

SUBJECT: APPLICABILITY OF PREVIOUS TESTING DATA WITHIN THE SHOALED AREAS OF THE OLYMPIA HARBOR FEDERAL NAVIGATION CHANNEL AND NEED FOR FURTHER TESTING

1. **Background.** The Federal Navigation Channel in Olympia Harbor has been characterized multiple times since the original characterization in 1988. Results of these characterizations are detailed in the suitability determinations from May 17, 2000 and September 14, 2006.

Briefly, the federal navigation channel was characterized in 1999 at a low rank. The standard list of DMMP COCs was analyzed for, and a tiered testing approach for TBT was used. There were no exceedances of any of the standard COCs, but there were exceedances of the BT for TBT at two locations in the turning basin and berth area. Bioaccumulation testing for TBT was conducted, and the DMMP agencies concluded that both samples passed bioaccumulation testing.

Concerns over possible dioxin contamination in Budd Inlet resulted in additional characterization of the federal navigation channel for dioxins/furans and limited PAH testing in 2006. No PAH exceedances were found, but dioxin concentrations were high throughout the majority of the project. As a result only limited dredging of the northern portion of the main channel was conducted.

2. **Shoaled Areas.** Bathymetric surveys of the federal navigation channels were conducted October 21-23, 2013. Analysis of the bathymetry revealed five distinct areas with sediments shoaled above the authorized depth of the navigation channels, see Figure 1. These areas are shown in detail in Figures 2a-d. Approximate volume of each shoaled area is presented in Table 1 below.

Table 1. Approximate volumes of shoaled areas within Olympia Harbor Federal Navigation Channel

Shoal	Authorized Depth (ft MLLW)	Volume (CY) mudline to authorized depth	Volume (CY) authorized + 2 ft overdepth	Total Volume (CY)
A	-30	80,473	72,992	153,465
B	-30	1,923	6,850	8,773
C	-30	4,407	9,223	13,631
D	-13	15,413	17,992	33,405
E	-12	4,748	5,259	10,007

3. **Sampling Intensity.** This project is ranked high by the DMMP agencies according to the guidelines set out in the User Manual for lower Budd Inlet and the federal navigation channel. In a high-ranked area the number of samples and analyses are calculated using the following guidelines (DMMP, 2013):
 - Maximum volume of sediment represented by each field sample = 4,000 cubic yards
 - Maximum volume of sediment represented by each analysis in the upper 4-feet of the dredging prism (surface sediment) = 4,000 cubic yards
 - Maximum volume of sediment represented by each analysis in the subsurface portion of the dredging prism = 12,000 cubic yards

Therefore, based on the total volume for each shoaled area, the following numbers of DMMUs would be required for a full characterization of the project.

Table 2. Sampling requirements and existing data points.

Shoal	Total Volume (CY)	# of DMMUs	# of existing dioxin data points (cores only)
A	153,465	39	7
B	8,773	3	2
C	13,631	4	1
D	33,405	9	4
E	10,007	3	2

4. **PSDDA disposal guidelines for Dioxin.** DMMUs with dioxin concentrations below 10 pptr TEQ are allowed for open-water disposal as long as the volume-weighted average concentration of dioxins in material from the entire dredging project does not exceed the Disposal Site Management Objective of 4 pptr TEQ.
5. **Review of Existing Dioxin Data.** The DMMP agencies reviewed the existing dioxin data for each of the shoals to determine if there was sufficient information to make a determination on the suitability of the material for open water disposal without additional testing. Included in this review was data from the Corps of Engineers 2006 Supplemental Testing for Dioxin, and data included in and collected for Ecology's 2013 Port of Olympia Budd Inlet (POBI) sediment investigation for the MTCA cleanup process.

Shoal A: Four cores were taken from the currently authorized portion of the turning basin in 2006 (Core ID: 5, 6, 7, 8). Each of these cores was characterized from mudline to -32 ft MLLW, and a z-sample was analyzed from -32 to -33 ft MLLW. In all four locations, the surface material had dioxin concentrations well above the threshold of 10 pptr TEQ, and the z-samples were all below 4 pptr TEQ, see Figure 3 and Table 3. Percent recovery on these cores ranged from 70 – 88% and the reported depths for each core were calculated assuming a linear expansion throughout the core.

Three cores were taken from within Shoal A as part of the 2013 POBI sediment investigation. The surface intervals were not characterized, but each core was characterized in one foot intervals starting at -32 ft MLLW. For each core the top two intervals characterized had elevated dioxin levels, ranging from 15.6 – 68.5 pptr TEQ. Dioxin concentrations decrease with depth in all three cores, but don't drop below the 10 pptr TEQ threshold until -35 ft MLLW. Percent recovery in these cores was high (92-93%) for SC-09 and SC-16, but was quite low (54%) for SC-05.

The DMMP agencies considered the above data and concluded there was no need for additional characterization of the dredge prism - all the data collected to date clearly indicates that the shoaled material has elevated dioxin concentrations well above the DMMP disposal site threshold of 10 pptr TEQ. The dredged material must be disposed at an approved confined location. The DMMP agencies also evaluated the above data with respect to anti-degradation. The results of the 2006 and 2013 sampling with regards to the leave surface are inconsistent. Considering that the more

recent data, and the data from the two cores with the highest core recoveries, indicate that the leave surface (-32 ft MLLW) has elevated dioxin concentrations, the DMMP agencies are not able to make a final determination on the antidegradation status of Shoal A. Additional sampling of the leave surface will be needed in the future, either as pre-dredge z-sampling to facilitate project design, or as post dredge sampling. This will have to be coordinated with Ecology and the Port of Olympia.

Shoal B: Two cores (Core ID: 9 and 10) from this shoal were taken in 2006 and analyzed for dioxin, see Figure 3. The surface sample was characterized from mudline to -32 ft MLLW, and a 1-foot z-sample from -32 to -33 ft MLLW was also characterized. Surface dioxin concentrations were elevated, at 30.74 and 25.63 pptr TEQ. Z-samples were less, both less than 10 pptr TEQ.

Based on these results the proposed dredged material from Shoal B would not pass for open water disposal and the material would have to be disposed at an approved confined site. The z-samples pass the antidegradation standard since both z-samples were less than 10 pptr TEQ.

Shoal C: One core (Core ID: 18) from this shoal was taken in 2006 and analyzed for dioxin, see Figure 3. The surface sample was characterized from mudline to -32 ft MLLW, and a 1 foot z-sample from -32 to -33 ft MLLW was also characterized. The surface dioxin concentration was elevated, at 32.32 pptr TEQ and the z-sample was not, at 0.17 pptr TEQ.

Therefore, based on these results, Shoal C would not pass for open water disposal and the material would have to be disposed at an approved confined site. The z-samples pass the State of Washington's anti-degradation standard so no additional testing of the z-layer would be required by the DMMP agencies.

Shoal D: Three cores (Core ID: OLYC01, OLYC02, and OLYC03) were collected from within Shoal D in 2007 (Figure 4), one of these cores (OLYC03/OLYC08) is located just outside the navigation channel boundaries on the west side, but is likely within the sideslopes of the dredge prism. Dioxin concentrations in all three of these cores were elevated well above the threshold of 10 pptr TEQ. Core recoveries, when recorded, ranged from 53 – 84%.

One core was taken as part of the 2013 POBI sampling. This core was located on the north edge of the shoal, in an area with minimal shoaling above the authorized depth. The surface 0-2 ft interval was not analyzed, but the 2-3, 3-4, and 4-5 ft intervals all had very low dioxin concentrations, ranging from 0.27 – 0.45 pptr TEQ.

Based on these results, Shoal D does not pass for open water disposal and the material would have to be disposed at an approved confined site. The information available on dioxin concentrations of the z-samples are conflicting, with some, but not all, data indicating that the Z-layer for Shoal D may pass antidegradation. Therefore, more data will be needed to make a final determination on the antidegradation status of Shoal D. Additional testing of some portions of the z-layer may be required by the DMMP agencies.

Shoal E: Two cores (Core ID: SC-35 and SC-36) were collected from within this shoal as part of the 2013 POBI sampling event, see Figure 4. Dioxin concentrations in the upper two feet of SC-35 were less than 10 pptr TEQ. The top two feet of SC-36 were not analyzed, but the 3-4 and 4-5 ft intervals were, and dioxin concentrations in these two intervals were also less than 10 pptr TEQ.

One surface grab sample from within Shoal E (SS-31) was also collected within the boat ramp channel. This sample is located on the edge of the shoaled area, so might not be representative of dredged material, but it does indicate that the surface sediments have elevated (19.6 ppt TEQ) dioxin concentrations.

On the basis of these results, the DMMP agencies determined that full characterization of this material would be needed to determine if it was suitable for open water disposal at a DMMP site. Given the dioxin concentrations seen in the 2013 POBI study, it is possible that some of the material could pass. Additional testing of the leave surface would be needed to make a determination on the antidegradation status of Shoal E.

Table 3: Previous testing results

Shoal	Volume (CY) with 2 ft. overdredge	Sampling Event	Core ID	Depth (ft MLLW)	Depth (ft of core)	Dioxin (ppt TEQ)	
A	153,465	2006 Corps Dioxin Evaluation	5	mudline to -32	0 to 4.7	22.16	
				-32 to -33	4.7 to 5.7	0.73	
			6	mudline to -32	0 to 3.6	16.92	
				-32 to -33	3.6 to 4.6	2.07	
			7	mudline to -32	0 to 2.8	15.28	
				-32 to -33	2.8 to 3.8	0.18	
			8	mudline to -32	0 to 3.9	19.19	
				-32 to -33	3.9 to 4.9	0.37	
			13b	mudline to -32	0 to 2.2	31.19	
				-32 to -33		0.14	
			14a	mudline to -20.4	0 to 4	21.22	
				-20.4 to -32	4 to 15.6	0.74	
			2013 POBI Investigation	SC-05	-32.2 to -33.2	2 to 3	21.2
					-32.3 to -34.2	3 to 4	15.7
		-34.2 to -35.2			4 to 5	17.7	
		-35.2 to -36.2			5 to 6	0.26 J	
		SC-09		-32.6 to -33.2	6 to 7	52	
				-33.2 to -34.2	7 to 8	68.5	
				-34.2 to -35.2	8 to 9	13.4	
				-35.2 to -36.2	9 to 10	6.0	
SC-16	-32.7 to -33.7	4 to 5		56.8			
	-33.7 to -34.7	5 to 6		15.6			
	-34.7 to -35.7	6 to 7	1.3				
SS-11	-27.8	0 to 10 cm	20.7				
SS-24	-28.8	0 to 10 cm	19.6				
B	8,773	2006 Corps Dioxin Evaluation	9	mudline to -32	0 to 0.7	30.74	
			10	mudline to -32	0 to 1.3	25.63	
			9*	-32 to -33	0.4 to 1.4	1.5	
			10*	-32 to -33	1.2 to 2.2	9.26	
C	13,631	2006 Corps Dioxin Evaluation	18a	mudline to -32	0 to 2.4	32.32	
			18b	-32 to -33	2 to 3	0.17	

Shoal	Volume (CY) with 2 ft. overdredge	Sampling Event	Core ID	Depth (ft MLLW)	Depth (ft of core)	Dioxin (pptr TEQ)
D	33,405	2007 East Bay Dredging Project	OLYC01	-14.2 to -18.2	0 to 4	53.6
			OLYC02	-7.6 to -12.6/-8.4 to -13.4	0 to 5	44.7
			OLYC03	-5.8 to -9.8	0 to 4	39.9
			OLYC07	-18.2 to -25.2 / -12.6 to -14.6 / -13.4 to -15.4	4 to 11 / 5 to 7	29.9
			OLYC08	-9.8 to -13.8	4 to 8	24.6
			OLYZ01	-25.2 to -26.2	11 to 12	0.33 J
			OLYZ02	-14.6 to -15.6 / -15.4 to -16.4	7 to 8	2.85 J
		OLYZ03	-13.8 to -14.8	8 to 9	78.2	
		2013 POBI Investigation	SC-43	-13 to -14	2 to 3	0.35 J
				-14 to -15	3 to 4	0.45 J
-15 to -16	4 to 5			0.27 J		
SS-49	-11.6	0 to 10 cm	39.5			
E	10,007	2013 POBI Investigation	SS-31	-4.8	0 to 10 cm	19.6
			SC-35	-10.5 to -11.5	0 to 1	5.4 J
				-11.5 to -12.5	1 to 2	2.4 J
			SC-36	-10.5 to -11.5	3 to 4	5.7 J
				-11.5 to -12.5	4 to 5	2.4 J

* triplicate cores taken at these location for sediment volume, z-sample collected from different core than surface sample

	4 - 10 pptr TEQ
	> 10 pptr TEQ

9. References.

DMMP, 2011. *Marine Sediment Quality Screening Levels: Adopting RSET Marine SLs for Use in DMMP*. A Clarification Paper prepared by Laura Inouye (Ecology) and David Fox (USACE) for the Dredged Material Management Program, June 2011.

DMMP, 2010. *Dredged Material Management Program New Interim Guidelines for Dioxins*. December 6, 2010.

DMMP, 2013. *Dredged Material Evaluation and Disposal Procedures (Users Manual)*. Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, July 2008.

DMMP, 2008b. *Quality of Post-Dredge Sediment Surfaces (Updated)*. A Clarification Paper Prepared by David Fox (USACE), Erika Hoffman (EPA) and Tom Gries (Ecology) for the Dredged Material Management Program, June 2008.

Ecology, 1995. *Sediment Management Standards – Chapter 173-204 WAC*. Washington State Department of Ecology, December 1995.

10. Agency Signatures.

Concur:

Date Kelsey van der Elst - Seattle District Corps of Engineers

Date Erika Hoffman - Environmental Protection Agency

Date Laura Inouye, Ph.D. - Washington Department of Ecology

Date Celia Barton - Washington Department of Natural Resources

Copies furnished:

DMMP signatories

Elizabeth Chien, Corps Navigation PM

John Hicks, Chief Corps Navigation

Olympia Harbor Federal Navigation Channel Shoaling

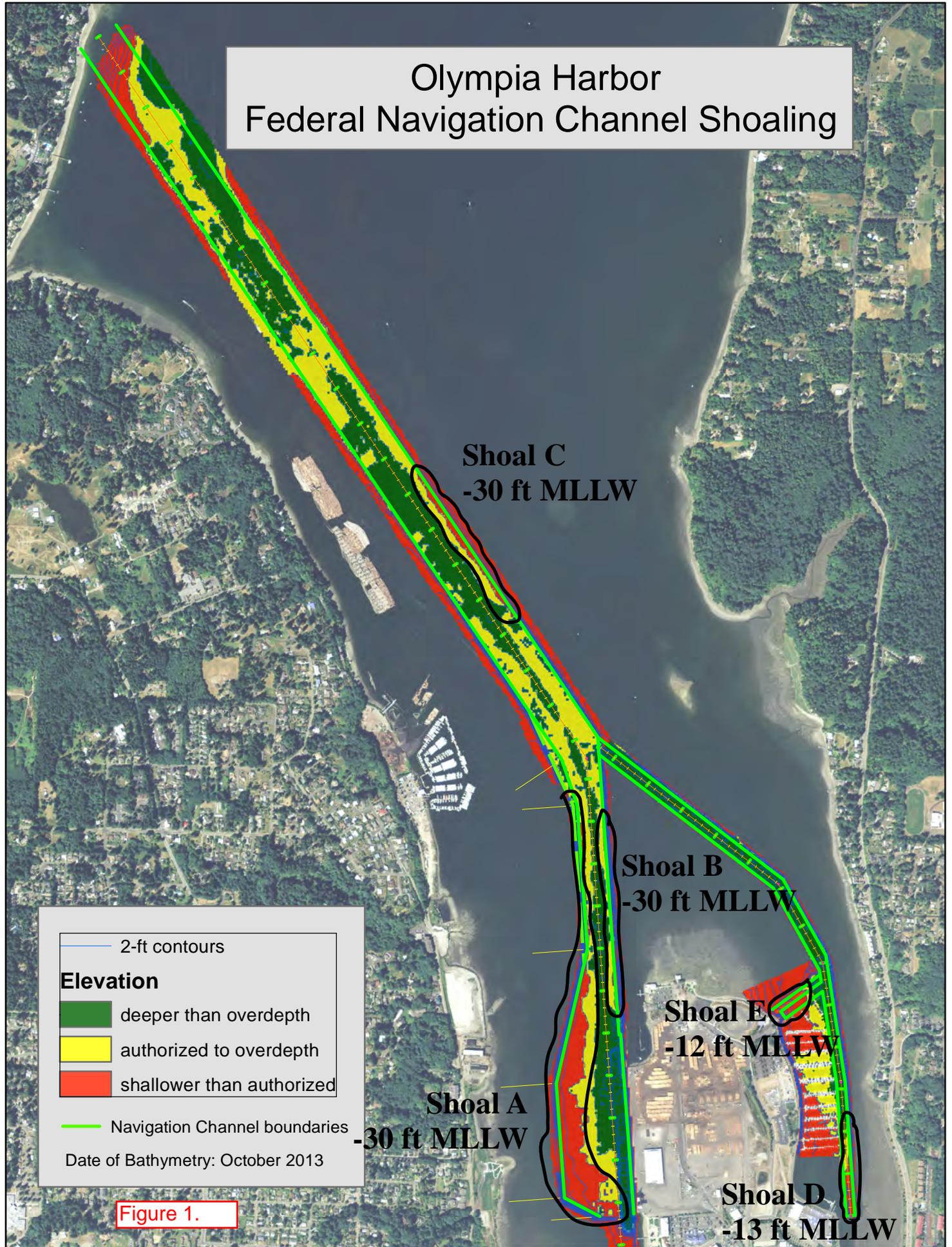


Figure 1.

Olympia Harbor - Turning Basin
Shoal A: 153,465 cy
Shoal B: 8,773 cy
Authorized depth: -30 ft MLLW

Shoal A

Shoal B

— 2-ft contours

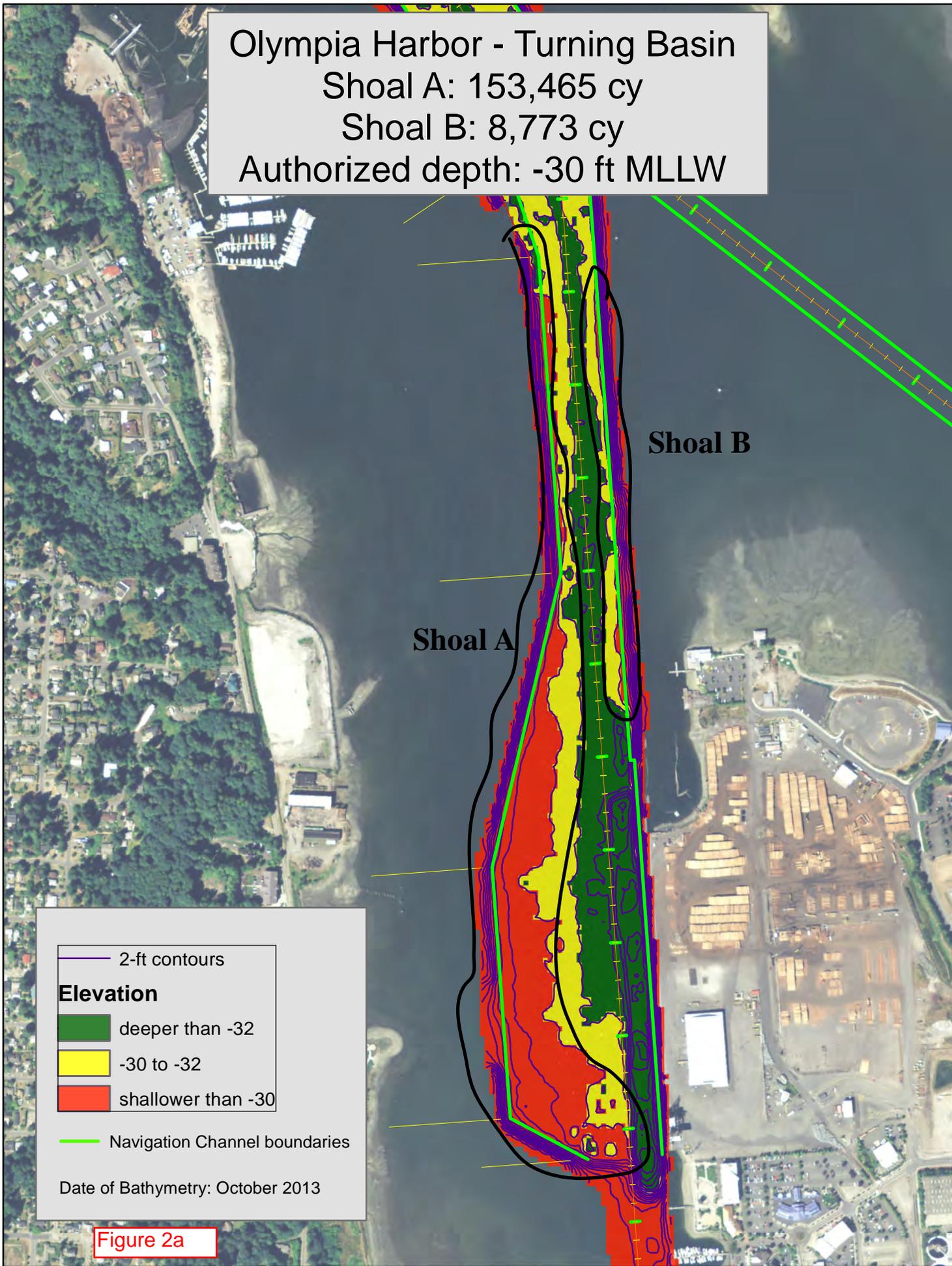
Elevation

- deeper than -32
- 30 to -32
- shallower than -30

— Navigation Channel boundaries

Date of Bathymetry: October 2013

Figure 2a



Olympia Harbor - Main Channel
Shoal C: 13,631 cy
Authorized depth: -30 ft MLLW

Shoal C

— 2-ft contours

Elevation

- deeper than -32
- 30 to -32
- shallower than -30

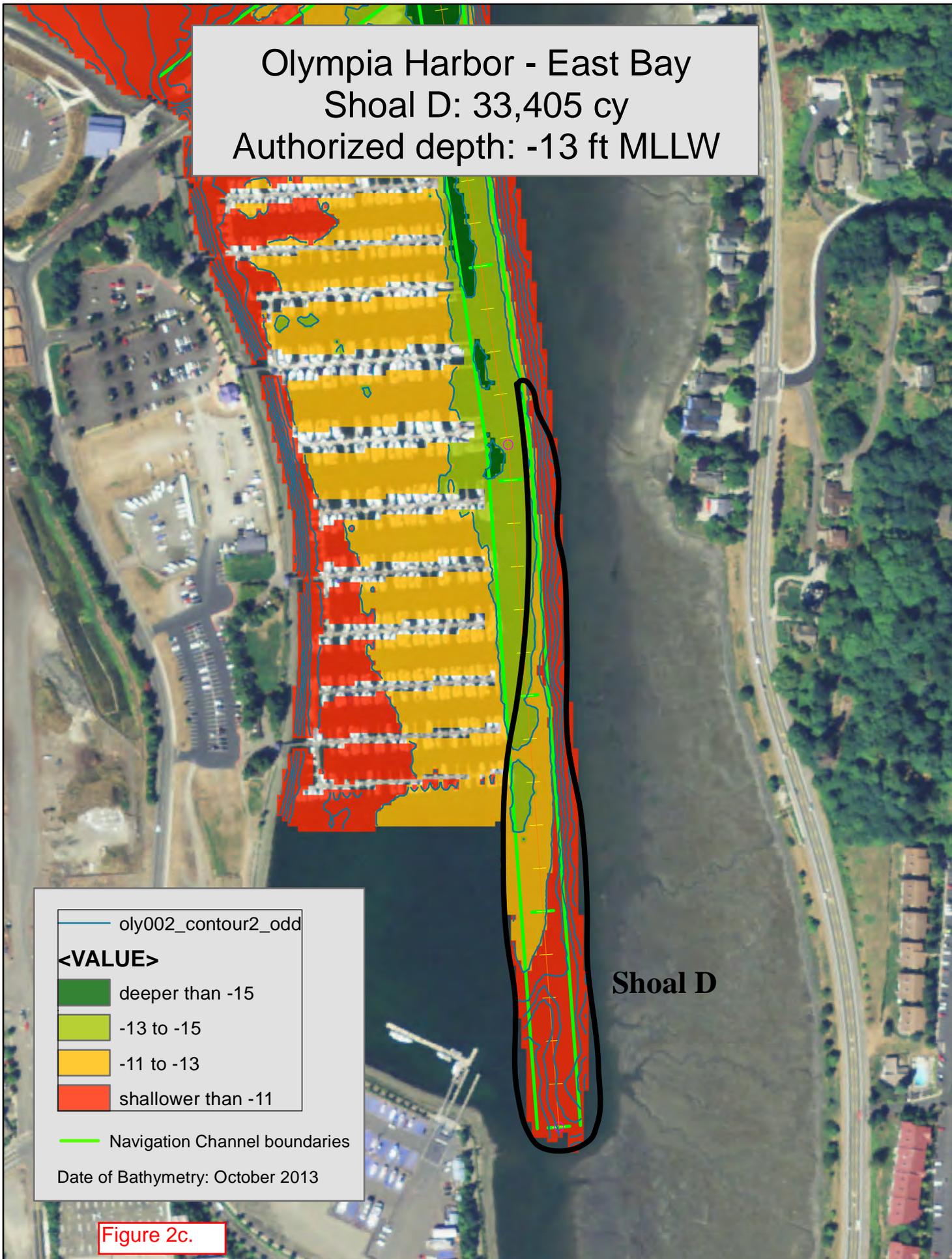
— Navigation Channel boundaries

Date of Bathymetry: October 2013

Figure 2b



Olympia Harbor - East Bay
Shoal D: 33,405 cy
Authorized depth: -13 ft MLLW



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- deeper than -15
- 13 to -15
- 11 to -13
- shallower than -11

Navigation Channel boundaries

Date of Bathymetry: October 2013

Shoal D

Figure 2c.

Olympia Harbor - East Bay
Shoal E: 10,007 cy
Authorized depth: -12 ft MLLW

Shoal E

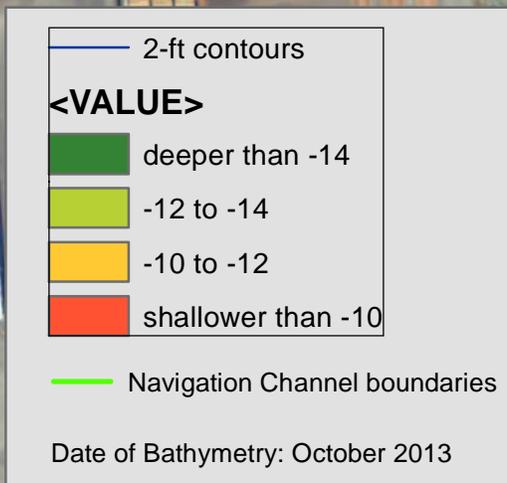


Figure 2d.

Olympia Harbor 2006 dioxin testing results and 2013 MTCA POBI

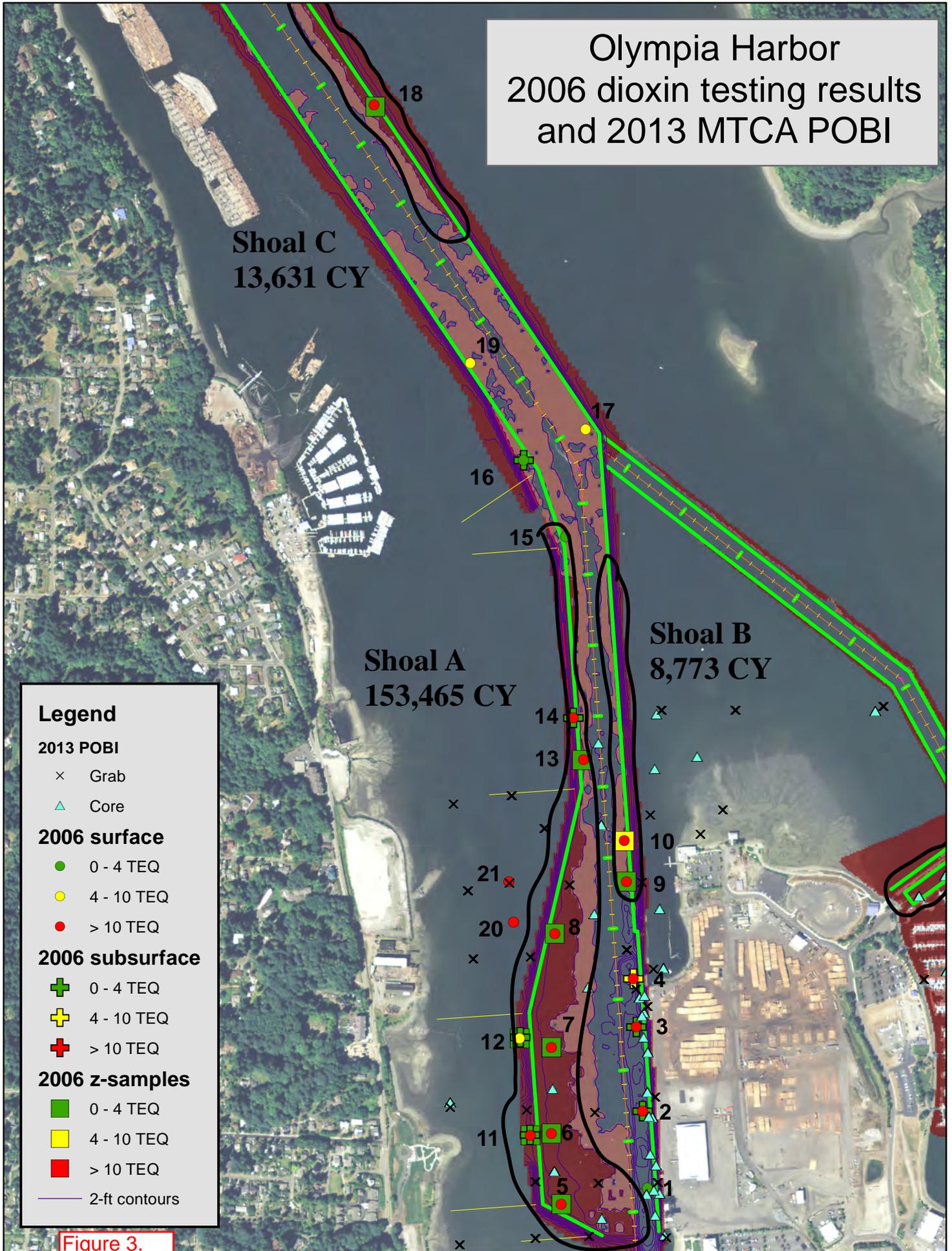


Figure 3.

Olympia Harbor POBI and 2007 dioxin testing results

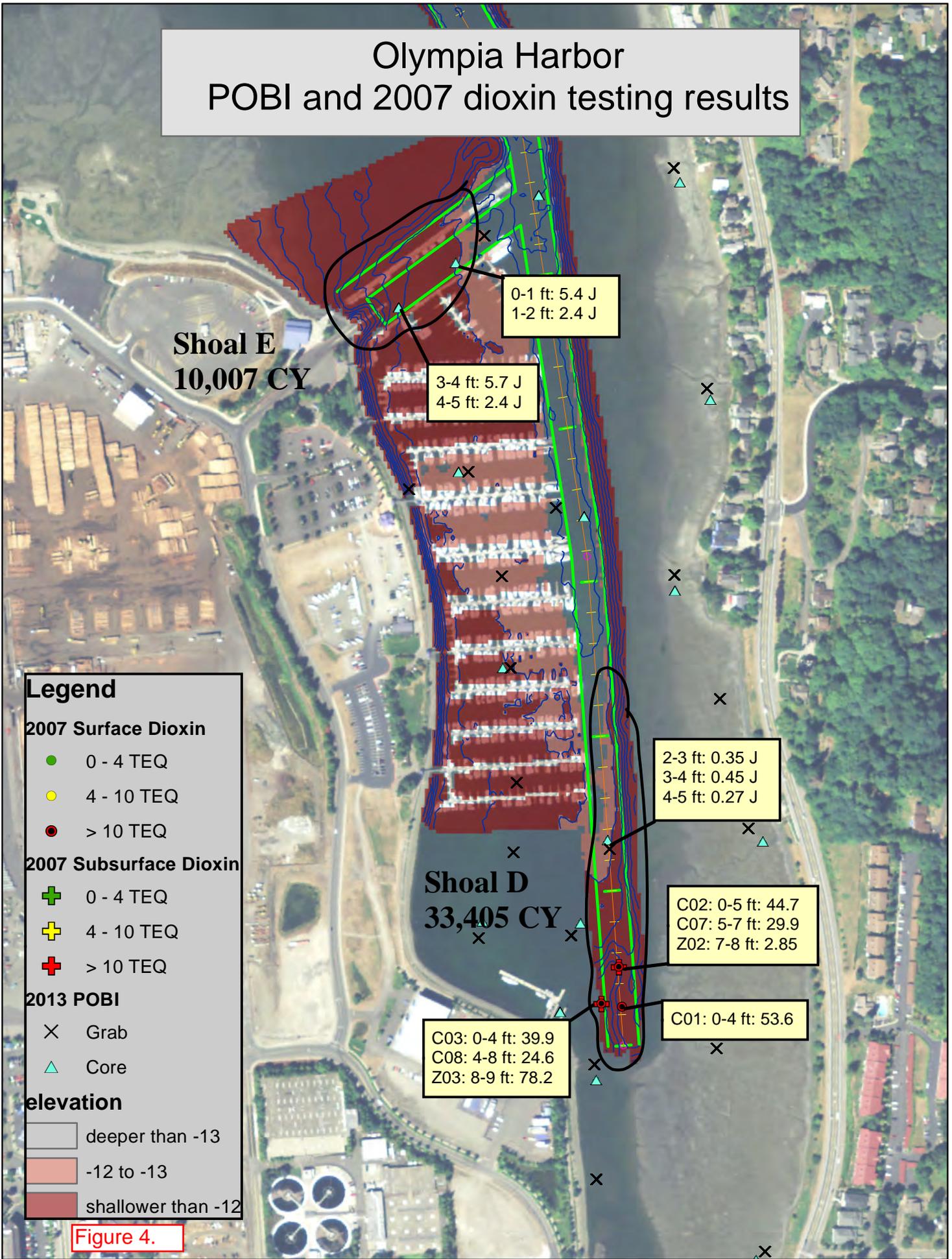


Figure 4.