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CENWS-HH-HE-CU 12 APR 2013

MEMORANDUM FOR RECORD

SUBJECT: Pacific Sound Resources (PSR) Superfund Site Marine Sediment Unit RA5 Cap Placement Monitoring.

1. Background

In 2005, as part of the original remedial action at Pacific Sound Resources (PSR), deep subtidal portions of the site, including Remedial Area 5 (RA5), received capping materials. Later monitoring showed that portions of the cap were thinner than originally designed. Cores from two locations on area RA5a of the cap showed a cap thickness of approximately 2-4 inches. The EPA approached the Corps of Engineers about utilizing sandy dredged material from the Swinomish Channel Federal navigation maintenance project to augment thin areas of the cap.

2. Cap Design

The original sediment cap design for marine sediment unit RA5 called for a minimum thickness of 27 inches of sandy dredged material, with an operational allowance of 13 inches for a maximum cap thickness of 40 inches. Sandy Swinomish Channel dredged material was identified as the preferred material for cap augmentation. Based on the characteristics of the Swinomish Channel dredged material, and the navigation dredging equipment employed, it was determined that between 2,500 and 3,000 cubic yards (cy) of material, placed by bottom dump barge, at 16 target locations on 100 foot spacing intervals, would achieve the required cap thickness (Figure 1). The 16 target locations were identified to address the cap thickness issues in the vicinity of monitoring stations RA5-05 (1.95 inches thick) and RA5-13 (3.9 inches thick) on the RA5a cap.

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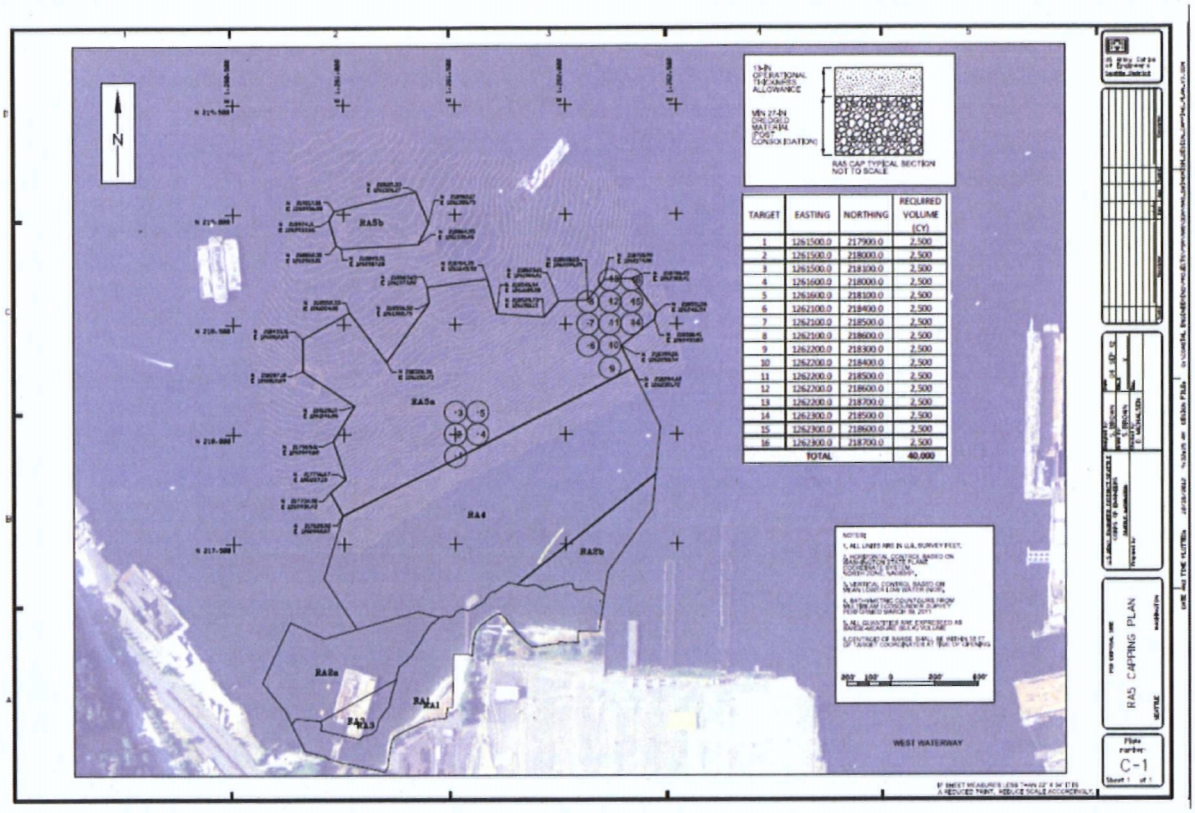

Figure 1: FY 2012 RA5 Sediment Capping Plan.

3. Available Volume and Placement Sequence

Due to funding limitations, the cap placement volume was limited to approximately 40,000 cy of material. The Corps' contractor indicated that they would use two scows for placement at PSR, the Swan Island and the Lummi Island, each scow holding approximately 1,500 cy of dredged material. Two placement events at each target location would therefore result in approximately 3,000 cy of material placed at each target site. Under this scenario, the 40,000 cy placement volume would be exceeded prior to some of the targets receiving material. Analysis showed that not placing material at targets 9, 13 and 16 (Figure 1) would not have a significant effect on the overall cap thickness, so these targets were designated as the lowest priority placement areas — to only receive material after capping the first two priority areas. The targets identified for each priority area are identified in Table 1.

Table 1: Placement Sequence

Placement Sequence	Targets
Priority Area 1	6,7,8,10,11,12,14,15
Priority Area 2	1,2,3,4,5
Priority Area 3	9,13,16

4. Placement Volumes

Table 2 shows the total volume placed at each target site. All of the targets in priority areas 1 and 2 received the minimum design criteria of 2,500 cy of material with most of the targets receiving closer to 3,000 cy of material. After placements at priority areas 1 and 2 were completed, there was enough material left to perform one more placement. Target 9 was identified as the most beneficial area for the final placement and received the final barge load of material for a total of 27 placements and 40,030 cy of material. Table 3 shows the time, target area and volume for each of the placements as well as the location within the Swinomish Channel dredge prism where the material originated from.

Table 2: Placement Volumes

Target	Volume Placed (CY)
1	2,950
2	2,990
3	2,930
4	3,050
5	2,770
6	3,060
7	3,020
8	3,000
9	1,440
10	3,060
11	2,990
12	2,910
14	2,910
15	2,950
Total Volume Placed (CY)	**40,030**

Table 3: Cap Material Source and Placement Locations.

Load Name	Channel Station (Dredging Start)	Channel Station (Dredging Stop)	Placement Time (PDT)	Placement Location	Volume Placed (CY)
Lummi 48	13+11	13+64	10/19/12 13:37:38	PSR Target #6	1680
Swan 1	13+61	14+52	10/19/12 23:21:05	PSR Target #7	1300
Lummi 49	14+52	15+21	10/20/12 12:37:33	PSR Target #8	1500
Swan 2	15+18	16+04	10/21/12 01:19:25	PSR Target#10	1590
Lummi 50	16+44	16+98	10/21/12 12:57:20	PSR Target #11	1520
Swan 3	17+00	17+65	10/22/12 01:34:05	PSR Target #12	1450
Lummi 51	18+00	18+53	10/22/12 12:58:34	PSR Target #14	1370

Swan 4	18+80	19+89	10/27/12 01:24:40	PSR Target #15	1400
Lummi 52	20+05	20+85	10/27/12 21:41:01	PSR Target #6	1380
Swan 5	21+30	21+84	10/28/12 23:29:13	PSR Target #8	1500
Lummi 53	11+57	12+27	10/29/12 10:56:52	PSR Target#10	1470
Swan 6	12+59	13+37	10/30/12 00:38:02	PSR Target #11	1470
Lummi 54	13+63	14+79	10/30/12 12:07:10	PSR Target #7	1720
Swan 7	14+94	15+73	10/30/12 22:34:34	PSR Target #15	1550
Lummi 55	15+97	16+94	10/31/12 11:13:19	PSR Target #12	1460
Swan 8	17+26	18+02	10/31/12 22:03:08	PSR Target #14	1540
Lummi 56	18+15	19+37	11/02/12 22:51:31	PSR Target #1	1450
Swan 9	19+54	20+88	11/03/12 10:19:44	PSR Target #2	1540
Lummi 57	20+88	22+00	11/03/12 22:51:36	PSR Target #3	1460
Swan 10	22+04	22+89	11/04/12 10:23:11	PSR Target #4	1560
Lummi 58	22+89	23+72	11/05/12 00:12:41	PSR Target #5	1410
Swan 11	23+72	24+26	11/05/12 12:34:20	PSR Target #1	1500
Lummi 59	24+57	25+04	11/06/12 01:27:23	PSR Target #2	1450
swan 12	25+30	25+86	11/06/12 09:31:47	PSR Target #3	1470
Lummi 60	26+07	26+74	11/07/12 00:46:23	PSR Target #4	1490
Swan 13	26+77	27+29	11/07/12 10:13:32	PSR Target #5	1360
Lummi 61	27+71	28+15	11/08/12 01:19:54	PSR Target #9	1440

5. Placement Accuracy

One of the issues identified with the 2005 capping project was the lack of accuracy in barge positioning during placement. In order to address this issue the Dredge Quality Management tool (DQM) was used to monitor the barge positioning during placements. The DQM records the position, heading, speed, draft and displacement of the scows during both dredging and disposal activities. The design called for the centroid of the barges to remain within a 50 ft radius of the target during placement. Figures 2 and 3 show the target areas along with the color coded outline of the barge position during placement. While there was some drift in the barge position during the duration of placement (approximately 2-3 minutes) the barges remained within the designated target areas while material was being released.

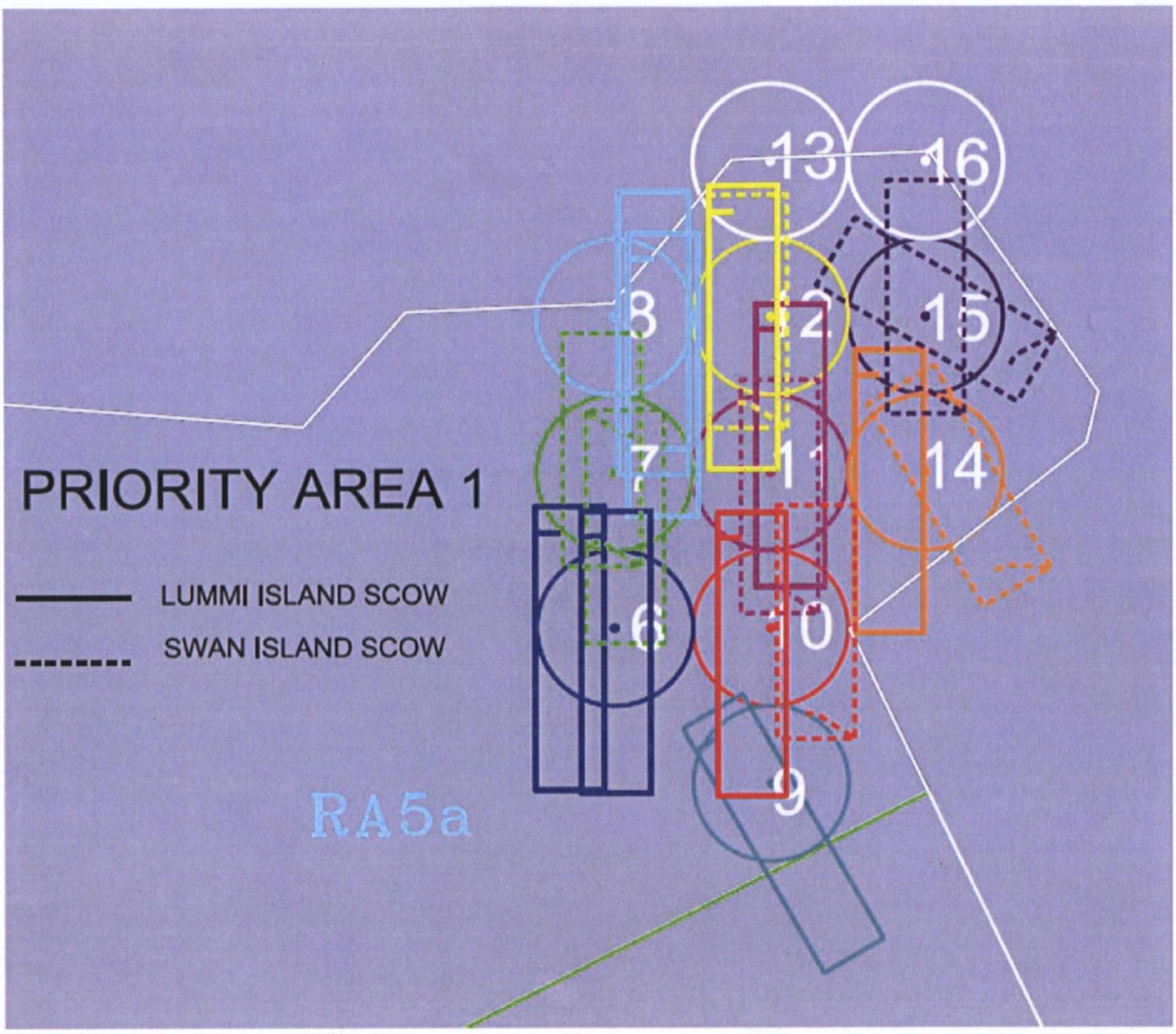

Figure 2: Priority Area 1 Placements.

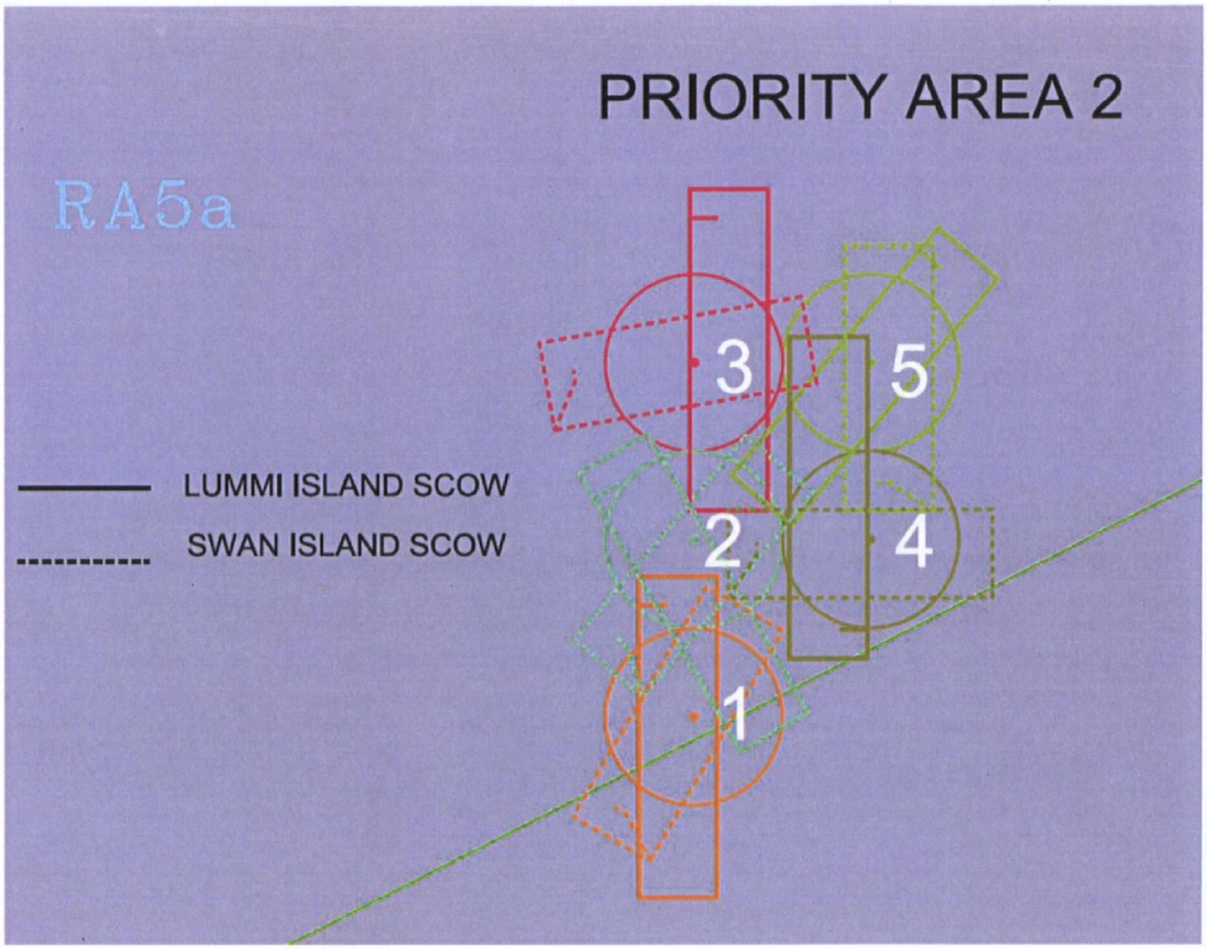

Figure 3: Priority Area 2 Placements

5. Conclusions

The contractor was able to place approximately 40,030 cy of material at two priority areas within the RA5a boundary. Overall the placement accuracy was very good with all of the barges able to place material within designated target areas, which should result in an even distribution of cap material. Additional monitoring work will include sediment cores to determine the accuracy of cap placement and thickness estimates, and will be used to further refine the cap design in the future.

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