
Other	2	7%					
Sec. Home	8	27%			Brace Sheathing	2	7%
Br. Chimney	2	7%			Brace Masonry	2	7%
None	14	47%			Other	2	7%

16. Indicate your age. Median age of 35

17. Indicate your gender.

## Chehalis Reservation Natural Hazard Mitigation Plan

Male	4	13%			Female	20	67%
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18. Please indicate your level of education.

Grade School	0	0%			Some HS	0	0%
HS Grad/GED	7	23%			Some College	14	47%
College Deg	6	20%			Post Degree	2	7%
Other	0	0%					

19. How long have you lived on the Chehalis Reservation?

Less than 1	0	0%			1-5 years	4	13%
5-9 years	4	13%			10-19 years	4	13%
20 years	14	47%					

20. If you have lived on the Chehalis Reservation for less than 1 year, in what state did you live before your move to Chehalis.

21. Do you have access to the Internet or World Wide Web?

Yes	25	83%			No	4	13%
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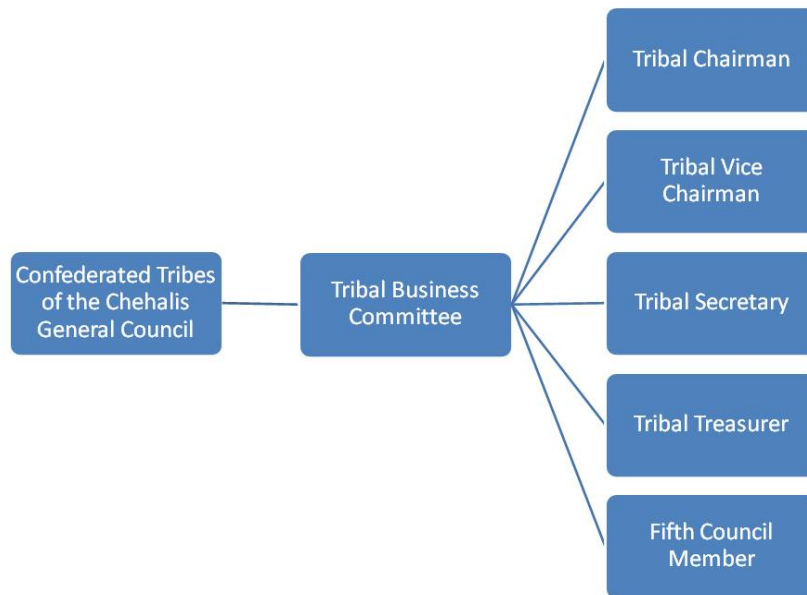
22. Do you own your home?

Yes	19	63%			No (rent)	9	30%
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23. Do you live in a single-family home?

Yes	17	57%			No	0	0%
Duplex	4	13%			Apartment 3-4	0	0%
Apartment 5	0	0%			Manf. Home	6	20%
Other	1	3%					

## Chapter 3: CHEHALIS RESERVATION PROFILE



### Tribal Government

The Chehalis tribal governing body is the General Council, which is comprised of all enrolled members 18 years of age and older. The Business Committee, a five-member body elected by the General Council for two-year terms, oversees tribal administration and business. The Business Committee is composed of the Tribal Chairman, Vice Chairman, Secretary, Treasurer, and Fifth Council Member.

The tribe's administrative functions are overseen by the general manager who reports directly to and receives policy direction from the Business Committee. The general manager oversees tribal operations through a departmental structure. The tribe's organizational structure and management system promote a separation of policy-making and management functions, and establish clear lines of authority within the organization.

The Chehalis Tribe provides a wide variety of public services to the community including Law Enforcement, Corrections, a Tribal court system, Medical/Dental Services, Head Start/Early Head Start, Elders meals and center, Vocational Rehabilitation, Education, Planning, Natural Resources, cultural and heritage programs and mental and behavioral health services including substance abuse counseling.

## Chehalis Reservation Natural Hazards Mitigation Plan

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A variety of federal and state grant and contract awards are administered throughout the tribal departments. During the most recently completed audit report, ending December 31, 2008, the Chehalis Tribe expended \$30,237,359 on federal services and programs. Department of Interior (DOI) and Department of Health and Human Services (DHHS) encompass about 74% of revenues, with state and other federal grants and contracts contributing 26% of grant/contract revenues. Current grant awards being implemented include the following: two projects in IHS Special Diabetes Program for Indians, COPS Tribal Resources Program, ACF Indian Head Start/Early Head Start, Dept of Justice Indian Alcohol and Substance Abuse grant, Department of Education Indian Education and BIA Transportation Planning and Indian Reservation Roads Construction.

The Chehalis Tribe operates several successful entertainment enterprises including the Great Wolf Lodge Resort, a 400 room hotel, convention center and indoor water park; the Lucky Eagle Casino, 106,000 sq ft casino and Eagles Landing Hotel, a 70-room hotel. The Tribe also owns and operates three convenience stores, two with a gas station; a cigarette stamping business and two construction companies. The Lucky Eagle Casino is very successful and has been in operation since 1996. The Chehalis Tribe opened the Great Wolf Lodge in 2008. The Chehalis Tribe has a total of 1,498 employees.

Table 2 Chehalis Tribe Employees

<b>Chehalis Tribe Employees</b>	
Chehalis Tribal Administration and Services	143
Lucky Eagle Casino	667
Great Wolf Lodge	593
Eagle's Landing Hotel	24
Chehalis Tribal Enterprises	71
Total tribal employment 2009	1,498

Source: Chehalis Tribe Human Resources Department, Feb. 2009

# Chehalis Reservation Natural Hazards Mitigation Plan

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## Statistical Profile:

### Confederated Tribes of the Chehalis Reservation

Population, 1990	-----	491	
Population, 2000	-----	691	
Average Annual Population Growth	-----	3.5%	
Tribal Enrollment 2000	-----	629	
Tribal Enrollment 2009	-----	828	
Service Population, 2000	-----	2,143	
Service Population, 2006	-----	3,453	
Households, 2000	-----	194	
Average Household Size, 2000	-----	3.56	
19 and under	-----	303	44%
20 - 64	-----	347	50%
65 and over	-----	41	6%
Median Age	-----	25	

### Race and Ethnic Categories, 2000:

White	-----	239	32.2%
Black/African American	-----	3	0.4%
American Indian & Alaska Native	-----	388	52.2%
Asian	-----		0 0.0%
Native Hawaiian & Other Pacific Islander	-----	0	0.0%
Other Race	-----	12	1.6%
Two or More Races	-----	49	6.6%
Hispanic*	-----	52	7.0%

### Housing Units, 2000

Single-Family	-----	139
Multifamily	-----	25
Manufactured Homes	-----	51

### Median Household Income

1989 (Census 1009 in 1999 \$'s)	-----	\$18,556
1999 (Census 2000)	-----	\$30,000

Explanation: \*Person of Hispanic Origin can be of any race  
Source: Thurston Regional Planning Council, Profile 2009

## Socio-Economic

Figures from the 2000 U.S. Census confirm the Chehalis Reservation population of 691 persons. This is an increase of 41% over the 1990 U.S. Census. In direct comparison, Grays Harbor County population increased a mere 4.7%, Thurston County population increased 28.6%, and Washington State American Indian/Alaska Native populations increased 29%. According to The U.S. Bureau of Indian Affairs, U.S. Labor Force Report, 2006 there are 728 enrolled members of the Chehalis Tribe. The same report accounts for a service population of 3,453; a service population is defined as "enrolled and non-enrolled Native Americans living on and near the Reservation and non-Native American with familial or economic ties to the Reservation and receiving services". Census 2000 data indicate a majority of the

## Chehalis Reservation Natural Hazards Mitigation Plan

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population, approximately 44%, under the age of 19, with a median age of 24.5 years. By contrast, Grays Harbor County has a median age of 36.8 and Thurston County a median age of 36.5.

### **Tribal Lands**

The Chehalis Reservation is located in southwestern Washington State in a river valley formed by the confluence of the Black River and the Chehalis River. The Reservation is approximately 5,000 acres in size and consists of agricultural areas, residential neighborhoods and forested stands. The mountains of Capitol Forest and the Doty Hills to the north border the valley.

The current and historical paths taken by the Chehalis and Black rivers dominate the Chehalis Reservation. The current river channels within the Reservation contain approximately (10) ten miles of the Chehalis River and the principal fish harvested are Spring Chinook Salmon, Coho Salmon, Fall Chum Salmon, Fall/Summer Chinook Salmon and Winter Steelhead.

Historically surrounded by thick forests, the Chehalis Reservation currently has over 2,700 acres of forested stands. There are many stands of White Oak and Douglas Fir as well as riparian areas consisting of a mixture of Western Red Cedar, Big Leaf Maple, Cottonwoods and Alder trees. Many of the stands are second growth populations due to the heavy logging that occurred here within the past 100 years. The regular flooding of the rivers has created fertile soils in the valley. The rich soils combined with the long growing season provide a productive agriculture zone. Agriculture became prevalent in the valley and on the Reservation once European settlers moved to the area in the late 1800s. At the peak of farming activities on the Reservation, there were approximately 1,100 acres of land used for raising crops like hay or alfalfa or pasturelands for livestock.

The large quantity of wetlands, riparian areas and water features along with unique land features such as acres of natural prairie lands, provide habitat for a great variety of flora and fauna. Some of the major animal species found in the area include: elk from the Olympic Elk Herd, white-tailed deer, river otter, opossum, raccoon, bald eagle, great blue heron, kingfisher and approximately (3) three miles of the Black River, upstream from the mouth of the river. Many wetlands, sloughs and oxbow ponds are remnants of old river channels. Tribal members utilize the river in many ways but primarily for harvesting salmon in customary fishing sites. Unique flora found on the Reservation includes camas, shooting stars, wild strawberries and white oak.

Since the adoption of the Chehalis Comprehensive Plan, 2004, the Tribe has pursued a policy of purchasing farmland located primarily on the floodplain for conservation purposes including reforestation, wildlife habitat and wetlands development.



# Chehalis Reservation Natural Hazards Mitigation Plan

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## Historic/Traditions/Culture

Historically, the indigenous population of the Chehalis originally occupied a specific geography within the Chehalis watershed. This watershed encompasses a region from the foothills of the Cascade mountain range to the Pacific Ocean in the southwest region of the state of Washington. "Chehalis" is a collective name for several Shalishan Tribes living on the Chehalis River, its affluent, and in Grays Harbor. The Chehalis people have lived on a reservation since the 1850s; however, important archaeological, cultural, and historic sites are scattered throughout the original indigenous geography.

The Chehalis Tribe did not sign a treaty but in 1864, by executive order, land was set aside for the Chehalis reservation. In 1939, the Confederated Tribes of the Chehalis reservation was formed and approved by the federal government and its Constitution was amended in 1973 (Chehalis). "In the old days we gathered sacred roots and berries. We fished the Chehalis, Black, Cowlitz, Satsop, Wynoochee, Elk, Johns, Skookumchuck and Newaumkum rivers. Our people fished and hunted from the mountains, across the prairie, to Grays Harbor and the lower Puget Sound. In the old days, the baskets carried and stored our foods. We relied upon the baskets, the rivers, the land, the roots, the berries, the fish, and the animals. Our lives were tied together by the Creator" (Bellon, Francis and Hicks).

At one time, there were many villiages in the Upper Chehalis region, principal ones being located in the Upper Chehalis region, principal ones being located at the mouths of rivers and creeks. Elders of the Tribe have identified major village sites as they remembered from years previous, including the mouths of Lincoln Creek, Scatter Creek, Skookumchuck River, Black River, Cedar Creek and at Grand Mound. A very large settlement once stood at Grand Mound; its name was 'aqáygt, meaning "long prarie". About a mile above the mouth of the Skookumchuck was a village called 'tè·wt'n, meaning "fording place". Where the Black River enters the Chehalis near Oakville there was a village called s 'àc □ l't, or "made lake". Continuing down river, there were villiages at the mouth of Cedar Creek and below Porter. Near Malone was 'nsxà·wm or "carrot place" indicating a place where wild carrots were plentiful (Bellon, Francis and Hicks).

Within the village lived one or more extended families or "house groups", each occupying it's own large (from 80-100 feet long) house constructed from cedar planks. The house group included a headman, his wives and relatives, and may have included some slaves, either captured or traded from other Tribes. Each family within the longhouse had its own fire, and cattail mats were often hung as partitions. Around the inside walls of the house was a double row of cedar platforms used for sleeping and sitting, covered with several thicknesses of mats. Above the platforms were shelves for storing household goods and provisions. Smoke left the building through a hole in the roof covered with a hinged board that could be opened or closed with a pole. Unlike Puget Sound, where the houses had shed-type roofs, the Chehalis house had a gabled roof and verticle wall boards. During the summer months when the house was not lived in, the boards were lowered and fresh air let in (Bellon, Francis and Hicks). Gaining a livelihood from the resources of the land and waters demanded adjustment to seasonal patterns.

## Chehalis Reservation Natural Hazards Mitigation Plan

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The Upper Chehalis like all tribes in the area, followed the natural cycle of the flora and fauna of their territory and moved about a great deal during the course of the year to collect certain kinds of foods. Various species of fish were caught at certain places. Elk hunting took place when travel in the mountains was easiest. Large quantities of fish, meat, roots and berries were dried or smoked, then stored inside the longhouse. Women gathered and prepared all the vegetable foods. Camas bulbs, roots of bracken fern, wild sunflower, wild carrots, acorns, and hazelnuts formed a part of the Chehalis diet. Berry picking was an important activity during summer months. Entire families might camp at the berry-picking grounds, the women and children picking and preparing the fruit while the men went to fish, hunt and compete in horse races. This was a time that people looked forward to, a chance to meet friends and relatives and to enjoy games and feasting when the work was complete (Bellon, Francis and Hicks).

In order to encourage the growth of berries and camas, the Upper Chehalis would burn the prairie lands every two or three years. In this way they were assured of a good supply in those areas. Such resource areas were not used exclusively by one village but rather shared by several villages and even among people of different tribes. Fishing occupied the men beginning in late spring and ending in late fall. Four kinds of salmon, (Chinook, pink, silver and dog) as well as steel head frequented the waters of the Upper Chehalis territory. Small fish like suckers and trout could be caught year round. Eels migrate up the Chehalis River in late spring and at Rainbow Falls, caught on the rocks as they attempted to ascend. In June, eels could be found also in Lincoln Creek just before the fishing began in the Skookumchuck. The resources of nearby salt-water areas supplemented the diet of the Upper Chehalis; they went up the Black River to Mud Bay to gather clams and to catch flounder.

The Upper Chehalis used a combination of spears, hooks, nets, traps and weirs to obtain their year's supply of salmon. Members of two or more families shared in the catch. When one group had caught enough for its needs, another group came and fished the site. Spears and gaff hooks were essential fishing gear throughout this area. The spear was generally used in shallow water or at traps and weirs, the hooks in deeper water. The Upper Chehalis used a variety of nets, including seine nets, tubular nets and dip nets. A strong reliance on fish in the subsistence economy of the Upper Chehalis is typical of a river people, but they also relied heavily on deer, elk and smaller game that frequented their territory. When an elk was killed, the hunting party butchered and dried the meat before packing it all the way to the village. The successful hunter gave a feast at which he shared the elk meat with his friends and relatives. Elk tallow was used like butter on dried fish and meat, and also rubbed on the face to prevent chapping.

## **Chapter 4: RISK ASSESSMENT**

### **Risk Assessment Introduction**

The Confederated Tribes of the Chehalis Reservation (Chehalis Tribe) developed this plan to meet the requirements of C.F.R.44, 201.7, Tribal Mitigation Plan. More importantly, the plan was created to reduce future loss of life, land and property due to natural hazards that affect the Tribe. It is difficult to predict when natural hazards will affect the Reservation; however, it is accurate to say they will.

The Chehalis Tribe is a small, tightly knit community. The Tribe, Tribal community, contractors, Tribal employees, and others worked closely together to assess create this risk assessment.

The largest and most costly disasters to occur in the area of the Reservation have been floods. The most recent disaster occurred in December of 2007. The Reservation faces many natural and manmade hazards. Although some are on a seemingly small scale, they often prove disabling to the Reservation community.

During one of the community meetings, tribal members were invited to list all the possible hazards that they thought might impact the community. Work group members were also invited to list all potential hazards that they believed could possibly occur.

The hazards listed are the result of these brainstorming sessions. Once listed, the work group ranked the probably of occurrence, vulnerability of the community and overall risk rating.

**Table 3.1 Hazard/Risk Rating**

<b>Hazard</b>	<b>Probability of Occurrence</b>	<b>Vulnerability</b>	<b>Overall Risk Rating</b>
<b>Flooding</b>	High	High	High
<b>Earthquake</b>	High	High	High
<b>Severe Storm</b>	High	High	High
<b>Volcano</b>	Low	High	Medium
<b>Wildfire</b>	High	Low	Medium
<b>Drought</b>	Medium	High	Medium
<b>Landslide</b>	Low	Medium	Medium
<b>Tsunami</b>	Low	Low	Low

**Risk Rating:** and adjective description (High, Medium, or Low) of the overall threat posed by a hazard is assessed for the next 25 years. Risk is the subjective estimate of the combination of a given hazard's probability of occurrence and the reservation's vulnerability to the hazard.

# Chehalis Reservation Natural Hazards Mitigation Plan

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- **High:** There is a strong potential for a disaster of major proportions during the next 25 years; or history suggests the occurrence of multiple disasters of moderate proportions during the next 25 years.
- **Medium:** There is a medium or moderate potential for a disaster of less than major proportions during the next 25 years.
- **Low:** there is little potential for a disaster during the next 25 years.

**Probability of Occurrence:** An adjective description (High, Medium, Low) of the probability of a hazard impacting the Chehalis Reservation within the next 25 years.

- **High:** there is great likelihood that a hazardous event will occur within the next 25 years.
- **Medium:** There is a medium likelihood that a hazardous event will occur within the next 25 years.
- **Low:** There is little likelihood that a hazardous event will occur within the next 25 years.

**Vulnerability:** Vulnerability can be expressed as a combination of the severity of a natural hazard's effect and its consequential impacts to the community. An adjective description (High, Medium, Low) of the potential impact a hazard could have on the Chehalis Reservation. It considers the population, property, commerce, infrastructure and services as risk relative to the surround region and counties.

- **High:** The total population, property, commerce, infrastructure and services of the reservation that are uniformly exposed to the effects of a hazard of potentially great magnitude. In a worst case scenario, there could be a disaster of major to catastrophic proportions.
- **Medium:** The total population, property commerce, infrastructure and services of the reservation that are exposed to the effects of a hazard of moderate influence; or the total population, property, commerce, infrastructure and services of the reservation are exposed to the effects of a hazard of moderate influence, but not all to the same degree; or an important segment of the total population, property, commerce, infrastructure and services of the reservation are exposed to the effects of the hazard. In a worst case scenario, there could be a disaster of moderate to major, though not catastrophic, proportions.
- **Low:** A limited area or segment of the population, property, commerce, infrastructure and services of the reservation is exposed to the effect of a hazard. In a worst case scenario, there could be a disaster of minor to moderate proportions.

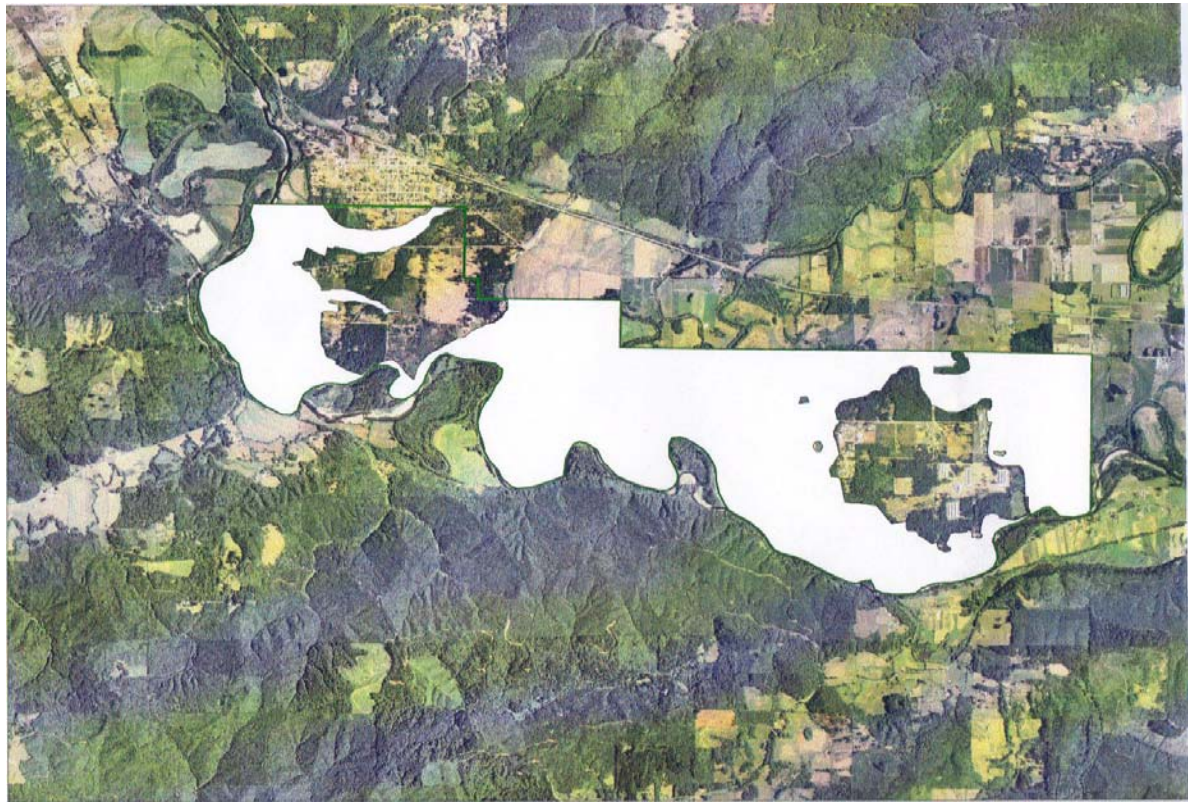
The following hazards were identified for further study:

1. Flood
2. Earthquake

3. Severe Winter Storm
4. Volcano
5. Wildfire

The hazards selected for study were identified as most likely to occur, based on reservation history and experience and are of the most concern to community residents. All hazards with a “high” probability of occurrence – Flooding, Earthquake, Severe Storm and Wildfire were selected for study. Volcano was also selected as the reservation is within 75 of Mount St. Helens which has erupted several times in the past 30 years. While the likelihood of eruption is “medium”, the vulnerability of the reservation is considered “high” as the pyroclastic eruptions of this volcano are likely to reach the reservation and particularly detrimental and harmful to mechanical and electrical equipment. Pyroclastic or ash eruption also carries heightened health risk for persons with certain medical conditions which are prevalent on the reservation.

## RISK ASSESSMENT



Above map of flood affected areas, December 2007 incident.

**P'ucú-** (Kinkade)

## Flood

*The Great Spirit, angry about the wickedness of people and animals, decided to rid the earth of all but the good animals, one good man, and his family. At the Great Spirit's direction, the man shot an arrow into a cloud, then another arrow into that arrow, and so on, making a rope of arrows from the cloud to the ground. The good animals and people climbed up. Bad animals and snakes started to climb up, but the man broke off the rope. Then the Great Spirit caused many days of rain, flooding up to the snow line of Tahoma (Mount Rainer). After all the bad people and animals drowned, the Great Spirit stopped the rain, the waters slowly dropped, and the good people and animals climbed down. To this day, there are no snakes on Tahoma. [Clark, pp. 31-32] Once a big flood came, people made ropes of twisted cedar limbs and used them to fasten their canoes to mountains. The flood covered the Olympic Mountains. Some of the ropes broke, and the canoes drifted to the country of the Flatheads. That is why the Skokomish and the Flatheads speak the same language. [Clark, p. 44] (Clark 44)*

<http://blog.americanrivers.org/wordpress/index.php/2007/12/06/lessons-from-flooding-in-the-pacific-northwest/>

## Definitions

**Cfs** = Cubic Feet per Second

**NWS** = National Weather Service

**Flood stage** is the elevation of a river's surface at a gauging station, determined by NWS, at which overflow of the natural banks of a river begins to cause damage in the local area by flooding.

**Flow** is the amount of water flowing in a river past the gauging station, usually stated in cubic feet per second - sometimes called stream flow or discharge.

**Gage height** is the elevation of a river's surface at a gauging station, in reference to an established elevation point – sometimes called stage. (USGS)

## PROBABILITY

Grays Harbor County is the most vulnerable county to floods in Washington State (Washington State Hazard Mitigation Plan, 2004, Tab 7.1.4 – p. 17) and floods are the most common natural disaster to occur in the County. The frequency of a moderate or higher flood event in the County from 1956 to 2004 was every three years. Recent studies have identified the frequency and peak flows of floods have increased since 1990. The probability of future flooding, based on long-term trends, can be assumed to be at least once every three years. The probability could be higher if present trends continue given there were seven major floods from 1990 to 2003 included in Federal Disaster Declarations.

The cause of flooding in Grays Harbor County is a combination of climate, topography, and land development. A predominately marine climate with mild wet winters dictates weather patterns in the County. Flood season usually begins in early November when heavy rainfall occurs. Pacific frontal systems become stationary over the region, bringing long periods of rainfall through February and often extending into March.

# Chehalis Reservation Natural Hazards Mitigation Plan

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Annual precipitation is 65" to 75" on the coast, 80" to 90" near the foothills, 125" to 150" on the windward slopes of the Olympic Mountains, and 100" for the Willapa Hills.

During long periods of rainfall, river and stream channels fill to overflowing. Intense precipitation combined with mild temperatures will cause snowmelt on the south slopes of the Olympic Mountains which can also induce or increase flooding. Extensive floodplains and wetlands contribute to the regional nature of flood events in the County. River floods happen most often when winter storms bring heavy rains from the southwest. The heavy precipitation causes the main river or stream channel's flood capacity to be exceeded. The effect of this is overflowing rivers and streams allowing water to flow from the floodway onto the floodplain.

The Chehalis River, a dominant factor in floods in the County, meanders east to west along a broad, flat river valley terminating in Grays Harbor. The largest tributaries of the Chehalis are the Satsop and Wynoochee Rivers originating on mountain slopes north of the river. The Chehalis River Basin is the second largest river basin in the state of Washington outside the Columbia River Basin. The total drainage area of the Chehalis River Basin is 2,660 square miles of which approximately 85% is forest lands. Approximately 257 square miles (164,000 acres), or 9.7% of the basin is agricultural land.

Approximately 75 percent of the Chehalis Reservation is located in the drainage of the Chehalis River Basin, creating an active floodplain that is subject to minor levels of flooding annually, with moderate or higher flooding occurring every three years. In the last three decades, the Chehalis Reservation has experienced several very large floods, including the 1986, 1990, 1996 and 2007 floods, each of which ranked as a flood of record at the time of its occurrence.

Flooding within the Chehalis Reservation restricts access to the Reservation for periods of one or more days, isolating portions of the Reservation, and may cause failure of individual water and waste water systems. Flooding of Chehalis Reservation lands requires immediate evacuation of non-residents, invacuation of residents (that is, keeping people within a building or other location while a dangerous situation exists outside the building or location), and severely limits access to basic goods and services. Severe flooding also can contribute to the formation of swift-moving water in floodways that is capable of significantly endangering residents and their property. Flooding of this type can affect more than two-thirds of the Chehalis Reservation. The consequences of floods within the Chehalis Reservation have been very costly in terms of human life, property and economic health. Significant damage has occurred to public and private investments, interrupted public services and schools and closed businesses. Flooding from 15-year and greater recurrence interval storms is severe, and endangers roads and many structures within the floodplain. (Chehalis Comprehensive Flood Hazard management Plan, 2009)

Typically, high water levels occur between November and February. Moderate flooding occurs when the flow rate exceeds about 26,000 cfs. Since 1972, this has occurred more than 20 times. Major flooding occurs when the rate exceeds about

# Chehalis Reservation Natural Hazards Mitigation Plan

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50,000 cfs. This has happened six times since 1972. In February 1996, the record flow rate was 75,000 cfs. The Black River is a slow, meandering stream that flows through Thurston County for approximately 19 miles. Extending from Black Lake, marshland lines the river and the water table is perennially at or above the ground surface. Back-flow from the Chehalis River causes the preponderance of flooding along the Black River and similar recurrence intervals are expected.

The reservation, because of the relative land area and population affected, is exposed to high vulnerability. The frequency of flooding, the potential for simultaneous flooding events, involving both the Black and Chehalis rivers, plus the historical record of recurrent flooding and cumulative costs, all suggest the assignment of a high-risk rating. (Thurston County IV-26).

Probability, likelihood and frequency of flood incidents in Chehalis Reservation are high, with moderate to severe intensity. The histories of floods are as follows:

A review of USGS flood gauge data shows that over a 37 year period, 1970-2008, there have been twelve major flood events on the Chehalis Reservation. Since 1990, seven major flood events have occurred.

**Table 3.2 Historical Flood Events Table**

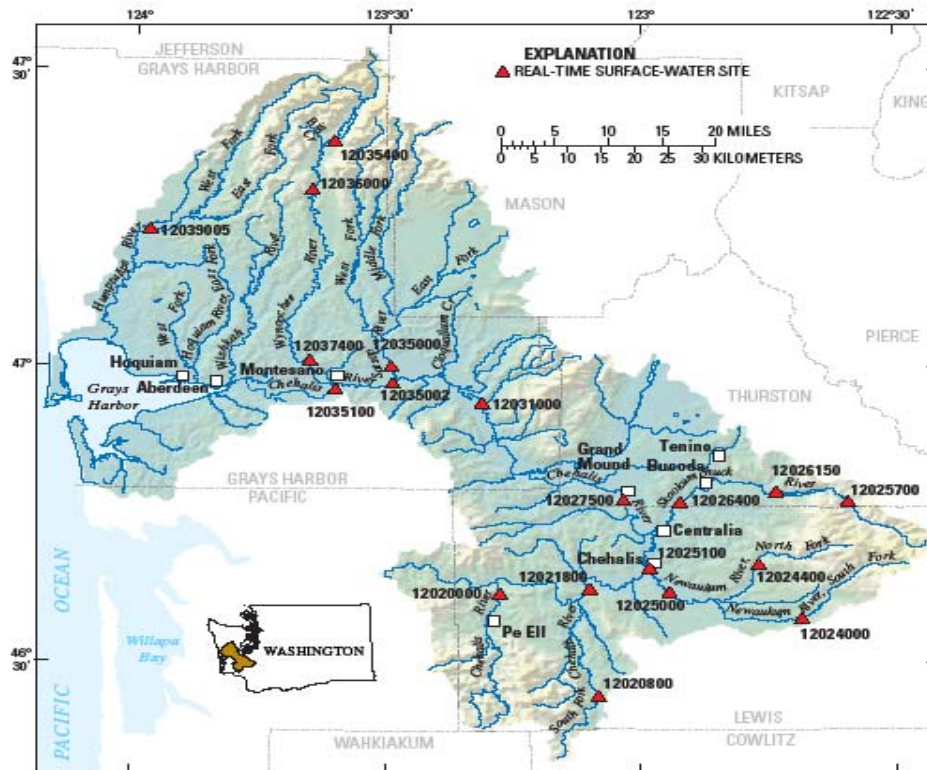
Historical Flood Events	Flood Gage @ Centralia	Flood Gage @ Grand Mound
December 2007	74.78 KCFS*	20.23 KCFS*
February 1996	74.31	19.98
January 1990	73.5	19.34
January 2009	72.4	18.18
November 1986	71.99	18.41
January 1972	71.65	18.21
November 1990	71.3	18.12
December 1975	71.17	17.73
January 1971	70.2	
April 1991		17.66
December 1996	70.18	
February 1990	69.91	17.46

\*KCFS (Thousands of Cubic Feet Per Second) for a particular stage at that river location

A Recent flood event, December 4, 2007, set a new record in peak stream flow in the upper watershed of the Chehalis River. The stream flow indicates a pattern resulting from a very intense rainstorm, according to the U.S. Geological Survey. Peak stream flow was recorded at 51,100cfs before floodwater swamped the instruments and destroyed equipment at Doty, WA. The previous record peak flow recorded at Doty was 28,900 cfs during the February 1996 flood. (USGS)



# Chehalis Reservation Natural Hazards Mitigation Plan



(USGS, Chehalis Basin)

Thurston County in its Natural Hazards Mitigation Plan, September 2009, Table 4.3.4, notes the following probability of Chehalis River flooding as follows:

Flood Severity	Events 1968 to 2009	Annual Probability	Rate of Occurrence (years)
Minor	62	151/2%	.7
Moderate	23	56.1%	1.8
Major	9	22.0%	4.6

## Identification and Profile

Floods cause loss of life and damage to structures, crops, land, flood control structures, roads and utilities. Floods also cause erosion and landslides and can transport debris and toxic products that cause secondary damage. Flood damage in Washington State exceeds damage by all other natural hazards. There have been 28 Presidential Major Disaster Declarations for floods in Washington State for flooding since 1970. While not every flood creates enough damage to merit such a declaration, most are severe enough to warrant intervention by authorities. Since 1980, to repair public facilities, help individuals recover from flood disasters and pay measure to prevent future flood damage required a \$522 million dollar investment. That is nearly 40% of the \$1.37 billion dollar amount spent on disaster relief and hazard mitigation during this time. The magnitude of most floods in Washington depend on particular combinations of intensity and duration of rainfall, pre-existing soil conditions (i.e. was ground wet or frozen before the storm), area of basin, elevation of rain or snow level and amount of snow pack. Synthetic changes to a basin can also affect the size of floods. (Pudlo 7.1.4 p1)

A flood is a general or temporary condition of partial or complete inundation of normally dry land areas from (1) overflow of inland or tidal waters (2) the unusual and rapid accumulation of runoff or surface waters from any source, or (3) mud flows or the collapse of shoreline land. (County 77) Several factors determine the severity of floods, including rainfall intensity (or other water source) and duration. A large amount of rainfall over a short time span can result in flash flood conditions. In locations where soil is saturated from a previous wet period or if rain is concentrated in an area of impermeable surfaces, such as a large parking lot, paved roadway or other impervious developed area, a small amount of rain can also result in floods. Topography and ground cover are also contributing factors for floods. Water run-off is greater in areas with steep slopes and little or no vegetative ground cover. The frequency of inundation is affected by climate, soil and channel slope.

### Characteristics of Flooding

1. Stationary frontal systems
2. Heavy precipitation
3. Increasing frequency of events
4. Saturated soils
5. Erosion
6. Flooding in association with another hazard event

Types of flooding common in the Chehalis area are:

1. River or stream building floods,
2. Flash floods,
3. Groundwater flooding

River and stream building floods occur because of prolonged heavy rainfall, a rapidly melting snow pack or a combination of these. According to the Natural Hazards Mitigation Plan for Thurston County, "historically, Thurston County must

# Chehalis Reservation Natural Hazards Mitigation Plan

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experience two or three days of rainfall averaging 2-5 inches per day for this type of flooding to occur". (T. County IV-21) The Chehalis River has flooded because of events in their watersheds outside of the reservation. River floods happen most often when winter storms bring heavy rains from the southwest. Heavy precipitation events occur when water exceeds the main river or stream channel's flood capacity. The effect of this is over flooding rivers and streams allowing water to flow from the floodway onto the floodplain. In addition, solid saturated with moisture will weaken and destabilize banks contributing to more flooding and erosion. The Chehalis River, a dominant factor in floods, meanders east to west along a broad, flat river valley terminating in Grays Harbor. The largest tributaries of the Chehalis are the Satsop and Wynoochee Rivers originating on the mountain slopes north of the river. River and stream building floods are the most common because of many river and stream and development patterns along them. (T. County IV-21)

There are three types of river flooding:

1. Nuisance/Minor flooding: The River exceeds bank-full conditions at one or more locations, generally flooding fields and forests. Some roads may be covered but passable. There may be enhanced erosion of some riverbanks.
2. Moderate flooding: Individual residential structures are threatened and evacuation recommended for selected properties. Some roads may be closed. Moderate damage may be experienced.
3. Major flooding: For neighborhood and community residents living on specific areas along the river the risk is higher and evacuation recommended. Major through fares may be closed and major damage is expected

A flash flood is a quick rise and fall of water level. Flash floods generally result from intense storms dropping large amounts of rain within a short period onto watersheds that cannot absorb or slow the flood. The natural terrain and vegetation of the Chehalis reservation help to reduce the potential for flash floods. As development continues, increasing the distribution and proportion of impervious surfaces, the threat from flash floods will increase. (T. County IC-22) Ground water flooding occurs when there is a high water table and persistent heavy rains. An upper, thin layer of permeable soils overlaying an impermeable layer of hardpan causes this situation.

As the ground absorbs more and more rainwater, the groundwater table rises and shows itself as flooding in areas where the land surface is below the water table. The conditions have historically been most severe in the second and subsequent years of consecutive wet years. According to the Army Corps of Engineers, the frequency of a groundwater flooding disaster is every 25 years. (T. County IV-22) FEMA has mapped most of the known floodplains in the United States. The Chehalis River extends for only 8.6 miles in Thurston County has an extensive floodplain, covering over (8) eight square miles. Land use is primarily agriculture, houses are scattered sparsely over the area. Some flooding occurs nearly every

year, but damage is usually light. Historically, minor/nuisance flooding occurs when the flow rate exceeds about 14,000 cfs. Since 1972, the river has exceeded the flow rate 48 times.

Groundwater has historically been most severe in the second and subsequent years of consecutive wet years. According to the U.S. Army Corps of Engineers (“Corps”) post event report on the storm of 1996-97, the frequency of groundwater flooding disaster is every 25 years. This was the first widespread flooding disaster event since 1972 and the worst on record until the winter of 1996, which was considered the “event of record” until December 2007. The 2007 event set a new record in peak stream flow in the upper watershed of the Chehalis River. The stream flow indicates a pattern resulting from a very intense rainstorm, according to the U.S. Geological Survey. Peak stream flow was recorded at 51,100 cfs before floodwaters swamped the instruments and destroyed equipment at Doty, WA. The previous record of peak stream flow recorded at Doty was 28,900 cfs during the February 1996 floor. (USGS)

Statistically, the Corps estimates there is approximately a 70% chance that the 1996-97 flooding will be equaled or exceeded at least once during a 30-year mortgage cycle. According to FEMA records for the March 1997 high groundwater flood event, only 15 of 237 damage sites (6%) occurred within the mapped 100-year floodplain. When added together, the 100- and 500- year floodplains it increased to 9%. (T. County IV-24)

## **Flood – Historic Profile**

Data gathered from the United States Geological Survey (USGS); NWS; Thurston County; Grays Harbor and Washington State Mitigation plans created this section of the NHMP. The data limitations were few. Technical data in the form of real-time surface water sites are available for download from the USGS website. The following chart indicates real-time surface-water sites monitored by the USGS. Identification No: 12027500 is Chehalis River near Grand Mound, WA and Identification No: 12025100 is Chehalis River at Centralia. USGS river gauging stations form the backbone of flood-warning systems in the state. Federal agencies such as the Corps of Engineers and the NWS and others, use the real-time stream flow data from USGS river gauging stations to monitor the rivers closely to protect people and property. (Clemen)



(FEMA, Debris after Washington Flood)

**Table 3.3 USGS Advanced Hydrologic Prediction Service: Seattle, Chehalis River near Grand Mound, Flood Categories (in feet) (USGS)**

<b>Major Flood Stage</b>	<b>17</b>
<b>Moderate Flood Stage</b>	<b>15.5</b>
<b>Flood Stage</b>	<b>14</b>
<b>Action Stage</b>	<b>12.2</b>
<b>Historical Crests</b>	
<b>20.23 feet</b>	<b>12/04/2007</b>
<b>19.98 feet</b>	<b>02/09/1996</b>
<b>19.34 feet</b>	<b>01/10/1990</b>
<b>18.41 feet</b>	<b>11/25/1986</b>
<b>18.39 feet</b>	<b>12/29/1937</b>

Flood Impacts (Chehalis River near Grand Mound):

At 19.0 feet, the Chehalis River will cause severe near record flooding, with deep and swift floodwaters inundating the Independence Valley. Flooding will occur all along the river including headwaters, tributaries and other streams within and near the Chehalis River Basin.

# Chehalis Reservation Natural Hazards Mitigation Plan

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At 17.5 feet, the Chehalis River will cause major flooding, inundating roads and farmlands in Independence Valley. Deep and swift floodwaters will cover SR-12 and Independence and Moon Roads. Flooding will occur all along the river including headwaters, tributaries, and other streams within and near the Chehalis River Basin.

At 15.5 feet, the Chehalis River will flood several roads in Independence Valley with swiftly moving water including SR-12 and James, Independence, Moon and Anderson Roads. Floodwaters will cut off access to and from Chehalis reservation and inundate nearby farmlands and some residential structures may be threatened.

At 14.0 feet, the Chehalis River will flood several roads in Independence Valley including James Road, Independence Road and Moon Road. Floodwaters will also cover nearby farmlands

At 12.5 feet, the Chehalis River will locally spill out of its banks into nearby fields and over a few roads. (USGS)

**Table 3.4 USGS Advanced Hydrologic Prediction Service: Seattle, Chehalis River at Centralia Flood Categories (in feet)**

<b>Major Flood Stage</b>	<b>72</b>
<b>Moderate Flood Stage</b>	<b>68.5</b>
<b>Flood Stage</b>	<b>65</b>
<b>Action Stage</b>	<b>61</b>
<b>Historical Crests</b>	
<b>72.78 feet</b>	<b>12/04/2007</b>
<b>74.31 feet</b>	<b>02/09/1996</b>
<b>73.5 feet</b>	<b>01/10/1990</b>
<b>71.99 feet</b>	<b>11/25/1986</b>
<b>71.65 feet</b>	<b>01/21/1972</b>

Flood Impacts (Chehalis River at Centralia):

At 73.4 feet, the Chehalis River will cause severe near record flooding with deep swift floodwaters inundating residential and business areas, roads including I-5 and farms. Flooding will occur all along the river including headwaters, tributaries and other streams within and near the Chehalis River Basin.

At 72.0 feet, the Chehalis River will cause major flooding inundating residential and commercial areas, farms and many roads including I-5. Floodwaters will be deep and swift in some areas. Flooding will occur all along the river including headwaters, tributaries and other streams within and near the Chehalis River Basin.

At 68.5 feet, the Chehalis River will flood some residential and commercial areas with water encroaching upon the first floor of some homes and businesses. Swift floodwaters will cover some roads.

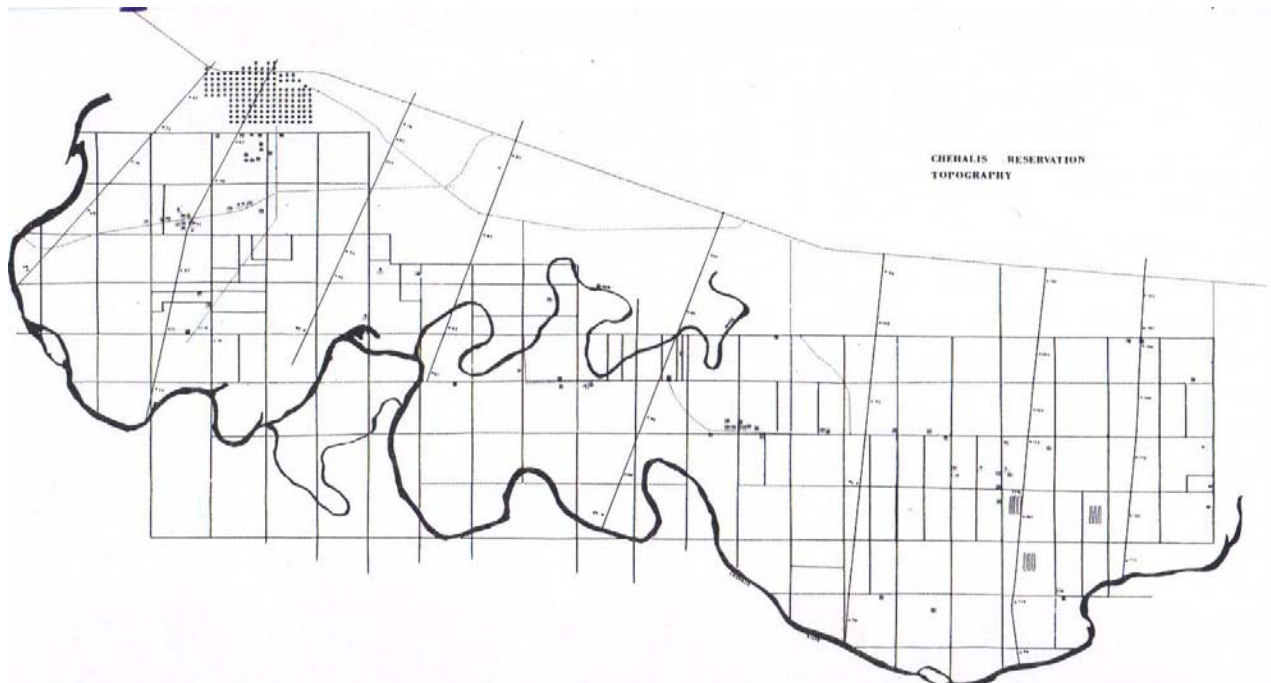
At 65.0 feet, the Chehalis River will cause shallow flooding of farmlands and some roads.

# Chehalis Reservation Natural Hazards Mitigation Plan

At 53 feet, the Chehalis River will spill over its banks into nearby pasturelands around Chehalis and Centralia.



(FEMA, Road Damage from Washington Floods)



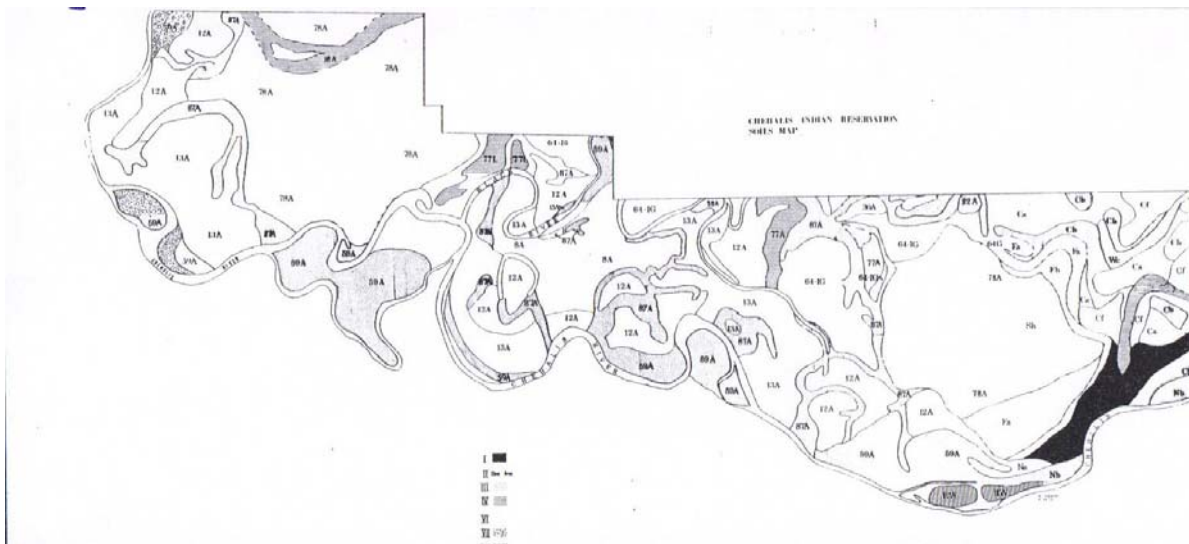
## Topography

Geological formations determine the topology of the Chehalis reservation. The geological map show older terraces forming "islands" of higher ground surrounded by alluvial floodplain. The higher terraces are 10 – 20 feet above surrounding lands and are the only areas of the reservation that do not flood.

The reservation land has an elevation of up to 115 feet above mean sea level on the highest eastern terrace. The surrounding floodplains average around 95 feet. The elevations drop on the western end of the reservation corresponding to the fall in the Chehalis River. The western terrace averages about 88 feet in elevation while the floodplains near the river, average about 70 feet. With the exception of a few relatively steep escarpments between the terraces and the floodplain, the land slopes at a very gradual rate.



# Chehalis Reservation Natural Hazards Mitigation Plan



## Soil Types on the Chehalis Reservation

The Chehalis Reservation holds six soil classifications:

CLASS I: Very little Class I land occurs in Western Washington. There is one small section subject to flooding and not currently used for agriculture.

Symbol	Name	Class	Woodland
Ce	Chehalis Loam	0-2% I	2o

CLASS II: Class II is the largest soil class, subject to annual flooding good for agriculture.

Symbol	Name	Class	Woodland Suitability
8a	Abiqua Silty Clay Loam	IIw	
F4-Ig, F4G	Arta silt loam	IIw	30Hp
Ca	Camas clay loam	IIs	3c
12A	Chehalis silt loam	IIw	OwHp
Cf	Chehalis silty clay loam	IIs	2o
13A	Cloquato silt loam	IIw	OwHp

CLASS III: Class III are generally found next to Class II soils and are generally found near the river or lower and are subject to more frequent and deeper flooding. In some cases, there is winter ponding and they are found narrow, lower, flood channels that interface with Class II soils.

Symbol	Name	Class	Woodland Suitability
22A	Bear Prairie Silt Loam	IIIs	20Hp
Cb	Camas gravelly loam	IIIs	3c
Nb	Newberg sandy loam, 20%	IIIs	3c
59A	Newberg silt loam	IIIw	2o
87A	Rennie silty loam clay loam	IIIw	OwHp
Wc	Wapato silty clay loam	IIIw	OwLp

# Chehalis Reservation Natural Hazards Mitigation Plan

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CLASS IV: Class IV is caused by frequent and severe flooding, is generally clayey, or silty, and is poorly drained. There are few narrow bands found.

Symbol	Name	Class	Woodland
77L	Klone gravelly silt loam	IVe	2fHp
18A	Nemah gravelly silt loam	IVw	OwLp
Ra	Reed clay	IVw	

CLASS V: Class V is the second largest types of soils found. Class V soils are composed of gravelly terrace soils and excessively drained. They are typical prairie soils become very dry in the summer season.

Symbol	Name	Class	Woodland
Fa	Fitch gravelly sandy loam	0-3% VIs	4f
Fb	Fitch gravelly sandy loam	3-15% VIs	4f
30A	Sol Duc gravelly loam	Vis	3fHp
8A	Spanaway very gravelly sandy loam	Vis	3fMp
Sh	Spanaway gravelly sandy loam	Vis	3f

Class VII & VIII: These soils are essentially gravelly bars or sandy bars along the river.

Symbol	Name	Class	Woodland
Rw	Riverwash	VIIIw	Ow
Ma	Alluvial Land	VIIIw	OwHp

## Impacts

Approximately 75 percent of the Chehalis Reservation is located on an active floodplain that is subject to significant flooding up to five times annually. Flooding within the Chehalis Reservation restricts access to the Reservation for periods of one or more days, isolating portions of the Reservation, and may cause failure of individual water and waste water systems. Severe flooding also can contribute to the formation of swift-moving water in floodways that is capable of significantly endangering residents and their property. Flooding of this type can affect more than two-thirds of the Chehalis Reservation.

The high frequency of flooding is caused by the unique geologic and physical environment of the Chehalis Reservation. These minor floods occur on the west, central, and eastern areas of the Chehalis Reservation, and cover up to half of the Reservation for periods of one or more days.



December 2007 Flood. Source: Chehalis Tribe

# Chehalis Reservation Natural Hazards Mitigation Plan

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Flooding of local roads limits access to and from higher ground atop the two glacial terraces. These two areas become isolated “islands” during most flooding events. Flood-related impacts to the Chehalis Reservation typically increase with an increase in the significance of the flood event. Moderate events jeopardize roads, bridges, property fences, outbuildings, wells and septic systems, and other structures (including private residences) constructed before the adoption of the Chehalis Flood Damage Prevention Ordinance. During such floods, residents of the central part of the Chehalis Reservation must be evacuated to higher ground. During past events, flooding has resulted significant damages to private and commercial properties and the evacuation of people from homes built on low ground. During such events, it may be difficult or impossible to leave the reservation for up to seven days. A tragic example of the isolation created by flooding occurred during the 1996 flood, when the Tribe experienced a fatality resulting from the inability to access emergency medical care.

Major floods resulting in severe impacts, including evacuation of people from residences in low-lying areas, and the inundation of major access roads, such as U.S. Highway 12, has historically occurred every 9 to 11 years. Consecutive years of major flooding (double floods) occur about every 20 years.

The 1996 flood covered 75 percent of the reservation with measured flood depths up to 10 feet. All access routes, including Howanut Road, Anderson Road, and Moon Road were under one to four feet of fast-moving water. U.S. Highway 12, which provides access to many secondary roads, also was flooded, and Interstate 5 was flooded and closed for several days. To improve emergency access, in 2002 the Tribe rebuilt Anderson Road. They elevated and straightened portions of the road and fitted it with nineteen (19) culverts to allow passage of most flood waters beneath the road. A hydraulic model was prepared prior to engineering and design of the road, assuring that the road construction resulted in no net loss of floodplain storage

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

# Chehalis Reservation Natural Hazards Mitigation Plan

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Reservation flooding has frequently damaged homes, including flooring, walls, electrical, plumbing, wells, septic, heating. Flooding destroys vehicles and mechanical equipment. Residents lose household items including furnishings, clothing, appliances, food, personal keepsakes and household pets. They become homeless for weeks or months until their homes are repaired or they can find other lodging. The Chehalis Reservation has a housing shortage and replacement housing can be difficult to locate. Cleanup and recovery is stressful and further traumatizes flood victims. Children miss schools days; parents may lose income during the disruption.

Reservation enterprises are closed during moderate to major flooding and lose revenue as customers and workers are unable to access businesses due to road closures and damaged roads.

Residents living on high ground on the reservation are unable to leave during major flooding to go to work. Children cannot leave the reservation to attend school. Access to specialty medical care is completely blocked. Firefighters cannot access the reservation for medical assistance calls or to fight fires. Homes that are not flooded are still likely to lack clean domestic water or sewer services due to overtopping of well heads and damage to pumps.

## **Data**

Data limitations were not found, historic data, National Weather Service, USGS information on floods in the area nearby the Chehalis Reservation. Telephone conversations with Ted Buehner, Warning Coordination Meteorologist, National Weather Service, and Seattle/Tacoma added open invitations to educate the public on StormWatchers and methods to incorporate the Tribe into "StormReady" program.

## **CHEHALIS AWARENESS**

Twenty-two (22) of 22 people interviewed, ranked flooding as the number one hazard on the Reservation.

## **Yakwilt&mx**

(Kinkade)

### *Thunderbird and Whale*

*Thunderbird is a bird of monstrous size and lives in a dark hole under the foot of the Olympic glacial field. Thunderbird soared from her dark hole in the mountains, far out over the placid waters and there poised herself high up in the air and waited for Whale to come to the surface of the water. Whale came and as quick as a flash, the powerful bird darted and seized it Whale in her flinty talons. Then, above the watery surface she lifted Whale and with great effort soared away toward the land areas. Passing beyond the oceans with her ponderous load, she was compelled to alight and rest her wings. Each and every time Whale was allowed to reach solid land there was a terrible battle; for Whale was powerful and fought for its life with terrible energy. Again Thunderbird would seize Whale; again Whale would escape. Again Thunderbird caught Whale. High into the air Thunderbird carried Whale over the land, dropping it to the land surface. Then, at this place there was another great battle. Thunderbird finally carried Whale to its nest in the lofty mountains, and there was the final and terrible contest fought. There was shaking, jumping up and trembling of the earth beneath, and a rolling up of the great waters...*

(Sciences)

## **Earthquake Probability**

Based upon data collected from the Pacific Northwest Seismic Network, in the last 129 years the average earthquakes had a magnitude of 5.716, a range of 7.1 – 4.9 magnitude with 27 occurrences making it a 20.9% probability in the next 129 years. The King County Hazard Mitigation Plan simply states Moderate Probability/High Impact (p 5-21). Grays Harbor County Hazard Mitigation Plan scored earthquake an 11 out of possible 12. (p75) Thurston County gave earthquake a “high probability of occurrence with high vulnerability” (p IV-6). However, according to Mazzotti and Adams, the last great earthquake along the Cascadian Subduction Zone was ~1700 A.D. and future occurrence “shows an interesting bimodal pattern of recurrence interval with long (more than 700 years) and short (less than 450 years) intervals” (p1956). That would estimate their probability dates of occurrence, for a great (M~9) earthquake along the Cascadian Subduction Zone, at 2150 A.D. to 2150 A.D. (+/-130 years). Nevertheless, our communities should prepare for a seismic event no matter WHAT the simple and complicated statistics predict. Because according to Huff, “common errors, both intentional and unintentional, associated with the interpretation of statistics, and these errors can lead to biased or inaccurate conclusions.”

## **Identification and Profile**

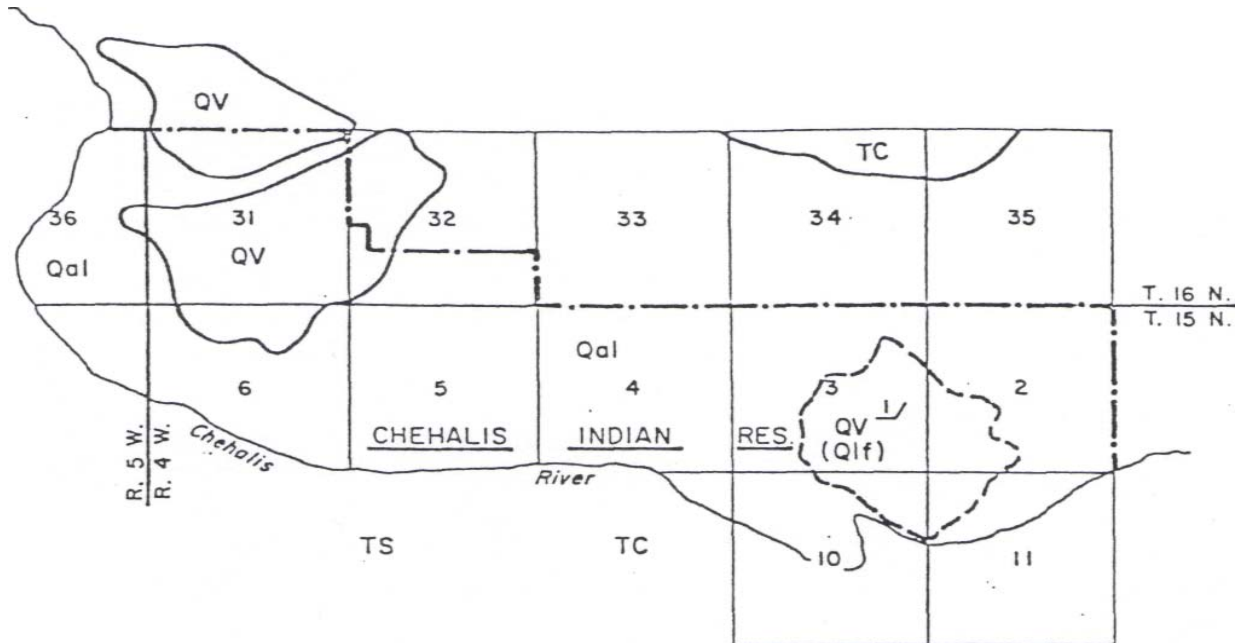
According to Rogers, “the principal hazards from earthquakes are surface faulting, ground failure and ground shaking”. (Rogers) Rogers states, “Surface faulting accompanies many large earthquakes, particularly in the western United States, and occurs when rock on either side of a fault is displaced at the earth’s surface. The slip may be vertical, horizontal, or a combination of both. In major earthquakes, the movement along a fault can be as much as (35) feet and the length of the surface rupture as great as 250 miles. Even small amounts of slip can

disrupt power, water supply, and communication lines. In an area where the fault line and roads cross, vertical slip greater than a few inches can completely disrupt transportation infrastructure.

In addition, faults that pass under structures are likely to cause severe structural damage if slippage occurs. (Rogers 113) Ground failure (which includes landslides, liquefaction and settlement) is induced by earthquake shaking in some geologic materials having unfavorable physical properties. (Rogers 113) Liquefaction occurs when ground shaking produces high water pressure under the earth's surface and causes sand layer to act as liquid. (Rogers 115) Settlement is simply compaction of loose soils. This phenomenon can be damaging to roadways, particularly near bridge abutments, where the roadbed may settle while the bridge remains fixed. (Rogers 115) Although all of these earthquake-induced phenomenon's can play an important part in causing damage, it is possible to experience an earthquake in which the damage is caused solely by ground shaking. In fact, in most earthquakes, ground shaking is the greatest hazard, causing the largest percentage of damage. Ground shaking is caused by earth waves that travel away from the earthquake source and may cause damage at distances of as much as 50-75 miles. (Rogers 116) Site conditions are a major element affecting the likely intensity of ground shaking. Thick soils overlying solid rock intend to increase the level of ground shaking and prolong the duration of shaking. The degree to which this effect takes place is dependent on certain physical properties of the soil, especially its velocity, density, and thickness relative to the underlying rock. (Rogers 117) Larger and longer ground motions could cause total collapse". (Rogers 118)

# Chehalis Reservation Natural Hazards Mitigation Plan

Geology Map of the Chehalis Valley



## LEGEND

Qal - Alluvium, deposits of silt, sand and clay left by flood waters

QV - Vashon drift – the older, higher terraces of outwash sand and gravel from the Vashon glacier

## Geology

Geology of the Chehalis River Valley is a thick deposit of glacial sand and gravel filling the entire area between the Black Hills to the North and the Doty Hills to the South. Recent geomorphology created rich bottomland in between higher gravelly terraces. Ground water percolates easily through the permeable gravelly outwash deposits and the underlying bedrock serves to conserve this water at depths of less than 100 feet. The porous gravelly outwash deposits allow easy lateral as well as vertical movement of the water.

Depths of the largest Washington earthquakes are not precisely known because the calculations of depth require a number of seismograms for each earthquake. Before 1949, the number of earthquakes and their locations and sizes were determined

almost entirely using newspaper accounts of reported damage. As a result, information about early earthquakes is incomplete, the locations, depths and sizes of these earthquakes is less precise than those earthquakes recorded after 1969 by the University of Washington multi-station seismograph network (Linda Noson). Exceptions include the 1949, magnitude 7.1, Olympia earthquake and the 1965, magnitude 6.5 earthquake as they were large enough to be recorded at many seismograph stations around the world. An interesting fact about this pair of earthquakes is the lack of aftershocks. According to Algermissen and Perkins, a lack of aftershock is considered a characteristic of a deep earthquake. Most of the early large earthquakes in the Puget Sound region were deep. (Perkins)

The size of an earthquake is indicated by a number called magnitude. Magnitude is calculated from a measurement of either amplitude or duration of specific types of recorded seismic waves recorded on seismograms. The Richter scale assigns numerical estimates of the size of an earthquake. The unit assigned to the logarithmic relation to recorded ground motion increase in size by a factor of 10. The force at which an earthquake shakes the ground is measured with the Richter scale, which rates the earthquake's actual *force* on a scale from 0 to 9. A 0 level Richter rating cannot even be felt by a person, while a rating of 8 shakes hard enough to crumble buildings. The Richter scale is based on a reading from a *seismograph* — a device that detects the waves sent out by an earthquake. Each number on the Richter scale indicates an increase of ten times the force of the previous number. For example, the Richter scale rating of 2 is ten times the force of a level 1. A Richter scale level of 3 is ten times more powerful than a level two and one hundred times more powerful than a level 1, etc.

The intensity of an earthquake is indicated by the amount of ground shaking at a particular site, and determined from reports of human reaction to shaking, damage done to structures and other effects. The Modified Mercalli Intensity (MMI) scale is the most commonly used scale to rank earthquakes in the United States.

## Modified Mercalli Intensity (MMI) Scale (Wood)

1. Not felt by a very few under especially favorable circumstances.
2. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
3. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration is similar to the passing of a truck. Duration estimated.
4. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sounds. Sensations like a heavy truck striking a building. Standing motor cars rocked noticeably.
5. Felt by nearly everyone; many awakened. Some dishes and windows broken; unstable objects overturned. Pendulum clocks may stop.
6. Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
7. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving in motor cars.



- |     |                                                                                                                                                                                                                                                         |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.  | Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. |
| 9.  | Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.                                              |
| 10. | Some well-built wooden structures destroyed; most masonry and frame structures thrown out of plumb. Rails bent.                                                                                                                                         |
| 11. | Few, if any masonry structures remain standing. Bridges destroyed. Rails bent greatly.                                                                                                                                                                  |
| 12. | Damage total. Lines of sight and level distorted. Objects thrown into the air.                                                                                                                                                                          |

Therefore, *earthquake hazard* can be defined as the probability of occurrence of a specified level of ground shaking in a specified period of time. *Earthquake risk* is defined as the expected or probable life loss, injury, or building damage, given the probabilities that specific levels of ground shaking occur. (Rogers 120)

## **Earthquake – Historic Profile**

Historically, strong earthquakes have occurred in the Puget Sound region between Olympia and the Canadian border, in the Cascade Mountains and along the Washington-Oregon border. (Linda Noson)

On December 14, 1872, a MMI VI earthquake in the Cascade Mountains was felt over 390,000 square kilometers, extending as far south as Eugene, Oregon and north into British Columbia and possibly into Alaska. (Hake)

On January 11, 1909, a MMI VI earthquake in Blaine, Washington, near the northern border of Washington, was felt over 65,000 square kilometers. (Hake)  
On January 23, 1920, a MMI VII earthquake occurred near the Strait of Georgia, in the northern region of Washington, and was felt as far away as Anacortes and Bellingham, north to Vancouver Island, British Columbia. (Hake)

On July 15, 1936, a magnitude 5.75 or MMI VII earthquake was centered in the southeastern region, near Walla Walla, Washington and Milton, Oregon. The total damage amounted to about \$100,000 and was felt over 272,000 square kilometers, including most of Washington, Oregon and northern Idaho. (Hake)

On April 29, 1945, a MMI VI – VII earthquake was reported causing minor damage, about 100 miles from Chehalis, in North Bend, Palmer and Stampede Pass. The earthquake was felt over the 130,000 square kilometers or over the greater portion of Washington, a small section of western Idaho and in the vicinity near Portland, Oregon. (Hake)

On February 14, 1946, a MMI VII earthquake caused a few deaths and damage estimated at \$250,000. The damage included cracked plaster and slight chimney failure with a few cases of building damage in Seattle, less than 100 miles from Chehalis. The earthquake was felt over 182,000 square kilometers from southwestern British Columbia to northwestern Oregon. (Hake)

# Chehalis Reservation Natural Hazards Mitigation Plan

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On June 23, 1946, a 7.3 magnitude earthquake was reported in the Strait of Georgia, less than 100 miles from Chehalis, causing one death, heavy damage and tsunamis. Damage reports included flooding of fields and highways, fallen chimneys, and damage to industrial and residential buildings. The earthquake was felt at Bellingham, Olympia, Raymond, Tacoma, areas in Canada and an estimated 260,000 square kilometers. (Hake)

On April 13, 1949, a MMI VIII earthquake caused an estimated \$25 million dollars in property damage near Olympia, less than 100 miles from Chehalis. Eight deaths were caused, nearly all buildings in Olympia were damaged, water and gas mains were broken, and property damage included toppled chimneys and cracked walls. Power and communication networks were interrupted, transportation was suspended for several days, and railway bridges were ordered out of commission. The earthquake was felt in western Canada, eastward to western Montana and southward to Cape Blanco, Oregon. The total area affected was 400,000 square kilometers. (Hake)

On November 5, 1962, a MMI VII earthquake caused minor damage in Vancouver, Washington, and was located about 100 miles from Chehalis; the earthquake also affected Portland, Oregon. Numerous chimneys were damaged, several buildings reported fallen ceiling tiles, cracked plaster and broken windows. The total area affected was over 52,000 square kilometers of Washington and Oregon. (Hake)

On April 29, 1965, a MMI VII – VIII earthquake caused about \$12.5 million in damage throughout 340,000 square kilometers in northeastern region of Washington, parts of Oregon, northern Idaho, northwestern Montana and part of British Columbia. Three persons were killed by falling debris and four elderly women perished from heart failure attributed to the earthquake. (Hake)

On December 20, 1973, the largest earthquake in eastern Washington was a shallow 4.4 magnitude incident. The earthquake was located near Othello, located about 300 miles from Chehalis. (Linda Noson)

On May 16, 1976, a 5.1 magnitude earthquake was located in the Puget Sound area, located about 100 miles from Chehalis. (Linda Noson)

On September 8, 1976, a 4.5 magnitude earthquake was centered in the southern Puget Sound basin, about 100 miles from Chehalis. (Linda Noson)

On March 11, 1978, a 4.6 magnitude earthquake was centered near Bremerton, Washington, located less than 100 miles from Chehalis. The main shock was followed by 44 aftershocks. (Linda Noson)

Beginning on March 24, 1980 through May 21, 1980, Mount St. Helens, located about 100 miles from Chehalis, generated 312 earthquakes with an average magnitude of 4.5. (Network)

# Chehalis Reservation Natural Hazards Mitigation Plan

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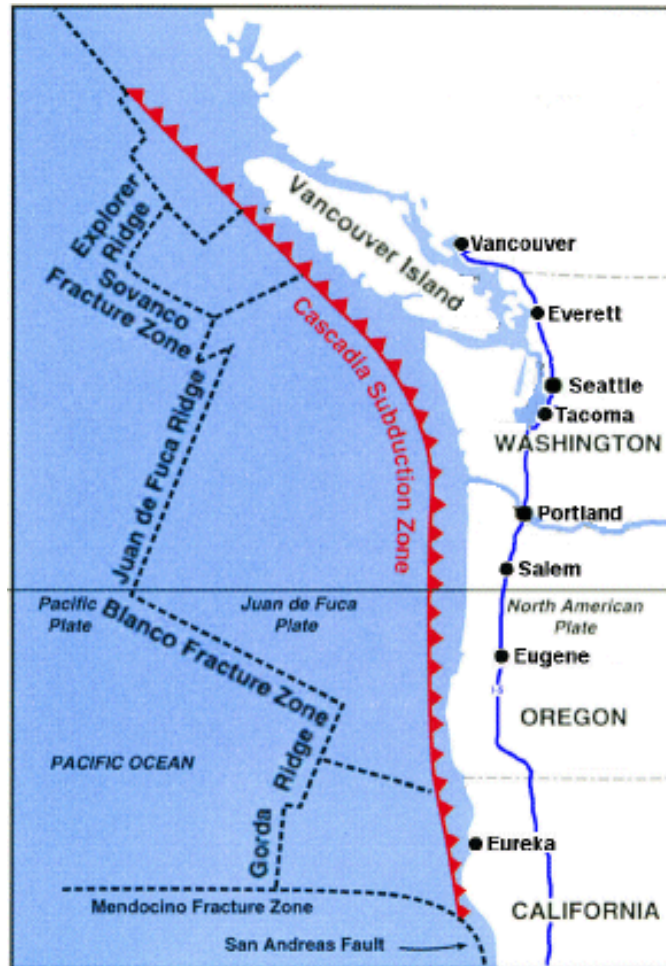
On February 13, 1981, a magnitude 7.3 earthquake was felt over 102,000 square kilometers and had more than 1,000 aftershocks distributed over the St. Helen's Zone. Weaver and Smith estimate that the St. Helen's Seismic Zone could be capable of generating a magnitude 7.0 + earthquake. (Linda Noson)

On February 28, 2001, a magnitude 6.8 earthquake struck western Washington at 10:55 am local time. The epicenter was located approximately 11 miles northwest of the capitol, Olympia, located less than 30 miles from Chehalis, and 36 miles southwest of Seattle. Two aftershocks of magnitudes higher than 2.5 were recorded during the first 48 hours after the main shock. (Filiatrault A.) On March 1, 2001, a Presidential declaration (FEMA-1361-DR, Washington) was issued for 22 declared counties and 24 Tribal Nations. (FEMA) On July 31, 2001, FEMA released a summary of the Disaster Assistance totals from this incident. Washington residents and businesses received \$129.7 million in recovery aid and 41,032 registrations from this disaster exceed the combined total of all other previous Washington disasters. Since the March 1, 2001 Presidential declaration, \$50.02 million in aid has been approved for temporary disaster housing assistance and minimal repair grants. Inspectors have completed 36,808 damage verifications in the declared counties. The Small Business Administration has approved \$76.82 million in low interest loans to homeowners, renters and businesses of all types. The Individual and Family Grant program has approved \$2.86 million for residents affected by the earthquake. The Chehalis Tribe government was reimbursed for \$30,000 damage to tribal governmental facilities.

**Table 3.5 FEMA Disaster Assistance Totals July 31, 2001**

<b>County</b>	<b>Registrations</b>	<b>Approved Temporary Housing Assistance</b>	<b>SBA Approved Disaster Loans</b>
<b>Grays Harbor</b>	2,075	\$3,556,692	\$2,166,400
<b>Lewis</b>	1,215	\$1,797,346	\$2,073,400
<b>Thurston</b>	5,386	\$5,632,584	\$12,916,900
<b>Chehalis Tribe</b>	0	0	0
<b>Totals</b>	8,676	\$10,986,622	\$17,156,700

## FUTURE EARTHQUAKE POTENTIAL



### **Cascadia Subduction Zone**

The Cascadia Subduction Zone (CSZ) is a very long sloping fault that stretches from Vancouver Island to Northern California. It separates the Juan de Fuca and North American plates. CSZ is where the two plates meet. Great Subduction Zone earthquakes are the largest earthquakes in the world and can exceed 9.0.

Earthquake size is proportional to fault area – the last known great earthquake in the northwest was in January 1700, just over 300 years ago. Geological evidence indicates that great earthquakes may have occurred at least (7) seven times in the last 3,500 years suggesting a return time of about 400 to 600 years.

### **Impacts**

The impact from earthquakes to communities is well-evidenced by the catastrophic events around the world; San Francisco in the United States; Kobe, Japan; Chengdu, China and Kashmire, Pakistan. Failed bridges, building and other structures can trap or bury people causing injury or death. Damage to community infrastructure is common and disrupts public and private commerce and services. Disruptions are

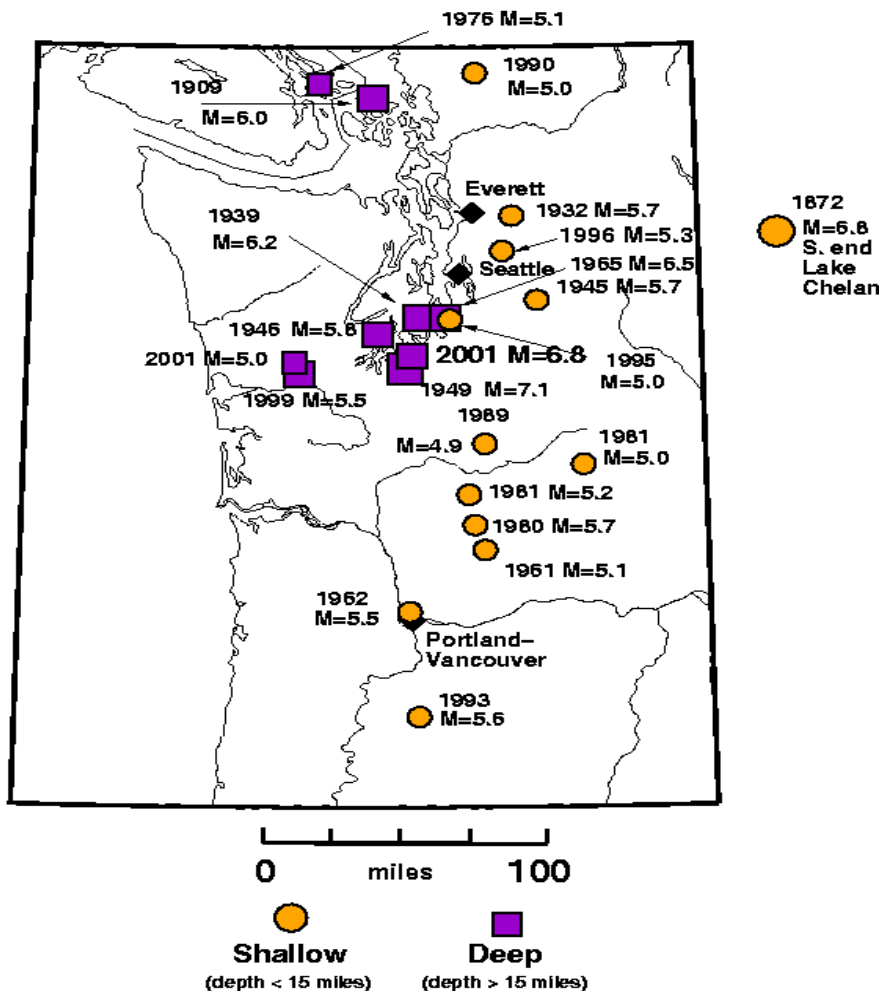
widespread and include communication, electrical, heat fuel, auto fuel and domestic water. Structural fires are a secondary hazard from earthquakes. Individuals may be displaced due to damaged homes or lack heat, light, water and/or sewer facilities. Major earthquakes may prevent travel to obtain services or aid. Subsequent economic impacts to businesses are likely following an earthquake.

Structures built since 2002 on the Chehalis Reservation are built to modern code, but structures built prior are likely to be vulnerable to ground shaking. Fire fighters and law enforcement can quickly become over-extended with response and recover operations. All fire assistance comes from outside the reservation and may face barriers due to disruption of transportation facilities or maybe unable to respond to the reservation community due to priority calls within their primary response area. Tribal services can expect a high number of requests for assistance to law enforcement, health and social services. Building and structural inspections will become priorities for planning and permitting services personnel and disrupt other operations. Tribal government may also be expected to house and feed tribal members if their residences are uninhabitable due to damage or until residences are inspected. Disruption to phone and transportation services may leave some residences stranded or trapped and unable to call or send for assistance making search and rescue operations necessary.

## **Data**

There were no issues of data limitations and data was obtained through the use of internet, library, journal, and scientific sources available to the public. An analysis of Tribal vulnerabilities focuses upon the public meeting input. The Tribal community members were more concerned with floods in the area and not actively concerned with earthquake.

## Selected Earthquakes since 1872



### CHEHALIS AWARENESS

From the Household Natural Hazards Preparedness Questionnaire, 83% of the reservation has experienced a natural disaster; however, only 53% of the reservation had experienced an earthquake. When asked the level of concern regarding earthquakes, with choices from (1) extremely concerned; (2) very concerned; (3) concerned; (4) somewhat concerned to (5) not concerned, a majority (40%) of the surveyed population chose (3) concerned. Only 7% of the surveyed population said that they were, "extremely concerned" about earthquake danger.

## SEVERE WINTER STORM

### PROBABILITY

According to Washington State Mitigation Plan, Counties Most Vulnerable to High Winds, with a recurrence rate of >100% - at least one occurrence per year, Thurston County is vulnerable to meteorological conditions, with a 175% recurrence rate; Grays Harbor County is vulnerable to meteorological conditions with a 170% recurrence rate. (Pudlo)

According to Washington State Mitigation Plan, Counties Most Vulnerable to Winter Storms, with a recurrence rate of >100% - at least one occurrence per year, Thurston County is vulnerable to meteorological conditions, with a 50% recurrence rate; Grays Harbor County is not vulnerable to meteorological conditions with a 40% recurrence rate. (Pudlo)

### Hazardous Weather Seasons

1. Flood season: Western Washington – November through February
2. Windstorm season: October through March.
3. Snow season: Western Washington – mid November through mid March.

*High winds* – The National Weather Service defines high winds as sustained winds of 40 mph or gusts of 58 mph or greater, not caused by thunderstorms, expected to last for an hour or more. Areas most vulnerable to high winds are those affected by a strong pressure difference from deep storms originating over the Pacific Ocean; an outbreak of very cold, Arctic air originating over Canada; or air pressure differences. Areas considered most vulnerable to high winds are 1) those most affected by conditions that lead to high winds, as described above, **and** 2) those with a high wind recurrence rate of 100 percent, meaning the area experiences at least one damaging high wind event every year. (Pudlo)

*Winter storm* – The National Weather Service defines a winter storm as having significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation. Heavy snowfall is 4 inches or more in a 12-hour period, or 6 inches or more in a 24-hour period in non-mountainous areas; and 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period in mountainous areas. Areas most vulnerable to winter storms are those affected by convergence of dry, cold air from the interior of the North American continent, and warm, moist air off the Pacific Ocean. Typically, significant winter storms occur during the transition between cold and warm periods. Areas considered most vulnerable to winter storm are 1) those most affected by conditions that lead to such storms, as described above, **and** 2) those with a recurrence rate of 50 percent, meaning the area experiences at least one damaging winter storm event every two years. (Pudlo) FEMA reports four severe storm disaster declarations in 2006 and 2007 for Grays Harbor County that caused damage or threats to the reservation population (Disaster Numbers 1734, 1682, 1671, 1641).

## IDENTIFICATION AND PROFILE

A severe storm is an atmospheric disturbance that results in one or more of the following phenomena: strong winds and large hail, thunderstorms, tornados, rain, snow, or other mixed precipitation. Typically, major impacts from a severe storm are to transportation infrastructure, services and loss of utilities. Most storms move into Washington from the Pacific Ocean. Considered for this profile are the following severe storm elements (using National Weather Service definitions):

1. High winds – Storms with sustained winds of 40 mph or gusts of 58 mph or greater, not caused by thunderstorms, expected to last for an hour or more.
2. Winter storm – A storm with significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation. Heavy snowfall is 4 inches or more in a 12-hour period, or six or more inches in a 24-hour period in non-mountainous areas; and 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period in mountainous areas.

Precipitation is recorded 20 to 25 days or more each month and December and January are the wettest months. Snowfall is light in the lower elevations. During the wet season, rainfall is usually of light to moderate intensity and continuous over a period. The strongest winds are generally from the south or southwest and occur during the fall and winter. In interior valleys, wind velocities reach 40 to 50 mph each winter, and 75 to 90 mph a few times every 50 years. The highest summer and lowest winter temperatures generally occur during periods of offshore easterly winds. During most of the year, the prevailing wind is from the southwest or west. The frequency of northeasterly winds is greatest in the fall and winter. Wind velocities ranging from four to 12 mph can be expected 60 to 70 percent of the time; 13 to 24 mph, 15 to 24 percent of the time; and 25 mph or higher, 1 to 2 percent of the time. The highest wind velocities are from the southwest or west and are frequently associated with rapidly moving weather systems. Extreme wind velocities can be expected to reach 50 mph at least once in two years; 60 to 70 mph once in 50 years; and 80 mph once in 100 years. (Pudlo)

According to the National Weather Service, there are three ingredients for a storm to develop cold air, moisture and lift. Cold air below freezing temperatures is necessary to make snow or ice. Air blowing over a body of water is an excellent source of moisture to form clouds and precipitation. To raise the moist air to form clouds and cause precipitation requires lift. An example of lift is warm air colliding with cold air and raising over the cold dome. The boundary between the warm and cold air masses is a front. Severe storms are dangerous and cause deaths in by traffic accidents on icy roads, death by hypothermia from prolonged exposure to cold and heart attacks from shoveling snow. (Pudlo 5-7 p3) According to the Center for Disease Control, carbon monoxide poisoning was a major health consequence of the severe storm in January of 1993. Because of the use of alternative sources of energy for indoor cooking and home heating, the risk of exposure to CO increased. (Control)



## **Severe Storm – Historic Profile**

January/February 1916 – Seattle's Greatest Snowstorm was one of the top 10 weather events in Washington during the 20th Century, according to the National Weather Service, Seattle Forecast Office. Seattle's snowfall in January was 23 inches, and February snowfall was 35 inches, for a two-month total of 58 inches. Seattle recorded its maximum snowfall ever in a 24-hour period, with 21.5 inches on February 1. Other parts of western Washington received between two to four feet of snow. Winds created snowdrifts as high as five feet. The region was crippled, with transportation essentially halted.

January 13, 1950 – The January 1950 Blizzard was one of the top 10 weather events in Washington during the 20th Century, according to The National Weather Service, Seattle Forecast Office. On this date, 21.4 inches of snow fell in Seattle, the second greatest 24-hour snowfall recorded with 25-40 mph winds. January had 18 days with high temperatures of 32 degrees or lower. The winter of 1949-50 was the coldest winter on record in Seattle, with an average temperature of 34.4 degrees.

October 12, 1962 – The Columbus Day Wind Storm was the top weather event in Washington during the 20th Century, according to the National Weather Service, Seattle Forecast Office. This storm is the greatest windstorm to hit the Northwest since weather recordkeeping began in the 19th century, and called the mother of all wind storms" in the 1900s. All windstorms in the Northwest are compared to this one. The Columbus Day Storm was the strongest widespread non-tropical windstorm to strike the continental U.S. during the 20th century, affecting an area from northern California to British Columbia. The storm claimed seven lives in Washington State; 46 died throughout the impacted region. One million homes lost power. More than 50,000 homes were damaged. Total property damage in the region was estimated at \$235 million (1962 dollars). The storm blew down 15 billion board feet of timber worth \$750 million (1962 dollars); this is more than three times the timber blown down by the May 1980 eruption of Mount St. Helens, and enough wood to replace every home in the state. Highest recorded wind speeds (before power went out at recording stations):

1. Naselle, Washington Coast – gust to 160 mph.
2. Bellingham and Vancouver – gusts of 113 mph.
3. Renton – gust of 100 mph.
4. Tacoma – gust of 88 mph.

April 5, 1972 – Washington's Deadliest Tornado Outbreak was one of the top 10 weather events in Washington during the 20th Century, according to the National Weather Service, Seattle Forecast Office. Three tornadoes touched down in Washington State on this day:

1. An F3 tornado touched down in Vancouver; it swept through a grocery store, bowling alley, and grade school near where Vancouver Mall is today. It caused six deaths, 300 injuries, and \$50 million in damage.

# Chehalis Reservation Natural Hazards Mitigation Plan

2. Later that day, another F3 tornado touched down west of Spokane near Davenport, and an F2 tornado struck rural Stevens County.
3. Numerous severe thunderstorms with large hail and damaging winds were reported over other areas of eastern Washington.

An F3 tornado has winds of 158-206 mph, and is capable of severe damage. An F2 tornado has winds of 113-157 mph and is capable of considerable damage. Because of these tornados, Washington led the nation in tornado deaths in 1972.

## November 1990 – Statewide Flooding

Federal Disaster #883 - Stafford Act disaster assistance provided \$57 million. It was classified as one of the top 10 weather events in Washington during the 20th Century, according to the National Weather Service, Seattle Forecast Office. This storm caused widespread, major flooding on western Washington Rivers. This storm caused two deaths. Damage estimated at \$250 million.

## December 1990 – Severe Storm

Federal Disaster #896 - Stafford Act disaster assistance provided – \$5.1 million. Causing floods, snow, and high winds.

## January 20, 1993 – The Inauguration Day Wind Storm

Federal Disaster #981, Stafford Act disaster assistance provided – \$24.2 million. This storm claimed five lives.

## December 1996 - January 1997 – Ice, Wind, Flooding, Snow-loading, Landslides

Federal Disaster #1159 - Stafford Act disaster assistance provided – \$83 million. Small Business Administration loans approved – \$31.7 million. Saturated ground combined with snow, freezing rain, rain, rapid warming and high winds within a five-day period produced flooding and landslides. Twenty-four deaths; \$140 million (est.) in insured losses; 250,000 people lost power.

## **Impacts**

The Chehalis Reservation, like most of western Washington is vulnerable to high winds because of the climatic conditions and prevalence of 100 ft to 150 ft tall conifer trees. High winds weaken standing trees and structures weighted with snow or ice. Two predominating species, Douglas fir, which are planted extensively on the reservation as a timber crop and western hemlock have shallow later root systems with top heavy crown. Trees are vulnerable to falling when soils are soaked from ongoing rainfall. Sustained high winds and gusts cause trees to sway significantly; repetitive swaying can weaken a tree's root hold in the saturated soils and force it to topple. Power lines, vehicles, homes and structures may be damaged. Transportation routes may be blocked. Falling tree limbs and debris can injure or cause death to individuals. Downed power lines may cause electrocutions. Severe winter storms cause wide spread power outages annually in our rural setting, which may take 2 to 5 days or longer to restore. Downed trees and debris hinder or prevent emergency response capabilities, forcing the closure of tribal government services and businesses. Homes without power may suffer from cold

and hypothermia when winds are combined with snow and low temperatures. Improperly stored foods can become rancid and unsafe to eat. Some people may resort to trying to heat their home with outdoor grills, exposing themselves and their families to carbon monoxide poisoning. Risks of home fires increase as people try to use candles for light, or start wood fires in unsafe stoves or homes with faulty chimneys or flues. Medically vulnerable individuals may be at risk of severe health consequences for oxygen respirators or other equipment.

The rural setting of the Chehalis Reservation can increase these impacts as the reservation is located at the furthest end of two county public utilities and often must wait longer for power restoration in the event of a storm. About 50% of the reservation population is dependent on well water, which must be pumped and septic systems with also utilize pumps. During power outages, many or most of our rural residents may be completely lacking drinking water or sewer services. When combined with flooding, this likelihood increases.

## **Data**

The comprehensive data from the State of Washington Hazard Mitigation Plan is cited throughout this section. The references included: National Weather service, Seattle Times, FEMA and National Oceanic and Atmospheric Administration.

## **CHEHALIS AWARENESS**

According to the Hazards Survey, over 40% of participants were “very concerned” about Severe Storms.

## **VOLCANO**

### **IDENTIFICATION AND PROFILE**

A volcano is a mountain connected to a reservoir of molten rock below the surface of the earth. Volcanoes are built up by an accumulation of their own eruptive products, lava and ash. Though there are no volcanoes within Thurston County, active volcanoes in the Cascade Range, including Mt. Rainier to the east and Mt. St. Helens to the south, could affect Thurston County with mud and debris flow (lahar), flooding due to an upstream lahar, and ashfall.



*Mt. Saint Helens in Washington state, USA*

### **Volcano – Historic Profile**

Cascade Range volcanoes in the U.S. have erupted more than 200 times during the past 12,000 years for an average of nearly two eruptions per century. At least five eruptions have occurred during the past 150 years. The last major eruption of Mt. Rainier was more than 1,000 years ago.

The most recent eruptions in the Cascade Range are the well-documented 1980-1986 eruptions of Mount St. Helens which claimed 57 lives and caused nearly a billion dollars in damage and response costs. The effects were felt throughout the northwest. Thurston County was affected by extensive ash fall which damaged internal combustion engines, caused transportation problems due to reduced visibility, and was a general nuisance. There was also an economic impact resulting from the closure of I-5. Over the past 200 years, Mount St. Helens has erupted three times, suggesting a recurrence interval of about 70 years.

Mount St. Helens is located 49 miles south of the Chehalis Indian Reservation.

Additional devastating impacts could result if winds move debris and ash toward Thurston County. This would disrupt transportation and other essential services,

and cause buildings to collapse while particulates, toxic gases and acid rains could affect public health, water supplies, animal, aquatic and other plant life.

Another eruption of Mount St. Helens would likely have an impact similar to that experienced in 1980.

When Mount St. Helens erupted on May 18, 1980, red hot lava did not spew out of the volcano and pour down its flanks. This perception of a volcanic eruption is a common one and is probably due in part to pictures seen on television or in books of the beautiful lava flows and lava fountains in Hawai'i. The type of eruptions in Hawai'i are known as *hawaiian volcanism* and are far less dangerous than the eruptions produced by Mount St. Helens. It is important to know what type of an eruption a volcano is most likely to produce so that the types of hazards produced by such an eruption can be identified. Knowledge of these types of hazards, will help determine where a person would need to go to be safe during a volcanic eruption.

Volcanic eruptions can be placed into two general categories: those that are explosive, such as at Mount St. Helens, and those that are effusive, such as in Hawai'i. The most active volcano in the world, Kilauea Volcano on the big island of Hawai'i, is generally a nonexplosive volcano (though there have been occasions when it erupted explosively). Eruptions from it normally result in gently flowing lava flows, spatter cones, and lava fountains. Another type of nonexplosive volcanism is *flood basalts*. Lava flows from this type of eruption are extruded from fissures and cover vast areas. These nonexplosive eruptions are the least dangerous type of volcanic eruption since people rarely get killed by them (Francis, 1993). However, they are devastating and may have global consequences.

Many eruptions are explosive in nature. They produce fragmental rocks from erupting lava and surrounding country rock. Some eruptions are highly explosive and produce fine volcanic ash that rises many kilometers into the atmosphere in enormous eruption columns. Explosive activity also causes widespread ash fall, pyroclastic flows, debris avalanches, landslides, pyroclastic surges, and lahars.

## **PROBABILITY**

In 1980 the Mount St. Helens eruption killed 57 people, caused nearly \$1 billion in property damage, buried 230 square miles with landslide debris, deposited ash as deep as a half-inch 300 miles away, and plugged the Toutle and Cowlitz rivers with mud. Southwest of King County, this mountain presents a potential volcanic threat to Puget Sound residents because of the probability that hazardous ashfall will be released during an eruption. In fact, about an hour after the eruption of Mount St. Helens in 1980, ash began to fall in Yakima in Eastern Washington (about 150 miles east of Seattle). The ashfall was so heavy it became so dark that lights were turned on all day. It took 10 weeks to haul away the ash from Yakima's streets, sidewalks, and roofs. While this hazard was last most spectacularly witnessed over 25 years ago, recent stirrings at St. Helens have brought that threat back into regional focus. (King County Office of Emergency Management).

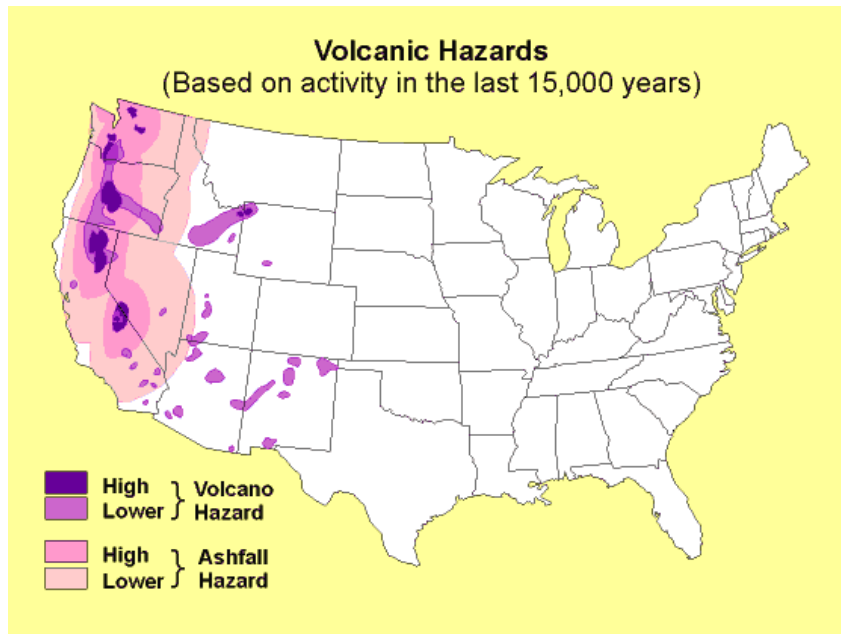
# Chehalis Reservation Natural Hazards Mitigation Plan

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The United States Geological Survey (USGS) reports that Mount Rainier has produced moderate quantities of ash in past eruptions. The eruption of Mount St. Helens in 1980 did deposit a scan layer of ash in Thurston County, but the fallout did pose a significant threat to the region. Thurston County winds prevail from the south and west, therefore ash is more likely to fall on the east side of the Cascades than the west side. If Mount St. Helens was to erupt, a resultant ash plume would require an easterly wind to deposit ash on the Chehalis Reservation. The USGS calculates that the annual provability for a significant ash deposit of one centimeter or greater in Thurston County is .02 percent for the south eastern third of the county, where the Chehalis Reservation is located. This hazard has a low probability.

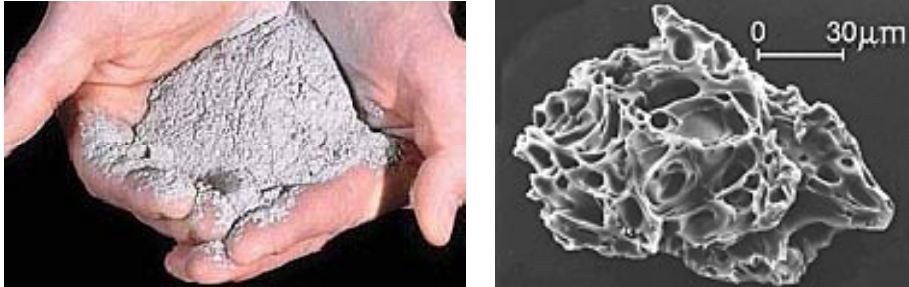
## **Volcanic Hazards (based on activity in the last 15,000 years).**

Areas in blue or purple show regions at greater or lesser risk of local volcanic activity, including lava flows, ashfalls, lahars (volcanic mudflows) and debris avalanches, based on the record of the last 15,000 years, as compiled by Mullineaux (1976). Areas in pink show regions at risk of receiving 5 cm or more of ashfall from large or very large explosive eruptions, originating at the volcanic centers shown in blue. These projected ashfall extents are based on observed ashfall distributions from an eruption ("large") of Mt. St. Helens that took place 3,400 years ago, and the eruption of Mt. Mazama ("very large") that formed Crater Lake, OR, 6,800 years ago. There is a moderate to high vulnerability of risk from these two volcanoes.



*The State of Montana Multi-Hazard Mitigation Plan and Statewide Hazard Assessment October 2004*

## Impacts



Volcanic ash, like the 1980 ash produced by the pyroclastic emissions of St. Helens, Washington, is made up of tiny jagged particles of rock and glass (photo on right; magnified 200 times).

Hazards of volcanic ash:

- Short-circuits and failure of electronic components, especially high-voltage circuits and transformers (wet ash conducts electricity).
- Eruption clouds and ashfall commonly interrupt or prevent telephone and radio communications.
- Volcanic ash can cause internal-combustion engines to stall by clogging air filters and also damage the moving parts. Engines of jet aircraft have suddenly failed after flying through clouds of even thinly dispersed ash.
- Roads, highways, and airport runways can be made treacherous or impassable because ash is slippery and may reduce visibility to near zero. Cars driving faster than 5 miles per hour on ash-covered roads stir up thick clouds of ash, reducing visibility and causing accidents.
- Ash also clogs filters used in air-ventilation systems to the point that airflow often stops completely, causing equipment to overheat.

Like airborne particles from dust storms, forest fires, and air pollution, volcanic ash poses a health risk, especially to children, the elderly, and people with cardiac or respiratory conditions, such as asthma, chronic bronchitis, and emphysema.

Source: U.S. Geological Survey Fact Sheet 027-00 Online Version 1.0 (USGS 2003c)

Clean up and recovery would likely be the greatest cost to both the public and private sector. The 1980 eruption of Mount St. Helens posed a major nuisance for community in Eastern Western. In Yakima, ash removal took ten weeks and cost \$2.2 million. Source: Tilling, Rover, I. et. Al. 1990. Eruptions of Mount St. Helens: Past, Present and Future, U.S. Geological Survey Special Interest Publication.

## Data

There were no issues of data limitations and data was obtained through internet, library, journal, and scientific sources available to the public. An analysis of Tribal vulnerabilities focuses upon the public meeting input and the Natural Hazards Preparedness Questionnaire. The Tribal community members are not actively concerned with Volcano hazards.

## **CHEHALIS AWARENESS**

From the Household Natural Hazards Preparedness Questionnaire, 83% of the reservation has experienced a natural disaster; however, only 7% of the reservation had experienced volcanic hazards. When asked the level of concern regarding volcanic hazards, 10% of participants were "very concerned", 3% of participants were "concerned", 27% of participants were "somewhat concerned", and 53% of participants were "not concerned" about volcanic hazards.



## WILDFIRE

### IDENTIFICATION AND PROFILE

Any instance of uncontrolled burning in grasslands, brush, or woodlands is classified as a wildfire, whereas uncontrolled burning within a forested area is a forest fire.

#### **Wildfire/Forest Fire - Historical Profile**

Forest and wildfires are most likely to occur during the local dry season, mid-May through October, and anytime during prolonged dry periods causing drought or near-drought conditions. The probability of a destructive fire depends on weather, fuel conditions, topography and human activities such as debris burning, land clearing, camping, and construction. Greater than four out of five forest and wildfires are started by people, often due to negligent behavior such as failure to properly extinguish smoking materials or campfires.

There have been no major forest fires or wildfires in Thurston County. However, the existence of large tracts of public and private forest, increasing population, increasing recreational use of forested land, and possible changing climate patterns, all increase the likelihood of a major fire.

Although nearly half of the County is forest land, three general areas are vulnerable to a major forest fire. These are Capital Forest in the west, Fort Lewis Military Reservation in the east, and large commercial tracts in the southeast. In each of these areas, development is prohibited or restricted.

All areas of the county are vulnerable to a wildfire, especially those areas surrounded by brush and grass which tend to dry out in the hotter months. The threat of fire increases in years following those years in which a large amount of debris is added to the forest floor as seen during the summer of 1997 following the massive amounts of fuel added during the wind and ice storm of December 1996. The flood of record in 2007 produced a similar abundance of fuel.

The impact of a major fire would be amplified by collateral effects such as loss of ground cover which could exacerbate runoff, flooding and landslides, loss of commercial and aesthetic value of the forest, destruction of wildlife habitat, and damage to power lines, pipelines and the communications and transportation infrastructure.

### PROBABILITY

Wildland fire hazard is somewhat unique in that it is the most frequent occurring hazard, with over 70 fires starting per year. Wildland fires are also preventable; over 95% occur as the result of accidents or poor human judgments. It is the only hazard that can be actively contained or suppressed in real time.

Numerous wildland fires will occur over the next 25 years. While few occur on the reservation, past fires have threatened homes including the destruction of one home on the Chehalis Reservation in the past three years.

# Chehalis Reservation Natural Hazards Mitigation Plan

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Thurston County Natural Hazards Mitigation Plan (September 2009) notes an expected total of 1775 fires may be predicted to occur over the next 25 years in Thurston County.

The existence of undeveloped grasslands and heavily forested areas, consistent with the rural nature of the Chehalis Reservation, coupled with an increasing population and the uncertain impact of a changing climate combine to suggest a moderate probability of occurrence. Reservation housing is interspersed throughout grasslands and forested areas. Furthermore, Chehalis lacks on reservation fire fighting capacity and must request aid from either Grand Mound (Thurston County) or Oakville's volunteer fire department (Grays Harbor), creating a delayed containment or suppression response. The destruction of large tracts of forest land would have immediate economic impact to the community through lost jobs and increased public support while collateral economic and social effects could impact the County for years. Accordingly, a "high" probability rating is assigned.

## Impacts

Wildland fire impact depends upon the size and location of the fire. Heat from wind-driven flames can destroy virtually any material in its path. People caught off guard by a rapidly spreading fire could suffer burn injuries or death. People fishing or hunting or recreating in remote or inaccessible areas of the reservation are particularly at risk.

Fire fighting consumes significant local and state resources and poses severe hazards to firefighting crews.

Potential damages include loss of timber and wildlife habitat; economic losses from lost timber and commercial enterprises on the reservation; loss of residences, vehicles and their contents; utilities lines and vehicles are also possible. Loss of vegetation on the slopes of the Chehalis River could seriously threaten fish habit.

Wildland fire also disrupts transportation facilities, requiring detour routes. Residents may be unable to access to residences; customers may be unable to access businesses to due heat, smoke or proximity to the wildland fire.

## Data

There were no issues of data limitations and data was obtained through the use of internet, library, journal, and scientific sources available to the public. An analysis of Tribal vulnerabilities focuses upon the Natural Hazards Preparedness Questionnaire. The Tribal community members are not actively concerned with wildfires.

## CHEHALIS AWARENESS

From the Household Natural Hazards Preparedness Questionnaire, 83% of the reservation has experienced a natural disaster; however, the reservation has never experienced a wildfire. When asked the level of concern regarding wildfires, 13% of participants were "very concerned", 30% of participants were "concerned", 27% of

participants were “somewhat concerned”, and 27% of participants were “not concerned” about wildfire/forest fire hazards.

## CLIMATE CHANGE

According to James Lovelock, “*Gaia Theory* is a view of the Earth that sees it as a self-regulating system made up from the totality of organisms, the surface rocks, the ocean and the atmosphere tightly coupled as an evolving system. The theory sees this system as having a goal – the regulation of the surface conditions so as always to be as favorable as possible for contemporary life”. (Lovelock 162)

*Greenhouse effect* defined by Lovelock is as follows. “Most of the sun’s radiant energy is in the visible and near infra-red. The air, when free of clouds and dust, is as transparent to this radiation as is the glass of a greenhouse. Surfaces on the Earth, or within the greenhouse, are warmed by sunlight and some of this warmth is transferred to the air in contact with the surfaces. The warm air stays in the greenhouse mainly because the walls and green roof prevent the restless wind from dissipating it.

The Earth is kept warm in a similar but not identical way, by the absorption of radiant heat emitted from the warm surface by gases, carbon dioxide, water vapor, and methane. These gases, although transparent to light, are partially opaque to the longer wavelengths emitted by a warm surface. In the absence of pollution, the greenhouse effect is benign and has long kept the surface air warm. Without it, the Earth would be 32°C colder and probably incompatible with life. (Lovelock 162-3).

Currently, the climate centers around the world have reported the Earth’s physical condition and see it as seriously ill and soon to pass into a morbid fever that may last as long as 100,000 years. I have to tell you, as intimate members of the Earth family, that civilization is in grave danger (Lovelock xiii). Without realizing it, we have poisoned the earth by our emission of greenhouse gases and weakened it by taking farmland and housing the land that was once the home of ecosystems that sustained the environment. We have driven the Earth to a crisis state from which it may never, on a human time scale, return to the lush and comfortable world we love and in which we grew up (Lovelock xiii). Global vulnerabilities include loss of habitat, food source, and large-scale wars over basic resources (food, water, and land base). Local vulnerabilities include possibilities of additional floods due to “increase of ocean volume mainly from the melting of land base ice” as Jim Hansen states in *Climate Change*. He also notes that rapidly rising sea levels will be the greatest threat because “these changes alter the distribution of forests and deserts and the availability of land on which to grow food. When the carbon dioxide abundance passes 500 ppm, we will enter the zone where temperatures will rise to a new steady state, perhaps six to eight degrees hotter than now (Lovelock 64-5). According to Wigley and Meehl, et al, in an article in the March 2005 issue of *Science*, “sea levels will rise between 10 and 30 centimeters by 2100” (Lovelock 61). Although these sources show an estimated average change in global change, it

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does not show “unpredicted extremes, including flood events and storms of great severity” (Lovelock 60).

There is no limit on data regarding global climate change – the Lovelock book references well rounded scientific sources including respected scientific journals, such as *Nature* and *Science*; organizations such as the Intergovernmental Panel on Climate Change (IPCC) and the International Geosphere Biosphere Program (IGBP) and many respected scientists. Probability of this event is in process as we watch Arctic ice caps melt, Greenland is disappearing, record heat in Europe killing over 30,000 people and others. In addition, record event report from the National Weather Service, Seattle, WA 128 am PDT Tuesday October 28 2008, record high temperature set at Quillayute, WA Airport, a record high temperature of 69 degrees was set at Quillayute, WA airport yesterday. This breaks the old record of 68 set in 1968. (Service) According to the NOAA Paleoclimatology website, the following chart provides an overview of developments to support the critical stage our planet is in. (NOAA)

Past 10 Years	1991 AD	1992 AD	1993 AD	1994 AD	1995 AD	1996 AD	1997 AD	1998 AD	1999 AD	2000 AD
The 1990s	Bangladesh Cyclone kills over 138,000. "Perfect Storm" develops off Nova Scotia.	August-Hurricane Andrew hits Florida, killing 54, costing \$25 billion.	"Storm of the Century" hits U.S. east coast with 270 missing. Midwest flooding causes \$18 billion damage.	Severe ice storm in southeast US cause an estimated \$3 billion in damages.	Atlantic Hurricane Season second busiest hurricane season since 1871. 830 die in Midwest heat wave.	Hurricanes Bertha and Fran hit North Carolina resulting in major flooding.	Impact of 1997-1998 ENSO warm event estimated at \$25 to \$-33 billion	Hurricane Mitch devastates Central America, killing estimated 11,000.	La Niña linked to drought conditions in much of U.S. and high precipitation in Pacific Northwest.	Wildfires in the Western U.S. burn over 6 million acres. Over 6 billion Homo sapiens on planet.

How do we mitigate against global climate change? Accept that change is coming and prepare ourselves for the inevitable.

## **RISK ASSESSMENT – ASSESSING VULNERABILITIES**

### **IDENTIFYING STRUCTURES**

The Vosper Residential Area is a medium density Planned Development Unit (PUD) located off Balch Road that will be built out over the next 20 years. There are currently (16) sixteen residential lots planned as (12) single family residences, including (5) five Housing and Urban Development's (HUD) and (4) four were reserved for the three multi-family units. Vosper is a 15.26 acre Tribal trust parcel. (Council)

The Oakes Residential Area is a medium density PUD located adjacent to the city of Oakville. The Oakes has (15) single-family lots, five of which are currently developed. (Council)

The Chehalis Tribal Housing Authority (CTHA) oversees the three HUD housing developments on the reservation, Tahown, Makum and Davis. Tahown and Makum are home-ownership developments and Davis is a rental development. Tahown, Makum and Davis are built out to their full capacities.

In addition, there are scattered rural home sites throughout the reservation. All housing in the floodplain is scattered site housing owned by both Indian and non-Indian reservation residents.

The Tribal Complex is a collection of government facilities developed around the Chehalis Baseball Field. Core Tribal government administrative functions including: accounting, planning and Tribal government are located in the main Tribal Center facility. The remaining sets of buildings are the hub for community activities and services, including: social and mental health services, Chehalis Tribal Clinic, Elders Center, Indian Head Start and Early Head Start, Youth Center, Public Safety, Health Clinic, Community Center, Natural Resources, and End of the Trail I convenience store. (Council)

Lucky Eagle Casino and Eagle's Landing Hotel is a 69 room hotel across from the Lucky Eagle Casino and there is a 20-space RV park in the hotel parking lot. (Council)

Great Wolf Lodge, a 400,000 sf Resort and Conference center includes a 24,000 sf conference center, indoor water park, and a 399 room resort employing 500 people. (Council)

The Tribe operates a convenience store and two convenience store/gas stations. End of Trail I is located adjacent to the Tribal Center. End of Trail II is located at the intersection of SR 12 and Anderson Rd. End of Trail III is located immediately north of the Great Wolf Lodge structure.

Chehalis Tribal Construction, a dirt work company employing 8-10 people, is located immediately south of End of Trail II on Anderson Road.

## TRANSPORTATION FACILITIES

### Ownership of Roads

The Chehalis Reservation Transportation Plan includes approximately 60 miles of roads under the jurisdiction of the Confederated Tribes of the Chehalis Reservation, the Bureau of Indian Affairs (BIA), the State of Washington, Grays Harbor and Thurston Counties, and private owners.

**Chehalis Reservation IRR inventory of roads by ownership** (see Table 15 for details):

- BIA Roads: approximately 2 miles
- City of Oakville: approximately 2 miles
- Grays Harbor County Roads: approximately 13 miles
- Thurston County Roads: approximately 18 miles
- Private Roads: approximately 2 miles
- WSDOT: approximately 25 miles

### Functional Classification of Roads

The Chehalis Tribe is utilizing the BIA Functional Classification for roads which consists of an analysis of transportation facilities taking into account current and future traffic generators, and their relationship to connecting or adjacent BIA, state, county, federal, and/or local roads, and other intermodal facilities. The Functional Classification is used to delineate the difference between the various road and/or intermodal transportation facility standards eligible for funding under the Indian Reservation Roads (IRR) program.

Transportation facilities are classified according to the following functional classifications:

Class 1 Roads: Major arterial roads providing an integrated network with characteristics for serving traffic between large population centers, generally without stub connections and having average daily traffic volumes of 10,000 vehicles per day or more with more than two lanes of traffic.

Class 2 Roads: Rural minor arterial roads providing an integrated network having the characteristics for serving traffic between large population centers, generally without stub connections. Class 2 roads may also link smaller towns and communities to major resort areas that attract travel over long distances and generally provide for relatively high overall travel speeds with minimum interference to through traffic movement. Generally provide for at least inter-county or inter-state service and are spaced at intervals consistent with population density. This class of road will have less than 10,000 vehicles per day.

Class 3 Roads: Streets located within communities serving residential areas.

# Chehalis Reservation Natural Hazards Mitigation Plan

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Class 4 Roads: Rural major collector road is collector to rural local roads.

Class 5 Roads: Rural local road that is either a section line and/or stub type roads, make connections within the grid of the road inventory system. This class of road may serve areas around villages, into farming areas, to schools, tourist attractions, or various small enterprises. Also included are roads and motorized trails for administration of forests, grazing, mining, oil, recreation, or other use purposes.

Class 6 Roads: City minor arterial streets that are located within communities, and serve as access to major arterials.

Class 7 Roads: City collector streets that are located within communities and serve as collectors to the city local streets.

Class 8 Roads: This class encompasses all non-road projects such as paths, trails, walkways, or other designated types of routes for public use by foot traffic, bicycles, trail bikes, snowmobiles, all terrain vehicles, or other uses to provide for the general access of non-vehicular traffic.

Class 9 Roads: This classification encompasses other transportation facilities such as public parking facilities adjacent to inventory routes and scenic byways, rest areas, and other scenic pullouts, ferry boat terminals, and transit terminals.

**Chehalis Reservation IRR inventory by Functional Class** (see Table 15 for details):

- Class 1 Roads                      approximately 25 miles
- Class 2 Roads                      approximately 2 miles
- Class 3 Roads                      approximately 11 miles
- Class 4 Roads                      approximately 23 miles

## **Construction Need for Roads**

The Chehalis Tribe is utilizing the BIA Construction Need coding system which is used in cost to construct calculations. In the BIA Construction Need coding system, transportation facilities are assigned a Construction Need using the following guidelines: Ownership or responsibility of the facility, whether it is within or provides access to the reservation or communities in which the majority of the residents are Indian, and whether it is vital to the economic development of the Tribe.

A summary of the Construction Need codes are as follows:

Construction Need 0: Transportation facilities which have been improved to their acceptable standard, or projects/facilities proposed to receive construction funds on an IRR TIP.

# Chehalis Reservation Natural Hazards Mitigation Plan

Construction Need 1: Existing BIA Roads needing improvement.

Construction Need 2: Construction need other than BIA roads needing improvement.

Construction Need 3: Substandard or other roads for which no improvements are planned (maintenance only).

Construction Need 4: Roads that do not currently exist and need to be constructed, proposed roads.

**Chehalis Reservation IRR inventory by Construction Need** (see Table 3.6 for details):

- Construction Need 0: approximately 4 miles
- Construction Need 1: approximately 2 miles
- Construction Need 2: approximately 55 miles
- Construction Need 4: approximately .3 miles



# Chehalis Reservation Natural Hazards Mitigation Plan

**Table 3.6  
Chehalis Reservation IRR Inventory**

Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 67 & 68	1 section 5	<b>Makum Lane</b>	BIA	Grays Harbor	0.1	Paved	3	1	X	X	
Pg. 69 & 70	2 section 5	<b>Davis Drive</b>	BIA	Grays Harbor	0.1	Paved	3	1	X	X	
Pg. 71 & 72	3 section 5	<b>Petoie Lane</b>	BIA	Grays Harbor	0.1	Paved	3	1	X	X	
Pg. 73 & 74	4 section 5	<b>Parsons Drive</b>	BIA	Grays Harbor	0.1	Paved	3	1	X	X	
Pg. 75 & 76	5 section 5	<b>Fern Drive</b>	BIA	Grays Harbor	0.1	Paved	3	1	X	X (route no. 5)	X (rename route to Rt. 5 section 5)
Pg. 75 & 76	5 section 10	<b>Oak Lane</b>	BIA	Grays Harbor	0.1	Paved	3	0	X		X
Pg. 77 & 78	6 section 5	<b>Tahown Drive</b>	BIA	Grays Harbor	0.2	Paved	3	1	X	X	
Pg. 79 & 80	7 section 5	<b>Lacamus Lane</b>	BIA	Grays Harbor	0.1	Paved	3	1	X	X	
Pg. 81 & 82	8 section 5	<b>Moon Road SW</b> -from School Land Rd. SW to Hwy 12	Thurston County	Thurston	0.2	Paved	4	2	X		X
Pg. 81 & 82	8 section 10	<b>Moon Road SW</b> -from Hwy 12 to bridge	Thurston County	Thurston	0.3	Paved	4	2	X	X	X (rename route to route 8 section 10, change length from 1.1 to 0.3)
Pg. 81 & 82	8 section 15	<b>Moon Road SW</b> - bridge #1	Thurston County	Thurston	0.038	Paved	4	2	X		X

# Chehalis Reservation Natural Hazards Mitigation Plan

Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 81 & 82	8 section 20	<b>Moon Road SW</b> -from end of bridge to gravel	Thurston County	Thurston	0.5	Paved	4	2	X		X
Pg. 81 & 82	8 section 25	<b>Moon Road SW</b> -from gravel south to end of road	Thurston County	Thurston	0.3	Gravel	4	2	X		X
Pg. 83 & 84	9 section 5	<b>183<sup>rd</sup> Ave SW</b> – from Case Road SW to bridge	Thurston County	Thurston	2.4	Paved	4	2	X		X
Pg. 83 & 84	9 section 10	<b>183<sup>rd</sup> Ave SW</b> –bridge #1	Thurston County	Thurston	.012	Paved	4	2	X		X
Pg. 83 & 84	9 section 15	<b>183<sup>rd</sup> Ave SW</b> – from end of bridge to US 12	Thurston County	Thurston	1.4	Paved	4	2	X		X
Pg. 83 & 84	9 section 20	<b>183<sup>rd</sup> Ave SW</b> – from Forstrom St. SW to bridge	Thurston County	Thurston	.60	Paved	4	2	X		X
Pg. 83 & 84	9 section 25	<b>183<sup>rd</sup> Ave SW</b> – bridge #2	Thurston County	Thurston	.004	Paved	4	2	X		X
Pg. 83 & 84	9 section 30	<b>183<sup>rd</sup> Ave SW</b> – from end of bridge to Moon Rd. SW	Thurston County	Thurston	.60	Paved	4	2	X		X
Pg. 83 & 84	9 section 35	<b>183<sup>rd</sup> Ave SW</b> – from Moon Rd. SW to end of road	Thurston County	Thurston	0.6	Paved	4	2	X		X
Pg. 85 & 86	10 section 5	<b>188th Ave SW</b> – from Anderson Rd. to bridge #1	Thurston County	Thurston	0.3	Paved	4	2	X	X (route no. 10)	X (rename Route 10 section 5, change length from 1.0 to 0.3, construction need change from 2 to 3)
Pg. 85 & 86	10 section 10	<b>188th Ave SW</b> – Bridge #1	Thurston County	Thurston	0.009	Paved	4	0	X		X

# Chehalis Reservation Natural Hazards Mitigation Plan

Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 85 & 86	10 section 15	<b>188<sup>th</sup> Ave SW</b> -from end of bridge #1 to start of bridge #2	Thurston County	Thurston	0.001	Paved	4	0	X		X
Pg. 85 & 86	10 section 20	<b>188<sup>th</sup> Ave SW</b> -bridge #2	Thurston County	Thurston	0.011	Paved	4	0	X		X
Pg. 85 & 86	10 section 25	<b>188<sup>th</sup> Ave SW</b> -from end of bridge #2 to Moon Rd.	Thurston County	Thurston	0.5	Paved	4	2	X		X
Pg. 85 & 86	10 section 30	<b>188<sup>th</sup> Ave SW</b> – from Forstrom St. SW to Marble St. SW	Thurston County	Thurston	0.7	Paved	3	2	X		X
	11 section 5	<b>River Road</b>	Privately owned	Grays Harbor	0.3	Earth	3	2	X	X	
Pg. 87 & 88	12 section 5	<b>Pearson Road</b>	BIA	Grays Harbor	0.6	Gravel	3	1	X	X (part of route no. 5327, section no. 820)	X (rename Route 12 section 5, change length from 1.1 to 0.6, const. need changed to 3)
Pg. 87 & 88	12 section 10	<b>Pearson Road</b>	Grays Harbor County	Grays Harbor	0.5	Gravel	3	2		X (part of route no. 5327, section no. 820)	X (rename to Route 12 section 10, and const. need change to 3)
Pg. 89 & 90	13 section 5	<b>Secena Road</b>	Privately owned	Grays Harbor	1	Gravel - - Poor	3	2	X	X (route no. 5327, section no. 810)	X (rename route no. to Route 13, change length from .5 to 1, and ownership changed from County to Privately owned)

# Chehalis Reservation Natural Hazards Mitigation Plan

Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 91 & 92	14 section 5	<b>Anderson Road</b> – from Hwy 12 to start of bridge #1	Thurston County	Thurston	0.20	Paved	4	0	X	X (route no. 5327, section no. 840)	X (rename route to Route 14 section 5, change length from 1.5 to 0.2)
Pg. 91 & 92	14 section 10	<b>Anderson Road</b> - bridge #1	Thurston County	Thurston	0.02	Paved	4	0	X		X
Pg. 91 & 92	14 section 15	<b>Anderson Road</b> –from end of bridge #1 to Reservation boundary	Thurston County	Thurston	0.10	Paved	4	0	X		X
Pg. 91 & 92	14 section 20	<b>Anderson Road</b> – from Reservation boundary to start of bridge #2	Thurston County	Thurston	0.20	Paved	4	0	X		X
Pg. 91 & 92	14 section 25	<b>Anderson Road</b> - bridge #2	Thurston County	Thurston	0.006	Paved	4	0	X		X
Pg. 91 & 92	14 section 30	<b>Anderson Road</b> –from bridge #2 to start of bridge #3	Thurston County	Thurston	0.2	Paved	4	0	X		X
Pg. 91 & 92	14 section 35	<b>Anderson Road</b> - bridge #3	Thurston County	Thurston	0.016	Paved	4	0	X		X
Pg. 91 & 92	14 section 40	<b>Anderson Road</b> –from end of bridge #3 to end of road	Thurston County,	Thurston	1	Paved	4	2	X		X
Pg. 93 & 94	15 section 5	<b>Balch Road</b>	Grays Harbor County	Grays Harbor	1.0	Paved	3	2	X	X (route 5327, sect. 850)	X (rename route no. to Route 15)
Pg. 95 & 96	16 section 5	<b>Howanut Road</b> -from Anderson Road to start of bridge #1	Grays Harbor County	Grays Harbor	0.8	Paved	4	2	X	X (part of route no. 5327, section no. 880)	X (rename route no. to Route 16 section 5 in IRR inventory )

# Chehalis Reservation Natural Hazards Mitigation Plan

Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 95 & 96	16 section 10	<b>Howanut Road</b> -bridge #1	Grays Harbor County	Grays Harbor	0.009	Paved	4	2	X	X (part of route no. 5327, section no. 880)	X(rename route to Route 16 section 10 , change length from 3.2 to 0.8)
Pg. 95 & 96	16 section 15	<b>Howanut Road</b> -from end of bridge #1 to start of bridge #2	Grays Harbor County	Grays Harbor	0.6	Paved	4	2	X		X
Pg. 95 & 96	16 section 20	<b>Howanut Road</b> -bridge #2	Grays Harbor County	Grays Harbor	0.031	Paved	4	2	X		X
Pg. 95 & 96	16 section 25	<b>Howanut Road</b> -from end of bridge #2 to start of bridge #3	Grays Harbor County	Grays Harbor	0.4	Paved	4	2	X		X
Pg. 95 & 96	16 section 30	<b>Howanut Road</b> -bridge #3	Grays Harbor County	Grays Harbor	0.005	Paved	4	2	X		X
Pg. 95 & 96	16 section 35	<b>Howanut Road</b> -from end of bridge #3 to start of bridge #4	Grays Harbor County	Grays Harbor	0.2	Paved	4	2	X		X
Pg. 95 & 96	16 section 40	<b>Howanut Road</b> -bridge #4	Grays Harbor County	Grays Harbor	0.005	Paved	4	2	X		X
Pg. 95 & 96	16 section 45	<b>Howanut Road</b> -from end of bridge #4 to start of bridge #5	Grays Harbor County	Grays Harbor	0.5	Paved	4	2	X		X
Pg. 95 & 96	16 section 50	<b>Howanut Road</b> -bridge #5	Grays Harbor County	Grays Harbor	0.039	Paved	4	2	X		X
Pg. 95 & 96	16 section 55	<b>Howanut Road</b> -from end of bridge #5 to Reservation boundary	Grays Harbor County	Grays Harbor	0.5	Paved	4	2	X		X

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Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 95 & 96	16 section 60	<b>Howanut Road</b> – from Reservation boundary to Elma Gate Rd.	Grays Harbor County	Grays Harbor	0.2	Paved	4	2	X		X
Pg. 97 & 98	17 section 5	<b>Fitzgerald Road</b>	Grays Harbor County	Grays Harbor	0.6	Gravel	3	2	X	X (route no. 5327, section no. 870)	X (rename route no. to Route 17 in IRR inventory)
Pg. 99 & 100	18 section 5	<b>Niederman Road</b>	Grays Harbor County	Grays Harbor	0.9	Paved	3	2	X	X ( route no. 5327, section no. 890)	X (rename route no. to Route 18 in IRR inventory)
Pg. 101 & 102	19 section 5	<b>Cemetery Road</b> – from Elma Gate Rd. to Reservation boundary	Grays Harbor County	Grays Harbor	0.5	Paved	3	2	X	X ( route no. 5327, section no. 830)	X (rename route no. to Route 19 in IRR inventory)
Pg. 101 & 102	19 section 10	<b>Cemetery Road</b> – from Reservation boundary to South Bank Road	Grays Harbor County	Grays Harbor	0.3	Paved	3	2	X	X ( route no. 5327, section no. 830)	X (rename route no. to Route 19 in IRR inventory)
Pg. 103 & 104	20 section 5	<b>South Bank Road</b> -from Fairview Street to start of bridge	Grays Harbor County	Grays Harbor	1.4	Paved	4	2	X	X ( route no. 5327, section no. 860)	X(rename route to Route 20 sec. 5, and change length from 1.6 to 1.4)
Pg. 103 & 104	20 section 10	<b>South Bank Road</b> -bridge	Grays Harbor County	Grays Harbor	0.204	Paved	4	2	X		X
Pg. 105 & 106	21 section 5	<b>Prairie Lane</b>	BIA	Grays Harbor	0.2	Paved	3	0	X		X
Pg. 107 & 108	22 section 5	<b>Tomahawk Drive</b>	BIA	Grays Harbor	0.2	Gravel	3	1	X		X
Pg. 109 & 110	23 section 5	<b>Albany Street</b> - from School Land Road SW to Hwy 12	Thurston County	Thurston	0.3	Paved	4	2	X		X
Pg. 109 & 110	23 section 10	<b>Albany Street</b> – From Hwy 12 to 185 <sup>th</sup> St. SW	Thurston County	Thurston	0.2	Paved	4	2	X		X

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Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 111 & 112	24 section 5	<b>Marble Street</b> - from Albany Street to bridge	Thurston County	Thurston	0.4	Paved	4	2	X		X
Pg. 111 & 112	24 section 10	<b>Marble Street</b> - bridge	Thurston County	Thurston	.004	Paved	4	2	X		X
Pg. 111 & 112	24 section 15	<b>Marble Street</b> – From end of bridge to Independence Road	Thurston County	Thurston	0.4	Paved	4	2	X		X
Pg. 113 & 114	25 section 5	<b>Independence Road</b> – from Marble Street SW to start of bridge	Thurston County	Thurston	0.8	Paved	4	2	X		X
Pg. 113 & 114	25 section 10	<b>Independence Road</b> – bridge	Thurston County	Thurston	0.082	Paved	4	2	X		X
Pg. 113 & 114	25 section 15	<b>Independence Road</b> – from end of bridge to Tribal Trust Property	Thurston County	Thurston	1.8	Paved	4	2	X		X
Pg. 115 & 116	26 section 5	<b>Old Hwy 99</b> - from State Hwy to start of bridge	Thurston County	Thurston	0.4	Paved	2	2	X		X
Pg. 115 & 116	26 section 10	<b>Old Hwy 99</b> - bridge	Thurston County	Thurston	0.008	Paved	2	2	X		X
Pg. 115 & 116	26 section 15	<b>Old Hwy 99</b> – from bridge to tribal trust property	Thurston County	Thurston	0.8	Paved	2	2	X		X
Pg. 117 & 118	27 section 5	<b>Case Road SW</b> - north to start of bridge	Thurston County	Thurston	0.6	Paved	4	0	X		X
Pg. 117 & 118	27 section 10	<b>Case Road SW</b> - bridge	Thurston County	Thurston	0.09	Paved	4	0	X		X
Pg. 117 & 118	27 section 15	<b>Case Road SW</b> - from end of bridge to tribal trust property	Thurston County	Thurston	1	Paved	4	0	X		X

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Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 119 & 120	28 section 5	<b>State Route 12</b> - I-5 overcrossing (bridge #1)	WSDOT	Thurston	0.04	Paved	1	2	X		X
Pg. 119 & 120	28 section 10	<b>State Route 12</b> – RR overcrossing (bridge #2)	WSDOT	Thurston	0.02	Paved	1	2	X		X
Pg. 119 & 120	28 section 15	<b>State Route 12</b> – from overcrossing to bridge #3	WSDOT	Thurston	1	Paved	1	2	X		X
Pg. 119 & 120	28 section 20	<b>State Route 12</b> – bridge #3	WSDOT	Thurston	0.05	Paved	1	2	X		X
Pg. 119 & 120	28 section 25	<b>State Route 12</b> – from bridge #3 to start of bridge #4	WSDOT	Thurston	1.5	Paved	1	2	X		X
Pg. 119 & 120	28 section 30	<b>State Route 12</b> – bridge #4	WSDOT	Thurston	.011	Paved	1	2	X		X
Pg. 119 & 120	28 section 35	<b>State Route 12</b> – from bridge #4 to start of bridge #5	WSDOT	Thurston	2	Paved	1	2	X		X
Pg. 119 & 120	28 section 40	<b>State Route 12</b> – bridge #5	WSDOT	Thurston	.008	Paved	1	2	X		X
Pg. 119 & 120	28 section 45	<b>State Route 12</b> – from bridge #5 to bridge #6	WSDOT	Thurston	1.1	Paved	1	2	X		X
Pg. 119 & 120	28 section 50	<b>State Route 12</b> – bridge #6	WSDOT	Thurston	.008	Paved	1	2	X		X
Pg. 119 & 120	28 section 55	<b>State Route 12</b> from bridge #6 to bridge #7	WSDOT	Thurston	0.5	Paved	1	2	X		X
Pg. 119 & 120	28 section 60	<b>State Route 12</b> – bridge #7	WSDOT	Thurston	.011	Paved	1	2	X		X
Pg. 119 & 120	28 section 65	<b>State Route 12</b> – from bridge #7 to bridge #8	WSDOT	Thurston	0.6	Paved	1	2	X		X



## Chehalis Reservation Natural Hazards Mitigation Plan

Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 119 & 120	28 section 70	<b>State Route 12</b> – bridge #8	WSDOT	Thurston	.026	Paved	1	2	X		X
Pg. 119 & 120	28 section 75	<b>State Route 12</b> – from bridge #8 to county boundary	WSDOT	Grays Harbor	0.5	Paved	1	2	X		X
Pg. 119 & 120	28 section 80	<b>State Route 12</b> – from county boundary to bridge #9	WSDOT	Grays Harbor	0.4	Paved	1	2	X		X
Pg. 119 & 120	28 section 85	<b>State Route 12</b> – bridge #9	WSDOT	Grays Harbor	.024	Paved	1	2	X		X
Pg. 119 & 120	28 section 90	<b>State Route 12</b> – from bridge #9 to bridge #10	WSDOT	Grays Harbor	1.1	Paved	1	2	X		X
Pg. 119 & 120	28 section 95	<b>State Route 12</b> – bridge #10 (Black River Bridge)	WSDOT	Grays Harbor	.03	Paved	1	2	X		X
Pg. 119 & 120	28 section 100	<b>State Route 12</b> – from bridge #10 to bridge #11	WSDOT	Grays Harbor	3.3	Paved	1	2	X		X
Pg. 119 & 120	28 section 105	<b>State Route 12</b> – bridge #11	WSDOT	Grays Harbor	.03	Paved	1	2	X		X
Pg. 119 & 120	28 section 110	<b>State Route 12</b> – from bridge #11 to bridge #12	WSDOT	Grays Harbor	2.5	Paved	1	2	X		X
Pg. 119 & 120	28 section 115	<b>State Route 12</b> – bridge #12	WSDOT	Grays Harbor	.02	Paved	1	2	X		X
Pg. 119 & 120	28 section 120	<b>State Route 12</b> – from bridge #12 to bridge #13	WSDOT	Grays Harbor	1.9	Paved	1	2	X		X
Pg. 119 & 120	28 section 125	<b>State Route 12</b> – bridge #13	WSDOT	Grays Harbor	.03	Paved	1	2	X		X
Pg. 119 & 120	28 section 130	<b>State Route 12</b> – from bridge #13 to bridge #14	WSDOT	Grays Harbor	2.5	Paved	1	2	X		X

# Chehalis Reservation Natural Hazards Mitigation Plan

Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 119 & 120	28 section 135	<b>State Route 12</b> – bridge #14	WSDOT	Grays Harbor	.02	Paved	1	2	X		X
Pg. 119 & 120	28 section 145	<b>State Route 12</b> – bridge #15	WSDOT	Grays Harbor	.03	Paved	1	2	X		X
Pg. 119 & 120	28 section 150	<b>State Route 12</b> – from bridge #15 to bridge #16	WSDOT	Grays Harbor	4.5	Paved	1	2	X		X
Pg. 119 & 120	28 section 155	<b>State Route 12</b> – bridge #16	WSDOT	Grays Harbor	.04	Paved	1	2	X		X
Pg. 119 & 120	28 section 160	<b>State Route 12</b> – from bridge #16 to Hwy 8 and Elma	WSDOT	Grays Harbor	.1	Paved	1	2	X		X
Pg. 121 & 122	29 section 5	<b>Blockhouse Road</b>	Grays Harbor County	Grays Harbor	0.4	Paved	4	2	X		X
Pg. 123 & 124	30 section 5	<b>Elma Gate Road</b>	Grays Harbor County, City of Oakville at East Main to Hwy 12	Grays Harbor	2.1	Paved	4	2	X		X
Pg. 125 & 126	31 section 5	<b>State Street</b> - from State Hwy 12 south to South Bank Road	City of Oakville	Grays Harbor	0.5	Paved	3	2	X		X
Pg. 127 & 128	32 section 5	<b>Duvall Lane</b>	Privately owned	Grays Harbor	0.1	Paved	3	0	X		X
Pg. 129 & 130	33 section 5	<b>Merritt Lane</b>	Privately owned	Grays Harbor	0.1	Paved	3	0	X		X
Pg. 131 & 132	34 section 5	<b>Mitchell Court</b>	Privately owned	Grays Harbor	0.1	Paved	3	0	X		X
Pg. 133 & 134	35 section 5	<b>Newton Street</b>	City of Oakville	Grays Harbor	0.1	Gravel	3	2	X		X
Pg. 135 & 136	36 section 5	<b>Oak Street</b>	City of Oakville	Grays Harbor	0.6	Paved	3	0	X		X

## Chehalis Reservation Natural Hazards Mitigation Plan

Map	Route No.	Route Name	Ownership	County Location	Length (miles)	Surface Type	Functional Class Code	Construction Need	2005 Tribal Inventory	1999 Official Status in BIA IRR Inventory	2006 Proposed Additions and Revisions to BIA IRR Inventory
Pg. 137 & 138	37 section 5	<b>Eagle Street</b>	City of Oakville	Grays Harbor	0.4	Paved	3	2	X		X
Pg. 141 & 142	39 section 5	<b>185<sup>th</sup> Ave SW</b>	Thurston County	Thurston	0.1	Paved	3	2	X		X
Pg. 143 & 144	40 section 5	<b>195<sup>th</sup> Ave SW</b>	Thurston County	Thurston	0.2	Dirt	3	2	X		X
Pg. 145 & 146	41 section 5	<b>Forstrom St SW</b>	Thurston County	Thurston	0.6	Paved	3	2	X		X
Pg. 147 & 148	42 section 5	<b>Ash Street</b>	City of Oakville	Grays Harbor	0.1	Paved	3	2	X		X
Pg. 149 & 150	43 section 5	<b>School Street</b>	City of Oakville	Grays Harbor	0.2	Paved	3	0	X		X
Pg. 151 & 152	44 section 5	<b>School Land Road SW</b>	Thurston County	Thurston	2	Paved	3	2	X		X
Pg. 153 & 154	45 section 5	<b>Subdivision Drive</b>	BIA	Grays Harbor	0.3	Paved	3	4	X		X
Pg. 155 & 156	46 section 5	<b>Park Street</b>	City of Oakville	Grays Harbor	0.1	Paved	3	2	X		X

# Chehalis Reservation Natural Hazards Mitigation Plan

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## Bridges

The National Bridge Inventory (NBI) is a national bridge inventory, which is the database of structural and appraisal data collected to fulfill the requirements of the National Bridge Inspection Standards. Each State and the BIA must maintain an inventory of all bridges that are subject to the NBI standards and provide this data to the Federal Highway Administration (FHWA). The NBI is maintained and monitored by the FHWA Office of Bridge Technology.

There are 33 bridges in the updated Chehalis Reservation Bridge Inventory. Table 3.7 shows summary data from the updated Chehalis Reservation Bridge Inventory.

<b>Table 3.7</b>			
<b>Chehalis Reservation Bridge Inventory</b>			
<b>Bridge I.D.</b>	<b>Length (ft)</b>	<b>Width (ft)</b>	<b>Surface</b>
Anderson - #1	108	49.4	Asphalt
Anderson - #2	36	48	Asphalt
Anderson - #3	85	49.7	Asphalt
Howanut - #1	50	24.6	Asphalt
Howanut - #2	165.8	28.6	Concrete
Howanut - #3	28.6	24.4	Asphalt
Howanut - #4	28.8	24.6	Asphalt
Howanut - #5	210	27.6	Concrete
Hwy 12 - #1	255	45	Asphalt
Hwy12 - #2	137	45	Asphalt
Hwy 12 - #3	261	28	Asphalt
Hwy 12 - #4	62	24	Asphalt
Hwy 12 - #5	45	36	Asphalt
Hwy 12 - #6	45	36	Asphalt
Hwy 12 - #7	60	36	Asphalt
Hwy 12 - #8	138	38	Asphalt
Hwy 12 - #9	131	37	Asphalt
Hwy 12 - #10	169	24	Asphalt
Hwy 12 - #11	163	24	Asphalt
Hwy 12 - #12	121	24	Asphalt
Hwy 12 - #13	189	24	Asphalt
Hwy 12 - #14	146	24	Asphalt
Hwy 12 - #15	165	24	Asphalt
Hwy 12 - #16	232	24	Asphalt
Hwy 99	44.7	23.3	Asphalt
Independence Rd	437	31	Concrete
Marble Street	23	24	Asphalt
Moon Rd	202.6	28	Asphalt
183 <sup>rd</sup> Ave SW - #1	65.9	24	Asphalt
183 <sup>rd</sup> Ave SW - #2	25.9	20.3	Asphalt

# Chehalis Reservation Natural Hazards Mitigation Plan

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Table 3.7 (continued) Chehalis Reservation Bridge Inventory cont.			
Bridge I.D.	Length (ft)	Width (ft)	Surface
S 188 <sup>th</sup> - #1	51.8	27.6	Asphalt
S 188 <sup>th</sup> - #2	61	27.6	Asphalt
Southbank-1	1077.3	27.6	Concrete

## Road Signs and Signals

A complete inventory of traffic signs on all roads in the IRR tribal inventory is not available, but includes stop signs on the following main roads:

### 2005 Stop Signs:

<u>Road Name</u>	<u>Number of Stop Signs</u>
Anderson Road	3
Howanut Road	2
Moon Road	2
Balch Road	1
Elma-Gate Road	1
South Bank Road	0
Cemetery Road	2
Block House Road	2
Niederman Road	1
Secena Road	0
183 <sup>rd</sup> Avenue (on reservation)	1
183 <sup>rd</sup> Avenue (off reservation)	2
195 <sup>th</sup> Avenue	0
State Street (City of Oakville)	1

There is one posted speed limit, 35 miles per hour, on the Reservation. The Tribe is discussing the possibility of reduced speed zones at the pedestrian crossing between the hotel and casino and other areas with road safety or pedestrian areas.

Road signs marking entry into the Reservation boundaries were installed in 2005.

## Street Lighting

Adequate street lighting is important for both pedestrian and vehicle safety, as well as for overall reservation security. However, as shown in the below list, only two roads on the Reservation currently have street lights, Howanut Road/188<sup>th</sup> Avenue and Niederman Road.

### 2005 Street Lights

<u>Road Name</u>	<u>Number of Street Lights</u>
Howanut Road	8
Secena Road	0

# Chehalis Reservation Natural Hazards Mitigation Plan

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Niederman Road	9
183 <sup>rd</sup> Avenue	0
195 <sup>th</sup> Avenue	0
South Bank Road	0
Fitzgerald Road	0
Cemetery Road	0
Balch Road	0
State Street (City of Oakville)	6
State Route 12 – in Oakville	6
State Route 12 – Elma Gate intersection	3
State Route 12- Anderson Road intersection	4
State Route 12- Moon Road intersection	4

## **Traffic Circulation Data**

Permanent traffic counters have recently been placed on Anderson, 188<sup>th</sup>, and Howanut Road and four mobile counters have recently been purchased and will be moved around to collect data on roads. The additional traffic count data which these counters will provide will assist in Tribal Transportation planning efforts.

## **Pedestrian Facilities**

There is a significant amount of pedestrian activity on the reservation by tribal members, and an increasing amount by visitors and tourists, making sidewalks an important issue on the reservation.

Currently, the only existing sidewalk is along Howanut Road/188<sup>th</sup> Avenue. It runs one mile between the Tribal Complex and the Lucky Eagle Casino/Eagle's Landing Hotel area. A pedestrian bridge has recently been constructed over 188<sup>th</sup> Avenue providing covered and safe pedestrian passage between the Hotel and Casino areas. Running underneath the pedestrian bridge is a raised and lighted crosswalk.

Pedestrian activity along Niederman Road in particular increases significantly on a seasonal basis in order to access those lands traditionally used for seasonal wholesale and retail fireworks sales. A new 0.4 mile sidewalk is being planned for the west side of Niederman Road. The sidewalk will start at Fern Drive and tie into the existing sidewalk near the Tribal Store at Howanut Road. The project will also include drainage improvements to both sides of Niederman.

Sidewalks were deliberately not installed along Anderson Road when that road was improved in 2003. Anderson Road is frequently covered by floodwaters which would undermine any sidewalks if they would have been built along the road. In the absence of sidewalks, extra wide shoulders were built to accommodate pedestrians.

# Chehalis Reservation Natural Hazards Mitigation Plan

## **Regional Public Transit**

The Chehalis Reservation does not receive any regional public transit service.

Thurston County, Intercity Transit: Intercity Transit is the Thurston County public transit provider. A 45 percent reduction in revenue due to the repeal of the motor vehicle excise tax prompted Intercity Transit to redraw its service boundary in 2002 with a focus on service in the more populated areas of Thurston County. Consequently, Intercity Transit eliminated service to southern Thurston County and rural areas. Subsequent tax increases have resulted in expansion of Intercity Transit service, however, there continues to be no service to rural areas and Intercity Transit has indicated that it has no plans to restore rural transit service.

Grays Harbor County: Grays Harbor Transit is the public transit provider in Grays Harbor County. Route 40 is the East County route and provides service from Hoquiam, to Aberdeen, Montesano, Elma, McCleary and Olympia, where riders can connect with the Olympia Greyhound Station and Olympia Transit Center. Other routes connect with Aberdeen, Hoquiam, Ocean Shores, Westport, Grayland, and the Quinault Reservation.

Mason County: Mason County Transportation Authority is the public transit provider in Mason County and provides connection to the Squaxin Island and Skokomish Reservations. Route 6 runs from Shelton to Olympia, making connection with Intercity Transit and other connections available from Olympia. The Mason County Transportation Authority provides service from Shelton north along Hood Canal to Brinnon where connections can be made with Jefferson Transit. Service also runs northeast from Shelton to Belfair where connections can be made to Bremerton. In Bremerton connections can be made with Kitsap Transit.

Lewis County: Twin Transit is the public transit provider in Lewis County. Twin Transit's core service area includes the cities of Centralia and Chehalis.

## **Chehalis Tribal Transportation Program**

The Chehalis Tribal Transportation Program is a grant funded rural transportation program providing variable fixed route and on-demand services for the Chehalis Reservation and surrounding rural areas, beginning in the Fall of 2004. The program provides transportation to the rural communities of Oakville, Rochester, and Grand Mound along State Route 12, and to those communities along I-5 between Centralia/Chehalis and Olympia. Further outlying areas are serviceable upon request.

One of the objectives of this service is to provide connection to Intercity Transit services. From Olympia, further connections can be made with Grays Harbor Transit, Mason County Transportation Authority, Pierce Transit and the Nisqually Reservation.

# Chehalis Reservation Natural Hazards Mitigation Plan

The Tribal Transportation Program provides an important transportation option for tribal members and others in the surrounding rural communities. Running between 6:00 a.m. and 4:00 p.m., Monday through Friday, data on the program for the first two months of 2005 shows that the program averages 800 plus miles of travel and about 20 riders per day. Over January and February 2005, a total of 915 riders made use of the program, and total mileage for the program was approximately 35,500 over 700 hours.

## **School Buses**

Transportation by school bus is provided to school children living on the reservation by the Tribal Head Start program, the Wa-He-Lut School, and the Oakville and Rochester School Districts. In 2005 Wa-He-Lut School provided transportation for 12 children living on the reservation, Rochester School District transported 52 and 4 special needs children, and Oakville transported approximately 50 students living on the reservation.

Pedestrian safety is of particular concern on streets with school bus stops as well as those streets children travel between home and the bus stop. The following lists indicate those streets with school bus stops. Not all of the roads are a part of the Tribal Roads Inventory:

### **Chehalis Tribal Head Start Program**

<u>Reservation Road</u>	<u>City of Oakville</u>	<u>Rochester</u>
Tahown Drive	Elma Gate Road	Hwy 12
Lacamus Lane	Center Street	
Petoie Lane	Oak Street	
195 <sup>th</sup> Avenue	South Bank Road	
Howanut Road	Oak Meadows Lane	
Fern Lane	Downey Lane	
	Main Street	
	Merritt Road	
	Newston St	

### **Oakville School District**

Tahown Drive	Fern Lane
Howanut Road	195 <sup>th</sup> Ave SW
Davis Drive	Elma Gate Road
Anderson Road	Howanut & Niederman Roads
Petoie Lane	

### **Rochester School District**

Highway 12	198 <sup>th</sup>	Tahown Drive
188th	179th	201st
Anderson Road	176 <sup>th</sup>	Hilt Street



# Chehalis Reservation Natural Hazards Mitigation Plan

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Moon Road  
183<sup>rd</sup> Road  
Forstrom Road

Lacamus Lane  
Applegate Loop

Albany  
Holm

## **Casino Bus Service**

The Lucky Eagle Casino provides bus shuttle service which brings customers on to the reservation from significant distances on a daily basis. The free bus shuttle service generally picks customers up in the morning, allows for an approximately four hour visit at the Casino in the afternoon and then returns customers to the communities they live in later in the day. Communities generally on the I-5 corridor to the north which are served by the shuttle service include Burien, Tukwila, Federal Way, Tacoma, Lacey/Olympia, Seattle, Kirkland, Bellevue, Renton, Puyallup, Kent, and Lakewood. To the east, shuttle service is provided to the Grays Harbor County communities of Hoquiam, Aberdeen, Montesano, and Elma. Communities in Kitsap County which are served by the shuttle service include Poulsbo, Bremerton, and Port Orchard. To the south, shuttle service is provided to Vancouver, Kelso, and Woodland in Washington State and to the Portland, Oregon area.

## **Rail and Freight Issues**

In 2005 the Thurston Regional Planning Council began preliminary work on updating a regional Rail Plan which will consider both passenger and freight services. As a part of early discussions around that plan, TRPC staff contacted Tribal planning staff to solicit input on rail issues affecting the Chehalis Reservation. During these discussions tribal staff noted that a rail line runs along Tribal property the Tribe is developing for a convention center. Tribal staff conveyed interest in continuing to be apprised of any rail issues and plans which may affect the rail line in that area.

Truck traffic on both Highway 12 and Anderson Road, the primary access facility, has been an issue of long standing concern to the Tribe. Economic, government services and residential development during the past ten years necessitated the design and construction of a new Anderson Road in 2002. This work brought the road, originally constructed in 1925, up to current standards to support economic growth and the truck traffic associated with that growth. The Tribe is currently working with WSDOT to bring the Black River Bridge on SR 12 up to current standard. Moon Road, the secondary access facility, is also in need of improvement to accommodate truck and recreational vehicle traffic.

# Chehalis Reservation Natural Hazards Mitigation Plan

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## **RISK ASSESSMENT – ASSESSING VULNERABILITITES – ESTIMATING POTENTIAL LOSSES**

### **MITIGATION CONSTRUCTION PROJECTS Standard Construction and Remodel Rates**

To calculate the replacement costs of infrastructure, specifically buildings, can be estimated by using Washington State's Per Square Foot Construction Rates multiplied by the total square footage of the replacement structure. These total costs will vary depending on the type, usage, and location of the structure(s). Debris Removal is not incorporated in the replacement values of each structure; but is calculated as a separate project authorized under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (P.L. 93-288, as amended), Public Assistance Guidelines.

Within Washington State, the rates are higher:

Replacement (New Construction) Cost per square Foot.	\$200.00
Rebuild/Remodel Cost per square Foot.	\$150.00

# Chehalis Reservation Natural Hazards Mitigation Plan

**Table 3.3**

Chehalis Tribe 2007-08 COPE Table

Chehalis Tribe  
2007-08 COPE

Loc	Description	Building	Structure & Building Values	Flood Zones	EPO	BSEE	Signs	Construct Type	Sq. Footage	Yr. Built	Inspection Class	Staffs	Occupancy	Estimated Cost	Notes
11	607 Old Grocery Store #1 420 Hoquiam Road Okanogan, WA	\$380,000		C 80271916	\$ 254,800	\$ 154,000		Frame	1,501	1988	07	1	Store	No	New roof, gutters, siding in 2004 Remains square footage Insulation concrete floor, D15 Demolitor ENTRYPRIIZE
11.2	Generator	\$1,086,000									07	1	Admin	No	
12	Administration Building										07	1		No	
13	420 Hoquiam Road Okanogan, WA	\$1,390,000		C				Frame	9,213	1993 (2000/2008 renovations, red seal, plumbing) renovations completed)	07	1	Clinic	No	
13.2	Health Clinic Annex 420 Hoquiam Road Okanogan, WA	\$259,700		C				Frame	1,440	1999	07	1	Clinic, Aux		
14	Office 420 Hoquiam Road Okanogan, WA	\$34,100		C	\$ 6,600			Frame	612	1980	07	1	Offices		
15	104th A24247 Cemetery 420 Hoquiam Road Okanogan, WA	\$1,084,326		C	\$ 15,000			Frame / Metal Roof	10,400	2005	07	1	Health	No connections	
16	420 Hoquiam Road Okanogan, WA	\$55,200		C				Frame	1,040	1998	07	1	Pygmy		
17	Well House 420 Hoquiam Road Okanogan, WA	\$9,500		C				Frame	100	1980	07	1	Pump		
18	Water Tower 420 Hoquiam Road Okanogan, WA	\$1,200,000		C					720,000 gallon cap	2002	07	1	N/A		
19	420 Hoquiam Road Okanogan, WA	\$522,500		C	\$ 100,300			Frame	3,424	1990	07	1		No	ENTRYPRIIZE
110	420 Hoquiam Road Okanogan, WA	\$927,300		C	\$ 252,400			Frame / Metal Roof	12,200	1999	07	1	ChildCare	Fire Alarm	2004 Renovation Re-valuable
111	420 Hoquiam Road Okanogan, WA	\$50,816		C	\$ 25,300			Metal	1,330	1975	07	1	Storage		
112	420 Hoquiam Road Okanogan, WA	\$4,000		C	\$ 9,900			Frame/Metal	1,200	1978	07	1	Storage		Try & Locate
113	420 Hoquiam Road Okanogan, WA	\$27,700		C				Frame	612	2000	07	1	N/A		
21	Water Tower #2 420 Hoquiam Road Okanogan, WA	\$200,000		C					100,000 gallon cap	1980	07	1	N/A		
31	1910 L - 1st St Accession Road Okanogan, WA	\$1,500,000		B 80398545	\$ 1,000,000	\$ 400,000		Frame	2,200	2002	07	1	retail	No	

1/24/2008

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# Chehalis Reservation Natural Hazards Mitigation Plan

Chehalis Tribe  
2007-08 COPE

Loc	Description	Building	Marshall & Swift Rating Values	Flood Zones	BPP	BIEE	Signs	Construct Type	Sq. Footage	Yr. Built	Protection Class	Stories	Occupancy	Structure/Fire Controls	Notes
3-1.5	Espresso Stand (NEV) 18104 - 18105 Anderson Rd Oakville, WA 98568	\$8,000		B				Frame	225	Unk	7	1	Espresso		ENTERPRISE
4-1	Rental Dwelling 7593 Hwy 12 Oakville, WA	\$180,000		B		\$ - 11,500 LOR		Frame	1,200	1985	07	1	Tenant occupied		
4-2	Garage 7593 Hwy 12 Oakville, WA	\$24,000		B				Frame	600	1985	7	1			
4-3	Shed 7593 Hwy 12 Oakville, WA	\$12,000		B				Frame	100	1985	7	1			
4-4	Well House Shed 7593 Hwy 12 Oakville, WA	\$12,194		B				Frame	180		7	1	Storage		
4-5	Metall Building 7593 Hwy 12 Oakville, WA	\$33,750		B				metal	900		7	1			
5-1	Office 18016 Anderson Road Rochester, WA	\$56,000		B	\$ 10,000	\$ - 33,500		Frame	2,500	1950	07	1	Offices		
5-2	Barn 18016 Anderson Road Rochester, WA	\$4,000		B				Frame	1,500	1950	07	1			
5-3	Rump House 18016 Anderson Road Rochester, WA	\$2,000		B				Frame	150	1950	07	1			
5-4	Workshop Building 18016 Anderson Road Rochester, WA	\$5,000		B				Frame	250	1950	07	1			
5-5	Barn #2 18016 Anderson Road Rochester, WA	\$5,000		B				Frame	1,500	1950	7	1			
5-7	Garage 18016 Anderson Road Rochester, WA	\$5,000		B				Frame	400	1950	7	1			
6-1	Blanket Signs 1-5 north of exit 86 and Exit of Trail Stove			C		\$ 423,500									ENTERPRISE
7-1	Rental Duplex 39 & 45 Merritt Ave Oakville, WA	\$265,000		C	\$ 3,700	\$ - 13,200		Frame	2000	2002	7	1	Tenant Occupied		
8-1	Public Safety Building (Court Police Dept) 24 Noddeman Road Oakville, WA	\$1,800,000		C	\$ 600,000	7777777		masonry & frame	10500	2005	7	1	garage	sprinklers	Speak with Rich Wynnan Police Chief Reed Contacts call
9-1	Banley Hibbs Home 207 Fougner Road Oakville, WA	\$71,000		A		\$6,800 LOR		Frame	1243	1999	8	1			
9-2	Quality Air Conditioning 18016 Anderson Road Rochester, WA	\$0		A				Frame	3000	1920	8	1			

# Chehalis Reservation Natural Hazards Mitigation Plan

Chehalis Tribe  
2007-08 COPE

Loc	Description	Building	Marshall & Swift Building Values	Flood Zones	BPP	BIEE	Signs	Construct Type	Sq. Footage	Yr. Built	Protection Class	Stories	Occupancy	Special/HazFire Controls	Notes
15-1	Garage - 48 X 24 ft 24500 Old Hwy SW Centralia, Wa. 98531	\$150,000		C				Frame	1800	1994		1			Re-evaluate at end of September
16-1	Dwelling 21221 Old Hwy 99 Centralia, Wa. 98531			C											
16-2	Barn 21221 Old Hwy 99 Centralia, Wa. 98531			C											
16-3	Metal Bldg 21221 Old Hwy 99 Centralia, Wa. 98531	\$125,138		C				Metal	1800	1994		1			Inspect
17-1	Land - Robert Layman Property - 38 Acres 19121 Mood Road SW Rochester Wa 98579			A											
18-1	Land Gleason Prop - 4 Acres Lots 7-11, Blk 4, Bagshaw Oakville, Wa. 98598	\$5,000		C											
18-1	Branner Property - 168 Acres 826 Ash Street Oakville, Wa. 98598			B				Frame	1760	1999		1			Barn
20-1	Blubaugh Property - Land 70 Acres 12833 SW 188th Ave Rochester, Wa. 98568			A											
21-1	Mobile Home and Carport 5820 216th St. SW Centralia, Wa. 98531	\$26,022		C	\$ 0,000 LOR			Frame	600	1990		1			
21-2	Barn 5820 216th St. SW Centralia, Wa. 98531	\$123,850		C				Frame	1200			1			
21-3	Outbuilding 5820 216th St. SW Centralia, Wa. 98531	\$13,381		C				Frame	120			1			
21-4	Wind Shed 5820 216th St. SW Centralia, Wa. 98531	\$18,700		C				Frame	400			1			
21-5	Modular and Porch 5820 216th St. SW Centralia, Wa. 98531	\$149,449		C	\$ 7,800 LOR			Frame	1300						
21-6	Carport & Storage 5820 216th St. SW Centralia, Wa. 98531	\$8,650		C				Frame	480						
21-7	Out Building 5820 216th St. SW Centralia, Wa. 98531	\$5,000		C				Frame	160						
21-8	Small Storage 5820 216th St. SW Centralia, Wa. 98531	\$5,000		C				Frame	24						
21-9	Out House 5820 216th St. SW Centralia, Wa. 98531							Frame	25						
21-10	Wind Shed 5820 216th St. SW Centralia, Wa. 98531	\$5,000		C				Frame	120						

1/24/2009

# Chehalis Reservation Natural Hazards Mitigation Plan

Chehalis Tribe  
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Loc	Description	Building	Market & Rental Value	Flood Zones	BRP	BREE	Signs	Construct Type	Sq. Footage	Yr. Built	Proction Class	Stories	Occupancy	Special/Infr. Controls	Notes
24-11	Wood Shed 8439 218th St. SW Centralia, WA 98531	\$3,000		C				Frame	225						
24-1	Dwelling 18123 Anderson Rd Olyville, WA 98558	\$246,593		B				Frame	2450	Link	7	1	Dwelling		MOVE TO CHEHALIS TRIBAL CONSTRUCTION ENTERPRISE
24-1	Barn 18125 Anderson Rd Olyville, WA 98558	\$131,025		B				Frame	120	Link	7	1			
24-1	Main Dwelling w/ garage 20938 Billie Mills St. SW Centralia, WA 98531	\$133,724		C				Frame	1316	1929	7	1	Dwelling	No	
24-2	Road House (To be demo) 20938 Billie Mills St. SW Centralia, WA 98531							Frame	162	1929	7	1		No	
24-3	Woodwork Shop (To be demo) 20938 Billie Mills St. SW Centralia, WA 98531	\$5,000		C				Frame	288	1928	7	1		No	
24-4	100 Terry House #1 (To be demo) 20938 Billie Mills St. SW Centralia, WA 98531	\$5,000		C				Frame	665	1928	7	1		No	
24-5	100 Terry House #2 (To be demo) 20938 Billie Mills St. SW Centralia, WA 98531	\$5,000		C				Frame	800	1928	7	1		No	
24-6	Barn w/2 side sheds (To be demo) 20938 Billie Mills St. SW Centralia, WA 98531	\$5,000		C				Frame	2504	1928	7	2		No	
24-7	Wood shed (To be demo) 20938 Billie Mills St. SW Centralia, WA 98531	\$5,000		C				Frame	224	1928	7	1		No	
24-1	Dwelling 20844 SW Billie Mills St SW Centralia WA 98531	\$135,600		C	\$ 1,500	8403_LOR		Frame	2000	1991		1			Eval Blm & Add to Schedule
24-1	TGA Mobile Modular 12888 - 198th SW Rochester (rented space from Calans - Consents Only)	\$0		C	\$ 104,000			Frame	1722	2005	7	1		No	



# Chehalis Reservation Natural Hazards Mitigation Plan

Chehalis Tribe  
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Lic	Description	Building	Marshall & Swift Building Values	Flood Zones	BP	BIEE	Signs	Construct Type	Sq. Footage	Yr. Built	Protection Class	Stories	Occupancy	Structural/Frame Concrete	Notes	
35-2	2169 South Bank Road Oakhville, WA			C				Concrete							(See location 34-1 for notes) 12" diameter 20' high Poor condition	
35-3	2168 South Bank Road Oakhville, WA			C											Metal roof in poor condition 20' high	
35-4	2169 South Bank Road Oakhville, WA		\$115,548	C					1500			1			new concrete, metal roof & siding occupancy garage/storage	
35-5	2168 South Bank Road Oakhville, WA			C				Wood frame	900						metal siding occupancy vacant	
		total:	\$19,981,132			\$5,535,103	\$ 1,424,000									\$ 425,000
		Grand Total:	\$25,363,132													



# Chehalis Reservation Natural Hazards Mitigation Plan

## RISK ASSESSMENT – ASSESSING VULNERABILITIES – IDENTIFYING STRUCTURES

Name	Year Built	Building Type	Foundation Type	Planned (P) for Approved Development (AD)	Critical Facility Y/N	Building Stock	Interruption of Services @ 100%	Interruption of Services @ 80%	Interruption of Services @ 60%	Interruption of Services @ 40%	Interruption of Services @ 20%	Interruption of Services @ 0%
Medical Center	2006	Tilt up Concrete		P&AD	Y	Medical						
Police Department	2005	Light Steel/CMU		P&AD	Y	Emergency Response Agency						
Public Works	2008	Pole Barn		P&AD	Y	Emergency Response Agency						
Community Center	08/09	CMU		P&AD	Y	Evacuation Shelter						
Tribal Center	1974	Stock Built		P&AD	Y	Evacuation Shelton						
Head Start	1996	Modular		P&AD	Y	Special Needs Population						
Elders Center	1996	Modular		P&AD	Y	Special Needs Population						
Social & Family Services Bldg.	1992	Stick Built/ Modular		P&AD	Y	Special Needs Population						
Eagles Landing		High Density Commercial		P&AD	Y	High density population – includes tourists, elders, special needs						

## RISK ASSESSMENT – ASSESSING VULNERABILITIES – IDENTIFYING STRUCTURES

Name	Year Built	Owner	Critical Facility Y/N	Interruption of Services @ 100%	Interruption of Services @ 80%	Interruption of Services @ 60%	Interruption of Services @ 40%	Interruption of Services @ 20%	Interruption of Services @ 0%
Telephone	2008	Tribe	Y						
Potable Water	2002	Tribe	Y						
Waste Water									
Casino/Hotel	2008	Tribe	Y						
Petoie Housing	2008	Tribe	Y						
Tribal Complex	2005	Tribe	Y						
Electric power lines		PSE/Grays Harbor PUD	Y						

# Chehalis Reservation Natural Hazards Mitigation Plan

RISK ASSESSMENT - ASSESSING VULNERABILITIES - IDENTIFYING ECONOMIC STRUCTURES												
Name	Year Built	Building Type	Foundation Type	Planned (P) or Approved Development (AD)	Critical Facility (y/n)	Building Stock	Interruption of Services @ 100%	Interruption of Services at 80%	Interruption of Services @ 60%	Interruption of Services @ 40%	Interruption of Services @ 20%	Interruption of Services @ 0%
Great Wolf Lodge	2008	Multi-level, High density resort		P&AD		High density population includes tourists, families, special needs						
Eagles Landing Hotel	2003	Multi-level, High density resort		P&AD		High density population - includes tourists, conference attendees, families						
& 2008												
Name	Year Built	Building Type	Foundation Type	Planned (P) or Approved Development (AD)	Critical Facility (y/n)	Building Stock	Interruption of Services @ 100%	Interruption of Services at 80%	Interruption of Services @ 60%	Interruption of Services @ 40%	Interruption of Services @ 20%	Interruption of Services @ 0%
Lucky Eagle Casino	Built 1997, Add 2002 & 2008	High Density Commercial		P&AD		High density population - includes tourists, elders, special needs,						
End of the Trail I - Mini Mart	1997	Grocery store		P&AD		Supplies and Basic need items						
End of the Trail II - Gas Station & Mini Mart	2002	Gas station, Propane, and Mini Mart		P&AD		Fuel, Propane, Supplies and Basic need items						

# Chehalis Reservation Natural Hazards Mitigation Plan

RISK ASSESSMENT - ASSESSING VULNERABILITIES - IDENTIFYING HIGH DENSITY RESIDENTIAL													
Residential Area Name	Neighborhood	Building Type(s)	Location	Floodplain (Y/N)	Planned (P) or Approved Development (AD)	Notes	Building Stock	Interruption of Services @ 100%	Interruption of Services at 80%	Interruption of Services @ 60%	Interruption of Services @ 40%	Interruption of Services @ 20%	Interruption of Services @ 0%
Core	Tahown	Mixed (stucco, mobile, manufactured, modular)	Anderson Rd & Howanut Rd	N	P&AD	Utilities are limited and include community water, power, cable and telephone. Community septic system replaced on (8) year cycle systems.	High density HUD development						
Core	Makum	Mixed (stucco, mobile, manufactured, modular)	Along Howanut and bordered on west by Niederman Road	N	P&AD	Utilities are limited and include community water, power, cable and telephone	High density HUD Homeownership development						
Core	Davis Road	Mixed (stucco, mobile, manufactured, modular), apartment rental units, multi-family and single family rental units	Off Niederman Road adjacent to Chehalis Tribal Complex	N	P&AD	Utilities include community water, power, cable and telephone. Community septic system replaced on (8) year cycle systems.	High density HUD rental development						

# Chehalis Reservation Natural Hazards Mitigation Plan

RISK ASSESSMENT - ASSESSING VULNERABILITIES - IDENTIFYING HIGH DENSITY RESIDENTIAL													
Residential Area Name	Neighborhood	Building Type(s)	Location	Floodplain (Y/N)	Planned (P) or Approved Development (AD)	Notes	Building Stock	Interruption of Services @ 100%	Interruption of Services at 80%	Interruption of Services @ 60%	Interruption of Services @ 40%	Interruption of Services @ 20%	Interruption of Services @ 0%
Core	Core	Individual allotment residents. Future use includes: community facilities, churches and recreational facilities	Bounded on the south by Secena Road and on the north by Howanut Road	N	P&AD	Homes are served by individual septic systems.	Individual allotments						
Oakes	Oakes/Mitchell	Permitted for up to 15 units with individual septic systems	Adjacent to the City of Oakville	N	P&AD	No Tribal utilities are provided. No Tribal water and served by City of Oakes.	9.52 acre parcel , located above the floodplain						
Vosper	Vosper	Medium density development with mixed low to moderate income, single family housing.	Off of Balch Road	N	P&AD		HUD planned unit development, 15.26 acres held in trust for the Tribe						

# Chehalis Reservation Natural Hazards Mitigation Plan

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RISK ASSESSMENT - ASSESSING VULNERABILITIES - IDENTIFYING HIGH DENSITY RESIDENTIAL													
Residential Area Name	Neighborhood	Building Type(s)	Location	Floodplain (Y/N)	Planned (P) or Approved Development (AD)	Notes	Building Stock	Interruption of Services @ 100%	Interruption of Services at 80%	Interruption of Services @ 60%	Interruption of Services @ 40%	Interruption of Services @ 20%	Interruption of Services @ 0%
Rural Residential	Central	Mixed stick built & Modular Construction	Along Howanut Road	Y	P&AD	Homes served by small community well and individual septic systems. Also, area is not suitable for further residential development.	Low population density - range is (1unit:1acre) to (1unit:10acres).						
Rural Residential	Western	Mixed stick built & Modular Construction	Located along Balch, South Bank, and Cemetery Roads	N	P&AD	Checkerboard of fee simple and trust lands.	Future development density estimation is 1 unit to 5 acres						

## RISK ASSESEMENT – ASSESSING VULNERABILITIES – ANALYZING DEVELOPMENT TRENDS

In 2004, the Tribe adopted its first Comprehensive Land Use Plan implementing Zoning Ordinance. Land use categories include (5) zones: Chehalis Forested Lands, Rural/Agriculture, Commercial, Residential and Sensitive Lands (Environmental and Cultural). Sensitive Lands may overlay any other zone (Council). The Land Use Plan assures compatibility of land uses on the Reservation. The Land Use Plan protects the natural resources native to the area and assures that adequate locations are available for affordable housing. The Land Use Plan

# Chehalis Reservation Natural Hazards Mitigation Plan

protects property rights of all residents. While developing the Land Use Plan the Tribe found the Chehalis Tribe has jurisdiction and duty to protect quality of the environment within the boundaries of the Chehalis reservation. The Chehalis reservation is a small land base that must provide for the economic, residential, cultural, recreational and governmental needs of the Chehalis Tribal community, now and in the future. The Chehalis reservation contains ecologically sensitive lands, culturally sensitive historic sites and archaeological sites, and includes portions of the Black and Chehalis rivers. Any action adversely affecting these and all areas within the Reservation ecosystem affects the Tribe.

## **Land Use Criteria**

The Chehalis Tribe has put forth the following objectives in developing a comprehensive land use plan, as established within the Chehalis Permitting Ordinance, and developed specific criteria for the final land use designation for each area.

1. Protection of the essential Tribal character of the Reservation in its entirety;
2. Suitability of the natural environment to support a specific land use action and surrounding density;
3. Presence or absence of existing infrastructure and ease of expandability;
4. Protection of natural resources and features of the Chehalis river from contamination, pollution and other degradation;
5. Protection and enhancement of habitat of all types of fish, forestry and wildlife;
6. Minimizing or eliminating adverse impacts that would result from locating developments in environmentally sensitive areas;
7. Preservation of open, rural environment that has been traditional within the exterior boundaries of the Chehalis Indian Reservation;
8. Sufficient development within to enable housing, public services and employment for residents of the Reservation;
9. Conformance with Chehalis Flood Damage Prevention Ordinance, #199-44, to ensure all future developments meet flood hazard reduction standard, thereby, reducing flooding threats and impacts to reservation residents, their property, Tribal services and community infrastructure.

## **Primary Land Use Designations**

### **Chehalis Forested Lands**

The Comprehensive Land Use Plan establishes the Chehalis Forested Lands designation as the primary designation of lands within the reservation boundaries. The intent of the Chehalis Forested Lands designation is to preserve or rehabilitate larger contiguous tracts of land for natural resource management. These lands provide timber, water resources, fisheries, wildlife habitat, spiritual refuge, recreation and open space, and allow for the natural flooding of the Chehalis and

## Chehalis Reservation Natural Hazards Mitigation Plan

Black rivers. Areas designated as Chehalis lands contain several of the following features: potential marketable timber or the capacity for timber harvest and replanting, critical watershed basins, significant parcels of Sensitive Lands, lands bordering the rivers, native plants, and fish and wildlife habitats. They are typically (10) acres or larger and have no improved roads or services. They may be located along the river, within the flood plain and in the major floodways. Chehalis Forested Lands are rarely developed and recreation use is encouraged. An important Tribal goal is the reclamation of lands formerly used for agriculture/rural for use as forested lands. These lands are subject to annual flooding and are not suitable for residential or commercial uses other than forestry and related uses. Lands along the Chehalis and Black rivers and land east of Anderson Road in the floodway and lands bordering the Chehalis, Black and Willamette waters are considered Chehalis Forested Lands. The lands bordering the Chehalis River are also designated Chehalis Forested Lands and conservation of these lands are critical to the Tribe's management of the Chehalis fisheries.

## Chehalis Reservation Natural Hazards Mitigation Plan

Summary of Proposed Development Zones							
Development Zone ID	Acres	Name	Type	Current Units	Current Population	Future Units	Future Population
1	195	Core	CR	10	36	78	278
2	7	Oakes	HDR	7	25	13	47
3	15	Vosper	MDR	0	0	23	82
4	83		C	0	0	0	0
5	23		LDR	0	0	18	63
6	41		LDR	14	50	31	109
7	180		RA	4	14	18	64
8	7	Makum	HDR	5	18	14	50
9	22	Davis/Fern	RA	36	128	43	153
10	14	Tahown	HDR	23	82	28	99
11	3	Mitchell	HDR	10	36	7	25
12	13		HDR	0	0	1	0
13	257		RA	7	25	26	92
14	25		RA	0	0	2	9
15	17		C	0	0	0	0
16	150		RA	1	4	15	53
17	14		MDR/C	8	28	3	12
18	136		MDR/C	0	0	34	121
19	98	SBankRd	RA	41	146	10	35
20	11		RA	0	0	1	4
21	11		HDR	18	64	22	78
22	3		RA	0	0	0	1
23	19		LDR	0	0	14	50
24	19		MDR/C	0	0	5	17
25	89		RA	4	14	9	32
26	274		RA	11	39	27	97
Other	2471		OTHER	8	28	8	28
<b>Total</b>	<b>4197</b>			<b>207</b>	<b>737</b>	<b>450</b>	<b>1599</b>

LEGEND: CR – Core Residential; HDR – High Density Residential; MDR – Medium Density Residential; C – Commercial; LDR- Low Density Residential; RA- Rural/Agricultural



# Chehalis Reservation Natural Hazards Mitigation Plan

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## **Residential**

New residential construction is not being permitted within the flood plain. All development within the reservation must conform to the Chehalis Flood Damage Prevention Ordinance.

Core Residential Area is located along the north and south sides of Howanut and on both sides of Anderson. Tribal government administration, housing authority, public safety, health and social services are located within this area. HUD housing developments are located at Makum Road and Tahown Road. Home ownership developments and a third HUD rental development are on Davis Road. This land has been the traditional development area within the reservation due to its location above the 100-year floodplain. The 100-year floodplain borders the Core residential area on the north, south, east, and west. Core residential area is surrounded on all four sides by floodplain.

Oakes Residential Area is located above the 100-year floodplain and is a high-density planned unit development adjacent to the City of Oakville.

Vosper Residential Area is located off Balch Road and above the 100-year floodplain. The Vosper development and adjoining land is above the 100-year floodplain and designated residential.

Rural Residential Area is low density rural residence developed at scattered sites throughout the reservation - current uses include individual leisure and recreation uses. Lands in the western portion of the reservation along Balch, South Bank and Cemetery Roads are above the 100-year flood plain.

## Planned Unit Developments

In the next 20 years, the Chehalis Business Committee may approve Planned Unit Developments containing apartments, duplexes or multi-family units on lots under one acre, and single family dwellings on lots one acre or less to provide affordable housing within residential designations under the Special Permit process.

Planned Unit Developments may not be located within the floodplain due to the chronic nature of flooding on the reservation and the impacts of such flooding on water, wastewater and road systems. During annual flood events, instability within the jurisdiction to assure the safety of residents during frequent flood events includes the lack of access to roadways and services.

## **Rural / Agricultural Lands**

Most R/A Lands are within the 100-year floodplain and located between the Tribal center complex and the Elma Gate Road. The area has a high water table, no public utilities and subject to frequent flooding. Significant portions of this area also may meet the Sensitive Lands criteria and lie within major floodways. It is the Tribe's intention to convert these areas to Chehalis Forested or Recreation use. This area is located within the floodplain and subject to frequent flooding. During severe

# Chehalis Reservation Natural Hazards Mitigation Plan

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flooding, this area becomes part of the floodway. All are within the 100-year floodplain and these lands are generally unsuitable for intense residential developments. Existing homes have been built up to withstand frequent floods, though they may not be above the 100-year floodplain. Existing homes were built prior to adoption of building codes, floodplain ordinance and land use policies. Five homes were elevated above BFF in 1997.

## **Commercial Lands**

Commercial lands may be located within the floodplain within the constrictions of the Chehalis Flood Damage Prevention Ordinance and subject to hydraulic study to assure no net loss of flood storage. However, due to unsuitable lands, future commercial areas are likely to be outside the exterior boundaries of the reservation. Anderson Road due to its location in the severe flood way of the 100-year floodplain and it has carefully designed for floodplain storage and flood passage.

## **Industrial Lands**

The Tribe has chosen not to have an industrial zone.

## **Summary of Tribal Land Use Goals and Objective**

The Tribe's Zoning Ordinance ensures use of land that is sensitive to physical and aesthetic nature, protects and reinforces Tribal lifestyles and culture; provides planned community facilities, roads; prudently manage economic development; assure compatibility with adjacent lands; protect and enhance fish, wildlife, forests, water, agriculture and other natural resources; prevent degradation; preserve rural character; carefully manage gravel or other mineral mining; ensure housing and business developments meet the needs of Tribal members and Reservation residents; protect against development in areas subject to historic flood events, long standing periods of standing water, and geological unstable areas without impacting historic and cultural patterns of Chehalis Tribal life; ensure consistent development of public facilities and services; preserve and restore natural conditions of Willamette Creek, Chehalis and Black rivers as well as other Reservation aquatic areas; preserve and protect cemeteries, archeological sites, and artifacts from harm; to maintain and enhance trails, berry and fruit picking areas of the Chehalis Tribe. Chehalis Tribal culture emphasizes living within nature's limitations rather than controlling nature for man's benefit. In conclusion, future developments are consistent with the Chehalis Flood Damage Prevention Ordinance, #1997-44 to meet flood hazard reduction standards and thereby reduce flooding threats and impacts to Reservation residents, their property, tribal services and community infrastructure.

# Chehalis Reservation Natural Hazards Mitigation Plan

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## **RISK ASSESSMENT – ASSESSING VULNERABILITIES – ASSESSING CULTURAL AND SACRED SITES**

### **Sensitive Lands**

The Sensitive Lands designation is an overlay of additional land use restriction rather than a land use category in itself. It includes natural floodways, land with physical limitations such as steep slopes, archaeological, historic or cultural sites. It includes Tribal ceremonial sites, cemeteries, and burial sites and sites used for collecting materials for cultural uses. Such lands can be of any size or shape and maybe located throughout the reservation. All bodies of water on the reservation are sensitive areas including lands immediately adjacent to bordering waterways. Sensitive lands include both banks of the Chehalis River along with the land from the riverbank 300 feet landward from the bank within the reservation exterior boundaries. It also includes both banks of the Black River and land adjacent to the Black River 300 feet from the riverbank of both sides. Both banks for the Willamette Creek; in addition, land adjacent to Willamette Creek 150 feet from the creek banks on both sides.

## **PLAN INCORPORATION AND COORDINATION**

Plans developed by the jurisdiction are the responsibility of the Chehalis Planning Department which has the responsibility of assuring compatibility of plan goals and objectives, strategies and mitigation projects. The Workgroup, inclusive of the directors of Chehalis Department of Natural Resources (CDNR), the Public Safety Department and the Planning Department, reviews each draft for plan compatibility, coordination and incorporation. Final drafts plans are also reviewed by the Chehalis Office of Tribal Attorney assure compatibility with tribal ordinances and laws.

The Chehalis Comprehensive Flood Hazard Mitigation Plan (CFHMP) was developed during the same period as this update to NHMP and both plans were continuously reviewed during development for coordination of goals, objectives and projects. The Chehalis Long Range Transportation Plan (LRTP) was adopted in 2006 and revised during 2009 by the Chehalis Planning Department. (The LRTP 2009 update concludes the public comment period Dec 20, 2009 and will be scheduled for adoption in early 2010.)

## ***Chapter 5: MITIGATION STRATEGY***

### **Introduction**

This chapter describes the Chehalis Reservation's mitigation strategy. The mitigation strategy serves as the long-term guide for reducing potential losses described in the risk assessment. The mitigation strategy consists of goals and prioritized mitigation initiatives.

Mitigation initiative refers to an action designed to reduce or eliminate losses resulting from natural hazards.

The 2004 plan listed county-wide mitigation initiatives that deemed to be beneficial to the majority of county stakeholders. Only 1½ square miles of the Chehalis Reservation's nine square mile reservation overlaps Thurston County. The majority of the Reservation overlaps Grays Harbor County. The majority of Thurston County stakeholders reside within the Deschutes Watershed while the Chehalis Reservation is in the Chehalis Basin Watershed in its entirety. This update, therefore, eliminates Thurston County county-wide initiatives.

The 2004 plan contained specific jurisdictional initiatives within the plan annex. This update contains expanded, detailed initiatives specific to the Chehalis Indian Reservation, its geography and the reservation community needs.

Mitigation goals and objectives have been revised from the 2004 plan to eliminate and revise statements specific to the regional nature of the 2004 plan. The new plan goals are specific to the Chehalis Indian Reservation.

Mitigation actions specific to other jurisdictions have been eliminated.

2004 plans specific to the Chehalis Indian Reservation jurisdiction were completed as detailed below.

# Chehalis Natural Hazards Mitigation Plan

## **Mitigation Plan Goals**

The four goals of the mitigation plan are:

1. Protect Tribal residents from injury, death or displacement due to natural hazards.
2. Reduce the possibility of damage or losses to existing assets, particularly critical infrastructure and facilities owned by the Tribe due to flood, earthquake, severe storm, winter storm, landslides and extreme heat and other natural hazards.
3. Increase preparedness for natural disasters by Reservation residents and the Tribe as a whole.
4. Implement programs to facilitate and reduce the cost of natural response and recovery.

Many of the strategies created to meet these goals do not require substantial funding or resources. They do require planning and coordination by Tribal membership. Fortunately, the Tribe has several working committees to begin mitigating risks using various methods.

The Tribal Council will oversee the implementation of their plan with the assistance of the Planning Department. The plan will be reviewed following all disasters as well as every (5) five years. The Tribal General Council will be notified of all updates via announcements in the Chehalis Tribal newsletter.

## **Identification of Mitigation Initiatives**

The 2004 plan identified three (3) initiatives specific to the Chehalis Indian Reservation. Two of the three were specific to flooding hazard; one was specific to earthquake hazard.

For this update, the work group reviewed:

- The 2004 plan reservation specific initiatives,
- The Chehalis Comprehensive Emergency Management Plan,
- The Chehalis Flood Hazard Management Plan,
- The updated Risk Assessment,
- Hazard exposure tables, and
- Tribal records of past hazards for the past 25 years.

Mitigation initiatives include actions specific to flood hazards, actions applicable to all hazards and actions pertaining to other specific hazards. As noted during the Risk Assessment, the Chehalis Reservation is particularly vulnerable to flooding due

## Chehalis Natural Hazards Mitigation Plan

to its geographical location within the Chehalis Basin floodplain and its close physical proximity to the Chehalis and Black rivers. Flooding is an annual hazard for reservation residents, government and businesses. Flooding is also a hazard that can completely prohibit use of roads to access reservation government offices and services, businesses and residents. In such instances, the tribal government is solely responsible for the health and safety of its residents for up to five days without outside assistance.

Six structural mitigation measures have been identified all related to flooding hazards. Road issues have contributed to flooding for decades despite tribal government efforts to work with county roads departments. The location of the reservation at the far end of the two counties, coupled with our relatively low rural population and the use of these roads for reservation access and local travel only, means that reservation roads projects on county-owned roads do not rise to the level of "regional significance" and have not qualified for funding available to the counties for improvements. The Tribe has extremely limited transportation funds, relying on BIA funding, which cannot be utilized for construction of county-owned road facilities.

Two of the measures identified involve county or state owned facilities which the county or state are unable to fund. The remaining measures identify structures permitted many years ago, and structures created by local landowners without permits. None of these structures would be permitted under contemporary regulations and are in dire need of redesign and/or removal. The annual nature of the flooding hazard makes these measures a priority. Of the five non-structural mitigation measures, four address hazards other than flooding.

### **Prioritization**

Mitigation initiatives are prioritized, as under the 2004 plan, by the Chehalis community based on factors relevant to the jurisdiction, its location and its needs. In general, they were prioritized according to their relationships to the plan's goals. Some priorities were established under related planning processes. Structural flood specific mitigation priorities were developed under the Comprehensive Flood Hazard Management Plan process, which preceded the NHMP process. Transportation related project priorities were prioritized under the Chehalis Long Range Transportation Plan (2006). The NHMP work group reviewed planned actions and considered the following factors:

- previous planning processes and actions required by adopted plans,
- actions providing mitigation of hazards and improvement of safety to the greatest number of reservation residents
- preventative actions

# Chehalis Natural Hazards Mitigation Plan

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## IMPLEMENTATION OF 2004 PLAN TRIBAL MITIGATION ACTIONS

This section contains the mitigation actions identified specific to Chehalis Reservation, as identified within the 2004 plan. All Chehalis Reservation jurisdiction mitigation actions under the 2004 plans have been completed.

**Government Entity:** Chehalis Tribe

**Hazard Type:** Flood Hazard, Severe Winter Storms

**Category:** Public Information

**CTCR-FH1** (Natural Hazards Mitigation Plan for the Thurston Region, Oct 6, 2003)

**Mitigation Initiative:** Install an 800 number for all employees and Tribal members to call when flooding occurs.

**Priority:** 1 of 3

**Implementor:** Confederated Tribes of the Chehalis Reservation, Public Safety

**Department**

**Estimated Cost:** \$0

**Adopted Date:** October 31, 2005

**Implementation Status:** **Complete**

The Chehalis Tribe implemented a toll-free Severe Weather Information line at 1-866-623-8883 that is publicized throughout the reservation, including the tribal newspaper, by email to tribal employees and at the tribal member General Council meeting. The weather phone number is operative year-round.

# Chehalis Natural Hazards Mitigation Plan

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**Government Entity:** Chehalis Tribe

**Hazard Type:** All Hazards

**Category:** Public Information

**CTCR-FH2** (Natural Hazards Mitigation Plan for the Thurston Region, Oct 6, 2003)

**Mitigation Initiative:** Improve main access road (Anderson Road) for access on and off Reservation during annual flood events.

**Priority:** 2 of 3

**Time Period:** April 2001 – October 2003

**Implementor:** Confederated Tribes of the Chehalis Reservation, Planning Department

**Department**

**Estimated Cost:** \$2,500,000

**Adopted Date:** October 6, 2003

**Implementation Status:** Complete

Anderson Rd was completely redesigned and rebuilt utilizing WA Department of Ecology, FCAAP funds (design) and BIA Indian Reservation Roads construction funds (design and construction). The road was designed to flood at the same time as connecting access, State Route 12. A hydrology study was conducted to assure no net floodplain storage loss. 19 culverts were installed in the 2/3 mile road to assure no damming resulted from road construction. Anderson Road opened October 21, 2003.



## Chehalis Natural Hazards Mitigation Plan

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**Government Entity:** Chehalis Tribe  
**Hazard Type:** Earthquake  
**Category:** Hazard Damage Reduction

**CTCR-FH3** (Natural Hazards Mitigation Plan for the Thurston Region, Oct 6, 2003)

**Mitigation Initiative:** Inspect all critical facilities for earthquake readiness.

**Priority:** 3 of 3

**Implementor:** Confederated Tribes of the Chehalis Reservation, Planning Department

**Department**  
**Estimated Cost:** \$0

**Adopted Date:** October 6, 2003

**Implementation Status:** Complete

The Chehalis Tribe Chief Building Officer (CBO) inspected all critical facilities for earthquake readiness. The CBO, Public Safety Director and the Realty Officer also completed FEMA training in inspection of earthquake damaged facilities.

Implementation of the 2004 mitigation actions specific to the Chehalis Tribe went as planned.

Implementation of the Severe Weather Line was achieved quickly and without complications. During the past five years, the line is typically activated in October and concludes operation in April. The phone number is published in the tribal newsletter during months of operations, posted on flyers throughout the community, distributed electronically to tribal staff, posted on the tribal reader board (active since Jan 2008) and is published on the Chehalis Tribe's website, which became active in August 2009.

Implementation of the Anderson Rd project, which included a hydrology study, road design and construction, occurred over a multi-year period. Hydrology was funded

## Chehalis Natural Hazards Mitigation Plan

through WA Dept of Ecology grant funding. Design and construction was funded through the Bureau of Indian Affairs (BIA). The project was highly complex and involved coordination tribal, BIA, two counties and WA State rights-of-way. NEPA was prepared and submitted through the BIA. SEPA was conducted through Thurston County. A legal challenge to the project was initiated by several local near-reservation, non-tribal residents and local media coverage of the project was not supportive of the project. The Thurston County Commission and Grays Harbor Planning Board, however, supported the project. The legal challenge was heard and dismissed by the Thurston County Hearing Board. Construction was uneventful and was completed on schedule prior during dry weather. Construction detour was coordinated with Thurston County Roads. The project has proved successful. Closure of the road during flood events has been reduced from 3-5 closures annually to closure less than once annually. The design withstood a new flood of record in 2007 without damage to the facility. The community now has access during minor and moderate flood events and the duration of lack of access during major events is now diminished. The adverse impacts to neighboring communities which some non-reservation residents anticipated were not realized. The project has had no discernable negative impact to neighboring communities and jurisdictions.

Implementation of earthquake inspection protocols was completed without concerns or problems. Three tribal staff attended specialized training and received certification in post-earthquake of inspection of residential and commercial facilities. Protocols are now in place to assure post-event inspection of facilities prior to re-occupancy. Commercial facilities are now required to receive a new Certificate of Occupancy following an earthquake event.

# Chehalis Natural Hazards Mitigation Plan

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## **TRIBAL CAPACITY ASSESSMENT**

See Appendix A

## **MITIGATION STRATEGY – TRIBAL CAPACITY ASSESSMENT**

See Appendix B

## **MITIGATION STRATEGY – TRIBAL FUNDING SOURCES**

See Appendix B

## **MITIGATION STRATEGY**

See Appendix B

# Chehalis Reservation Natural Hazard Mitigation Plan

## ***Chapter 6: PLAN MAINTENANCE STRATEGY***

### **ADOPTION BY TRIBAL GOVERNING BODY**

The Confederated Tribes of the Chehalis Reservation must have its governing body adopt the plan. The Tribe assures that the proper process is followed according to its laws or rules including adequate public notice and public hearings.

Adoption by the Chehalis Tribe demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this plan and authorizes responsible parties to execute their responsibilities. A resolution documenting plan adoption is attached.

The 2004 plan was a multi-jurisdictional plan and included annexes detailing individual jurisdiction specific plans and supporting resolutions. This update is a tribal plan specific to the Chehalis Indian Reservation.

### **IMPLEMENTATION**

The Chehalis Tribe is solely responsible for the implementation of this updated plan. The jurisdiction has a CEMP, which is referenced in this document. Future updates to the CEMP will reference the approved NHMP. The Tribe also has a Comprehensive Flood Hazard Management Plan which will reference the NHMP when updated.

CEMP is due for update every four years with the next update scheduled for 2011. The CEMP update will be reviewed by the Workgroup for recommendation of minor, technical or substantive changes to the NHMP prior to its five year update.

The Tribal Council will oversee the implementation of their plan with the assistance of the Planning Department. The plan will be reviewed following all disasters as well as every (5) five years as required. The Tribal General Council will be notified of all updates via announcements in the Chehalis Tribal newsletter

### **PLAN MONITORING & EVALUATION**

The plan will be monitored and evaluated annually by the Director of Planning, Chehalis Tribe and the EMHSC at the March meeting of the EMHSC. The committee will include a work session agenda item dedicated to a jurisdiction wide assessment of the plan. The annual work session will assess the following:

1. Progress towards the plan's goals and objectives
2. Progress towards mitigation initiatives
3. Implementation issues
4. General information activities

## Chehalis Reservation Natural Hazard Mitigation Plan

A report will be made by the Director of Planning to the Chehalis Business Committee inclusive of any recommendations for future updates.

The BASE COMPREHENSIVE EMERGENCY MANAGEMENT PLAN (CEMP) - Is the governing document for which the Confederated Tribes of the Chehalis will conduct emergency and disaster operations. This plan will be maintained by the Tribal Emergency and Safety (EM&S) Manager, complying with the following time-line:

1. Department of Homeland Security requires review every 4 years; however, Business Committee review will occur every two years, established by the adopting of this document by the Business Committee.
2. Corrections and recommendations for change will be collected by the EM Manager and reviewed by the Emergency Management/Homeland Security (EM/HS) Committee.
3. All changes supported by the EM/HS Committee will be placed on a master sheet, which will include why they are recommended (Example: Meets Tribal Operational Procedure).
4. Six months prior to the final review date, the EM&S Manager will publish a review schedule, which will be provided to departmental managers and the Business Committee.
5. The revised CEMP will be provided to all Business Committee Members, 90 days in advance of the final review date and adoption.

MITIGATION SECTION- The Confederated Tribes of the Chehalis Mitigation Plan coordinates Thurston County and other jurisdictions.

1. The initial Hazard Mitigation Plan assessment and review will be conducted annually after the Plan has been formally adopted. (12/06)

### **PLAN MAINTENANCE**

Plan maintenance is an ongoing task which is executed through the plan's five year cycle. Plan maintenances assures that information is current and accurate.

Changes to the mitigation plan will be initiated based on outcomes that are realized as part of annual plan monitoring, events after a major disaster, or on an as-needed basis to suit the needs of the Chehalis Indian Reservation.

Minor revisions will be handled by the Planning Department.

Technical revisions, such as additions or deletions of data or alterations to hazard profiles and the risk assessment are the responsibility of the Planning Department upon recommendation by the workgroup.

# Chehalis Reservation Natural Hazard Mitigation Plan

Substantive changes, such as FEMA request for significant changes or analysis to the general plan will require a recommendation from the EMHSC to the Planning Department and may require review and re-adoption by the Chehalis Business Committee.

## **DISTRIBUTION OF REVISIONS**

The Chehalis Planning Department is responsible for maintaining a master copy of the plan and distributing relevant updates. Plan updates will be distributed electronically via email or other form of electronic media such as a compact disc. Printed copies can be requested by contacting the Chehalis Planning department. A current version of the plan will be accessible online through the Chehalis Tribe's website at [www.chehalis-tribe.org](http://www.chehalis-tribe.org).

## **MITIGATION MEASURES AND PROJECT CLOSE OUTS**

Mitigation measures and project close outs are the responsibility of the department as described in Appendix A. Projects involving transportation facilities are the responsibility of the Planning Department. Projects involving environmental and natural features of the reservation are the responsibility of the CDNR. Projects involving public safety are the responsibility of the Public Safety Department. The Workgroup shall share information regarding projects as they are implemented and completed.

The Chehalis Tribe is a relatively small jurisdiction with limited staff. Initiation and submission of projects utilizing federal or state grant funds falls under the Chehalis Grant Development and Review Policy. The policy furthermore documents the grant development and review process, assuring that grants submitted on behalf of the Confederated Tribes of the Chehalis Reservation by tribal staff or by intertribal consortia are duly authorized, meet a professional standard, and are consistent with tribal goals and objectives. The policy further assures that:

- The applying department has the legal authority to apply for assistance and the capability to ensure proper planning, management and completion of the project, including funds sufficient to pay any matching share of the project
- Authorized representatives of the funding agency will be granted access to and the right to examine all records related to the award
- Federal and federally originating state grant funded projects will comply with all federal Acts, laws, executive orders and statues inclusive of personnel administration, non discrimination and civil rights, labor standards, environmental standards, historic preservation, animal welfare, lobbying and political activities, drug-free workplace, maintenance of effort, and financial standards including audit and non-supplantation of funds

## Chehalis Reservation Natural Hazard Mitigation Plan

The policy includes a process assuring departmental review, financial (budget) approval, approval of the General Manager and approval by resolution of the Chehalis Business Committee.

Projects utilizing tribal funds are authorized through our contracts authorization process, which is similar to our Grant Development and Review Policy and assures departmental review, financial (budget) approval, approval of the General Manager and approval by resolution of the Chehalis Business Committee.

Projects specific to the NHMP mitigation strategies will be reviewed annually by the Workgroup and reported to the EMHSC.

### **CONTINUED PUBLIC INVOLVEMENT**

The Chehalis Tribe engages in continuous efforts to inform and involve the public. Hazard planning has historically been incorporated in land use planning, emergency management, Elders, health and social services due to the frequency of severe flooding on the Reservation. These efforts continue. As different plans are updated, discussion of hazards and their relationship to various plans are included in the public processes.

Copies of all plans are also distributed annually in November at the Chehalis Annual Meeting. Tribal members picking up copies of existing plans are encouraged to comment on plans whether or not they are in a public review period and comments are taken on existing plans at the Annual Meeting.

Copies of all plans are available on the Chehalis Tribe website. Copies of the LRTP, CFHMP and NHMP are also available on the Thurston Regional Planning Council website.

# Chehalis Reservation Natural Hazard Mitigation Plan

## ***APPENDICES***

### **A. TRIBAL CAPABILITY ASSESSMENT**

The Confederated Tribes of the Chehalis has implemented multiple Tribal Resolutions requiring the adoption of the National Incident Management Systems (NIMS); instituting the Incident Command Systems (ICS); Complying with Washington State Revised Code (RCW) 38.52.070 establishing this tribe as an Independent Emergency Management Jurisdiction; the implementation of the Tribal Comprehensive Emergency Management Plan (CEMP) as the primary document to be used during disaster management.

Please note chart below containing a description of each policy/capacity and hazards addressed.

Since the formation of the first hazard plan, the Chehalis Tribe has made tremendous progress in developing and implementing a broad range of hazard management policies and plans. During the interim, the Tribe has developed and adopted the Chehalis Reservation Comprehensive Land Use Plan and Chehalis Zoning Ordinance, the Chehalis Construction Safety Ordinance, The Chehalis Comprehensive Flood Hazard Management Plan and the Pandemic Flu Plan; and updated the Comprehensive Emergency Management Plan.

As development of these plans has occurred over the past five years, the Tribe has developed its philosophy, strategy and approach to hazard management. A flood of record occurred during this time period, further sharpening and motivating the Tribe's approach to implementation of hazard policies, programs, ordinances and plans.

The Tribe is a community that has experienced several major natural disasters within the lifetime of the majority of its citizens. The community considers disaster planning to be an important and serious endeavor and realizes the direct applicability of hazard policies and plans to daily life. Elected leadership of the Tribe has responded to community concerns by preparing and adopting policies and plans addressing hazards and setting forth mitigation plans to protect from future hazards. The Tribe has also addressed development within hazard prone areas and adopted and imposed regulations for development including restrictions and bans on certain type of developments and within certain high hazard areas to protect from loss of life and to safeguard against impacts that may heighten or aggravate existing hazards and hazard areas.



# Chehalis Reservation Natural Hazard Mitigation Plan

**Table 4.1 Hazard Management Policies**

<b>Policy Name</b>	<b>Date Adopted</b>	<b>Hazards Addressed</b>
<b>Chehalis Flood Damage Prevention Ordinance</b>	Oct 1997	Flooding
<b>Chehalis Permitting Ordinance</b>	Oct 2002	Negative impacts to the environment and to cultural resources; impacts to fish, forestry and wildlife resources; flooding; impacts to/contamination of ground water and air quality; cumulative impacts
	Rev Apr 2007	Same as above.
<b>Comprehensive Emergency Management Plan (CEMP)</b>	2001	Civil disturbance, critical shortage, dam failure, drought, earthquake, epidemic, flood, hazardous material incident, heat wave, landslide, storm, terrorism, tsunami, volcano, Wild/Forest Fire
	Rev Nov 2003	All hazards, non-specific
	Rev Mar 2007	All hazards, non-specific
<b>Chehalis Reservation Comprehensive Land Use Plan and Chehalis Zoning Ordinance</b>	Dec 2004	Flooding, degradation or other impacts to sensitive environmental resources and cultural sites and resources, loss of agricultural lands, loss of forested and undeveloped lands.
<b>Chehalis Construction Safety Ordinance</b>	Jun 2007	Construction accidents, unsafe activities
<b>Comprehensive Flood Hazard Management Plan (CEMP)</b>	Jan 2009	Flooding
<b>Pandemic Flu Plan</b>	Sep 2009	Pandemic influenza
<b>Natural Hazard Mitigation Plan for the Thurston Region</b>	2004	Flooding, earthquake, severe storm, volcano and wildfire
<b>Chehalis Natural Hazard Mitigation Plan</b>	2009 (Update)	Flood, earthquake, severe winter storm, volcano and wildfire

# Chehalis Reservation Natural Hazard Mitigation Plan

## **Hazard Management Plans and Capabilities**

### **CHEHALIS FLOOD PROTECTION ORDINANCE**

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**Adopted** Oct 1997; updated Aug 2006; revised Aug 2009

**Description** The Flood Protection Ordinance regulates development within the floodplain in compliance with FEMA National Flood Insurance Program regulations.

**Hazards Addressed** Flooding

**Pre/Post Disaster** The Chehalis Flood Protection Ordinance provides regulation designed to prevent or mitigate disaster impacts. It is pre-disaster regulation.

**Development in Hazard Prone Area** The ordinance limits and/or prohibits development in flood hazard prone areas.

### **CHEHALIS COMPREHENSIVE PLAN AND ZONING ORDINANCE**

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**Adopted** Jan 2003

**Description** Plan and ordinance regulating development within the Chehalis Reservation; land use regulations for the jurisdiction.

**Hazards Addressed** Development with the floodplain and environmentally and/or culturally sensitive areas

**Pre/Post Disaster** Pre disaster

**Development in Hazard Prone Area** Restricts development in the flood plain and in ecologically and culturally sensitive areas

### **THURSTON COUNTY NATURAL HAZARD MITIGATION PLAN**

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**Adopted** 2004

**Description** County-wide, regional assessment. identification and mitigation plan of natural hazards.

**Hazard Addressed** All assessed hazards

**Pre/Post Disaster** Pre and Post

**Development in Hazard Prone Areas** Addressed development in some hazard prone areas; no hazard prone areas within the Chehalis Reservation addressed

### **COMPREHENSIVE EMERGENCY MANAGEMENT PLAN**

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# Chehalis Reservation Natural Hazard Mitigation Plan

**Adopted** Nov 2005; updated May 2008

**Description** The CEMP is an all hazards plan, designed to meet the requirements of Confederated Tribes of the Chehalis Resolution 2003-76 and the Revised Code of Washington (RCW 38.52). To include the four phases of Emergency Management; Mitigation, Preparedness, Response, and Recovery by emphasizing the seamless transition between Response and Recovery entitled Emergency and Disaster Management. CEMP implements National Incident Management System activities to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life and property and harm to the environment.

**Hazards Addressed** The CEMP is an all hazards plan

**Pre/Post Disaster** The CEMP is designed to be implemented in the event of an emergency.

**Development in Hazard Prone Area** The CEMP does not address development in hazard prone areas.

## LONG RANGE TRANSPORTATION PLAN

**Adopted** Dec 2006; update due Jan 2010

**Description** Chehalis Long Range Transportation Plan (LRTP) meets FHWA requirements for inventory, planning, and improvements to transportation facilities within the jurisdiction. LRTP prioritizes transportation projects within the Chehalis Reservation jurisdiction.

**Hazards Addressed** All hazards to transportation facilities.

**Pre/Post Disaster** Pre disaster

**Development in Hazard Prone Area** LRTP does not address development in Hazard Prone Areas

## CHEHALIS COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN

**Adopted** Mar 2009

**Description** Chehalis CFHMP was prepared in accordance with Washington Administrative Code 172-145-040 to provide a plan to identify the area of the 100-year frequency floodplain. CFHMP evaluates discharges from both the Chehalis River and Black River and identifies and prioritizes mitigation projects within the Reservation boundaries.

**Hazards Addressed** Flooding

**Pre/Post Disaster** Pre and Post disaster

# Chehalis Reservation Natural Hazard Mitigation Plan

**Development in Hazard Prone Area** CFHMP supports and references Chehalis zoning, permitting and flood prevention ordinances

## **PANDEMIC FLU PLAN**

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**Adopted** Sep 2009

**Description** Influenza (flu) pandemics occurred three times in the past century; in 1918-19, 1957-58, and 1968-69. The Pandemic Flu Plan supplements the CEMP with a specific strategy and plan of operation for influenza pandemic.

**Hazards Addressed** Influenza pandemic

**Pre/Post Disaster** Pre and Post disaster

**Development in Hazard Prone Area** No, Not applicable

## **Evaluation of Post-Disaster Hazard Management Policies and Capabilities**

The Tribe enacted its first ordinance related to hazard mitigation in 1997 with the adoption of the Chehalis Flood Prevention Ordinance. Since that time, the Tribe has worked diligently to provide the jurisdiction with a range of land use and permitting policies addressing appropriate and inappropriate development and establishing processes for reviewing and permitting of new development within hazard prone areas of the reservation.

In 2004 the Tribe was a participant in the Thurston County Natural Hazards Mitigation Plan and in 2005, the Tribe adopted its first Comprehensive Emergency Management Plan.

Since 1996, the Tribe has responded to two floods of record, two other major floods, moderate flooding, an earthquake, a flu pandemic and several major winter storms. Planning, development and implementation of the above noted plans and ordinances has been result of the Tribe's desire to craft and implement policies and processes that most closely meet the needs of our rural community.

In addition to plans and ordinances, the Tribe has an Emergency Management Homeland Security Committee EMHSC that meets monthly to discuss disaster hazard management issues.

Each of our plans and ordinances has been put to the test during under actual disaster events. The Tribe's EMHSC meets prior to known or anticipated disasters to review applicable plans and response mechanisms. For on-going events, such as pandemic influenza, the EMHSC meets weekly throughout the event.

## Chehalis Reservation Natural Hazard Mitigation Plan

Following an event, the EMHSC conducts several meetings to de-brief and review activities and responses throughout the event including a review of community complaints.

Recommendations for revisions to existing or drafting on new plans or policies are forwarded from EMHSC to the Tribe's elected leadership. The Planning Department is the lead department for development of new plans and coordinates ordinance development with the Tribal Attorney. Public Safety Department is responsible for implementation of new or revised disaster hazards plans or policies.

The Chehalis Tribe is very experienced at responding to flood events and has used the lessons learned and procedures developed during these hazard events to develop effective hazard disaster response policies and plans for the protection of the reservation community.

### **Evaluation of the Tribe's Policies Related to Development in Hazard Prone Areas**

The Chehalis Tribe is somewhat unique in having a full complement of flood prevention, permitting and zoning ordinances to regulate development in Hazard Prone Areas. Our ordinances have been utilized as model tribal ordinances by other area tribes.

Chehalis has regulated development within the floodplain since 1997 and has required permitting of all construction, grading, paving and related activities within the Reservation boundaries and on off-reservation trust lands since Oct 2002. A key element of our permitting regulations is the regulation of development in hazard prone areas. As a jurisdiction that is over 70% floodplain, the Tribe recognized the critical nature of limiting and regulating development in hazard prone areas and identifying and encouraging development within areas with the lowest risk of hazards.

The Chehalis LRTP was the first plan submitted by an area tribe to BIA when FHWA announced plans to require LRTP from all federally-recognized tribes. Several area tribes have used this plan, and the process used to develop this plan as a model.

The Comprehensive Flood Hazard Management Plan, funded through WA Department of Ecology, is also unique among area tribes. The Tribe undertook this project to further develop and support its land use policies in regulating development in hazard prone areas.

The Pandemic Flu Plan is the Tribe's most recent hazard specific plan.

## Chehalis Reservation Natural Hazard Mitigation Plan

The development of NHMP is a natural progression given the Tribe's development over the past ten years in developing, adopting and implementing plans and ordinances addressing disaster hazard pre and post mitigation activities.

Since the adoption of the 2004 plan, the Tribe has developed, adopted and implemented LRTP; updated the CEMP; developed, adopted and implemented the CFHMP; and had five years experience in administration and enforcement of its permitting, zoning and land use ordinances. Our flood prevention policies were audited by FEMA during the development of CFHMP.

The jurisdiction has a significantly greater breadth and depth of experience in administration of pre and post hazard plans since the 2004 plan was implemented and now undertakes to administer and implement its own plan specific to its jurisdiction.

### B. MITIGATION STRATEGY- TRIBAL CAPACITY ASSESSMENT AND TRIBAL FUNDING SOURCES:

The Confederated Tribes of the Chehalis Reservation has provided funds for past mitigation utilizing tribal revenues and through grants and contracts with federal and state agencies. Past projects include the elevation of homes above the floodplain with FEMA, the rebuilding of Anderson Road with the Bureau of Indian Affairs and our Comprehensive Flood Hazard Management Plan with Washington State Department of Ecology.

The Chehalis Tribe plans to provide for future mitigation utilizing tribal revenues and federal grants and contracts as funds are available and appropriate.

### C. MITIGATION STRATEGY-IDENTIFICATION AND ANALYSIS OF TRIBAL MITIGATION ACTIONS:

As page 26 (Topography) indicates; and selected data throughout the plan presents; the Identification and analysis of the Chehalis Tribal Mitigation Actions is contingent upon multiple factors, which are not predictable prior to an incident occurring.

The Chehalis Reservation lies between three Counties Grays Harbor, Lewis, and Thurston Counties. Any pre or post mitigation actions taken to protect their jurisdiction could have a devastating impact on the Chehalis Tribal Community. At present the Chehalis Tribe is attempting to partner with all three Counties in an effort to develop communications, through the Tribal Emergency Management Homeland Security Committee (EMHSC), that will open lines of communications necessary to share information required in the analysis process.

# Chehalis Reservation Natural Hazard Mitigation Plan

## D. MITIGATION MEASURES:

**Structural mitigation measures** proposed by the Chehalis Tribe for this NHMP are as follows:

- 1) Raise Moon Road south of U.S. Highway 12 in a manner to improve emergency access during flooding and provide a second access road engineered to contemporary standards to the reservation during emergencies. This project would include smoothing the grade of the road to remove dips, providing a road shoulder, redesign of the Moon Rd/188<sup>th</sup> intersection and installation of appropriately-sized culverts to allow floodwater passage.
- 2) Install large-diameter culverts beneath State Road at Harris Creek. Currently, State Road acts as a levee and obstructs the flow of floodwater across the floodplain, resulting in backwater pooling behind the existing road. The goal of this measure is to improve floodwater passage across the floodplain; this measure also will extend the period of access provided by State Road during significant flood events.
- 3) Install culverts under South Bank Road along the approach to the Sickman-Ford bridge. Prior to its reconstruction, the old road was elevated on piles and did not obstruct Chehalis River's high discharge flows. The goal of this project is to increase conveyance of floodwaters, prevent backwater conditions from developing, and thus reduce the potential for increased flood surface elevations upstream of the road.
- 4) Remove push-up levee downstream of the Sickman-Ford bridge. This unpermitted levee was installed by a previous property owner and is not in compliance with U.S. Army Corps of Engineers standards. Removing the levee would increase river conveyance during flooding. The levee may be exacerbating conditions that could lead to an avulsion upstream of the levee.
- 5) Remove road embankment fill under Balch Road, which currently acts as a levee. This project would increase river conveyance during flooding and reduce upstream flood levels.
- 6) Replace U.S. Highway 12 bridge at Black River. The existing bridge is a multi-span, steel truss and concrete beam structure constructed in 1932 and provides important access for the Reservation between SR 8 and Interstate 5. Currently, the bridge and road prism constrict high flows. This hydraulic condition is causing bank erosion and bed scour, which prompted repairs in 2001 to protect the bridge piers and abutments. The failure of these critical components could result in loss of the bridge during a significant storm event. In addition to the possible loss of access, a joint Tribe/WSDOT study (WSDOT 2005) found that erosive conditions resulting from the constriction

## Chehalis Reservation Natural Hazard Mitigation Plan

likely are degrading existing Black River aquatic and riparian habitat, which is inconsistent with the Tribe's guiding principles.

**Table 4.2 Structural Mitigation Measures**

Rank	Strategy	NHMP Goals	Potential Funding Source	Estimated Cost
1.	Raise Moon Rd south of U.S. Highway 12	1,2	FEMA, BIA IRR Construction, BIA IRR HPP, Thurston County, Chehalis Tribe	Unknown
2.	Culvert and Bridge replacement along Harrison Creek, south of Oakville	1,2	FHWA, WSDOT, Grays Harbor County	Unknown
3.	Install culverts under South Bank Road along approach to Sickman-Ford	1,2	Grays Harbor County, State of Washington (multiple programs), FEMA	Unknown
4.	Remove push-up levee downstream of Sickman-Ford Bridge	1,2	WA FCAAP, SRFB, FEMA	Unknown
5.	Remove road embankment fill under Balch Road approach (abandoned)	1,2	Grays Harbor County, State of WA, FEMA, Chehalis Tribe	Unknown
6.	Replace U.S. Highway 12, Black River Bridge	1,2	FHWA, State of Washington	PE \$640,000 CN \$4.4 million ROW \$65,000

BIA – Bureau of Indian Affairs  
 IRR – Indian Reservation Roads  
 FEMA – Federal Emergency Management Agency  
 FHWA – Federal Highway Administration  
 FCAAP – Washington State's Flood Control Assistance Account Program  
 SRFB – Washington State's Salmon Recovery Funding Board  
 WSDOT – Washington State Department of Transportation



# Chehalis Reservation Natural Hazard Mitigation Plan

## Mitigation Responsibilities and Timeframes

<b>1.</b>	Raise Moon Rd south of U.S. Highway 12	1,2	FEMA, BIA IRR Construction, BIA IRR HPP, Thurston County, Chehalis Tribe	Unknown
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This project is a transportation project and is the responsibility of the Chehalis Planning Department, Transportation Planning division. This project will require extensive coordination with Thurston County, which owns the road. Half of the road is within the Chehalis Reservation. The Tribe is currently working with the county to transfer ownership of the road to the Chehalis Tribe to facilitate project planning and implementation.

Existing resources: no funds have been committed.

Timeframe: 2010-2015

<b>2.</b>	Culvert and Bridge replacement along Harrison Creek, south of Oakville	1,2	FHWA, WSDOT, Grays Harbor County	Unknown
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This project is a transportation project and is the responsibility of the Chehalis Planning Department, Transportation Planning division. This project will require extensive coordination with Grays Harbor County, which owns the bridge.

Existing resources: no funds have been committed

Timeframe: 2010-2014

<b>3.</b>	Install culverts under South Bank Road along approach to Sickman-Ford	1,2	Grays Harbor County, State of Washington (multiple programs), FEMA	Unknown
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This project is a transportation project and is the responsibility of the Chehalis Planning Department, Transportation Planning division. This project will require extension coordination with Grays Harbor County, which owns the bridge.

Existing resources: no funds have been committed

Timeframe: 2010-2013

<b>4.</b>	Remove push-up levee downstream of Sickman-	1,2	SRFB	\$221,177
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## Chehalis Reservation Natural Hazard Mitigation Plan

### Ford Bridge

This project is a natural resources project and is the responsibility of the Chehalis Natural Resources Department.

Existing resources: The Tribe applied for and was awarded Washington Salmon Recovery Funding Board funds

Timeframe: 2010 - 2011

<b>5.</b>	Remove road embankment fill under Balch Road approach (abandoned)	1,2	Chehalis Tribe BIA	TBD
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This project is a transportation project and is the responsibility of the Chehalis Planning Department, Transportation.

Existing resources: An RFP has been issued for design and engineering to remove the embankment and replace an undersized culvert. The Tribe will pay for design and engineering, TBD, out of fuel tax revenues. Construction work will be done with BIA construction funding, possibly Recovery Act funding.

Timeframe: 2010-2011

<b>6.</b>	Replace U.S. Highway 12, Black River Bridge	1,2	FHWA, State of Washington	PE \$640,000 CN \$4.4 million ROW \$65,000
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This project is a natural resources project and is the responsibility of the Chehalis Natural Resources Department.

Existing resources: the Tribe provided feasibility funding to WSDOT in the past. No funds are currently committed to the project.

Timeframe: 2010-2015

## Chehalis Reservation Natural Hazard Mitigation Plan

**Non-structural mitigation measures** proposed by this Plan are summarized below:

- 1) Implement the Emergency Preparedness and Response Plan for the Chehalis Tribe adopted in May 2008.
- 2) Elevate homes in the floodplain inundated by previous flood events.
- 3) Improve hazard warning procedures. This strategy needs to be further analyzed, but may include one or more of the following: add another real-time flow gauge closer to reservation; use a warning system that is not dependent on telephone calls, such as text messages; and purchase National Weather hand-cranked radios for every household on the Chehalis Reservation.
- 4) Develop a community-wide natural hazards educational outreach program. Educate the community on hazards and emergency preparedness to increase public awareness. This education program will include new information and knowledge of hazard warning, response and evacuation procedures. The goal is to help improve citizen and local officials' understanding of hazards, hazard regulations and weatherproofing and floodproofing and earthquake proofing options. The Chehalis Tribe will use a variety of outreach methods, including articles in the Tribe's monthly newsletter, brochures and informational flyers, and community meetings.
- 5) Acquire facilities and equipment to improve emergency preparedness and responsiveness, such as back-up generators and fuel storage facilities.

## Chehalis Reservation Natural Hazard Mitigation Plan

**Table 4.3 Non-Structural Mitigation Measures**

Rank	Strategy	NHMP Goals	Potential Funding Source	Estimated Cost
1	Implement the Emergency Preparedness and Response Plan	3		\$0
2	Elevate homes in the floodplain inundated by previous events.	1, 3,4	FEMA	\$250,000
3	Improve hazard warning procedures	1,3,4	FCAAP, FEMA	Unknown
4	Develop a community-wide natural hazards educational outreach program	3		\$0
5	Acquire facilities and equipment to improve emergency preparedness and responsiveness	4	Chehalis Tribe	\$250,000

### **Non-Structural Mitigation Responsibilities and Timeframes**

1	Implement the Emergency Preparedness and Response Plan	3		\$0
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This project is the responsibility of the Chehalis Public Safety Department.

Existing resources: Plan has been adopted by the Tribe

Timeframe: 2010-2011

## Chehalis Reservation Natural Hazard Mitigation Plan

<b>2</b>	Elevate homes in the floodplain inundated by previous events.	1, 3,4	FEMA	\$250,000
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This project is the responsibility of the Chehalis Tribe Planning Department.

Existing resources: A successful grant was submitted to FEMA. Funding is awaiting approval of the NHMP.

Timeframe: 2010-2011

<b>3</b>	Improve hazard warning procedures	1,3,4	FCAAP, FEMA	Unknown
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This project is the responsibility of the Chehalis Tribe Public Safety Department.

Existing resources: The Tribe has an existing hazards "hot line" for employees and residents to warn of approaching hazards and to direct to residents to assistance.

Timeframe: 2010-2013

<b>4</b>	Develop a community-wide natural hazards educational outreach program	3		\$0
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This project is the responsibility of the Chehalis Tribe Public Safety Department.

Existing resources: Educational materials are available from FEMA, Department of Ecology and other resources. Materials specific to the Chehalis Reservation will need to be developed.

Timeframe: 2010-2012

<b>5</b>	Acquire facilities and equipment to improve emergency preparedness and responsiveness	4	EMD, Chehalis Tribe	\$250,000
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This project is the responsibility of the Chehalis Tribe Public Safety Department.

Existing resources: All critical facilities have been equipped with backup generators for use during power outages that accompany a diversity of natural disasters including, flood, storm and earthquake. The Tribe has designated facilities as shelters for community residents during disasters.

Timeframe: 2010-2011

# Chehalis Reservation Natural Hazard Mitigation Plan

## **MITIGATION FUNDING RESOURCES**

### **Bureau of Indian Affairs Funding**

BIA IRR planning and construction funds are distributed based on a population formula. Bureau are distributed for the improvement of the Chehalis Indian Reservation roads system and facilities.

For the past two years, the Chehalis Tribe has received formula allocations of less than \$200,000 annually for planning and construction activities. Funds are distributed in August of each year. Additional BIA IRR funds, including High Priority Projects (HPP) and special projects funding, such as Bridges, are announced as the BIA has funds available. These funds are competitive and ceiling amounts are not known in advance, nor is the timing of announcements. Chehalis has received one HPP award of \$230,000 in the past for construction of a 1.1 mile of sidewalk.

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### **FEMA Funding**

The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The Chehalis Tribe received an HMGP award in 1997 following the 1996 flood of record event. Project awards are based on documented losses.

The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

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### **Washington State's Flood Control Assistance Account Program**

FCAAP grants are available through WA State. In 2009, no FCAAP solicitation was released, however, due to state budget restrictions. FCAAP grants provide funding for flood plans and studies to assist jurisdictions in developing pre and post disaster

## Chehalis Reservation Natural Hazard Mitigation Plan

mitigation for flood hazards. FCAAP project awards are competitive and modest and typically in the \$25,000 - \$75,000 range.

### **Washington State's Salmon Recovery Funding Board**

SRFB grants support salmon recovery by funding habitat protection and restoration projects and support related programs and activities that produce sustainable and measurable benefits for fish and their habitat. Award limit is \$200,000.

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