.PARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-2255

REPLY TO
ATTENTION OF
Operations Division
Dredged Material Management Office

August 19, 1993

Betsy Striplin
Striplin Environmental Associates
6541 Sexton Dr. NW, Suite E1
Olympia, WA 98502

Reference: 199300020
Konoike-Pacific Tacoma Terminals, Inc.

Dear Ms. Striplin:

The purpose of this letter is to advise you of additional sampling and analyses that will have to be accomplished to complete the PSDDA data submittal requirements for the Konoike-Pacific Tacoma Terminals, Inc. dredging project on Blair Waterway. Data currently submitted for two of the three dredged material management units tested are insufficient to make a suitability determination. The following data quality issues were discovered after reviewing the data report submitted, and will have to be corrected to evaluate dredged material suitability for unconfined open-water disposal (UCOWD). The absence of these data would result in all three management units being judged unsuitable for UCOWD.

1. The PSDDA convention for summing total LPAH, HPAH, DDT, and PCB is as follows. Only detected values are summed for a total value. If all values (e.g., aroclors) are undetected, the highest detection limit is reported for the total. In the data summary for the three DMMU's tested, this convention was not followed. The corrected totals are depicted in table below.

CHEMICAL	DMMU-1	DMMU-2	DMMU-3
Total LPAH (ppb)	1060 (1114)[1]	414 (452)	4208[2]
Total DDT (ppb)	1.8 u (3.45 u)	3.9 (6.9 u)	19 u (35.7 u)
Total PCB (ppb)	95 (< 168.8)	240 (< 321)	4700 (< 5535)
Total PCB (ppm,TOC norm)	26.3 (<46.9)[3]	24.5 (< 32.7)	293.7 (345.9)

[1]/ values in parenthesis indicate summed values in report.
[2]/ no change
[3]/ TOC value = 0.36%

The corrected total PCB for DMMU-1 drops it under the PSDDA SL of 130 ppb, and more importantly under the PSDDA bioaccumulation trigger (BT) of 38 ppm (TOC normalized). The PSDDA program recommends use of best professional judgement when interpreting TOC normalized PCB data, when TOC values are less than 0.5% (see enclosure 1, Section 2a extracted from January 1991 DMEAR Report, especially page 41, first paragraph, fourth sentence). DMMU-1 has several SL exceedances for a number of LPAH's (Phenanthrene, Anthracene, and Total LPAH) and HPAH's (Fluoranthene, Pyrene, Benzo(a)anthracene, Benzofluoroanthene, Indeno(g,h,i,)pyrene, and Total HPAH), which would require normal PSDDA bioassay testing to assess the suitability of the material for UCOWD. No biological testing has been conducted on this DMMU to date.

2. Biological testing for DMMU-2 showed that two of the four bioassay results were acceptable for regulatory decisionmaking. The *Neanthes* 20-day biomass results were acceptable, and passed PSDDA nondispersive interpretive guidelines. The saline microtox test showed light enhancement, which cannot be interpreted by the PSDDA program, but is generally considered to be a nontoxic response. There was a problem with the gradual failure of the luminescence detector during the microtox test, although the results are still considered acceptable for decisionmaking.

3. Biological testing conducted on DMMU-2 demonstrated significant performance problems for the amphipod (*Ampelisca abdita*) and sediment larval (*Strogylocentrotus purpuratus*) bioassays, which are discussed below. The amphipod bioassay results failed the negative control performance standard (10% mortality) and the reference sediment performance standard (≤ 20% mortality over control sediment) at 18% mortality and 85% mortality, respectively. Because of these performance failures, the test results cannot be used in a PSDDA regulatory decision. The test termination protocol used for the sediment larval test followed the ASTM test termination method and not the PSDDA method. Applying PSDDA interpretation guidelines to the results by normalizing to the seawater control, the reference sediment fails to meet PSDDA performance limits (reference ≤ 20% over seawater control) at 58.4% mortality; and DMMU-2 test sediment showed 40.3% mortality relative to the seawater control. These results cannot be used in a PSDDA agency regulatory decision.

4. The PSDDA agencies determination relative to DMMU-1 and DMMU-2 are that biological testing is necessary to render a suitability determination on these two dredged material management units. PSDDA will require resampling of DMMU-1 to run the four mandated PSDDA bioassays, and resampling DMMU-2 to rerun the amphipod and sediment larval bioassays.

5. The chemical testing results for DMMU-3 confirm that this DMMU is not suitable for UCOWD with ML exceedances for Copper (1.2 X ML) and PCB (1.88 X ML).

6. Please call me at (206) 764-3768 if you have any questions.

Sincerely,

David R. Kendall, Ph.D.
Chief, Dredged Material Management Office

Enclosure

cc: Justine Barton, EPA
Desiree Turner/Gene Revelas, DNR
Pat Trerice, Ecology
DMMO File

IV. CONCLUSIONS AND RECOMMENDATIONS.

A. PSDDA Guideline Applications.

Projects tested during the 1990 dredging year covered by this report generally complied with PSDDA sampling and testing guidelines, which allow for best professional judgement in interpreting test data (EPTA, page II-106; Phase I MPR, pages A-17 and A-25).

1. Summary Comparison of 1989/1990 Applications.

In general, a comparison of the performance for chemistry and biological testing conducted showed that applicants/agents/laboratories have improved during the 1990 dredging year. The improvements in QA/QC performance between DY 1989 and 1990 were encouraging, and are expected to improve through ongoing coordination with dredgers/applicants and laboratories through workshops, and the annual review process. A workshop is scheduled for January 24, 1991 with chemistry laboratory chemists to discuss detection limit problems and QA/QC requirements relative to the PSDDA program. The PSDDA User Manual is expected to be in a draft-final form in January 1991 and will be made readily available to dredgers/applicants and laboratories conducting PSDDA testing.

2. Topics of Special Concern.

The following topics surfaced during the 1990 dredging year and are discussed below.

a. Bioaccumulation Trigger for PCB. With the finalization of the PSDDA study, a change to the total PCBs human health bioaccumulation trigger value specification was made that is described in the Phase II MPR, pages 5-14 through 5-16. The trigger value was increased from 1,789 ppb (dry weight sediment basis) to 38,000 ppb (dry weight, total organic carbon [TOC] basis).[4] As explained in the cited text, the change better characterizes the biological availability of the compounds in the aquatic environment, and is equivalent to the former value at about 70% solids (30% water) and 3% TOC in the sediment and a 3% lipid value in the organism.

The change did not affect any of the suitability decisions on projects during DY 90. What follows is a discussion that is not reflected in the summary tables and appendices because of the rules change. Several projects during this period, for which suitability decisions were made prior to rule change, would have exceeded the current bioaccumulation trigger due either to high detection/quantitation limits or to very low reported values of TOC. The discussion also suggests updates for the values used in the theoretical bioaccumulation calculation that could be used for a better specification.

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[4] Please note that the value in table A.8 on page A-27 of the Phase II MPR erroneously states 38 ppb, not 38,000 ppb. The correct value of 38 ppm (38,000 ppb) is given on page 5-16. A change page has been issued to correct the error.

encl 1.

The current SL for total PCBs is 130 ppb, and this is the required detection/quantitation limit specified by the PSDDA agencies in the Phase II MPR. According to the PSEP Recommended Protocols Guidelines, the achievable detection/quantitation limit for total PCBs is in the range of 10-50 ppb; and the precision of the TOC measurement is to the nearest 0.01g in a 50g minimum sample size, or 0.02+/-0.01%.

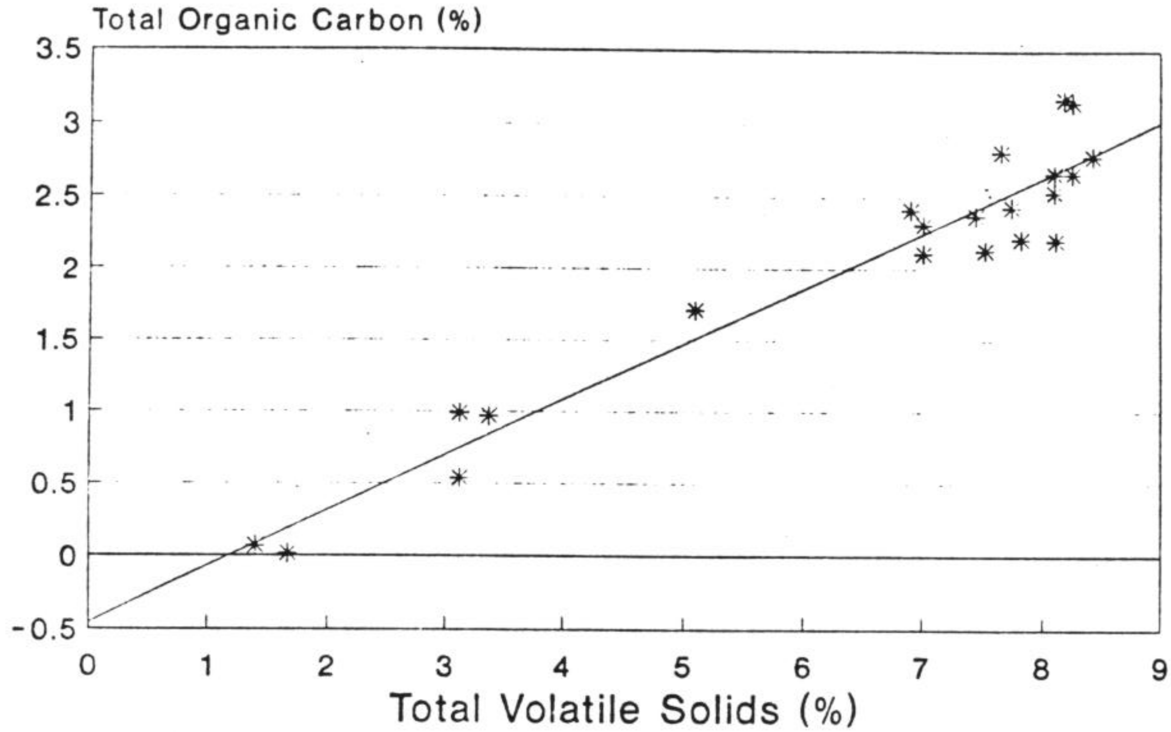
TABLE 12 indicates the samples that would have shown problems according to these specifications.

Sample--Composite	PCB,ppb	TOC,%	PCB/TOC	Problem
Duwamish--C1/1	9.6 U	0.013	73,846	Low TOC
METRO Emerg Byp C1/1	100 U	0.05	200,000	Low TOC, High U Value
METRO Emerg Byp C2/1	100 U	0.05	200,000	Low TOC, High U Value
METRO Emerg Byp S1/1	126	0.07	180,000	Low TOC
METRO Emerg Byp S2/1	200 U	0.08	250,000	Low TOC High U Value
METRO Emerg Byp S3/1	200 U	0.09	222,222	Low TOC, High U Value
METRO Emerg Byp S4/1	200 U	0.39	51,282	High U Value

The Duwamish O&M sample C1/1 showed an undetected value of 9.6 ppb (satisfactory according to the stated PSEP range) but a very low reported value of 0.0013% TOC. This value was determined to be reasonable but not significantly different from zero by linear least-squares regression of TOC on total volatile solids (Figure 8). Clearly, since division by zero is undefined and the TOC-normalized PCB value increases very rapidly as zero is approached, the theoretical model does not apply very well with very low TOC.

The Computerized Risk Assessment Bioaccumulation System (CRABS), an expert system authored by Henry Lee II and Bruce Boese, was consulted to discern whether the results of the calculation are reasonable. CRABS provides reasonable choices for the other required parameters depending on bioaccumulation organism selected, and compares bioaccumulation calculations to tissue values reported in the literature. In the present instance, Macoma nasuta, the bioaccumulation organism specified in PSDDA and recommended in the 1990 EPA/Corps "Draft Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters" was selected. Values from the literature for this species were used: an accumulation factor of 4 (more than twice the value of 1.72 used in the PSDDA Phase II MPR) and a lipid value of 5.5%, wet-weight basis. CRABS reported the resulting value of 15,990 ppb to be well out of range of the reported values (5,400 ppb is the 99th percentile reported in NOAA, 1988). Thus, there is further reason to believe that the model is not adequate at this low level of TOC.

Figure 8. Duwamish O&M Conventionals Regression of TOC on TVS

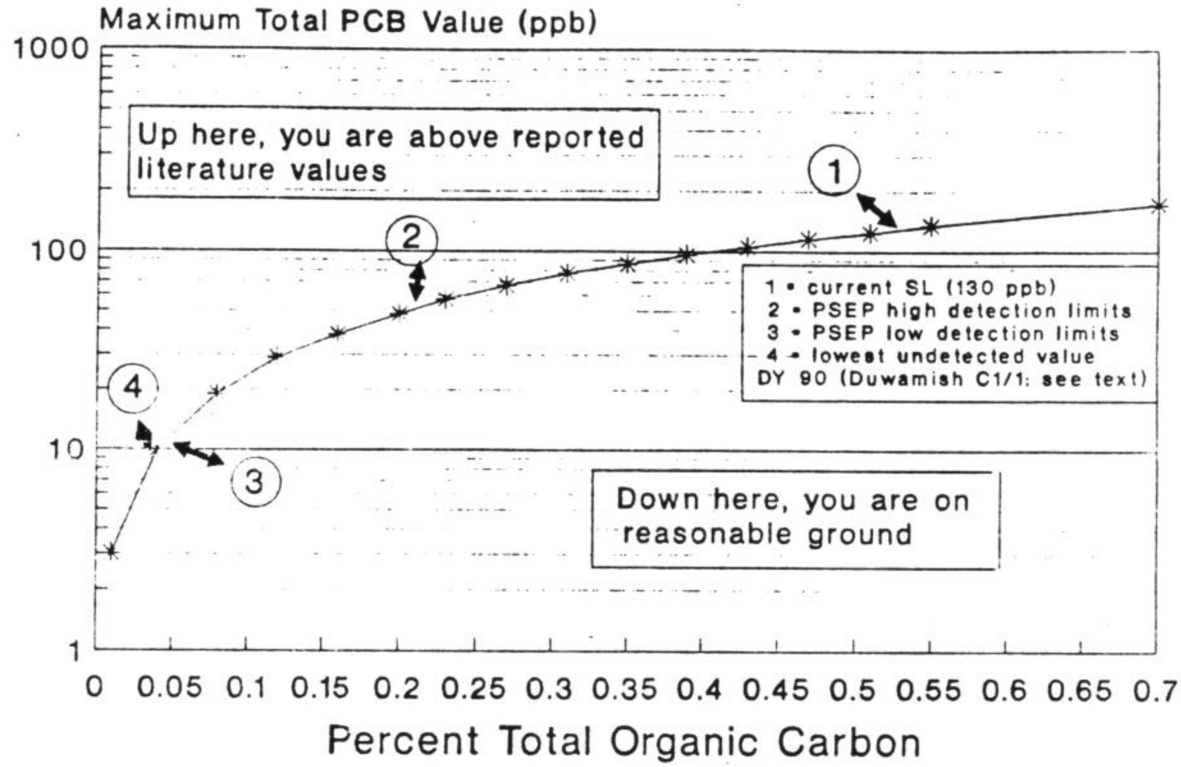


y = -0.446 + 0.38x
r = 0.961 (n = 21; p<.001)

All but one of the calculations reported above would be tagged as "out of range." Figure 9 shows a graphical solution of the greater-than-the-99th-percentile-out-of-range problem, with various values illustrated for comparison. The figure illustrates that theoretical bioaccumulation calculations are not reliable at low concentrations of TOC. Best professional judgement should be applied in determining whether the bioaccumulation trigger for PCB has been exceeded, when TOC levels are at 0.5% or lower. Careful consideration must be given to the interpretation difficulties that would result from doing bioaccumulation testing when TOC is low enough to produce unreasonable theoretical values (as compared to literature values). Also, calculations indicate (not shown on this graph), that the PSDDA total PCB SL of 130 ppb is higher than the PSDDA bioaccumulation trigger value at TOC values below about 0.18%. These TOC values are very low compared to the "average" Puget Sound value discussed in the Phase II MPR. Work is ongoing to determine the frequency that Puget Sound dredged sediments might fall into this low range. The PSDDA agencies should provide information to prospective dredgers that these low levels of TOC require particular attention to the precision of the conventionals testing as well as the PCB analysis.

Of the 7 total PCB values reported in Table 12, 3 are undetected above the SL, and would require retesting currently. These values, if they are appropriate to use for the bioaccumulation calculation, would necessitate bioaccumulation testing to take place. The PSDDA agencies need to make certain that reasonable detection limits for PCBs are attained.

FIG. 9. Graphical Solution of Bioaccumualation Where Theoretical B/A Goes Bad!



b. Chemistry Quality Assurance/Quality Control Conclusions and Recommendations. The following is a description of performance during DY 90.

(1) Overview. For DY 90, QA/QC for chemical analyses was generally very good. Quality control for chemical testing was analyzed for all eleven projects. No major problems were encountered in any of these projects. Accuracy was evaluated as a function of reference material, matrix spike and surrogate spike recoveries. For metals, certified reference materials and matrix spikes were utilized in tandem for most projects and provided a solid basis for accuracy determinations. For organics, there were minor problems with matrix spike recovery, but poor matrix spike performance alone is not taken as a sufficient basis for rejecting chemical testing results. Low matrix spike recoveries may result from matrix interferences in the sample. Surrogate spike recovery, which is the only QA/QC check performed for every sample, is deferred to when matrix spike recoveries are questionable. Only about five percent of surrogate-spiked samples exceeded PSDDA warning limits while none at all exceeded EPA CLP control limits. Precision, as measured by replicate analyses, was excellent for all projects. Method blanks detected no major problems with laboratory contamination.

Table 3. Results of Chemical Analyses on Composite Samples Including PSDDA Screening Levels (SL), Maximum Levels (ML) and Bioaccumulation Trigger (BT). Shaded Values Exceed SL.

PARAMETER	K-Pac DMMU 1	K-Pac DMMU 2	K-Pac DMMU 3	PSDDA		
				SL	BT	ML
CONVENTIONALS:						
Total Solids (%)	80.4	52.9	74.9	---	---	---
Total Volatile Solids(%)	1.46	7.53	2.17	---	---	---
Total Organic Carbon (%)	0.36	0.98	1.6	---	---	---
Total Sulfides (mg/kg)	210	180	610	---	---	---
Ammonia (mg/kg)	5.8	18	7.7	---	---	---
Grain Size (percent fines)	23.9	89.7	22.7	---	---	---
METALS (ppm):						
Antimony	14	38	180 (Exceeds BT)	20	146	200
Arsenic	U12	U26	240	57	507.1	700
Cadmium	U0.1	0.11	0.57	0.96	---	9.6
Copper	43	130	1000 (Exceeds ML)	81	---	810
Lead	33	61	230	66	---	660
Mercury	0.179	0.280	0.260	0.21	1.5	2.1
Nickel	14	16	80	140	1022	---
Silver	U0.2	0.28	0.63	1.2	4.6	6.1
Zinc	120	230	840	160	---	1600
ORGANICS (ppb):						
LPAH						
Naphthalene	U18	25	330	210	---	2100
Acenaphthalene	U18	U19	28	64	---	640
Acenaphthene	40	24	330	63	---	630
Fluorene	30	35	440	64	---	640
Phenanthrene	820	220	2400	320	---	3200
Anthracene	170	110	550	130	---	1300
2-Methylnaphthalene	U18	U19	130	67	---	670
Total LPAH	1114	452	4208	610	---	6100
HPAH						
Fluoranthene	1400	660	3000	630	4600	6300
Pyrene	1400	770	2500	430	---	7300
Benzo(a)anthracene	570	280	1000	450	---	4500

PARAMETER	K-Pac DMMU 1	K-Pac DMMU 2	K-Pac DMMU 3	PSDDA SL	PSDDA BT	PSDDA ML
Chrysene	610	370	1100	670	---	6700
Benzofluoranthenes	1090	590	1670	800	---	8000
Benzo(a)pyrene	480	270	920	680	4964	6800
Indeno(1,2,3-c,d)pyrene	320	150	510	69	---	5200
Dibenzo(a,h)anthracene	75	35	100	120	---	1200
Benzo(g,h,i)perylene	280	130	440	540	---	5400
Total HPAH	6225	3255	11240	1800	---	51000
CHLORINATED HYDROCARBONS						
1,3-Dichlorobenzene	U2	U3	U3	170	1241	---
1,4-Dichlorobenzene	U2	U3	U3	26	190	260
1,2-Dichlorobenzene	U2	U3	U3	19	37	350
1,2,4-Trichlorobenzene	U5.5	U5.7	U5.6	13	---	64
Hexachlorobenzene (HCB)	U11	U11	U11	23	168	230
PHTHALATES						
Dimethyl phthalate	U18	U19	U19	160	1168	---
Diethyl phthalate	U18	U19	25	97	---	---
Di-n-butyl phthalate	U18	U19	U19	1400	10220	---
Butyl benzyl phthalate	U18	U19	56	470	---	---
Bis(2-ethylhexyl)phthalate	110	240	4200	3100	13870	---
Di-n-octyl phthalate	U18	U19	29	6200	---	---
PHENOLS						
Phenol	U18	U19	U19	120	876	1200
2 Methylphenol	U9.2	U9.6	U9.4	20	---	72
4 Methylphenol	U18	U19	49	120	---	1200
2,4-Dimethylphenol	U9.2	U9.6	12	29	---	50
Pentachlorophenol	U55	U57	U56	100	504	690
MISCELLANEOUS EXTRACTABLES						
Benzyl alcohol	U11	U11	U11	25	---	73
Benzoic acid	U92	U96	U94	400	---	690
Dibenzofuran	44	22	310	54	---	540
Hexachloroethane	U18	U19	U19	1400	10220	14000
Hexachlorobutadiene	U18	U19	U19	29	212	290
N-Nitrosodiphenylamine	U11	U11	U11	28	161	220
VOLATILE ORGANICS						
Trichloroethene	U2	U3	U3	160	1168	1600
Tetrachloroethene	U2	U3	U3	14	102	210
Ethylbenzene	U2	U3	U3	10	27	50

PARAMETER	K-Pac DMMU 1	K-Pac DMMU 2	K-Pac DMMU 3	PSDDA SL	BT	ML
Total Xylene	U2	U3	U3	12	---	160
PESTICIDES						
Total DDT	U3.45	U6.9	U35.7 D [1]	6.9	50	69
p,p'-DDE	U0.73	3.9	U7.4 D [1]	---	---	---
p,p'-DDD	U0.92	U1	U9.3 D [1]	---	---	---
p,p'-DDT	U1.8	U2	U19 D [1]	---	---	---
Aldrin	U0.55	U0.61	U5.6 D [1]	10	37	---
Chlordane	U0.55	U0.61	U5.6 D [1]	10	37	---
Dieldrin	U0.73	U0.81	U7.4 D [1]	10	37	---
Heptachlor	U0.55	U0.61	U5.6 D [1]	10	37	---
Lindane	U0.55	U0.61	U5.6 D [1]	10	---	---
Total PCBs	<168.8; <46.9 ppm TOC normalized (Exceeds BT)	<321; <32.7 ppm TOC normalized	<5535 D [1]; 345.9 ppm TOC normalized (Exceeds ML)	130	38 [2]	2500

[1] Sample diluted.
[2] Reported in parts per million, TOC normalized.

Table 4. Results of Conventional Analyses at Reference Station CRR2.

Parameter	Reported Value
Percent fines (%)	81.5
Total solids (%)	47.8
Total volatile solids (%)	2.73
Total organic carbon (%)	0.72
Ammonia (mg/kg)	11
Total sulfides (mg/kg)	40

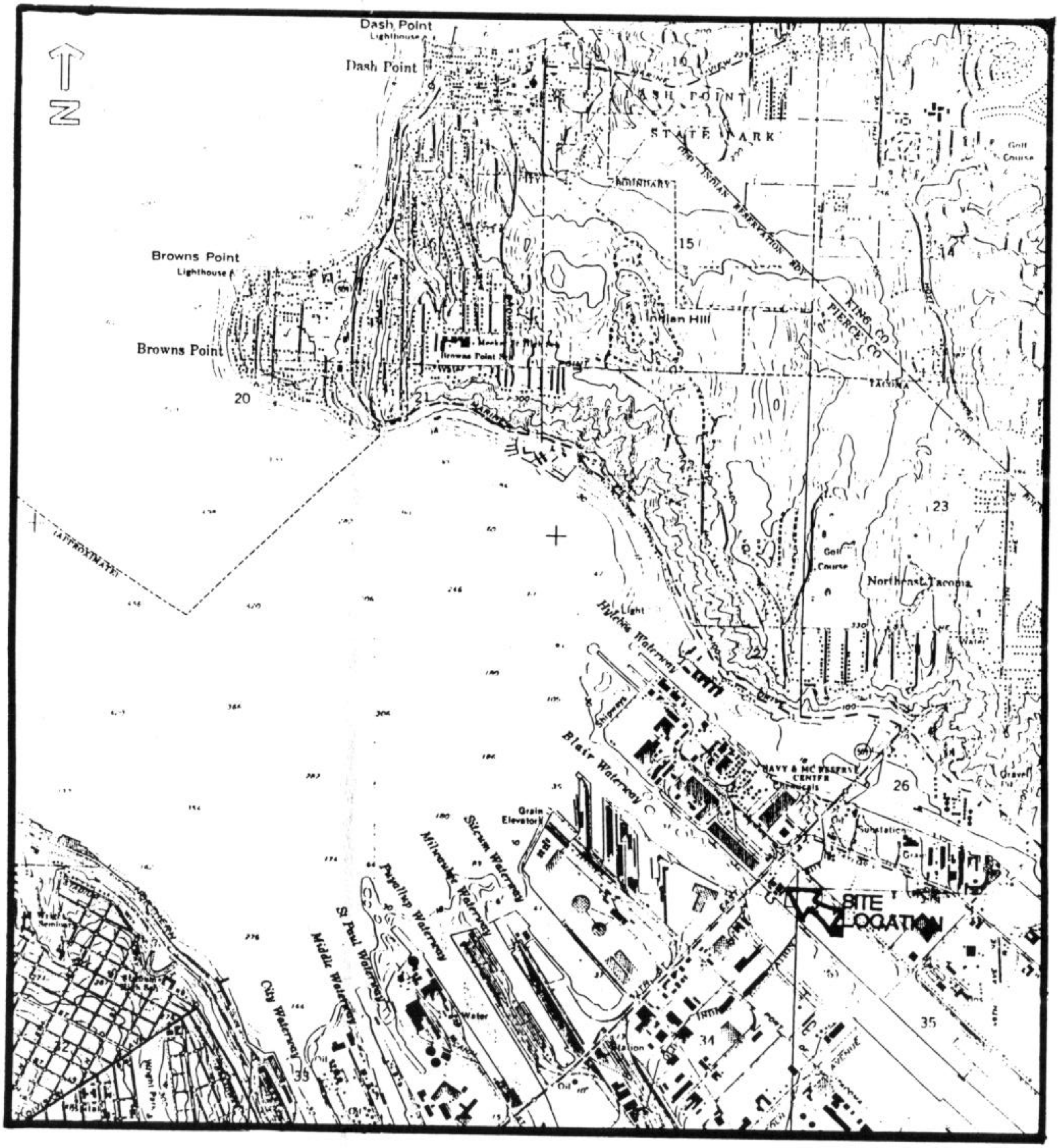


Figure 1. Vicinity Map.

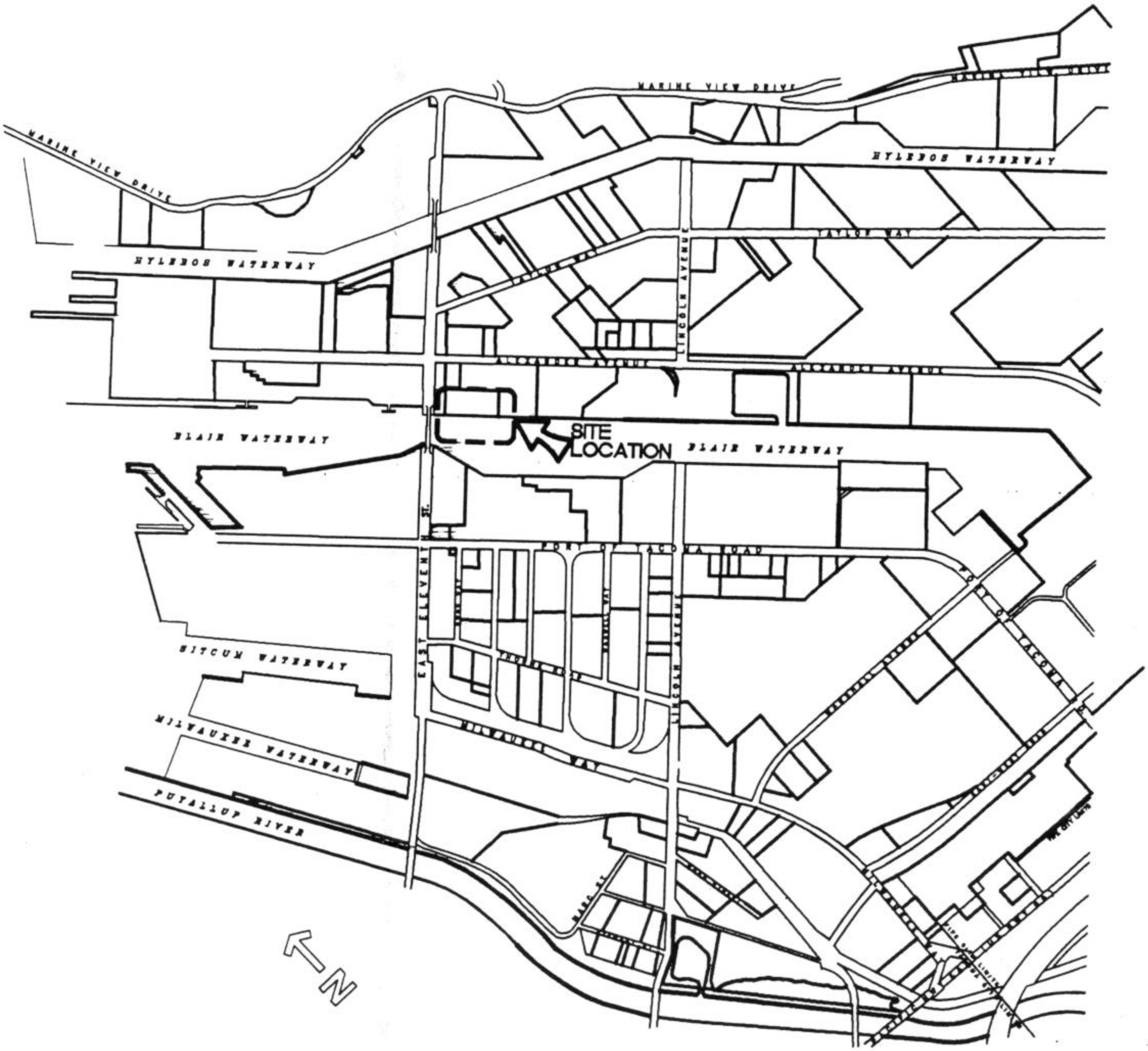


Figure 2. Location Map.

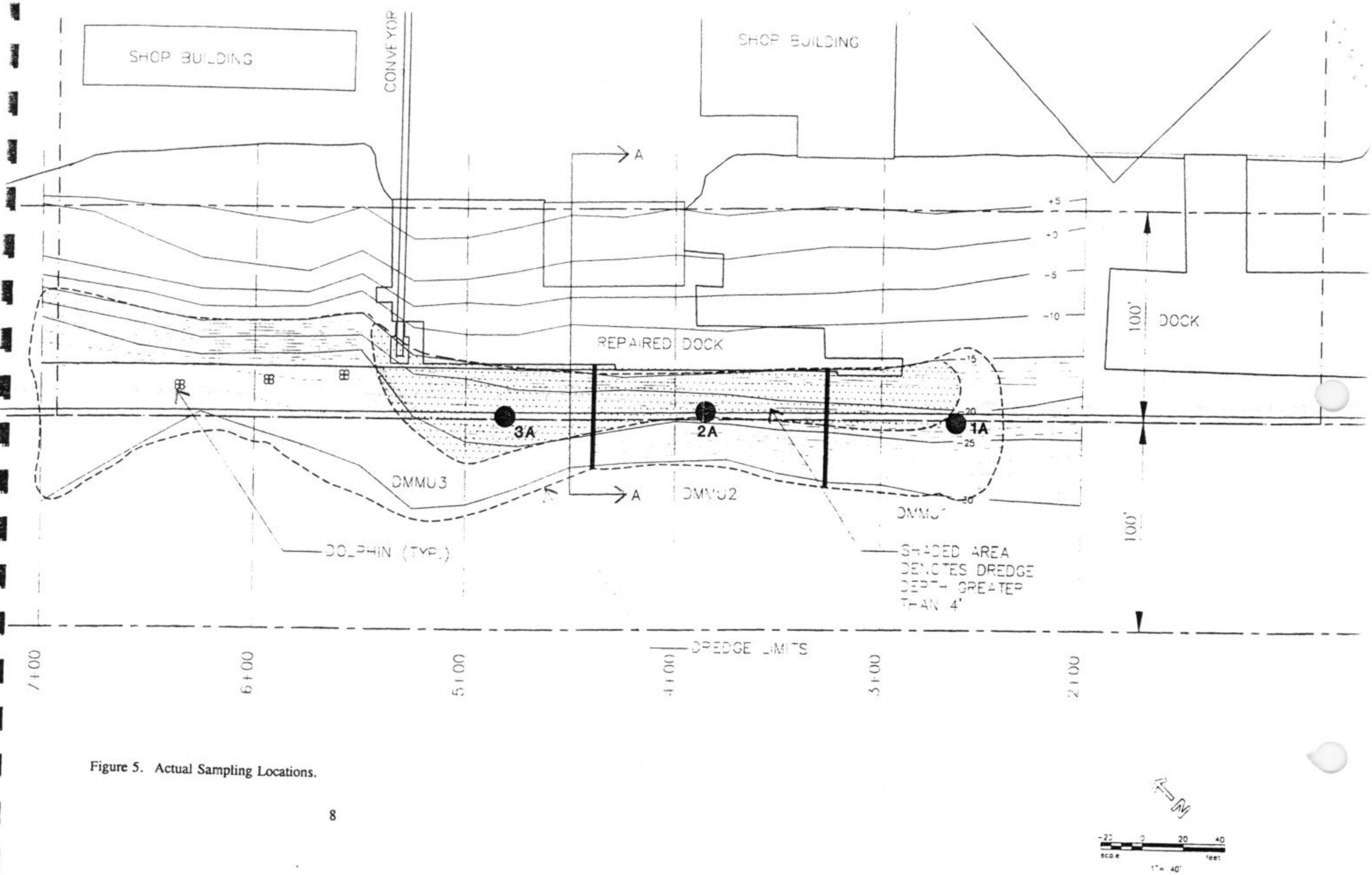


Figure 5. Actual Sampling Locations.