Pacific Chapter WEDA

Analysis of Morphologic Effects for Maintenance of Navigation Channels in Tidal Estuaries & River Deltas

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Outline of Presentation

- Morphology Analysis
- Example 1 – Grays Harbor, WA
- Example 2 – West Channel, Ilwaco, WA
- General Conclusions

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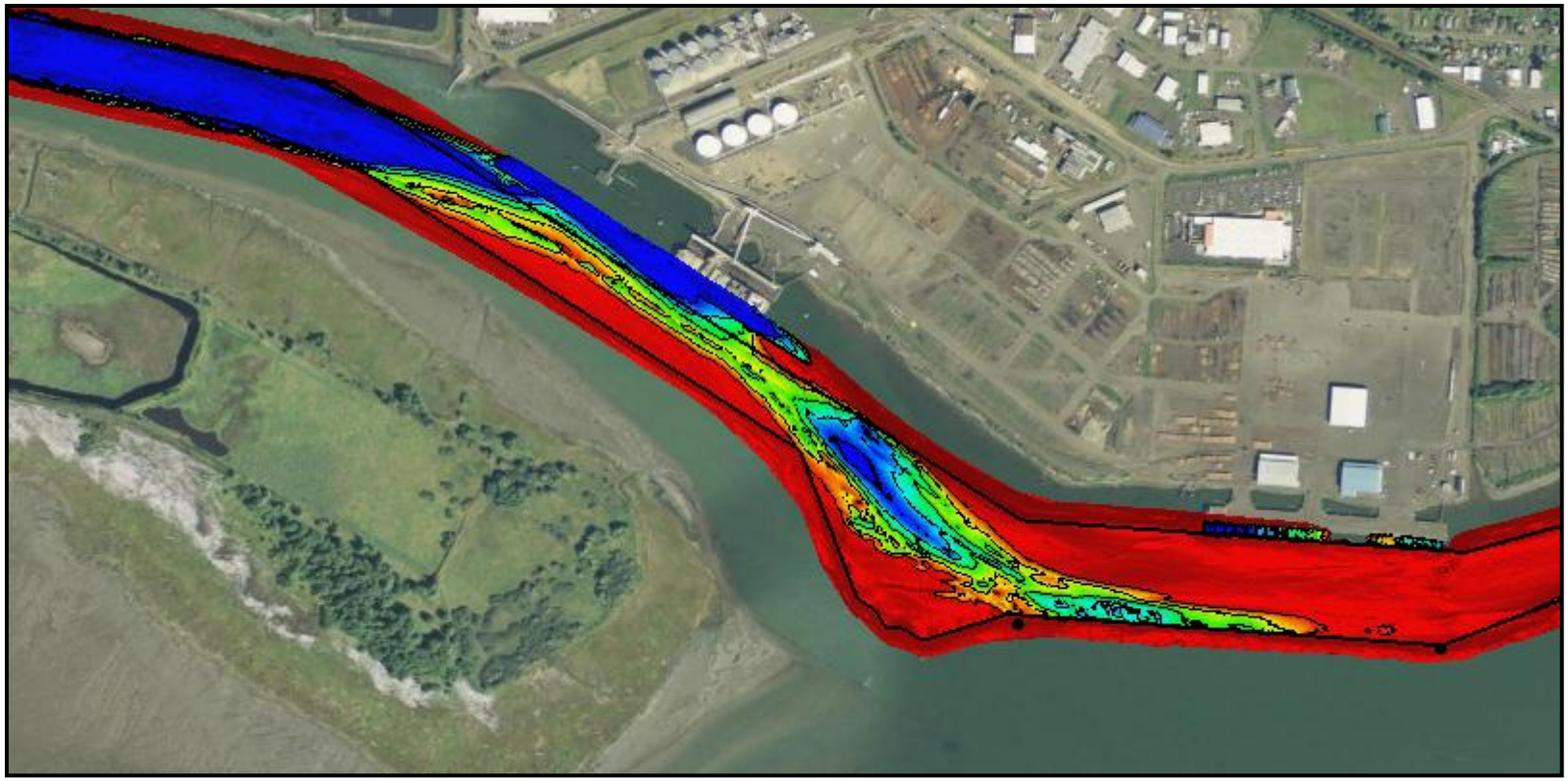
Principals of Morphology Analysis

- Collect/ compile reliable data (bathymetry, etc.)
- Analyze and confirm spatial patterns
- Evaluate trends that change with time



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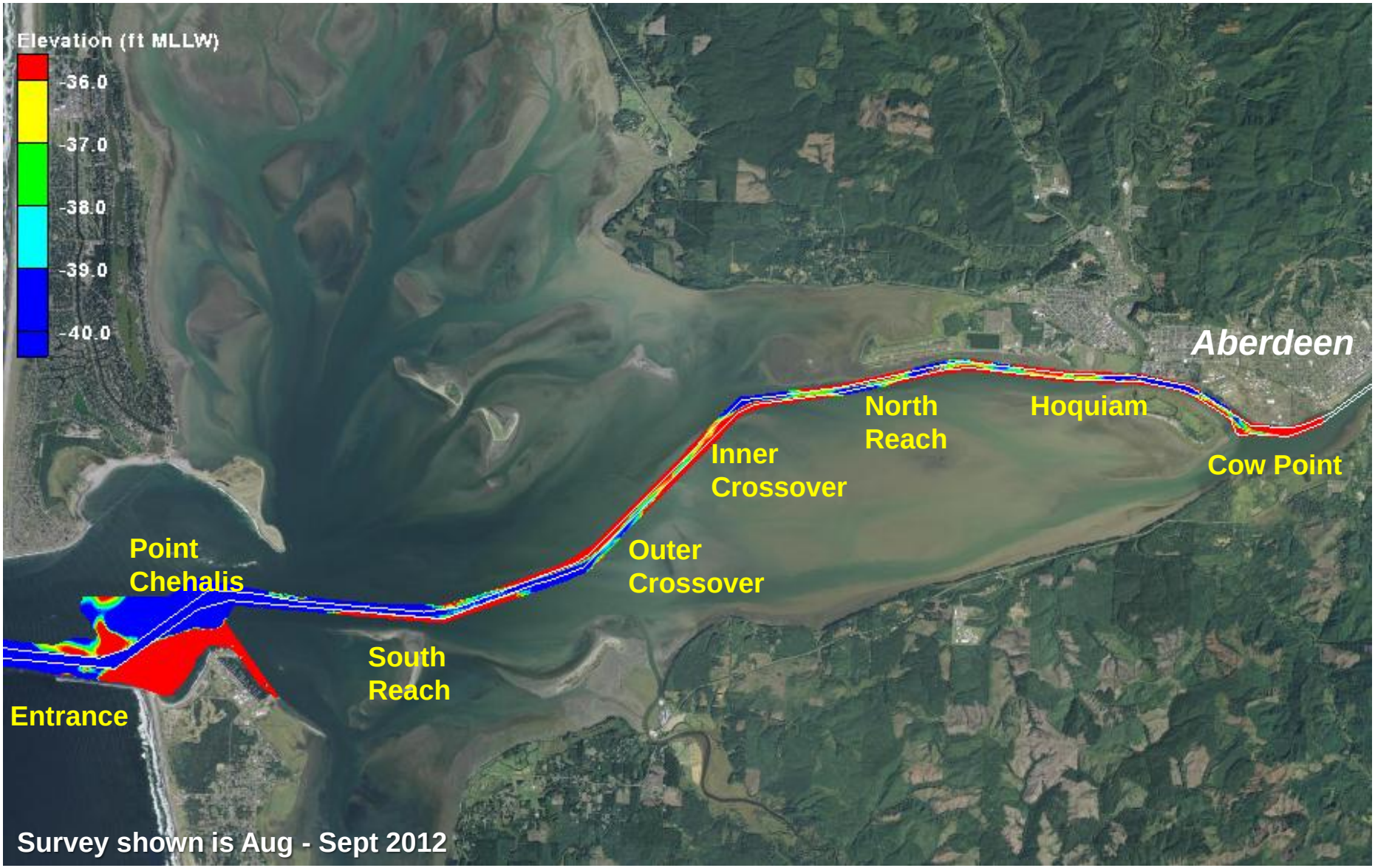
Pacific Ocean
Seattle
Grays Harbor
Ilwaco

Grays Harbor Federal Navigation Channel



Inner Harbor Dredging ~ 1.1 Million CY/Year

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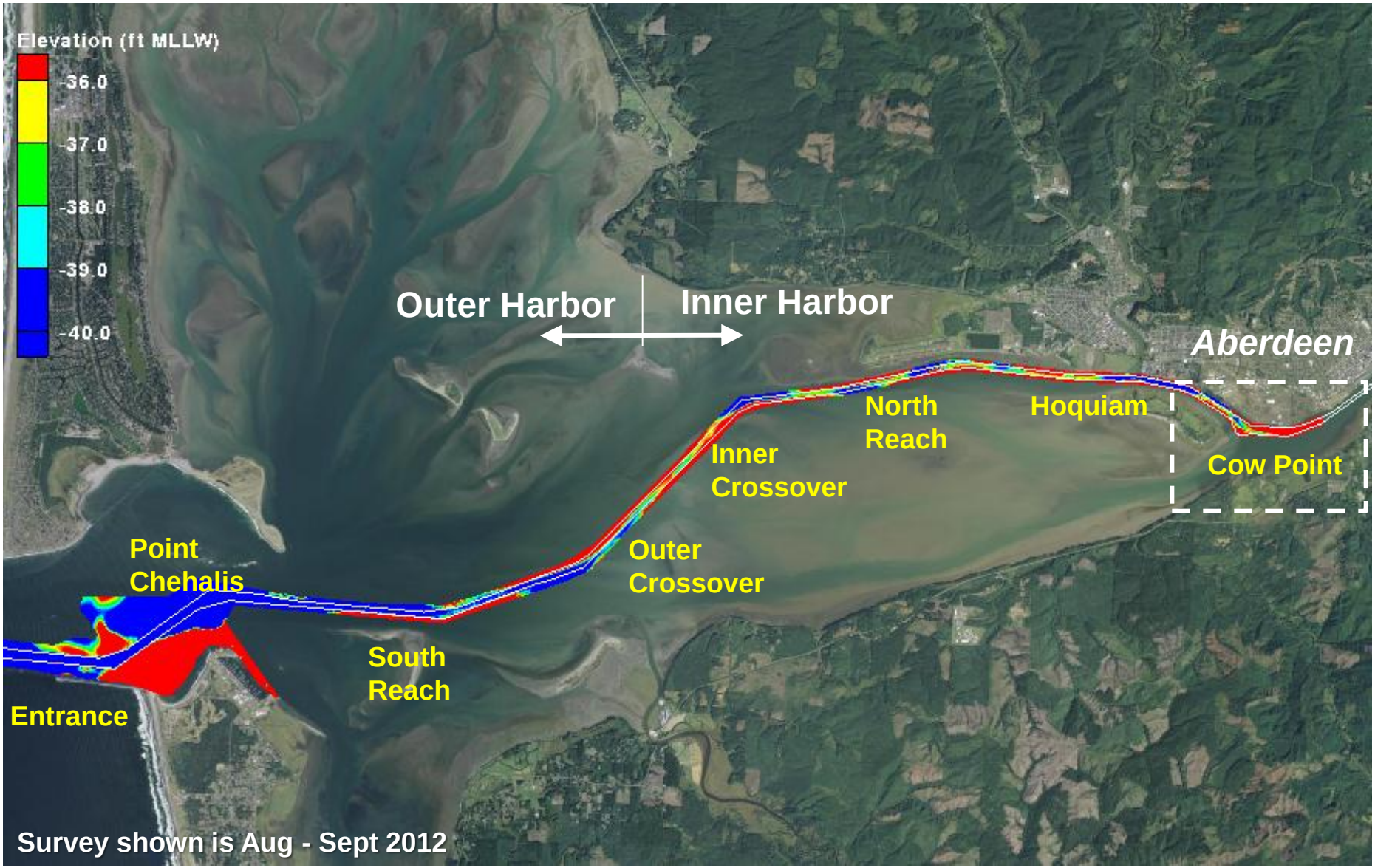
Grays Harbor Federal Navigation Channel



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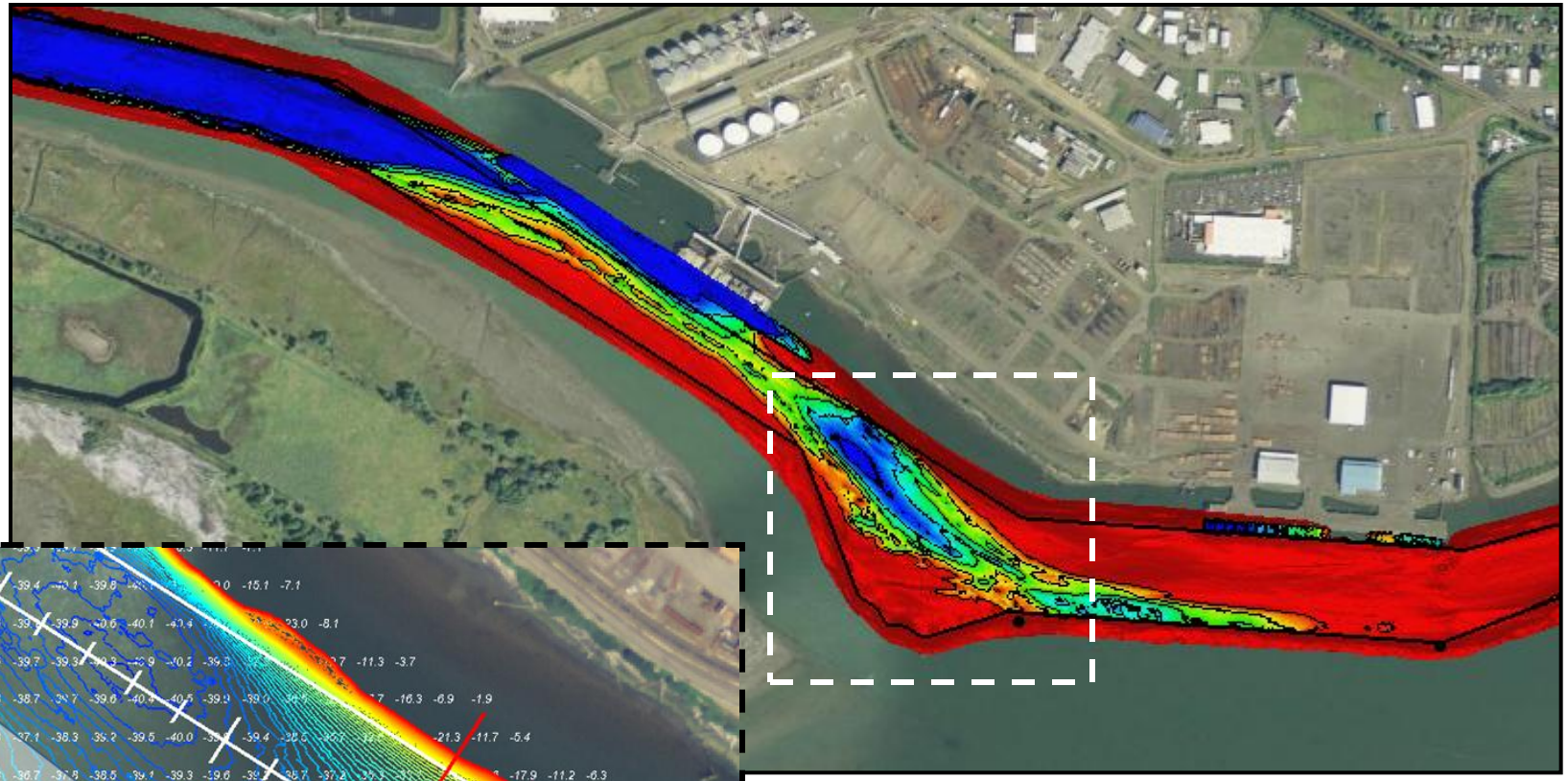

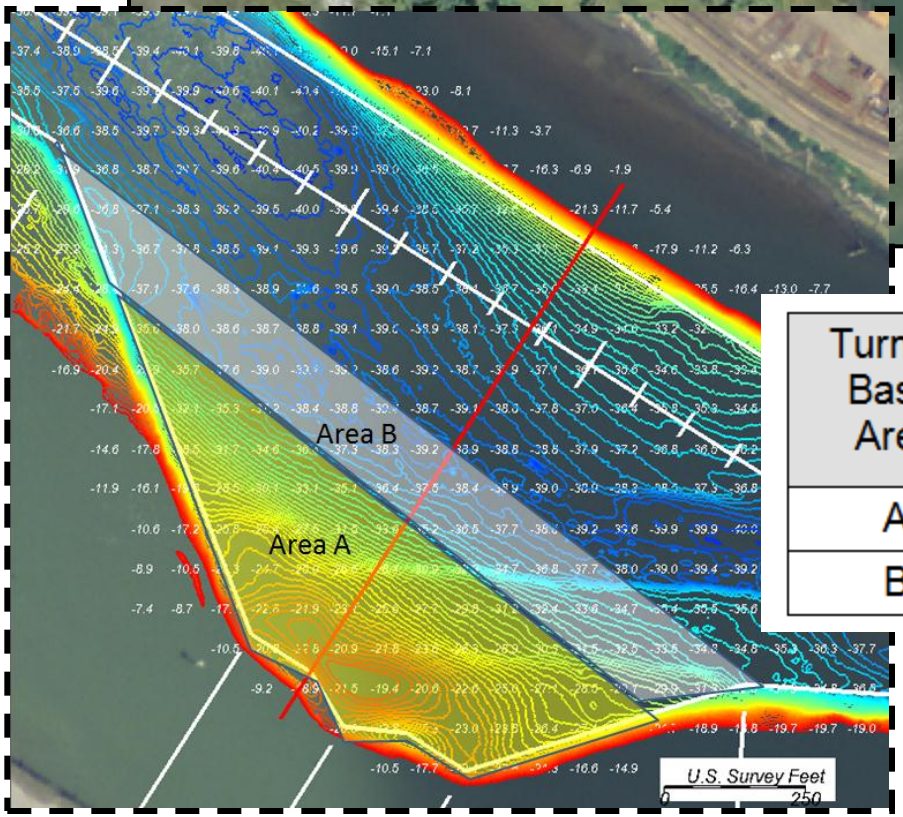

Turning Basin Area	Sedimentation Rate (feet/month)	
	Nov. – Feb.	Mar – Oct.
A	2	0.5
B	1	0.25

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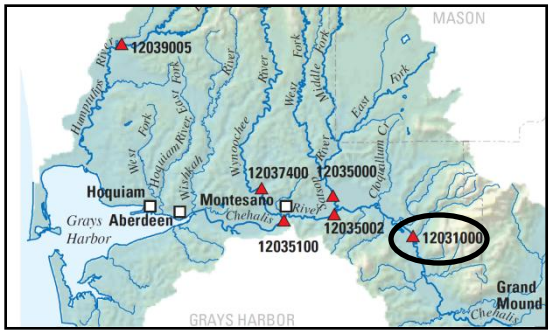
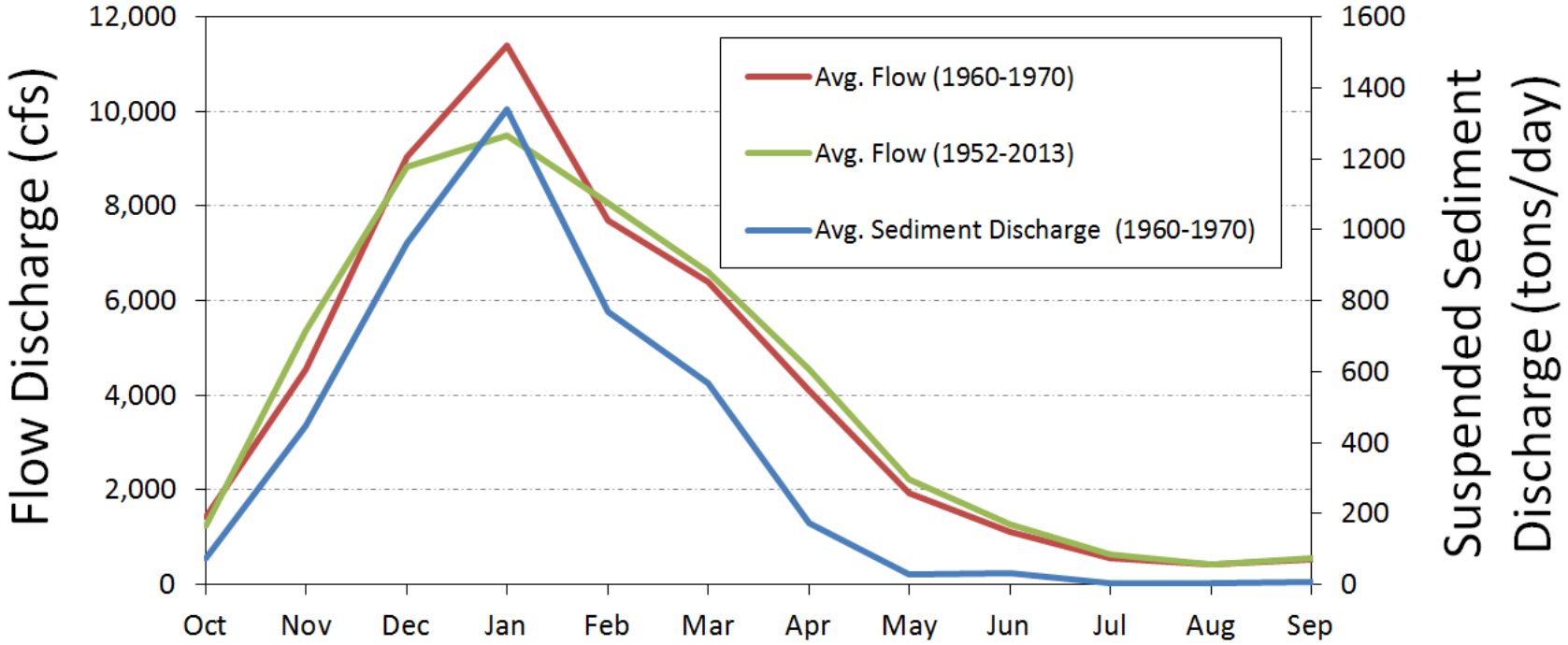
Sediment Discharge from Chehalis River



Chehalis River at Porter, WA

Monthly Statistics of Flow & Sediment Discharge



Notes:

(1) Long-term data shows consistent pattern between sediment and flow discharge

(2) Maximum sediment & flow discharge typically occurs in January

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Solution to Problem of Rapid Shoaling

- Forecast anticipated sedimentation in advance to prioritize dredging areas
- Modify existing practices to a twice-dredging scenario
  - Initial dredging at beginning of dredging window to provide navigable depth

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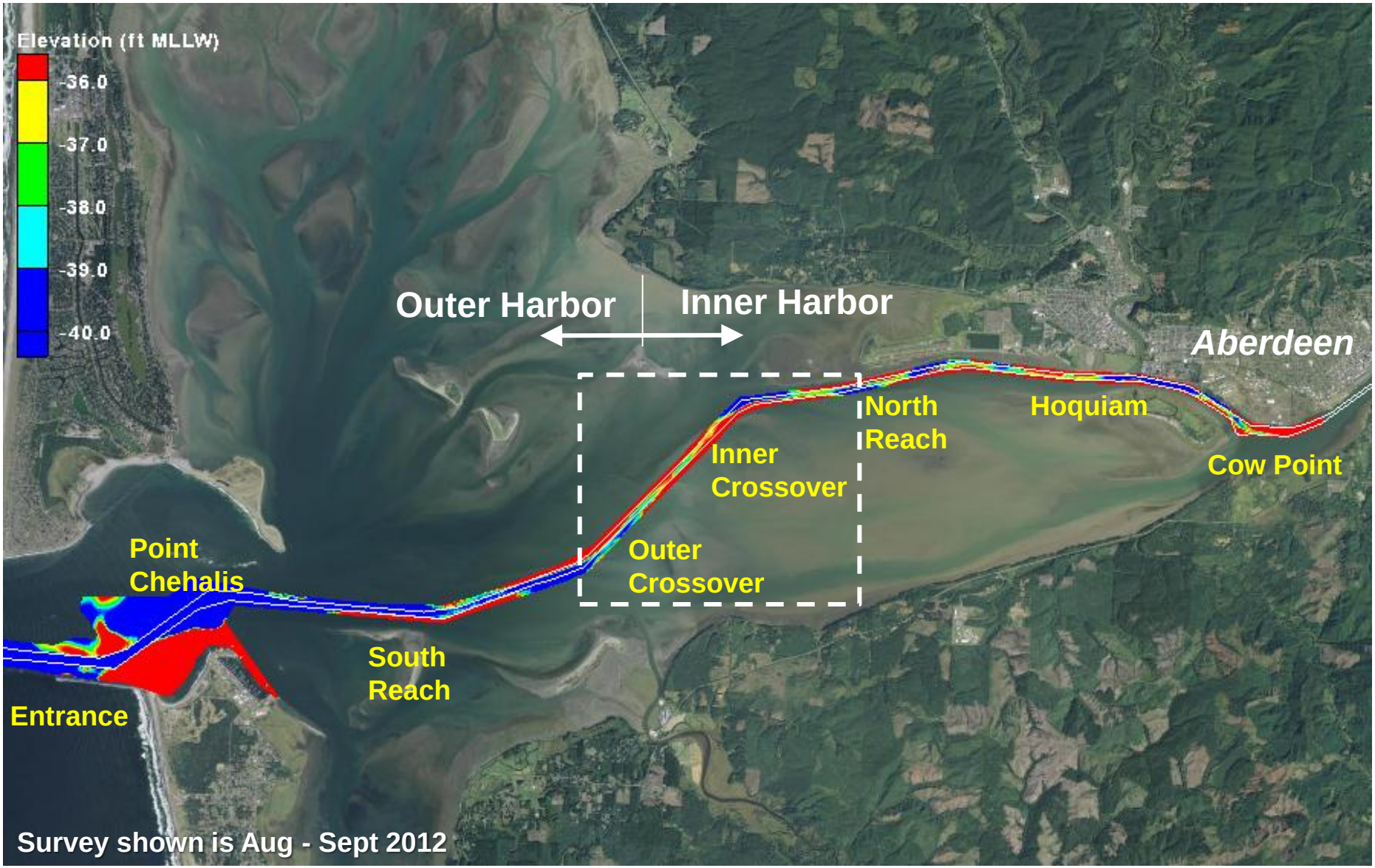
Grays Harbor Federal Navigation Channel



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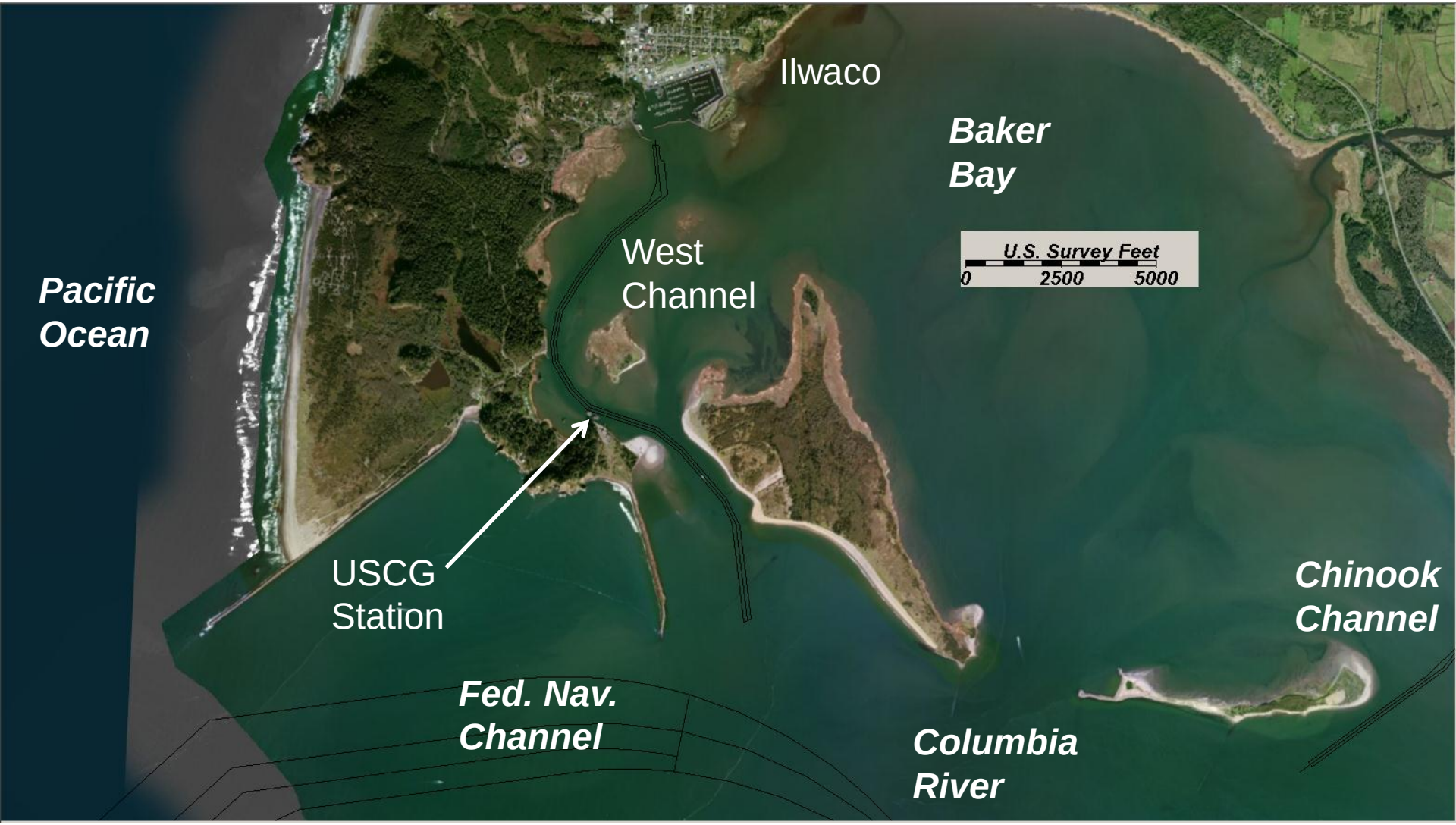
Project Location – West Channel



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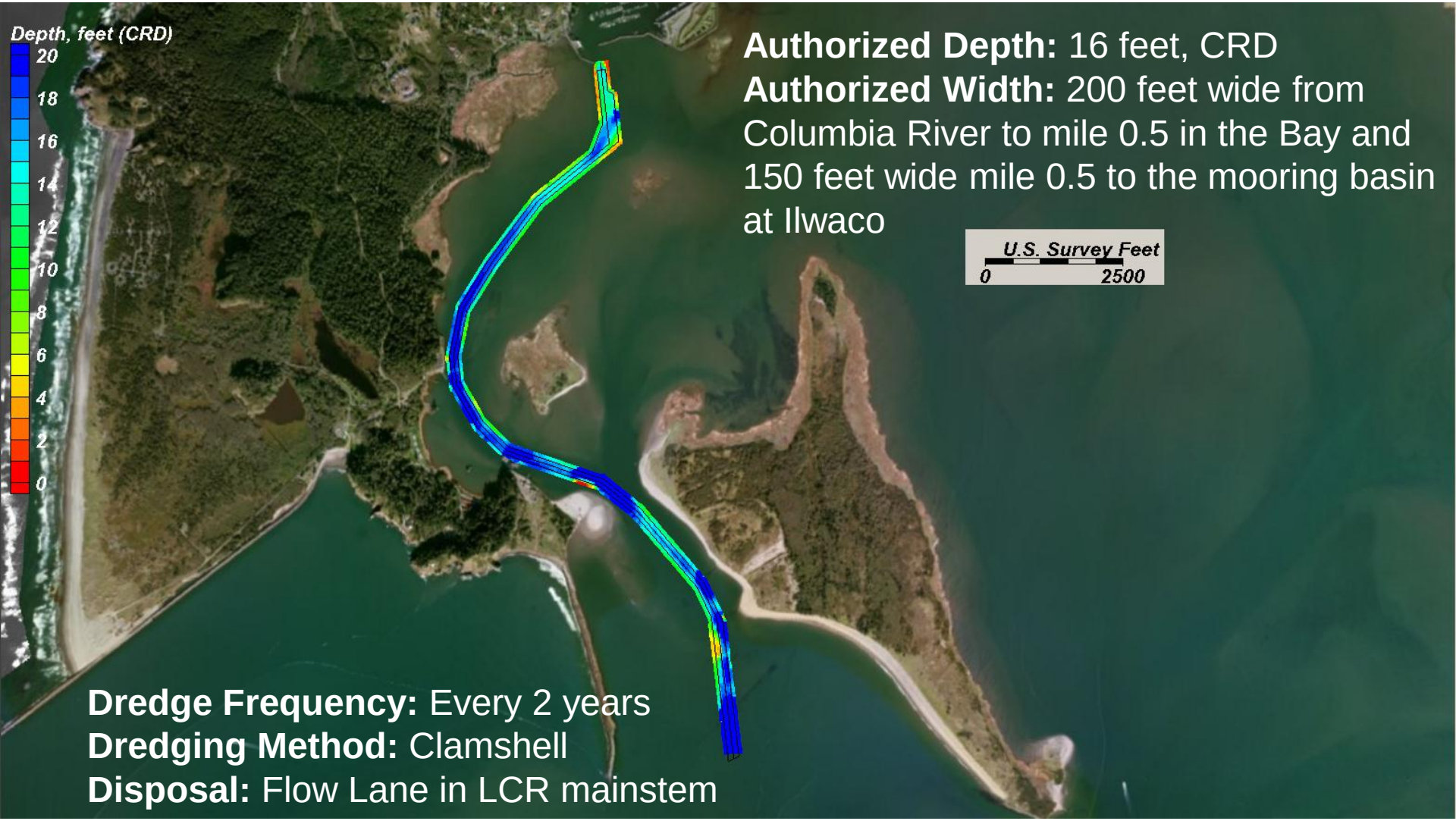
West Channel Dredging Summary



Authorized Depth: 16 feet, CRD
Authorized Width: 200 feet wide from Columbia River to mile 0.5 in the Bay and 150 feet wide mile 0.5 to the mooring basin at Ilwaco

Dredge Frequency: Every 2 years
Dredging Method: Clamshell
Disposal: Flow Lane in LCR mainstem

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West Channel Dredging Summary

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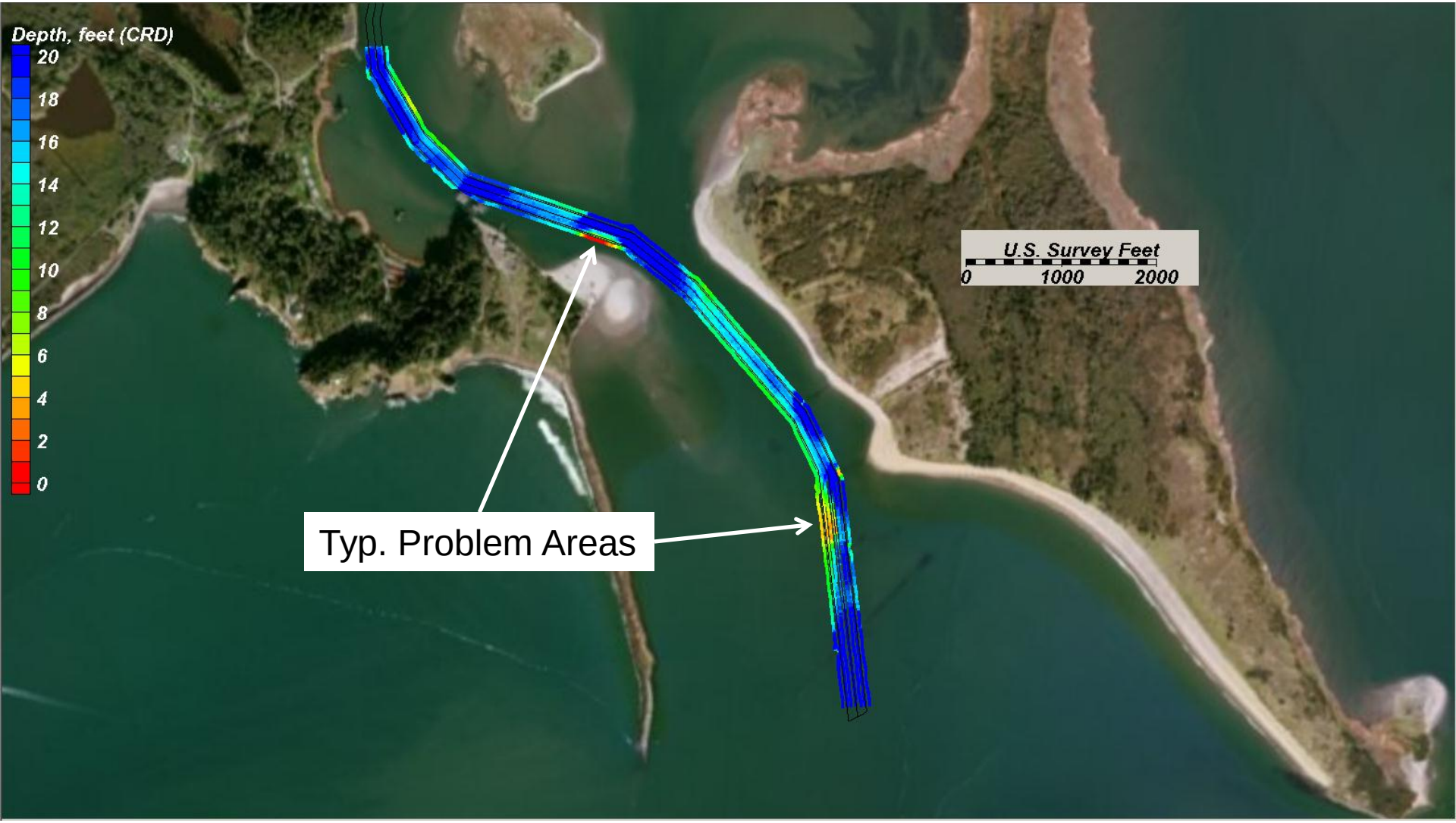
Problem Shoaling Areas



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Sedimentation Patterns, 2005 - 2006

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Sedimentation Patterns, 2013 -2014

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Sedimentation Patterns & Trends

- It appears that sedimentation in some areas of the South Channel results from meandering of the tidal channel
- It is possible that slight re-alignment of the channel may reduce maintenance dredging requirements
- It appears that the pattern of sedimentation in the Channel is relatively constant from year to year. Highest rates of sedimentation mostly occurs at the same areas.
- Deeper dredging depth at some locations may result in higher rates of sedimentation
- It is possible that there is a depth of equilibrium relatively stable depth) at some locations along the channel. For significant length of the channel this depth of equilibrium is deeper than 15 ft.

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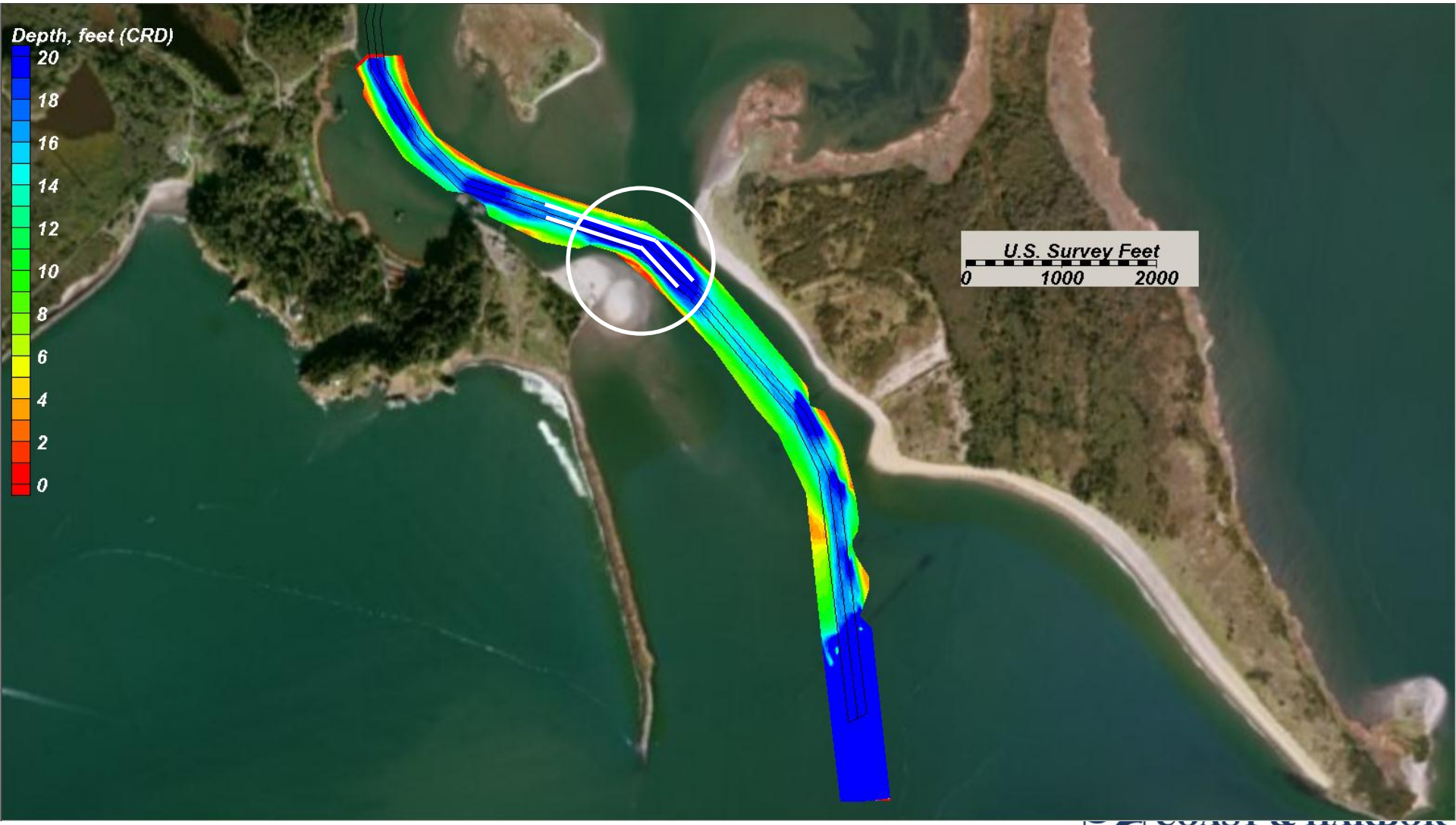
Potential Channel Realignment



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Conclusions

- Tidal estuaries and river deltas are dynamic
- Planning and design of maintenance dredging must also be dynamic
- Understanding and working with natural processes allows for dredging where its needed most.
- Maintenance dredging provides opportunity to learn and test different approaches with can help with larger scale projects including deepening.
- Collection of adequate survey data, including areas outside of the authorized channel is needed but not often available.

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