COOS BAY
[Local Sponsor: International Port of Coos Bay]

Description

The U.S. Environmental Protection Agency (EPA) designated three Ocean Dredged Materials Disposal Sites (ODMDSs) (E, F and H) for disposal of channel maintenance dredged material in **1986** (Figure 1), under Section 102 of the Marine Protection, Research and Sanctuaries (MPRSA). The selection and eventual designation of these ODMDSs, documented in the **1986** ODMDS Designation Environmental Impact Statement (EIS), was based on studies of the physical, chemical, and biological conditions of the Coos Bay offshore area. The area in the vicinity of ODMDS E and F was identified and selected for disposal of coarse-grained material dredged from below River Mile (RM) 12. The area in the vicinity of ODMDS H was identified and selected for disposal of fine-grained material dredged from above RM 12.

The EPA-designated ODMDSs (ODMDSs E, F, and H) have been used for disposal of channel maintenance dredged material since **1977**. The U.S. Army Corps of Engineers, Portland District (Corps) bathymetric monitoring and ODMDS studies indicate that dispersion rates from ODMDSs E and F have been much less than predicted. Except for 79,900 cubic yards (CY) placed in **2006**, no material has been placed at ODMDS E since **1990** due to mounding in the area. The original ODMDS F experienced similar low dispersive rates and mounding conditions at the site.

In **1989**, ODMDS F was doubled in size by expansion to the north under the Corps Section 103 authority. Mounding in the expanded area was significant and further expansion was evaluated as part of the Coos Bay Channel Deepening Feasibility Report EIS. The Corps, using its Section 103 authority in **1995**, selected the expanded area around the EPA designated ODMDS F for dredged material disposal pending final site designation by EPA, Region 10.

Under the Corps Section 103 authority, an area for a one-time rock disposal (Rock Site) from the channel deepening project was selected on the basis of the physical bottom characteristics of substrate and depth. The substrate at this location is principally gravel and cobbles intermixed with coarse sand and rock outcrops. The depth is such that rock material placed at this location would either remain at the site or slowly move further offshore.

The locations of the EPA Section 102-designated sites are shown on Figure 1, with specific-site coordinates as follows:

Site	Depth (m)	Size (m)	Coordinates
H	55	1097 x 442	43° 23' 53”N, 124° 22' 48”W
			43° 23' 42”N, 124° 23' 01”W
			43° 24' 16”N, 124° 23' 26”W
			43° 24' 05”N, 124° 23' 38”W
			(NAD 27, 40 CFR 228.12)

E	17	1097 x 427	43° 21' 59”N, 124° 22' 45”W 43° 21' 48”N, 124° 21' 59”W 43° 21' 35”N, 124° 22' 05”W 43° 21' 46”N, 124° 22' 51”W (NAD 27, 40 CFR 228.12)
F (EPA)*	24	1097 x 427	43° 22' 44”N, 124° 22' 18”W 43° 22' 29”N, 124° 21' 34”W 43° 22' 16”N, 124° 21' 42”W 43° 22' 31”N, 124° 22' 26”W (NAD 27, 40 CFR 228.12)
F (103)*	24	4450 x 2450	43° 22' 58”N, 124° 19' 32”W 43° 21' 50”N, 124° 20' 29”W 43° 22' 52”N, 124° 23' 28”W 43° 23' 59”N, 124° 22' 31”W (NAD 83, Fed. Reg. 3/31/00)
Rock Site*	34	650 x 180	43° 22' 04”N, 124° 23' 11”W 43° 21' 59”N, 124° 23' 14”W 43° 22' 10”N, 124° 23' 37”W 43° 22' 05”N, 124° 23' 39”W (NAD 27, Corps Section 103)

*With EPA’s designation of a new Site F at Coos Bay effective on **<u>June 12, 2006</u>** the original EPA-designated Site F and the USACE alternate Section 103 Site F (not shown on Figure 1) expired. The Rock Site was a one-time use site for rock excavated as part of the 1995 channel improvement project.

The FINAL coordinates and dimensions for the **present** EPA-designated Site F near Coos Bay (NAD 83) are:

43° 22′ 54.8887″ N, 124° 19′ 28.9905″ W
43° 21′ 32.8735″ N, 124° 20′ 37.7373″ W
43° 22′ 51.4004″ N, 124° 23′ 32.4318″ W
43° 23′ 58.4014″ N, 124° 22′ 35.4308″ W

Size: 14,600 feet long and 8,000 feet wide.
Depth: Ranges from 20 to 170 feet deep.

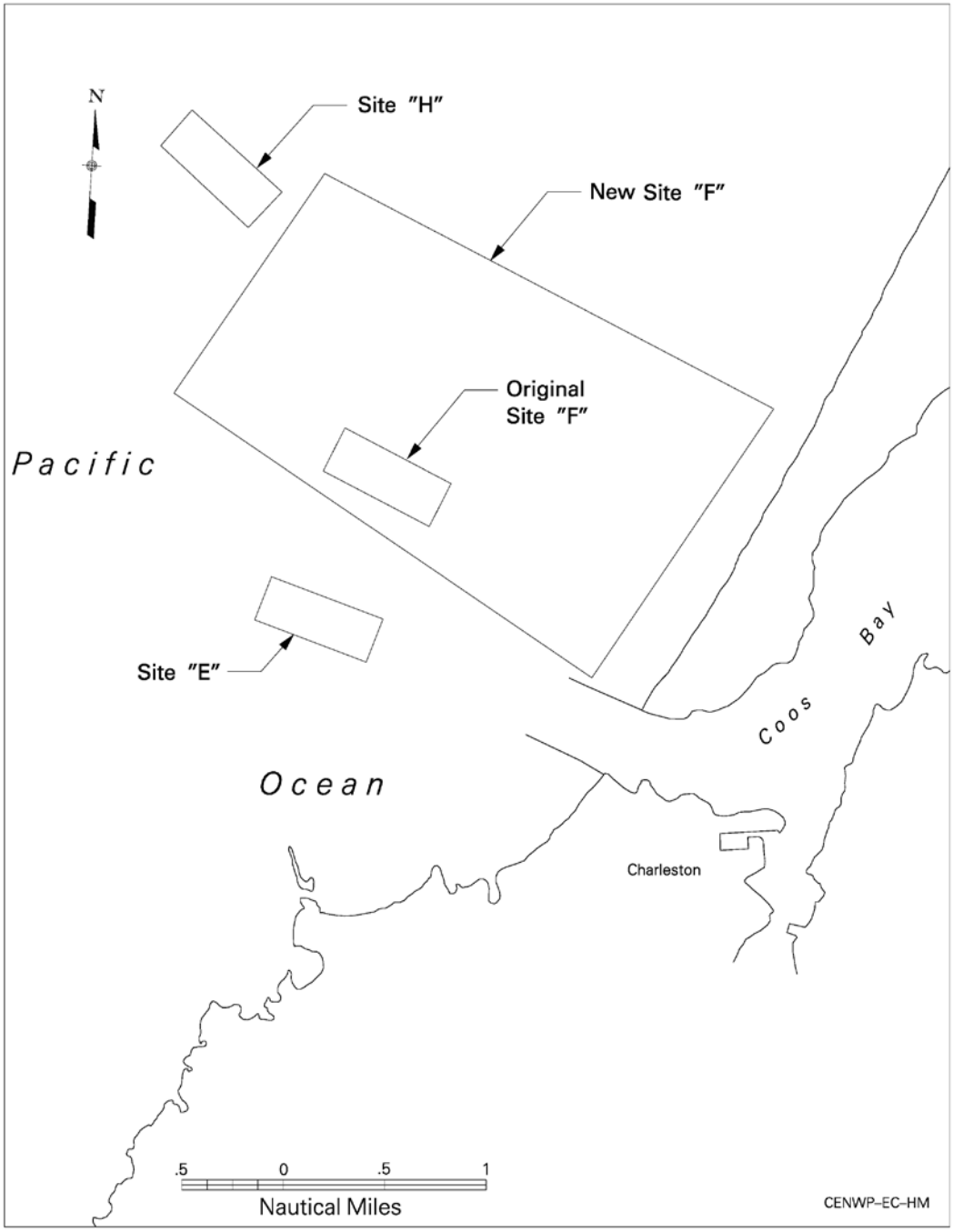


Figure 1: Coos Bay ODMDSs and Vicinity

Dredged Material Description

Sediment from the Coos Bay entrance bar is sand with an average in-place density of 1,980 grams/liter. In the bay itself, sediment tends to be mixed: sand, silty sand, silt, and organic silt. Sandy silt or silty sand is found in the upper reaches of the project, from RM 12 to RM 15. The average density is 1,325 grams/liter in Isthmus Slough above RM 14.0.

Material from the upper channel has finer grained characteristics and is therefore subject to more frequent sampling and testing. Analyses can include physical characteristics, heavy metals, tributyltin (TBT), pesticides/polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs). Limited dioxin testing has also been conducted. The material dredged from the navigation channel has been found suitable for unconfined in-water disposal. Berthing areas have been found to be more contaminated and have required biological testing. All areas in the upper bay that have been evaluated by biological testing have been found to be suitable for ocean disposal.

Analyses of samples from the lower bay found the material to be predominantly coarse-grained and suitable for unconfined in-water disposal without additional testing except for Roseberg Lumber that has elevated concentrations of TBT and PAHs in some areas. A portion of the area adjacent to Roseberg Lumber was found to be unsuitable for open-water disposal based upon biological testing. In following years, subsequent sampling and chemical analysis at the Roseberg Lumber docks have shown the material to be suitable for unconfined in-water disposal.

Sediment Evaluation – Navigation Channel

1980 September. Sediments were subjected to elutriate and bulk chemical, benthic, and physical analyses from the Coos River navigation channel at RM 0.0 of its main stem and RM 7.5 on South Fork Coos River. Water from the same locations was collected for use in performing tests and was chemically analyzed for comparison with the sediment elutriate data.

1986 May. Sediment samples (3) from Isthmus Slough were collected using a vibra-corer and subjected to physical analyses.

1987 September. Sediment samples (3) were collected from Isthmus Slough at the same locations sampled in May 1986 using a gravity corer. Sediment samples were subjected to bulk chemical and physical analyses. The bulk chemistry included total organic carbon (TOC), metal, PAH, and pesticide/PCB analysis. No PAHs or pesticides/PCBs were detected, all metals were below concern levels and the material to be dredged was determined to be suitable for unconfined in-water disposal.

1989 June. Sediment samples were collected from 21 stations from RM 0.0 to RM 15.0 along the main Coos Bay Federal Navigation Channel. These sediment samples were collected as part of the Coos Bay Channel Deepening Reconnaissance Study. All samples were subjected to physical analyses while the finer grained sediments collected above RM 10.5 were also analyzed for bulk chemistry. The bulk chemical analyses included TOC, metals, PAHs, and pesticide/PCBs. All the material to be dredged was determined to be suitable for unconfined in-water disposal.

1993 April. Sediment samples were collected and analyzed from the main federal navigation channel, a proposed expansion of the RM 12 turning basin, and various locations along the sides of the main channel. These samples were collected and analyzed for three purposes; 1. sediment quality evaluation of the Isthmus Slough sediments, 2. sediment quality evaluation of the material to be removed by expanding the RM 12 turning basin as part of the proposed channel deepening, and 3. Project-wide TBT evaluation. All project sediments were found to be suitable for unconfined in-water disposal.

1994 July. Sediment samples (10) were collected along two transects and evaluated for metal and TBT contamination to satisfy questions raised by Oregon's Department of Environmental Quality (DEQ). DEQ had information on TBT and metal contamination at Hilstrom Marine and Mid-coast Marine in the Isthmus Slough area of the bay. They were concerned that deepening the channel would cause slumping of contaminated material into the channel. At Hilstrom the analyses showed that the TBT contamination dropped dramatically towards the channel. At Mid-coast Marine contamination was not as high but mid-channel sediments were found to contain 150 ppb TBT. This is above the screening level of 30 ppb used by EPA, Region 10. Additional evaluation (biological) would be needed prior to dredging material at the upper end of the federal project.

1995 May. Three sediment samples were collected from the Federal Channel above RM 15 for physical, chemical, and biological evaluations. Chemical testing included analyses for TBT and PAHs. Two bioassays, the 10 day amphipod Rhepoxynius abronius and 48 hour oyster larval Crassostrea gigas, were conducted along with a 28 day benthic worm Nepthys caecoides bioaccumulation study. Based upon the chemistry and the bioassay results the material from the Federal Channel was determined to be suitable for unconfined in-water disposal.

1998 August. Sixteen sediment samples were collected in Coos Bay and Isthmus Slough, August 11-12, 1998. All 16 samples were sent to Sound Analytical Services, Inc. laboratory in Tacoma, WA, for physical analyses. Eleven samples were selected for the following chemical analyses: metals, TOC, pesticides/PCBs, phenols, phthalates, chlorinated organic compounds, miscellaneous extractables, and PAHs. Nine stations were sampled for tributyltin (TBT). Only 2 (both at Hilstrom) of the 9 stations indicated the presence of a butyltin compound (monobutyltin). The level of the highest concentration of monobutyltin was 43.3% of the screening level (SL). The SL used are those adopted for use in the draft Dredge Material Evaluation Framework (DMEF) for the Lower Columbia River Management Area (1998). The median grain size for all sediment was 0.18mm, with 29.2% fines. No chemical analyses were detected above the SL. The proposed dredge material from this project is acceptable for both unconfined in-water and upland disposal. No significant, adverse ecological impacts are expected from such disposal in terms of sediment toxicity.

1999 July. Fifteen sediment samples were collected in Coos Bay, from Charleston and the entrance channel, to the confluence of Coos River on July 1, 1999. This round of samples was collected as a follow-up to the 1998 sampling event after the petroleum spill from the ship, New Carrissa, north of the entrance channel. All 15 samples were sent to Sound Analytical Services, Inc. laboratory in Tacoma, WA, for physical analyses and a Total Petroleum Hydrocarbon – Hydrocarbon Identification (TPH-HCID) screen. The TPH-HCID analysis was selected to detect

free petroleum product, in the form of “tar ball” that might have migrated into the bay. If any free petroleum products were detected, a follow-up PAH analysis was to be carried out. No hydrocarbons were detected; indicating no free product was collected. Visual screening of the material collected, also, indicated no free product was present.

This sampling event confirmed that the determination made following the 1998 sampling event was still valid and that the proposed dredge material from this project was acceptable for both unconfined in-water and upland disposal. No significant, adverse ecological impacts were expected from such disposal in terms of sediment toxicity.

2002 December. A Tier I evaluation for access to a Coos Bay Barge Offloading Platform at RM 2.5 was conducted following procedures set forth in the Inland Testing Manual (ITM) and the Ocean Disposal Testing Manual (Green Book). The report presented information used in a Tier I evaluation of 800-1,000 CY of material to be dredged in order to provide access to a barge offloading area at Coos Bay RM 2.5. Access was needed to provide an offloading platform for stone to be used to for emergency repair of a breach in the north jetty at Coos Bay. Dredged material was proposed to be sidecast along the shore next to the off-loading platform.

The Tier I evaluation of the proposed dredge material from this project indicated that the material was acceptable for both unconfined in-water and upland disposal. No significant, adverse ecological impacts were expected from such disposal in terms of sediment toxicity. Further, the proposed project met the “No Test” volume for small projects as provided in DMEF Section 6.6.4 and Table 6-2.

2004 September. Seventeen (17) sediment samples were collected along the length of the federal navigation channel in Coos bay, Isthmus Slough and Charleston Channel, on September 15, 2004. All samples were submitted for physical and chemical analyses, including metals (9 inorganic), TOC, pesticides, PCBs, chlorinated organic compounds, phenols, phthalates, miscellaneous extractables, PAHs and total and pore water organotin (TBT).

The physical analyses resulted in mean values of 1.6% gravel (shell hash) (0%-10.0% range), 69.6% sand (4.0%-98.8% range), and 28.8% silt/clay (1.2%-96.0% range), with 4.5% volatile solids (0.2%-16.7% range).

The chemical analyses indicated only low levels of contamination in any of the samples, with all levels well below their respective DMEF screening levels, with the exception of several semi-volatile compounds, in which the lab was not able to reach sufficiently low detection levels. However, none of the phenols, chlorinated organic compounds or miscellaneous extractables or the pesticide chlordane have ever been detected above DMEF screening levels in previous studies at Coos Bay. Several pore water organotin (TBT) detection levels were also elevated, due to insufficient porewater in high sand (>95%) content samples. TBT levels have been of concern in Coos Bay, primarily in the fine-grained sediment areas of Isthmus Slough; all sample with greater than 10% fines (<230 sieve) had sufficient pore water available and the lab was able to achieve detection levels below the DMEF SL of 0.15 ug/L. In addition, bulk whole sediment TBT was run with results well below levels of concern (non-detect at <1.3 ug/kg) for samples where sufficient pore water was not available.

Using the data collected in this and numerous previous sampling events, the material represented by all samples in this sampling event is determined to be suitable for unconfined, in-water placement, without further characterization.

2009 September. Sixteen box core grab samples and three gravity core samples were collected from the project area on September 16, 2009. All 19 sediment samples were submitted for physical analyses, with 8 samples collected from finer-grained areas further subjected to chemical analyses.

The two samples collected from Charleston Channel (BC-1 and BC-2) had a mean grain-size of 98.75% sand. The samples collected from RM 1-12 (BC-3 to BC12) had a mean grain-size of 86.48% sand. Three samples were collected from station 13 (RM 12). A box core surface sample (BC-13), a gravity core of the dredge prism (GC-13A), and a gravity core of the new surface material (GC-13Z) were collected and analyzed to evaluate the entire area to be dredged and determine if the accumulating sediment are homogenous from top to bottom. The mean grain-size was 35.45% sand and 64.51% fines with very little difference between the samples. A gravity core sample was collected from station 14, near RM 13 (GC-14A) to characterize the dredge prism. An attempt was made to collect a second gravity core sample to characterize the new surface material (NSM) but not enough sediment could be collected for a sample. The grain-size of GC-14A was 76% sand and 23.38% fines. Three box core surface samples (BC 15-17) were collected from Isthmus Slough (RM 14-15) to characterize the NSM in recently dredged areas. The mean grain-size was 9.84% sand and 90.16% fines. Total organic carbon (TOC) was calculated for samples 12-17 and averaged 2.87%, and had a range of 0.597% (BC-12) to 4.33% (BC-17). Levels of metals were consistent with historical values and did not approach the Sediment Evaluation Framework for the Pacific Northwest (SEF) marine SLs. All analyte concentrations were substantially below the SLs. The material within the Federal Navigation Channel (FNC) study area is suitable for dredging and unconfined in-water placement without further characterization.

2014 July. Eleven ponar grab samples from four dredged material management units (DMMUs) were attempted from shoaling areas located between RM 0 and 11+47 of the FNC. No material was collected from the three samples located within DMMU 2 (RMs 2+00 to 5+40) because large shell fragments prevented the ponar sampler from completely closing. The eight successful grabs were composited into three samples and submitted for physical analysis. Grain size of the three composite samples was found to be at least 95% sand. Discrete samples were collected from eight shoaling areas between RM 11+47 to 15+05. Each of these eight samples was submitted for physical and chemical analysis. Grain size ranged from 7.4% to 80% sand and 19 to 92 % fines. Two grabs were also collected and composited into one sample from the Charleston Channel and submitted for physical (95% sand) and chemical analysis. All material was found to be suitable for unconfined, in-water placement.

ODMDS HISTORY

Designation

1977. Coos Bay ODMDS E and F received interim site designation from EPA on **January 11, 1977** (42 FR 2461).

1986. EPA final rule making and site designation of ODMDSs F and H was completed on **August 21, 1986** (51 FR 29929).

In **1989** the Corps, under its MPRSA Section 103 authority, selected an alternative area for dredged material disposal north and adjacent to the EPA-designated ODMDS F. This effectively doubled the size of ODMDS F.

In **1994** the Corps, under its Section 103 authority, selected additional areas adjacent to Site F. A "Rock Site" was also selected under Section 103 in **1994** to receive rock excavated during the Coos Bay Channel Deepening project. EPA, by letter dated December 20, 1999, extended the Section 103 selection of ODMDS F. The letter states that the extension would begin on **March 17, 2000** and extend through **December 21, 2003**. In a **March 11, 2004** letter to EPA, Region 10 the Corps requested concurrence for extension of EPA's concurrence for use of the Section 103 Site F for the remaining time allowed under Water Resources Development Act (WRDA) 92. EPA provided the concurrence in their letter of **March 31, 2004** allowing use of the site in **2004** and if necessary the **2005** dredging season.

The EPA published the Proposed Rule for the designation of the larger ODMDS F in the **March 31, 2000** Federal Register (Vol. 65, No. 63). Few comments were received; however a letter from Oregon DEQ delayed issuance of the Final Rule. EPA has received official clarification from DEQ.

The EPA published the Final Rule for the designation of a new Site F in the **May 11, 2006** Federal Register (Vol. 71, No. 91) and de-designated the previous smaller Site F. The actions became effective on **June 12, 2006**.

Evaluation Studies for Designation

1979 January. Oregon State University (OSU) under contract with Corps conducted site evaluation and monitoring studies. These studies were conducted in five phases and were completed in **1983 September**.

1984 December. The Coos Bay Offshore Disposal Site Investigation, Final Report based upon the OSU study was published by the Corps. The three-volume report plus summary included all five phases of the study.

1986 February. The joint Corps/EPA, Region 10 Coos Bay, Oregon Dredged Material Disposal Site Designation, Final Environmental Impact Statement was made available for review leading to final site designation of ODMDSs E, F, and H.

1994 January. The Corps Coos Bay Feasibility Report on Navigation Improvements with Environmental Impact Statement was completed which recommended expansion of Site F and selection of a onetime use ODMDS for the placement of rock.

MANAGEMENT/MONITORING

Management/Monitoring Plan

A Coos Bay ODMDS E, F, H, and Rock Management/Monitoring Plan was written as part of the requirements of the Coos Bay Feasibility Report On Navigation Improvements published by the Corps in **1994.** The plan called for conducting bathymetric surveys annually as a Tier I activity, as listed in Table 1.

Table 1: Bathymetric Surveys of Coos Bay ODMDSs.

Year	ODMDS E	ODMDS F				ODMDS H	ODMDS "ROCK"
		EPA	OS	OS-99	NS		
1982	July	July					
1983							
1984							
1985							
1986	Sept	Sept				Sept	
1987	May	May					
1988	Aug	Aug				Aug	
1989	Apr / Sept	Apr/Sept				Sept	
1990							
1991	Sept	Sept				Sept	
1992	May	May					
1993	Oct	May/Sept				Oct	
1994	May	Apr			July	May	
1995	Oct	Oct			Oct	Oct	
1996	May	May	May		May	May	July
1997	June/Sept	June/Sept			Sept	June/Sept	Sept
1998	May	May	May		May	May	May
1999	June	June		June/Jul/Sept	June	June	June
2000	Sept	Sept		Sept	Sept	Sept	
2001	June					June	June
2002	June			June	June	June	
2003		May	May	May	May		
2004		July	July	July	July		
2005		Oct	Oct	Oct	Oct	Aug/Oct	
2006	Feb	Feb					
2007	July	July				July	
2008	July	Sept				July	
2009	June	June				May	
2010	May	May/September				May	
2011		May/September					
2012	June	May/August				June	
2013	June	June/November				June	
2014	Sept	April/September				Sept	
2015	May	May				May	

Copies of most-recent bathymetry and bathymetry difference plots as listed in Table 1 for the

Coos Bay ODMDSs are attached to the end of the document.

As required for EPA Section 102 Site F designation in 2006, a Site Management/Monitoring Plan (SMMP) was part of the designation documents. This SMMP superseded all previous management plans for ocean disposal of dredged material. It requires routine annual bathymetric surveys to be conducted as well as periodic reassessment of the use of the site by important biological resources on a 7-9 year basis. Special Studies are non-routine studies of specified duration that are intended to address specific questions or issues that are not covered by routine monitoring events or that arise from routine monitoring. These may be required as needed to cover such occurrences as the grounding of the New Carissa.

Results of Monitoring

Historically mounding has been experienced at both ODMDS E and F. Use of ODMDS E was limited to less than 150,000 cubic yards in **1987** because of its proximity to the entrance channel and shallow depth. Use of ODMDS E was limited to when the approach to ODMDS F was unsafe and when littoral drift conditions assure that material will be carried away from the channel. Except for 79,900 CY placed in **2006** no material has been placed at ODMDS E since **1990**.

Bathymetric monitoring of ODMDS E in **July 1982** indicated mounding of dredged material to a depth less than -48 feet MLLW. By **1986** the minimum depth decreased to -42 feet MLLW. Depths have steadily increased since dredged material quantities have been limited. By **May 1994** depths had increased deeper than those surveyed in **July 1982** by as much as 9 feet, all locations within the site were deeper than -48 feet MLLW. The depth contours between **September 1997** and **May 1998** in the area of the top of the mound decreased 2 feet showing continued erosion from the site. The area bathymetry seems fairly stable between **1998** and **June 2001**. Note that the **September 2000** showing 2 feet lower mound elevations is not consistent with the **June 1999** and subsequent later surveys. The **June 2002** surveys indicate that the material is fairly stable, with slight erosion continuing. By **February 2006** the depth contours at Site E had decreased up to -18 feet relative to the **September 1986** survey. Between **2007-2015** the trend noted in **2006** continues with the area being fairly stable.

Mounding has also been significant at the **1986** EPA-designated ODMDS F. By **July 1982** surveys already showed a seaward migration of bathymetric contour lines indicating the accumulation of dredged material. By **May 1990** a maximum of 15 feet of material had accumulated compared to the **July 1982** survey. The top of the mound exceeded -54 feet MLLW. The EPA designated ODMDS F was expanded to the north in **1989** doubling the size of the site. By **April 1994** a maximum of 21 feet of material had accumulated in the expanded portion of the site when compared to the **July 1982** survey. Except for 106,507 CY in **2006** no material from the federal channel has been placed in the area of the EPA designated ODMDS F or the area of the **1989** expansion since **1994**. The **September 2000** survey shows a 19-foot mound in the NW corner of this area. This feature is contained and centered on one track line and may not actually exist, however it is more than one point on that track so cannot be dismissed without further surveys. Regulatory Branch is not aware and does not believe any permitted material was placed offshore in **2000**. The **June 2002** survey does not confirm the 19-foot mound noted in the **2000**

survey. The **May 2003** survey is consistent with the **June 2002** survey. The mound continues to erode and shift material toward the northeast as seen in the **February 2006** survey where the 60-foot depth contour is restricted to the east third of the original EPA Site F.

The nearshore area of ODMDS F (F (NH95)) has been monitored since **October 1995** with the placement of material in the nearshore area. No material was placed in this area in **2000** or **2001**. The bathymetry in **September 2000** indicates a 1-foot to 5-foot increase in bottom height throughout the nearshore site when compared to the **October 1995** survey. The previous **June 1999** survey showed decrease depths along the shoreward edge of F (NH 95). This general trend of decreasing depth has continued across the area except in the very southeast corner of the site. Dredged material placement in the nearshore area is controlled through use of a grid system to distribute dredged material. The **2013** vs. **1982** difference plot did not indicate any significant mounding in the nearshore portion of Site F, the maximum accretion noted was +4 feet. The majority of the nearshore area has shown a loss of material and had an elevation change of up to -10 feet since **1982**. The **2015** survey shows that the mounding seen along the shoreward edge of the site in **2013** has dissipated, and the overall nearshore portion of the site accreted 2-3 feet since **2013**.

The offshore area (OS 99) was used between **1997-2004** for sandy O&M dredged material. The placement area was moved at two-year intervals (**1997-1998**, **1999-2000**, **2001-2003**) in order to spread the material and avoid excessive mounding. The **June/July 1999** survey difference plot shows a 9-foot accumulation in the area used in the **1997** and **1998** dredging seasons. The **September 1999** and **September 2000** bathymetric difference plot show 15-foot and 19-foot accumulation from dredged material placement during the **1999** and **2000** dredging seasons respectively. The **June 2002** and **May 2003** plots show an accumulation of 15 and 23 feet respectively in the area used for placement in **2001** and **2002**. A decrease from 19 feet to 16 feet of accumulation is seen in the area used in **1999** and has remained fairly stable. Maximum mound height reduced to 13-14 feet by **2013** and down to 10 feet in **2015**.

Material was placed in the Site F nearshore area exclusively in **2004** and **2005**. The preferred management option for sandy material removed from Coos Bay is to first place it in this nearshore area. In **2006** a limited amount of material (106,507 CY) was placed in the original EPA designated Site F pending EPA's designation of a new larger Site F in **2006**. In **2007** the new grid system was used to distribute the material dredged. While the nearshore area of the new Site F was primarily used for dredged material placement in **2007** due to the large volume (1,122,600 CY) dredged some material was distributed offshore. Comparing plots **2008-2011** the offshore area is very similar with little change. The **2011** vs **2013** plots show a maximum of 3 to 4 feet accretion in some portions of the offshore area. Since 2013, the elevation of the offshore portion of the site has changed very little, increasing up to 2 feet in areas by **2015**.

Increased placement of fine-grained material has caused mounding at ODMDS H. A total of 6.98 million CY (MCY) of fine-grained dredged material was placed in the site between **1986** through **2005** (see Table 2). The maximum mound height, 11 feet, as of **June 2001** occurred at a water depth of 180 feet and will have no significant effect on the wave climate in the area. In **October 2005** mound heights were a maximum 10 feet at several locations after placement of 262,788 CY. These heights remained in **2007** but were reduced to 8-9 feet by **2008.** In **2009** a total of

1,081,799 CY of material was placed in Site H between July and October however the **2009** bathymetric survey was conducted in May. Comparing the **2010** survey with the **2009** survey mound height generally increased 4-6 feet throughout Site H with a maximum increase of 8 feet. Comparing the **2010** survey to the baseline **1986** survey overall mound height was around 10 feet higher with a maximum of 15 feet increase in a localized area. The maximum increase from 1986 was 11 feet in **2013** and 13 feet in **2014**. The movement of material is evident outside of the boundaries of the EPA designated site based upon the difference plots. While small changes are indicated comparing the **2012** and **2013** difference survey plots there is not a substantial change evident, the entire site is between -3 and+2 feet. Site H was not used in 2014.

Special Studies

Baseline information at ODMDS H was gathered during the Corps/OSU site evaluation studies between **1979** and **1983**, and during pre-disposal sampling in **1985**. Post-disposal monitoring studies were conducted in **May 1986**, **September 1987**, **September 1988**, and **September 1989**. The monitoring program was designed to determine initially if dredged material was physically altering the sediments within and near ODMDS H. When results showed persistent increases in percent fines and organic content, chemical and biological evaluations were added to the monitoring studies.

It was concluded that disposal activities of the types observed and studied at ODMDS H could be considered one more perturbation although perhaps more direct than most natural perturbations. The nearshore organisms which must deal with constant perturbations of many types have been able to deal with dredged material disposal activities at ODMDS H. The data appears to support the original supposition that ODMDS H is an area of communal transition and thus would be able in the long-term to handle disposal events and recover to near predisposal community levels for most species. The impacts are acceptable and no alternative disposal site for fine-grained material is required. It should be further noted that as a result of these studies the disposal of fine-grained dredged material on dissimilar sandy substrates is more readily accepted for other locations.

Geo Recon International, Ltd. completed sidescan sonar and sub-bottom profiling study of the offshore disposal sites with data collected between **September 11-14, 1989**. An earlier sidescan sonar survey was completed in **October 1981** by Ogden Beeman & Assoc. under contract with the Corps.

Published in **February 1990,** Ogden Beeman & Associates, Inc. completed a Coos Bay Site "F" Mounding Study under contract with Corps as part of the Coos Bay channel deepening reconnaissance study. The Beeman study indicated that an area three times the original size of ODMDS F, with continued use of ODMDS E at “present levels”, would provide sufficient capacity for the estimated quantities dredged for the next 25 years. However, the study did not address the potential navigational hazard caused by disposal within the area and eventual creation of a mound from the bottom elevation of -80 feet up to -50 feet.

In **April and October 1992**, demersal fishes, benthic and epibenthic invertebrates, and sediment characteristics were studied at and adjacent to ODMDS F by the National Marine Fisheries Service (NMFS) under contract to the Corps. This study was for the purpose of gathering information offshore in and around ODMDS F. Data collected in **1992** was compared to data

collected in **1979-1980** to determine if the biological communities had changed. General trends seen in the 1992 data set coincide with those found in **1979-1980**. This information supported expansion of ODMDS F as part of the Coos Bay Channel Deepening Feasibility Report EIS and as a Section 103 action in **1994** and EPA Section 102 in **2006**. Two reports were produced by the NMFS dated **1992** and **1994**.

Computer modeling of disposal operations to determine short-term and long-term sediment fate was conducted prior to disposal. A **June 1995** report presented the results of a computer simulated model of the placement of 400,000 CY in the shallow water (<60 feet) portion of the expanded ODMDS F. As a direct result of the modeling, the proposed shallow water disposal area was moved 500 feet further offshore than originally planned. This move was necessary to avoid placement of material outside of the boundaries of ODMDS F during disposal. The actual amount placed in **1995** was 295,000 CY. A follow-on report was prepared assessing the actual post-disposal conditions to those predicted by the model. Actual bathymetric changes compared well with those predicted by the model. The predicted change was 2.9 feet or less; the actual was 3.0 feet or less. The material was contained within the boundaries of ODMDS F. In **1998** 237,421 CY was placed in this nearshore area [ODMDS F (NS)].

The follow-on assessment report also presented the results of modeling the proposed placement of 1.3 MCY in an area of ODMDS F seaward of the original ODMDS F in **1996**. The offshore disposal area, labeled "ODMDS F(OS96)", is situated along the western boundary of ODMDS F. This is seaward of the existing mound created at the original designated ODMDS F in water depths varying between 90 feet to 145 feet. As a result of the modeling it was recommended that a slight shifting of the proposed target area be made. This shift minimized the potential of placement of material on the existing mound.

In **August and September 1999** sediment profiling imagery (SPI) was conducted at the Coos Bay ODMDSs to identify the depositional "foot-print" arising from a single load of dredged material placed offshore. Three disposal events were studied with-in the Section 103 ODMDS F at water depths from 60 to 200 feet. The prototype data was collected in order to verify the accuracy of simulated disposal events obtained by mathematical models. A follow-on comparison of SPI data and STFATE simulation results evaluation report was completed in **December 2004**. Results of the simulation indicate STFATE provides a conservative estimation of actual disposal mound thickness.

In **June and August 2008**, the EPA collected information about the marine environment from 23 stations and 3 duplicate stations in and near Coos Bay Sites F and H (Figure 2). In June, the EPA conducted a side-scan sonar survey of Sites F and H, collected sediment samples for physical, chemical, and benthic infaunal analyses. In August, EPA only collected sediment grabs for benthic infaunal analysis. All samples were collected using a Young-modified (0.1 m^2) Van Veen grab sampler.

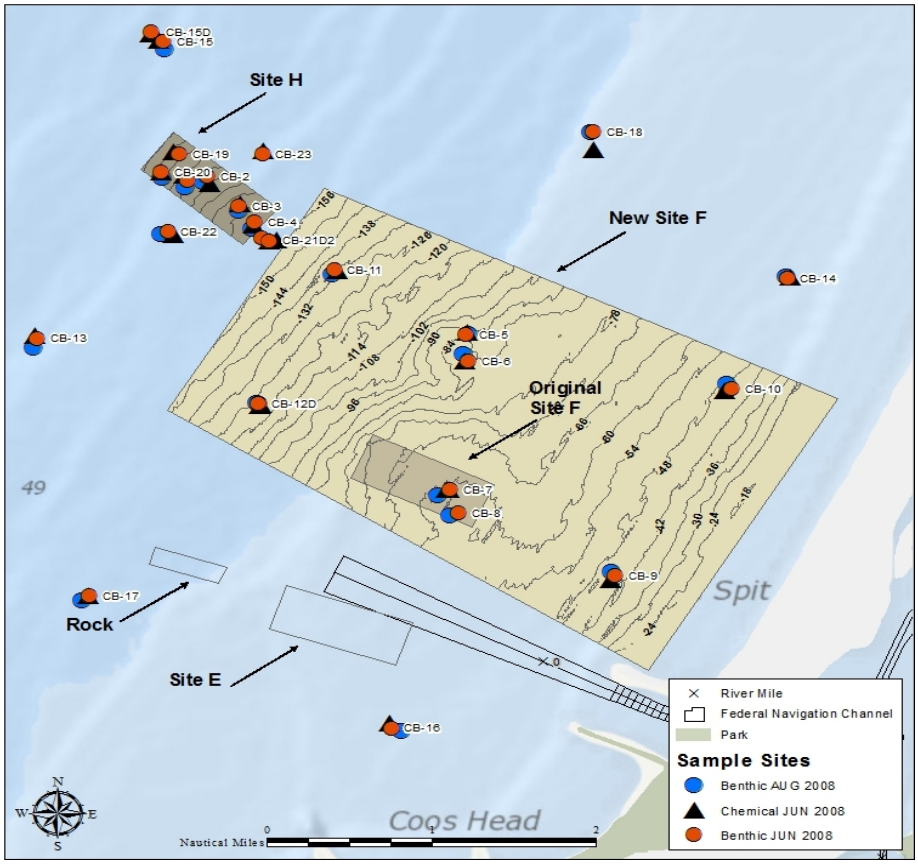


Figure 2. 2008 Sampling Locations for ODMDS F and H.

Grain size within Site F and H was primarily sand, with totals ranging from 98% to 100% sand-sized grains (% sand) at Site F, 69 to 99% sand within Site H, and 89% to 99% sand at the reference stations. Because of the low surface area, a sand matrix is considered low risk for contamination.

Twenty-six samples were analyzed per the SEF (2009) sampling guidelines for metals, semi-volatile organic compounds (SVOCs), PCBs, and pesticides. Overall, metal concentrations were well below the SEF marine SLs. Organotin compounds, which were analyzed for bulk sediment values, were either undetected or estimated at most stations. Monobutyltin was detected at station CB-15, and tributyltin was detected at stations CB-15 and CB-22; however, there are no SEF SLs for organotins in bulk sediment.

None of the SVOCs analyzed at Sites F, H, and the reference stations exceeded their respective SEF screening levels. All SVOCs were either not detected, detected but below the SEF SL, or the reporting limit was slightly higher than the screening level. In these cases, EPA believes that these contaminants are not present at the site because sampling of the dredged material by the Corps prior to disposal did not detect these compounds. No PCBs or pesticides were detected at any of the sampling stations, although the reporting level at several stations was again slightly above the SEF SL for several compounds. These contaminants are not believed to be present above their SLs for the reason mentioned above.

The **2008** data indicate a difference between the benthic infaunal community within the disposal

sites and in areas outside the disposal sites. Overall, there is a clear tendency for lower benthic community metrics and indices within the disposal sites as compared to outside the disposal sites. For a few metrics and seasons, there were exceptions to this tendency. However, the sampling effort at both sites, particularly for the reference stations, suffered from a low number of sampling stations. Thus, it is difficult to determine for some of the metrics if these differences are meaningful. These disposal sites are located in areas of relatively high spatial heterogenity of benthic infauna, so increasing the number of samples may provide greater certainty about the potential trends observed. If the differences observed were substantiated by a stronger data set, it would need to be determined whether these potential differences are meaningful to higher trophic levels. It is unknown if the composition of the organisms would alter any feeding habitats of epibenthic vertebrates or invertebrates.

The impact of disposal on infaunal invertebrates at these sites and their likely recovery period is unknown. At Site F, disposal of dredged materials occurred 9 to 12 months prior to the June sampling and a few days prior to the August sampling. Given that similar trends in the benthic infauna were seen in June and August, it is unclear how fast organisms recolonize post-disposal. Furthermore, it may be of interest to see how cumulative disposals over many years affect the infauna. For Site H, disposal had not occurred at the site for 3 years, thus, the assumption is that the infaunal community would be the same as the community outside the disposal site. This does not appear to be situation, thus, further information would need to be gathered to determine the length of the recovery period for infaunal communities at disposal sites.

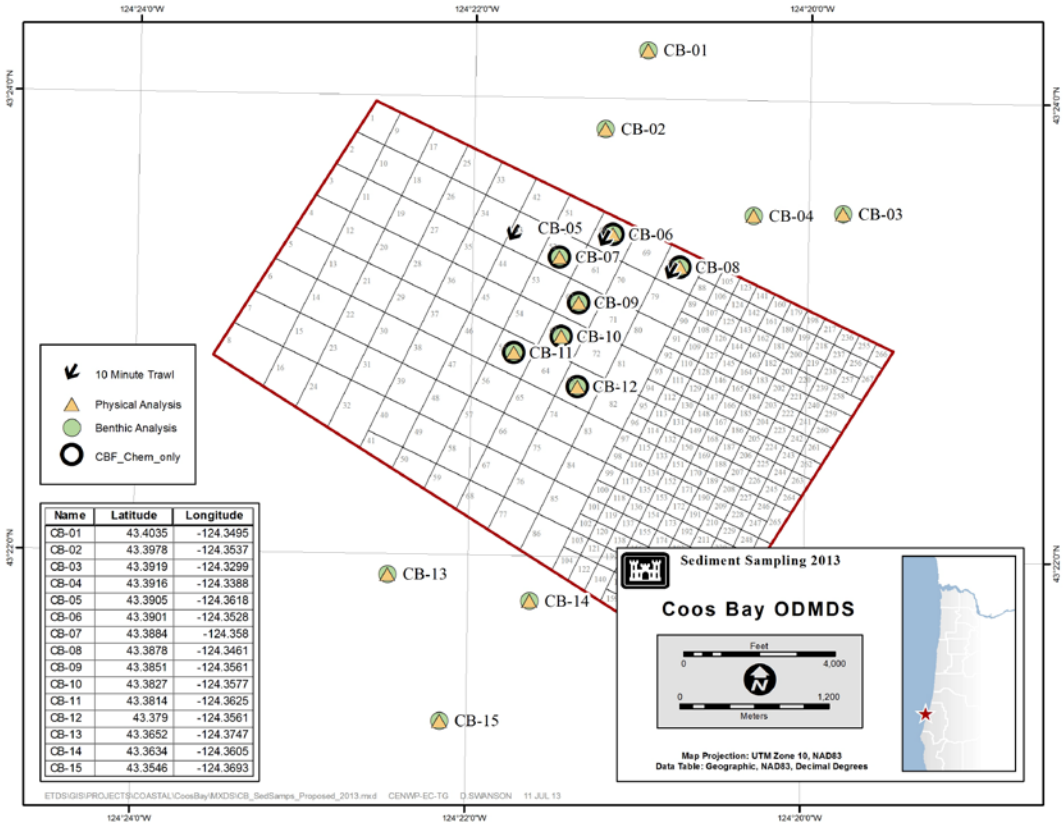
In **August 2013**, AECOM and Marine Taxonomic Services (MTS) conducted physical, chemical, and biological monitoring in and near Coos Bay Site F (Figure 3) and H (Figure 4). All samples were submitted for physical (ARI) and benthic analyses (MTS). The samples located within the ODMDSs were also submitted for chemical analysis for pesticides, TBTs (ALS), metals, TOC, total solids, SVOCs, TPH, and PCBs (EPA-Manchester). Samples within the site were over 90% sand. No chemicals of concern were detected of the SEF marine SLs.

A total of 94 benthic invertebrate taxonomic identifications and 3,285 individuals were captured from 14 stations at Site F. The highest species abundance and density per meter was found at CBF-15. A total of 148 benthic invertebrate taxonomic identifications and 4,658 individuals were captured from 14 stations at Site H. The highest species abundance and density per meter was found at CBH-09.

Additionally, three otter trawls were completed at Site F and four were completed at Site H. A total of 430 fish were captured within the three trawls towed at Site F. Of those captured, 18 were smelt (Osmeridae), a pelagic species. The captured fish were represented by 15 species (including smelt). Of those, sanddabs and juvenile rockfish were not identified to species so there may have been slightly more than 14 demersal species captured. The demersal species were dominated by saddab, pacific cod, and English sole. There were 264 motile epibenthic invertebrates (of 6 species) and 212 Dungeness crab captured in the trawls.

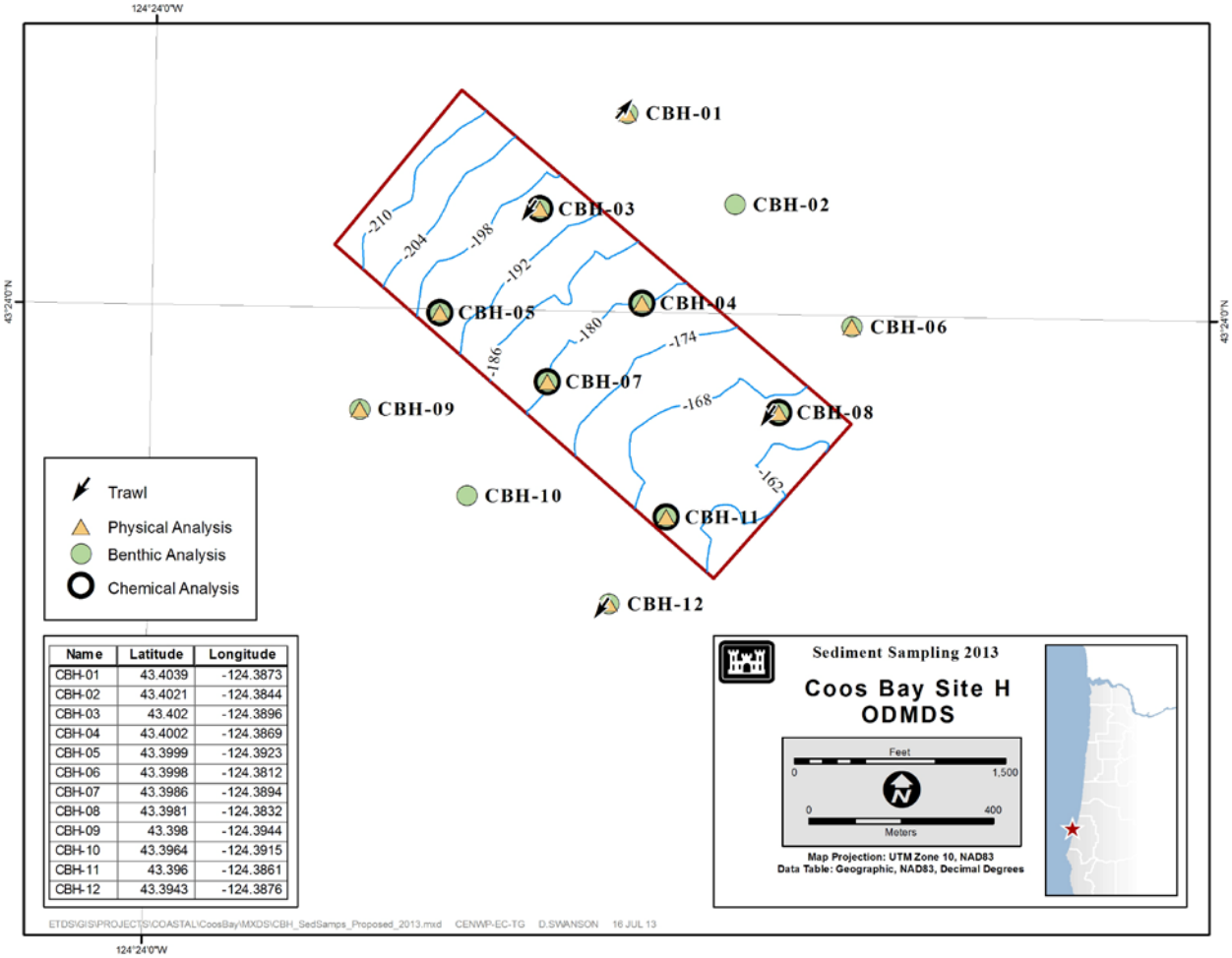
A total of 381 fish were captured within the four trawls towed at Site H. Two pelagic species (smelt and shiner surfperch) and 15 demersal taxa were identified. Of those, sanddabs and juvenile rockfish were not identified to species so there may have been slightly more than 15 demersal species captured. Juvenile plueronectids were also not identified to species; however,

only one was captured. The demersal species were dominated by sanddab, English sole, and lingcod.



Name	Latitude	Longitude
CB-01	43.4035	-124.3495
CB-02	43.3978	-124.3537
CB-03	43.3919	-124.3299
CB-04	43.3916	-124.3388
CB-05	43.3905	-124.3618
CB-06	43.3901	-124.3528
CB-07	43.3884	-124.358
CB-08	43.3878	-124.3461
CB-09	43.3851	-124.3561
CB-10	43.3827	-124.3577
CB-11	43.3814	-124.3625
CB-12	43.379	-124.3561
CB-13	43.3652	-124.3747
CB-14	43.3634	-124.3605
CB-15	43.3546	-124.3693

Figure 3. 2013 Sampling Locations for ODMDS Site F.



Name	Latitude	Longitude
CBH-01	43.4039	-124.3873
CBH-02	43.4021	-124.3844
CBH-03	43.402	-124.3896
CBH-04	43.4002	-124.3869
CBH-05	43.3999	-124.3923
CBH-06	43.3998	-124.3812
CBH-07	43.3986	-124.3894
CBH-08	43.3981	-124.3832
CBH-09	43.398	-124.3944
CBH-10	43.3964	-124.3915
CBH-11	43.396	-124.3861
CBH-12	43.3943	-124.3876

Figure 4. 2013 Sampling Locations for ODMDS Site H.

Newfields completed SPI at Site H in the summer of **2014.** The purpose of the study was to map the extent (presence and thickness) of the existing dredged material disposal mound at the site. The overall condition of the benthic habitat at Site H was evaluated through the analysis of SPI images at 13 onsite locations and 4 offsite locations. A minimum of three replicates were taken at each station within 50 meters of each other.

Dredged material was observed within Site H as well as at two stations (CB-11 and CB-15) outside the ODMDS boundaries. Dredged material measured both within and outside the ODMDS consisted of light and dark gray reduced very fine sands and sandy silts with some clays. Dredged material was thickest at station CB-08 in the southeast corner of the disposal site and at station CB-11 outside of the southwest disposal site boundary. Dredged material was also detected in the northwest region of the ODMDS (CB-02, CB-13, and CB-14) and at station CB-15 outside of the northeast disposal site boundary. Rocks and cobbles were present on the seafloor in the southeast corner of the ODMDS (at stations: CB-01, 03, 04, and 10). The surfaces of the rock were colonized by epifauna suggesting the rocks had been on location for some time.

The benthic habitat both within the ODMDS as well as offsite was predominantly hard sands. Very little fines or organic material were observed. Benthic organisms observed were predominantly Stage I taxa (polychaetes). Higher order Stage II and III organisms were generally observed in the presence of dredged material. Offsite locations had a relatively unimpacted benthic habitat (see Figure 5 below).

Multibeam hydrographic surveys were conducted by David Evans and Associates of Site H and the nearshore portion of Site F in **2014** (see Figure 6 (Site F) and 7 (Site H) below). The results are described in the August 2014 report entitled *Ocean Dredged Material Disposal Site, Coos Bay, Oregon, Sites F & H, Hydrographic Site Survey Site Characterization*.

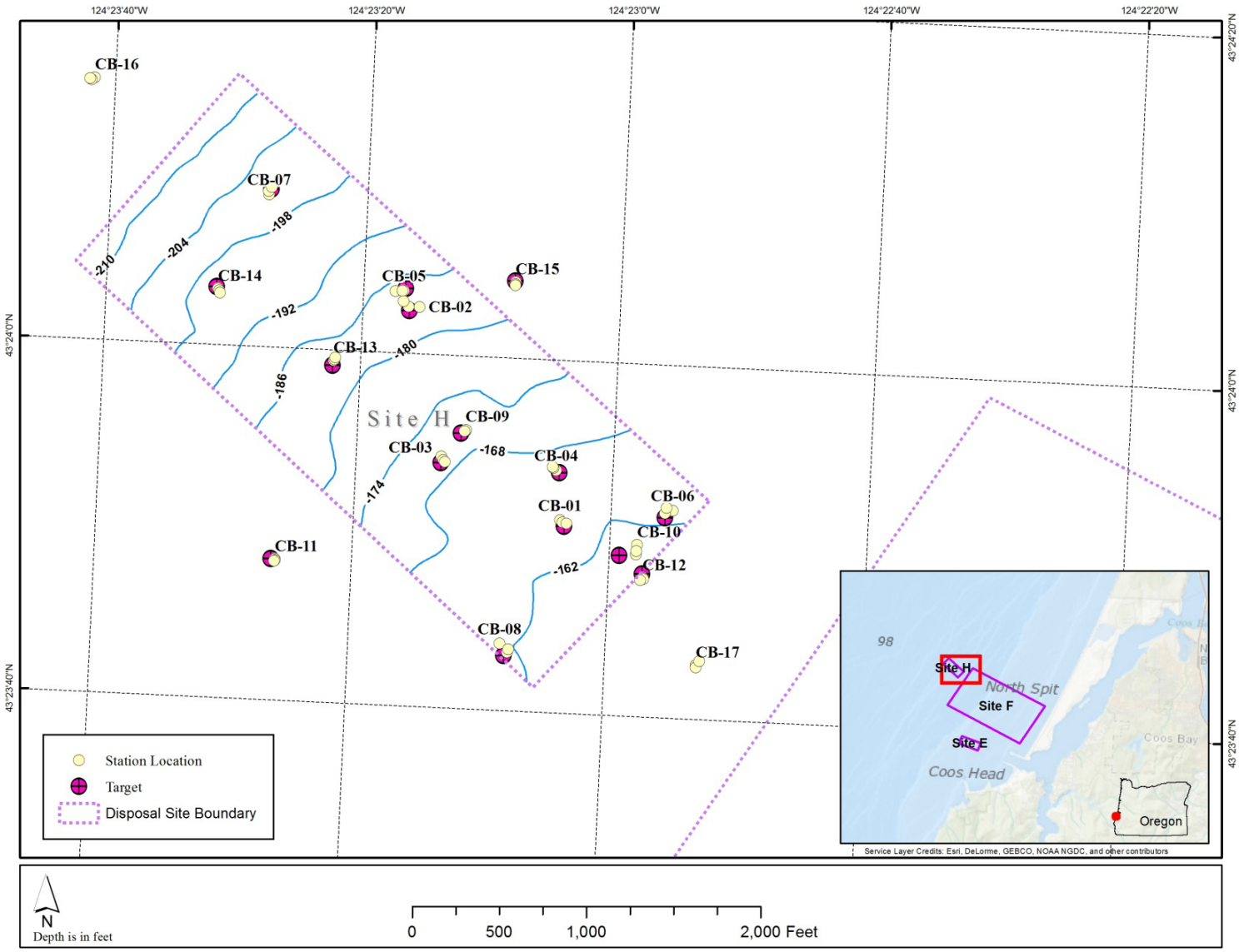


Figure 5. July 22, 2014 Coos Bay Site H SPI Locations.

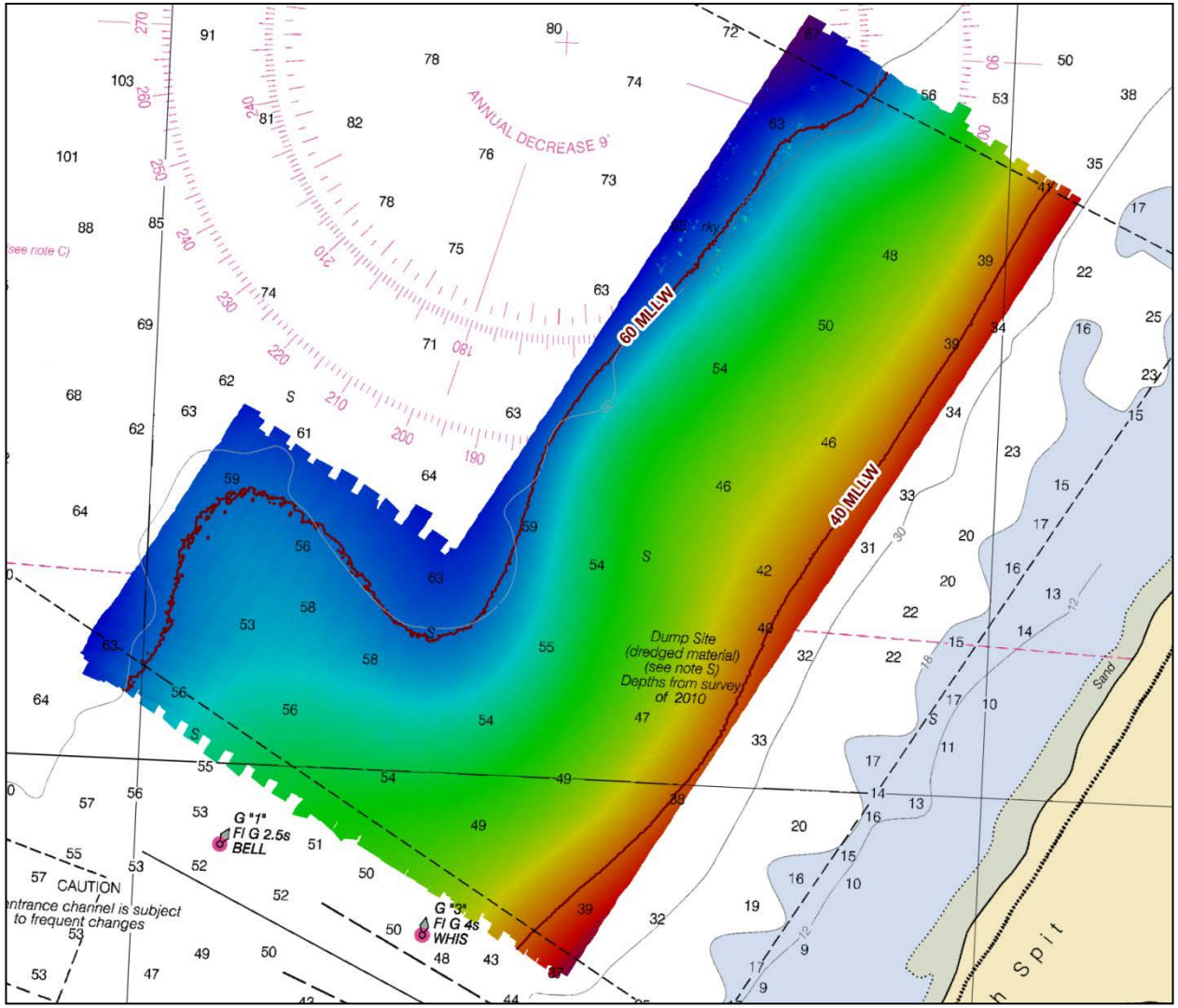


Figure 6. Site F, Hill Shade Image Depicting Multibeam Bathymetric Sonar Coverage, 2014.

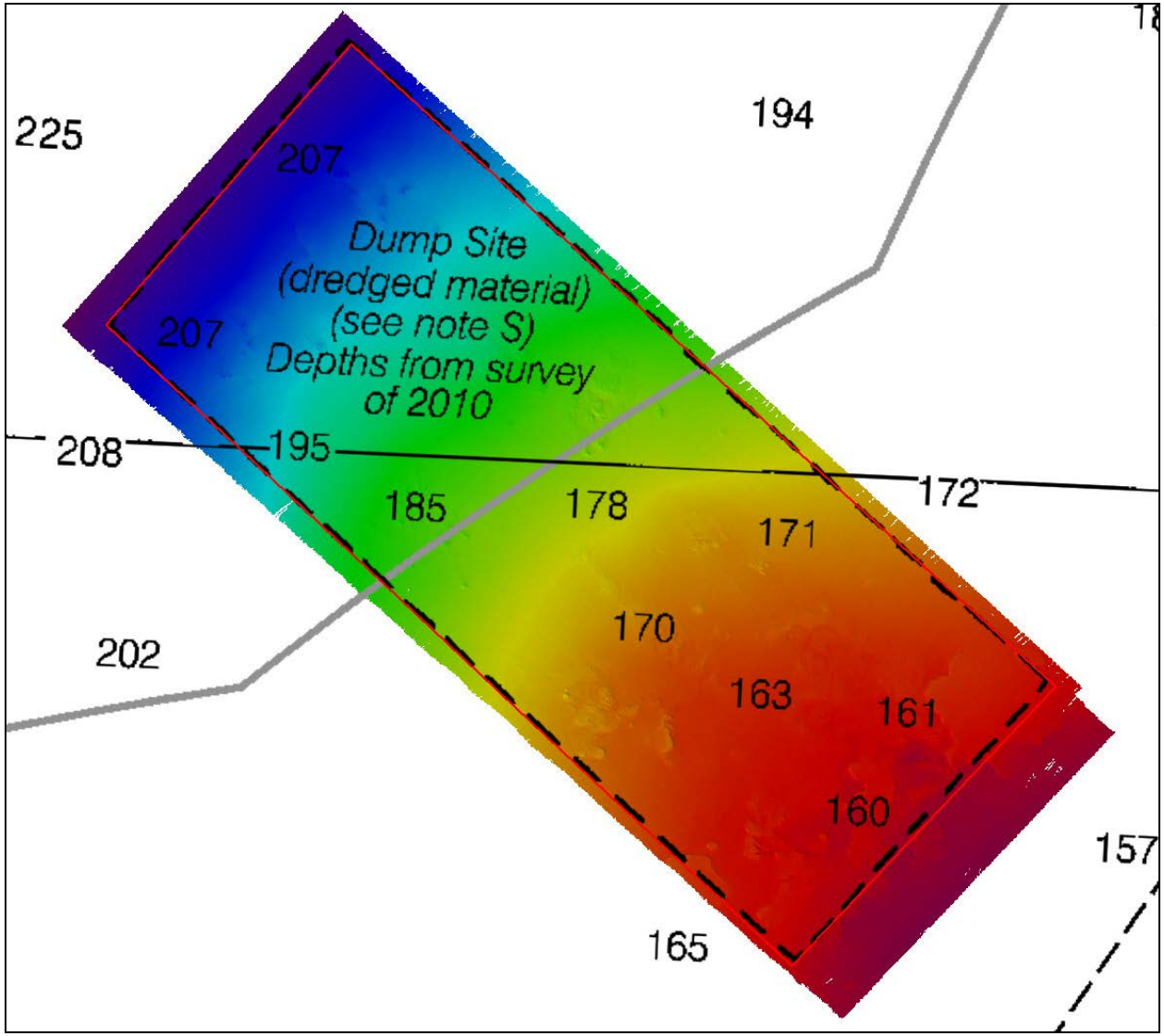


Figure 7. Site H, Hill Shade Image Depicting Multibeam Bathymetric Sonar Coverage, 2014.

Management/Monitoring Actions and Recommendations
Beginning in **1992**, the Corps was notified of requirements for annual bathymetric surveys of all ODMDSs as a Tier I monitoring requirement. Table 2 lists the volumes, in 1,000s of CY, placed at the Coos Bay ODMDSs from the 1976 fiscal year to present.

ODMDS E: In **1987** disposal of dredged material at ODMDS E was limited to no more than 150,000 CY annually. Except for 79,900 CY placed in **2006** no material has been placed at ODMDS E since **1990**. It was recommended that the disposal site not be used for disposal and the annual bathymetric surveys be conducted.

ODMDS F: In **1988** disposal at ODMDS F was restricted to the outer (deeper) one-half of the site. In **1989** ODMDS F was doubled in size by expansion to the north under the Corps Section 103 authority. All dredged material placed at ODMDS F was restricted to the expanded area. Mounding in the expanded area has been significant and further expansion was evaluated as part of the Coos Bay Feasibility Report On Navigation Improvements With Environmental Impact Statement, **January 1994**. The Corps, using its Section 103 authority, in **1994** selected the expanded portion of ODMDS F for dredged material disposal pending final site designation by EPA, Region 10. Only limited material from permit dredging had been placed in the original EPA Site F since **1994**. No Corps dredged material should be placed in this area or the **1989** Site F Section 103 expansion area. This area should continue to be surveyed annually to monitor changes in bathymetry.

In **1996** and **1997** sandy material dredged as part of the Coos Bay Channel Deepening Project construction was placed in a 3,000 ft by 6,000 ft area along the seaward boundary of the expanded ODMDS F [ODMDS F(OS95)]. No further disposal has taken place in this area and none is planned at that time.

Sandy dredged material was placed in an offshore area [F (NH95)] north of the originally designated ODMDS F in **1995**. [Note: This area is denoted in the bathymetric plots as Disposal Site “OS” or “OSyy”.] In **1997** and **1998** again O&M material was placed in an area north of the original EPA designated ODMDS F. The area is roughly the size of the original expanded ODMDS F. The **June/July 1999-May 1996** difference plot shows an accumulation of a maximum of 9 feet of material. The placement area was moved to the north in **1999** to avoid additional mounding. In **2001** the placement area was moved offshore (see 2000 bathymetric plots) as the area used in **1999** and **2000** had mounded to 19 feet. The **September 2000-July 1982** difference plot indicates a total accumulation of 20 feet of material at the highest points in the disposal area. However, the **June 2002-July 1982** difference plot indicates 19 feet of accumulation thereby suggesting that the deposited material is beginning to disperse at the site. Based the **June 2002** bathymetric survey, the deposited material is dispersing in a northeasterly direction. The **May 2003** survey of the area being used had mounded to 24 feet and again the placement area was moved north. By **2008** maximum mound height has been reduced to 14 feet in a very limited area and 84 feet of water. The areas that have received dredged material should continue to be surveyed annually to monitor changes in bathymetry. The overall goal is to create smooth bathymetric changes and avoid individual mounds.

In **1995** 295,000 CY and in **1998** 237,421 CY of material was placed in the shallow water portion of ODMDS F [ODMDS F(NS95)]. Placement height was managed to a maximum placement of 3 feet by dividing the area into 180 (200 x 500-foot) cells. Based upon the **June 1999** bathymetric plots which indicate little movement of material from the site (3-foot accumulation with-in the site), placement in **1999** was restricted to 100,000 CY in the southern portion of ODMDS F(NS95). An apparent buildup of material along the shoreward portion of the site, up to 8 feet, was also noted in the **June 1999** survey. This build-up appears to have continued as seen in the **September 2000** bathymetric survey. Material had accumulated by 1 to 5 feet over almost the entire area compared to the **October 1995** baseline survey. The nearshore area should continue to be the primary area for dredged material placement. Close coordination with the local fishing industry, U.S. Coast Guard, and local interests is needed to continue use of this nearshore area in the future. This area should continue to be surveyed annually to monitor changes in bathymetry. Placement control measures will be necessary.

In **2006**,upon EPA's final site designation of the new Site F, the site was partitioned into 268 cells (see Figure 8). The **nearshore** cells are 500 by 500 feet while the **offshore** (greater than 60 feet water depth) are 1,000 by 1,000 feet. It is the management intent to place material in the nearshore area to the maximum extent possible and to avoid areas which have experienced mounding in the past. Prior to EPA site designation of the "new" Site F a total of 79,927 CY were placed into Site E and 106,507 CY into the original EPA Site F. After designation portions of the larger new Site F were used.

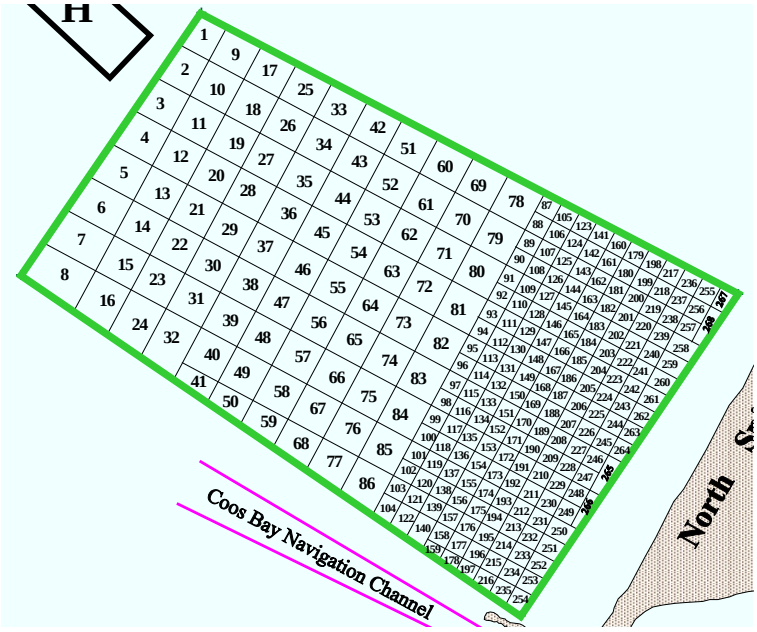


Figure 8. ODMDS Site F showing grid cell layout (2006).

In **2007** a total of 7 Coos Bay Dump Plans were used to distribute 1,122,613 CY of the material dredged. The amount dredged at Coos Bay in **2007** was double the amount dredged in the previous 3 years. Periodically, every 5 to 6 years, dredge volumes exceed 1 MCY. In **2008**, 4 Site F dump plans were used to place 791,500 CY. In **2009**, 4 dump plans for two hopper dredges were used to place 938,898 CY. Multiple dump plans for nearshore and off-shore placement are

used annually.

<u>ODMDS H</u>: The **October 1995** ODMDS H bathymetric difference plots showed a mound at this site as a result of placing material at the site in **August and September 1995**. This was also evident in the **May 1998** through **June 2002** difference plots. The **June 2002-September 1986** difference plot indicated an accumulation of 13 feet of deposited materials at the highest spots in the disposal area. In **2006,** after placement of 262,788 CY in **2005,** mound height was 10 feet. A total of 1,081,799 CY of material was placed in Site H between **July** and **October 2009**. Comparing the **2010** survey with the **2009** survey mound height generally increased 4-6 feet throughout Site H with a maximum increase of 8 feet. Comparing the **2010** survey to the baseline **1986** survey overall mound height was around 10 feet higher with a maximum of 15 feet increase in a localized area. A maximum increase of 11 feet above baseline is shown in the **2013** difference plot. Bottom elevations in some areas of the site decreased by as much as 5-4 feet between **2014-2015**, but the maximum increase above baseline was 15 feet near the center of the Site. At this time there is no management option available within ODMDS H for dredged material placement because of its small size. Site expansion to contain all the material placed should be further evaluated in the future. This area should continue to be surveyed annually to monitor changes in bathymetry.

At the end of the **2005** dredging season several thousand cubic yards of material containing levels of total DDT above DMEF screening levels from the permitted "Coos Bay City Docks" was placed at Site H. This material was not subjected to Tier III biological analysis as required by the DMEF to determine if the material was suitable for unconfined in-water placement. Initially the Corps had planned to sample the site and conduct analyses of total DDT in **2006**, but by mutual agreement between the Corps and EPA, it was determined that the material containing DDT was distributed in a very thin layer at the site and levels of DDT present would not be detectable, therefore, sampling was not conducted. No adverse environmental impact is anticipated.

ROCK SITE: Rock from the channel deepening was placed in an area selected under the Corps Section 103 authority south of the ODMDS F and west of ODMDS E creating a mound with a maximum height of 5 feet. No further disposal has taken place in this area and none is planned. No further management is required at this time. Last bathymetric survey was conducted in **June 2001**.

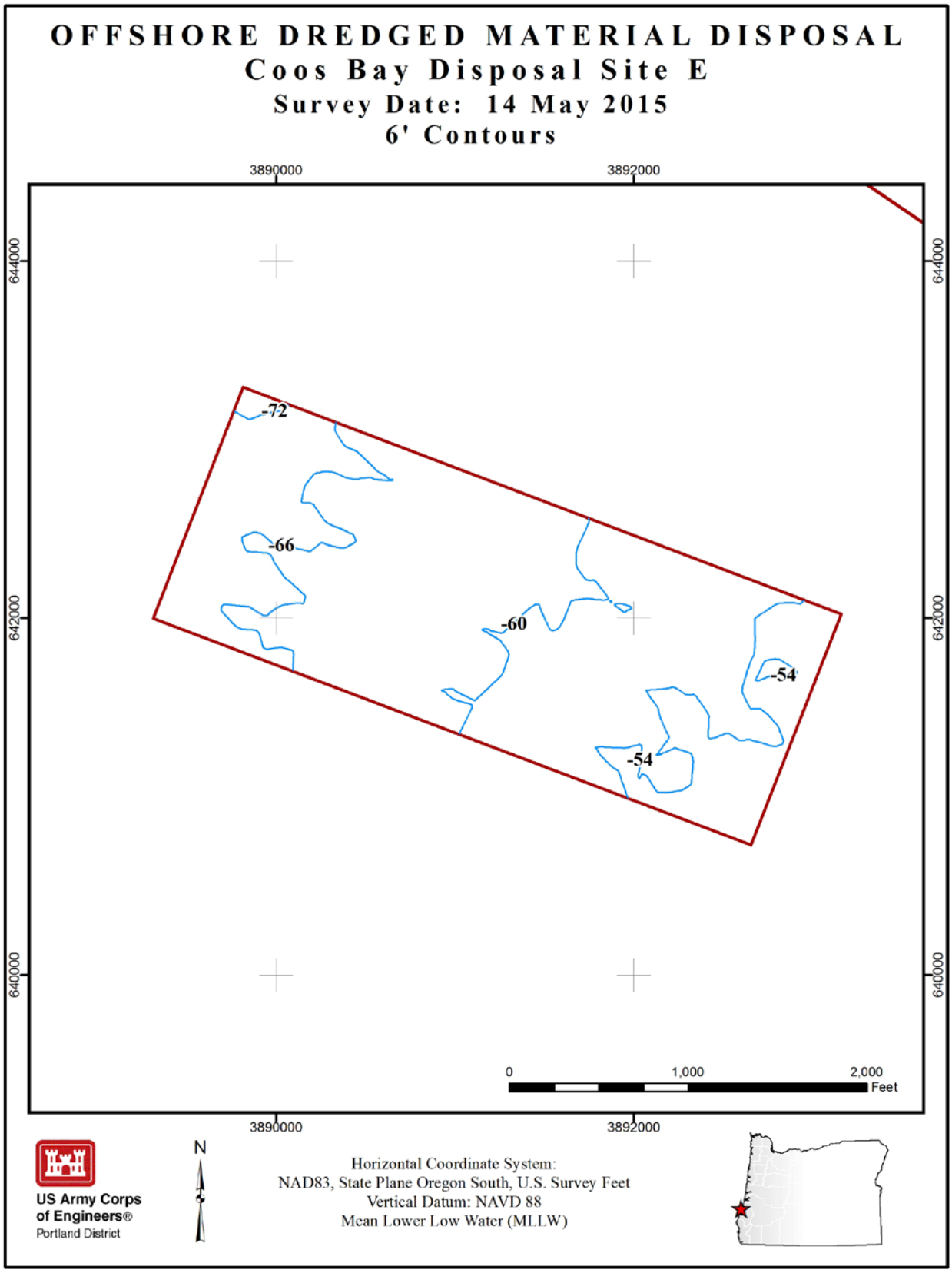
Table 2

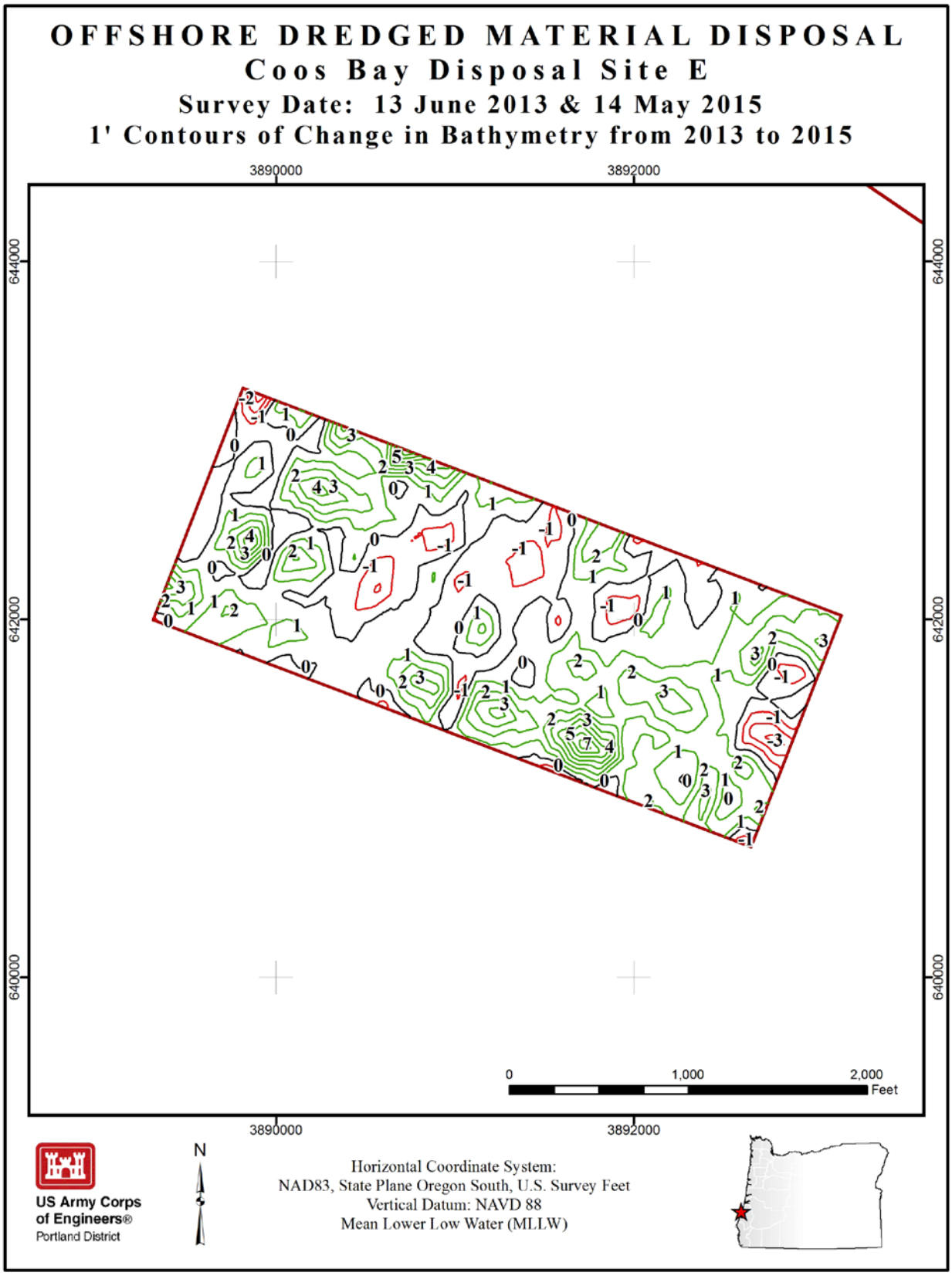
Volumes Placed [In thousands of CY] at Coos Bay ODMDSs

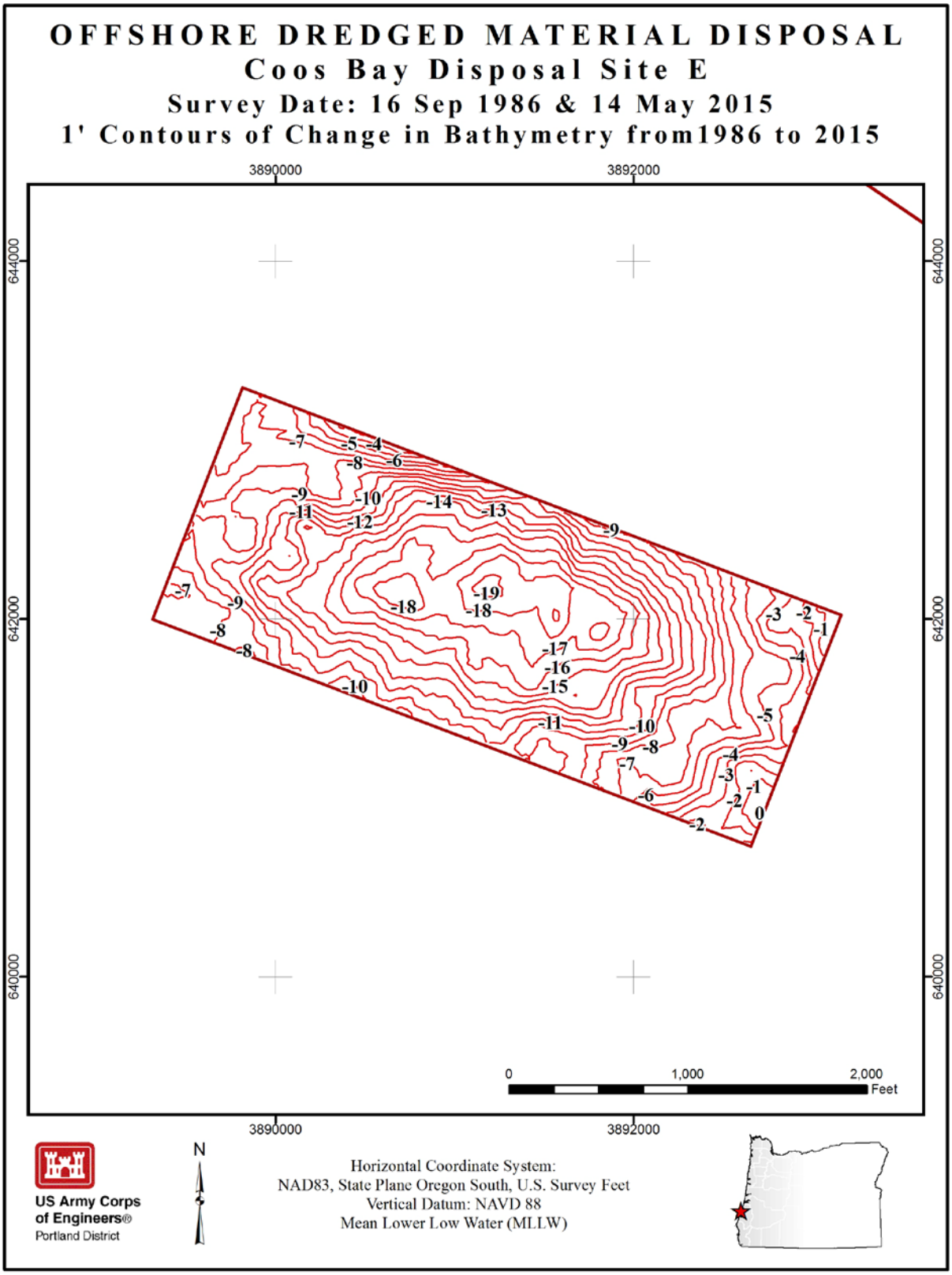
Fiscal Year	Quantity		
	ODMDS E	ODMDS F	ODMDS H
1976	1,120.1	840.6	
1977	847.8	405.5	
1978	901.3	872.7	
1979	902.8	1,161.9	
1980	207.3	1,014.4	
1981	660.7		
1982	919.2		
1983	336.0	104.8	
1984	720.6	629.3	
1985			
1986	309.1	1,192.5	413.4
1987	116.4	1,032.9	39.9
1988		965.8	658.1
1989	127.2	440.5	
1990	25.0	637.7	401.7
1991		1,247.7	21.4
1992		742.6	757.2
1993		719.9	898.9
1994		722.3	401.2
1995		686.6	545.9
1996		1,760.1	248.9
1997**		609.4	1,347.4
1998*		965.9	20.0
1999#		774.6	836.6
2000		903.8	
2001		789.1	127.1
2002	1,313.9		
2003		768.0	
2004		425.8	
2005		564.0	262.8
2006†	79.9	487.5	
2007		1,122.6	
2008		791.5	
2009		945.9	1,078.6
2010		690.2	
2011		812.7	
2012††		663.1	10.5
2013		608.0	1.7
2014		496.5	

In **1997, a total of 181,090 CY of material were placed into a one-time use area known as the "Rock Site." This site was selected to receive rock excavated as part of the Coos Bay Channel Deepening Project.
*In **1998**, a total of 90,970 CY of material was material placed under permit, 70,970 CY went to the original Site F and 20,000 to Site H.
#In **1999**, a total of 39,610 CY of material was material placed under permit, 22,010 CY went to the original Site F and 17,600 to Site H.
†In **2006**, the EPA 103 designation for Site F expired. Prior to the new (expanded) Site F 103 designation, by agreement with EPA, 79,927 CY of material was placed in Site E and 106,507 CY of material placed at the former Site F. In 2006 after EPA designated the new Site F, an additional 381,003 CY of material was placed in the near shore portion of the 2006 Site F, for a total of 487,510 CY placed within the 2006 EPA 103 Site F.
††In **2012**, under regulatory permit number NWP-2007-5, Roseburg Forest Products dredged a total of 16,800 cy from their dock on the North Spit and Ocean Terminals dredged 8,400 cy of material from their dock in North Bend. A total of 25,200 was placed at Site F under permit. The Corps also placed 637,879, for a total of 663,079 cy of material placed at Site F in 2012. Oregon Chip Terminal dredged 10,500 cy of material from their dock in the upper bay under the same permit and placed the material at Site H.

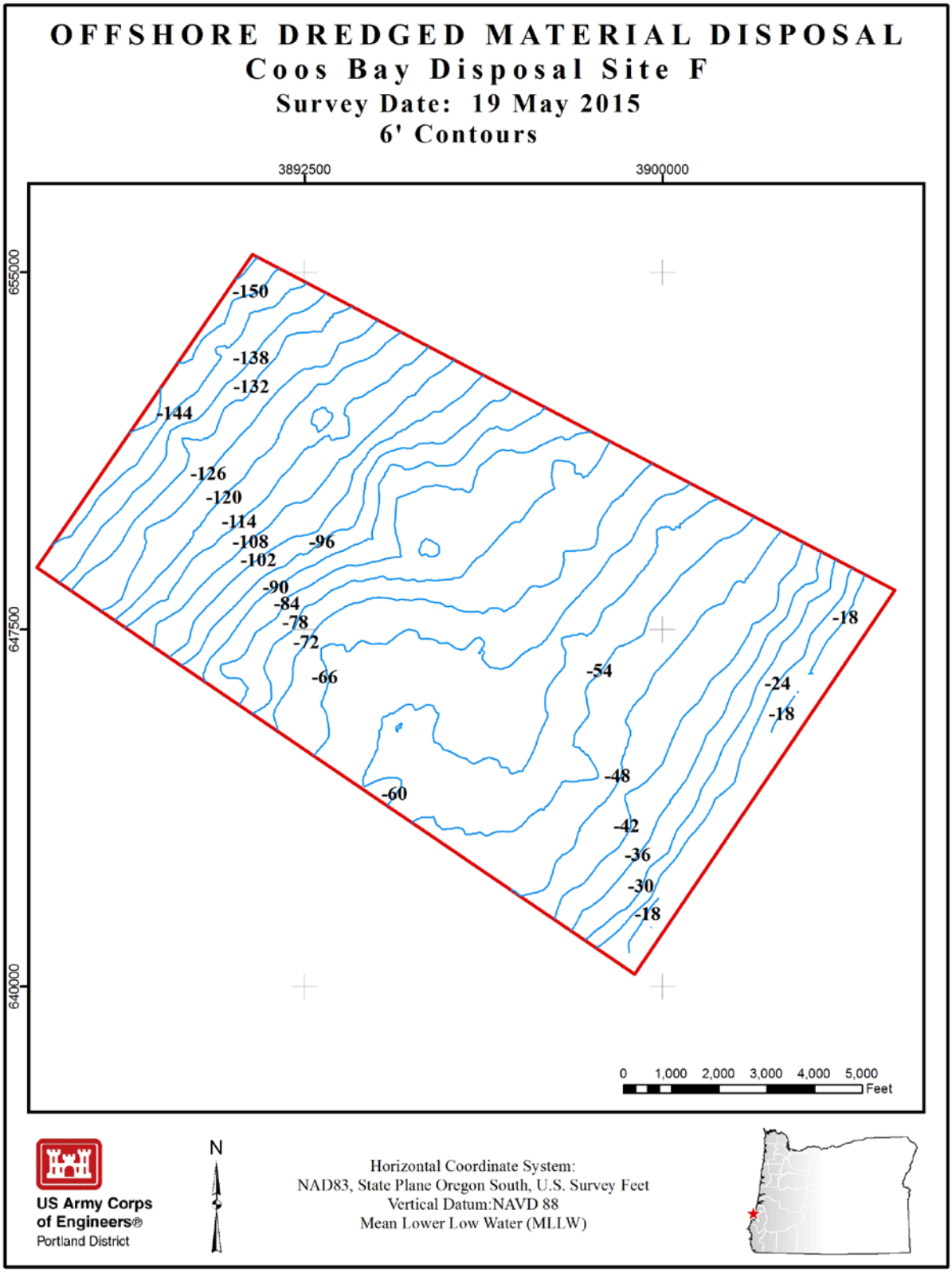
ODMDS E


OFFSHORE DREDGED MATERIAL DISPOSAL
Coos Bay Disposal Site E
Survey Date: 14 May 2015
6' Contours
3890000
3892000
644000
642000
640000
-72
-66
-60
-54
-54
0
1,000
2,000
Feet
US Army Corps of Engineers®
Portland District
N
Horizontal Coordinate System:
NAD83, State Plane Oregon South, U.S. Survey Feet
Vertical Datum: NAVD 88
Mean Lower Low Water (MLLW)


OFFSHORE DREDGED MATERIAL DISPOSAL
Coos Bay Disposal Site E
Survey Date: 13 June 2013 & 14 May 2015
1' Contours of Change in Bathymetry from 2013 to 2015
3890000
3892000
644000
642000
640000
0
1,000
2,000
Feet
US Army Corps of Engineers®
Portland District
N
Horizontal Coordinate System:
NAD83, State Plane Oregon South, U.S. Survey Feet
Vertical Datum: NAVD 88
Mean Lower Low Water (MLLW)


OFFSHORE DREDGED MATERIAL DISPOSAL
Coos Bay Disposal Site E
Survey Date: 16 Sep 1986 & 14 May 2015
1' Contours of Change in Bathymetry from1986 to 2015
3890000
3892000
644000
642000
640000
0
1,000
2,000
Feet
US Army Corps of Engineers®
Portland District
N
Horizontal Coordinate System:
NAD83, State Plane Oregon South, U.S. Survey Feet
Vertical Datum: NAVD 88
Mean Lower Low Water (MLLW)

ODMDS F


OFFSHORE DREDGED MATERIAL DISPOSAL
Coos Bay Disposal Site F
Survey Date: 19 May 2015
6' Contours
3892500
3900000
655000
647500
640000
-150
-138
-132
-144
-126
-120
-114
-108
-96
-102
-90
-84
-78
-72
-66
-54
-18
-24
-18
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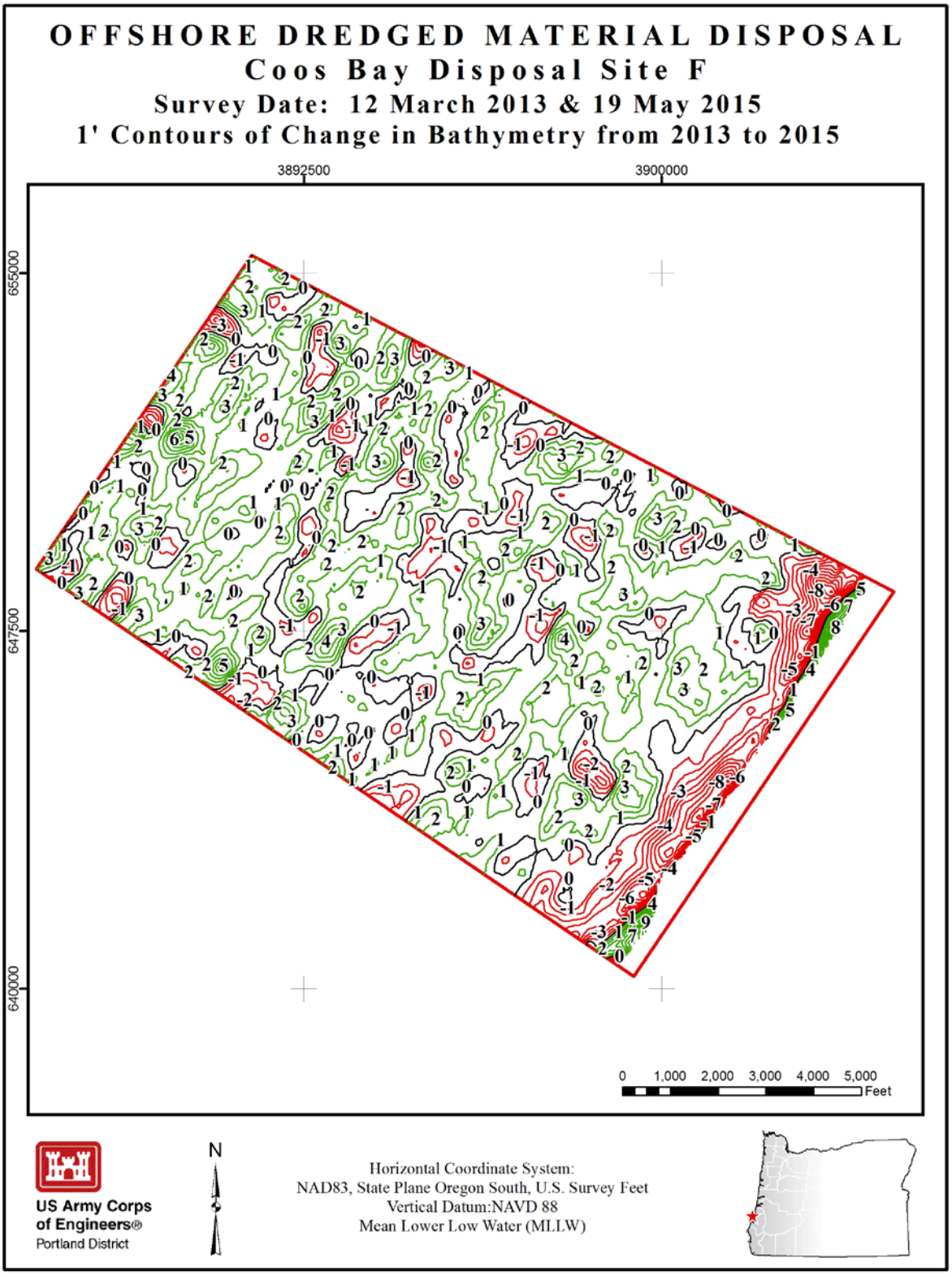
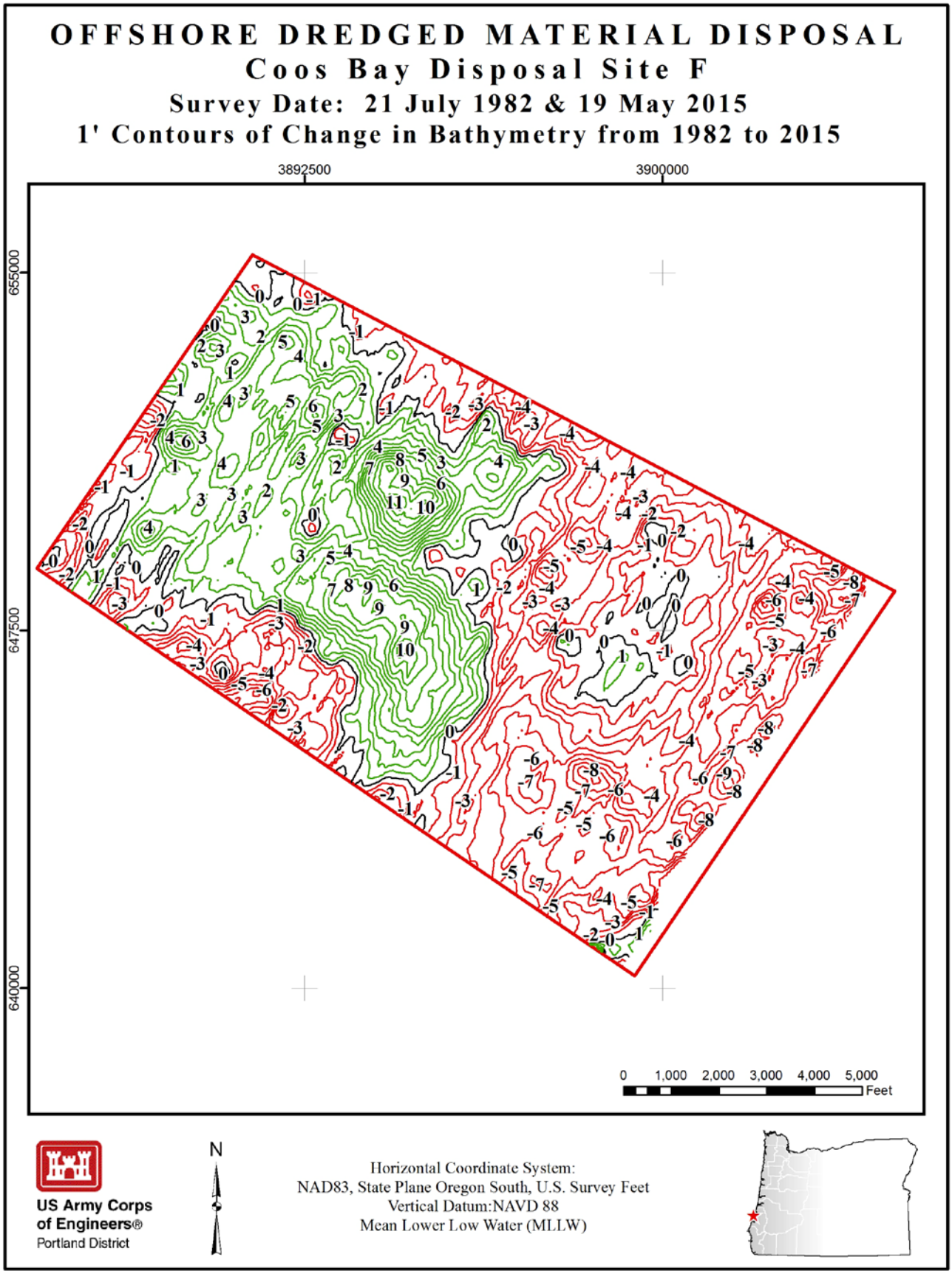
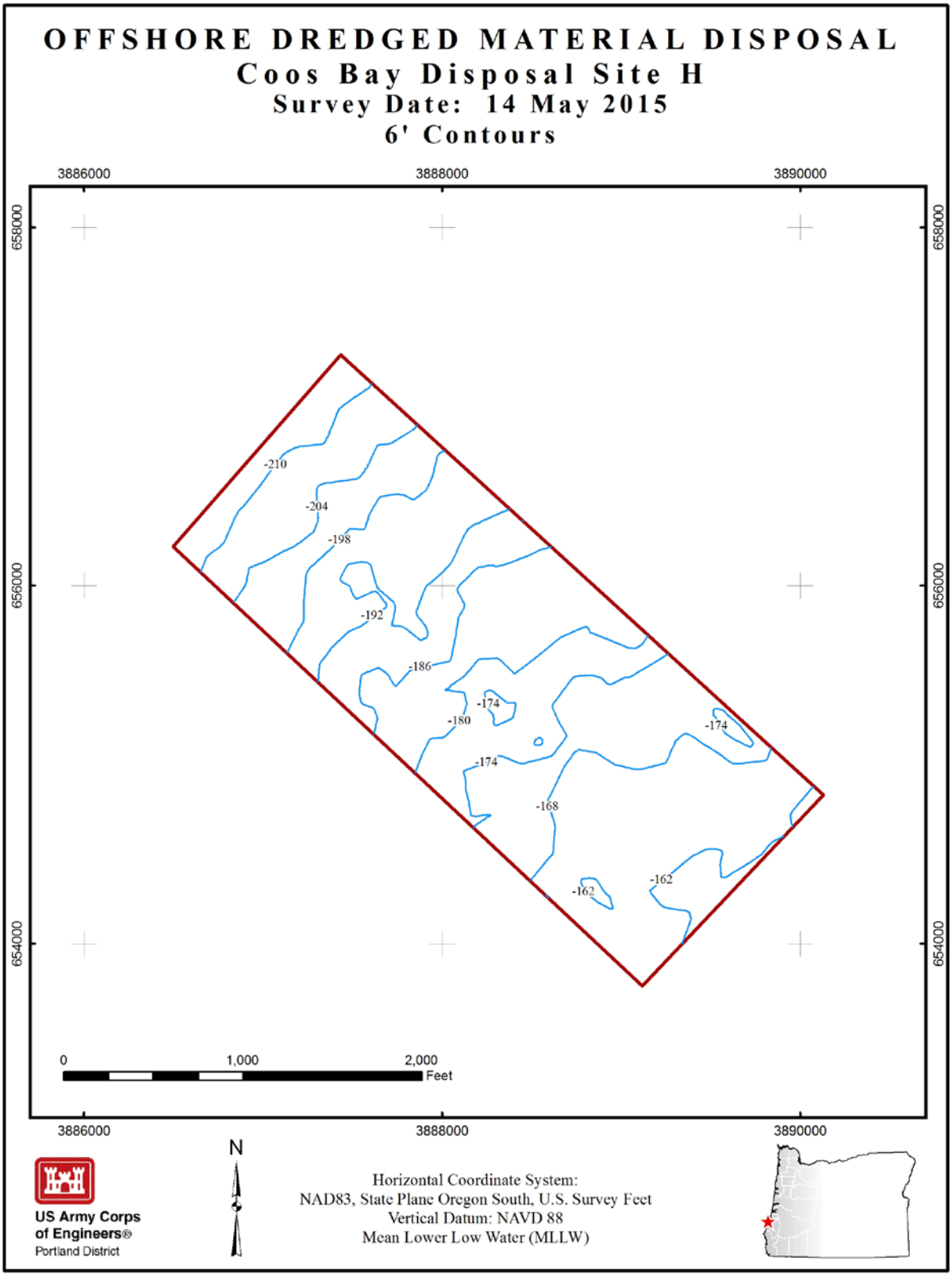
-18
0 1,000 2,000 3,000 4,000 5,000
Feet
US Army Corps
of Engineers®
Portland District
N
Horizontal Coordinate System:
NAD83, State Plane Oregon South, U.S. Survey Feet
Vertical Datum:NAVD 88
Mean Lower Low Water (MLLW)


OFFSHORE DREDGED MATERIAL DISPOSAL
Coos Bay Disposal Site F
Survey Date: 12 March 2013 & 19 May 2015
1' Contours of Change in Bathymetry from 2013 to 2015
3892500
3900000
655000
647500
640000
0 1,000 2,000 3,000 4,000 5,000
Feet
US Army Corps of Engineers®
Portland District
N
Horizontal Coordinate System:
NAD83, State Plane Oregon South, U.S. Survey Feet
Vertical Datum:NAVD 88
Mean Lower Low Water (MLLW)


OFFSHORE DREDGED MATERIAL DISPOSAL
Coos Bay Disposal Site F
Survey Date: 21 July 1982 & 19 May 2015
1' Contours of Change in Bathymetry from 1982 to 2015
3892500
3900000
655000
647500
640000
0 1,000 2,000 3,000 4,000 5,000
Feet
US Army Corps of Engineers®
Portland District
N
Horizontal Coordinate System:
NAD83, State Plane Oregon South, U.S. Survey Feet
Vertical Datum:NAVD 88
Mean Lower Low Water (MLLW)

ODMDS H


OFFSHORE DREDGED MATERIAL DISPOSAL
Coos Bay Disposal Site H
Survey Date: 14 May 2015
6' Contours
3886000
3888000
3890000
658000
656000
654000
-210
-204
-198
-192
-186
-174
-180
-174
-174
-168
-162
-162
0
1,000
2,000
Feet
N
US Army Corps of Engineers®
Portland District
Horizontal Coordinate System:
NAD83, State Plane Oregon South, U.S. Survey Feet
Vertical Datum: NAVD 88
Mean Lower Low Water (MLLW)

OFFSHORE DREDGED MATERIAL DISPOSAL
Coos Bay Disposal Site H
Survey Date: 29 September 2014 & 14 May 2015
1' Contours of Change in Bathymetry from 2014 to 2015
3886000
3888000
3890000
658000
656000
654000
0
1,000
2,000
Feet
N
US Army Corps of Engineers®
Portland District
Horizontal Coordinate System:
NAD83, State Plane Oregon South, U.S. Survey Feet
Vertical Datum: NAVD 88
Mean Lower Low Water (MLLW)

OFFSHORE DREDGED MATERIAL DISPOSAL
Coos Bay Disposal Site H
Survey Date: 16 September 1986 & 14 May 2015
1' Contours of Change in Bathymetry from 1986 to 2015
3886000
3888000
3890000
658000
656000
654000
0
1,000
2,000
Feet
N
US Army Corps of Engineers®
Portland District
Horizontal Coordinate System:
NAD83, State Plane Oregon South, U.S. Survey Feet
Vertical Datum: NAVD 88
Mean Lower Low Water (MLLW)