

# Wishkah Road Comprehensive Flood Study - Meeting 2

## Project Update & Alternatives Discussion

Grays Harbor County Public Works  
With Funding From Chehalis River Basin Flood Authority

October 13, 2016



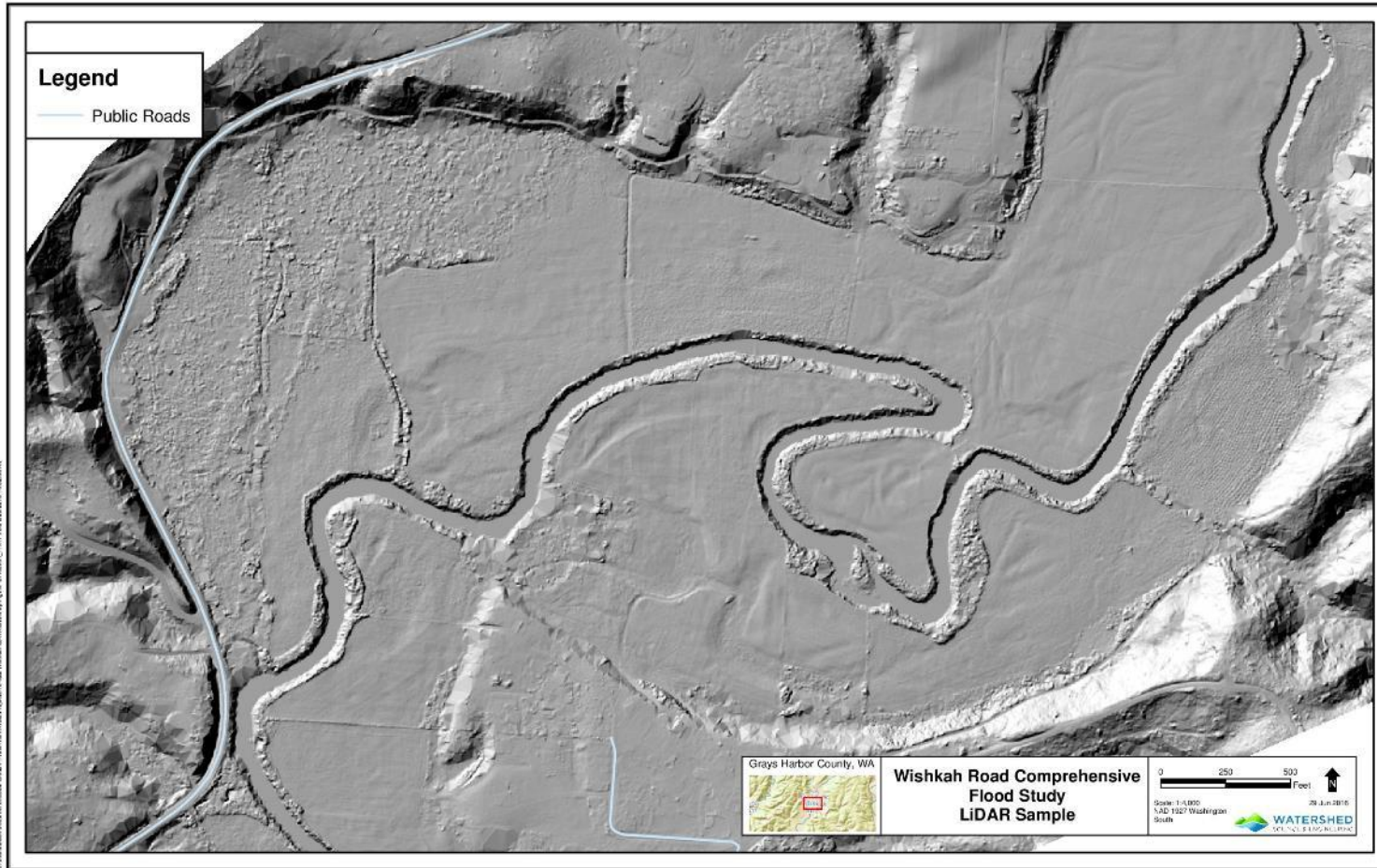


# Study Purpose

- Funded by Chehalis River Basin Flood Authority
- Reach Scale Assessment MP 2.2 to MP 7.6
- Reduce or Eliminate Flooding
- Cost Effective
- Separate from Floodwall project



# Project Process: Part 1



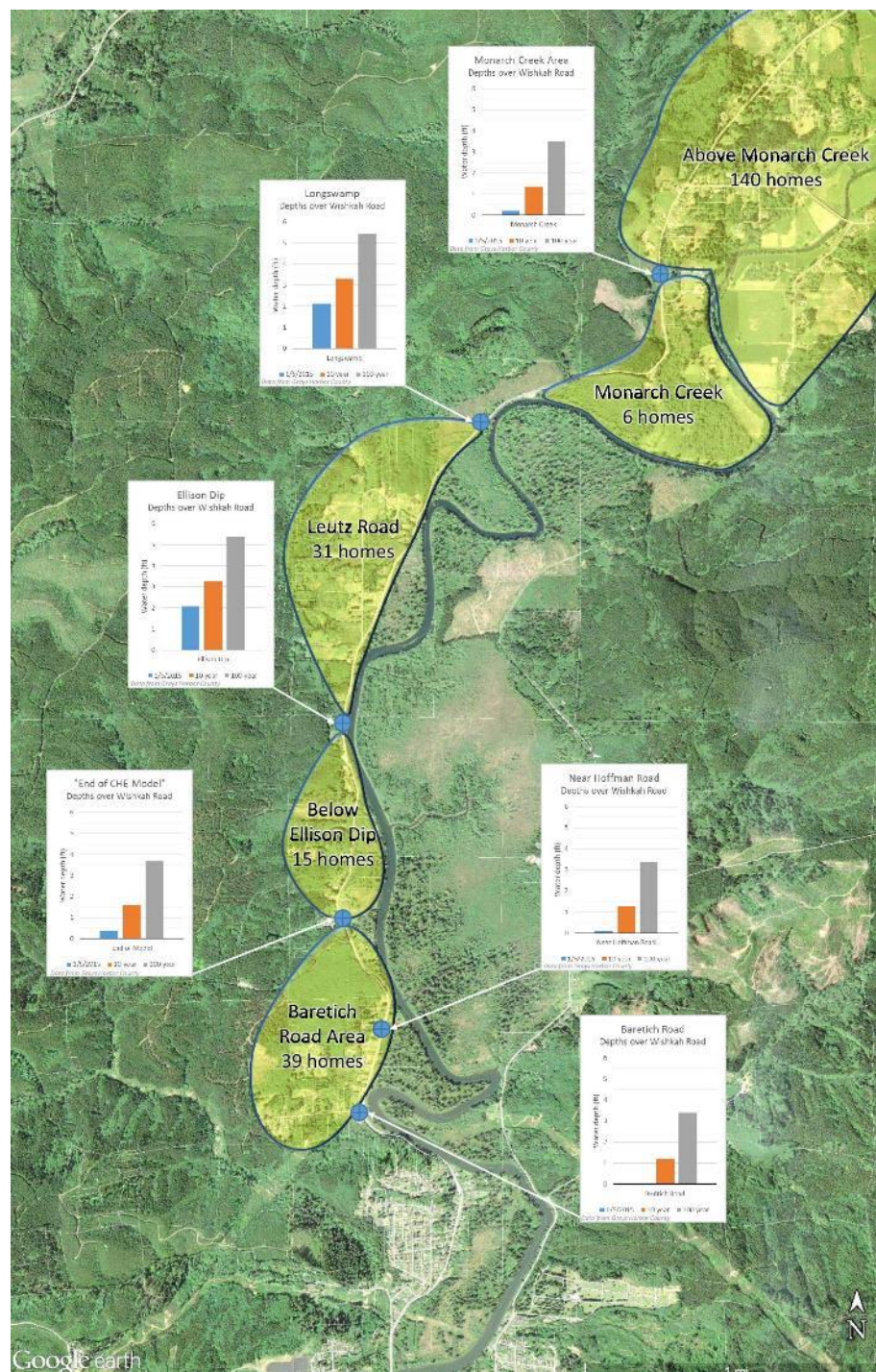
- Assess Existing Conditions
  - ✓ Flooding History & Closures
  - ✓ Topographic (LiDAR) Data
  - ✓ Bathymetry (Channel Survey)
  - ✓ Hydrologic Analysis
    - ✓ *Wishkah River Flow*
    - ✓ *Tidal Water Levels*
  - ✓ Hydraulic Modeling of Existing Conditions
- Verify Model
- Define Flood Reduction Alternatives



# Project Process: Part 2

## • Alternatives Analysis

- Screen for Feasibility
- Preliminary Designs
- Additional Analysis
  - *Hydraulic Modeling*
  - *Geotechnical*
  - *Other Considerations*
- Benefit/Cost Analysis
- Preferred Alternative
- Scope & Schedule for Final Design & Permitting



# Hydrology

## ➤ Calibration Events

- January 9, 2015
- December 8, 2015

## ➤ River flow and tide combinations:

- 10-year flow; 10-year tide
- 2-year flow; 100-year tide
- 100-year flow; 2-year tide
- 2-year tide; low flow
- Low tide; 2-year flow



# Model Extent





# Project Area



	Location along Wishkah Road																															
	Baretich Road				Frosty Way				Hoffman Road				End of CHE Model				Ellison Dip				Long Swamp				Monarch Creek				Vienna Tracts			
	Min Gnd <sup>1</sup> (feet)	Max WL (feet)	Depth (feet)	Duration (hrs)	Min Gnd <sup>2</sup> (feet)	Max WL (feet)	Depth (feet)	Duration (hrs)	Min Gnd <sup>2</sup> (feet)	Max WL (feet)	Depth (feet)	Duration (hrs)	Min Gnd <sup>1</sup> (feet)	Max WL (feet)	Depth (feet)	Duration (hrs)	Min Gnd <sup>1</sup> (feet)	Max WL (feet)	Depth (feet)	Duration (hrs)	Min Gnd <sup>1</sup> (feet)	Max WL (feet)	Depth (feet)	Durati on (hrs)	Min Gnd <sup>1</sup> (feet)	Max WL (feet)	Depth (feet)	Duration (hrs)	Min Gnd <sup>2</sup> (feet)	Max WL (feet)	Depth (feet)	Duration (hrs)
Condition																																
Calibration Events																																
January 9, 2015 (simulated)	10.50	10.50	0.00	0.25	11.10	10.63	-0.47	0.00	10.90	11.33	0.43	4.00	11.12	11.66	0.54	4.50	10.76	12.61	1.85	10.50	11.66	14.41	2.75	20.50	15.63	15.59	-0.04	0.00	18.40	19.93	1.53	34.00
January 9, 2015 (observed)		10.35				10.66				11.13				11.50				12.84				13.80				15.83						
January 9, 2015 (difference)		0.15				-0.03				0.20				0.16				-0.23				0.61				-0.24						
December 9, 2015	10.50	11.81	1.31	7.75	11.10	11.87	0.77	3.50	10.90	12.18	1.28	7.00	11.12	12.33	1.21	7.25	10.76	12.81	2.05	26.50	11.66	14.07	2.41	29.50	15.63	15.59	-0.04	0.00	18.40	19.80	1.40	29.75
Candidate 200-year events																																
100-year tide, 2- year flow	10.50	13.24	2.74	18.75	11.10	13.25	2.15	16.25	10.90	13.27	2.37	20.25	11.12	13.32	2.20	18.25	10.76	13.61	2.85	30.75	11.66	14.57	2.91	31.00	15.63	15.56	-0.07	0.00	18.40	19.25	0.85	10.25
2-year tide, 100- year flow	10.50	13.64	3.14	28.75	11.10	13.92	2.82	30.75	10.90	14.72	3.82	33.25	11.12	15.15	4.03	33.75	10.76	16.15	5.39	42.00	11.66	17.87	6.21	43.00	15.63	18.59	2.96	26.75	18.40	23.09	4.69	47.00
Candidate 100-year events																																
10-year tide, 10- year flow	10.50	12.75	2.25	13.50	11.10	12.81	1.71	19.25	10.90	13.18	2.28	27.00	11.12	13.46	2.34	26.50	10.76	14.36	3.60	35.75	11.66	15.91	4.25	36.00	15.63	16.63	1.00	10.75	18.40	21.01	2.61	26.00
Candidate 20-year events																																
10-year tide, 2- year flow	10.50	12.39	1.89	12.00	11.10	12.39	1.29	9.00	10.90	12.43	1.53	11.75	11.12	12.47	1.35	11.50	10.76	12.80	2.04	19.25	11.66	14.09	2.43	24.25	15.63	15.56	-0.07	0.00	18.40	19.22	0.82	9.50
2-year tide, 10- year flow	10.50	12.15	1.65	8.75	11.10	12.20	1.10	11.75	10.90	12.69	1.79	21.75	11.12	13.03	1.91	22.50	10.76	14.08	3.32	32.75	11.66	15.76	4.10	35.50	15.63	16.51	0.88	10.50	18.40	21.00	2.60	26.00
Candidate 2-year events																																
MHHW tide, 2- year flow	10.50	9.95	-0.55	0.00	11.10	10.57	-0.53	0.00	10.90	10.82	-0.08	0.00	11.12	11.06	-0.06	0.00	10.76	11.84	1.08	19.00	11.66	13.49	1.83	22.00	15.63	15.56	-0.07	0.00	18.40	19.20	0.80	9.50

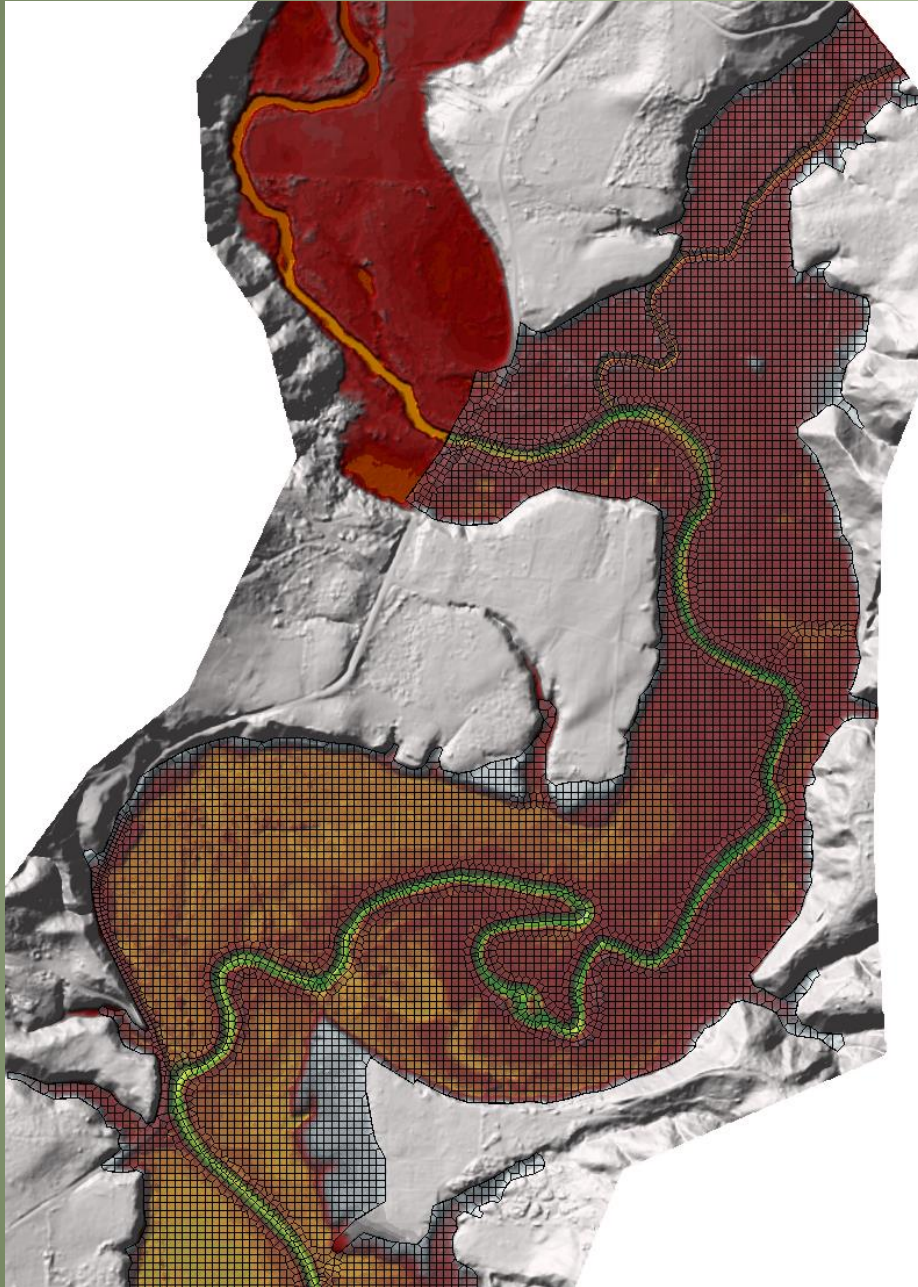


# Event-Elevation-Duration Data for Simulated Tide Record at Aberdeen

Total Hours Analysed	385704																		
Total Events Analysed	381286																		
Period of Analysis	10/01/1972 - 9/30/2016 (44 years)																		
	Elevation (NAVD)									Wishkah River Flow Quantiles				Aberdeen Tide Quantiles					
	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5		2-year	8,790 cfs		2-year	11.0 feet NAVD					
Duration(hr)	# of Events										10-year	13,700 cfs		10-year	11.9 feet NAVD				
1	687	225	59	22	3	2	1	0		25-year	16,100 cfs		25-year	12.4 feet NAVD					
2	373	113	27	10						100-year	20,500 cfs		100-year	13.2 feet NAVD					
3	106	24	8	2															
4	14	4																	
%t>= Elevation	0.31%	0.09%	0.02%	0.01%	0.001%	0.001%	0.0003%	0.0%											
hr>= Elevation	1180	366	94	34	3	2	1	0											
Total Events	687	225	59	22	3	2	1	0											

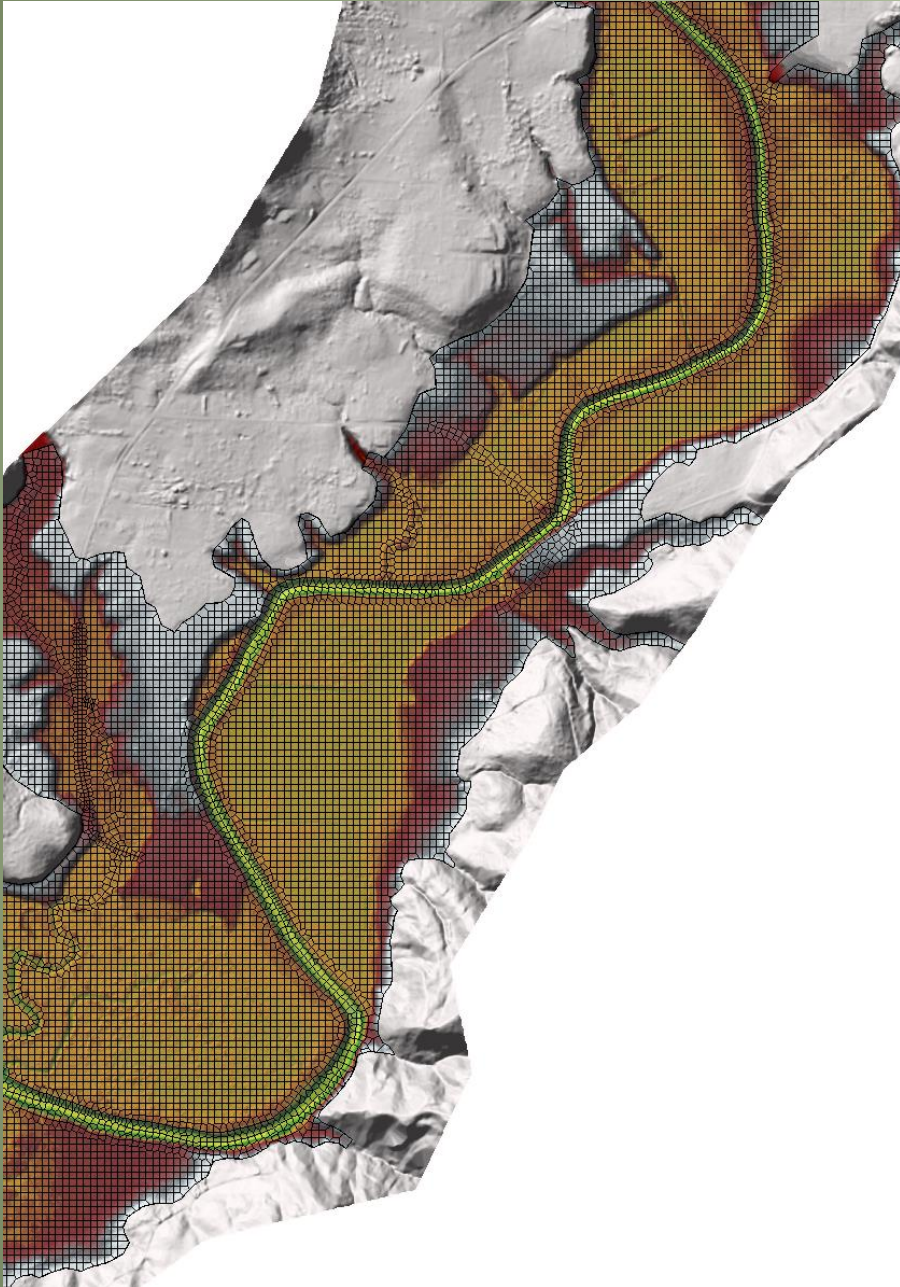
Tidal Data

# 2D Mesh North

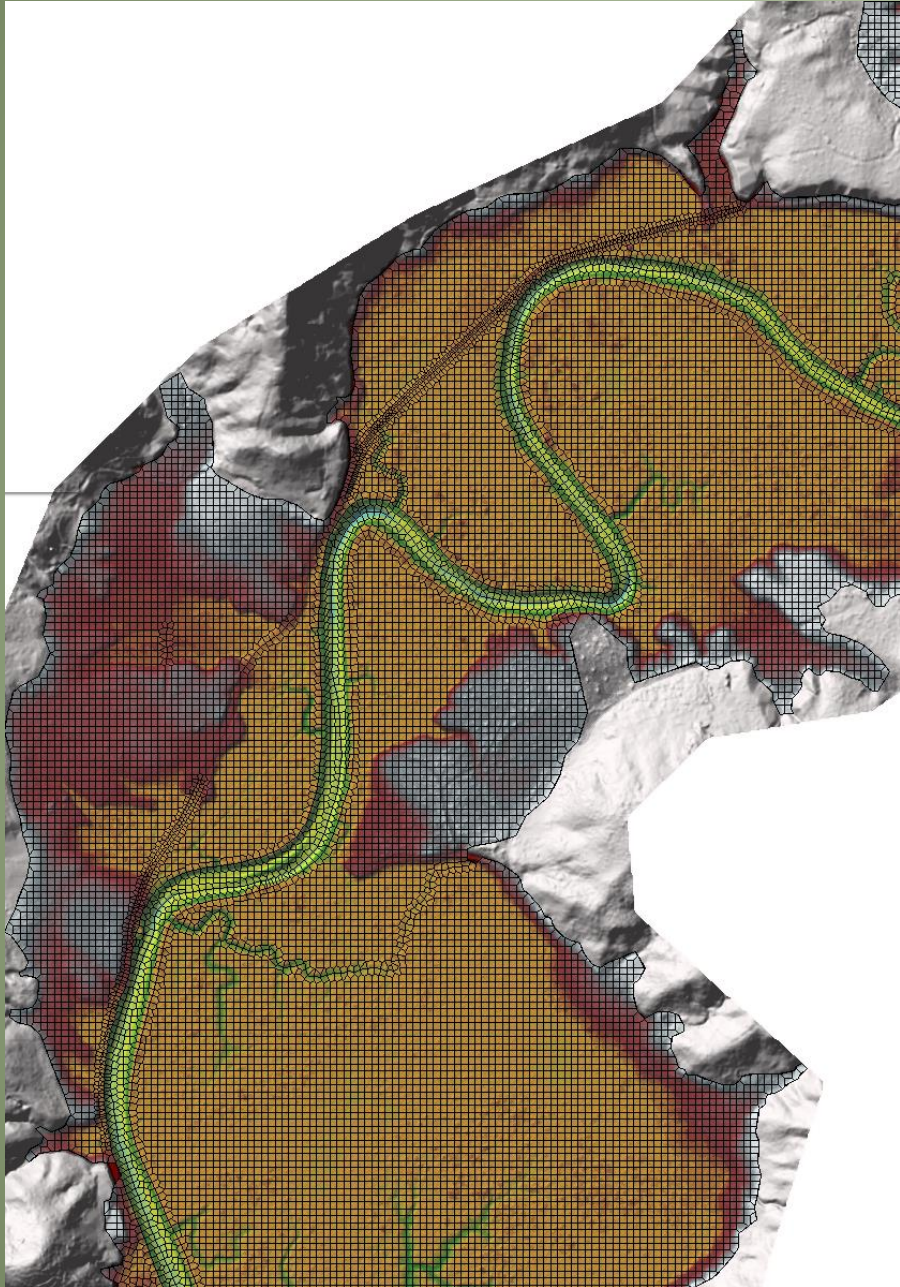




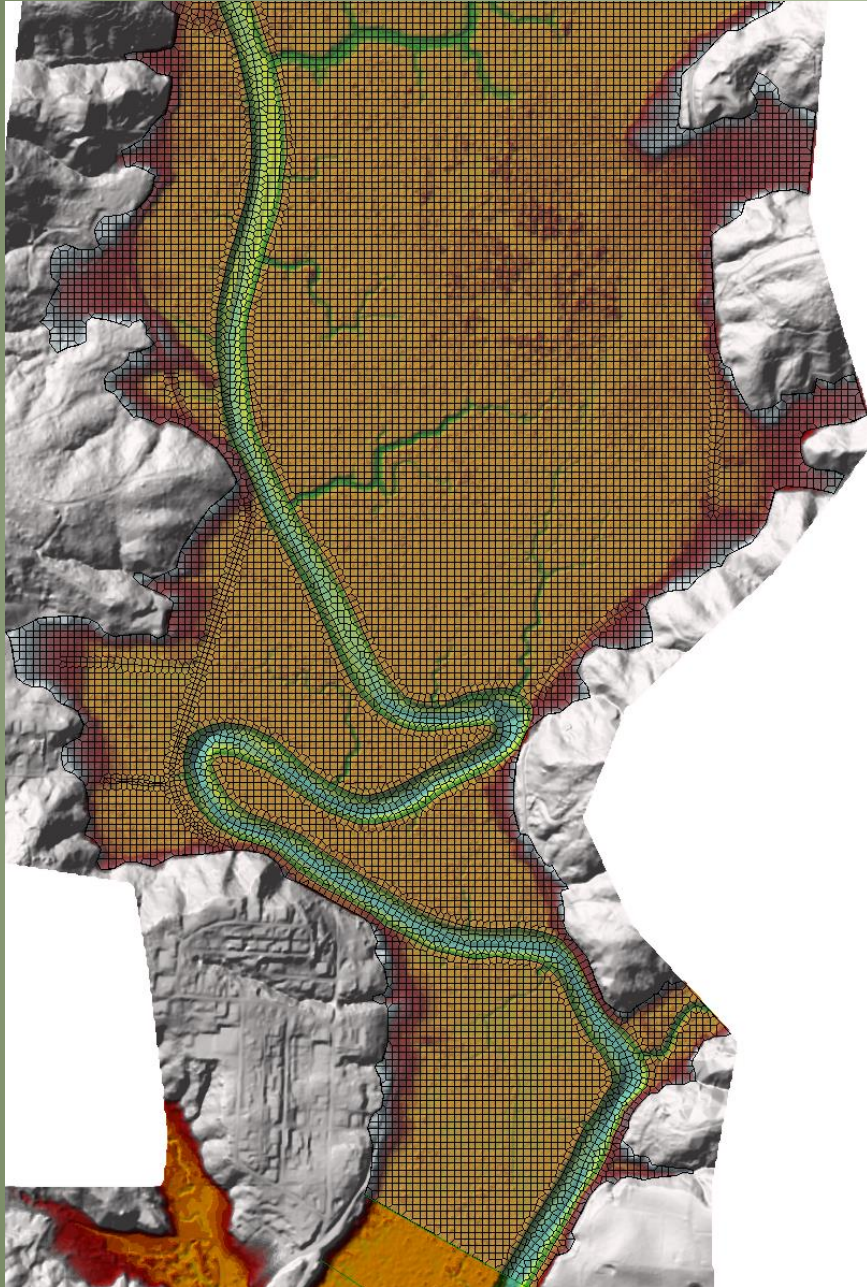
# 2D Mesh Middle - North



# 2D Mesh Middle - South







# 2D Mesh South

- Raise Road
  - Fill
  - Pilings
- Improve culverts/bridges
- Levee
- Floodwall
- Relocate road
- Non-traditional
  - Helicopter pad(s)
  - Hovercraft/Amphibious Vehicle
  - ??

# Alternatives

Each site may have different set of alternatives.



# Timeline

## Part 1

- ~~Physical Data Gathering~~  
~~May-June 2016~~
- ~~Historical Data~~  
~~June-September 2016~~
- ~~Existing Conditions Assessment~~  
~~July-September 2016~~
- Alternatives Discussion Meeting  
October 2016

## Part 2

- Preliminary Designs & Permitting Strategies  
November - December 2016
- Additional Analyses  
January – April 2017
- Preferred Alternative  
May 2017

## ✓ Public Meetings

*Next meeting April 2017*

## ✓ EZ View website

[www.ezview.wa.gov](http://www.ezview.wa.gov)

*Scroll down to Grays Harbor County –  
Wishkah Road Comprehensive Flood Study  
Project*

## ✓ Call or E-mail WSE

206-521-3000

[mark@watershedse.com](mailto:mark@watershedse.com)

## ✓ Call or E-mail GHCOG

360-537-4386

[vcummings@ghcog.org](mailto:vcummings@ghcog.org)

How do I  
participate?

Questions?

Comments

Ideas





# Wrap Up

## Next Steps

Select alternatives that warrant preliminary designs

Identify and carry out necessary analyses to assess alternatives

## Next Meeting

Present Results & Choose Preferred Alternative

April, 2016

## Larry Karpack & Mark Indrebo

*Watershed Science & Engineering*

206-521-3000

[mark@watershedse.com](mailto:mark@watershedse.com)

## Vicki Cummings

*Grays Harbor Council of Government*

360-537-4386

[vcummings@ghcog.org](mailto:vcummings@ghcog.org)

# Thank You

