

SUBJECT: DETERMINATION OF THE SUITABILITY OF DREDGED MATERIAL TESTED UNDER PSDDA GUIDELINES FOR THE PORT OF EVERETT PIERS 1 AND 3 MAINTENANCE DREDGING PROJECT FOR DISPOSAL AT THE PSDDA PORT GARDNER OPEN-WATER NONDISPERSIVE SITE.

1. The Port of Everett proposes to maintenance dredge 51,000 cubic yards of sediments from the north side of Pier 1 and south side of Pier 3. The following summary reflects the PSDDA agencies' (Corps, Department of Ecology, Department of Natural Resources and the Environmental Protection Agency) suitability determination for disposal of this material at the PSDDA Port Gardner open-water nondispersive site.
2. The PSDDA agencies ranked the project area "high", based on the guidance provided in the PSDDA Management Plan Report, Phase II (page A-10) for the East Waterway in Everett.
3. A sampling and analysis plan was developed for full characterization and approved by the PSDDA agencies 2 September 1993.
5. Eleven dredged material management units (DMMUs) were characterized. Uncomposited surface sediments from six locations on the north side of Pier 1 were collected to form DMMUs 1 through 6. Subsurface sediments from two locations on the north side of Pier 1 were composited to form DMMU 7. Uncomposited surface sediments from three locations on the south side of Pier 3 were collected to form DMMUs 8 though 10. Subsurface sediments from two locations on the south side of Pier 3 were composited to form DMMU 11 (see Figures 7 and 8 of the sampling and analysis plan).
6. The chemistry data indicated that two of the DMMUs (10 and 11) had no detected or undetected exceedances of the PSDDA screening levels (SL). All other DMMUs had multiple SL exceedances. In addition, DMMUs 3 and 7 each had three exceedances of PSDDA maximum levels (ML) and were found unsuitable for open-water disposal in the absence of Tier IV evaluation data. DMMU 3 also had a single bioaccumulation trigger (BT) exceedance. No other DMMUs had ML or BT exceedances. See Attachment 1 for a tabulated summary of testing data.
7. The SL exceedances for 9 of the 11 DMMUs triggered the requirement for biological testing of these DMMUs under the tiered testing approach. In addition, biological testing was conducted for DMMU 10 by mistake. The amphipod 10-day acute toxicity test, echinoderm sediment larval combined mortality and abnormality (effective mortality) test, the *Neanthes* 20-day biomass test, and the Microtox bacterial luminescence test were conducted. PSDDA interpretation guidelines specified in the Phase II Management Plan Report (Sept 1989), modified by changes made at the second, fourth and sixth annual review meetings, were used to evaluate the bioassay data.

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Piers 1 and 3 Maintenance Dredging

8. Because of the proximity of this project to the barge berth area on the south side of Pier 1, an area where woody material is mixed with sediment, the Port of Everett elected to conduct side-by-side testing of *Rhepoxynius abronius* and *Ampelisca abdita* for the amphipod test. *Rhepoxynius abronius* is known to be sensitive to fine-grain sediments, while *Ampelisca abdita* is not.

9. The control sediment for the *Rhepoxynius* and *Neanthes* bioassays was collected at West Beach, the control sediment for *Ampelisca* from Narragansett RI, while the seawater control for the sediment larval test came from the National Marine Fisheries Service facility at Mukilteo. Three reference sediments were used during the first round of testing, two from Carr Inlet and one from West Beach. Three additional reference sediments from Carr Inlet were used during subsequent retests. See Attachment 2 for test and reference grainsize matchups.

10. Attachment 1 includes the results of biological testing, while Attachment 2 tallies "hits" in the bioassays. In the amphipod test, woody debris was not a problem as it was for the South Terminal barge berth. Both *Ampelisca abdita* and *Rhepoxynius abronius* exhibited hits for the same two DMMUs (6 and 8). *Ampelisca abdita* exhibited hits under the single-hit rule for these two DMMUs, while *Rhepoxynius abronius* exhibited hits under the two-hit rule. Attachments 1 and 2 reflect the *Ampelisca* results. The magnitude of the hits was irrelevant in this case; these two DMMUs would have been found unsuitable for open-water disposal regardless of the amphipod species used in the interpretation.

11. In the *Neanthes* 20-day biomass test, Carr Inlet Ref 8 failed to meet the performance standard of at least 80% of the control sediment biomass. Ref 8 was therefore rejected from use for the interpretation of this bioassay. Test sediments that would have been compared to Ref 8 were instead compared to Ref 4 and Ref 9. The interpretation for these DMMUs was exactly the same, regardless of whether Ref 4 or Ref 9 was used for comparison. The results are found in Attachment 2.

12. The larval test, using *Strongylocentrotus purpuratus*, experienced quality control problems, with poor results for the Carr Inlet reference sediments and most of the test sediments. A retest was conducted using *Dendraster excentricus* for the two test sediments (DMMU 1 and 5) whose overall pass/fail interpretation was still in question at the time of the retest. The retest was conducted in concert with a retest of South Terminal barge berth test sediments. Both DMMU 1 and 5 scored hits under the single-hit rule in the retest.

13. In the Microtox bioassay, QA/QC problems forced a retest of one of the test sediments. In the original test, DMMU 2 and 9 exhibited hits under the two-hit rule. An evaluation of the five replicates at the highest concentration resulted in no other hits for any of the other DMMUs. However, further evaluation revealed a discrepancy between the results of the dilution series for two of the DMMUs (5 and 8) and the five replicates at the highest concentration for these test sediments. DMMU 8 had already failed testing based on the

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Neanthes 20-day and amphipod bioassays. However, a retest of DMMU 5 was necessary to resolve the discrepancy (DMMU 5 was simultaneously being subjected to a retest for the larval bioassay). QA/QC problems were again encountered in the retest. An additional retest was unnecessary because DMMU 5 exhibited a hit under the single-hit rule in the larval retest and was found unsuitable for open-water disposal.

14. Only two DMMUs passed PSDDA disposal guidelines for open-water disposal. These were DMMUs 10 and 11, the two DMMUs without any SL exceedances (DMMU 10 exhibited a single hit under the two-hit rule for the 20-day test, without a corroborating hit for any other bioassay). All other test sediments were found unsuitable for open-water disposal (see Attachment 2).

15. In summary, the PSDDA-approved sampling and testing plan was followed, and quality assurance, quality control guidelines specified by PSDDA were generally complied with. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the PSDDA program. Based on the results of the chemical and biological testing, the following consensus decision was made by the PSDDA agencies:

All 34,000 cubic yards (DMMUs 1, 2, 3, 4, 5, 6 and 7) proposed for dredging from the north side of Pier 1 were found unsuitable for open-water disposal. The 7,000 cubic yards on the south side of Pier 3, represented by DMMUs 8 and 9, were also found unsuitable for open-water disposal. The 10,000 cubic yards from the south side of Pier 3, represented by DMMUs 10 and 11 are suitable for disposal at the Port Gardner open-water nondispersive site.

16. Based on the "high" ranking for this project, under PSDDA recency guidelines the data collected for the full characterization of project sediments are valid for 2 years after the sampling date. If a "changed condition" (eg. after a spill event) occurs between the date of this suitability determination and the time of dredging, the PSDDA agencies will determine whether additional sampling and testing are required prior to dredging.

17. This memorandum documents the suitability of proposed dredged sediments for disposal at a PSDDA open-water disposal site. This suitability determination does not constitute final agency approval of the project.

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Concur:

10/13/94
Date

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

9/9/94
Date

David F. Fox
David Fox
Seattle District Corps of Engineers

10/12/94
Date

Justine Barton
Justine Barton
Environmental Protection Agency, Region X

9/22/93
Date

Sandra Manning
Sandra Manning
Washington Department of Ecology

9/21/94
Date

Deborah C. Lester
Deborah Lester
Washington Department of Natural Resources

Copies Furnished:

DMMO file/CENPS-OP
Dennis Gregoire/Port of Everett
Pat Cagney/CENPS-EN-PL-ER
Cliff Whitmus/Pentec
Teresa Michelsen/Ecology

Justine Barton/EPA
Sandra Manning/Ecology
Deborah Lester/DNR
Terry Williams/Tulalip Tribes
Jack Gossett/CENPS-OP-RG

PORT OF EVERETT PIERS 1 & 3
 CHEMICALS EXCEEDING
 PSD/DA GUIDELINE VALUES,
 BIOASSAY DATA
 AND INTERPRETATION

| METALS (ppm dry wt): | Guideline Values | | | DMIMUs | | | | | | | | | | |
|----------------------|------------------|-----|------|--------|------|-----|-----|------|-----|-----|-------|------|------|------|
| | SL | BT | ML | # 1 | # 2 | # 3 | # 4 | # 5 | # 6 | # 7 | # 8 | # 9 | # 10 | # 11 |
| Cadmium | 0.96 | --- | 9.6 | | 1.27 | 2.3 | 1.5 | 1.13 | 1.5 | 1.0 | 1.35 | 1.13 | | |
| Copper | 81 | --- | 810 | 81.5 | 83.9 | 102 | | | | | 106 | | | |
| Lead | 66 | --- | 660 | 78 | 68 | 91 | 67 | | | | 95 | | | |
| Mercury | 0.21 | 1.5 | 2.1 | | | | | | | | .26 E | | | |
| Zinc | 160 | --- | 1600 | | | 211 | | 195 | | | | | | |

ORGANICS (ppb dry wt):

| | | | | | | | | | | | | | | |
|-------------------------|------|------|-------|-----|-------|--------|--------|------|-------|--------|--------|--------|--|--|
| 2-Methylnaphthalene | 67 | --- | 670 | | | 140 | 90 | | 91 | 320 | 110 | 92 U | | |
| Acenaphthene | 63 | --- | 630 | 120 | 130 | 580 | 130 | | 260 | 1200* | 170 | 92 U | | |
| Acenaphthylene | 64 | --- | 640 | | | 81 | 77 U | | | 68 U | 69 | 92 U | | |
| Fluorene | 64 | --- | 640 | 140 | 160 | 780* | 140 | | 260 | 790* | 230 | 92 U | | |
| Naphthalene | 210 | --- | 2100 | | | 340 | 480 | | 340 | 1300 | 440 | | | |
| Phenanthrene | 320 | --- | 3200 | 500 | 530 | 1800 | 340 | | 670 | 870 L | 890 | | | |
| Anthracene | 130 | --- | 1300 | 140 | 260 | 1900* | 200 | | 350 | 510 L | 240 | | | |
| Total LPAH | 610 | --- | 6700 | 918 | 1327 | 5621 | 1380 | | 2022 | 4990 | 2149 | | | |
| Fluoranthene | 630 | 4600 | 6300 | | 1400 | 6100 | 710 | | 1900 | 1400 L | 1500 | | | |
| Pyrene | 430 | --- | 7300 | | 940 L | 3100 L | 750 | | 1300 | 1100 | 1200 L | | | |
| Benzo(a)anthracene | 450 | --- | 4500 | | 600 | 2300 | | | | | 710 | | | |
| Chrysene | 670 | --- | 6700 | | | 2400 | | | | 690 | 860 | | | |
| Dibenzo(a,h)anthracene | 120 | --- | 1200 | | | 210 | | | | | | | | |
| Benzo(b)fluoranthene | 800 | --- | 8000 | | | 3000 | | | | | 1000 | | | |
| Benzo(a)pyrene | 680 | 4964 | 6800 | | | 1100 | | | | | | | | |
| Indeno(1,2,3-c,d)pyrene | 69 | --- | 5200 | | 100 | 380 | 96 | | 120 G | 84 | 140 | 96 L | | |
| Total HPAH | 1800 | --- | 51000 | | 4497 | 18900 | 2776 | | 5106 | 4827 | 5927 | 2036 | | |
| Hexachlorobenzene | 23 | 168 | 230 | | 42 U | 57 U | 38 U | | | 68 U | 49 U | 92 U | | |
| 2-Methylphenol | 20 | --- | 72 | | 42 U | 57 U | 38 U | | | 68 U | 49 U | 46 U | | |
| 2,4-Dimethylphenol | 29 | --- | 50 | | 42 U | 57 U* | 38 U | | | | 49 U | 46 U | | |
| 4-Methylphenol | 120 | --- | 1200 | | | 250 | 390 | | | | 280 | | | |
| Pentachlorophenol | 100 | 504 | --- | | 210 U | 280 U | 380 U | | | 340 U | 250 U | 460 U | | |
| Benzoic acid | 216 | --- | 690 | | 420 U | 570 U | | | | 680 U | 490 U | 460 U | | |
| Benzyl alcohol | 10 | --- | 73 | | 42 U | 57 U | 38 U | | 36 UG | 68 U | 49 U | 46 U | | |
| Dibenzofuran | 54 | --- | 540 | 66 | 140 | 410 | 120 | | 200 | 700* | 180 | 92 U | | |
| Hexachlorobutadiene | 29 | 212 | 290 | | 42 U | 57 U | 77 U | | | 68 U | 49 U | 92 U | | |
| N-Nitrosodiphenylamine | 28 | 161 | 220 | | 42 U | 57 U | 77 U | | | 68 U | 49 U | 92 U | | |
| Total DDT | 6.9 | 50 | 69 | | 10.6 | | | | | | | | | |
| Total PCBs | 130 | --- | 2500 | | 340 | | 100 UG | 40 U | | | | 100 UG | | |

* = Exceeds ML
 underlined = Exceeds BT

(Carbon normalized)

202 203
 207

8 25 30 24 3 14 22 29 17 0 0

51 52 53 54 55 56

ATTACHMENT 1

PORT OF EVERETT PIERS 1 & 3
 CHEMICALS EXCEEDING
 PSDDA GUIDELINE VALUES,
 BIOASSAY DATA
 AND INTERPRETATION

| CONVENTIONALS: | # 1 | # 2 | # 3 | # 4 | # 5 | DMIMUs | | | | | | West | Carr | Carr | Carr | Carr | Carr |
|-----------------------|-------|-------|--------|--------|-------|--------|--------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | | | | # 6 | # 7 | # 8 | # 9 | # 10 | # 11 | Beach | Inlet | Inlet | Inlet | Inlet | Inlet |
| | | | | | | | | | | | | Ref 4 | REF 8 | REF 9 | A37 | C24 | D34 |
| Percent Fines | 4 | 24 | 38 | 23 | 10 | 56 | 16 | 26 | 23 | 4 | 2 | 4 | 58 | 49 | 41 | 38 | 27 |
| Bulk Ammonia (mg/kg) | NT | 53.4 | 87.9 | 22.8 | 22.1 | 90.5 | 47.1 | 27.6 | 14.3 | 5.6 | 2.5 | 3.5 | 1.1 | 5 | 17.0 | 17.0 | 15.0 |
| Bulk Sulfides (mg/kg) | 3.5 U | 406 G | 7590 G | 81.1 G | 522 G | 496 G | 98.2 U | 651 G | 2190 G | 3.4 U | 3.1 U | 7.6 | 12 | 22 | 29.0 | 15.0 | 30.0 |
| TOC (%) | 1.1 | 2.4 | 5.2 | 2.9 | 0.8 | 2.5 | 1.2 | 4.11 | 6.9 | 0.9 | .3 | 0.2 | 0.4 | 0.7 | 0.5 | 0.5 | 0.5 |

BIOASSAYS:

| | | | | | | | | | | | | | | | | | |
|---|-------|------|----|------|------|-------|------|------|------|-------|----|-------|----|-------|-----|-----|------|
| Amphipod test - <i>Ampelisca abdita</i> (% mortality) | 10 | 20 | NT | 8 | 17 | 52 | 13 | 74 | 10 | 11 | NT | NT | 12 | 7 | NT | NT | NT |
| Larval retest - <i>D. excentricus</i> (% eff mort) | 41.3 | NT | NT | NT | 31.3 | NT | NT | NT | NT | NT | NT | 0 | NT | NT | 0.7 | 5.1 | 12.4 |
| Neanthes (individual biomass in mg) | 10.18 | 9.42 | NT | 6.95 | 9.80 | 10.44 | 7.67 | 5.93 | 7.76 | 11.36 | NT | 17.03 | QA | 15.95 | NT | NT | NT |
| Microtox (% light diminution) - original test | LE | 30.7 | NT | LE | QA | LE | LE | QA | 22 | LE | NT | NT | LE | LE | NT | NT | NT |
| Microtox (% light diminution) - retest | NT | NT | NT | NT | QA | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | 8.5 |

LE = light enhancement (non-toxic)

QA = quality assurance problem, data discarded

NT = not tested

INTERPRETATION:

| | | | | | | | | | | | |
|-----------------------|------|------|------|------|------|------|-------|------|------|------|------|
| Volume (cubic yards): | 4000 | 4000 | 4000 | 4000 | 4000 | 4000 | 10000 | 3000 | 4000 | 3000 | 7000 |
| Pass/Fail: | Fail | Fail | Fail | Pass | Pass |

ATTACHMENT 2
PORT OF EVERETT PIERS 1 & 3 MAINTENANCE DREDGING
BIOASSAY INTERPRETATION

| DAIS ID | Sample ID | Chemical Hits | Reference Sediment Match | Amphipod ¹ 10-Day Mortality | Neanthes 20-Day Biomass | Microtox | Sediment Larval | Total Hits | Pass/Fail |
|---------|-----------|---------------|--------------------------|--|-------------------------|------------------|--------------------|------------|-----------|
| S1 | DMMU 1 | --- | Ref 4 | --- ⁴ | X | --- ⁶ | XX ³ | XX+ | Fail |
| S2 | DMMU 2 | --- | Ref 8 | --- ⁴ | X ⁵ | X | QA ² | XX | Fail |
| S3 | DMMU 3 | XX | N/A | NT | NT | NT | NT | XX | Fail |
| S4 | DMMU 4 | --- | Ref 8 | --- ⁴ | XX ⁵ | --- ⁶ | --- ^{2,4} | XX | Fail |
| S5 | DMMU 5 | --- | Ref 4 | --- ⁴ | X | QA | XX ³ | XX+ | Fail |
| S6 | DMMU 6 | --- | Ref 9 | XX | X | --- ⁶ | QA ² | XX+ | Fail |
| C1 | DMMU 7 | XX | Ref 4/8 | --- ⁴ | XX ⁵ | --- ⁶ | --- ^{2,4} | XX+ | Fail |
| S7 | DMMU 8 | --- | Ref 8 | XX | XX ⁵ | QA | QA ² | XX+ | Fail |
| S8 | DMMU 9 | --- | Ref 8 | --- ⁴ | XX ⁵ | X | QA ² | XX+ | Fail |
| S9 | DMMU 10 | --- | Ref 4 | --- ⁴ | X | --- ⁶ | --- ^{2,4} | X | Pass |
| C2 | DMMU 11 | --- | N/A | NT | NT | NT | NT | --- | Pass |

¹*Ampelisca abdita*

²*Strongylocentrotus purpuratus*

³*Dendraster excentricus* (larval retest)

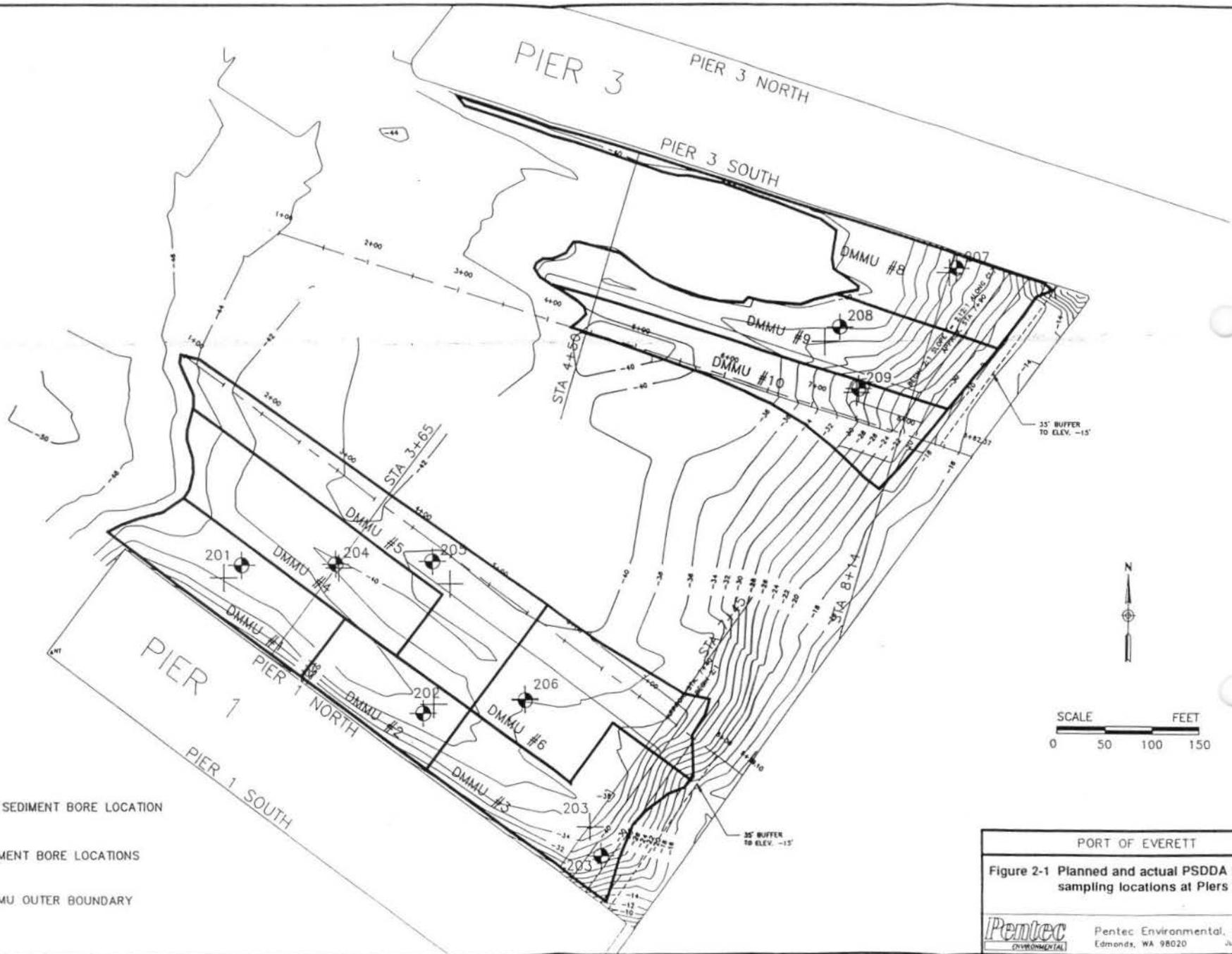
⁴Test sediment was not greater than 20% over control; no reference comparison required

⁵Ref 8 failed to meet its performance standard of >80% of control; comparison made to other reference sediments

⁶Light enhancement; considered non-toxic; no reference comparison required

NT = not tested; N/A = not applicable (no bioassays conducted)

QA = quality assurance problem (retest unnecessary)

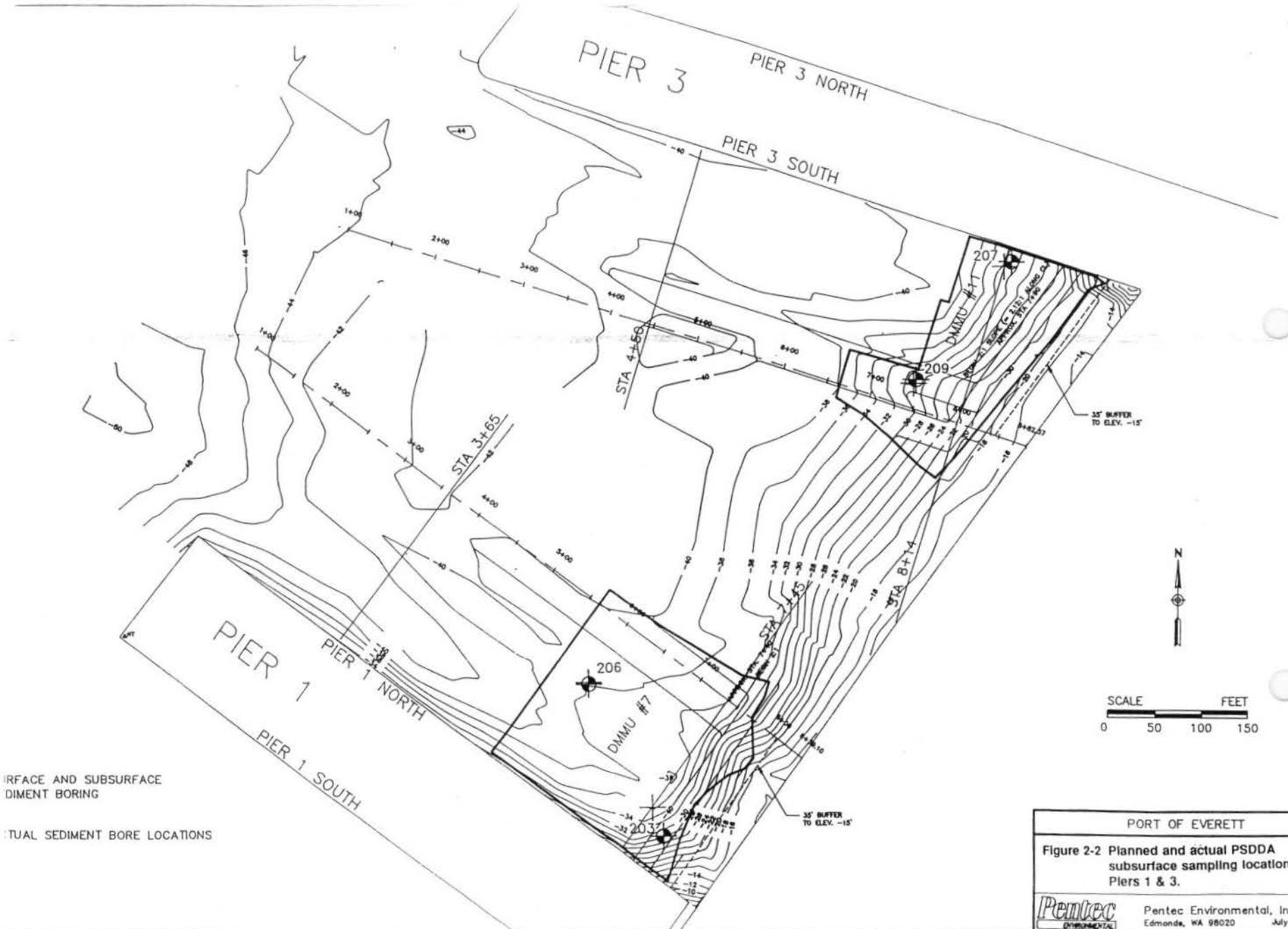


RELIMINARY SEDIMENT BORE LOCATION

ACTUAL SEDIMENT BORE LOCATIONS

OUTER BOUNDARY DMMU

| | |
|---|--|
| PORT OF EVERETT | |
| Figure 2-1 Planned and actual PSDDA sampling locations at Piers 1 and 3 | |
| | Pentec Environmental, Inc. Edmonds, WA 98020 July |



IRFACE AND SUBSURFACE
DIMENT BORING

ITUAL SEDIMENT BORE LOCATIONS

| | |
|--|---|
| PORT OF EVERETT | |
| Figure 2-2 Planned and actual PSDDA subsurface sampling locations Piers 1 & 3. | |
| | Pentec Environmental, Inc Edmonds, WA 98020 July 1 |

Table 2-1 Sample locations and coordinates of bore locations of core samples collected at Port of Everett Piers 1 & 3 during November 1993 and April 1994.

| DMMU | Sample location | Coordinates | | | | Expected mudline elevation | Proposed dredge depth | Actual mudline elevation | Depth at bottom of stratigraphic unit | | Sample date | Resample date | |
|------|-----------------|-------------------------|---------|-----------|-----------------|----------------------------|-----------------------|--------------------------|---------------------------------------|------------------------|-------------|---------------|--------|
| | | State Plane Coordinates | | Latitude | Longitude | | | | Wood/silt ¹ | Sand/wood ¹ | | | |
| | | Northing | Easting | | | | | | | | | | |
| 1 | 201 | 1 | 360,408 | 1,299,909 | 47° 58' 46.6" N | 122° 13' 25.3" E | -42 | -46 | -41 | - | - | 11/21/93 | 4/7/94 |
| 2 | 202 | 2 | 360,251 | 1,300,101 | 47° 58' 45.1" N | 122° 13' 22.5" E | -41 | -46 | -41 | -43 | - | 11/21/93 | |
| 3 | 203 | 3 | 360,101 | 1,300,287 | 47° 58' 43.6" N | 122° 13' 19.7" E | -34 | -46 | -34 | -40 | - | 11/20/93 | |
| 4 | 204 | 4 | 360,409 | 1,300,009 | 47° 58' 46.6" N | 122° 13' 23.9" E | -40 | -46 | -40 | -44 | - | 11/24/93 | |
| 5 | 205 | 5 | 360,412 | 1,300,111 | 47° 58' 46.7" N | 122° 13' 22.4" E | -40 | -46 | -40 | -44 | - | 11/21/93 | 4/7/94 |
| 6 | 206 | 6 | 360,274 | 1,300,199 | 47° 58' 45.3" N | 122° 13' 21.1" E | -38 | -46 | -38 | -43 | > -47 | 11/21/93 | |
| 7 | 203 | | 360,101 | 1,300,287 | 47° 58' 43.6" N | 122° 13' 19.7" E | -34 | -46 | -34 | -40 | - | 11/20/93 | |
| 7 | 206 | | 360,274 | 1,300,199 | 47° 58' 45.3" N | 122° 13' 21.1" E | -38 | -46 | -38 | -43 | > -37 | 11/21/93 | |
| 8 | 207 | 7 | 360,719 | 1,300,677 | 47° 58' 49.8" N | 122° 13' 14.2" E | -30 | -41 | -30 | -35 | - | 11/20/93 | |
| 9 | 208 | 8 | 360,657 | 1,300,551 | 47° 58' 49.2" N | 122° 13' 16.0" E | -36 | -41 | -38 | -43 | > -47 | 11/29/93 | |
| 10 | 209 | 9 | 360,592 | 1,300,571 | 47° 58' 48.5" N | 122° 13' 15.7" E | -29 | -41 | -30 | -35 | - | 11/20/93 | |
| 11 | 207 | | 360,719 | 1,300,677 | 47° 58' 49.8" N | 122° 13' 14.2" E | -30 | -41 | -30 | -35 | - | 11/20/93 | |
| 11 | 209 | | 360,592 | 1,300,571 | 47° 58' 48.5" N | 122° 13' 15.7" E | -29 | -41 | -30 | -35 | - | 11/20/93 | |

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1. Depths are rounded to the nearest integer.
2. Depth to bottom of wood/silt based on the free fall depth of the coring device if greater than the depth to bottom of the wood/silt as interpreted on the core log.
3. Two cores driven at station 206. Depths based on data from November 21, 1993.
4. Stratigraphic unit not encountered.