

# **Chehalis Basin Flood Warning System Improvements**

## **CITY OF CENTRALIA**

### **NEEDS ASSESSMENT MEETING MINUTES**

**Date:** 12/2/2009

**Location:** Centralia City Hall, Centralia, Washington

**Present:**

Kahle Jennings, Public Works Director, City of Centralia  
Carol Hamilton, City Manager's Office, City of Centralia  
Paul McFadden, Stormwater, Street & Fleet Operations Manager, City of Centralia  
Jan Stemkoski, City Engineer, City of Centralia  
Jim Walkowski, Chief, Riverside Fire Authority  
Robert Berg, Chief of Police, City of Centralia  
Bill Bates, Centralia City Council  
Emil Pierson, Community Development Director, City of Centralia  
Ray Walton, WEST Consultants  
Greg Dutson, Engineered Monitoring Solutions  
Jerry Louthain, HDR, Inc.

**Discussion Items:**

Typical Flood Scenarios

Flooding in and adjacent to the City occurs from several sources, with the primary source being the Chehalis River which flows from south to north along the westerly portion of the City. The Skookumchuck River is another major flooding source as it flows from the northeasterly portion of the City through the westerly portion of the City to its confluence with the Chehalis River west of Interstate 5 and just south of the Harrison Street exit from I-5. China Creek also contributes to flooding in the north-central portion of the City as it flows from east to west to the Chehalis River. This small drainage causes localized urban-type flooding through this portion of the City, with some of the creek being free-flowing through a creek bed in the City and some portions in culverts and pipelines under portions of the City. Salzer Creek flows from east to west in the southerly portion of the City with some localized flooding from this source combined with backwater flooding from the Chehalis River during flooding events on the Chehalis River.

The typical flooding scenarios in the City are that flooding occurs first on the smaller drainages of China and Salzer Creeks, followed by flooding from the Skookumchuck River, and then from the Chehalis River. When the Chehalis River reaches flood stage or higher, backwater flooding from the Chehalis causes additional flooding on the lower reaches of each of these tributaries.

Because of the Skookumchuck Dam, which is located at about River Mile 22 on the Skookumchuck River and the reservoir behind the dam, the severity of flooding of the Skookumchuck River is largely based on how full the reservoir is at the beginning of a flood event. This dam and reservoir has no license requirements for flood control, but

does provide some significant benefits to the lowering of flood peaks on the Skookumchuck if the reservoir is low enough to provide storage of flood waters during a flood event.

#### Data Collecting/Forecasting Methods:

The City uses the predictive model presented in the USACE Chehalis Flood Ground Truthing Project report and floodplain mapping based on the January 1990 flood, showing Chehalis, Newaukum, and Skookumchuck River Flood Phases 1-4, with Phase 4 being the most severe. The City combines this information with NWS weather and river forecast and stream gage data.

Manual level measurements are made at China Creek and Salzer Creek. Flood severity estimates are also based on these unreferenced historical high water marks and observations by City crews.

#### Notification and Communication Methods:

Flood warnings and evacuation messages are sent via the City's Emergency Operations Center. The city is divided into 4 subsections and unified command posts are established for each section in case EOC is not able to provide coordination.

Notification methods used include radio/TV broadcasts, City's website, HAM radio network (about 20 people), Code Red dialout service (Lewis County system), and the DOT low frequency network.

#### Improvements Desired:

- Automated local monitoring stations for China Creek, Salzer Creek, Big Hanafordr Creek drainage, Little Hanafordr Creek drainage and on the Newaukum River.
- USGS gage sites at Doty on the Chehalis has been washed out during high flows and needs to be hardened or protected from high flows.
- Dam failure warning systems for the Skookumchuck Dam and Mayfield Hydro projects.
- Precipitation gage upstream of Skookumchuck Dam, in the vicinity of the USGS streamgage, Skookumchuck River near Vail, near River Mile 29.

#### Other Discussion

NWS correctly predicted the 12/07 event but flood levels rose much faster than normal (debris dam failures in upper Chehalis River basin). City staff reported that typical times between river crests at Doty gage (near River Mile 102) and City (River Mile 67 at Skookumchuck mouth) are 24-48 hours, but for this flood it was only approximately 16 hours. The Doty gage failed during the 12/07 flood event with the bridge at the gage location being washed out.

They noted that their internet site may receive 10,000 hits during a flood event, and is often overwhelmed.

# **Chehalis Basin Flood Warning System Improvements**

## **CITY OF CHEHALIS**

### **NEEDS ASSESSMENT MEETING MINUTES**

**Date:** 12/2/2009

**Location:** Chehalis Community Development Building, Chehalis, WA

**Present:**

Bob Nacht, Community Development Director, City of Chehalis  
Bobbi Boone, Community Development Technician, City of Chehalis  
Rick Sahlin, Street/Storm Superintendent, City of Chehalis  
Kelvin Johnson, Fire Chief, City of Chehalis  
Ray Walton, WEST Consultants, Inc.  
Greg Dutson, Engineered Monitoring Solutions  
Jerry Louthain, HDR, Inc.

**Discussion Items:**

Typical Flood Scenarios

Flooding in and adjacent to the City occurs from several sources, with the primary source being the Chehalis River which flows from the west and south to the north along the westerly portion of the City. The Newaukum River is another major flooding source as it flows from the southeast through the southerly portion of the City to its confluence with the Chehalis River west of Interstate 5. Coal Creek also contributes to flooding in the north-easterly portion of the City as it flows from east to west to the Chehalis River. Salzer Creek flows from east to west north of the City with some localized flooding from this source combined with backwater flooding from the Chehalis River during flooding events on the Chehalis River.

The typical flooding scenarios in the City are that flooding occurs first on the smaller drainages of Coal and Salzer Creeks, followed by flooding from the Newaukum River, and then from the Chehalis River. When the Chehalis River reaches flood stage or higher, backwater flooding from the Chehalis causes additional flooding on the lower reaches of each of these tributaries.

Data Collecting/Forecasting Methods:

The City contracts with Lewis County Emergency Services to assist with the forecasting and coordination of flood emergencies. The City personnel uses the Lewis County forecasting website for weather and river level forecast information. They review the forecast information and stream gage data and combine the information with local knowledge gathered from field personnel to estimate the flood impacts in their local area. The City also uses the predictive model presented in the USACE Chehalis Flood Ground Truthing Project report and floodplain mapping based on the January 1990 flood,

showing Chehalis, Newaukum, and Skookumchuck River Flood Phases 1-4, with Phase 4 being the most severe. The Fire Chief participates in the Lewis County Emergency Operations Center during flooding events to coordinate flood warning activities for the City.

They use 7 local staff gages for local stream level monitoring. They rely heavily on the USGS gage, Newaukum River near Chehalis, at River Mile 4.1 for their estimating of flood levels from the Newaukum River, and the Chehalis River near Doty, at River Mile 101.8, for the Chehalis River.

#### Notification and Communication Methods:

All road closure or flood warnings are posted on the City's website and sent to the County for them to include on the county's website as well.

#### Improvements Desired:

An interface to a basin wide system that would provide stream levels and forecasting info.

An automated redundant gauge at Doty or other upstream location.

An automated gauge for the Chehalis River at the Treatment Plant.

A NWS automated gauge at the Mellen Street bridge.

A real-time monitoring station at Adna that would include flow in cfs so that could be made into a prediction point.

#### Other Discussion

In addition to the Chehalis River flooding, Salzer Creek and the Newaukum River can have a significant effect on flooding in portions of the City. Salzer Creek does cause some local flooding, primarily in combination with flooding on the Chehalis River.

# Chehalis Basin Flood Warning System Improvements

## GRAYS ARBOR COUNTY

### NEEDS ASSESSMENT MEETING MINUTES

**Date:** 12/1/2009

**Location:** Grays Harbor County, Forestry Building, Montesano, Washington

**Present:**

Terry Willis, Grays Harbor County Commissioner  
Chuck Wallace, GHC Deputy Director for Emergency Management  
Jeff Nelson, GHC Environmental Health  
Garrett Dalan, GHC Environmental Health  
Larry Bishop, Citizen  
Megan Crowley, Citizen  
Ray Walton, WEST Consultants, Inc.  
Greg Dutson, Engineered Monitoring Solutions  
Jerry Louthain, HDR, Inc.

**Discussion Items:**

Typical Flood Scenarios

In addition to flooding from the mainstem of the Chehalis River, flooding in the Chehalis River Basin portion of Grays Harbor County occurs from two primary tributary sources, the Satsop River and the Wynoochee River and their minor tributaries. Chehalis Basin flooding also occurs on the Wishkah, Hoquiam, and Humptulips Rivers, however most of the County portions of these floodplains have only limited development and relatively minor damages occur. These three river systems also are not direct tributaries to the Chehalis River mainstem as the mouths of these rivers are within the salt water body of Grays Harbor.

Because the County is located in the most downstream portion of the Chehalis Basin, they have a long lead time for notification regarding impending flooding from the mainstem Chehalis River. Typically flooding on the Satsop and Wynoochee Rivers occurs prior to the crest on the Chehalis River reaching the County. When the Chehalis River reaches flood stage or higher, backwater flooding from the Chehalis also causes some additional flooding on the lower reaches of each of these tributaries. Additional flooding also occurs due to high tides near the mouths of these rivers and on the mainstem Chehalis River as far upstream as just upstream of the Satsop River mouth.

Flooding on the Wynoochee River is largely influenced by flow releases from Wynoochee Dam, which is located River Mile 52.

### Data Collecting/Forecasting Methods:

The County use the NWS weather and river forecasts that reference the USGS stream gages located at Grand Mound (River Mile 60) and Porter (RM 33) on the Chehalis River. There are two additional gages on the Chehalis River, one near Satsop and one near Montesano, however these gages do not provide reliable readings since they both are influenced by tidewater during high tides on the Chehalis River. They also monitor the University of Washington's website. The gage sites on the Satsop River and Wynoochee River are used as well for monitoring flows on these rivers. One real-time gaging station is located at River Mile 2.3 on the Satsop, and three real-time gages on the Wynoochee at River Miles 5.9 (above Black Creek), 40.6, (above Save Creek) and 51.3 (just below Wynoochee Dam).

Of these two gages, the Satsop gage is relied upon more because the Montesano gage is more influenced by ocean tides.

Outflow condition at Wynoochee Dam is also used to forecast stream levels.

Another matter that was discussed was that the USGS gage at the Humptulips River has been funded for another year.

### Notification and Communication Methods:

Messages are provided to the general public via a dial out notification service, the Grays Harbor County website, the Grays Harbor County Emergency Management website, radio and television broadcasts, and at times, a ham radio network.

Grays Harbor County Emergency Management will use National Weather Service forecasts to give a 36-48 hour notification window of impending flooding to the affected areas. Emergency Management initiates the dial out notification service to the areas which will be impacted by the flooding, sends e-mails to the various entities such as Police Chiefs, Fire Chiefs, Citizen Corps Groups and to the local Media and posts the information on the County and Emergency Management websites. In some instances, the Grays Harbor Sheriff's Office will go door to door to warn property owners of impending flooding and the need to evacuate.

### Improvements Desired:

- Would like rain gages in the Satsop and Wynoochee River basins, and all gages viewable over the internet.
- Would like outflow flow quantity and reservoir level data from Wynoochee Dam in real time. They would also like the Corps to notify them of future releases when known.
- Would like better coordination and communication from the Corps to use and to inform the public regarding operating procedures at Wynoochee Dam
- Would like a stream gage at Elma to be used for forecasting river levels.

- Additional stage only stream gage stations would be helpful to some local residents.
- Would like the USGS to account for tidal influence levels at the Montesano stream gage.
- Would like better coordination with WSDOT regarding road closures to improve coordination with evacuation routes etc.

#### Other Discussion

Megan Crowley voiced concern over repeated flooding of her commercial horse boarding/training facility and the surrounding area. It was discussed that additional lead time is needed so that she can coordinate the evacuation of her facility. She did indicate that she gets a call from the Corps regarding releases from Wynoochee Dam.

# **Chehalis Basin Flood Warning System Improvements**

## **LEWIS COUNTY**

### **NEEDS ASSESSMENT MEETING MINUTES**

**Date:** 12/3/2009

**Location:** Lewis County Offices, Chehalis, Washington

**Present:**

Fred Chapman, Building Official, Lewis County  
Ross McDowell, Deputy Director, Lewis County Sheriff's Office  
Gregg Peterson, Curtis, Boistfort Fire District  
Ray Walton, WEST Consultants, Inc.  
Greg Dutson, Engineered Monitoring Solutions  
Jerry Louthain, HDR, Inc.

**Discussion Items:**

Typical Flood Scenarios

Flooding in the Chehalis Basin portion of Lewis County occurs from several sources. The primary source is the Chehalis River, along with the South Fork Chehalis River, which flows from the southwesterly corner of the County in a northerly, then easterly, then northerly direction until it flows into Thurston County just north of the City of Centralia. The Newaukum River, along with its' primary tributaries, the North, Middle, and South Fork of the Newaukum, is another major flooding source in the Chehalis Basin portion of the County. The three main tributaries come out of the hills in eastern Lewis County to form the mainstem Newaukum and from there it flows from the southeast to its' confluence with the Chehalis River west of Interstate 5. The Skookumchuck River is another flooding source, however only a short reach of the Skookumchuck River lies in the County. Approximately a 15-mile reach of the Skookumchuck River lies in Thurston County from Skookumchuck Dam downstream to the County line at approximately River Mile 5. The Skookumchuck then flows for only a few miles to the northeasterly portion of the City of Centralia and then through the westerly portion of the City to it's confluence with the Chehalis River west of Interstate 5 and just south of the Harrison Street exit from I-5.

The typical flooding scenarios in the County are that flooding occurs first on the smaller drainages of the numerous small tributary streams in the County, followed by flooding from the Skookumchuck and Newaukum Rivers, and then from the Chehalis River. When the Chehalis River reaches flood stage or higher, backwater flooding from the Chehalis causes additional flooding on the lower reaches of each of these tributaries.

Data Collecting/Forecasting Methods:

The County uses the predictive model presented in the USACE Chehalis Flood Ground Truthing Project report and floodplain mapping based on the January 1990 flood, showing Chehalis, Newaukum, and Skookumchuck River Flood Phases 1-4, with Phase 4 being the most severe.

County receives alert messages from NWS via email and webinars.

Once on alert, Ross watches NWS climate forecasts and stream gage levels. Riverwatchers (approximately 150 citizens) are also used especially along South Fork Chehalis.

Flood level estimates are then made based on the NWS climate data, local knowledge, and Riverwatcher information.

#### Notification and Communication Methods:

County utilizes an Emergency Operation Center located in the Sheriff's office. Ross McDowell initiates the activation of the County EOC, which typically becomes operational when a Phase 3 Flood is predicted. CCD STACY Brown is Ross' alternate. Notification is provided via a limited phone tree to local jurisdictions, the County's website, TV/Radio announcements, NOAA radios and a CodeRed dial out service. CodeRED is a system that gives "action to be taken now" notifications and is geographically based.

Boistfort utilizes fire trucks etc. with sirens to alert residents in the community. The County also provides flood notification information to downstream counties and cities within the Chehalis River basin. They receive notifications from EMD using MyStateUSA.

#### Improvements Desired:

Stream gage at Beaver Creek on the South Fork of the Chehalis  
Rain gage on Elk Creek or Rock Creek and Upper Newaukum Basin  
Stream gage w/ flow at Elk Creek  
Snotel site on Boistfort Peak  
Add flow and predictive capabilities to the Adna stream gage  
Siren/loud speaker network for upper Chehalis communities

#### Other Discussion

Outlying communities in Lewis County have very little advance notice of floods. Early detection and notification is much more important in this area of the basin, particularly in the upper Chehalis and South Fork Chehalis basins.

Some concern over the dams located upstream on the Skookumchuck and the Cowlitz Rivers. Ross mentioned that Tacoma City Light has a new Emergency Response Coordinator.

They noted that new streamflow gages are being set up on Elk Creek and Salzer Creek by USGS.

They would like messages broadcast in English and Spanish.

# **Chehalis Basin Flood Warning System Improvements**

## **T HURSTON COUNTY**

### **NEEDS ASSESSMENT MEETING MINUTES**

**Date:** 11/30/2009

**Location:** Thurston County Courthouse, Olympia, Washington

**Present:**

Andrew Kinney, Thurston County  
Kathy Estes, Thurston County  
Mark Swartout, Thurston County  
Ray Walton, WEST Consultants, Inc.  
Greg Dutson, Engineered Monitoring Solutions

**Discussion Items:**

Typical Flood Scenarios

Flooding in the Chehalis Basin portion of Thurston County occurs from two primary sources, the Skookumchuck River and the Black River and their minor tributaries. Approximately a 15-mile reach of the Skookumchuck River lies in the County from Skookumchuck Dam downstream to the Lewis County line at approximately River Mile 5. The Skookumchuck then flows for only a few miles to the northeasterly portion of the City of Centralia and then through the westerly portion of the City to its confluence with the Chehalis River west of Interstate 5 and just south of the Harrison Street exit from I-5. There are three active real-time USGS gauging stations on the Skookumchuck River drainage, one upstream of the reservoir, one just downstream of the dam, and one downstream of the Town of Bucoda. The Black River flows from Black Lake located near Olympia, in a southwesterly direction to the southwestern corner of the County near the City of Rochester and the community of Gate. A short reach of the Chehalis River also flows through the southwesterly portion of the County.

The typical flooding scenarios in the County are that flooding occurs first on the smaller drainages of the numerous small tributary streams in the County, followed by flooding from the Black and Skookumchuck River and then the Chehalis River. When the Chehalis River reaches flood stage or higher, backwater flooding from the Chehalis causes additional flooding on the lower reaches of each of these tributaries.

Data Collecting/Forecasting Methods:

Thurston County subscribes to the NWS eWarn system for weather alerts and warnings. NWS pushes the warnings to the county via email and txt.

The county reviews NWS wind, rain, flood elevation predictions, Snotel estimates, CoCoRaHs, freeze estimates, and USGS stream gage readings.

The current weather conditions, current USGS stream gage data, and the NWS predictions are combined with local knowledge of County personnel to make predictions about the severity of the flooding.

#### Notification and Communication Methods:

Kathy Estes makes decision to activate the EOC along with input from boss.

Media notifications are produced when there is a flood watch from the NWS that could cause localized impacts. Any notifications to the public are also sent to Grays Harbor and Lewis County.

The ALERT telephone service is used to disseminate the warning calls to the general public. About 650 phone numbers included. The County currently pays \$1500 to \$2000 for each event. The current system does not meet their needs.

River level data is displayed on the county's website at <http://www.co.thurston.wa.us/em/Rivers/Chehalis.htm>.

Typically, the county has plenty of time to staff up in the event the EOC is activated and use the ALERT system. EOC initiates the notifying of staff to work by e-mail and has worked well in the past.

The County likes using the USGS gaging stations and data.

#### Improvements Desired:

- Better predictive model for local flooding impacts.
- Improved method for data display and assimilation.
- Expansion of the Riverwatch (local visual observation) network.
- Improved communication regarding status and condition of flood control structures in the basin during events.
- Would like flood inundation mapping capability
- Would like additional gages on the Skookumchuck River located at \_\_\_\_\_ to improve the prediction models.
- Would like notification system for any potential Skookumchuck Dam failure.

#### Other Discussion

The county would like to keep the USGS and NWS gages as the back bone of any new monitoring program.

40 minute lead time for inundation from Skookumchuck dam failure. No notification system currently in place.

The predictive model of the Skookumchuck River by NWS is not using side channel input. By the time it reaches the Bucoda gage it's too late – could be solved by additional gages or by updating the model.

Would like to have a notification system based on geographic area that is capable of supporting the needs of other emergencies such as chemical spills, fire, etc.

Would like to develop “threshold” levels for river flooding.

They have a number of levees in the County, but are unsure of ownership. They would like to see better communication of levee failures.

# **Chehalis Basin Flood Warning System Improvements**

## **TOWN OF BUCODA**

### **NEEDS ASSESSMENT MEETING MINUTES (phone interview)**

**Date:** 2/4/2010

**Location:** Phone Interview

#### **Present:**

Jim Fowler, Bucoda Fire Dept, 360-867-2648,  
Greg Dutson, Engineered Monitoring Solutions

#### **Discussion Items:**

##### Typical Flood Scenario:

The Skookumchuck River flows roughly north to south through the Town of Bucoda and then dumps into the Chehalis River at Centralia. Flooding occurs in Bucoda when the Chehalis River levels become so high that the Skookumchuck River backs up from its confluence with the Chehalis River. The backup of flow causes the Skookumchuck River levels to rise and flood parts of Bucoda from the south.

##### Data Collecting/Forecasting Methods:

Typically, the Bucoda emergency personnel will watch weather forecasts and then monitor the USGS river gages (USGS 12026150 and 12026400) along the Skookumchuck River. They will also place a call to Trans-Alta to get the Skookumchuck River reservoir level. Based on the NWS weather forecasts, the readings of the gages and the reservoir level they will then estimate the severity of the flood levels and take appropriate measures.

##### Notification and Communication Methods:

During flooding events caused by storms, typically they are able to have 24 hours notice of possible flooding. During these events, the City prints up flyers and they are passed out door-to-door to the effected residences (approximately 400). The flyers contain a warning notice of possible flood and the evacuation routes to take.

A breach of the Skookumchuck Dam will cause flooding of 2/3 of the town within two hours of the breach. A siren on top of the fire house will be used as the primary notification method to notify the town of the emergency. The siren is tested nightly with a short audible wail. The plan is to turn the siren on and leave it on in the event of a dam breach. The current siren is over 60 years old.

During flood events, the EOC for the city moves to higher ground up off of 8<sup>th</sup> street and is operated with generators and radios.

Improvements Desired:

A stage-only automated stream gage on the Skookumchuck River at the 7<sup>th</sup> Street bridge in Bucoda.

Access to the Skookumchuck Reservoir level data in a near real-time interface.

An improved interface to the USGS gage data, NWS data, and the reservoir level data.

A digital siren with voice message capability to be used to notify the town population during flood events.

Other Discussion:

Jim indicated that the USGS gages along the Skookumchuck River at Bloody Run and Bucoda have been very stable and he was not aware that they had experienced any damage or down time.

# Chehalis Basin Flood Warning System Improvements

## TOWN OF PE ELL

### NEEDS ASSESSMENT MEETING MINUTES (phone interview)

**Date:** 1/4/2010

**Location:** Phone Interview

**Present:**

Deloris Lee, Town of Pe Ell  
Greg Dutson, Engineered Monitoring Solutions

**Discussion Items:**

Typical Flood Scenarios

The town of Pe Ell is located close to the headwaters of the Chehalis River. Subsequently, the river is flashy in their area but localized flooding within the City limits is minimal.

Data Collecting/Forecasting Methods:

City personnel watch NOAA weather reports and forecasts. Water levels of the Chehalis river are observed manually at the City's water treatment and sewer treatment plants.

Notification and Communication Methods:

If water level in the river gets too high then the City contacts Ross McDowell at Lewis County to let them know that the water is rising.

Once they are in an alarm condition, they monitor the Lewis County website for updates and evacuation notices.

Improvements Desired:

- Would like additional stream gage somewhere upstream of the City to assist with river level monitoring and flood forecasting.

## **Chehalis Basin Flood Warning System Improvements**

### **CONFEDERATED TRIBES OF THE CHEHALIS RESERVATION AND CITY OF OAKVILLE**

#### **NEEDS ASSESSMENT MEETING MINUTES**

**Date:** 12/1/2009

**Location:** Lucky Eagle Casino, Rochester, Washington

**Present:**

J Glen Connelly, Environmental Program Specialist Chehalis Tribe  
Ralph Wyman, Chief of Police at the Tribal Police Dept.  
Mark White, Director of Natural Resources Dept.  
Dan Thompson, Oakville Public Works Dept.  
Jim Mattheis, Lucky Eagle Casino  
Earl McWhorter, Lucky Eagle Casino - TGA  
Ray Walton, WEST Consultants, Inc.  
Greg Dutson, Engineered Monitoring Solutions  
Jerry Louthain, HDR, Inc.

**Discussion Items:**

Typical Flood Scenarios

Primary flooding issues are high river levels of the Chehalis River that combine with the Black River to cause backwater flooding into lowland areas near the confluence of these two rivers. Flooding from the Black River typically occurs prior to flooding from the Chehalis River, since there is a much larger drainage basin upstream of the confluence with the Black and Chehalis Rivers. During large flooding events on the Black River, significant flooding can occur from the Black River by itself. The Tribe's Reservation lands include several miles of Chehalis River floodplain, and some flooding occurs all along this reach of the river. Half of Oakville might be flooded during major events.

Data Collecting/Forecasting Methods:

Since flood events for this part of the basin have long times for warning of flooding from the Chehalis River, the emergency management personnel for the Confederated Tribes of the Chehalis Reservation (Tribe) watch long range weather forecasts for flood warnings etc. When an event is forecasted they will monitor the NWS prediction data and any warnings issued from the State EMD. The USGS gaging station at Grand Mound (River Mile 70) is the primary stage measurement that is used for forecasting and early warning detection. They also receive some emails from other counties in the basin.

Ralph Wyman is the point person for the Tribe who reviews the data and field reports to determine the severity of the event and to make decisions to evacuate the tribal lands

and the casino properties. The casino needs a three-hour minimum amount of time to evacuate the casino properties, which are totally evacuated, except for a few emergency staff, during a major flooding event from the Chehalis River. This is because the primary access route, State Highway 12, is inundated in both directions from the casino during these major floods. The casino properties are located on higher ground than the surrounding area, so they become an island during major flooding events.

The City of Oakville works closely with the Tribe to coordinate flood forecasting and visual observations. The easterly and southerly portion of the City flood during a major event, such as the December 2007 flood. Some flooding also occurs due to flooding from Harris Creek which enters the Chehalis River south and west of the City.

Oakville has a rain gage that is maintained by King 5 news.  
Tribe rain gage data goes to Washington Department of Ecology.

#### Notification and Communication Methods:

Once a decision to evacuate is made, the emergency staff of the Tribe and the City of Oakville use a phone tree and word of mouth to communicate the evacuation notice to the general public. Evacuation and road closure information is also posted on the reader board along Highway 12 at the Anderson Road entrance to the casino.

#### Improvements Desired:

- Would like additional stream gage somewhere upstream on the Black River to improve flood level forecasting at the confluence of the Black River and the Chehalis River.
- Would like additional stream gage on Chehalis River in the vicinity of the mouth of Independence Creek (near the Thurston/Grays Harbor County line).
- Would like improved communication from Lewis County and WSDOT regarding flood severity and highway closures.
- Would like mobile readerboards to place along Highway 12 during event for improved notification.
- Would like to be able to access central "basin" website with flood data and coordination information.
- Would like access to the Skookumchuck Reservoir levels and a notification system in case of dam break.

#### Other Discussion

Doppler radar coming to region next year.