

A panoramic night view of the Seattle skyline, featuring the Space Needle and various city buildings illuminated against a dark blue sky.

# **Dredge Equipment Operational Analysis & Business Plan**

## **Oregon Infrastructure Finance Authority, IFA**

*WEDA Pacific Chapter  
FALL 2014 Conference*

*Will Templeton  
John Dawson  
Vladimir Shepsis*

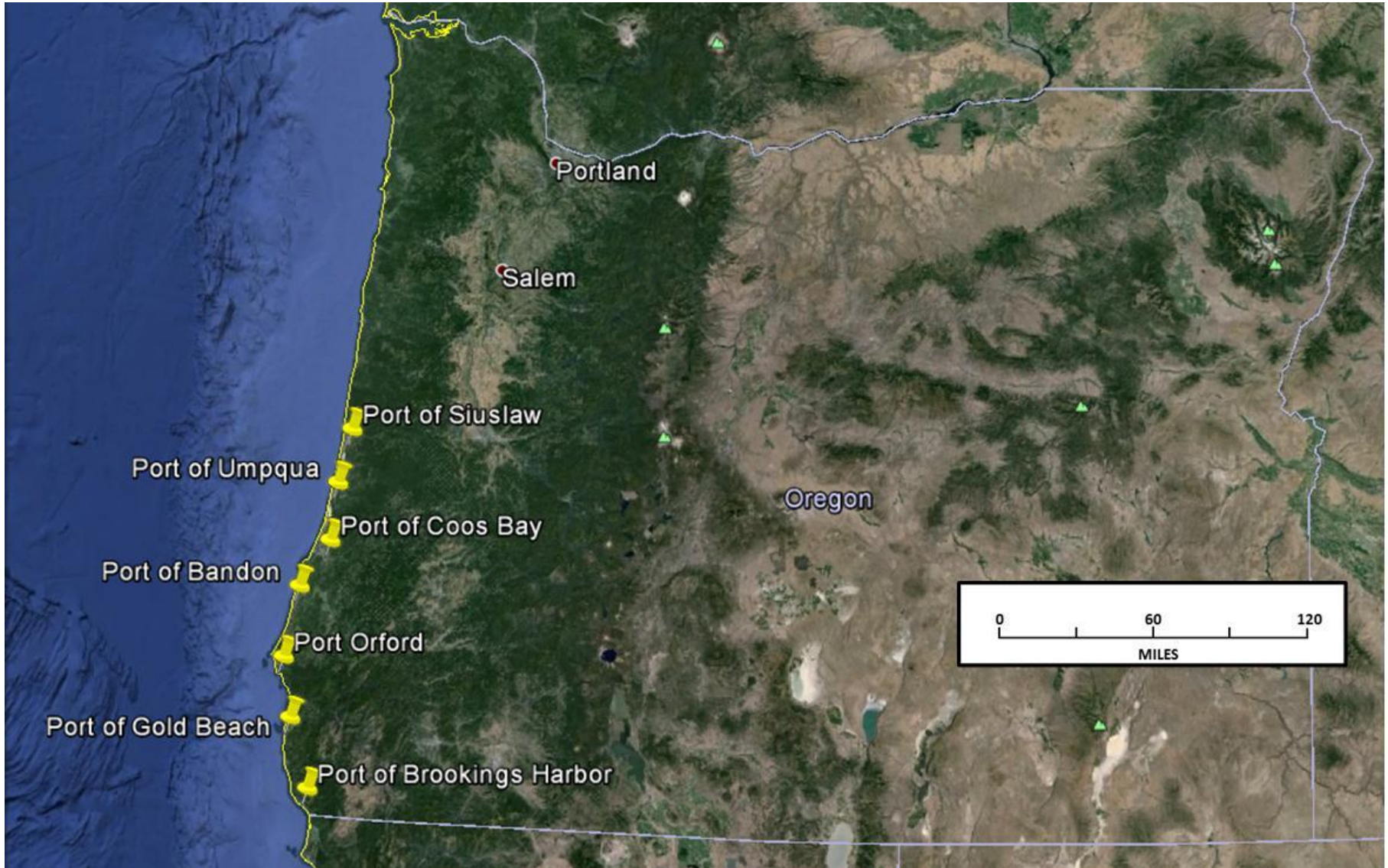
*October 23, 2014*



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# Project Overview



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# Presentation Overview

- 1. Existing Data Collection, Review, and Processing**
- 2. Maintenance Dredging Requirements**
- 3. Disposal Sites and Method of Disposal**
- 4. Develop Alternatives of Dredging Equipment**
- 5. Selection of the Preferred Alternatives and Recommendations**



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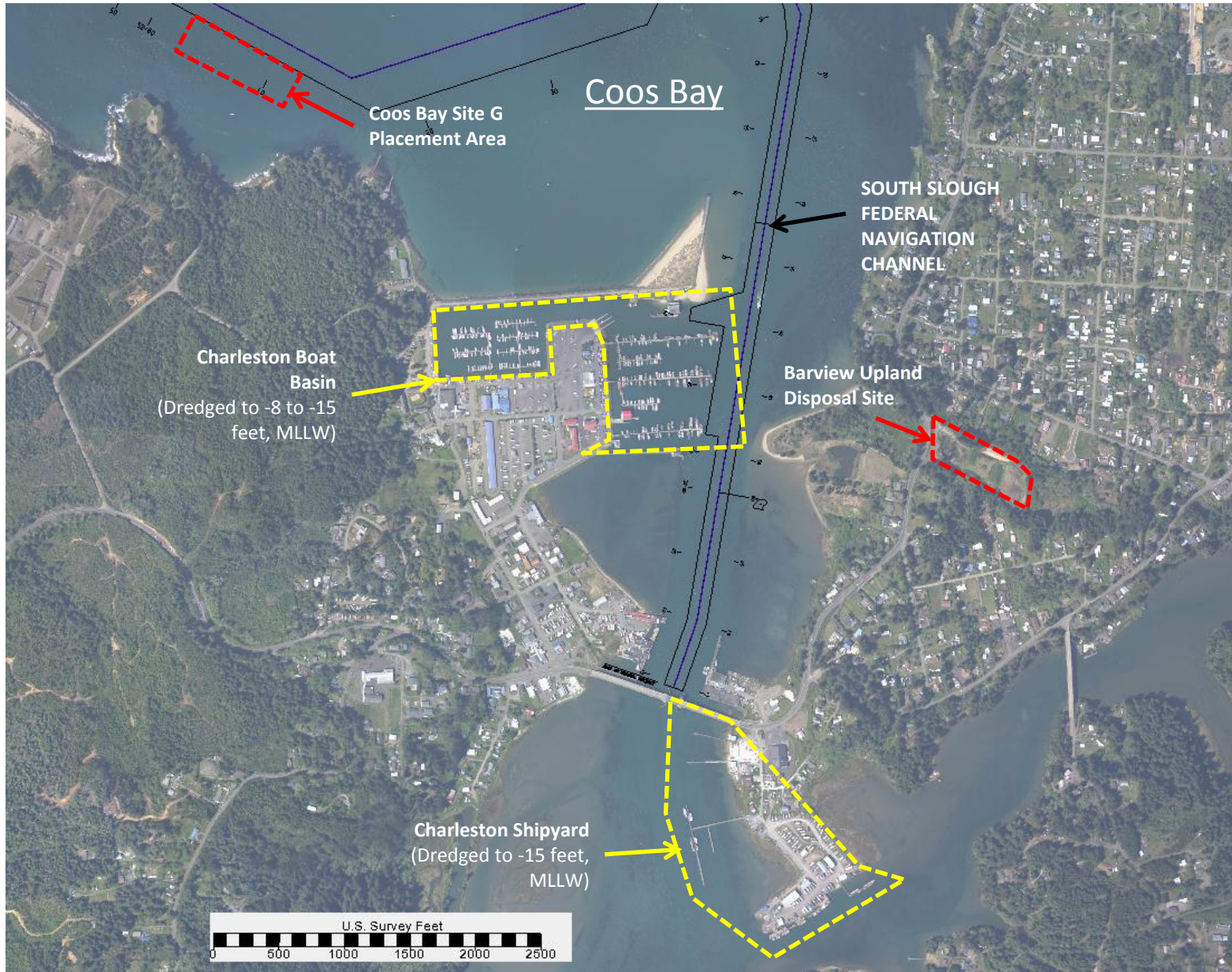


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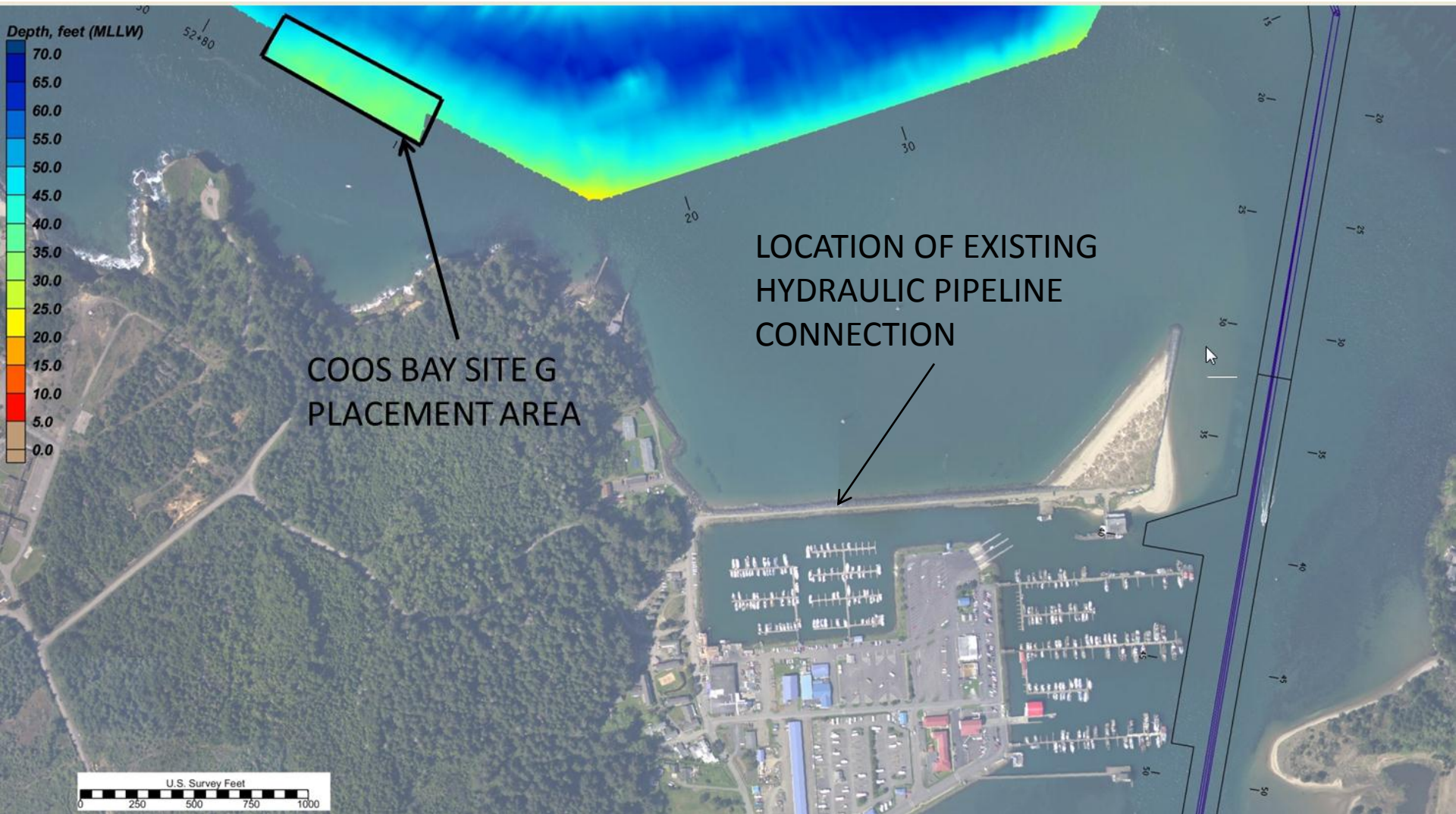


# International Port of Coos Bay (Charleston Marina)





# Existing USACE In-Water Placement site near Charleston Marina)



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# Oregon International Port of Coos Bay (Charleston Marina)

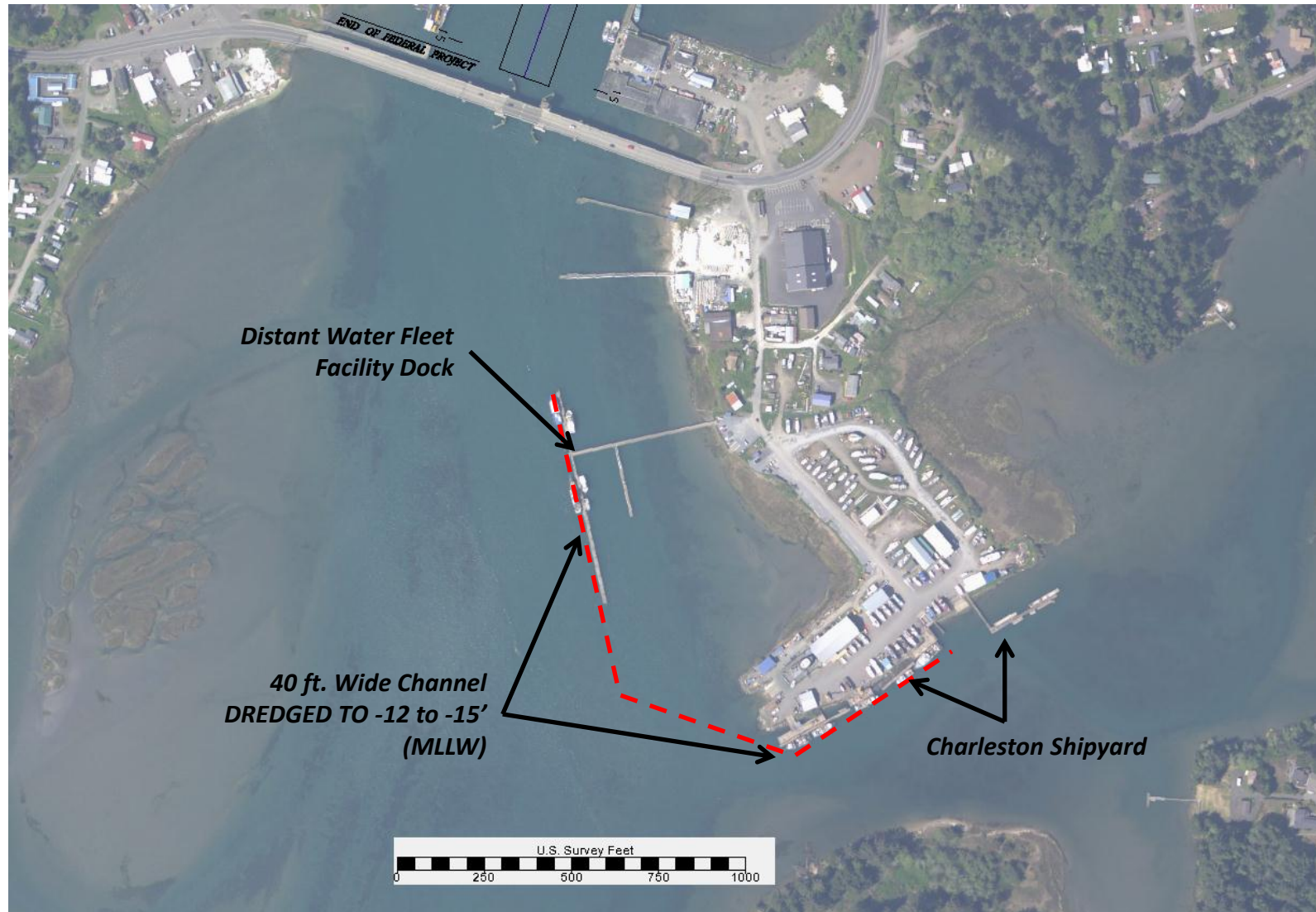


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# Oregon International Port of Coos Bay (Charleston Shipyard)



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# Data from the Port



## PORT OF COOS BAY (CHARLESTON MARINA COMPLEX) HISTORICAL DREDGE SUMMARY

DATA BASED UPON QUESTIONNAIRE DATA RECEIVED

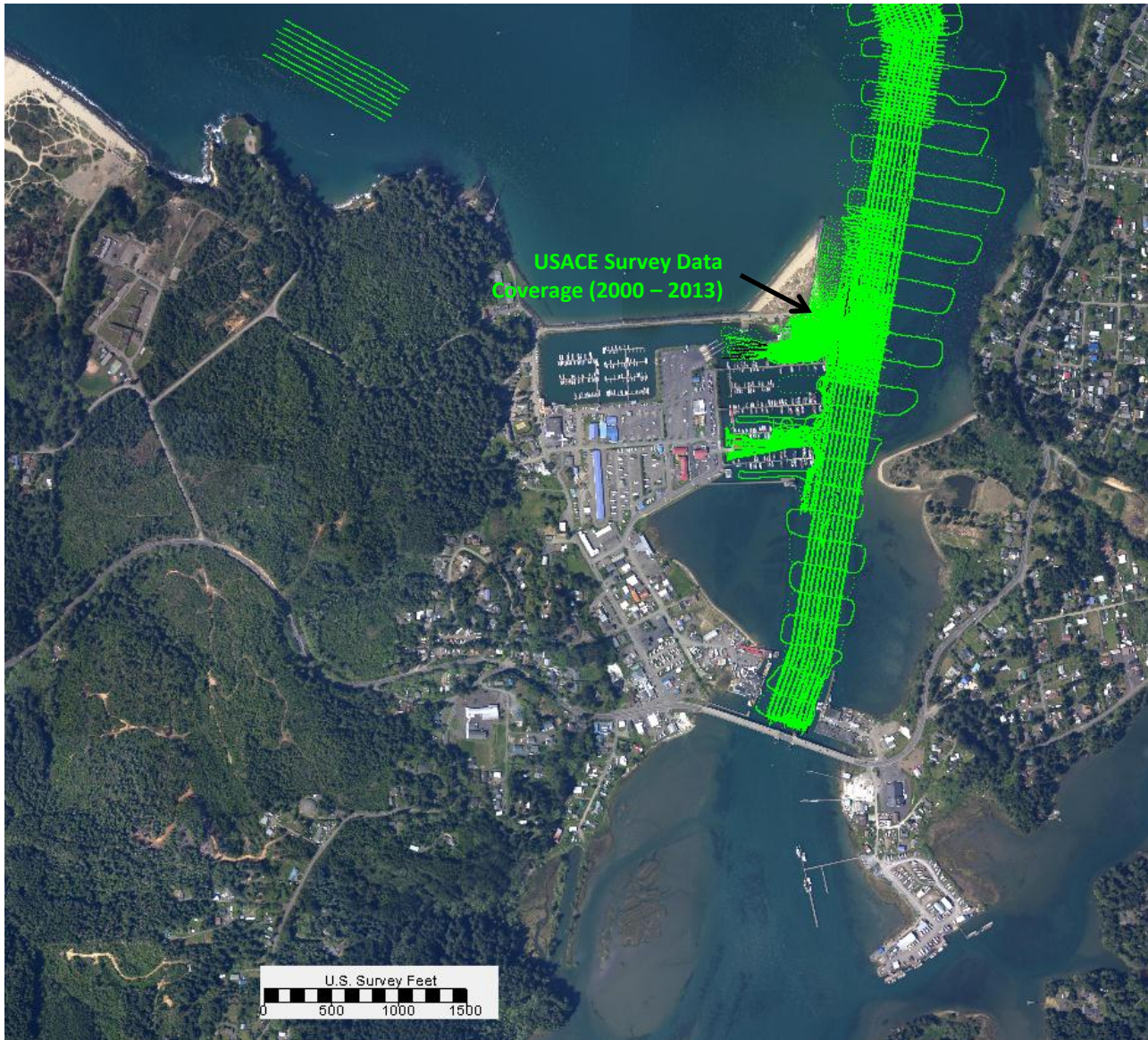
Event No.	Dredging Date	Dredge Area Name (ft <sup>2</sup> /acreage)	Design Dredge Depth (feet, MLLW)	Overdredge Allowance (feet)	Quantity Dredged (CY)	Disposal Site	Dredging Equipment Used
1	11/30/2003 to 3/15/2004	Charleston BB and Shipyard	8.0-15.0	unknown	30,000*	Coos Bay Site G (Flow Lane)	Hydraulic Cutterhead
2	Jun-05	Charleston BB and Shipyard	8.0-15.0	unknown	20,000*	Barview (Upland)	Hydraulic Cutterhead



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# Army Corps of Engineers Data



\* Data from Portland District USACE. Ports did not provide this data.

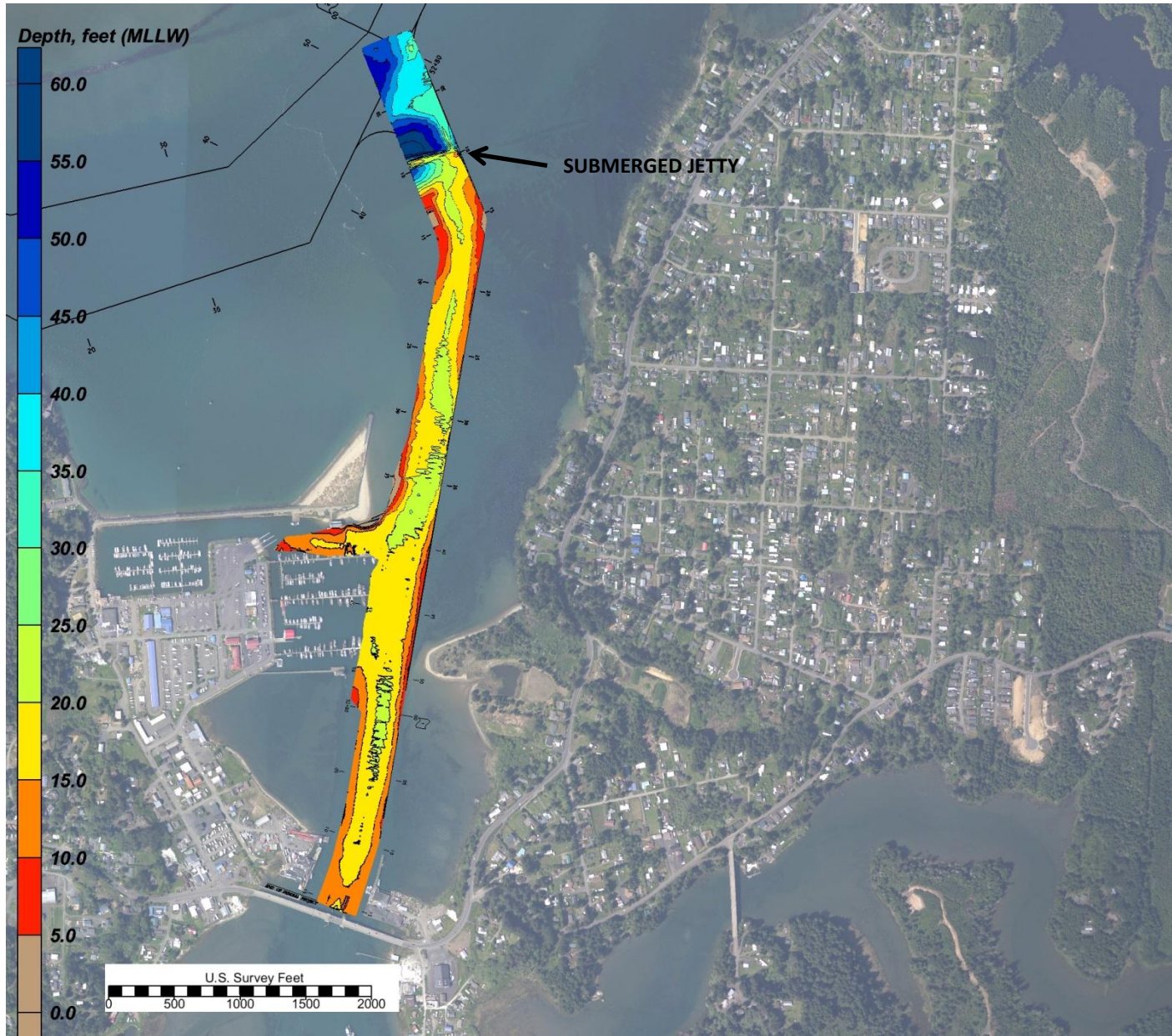


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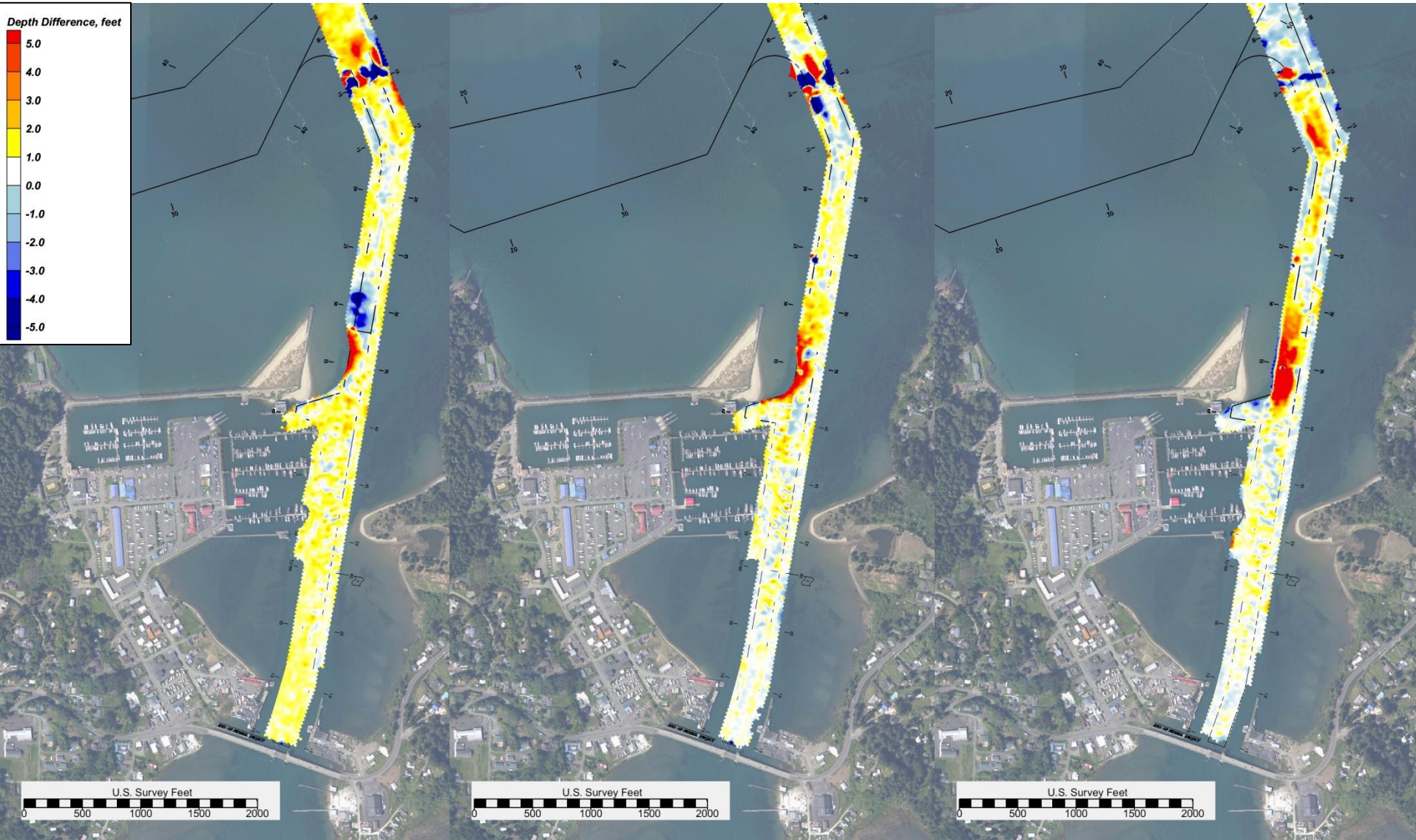


# Corps of Engineers Bathymetry September 2013





# South Slough Navigation Channel Difference Plots



Jan 2000 to Sept 2000

April 2001 to Sept 2001

March 2002 to August 2002

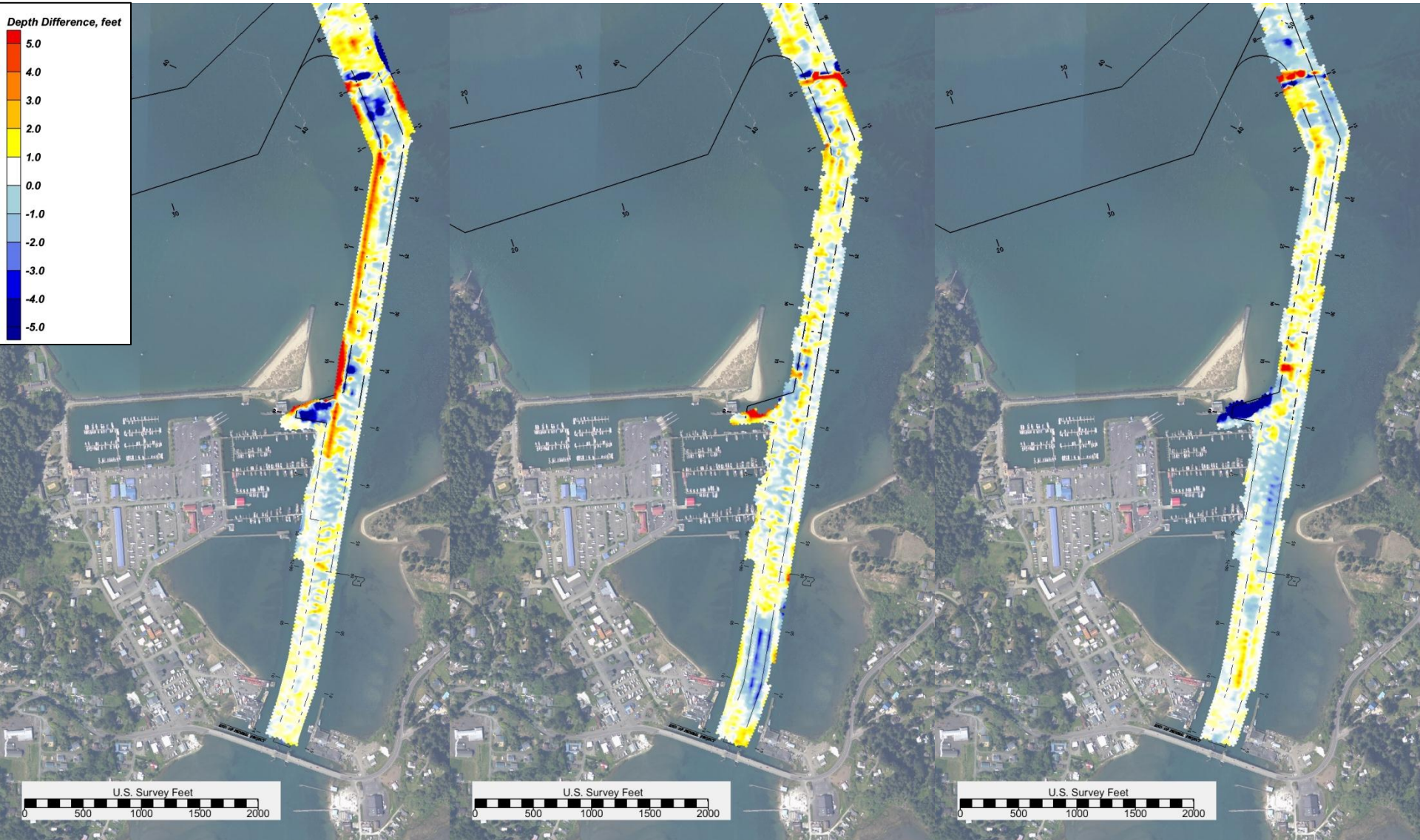


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# South Slough Navigation Channel Difference Plots



March 2003 to Oct 2003

March 2004 to Oct 2004

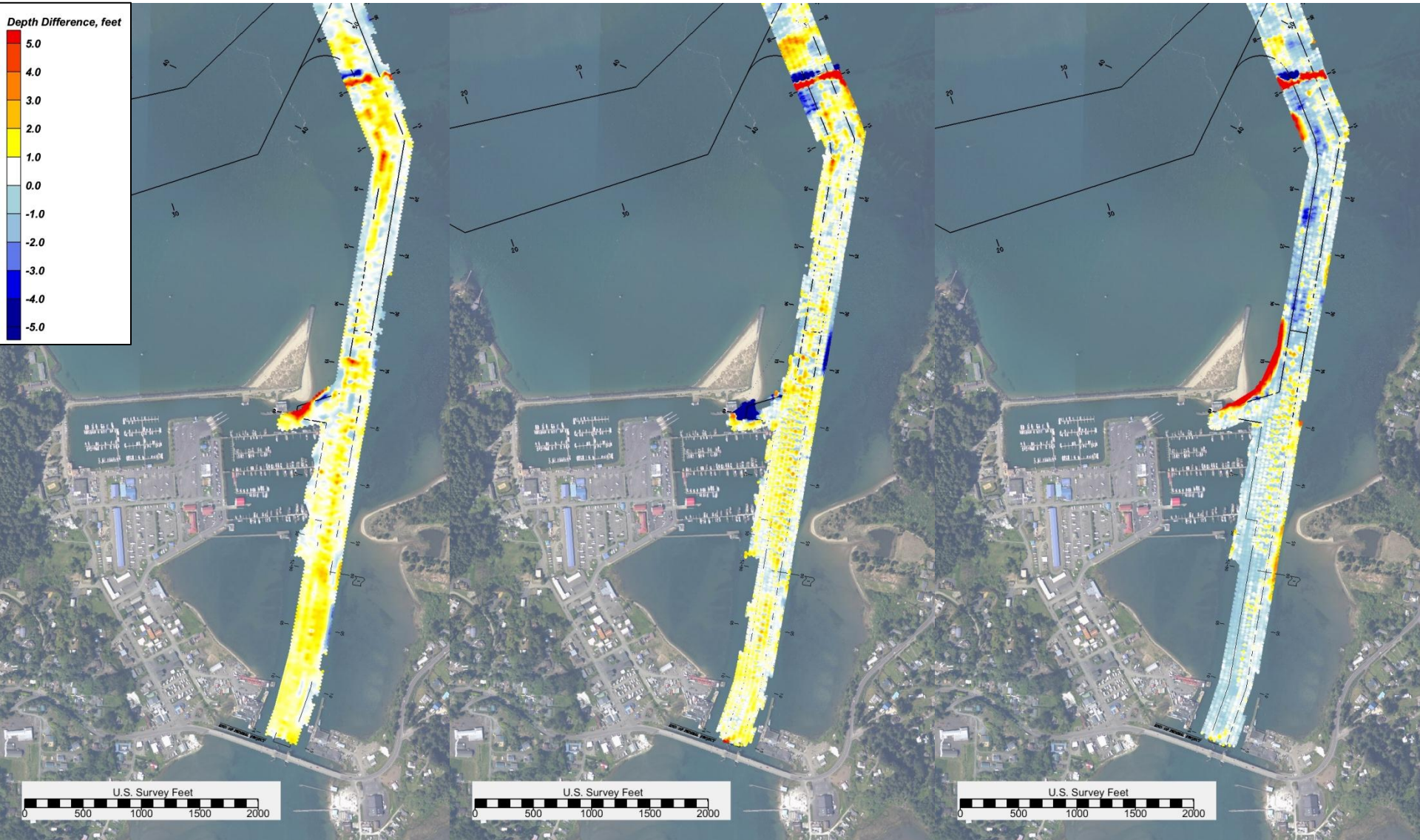
Jan 2005 to Sept 2005



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# South Slough Navigation Channel Difference Plots



Jan 2006 to Oct 2006

Feb 2007 to Sept 2007

Jan 2008 to Oct 2008

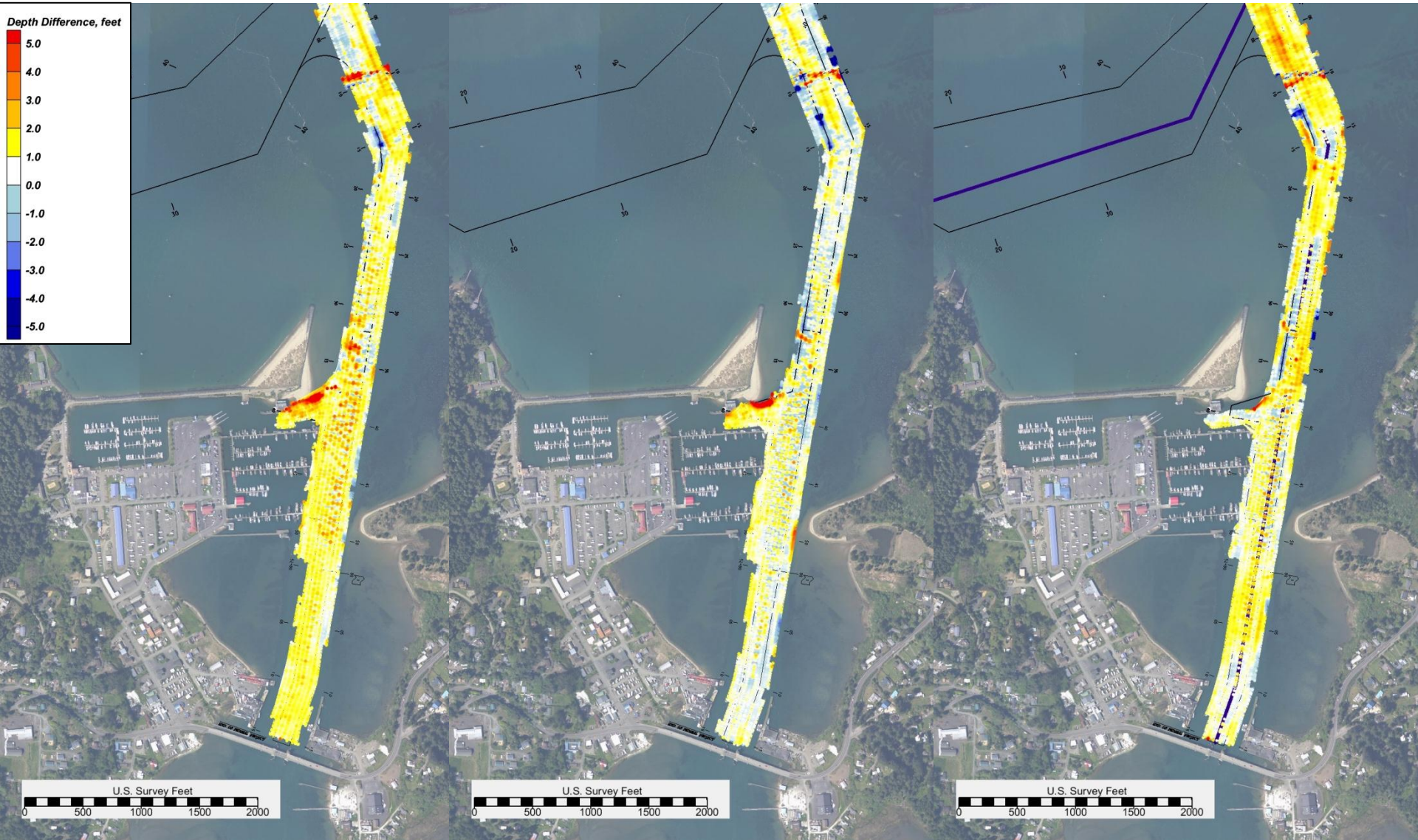


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# South Slough Navigation Channel Difference Plots



Feb 2009 to Sept 2009

March 2010 to Oct 2010

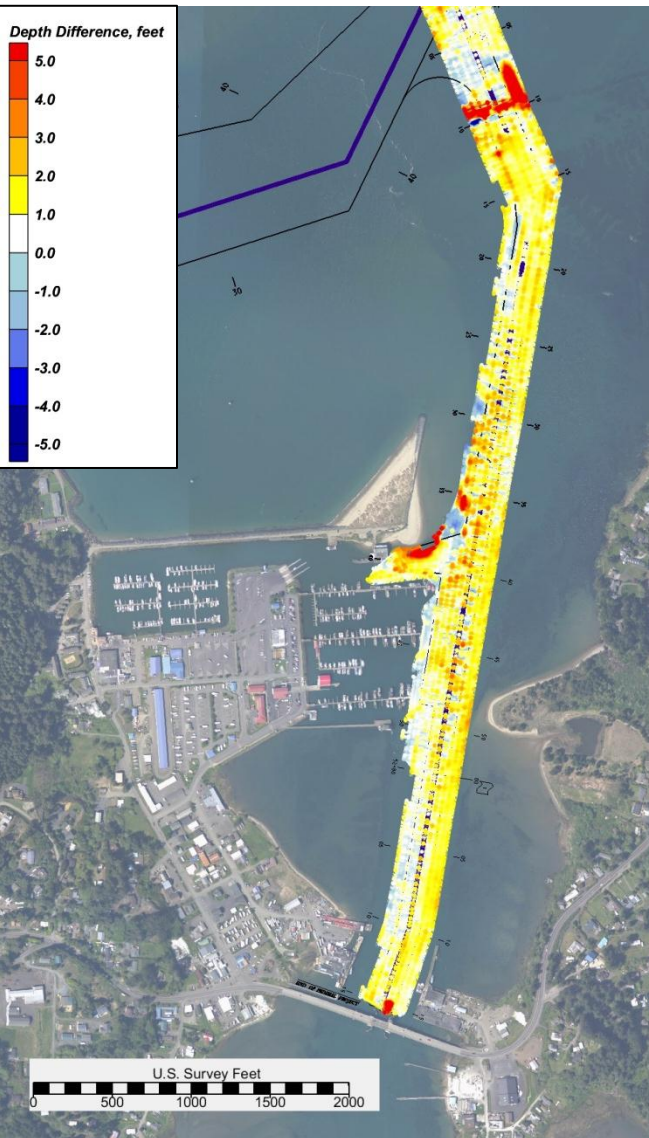
March 2011 to July 2011



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# South Slough Navigation Channel Difference Plots



July 2012 to Sept 2013



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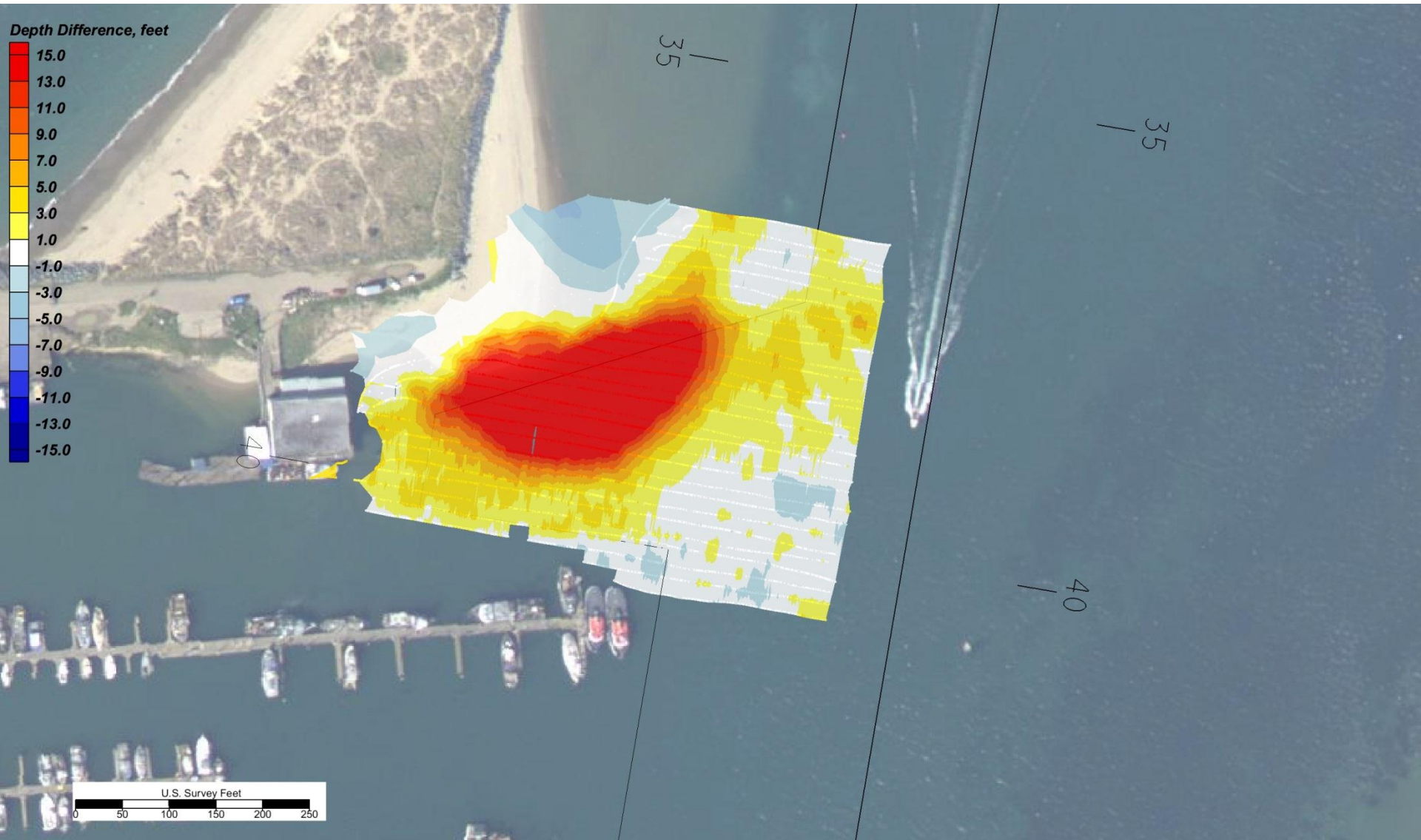
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# 4-12-2006 to 7-18-2007 Turning Basin Difference Plot



# 10-27-2009 to 9-16-2011 Turning Basin Difference Plot





# Estimated Volumes of Dredging

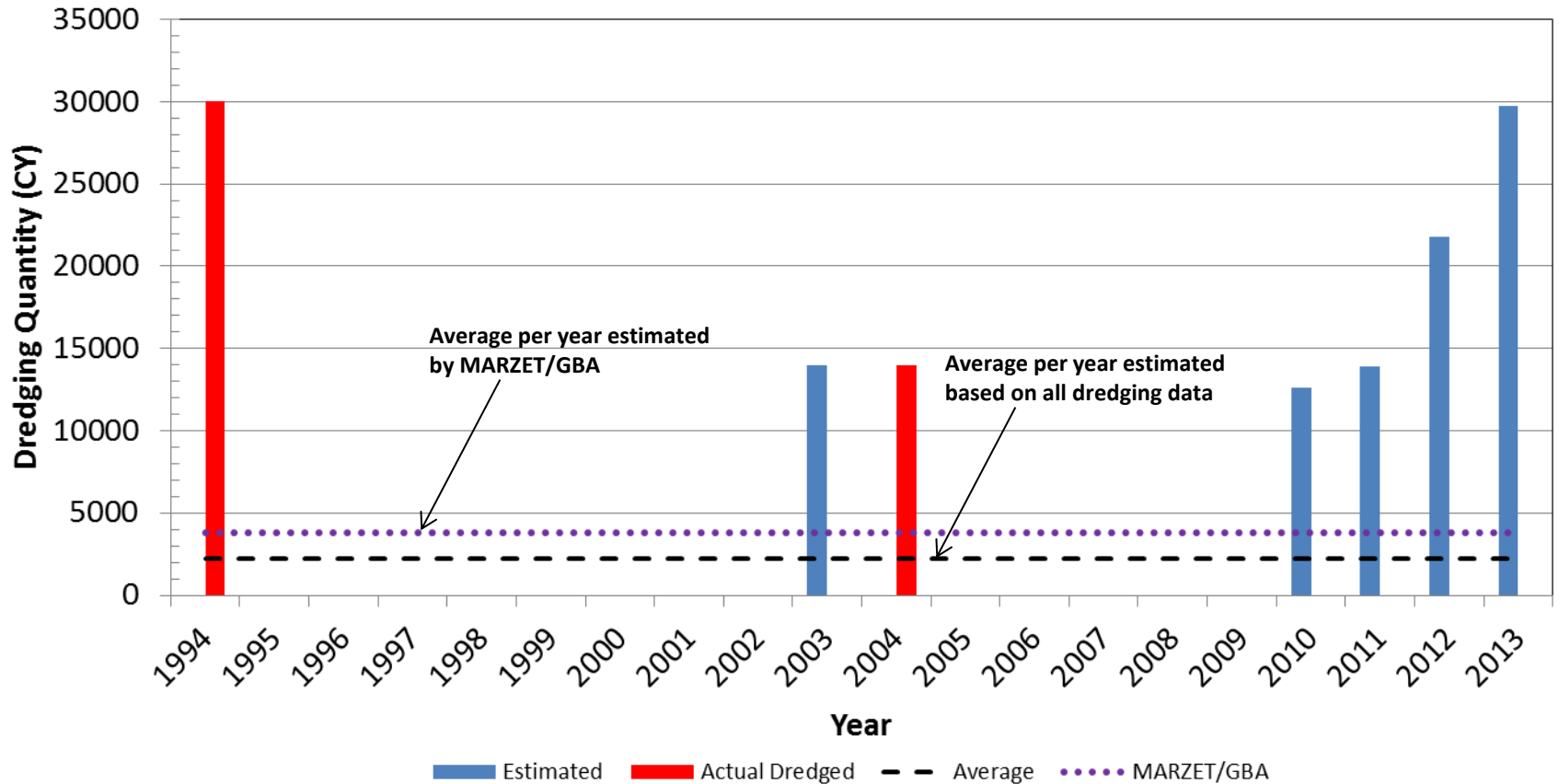
- Outer and Inner Basins, including Approach Channel (based on Port dredging data, MARZET study, and GBA data)
- DWFD and Charleston Shipyard, including all docks and channel (based on Port dredging data and MARZET study)
- Federal Channel, including turning basin (based on Corps surveys)



# Charleston Marina Complex – Inner Basin



## Charleston Marina Complex Inner Basin Maintenance Dredging

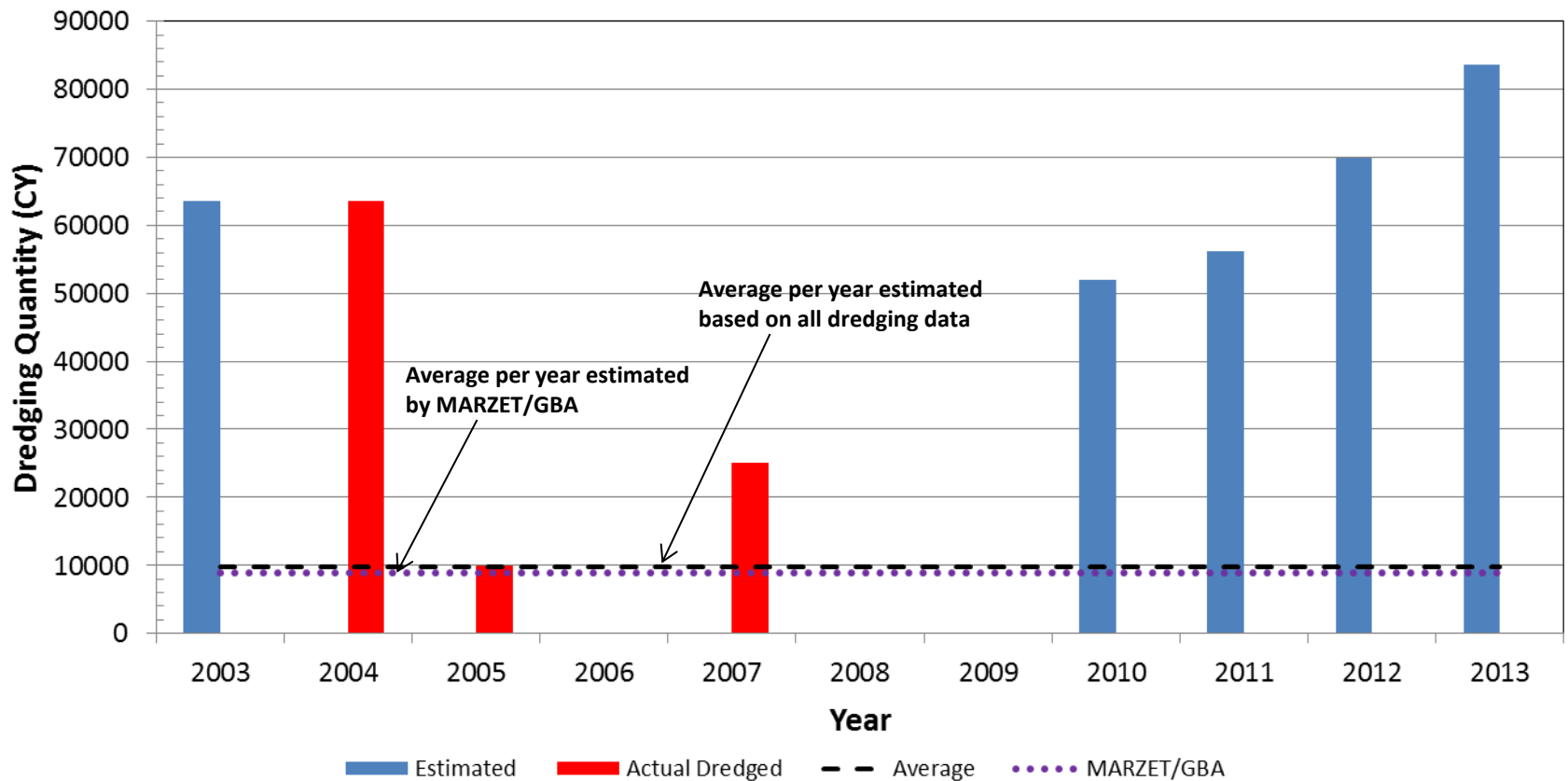




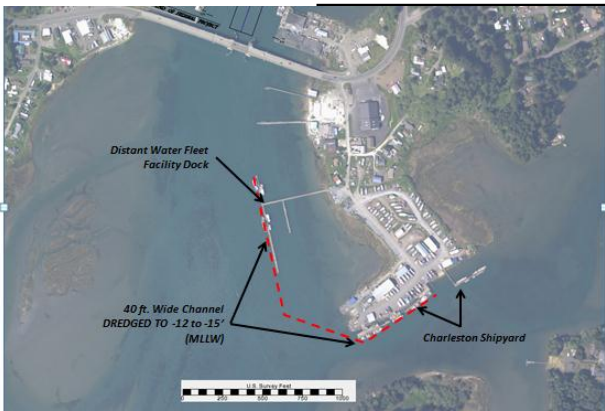
# Charleston Marina Complex – Outer Basin



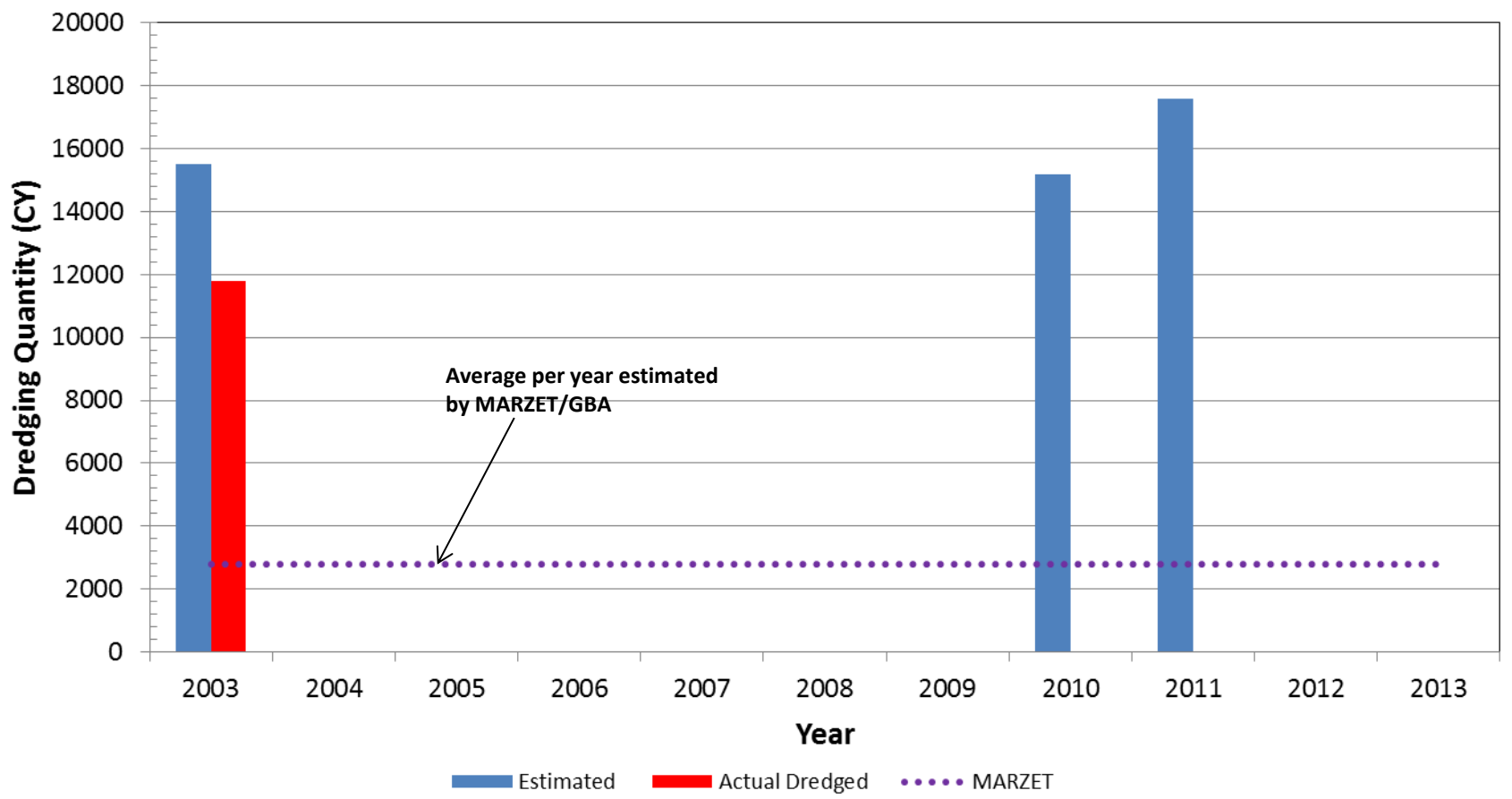
## Charleston Marina Complex Outer Basin Maintenance Dredging



# Charleston Distant Water Fleet Dock and Shipyard



## DFWD/Channel/Charleston Shipyard Maintenance Dredging





# Charleston Marina – Maintenance Dredging Summary

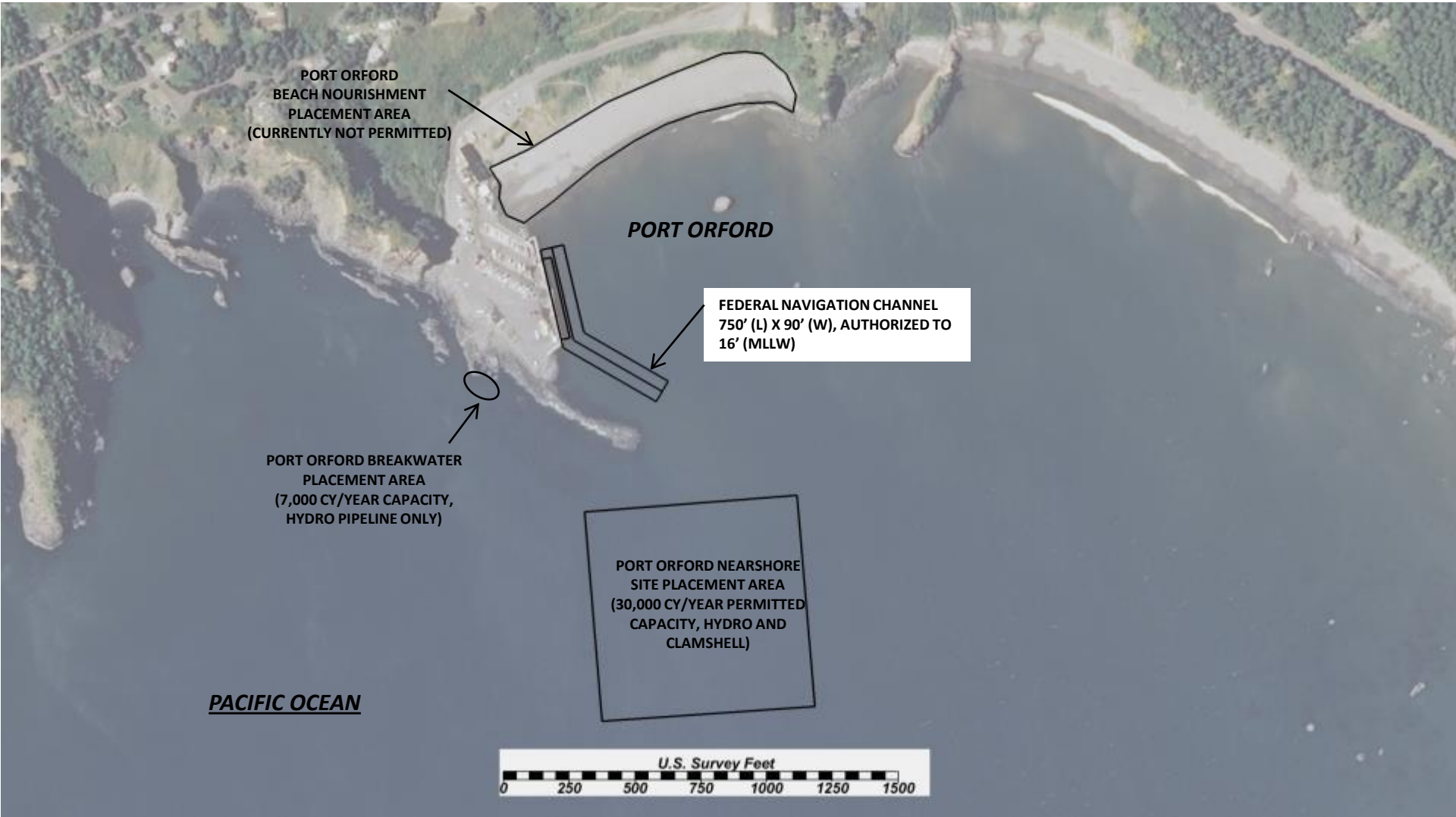
Dredging Site	Yearly maintenance dredging requirement
Inner Basin	3,750
Outer Basin	10,000
Shipyard	2,800
Total Marina	16,550



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# Port Orford

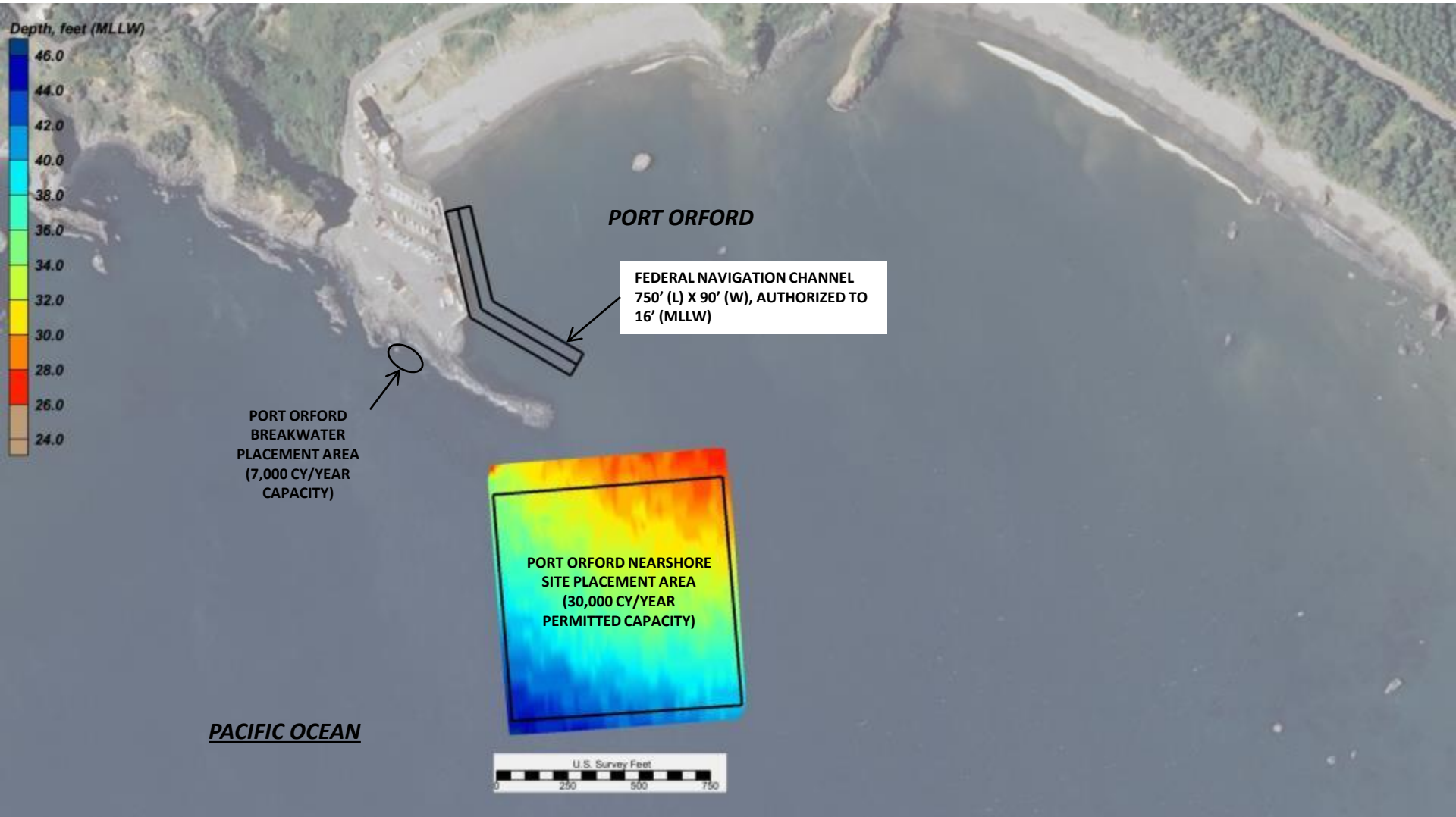


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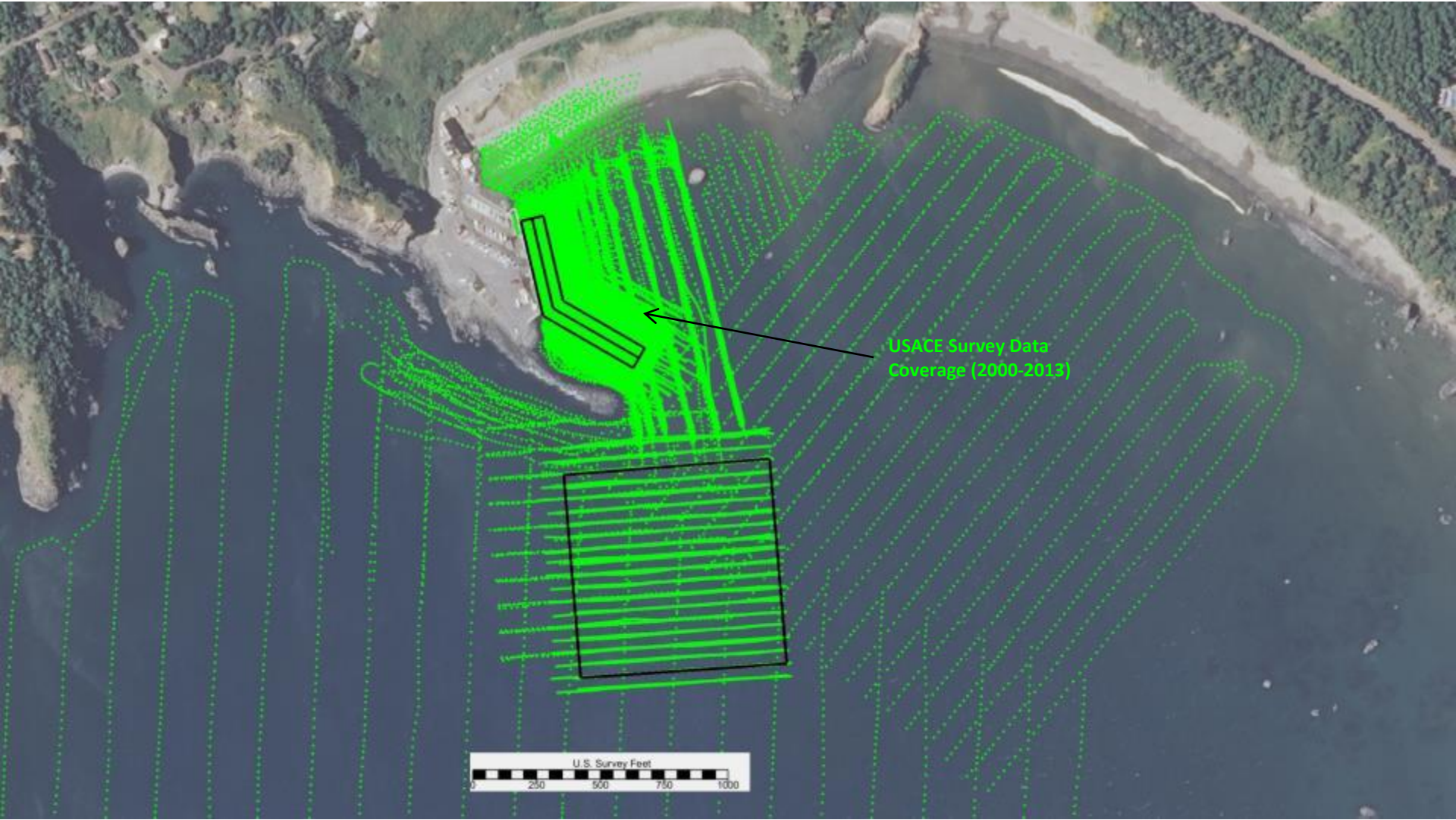
# Port Orford



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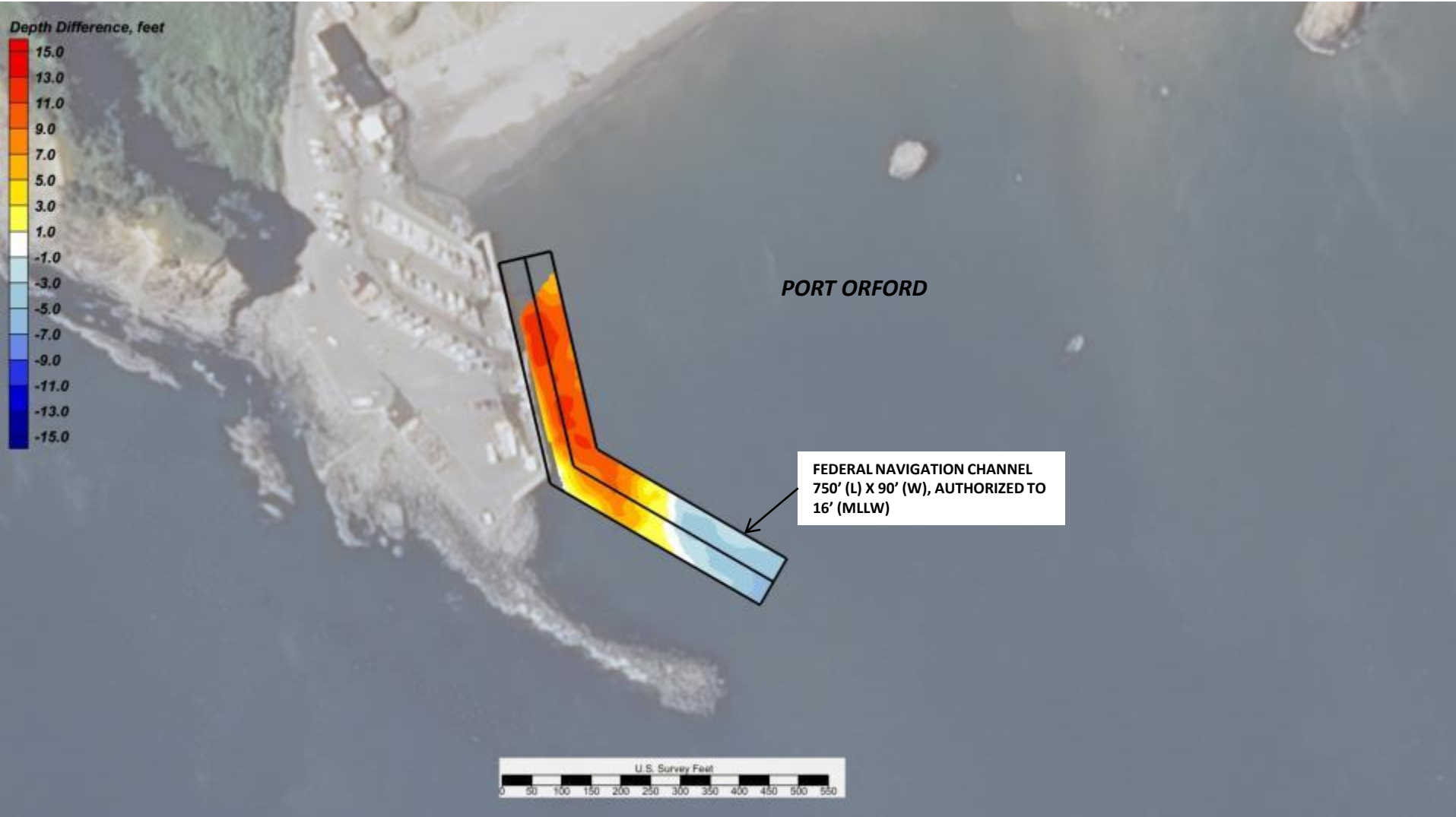
# Port Orford



\* Data from Portland District USACE. Ports did not provide this data.



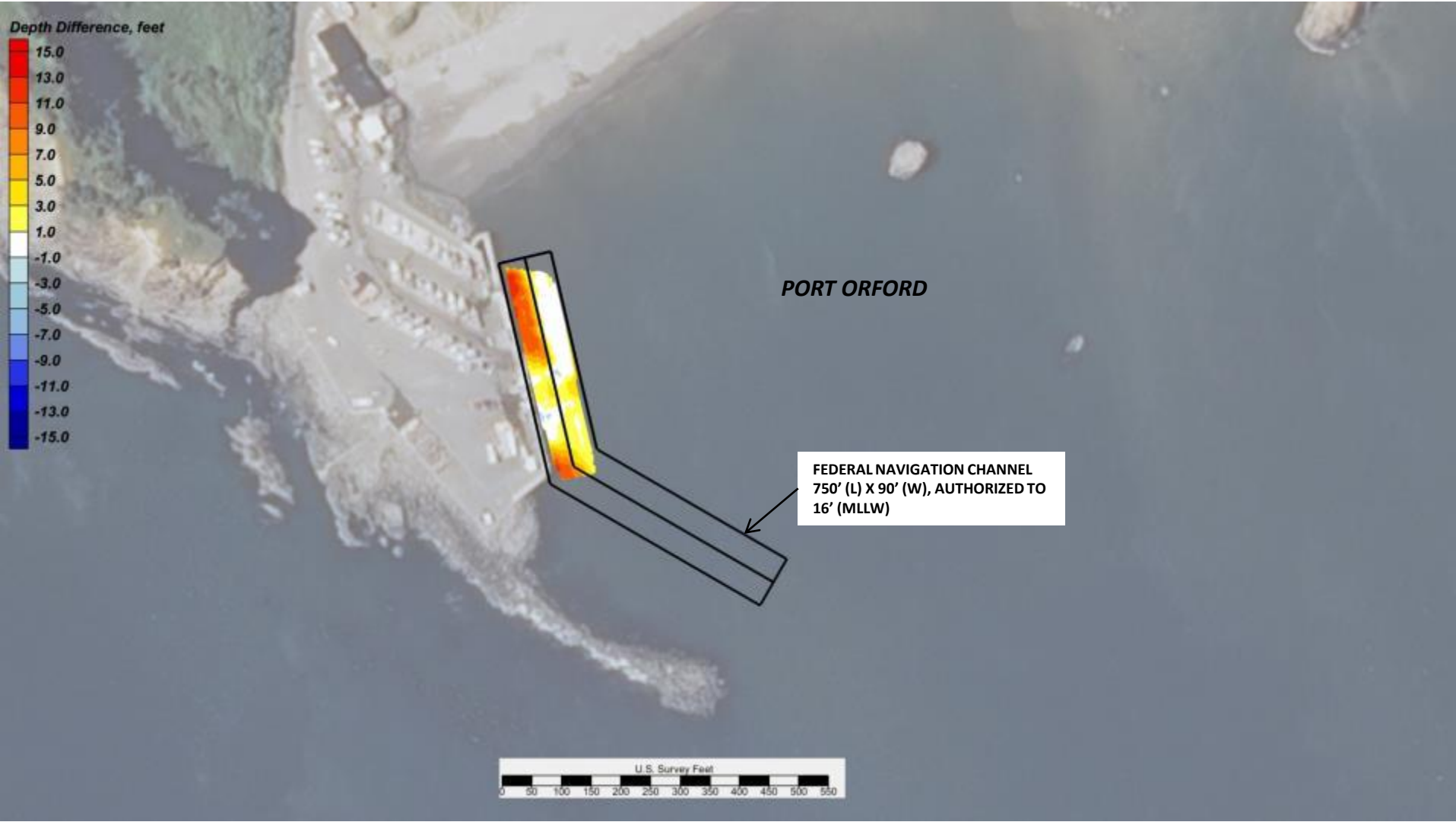
# Port Orford FNC 2001 (Post-dredge) to 2003 (Pre-dredge)



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# Port Orford FNC 2003 (Post-dredge) to 2004 (Pre-dredge)

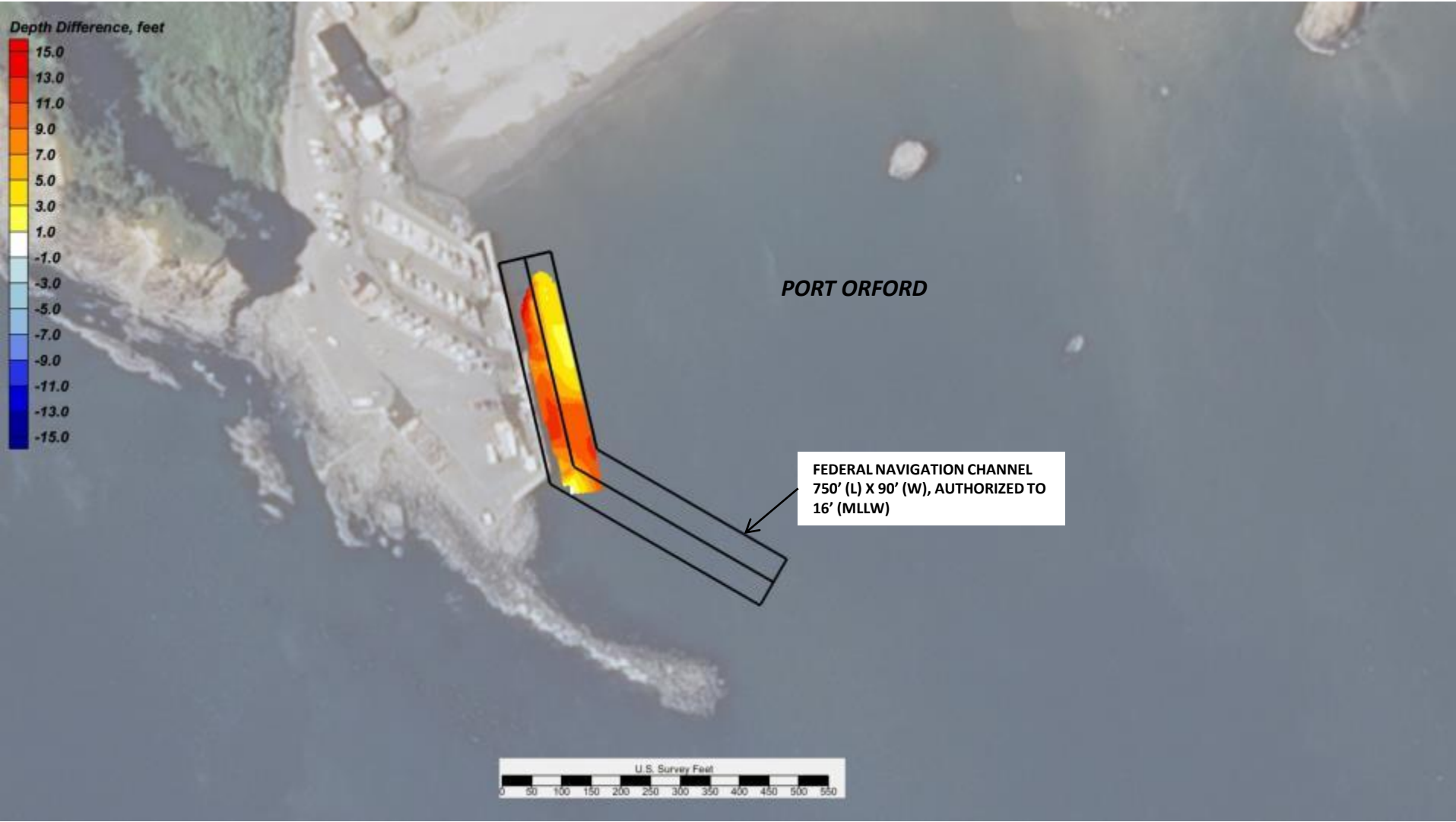


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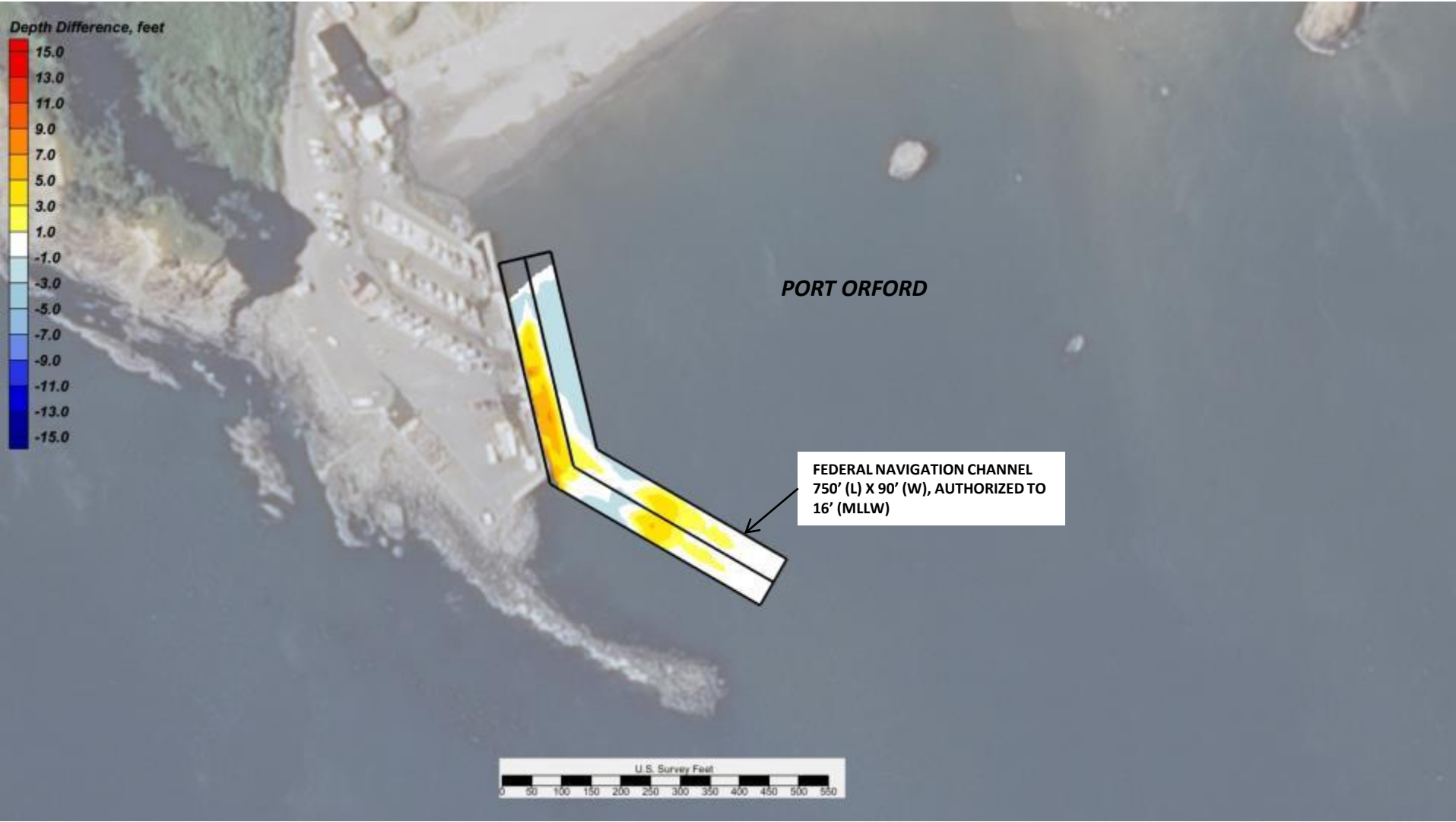
# Port Orford FNC 2005 (Post-dredge) to 2006 (Pre-dredge)



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# Port Orford FNC 2006 (Post-dredge) to 2007 (Pre-dredge)

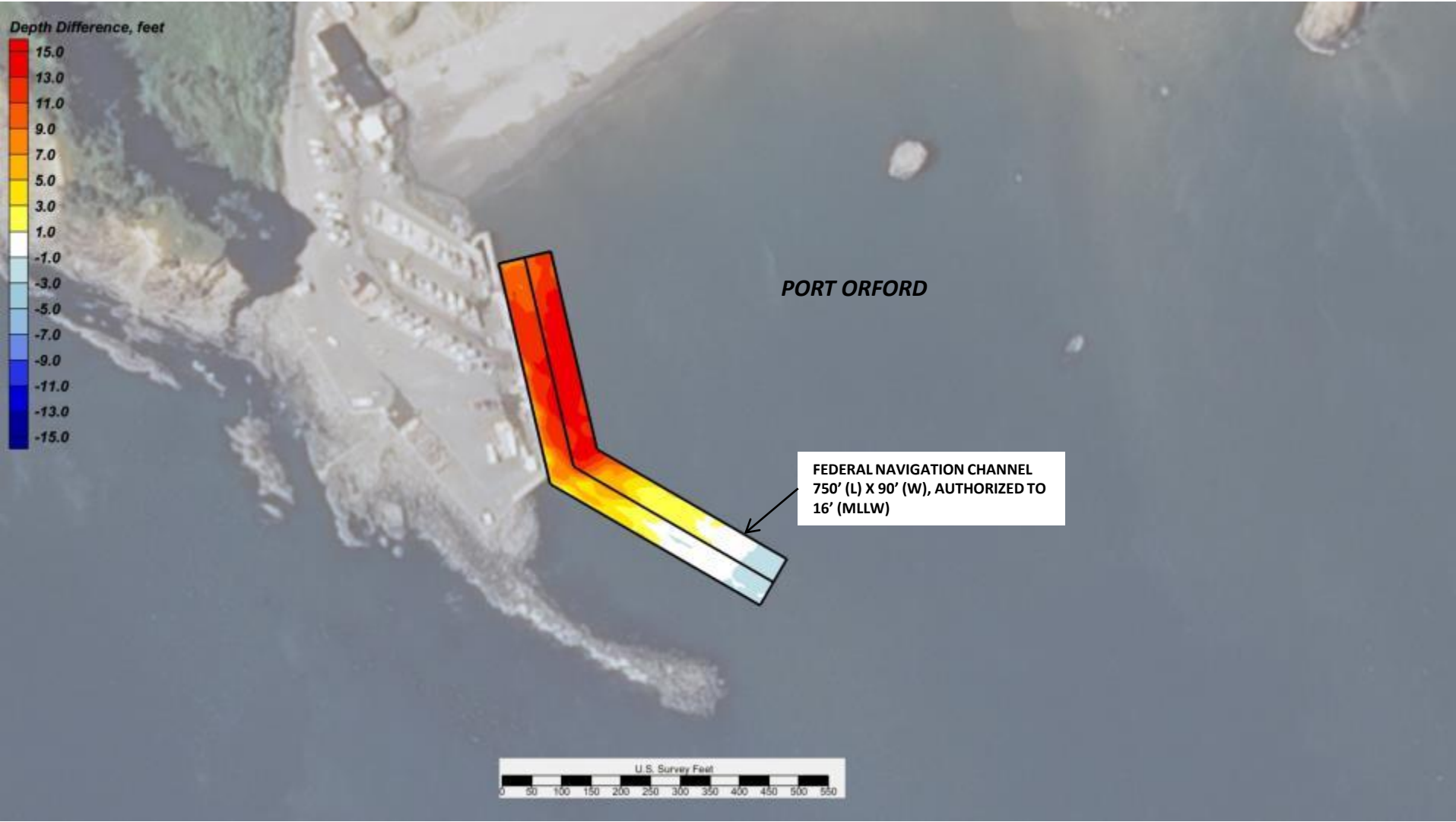


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# Port Orford FNC 2007 (Post-dredge) to 2009 (Pre-dredge)



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# Port Orford FNC 2009 (Post-dredge) to 2010 (Pre-dredge)



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## PORT OF ORFORD HISTORICAL DREDGE SUMMARY

DATA BASED UPON QUESTIONNAIRE DATA RECEIVED

Event No.	Dredging Date or Year	Dredge Area Name	Design Dredge Depth (feet, MLLW)	Overdredge Allowance (feet)	Quantity Dredged (CY)	Disposal Site	Dredging Equipment Used
1	1998	FNC	16.0	2.0	6,508	OW Nearshore	Crane, submersible pump
2	Jan-01	FNC	16.0	2.0	4,551	OW Nearshore	Crane, submersible pump
3	Aug-03	FNC	16.0	2.0	30,387	OW Nearshore	Clamshell
4	Aug-04	FNC	16.0	2.0	8,779	OW Nearshore	Crane, submersible pump
5	Jun-05	FNC	16.0	2.0	7,423	OW Nearshore	Crane, submersible pump
6	May-06	FNC	16.0	2.0	7,423	OW Nearshore	Crane, submersible pump
7	Jul-07	FNC	16.0	2.0	30,961	OW Nearshore	Clamshell
8	Jun-09	FNC	16.0	2.0	23,548	OW Nearshore	Clamshell
9	2010	FNC	16.0	2.0	23,104	OW Nearshore	Clamshell
10	2014*	FNC	16.0	2.0	3,000*	OW Nearshore	Unknown

Notes:  
 \* Dredging In progress



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# Port Orford Estimated Volumes of Dredging

- **Federal Navigation Channel Dredging**

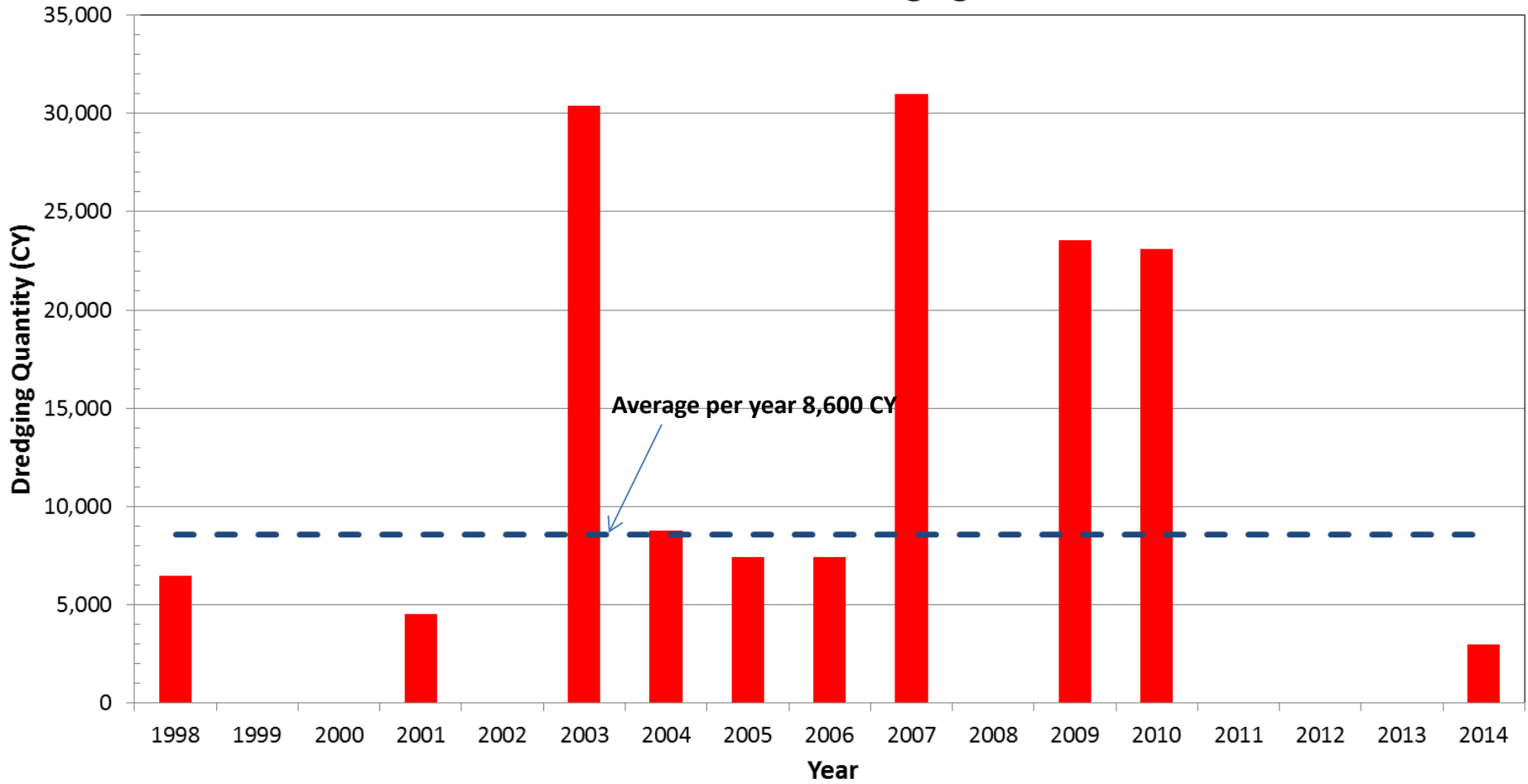
- Dredging during the winter is not feasible due to large waves and swell
- Dredging during the summer time is feasible due to protection by the Port Orford headlands and the existing breakwater



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## Port Orford Maintenance Dredging Volumes



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# Port Orford – Maintenance Dredging Summary

Dredging Site	Yearly maintenance dredging requirement
FNC Channel	8,600 CY

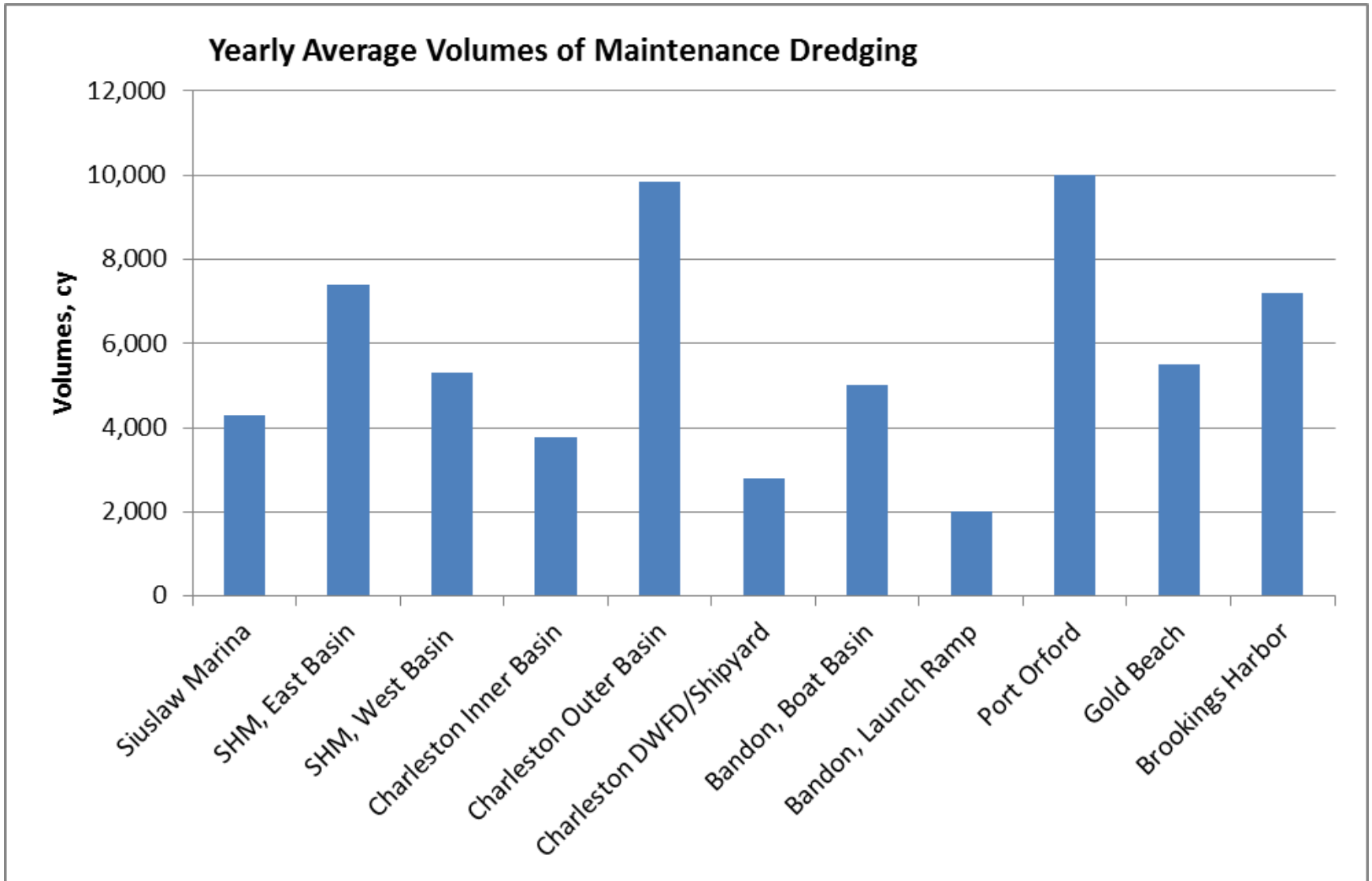


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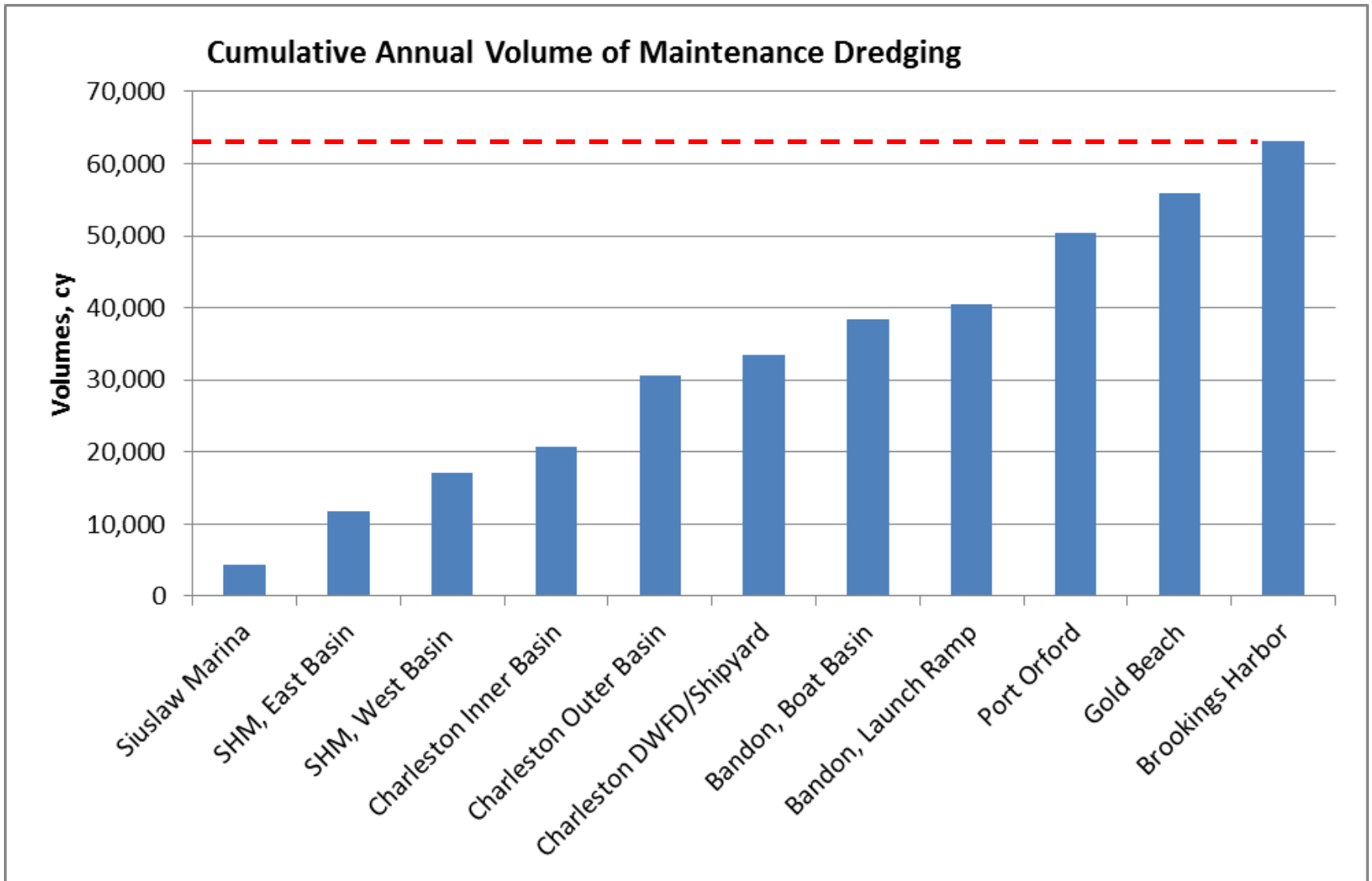
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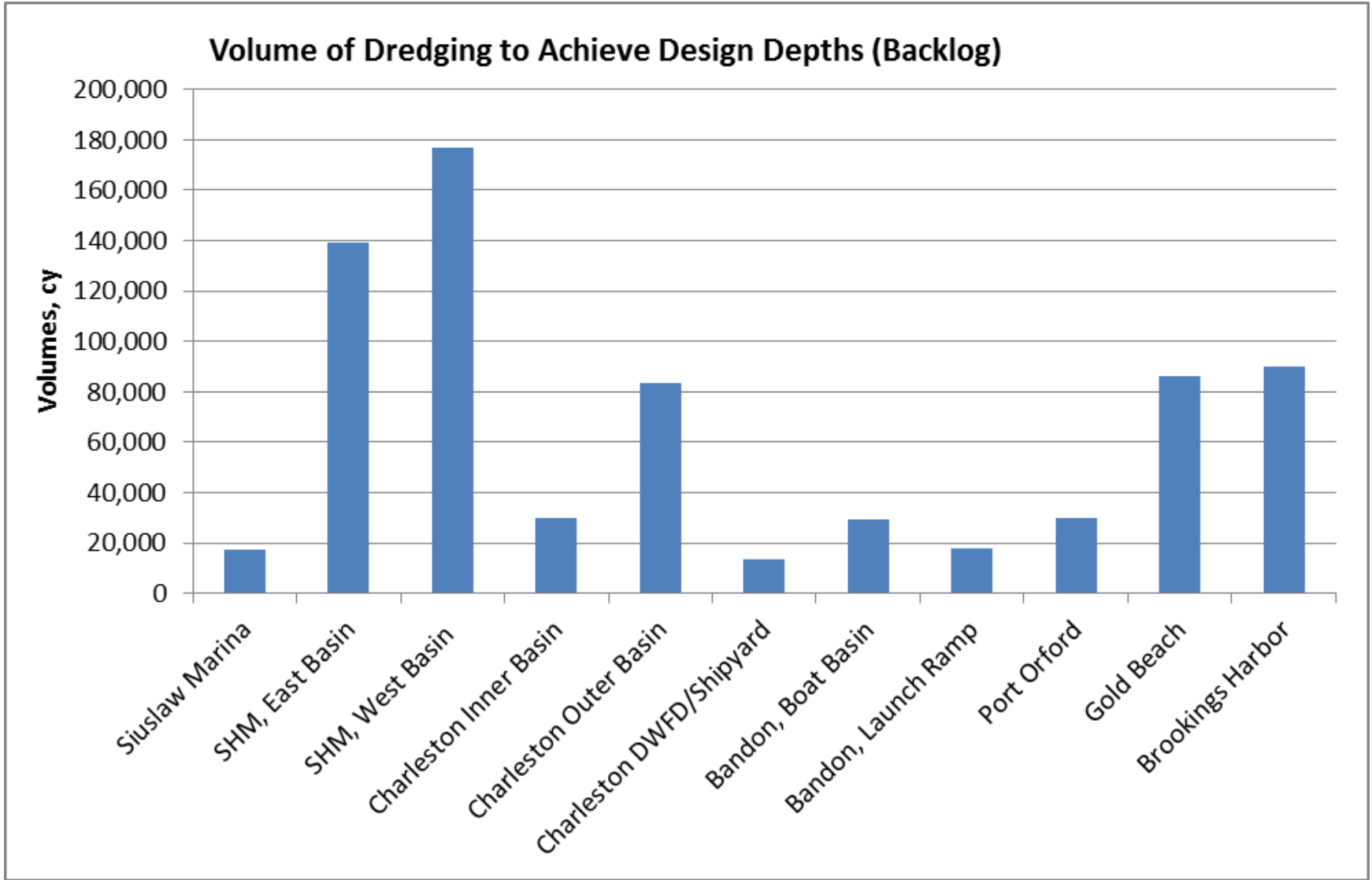
# Maintenance Dredging Requirements



# Maintenance Dredging Requirements

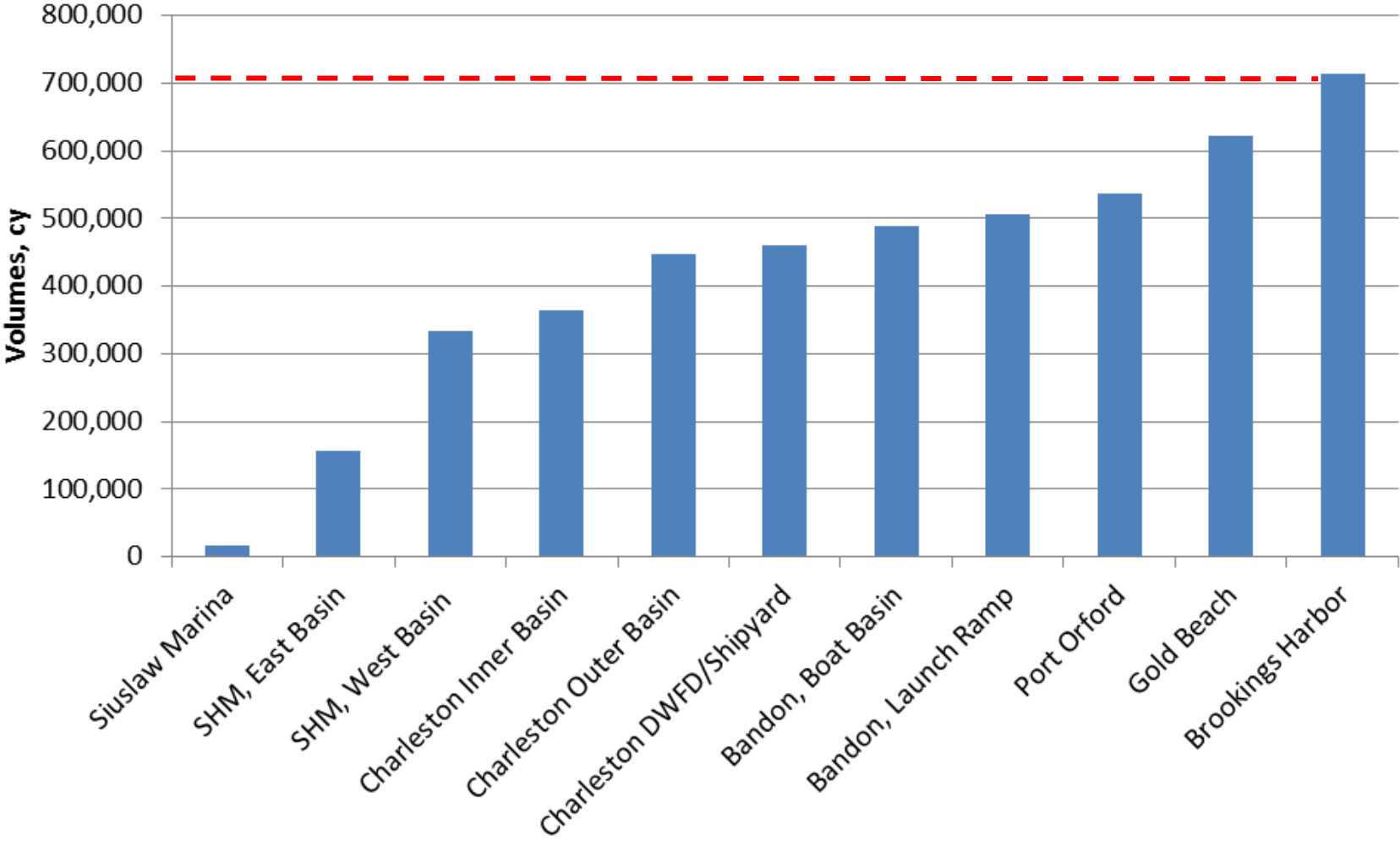


# Maintenance Dredging Requirements -Backlog





### Cumulative Volume of Dredging to Achieve Design Depths (Backlog)



# Intermediate Data Analysis Summary

- Yearly volume of sedimentation and maintenance dredging requirements respectively for all Southern Ports dredging projects is estimated at 63,000 cy per year
- Because of non-regular and non-systematic maintenance dredging practice, a significant amount of sediment (more than 700,000 cubic yards) has accumulated in marinas, inner channels, and other facilities of the Southern Oregon Ports.
- Considering the preferred directions of the Oregon State IFA, the current strategy is to consider dredging of the backlog as a separate dredging project, and focus on maintenance dredging requirements only.



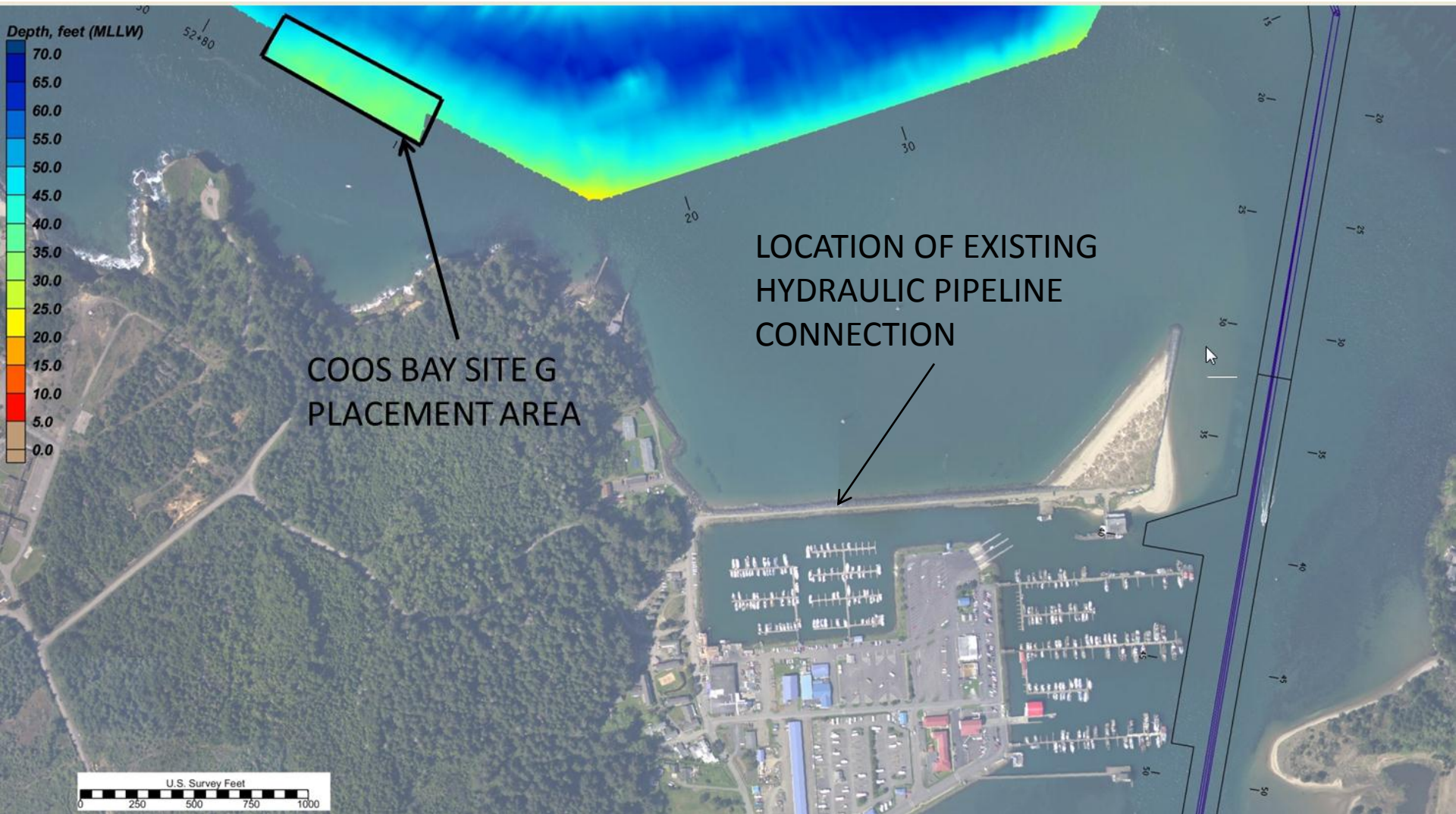
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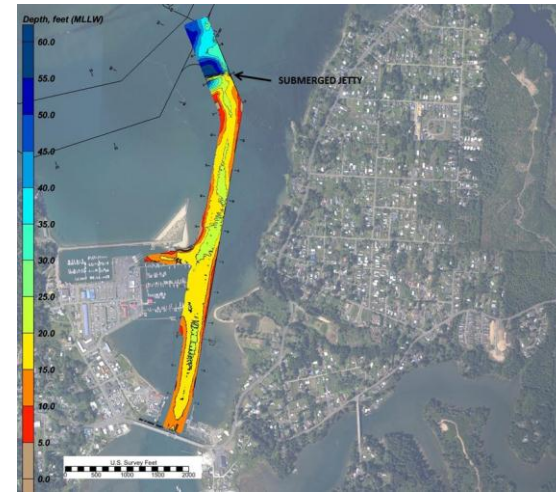
# Existing USACE In-Water Placement site near Charleston Marina)



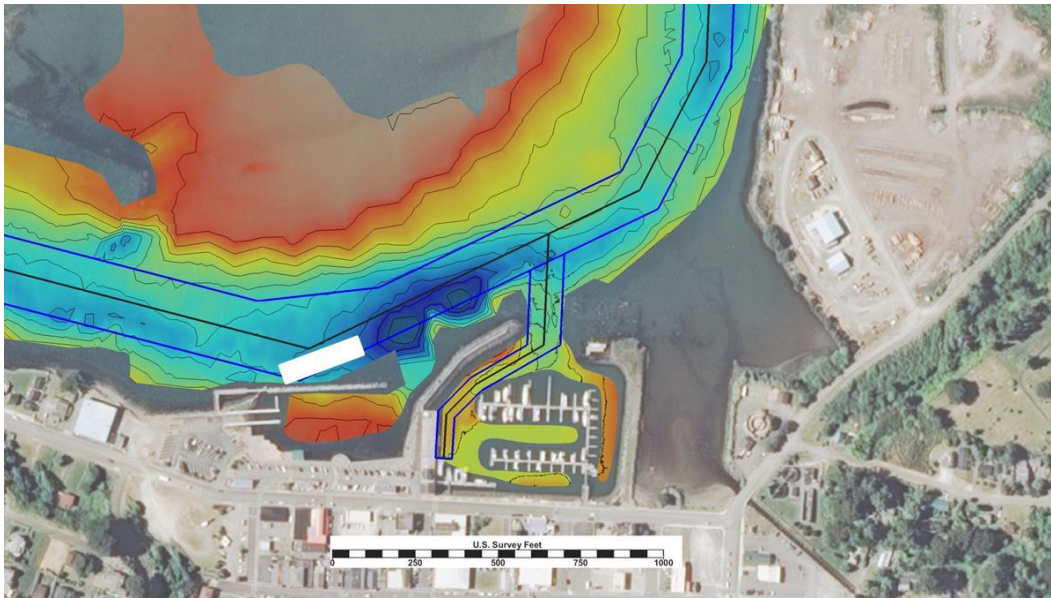
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# Possible flow lane disposal site at Charleston Marina



# Possible flow lane disposal site at Port of Bandon



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# Dredging Equipment Alternatives

Example Portable Dredges Manufactured by Ellicott Machine Co.

Series	Discharge Diameter	Maximum Digging Depth	Total Power	Pump Power	Cutter Power	Nominal Pump Capacity Range
360SL 8"	8"	15'	375 HP	290 HP	40 HP	up to 125 cu yds/hr
	203 mm	4.57 m	280 kW	216 kW	30 kW	100 m3/hr
460SL 10"	10"	20'	440 HP	320 HP	40 HP	up to 250 cu yds/hr
	245 mm	6.1 m	328 kW	238 kW	30 kW	190 m3/hr
370HP	10-12"	20-42'	440 HP	320 HP	40 HP	up to 250 cu yds/hr
	254-304 mm	6.1-12.8 m	328 kW	239 kW	30 kW	190 m3/hr
670HP	12-14"	33-42'	800 HP	560 HP	100 HP	100-450 cu yds/hr
	304-355 mm	10-12.8 m	597 kW	418 kW	75 kW	345 m3/hr



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	203 mm	4.57 m	280 kW	216 kW	30 kW	100 m3/hr
460SL 10"	10"	20'	440 HP	320 HP	40 HP	up to 250 cu yds/hr
	245 mm	6.1 m	328 kW	238 kW	30 kW	190 m3/hr
370HP	10-12"	20-42'	440 HP	320 HP	40 HP	up to 250 cu yds/hr
	254-304 mm	6.1-12.8 m	328 kW	239 kW	30 kW	190 m3/hr
670HP	12-14"	33-42'	800 HP	560 HP	100 HP	100-450 cu yds/hr
	304-355 mm	10-12.8 m	597 kW	418 kW	75 kW	345 m3/hr



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# Dredging Equipment Estimated Hourly Production Rates

Dredging Project	370 HP Hourly Production Rates (cy/hour)	360SL Hourly Production Rates (cy/hour)	8" Toyo Pump Production Rates (cy/hour)
Port of Siuslaw Marina	100	58	N/A
Port of Umpqua - Salmon Harbor Marina West Basin	173	141	N/A
Port of Umpqua - Salmon Harbor Marina East Basin	160	122	N/A
Charleston Marina Complex	180	137	N/A
Charleston Shipyard	134	102	N/A
Port of Bandon Boat Basin and Launch Ramp	185	160	84
Port Orford	126	67	49
Port of Gold Beach Basin	134	117	N/A
Port of Brookings Harbor Marina	134	100	N/A

Factors Effecting Production Rates (considered as part of this analysis):

- Dredging Depth
- Physical Characteristics of dredged sediment
- Distance to disposal sites
- Etc.



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# Available Hours for Maintenance Dredging- Assumptions

- The dredging window is limited to four months: November, December, January, and February.
- Working days per month: 24 days.
- Working hours per day: 8 hours.
- Effectiveness of dredging operations = 65%, implying that 35% of the time the dredge will work at a low production rate or stand-by due to weather conditions, maintenance, and/or other factors.
- Time duration of one mobilization/demobilization cycle is 4 days, including mobilization of the dredge, assembling/disassembling pipeline, workboat, anchoring, etc.



## Dredging Alternatives Yearly Production Rate - Time to Complete Maintenance Dredging (est 63,000 CY) Based Upon Type of Equipment

Alternative	Estimated Hours to Complete Maintenance Dredging at all Ports (hrs)	Total Available Hours per Year (hrs)
12-inch 370 HP	433	360
10-inch 360 SL	610	360
12-inch 370 HP & 8-inch Toyo Pump	353	360
10-inch 360 SL & 8-inch Toyo Pump	460	360



# Summary

- In September 2014 CHE submitted the final technical memorandum to the Oregon Infrastructure Finance Authority for their review.
- The Oregon IFA is currently reviewing the financial aspects of funding these operations.
- Operation of State owned dredging equipment is financially and logistically feasible
- The unit cost, on average, for all seven ports was estimated to be in the range of \$4 and \$7 per cubic yard based upon the option selected for State's to own their own portable dredging equipment.





Thank You WEDA!

Questions?

*WEDA Pacific Chapter  
FALL 2014 Conference*

*October 23, 2014*



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