CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD **July 24, 2000**

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED FEDERAL AND NON-FEDERAL OPERATION AND MAINTENANCE DREDGED MATERIAL FROM SQUALICUM WATERWAY, BELLINGHAM BAY, PUGET SOUND (Public Notice CENWS-0D-TS-NS-9) EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT (CWA) FOR OPEN-WATER DISPOSAL AT THE BELLINGHAM BAY NON-DISPERSIVE DISPOSAL SITE, ROSARIO STRAIT DISPERSIVE DISPOSAL SITE, OR AT A BENEFICIAL USE SITE.

1. Introduction. The following summary reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) on the suitability of material from the Squalicum Waterway in Bellingham, Washington for unconfined open-water disposal. For this project an estimated 172,000 cy of maintenance material from the federal navigation channel and associated Port of Bellingham berths were proposed to be dredged and underwent PSDDA sampling. Disposal is anticipated to be at the Bellingham Bay (non-dispersive) or Rosario Strait (dispersive) PSDDA disposal sites or at a beneficial use site(s) in Bellingham Bay. Project depth of 28 ft. would be provided along with one foot of advance maintenance (to 29 ft.) with one foot of allowable overdepth. Relevant dates for regulatory tracking purposes are included in Table 1.

Table 1. Regulatory Tracking Dates

SAP received	April 4, 2000
SAP approved	May 2, 2000
Sampling dates	May 22-26, 2000
Data report submitted	July 3, 2000
Recency Determination: High Concern (2 years) Moderate Concern (5-7 years)	May 2002 May 2005 - 2007

2. Background. The characterization and dredging history of this project area in the last ten years is complicated. The federal navigation channel was last characterized in 1994; the majority of the dredging was completed in 1996 with the last few spots finished in 1998. The Port of Bellingham last dredged the berths at Bellingham Cold Storage in 1995 (42,867 cy) and 1998 (1,000 cy). There have been five PSDDA characterizations or related sediment studies in the last decade, with most areas eventually found suitable for open-water disposal at the Bellingham Bay non-dispersive site, though not all passed the more stringent guidelines for dispersive site disposal. In 1994, the most recent previous sampling event, all 210,000 cy of federal material and 48,000 cy of port material was found suitable for open-water disposal at a PSDDA non-dispersive site. For the most part, sediments characterized during this round of testing was material settled from the Nooksack River and Squalicum Creek since the last dredging events. Only a small portion of the right berth area (S1 and S2) has not been recently dredged.

Table 2. Project Synopsis.

Time of proposed dredging	probably piecemeal throughout recency/frequency period (2000 – 2005)
Proposed disposal sites	Rosario Strait or Bellingham Bay PSDDA sites or Bellingham Bay beneficial use sites
Sediment ranking	high/moderate
Project last dredged	major dredging (166,946 cy) 1996; minor dredging (6,211 cy) 1998

3. **Sampling**. For the 2000 characterization, as in 1994, the head of the waterway was ranked "high" while the remainder of the project was ranked "moderate." Though down-rankings were considered, after careful review of past sampling results the DMMP agencies decided to retain these rankings for the current testing cycle. The 2000 field sampling effort included collection of 37 core samples for compositing into 6 high-ranked dredged material management unit (DMMU) samples and 11 moderately-ranked composite DMMU. Conventional parameters measured in the 17 DMMU samples are depicted in Tables 3 and 4.

Table 3. Conventional results for high-ranked DMMUs.

PARAMETER		S1	S2 (sub)	S3	S4 (sub)	S5	S6 (sub)
Volume (cubic yards)		2,759	1,688	2,699	3,687	5,687	9,330
GRAIN SIZE	% Gravel	0.4	2.0	17.6	14.6	6.5	5.4
	% Sand	20.3	42.0	49.8	67.2	29.0	46.4
	% Silt	56.2	36.7	23.2	11.5	43.3	30.7
	% Clay	23.0	19.3	9.4	6.5	21.2	17.6
	% Fines (clay+silt)	79.2	56.0	32.6	18.0	64.5	48.3
Total Solids, %		58.0	66.8	68.3	79.2	60.2	71.6
Volatile Solids, %		5.3	7.0	7.3	6.8	9.5	4.7
Total Organic Carbon, %		1.8	3.7	3.9	3.8	3.9	1.8
Total Sulfides, mg/kg		1,900	1,800	480	82	1,600	1,200
Total Ammonia, mg/kg		39	32	37	20	83	55

Table 4. Conventional results for moderate-ranked DMMUs.

PARAMETER		C1	C2	C3	C4 (sub)	C5	C6	C7	C8	C9 (sub)	C10	C11
Volume (cy)		4,832	15,902	15,199	15,608	15,164	11,564	15,659	15,778	13,945	15,311	7,092
GRAIN SIZE	% Gravel	4.0	0.1	0.5	2.2	0.2	0.2	0.3	0	3.5	0	1.8
	% Sand	22.2	16.5	19.4	26.7	4.4	5.1	5.2	5.9	27.5	6	3.9
	% Silt	51.0	61.9	64.2	44.0	73.8	74.1	76.0	71.8	46.2	69.5	66.4
	% Clay	22.8	21.5	15.9	27.0	21.8	20.4	18.4	22.2	22.8	24.6	27.9
	% Fines	73.8	83.4	80.1	71.0	95.6	94.5	94.4	94.0	69.0	94.1	94.3
Total Solids, %		60.5	56.9	56.1	66.4	55.1	56.5	56.3	55.4	66.7	54.1	52.2
Volatile Solids, %		5.2	6.9	6.7	4.7	6.7	6.5	6.5	6.5	4.3	6.4	6.2
TOC, %		2.1	2.6	2.2	1.6	2.4	2.2	2.2	2.1	1.6	2.0	1.8
Total Sulfides, mg/kg		1,700	1,300	320	32	710	1,200	830	160	670	1,200	240
Total Ammonia, mg/kg		59	72	62	65	73	62	55	63	56	68	48

4. Chemical Analysis. The Agencies' approved sampling and analysis plan was followed, and quality assurance/quality control guidelines specified by PSEP and the PSDDA program were generally complied with. Chemical analysis results depicted in Table 5 demonstrated that the dredged material management units characterized were predominately free of chemicals of concern, with 13 out of 17 DMMU with no chemical exceedances of screening levels. Three of those DMMU with SL exceedances (C5, C6 and C7) exhibited borderline exceedances of nickel but no other chemicals of concern. Only one DMMU (S2) exhibited multiple and/or high levels of chemicals of concern, with levels of lead measured at 2,100 ppm (ML = 1,200) and 2,4-Dimethylphenol measured at 62 ppb (SL = 29 ppm).

Table 5. Selected chemistry results.[1]

PARAMETER		Chemical Guidelines SL	BT	ML	C5 (M)	C6 (M)	C7 (M)	S2 (H)
Volume (cubic yards)					15,164	11,564	15,659	1,688
METALS (ppm)	Lead	450	--	1,200				2,100
	Nickel	140	370	370	140	141	140	
2,4-Dimethylphenol (ppb)		29	--	210				62

[1]Table includes all chemicals of concern (COCs) that exceeded PSDDA SL triggers. No additional COCs exceeded SLs.

5. TBT. Analysis for tributyltin (TBT) was tiered. Porewater from four DMMU considered to have the highest risk for TBT contamination due to proximity to the marina and/or berths (S3, S4, C1 and C5) was analyzed for TBT. These initial analyses were expedited and completed prior to the expiration of TBT holding times for the remainder of the samples. No TBT was detected (0.02 detection limit) in S4 or C5. Low amounts were detected in S3 (0.053 ug/L) and C1 (0.13 ug/L). Because there were no exceedances of the TBT bioaccumulation trigger (0.15 ug/L) no further TBT analysis was required.

6. Nickel Exceedances. Three DMMU (C5, C6 and C7) in the turning basin area of the navigation channel had nickel detected right at the SL. Analysis of the data showed that Ni concentrations were localized in the surface portion of the turning basin material, and decreasing concentrations with increasing distance from the turning basin. Grain size showed a high negative correlation with Ni concentration (Figure 1). Similar concentrations have been found in the waterway in past sampling. Though SL exceedances usually trigger Tier 3 bioassays before being found suitable for open water disposal, the agencies' suspended this requirement for these DMMU. This "best professional judgement" decision was based on the following lines of evidence:

- similar and greater levels of Ni found in the same area before have passed bioassays
- there is circumstantial evidence that background levels of Ni in the Bellingham Bay area are high
- there are no apparent anthropogenic sources
- these DMMU showed no SL exceedances of any other COC

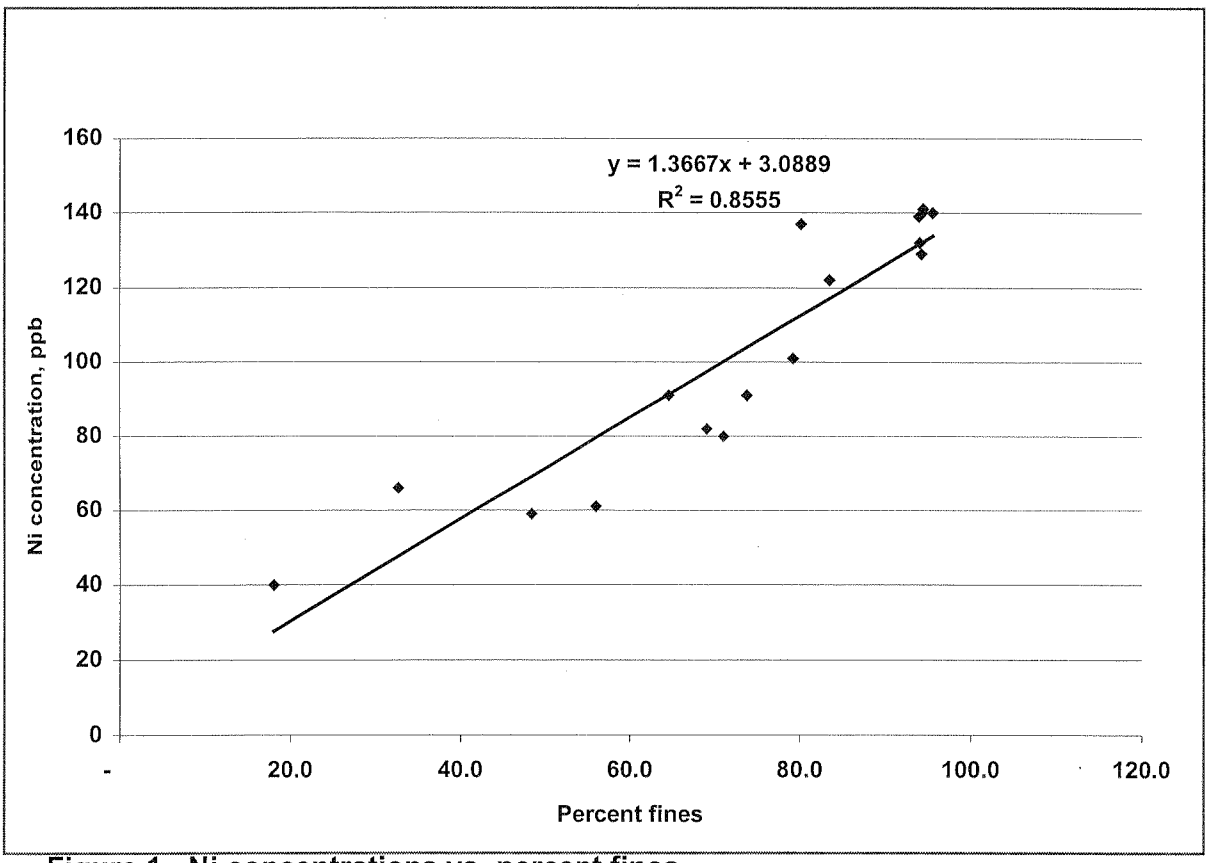

Figure 1. Ni concentrations vs. percent fines.

7. <u>S2: Lead and 2,4-dimethylphenol Exceedances</u>. Subsurface DMMU S2, in the right berth area, had both an SL exceedance of 2,4-dimethylphenol and an ML exceedance of lead (Table 5). This level of lead caused much more concern among the agency representatives than did the detections of nickel. To establish an approach for further testing of this DMMU, the agencies looked at the site history, laboratory QA/QC data, and potential human health and environmental effects of lead.

A review of the site history showed that both a plywood company and a boat building business have been located in the area north of the right berthing area since the 1920s. Boat building, of both metal and wooden boats, ceased in the 1960's, though a plywood company continues to operate today. This area was filled to its present shoreline in the 1940s and 50s. At present, the source or extent of subsurface contamination is undetermined.

The analytical laboratory reviewed its procedures and found no indication that the lead measurement was erroneous. There are also potential human as well as environmental effects of lead contamination.

With the above information, the agencies agreed on a plan for further evaluation of S2. The following Tier 3 tests were required before S2 could be considered for open water disposal:

- Acute bioassays with the usual suite of bioassay tests. *Mytilus* should be the species chosen for the larval bioassay due to its sensitivity to metals. Should the sediment fail these tests, it would be unsuitable for open-water disposal.
- 28-day bioaccumulation tests on two species before the sediment could be considered suitable for open-water disposal. Tissue analysis would be for Pb only.
- Should the area be dredged, regardless of disposal area, Z samples would need to be analyzed to make sure that the exposed surface does not exceed Ecology non-degradation standards. Further dredging may be necessary if contamination is shown to go deeper than the proposed dredging prism.
- Bioassay and bioaccumulation tests could be tiered or conducted concurrently.
- Though it was found suitable for open-water disposal, no portion of S1 should be removed without further testing of subsurface sediments.

Bellingham Cold Storage chose not to pursue further action at this site as part of the current project.

9. Suitability. This memo documents the suitability of proposed dredged sediments in the Squalicum Waterway navigation channel and berthing areas for open water disposal. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the PSDDA program. Based on the results of the chemical testing, the DMMP agencies concluded that 16 out of 17 DMMU, representing 170,200 cy, are suitable for open water disposal. The remaining DMMU (S2) representing 1,688 cy, is not suitable for open water disposal pending further testing. Though the DMMU overlying S2 (S1) is suitable for open water disposal, it should not be removed until the risk of exposing contaminated sediments is evaluated. Open water disposal may be at the Bellingham Bay non-dispersive site, Rosario Strait dispersive site, or a beneficial use site. However, this suitability determination does not constitute final agency approval of the project. A dredging plan for this project must be completed as part of the final project approval process. A final decision will be made after full consideration of agency input, and after an alternative analysis is done under Section 404(b)(1) of the Clean Water Act.

Concur:

7/24/00
Date

Lauran Cole Warner, Seattle District Corps of Engineers

August 1, 2000
Date

Justine Barton, Environmental Protection Agency

1 Aug 00
Date

Rick Vining, Washington Department of Ecology

25 JUL 00
Date

Ted Benson, Washington Department of Natural Resources

Copied furnished:
Lummi Tribe
George Hart, Corps
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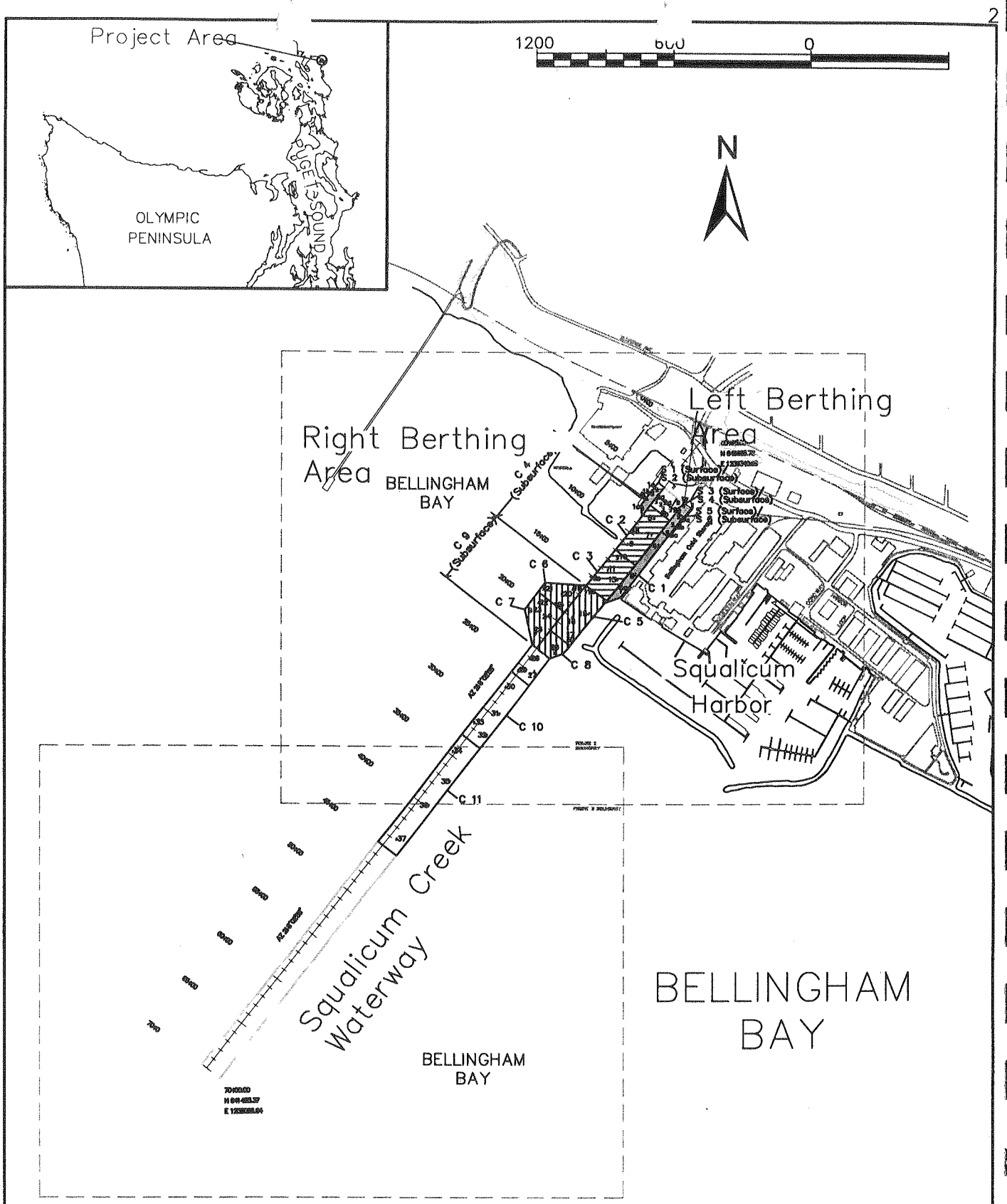
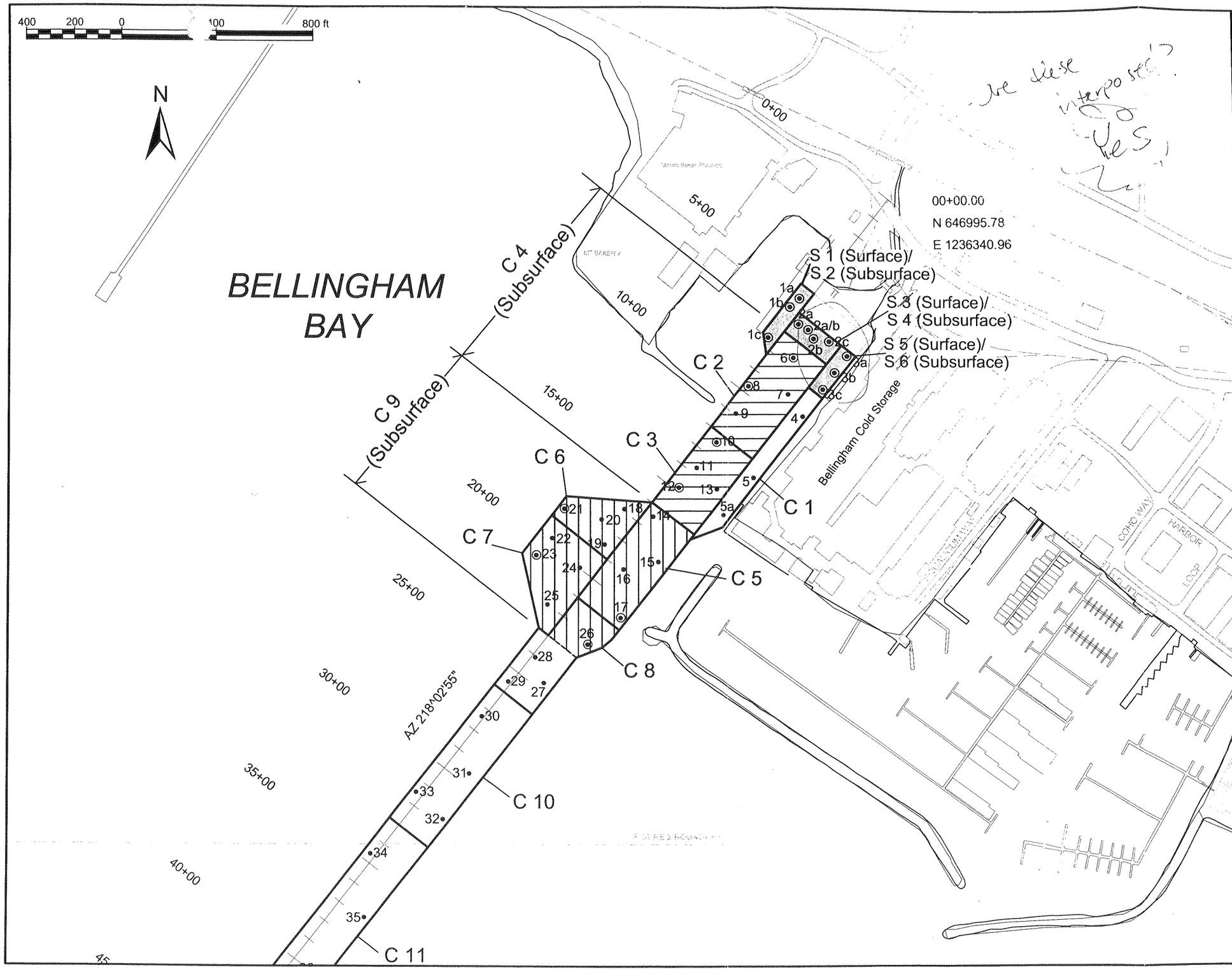
Rick Vining, Ecology
Justine Barton, EPA
Ted Benson, DNR
Doug Thomas, Bellingham Cold Storage
Mike Stoner, Port of Bellingham
Muffy Walker, Corps
DMMO file



STRIPLIN Environmental Associates	FIGURE: 1 Squalicum Creek Waterway Navigation Channel Location Map	Squalicum Creek Waterway May 2000 FILE: C:\GIS\SQUALICUM_HARBOR\FIGURES\Figures.DWG



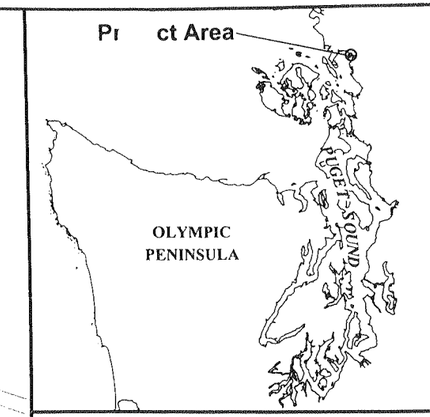


FIGURE: 2

Actual DMMUs and Sampling Locations at the Head of Squalicum Creek Waterway

NOTES

1. HORIZONTAL CONTROLE BASED ON LAMBERT GRID PROJECTION FOR WASHINGTON NORTH ZONE, NAD 83/91
2. BASE MAP PREPARED FROM AERIAL PHOTOGRAPHY FLOWN 19 APR 1993, BY SURVEY BRANCH, SEATTLE DISTRICT, CORPS OF ENGINEERS.
3. BATHYMETRY PROVIDED BY SEATLE DISTRICT, CORPS OF ENGINEERS, AUGUST 1999
4. FILE: C:\GIS\SQUALICUM_HARBOR\FIGURES\FIGURES.DWG, APRIL 2000

LEGEND

- • Surface (0-4ft) Sediment Sampling Station
- ○ Subsurface (>4ft) Sediment Sampling Station
- Subsurface Composite C4
- Subsurface Composite C9
- High-ranked Sediment

All Other Sediments are Moderate-ranked

Squalicum Creek Waterway

August 2000

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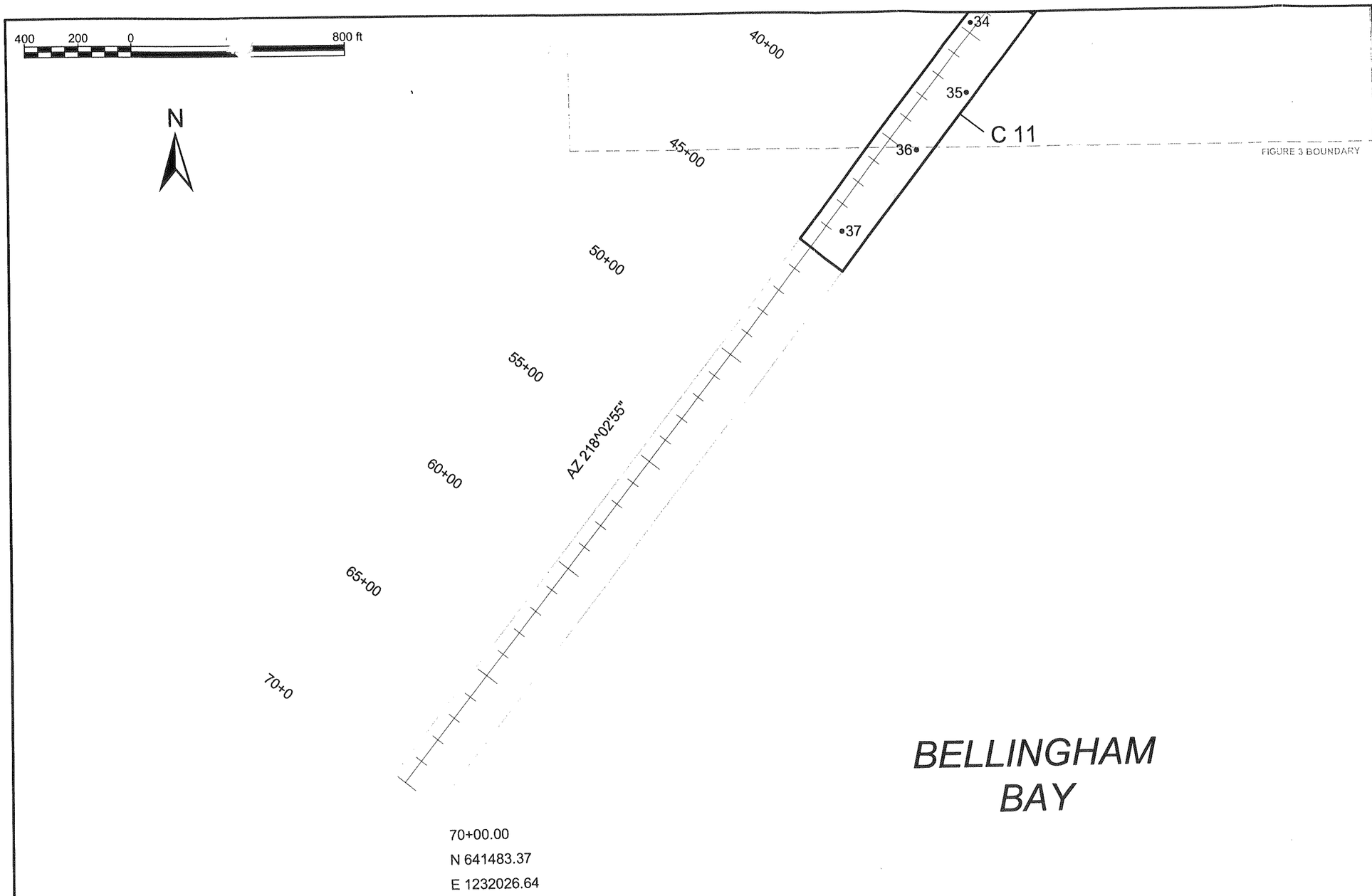

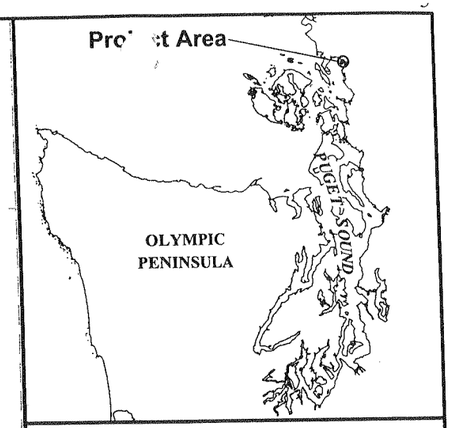

FIGURE: 3

Actual DMMUs and Sampling Locations at the Mouth of Squalicum Creek Waterway

NOTES

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LEGEND

- • Surface (0-4ft) Sediment Sampling Station
- ○ Subsurface (>4ft) Sediment Sampling Station

Sediments are Moderate-ranked

Squalicum Creek Waterway

August 2000

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