CENWS-OD-TS-DM

MEMORANDUM FOR RECORD 30 July 1998

SUBJECT: DETERMINATION ON THE SUITABILITY OF MAINTENANCE MATERIAL DREDGED FROM THE INNER CHANNEL OF GRAYS HARBOR OPERATION AND MAINTENANCE DREDGING PROJECT (PN: CENPS-OP-NP-97 DATED 18 OCTOBER 1996) IN GRAYS HARBOR, WASHINGTON EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT (CWA) FOR OPEN-WATER DISPOSAL AT EITHER THE POINT CHEHALIS OR THE SOUTH JETTY ESTUARINE OPEN WATER DISPOSAL SITES.

1. The following summary reflects the consensus determination of the Agencies' (U.S. Army Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency) with jurisdiction on dredging and disposal on the suitability of the estimated 2,120,000 cubic yards of material scheduled for maintenance dredging, to restore the authorized navigation depths to -32 feet (MLLW) for the federally maintained inner channel, Grays Harbor, Washington. The material will be disposed at either the South Jetty or Point Chehalis estuarine disposal sites. The determination of suitability is based on the acceptability of the sampling plan and all relevant test data contained in THE July 7, 1998 SAIC Data Summary Report.

2. The Agencies' approved sampling and analysis plan for testing the inner harbor dredging area was followed, and quality assurance/quality control guidelines specified by the Grays Harbor/Willapa Bay dredged material management plan sampling and testing guidelines, were generally complied with. The data gathered were deemed sufficient and acceptable for decision making by the Agencies based on best professional judgment.

Table 1. Regulatory Tracking Dates

SAP Approval date:	April 1, 1998
Sampling date(s):	April 29, 1998
Data report submittal date:	July 7, 1998
Recency Determination Date: Low Concern (6 years)	April 2004

3. Previous testing in 1992, 1994, and 1996 from eight, nine, and nine composited analyses, respectively stratified within shoaled areas from all five inner channel reaches in 1992, from three of the five reaches (excluding Elliott Slough Turning basin and Crossover) in 1994, and three of the five in 1996 (excluding North Channel and Hoquiam Reaches), all showed the O&M material to be suitable for unconfined open-water disposal. Chemical testing data from the 1992 analyses showed that only two of the eight DMMU had minor detected chemical exceedances of PSDDA screening level (SL) guidelines (1992 SDM), whereas none of the nine DMMU in either 1994 and 1996 had any detected or undetected exceedances of screening levels for chemicals of concern.

Table 2. Summary of Sampling and Compositing, Dredging and Disposal Alternatives within each Inner Channel Reach for the Grays Harbor O&M Project[1].

Channel Reach	Estimated Volume (cubic yards)	Samples no. ID[1]	Composite ID	Dredge Method / Disposal Alternative
Bar	250,000	none	no test[2]	Government Hopper / South Beach berm/3.9 mile ocean site
Entrance	150,000	none	no test[2]	Government Hopper / Halfmoon Bay berm or gully, South Jetty
Inner South Reach	150,000	none	no test[2]	Clam Shell / Pt. Chehalis
Outer South Reach	250,000	none	no test[2]	Clam Shell / Beach fill
Crossover	150,000 (total: 300,000)	7-25	C3, C4, C5 (½ tested in 1996)	Clam Shell / Pt. Chehalis
North Channel	200,000	not sampled	not sampled (tested in 1994)	Clam Shell / South Jetty, Pt. Chehalis
Hoquiam	100,000	not sampled	not sampled (tested in 1994)	Clam Shell / South Jetty, Pt. Chehalis
Cow Point	650,000	not sampled	not sampled (½ tested in 1994 ½ tested in 1996)	Clam Shell / South Jetty, Pt. Chehalis
Elliott Slough / Turning Basin	70,000	not sampled	not sampled (tested in 1996)	Clam Shell / South Jetty, Pt. Chehalis
Upstream widening and Deepening	55,000	26-32	C6	Clam Shell / South Jetty, Pt. Chehalis
TOTALS	2,120,000	26	4	

3. The 1998 sampling and compositing strategy (Table 2) consisted of targeting shoaled upstream areas within each of the dredging areas excluding areas previously sampled during 1994 and 1996 consistent with the approach outlined in the 1995 Grays Harbor/Willapa Bay dredged material management plan. The sampling targeted the remainder of the uncharacterized dredged material remaining from the 1994 and 1996 characterizations (150,000 cy), thereby completing the federal project characterization within all five reaches (See Figure 1). Additionally, material in the entrance to the Westport Marina (22,700 cy, testing results are summarized in a separate suitability determination) and material from the upstream widening and deepening (55,000 cy) were characterized as part of this sampling effort. A total dredging volume of 2.12 million cubic yards is estimated when including the material from the bar, entrance channel, and inner and outer reaches.

4. Table 3 summarizes the sediment conventional parameters for the four surface analyses conducted. Chemical analysis of the composited samples indicated that there were not detected or undetected exceedances of screening levels for all 56 chemicals of concern. Grays Harbor SL's are used to establish a concern for biological effects, where chemicals below the

[1] Note that results of federal testing (grab samples 1 -6, composited into C1 and C2) conducted at the Westport Marina entrance were summarized in a separate suitability determination dated 8 July 1998.
[2] Meets exclusionary criteria outlined in 40 CFR230.60(a),(b),(c), and (d) of the Clean Water Act (CWA).

SL have a low level of concern. In addition to the 56 chemicals of concern routinely analyzed under the Grays Harbor/Willapa Bay DMMP (dredged material management plan), congeners of dioxin including 2,3,7,8-TCDD were also quantified.

Table 3. Sediment Conventional Parameters for all four dredged material management units and reference sediment.

Parameter	Upstream Widening and Deepening	Crossover Reach			Reference GHS7-10
	C6 55,000 cy	C5 50,000 cy	C4 50,000 cy	C3 50,000 cy	
Grain Size:					
% Gravel	4.5	0.3	0.1	0.9	<0.1
% Sand	90.2	83.4	90.0	91.0	86.9
% Silt	1.3	8.0	4.2	1.7	7.5
% Clay	4.0	7.9	5.6	6.2	5.6
% Fines	5.3	15.9	9.8	7.9	13.1
Total Solids, %	75.8	66.9	70.6	64.1	72.6
Volatile Solids, %	2.7	3.2	2.6	2.8	2.8
Total Organic Carbon, %	0.4	0.7	0.4	0.7	0.36
Total Sulfides, mg/kg	<13	<15	<14	<16	<14
Total Ammonia, mg/kg	3.2	7.6	4.6	6.6	2.7

5. Four composited sediment samples were also analyzed for dioxins by Maxim Technologies, Incorporated utilizing EPA method 8290. These data are summarized in Table 4. Results indicated that 2,3,7,8 TCDD (Tetrachloro-Dibenzo-p-Dioxin) was detected in only one of the four samples and was quantitated at 0.13 pptr (parts per trillion). This congener is regarded by the EPA as the most toxic form of dioxin. A few other less toxic dioxin congeners were detected at low parts per trillion concentrations. In the following table, the toxicity equivalence in terms of 2,3,7,8-TCDD is shown for the nine most toxic congeners of furan and dioxin (undetected congeners were summed at ½ the detection).

Table 4. Native congeners of Dioxin quantitated in Grays Harbor O&M sediments.

NATIVE CONGENERS[3] (pptr)	TEF[4]	C3 (TEC)	C4 (TEC)	C5 (TEC)	C6 (TEC)
2,3,7,8-TCDD	1	0.13 (0.13)	0.56u (0.28)	0.34u (0.17)	0.29u (0.15)
1,2,3,7,8-PeCDD	0.5	0.25 (0.13)	0.22 (011)	0.27 (0.14)	0.14 (0.07)
1,2,3,7,8-HxCDD	0.1	0.94 (0.09)	0.95 (0.09)	0.86 (0.09)	0.88 (0.09)
1,2,3,4,7,8-HpCDD	0.01	22.4 (0.22)	10.5 (0.11)	9.1 (0.09)	6.9 (0.07)
OCDD	0.001	78 (0.08)	25 (0.03)	16 (0.02)	13 (0.01)
2,3,7,8-TCDF	0.1	0.37 (0.04)	0.3 (0.03)	0.24 (0.02)	0.34 (0.03)
1,2,3,7,8-PeCDF	0.05	0.18 (0.01)	0.12 (0.01)	0.22 (0.01)	0.09 (0.005)
2,3,4,7,8-PeCDF	0.5	0.07 (0.04)	0.13 (0.07)	0.17 (0.09)	0.08 (0.04)
1,2,3,7,8-HxCDF	0.1	0.91 (0.09)	1.22 (0.12)	1.17 (0.12)	0.82 (0.08)
1,2,3,7,8-HpCDF	0.01	1.22 (0.01)	1.29 (0.01)	1.05 (0.01)	0.82 (0.01)
OCDF	0.001	2.1 (0.002)	1.9 (0.002)	1.3 (0.001)	0.87 <0.00
TOTALS:		0.842	0.862	0.761	0.555

[3] TCDD = Tetrachlorodibenzodioxin; TCDF = Tetrachlorodibenzofuran
PeCDD = Pentachlorodibenzodioxin; PeCDF = Pentachlorodibenzofuran
HxCDD = Hexachlorodibenzodioxin; HxCDF = Hexachlorodibenzofuran
HpCDD = Heptachlorodibenzodioxin; HpCDF = Heptachlorodibenzofuran
OCDD = Octachlorodibenzodioxin; OCDF = Octachlorodibenzofuran

[4] Toxicity Equivalent Factor (TEF's summed for each congener expressed in parenthesis)

6. One way to summarize potential toxicity for mammals is to calculate the toxicity equivalent concentrations (TEC) measured in tissue. Total TEC is calculated by multiplying the toxicity equivalent factor (TEF) by the congener specific concentration and summing the TEC's for all congeners. Total TEC comparisons are usually used for food ingestion, and have limited applicability to sediment because TEC **does not** consider the relative bioavailability of the congeners. Accordingly, TEC overstates toxicity to mammals when applied to sediments. TEC as a toxicity measure does not apply to fish, shellfish or birds. For comparison purposes only, the TEC's ranged from a low of 0.55 to a high of 0.86 pptr.

7. Based on the Agencies' present best professional judgment, these low concentrations are unlikely to be environmentally harmful for this project. The Agencies' consensus is that the material is suitable for either estuarine or ocean unconfined open-water disposal relative to these dioxin test results.

8. Safety net biological testing to confirm lack of toxicity for the federal O&M sediments were conducted randomly on two of the samples (Crossover Reach: C5; and Upstream Widening and Deepening: C6). The two DMMU, C5 and C6 underwent biological testing after chemical analyses were completed and reviewed by the Agencies. Chemical analyses for these two DMMU showed no chemical guideline exceedances, and the two DMMU were selected by the Dredged Material Management Office in consultation with the Agencies.

9. The performance standards and interpretation guidelines specified for Grays Harbor and Willapa Harbor were used to evaluate the bioassay data collected (Table 5). Reference sediments were collected from an approved Grays Harbor reference site at Station GHS7, to match the grain sizes of the two samples (see Tables 2 and 6). Both control sediments and reference sediments met the performance standards for all three bioassays conducted.

10. The results of these analyses are summarized in Table 6 below. The results showed that for the two DMMU tested, biological testing results passed Grays Harbor disposal site interpretation guidelines for dispersive sites for the amphipod, echinoderm sediment larval, and the *Neanthes* 20-day growth tests. Based on the results of these biological tests, these two DMMU passed Grays Harbor open-water disposal guidelines.

Table 5(a). SOLID PHASE BIOASSAY PERFORMANCE STANDARDS

PARAMETER	AMPHIPOD BIOASSAY	SEDIMENT LARVAL BIOASSAY	*NEANTHES* 20-DAY GROWTH TEST
Negative control performance	Mortality $\leq$ 10 %	CMA[1] $\leq$ 30 %	Mortality $\leq$ 10 % Growth rate[3] $\geq$ 0.38
Reference sediment performance	Reference mortality minus control mortality $\leq$ 20 %	NCMA[2] $\leq$ 35 %	Mean individual growth rate[3] $\geq$ 80 % of control

[1] Combined mortality and abnormality.

[2] Normalized combined mortality and abnormality (see text).

[3] Expressed as mg/individual-day (dry weight); $\geq$ 0.72 as a performance target.

Table 5(b). SOLID PHASE BIOASSAY INTERPRETIVE GUIDELINES FOR SINGLE-HIT FAILURES [1]

INTERPRETIVE COMPARISON	AMPHIPOD BIOASSAY	SEDIMENT LARVAL BIOASSAY	*NEANTHES* 20-DAY GROWTH TEST
Test response comparison to negative control	Test sediment mortality minus control mortality > 20 %	Test sediment NCMA > 20 %	Mean test sediment individual growth rate < 80 % of mean control individual growth rate
Test response comparison to reference sediment	Test sediment mortality minus reference mortality > 10 %	Test sediment NCMA minus reference NCMA > 15 %	Mean test sediment individual growth rate < 70 % of reference
Statistical comparison to reference sediment	Statistical significance ($p < 0.05$)	Statistical significance ($p < 0.10$)	Statistical significance ($p < 0.05$)

[1] Test sediment responses which are less than the interpretative criteria shown in Table 10-2 for a "single-hit" failure, but exhibit a response greater than 20% over the control, and are significantly different from the reference sediment are interpreted as a "two-hit" response, requiring another "hit" (single or double) to judge a DMMU unsuitable for unconfined open-water disposal.

Table 6. Biological Testing Summary.

STATION	Amphipod (Rhepoxynius sp.) Mortality (%) (species ID)	Echinoderm Larval (Dendraster sp.) (NCMA)[5] %	20-day *Neanthes* Growth		
			Survival (%)	Growth (mg/ind/day, dry wgt.)	Growth % of reference
Control	7.0 ± 5.7	0.0 ± 26.5	100	0.50 mg, initial wgt 0.65 + 0.17	94.2 %
GHS7-10 Reference (13.1 % fines)	5.0 ± 3.5	29.8 ± 19.6	92	0.69 ± 0.22	--
C5 (15.9 % fines)	8.0 ± 4.5	44.4 ± 29.3	100	0.60 ± 0.10	86.9 %
C6 (5.3 % fines)	10.0 ± 7.9	27.3 ± 18.1	96	0.70 ± 0.16	101.4 %
Reference toxicant	1.08 mg/L Cd (96 hr LC50)	4.96mg/L Cd (EC50)	7.18 mg/L Cd (96 hr LC50)		
Lab control limits:	0.0 - 2.84 mg/L	5.1 - 12.6 mg/L	1.9 - 15.0 mg/L		

[5] NCMA = normalized combined mortality and abnormality

11. Based on the chemistry and biological testing results described above no bioassay or bioaccumulation testing were required for the remaining two DMMU.

12. The Agencies concluded based on the above discussion and summary of sediment chemical and biological characterization results for the inner harbor of the Grays Harbor Operations and Maintenance Project, that the total dredging volume of 2,120,000 cubic yards, including the 205,000 cubic yards tested is suitable for disposal at either the South Jetty or Point Chehalis estuarine disposal sites.

Concur:

7 Aug 98
Date

Lauren Cole-Warner, Seattle District Corps of Engineers

6 Aug 98
Date

David Kendall, Ph.D., Seattle District Corps of Engineers

8/6/98
Date

Justine Barton, Environmental Protection Agency

8/6/98
Date

for Rick Vining, Washington Department of Ecology

6 AUG 98
Date

Ted Benson, Washington Department of Natural Resources

Copies Furnished:
Alex Sumeri, Corps
Lauren Cole-Warner, Corps
Rick Vining, Ecology
Ted Benson, DNR
Justine Barton, EPA
DMMO file

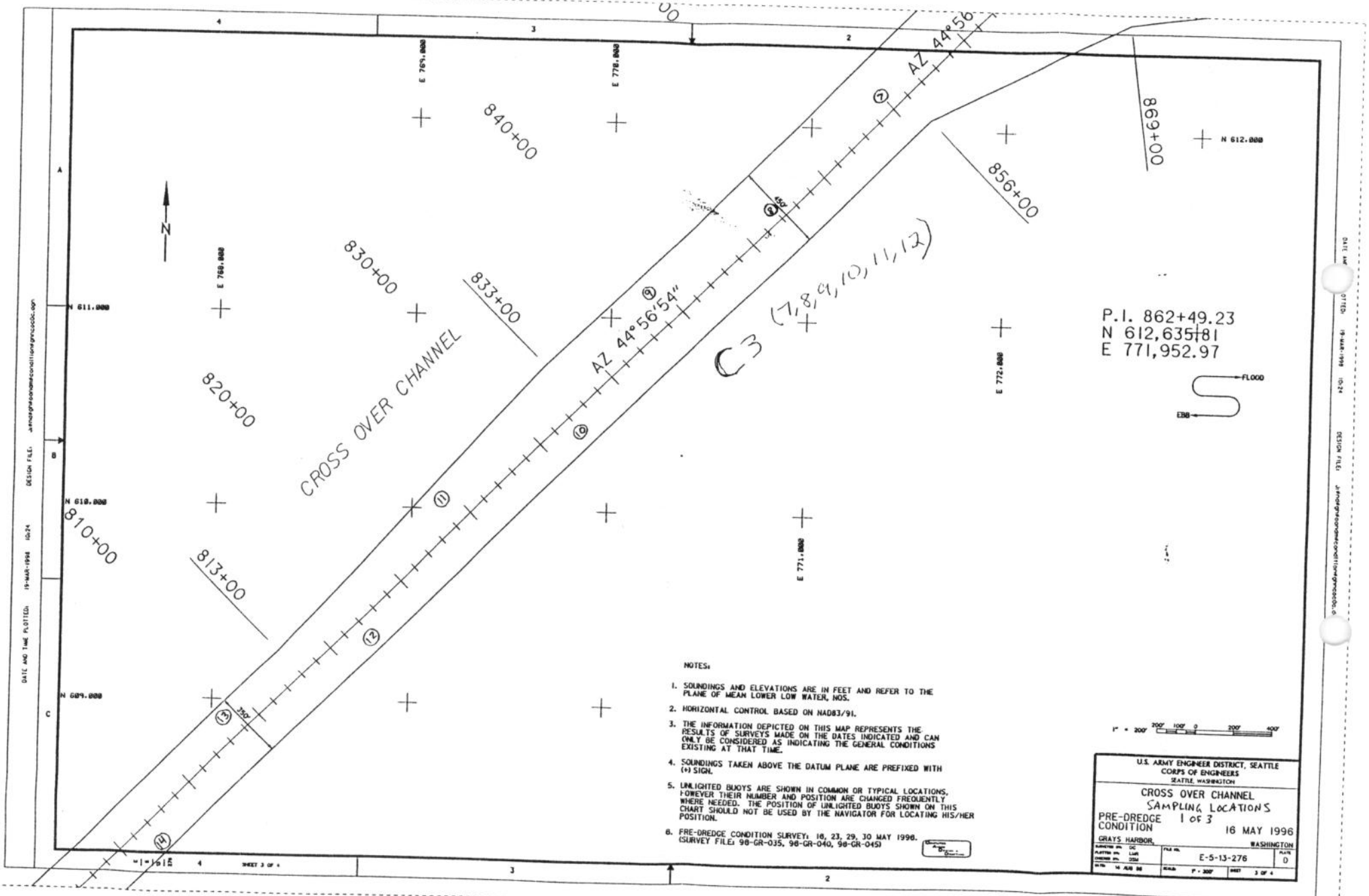

AZ 44°56'54"
CROSS OVER CHANNEL
AZ 44°56'54"
C3 (7,8,9,10,11,12)
840+00
830+00
833+00
820+00
810+00
813+00
856+00
869+00
N 612.000
N 611.000
N 610.000
N 609.000
E 769.000
E 770.000
E 768.000
E 772.000
E 771.000
P.I. 862+49.23
N 612,635.81
E 771,952.97
FLOOD
EBB
N
1" = 200'
200' 100' 0 200' 400'
NOTES:
1. SOUNDINGS AND ELEVATIONS ARE IN FEET AND REFER TO THE PLANE OF MEAN LOWER LOW WATER, NOS.
2. HORIZONTAL CONTROL BASED ON NAD83/91.
3. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
4. SOUNDINGS TAKEN ABOVE THE DATUM PLANE ARE PREFIXED WITH (+) SIGN.
5. UNLIGHTED BUOYS ARE SHOWN IN COMMON OR TYPICAL LOCATIONS, HOWEVER THEIR NUMBER AND POSITION ARE CHANGED FREQUENTLY WHERE NEEDED. THE POSITION OF UNLIGHTED BUOYS SHOWN ON THIS CHART SHOULD NOT BE USED BY THE NAVIGATOR FOR LOCATING HIS/HER POSITION.
6. PRE-DREDGE CONDITION SURVEY: 18, 23, 29, 30 MAY 1996. (SURVEY FILE: 96-GR-035, 96-GR-040, 96-GR-045)
U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON
CROSS OVER CHANNEL
SAMPLING LOCATIONS
PRE-DREDGE CONDITION 1 OF 3
16 MAY 1996
GRAYS HARBOR, WASHINGTON
E-5-13-276
D
SHEET 3 OF 4

Figure 1(a)

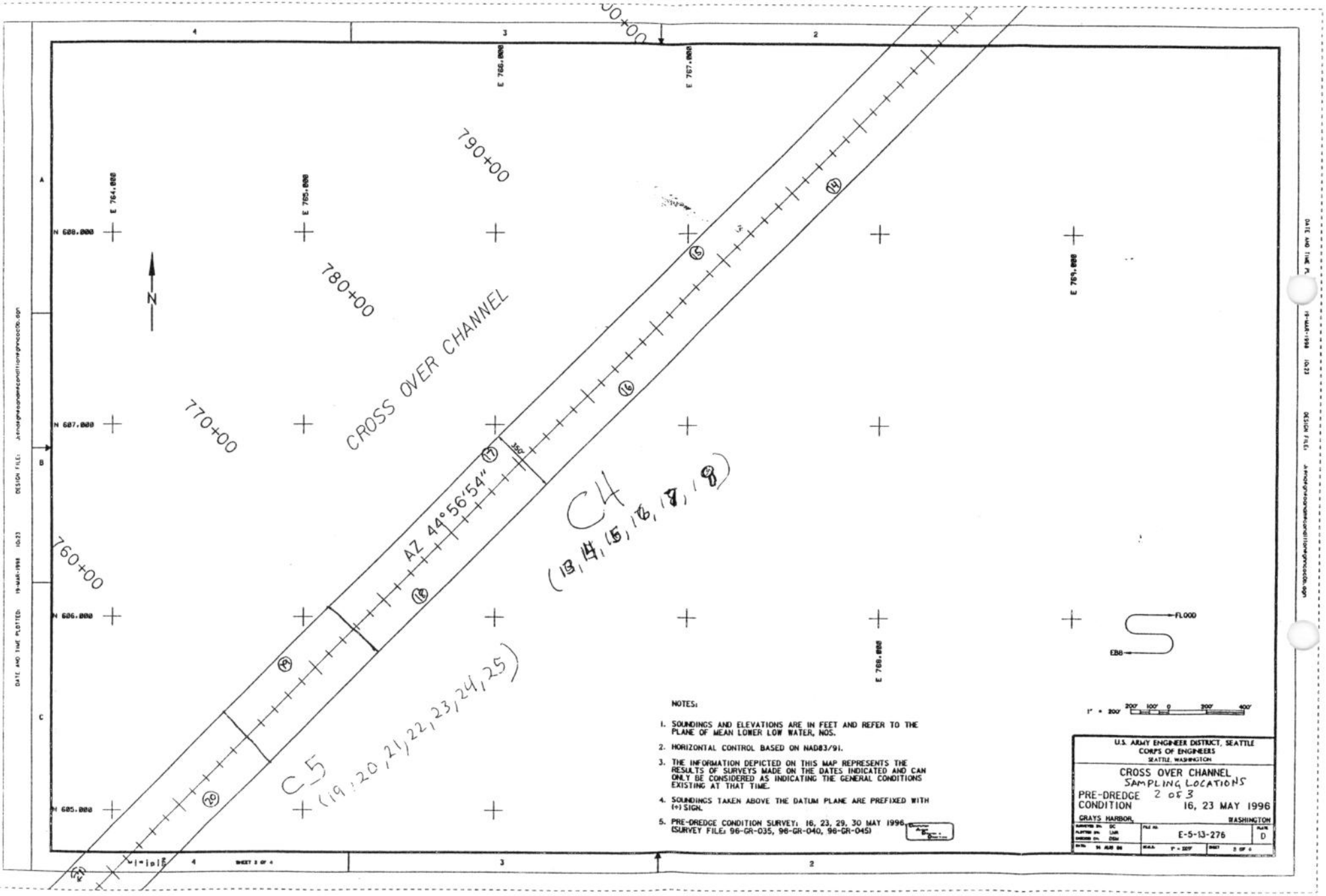
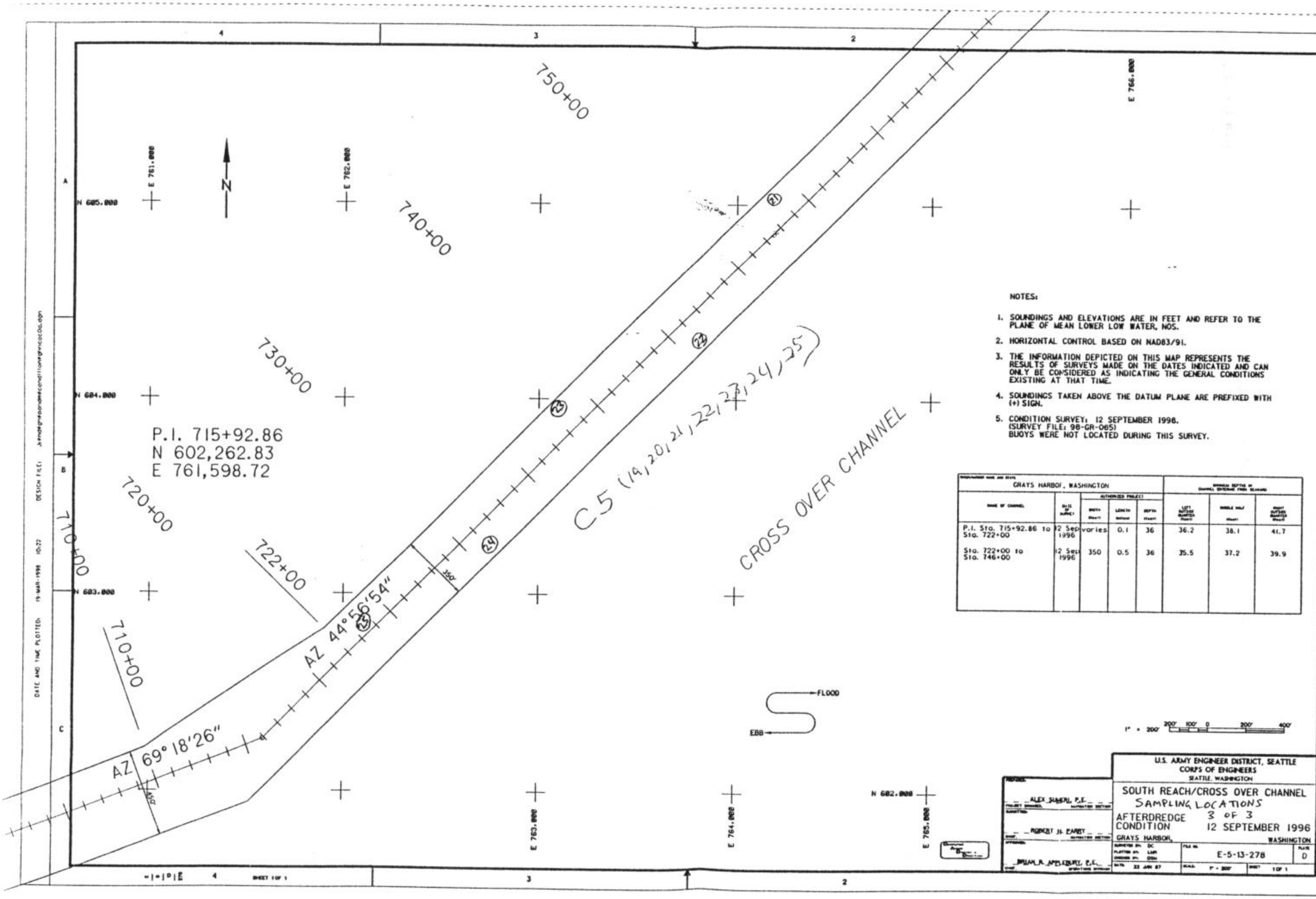

790+00
780+00
770+00
760+00
CROSS OVER CHANNEL
AZ 44°56'54"
350'
C4
(13, 14, 15, 16, 17, 18)
C5
(19, 20, 21, 22, 23, 24, 25)
E 764.000
E 765.000
E 766.000
E 767.000
E 768.000
E 769.000
N 608.000
N 607.000
N 606.000
N 605.000
FLOOD
EBB
NOTES:
1. SOUNDINGS AND ELEVATIONS ARE IN FEET AND REFER TO THE PLANE OF MEAN LOWER LOW WATER, NOS.
2. HORIZONTAL CONTROL BASED ON NAD83/91.
3. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
4. SOUNDINGS TAKEN ABOVE THE DATUM PLANE ARE PREFIXED WITH (+) SIGN.
5. PRE-DREDGE CONDITION SURVEY: 16, 23, 29, 30 MAY 1996 (SURVEY FILE: 96-GR-035, 96-GR-040, 96-GR-045)
1" = 200'
200' 100' 0 200' 400'
U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON
CROSS OVER CHANNEL
SAMPLING LOCATIONS
PRE-DREDGE CONDITION
2 of 3
16, 23 MAY 1996
GRAYS HARBOR, WASHINGTON
E-5-13-276
D

Figure 1(b)



NOTES:

1. SOUNDINGS AND ELEVATIONS ARE IN FEET AND REFER TO THE PLANE OF MEAN LOWER LOW WATER, NOS.
2. HORIZONTAL CONTROL BASED ON NAD83/91.
3. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
4. SOUNDINGS TAKEN ABOVE THE DATUM PLANE ARE PREFIXED WITH (+) SIGN.
5. CONDITION SURVEY: 12 SEPTEMBER 1996.
(SURVEY FILE: 96-GR-065)
BUOYS WERE NOT LOCATED DURING THIS SURVEY.

GRAYS HARBOF, WASHINGTON

[illegible]	[illegible]	AUTHORIZED PROJECT			[illegible]		
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
P.I. Sta. 715+92.86 to Sta. 722+00	12 Sep 1996	varies	0.1	36	36.2	38.1	41.7
Sta. 722+00 to Sta. 746+00	12 Sep 1996	350	0.5	36	35.5	37.2	39.9

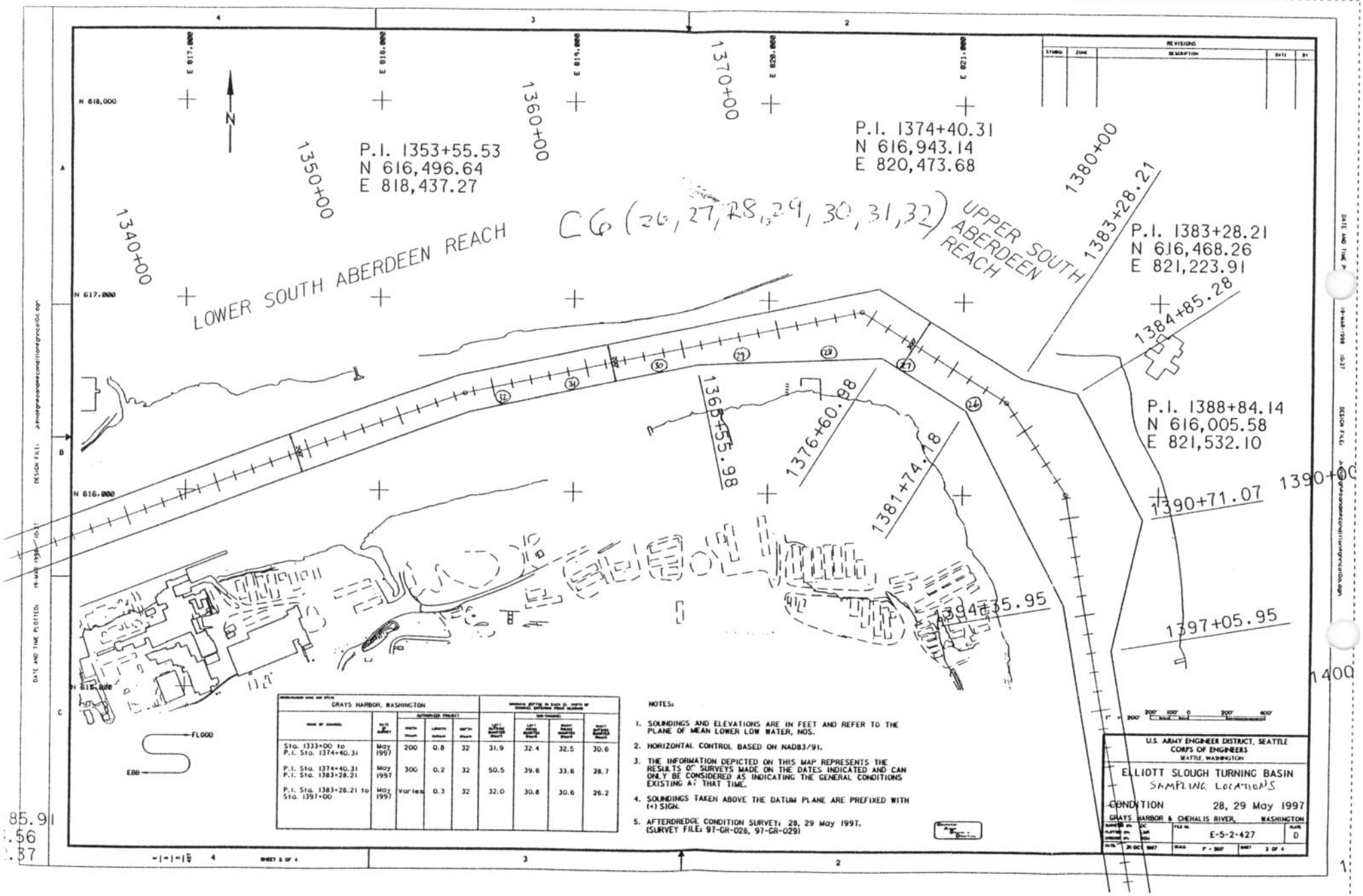
U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

SOUTH REACH/CROSS OVER CHANNEL
SAMPLING LOCATIONS
AFTERDREDGE CONDITION 3 OF 3
12 SEPTEMBER 1996
GRAYS HARBOR, WASHINGTON

ALEX SUMERI, P.E.
ROBERT J. PARRY
WILLIAM R. APPLEBURY, P.E.

SURVEYED BY: DC
PLOTTED BY: LMR
CHECKED BY: DSM
FILE NO. E-5-13-278
PLATE D
SCALE 1" = 200'
SHEET 1 OF 1

Figure 1(c)



GRAYS HARBOR, WASHINGTON								
		AUTHORIZED PROJECT						
						NON-CHANNEL		
REACH OF CHANNEL	DATE SURVEY	WIDTH (Feet)	LENGTH (Miles)	DEPTH (Feet)	LEFT HAND (Feet)	LEFT HAND (Feet)	RIGHT HAND (Feet)	RIGHT HAND (Feet)
Sta. 1333+00 to P.I. Sta. 1374+40.31	May 1997	200	0.8	32	31.9	32.4	32.5	30.6
P.I. Sta. 1374+40.31 P.I. Sta. 1383+28.21	May 1997	300	0.2	32	50.5	39.6	33.6	28.7
P.I. Sta. 1383+28.21 to Sta. 1397+00	May 1997	Varies	0.3	32	32.0	30.8	30.6	26.2

NOTES:

1. SOUNDINGS AND ELEVATIONS ARE IN FEET AND REFER TO THE PLANE OF MEAN LOWER LOW WATER, NOS.
2. HORIZONTAL CONTROL BASED ON NAD83/91.
3. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
4. SOUNDINGS TAKEN ABOVE THE DATUM PLANE ARE PREFIXED WITH (+) SIGN.
5. AFTERDREDGE CONDITION SURVEY: 28, 29 May 1997. (SURVEY FILE: 97-GR-028, 97-GR-029)

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

ELLIOTT SLOUGH TURNING BASIN
SAMPLING LOCATIONS

CONDITION 28, 29 May 1997

GRAYS HARBOR & CHEHALIS RIVER, WASHINGTON

E-5-2-427

Figure 1 (a)