BACKGROUND / REFERENCE DOCUMENT

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I. Legislation (http://apps.leg.wa.gov/documents/billdocs/2011-12/Pdf/Bills/Session%20Laws/Senate/5127.SL.pdf)

NEW SECTION. **Sec. 313. FOR THE OFFICE OF FINANCIAL MANAGEMENT --** Chehalis River Basin Flood Relief Projects (91000398)

The appropriation in this section is subject to the following conditions and limitations:

(1) Projects funded under this section must be reviewed and approved by both the Chehalis River basin flood authority and the Chehalis tribe prior to the allotment of funds by the office of financial management.

(2) Up to $1,875,000 of the appropriation is for repairing and modifying levees and dikes, including but not limited to, the airport levee, levees protecting the Adna and Bucoda areas.

(3) Up to $2,075,000 of the appropriation is for modification of the Sickman Ford bridge, and floodplain culverts, to open up the channel, increase conveyance, and allow for flood relief.

(4) Up to $50,000 of the appropriation is for installation and calibration of a rain gauge on the Chehalis reservation.

(5) Up to $500,000 of the appropriation is for construction of evacuation routes and pads to avoid future livestock losses.

(6) Up to $500,000 of the appropriation is for improvements to areas affected by the Satsop river.

Appropriation:
State Building Construction Account--State $5,000,000
Prior Biennia (Expenditures) $0
Future Biennia (Projected Costs) $0
TOTAL $5,000,000

II. Project Categories

- **Category A [$1,875,000]:** *"Repairing and Modifying Levees and Dikes (including but not limited to, airport levee, levees protecting Adna and Bucoda)."*
- **Category B [$2,075,000]:** *"Modification of Sickman Ford Bridge and Floodplain Culverts (to open channel, increase conveyance and offer flood relief)."*
- **Category C [$50,000]:** "*Installation and Calibration of a Rain Gauge on the Chehalis Reservation.*"
- **Category D [$500,000]:** "*Construction of Evacuation Routes and Pads (to avoid future livestock losses).*"
- **Category E [$500,000]:** "*Improvements to Areas Affected by the Satsop River.*"

III. Funding Status

Category A [$1,875,000]: "Repairing and Modifying Levees and Dikes (including but not limited to, airport levee, levees protecting Adna and Bucoda)."					
Project	**Cost**		**FA Obligated**	**Chehalis Tribe Concurred**	**OFM Approved**
1. Airport Levee (Construct Phase I)	$	1,239,829	7/13/2012	8/10/2012	****
2. Adna Levee (Construct Full Project)	$	244,145	7/13/2012	7/19/2012	****
3. Bucoda (Preliminary Design, Costing)	$	42,000	7/26/2012		
Total Obligated →	$	1,483,974			
Total Remaining →	$	349,026			

Category B [$2,075,000]: "Modification of Sickman Ford Bridge and Floodplain Culverts (to open channel, increase conveyance and offier flood relief)."					
Project	**Cost**		**FA Obligated**	**Chehalis Tribe Concurred**	**OFM Approved**
Total Obligated →	$	0			
Total Remaining →	$	2,075,000			

Category C [$50,000]: "Installation and Calibration of a Rain Gauge on the Chehalis Reservation."					
Project	**Cost**		**FA Obligated**	**Chehalis Tribe Concurred**	**OFM Approved**
1. Chehalis Tribe Flood Gage Station	$	50,000	7/2/2012	7/3/2012	****
Total Obligated →	$	50,000			
Total Remaining →	$	0			

Category D [$500,000]: "Construction of Evacuation Routes and Pads (to avoid future livestock losses)."					
Project	**Cost**		**FA Obligated**	**Chehalis Tribe Concurred**	**OFM Approved**
1. Lewis County Conservation District Critter Pads.	$	500,000	(6/19/2012) 8/13/2012		
Total Obligated →	$	500,000			
Total Remaining →	$	0			

Category E [$500,000]: "Improvements to Areas Affected by the Satsop River."					
Project	**Cost**		**FA Obligated**	**Chehalis Tribe Concurred**	**OFM Approved**
Total Obligated →	$	500,000			
Total Remaining →	$	0			

IV. **Category A [$1,875,000]:** *"Repairing and Modifying Levees and Dikes (including but not limited to, airport levee, levees protecting Adna and Bucoda)."*		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
1. Airport Levee (Phase I levee base improvement) **Location:** City of Chehalis, Lewis County **Ownership:** Chehalis-Centralia Airport (City of Chehalis, Lewis County) **Project Description/Benefits:** Over the past few years the Chehalis-Centralia Airport has been working towards a "shovel ready" project for enhancing the Airport Levee. This enhancement project is designed to provide protection against a 100-year flood event for the Airport and to a lesser degree I-5. Civil plans for this project have been completed by RB Engineering and involve raising the existing 2.3 miles of earthen levee to an elevation three feet above the 100-year flood level as recently identified by FEMA. This is accomplished by widening the base of the levee and constructing it higher as to maintain existing side slopes. In addition to the existing levee improvements, this project would involve elevating Airport Road along the south side of the Airport including the replacement of all utility infrastructures. The cost estimate for this project is approximately $3.2 million with the roadway improvements responsible for the majority of the cost. The Airport has not had a chance to complete the hydraulic analysis to identify any potential impacts caused by this project, so we are proposing a scaled version of this project that we believe will not have any measurable change to any other area in the basin in the available hydraulic model and will fit within the Engrossed Senate Bill 5127 budget. See proposed project location at http://goo.gl/maps/P9RBc. Representatives from Lewis County, City of Chehalis, Chehalis-Centralia Airport, and WSDOT recently met to discuss a project that could be proposed to the Flood Authority and the Chehalis Tribe as outlined in Senate Bill 5127. We all agree that a project elevating the Airport Levee is not practical within the timeframe set by ESB 5127 because it does not allow for the identification and mitigation of	**Budget:** $1,239,829 (detailed cost estimate provided) **Lead Agency:** Chehalis-Centralia Airport. The Chehalis-Centralia Airport is a public entity through a joint venture between Lewis County and the City of Chehalis. We are governed by the appointed Chehalis-Centralia Airport Governing Board. The Airport is capable of receiving the funds and managing the project through design, advertising, and execution. We will be utilizing RB Engineering to assist us with the project management. In similarity, we complete multimillion dollar infrastructure construction projects through FAA Airport Improvement Program grants. I think you would look at this as an annual average FTE. Granted this project is not going to support 17.2 individual people for a whole year, however, it is affecting a fraction of many more "lives" in the region which all total up to 17.2 FTE jobs for a year. **Jobs Supported:** Utilizing the Input-Output Model methodology for estimating economic impacts published by the Washington State OFM, there is a job impact of 17.2 direct and indirect jobs for this project. This was derived by breaking down our project cost estimate into three NAICS categories; Construction, Truck Transportation, and Engineering Services.	**Next Steps:** The project will be managed and administrated by the Chehalis-Centralia Airport with the assistance of RB Engineering. Construction plans will be completed and then the project could be placed out for bid. Depending on the season timeframe, construction would commence either this summer or early next spring.

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Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
potential impacts. However, it is agreed that improving the existing levee by completing the required width expansion, but not causing an increase in elevation, could be completed within the narrow timeframe to create jobs. This project would enhance safety by providing a sounder levee for the protection of the Airport and I-5. It would also allow for future enhancement at a reduced cost, and would fit within the appropriations of ESB 5127 including the consideration of the levees protecting the Adna and Bucoda areas. This improvement project would not involve any work on Airport Road, would not create any new levees, and it is assumed that it would not cause any measurable impacts beyond the impact of placing the required material for the base expansion on the inside of the levee. Cross section illustrating the enhancement of the levee versus the proposed base improvement is available. **Adverse Impacts/Effects:** "Phase I project is assumed to not cause any measurable impacts beyond the impact of placing the required material for the base expansion on the inside of the levee. The fill is essential being placed inside of an existing wall so as long as the levee is not overtopped, the additional 55,000 cubic yards will not have an adverse effect. There have been studies that show an insignificant downstream impact if the entire airport property was filled to simulate a higher levee. The fill required for this levee project is less than one percent of the overall airport property volume, so I would conclude that in the event the levee was overtopped or breached, this project would have no measurable downstream impact."	The corresponding estimates were then inputted into the model where it estimated the jobs impact along with an economic output multiplier of $2.6M and a labor impact of $982k. These numbers seem consistence and reasonable when compared to the project scope.	
2. Adna Rails to Trails "Levee" Maintenance **Location:** Adna, Lewis County **Ownership:** Washington State Parks owns the Willapa Trail System; the system is within Lewis County.	**Budget:** Lewis County cost estimate of $244,145 including permitting costs (detailed cost estimate provided) Recommended that funding be through Lewis County as we already have an MOA with OFM to disburse monies on flood mitigation projects.	**Next steps:** Begin steps necessary to permit this project including cultural resources evaluation, and JARPA for HPA. Lewis County is proposing to use County Forces or contract out the

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Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Project Description/Benefits: Project consists of cleaning the drainage pathway along the historic rail grade (now Willapa Trail System) to prevent 2007 level flooding that occurred when the blocked drainage was ineffective in conveying flood waters and allowed for more severe flooding to the Adna High School and surrounding households. This system has been historically maintained by the rail system owner preventing the type and extent of flooding that happened in the 2007 flood, but had fallen into disrepair and was unable to convey stormwater effectively during the event. This project will restore the drainage pathway to approximately 7,500 lineal feet of the drainage system and replace culverts as needed in order to provide historic levels of protection to the surrounding areas. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** This project incorporates debris removal and culvert cleanout of existing drainage facilities along the rail grade deeded to the Washington State Parks in 1995 for their Rails to Trails project. Parks Department improvements have been limited to the surface restoration of the former railroad grade in an effort to create a trail system that will eventually enable pedestrians, bicyclist and equestrian use from Chehalis to Raymond. Existing drainage routes along the rail grade have become clogged with debris and culverts plugged from major storm events in this region. This project would restore previously established drainage routes and provide additional flood protection for a concentrated group of residents, business, a fire station, a public park and a public school within the unincorporated Adna community. Drainage routes established during the railroad construction (circa 1897) would not be altered from conditions that have existed for over 100-years. Therefore, no measurable downstream impacts are expected with this proposed project.	**Lead Agency:** Lewis County. The Rails to Trails program is owned and operated by the Washington State Parks and Recreation Commission and therefore lead agency status would remain with the owner. Lewis County (Flood Authority) will support this project through an Inter-Agency agreement for initial drainage improvements and continued drainage maintenance for the Rails to Trails – Adna to Littell portion of their pathway. **Jobs Supported:** Utilizing the Washington Input-Output Model (NAICS) Simple Impact Analysis for estimating direct impacts (attached) published by the Washington State OFM, there is a job impact of 3.1 direct and indirect jobs for this project. This was derived by breaking down our project cost estimate into three NAICS categories; Construction, Truck Transportation, and Engineering Services. The corresponding estimates were then inputted into the model where it estimated the jobs impact along with an economic output of $484k and a labor income of $176k. These numbers seem reasonable when compared to the project scope.	project; however, State Parks will need to approve. Need to talk with State Parks, and determine potential future O&M costs.
3. Bucoda Levee **Location:** Bucoda, Thurston County	**Budget:** $42,000. **Lead Agency:** Town of Bucoda	**Next Steps:** The Phase I -- Design portion of the proposed project is assumed to be able to be completed in

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Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Ownership: Town of Bucoda **Project Description/Benefits:** The proposed project is to raise and extend an existing levee in order to fully encircle the Town of Bucoda's wellhead with a continuous levee system that protects the Town's drinking water system. The existing levee is approximately 500 feet long. The top of the existing levee varies in elevation from about 251 to 253 feet. The existing levee is shaped like a trapezoid. The elevation of the 2009 flood was approximately 253 feet. The elevation of the access road into wellhead site varies from about 251 to 254 feet. The proposed project is to raise and extend the existing levee in order to fully encircle the Town's wellhead with a continuous levee system with an average elevation of 256 and roughly 3 feet of freeboard. The existing levee was repaired by the US Army Corps of Engineers (Corps) in 2002. Town officials are seeking additional historic and technical information from the Corps. The Town's engineer estimates the proposed project will require about 300 cubic yards of material. The Phase I -- Design costs are estimated to be about $42,000 and 530 FTE hours. The Phase II -- Construction costs are not yet known but the work effort is estimated to be about 1,480 FTE hours. The Phase I -- Design will address the cost to improve the levee separate from the cost to repair the levee from any deferred maintenance as requested by the Office of Financial Management. See proposed project location at http://goo.gl/maps/P9RBc. The proposed project is viewed as essential to protect the Town's drinking water system including the wellhead, pumps, generator and equipment from future floods. The proposed project is intended to protect the Town's wellhead infrastructure from direct flood velocity damage as well as backwater ponding. **Adverse Impacts/Effects:** The proposed project was evaluated for upstream and downstream effects on 7/23/2012 using the Chehalis	**Jobs Supported:** Design about 530 hours. Construction - about 30 days with 6 people = 1,440 hours + 5 days at the gravel pit with one operator = 40 hours. Total estimate = 2,010 hours, 11.6 months,or about 1.0 FTE	time for consideration for the 2013-15 state capital budget (October-November 2012). The Phase II – Construction portion of the proposed project is assumed to be likely able to be completed by July 1, 2013 depending on the cost and available funding.

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HEC-RAS model by Larry Karpack of Watershed Science and Engineering (email). Larry's analysis determined there would likely be no observable difference of more than 0.01 feet (i.e., 0.12 inches) above baseline at any location as a result of the proposed project. Larry modeled for a February 1996 flood event (the biggest observed flood on the Skookumchuck system since the construction of the Skookumchuck dam).		
4. Wishkah Road – Kersh (Alternatives Analysis, Preliminary Design) **Location:** Grays Harbor County **Ownership:** Grays Harbor County, City of Aberdeen and private. **Project Description/Benefits:** The project need is to reduce/eliminate flooding to the Wishkah Road between milepost 2.2 and milepost 2.7. Initial project alternatives include: (1) acquiring two parcels of land adjacent to the river to provide additional flood plain storage and (2) constructing a 2,000 foot long sheet pile wall/dike. Grays Harbor County is interested in soliciting interest from consulting firms with expertise in Civil/Flood design work to: Identify three or more alternatives to reduce/eliminate flooding in this area. Identify permits required for each alternative proposal. Identify property and easements needed to be acquired for each alternative proposal. Prepare preliminary plan and Design and Construction Cost estimates for each alternative proposal. Recommend an alternative for final design. Provide a Scope and Schedule for final design and permits. The proposed project would reduce frequent property damage and allow free access to critical public services, e.g., fire, ambulance,	**Budget**: Preliminary Design: $100,000 Final Design and PS&E: $200,000 **Lead Agency:** Grays Harbor County **Jobs Supported**: Preliminary Design = 780 hours or 0.40 FTE. Final design and permitting = 2,150 FTE hours or roughly 1.00 FTE. Construction = 13 jobs for 6 months or 7.9 FTE.	**Next Steps:** It will take some time to accomplish a final complete design with all permits for the proposed project. The Preliminary Design portion of the proposed project is however assumed to be able to be completed in time for consideration for the 2013-2015 capital budget (October-November 2012). Further Studies Needed -- Studies and documentation necessary to support permitting and environmental review. Hydraulic analysis to determine adverse impacts/effects… Alternative 1: Assume that analysis and design of a bank protection and flood reduction project at this site will require detailed hydraulic analysis. A hydraulic model of the reach of the river in the vicinity of the project site (approximately a 1 mile reach) can be prepared and used to evaluate flood levels and scour issues for various bank protection alternatives at an estimated cost of $25,000. Alternative 2: If explicit consideration

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hospital, etc. An additional benefit of the land acquisition would be the restoration of the natural tidal floodplain. If the purchase and removal of existing structures was accomplished, the opening up of the natural floodplain could be achieved. This step may be preferred but is not required to achieve flood mitigation. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined. The Chehalis River hydraulic model is not set up to look at sites up the Wishkah River. The sheet pile wall could have some impact on flood levels. A hydraulic model of the Wishkah River would be necessary to evaluate potential effects of the project on upstream and downstream water levels. Our (WSE) understanding is the flooding in this area is caused by high tide levels but river flows can also contribute to flooding. The hydraulic model would allow analysis of various tide and river flow conditions as necessary to establish a design height for the dike. It should be noted that tidal flooding may be increasing as a result of sea level rise (NOAA estimates that global sea levels are rising by approximately 0.1 foot per decade and observations at Toke Point, WA show sea levels rising by about 0.04 feet per decade at that location). The design would need to take sea level trends into account. Additional possible negative effects could include: purchase of private property; disturbance of a small amount of tidally influence wetland; disruption of naturally growing flora and fauna.		of hydraulic impacts of the downstream diking projects is to be done a model of the lower 5 miles of the river could be prepared at an estimated cost of $60,000 including survey, hydrology, hydraulics, and alternative analysis.
5. Humptulips Dike Road **Location:** Grays Harbor County **Ownership:** *** **Project Description/Benefits:** Identified from Grays Harbor County Draft Hazard Mitigation Plan 2001. This project is presently undefined.	**Budget:** Unknown/undetermined. **Lead Agency:** *** **Jobs Supported:** Unknown/undetermined.	**Next Steps:** To be determined.

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Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Adverse Impacts/Effects: Unknown/undetermined.		
6. Southside Dike/Levee Certification (Certification) **Location:** Aberdeen, Grays Harbor County **Ownership:** City of Aberdeen **Project Description/Benefits:** In order for the current flood protection status of South Aberdeen to be recognized Aberdeen needs to complete a certification process for its dike even though it was designed and built by the U.S. Army Corps of Engineers. This process is ongoing and is being done in-house. There may be some dike improvements needed to meet the certification requirements. This project documents effectiveness of existing diking system. Certifying the Southside Dike will ensure compliance with U.S. Army Corps of Engineers standards and the effectiveness of the Southside Dike to protect South Aberdeen from flooding events. The South Side Dike protects a resident population of approximately 4,000, an elementary school, a junior high school, major shopping centers, and various commercial businesses. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Assuming the levee certification will not result in a change to the size of the levee it will have no impact on hydraulic conditions and therefore no analysis is necessary.	**Budget:** $50,000 (geotech) **Lead Agency:** City of Aberdeen **Jobs Supported:** Unknown/undetermined.	**Next Steps:** This proposed project is anticipated to be completed within the year. Further studies needed -- FEMA requires levee certification before areas protected by levees can be shown as out of the 100-year floodplain. FEMA review of levee certification requests can be costly as FEMA typically requires as-built surveys, geotechnical analysis, hydraulic analysis (including seepage), erosion analysis, freeboard analysis, evaluation of any penetrations through the dike, etc. before certifying the levee. FEMA is currently in the process of revising their guidelines for how to map areas protected by levees so, to the best of our (WSE) knowledge, nothing could be done to get the levee certified until after FEMA finalizes their new guidelines.
7. Dike bank of Wishkah north of Highway (Preliminary Design) **Location:** Aberdeen, Grays Harbor County (East bank of Wishkah from Kansas Street to Chehalis street) **Ownership:** City of Aberdeen	**Budget:** Preliminary Design: $47,000 Final Design (PS&E) and Construction: $235,000 **Lead Agency:** City of Aberdeen	**Next Steps:** The Phase I – Preliminary Design portion of the proposed project is assumed to be able to be completed in time for consideration for the 2013-15 state capital budget (October-November 2012).

IV. Category A [$1,875,000]: *"Repairing and Modifying Levees and Dikes (including but not limited to, airport levee, levees protecting Adna and Bucoda)."*		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Project Description/Benefits: The northeast area of Aberdeen is partially protected by a dike along the Chehalis River behind the Wal-Mart/Gateway Plaza mall area. When extreme conditions exist water floods the area from the Wishkah River north of the highway. The proposed project is to raise local road elevations adjacent to the Wishkah River, install tide gates and create a dike system to reduce the frequency of flooding in the immediate area. The proposed project is listed in the City of Aberdeen's Public Works Master Project List (January 2011) and would be located primarily on existing public right of ways with small portions on an easement on upland ground specifically obtained for the project. Project is proposed to prevent flood waters from entering an important commercial area in Aberdeen. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined. The Chehalis River hydraulic model is not set up to look at sites up the Wishkah River. A hydraulic model of the Wishkah River would be necessary to evaluate potential effects of the project on upstream and downstream water levels. Flooding in this area is primarily caused by high tide levels but river flows may also contribute to flooding. The hydraulic model would allow analysis of various tide and river flow conditions to establish a design height for the dike. It should be noted that tidal flooding may be increasing as a result of sea level rise (NOAA estimates that global sea levels are rising by approximately 0.1 foot per decade and observations at Toke Point, WA show sea levels rising by about 0.04 feet per decade at that location). The design should take sea level trends into account. It is our (WSE) opinion that wind wave run-up is not likely to be significant enough to affect the design but boat waves should be considered.	**Jobs Supported:** The Phase I – Preliminary Design costs are initially estimated to be about $47,000 and 375 FTE hours. The Phase II -- Construction costs are initially estimated to be about $235,000 and the work effort is initially estimated to be about 1,000 FTE hours and last for about two to four months.	Further studies needed -- (1) Studies and documentation necessary to support permitting and environmental review. (2) Hydraulic analysis to determine adverse impacts/effects . . . Alternative 1: Assume that water levels in this area are wholly controlled by tidal flooding and are at the same level as Grays Harbor (e.g. local conditions are not a factor). Because the loss of floodplain storage due to the dike project will be negligible no additional analysis is necessary. Alternative 2: If explicit consideration of hydraulic impacts is required a hydraulic model of the Wishkah River would need to be developed. A model of the lower 5 miles of the river (which would allow detailed hydraulic analysis of the four Wishkah River projects) is estimated to cost $60,000 including survey, hydrology, hydraulics, and alternatives analysis.
8. Trail/Dike behind Burger King (Preliminary Design) **Location:** Aberdeen, Grays Harbor County (East bank of Wishkah	**Budget:** Preliminary Design: $24,600 Final Design (PS&E) and Construction:	**Next Steps:** The Phase I – Preliminary Design portion of the proposed project is assumed to be able to be completed

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Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
between Wishkah and Heron) **Ownership:** City of Aberdeen **Project Description/Benefits:** The Burger King property is located between the Wishkah and the Heron street bridges. Extreme high water can top the bank and flood the adjacent commercial property. A small dike or elevated walkway along the river would help keep the river in its banks. The proposed project is listed in the City of Aberdeen's Public Works Master Project List (January 2011) and would be located on an easement on upland ground specifically obtained for the project. Project is proposed to prevent flooding from the river from entering an important commercial property in Aberdeen. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined. The Chehalis River hydraulic model is not set up to look at sites up the Wishkah River. A hydraulic model of the Wishkah River would be necessary to evaluate potential effects of the project on upstream and downstream water levels. Flooding in this area is primarily caused by high tide levels but river flows might also contribute to flooding. The hydraulic model would allow analysis of various tide and river flow conditions as necessary to establish a design height for the dike. It should be noted that tidal flooding may be increasing as a result of sea level rise (NOAA estimates that global sea levels are rising by approximately 0. 1 foot per decade and observations at Toke Point, WA show sea levels rising by about 0.04 feet per decade at that location). The design should take sea level trends into account. This site is also close enough to Grays Harbor that wave run-up may need to be considered in establishing a dike height. It is our (WSE) opinion that wind wave run-up is not likely to be significant enough to affect the design but boat waves should be considered.	$124,500 **Lead Agency:** City of Aberdeen **Jobs Supported:** The Phase I – Preliminary Design costs are initially estimated to be about $24,600 and 200 FTE hours. The Phase II -- Construction costs are initially estimated to be $124,500 and the work effort is initially estimated to be about 1,000 FTE hours (.60 FTE) and last for about one to two months.	in time for consideration for the 2013-15 state capital budget (October-November 2012). Further studies -- (1) Studies and documentation necessary to support permitting and environmental review. (2) Hydraulic analysis to determine adverse impacts/effects . . . Alternative 1: Assume that water levels in this area are wholly controlled by tidal flooding and are at the same level as Grays Harbor (e.g. local conditions are not a factor). Because the loss of floodplain storage due to the dike project will be negligible no additional analysis is necessary. Alternative 2: If explicit consideration of hydraulic impacts is required a hydraulic model of the Wishkah River would need to be developed. A model of the lower 5 miles of the river (which would allow detailed hydraulic analysis of the four Wishkah River projects) is estimated to cost $60,000 including survey, hydrology, hydraulics, and alternatives analysis.
9. Market Street Dike (Preliminary Design)	**Budget:**	**Next Steps:** The Phase I – Preliminary

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Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Location: Aberdeen, Grays Harbor County (Market Street from D Street to 1st Street) **Ownership:** City of Aberdeen **Project Description/Benefits:** High water from the Wishkah River overtops the river bank in the Market Street area. The proposed project is to raise half the roadway and adjacent sidewalk from South E Street to East 1st Street and to create a small dike to reduce the frequency of flooding in the area. The proposed project is listed in the City of Aberdeen's Public Works Master Project List (January 2011) and would be located on public road right of way. The Phase I – Preliminary Design costs are initially estimated to be about $113,000 and 750 FTE hours. The Phase II -- Construction costs are initially estimated to be $565,000 and the work effort is initially estimated to be about 2,800 FTE hours and last for about two to three months. Project is proposed to prevent flood waters from entering an important commercial area in Aberdeen. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined. The Chehalis River hydraulic model is not set up to look at sites up the Wishkah River. A hydraulic model of the Wishkah River would be necessary to evaluate potential effects of the project on upstream and downstream water levels. Flooding in this area is primarily caused by high tide levels but river flows may also contribute to flooding. The hydraulic model would allow analysis of various tide and river flow conditions to establish a design height for the dike. It should be noted that tidal flooding may be increasing as a result of sea level rise (NOAA estimates that global sea levels are rising by approximately 0.1 foot per decade and observations at Toke Point, WA show sea levels rising by about 0.04 feet per decade at that location). The design should take sea level trends into account. It is our (WSE) opinion that wind wave	Preliminary Design: $113,000 Final Design (PS&E) and Construction: $564,988 **Lead Agency:** City of Aberdeen **Jobs Supported:** Phase I – Preliminary Design = 750 FTE hours. Phase II – Construction = 2,800 FTE hours. Total = 3,550 FTE hours or roughly 1.7 FTE.	Design portion of the proposed project is assumed to be able to be completed in time for consideration for the 2013-15 state capital budget (October-November 2012). Further studies needed -- (1) Surveys. (2) Studies and documentation necessary to support permitting and environmental review. (3) Hydraulic analysis to determine adverse impacts/effects . . . Alternative 1: Assume that water levels in this area are wholly controlled by tidal flooding and are at the same level as Grays Harbor (e.g. local conditions are not a factor). Because the loss of floodplain storage due to the dike project will be negligible no additional analysis is necessary. Alternative 2: If explicit consideration of hydraulic impacts is required a hydraulic model of the Wishkah River would need to be developed. A model of the lower 5 miles of the river (which would allow detailed hydraulic analysis of the four Wishkah River projects) is estimated to cost $60,000 including survey, hydrology, hydraulics, and alternatives analysis.

IV. Category A [$1,875,000]: *"Repairing and Modifying Levees and Dikes (including but not limited to, airport levee, levees protecting Adna and Bucoda)."*		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
run-up is not likely to be significant enough to affect the design but boat waves should be considered.		

V. Category B [$2,075,000]: *"Modification of Sickman Ford Bridge and Floodplain Culverts (to open channel, increase conveyance and offier flood relief)."*		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Sickman Ford Bridge **Location:** Chehalis Reservation. **Ownership:** *** **Project Description/Benefits:** Project information (bridge and culverts) being developed by the Chehalis Tribe. **Adverse Impacts/Effects:** Unknown/undetermined.	**Budget:** Unknown/undetermined. **Lead Agency:** *** **Jobs Supported:** Unknown/undetermined.	**Next Steps:** Hydrology study on bridge options.
Culvert Projects (as funding allows). **Location:** *** **Ownership:** *** **Project Description/Benefits:** Additional opportunities for projects under this subsection are listed in the Proposed Project Matrix depending on the final cost estimate of the Sickman Ford Bridge Project. Examples could potentially include: • South Elma Road • Larger culverts in S. Bank Road (S. Elma/Wakefield) area • Porter Road culverts • Flood reductions/salmon passage culverts? **Adverse Impacts/Effects:** Unknown/undetermined.	**Budget:** Unknown/undetermined. **Lead Agency:** *** **Jobs Supported:** Unknown/undetermined.	**Next Steps:** To be determined.

VI. Category C Projects [$50,000]: "*Installation and Calibration of a Rain Gauge on the Chehalis Reservation.*"		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Chehalis Tribe Flood Gage Station **Location:** The Chehalis Tribe is researching potential locations for a gauge to better predict impacts to the Chehalis Reservation. **Ownership:** Chehalis Tribe **Project Description:** Install new stream gage on the Chehalis River and calibrate gage over a period of three years. The gage will be installed at the Independence Road Bridge, about three miles SW of the community of Rochester, WA. The gage will consist of a non-contact radar sensor mounted on the bridge to sense river stage and a steel shelter located on the downstream side of the bridge to house an electronic data logger, battery and satellite transmitter and antenna. The gage will be equipped to transmit data via satellite telemetry which enable the USGS to post current stage information on the web every hour. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** None. Localized, temporary from construction/installation if at all.	**Budget:** to be determined **Lead Agency:** Chehalis Tribe **Jobs Supported**: 0.3 FTE for installation, calibration and Maintenance/operation of gauge for I year. (Tribe will assume M/O beyond 1 year).	**Next Steps:** Signed Review & Approval Form for 5127 funding was submitted 7/02/2012 from CRBFA to Chehalis Tribe for signature. Tribe signed 7/03/2012. Joint approval has been forwarded on to OFM. The Tribe has a contract ready to sign with USGS. Upon approval by OFM and a contract signed with OFM the Tribe will sign with the USGS for the project to be completed by September 31,2012

VII. Category D Projects [$500,000]: "*Construction of Evacuation Routes and Pads (to avoid future livestock losses).*"		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Lewis County Conservation District Critter Pad Installation **Location:** Basin-wide **Ownership:** Private land owners. **Project Description:** Critter pads reduce livestock mortality and economic loss to landowners and local communities. They provide an area elevated above the flood level to hold livestock and critical farm equipment during a flood event. The Lewis County Conservation District has taken the lead to work with farmers to identify potential sites for critter pads in Lewis County. The Conservation District has contacted Thurston and Grays Harbor Conservation Districts and the Chehalis Tribe to see if there is interest for critter pads in the two counties. Three critter pads are proposed for construction at farms along Bunker Creek Road, two at locations along the upper Chehalis River, one at a location along the main stem Chehalis River (near City of Chehalis) and one at Ceres Hill. Each of the critter pads require engineering design and permit approval by Lewis County. The pads range in size from 37 x 37 feet to 151 x 151 feet and the heights are from 5 feet to 15 feet. Pad are essential to reducing livestock mortality and economic loss to landowners and local communities. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** The critter pads are designed and located to have no measurable impact upstream or downstream by their placement for example out of the floodway and their use of on- or near-site materials to mitigate against any flood elevation rise. A HEC RAS report has been completed showing minimal rise at proposed critter pad locations (i.e., report states that for the 100-year flow, there is "no change in stage at the Bunker Creek Road and Upper Chehalis segments, and a 0.04-ft increase upstream of the South Fork site").	**Budget:** $500,000. [Note: Initial estimated cost is roughly $865,734. ESB 5127 funding share would contribute $500,000.] **Lead Agency:** Washington State Conservation Commission. **Jobs Supported:** Each critter pad requires engineering designs and construction. Construction jobs will be limited to the contractor awarded the project. Each pad will create a minimum of five to ten jobs for two weeks to two months based on the size of the pad. Depending on total cost up to seven pads may be constructed.	**Next Steps:** Permit application packets have been prepared and submitted to Lewis County. Flood elevation surveys for each of the seven sites have been prepared and submitted to FEMA. Final design and specification bid packets are scheduled to be completed by August 17, 2012 to secure a qualified construction contractor.

VIII. Category E Projects [$500,000]: "*Improvements to Areas Affected by the Satsop River.*"		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Satsop River Floodplain Restoration (Alternatives Analysis, Preliminary Design). **Location:** Grays Harbor County **Ownership:** Grays Harbor County **Project Description:** The Satsop River Floodplain Restoration project consists of approximately 100 acres of floodplain habitat that is negatively impaired by approximately 5,200 lineal feet of constructed dike and approximately 2,500 lineal feet of riprapped riverbank. During 2001 the Satsop Committee (WDFW, Corps, Grays Harbor County, and local citizens) met to develop a project approach to meet the needs of both fish and people. As a result, the Committee has worked with the U.S. Army Corps of Engineers to develop a Channel Migration Study and Preliminary Restoration Plan. The Satsop Committee has identified the dike, riprap, ponds, and excessive eroding banks as areas to focus restoration efforts that will restore floodplain functions and re-establish access to off-channel habitat. Grays Harbor County is interested in soliciting interest from consultants with expertise in Civil/Flood design work to: Determine the scope of the project. Model the flood impacts for removing the Dike. Identify the permits required for this work. Identify property and easements needed to do this project. Prepare preliminary plans and design and construction cost estimates for this project. Provide a schedule for final design and permits. Removal of a hard armor diking system created in the 1960's to protect three gravel extraction ponds will allow for the river to naturally access once again about 2/3 of the migration zone of the Satsop River in its lower reach. This is in turn anticipated to reduce erosion damage, save valuable prime farm soils and create better habitat for fish and other wildlife. Studies completed include: Satsop River Floodplain Restoration	**Budget** The Phase I – Preliminary Design costs are initially estimated to be about $50,000. Final Design (PS&E) is initially estimated at $80,000. Phase II -- Construction costs are initially estimated at $500,000. **Lead Agency:** Grays Harbor County. **Jobs Supported:** Phase I – Preliminary Design = Undetermined. Final Design (PS&E) = Undetermined. Phase II – Construction = 9 jobs for three to four months (2.3 to 3.0 FTE).	**Next Steps:** Issuance of an RFP upon adequate funding. Further studies needed -- (1) Studies and documentation necessary to support permitting and environmental review. (2) Hydraulic analysis to determine adverse impacts/effects. The proposed project on the Satsop includes removal or modification of the revetment/levee along the left bank of the river and reestablishing floodplain connectivity. The current Chehalis River model has a branch up the Satsop River (to upstream of Highway 12) but the data used in that branch of the model is outdated. New surveys were collected on the lower Satsop in November 2011 and new LiDAR data will be available from FEMA in the very near future. These data can be used to develop an up-to-date hydraulic model of the lower Satsop River. Alternative 1: Develop a HEC-RAS hydraulic model and updated site hydrology to facilitate investigation of alternatives to restore floodplain connectivity, reduce bank erosion, and (possibly) reduce flooding. Estimated cost for model development and calibration: $15,000 - 20,000. Alternative 2: Develop a 2-dimensional hydraulic model to allow a more accurate and refined evaluation of

Project (May 5, 2004) prepared for the Seattle District, Corps of Engineers by WEST Consultants. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined. Negative effects of this project may include localized disturbance of flora and fauna on site.		hydraulic conditions in the current and proposed conditions. A 2-d model will provide detailed hydraulic information as required to develop a robust project design and will also allow a more thorough review of potential project impacts and benefits. Estimated cost for model development and calibration: $25,000.

IX. Other Significant Projects (OFM Report)		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Revetment to Protect Montesano Rd, Sewage Treatment Plant and Mary's River Lumber (Alternatives Analysis, Preliminary Design). **Location:** Grays Harbor County. **Ownership:** *** **Project Description/Benefits:** The project site is the existing Mary's River Lumber Company mill located at 93 State Route 107, approximately one-half mile south of Montesano, WA. The location is an irregularly shaped parcel that encompasses approximately 30 acres and is developed as a lumber mill. The western edge of the site is defined by State Route 107, while the Chehalis River forms the eastern boundary. Site features includes several buildings and ancillary structures that are used for processing timber. Over the course of the last several years, bank erosion by the Chehalis River has occurred along the eastern edge of the site. However, during the December 2007 flood, significant damage was noted to the bank in front of the log deck and sawmill building. Specifically, the river bank extending approximately 100 feet north of the northeast corner of the "step-feeder" portion of the sawmill building had significant erosion, resulting in a slope failure adjacent to the log deck area at the northeast corner of the "step feeder" and "sharp chain" building, thereby exposing the underside of the concrete slab approximately 15-20 feet landward of the deck edge along the entire length of the building. Soil erosion exposed a gap between timber piles and the underside of the slab in the area. Preliminary emergency repairs being considered for the subject site include: (1) Installation of a sheet pile wall along a 140-foot section of the river bank immediately north of the sawmill building; and (2) Bank armoring of the river bank along a 600-foot section south of the mill (adjacent to the lumber storage yard). Longer-term solutions are needed. See proposed project location at http://goo.gl/maps/P9RBc. The City of Montesano and/or Grays Harbor County is interested in	**Budget:** The Phase I – Preliminary Design costs are initially estimated to be about $100,000. Final Design (PS&E) is initially estimated at $200,000. Phase II -- Construction costs projected at $14,000,000. **Lead Agency:** *** **Jobs Supported:** 120 family wage jobs will be protected by protecting this business.	**Next Steps:** Issuance of an RFP upon adequate funding. Further studies needed -- (1) Studies and documentation necessary to support permitting and environmental review. (2) Hydraulic analysis to determine adverse impacts/effects . . . Alternative 1: Assume that the analysis and design work performed in 2008 is sufficient and that the proposed design can move forward without additional hydraulic or geomorphic analysis. Alternative 2: If evaluation of a side channel reconnection along the left bank upstream of the South Montesano Bridge or other broader scale alternatives are to be considered the existing model will need to be modified or refined. Additional channel cross sections would also improve the resolution of the model, which would be necessary for detailed hydraulic evaluations. Some geomorphic evaluations have already been performed but these should be extended to present day. Consideration of the effect of today's flow patterns (depths and velocities) on bank erosion upstream of the Mary's River property is required. Additional information on the range of alternatives under consideration is necessary before we can define the scope for additional survey, modeling,

IX. Other Significant Projects (OFM Report)		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
soliciting interest from consulting firms with expertise in Civil/Flood design work to study the Mary's River Lumber Company mill site. The consultant would: Develop three or more alternative proposals. Identify the upstream/downstream impacts of the alternative proposals, including a "do nothing" alternative. Recommend alternative(s) for further evaluation. Prepare cost estimates. Identify required permits and easements (and the likelihood of obtaining the required permits and easements). Develop a scope of work, schedule and engineering budget for completing the PS&E for the preferred alternative. The benefits of this project would be to protect this $20 million business (with significant tax benefits and 120 family wage jobs), as well likely also protect Montesano Road and the sewage treatment plant. Studies Completed -- Limited Geotechnical Report, Mary's River Lumber March 5, 2008. Submitted to Parametrix, Inc. by AMEC Earth and Environmental Inc. 29 pages. A coordination meeting was held on April 8, 2010 attended by representatives from Mary's River Lumber Company and city, state, and federal staff, the Quinault Indian Nation, Chehalis Tribe and Parametrix to discuss potential approaches/solutions to address the ongoing bank erosion that is occurring at the Mary's River Lumber mill site. Main conclusion summary points from the meeting were: Consider a combination of options that address bank erosion in several areas. Consider a combination of armoring techniques that not only provide mill site protection but bank roughness and fish habitat. Incorporate restoration and mitigation as an integral part of any option. Consider short-term and long-term effects of option to be		and hydraulic analysis. The estimated cost could range from $20,000 to $50,000 depending on the range of projects to be considered.

IX. Other Significant Projects (OFM Report)		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
implemented. An action plan that meets U.S. Army Corps of Engineers nationwide permit criteria would be more expedient than an individual permit. An action plan taken by Mary's River Lumber must be cost-effective. Explore and determine applicable bank restoration, enhancement, and preservation funding sources, and navigation for barge usage. **Adverse Impacts/Effects:** To be determined as part of the consultant's findings under this proposal.		
Highway 6 openings and Scheuber Bypass **Location:** Lewis County. **Ownership:** *** **Project Description/Benefits:** Excavate approximately 550,000 cu yds of earth to build a 500-foot wide channel across the left overbank from downstream of Highway 603 to State Route 6. Construct a new 500-foot wide bridge or a number of box culverts under State Route 6 just to the east of Scheuber Road. This project will require property acquisition or flood easements on left bank properties. The proposed channel would be a high flow bypass and would not be constructed to provide fish habitat. The bed of the channel would be similar to the downstream flow path on the north side of SR-6. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined.	**Budget:** Construction is estimated at ~$30,000,000 (WSE/Sargent). **Lead Agency:** *** **Jobs Supported:** Unknown/undetermined.	**Next Steps:** To be determined.
Mellen Street High Flow Bypass **Location:** Lewis County. **Ownership:** ***	**Budget:** Construction is estimated at ~$83,000,000 (WSE/Sargent). **Lead Agency:** *** **Jobs Supported:**	**Next Steps:** To be determined.

IX. Other Significant Projects (OFM Report)		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Project Description/Benefits: Excavation of a 700 foot wide by 10 foot deep channel across the left overbank from upstream of Mellen Street to downstream of the Skookumchuck River confluence. Includes bridge or culverts at return point (Cooks Road) and at entry point (Military Road), and possibly at Scheuber Road. Will require property acquisition and relocation of residents. It is assumed that the high flow bypass channel, which will only have water in it during floods greater than about 12,000 cfs, will be lined with vegetation and not designed as a habitat feature. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined.	Unknown/undetermined.	
Centralia Levees on Skookumchuck and downstream on Chehalis **Location:** Lewis County. **Ownership:** *** **Project Description/Benefits:** Portions of USACE Twin Cities Levee Project. Reaches (Levees) 1, 12, 13, 14, 15, and 16. Have these previously been cost estimated by the Corps? Not Estimated by WSE Team. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined.	**Budget:** Construction is estimated at ~$68,000,000 (USACE Twin Cities Close-out Report – levees only) **Lead Agency:** *** **Jobs Supported:** Unknown/undetermined.	**Next Steps:** To be determined.
Bucoda Main Street improvements **Location:** Thurston County. **Ownership:** *** **Project Description/Benefits:** Install twin 25 foot wide x 5 foot tall box culverts or a 50 foot bridge to allow overflows to pass under Main Street along Skookumchuck River overflow path. Also need to raise	**Budget:** Construction is estimated at ~$3,700,000 (WSE/Sargent). **Lead Agency:** *** **Jobs Supported:** Unknown/undetermined.	**Next Steps:** To be determined.

IX. Other Significant Projects (OFM Report)		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
1,500 feet of road (1 to 2 feet on average) to an elevation of 246 feet in order to provide access to residents south of 11th Street during large floods. Will require acquisition of several properties. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined.		
South Elma Road openings **Location:** Grays Harbor County. **Ownership:** *** **Project Description/Benefits:** Increase the width of the overflow bridge on the right (north) floodplain of the Chehalis River under Wakefield (South Elma) Road near Elma. The current opening is approximately 350 feet wide. The proposed opening would be 1,200 feet wide. Assume no significant new floodplain excavation would be required. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined.	**Budget:** Construction is estimated at ~$19,000,000 (WSE/Sargent). **Lead Agency:** *** **Jobs Supported:** Unknown/undetermined.	**Next Steps:** To be determined.
Porter Creek Road openings **Location:** Grays Harbor County. **Ownership:** *** **Project Description/Benefits:** Increase the width of the overflow bridge along the left bank of the Chehalis River at Porter Creek Road. Current opening is approximately 240 feet wide. Proposed opening would be 1500 feet wide. Some new excavation would be required. A detailed cost estimate was not produced for this project – costs were estimated based on comparison with the South Elma Road project. See proposed project location at http://goo.gl/maps/P9RBc.	**Budget:** Construction is estimated at ~$23,000,000 (WSE/Sargent). **Lead Agency:** *** **Jobs Supported:** Unknown/undetermined.	**Next Steps:** To be determined.

IX. Other Significant Projects (OFM Report)		
Project Information	**Project Costs / Sponsors**	**Timeline, Status, Notes**
Adverse Impacts/Effects: Unknown/undetermined.		
Minor Floodwall Improvement along I-5 near Dillenbaugh Creek **Location:** Lewis County. **Ownership:** *** **Project Description/Benefits:** Provide low (1 – 2 foot high) concrete floodwall along the west side of the southbound I-5 lanes just to the north of the 13th Street Interchange. Assume wall would need to contain floodwater less than 1 foot deep with 1-2 feet of freeboard. Assume total length of wall required is less than 2000 feet. See proposed project location at http://goo.gl/maps/P9RBc. **Adverse Impacts/Effects:** Unknown/undetermined.	**Budget:** Construction is estimated at ~$1,600,00 (WSE/Sargent). **Lead Agency:** *** **Jobs Supported:** Unknown/undetermined.	**Next Steps:** To be determined.

Other Estimations:

1. **Mainstem dam** – previously estimated by EES – $245 million (source EES).

2. **USACE Twin cities project** – previously estimated by the USACE - $205 million (source: USACE Closeout report).

3. **WSDOT floodwalls/berms and airport levee** – previously estimated by WSDOT – $80 -$100 million (source WSDOT presentation).

4. **Chehalis airport levee improvements** – previously estimated by WSDOT - $3.2 million (source WSDOT presentation)

5. **Combinations of Alternatives to be estimated by WSE using previously estimated projects:**

a. Mainstem Dam on Chehalis River, Airport levee, Dillenbaugh minor fix, levees on Skookumchuck at Centralia, Levee downstream of Skookumchuck on Chehalis River, Sickman Ford Bridge Modification, and South Elma Overflow Bridge. Estimated Cost: $245 + 3.2 +1.6 + 68 + 2 + 19 = $340 million.

b. Same #1 above and add I-5 levees and flood walls Estimated Cost: $245 + 3.2 +1.6 + 68 + 2 + 19 + 100 = $440 million

c. I-5 levees and walls, Airport levee, Mellen and Scheuber Road Bypasses, levees on Skookumchuck and downstream of Skookumchuck on Chehalis, Sickman Ford Bridge and South Elma Road Overflow Bridge. Estimated Cost: $100 +3.2 + 83 + 30 + 68 + 2 + 19 = $305 million