# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | Marine Sediment Standards | | NFK UPRIV1 | | NFK UPRIV2 | | NFK001 | | NFK002 | | NFK003 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L4321-23 | | L4321-24 | | L4321-1 | | L4321-2 | | L4321-3 | |
| Sample Depth (cm) | | | 0-10 | | 0-10 | | 0-10 | | 0-10 | | 0-10 | |
| Sample Date | | | 8/19/94 | | 8/19/94 | | 8/18/94 | | 8/18/94 | | 8/18/94 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 7.51 | | 75.6 | U | 9.74 | | 8.54 | | 6.88 | |
| Naphthalene | 99 | 170 | 4.81 | U | 75.6 | U | 4.37 | U | 5.04 | U | 4.89 | U |
| Acenaphthylene | 66 | 66 | 1.77 | U | 28.1 | U | 1.62 | U | 1.9 | U | 1.8 | U |
| Acenaphthene | 16 | 57 | 1.22 | U | * 19.3 | U | 1.14 | U | 1.31 | U | 1.22 | U |
| Fluorene | 23 | 79 | 1.77 | U | * 28.1 | U | 1.62 | U | 1.9 | U | 1.8 | U |
| Phenanthrene | 100 | 480 | 7.51 | G | 28.1 | UG | 7.84 | G | 8.54 | G | 6.88 | G |
| Anthracene | 220 | 1200 | 1.77 | U | 28.1 | U | 1.9 | G | 1.9 | U | 1.8 | UG |
| 2-Methylnaphthalene | 38 | 64 | 4.81 | U | ** 75.6 | U | 4.37 | U | 5.04 | U | 4.89 | U |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 76.7 | | 75.6 | U | 86.6 | | 109 | | 83.8 | |
| Fluoranthene | 160 | 1200 | 17.2 | | 28.1 | U | 15.9 | G | 20.9 | | 19.9 | G |
| Pyrene | 1000 | 1400 | 15.4 | G | 28.1 | UG | 17.8 | G | 20.3 | G | 18.5 | G |
| Benzo(a)anthracene | 110 | 270 | 5.8 | | 28.1 | U | 7.54 | G | 8.32 | | 6.93 | G |
| Chrysene | 110 | 460 | 6.9 | | 28.1 | U | 9.88 | | 10.3 | | 9.5 | |
| Total Benzofluoranthenes | 230 | 450 | 9.34 | | 75.6 | U | 16.4 | | 20 | | 18.6 | |
| Benzo(b)fluoranthene | | | 9.34 | | 75.6 | U | 9.82 | | 14 | | 12.6 | |
| Benzo(k)fluoranthene | | | 4.81 | UL | 75.6 | UL | 6.6 | J | 6.1 | L | 6 | J |
| Benzo(a)pyrene | 99 | 210 | 6.8 | X | 47.4 | UX | 6.35 | G | 9.05 | X | 7.12 | G |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 7.13 | | * 47.4 | U | 7.13 | G | 10.1 | | 3.2 | G |
| Dibenzo(a,h)anthracene | 12 | 33 | 4.81 | U | ** 75.6 | U | 4.37 | UG | 5.04 | U | 4.89 | UG |
| Benzo(g,h,i)perylene | 31 | 78 | 6.1 | G | * 47.4 | UG | 5.57 | G | 10.5 | G | 3.09 | UG |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.144 | UBEG | 2.22 | UBEG | 0.132 | UEG | 0.153 | UBEG | 0.151 | UEG |
| 1,4-Dichlorobenzene | 3.1 | 9 | 0.144 | UBEG | 2.22 | UBEG | 0.281 | BEG | 1.38 | BEG | 2.34 | BEG |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 0.144 | UEG | ** 2.22 | UEG | 0.132 | UEG | 0.153 | UEG | 0.151 | UEG |
| Hexachlorobenzene | 0.38 | 2.3 | 0.144 | UEG | * 2.22 | UEG | 0.132 | UEG | 0.153 | UEG | 0.151 | UEG |
| Diethyl Phthalate | 61 | 110 | 2.98 | U | 47.4 | U | 2.75 | U | 3.14 | U | 3.09 | U |
| Dimethyl Phthalate | 53 | 53 | 1.22 | U | 19 | U | 1.14 | U | 1.31 | U | 1.22 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 6.13 | BG | 116 | BG | 6.65 | B | 8.61 | BG | 9.5 | B |
| Benzyl Butyl Phthalate | 4.9 | 64 | 1.77 | U | * 28.1 | U | 1.62 | U | 1.9 | U | 1.8 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 16.9 | | 37 | | 15 | | 31.3 | B | 30.7 | |
| Di-N-Octyl Phthalate | 58 | 4500 | 1.77 | UL | 28.1 | UL | 1.62 | UL | 1.9 | UL | 1.8 | UL |
| Dibenzofuran | 15 | 58 | 2.98 | U | * 47.4 | U | 2.75 | U | 3.14 | U | 3.09 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | 2.98 | U | ** 47.4 | U | 2.75 | UG | 3.14 | U | 3.09 | UG |
| N-Nitrosodiphenylamine | 11 | 11 | 2.98 | U | ** 47.4 | U | 2.75 | U | 3.14 | U | 3.09 | U |
| Total PCBs | 12 | 65 | 1.44 | U | * 22.2 | U | 19.4 | | 1.53 | U | 1.51 | U |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 220 | U | 130 | U | 190 | U | 180 | U | 170 | U |
| 2-Methylphenol | 63 | 63 | 54 | U | 32 | U | 46 | U | 43 | U | 43 | U |
| 4-Methylphenol | 670 | 670 | 54 | U | 32 | U | 46 | U | 43 | U | 43 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 54.0 | U | ** 32.0 | U | ** 46.0 | U | ** 43.0 | U | ** 43.0 | U |
| Pentachlorophenol | 360 | 690 | 54 | U | 32 | U | 46 | U | 43 | U | 43 | U |
| Benzyl Alcohol | 57 | 73 | 54 | U | 32 | U | 46 | U | 43 | U | 43 | U |
| Benzoic Acid | 650 | 650 | 220 | U | 130 | U | 190 | U | 180 | U | 170 | U |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 22 | J | 11 | J | 19 | J | 18 | J | 17 | J |
| Cadmium, Total | 5.1 | 6.7 | 0.6 | U | 0.35 | U | 0.51 | U | 0.48 | U | 0.46 | U |
| Chromium, Total | 260 | 270 | 26.6 | | 12.6 | | 25.1 | | 24.8 | | 32.7 | |
| Copper, Total | 390 | 390 | 27.8 | | 12.1 | | 31 | | 26.9 | | 29 | |
| Lead, Total | 450 | 530 | 17 | J | 4.9 | J | 17 | J | 13 | J | 13 | J |
| Mercury, Total | 0.41 | 0.59 | 0.08 | J | 0.035 | J | 0.1 | JE | 0.078 | JE | 0.21 | JE |
| Silver, Total | 6.1 | 6.1 | 0.8 | U | 0.46 | U | 0.68 | U | 0.64 | U | 0.62 | U |
| Zinc, Total | 410 | 960 | 80.3 | | 50 | | 77.8 | | 68 | | 71.7 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 1.81 | | 0.0675 | | 1.67 | | 1.37 | | 1.39 | |
| Acid Volatile Sulfides (mg/Kg) | | | 420 | E | 40 | UE | 220 | E | 750 | E | 770 | E |
| Gravel (%) | | | 0.2 | | 5.6 | | 0.2 | | 0.6 | | 0.2 | |
| Sand (%) | | | 64.1 | | 92 | | 48.3 | | 46.9 | | 49.9 | |
| Silt (%) | | | 33.3 | | 3 | | 46.9 | | 38.6 | | 39.6 | |
| Clay (%) | | | 3.5 | | 0.3 | | 4.8 | | 14.3 | | 10.4 | |
| Fines (%) | | | 36.8 | | 3.3 | | 51.7 | | 52.9 | | 50 | |
| Salinity (ppt) | | | 14 | | 17 | | | | 16 | | | |
| % Solids | | | 49.7 | | 84 | | 59 | | 62.5 | | 63 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | | | NFK004 | | NFK004A | | NFK005 | | NFK006 | | NFK007 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Marine Sediment | | L4321-4 | | L4384-1 | | L4321-5 | | L4321-6 | | L4321-7 | |
| Sample Depth (cm) | Standards | | 0-10 | | 0-10 | | 0-10 | | 0-10 | | 0-10 | |
| Sample Date | | | 8/18/94 | | 8/22/94 | | 8/18/94 | | 8/18/94 | | 8/22/94 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 21 | | 33.1 | | 41.2 | | 179 | | 3.8 | |
| Naphthalene | 99 | 170 | 4.65 | U | 2.74 | U | | | 5.62 | UG | 3.12 | U |
| Acenaphthylene | 66 | 66 | 1.74 | U | 1.05 | U | 1.6 | U | 2.1 | U | 1.16 | U |
| Acenaphthene | 16 | 57 | 1.16 | U | 1.3 | | 3.45 | | 11.2 | | 0.809 | U |
| Fluorene | 23 | 79 | 1.74 | U | 1.6 | J | 3.33 | | 10.7 | | 1.16 | U |
| Phenanthrene | 100 | 480 | 19 | G | 26.2 | G | 27.5 | G | 141 | G | 3.8 | G |
| Anthracene | 220 | 1200 | 2.4 | G | 4.01 | | 6.93 | | 15.8 | G | 1.16 | UG |
| 2-Methylnaphthalene | 38 | 64 | 4.65 | U | 2.74 | U | 4.27 | U | 5.62 | U | 3.12 | U |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 195 | | 258 | | 421 | | 575 | | 46 | |
| Fluoranthene | 160 | 1200 | 37.5 | G | 55.6 | | 114 | | 94.8 | G | 9.6 | G |
| Pyrene | 1000 | 1400 | 34.3 | G | 43.1 | G | 94 | G | 100 | G | 7.8 | G |
| Benzo(a)anthracene | 110 | 270 | 15.2 | G | 21.9 | | 35.4 | | 47.7 | G | 3.6 | G |
| Chrysene | 110 | 460 | 20 | | 30.9 | | 37.1 | | 49 | | 4.94 | G |
| Total Benzofluoranthenes | 230 | 450 | 35.7 | | 56.7 | | 59.6 | | 121 | | 9.04 | |
| Benzo(b)fluoranthene | | | 24.7 | | 40.4 | | 41.7 | | 88.2 | | 5.84 | G |
| Benzo(k)fluoranthene | | | 11 | | 16.3 | L | 17.9 | L | 32.9 | | 3.2 | JG |
| Benzo(a)pyrene | 99 | 210 | 15 | G | 24.5 | X | 28 | X | 72.3 | G | 3.4 | JG |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 18.1 | G | 12.5 | | 25.8 | | 42.8 | G | 5.18 | G |
| Dibenzo(a,h)anthracene | 12 | 33 | 5.5 | G | 3.2 | | 6.5 | | 17.6 | G | 3.12 | UG |
| Benzo(g,h,i)perylene | 31 | 78 | 13.9 | G | 9.8 | G | 21 | G | 29.3 | G | 2.4 | JG |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.142 | UEG | 0.0848 | UBEG | 0.127 | UBEG | 0.171 | UEG | 0.0925 | U |
| 1,4-Dichlorobenzene | 3.1 | 9 | 3.28 | BEG | 1.61 | BEG | 2.37 | BEG | 0.17 | BEG | 0.0925 | U |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 0.142 | UEG | 0.0848 | UEG | 0.127 | UEG | 0.171 | UEG | 0.0925 | U |
| Hexachlorobenzene | 0.38 | 2.3 | 0.142 | UEG | 0.0848 | UEG | 0.127 | UEG | 0.171 | UEG | 0.0925 | U |
| Diethyl Phthalate | 61 | 110 | 2.9 | U | 1.8 | U | 2.67 | U | 3.52 | U | 1.97 | U |
| Dimethyl Phthalate | 53 | 53 | 1.16 | U | 0.723 | U | 1.07 | U | 1.43 | U | 0.809 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 9.48 | B | 2 | BG | 6.73 | BG | 10.8 | B | 4.16 | B |
| Benzyl Butyl Phthalate | 4.9 | 64 | 3.88 | | 3.57 | | 3.99 | | 2.2 | J | 1.16 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 33.8 | | 65.3 | | 70.0 | B | 16.8 | | 12 | |
| Di-N-Octyl Phthalate | 58 | 4500 | 1.74 | UL | 1.05 | UL | 1.6 | UL | 2.1 | UL | 1.16 | U |
| Dibenzofuran | 15 | 58 | 2.9 | U | 1.8 | U | | | 3.5 | J | 1.97 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | 2.9 | UG | 1.8 | U | 2.67 | U | 3.52 | UG | 1.97 | U |
| N-Nitrosodiphenylamine | 11 | 11 | 3 | J | 1.8 | U | 2.67 | U | 3.52 | U | 1.97 | U |
| Total PCBs | 12 | 65 | 4.4 | | 9.32 | | 8.97 | | 9.07 | | 5.84 | |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 180 | U | 290 | U | 160 | U | 150 | U | 140 | U |
| 2-Methylphenol | 63 | 63 | 45 | U | ** 72.0 | U | 40 | U | 37 | U | 34 | U |
| 4-Methylphenol | 670 | 670 | 45 | U | 72 | U | 280 | | 37 | U | 34 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 45.0 | U | ** 72.0 | U | ** 40.0 | U | ** 37.0 | U | ** 34.0 | U |
| Pentachlorophenol | 360 | 690 | 45 | U | 72 | U | 40 | U | 37 | U | 34 | UG |
| Benzyl Alcohol | 57 | 73 | 45 | U | * 72.0 | U | 40 | U | 37 | U | 34 | U |
| Benzoic Acid | 650 | 650 | 180 | U | 290 | U | 160 | U | 150 | U | 150 | J |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 20 | J | 24 | J | 16 | J | 51.3 | | 6.3 | U |
| Cadmium, Total | 5.1 | 6.7 | 0.5 | U | 0.8 | U | 0.45 | U | 0.41 | U | 0.38 | U |
| Chromium, Total | 260 | 270 | 26 | | 34.2 | | 24.1 | | 22.4 | | 17.9 | |
| Copper, Total | 390 | 390 | 31.4 | | 56.2 | | 34.1 | | 42 | | 22.6 | |
| Lead, Total | 450 | 530 | 20 | J | 43 | | 27.8 | | 58 | | 14 | J |
| Mercury, Total | 0.41 | 0.59 | 0.088 | JE | 0.18 | J | 0.12 | JE | 0.053 | JE | 0.072 | JE |
| Silver, Total | 6.1 | 6.1 | 0.67 | U | 1.1 | U | 0.67 | J | 0.53 | U | 0.53 | J |
| Zinc, Total | 410 | 960 | 83.9 | | 184 | | 92.7 | | 138 | | 55.2 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 1.55 | | 4.01 | | 1.5 | | 1.05 | | 1.73 | |
| Acid Volatile Sulfides (mg/Kg) | | | 1500 | E | 1800 | E | 640 | E | 40 | UE | 1200 | E |
| Gravel (%) | | | 1 | | 0.2 | | 4 | | 30 | | 0.2 | |
| Sand (%) | | | 57.6 | | 33.4 | | 61.3 | | 50.4 | | 40 | |
| Silt (%) | | | 29.4 | | 43.4 | | 30.9 | | 15.8 | | 52.9 | |
| Clay (%) | | | 11.7 | | 23.1 | | 3.6 | | 4.1 | | 7.2 | |
| Fines (%) | | | 41.1 | | 66.5 | | 34.5 | | 19.9 | | 60.1 | |
| Salinity (ppt) | | | 15 | | 8 | | | | | | | |
| % Solids | | | 60.1 | | 37.7 | | 67.2 | | 73.1 | | 79.3 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | Marine Sediment Standards | | NFK008 | | NFK008 | | NFK008 | | NFK008 | | NFK008 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L4321-8 | | L6725-26 | | L6725-27 | | L6725-28 | | L6725-29 | |
| Sample Depth (cm) | | | 0-10 | | 0-30 | | 30-60 | | 60-90 | | 90-120 | |
| Sample Date | | | 8/17/94 | | 8/28/95 | | 8/28/95 | | 8/28/95 | | 8/28/95 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 15.8 | | 11.7 | | 9.19 | | 124 | U | 190 | U |
| Naphthalene | 99 | 170 | 5.26 | U | 3.53 | UG | 3.3 | UG | * 124 | UG | ** 190 | UG |
| Acenaphthylene | 66 | 66 | 1.92 | U | 1.3 | UG | 1.21 | UG | 47 | U | ** 69.3 | U |
| Acenaphthene | 16 | 57 | 1.35 | U | 0.93 | UG | 0.825 | UG | * 32.2 | U | * 47.4 | U |
| Fluorene | 23 | 79 | 1.92 | U | 1.3 | UG | 1.3 | JG | * 47 | U | * 69.3 | U |
| Phenanthrene | 100 | 480 | 13.5 | | 9.63 | G | 6.89 | G | 47 | UG | 69.3 | UG |
| Anthracene | 220 | 1200 | 2.3 | JG | 2.1 | JG | 1 | JG | 47 | UG | 69.3 | UG |
| 2-Methylnaphthalene | 38 | 64 | 5.26 | U | 3.53 | UG | 3.3 | UG | ** 124 | UG | ** 190 | UG |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 160 | | 95.4 | | 67.1 | | 124 | U | 190 | U |
| Fluoranthene | 160 | 1200 | 31.6 | | 24.2 | G | 14.7 | G | 47 | UG | 69.3 | UG |
| Pyrene | 1000 | 1400 | 29.8 | | 14.6 | G | 9.42 | G | 47 | UG | 69.3 | UG |
| Benzo(a)anthracene | 110 | 270 | 13.1 | | 7.95 | G | 5 | G | 47 | UG | 69.3 | UG |
| Chrysene | 110 | 460 | 17.2 | | 9.16 | G | 7.62 | G | 47 | UG | 69.3 | UG |
| Total Benzofluoranthenes | 230 | 450 | 33.3 | | 15.9 | | 13.4 | | 124 | U | 190 | U |
| Benzo(b)fluoranthene | | | 21 | | 11.8 | G | 8.79 | G | 124 | UG | 190 | UG |
| Benzo(k)fluoranthene | | | 12.3 | L | 4.1 | JG | 4.6 | JG | 124 | UG | 190 | UG |
| Benzo(a)pyrene | 99 | 210 | 15.4 | L | 8.23 | G | 6.3 | G | 76.7 | UG | * 120 | UG |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 11.9 | G | 8.14 | G | 5.87 | G | * 76.7 | UG | ** 120 | UG |
| Dibenzo(a,h)anthracene | 12 | 33 | 5.26 | U | 3.53 | UG | 3.3 | UG | ** 124 | U | ** 190 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 7.5 | G | 7.26 | G | 4.82 | G | * 76.7 | UG | ** 120 | UG |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.17 | JEG | 0.0558 | UG | 0.0534 | UG | 1.98 | UG | 2 | U |
| 1,4-Dichlorobenzene | 3.1 | 9 | 1.74 | E,G | 0.963 | G | 1.18 | G | ** 9.18 | G | ** 15.1 | G |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 0.16 | UEG | * 1.30 | UG | * 1.21 | UG | ** 47 | UG | ** 69.3 | UG |
| Hexachlorobenzene | 0.38 | 2.3 | 0.16 | UEG | 0.0558 | UG | 0.0534 | UG | * 1.98 | UG | * 2 | U |
| Diethyl Phthalate | 61 | 110 | 3.27 | U | 2.23 | UG | 2.09 | UG | * 76.7 | U | ** 120 | U |
| Dimethyl Phthalate | 53 | 53 | 1.35 | U | 0.93 | UG | 0.825 | UG | 32.2 | U | 47.4 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 7.31 | G,B | 6.56 | BG | 9.03 | BG | 76.7 | U,B | 120 | U,B |
| Benzyl Butyl Phthalate | 4.9 | 64 | 1.92 | UB | 1.3 | UG | 1.21 | UG | * 47 | U | ** 69.3 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | ** 140 | B | 28 | G | 23 | G | 47 | U | * 69.3 | U |
| Di-N-Octyl Phthalate | 58 | 4500 | 1.92 | UL | 1.3 | UG | 1.21 | UG | 47 | U | * 69.3 | U |
| Dibenzofuran | 15 | 58 | 3.27 | U | 2.23 | UG | 2.09 | UG | ** 76.7 | U | ** 120 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | 3.27 | U | 2.23 | UG | 2.09 | UG | ** 76.7 | UG | ** 120 | UG |
| N-Nitrosodiphenylamine | 11 | 11 | 4 | J | 2.23 | U,B,G | 2.5 | J,B,G | ** 76.7 | U,B | ** 120 | U,B |
| Total PCBs | 12 | 65 | ** 135 | | ** 22.5 | | ** 3950 | | ** 119 | | * 58.4 | U |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 210 | U | 200 | U | 170 | U | 130 | U | 130 | U |
| 2-Methylphenol | 63 | 63 | 51 | U | 48 | U | 43 | U | 31 | U | 33 | U |
| 4-Methylphenol | 670 | 670 | 51 | U | 48 | U | 43 | U | 31 | U | 33 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 51.0 | U | ** 48.0 | UG | ** 43.0 | UG | ** 31.0 | UG | ** 33.0 | UG |
| Pentachlorophenol | 360 | 690 | 51 | U | 48 | U | 43 | U | 31 | U | 33 | U |
| Benzyl Alcohol | 57 | 73 | 51 | U | 48 | UG | 43 | UG | 31 | UG | 33 | UG |
| Benzoic Acid | 650 | 650 | 210 | U | 349 | E | 210 | JE | 130 | UE | 130 | UE |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 21 | J | 7.6 | U | 7.8 | U | 5.5 | U | 5.7 | U |
| Cadmium, Total | 5.1 | 6.7 | 0.57 | U | 0.53 | J | 0.9 | J | 0.32 | U | 0.34 | U |
| Chromium, Total | 260 | 270 | 27.5 | | 24.6 | | 25.2 | | 12.4 | | 13 | |
| Copper, Total | 390 | 390 | 31.5 | | 34 | | 36.8 | | 12.2 | | 10.1 | |
| Lead, Total | 450 | 530 | 28 | J | 21 | J | 28.4 | | 3.2 | U | 3.4 | U |
| Mercury, Total | 0.41 | 0.59 | ** 0.841 | E | 0.1 | J | ** 37.1 | | 0.046 | J | 0.03 | J |
| Silver, Total | 6.1 | 6.1 | 0.76 | U | 0.87 | J | 0.95 | J | 0.43 | U | 0.45 | U |
| Zinc, Total | 410 | 960 | 98.7 | | 99.3 | | 98.1 | | 32.8 | | 27.1 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 1.66 | | 2.15 | | 2.06 | | 0.0404 | | 0.0274 | |
| Acid Volatile Sulfides (mg/Kg) | | | 480 | E | | | | | | | | |
| Gravel (%) | | | 0.2 | | 0.2 | | 4.7 | | 2.7 | | 0.2 | |
| Sand (%) | | | 55.4 | | 51 | | 55.7 | | 91.6 | | 95.9 | |
| Silt (%) | | | 31.7 | | 48 | | 37.5 | | 5.7 | | 3.8 | |
| Clay (%) | | | 12.8 | | 1.2 | | 2 | | 0.3 | | 0.3 | |
| Fines (%) | | | 44.5 | | 49.2 | | 39.5 | | 6 | | 4.1 | |
| Salinity (ppt) | | | | | | | | | | | | |
| % Solids | | | 52.7 | | 56.4 | | 63 | | 86.2 | | 82.9 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | | | NFK009 | | NFK009 | | NFK009 | | NFK009 | | NFK009 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Marine Sediment | | L4321-25 | | L4321-26 | | L4321-27 | | L4321-28 | | L4321-9 | |
| Sample Depth (cm) | Standards | | 0-15 | | 15-30 | | 30-45 | | 45-60 | | 0-10 | |
| Sample Date | | | 8/31/94 | | 8/31/94 | | 8/31/94 | | 8/31/94 | | 8/17/94 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 80.8 | | 27.8 | | 73.1 | | 5.1 | | 27.6 | |
| Naphthalene | 99 | 170 | 3.73 | U | 2.78 | UE | 9.07 | U | 9.72 | U | 4.54 | U |
| Acenaphthylene | 66 | 66 | 1.4 | U | 1.01 | UE | 3.38 | U | 3.67 | U | 1.7 | U |
| Acenaphthene | 16 | 57 | 6.66 | | 2.6 | E | 5.12 | | 2.57 | U | 2.1 | J |
| Fluorene | 23 | 79 | 5.91 | | 1.3 | E | 4 | J | 3.67 | U | 2.1 | J |
| Phenanthrene | 100 | 480 | 55.7 | G | 19 | GE | 53.6 | G | 5.1 | G | 20 | |
| Anthracene | 220 | 1200 | 12.5 | | 4.9 | E | 10.4 | | 3.67 | U | 3.33 | G |
| 2-Methylnaphthalene | 38 | 64 | 3.73 | U | 2.78 | UE | 9.07 | U | 9.72 | U | 4.54 | U |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 369 | | 118 | | 365 | | 104 | | 214 | |
| Fluoranthene | 160 | 1200 | 85.3 | | 29.6 | E | 87.7 | | 21.7 | | 47.1 | |
| Pyrene | 1000 | 1400 | 65 | G | 24 | GE | 65.7 | G | 24.6 | G | 39.1 | |
| Benzo(a)anthracene | 110 | 270 | 34.9 | | 11.5 | E | 33.3 | | 11.4 | | 17.5 | |
| Chrysene | 110 | 460 | 41.4 | | 12.3 | E | 40.4 | | 11.5 | | 20.9 | |
| Total Benzofluoranthenes | 230 | 450 | 84.3 | | 22.7 | | 78.3 | | 12 | | 40.4 | |
| Benzo(b)fluoranthene | | | 57.1 | | 16.1 | E | 55.7 | | 12 | J | 30.7 | |
| Benzo(k)fluoranthene | | | 27.2 | L | 6.6 | LE | 22.6 | L | 9.72 | UL | 9.69 | L |
| Benzo(a)pyrene | 99 | 210 | 37 | X | 11.5 | XE | 34.9 | X | 8.8 | X | 17.1 | L |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 12.1 | | 3.79 | E | 13.4 | | 7 | J | 15 | G |
| Dibenzo(a,h)anthracene | 12 | 33 | 3.73 | U | 2.78 | UE | 9.07 | U | 9.72 | U | 5 | J |
| Benzo(g,h,i)perylene | 31 | 78 | 8.73 | G | 2.9 | GE | 11 | G | 6.8 | G | 11.7 | G |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.11 | UBEG | 0.12 | BEG | 0.34 | BEG | 0.294 | UBEG | 0.15 | JEG |
| 1,4-Dichlorobenzene | 3.1 | 9 | ** 34.7 | BEG | ** 712 | BEG | ** 489 | BEG | ** 102 | BEG | ** 10.5 | E,G |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 0.11 | UEG | 0.0859 | UEG | 0.267 | UEG | 0.294 | UEG | 0.139 | UEG |
| Hexachlorobenzene | 0.38 | 2.3 | 0.11 | UEG | 0.0859 | UEG | 0.267 | UEG | 0.294 | UEG | 0.139 | UEG |
| Diethyl Phthalate | 61 | 110 | 2.33 | U | 1.72 | UE | 5.69 | U | 6.06 | U | 2.84 | U |
| Dimethyl Phthalate | 53 | 53 | 0.93 | U | 0.707 | UE | 2.3 | U | 2.57 | U | 1.13 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 6.64 | BG | 3.7 | BGE | 14 | BG | 7.7 | BG | 7.53 | G,B |
| Benzyl Butyl Phthalate | 4.9 | 64 | * 6.25 | | 1.01 | UE | 3.38 | U | * 17.0 | | 1.9 | B |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | ** 88.0 | | 19.9 | E | ** 149 | | 25 | | ** 253 | B |
| Di-N-Octyl Phthalate | 58 | 4500 | 1.4 | UL | 1.01 | ULE | 3.38 | UL | 3.67 | UL | 1.7 | UL |
| Dibenzofuran | 15 | 58 | 2.33 | U | 1.72 | UE | 5.69 | U | 6.06 | U | 2.84 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | 2.33 | U | 1.72 | UE | * 5.69 | U | * 6.06 | U | 2.84 | U |
| N-Nitrosodiphenylamine | 11 | 11 | 8.13 | | 5.86 | E | 5.69 | U | 6.06 | U | 5 | J |
| Total PCBs | 12 | 65 | 1.1 | U | * 14.7 | | 2.67 | U | 10.6 | | * 33.3 | |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 140 | U | 140 | UE | 130 | U | 140 | U | 220 | U |
| 2-Methylphenol | 63 | 63 | 35 | U | 34 | UE | 32 | U | 33 | U | 55 | U |
| 4-Methylphenol | 670 | 670 | 35 | U | 34 | UE | 32 | U | 33 | U | 55 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 35.0 | U | ** 34.0 | UE | ** 32.0 | U | ** 33.0 | U | ** 55.0 | U |
| Pentachlorophenol | 360 | 690 | 35 | U | 34 | UE | 32 | U | 33 | U | 55 | U |
| Benzyl Alcohol | 57 | 73 | 35 | U | 34 | UE | 32 | U | 33 | U | 55 | U |
| Benzoic Acid | 650 | 650 | 140 | U | 140 | UE | 130 | U | 140 | U | 220 | U |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 12 | JE | 14 | JE | 13 | JE | 8 | JE | 22 | J |
| Cadmium, Total | 5.1 | 6.7 | 0.96 | J | 1.2 | J | 0.54 | J | 0.37 | U | 0.59 | U |
| Chromium, Total | 260 | 270 | 21.8 | | 28.8 | | 19.9 | | 13.4 | | 25.2 | |
| Copper, Total | 390 | 390 | 125 | GE | 133 | GE | 104 | GE | 22.4 | GE | 60.9 | |
| Lead, Total | 450 | 530 | 52.6 | LE | 62.3 | LE | 38 | LE | 7.1 | JLE | 68.1 | |
| Mercury, Total | 0.41 | 0.59 | 0.21 | J | ** 0.853 | | 0.11 | J | 0.029 | J | 0.13 | JE |
| Silver, Total | 6.1 | 6.1 | 0.51 | U | 0.52 | J | 0.49 | J | 0.48 | U | 0.8 | U |
| Zinc, Total | 410 | 960 | 345 | GE | 240 | GE | 163 | GE | 44.6 | GE | 140 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 1.5 | | 1.98 | | 0.562 | | 0.545 | | 1.94 | |
| Acid Volatile Sulfides (mg/Kg) | | | 1100 | E | 1400 | E | 410 | E | 140 | E | 1500 | E |
| Gravel (%) | | | 33.8 | | 28.7 | | 15.3 | | 2.8 | | 10.4 | |
| Sand (%) | | | 55.6 | | 58 | | 77.2 | | 93.2 | | 53.5 | |
| Silt (%) | | | 8.2 | | 12.6 | | 7.9 | | 4 | | 26.7 | |
| Clay (%) | | | 1.6 | | 1.5 | | 0.9 | | 0.4 | | 10.1 | |
| Fines (%) | | | 9.8 | | 14.1 | | 8.8 | | 4.4 | | 36.8 | |
| Salinity (ppt) | | | | | | | | | | | 13 | |
| % Solids | | | 76.2 | | 78.7 | | 84 | | 81.4 | | 48.9 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | | | NFK009 | | NFK009 | | NFK009 | | NFK009 | | NFK009 FD | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Marine Sediment | | L6725-17 | | L6725-18 | | L6725-19 | | L6725-20 | | L4321-10 | |
| Sample Depth (cm) | Standards | | 0-30 | | 30-60 | | 60-90 | | 90-120 | | 0-10 | |
| Sample Date | | | 8/28/95 | | 8/28/95 | | 8/28/95 | | 8/28/95 | | 8/17/94 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 37.1 | | 20.1 | U | 73 | U | 161 | U | 16.6 | |
| Naphthalene | 99 | 170 | 8.28 | UG | 20.1 | UG | 73 | UG | * 161 | UG | 4.77 | U |
| Acenaphthylene | 66 | 66 | 3.05 | U | 7.53 | U | 26.8 | U | 58.2 | U | 1.78 | U |
| Acenaphthene | 16 | 57 | 2.18 | U | 5.02 | U | * 19.4 | U | * 41.1 | U | 1.21 | U |
| Fluorene | 23 | 79 | 3.1 | J | 7.53 | U | * 26.8 | U | * 58.2 | U | 1.78 | U |
| Phenanthrene | 100 | 480 | 25.9 | G | 7.53 | UG | 26.8 | UG | 58.2 | UG | 14.1 | |
| Anthracene | 220 | 1200 | 8.1 | G | 7.53 | UG | 26.8 | UG | 58.2 | UG | 2.5 | JG |
| 2-Methylnaphthalene | 38 | 64 | 8.28 | UG | 20.1 | UG | ** 73 | UG | ** 161 | UG | 4.77 | U |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 271 | | 20.1 | U | 73 | U | 161 | U | 196 | |
| Fluoranthene | 160 | 1200 | 60 | G | 7.53 | UG | 26.8 | UG | 58.2 | UG | 37.4 | |
| Pyrene | 1000 | 1400 | 41.1 | G | 7.53 | UG | 26.8 | UG | 58.2 | UG | 39.1 | |
| Benzo(a)anthracene | 110 | 270 | 25.3 | G | 7.53 | UG | 26.8 | UG | 58.2 | UG | 15.9 | |
| Chrysene | 110 | 460 | 33.6 | G | 7.53 | UG | 26.8 | UG | 58.2 | UG | 19.2 | |
| Total Benzofluoranthenes | 230 | 450 | 54.4 | | 20.1 | U | 73 | U | 161 | U | 35 | |
| Benzo(b)fluoranthene | | | 38.4 | G | 20.1 | UG | 73 | UG | 161 | UG | 26.4 | |
| Benzo(k)fluoranthene | | | 16 | G | 20.1 | UG | 73 | UG | 161 | UG | 8.6 | JL |
| Benzo(a)pyrene | 99 | 210 | 20.5 | G | 12.6 | UG | 46.2 | UG | 99 | UG | 15.7 | L |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 19.9 | G | 12.6 | UG | * 46.2 | UG | ** 99 | UG | 19.1 | G |
| Dibenzo(a,h)anthracene | 12 | 33 | 8.28 | U | * 20.1 | U | ** 73 | U | ** 161 | U | 4.77 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 15.8 | G | 12.6 | UG | * 46.2 | UG | ** 99 | UG | 14.7 | G |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.132 | UG | 0.318 | UG | 1.16 | UG | ** 2.57 | UG | 0.144 | UEG |
| 1,4-Dichlorobenzene | 3.1 | 9 | ** 11.6 | G | ** 38.2 | G | ** 24.1 | G | ** 90.4 | G | ** 11.9 | E,G |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 3.05 | UG | ** 7.53 | UG | ** 26.8 | UG | ** 58.2 | UG | 0.144 | UEG |
| Hexachlorobenzene | 0.38 | 2.3 | 0.132 | U | 0.318 | U | * 1.16 | UG | ** 2.57 | U | 0.144 | UEG |
| Diethyl Phthalate | 61 | 110 | 5.23 | U | 12.6 | U | 46.2 | U | * 99 | U | 2.99 | U |
| Dimethyl Phthalate | 53 | 53 | 2.18 | U | 5.02 | U | 19.4 | U | 41.1 | U | 1.6 | J |
| Di-N-Butyl Phthalate | 220 | 1700 | 17.3 | B | 28.2 | B | 125 | B | 99 | U,B | 5.2 | G,B |
| Benzyl Butyl Phthalate | 4.9 | 64 | 3.05 | U | * 7.53 | U | * 26.8 | U | * 58.2 | U | 1.78 | U,B |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 83.1 | | 12 | J | 34 | J | ** 92 | J | 45.5 | B |
| Di-N-Octyl Phthalate | 58 | 4500 | 3.05 | U | 7.53 | U | 26.8 | U | * 58.2 | U | 1.78 | UL |
| Dibenzofuran | 16 | 58 | 5.23 | U | 12.6 | U | * 46.2 | U | ** 99 | U | 2.99 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | * 5.23 | UG | ** 12.6 | UG | ** 46.2 | UG | ** 99 | UG | 2.99 | U |
| N-Nitrosodiphenylamine | 11 | 11 | 5.23 | U,B | ** 12.6 | U,B | ** 46.2 | U,B | ** 99 | U,B | 2.99 | U |
| Total PCBs | 12 | 65 | 36.2 | | 5.86 | U | * 22.4 | U | * 47.9 | U | 9.42 | |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 150 | U | 120 | U | 130 | UG | 120 | U | 210 | U |
| 2-Methylphenol | 63 | 63 | 36 | U | 30 | U | 31 | UG | 29 | U | 52 | U |
| 4-Methylphenol | 670 | 670 | 36 | U | 30 | U | 31 | UG | 29 | U | 52 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 36.0 | UG | ** 30.0 | UG | ** 31.0 | UG | 29 | UG | ** 52.0 | U |
| Pentachlorophenol | 360 | 690 | 36 | U | 30 | U | 31 | UG | 29 | U | 52 | U |
| Benzyl Alcohol | 57 | 73 | 36 | UG | 30 | UG | 31 | UG | 29 | UG | 52 | U |
| Benzoic Acid | 650 | 650 | 225 | E | 120 | UE | 130 | UEG | 120 | UE | 210 | U |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 6.9 | J | 5.3 | U | 5.3 | U | 5.2 | U | 19 | J |
| Cadmium, Total | 5.1 | 6.7 | 0.48 | J | 0.32 | U | 0.32 | U | 0.32 | U | 0.58 | U |
| Chromium, Total | 260 | 270 | 23.2 | | 13.1 | | 14.4 | | 12.9 | | 26.3 | |
| Copper, Total | 390 | 390 | 62.9 | | 13.7 | | 13 | | 10.4 | | 39.2 | |
| Lead, Total | 450 | 530 | 123 | | 3.2 | U | 3.2 | U | 3.2 | U | 31.9 | |
| Mercury, Total | 0.41 | 0.59 | * 0.555 | | 0.03 | J | 0.022 | U | 0.021 | U | 0.19 | JE |
| Silver, Total | 6.1 | 6.1 | 1.2 | J | 0.42 | U | 0.42 | U | 0.41 | U | 0.77 | U |
| Zinc, Total | 410 | 960 | 127 | | 41.8 | | 42.2 | | 30.1 | | 138 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 0.688 | | 0.239 | | 0.0671 | | 0.0292 | | 1.74 | |
| Acid Volatile Sulfides (mg/Kg) | | | | | | | | | | | 3300 | E |
| Gravel (%) | | | 9.1 | | 1.6 | | 0.4 | | 2.7 | | 13.4 | |
| Sand (%) | | | 72.9 | | 95.2 | | 94.7 | | 94.9 | | 47.5 | |
| Silt (%) | | | 15.8 | | 3.3 | | 4.9 | | 2.6 | | 18.3 | |
| Clay (%) | | | 2.3 | | 0.3 | | 0.3 | | 0.3 | | 21.2 | |
| Fines (%) | | | 18.1 | | 3.6 | | 5.2 | | 2.9 | | 39.5 | |
| Salinity (ppt) | | | | | | | | | | | | |
| % Solids | | | 75.7 | | 90.5 | | 87.9 | | 91.9 | | 51.8 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | Marine Sediment Standards | | NFK010 | | NFK011 | | NFK012 | | NFK013 | | NFK014 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L4321-11 | | L4321-12 | | L4321-13 | | L4321-14 | | L4321-15 | |
| Sample Depth (cm) | | | 0-10 | | 0-10 | | 0-10 | | 0-10 | | 0-10 | |
| Sample Date | | | 8/17/94 | | 8/22/94 | | 8/18/94 | | 8/19/94 | | 8/19/94 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 1.9 | | 11 | | 30 | U | 30.6 | U | 75.4 | U |
| Naphthalene | 99 | 170 | 2.04 | U | 7.77 | U | 30 | U | 30.6 | U | 75.4 | U |
| Acenaphthylene | 66 | 66 | 0.764 | U | 2.93 | U | 11 | U | 11.7 | U | 27.5 | U |
| Acenaphthene | 16 | 57 | 0.509 | U | 2.05 | U | 7.87 | U | 7.78 | U | * 18.8 | U |
| Fluorene | 23 | 79 | 0.764 | U | 2.93 | U | 11 | U | 11.7 | U | * 27.5 | U |
| Phenanthrene | 100 | 480 | 1.9 | | 11 | G | 11 | UG | 11.7 | UG | 27.5 | UG |
| Anthracene | 220 | 1200 | 0.764 | UG | 2.93 | UG | 11 | UG | 11.7 | UG | 27.5 | UG |
| 2-Methylnaphthalene | 38 | 64 | 2.04 | U | 7.77 | U | 30 | U | 30.6 | U | ** 75.4 | U |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 22.4 | | 122 | | 335 | | 43 | | 65 | |
| Fluoranthene | 160 | 1200 | 3.36 | | 33 | G | 48 | G | 11.7 | UG | 30 | G |
| Pyrene | 1000 | 1400 | 3.23 | | 24.2 | G | 39.2 | G | 13 | G | 35 | G |
| Benzo(a)anthracene | 110 | 270 | 2.13 | | 11.6 | G | 42.1 | G | 15 | G | 27.5 | UG |
| Chrysene | 110 | 460 | 3.44 | | 16.3 | G | 49.6 | | 15 | J | 27.5 | U |
| Total Benzofluoranthenes | 230 | 450 | 3.93 | | 13 | | 105 | | 30.6 | U | 75.4 | U |
| Benzo(b)fluoranthene | | | 3.93 | | 13 | JG | 60.7 | | 30.6 | U | 75.4 | U |
| Benzo(k)fluoranthene | | | 2.04 | UL | 7.77 | UG | 44 | J | 30.6 | U | 75.4 | U |
| Benzo(a)pyrene | 99 | 210 | 2.2 | JG | 7.8 | JG | 30 | G | 19.4 | UG | 46.4 | UG |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 2.1 | JG | 9.7 | JG | 21 | G | 19.4 | UG | * 46.4 | UG |
| Dibenzo(a,h)anthracene | 12 | 33 | 2.04 | U | 7.77 | UG | * 30 | UG | * 30.6 | UG | ** 75.4 | UG |
| Benzo(g,h,i)perylene | 31 | 78 | 2 | G | 6 | JG | 19 | UG | 19.4 | UG | * 46.4 | UG |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.076 | JEG | 0.235 | U | 0.9 | UEG | 0.944 | UEG | ** 2.32 | UEG |
| 1,4-Dichlorobenzene | 3.1 | 9 | 0.152 | E,G | 0.235 | U | 0.9 | UBEG | 1.3 | BEG | 2.5 | BEG |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 0.0618 | UEG | 0.235 | U | * 0.90 | UEG | * 0.944 | UEG | ** 2.32 | UEG |
| Hexachlorobenzene | 0.38 | 2.3 | 0.0618 | UEG | 0.235 | U | * 0.90 | UEG | * 0.944 | UEG | ** 2.32 | UEG |
| Diethyl Phthalate | 61 | 110 | 1.27 | U | 4.99 | U | 19 | U | 19.4 | U | 46.4 | U |
| Dimethyl Phthalate | 53 | 53 | 0.509 | U | 2.05 | U | 7.87 | U | 7.78 | U | 18.8 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 3.31 | G,B | 7.6 | J,B | 64 | B | 58.3 | B | 102 | B |
| Benzyl Butyl Phthalate | 4.9 | 64 | 0.764 | U,B | 2.93 | U | * 45.7 | | * 17 | J | * 27.5 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 2.21 | B | 8.48 | | ** 272 | | * 51.7 | | ** 118 | |
| Di-N-Octyl Phthalate | 58 | 4500 | 0.764 | UL | 2.93 | U | 11 | UL | 11.7 | UL | 27.5 | UL |
| Dibenzofuran | 15 | 58 | 1.27 | U | 4.99 | U | * 19 | U | * 19.4 | U | * 46.4 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | 1.27 | U | * 4.99 | U | ** 19 | UG | ** 19.4 | UG | ** 46.4 | UG |
| N-Nitrosodiphenylamine | 11 | 11 | 1.27 | U | 4.99 | U | ** 19 | U | ** 19.4 | U | ** 46.4 | U |
| Total PCBs | 12 | 65 | 0.618 | U | 2.35 | U | 9 | U | 9.44 | U | * 23.2 | U |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 140 | U | 140 | U | 140 | U | 140 | U | 130 | U |
| 2-Methylphenol | 63 | 63 | 35 | U | 34 | U | 33 | U | 35 | U | 32 | U |
| 4-Methylphenol | 670 | 670 | 35 | U | 34 | U | 33 | U | 35 | U | 32 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 35.0 | U | ** 34.0 | U | ** 33 | U | ** 35.0 | U | ** 32.0 | U |
| Pentachlorophenol | 360 | 690 | 35 | U | 34 | UG | 33 | U | 35 | U | 32 | U |
| Benzyl Alcohol | 57 | 73 | 35 | U | 34 | U | 33 | U | 35 | U | 32 | U |
| Benzoic Acid | 650 | 650 | 140 | U | 140 | U | 140 | U | 140 | U | 130 | U |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 14 | J | 6.2 | U | 9.4 | J | 11 | J | 9.7 | J |
| Cadmium, Total | 5.1 | 6.7 | 0.38 | U | 0.37 | U | 0.36 | U | 0.39 | U | 0.36 | U |
| Chromium, Total | 260 | 270 | 14.1 | | 16.1 | | 11.3 | | 13.9 | | 13 | |
| Copper, Total | 390 | 390 | 14.8 | | 15.4 | | 11.1 | | 12.5 | | 11.3 | |
| Lead, Total | 450 | 530 | 6.4 | J | 7.2 | J | 5.8 | J | 5.8 | J | 4.6 | J |
| Mercury, Total | 0.41 | 0.59 | 0.319 | E | 0.034 | JE | 0.025 | UE | 0.024 | UE | 0.025 | JE |
| Silver, Total | 6.1 | 6.1 | 0.51 | U | 0.5 | U | 0.48 | U | 0.51 | U | 0.47 | U |
| Zinc, Total | 410 | 960 | 54.2 | | 51.1 | | 41.8 | | 51.4 | | 45.1 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 2.75 | | 0.682 | | 0.178 | | 0.18 | | 0.069 | |
| Acid Volatile Sulfides (mg/Kg) | | | 40 | UE | 50 | UE | 40 | UE | 40 | UE | 40 | UE |
| Gravel (%) | | | 1.6 | | 3.6 | | 0.4 | | 0.2 | | 0.2 | |
| Sand (%) | | | 89.2 | | 87.8 | | 95.4 | | 95.9 | | 100.1 | |
| Silt (%) | | | 8.3 | | 8.9 | | 4 | | 4.6 | | 0.6 | |
| Clay (%) | | | 1.6 | | 0.3 | | 0.3 | | 0.3 | | 0.3 | |
| Fines (%) | | | 9.9 | | 9.2 | | 4.3 | | 4.9 | | 0.9 | |
| Salinity (ppt) | | | 22 | | | | 5 | | 10 | | | |
| % Solids | | | 76.8 | | 80.5 | | 80.8 | | 77.7 | | 83.1 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | Marine Sediment Standards | | NFK014 FD | | NFK015 | | NFK016 | | NFK1992 | | NFK1992 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L4321-16 | | L4321-17 | | L4321-18 | | L6725-35 | | L6725-36 | |
| Sample Depth (cm) | | | 0-10 | | 0-10 | | 0-10 | | 0-30 | | 30-60 | |
| Sample Date | | | 8/19/94 | | 8/22/94 | | 8/22/94 | | 8/23/95 | | 8/23/95 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 16.6 | | 1.75 | U | 3.47 | | 4.79 | | 10 | |
| Naphthalene | 99 | 170 | 17.4 | U | 1.75 | U | 5.41 | U | 5.94 | UG | 23.3 | UG |
| Acenaphthylene | 66 | 66 | 6.4 | U | 0.66 | U | 1.98 | U | 2.2 | UG | 8.57 | U |
| Acenaphthene | 16 | 57 | 4.57 | U | 0.464 | U | 1.35 | U | 1.49 | UG | 5.71 | U |
| Fluorene | 23 | 79 | 6.4 | U | 0.66 | U | 1.98 | U | 2.2 | UG | 8.57 | U |
| Phenanthrene | 100 | 480 | 16.6 | G | 0.66 | UG | 3.47 | G | 4.79 | G | 10 | JG |
| Anthracene | 220 | 1200 | 6.4 | UG | 0.66 | UG | 1.98 | UG | 2.2 | UG | 8.57 | UG |
| 2-Methylnaphthalene | 38 | 64 | 17.4 | U | 1.75 | U | 5.41 | U | 5.94 | UG | 23.3 | UG |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 165 | | 1.75 | U | 7.95 | | 80 | | 23.3 | U |
| Fluoranthene | 160 | 1200 | 24.5 | G | 0.662 | UG | 4.16 | G | 20.9 | G | 8.57 | UG |
| Pyrene | 1000 | 1400 | 24.8 | G | 0.66 | UG | 3.79 | G | 16.3 | G | 8.57 | UG |
| Benzo(a)anthracene | 110 | 270 | 15 | G | 0.66 | UG | 1.98 | UG | 7.58 | G | 8.57 | UG |
| Chrysene | 110 | 460 | 17 | | 0.66 | UG | 1.98 | UG | 9.54 | G | 8.57 | UG |
| Total Benzofluoranthenes | 230 | 450 | 21 | | 1.75 | U | 5.41 | U | 9.1 | | 23.3 | U |
| Benzo(b)fluoranthene | | | 21 | | 1.75 | UG | 5.41 | UG | 9.1 | JG | 23.3 | UG |
| Benzo(k)fluoranthene | | | 17.4 | U | 1.75 | UG | 5.41 | UG | 5.94 | UG | 23.3 | UG |
| Benzo(a)pyrene | 99 | 210 | 11 | G | 1.09 | UG | 3.42 | UG | 5.6 | JG | 14.8 | UG |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 19 | G | 1.09 | UG | 3.42 | UG | 5.6 | JG | 14.8 | UG |
| Dibenzo(a,h)anthracene | 12 | 33 | * 17.4 | UG | 1.75 | UG | 5.41 | UG | 5.94 | UG | * 23.3 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 32.6 | G | 1.09 | UG | 3.42 | UG | 5.4 | JG | 14.8 | UG |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.518 | UEG | 0.053 | U | 0.19 | J | 0.095 | UG | 0.371 | UG |
| 1,4-Dichlorobenzene | 3.1 | 9 | 0.55 | BEG | 0.053 | U | 0.162 | U | 0.095 | UG | 0.43 | JG |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 0.518 | UEG | 0.053 | U | 0.162 | U | ** 2.2 | UG | ** 8.57 | UG |
| Hexachlorobenzene | 0.38 | 2.3 | * 0.518 | UEG | 0.053 | U | 0.162 | U | 0.095 | UG | 0.371 | UG |
| Diethyl Phthalate | 61 | 110 | 11 | U | 1.09 | U | 3.42 | U | 3.66 | UG | 14.8 | U |
| Dimethyl Phthalate | 53 | 53 | 4.57 | U | 0.464 | U | 1.35 | U | 1.49 | UG | 5.71 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 33.8 | B | 2.2 | J,B | 6.6 | J,B | 71.6 | BG | 20 | J,B |
| Benzyl Butyl Phthalate | 4.9 | 64 | 114 | | 0.66 | U | 1.98 | U | 2.2 | UG | * 8.57 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 34.1 | | 0.89 | J | 4.37 | | 11.2 | G | 16.3 | |
| Di-N-Octyl Phthalate | 58 | 4500 | 6.4 | UL | 0.66 | U | 1.98 | U | 2.2 | UG | 8.57 | U |
| Dibenzofuran | 15 | 58 | 11 | U | 1.09 | U | 3.42 | U | 3.66 | UG | 14.8 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | ** 11.0 | UG | 1.09 | U | 3.42 | U | 3.66 | UG | ** 14.8 | UG |
| N-Nitrosodiphenylamine | 11 | 11 | 11 | U | 1.09 | U | 3.7 | J | 3.66 | U,B,G | ** 14.8 | U,B |
| Total PCBs | 12 | 65 | 5.18 | U | 0.53 | U | 1.62 | U | 1.8 | U | 7.14 | U |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 150 | U | 140 | U | 150 | U | 150 | U | 120 | U |
| 2-Methylphenol | 63 | 63 | 36 | U | 33 | U | 38 | U | 37 | U | 31 | U |
| 4-Methylphenol | 670 | 670 | 36 | U | 33 | U | 38 | U | 37 | U | 31 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 36.0 | U | ** 33.0 | U | ** 38.0 | U | ** 37.0 | UG | ** 31.0 | UG |
| Pentachlorophenol | 360 | 690 | 36 | U | 33 | UG | 38 | UG | 37 | U | 31 | U |
| Benzyl Alcohol | 57 | 73 | 36 | U | 33 | U | 38 | U | 37 | UG | 31 | UG |
| Benzoic Acid | 650 | 650 | 150 | U | 140 | U | 150 | U | 180 | JE | 323 | E |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 12 | J | 6.2 | U | 7 | U | 7.9 | J | 5.6 | U |
| Cadmium, Total | 5.1 | 6.7 | 0.4 | U | 0.37 | U | 0.42 | U | 0.39 | U | 0.33 | U |
| Chromium, Total | 260 | 270 | 14.3 | | 10.9 | | 16.1 | | 18.3 | | 11.3 | |
| Copper, Total | 390 | 390 | 14.4 | | 13.6 | | 22.2 | | 20.5 | | 13.7 | |
| Lead, Total | 450 | 530 | 7.7 | J | 6.4 | J | 7.4 | J | 7.1 | J | 4 | J |
| Mercury, Total | 0.41 | 0.59 | 0.026 | UE | 0.025 | UE | 0.039 | JE | 0.069 | J | 0.022 | J |
| Silver, Total | 6.1 | 6.1 | 0.53 | U | 0.49 | U | 0.56 | U | 0.51 | U | 0.53 | J |
| Zinc, Total | 410 | 960 | 52.7 | | 48.1 | | 56.8 | | 60.7 | | 46.5 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 0.328 | | 3.02 | | 1.11 | | 1.01 | | 0.21 | |
| Acid Volatile Sulfides (mg/Kg) | | | 50 | UE | 50 | UE | 60 | UE | | | | |
| Gravel (%) | | | 0.2 | | 0.8 | | 1.8 | | 0.7 | | 5.1 | |
| Sand (%) | | | 95.3 | | 99.2 | | 95 | | 79.4 | | 91.6 | |
| Silt (%) | | | 4.2 | | 0.4 | | 3.3 | | 19.2 | | 3.4 | |
| Clay (%) | | | 0.4 | | 0.3 | | 0.3 | | 1.1 | | 0.3 | |
| Fines (%) | | | 4.6 | | 0.7 | | 3.6 | | 20.3 | | 3.7 | |
| Salinity (ppt) | | | | | | | | | | | | |
| % Solids | | | 75.7 | | 81 | | 71.5 | | 72.1 | | 88.2 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | Marine Sediment Standards | | NFK1992 | | NFK1992 | | NFK1992 FD | | NFK1992 FD | | NFK201 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L6725-37 | | L6725-38 | | L6725-44 | | L6725-45 | | L6725-1 | |
| Sample Depth (cm) | | | 60-90 | | 90-120 | | 0-30 | | 30-60 | | 0-10 | |
| Sample Date | | | 8/23/95 | | 8/23/95 | | 8/23/95 | | 8/23/95 | | 8/23/95 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 4.33 | U | 69.3 | U | 6.11 | | 59.1 | U | 33.9 | |
| Naphthalene | 99 | 170 | 4.33 | UG | 69.3 | UG | 7.4 | UG | 59.1 | UG | 3.56 | UG |
| Acenaphthylene | 66 | 66 | 1.64 | UG | 26.5 | U | 2.75 | UG | 21.4 | UG | 1.3 | UG |
| Acenaphthene | 16 | 57 | 1.12 | UG | * 17.7 | U | 1.88 | UG | 15.1 | UG | 2.2 | G |
| Fluorene | 23 | 79 | 1.64 | UG | * 26.5 | U | 2.75 | UG | 21.4 | UG | 2.6 | G |
| Phenanthrene | 100 | 480 | 1.64 | UG | 26.5 | UG | 6.11 | G | 21.4 | UG | 24.3 | G |
| Anthracene | 220 | 1200 | 1.64 | UG | 26.5 | UG | 2.75 | UG | 21.4 | UG | 4.82 | G |
| 2-Methylnaphthalene | 38 | 64 | 4.33 | UG | ** 69.3 | UG | 7.4 | UG | * 59.1 | UG | 3.56 | UG |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 4.33 | U | 69.3 | U | 69.4 | | 59.1 | U | 133 | |
| Fluoranthene | 160 | 1200 | 1.64 | UG | 26.5 | UG | 19.3 | G | 21.4 | UG | 30 | G |
| Pyrene | 1000 | 1400 | 1.64 | UG | 26.5 | UG | 15.4 | G | 21.4 | UG | 25.7 | G |
| Benzo(a)anthracene | 110 | 270 | 1.64 | UG | 26.5 | UG | 8 | G | 21.4 | UG | 12.1 | G |
| Chrysene | 110 | 460 | 1.64 | UG | 26.5 | UG | 8.65 | G | 21.4 | UG | 14.1 | G |
| Total Benzofluoranthenes | 230 | 450 | 4.33 | U | 69.3 | U | 11 | | 59.1 | U | 18 | |
| Benzo(b)fluoranthene | | | 4.33 | UG | 69.3 | UG | 11 | JG | 59.1 | UG | 12.6 | G |
| Benzo(k)fluoranthene | | | 4.33 | UG | 69.3 | UG | 7.4 | UG | 59.1 | UG | 5.4 | JG |
| Benzo(a)pyrene | 99 | 210 | 2.76 | UG | 44.2 | UG | 7 | JG | 36.5 | UG | 11.2 | G |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 2.76 | UG | * 44.2 | UG | 4.63 | UG | * 36.5 | UG | 12 | G |
| Dibenzo(a,h)anthracene | 12 | 33 | 4.33 | UG | ** 69.3 | U | 7.4 | UG | ** 59.1 | UG | 3.56 | UG |
| Benzo(g,h,i)perylene | 31 | 78 | 2.76 | UG | * 44.2 | UG | 4.63 | UG | * 36.5 | UG | 9.9 | G |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.0701 | UG | 1.12 | UG | 0.119 | UG | 0.943 | UG | 0.0586 | UG |
| 1,4-Dichlorobenzene | 3.1 | 9 | 0.0701 | UG | 1.12 | UG | 0.14 | JG | 0.943 | UG | 0.0586 | UG |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | * 1.64 | UG | ** 26.5 | UG | ** 2.75 | UG | ** 21.4 | UG | * 1.3 | UG |
| Hexachlorobenzene | 0.38 | 2.3 | 0.0701 | UG | * 1.12 | UG | 0.119 | UG | * 0.943 | UG | 0.0586 | UG |
| Diethyl Phthalate | 61 | 110 | 2.76 | UG | 44.2 | U | 4.63 | UG | 36.5 | UG | 2.25 | UG |
| Dimethyl Phthalate | 53 | 53 | 1.12 | UG | 17.7 | U | 1.9 | UG | 15.1 | UG | 0.901 | UG |
| Di-N-Butyl Phthalate | 220 | 1700 | 5.87 | BG | 46 | J,B | 15.3 | BG | 49 | J,B,G | 4.1 | J,B,G |
| Benzyl Butyl Phthalate | 4.9 | 64 | 1.64 | UG | * 26.5 | U | 2.75 | UG | * 21.4 | UG | 1.4 | JG |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 1.64 | UG | 32 | J | 16.9 | G | 30 | JG | 15.2 | G |
| Di-N-Octyl Phthalate | 58 | 4500 | 1.64 | UG | 26.5 | U | 2.75 | UG | 21.4 | UG | 1.3 | UG |
| Dibenzofuran | 15 | 58 | 2.76 | UG | * 44.2 | U | 4.63 | UG | * 36.5 | UG | 2.25 | UG |
| Hexachlorobutadiene | 3.9 | 6.2 | 2.76 | UG | ** 44.2 | UG | * 4.63 | UG | ** 36.5 | UG | 2.25 | UG |
| N-Nitrosodiphenylamine | 11 | 11 | 2.76 | U,B,G | ** 44.2 | U,B | 4.63 | U,B,G | ** 36.5 | U,B,G | 2.25 | U,B,G |
| Total PCBs | 12 | 65 | 1.34 | U | * 20.6 | U | 2.25 | U | * 17.6 | U | ** 135 | |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 150 | U | 120 | U | 150 | U | 120 | UG | 200 | U |
| 2-Methylphenol | 63 | 63 | 37 | U | 30 | U | 37 | U | 29 | UG | 50 | U |
| 4-Methylphenol | 670 | 670 | 37 | U | 30 | U | 37 | U | 29 | UG | 50 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 37.0 | UG | ** 30.0 | UG | ** 37.0 | UG | 29 | UG | ** 50.0 | UG |
| Pentachlorophenol | 360 | 690 | 37 | U | 30 | U | 37 | U | 29 | UG | 50 | U |
| Benzyl Alcohol | 57 | 73 | 37 | UG | 30 | UG | 37 | UG | 29 | UG | 50 | UG |
| Benzoic Acid | 650 | 650 | 150 | UE | 120 | UE | 180 | JE | 120 | UEG | 200 | UE |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 6.7 | U | 4.9 | U | 6.9 | J | 5.5 | U | 8.1 | U |
| Cadmium, Total | 5.1 | 6.7 | 0.39 | U | 0.3 | U | 0.36 | U | 0.33 | U | 0.51 | J |
| Chromium, Total | 260 | 270 | 13 | | 11.8 | | 17.3 | | 11.2 | | 24.2 | |
| Copper, Total | 390 | 390 | 18.1 | | 11.1 | | 20.6 | | 11.7 | | 37.6 | |
| Lead, Total | 450 | 530 | 3.9 | U | 3 | U | 8 | J | 3.9 | J | 37.8 | |
| Mercury, Total | 0.41 | 0.59 | 0.027 | U | 0.023 | U | 0.043 | J | 0.022 | U | 0.1 | J |
| Silver, Total | 6.1 | 6.1 | 0.53 | U | 0.44 | J | 0.59 | J | 0.44 | J | 0.97 | J |
| Zinc, Total | 410 | 960 | 37.1 | | 27.4 | | 62.8 | | 43.7 | | 103 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 1.34 | | 0.0678 | | 0.799 | | 0.0795 | | 2.22 | |
| Acid Volatile Sulfides (mg/Kg) | | | | | | | | | | | | |
| Gravel (%) | | | 9.4 | | 2 | | 1 | | 2.8 | | 0.2 | |
| Sand (%) | | | 86 | | 95.2 | | 91.1 | | 95.5 | | 49.6 | |
| Silt (%) | | | 4.5 | | 2.8 | | 7.6 | | 1.8 | | 46.9 | |
| Clay (%) | | | 0.3 | | 0.3 | | 0.5 | | 0.3 | | 3.8 | |
| Fines (%) | | | 4.8 | | 3.1 | | 8.1 | | 2.1 | | 50.7 | |
| Salinity (ppt) | | | | | | | | | | | | |
| % Solids | | | 73.6 | | 91 | | 72.8 | | 91.6 | | 54.5 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | | | NFK201 | | NFK201 FD | | NFK202 | | NFK203 | | NFK204 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Marine Sediment | | L7462-16 | | L7462-17 | | L6725-2 | | L6725-3 | | L6725-4 | |
| Sample Depth (cm) | Standards | | 0-10 | | 0-10 | | 0-10 | | 0-10 | | 0-10 | |
| Sample Date | | | 12/5/95 | | 12/5/95 | | 8/23/95 | | 8/23/95 | | 8/23/95 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 4.2 | U | 8.4 | | 7.4 | | 58.1 | | 28.8 | |
| Naphthalene | 99 | 170 | 4.2 | U | 7.7 | U | 4.42 | UG | 6.41 | UG | 7.74 | UG |
| Acenaphthylene | 66 | 66 | 4.2 | U | 7.7 | U | 1.66 | UG | 2.43 | U | 2.91 | U |
| Acenaphthene | 16 | 57 | 4.2 | U | 7.7 | U | 1.1 | UG | 2.1 | J | 2.02 | U |
| Fluorene | 23 | 79 | 4.2 | U | 7.7 | U | 1.66 | UG | 2.8 | J | 2.91 | U |
| Phenanthrene | 100 | 480 | 4.2 | U | 8.4 | | 7.4 | G | 45.1 | G | 24.9 | G |
| Anthracene | 220 | 1200 | 4.2 | U | 7.7 | U | 1.66 | UG | 8.11 | G | 3.9 | JG |
| 2-Methylnaphthalene | 38 | 64 | 4.2 | U | 7.7 | U | 4.42 | UG | 6.41 | UG | 7.74 | UG |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 5.1 | | 45 | | 78.6 | | 421 | | 242 | |
| Fluoranthene | 160 | 1200 | 5.1 | | 21 | | 17.4 | G | 91 | G | 52.1 | G |
| Pyrene | 1000 | 1400 | 4.2 | U | 15 | | 11.3 | G | 75.9 | G | 45 | G |
| Benzo(a)anthracene | 110 | 270 | 4.2 | U | 7.7 | U | 6.2 | G | 36.7 | G | 20.3 | G |
| Chrysene | 110 | 460 | 4.2 | U | 9 | | 6.22 | G | 42.1 | G | 33.3 | G |
| Total Benzofluoranthenes | 230 | 450 | 4.2 | U | 7.7 | U | 14.3 | | 67.6 | | 40.9 | |
| Benzo(b)fluoranthene | | | 4.2 | U | 7.7 | U | 9.57 | G | 43.5 | G | 28.9 | G |
| Benzo(k)fluoranthene | | | 4.2 | U | 7.7 | U | 4.7 | JG | 24.1 | G | 12 | JG |
| Benzo(a)pyrene | 99 | 210 | 4.2 | U | 7.7 | U | 6.38 | G | 34.7 | G | 18.4 | G |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 4.2 | U | 7.7 | U | 7.85 | G | 32.7 | G | 16.1 | G |
| Dibenzo(a,h)anthracene | 12 | 33 | 4.2 | U | 7.7 | U | 4.42 | UG | 6.6 | J | 7.74 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 4.2 | U | 7.7 | U | 6.99 | G | * 33.5 | G | 16 | G |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | ** 4.2 | U | ** 7.7 | U | 0.0736 | UG | 0.107 | UG | 0.123 | UG |
| 1,4-Dichlorobenzene | 3.1 | 9 | * 4.2 | U | * 7.7 | U | 0.29 | G | ** 13.7 | G | 0.383 | G |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | ** 4.2 | U | ** 7.7 | U | * 1.66 | UG | ** 2.43 | UG | ** 2.91 | UG |
| Hexachlorobenzene | 0.38 | 2.3 | ** 4.2 | U | ** 7.7 | U | 0.0736 | UG | 0.107 | U | 0.123 | U |
| Diethyl Phthalate | 61 | 110 | 4.2 | U | 7.7 | U | 2.8 | UG | 4.1 | U | 4.82 | U |
| Dimethyl Phthalate | 53 | 53 | 4.2 | U | 7.7 | U | 1.1 | UG | 1.65 | U | 2.02 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 4.2 | U | 7.7 | U | 4.8 | J,B,G | 19.2 | B | 16.1 | B |
| Benzyl Butyl Phthalate | 4.9 | 64 | 4.2 | U | * 7.7 | U | 1.66 | UG | * 11.1 | | 2.91 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 4.2 | U | 12 | | 18.7 | G | ** 88.4 | | 23 | |
| Di-N-Octyl Phthalate | 58 | 4500 | 4.2 | U | 7.7 | U | 1.66 | UG | 2.43 | U | 2.91 | U |
| Dibenzofuran | 15 | 58 | 4.2 | U | 7.7 | U | 2.8 | UG | 4.1 | U | 4.82 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | ** 8.4 | U | ** 15 | U | 2.8 | UG | * 4.1 | UG | * 4.82 | UG |
| N-Nitrosodiphenylamine | 11 | 11 | 4.2 | U | 7.7 | U | 2.8 | U,B,G | 4.1 | U,B | 4.82 | U,B |
| Total PCBs | 12 | 65 | 26.0 | | 32.0 | | 12.1 | | 3 | | 2.35 | U |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 280 | U | 240 | U | 180 | UG | 170 | U | 180 | U |
| 2-Methylphenol | 63 | 63 | ** 280 | U | ** 240 | U | 45 | UG | 42 | U | 43 | U |
| 4-Methylphenol | 670 | 670 | 140 | U | 120 | U | 45 | UG | 42 | U | 43 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 420 | U | ** 370 | U | ** 45 | UG | ** 42 | UG | ** 43.0 | UG |
| Pentachlorophenol | 360 | 690 | ** 700 | U | * 610 | U | 45 | UG | 42 | U | 43 | U |
| Benzyl Alcohol | 57 | 73 | ** 700 | U | ** 610 | U | 45 | UG | 42 | UG | 43 | UG |
| Benzoic Acid | 650 | 650 | ** 1400 | U | ** 1200 | U | ** 1500 | E,G | 252 | E | 323 | E |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | | | | | 9.8 | J | 7.2 | J | 14 | J |
| Cadmium, Total | 5.1 | 6.7 | | | | | 0.47 | U | 0.55 | J | 0.43 | U |
| Chromium, Total | 260 | 270 | | | | | 28.7 | | 24 | | 21.3 | |
| Copper, Total | 390 | 390 | | | | | 36.6 | | 48.6 | | 30.7 | |
| Lead, Total | 450 | 530 | | | | | 32.6 | | 62.2 | | 24.1 | |
| Mercury, Total | 0.41 | 0.59 | | | | | 0.23 | J | ** 3.72 | | 0.085 | J |
| Silver, Total | 6.1 | 6.1 | | | | | 0.87 | J | 0.91 | J | 0.58 | U |
| Zinc, Total | 410 | 960 | | | | | 106 | | 175 | | 89.9 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 3.33 | | 1.55 | | 1.63 | | 1.03 | | 0.892 | |
| Acid Volatile Sulfides (mg/Kg) | | | | | | | | | | | | |
| Gravel (%) | | | 0.2 | | 0.3 | | 0.4 | | 0.2 | | 2.3 | |
| Sand (%) | | | 41.1 | | 55.8 | | 35.1 | | 71.6 | | 66.8 | |
| Silt (%) | | | 52.5 | | 37.4 | | 60.2 | | 26.7 | | 28.6 | |
| Clay (%) | | | 6.6 | | 6.7 | | 4.5 | | 1.3 | | 2.3 | |
| Fines (%) | | | 59.1 | | 44.1 | | 64.7 | | 28 | | 30.9 | |
| Salinity (ppt) | | | | | | | | | | | | |
| % Solids | | | 49.5 | | 55.3 | | 59.9 | | 65 | | 62.3 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | Marine Sediment Standards | | NFK207 | | NFK207 | | NFK301 | | NFK302 | | NFK303 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L6725-8 | | L6725-9 | | L7462-1 | | L7462-2 | | L7462-3 | |
| Sample Depth (cm) | | | 0-30 | | 30-60 | | 0-10 | | 0-10 | | 0-10 | |
| Sample Date | | | 8/28/95 | | 8/28/95 | | 12/6/95 | | 12/6/95 | | 12/6/95 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 261 | | 110 | | 5.4 | U | 230 | U | 17 | |
| Naphthalene | 99 | 170 | 18.2 | UG | 30.4 | UG | 5.4 | U | ** 230 | U | 5.8 | U |
| Acenaphthylene | 66 | 66 | 9.4 | J | 11.4 | UG | 5.4 | U | ** 230 | U | 5.8 | U |
| Acenaphthene | 16 | 57 | 16.7 | | 18.5 | G | 5.4 | U | ** 230 | U | 5.8 | U |
| Fluorene | 23 | 79 | 16.2 | | 11.4 | UG | 5.4 | U | ** 230 | U | 5.8 | U |
| Phenanthrene | 100 | 480 | 182 | G | 73.4 | G | 5.4 | U | * 230 | U | 17 | |
| Anthracene | 220 | 1200 | 36.7 | G | 18 | JG | 5.4 | U | * 230 | U | 5.8 | U |
| 2-Methylnaphthalene | 38 | 64 | 18.2 | UG | 30.4 | UG | 5.4 | U | ** 230 | U | 5.8 | U |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 3150 | | 823 | | 13 | | 230 | U | 130 | |
| Fluoranthene | 160 | 1200 | 598 | G | 172 | G | 7.1 | | * 230 | U | 35 | |
| Pyrene | 1000 | 1400 | 556 | G | 148 | G | 5.8 | | 230 | U | 24 | |
| Benzo(a)anthracene | 110 | 270 | 300 | G | 61.6 | G | 5.4 | U | * 230 | U | 9.8 | |
| Chrysene | 110 | 460 | 313 | G | 70.9 | G | 5.4 | U | * 230 | U | 15 | |
| Total Benzofluoranthenes | 230 | 450 | 545 | | 110 | | 5.4 | U | 230 | U | 23 | |
| Benzo(b)fluoranthene | | | 402 | G | 76 | G | 5.4 | U | 230 | U | 12 | |
| Benzo(k)fluoranthene | | | 143 | G | 36 | JG | 5.4 | U | 230 | U | 11 | |
| Benzo(a)pyrene | 99 | 210 | 367 | G | 73.4 | G | 5.4 | U | ** 230 | U | 11 | |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 221 | G | 96.8 | G | 5.4 | U | ** 230 | U | 6.7 | |
| Dibenzo(a,h)anthracene | 12 | 33 | 44.1 | | * 30.4 | UG | 5.4 | U | ** 230 | U | 5.8 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 207 | G | 90.6 | G | 5.4 | U | ** 230 | U | 8 | |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.608 | G | 0.49 | UG | ** 5.4 | U | ** 230 | U | ** 5.8 | U |
| 1,4-Dichlorobenzene | 3.1 | 9 | 263 | G | 10.6 | G | * 5.4 | U | ** 230 | U | * 5.8 | U |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | ** 6.64 | UG | ** 11.4 | UG | ** 5.4 | U | ** 230 | U | ** 5.8 | U |
| Hexachlorobenzene | 0.38 | 2.3 | 0.29 | U | * 0.49 | UG | ** 5.4 | U | ** 230 | U | ** 5.8 | U |
| Diethyl Phthalate | 61 | 110 | 11.5 | U | 20 | UG | 5.4 | U | ** 230 | U | 5.8 | U |
| Dimethyl Phthalate | 53 | 53 | 4.55 | U | 7.6 | UG | 5.4 | U | ** 230 | U | 5.8 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 41.6 | B | 28 | J,B,G | 5.4 | U | * 230 | U | 5.8 | U |
| Benzyl Butyl Phthalate | 4.9 | 64 | 44.4 | | * 11.4 | UG | * 5.4 | U | ** 230 | U | * 5.8 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 503 | | 83.5 | G | 9.2 | | ** 230 | U | 8 | |
| Di-N-Octyl Phthalate | 58 | 4500 | 6.64 | U | 11.4 | UG | 5.4 | U | * 230 | U | 5.8 | U |
| Dibenzofuran | 15 | 58 | 11.5 | U | * 20 | UG | 5.4 | U | ** 230 | U | 5.8 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | ** 11.5 | UG | ** 20 | UG | ** 10 | U | ** 440 | U | ** 12 | U |
| N-Nitrosodiphenylamine | 11 | 11 | 12 | J,B | ** 20 | U,B,G | 5.4 | U | ** 230 | U | 5.8 | U |
| Total PCBs | 12 | 65 | 28.0 | | 9.49 | U | 2.15 | | * 50 | | 11.1 | |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 130 | U | 120 | U | 250 | U | 140 | U | 260 | U |
| 2-Methylphenol | 63 | 63 | 33 | U | 30 | U | ** 250 | U | ** 140 | U | ** 260 | U |
| 4-Methylphenol | 670 | 670 | 33 | U | 30 | U | 130 | U | 72 | U | 130 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 33.0 | UG | ** 30 | UG | ** 380 | U | ** 220 | U | ** 390 | U |
| Pentachlorophenol | 360 | 690 | 33 | U | 30 | U | * 630 | U | 360 | U | * 640 | U |
| Benzyl Alcohol | 57 | 73 | 33 | UG | 30 | UG | ** 630 | U | ** 360 | U | ** 640 | U |
| Benzoic Acid | 650 | 650 | 130 | UE | 140 | JE | ** 1300 | U | ** 720 | U | ** 1300 | U |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 6.2 | U | 5 | U | | | | | | |
| Cadmium, Total | 5.1 | 6.7 | 0.82 | J | 0.53 | J | | | | | | |
| Chromium, Total | 260 | 270 | 27.7 | | 17.9 | | | | | | | |
| Copper, Total | 390 | 390 | 123 | | 118 | | | | | | | |
| Lead, Total | 450 | 530 | 103 | | 36.7 | | | | | | | |
| Mercury, Total | 0.41 | 0.59 | 0.367 | | 0.14 | J | | | | | | |
| Silver, Total | 6.1 | 6.1 | 1.4 | J | 0.61 | J | | | | | | |
| Zinc, Total | 410 | 960 | 263 | | 133 | | | | | | | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 0.286 | | 0.158 | | 2.4 | | 0.0317 | | 2.25 | |
| Acid Volatile Sulfides (mg/Kg) | | | | | | | | | | | | |
| Gravel (%) | | | 18.6 | | 13.6 | | 0.5 | | 0.9 | | 1 | |
| Sand (%) | | | 72.1 | | 84.6 | | 44.9 | | 97.6 | | 42.7 | |
| Silt (%) | | | 8.5 | | 1.8 | | 46.5 | | 1.4 | | 49.7 | |
| Clay (%) | | | 0.9 | | 0.3 | | 8.2 | | 0.3 | | 6.6 | |
| Fines (%) | | | 9.4 | | 2.1 | | 54.7 | | 1.7 | | 56.3 | |
| Salinity (ppt) | | | | | | | | | | | | |
| % Solids | | | 82.8 | | 88.8 | | 50.1 | | 93.8 | | 49.8 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | Marine Sediment Standards | | NFK205 | | NFK206 | | NFK206 FD | | NFK207 | | NFK207 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L6725-5 | | L6725-6 | | L6725-7 | | L6725-10 | | L6725-11 | |
| Sample Depth (cm) | | | 0-10 | | 0-10 | | 0-10 | | 60-90 | | 90-120 | |
| Sample Date | | | 8/28/95 | | 8/28/95 | | 8/28/95 | | 8/28/95 | | 8/28/95 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 12.9 | | 5.17 | U | 12.9 | U | 60 | U | 179 | U |
| Naphthalene | 99 | 170 | 4.01 | UG | 5.17 | UG | 12.9 | UG | 60 | UG | ** 179 | UG |
| Acenaphthylene | 66 | 66 | 1.5 | UG | 1.9 | U | 4.76 | UG | 21.9 | UG | ** 66.2 | U |
| Acenaphthene | 16 | 57 | 1.01 | UG | 1.37 | U | 3.33 | UG | 15.3 | UG | * 46.4 | U |
| Fluorene | 23 | 79 | 1.5 | UG | 1.9 | U | 4.76 | UG | 21.9 | UG | * 66.2 | U |
| Phenanthrene | 100 | 480 | 10.9 | G | 1.9 | UG | 4.76 | UG | 21.9 | UG | 66.2 | UG |
| Anthracene | 220 | 1200 | 2 | JG | 1.9 | UG | 4.76 | UG | 21.9 | UG | 66.2 | UG |
| 2-Methylnaphthalene | 38 | 64 | 4.01 | UG | 5.17 | UG | 12.9 | UG | * 60 | UG | ** 179 | UG |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 116 | | 2.4 | | 5.5 | | 60 | U | 179 | U |
| Fluoranthene | 160 | 1200 | 25.3 | G | 2.4 | JG | 5.5 | JG | 20 | UG | 70 | UG |
| Pyrene | 1000 | 1400 | 16 | G | 1.9 | UG | 4.76 | UG | 21.9 | UG | 66.2 | UG |
| Benzo(a)anthracene | 110 | 270 | 8.02 | G | 1.9 | UG | 4.76 | UG | 21.9 | UG | 66.2 | UG |
| Chrysene | 110 | 460 | 11.3 | G | 1.9 | UG | 4.76 | UG | 21.9 | UG | 66.2 | UG |
| Total Benzofluoranthenes | 230 | 450 | 22 | | 5.17 | U | 12.9 | U | 60 | U | 179 | U |
| Benzo(b)fluoranthene | | | 15.2 | G | 5.17 | UG | 12.9 | UG | 60 | UG | 179 | UG |
| Benzo(k)fluoranthene | | | 6.8 | JG | 5.17 | UG | 12.9 | UG | 60 | UG | 179 | UG |
| Benzo(a)pyrene | 99 | 210 | 9.81 | G | 3.27 | UG | 8.1 | UG | 37.2 | UG | * 113 | UG |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 11.5 | G | 3.27 | UG | 8.1 | UG | * 37.2 | UG | ** 113 | UG |
| Dibenzo(a,h)anthracene | 12 | 33 | 4.01 | UG | 5.17 | U | * 12.9 | UG | ** 60 | UG | ** 179 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 12.5 | G | 3.27 | UG | 8.1 | UG | * 37.2 | UG | ** 113 | UG |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 0.0628 | U,G,X | 0.0833 | UG | 0.207 | UG | 0.941 | UG | ** 2.85 | UG |
| 1,4-Dichlorobenzene | 3.1 | 9 | 0.169 | GX | 0.0833 | UG | 0.207 | UG | 2.25 | G | 2.85 | UG |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | * 1.50 | UG | ** 1.90 | UG | ** 4.76 | UG | ** 21.9 | UG | ** 66.2 | UG |
| Hexachlorobenzene | 0.38 | 2.3 | 0.0628 | UX | 0.0833 | UG | 0.207 | UG | * 0.941 | UG | ** 2.85 | U |
| Diethyl Phthalate | 61 | 110 | 2.51 | UG | 3.27 | U | 8.1 | UG | 37.2 | UG | ** 113 | U |
| Dimethyl Phthalate | 53 | 53 | 1.01 | UG | 1.37 | U | 3.33 | UG | 20 | UG | 50 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 9.9 | BG | 5.5 | J,B | 12 | J,B,G | 81.5 | BG | * 310 | B |
| Benzyl Butyl Phthalate | 4.9 | 64 | 1.5 | UG | 1.9 | U | 4.76 | UG | * 21.9 | UG | ** 66.2 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 18.7 | G | 4.86 | | 4.76 | UG | 20 | JG | ** 79 | J |
| Di-N-Octyl Phthalate | 58 | 4500 | 1.5 | UG | 1.9 | U | 4.76 | UG | 21.9 | UG | * 66.2 | U |
| Dibenzofuran | 15 | 58 | 2.51 | UG | 3.27 | U | 8.1 | UG | * 37.2 | UG | ** 113 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | 2.51 | UG | 3.27 | UG | ** 8.10 | UG | ** 37.2 | UG | ** 113 | UG |
| N-Nitrosodiphenylamine | 11 | 11 | 2.51 | U,B,G | 3.27 | U,B | 8.1 | U,B,G | ** 37.2 | U,B,G | ** 113 | U,B |
| Total PCBs | 12 | 65 | * 61.8 | | 1.58 | U | 3.81 | U | * 17.5 | U | * 53.0 | U |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 210 | UG | 130 | U | 140 | U | 100 | UG | 100 | U |
| 2-Methylphenol | 63 | 63 | 52 | UG | 31 | U | 34 | U | 34 | UG | 34 | U |
| 4-Methylphenol | 670 | 670 | 52 | UG | 31 | U | 34 | U | 34 | UG | 34 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 52.0 | UG | ** 31.0 | UG | ** 34.0 | UG | ** 34.0 | UG | ** 34.0 | UG |
| Pentachlorophenol | 360 | 690 | 52 | UG | 31 | U | 34 | U | 34 | UG | 34 | U |
| Benzyl Alcohol | 57 | 73 | 52 | UG | 31 | UG | 34 | UG | 34 | UG | 34 | UG |
| Benzoic Acid | 650 | 650 | 310 | JEG | 130 | UE | 140 | UE | 100 | UEG | 100 | UE |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | 9.1 | U | 8 | J | 6.4 | J | 6.1 | U | 6 | U |
| Cadmium, Total | 5.1 | 6.7 | 0.54 | U | 0.32 | U | 0.33 | U | 0.38 | U | 0.36 | U |
| Chromium, Total | 260 | 270 | 22 | | 22 | | 12.6 | | 14.5 | | 15.7 | |
| Copper, Total | 390 | 390 | 28.8 | | 26.3 | | 13.7 | | 9.2 | | 9.04 | |
| Lead, Total | 450 | 530 | 18 | J | 6.2 | J | 3.3 | U | 10 | J | 3.6 | U |
| Mercury, Total | 0.41 | 0.59 | 0.33 | J | 0.028 | J | 0.026 | U | 0.025 | U | 0.025 | U |
| Silver, Total | 6.1 | 6.1 | 0.89 | J | 0.44 | U | 0.44 | U | 0.49 | U | 0.61 | J |
| Zinc, Total | 410 | 960 | 81.3 | | 52.9 | | 50.8 | | 26.5 | | 25.6 | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 2.07 | | 0.948 | | 0.42 | | 0.0914 | | 0.0302 | |
| Acid Volatile Sulfides (mg/Kg) | | | | | | | | | | | | |
| Gravel (%) | | | 0.3 | | 1.2 | | 7 | | 0.2 | | 0.7 | |
| Sand (%) | | | 51.8 | | 86.5 | | 91 | | 91.4 | | 92.9 | |
| Silt (%) | | | 43.9 | | 12.2 | | 2 | | 8.5 | | 6.4 | |
| Clay (%) | | | 4.4 | | 0.3 | | 0.4 | | 0.3 | | 0.3 | |
| Fines (%) | | | 48.3 | | 12.5 | | 2.4 | | 8.8 | | 6.7 | |
| Salinity (ppt) | | | | | | | | | | | | |
| % Solids | | | 51.8 | | 87.2 | | 79.3 | | 80 | | 80.1 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | Marine Sediment Standards | | NFK304 | | NFK305 | | NFK306 | | NFK307 | | NFK308 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L7462-4 | | L7462-5 | | L7462-6 | | L7462-7 | | L7462-8 | |
| Sample Depth (cm) | | | 0-10 | | 0-10 | | 0-10 | | 0-10 | | 0-10 | |
| Sample Date | | | 12/6/95 | | 12/6/95 | | 12/6/95 | | 12/6/95 | | 12/6/95 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 6.1 | U | 5.6 | U | 4.5 | U | 13 | | 7.9 | |
| Naphthalene | 99 | 170 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Acenaphthylene | 66 | 66 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Acenaphthene | 16 | 57 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Fluorene | 23 | 79 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Phenanthrene | 100 | 480 | 6.1 | U | 5.6 | U | 4.5 | U | 13 | | 7.9 | |
| Anthracene | 220 | 1200 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| 2-Methylnaphthalene | 38 | 64 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 6.1 | U | 30 | | 12 | | 63 | | 27 | |
| Fluoranthene | 160 | 1200 | 6.1 | U | 12 | | 5.4 | | 27 | | 11 | |
| Pyrene | 1000 | 1400 | 6.1 | U | 12 | | 6.1 | | 21 | | 10 | |
| Benzo(a)anthracene | 110 | 270 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Chrysene | 110 | 460 | 6.1 | U | 6 | | 4.5 | U | 15 | | 5.5 | |
| Total Benzofluoranthenes | 230 | 450 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Benzo(b)fluoranthene | | | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Benzo(k)fluoranthene | | | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Benzo(a)pyrene | 99 | 210 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Dibenzo(a,h)anthracene | 12 | 33 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | ** 6.1 | U | ** 5.6 | U | ** 4.5 | U | ** 12 | U | ** 4.1 | U |
| 1,4-Dichlorobenzene | 3.1 | 9 | * 6.1 | U | * 5.6 | U | * 4.5 | U | ** 12 | U | * 4.1 | U |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | ** 6.1 | U | ** 5.6 | U | ** 4.5 | U | ** 12 | U | ** 4.1 | U |
| Hexachlorobenzene | 0.38 | 2.3 | ** 6.1 | U | ** 5.6 | U | ** 4.5 | U | ** 12 | U | ** 4.1 | U |
| Diethyl Phthalate | 61 | 110 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Dimethyl Phthalate | 53 | 53 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Benzyl Butyl Phthalate | 4.9 | 64 | * 6.1 | U | * 5.6 | U | 4.5 | U | * 12 | U | 4.1 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 13 | | 22 | | 7.4 | | 26 | | 4.1 | U |
| Di-N-Octyl Phthalate | 58 | 4500 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Dibenzofuran | 15 | 58 | 6.1 | U | 5.6 | U | 4.5 | U | 12 | U | 4.1 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | ** 12 | U | ** 11 | U | ** 8.7 | U | ** 25 | U | ** 8.6 | U |
| N-Nitrosodiphenylamine | 11 | 11 | 6.1 | U | 5.6 | U | 4.5 | U | ** 12 | U | 4.1 | U |
| Total PCBs | 12 | 65 | 18.6 | | ** 10400 | | 43.6 | | 49.8 | | * 29.3 | |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 240 | U | 240 | U | 270 | U | 220 | U | 250 | U |
| 2-Methylphenol | 63 | 63 | ** 240 | U | ** 240 | U | ** 270 | U | ** 220 | U | ** 250 | U |
| 4-Methylphenol | 670 | 670 | 120 | U | 120 | U | 140 | U | 110 | U | 120 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 360 | U | ** 370 | U | ** 410 | U | ** 320 | U | ** 370 | U |
| Pentachlorophenol | 360 | 690 | * 590 | U | * 610 | U | * 680 | U | * 540 | U | * 620 | U |
| Benzyl Alcohol | 57 | 73 | ** 590 | U | ** 610 | U | ** 680 | U | ** 540 | U | ** 620 | U |
| Benzoic Acid | 650 | 650 | ** 1200 | U | ** 4500 | | ** 1400 | U | ** 1100 | U | ** 1200 | U |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | | | | | | | | | | |
| Cadmium, Total | 5.1 | 6.7 | | | | | | | | | | |
| Chromium, Total | 260 | 270 | | | | | | | | | | |
| Copper, Total | 390 | 390 | | | | | | | | | | |
| Lead, Total | 450 | 530 | | | | | | | | | | |
| Mercury, Total | 0.41 | 0.59 | | | | | | | | | | |
| Silver, Total | 6.1 | 6.1 | | | | | | | | | | |
| Zinc, Total | 410 | 960 | | | | | | | | | | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 1.96 | | 2.15 | | 3.12 | | 0.896 | | 2.9 | |
| Acid Volatile Sulfides (mg/Kg) | | | | | | | | | | | | |
| Gravel (%) | | | 0.4 | | 3.5 | | 0.4 | | 0.2 | | 0.2 | |
| Sand (%) | | | 36.2 | | 49.5 | | 35.5 | | 82.1 | | 39.9 | |
| Silt (%) | | | 55.6 | | 41.7 | | 57.1 | | 15 | | 52.3 | |
| Clay (%) | | | 8 | | 5.5 | | 7 | | 2.9 | | 8 | |
| Fines (%) | | | 63.6 | | 47.2 | | 64.1 | | 17.9 | | 60.3 | |
| Salinity (ppt) | | | | | | | | | | | | |
| % Solids | | | 53.5 | | 52.1 | | 48.1 | | 60.7 | | 52.8 | |

# Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID | Marine Sediment Standards | | NFK308 FD | | NFK309 | | NFK310 | | NFK311 | | NFK312 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L7462-18 | | L7462-9 | | L7462-10 | | L7462-11 | | L7462-12 | |
| Sample Depth (cm) | | | 0-10 | | 0-10 | | 0-10 | | 0-10 | | 0-10 | |
| Sample Date | | | 12/6/95 | | 12/5/95 | | 12/5/95 | | 12/5/95 | | 12/5/95 | |
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | | | 5.9 | U | 6.2 | U | 10 | | 11 | |
| Naphthalene | 99 | 170 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Acenaphthylene | 66 | 66 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Acenaphthene | 16 | 57 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Fluorene | 23 | 79 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Phenanthrene | 100 | 480 | | | 5.9 | U | 6.2 | U | 10 | | 11 | |
| Anthracene | 220 | 1200 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| 2-Methylnaphthalene | 38 | 64 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | | | 6.4 | | 6.2 | U | 97 | | 86 | |
| Fluoranthene | 160 | 1200 | | | 6.4 | | 6.2 | U | 25 | | 23 | |
| Pyrene | 1000 | 1400 | | | 5.9 | U | 6.2 | U | 20 | | 19 | |
| Benzo(a)anthracene | 110 | 270 | | | 5.9 | U | 6.2 | U | 8.5 | | 7.1 | |
| Chrysene | 110 | 460 | | | 5.9 | U | 6.2 | U | 14 | | 12 | |
| Total Benzofluoranthenes | 230 | 450 | | | 5.9 | U | 6.2 | U | 20 | | 17 | |
| Benzo(b)fluoranthene | | | | | 5.9 | U | 6.2 | U | 9.8 | | 8.1 | |
| Benzo(k)fluoranthene | | | | | 5.9 | U | 6.2 | U | 9.8 | | 9.1 | |
| Benzo(a)pyrene | 99 | 210 | | | 5.9 | U | 6.2 | U | 9.8 | | 8.1 | |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Dibenzo(a,h)anthracene | 12 | 33 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Benzo(g,h,i)perylene | 31 | 78 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | | | ** 5.9 | U | ** 6.2 | U | ** 8.5 | U | ** 6.6 | U |
| 1,4-Dichlorobenzene | 3.1 | 9 | | | * 5.9 | U | * 6.2 | U | * 8.5 | U | * 6.6 | U |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | | | ** 5.9 | U | ** 6.2 | U | ** 8.5 | U | ** 6.6 | U |
| Hexachlorobenzene | 0.38 | 2.3 | | | ** 5.9 | U | ** 6.2 | U | ** 8.5 | U | ** 6.6 | U |
| Diethyl Phthalate | 61 | 110 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Dimethyl Phthalate | 53 | 53 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Benzyl Butyl Phthalate | 4.9 | 64 | | | * 5.9 | U | * 6.2 | U | * 8.5 | U | * 6.6 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | | | 5.9 | U | 18 | | 19 | | 18 | |
| Di-N-Octyl Phthalate | 58 | 4500 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Dibenzofuran | 15 | 58 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | | | ** 12 | U | ** 12 | U | ** 17 | U | ** 13 | U |
| N-Nitrosodiphenylamine | 11 | 11 | | | 5.9 | U | 6.2 | U | 8.5 | U | 6.6 | U |
| Total PCBs | 12 | 65 | * 14.4 | | * 12.9 | | * 33.5 | | * 19.4 | | * 17.5 | |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | | | 240 | U | 240 | U | 260 | U | 260 | U |
| 2-Methylphenol | 63 | 63 | | | ** 240 | U | ** 240 | U | ** 260 | U | ** 260 | U |
| 4-Methylphenol | 670 | 670 | | | 120 | U | 120 | U | 130 | U | 130 | U |
| 2,4-Dimethylphenol | 29 | 29 | | | ** 360 | U | ** 360 | U | ** 380 | U | ** 400 | U |
| Pentachlorophenol | 360 | 690 | | | * 600 | U | * 600 | U | * 640 | U | * 660 | U |
| Benzyl Alcohol | 57 | 73 | | | ** 600 | U | ** 600 | U | ** 640 | U | ** 660 | U |
| Benzoic Acid | 650 | 650 | | | ** 1200 | U | ** 1200 | U | ** 1300 | U | ** 1300 | U |
| Metals (mg/Kg-Dry Weight) | | | | | | | | | | | | |
| Arsenic, Total | 57 | 93 | | | | | | | | | | |
| Cadmium, Total | 5.1 | 6.7 | | | | | | | | | | |
| Chromium, Total | 260 | 270 | | | | | | | | | | |
| Copper, Total | 390 | 390 | | | | | | | | | | |
| Lead, Total | 450 | 530 | | | | | | | | | | |
| Mercury, Total | 0.41 | 0.59 | | | | | | | | | | |
| Silver, Total | 6.1 | 6.1 | | | | | | | | | | |
| Zinc, Total | 410 | 960 | | | | | | | | | | |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 1.93 | | 2.02 | | 1.95 | | 1.53 | | 1.97 | |
| Acid Volatile Sulfides (mg/Kg) | | | | | | | | | | | | |
| Gravel (%) | | | 0.5 | | 0.3 | | 0.2 | | 0.4 | | 0.3 | |
| Sand (%) | | | 44.9 | | 46 | | 38.1 | | 56.4 | | 55.4 | |
| Silt (%) | | | 46.5 | | 46.9 | | 53.3 | | 40.1 | | 40.8 | |
| Clay (%) | | | 8.2 | | 6.8 | | 8.8 | | 3 | | 3.8 | |
| Fines (%) | | | 54.7 | | 53.7 | | 62.1 | | 43.1 | | 44.6 | |
| Salinity (ppt) | | | | | | | | | | | | |
| % Solids | | | 60 | | 55 | | 55 | | 51.7 | | 51.8 | |

## Table 4-3
## SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

| Sample ID<br>Laboratory ID<br>Sample Depth (cm)<br>Sample Date | Marine Sediment Standards | | NFK313<br>L7462-13<br>0-10<br>12/5/95 | | NFK314<br>L7462-14<br>0-10<br>12/6/95 | | NFK315<br>L7462-15<br>0-10<br>12/5/95 | |
|---|---|---|---|---|---|---|---|---|
| | SQS | CSL | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (mg/Kg-Organic Carbon) | 370 | 780 | 6.5 | U | 6.8 | U | 15 | |
| Naphthalene | 99 | 170 | 6.5 | U | 6.8 | U | 5.2 | U |
| Acenaphthylene | 66 | 66 | 6.5 | U | 6.8 | U | 5.2 | U |
| Acenaphthene | 16 | 57 | 6.5 | U | 6.8 | U | 5.2 | U |
| Fluorene | 23 | 79 | 6.5 | U | 6.8 | U | 5.2 | U |
| Phenanthrene | 100 | 480 | 6.5 | U | 6.8 | U | 15 | |
| Anthracene | 220 | 1200 | 6.5 | U | 6.8 | U | 5.2 | U |
| 2-Methylnaphthalene | 38 | 64 | 6.5 | U | 6.8 | U | 5.2 | U |
| HPAH (mg/Kg-Organic Carbon) | 960 | 5300 | 24 | | 56 | | 130 | |
| Fluoranthene | 160 | 1200 | 14 | | 20 | | 39 | |
| Pyrene | 1000 | 1400 | 10 | | 14 | | 22 | |
| Benzo(a)anthracene | 110 | 270 | 6.5 | U | 6.8 | U | 8.8 | |
| Chrysene | 110 | 460 | 6.5 | U | 6.8 | | 15 | |
| Total Benzofluoranthenes | 230 | 450 | 6.5 | U | 7.3 | | 22 | |
| Benzo(b)fluoranthene | | | 6.5 | U | 7.3 | | 12 | |
| Benzo(k)fluoranthene | | | 6.5 | U | 6.8 | U | 10 | |
| Benzo(a)pyrene | 99 | 210 | 6.5 | U | 6.8 | | 11 | |
| Indeno(1,2,3-Cd)Pyrene | 34 | 88 | 6.5 | U | 6.8 | U | 7.2 | |
| Dibenzo(a,h)anthracene | 12 | 33 | 6.5 | U | 6.8 | U | 5.2 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 6.5 | U | 6.8 | U | 8.8 | |
| Other Nonionizable Organics (mg/Kg-Organic Carbon) | | | | | | | | |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | ** 6.5 | U | ** 6.8 | U | ** 5.2 | U |
| 1,4-Dichlorobenzene | 3.1 | 9 | * 6.5 | U | * 6.8 | U | ** 20 | |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | ** 6.5 | U | ** 6.8 | U | ** 5.2 | U |
| Hexachlorobenzene | 0.38 | 2.3 | ** 6.5 | U | ** 6.8 | U | ** 5.2 | U |
| Diethyl Phthalate | 61 | 110 | 6.5 | U | 6.8 | U | 5.2 | U |
| Dimethyl Phthalate | 53 | 53 | 6.5 | U | 6.8 | U | 5.2 | U |
| Di-N-Butyl Phthalate | 220 | 1700 | 6.5 | U | 6.8 | U | 5.2 | U |
| Benzyl Butyl Phthalate | 4.9 | 64 | * 6.5 | U | * 6.8 | U | * 5.2 | U |
| Bis(2-Ethylhexyl)Phthalate | 47 | 78 | 10 | | 20 | | 34 | |
| Di-N-Octyl Phthalate | 58 | 4500 | 6.5 | U | 6.8 | U | 5.2 | U |
| Dibenzofuran | 15 | 58 | 6.5 | U | 6.8 | U | 5.2 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | ** 13 | U | ** 14 | U | ** 10.0 | U |
| N-Nitrosodiphenylamine | 11 | 11 | 6.5 | U | 6.8 | U | 5.2 | U |
| Total PCBs | 12 | 65 | 3.43 | | 5.99 | | ** 19000 | |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | |
| Phenol | 420 | 1200 | 240 | U | 260 | U | 250 | U |
| 2-Methylphenol | 63 | 63 | ** 240 | U | ** 260 | U | ** 250 | U |
| 4-Methylphenol | 670 | 670 | 120 | U | 130 | U | 130 | U |
| 2,4-Dimethylphenol | 29 | 29 | ** 360 | U | ** 400 | U | ** 380 | U |
| Pentachlorophenol | 360 | 690 | * 600 | U | * 660 | U | * 630 | U |
| Benzyl Alcohol | 57 | 73 | ** 600 | U | ** 660 | U | ** 630 | U |
| Benzoic Acid | 650 | 650 | ** 1200 | U | ** 1300 | U | ** 1300 | U |
| Metals (mg/Kg-Dry Weight) | | | | | | | | |
| Arsenic, Total | 57 | 93 | | | | | | |
| Cadmium, Total | 5.1 | 6.7 | | | | | | |
| Chromium, Total | 260 | 270 | | | | | | |
| Copper, Total | 390 | 390 | | | | | | |
| Lead, Total | 450 | 530 | | | | | | |
| Mercury, Total | 0.41 | 0.59 | | | | | | |
| Silver, Total | 6.1 | 6.1 | | | | | | |
| Zinc, Total | 410 | 960 | | | | | | |
| Conventionals | | | | | | | | |
| % TOC | | | 1.84 | | 1.92 | | 2.51 | |
| Acid Volatile Sulfides (mg/Kg) | | | | | | | | |
| Gravel (%) | | | 0.2 | | 0.2 | | 0.3 | |
| Sand (%) | | | 41.7 | | 49.9 | | 60 | |
| Silt (%) | | | 52.6 | | 46.7 | | 35.7 | |
| Clay (%) | | | 6 | | 3.6 | | 4.4 | |
| Fines (%) | | | 58.6 | | 50.3 | | 40.1 | |
| Salinity (ppt) | | | | | | | | |
| % Solids | | | 53.6 | | 48.5 | | 47.9 | |

# Table 4-3
# SEDIMENT CHEMISTRY RESULTS / SMS COMPARISON

XXXX = Detected chemical exceeds SQS/CSL criteria.
* = Chemical exceeds SQS criteria.
** = Chemical exceeds CSL criteria.
SQS/CSL criteria per Sediment Management Standards, Chapter 173-204.

Qual. = Laboratory qualifier.

Qualifier Code:
- U = Undetected at the method detection limit.
- G = Low standard reference material recovery.
- J = Detected below quantification limits.
- L = High standard reference material recovery.
- B = Blank contamination
- E = Estimate based on high relative percent difference in duplicate, high relative standard deviation in triplicate, or high or low surrogate recoveries.
- X = Biased data based on very low surrogate recoveries or very low matrix spike recoveries.

# Table 4-4
## SEDIMENT CHEMISTRY RESULTS / AET COMPARISON

| Sample ID | | | NFK UPRIV2 | | NFK008 | | NFK008 | | NFK009 | | NFK009 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | Puget Sound | | L4321-24 | | L6725-28 | | L6725-29 | | L6725-19 | | L6725-20 | |
| Sample Depth (cm) | AET Values | | 0-10 | | 60-90 | | 90-120 | | 60-90 | | 90-120 | |
| Sample Date | | | 8/19/94 | | 8/28/95 | | 8/28/95 | | 8/28/95 | | 8/28/95 | |
| | LAET | 2LAET | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (ug/Kg-Dry Weight) | 5200 | 13000 | 51 | U | 50 | U | 52 | U | 49 | U | 47 | U |
| Naphthalene | 2100 | 2400 | 51 | U | 50 | UG | 52 | UG | 49 | UG | 47 | UG |
| Acenaphthylene | 1300 | 1300 | 19 | U | 19 | U | 19 | U | 18 | U | 17 | U |
| Acenaphthene | 500 | 730 | 13 | U | 13 | U | 13 | U | 13 | U | 12 | U |
| Fluorene | 540 | 1000 | 19 | U | 19 | U | 19 | U | 18 | U | 17 | U |
| Phenanthrene | 1500 | 5400 | 19 | UG | 19 | UG | 19 | UG | 18 | UG | 17 | UG |
| Anthracene | 960 | 4400 | 19 | U | 19 | UG | 19 | UG | 18 | UG | 17 | UG |
| 2-Methylnaphthalene | | | 51 | U | 50 | UG | 52 | UG | 49 | UG | 47 | UG |
| HPAH (ug/Kg-Dry Weight) | 12000 | 17000 | 51 | U | 50 | U | 52 | U | 49 | U | 47 | U |
| Fluoranthene | 1700 | 2500 | 19 | U | 19 | UG | 19 | UG | 18 | UG | 17 | UG |
| Pyrene | 2600 | 3300 | 19 | UG | 19 | UG | 19 | UG | 18 | UG | 17 | UG |
| Benzo(a)anthracene | 1300 | 1600 | 19 | U | 19 | UG | 19 | UG | 18 | UG | 17 | UG |
| Chrysene | 1400 | 2800 | 19 | U | 19 | UG | 19 | UG | 18 | UG | 17 | UG |
| Total Benzofluoranthenes | 3200 | 3600 | 51 | U | 50 | U | 52 | U | 49 | U | 47 | U |
| Benzo(b)fluoranthene | | | 51 | U | 50 | UG | 52 | UG | 49 | UG | 47 | UG |
| Benzo(k)fluoranthene | | | 51 | UL | 50 | UG | 52 | UG | 49 | UG | 47 | UG |
| Benzo(a)pyrene | 1600 | 3000 | 32 | UX | 31 | UG | 33 | UG | 31 | UG | 29 | UG |
| Indeno(1,2,3-Cd)Pyrene | 600 | 690 | 32 | U | 31 | UG | 33 | UG | 31 | UG | 29 | UG |
| Dibenzo(a,h)anthracene | 230 | 540 | 51 | U | 50 | U | 52 | U | 49 | U | 47 | U |
| Benzo(g,h,i)perylene | 670 | 720 | 32 | UG | 31 | UG | 33 | UG | 31 | UG | 29 | UG |
| Other Nonionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 35 | 50 | 1.5 | UBEG | 0.8 | UG | 0.5 | U | 0.78 | UG | 0.75 | UG |
| 1,4-Dichlorobenzene | 110 | 120 | 1.5 | UBEG | 3.71 | G | 4.14 | G | 16.2 | G | 26.4 | G |
| 1,2,4-Trichlorobenzene | 31 | 51 | 1.5 | UEG | 19 | UG | 19 | UG | 18 | UG | 17 | UG |
| Hexachlorobenzene | 22 | 70 | 1.5 | UEG | 0.8 | UG | 0.5 | U | 0.78 | UG | 0.75 | U |
| Diethyl Phthalate | 200 | 1200 | 32 | U | 31 | U | 33 | U | 31 | U | 29 | U |
| Dimethyl Phthalate | 71 | 160 | 13 | U | 13 | U | 13 | U | 13 | U | 12 | U |
| Di-N-Butyl Phthalate | 1400 | 5100 | 78.2 | BG | 31 | U,B | 33 | U,B | 83.6 | B | 29 | U,B |
| Benzyl Butyl Phthalate | 63 | 900 | 19 | U | 19 | U | 19 | U | 18 | U | 17 | U |
| Bis(2-Ethylhexyl)Phthalate | 1300 | 1900 | 25 | | 19 | U | 19 | U | 23 | J | 27 | J |
| Di-N-Octyl Phthalate | 6200 | 6200 | 19 | UL | 19 | U | 19 | U | 18 | U | 17 | U |
| Dibenzofuran | 540 | 700 | 32 | U | 31 | U | 33 | U | 31 | U | 29 | U |
| Hexachlorobutadiene | 11 | 120 | * 32.0 | U | * 31.0 | UG | * 33.0 | UG | * 31.0 | UG | * 29 | UG |
| N-Nitrosodiphenylamine | 28 | 40 | * 32 | U | * 31 | U,B | * 33 | U,B | * 31 | U,B | * 29 | U,B |
| Total PCBs | 130 | 1000 | 15 | U | 48.1 | | 16 | U | 15 | U | 14 | U |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 130 | U | 130 | U | 130 | U | 130 | UG | 120 | U |
| 2-Methylphenol | 63 | 72 | 32 | U | 31 | U | 33 | U | 31 | UG | 29 | U |
| 4-Methylphenol | 670 | 1800 | 32 | U | 31 | U | 33 | U | 31 | UG | 29 | U |
| 2,4-Dimethylphenol | 29 | 72 | * 32.0 | U | * 31.0 | UG | * 33.0 | UG | * 31.0 | UG | 29 | UG |
| Pentachlorophenol | 360 | 690 | 32 | U | 31 | U | 33 | U | 31 | UG | 29 | U |
| Benzyl Alcohol | 57 | 73 | 32 | U | 31 | UG | 33 | UG | 31 | UG | 29 | UG |
| Benzoic Acid | 650 | 760 | 130 | U | 130 | UE | 130 | UE | 130 | UEG | 120 | UE |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 0.0675 | | 0.0404 | | 0.0274 | | 0.0671 | | 0.0292 | |
| % Solids | | | 84 | | 86.2 | | 82.9 | | 87.9 | | 91.9 | |

XXX = Detected chemical exceeds LAET/2LAET criteria.
* = Chemical exceeds LAET criteria.
** = Chemical exceeds 2LAET criteria.

AET values per Barrick et al. 1988.
LAET = Lowest AET value.
2LAET = Second lowest AET value.

Qual. = Laboratory qualifier.

Qualifier Code:
- U = Undetected at the method detection limit.
- G = Low standard reference material recovery.
- J = Detected below quantification limits.
- L = High standard reference material recovery.
- B = Blank contamination
- E = Estimate based on high relative percent difference in duplicate, high relative standard deviation in triplicate, or high or low surrogate recoveries.
- X = Biased data based on very low surrogate recoveries or very low matrix spike recoveries.

# Table 4-4
## SEDIMENT CHEMISTRY RESULTS / AET COMPARISON

| Sample ID | Puget Sound AET Values | | NFK012 | | NFK013 | | NFK014 | | NFK1992 | | NFK1992 FD | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L4321-13 | | L4321-14 | | L4321-15 | | L6725-38 | | L6725-45 | |
| Sample Depth (cm) | | | 0-10 | | 0-10 | | 0-10 | | 90-120 | | 30-60 | |
| Sample Date | | | 8/18/94 | | 8/19/94 | | 8/19/94 | | 8/23/95 | | 8/23/95 | |
| | LAET | 2LAET | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (ug/Kg-Dry Weight) | 5200 | 13000 | 53 | U | 55 | U | 52 | U | 47 | U | 47 | U |
| Naphthalene | 2100 | 2400 | 53 | U | 55 | U | 52 | U | 47 | UG | 47 | UG |
| Acenaphthylene | 1300 | 1300 | 20 | U | 21 | U | 19 | U | 18 | U | 17 | UG |
| Acenaphthene | 500 | 730 | 14 | U | 14 | U | 13 | U | 12 | U | 12 | UG |
| Fluorene | 540 | 1000 | 20 | U | 21 | U | 19 | U | 18 | U | 17 | UG |
| Phenanthrene | 1500 | 5400 | 20 | UG | 21 | UG | 19 | UG | 18 | UG | 17 | UG |
| Anthracene | 960 | 4400 | 20 | UG | 21 | UG | 19 | UG | 18 | UG | 17 | UG |
| 2-Methylnaphthalene | | | 53 | U | 55 | U | 52 | U | 47 | UG | 47 | UG |
| HPAH (ug/Kg-Dry Weight) | 12000 | 17000 | 597 | | 78 | | 44 | | 47 | U | 47 | U |
| Fluoranthene | 1700 | 2500 | 86 | G | 21 | UG | 20 | G | 18 | UG | 17 | UG |
| Pyrene | 2600 | 3300 | 69.8 | G | 24 | G | 24 | G | 18 | UG | 17 | UG |
| Benzo(a)anthracene | 1300 | 1600 | 74.9 | G | 27 | G | 19 | UG | 18 | UG | 17 | UG |
| Chrysene | 1400 | 2800 | 86.2 | | 27 | J | 19 | U | 18 | UG | 17 | UG |
| Total Benzofluoranthenes | 3200 | 3600 | 187 | | 55 | U | 52 | U | 47 | U | 47 | U |
| Benzo(b)fluoranthene | | | 108 | | 55 | U | 52 | U | 47 | UG | 47 | UG |
| Benzo(k)fluoranthene | | | 79 | J | 55 | U | 52 | U | 47 | UG | 47 | UG |
| Benzo(a)pyrene | 1600 | 3000 | 53 | G | 35 | UG | 32 | UG | 30 | UG | 29 | UG |
| Indeno(1,2,3-Cd)Pyrene | 600 | 690 | 38 | G | 35 | UG | 32 | UG | 30 | UG | 29 | UG |
| Dibenzo(a,h)anthracene | 230 | 540 | 53 | UG | 55 | UG | 52 | UG | 47 | U | 47 | UG |
| Benzo(g,h,i)perylene | 670 | 720 | 33 | UG | 35 | UG | 32 | UG | 30 | UG | 29 | UG |
| Other Nonionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | 35 | 50 | 1.6 | UEG | 1.7 | UEG | 1.6 | UEG | 0.76 | UG | 0.75 | UG |
| 1,4-Dichlorobenzene | 110 | 120 | 1.6 | UBEG | 2.3 | BEG | 1.7 | BEG | 0.76 | UG | 0.75 | UG |
| 1,2,4-Trichlorobenzene | 31 | 51 | 1.6 | UEG | 1.7 | UEG | 1.6 | UEG | 18 | UG | 17 | UG |
| Hexachlorobenzene | 22 | 70 | 1.6 | UEG | 1.7 | UEG | 1.6 | UEG | 0.76 | UG | 0.75 | UG |
| Diethyl Phthalate | 200 | 1200 | 33 | U | 35 | U | 32 | U | 30 | U | 29 | UG |
| Dimethyl Phthalate | 71 | 160 | 14 | U | 14 | U | 13 | U | 12 | U | 12 | UG |
| Di-N-Butyl Phthalate | 1400 | 5100 | 114 | B | 105 | B | 70.4 | B | 31 | J,B | 39 | J,B,G |
| Benzyl Butyl Phthalate | 63 | 900 | * 61.3 | | 31 | J | 19 | U | 18 | U | 17 | UG |
| Bis(2-Ethylhexyl)Phthalate | 1300 | 1900 | 484 | | 93.1 | | 81.5 | | 22 | J | 20 | JG |
| Di-N-Octyl Phthalate | 6200 | 6200 | 20 | UL | 21 | UL | 19 | UL | 18 | U | 17 | UG |
| Dibenzofuran | 540 | 700 | 33 | U | 35 | U | 32 | U | 30 | U | 29 | UG |
| Hexachlorobutadiene | 11 | 120 | * 33 | UG | * 35.0 | UG | * 32.0 | UG | * 30.0 | UG | * 29.0 | UG |
| N-Nitrosodiphenylamine | 28 | 40 | * 33 | U | * 35 | U | * 32 | U | * 30 | U,B | * 29 | U,B,G |
| Total PCBs | 130 | 1000 | 16 | U | 17 | U | 16 | U | 14 | U | 14 | U |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | | | |
| Phenol | 420 | 1200 | 140 | U | 140 | U | 130 | U | 120 | U | 120 | UG |
| 2-Methylphenol | 63 | 72 | 33 | U | 35 | U | 32 | U | 30 | U | 29 | UG |
| 4-Methylphenol | 670 | 1800 | 33 | U | 35 | U | 32 | U | 30 | U | 29 | UG |
| 2,4-Dimethylphenol | 29 | 72 | * 33 | U | * 35.0 | U | * 32.0 | U | * 30.0 | UG | 29 | UG |
| Pentachlorophenol | 360 | 690 | 33 | U | 35 | U | 32 | U | 30 | U | 29 | UG |
| Benzyl Alcohol | 57 | 73 | 33 | U | 35 | U | 32 | U | 30 | UG | 29 | UG |
| Benzoic Acid | 650 | 760 | 140 | U | 140 | U | 130 | U | 120 | UE | 120 | UEG |
| Conventionals | | | | | | | | | | | | |
| % TOC | | | 0.178 | | 0.18 | | 0.069 | | 0.0678 | | 0.0795 | |
| % Solids | | | 80.8 | | 77.7 | | 83.1 | | 91 | | 91.6 | |

XXX = Detected chemical exceeds LAET/2LAET criteria.
* = Chemical exceeds LAET criteria.
** = Chemical exceeds 2LAET criteria.

AET values per Barrick et al. 1988.
LAET = Lowest AET value.
2LAET = Second lowest AET value.

Qual. = Laboratory qualifier.

Qualifier Code:
U = Undetected at the method detection limit.
G = Low standard reference material recovery.
J = Detected below quantification limits.
L = High standard reference material recovery.
B = Blank contamination
E = Estimate based on high relative percent difference in duplicate, high relative standard deviation in triplicate, or high or low surrogate recoveries.
X = Biased data based on very low surrogate recoveries or very low matrix spike recoveries.

# Table 4-4
## SEDIMENT CHEMISTRY RESULTS / AET COMPARISON

| Sample ID | Puget Sound AET Values | | NFK207 | | NFK207 | | NFK207 | | NFK302 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory ID | | | L6725-10 | | L6725-11 | | L6725-9 | | L7462-2 | |
| Sample Depth (cm) | | | 60-90 | | 90-120 | | 30-60 | | 0-10 | |
| Sample Date | | | 8/28/95 | | 8/28/95 | | 8/28/95 | | 12/6/95 | |
| | LAET | 2LAET | Value | Qual. | Value | Qual. | Value | Qual. | Value | Qual. |
| LPAH (ug/Kg-Dry Weight) | 5200 | 13000 | 50 | U | 54 | U | 174 | | 72 | U |
| Naphthalene | 2100 | 2400 | 50 | UG | 54 | UG | 48 | UG | 72 | U |
| Acenaphthylene | 1300 | 1300 | 20 | UG | 20 | U | 18 | UG | 72 | U |
| Acenaphthene | 500 | 730 | 14 | UG | 14 | U | 29.3 | G | 72 | U |
| Fluorene | 540 | 1000 | 20 | UG | 20 | U | 18 | UG | 72 | U |
| Phenanthrene | 1500 | 5400 | 20 | UG | 20 | UG | 116 | G | 72 | U |
| Anthracene | 960 | 4400 | 20 | UG | 20 | UG | 29 | JG | 72 | U |
| 2-Methylnaphthalene | | | 50 | UG | 54 | UG | 48 | UG | 72 | U |
| HPAH (ug/Kg-Dry Weight) | 12000 | 17000 | 50 | U | 54 | U | 1310 | | 72 | U |
| Fluoranthene | 1700 | 2500 | 20 | UG | 20 | UG | 271 | G | 72 | U |
| Pyrene | 2600 | 3300 | 20 | UG | 20 | UG | 234 | G | 72 | U |
| Benzo(a)anthracene | 1300 | 1600 | 20 | UG | 20 | UG | 97.4 | G | 72 | U |
| Chrysene | 1400 | 2800 | 20 | UG | 20 | UG | 112 | G | 72 | U |
| Total Benzofluoranthenes | 3200 | 3600 | 50 | U | 54 | U | 180 | | 72 | U |
| Benzo(b)fluoranthene | | | 50 | UG | 54 | UG | 120 | G | 72 | U |
| Benzo(k)fluoranthene | | | 50 | UG | 54 | UG | 57 | JG | 72 | U |
| Benzo(a)pyrene | 1600 | 3000 | 34 | UG | 34 | UG | 116 | G | 72 | U |
| Indeno(1,2,3-Cd)Pyrene | 600 | 690 | 34 | UG | 34 | UG | 153 | G | 72 | U |
| Dibenzo(a,h)anthracene | 230 | 540 | 50 | UG | 54 | U | 48 | UG | 72 | U |
| Benzo(g,h,i)perylene | 670 | 720 | 34 | UG | 34 | UG | 143 | G | 72 | U |
| Other Nonionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | |
| 1,2-Dichlorobenzene | 35 | 50 | 0.86 | UG | 0.86 | UG | 0.78 | UG | ** 72 | U |
| 1,4-Dichlorobenzene | 110 | 120 | 2.06 | G | 0.86 | UG | 16.8 | G | 72 | U |
| 1,2,4-Trichlorobenzene | 31 | 51 | 20 | UG | 20 | UG | 18 | UG | ** 72 | U |
| Hexachlorobenzene | 22 | 70 | 0.86 | UG | 0.86 | U | 0.78 | UG | ** 72 | U |
| Diethyl Phthalate | 200 | 1200 | 34 | UG | 34 | U | 30 | UG | 72 | U |
| Dimethyl Phthalate | 71 | 160 | 10 | UG | 10 | U | 12 | UG | * 72 | U |
| Di-N-Butyl Phthalate | 1400 | 5100 | 74.5 | BG | 93.5 | B | 45 | J,B,G | 72 | U |
| Benzyl Butyl Phthalate | 63 | 900 | 20 | UG | 20 | U | 18 | UG | * 72 | U |
| Bis(2-Ethylhexyl)Phthalate | 1300 | 1900 | 20 | JG | 24 | J | 132 | G | 72 | U |
| Di-N-Octyl Phthalate | 6200 | 6200 | 20 | UG | 20 | U | 18 | UG | 72 | U |
| Dibenzofuran | 540 | 700 | 34 | UG | 34 | U | 30 | UG | 72 | U |
| Hexachlorobutadiene | 11 | 120 | * 34.0 | UG | * 34.0 | UG | * 30 | UG | ** 140 | U |
| N-Nitrosodiphenylamine | 28 | 40 | * 34 | U,B,G | * 34 | U,B | * 30 | U,B,G | ** 72 | U |
| Total PCBs | 130 | 1000 | 16 | U | 16 | U | 15 | U | 16 | |
| Ionizable Organics (ug/Kg-Dry Weight) | | | | | | | | | | |
| Phenol | 420 | 1200 | 100 | UG | 100 | U | 120 | U | 140 | U |
| 2-Methylphenol | 63 | 72 | 34 | UG | 34 | U | 30 | U | ** 140 | U |
| 4-Methylphenol | 670 | 1800 | 34 | UG | 34 | U | 30 | U | 72 | U |
| 2,4-Dimethylphenol | 29 | 72 | * 34.0 | UG | * 34.0 | UG | * 30 | UG | ** 220 | U |
| Pentachlorophenol | 360 | 690 | 34 | UG | 34 | U | 30 | U | 360 | U |
| Benzyl Alcohol | 57 | 73 | 34 | UG | 34 | UG | 30 | UG | ** 360 | U |
| Benzoic Acid | 650 | 760 | 100 | UEG | 100 | UE | 140 | JE | * 720 | U |
| Conventionals | | | | | | | | | | |
| % TOC | | | 0.0914 | | 0.0302 | | 0.158 | | 0.0317 | |
| % Solids | | | 80 | | 80.1 | | 88.8 | | 93.8 | |

XXX = Detected chemical exceeds LAET/2LAET criteria.
* = Chemical exceeds LAET criteria.
** = Chemical exceeds 2LAET criteria.

AET values per Barrick et al. 1988.
LAET = Lowest AET value.
2LAET = Second lowest AET value.

Qual. = Laboratory qualifier.

Qualifier Code:
U = Undetected at the method detection limit.
G = Low standard reference material recovery.
J = Detected below quantification limits.
L = High standard reference material recovery.
B = Blank contamination
E = Estimate based on high relative percent difference in duplicate, high relative standard deviation in triplicate, or high or low surrogat
X = Biased data based on very low surrogate recoveries or very low matrix spike recoveries.

### 4.4.1 Conventionals

#### *4.4.1.1 Salinity*

Four preliminary interstitial salinity samples were collected in 1994 prior to Phase 1 to guide the selection of bioassay organisms, and determine whether comparison to marine sediment criteria was appropriate. Salinity measurements ranged from 3 to 9 parts per thousand (ppt), and are defined by SMS as low salinity sediments (i.e., 0.5 to 25 ppt). These samples were collected during low tide, when the lowest salinities were expected.

Phase 1 salinity data for upriver stations (NFKUPRIV1, NFKUPRIV2, NFK010) ranged from 14 to 22 ppt, while stations located adjacent to or downstream of the outfall ranged from 5 to 16 ppt. These data confirm the low-salinity sediment designation for the outfall study area.

#### *4.4.1.2 Total Organic Carbon*

Surface sediment TOC concentrations ranged from 0.03 to 4.01 percent; for comparison, a range of 0.5 to 3 percent is typical for Puget Sound marine sediments (Michelsen, 1992). **Figure 4-2** illustrates the spatial distribution of TOC values.

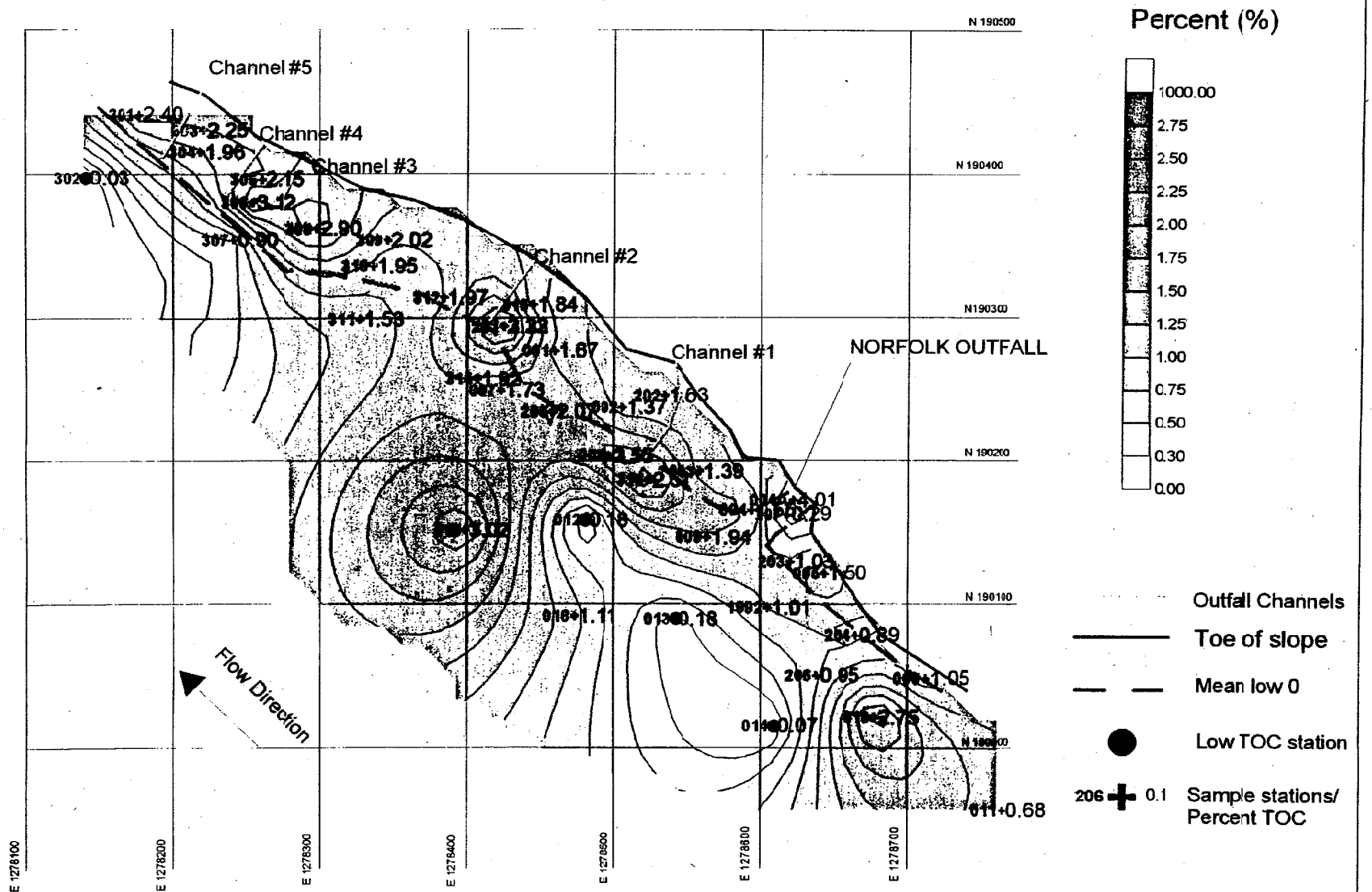
The following Norfolk surface sediment stations are characterized by low TOC concentrations (<0.2 percent) and are compared to AET values in addition to SMS criteria:

- NFKUPRIV2
- NFK012
- NFK013
- NFK014
- NFK302

These stations are located in the subtidal river channel and are dominated by coarse-grained sediment (refer to **Chapter 4.4.1.3**).

#### *4.4.1.3 Particle Size Distribution*

Particle size distribution data are reported in **Table 4-3** as percentages of gravel, sand, silt, and clay. In addition, the distribution of percent fines (silt + clay) is illustrated in **Figure 4-3**, to indicate areas of deposition and scouring. Generally, the coarsest sediments identified in the study area (<5 percent fines) were located in the subtidal river channel (e.g., NFK012 through NFK016, and NFK302), and probably reflects greater scouring action from river flow. Finer sediments (> 60 percent fines) were located at intertidal stations (e.g., NFK004a, NFK202, NFK310) where sediment deposition appears more pronounced.

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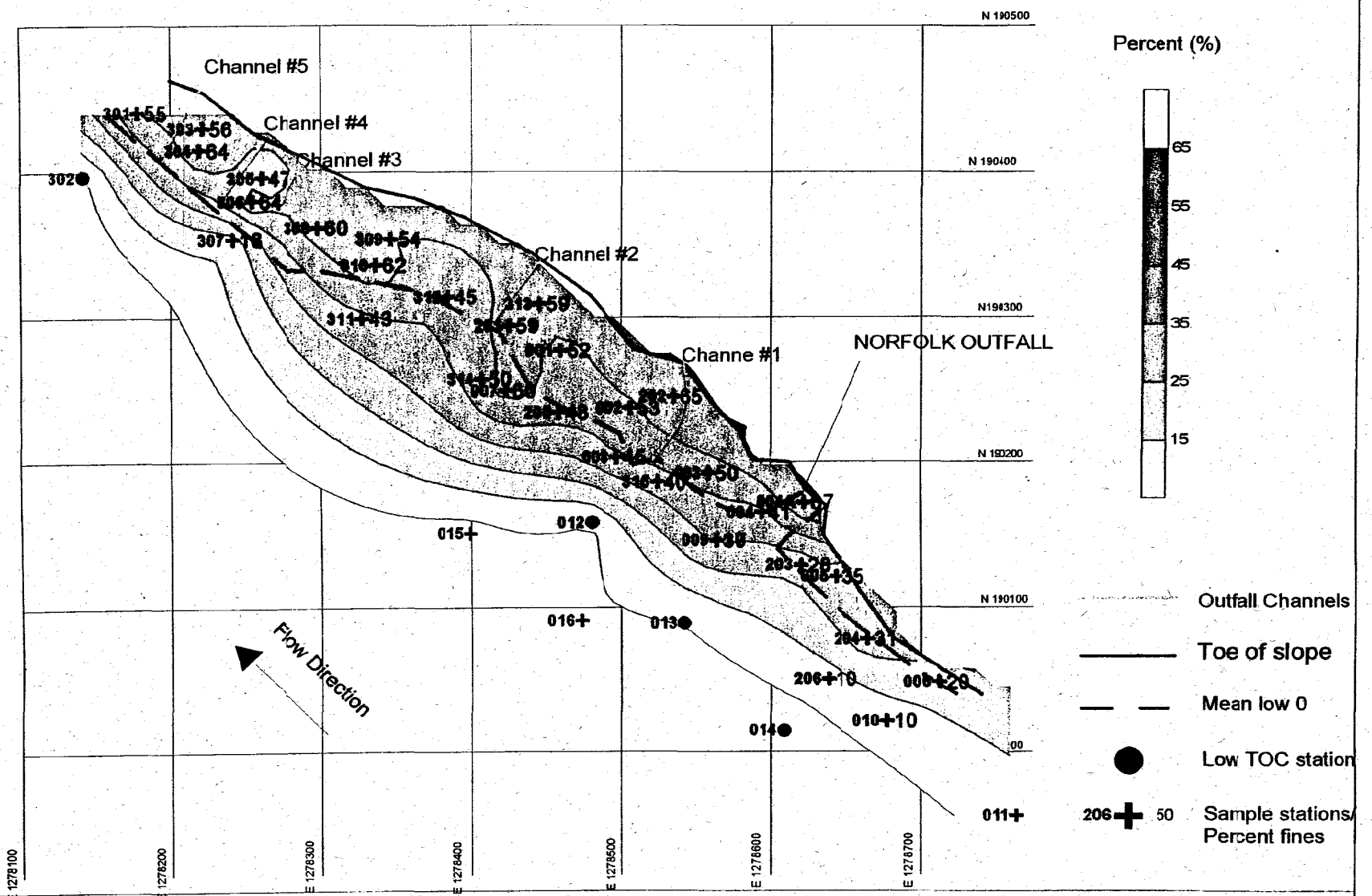
# Norfolk Sediment Cleanup Study

Concentration Contours of Total Organic Carbon in surface sediment

Figure 4-2

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Norfolk Sediment Cleanup Study

Contours of fines in surface sediments

Figure 4-3

### 4.4.2 Inorganics

**Table 4-5** presents a summary of SMS exceedences of detected inorganic chemicals. Mercury was the only inorganic chemical to exceed SMS criteria, with exceedances of CSL criteria at two stations. Methyl mercury represented a small fraction (0.03 to 3.1 percent) of the total mercury content, based on Phase 1 measurements at the bioassay stations (**Appendices B and D**). Mercury also exceeded the CSL at two of three pre-Phase 1 sediment stations (**Appendix A**).

**Table 4-5**
**SUMMARY OF SURFACE SEDIMENT EXCEEDANCES OF SMS CRITERIA OR AET VALUES[a]**

| Chemical | Stations Exceeding SQS Only[b] | Stations Exceeding CSL[b] |
|---|---|---|
| Mercury | | NFK008 NFK203 |
| Total PCBs | NFK001 NFK009<br>NFK201 NFK202<br>NFK205 NFK304<br>NFK306 NFK307<br>NFK308 NFK309<br>NFK310 NFK311<br>NFK312 | NFK008 NFK201<br>NFK305 NFK315 |
| 1,4-Dichlorobenzene | NFK004 | NFK009 NFK203<br>NFK315 |
| Bis (2-ethylhexyl) phthalate | NFK004a NFK005 | NFK008 NFK009<br>NFK203 |
| Benzyl butyl phthalate | NFK203 NFK012[c] | |
| Phenanthrene | NFK006 | |
| Indeno (1,2,3-cd) pyrene | NFK006 | |
| Dibenzo (a,h) anthracene | NFK006 | |
| Benzo (g,h,i) perylene | NFK203 | |
| Benzoic acid | | NFK202 |

Footnotes:

[a]Exceedences based on detected chemicals only.

[b]SQS/CSL exceedances are reported for stations with TOC concentrations >0.2 percent.

[c]LAET/2LAET exceedances are reported for stations with TOC concentrations <0.2 percent.

Other Notes:

SMS: Sediment Management Standards, WAC 173-204
SQS: Sediment Quality Standards, WAC 173-204-320
CSL: Cleanup Screening Levels, WAC 173-204-520
LAET: Lowest Apparent Effects Threshold, PSEP 1988
2LAET: Second Lowest AET Value

### 4.4.3 Organics

**Table 4-5** presents a summary of SMS/AET exceedances for detected organic chemicals. This summary is based on SMS comparisons for surface sediment stations with TOC concentrations >0.2 percent, and AET comparisons for surface sediment stations with TOC concentrations <0.2

percent. Four organic chemicals (Total PCBs, 1,4-dichlorobenzene, bis (2-ethylhexyl) phthalate, and benzoic acid) exceeded CSL criteria. The PCB detections at Stations NFK305 and NFK315 were significant, exceeding the CSL criteria by factors of 160 and 292, respectively. Eight organic chemicals exceeded SQS criteria only; however, three of the SQS exceedances were due to various PAHs at station NFK006, which is located upgradient and removed from the influence of the Norfolk CSO outfall source area. Method blank contamination associated with exceedances of 1,4-dichlorobenzene and bis (2-ethylhexyl) phthalate did not affect sample results (EBDRP, 1995c; **Appendix D**), since method blank concentrations were much lower than sample results.

For those surface sediment stations exhibiting TOC concentrations <0.2 percent, a detection of butyl benzyl phthalate at Station NFK012 exceeded the corresponding LAET value by a factor of 1.3. No other chemicals exceeded LAET/2LAET values at low TOC stations.

Stations with low TOC concentrations also exhibited several exceedances of SMS criteria for undetected nonionizable organics, based on detection limit values (**Table 4-3**). However, when compared to AET values, the detection limits were generally below LAETs with the exception of hexachlorobutadiene.

## 4.5 SUBSURFACE SEDIMENT RESULTS

**Table 4-3** includes subsurface sediment chemistry data for conventionals and SMS chemicals. Similar to the surface sediment presentation, concentrations of SMS chemicals are compared to SMS criteria. If TOC values are less than 0.2 percent, SMS chemicals are also compared to AET values (**Table 4-4**). Evaluation of sediment core data for waste disposal purposes is presented in **Appendix K**.

During Phase 1, one core ($NFK009_{Ph1}$) was collected and sectioned into four segments (0 to 15 cm, 15 to 30 cm, 30 to 45 cm, and 45 to 60 cm). During Phase 2, four cores (NFK008, $NFK009_{Ph2}$, NFK1992, NFK207) were collected, and each core was sectioned into four segments (0 to 30 cm, 30 to 60 cm, 60 to 90 cm, and 90 to 120 cm; or 0 to 1 foot, 1 to 2 foot, 2 to 3 foot, and 3 to 4 foot) for comparison to SMS criteria. The following discussion focuses on the Phase 2 core data, since this provides more chemical data at greater depths. It should be recognized that the sediment coring effort was limited to an area around the Norfolk outfall, and that subsurface chemistry data for downstream Phase 3 stations are lacking.

### 4.5.1 Conventionals

#### *4.5.1.1 Total Organic Carbon*

TOC concentrations ranged between 0.28 to 2.15 percent in the upper section (0 to 30 cm). TOC concentrations generally decreased with depth, ranging between 0.02 to 0.06 percent in the deepest core sections (90 to 120 cm).

The following Norfolk core sections are characterized by low TOC concentrations (<0.2 percent) and were compared to AET values in addition to SMS criteria:

- NFK008 (60 to 90), (90 to 120)
- $NFK009_{Ph2}$ (60 to 90), (90 to 120)
- NFK1992 (30 to 60),(90 to 120); [For comparison, the 60 to 90 cm section has a TOC concentration of 1.34 percent]
- NFK207 (30 to 60), (60 to 90), (90 to 120)

#### *4.5.1.2 Particle Size Distribution*

Sand was the dominant fraction (>50 percent) in all core sections, and increased with sample depth. The sand fraction ranged from 51 to 80 percent in surface sections (0 to 30 cm), and increased to 93 to 96 percent in the deepest core sections (90 to 120 cm). Conversely, percent fines (silt + clay) ranged from 9.4 to 49.2 percent in surface core sections, and decreased to 2.9 to 6.7 percent in bottom core sections.

### 4.5.2 Inorganics

**Table 4-6** presents a summary of SMS criteria exceedences for detected inorganic chemicals. Similar to surface sediments, mercury was the only inorganic chemical to exceed SMS criteria (at two stations) in subsurface core sections. No mercury exceedances were reported below a 60-cm (2-foot) depth.

### 4.5.3 Organics

**Table 4-6** presents a summary of SMS/AET exceedances for detected organic chemicals. This summary is based on SMS comparisons for core sections with TOC concentrations >0.2 percent, and AET comparisons for core sections with TOC concentrations <0.2 percent. A total of 16 organic chemicals exceeded SMS criteria, of which 12 chemicals (primarily PAHs) were associated with exceedances at a single core station (NFK207, 0 to 30 cm). This core station is located within the Norfolk outfall channel, and also exhibits a relatively low TOC concentration of 0.28 percent. For those core stations exhibiting TOC concentrations <0.2 percent, there were no corresponding exceedances of LAET values.

In conclusion, there were no exceedances of SMS criteria or AET values at the upgradient core station NFK1992, or below a 60-cm (2-foot) depth in any core station located adjacent to or downgradient of the Norfolk CSO outfall. This is based on using appropriate comparisons (i.e., using AET values for evaluating core sections with TOC <0.2 percent). Therefore, chemical characterization of sediment cores have been adequately defined for remediation purposes.

## Table 4-6
## SUMMARY OF SEDIMENT CORE EXCEEDANCES OF SMS CRITERIA OR AET VALUES[a]

| Chemical | Station Cores Exceeding SQS Only[b] | Station Cores Exceeding CSL[b] |
|---|---|---|
| Mercury | NFK009$_{Ph2}$ (0 to 30) | NFK008 (30 to 60)<br>NFK009$_{Ph1}$ (15 to 30) |
| Total PCBs | NFK008 (0 to 30)<br>NFK009$_{Ph1}$ (15 to 30)<br>NFK009$_{Ph2}$ (0 to 30)<br>NFK207 (0 to 30) | NFK008 (30 to 60) |
| 1,4-Dichlorobenzene | | NFK009$_{Ph1}$(0 to 15), (15 to 30), (30 to 45), (45 to 60)<br>NFK009$_{Ph2}$(0 to 30), (30 to 60)<br>NFK207 (0 to 30) |
| Bis (2-ethylhexyl) phthalate | | NFK009$_{Ph1}$(0 to 15), (30 to 45)<br>NFK009$_{Ph2}$ (0 to 30)<br>NFK207 (0 to 30) |
| Benzyl butyl phthalate | NFK009$_{Ph1}$(0 to 15), (45 to 60)<br>NFK207 (0 to 30) | |
| Acenaphthene | NFK207 (0 to 30) | |
| Phenanthrene | NFK207 (0 to 30) | |
| Fluoranthene | NFK207 (0 to 30) | |
| Benzo(a)anthracene | | NFK207 (0 to 30) |
| Chrysene | NFK207 (0 to 30) | |
| Total Benzofluoranthenes | | NFK207 (0 to 30) |
| Benzo(a)pyrene | | NFK207 (0 to 30) |
| Indeno (1,2,3-cd) pyrene | | NFK207 (0 to 30) |
| Dibenzo (a,h) anthracene | | NFK207 (0 to 30) |
| Benzo (g,h,i) perylene | | NFK207 (0 to 30) |
| Total HPAHs | NFK207 (0 to 30) | |
| N-Nitrosodiphenylamine | | NFK207 (0 to 30) |

Footnotes:

[a]Exceedence based on detected chemicals only.

[b]SQS/CSL exceedances are reported for stations with TOC concentrations >0.2 percent.

Other Notes:

(0 to 30) Core section in centimeters.
SMS: Sediment Management Standards, WAC 173-204
SQS: Sediment Quality Standards, WAC 173-204-320
CSL: Cleanup Screening Levels, WAC 173-204-520
LAET: Lowest Apparent Effects Threshold, PSEP 1988
2LAET: Second Lowest AET Value

# 5.0 DATA INTERPRETATION

## 5.1 CHEMICALS OF CONCERN

### 5.1.1 Selection Criteria

As an element of the 1991 Consent Decree agreement, the EBDRP Panel was directed to use Washington State sediment standards to determine the level of sediment cleanup. Therefore, identification of chemicals of concern (COCs) for the Norfolk CSO site was based on comparison to SMS criteria (WAC 173-204), which includes both chemical and biological effects criteria. Since Phase 1 bioassay data were rejected for this report, COC identification was based strictly on exceedances of SMS chemical criteria (i.e., SQS and CSL concentrations). An exception to this approach was employed at stations with low TOC concentrations (<0.2 percent), where nonionizable organic chemicals were compared to dry weight AET values to identify COCs.

The SMS provides for site cleanup standards that may range from SQS to CSL/MCUL criteria, based on an evaluation of associated cost and net environmental benefits. Therefore, estimation of the areas of contaminated sediments above SQS and above CSL/MCUL concentrations is the first step in determining cleanup standards for the Norfolk CSO site.

### 5.1.2 Chemicals of Concern from Norfolk CSO

The surface sediment characterization (**Chapter 4.4**) identified four chemicals of concern (mercury, 1,4-dichlorobenzene, bis(2-ethylhexyl)phthalate, and PCBs) around the Norfolk CSO outfall based on exceedances of CSL criteria. Although core data for station NFK207 (located within the Norfolk outfall channel) showed exceedances of SMS criteria for several PAHs in the surface section (0 to 30 cm), PAHs were not evaluated further as COCs. This is due to the fact that PAH exceedances were generally limited to this single core section, and therefore PAHs were not considered a widespread problem in the study area.

Benzoic acid exceeded the CSL at one downstream station (NFK202), and three PAHs exceeded SQS criteria at one upstream station (NFK006); however, the position of these stations does not indicate association with the Norfolk outfall. Station NFK202 is located at the base of a heavily vegetated slope and NFK006 is located next to a large wooded barge made of treated wood. These chemicals are not identified as COCs from the Norfolk CSO.

For data interpretation, SURFER contour concentration maps were generated for each COC using kriging methods. Generally, kriging creates the best overall interpretation of most data sets (Golden Software, 1994). Calculation of areas exceeding SQS and CSL criteria in the contour maps were determined by Arcview GIS methods. Results of the concentration contouring are discussed for each COC.

#### 5.1.2.1 Mercury

**Figure 5-1** illustrates the concentration contours for total mercury in surface sediment. The surface pattern indicates two areas of exceedances. One area is at NFK203 (3.72 mg/kg), which is located adjacent to the Norfolk CSO outfall channel. A smaller area at NFK008 (0.84 mg/kg), located downstream of the Norfolk outfall, appears independent from the CSO footprint based upon the low mercury concentrations reported in between these two hotspots. Since mercury was not tested during Phase 3, it is not plotted for the downstream Phase 3 stations (NFK301 to NFK315).

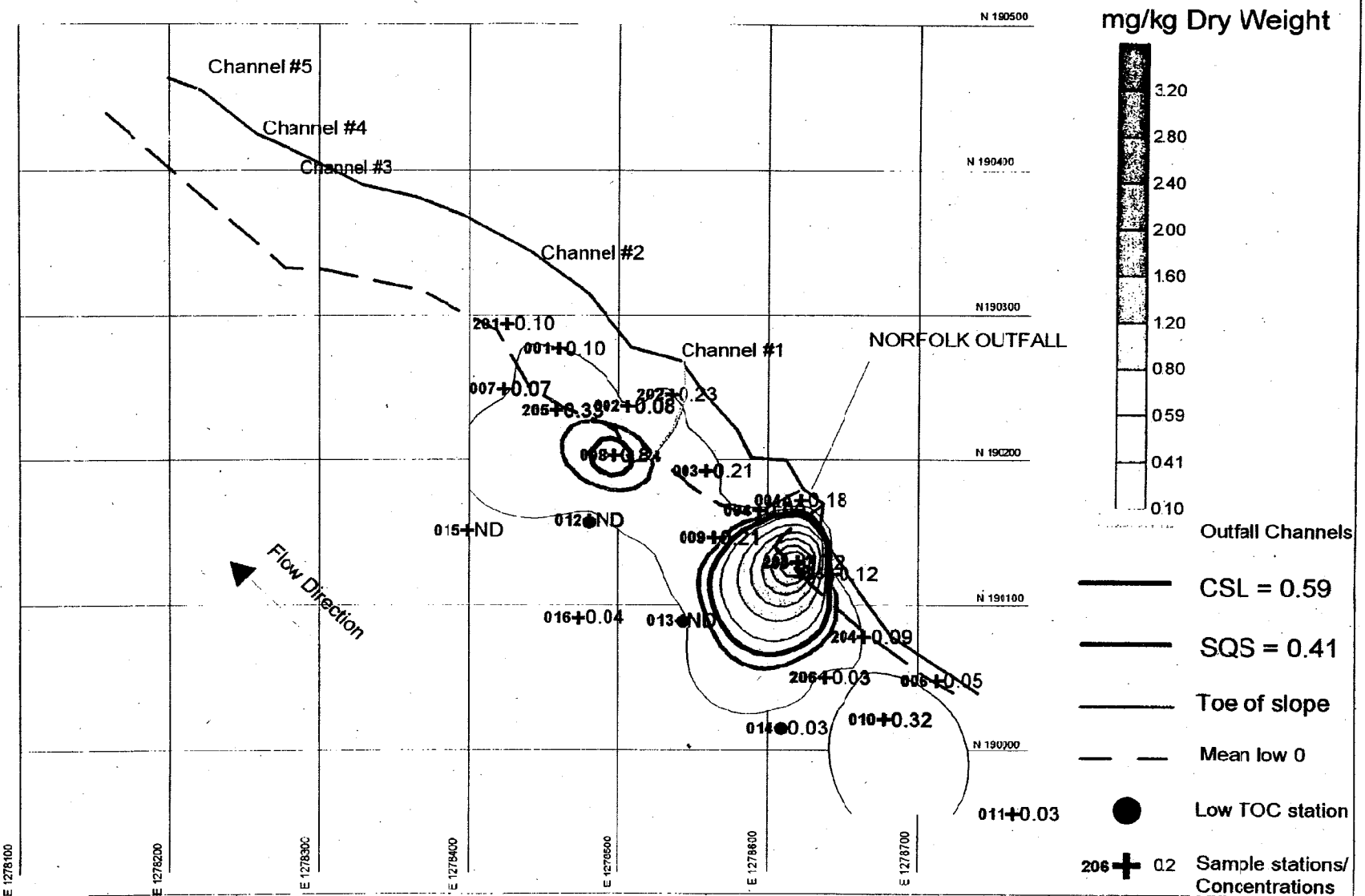
The total surface area exceeding mercury SQS/CSL criteria is combined with other COCs to define the total surface area exceedances (refer to **Chapter 5.1.2.5**). As indicated by Phase 2 coring data (**Chapter 4.5**), mercury did not exceed SMS criteria below 2-foot depth in any core, including one core station located at the NFK008 hotspot.

Available data for characterizing source contributions of mercury are limited. Data presented in the *Pollutant Loading Analyses for the Elliott Bay Waterfront Recontamination Study* (Herrera Environmental Consultants, 1995) identified a mercury concentration range of 0.38 to 3.22 mg/kg in sediments collected from within KCWPCD and City CSOs. The same study presented geometric mean mercury concentrations of 0.2 to 0.26 mg/kg in particulate material discharged from storm drains from residential, commercial, and industrial areas. Mercury has been used as a marker of the extent of sediment contamination resulting from untreated sewage discharges in British Columbia (Chapman et. al., 1996). Finally, the Norfolk regulator was sampled four times during overflow events in 1988 through 1991, and mercury was detected during all four events at concentrations between 0.0002 and 0.0007 mg/L. Modeling results indicate that after source control (of volume), the sediment concentrations are projected to be less than SQS even if the mercury concentration in the outflow stays the same.

#### 5.1.2.2 1,4-Dichlorobenzene

**Figure 5-2** illustrates the concentration contours for 1,4-dichlorobenzene in surface sediment. The surface pattern indicates a CSL exceedance contour extending from station NFK203 (located adjacent to the Norfolk CSO outfall channel), extending downstream through station NFK009, and ending after station NFK315 (which is located at the channel mouth of Outfall Channel #1). The downstream limit to the SQS contour (which represents the downstream limit of the CSO footprint) extends slightly further, but appears to end prior to stations NFK008 and NFK202. Since the concentration of 1,4-dichlorobenzene (both OC-normalized and DW) at downstream station NFK315 exceeds the concentration at upstream stations NFK009 and NFK203, there is the possibility that the downstream station has received additional input from the Boeing outfall. However, there is no data to confirm this. Finally, the concentration contours were not affected by low TOC stations (i.e., NFK012, NFK013, NFK014, NFK302), which exhibited low 1,4-dichlorobenzene concentrations.

The total surface area exceeding 1,4-dichlorobenzene SQS/CSL criteria is combined with other COCs to define the total surface area exceedances (refer to **Chapter 5.1.2.5**). As indicated by Phase 2 coring data (**Chapter 4.5**), 1,4-dichlorobenzene did exceed SMS criteria below 2-foot depth at coring stations NFK008 and NFK009; however, the deeper core sections exhibited low TOC, and additional comparison to dry-weight LAET values showed no exceedances. At core

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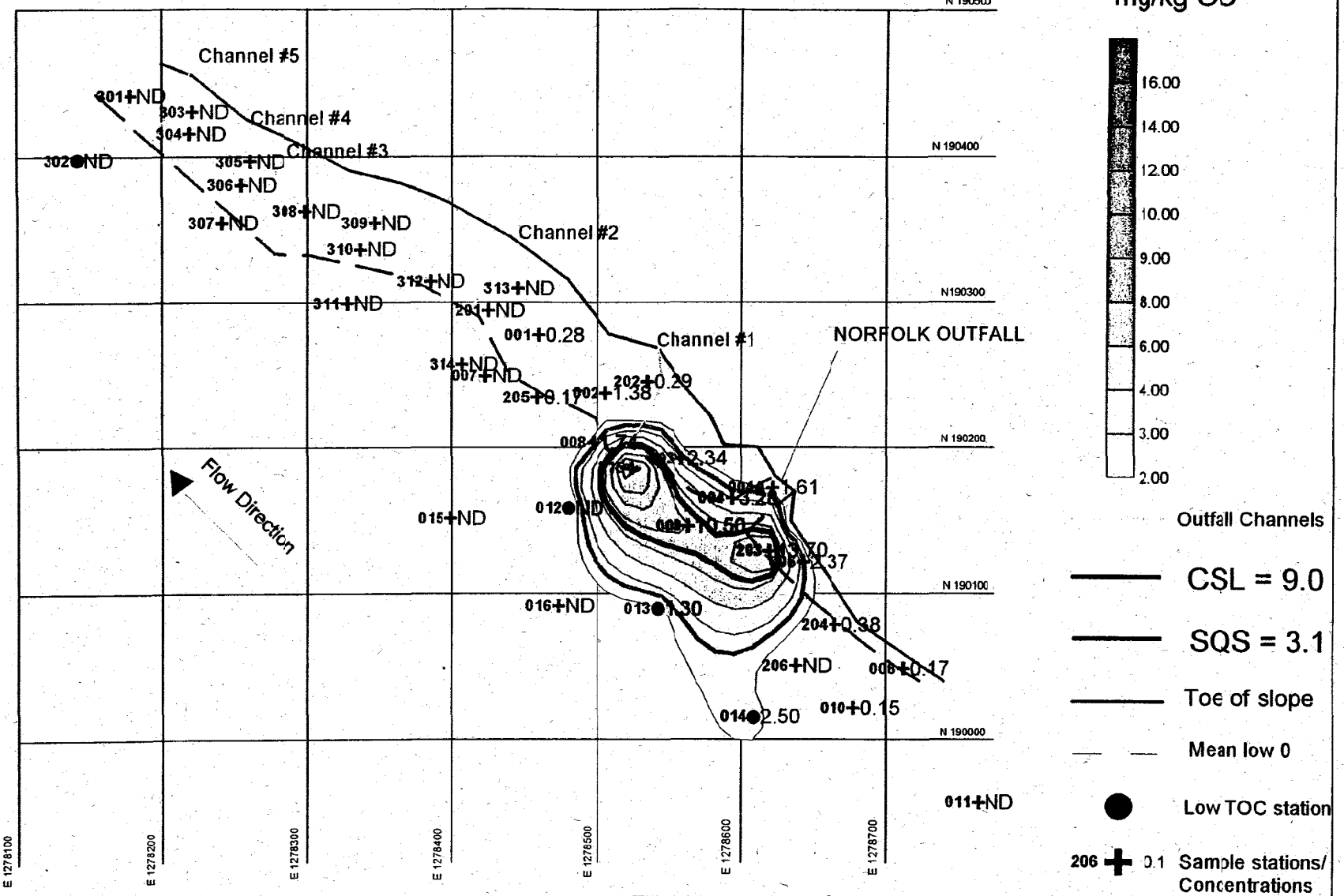
# Norfolk Sediment Cleanup Study

Concentration Contours of Total Mercury in surface sediments

Figure 5-1

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Norfolk Sediment Cleanup Study

Concentration Contours of 1,4-Dichlorobenzene in surface sediments

Figure 5-2

station NFK009, the dry-weight concentration was greatest in the 1- to 2-foot core section (91.4 µg/kg), but decreased to 16.2 µg/kg (2- to 3-foot section) and to 26.4 µg/kg (3- to 4-foot section). Therefore, depth of sediment contamination is assumed to be 2 feet.

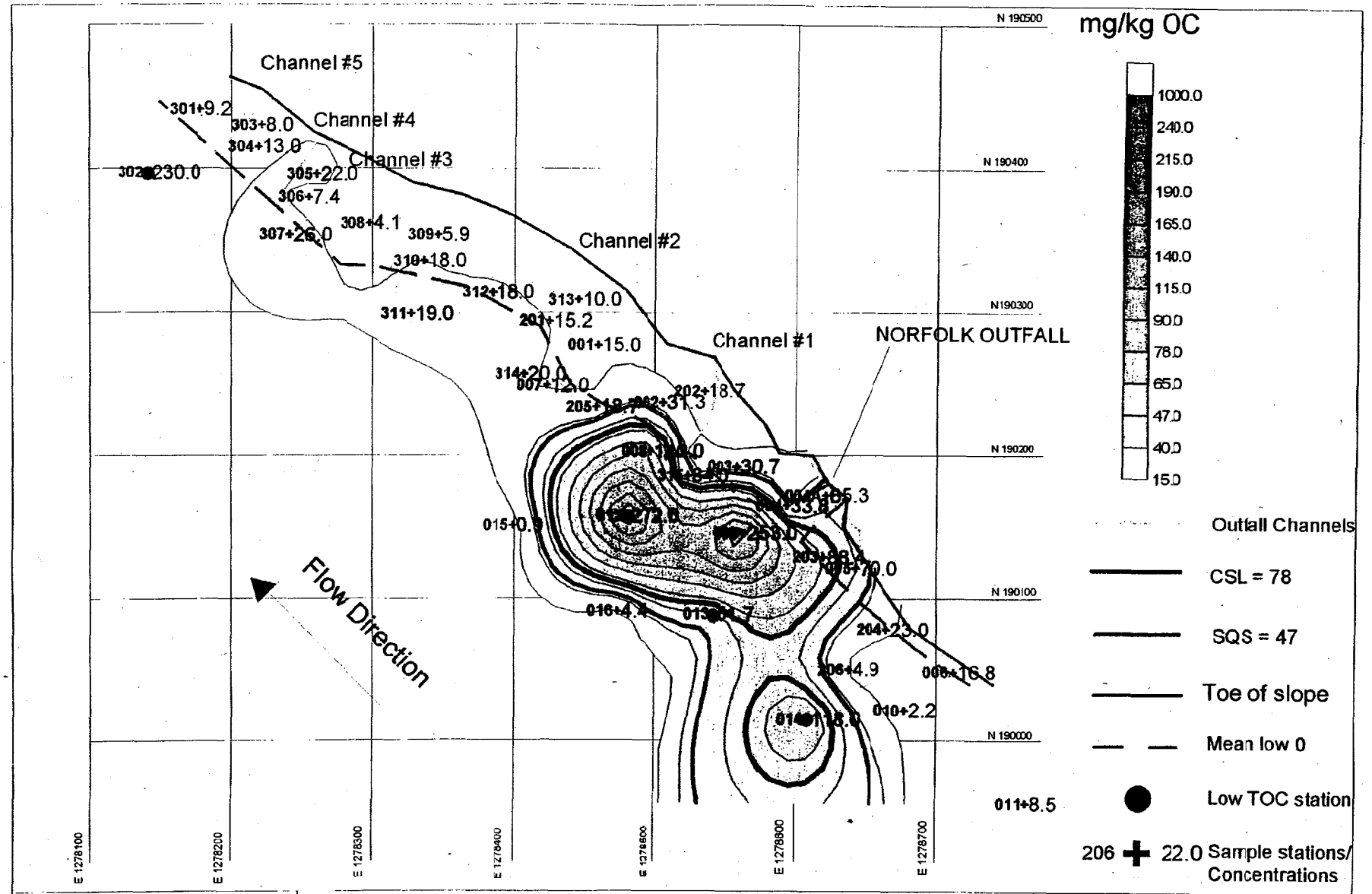
The main source of 1,4-dichlorobenzene to sewage appears to be toilet block deodorizers (Verschueren, 1983); therefore, source control (beyond controlling for the overflows) can be easily accomplished by removal of the toilet block deodorant. Similar to mercury, 1,4-dichlorobenzene serves as a useful marker of the extent of outfall-related sediment contamination, particularly for untreated discharges (Chapman et al, 1996). Once associated with sediments, 1,4-dichlorobenzene is persistent (Oliver and Nicol, 1982). In other studies, this COC has shown high correspondence with both toxicity and changes in benthic community structure, and the correspondence with toxicity increased when 1,4-dichlorobenzene was normalized to TOC (Chapman et al, 1996).

#### *5.1.2.3 Bis (2-ethylhexyl) phthalate*

**Figure 5-3** illustrates the concentration contours for bis (2-ethylhexyl) phthalate in surface sediment. The surface pattern indicates large SQS and CSL exceedance contours in the vicinity of the Norfolk CSO outfall, with the downstream CSO footprint ending near station NFK205. However, it is apparent that inclusion of low TOC stations (NFK012, NFK013, and NFK014) has affected the concentration contours. Therefore, surface concentrations were also contoured on a dry weight basis (**Figure 5-4**). The dry weight contours indicate a more realistic picture of the Norfolk CSO footprint, with peak concentrations evident near the base of the outfall and at two downstream stations.

The total surface area exceeding SQS and CSL criteria was not estimated, due to the impact of low TOC stations on the generation of these contours. However, the total surface area exceeding LAET/2LAET values is combined with other COCs to define the total surface area exceedances (refer to **Chapter 5.1.2.5**). As indicated by Phase 2 coring data (**Chapter 4.5**), bis (2-ethylhexyl) phthalate exceeded SMS criteria below 2-foot depth at coring stations NFK009 and NFK207; however, the deeper core sections exhibited low TOC, and additional comparison to dry-weight LAET values showed no exceedances. At core station NFK009, the dry-weight concentration was greatest in the 0- to 1-foot core section (572 µg/kg), but decreased to less than 30 µg/kg below the 1-foot depth. At core station NFK207, the dry weight concentration was also greatest in the 0- to 1-foot core section (1440 µg/kg), but decreased to less than 25 µg/kg below the 2-foot depth. Therefore, depth of sediment contamination is assumed to be 2 feet.

Phthalates have been used as plasticizers since the 1930s, primarily for production of polyvinyl chloride and other polymers. They are also used in household products. Therefore, their distribution in the environment is widespread. Bis (2-ethylhexyl) phthalate strongly sorbs to sediment due to its low water solubility, and is relatively persistent in the environment. Source control, other than control of the overflow, may be difficult because of the widespread sources.

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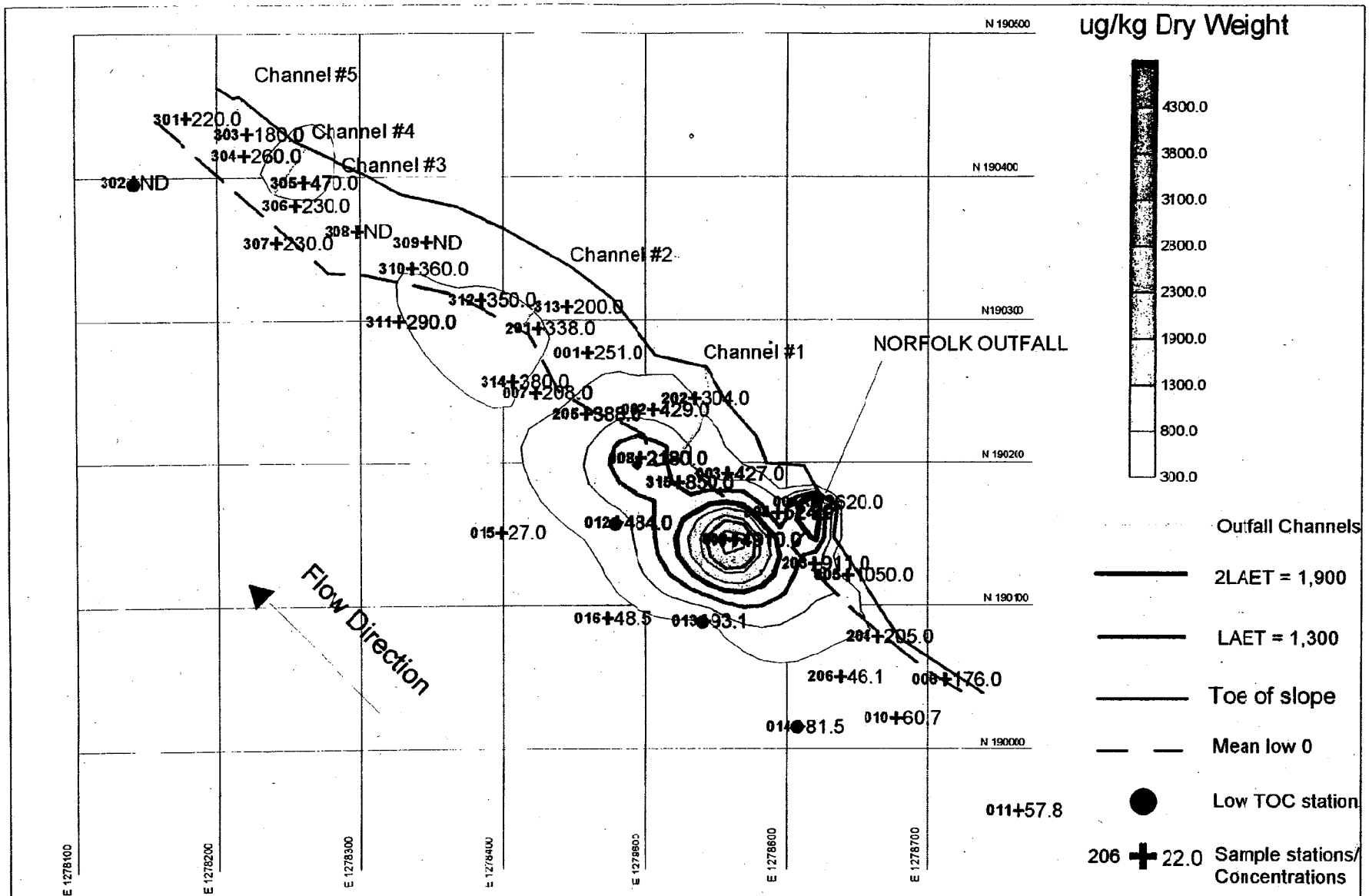
# Norfolk Sediment Cleanup Study

Concentration Contours of Bis(2-EthylHexyl)Phthalate in surface sediments

Figure 5-3

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# Norfolk Sediment Cleanup Study

Concentration Contours of Bis(2-EthylHexyl)Phthalate in surface sediments

Figure 5-4

#### *5.1.2.4 PCBs*

**Figure 5-5** illustrates the concentration contours for total PCBs in surface sediment. The surface patterns are dominated by hotspots at station NFK315 (19,000 mg/kg OC),which is located at the channel mouth of Boeing Outfall #1, and at station NFK305 (10,400 mg/kg OC), which is located approximately 400 feet downstream of the Norfolk outfall. It is clear that the downstream PCB hotspot at NFK305 is unrelated to the Norfolk CSO outfall footprint. A third area of smaller PCB magnitude is located at station NFK201 (135mg/kg OC), which appears independent of the NFK305/315 hotspots.

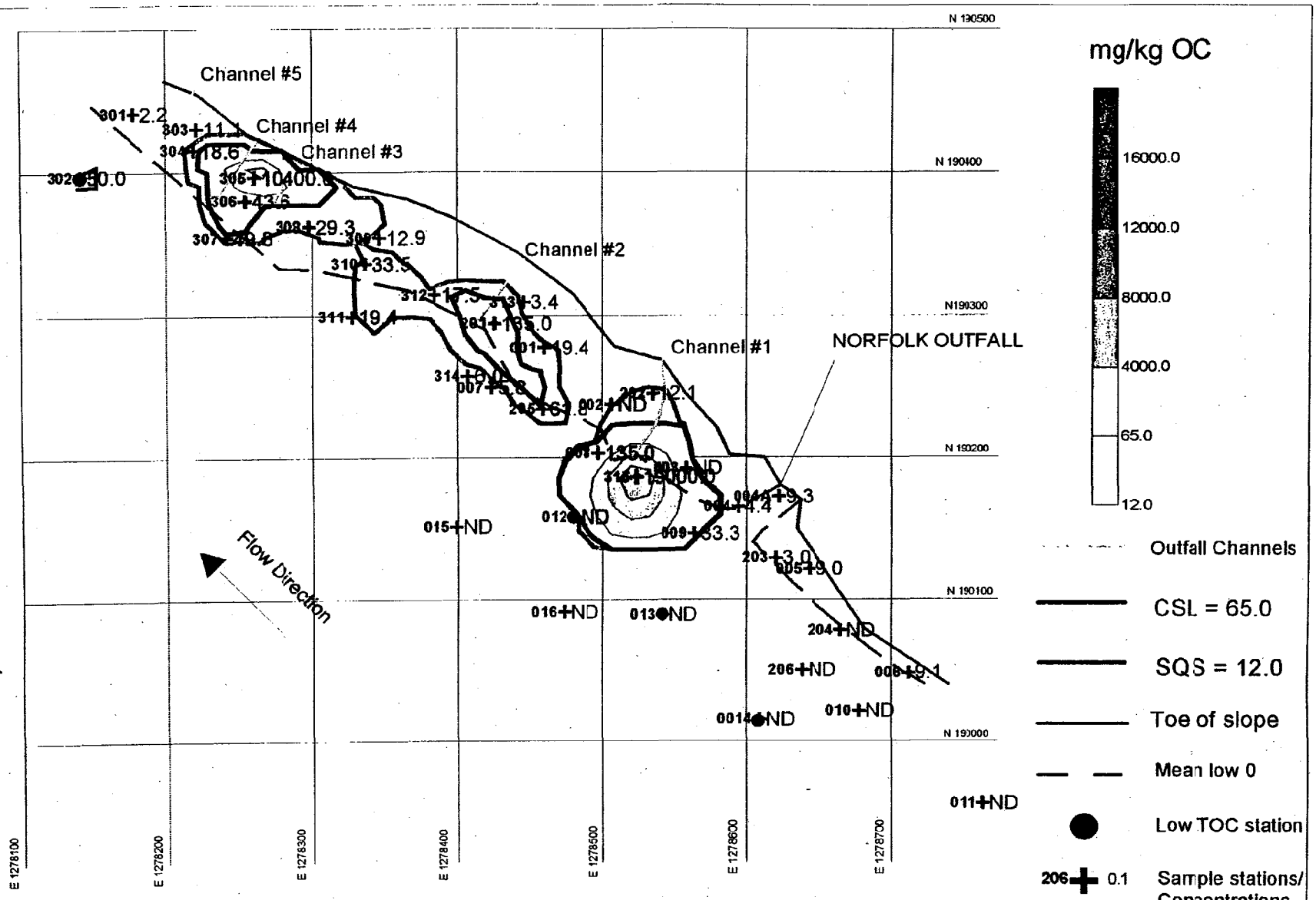
For the PCB hotspot at NFK315, the total surface area exceeding SQS/CSL criteria is combined with other COCs to define the total surface area exceedances (refer to **Chapter 5.1.2.5**). As indicated by Phase 2 coring data (**Chapter 4.5**), PCBs exceeded SMS criteria below 2-foot depth at core station NFK008 (located within 20 feet of the NFK315 hotspot); however, the deeper core sections exhibited low TOC, and additional comparison to dry-weight LAET values showed no exceedances. Dry weight concentrations at this core station were greatest between 1 to 2 feet (81,400 µg/kg), and decreased to less than 50 µg/kg below a 2-foot depth. Therefore, depth of sediment contamination is assumed to be 2 feet.

The concentration contours associated with the PCB hotspots at downstream stations NFK201 and NFK305 are not considered part of the Norfolk CSO footprint, and therefore associated surface area exceedences have not been included for these downstream locations.

Current uses of PCBs are restricted to insulating materials in electrical capacitors and certain transformers employed in enclosed areas. Historically, PCBs were used in hydraulic fluids, plasticizers in waxes, additives (in paints, adhesives, and caulking compounds), and components in paper manufacture (Mearns et.al., 1991). Sources of PCBs to aquatic environments include municipal sewage treatment plants, industrial runoff, leaching from disposal sites, and refuse incineration.

#### *5.1.2.5 Total Cleanup Areas And Volumes Defined by Norfolk CSO Chemicals of Concern*

The surface areas for SQS/CSL exceedances (or LAET/2LAET exceedances for bis (2-ethylhexyl) phthalate) determined by contour plotting were overlaid for the four COCs, and total surface areas that may require cleanup were estimated by Arcview GIS methods. Using this approach, the total surface area exceeding SQS criteria is estimated at 20,000 square feet, and the total surface area exceeding CSL criteria is estimated at 14,800 square feet (**Figure 5-6**). Assuming a 2-foot depth of contamination, total sediment volume exceeding SQS criteria is estimated at 1,481 cubic yards, and total sediment volume exceeding CSL criteria is estimated at 1,096 cubic yards. As indicated, these estimates include the PCB hot spot associated with Station NFK315, but exclude the PCB hot spots located further downstream and beyond the CSO footprint.

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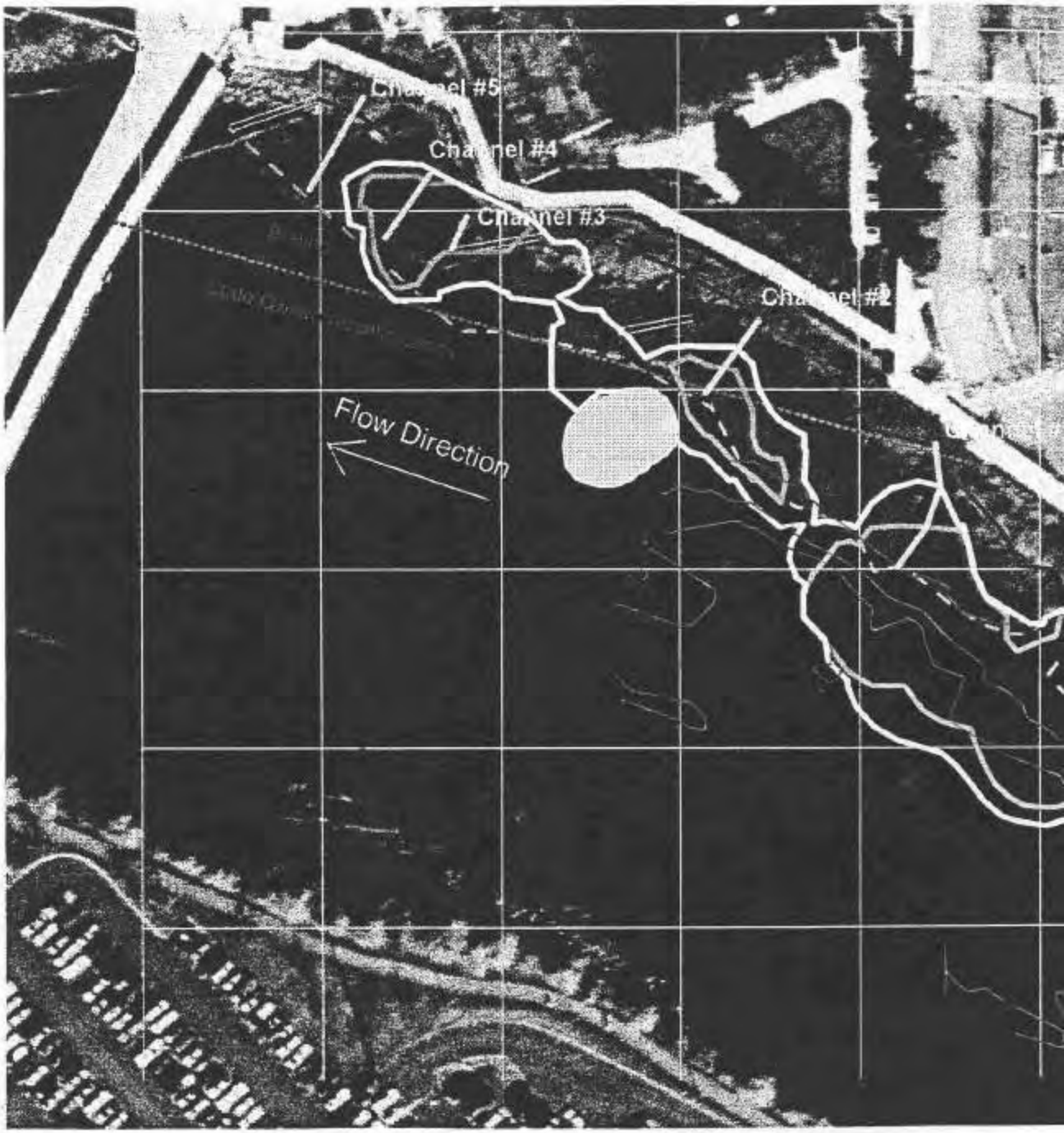
# Norfolk Sediment Cleanup Study

Concentration Contours of Total PCBs in surface sediments

Figure 5-5

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Norfolk Sedim

SQS/CSL Exce

Approximate Rockpile
Outfall Flow Channels
Bathymetry
Area of SQS Exceedance
Area of CSL Exceedance
Property Line
Toe of the slope
Approximate Mean low 0
Wingwall
Grid

- Photo copyright 1996 City of Seattle.
- Bathymetry from David Evans & Assoc.
- Property Line from King County Engineering Dept. Map, 1994
- Other data from KCWPCD

N
W E
S

100 0 100 200 Feet

Cleanup Study

dance Boundaries

Figure 5-6

### 5.1.3 Chemicals of Concern from Other Sources

The tabulated data and concentration contour maps do not indicate other source areas upgradient of the Norfolk outfall, with the exception of limited PAH exceedances of SQS criteria at station NFK006. This station is located approximately 140 feet upstream, and may be influenced by creosote from the adjacent wood barge; however, there is no data to confirm this. Further upstream, samples collected at the Duwamish reference stations (NFKUPRIV1, NFKUPRIV2) showed no exceedances of SMS criteria.

Potential downstream contaminant sources include storm drain discharges from the Boeing outfalls. The contour maps presented in this chapter generally indicate peak concentrations of the four COCs near the channel of the CSO outfall, followed by a second peak near the channel mouth of Boeing Outfall #1. For PCBs, the downstream hot spot at station NFK305 is located near the channel mouth of Boeing outfall #4. It is unknown whether these peak concentrations represent current or historical discharges to the river. Since the PCB hotspot areas appear independent, this cleanup study is strictly focused on those areas associated with the footprint of the Norfolk CSO outfall.

## 5.2 POTENTIAL FOR CONTAMINANT MIGRATION

The possible mechanisms for contaminant migration include (1) sediment erosion and subsequent resettling, (2) sediment reworking, including bioturbation, and (3) contaminant repartitioning to the water column.

The Duwamish River is generally a region of sedimentation. Sediment erosion could occur under extremely high river discharges (however, the river is regulated upstream by the Howard Hansen dam) or extreme tidal surges from Elliott Bay. Either of these condition is rare, and therefore the likelihood of sediment erosion and subsequent resettling is considered to be small.

It is certain that the sediment will be reworked to some extent by a number of processes including bioturbation and vessel wake turbulence. However, these processes will generally diffuse the contamination vertically through the sediment column, and thus will dilute sediment concentrations.

As the overlying water becomes cleaner, linear-isotherm partitioning suggests that some contamination will move from the sediment to the water column. This would tend to reduce sediment concentrations, and the flux to the water column would be flushed to Elliott Bay and quickly mixed below detection levels.

Overall, the potential for significant (sufficient to cause concern) sediment migration is considered to be small.

## 5.3 POTENTIAL FOR NATURAL RECOVERY

The mechanisms for natural recovery include (1) natural sedimentation and burial, (2) sediment reworking, and (3) contaminant repartitioning to the water column.

Natural sedimentation does occur in the Duwamish River, as the river velocities decrease where the river meets salt water, and the river widens. However, sedimentation rates are generally small, and natural recovery through this process would take a long time. As with natural sedimentation, sediment reworking through processes such as bioturbation and vessel wake turbulence is also a slow process.

Contaminant repartitioning to the overlying water column could occur if the water column concentrations were less than those estimated from equilibrium partitioning theory. In general, the flows from upstream are relatively clean, and once the Norfolk CSO discharge is controlled and other nearby sources are controlled, we would expect to see decreased ambient water column concentrations of the chemicals of concern. While this would result in decreasing contaminant concentrations in the sediment, the rate of recovery is uncertain, and would probably be slow because the organic contaminants of concern (e.g. PCBs) are strongly adsorbed to sediments. Modeling results indicate that sediment concentrations are reduced much more slowly in the absence of high sedimentation rates. At the Norfolk site, the net sedimentation rate appears to be low, based on the observation of little change in stakes left in the intertidal area for 2 years.

It is clear that as discharges are controlled and contaminant sources eliminated or reduced, natural recovery would occur. However, with the available information, it is not possible to predict how long this would take. It is likely that each of the processes reviewed would act slowly, and together they would still take considerable time to meet sediment quality standards.

## 5.4 POTENTIAL FOR SEDIMENT RECONTAMINATION

Sediment recontamination could potentially come from three sources: (1) the Norfolk CSO discharge, (2) from nearby sources within the tidal excursion range of the Norfolk discharge point (e.g., Boeing outfalls), and (3) from ambient concentrations carried by the Duwamish River.

The sediment recontamination modeling results indicate that discharges from the Norfolk outfall following CSO reductions should not cause sediment recontamination that would exceed the sediment quality standards. The model results indicate that the river mixing width required to meet sediment quality criteria is very small, and much smaller than the width of the area of observed contamination.

As previously discussed, the Boeing Company recently collected and tested sediment samples from the base of their downstream storm drain outfalls for PCBs, and results were generally nondetects (refer to **Chapter 3.1.2** and **Appendix F**). However, the tabulated data and concentration contours for the chemicals of concern indicates a possible association between the

storm drains and elevated contaminant levels. Therefore, current findings cannot totally dismiss the Boeing outfalls as unlikely to cause sediment recontamination.

Finally, sediment sampling conducted upstream of the Norfolk CSO outfall show no significant concentrations of the chemicals of concern. Therefore, the overall potential for sediment recontamination following various levels of cleanup is considered to be small.

# 6.0 APPLICABLE LAWS AND REGULATIONS

## 6.1 IDENTIFICATION OF APPLICABLE LAWS AND REGULATIONS

This chapter presents the applicable laws and regulations which govern cleanup at the Norfolk site, and the cleanup standards which will be applied to site sediments based upon this review. Many federal, state, and local laws, regulations , and ordinances may affect the Norfolk sediment remediation project. Some of these programs directly address the management of contaminated materials, dredged material, or sediments. Other programs may impose requirements that impact the manner in which the sediment cleanup will be implemented.

The selection of the applicable laws and regulations depends on site characteristics and location, the remedial actions selected, the substances present at the site and the exposure pathways by which contaminants at the site may become a risk to human health or the environment.

### 6.1.1 Federal Laws and Regulations

#### *6.1.1.1 Consent Decree No. C90-395 WD, U.S. District Court, Western District of Washington*

Under its authority as a natural resource trustee provided by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the National Oceanic and Atmospheric Administration (NOAA) sued the City of Seattle and Metro (now KCWPCD) on March 19, 1990 to recover damages caused by the releases of hazardous substances discharged from their combined sewer overflows and storm drains located in the Duwamish River and Elliott Bay (EBDRP 1994a). Joining in this suit were other natural resource damage assessment (NRDA) trustees including U.S. Fish and Wildlife Service, Ecology, Muckleshoot Indian Tribe, and the Suquamish Indian Tribe. A Consent Decree (Consent Decree, 1991) was signed to settle the law suit which required the City and Metro to expend a total of $24 million for source control, remediation, and habitat restoration activities to mitigate the alleged damages. The remediation of the Norfolk site is being performed under the authority of the Consent Decree.

#### *6.1.1.2 National Environmental Policy Act (NEPA) 42 USC, 4321 et seq. and 40 CFR 1500 et seq.*

The National Environmental Policy Act (NEPA) was enacted in 1969 to establish a national policy for the protection of the environment. The Council on Environmental Quality (CEQ) was established to advise the President and to carry out certain other responsibilities relating to implementation of NEPA by federal agencies. Pursuant to Presidential Executive Order, federal agencies are obligated to comply with NEPA regulations adopted by the CEQ (40 CFR Parts 1500-1508). These regulations outline the responsibilities of federal agencies under NEPA and provide specific procedures for preparing environmental documentation to comply with NEPA.

NOAA, as the lead federal agency for the NEPA process, will prepare an Environmental Assessment (EA) and will publish it in the Federal Register. It is expected that the EA will result in a finding of no significant impact (FONSI).

#### *6.1.1.3 Resource Conservation and Recovery Act, 42 USC 6901 and 40 CFR 260 et seq.*

RCRA was enacted to regulate the management of hazardous waste, to ensure the safe treatment, storage, and disposal of wastes, and to provide for resource recovery from the environment by controlling hazardous wastes "from cradle to grave". Because the state has been authorized to implement both Subtitles C and D of RCRA, the only regulations under the federal program would be those developed under the Hazardous and Solid Waste Act (HSWA) amendments for which EPA has not delegated regulatory authority to the state (e.g., land disposal restrictions). RCRA Subtitles C and D and 40 CFR 268 are applicable for upland disposal options of dredge sediments.

#### *6.1.1.4 Clean Water Act, 33 USC 1251 et seq. and Federally Promulgated Water Quality Standards, 40 CFR 131*

The Clean Water Act (CWA) requires the establishment of guidelines and standards to control the direct or indirect discharge of pollutants to waters of the United States. Effluent limitations developed for the regulated pollutants are applied to point source discharges on a case-by-case basis.

Section 304 of the CWA (33 USC 1314) requires EPA to publish Water Quality Criteria, which are developed for the protection of human health and aquatic life. These water quality criteria are promulgated in 40 CFR 131, which is also referred to as the National Toxics Rule (NTR). Federal water quality criteria are used by states to set water quality standards for surface water.

Discharges of material into navigable waters are regulated under Sections 401 and 404 of the CWA (33 USC 1341 and 1344), 40 CFR 230 (Section 404(b)(1) guidelines), 33 CFR 320 (general policies), 323 and 325 (permit requirements), and 328 (definition of waters of the United States). These requirements regulate the discharge of dredged or fill material to navigable waters of the United States. The ACOE has the primary responsibility for administering the Section 404 permit program. Section 401 requires state water quality certification before 404 permits can be issued. This allows states to veto a permit application for non-compliance with state and local water quality laws or to request the ACOE to place conditions on the 404 permit.

#### *6.1.1.5 Rivers and Harbors Act, 33 USC 403 and 40 CFR 320, 323*

This Act prohibits unauthorized activities that obstruct or alter a navigable waterway. In particular, Section 10 of the Act applies to any dredging and/or disposal activity in navigable waters of the United States, including the Duwamish River. Therefore, the Rivers and Harbors Act is applicable to the Norfolk site.

U.S. Army Corps of Engineers (ACOE) permits are needed for the discharge of dredge or fill material into waters of the United States. There are general permits which include regional permits issued by district or divisional engineers on a regional basis and nationwide permits

which are issued by the Chief of Engineers. If the activity is not covered by a general permit, an individual permit application must be filed. The Secretary of the Army acting through the Chief of Engineers authorizes the permit. Several policies are applicable to the review of permit applications which include: public interest review; effect on wetlands; fish and wildlife; water quality; historic, cultural, scenic and recreational values; effects on limits of the territorial sea; consideration of property ownership; other federal, state, or local requirements; safety impoundment and structures; water resource values; water supply and conservation; navigation; and mitigation. The public interest review involves the evaluation of probable impacts, including cumulative impacts, of the proposed activity and its intended use of the public interest. In turn, this evaluation is based on a balancing of the benefits of the proposal against its reasonably foreseeable detriments. The criteria used for this evaluation are outlined in 40 CFR 320.4.

#### *6.1.1.6 Toxic Substances Control Act, 15 USC 2600 et seq. and 40 CFR 760 et seq.*

TSCA authorizes the EPA to establish regulations pertaining to the control of chemical substances or mixtures that pose imminent hazards. EPA has published regulations pertaining to, among other chemicals, PCBs. 40 CFR 761 Subpart D regulates the storage and disposal of PCBs including soils and sediments excavated from regulated units which have PCB concentrations greater than 50 mg/kg DW. PCB-contaminated materials at these concentrations must be incinerated or disposed of in a qualifying chemical waste landfill. PCB-contaminated liquids may alternatively be disposed of in high efficiency boilers which meet specific criteria.

PCBs have been detected in two different hot spots at the Norfolk site at concentrations greater than the 50 mg/kg threshold. If sediments are removed from the site with concentrations greater than 50 mg/kg, then TSCA will be appropriately applied.

#### *6.1.1.7 Comprehensive Environmental Response, Compensation and Liability Act, 42 USC 9601 and National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR 300*

CERCLA, also known as Superfund, and the NCP provide the national policy and procedures to identify and cleanup contaminated sites on the National Priority List (NPL). The Norfolk site is not an NPL site, nor is it being considered for the NPL. CERCLA also provides for natural resource trustees to assess and seek compensation for damages to natural resources resulting from releases of hazardous materials (42 USC 9607). The Consent Decree (Section 6.1.1.1) was filed under the authority of CERCLA.

### 6.1.2 State Laws and Regulations

#### *6.1.2.1 Sediment Management Standards, Chapter 173-204 WAC*

The Sediment Management Standards (SMS) (Chapter 173-204 Washington Administrative Code (WAC)) regulations are promulgated under the Water Pollution Control Act (Chapter 90.48 Revised Code of Washington (RCW)), Model Toxics Control Act (MTCA) (Chapter 90.105D RCW), and the Puget Sound Water Quality Authority Act (Chapter 90.52 RCW) to establish marine, low salinity and freshwater surface sediment standards for Washington state. To date, only marine sediment standards for Puget Sound have been established. Marine sediments are

defined as those sediments in which the interstitial pore water contains 25 parts per thousand (ppt) salinity or greater.

The SMS relies on chemical and biological criteria to designate sediments. Most of the chemical criteria are derived from the apparent effects threshold (AET) method, an empirical method based on Puget Sound chemistry and biological effects data. Chemical criteria are established for a "no adverse effect" level (or SQS) and a "minor adverse effect" level (or CSL/MCUL). The SMS regulations recognize that a cleanup action may not achieve the objective of no adverse effects initially; therefore, minimum cleanup levels were established. These cleanup levels are the maximum allowed chemical concentration and level of biological effects permissible at the site that are expected to result in no adverse effects by year ten after completion of the active cleanup action. These regulations are applicable and shall be used to determine the sediment standards for the Norfolk site.

#### *6.1.2.2 Shoreline Management Act, Chapter 90.58 RCW and Chapter 173-14 WAC*

The regulations in Chapter 173-14 WAC were developed pursuant to Chapter 90.58 RCW to protect shoreline values while still fostering reasonable use. These regulations require substantial development permits to be obtained for any project or action which occurs within 200 feet of the ordinary high water mark of marine waters and materially interferes with the normal public use of the water or shorelines of the state. The local government (City of Tukwila Planning Division) issues substantial development permits (**Chapter 6.1.3.1**). The Washington State Department of Ecology (Ecology) and the Attorney General are sent copies of the permit by the local government for review. Since they do not have permit approval authority, they may request review of the permit by the Shorelines Hearings Board if they are dissatisfied with the permit. The average time for approval of a substantial development permit application is approximately 4 to 12 months. Two other permits, a conditional use permit and a variance permit, may also be issued. A conditional use permit is designed to allow greater flexibility in varying the application of land use activities. A variance permit grants relief in extraordinary or unique circumstances from "specific bulk, dimensional, or performance standards" of master programs. These two permits need to be granted by the local planning department and Ecology. It is not anticipated that remedial activities at the Norfolk site will deviate from the goals of the King County Shoreline Master Program. Therefore, it is anticipated that only a substantial use permit will be required for the Norfolk site.

#### *6.1.2.3 Puget Sound Estuary Program*

The Puget Sound Estuary Program (PSEP) was established in 1987 under the authority of the National Estuary Program (NEP), Section 320 of the Clean Water Act (33 USC 1330). The NEP was established to protect estuaries of national significance by requiring a management conference to develop a comprehensive management plan for the estuary. PSEP is jointly managed by the U.S. Environmental Protection Agency (EPA), Ecology and the Puget Sound Water Quality Authority (PSWQA) in cooperation with federally recognized Native American Indian tribes of western Washington. The PSWQA authored the *1991 Puget Sound Water Quality Management Plan* (PSWQA, 1991), which was adopted by EPA as the Puget Sound Comprehensive Conservation and Management Plan. Action plans within the Plan which are applicable to the Norfolk site include

the Contaminated Sediment and Dredging action plan, the Municipal and Industrial Discharges action plan and the Stormwater and Combined Sewer Overflows action plan. Under Chapter 70.90 RCW, PSWQA, state agencies and local governments are required to "evaluate and incorporate as applicable, subject to the availability of appropriated funds or other funding sources, the provisions of the Plan, including any guidelines, standards and timetables contained in the Plan." Therefore, the Plan does not have specific regulatory force but must be considered during actions which are covered by the Plan. Thus, the Plan shall be considered as guidance. Under PSEP, *Puget Sound Protocols* were developed to standardize the collection and analysis methods used for chemical and biological testing in Puget Sound. The use of standardized protocols by all agencies, consultants, and investigators continues to increase the usefulness of the information collected by allowing comparisons with other data collected using similar methods. The protocols are updated periodically as advances in technology and changes in needs are identified or warranted.

#### *6.1.2.4 State Environmental Policy Act, Chapter 43,21C RCW and Chapter 197-11 WAC*

The State Environmental Policy Act (SEPA), Chapter 43.21C RCW, sets forth the state's policy for protection and preservation of the natural environment. Chapter 197-11 WAC are the state's rules to implement this act. Local jurisdictions must also implement the policies and procedures of SEPA. Ecology, the SEPA lead agency, will submit the state's response to the NEPA EA, (**Chapter 6.1.1.2**), for the Norfolk site. After a FONSI is issued, if applicable, the state lead will adopt the federal document. This adoption is necessary prior to the issuance of most of the other permits needed to conduct remedial activities at the Norfolk site.

#### *6.1.2.5 Historic Preservation Act, Chapter 27.34 RCW, Chapter 27.44 RCW, and Chapter 27.53 RCW*

These acts prohibit disturbing any Native American grave sites or other historical or prehistorical archeological resources without a permit or supervision from the proper department or tribes. Because the Norfolk site is located in the native bed of the Duwamish River, it is not expected that any historic or prehistoric remains will be encountered. If any article is uncovered, these requirements will apply, and the Suquamish Tribe and the Muckleshoot Indian tribe, as federally recognized tribes of interest, will be consulted.

#### *6.1.2.6 Washington Dangerous Waste Regulations, Chapter 70.105 RCW and Chapter 173-303 WAC*

The regulations found in Chapter 173-303 WAC were developed to implement Chapter 70.105 RCW and are based on the state's authority to administer RCRA. The Dangerous Waste Regulations provide criteria for determining whether solid wastes which are removed during remediation are dangerous or extremely hazardous. These regulations also provide rules which apply to the generators of hazardous substances and the treatment, manifesting, transporting, disposal and storage of these substances. Removing contaminated sediments from the river constitutes generating such substances. If sufficient quantities of hazardous substances are removed such that the small quantity exemption does not apply, then these regulations will potentially be used for the dredged sediments.

#### 6.1.2.7 Washington Hydraulic Code, Chapter 75.20 RCW and Chapter 220-110 WAC

This act establishes requirements for performing work that would use, divert, obstruct, or change the natural flow or bed of any salt or fresh waters and sets forth procedures for obtaining hydraulic project approval. For the Norfolk site, the Washington State Department of Fish and Wildlife would review the proposed hydraulic project for approval. Submittal for review includes general plans for the overall project and complete plans and specifications for the proposed construction or work below the old high waterline of state waters and for the proper protection of fish life. The proposed project will be either approved or denied within 45 calendar days of the receipt of a complete application and notice of compliance with applicable requirements of SEPA. If the Department of Fish and Wildlife believes that the proposed project will either directly or indirectly harm fish life, the project will be denied unless adequate mitigation can be assured by conditioning the approval or modifying the proposal. The provisions of WAC 220-110-270 and -320 are applicable for the Norfolk site.

#### 6.1.2.8 NPDES Permit Program, 33 USC 1251, 40 CFR 123, Chapter 90.48 RCW and Chapter 173-220 WAC

Section 402 of the Clean Water Act (33 USC 1251) requires EPA to issue permits for the discharge of any pollutant to navigable waters. Federal regulations (40 CFR 123) allow qualifying states to issue NPDES permits. Washington's Water Pollution Control Law (Chapter 90.58 RCW) and regulations (Chapter 173-220 WAC) meet the federal requirements for the state to issue NPDES permits. Water from dewatering activities associated with dredged sediments released to the Duwamish River would be regulated under an NPDES permit. However, water from such activity could be released to a sanitary sewer which would not require an NPDES permit but rather, approval from KCWPCD.

#### 6.1.2.9 Water Quality Standards for the Surface Waters of the State of Washington, Chapter 90.48 RCW and Chapter 173-201A WAC

These regulations establish water quality standards for the surface waters of the state as required by the Clean Water Act and the Water Pollution Control Act (Chapter 90.48 RCW). Specific standards apply for many toxic substances. These surface water quality standards will be applied during all remedial activities, as applicable.

#### 6.1.2.10 Model Toxics Control Act, Chapter 70.105D RCW and Chapter 173-340 WAC

The statute, Chapter 70.105D RCW, was created as a result of citizens' initiative Measure No. 97. MTCA requires Ecology to establish and periodically update minimum cleanup standards for hazardous substances, and investigate and remediate releases or threatened releases of hazardous substances.

The regulation, Chapter 173-340 WAC, promulgated under MTCA, establishes administrative processes and standards to identify, investigate, and cleanup facilities where hazardous substances pose a threat to human health and the environment. This regulation will be considered for the Norfolk site though it is not an official MTCA site.

#### *6.1.2.11 Solid Waste Management Act, Chapter 70.95 RCW and Chapter 173-304 WAC*

The Solid Waste Management Act provides the State's policy on landfill and solid waste disposal requirements. The policy places emphasis on Washington's dedication to recycling. This act and implementing regulations will be used when considering upland disposal remediation alternatives. Waste reduction and recycling will be considered wherever appropriate.

#### *6.1.2.12 State Aquatic Lands Management, Chapter 79.90 RCW and Chapter 332-30 WAC*

Land use authorizations of state owned aquatic lands are administered by the Department of Natural Resources (DNR). These areas include constitutionally established harbors, state tidelands, shorelands and the beds of navigable waters. Issuance of land use authorization for activities on these public lands is based upon evaluation of the proposed use by the department's Aquatic Lands Division. State law Chapter 79.90 RCW empowers DNR to set the terms and conditions to authorize uses of state owned aquatic lands. All the DNR's aquatic land use authorizations are contractual in nature and involve limited conveyances of rights to use state owned aquatic lands. The primary administrative rule on aquatic lands that guides the DNR is Chapter 332-30 WAC, Aquatic Lands Management, which established performance standards and operational procedures for aquatic lands uses.

### 6.1.3 Local Laws and Regulations

#### *6.1.3.1 Shoreline Master Program, Title 25 King County Code*

The City of Tukwila recently annexed the portion of King county which includes the site. The City will issue the Shoreline permit; however, until the Shoreline Master Program is modified (expected in 1997), the King County Shoreline Master Program (Title 25 King County Code) is the governing regulation. The Shoreline Master Program's overall goals are regulating development of shorelines to protect the ecosystem, provide maximum public use, encourage water dependent use, and preserve and increase views and access. The Shoreline Master Program provides standards for dredging and dredge disposal operations including shoreline fills. The Master Program will be considered in the decision making process during all phases of remediation.

### 6.1.4 Tribal Treaties

#### *6.1.4.1 Treaty of Point Elliott, 12 Statute 927*

The Treaty of Point Elliott was signed with Native American tribes occupying the lands within the Puget Sound Basin lying north of Point Pulley to the Canadian border and from the summit of the Cascade Mountains to the divide between Hood Canal and Puget Sound. The treaty guarantees "the right of taking fish at usual and accustomed grounds and stations ..." to all the signatory tribes and other allied and subordinate tribes and bands of Native American Indians. The Duwamish River is a usual and accustomed fishing area. This treaty is applicable, and will be observed to ensure that cleanup activities do not interfere with the rights of the tribes.

## 6.2 CLEANUP STANDARDS

In the 1991 Consent Decree agreement, the EBDRP Panel was directed to follow Washington state sediment standards as a minimum standard to determine the level of sediment cleanup. Therefore, identification of contaminated sediments was based on comparison to Washington State Sediment Management Standards (Chapter 173-204 WAC). The SMS have established cleanup standards for chemicals in marine sediments, while cleanup standards for low salinity sediments, freshwater sediments, and protection of human health are to be determined on a case-by-case basis. As discussed in **Chapter 4**, Phase 1 salinity data for surface sediments ranged from 14 to 22 ppt for upriver stations, and from 5 to 16 ppt for stations adjacent to or directly downstream of the Norfolk outfall. The decreased salinity at the outfall relative to the upstream locations is caused by low-salinity stormwater coming from the outfall. Since salinity measurements tended more towards marine designation, and field observations also indicated representative marine biota near the study area (e.g., presence of saltmarsh vegetation, intertidal barnacles, gammarid amphipods, and blue mussels), comparison to SMS criteria for marine sediments is considered appropriate for development of sediment cleanup areas.

The SMS marine chemical criteria for aquatic life are defined for two effects levels: a) Sediment Quality Standards (SQS) criteria, which establishes a level that will result in no adverse effects on biological resources; and 2) Cleanup Screening Level (CSL) criteria, which establish minor adverse effects levels and Minimum Cleanup Levels (MCULs) to be used in evaluation of cleanup alternatives. The site assessment identified four chemicals of concern (i.e., mercury, 1,4-dichlorobenzene, bis(2-ethylhexyl) phthalate, and PCBs) associated with the Norfolk outfall, based on comparison to respective SQS and CSL/MCUL criteria. These criteria are listed in **Table 6-1**; in addition, dry weight AET values are also listed for bis (2-ethylhexyl) phthalate, since dry weight comparisons were used to define the areal extent of contamination.

**Table 6-1**
**POTENTIAL SEDIMENT CLEANUP STANDARDS FOR NORFOLK CHEMICALS OF CONCERN**

| Chemical of Concern | SQS Criteria | CSL(MCUL) Criteria | LAET Value |
|---|---|---|---|
| Mercury | 0.41 mg/kg DW | 0.59 mg/kg DW | |
| 1,4-Dichlorobenzene | 3.1 mg/kg OC | 9 mg/kg OC | |
| Bis(2-ethylhexyl) phthalate | 47 mg/kg OC | 78 mg/kg OC | 1,300 ug/kg DW |
| Total PCBs | 12 mg/kg OC | 65 mg/kg OC | |

**Notes:**
SQS: Sediment Quality Standard
MCUL: Minimum Cleanup Level
OC: Organic Carbon
CSL: Cleanup Screening Level
LAET: Lowest Apparent Effects Threshold
DW: Dry weight

The SMS provides for site-specific cleanup standards that may range from SQS to CSL/MCUL criteria, based on evaluation of associated cost and net environmental benefits. In addition, human health risks may be considered for bioaccumulative chemicals such as PCBs. As part of the site assessment, potential sediment cleanup areas were estimated, by calculating the surface area exceeding SQS <u>and</u> CSL/MCUL criteria for each of the chemicals of concern. [Note:

sediment surface area exceedances for bis(2-ethylhexyl) phthalate were based on comparison to dry weight AET values, rather than organic carbon-normalized SQS/CSL criteria, since several low TOC stations affected the contouring of organic carbon normalized concentrations.] Individual chemical exceedance areas were then combined, yielding a total volume of sediments exceeding SQS and CSL criteria (or AET values for bis (2-ethylhexyl) phthalate) for the outfall footprint of 1,481 and 1,096 cubic yards, respectively. This assumes a 2-foot depth of contamination, consistent with the findings of the site assessment.

Following completion of the site assessment, several members of the EBDRP Panel became involved in interagency discussions regarding the potential for human health risks from PCBs in Duwamish River sediments, at this and other sites. As a result of these discussions, it became apparent that human health risks due to bioaccumulation of PCBs in seafoods, as well as adverse effects on juvenile salmonids migrating through the Duwamish River estuary, may occur at levels below the SQS. However, human health-based sediment standards have not yet been promulgated, nor have bioaccumulation-based site-specific standards been set for PCBs at any site. Plans are in place to develop such standards for sites in the Duwamish River, but these studies are not yet complete and are beyond the scope and schedule of this relatively small and routine cleanup.

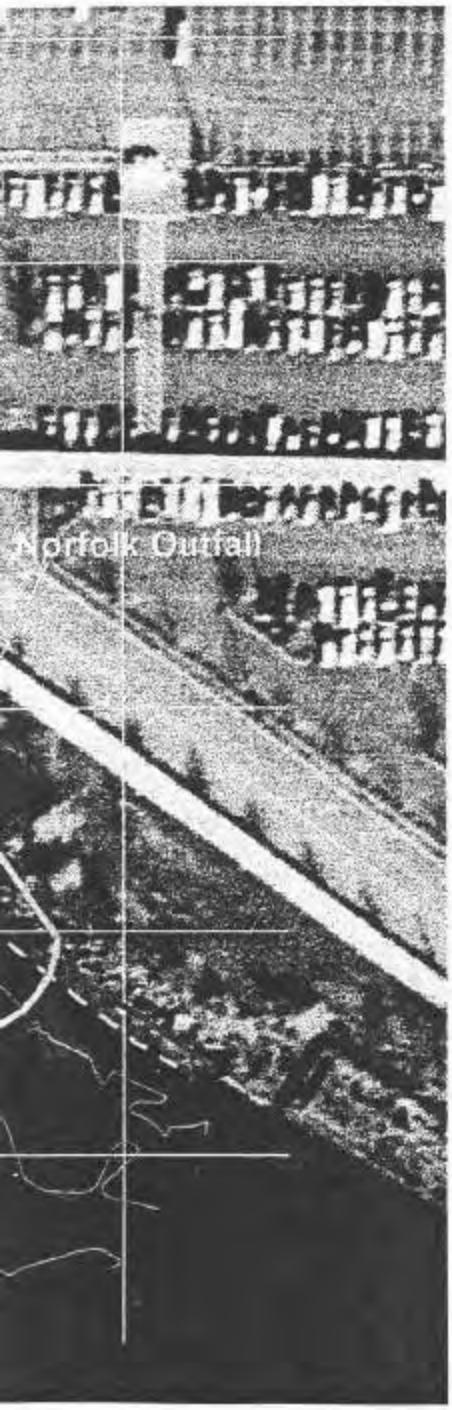
In order to address these concerns, the EBDRP Panel decided, as part of the planned cleanup at Norfolk, to remediate any additional, accessible sediments below SQS that contain detected levels of PCBs. The Panel believes that the benefits of achieving protection of human health and migrating juvenile salmonids outweighs the small additional cost of remediating these sediments. The extended sediment remediation area (**Figure 6-1**) is based on extending the PCB cleanup to nondetect levels. The calculated surface area for this sediment cleanup area is 32,300 square feet, and the estimated sediment cleanup volume is 2,392 cubic yards (assuming a 2-foot depth of contamination).

Although the remedial action is planned to address these additional sediments, the site-specific cleanup standards will be set at SQS. Without the detailed studies planned to be carried out over the next few years in the Duwamish, it is not yet appropriate to select a site-specific sediment standard that is protective of bioaccumulative effects of PCBs. Selection of the SQS as the long-term standard for all chemicals at the site is also consistent with the goals of the sediment source control program. This is appropriate because this site contains an operating CSO under an NPDES permit, and the NPDES program will be responsible for monitoring the area once the cleanup is completed.

EcoChem Team

Norfolk Sedim

Sediment Re




Approximate Rockpile
Outfall Flow Channels
Bathymetry
Remediation Area
Property Line
Toe of the slope
Approximate Mean low 0
Wingwall
Grid

- Photo copyright 1996 City of Seattle.
- Bathymetry from David Evans & Assoc.
- Property Line from King County Engineering Dept. Map, 1994
- Other data from KCWPCD

N
W E
S

100 0 100 200 Feet

Cleanup Study

ediation Area

Figure 6-1