# PHASE 2 REPORT - REVIEW COPY
# FURTHER SITE CHARACTERIZATION AND ANALYSIS
# VOLUME 2B - PRELIMINARY MODEL CALIBRATION REPORT
# HUDSON RIVER PCBs REASSESSMENT RI/FS

**OCTOBER 1996**

**for**
**U.S. Environmental Protection Agency**
**Region II**

**Volume 2B**
**Book 2 of 2**

Limno-Tech, Inc.
and
Menzie Cura & Associates, Inc.
and
The CADMUS Group, Inc.

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## Table 3-1
## Comparison of Upper Hudson River HUDTOX Geometry with 1984 Feasibility Study Estimates

| HUDTOX Segment | Upstream River Mile | Segment Surface Area (sq. ft.) | Segment Surface Area (Acres) | Estimated Reach Area (Acres) | NUS Reach Surface Area (Acres) | Upper Hudson River Reach Description (NUS 1984 Feasibility Study) |
|---|---|---|---|---|---|---|
| 1 | 194.6 | 1.360E+07 | 312.2 | | | |
| 2 | 191.6 | 4.789E+06 | 109.9 | | | |
| 3 | 190.3 | 7.894E+06 | 181.2 | ► 447 | 445 | *South end of Rogers Island to TI Dam |
| 4 | 188.4 | 9.063E+06 | 208.1 | ► 208 | 220 | TI Dam to Lock 6 |
| 5 | 186.1 | 1.233E+07 | 283.0 | ► 283 | 270 | Lock 6 to Lock 5 |
| 6 | 183.4 | 1.929E+07 | 442.8 | | | Near Batten Kill to south of Fish Creek |
| 7 | 177.5 | 1.377E+07 | 316.1 | | | South of Fish Creek to RM 174 |
| 8 | 173.8 | 2.195E+07 | 503.9 | ► 1263 | 1260 | RM 174 to Lock 4 |
| 9 | 168.0 | 1.474E+07 | 338.3 | ► 338 | 330 | Lock 4 to Lock 3 |
| 10 | 166.0 | 1.266E+07 | 290.6 | ► 291 | 330 | Lock 3 to Lock 2 |
| 11 | 163.4 | 1.940E+07 | 445.3 | ► 445 | 420 | Lock 2 to Lock 1 |
| 12 | 159.4 | 1.413E+07 | 324.3 | | | Lock 1 to Mohawk River |
| 13 | 156.5 | 1.414E+07 | 324.6 | ► 649 | 560 | Mohawk River to Federal Dam (RM 153.9) |
| Federal Dam | 153.9 | ------ | ------ | ------ | ------ | Federal Dam |
| *Totals* | | *1.777E+08* | *4080.4* | *3924* | *3835* | *< 5% difference over Upper Hudson* |

**Note: 50% of Segment 1 area included in estimate for comparison to 1984 Feasibility Study (NUS)*

***References:***

NUS, April 1984. Volume 1, Feasibility Study, Hudson River PCBs Site, New York, EPA Contract No. 68-01-6699. Table 4-2, page 4-13.

**Table 4-1**
**Hudson River HUDTOX Model Segmentation Geometry**


| Segment Number | Water or Sediment | Depth (m) | Volume ($m^3$) | Adjacent Segments Above | Adjacent Segments Below | Adjacent Segments Downstream | Surficial Interface Area ($m^2$) | Downstream Cross-section Interface Area ($m^2$) |
|---|---|---|---|---|---|---|---|---|
| 1 | w | 2.70 | 3.410E+06 | | 14 | 2 | 1.26E+06 | 708 |
| 2 | w | 3.34 | 1.485E+06 | | 15 | 3 | 4.45E+05 | 754 |
| 3 | w | 3.33 | 2.439E+06 | | 16 | 4 | 7.33E+05 | 649 |
| 4 | w | 2.20 | 1.851E+06 | | 17 | 5 | 8.42E+05 | 734 |
| 5 | w | 3.67 | 4.204E+06 | | 18 | 6 | 1.15E+06 | 786 |
| 6 | w | 3.20 | 5.740E+06 | | 19 | 7 | 1.79E+06 | 754 |
| 7 | w | 4.21 | 5.384E+06 | | 20 | 8 | 1.28E+06 | 839 |
| 8 | w | 3.54 | 7.216E+06 | | 21 | 9 | 2.04E+06 | 1198 |
| 9 | w | 3.81 | 5.220E+06 | | 22 | 10 | 1.37E+06 | 1152 |
| 10 | w | 2.43 | 2.856E+06 | | 23 | 11 | 1.18E+06 | 884 |
| 11 | w | 3.88 | 6.993E+06 | | 24 | 12 | 1.80E+06 | 1175 |
| 12 | w | 4.49 | 5.893E+06 | | 25 | 13 | 1.31E+06 | 1523 |
| 13 | w | 5.68 | 7.459E+06 | | 26 | Federal Dam | 1.31E+06 | |
| 14 | s | 0.05 | 6.317E+04 | 1 | 27 | | 1.26E+06 | |
| 15 | s | 0.05 | 2.224E+04 | 2 | 28 | | 4.45E+05 | |
| 16 | s | 0.05 | 3.667E+04 | 3 | 29 | | 7.33E+05 | |
| 17 | s | 0.05 | 4.210E+04 | 4 | 30 | | 8.42E+05 | |
| 18 | s | 0.05 | 5.726E+04 | 5 | 31 | | 1.15E+06 | |
| 19 | s | 0.05 | 8.959E+04 | 6 | 32 | | 1.79E+06 | |
| 20 | s | 0.05 | 6.395E+04 | 7 | 33 | | 1.28E+06 | |
| 21 | s | 0.05 | 1.020E+05 | 8 | 34 | | 2.04E+06 | |
| 22 | s | 0.05 | 6.845E+04 | 9 | 35 | | 1.37E+06 | |
| 23 | s | 0.05 | 5.879E+04 | 10 | 36 | | 1.18E+06 | |
| 24 | s | 0.05 | 9.009E+04 | 11 | 37 | | 1.80E+06 | |
| 25 | s | 0.05 | 6.562E+04 | 12 | 38 | | 1.31E+06 | |
| 26 | s | 0.05 | 6.567E+04 | 13 | 39 | | 1.31E+06 | |
| 27 | s | 0.05 | 6.317E+04 | 14 | 40 | | 1.26E+06 | |
| 28 | s | 0.05 | 2.224E+04 | 15 | 41 | | 4.45E+05 | |
| 29 | s | 0.05 | 3.667E+04 | 16 | 42 | | 7.33E+05 | |
| 30 | s | 0.05 | 4.210E+04 | 17 | 43 | | 8.42E+05 | |
| 31 | s | 0.05 | 5.726E+04 | 18 | 44 | | 1.15E+06 | |
| 32 | s | 0.05 | 8.959E+04 | 19 | 45 | | 1.79E+06 | |
| 33 | s | 0.05 | 6.395E+04 | 20 | 46 | | 1.28E+06 | |
| 34 | s | 0.05 | 1.020E+05 | 21 | 47 | | 2.04E+06 | |
| 35 | s | 0.05 | 6.845E+04 | 22 | 48 | | 1.37E+06 | |
| 36 | s | 0.05 | 5.879E+04 | 23 | 49 | | 1.18E+06 | |
| 37 | s | 0.05 | 9.009E+04 | 24 | 50 | | 1.80E+06 | |
| 38 | s | 0.05 | 6.562E+04 | 25 | 51 | | 1.31E+06 | |
| 39 | s | 0.05 | 6.567E+04 | 26 | 52 | | 1.31E+06 | |
| 40 | s | 0.15 | 1.895E+05 | 27 | 53 | | 1.26E+06 | |
| 41 | s | 0.15 | 6.672E+04 | 28 | 54 | | 4.45E+05 | |

## Table 4-1
## Hudson River HUDTOX Model Segmentation Geometry


| Segment Number | Water or Sediment | Depth (m) | Volume ($m^3$) | Adjacent Segments Above | Adjacent Segments Below | Adjacent Segments Downstream | Surficial Interface Area ($m^2$) | Downstream Cross-section Interface Area ($m^2$) |
|---|---|---|---|---|---|---|---|---|
| 42 | s | 0.15 | 1.100E+05 | 29 | 55 | | 7.33E+05 | |
| 43 | s | 0.15 | 1.263E+05 | 30 | 56 | | 8.42E+05 | |
| 44 | s | 0.15 | 1.718E+05 | 31 | 57 | | 1.15E+06 | |
| 45 | s | 0.15 | 2.688E+05 | 32 | 58 | | 1.79E+06 | |
| 46 | s | 0.15 | 1.919E+05 | 33 | 59 | | 1.28E+06 | |
| 47 | s | 0.15 | 3.059E+05 | 34 | 60 | | 2.04E+06 | |
| 48 | s | 0.15 | 2.053E+05 | 35 | 61 | | 1.37E+06 | |
| 49 | s | 0.15 | 1.764E+05 | 36 | 62 | | 1.18E+06 | |
| 50 | s | 0.15 | 2.703E+05 | 37 | 63 | | 1.80E+06 | |
| 51 | s | 0.15 | 1.969E+05 | 38 | 64 | | 1.31E+06 | |
| 52 | s | 0.15 | 1.970E+05 | 39 | 65 | | 1.31E+06 | |
| 53 | s | 0.25 | 3.159E+05 | 40 | 66 | | 1.26E+06 | |
| 54 | s | 0.25 | 1.112E+05 | 41 | 67 | | 4.45E+05 | |
| 55 | s | 0.25 | 1.834E+05 | 42 | 68 | | 7.33E+05 | |
| 56 | s | 0.25 | 2.105E+05 | 43 | 69 | | 8.42E+05 | |
| 57 | s | 0.25 | 2.863E+05 | 44 | 70 | | 1.15E+06 | |
| 58 | s | 0.25 | 4.480E+05 | 45 | 71 | | 1.79E+06 | |
| 59 | s | 0.25 | 3.198E+05 | 46 | 72 | | 1.28E+06 | |
| 60 | s | 0.25 | 5.099E+05 | 47 | 73 | | 2.04E+06 | |
| 61 | s | 0.25 | 3.423E+05 | 48 | 74 | | 1.37E+06 | |
| 62 | s | 0.25 | 2.940E+05 | 49 | 75 | | 1.18E+06 | |
| 63 | s | 0.25 | 4.505E+05 | 50 | 76 | | 1.80E+06 | |
| 64 | s | 0.25 | 3.281E+05 | 51 | 77 | | 1.31E+06 | |
| 65 | s | 0.25 | 3.284E+05 | 52 | 78 | | 1.31E+06 | |
| 66 | s | 0.50 | 6.317E+05 | 53 | 79 | | 1.26E+06 | |
| 67 | s | 0.50 | 2.224E+05 | 54 | 79 | | 4.45E+05 | |
| 68 | s | 0.50 | 3.667E+05 | 55 | 79 | | 7.33E+05 | |
| 69 | s | 0.50 | 4.210E+05 | 56 | 79 | | 8.42E+05 | |
| 70 | s | 0.50 | 5.726E+05 | 57 | 79 | | 1.15E+06 | |
| 71 | s | 0.50 | 8.959E+05 | 58 | 79 | | 1.79E+06 | |
| 72 | s | 0.50 | 6.395E+05 | 59 | 79 | | 1.28E+06 | |
| 73 | s | 0.50 | 1.020E+06 | 60 | 79 | | 2.04E+06 | |
| 74 | s | 0.50 | 6.845E+05 | 61 | 79 | | 1.37E+06 | |
| 75 | s | 0.50 | 5.879E+05 | 62 | 79 | | 1.18E+06 | |
| 76 | s | 0.50 | 9.009E+05 | 63 | 79 | | 1.80E+06 | |
| 77 | s | 0.50 | 6.562E+05 | 64 | 79 | | 1.31E+06 | |
| 78 | s | 0.50 | 6.567E+05 | 65 | 79 | | 1.31E+06 | |
| 79 | s | 0.50 | 8.256E+06 | 66 | 0 | | | |

**Table 4-2**
**Average Flows in the Upper Hudson River**
**for the Model Calibration Period (1/1/93 - 9/30/93)**

| HUDTOX Segment | Note | Gaged Flow ($ft^3$/sec) | Ungaged Tributary ($ft^3$/sec) | Remaining Ungaged ($ft^3$/sec) |
|---|---|---|---|---|
| 1 | Ft. Edward | 5418 | -- | 0 |
| 2 | | -- | -- | 27 |
| 3 | | -- | -- | 40 |
| 4 | | -- | -- | 48 |
| 5 | | -- | -- | 57 |
| 6 | Batten & Fish | -- | 1169 | 124 |
| 7 | | -- | -- | 78 |
| 8 | | -- | -- | 122 |
| 9 | Hoosic River | 1445 | -- | 0 |
| 10 | | -- | -- | 129 |
| 11 | | -- | -- | 199 |
| 12 | | -- | -- | 0 |
| 13 | Mohawk River | 6851 | -- | 72 |

Source: Processed from USGS data in TAMS/Gradient Database.

**Table 4-3**

**Total Suspended Solids Loads to the Upper Hudson River for the Model Calibration Period (1/1/93 - 9/30/93)**

| HUDTOX Segment | Location | Gaged Tributary (tons) | Ungaged Tributary (tons) | Minor Ungaged Tributary and Nonpoint (tons) | Algal Production (tons) |
|---|---|---|---|---|---|
| 1 | Ft. Edward | 35,664 | -- | -- | 333 |
| 2 | | -- | -- | 91.2 | 116 |
| 3 | | -- | -- | 134 | 191 |
| 4 | | -- | -- | 161 | 222 |
| 5 | | -- | -- | 190 | 302 |
| 6 | Batten Kill + Fish Creek[1] | -- | 52,264 | -- | 473 |
| 7 | | -- | -- | 260 | 337 |
| 8 | | -- | -- | 407 | 664 |
| 9 | Hoosic River | 86,654 | -- | -- | 446 |
| 10 | | -- | -- | 432 | 383 |
| 11 | | -- | -- | 664 | 587 |
| 12 | | -- | -- | 240 | 428 |
| 13 | Mohawk River | 248,723 | -- | -- | 428 |
| **Total** | | **371,041** | **52,264** | **2,579** | **4,910** |

[1]Estimated on a daily basis as described in Section 6.0

Source: Processed from data in TAMS/Gradient Database and Cole et al. (1992).

**Table 4-4**
**Total PCB Loads to the Upper Hudson River**
**for the Model Calibration Period (1/1/93 - 9/30/93)**

| HUDTOX Segment | Note | Gaged Tributaries (kg) | Ungaged Tributary (kg) | Remaining Ungaged and Nonpoint (kg) |
|---|---|---|---|---|
| 1 | Ft. Edward | 354 | -- | -- |
| 2 | | -- | -- | 0.182 |
| 3 | | -- | -- | 0.267 |
| 4 | | -- | -- | 0.323 |
| 5 | | -- | -- | 0.379 |
| 6 | Batten & Fish | -- | 8.52 | -- |
| 7 | | -- | -- | 0.520 |
| 8 | | -- | -- | 0.814 |
| 9 | Hoosic River | 22.1 | -- | -- |
| 10 | | -- | -- | 0.864 |
| 11 | | -- | -- | 1.33 |
| 12 | | -- | -- | 0.479 |
| 13 | Mohawk River | 88.1 | -- | -- |

Source: Processed from EPA and General Electric data in TAMS/Gradient Database.

# Table 4-5
## Upper Hudson River External Loads for HUDTOX Calibration Period (1/1/93-9/30/93)

**a) Entire Period (1/1/93 - 9/30/93): DAY 1 through DAY 272**

| | Non-point | | Upstream (Ft. Edward) | | Batten Kill & Fish Creek | | Hoosic River | | Mohawk River | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Load (kg) | % | Load (kg) | % | Load (kg) | % | Load (kg) | % | Load (kg) | % |
| TSS | 2.58E+6 | 0.6 | 3.55E+7 | 8.5 | 5.16E+7 | 12.3 | 8.56E+7 | 20.4 | 2.45E+8 | 58.3 |
| DOC | 2.49E+6 | 4.9 | 1.74E+7 | 34.2 | 4.36E+6 | 8.5 | 4.62E+6 | 9.1 | 2.21E+7 | 43.3 |
| Total PCBs | 5.157 | 1.1 | 351.96 | 74.3 | 7.69 | 1.6 | 21.72 | 4.6 | 86.87 | 18.3 |
| BZ#138 | 0.126 | 2.3 | 1.60 | 29.0 | 0.07 | 1.2 | 0.55 | 9.9 | 3.19 | 57.6 |
| BZ#101&90 | 0.153 | 1.7 | 4.92 | 55.0 | 0.13 | 1.5 | 0.55 | 6.1 | 3.19 | 35.7 |
| BZ#52 | 0.176 | 1.0 | 13.47 | 77.0 | 0.12 | 0.7 | 0.55 | 3.1 | 3.19 | 18.2 |
| BZ#28 | 0.121 | 0.4 | 24.17 | 89.2 | 0.10 | 0.4 | 0.41 | 1.5 | 2.30 | 8.5 |
| BZ#4 | 0.434 | 2.2 | 13.47 | 69.2 | 0.70 | 3.6 | 1.57 | 8.1 | 3.28 | 16.9 |
| | | | | | | | | | | |
| | Load ($m^3$) | % | Load ($m^3$) | % | Load ($m^3$) | % | Load ($m^3$) | % | Load ($m^3$) | % |
| Water | 5.14E+8 | 4.9 | 3.61E+9 | 34.2 | 9.02E+8 | 8.5 | 9.57E+8 | 9.1 | 4.57E+9 | 43.3 |

**b) Spring Runoff Event Period (3/26/93 - 5/10/93): DAY 85 through DAY 130**

| | Non-point | | Upstream (Ft. Edward) | | Batten Kill & Fish Creek | | Hoosic River | | Mohawk River | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Load (kg) | % | Load (kg) | % | Load (kg) | % | Load (kg) | % | Load (kg) | % |
| TSS | 1.25E+6 | 0.3 | 3.03E+7 | 8.3 | 4.72E+7 | 12.9 | 7.83E+7 | 21.5 | 2.08E+8 | 57.0 |
| DOC | 1.21E+6 | 4.2 | 7.67E+6 | 26.6 | 2.75E+6 | 9.5 | 2.92E+6 | 10.1 | 1.43E+7 | 49.5 |
| Total PCBs | 2.510 | 0.8 | 247.18 | 76.2 | 4.85 | 1.5 | 13.71 | 4.2 | 56.14 | 17.3 |
| BZ#138 | 0.061 | 1.7 | 1.17 | 31.7 | 0.04 | 1.1 | 0.35 | 9.4 | 2.06 | 56.1 |
| BZ#101&90 | 0.075 | 1.1 | 3.97 | 60.7 | 0.08 | 1.3 | 0.35 | 5.3 | 2.06 | 31.5 |
| BZ#52 | 0.086 | 0.7 | 10.08 | 79.7 | 0.07 | 0.6 | 0.35 | 2.7 | 2.06 | 16.3 |
| BZ#28 | 0.059 | 0.3 | 18.93 | 91.0 | 0.06 | 0.3 | 0.26 | 1.3 | 1.49 | 7.2 |
| BZ#4 | 0.211 | 2.9 | 3.58 | 48.8 | 0.44 | 6.0 | 0.99 | 13.5 | 2.12 | 28.9 |
| | | | | | | | | | | |
| | Load ($m^3$) | % | Load ($m^3$) | % | Load ($m^3$) | % | Load ($m^3$) | % | Load ($m^3$) | % |
| Water | 2.50E+8 | 4.2 | 1.59E+9 | 26.6 | 5.69E+8 | 9.5 | 6.04E+8 | 10.1 | 2.95E+9 | 49.5 |

**c) Non-Event Period**

| | Non-point | | Upstream (Ft. Edward) | | Batten Kill & Fish Creek | | Hoosic River | | Mohawk River | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Load (kg) | % | Load (kg) | % | Load (kg) | % | Load (kg) | % | Load (kg) | % |
| TSS | 1.32E+6 | 2.4 | 5.26E+6 | 9.5 | 4.40E+6 | 7.9 | 7.29E+6 | 13.2 | 3.71E+7 | 67.0 |
| DOC | 1.28E+6 | 5.8 | 9.78E+6 | 44.1 | 1.61E+6 | 7.2 | 1.71E+6 | 7.7 | 7.82E+6 | 35.2 |
| Total PCBs | 2.647 | 1.8 | 104.78 | 70.3 | 2.84 | 1.9 | 8.02 | 5.4 | 30.73 | 20.6 |
| BZ#138 | 0.065 | 3.5 | 0.44 | 23.5 | 0.02 | 1.3 | 0.20 | 10.9 | 1.13 | 60.8 |
| BZ#101&90 | 0.079 | 3.3 | 0.95 | 39.3 | 0.05 | 2.0 | 0.20 | 8.4 | 1.13 | 46.9 |
| BZ#52 | 0.091 | 1.9 | 3.39 | 69.8 | 0.04 | 0.9 | 0.20 | 4.2 | 1.13 | 23.2 |
| BZ#28 | 0.062 | 1.0 | 5.24 | 83.1 | 0.04 | 0.6 | 0.15 | 2.4 | 0.81 | 12.9 |
| BZ#4 | 0.223 | 1.8 | 9.89 | 81.7 | 0.26 | 2.1 | 0.58 | 4.8 | 1.16 | 9.6 |
| | | | | | | | | | | |
| | Load ($m^3$) | % | Load ($m^3$) | % | Load ($m^3$) | % | Load ($m^3$) | % | Load ($m^3$) | % |
| Water | 2.64E+8 | 5.7 | 2.02E+9 | 44.1 | 3.33E+8 | 7.2 | 3.53E+8 | 7.7 | 1.62E+9 | 35.2 |

Source: TAMS/Gradient Phase 2 Database

**Table 4-6**
**HUDTOX Temperature Forcing Functions**
**for January-September 1993 Calibration**

| Station 4 (Route 197) | | | Station 5 (Thompson Island Dam) | | | Station 8 (Waterford) | | |
|---|---|---|---|---|---|---|---|---|
| Temp. (deg. C) | Date | Julian Day | Temp. (deg. C) | Date | Julian Day | Temp. (deg. C) | Date | Julian Day |
| 2.10 | 2/3/93 | 33 | 5.27 | 2/3/93 | 33 | 7.63 | 2/3/93 | 33 |
| 4.27 | 2/23/93 | 53 | 7.09 | 2/23/93 | 53 | 6.87 | 2/23/93 | 53 |
| 9.43 | 3/29/93 | 87 | 8.17 | 3/29/93 | 87 | 17.25 | 3/29/93 | 87 |
| 4.40 | 4/13/93 | 102 | 7.63 | 4/13/93 | 102 | 21.57 | 4/13/93 | 102 |
| 5.30 | 4/23/93 | 112 | 5.60 | 4/23/93 | 112 | 16.75 | 5/3/93 | 122 |
| 7.45 | 4/25/93 | 114 | 7.90 | 4/25/93 | 114 | 16.55 | 5/5/93 | 124 |
| 7.90 | 4/27/93 | 116 | 7.75 | 4/27/93 | 116 | 16.80 | 5/7/93 | 126 |
| 8.25 | 4/29/93 | 118 | 8.20 | 4/29/93 | 118 | 21.50 | 5/12/93 | 131 |
| 9.25 | 5/1/93 | 120 | 9.75 | 5/1/93 | 120 | 17.25 | 5/14/93 | 133 |
| 11.00 | 5/3/93 | 122 | 11.25 | 5/3/93 | 122 | 18.00 | 5/16/93 | 135 |
| 11.75 | 5/5/93 | 124 | 11.90 | 5/5/93 | 124 | 17.75 | 5/18/93 | 137 |
| 12.25 | 5/7/93 | 126 | 12.55 | 5/7/93 | 126 | 16.00 | 5/20/93 | 139 |
| 16.25 | 5/12/93 | 131 | 17.15 | 5/12/93 | 131 | 17.00 | 5/22/93 | 141 |
| 15.75 | 5/14/93 | 133 | 15.50 | 5/14/93 | 133 | 19.25 | 5/24/93 | 143 |
| 16.00 | 5/16/93 | 135 | 16.85 | 5/16/93 | 135 | 18.50 | 5/26/93 | 145 |
| 15.25 | 5/18/93 | 137 | 15.25 | 5/18/93 | 137 | 20.25 | 6/2/93 | 152 |
| 15.75 | 5/20/93 | 139 | 15.75 | 5/20/93 | 139 | 21.50 | 6/4/93 | 154 |
| 17.00 | 5/22/93 | 141 | 17.25 | 5/22/93 | 141 | 23.50 | 6/8/93 | 158 |
| 15.75 | 5/24/93 | 143 | 16.25 | 5/24/93 | 143 | 24.00 | 6/10/93 | 160 |
| 16.75 | 5/26/93 | 145 | 16.75 | 5/26/93 | 145 | 27.00 | 6/12/93 | 162 |
| 16.75 | 6/2/93 | 152 | 16.75 | 6/2/93 | 152 | 27.00 | 6/14/93 | 164 |
| 17.00 | 6/4/93 | 154 | 17.25 | 6/4/93 | 154 | 23.25 | 6/16/93 | 166 |
| 15.75 | 6/6/93 | 156 | 15.75 | 6/6/93 | 156 | 26.17 | 6/27/93 | 177 |
| 17.25 | 6/8/93 | 158 | 17.50 | 6/8/93 | 158 | 26.15 | 7/6/93 | 186 |
| 18.25 | 6/10/93 | 160 | 18.25 | 6/10/93 | 160 | 31.00 | 7/8/93 | 188 |
| 18.50 | 6/12/93 | 162 | 19.00 | 6/12/93 | 162 | 31.50 | 7/10/93 | 190 |
| 22.25 | 6/14/93 | 164 | 22.00 | 6/14/93 | 164 | 27.50 | 7/12/93 | 192 |
| 21.00 | 6/16/93 | 166 | 21.00 | 6/16/93 | 166 | 29.25 | 7/14/93 | 194 |
| 23.63 | 6/27/93 | 177 | 23.27 | 6/27/93 | 177 | 28.25 | 7/18/93 | 198 |
| 26.00 | 7/6/93 | 186 | 24.75 | 7/6/93 | 186 | 26.00 | 7/20/93 | 200 |
| 25.75 | 7/8/93 | 188 | 27.00 | 7/8/93 | 188 | 27.50 | 8/4/93 | 215 |
| 27.75 | 7/10/93 | 190 | 27.75 | 7/10/93 | 190 | 25.00 | 8/6/93 | 217 |
| 26.25 | 7/12/93 | 192 | 26.75 | 7/12/93 | 192 | 26.50 | 8/8/93 | 219 |
| 26.50 | 7/14/93 | 194 | 27.50 | 7/14/93 | 194 | 25.50 | 8/10/93 | 221 |
| 25.25 | 7/16/93 | 196 | 26.20 | 7/16/93 | 196 | 24.50 | 8/12/93 | 223 |
| 25.50 | 7/18/93 | 198 | 25.75 | 7/18/93 | 198 | 21.00 | 8/14/93 | 225 |
| 23.00 | 7/20/93 | 200 | 23.50 | 7/20/93 | 200 | 27.75 | 8/16/93 | 227 |
| 24.50 | 8/2/93 | 213 | 24.75 | 8/2/93 | 213 | 26.80 | 8/26/93 | 237 |
| 24.75 | 8/4/93 | 215 | 25.50 | 8/4/93 | 215 | 26.80 | | 270 |
| 24.00 | 8/6/93 | 217 | 24.00 | 8/6/93 | 217 | | | |
| 23.75 | 8/8/93 | 219 | 23.50 | 8/8/93 | 219 | | | |
| 24.00 | 8/10/93 | 221 | 24.75 | 8/10/93 | 221 | | | |
| 22.75 | 8/12/93 | 223 | 23.75 | 8/12/93 | 223 | | | |
| 21.75 | 8/14/93 | 225 | 23.50 | 8/14/93 | 225 | | | |
| 25.00 | 8/16/93 | 227 | 25.75 | 8/16/93 | 227 | | | |
| 26.50 | 8/26/93 | 237 | 24.43 | 8/26/93 | 237 | | | |
| 26.50 | | 270 | 24.43 | | 270 | | | |

**Table 4-7**
**HUDTOX Initial Conditions of Sediment Solids for Calibration.**

| Water Column Segment | | Active Sediment Segment No | Bulk Density ($g/m^3$) | Lower Sediment Segment No | Bulk Density ($g/m^3$) | Deep Sediment Segment No. | Bulk Density ($g/m^3$) |
|---|---|---|---|---|---|---|---|
| | Thickness | 5 cm | | 5 cm | | 15, 25, 50 cm | |
| 1 | | 14 | 1.28E+06 | 27 | 1.30E+06 | 40, 53, 66 | 1.36E+06 |
| 2 | | 15 | 9.63E+05 | 28 | 9.88E+05 | 41, 54, 67 | 1.08E+06 |
| 3 | | 16 | 1.12E+06 | 29 | 1.08E+06 | 42, 55, 68 | 1.72E+06 |
| 4 | | 17 | 1.27E+06 | 30 | 1.20E+06 | 43, 56, 69 | 8.80E+05 |
| 5 | | 18 | 1.41E+06 | 31 | 1.31E+06 | 44, 57, 70 | 1.36E+06 |
| 6 | | 19 | 1.31E+06 | 32 | 1.12E+06 | 45, 58, 71 | 9.94E+05 |
| 7 | | 20 | 1.13E+06 | 33 | 1.10E+06 | 46, 59, 72 | 1.06E+06 |
| 8 | | 21 | 1.31E+06 | 34 | 1.15E+06 | 47, 60, 73 | 1.12E+06 |
| 9 | | 22 | 9.84E+05 | 35 | 6.90E+05 | 48, 61, 74 | 5.60E+05 |
| 10 | | 23 | 1.18E+06 | 36 | 8.55E+05 | 49, 62, 75 | 8.62E+05 |
| 11 | | 24 | 1.27E+06 | 37 | 9.60E+05 | 50, 63, 76 | 9.10E+05 |
| 12 | | 25 | 1.19E+06 | 38 | 1.09E+06 | 51, 64, 77 | 1.08E+06 |
| 13 | | 26 | 1.00E+06 | 39 | 6.90E+05 | 52, 65, 78 | 7.00E+05 |
| | Average Bulk Density | | 1.19E+06 | | 1.04E+06 | | 1.05E+06 |

## Table 4-8
## Total PCBs in the 0-5 cm Sediment Layer
## Estimated from GE 1992 Sediment Data

**PCB Mass per Bulk Volume of Sediment**

| Water Column Segment | Active Sediment Segment | Total PCB (ug/g) | BZ#4 (ug/L) | BZ#28 (ug/L) | BZ#52 (ug/L) | BZ#101 +90 (ug/L) | BZ#138 (ug/L) |
|---|---|---|---|---|---|---|---|
| 1 | 14 | 86,597 | 15,163 | 1,690 | 1,399 | 451 | 172 |
| 2 | 15 | 31,632 | 6,893 | 1,605 | 774 | 211 | 65 |
| 3 | 16 | 40,797 | 8,021 | 891 | 898 | 329 | 113 |
| 4 | 17 | 8,531 | 1,796 | 215 | 248 | 83 | 45 |
| 5 | 18 | 16,074 | 2,673 | 909 | 450 | 134 | 41 |
| 6 | 19 | 6,465 | 939 | 454 | 198 | 66 | 24 |
| 7 | 20 | 10,450 | 1,297 | 697 | 262 | 71 | 26 |
| 8 | 21 | 4,686 | 473 | 249 | 149 | 58 | 33 |
| 9 | 22 | 1,506 | 117 | 146 | 45 | 16 | 6 |
| 10 | 23 | 2,060 | 160 | 108 | 70 | 30 | 15 |
| 11 | 24 | 20,163 | 2,022 | 1,690 | 890 | 333 | 88 |
| 12 | 25 | 8,963 | 899 | 227 | 172 | 54 | 28 |
| 13 | 26 | 434 | 44 | 31 | 20 | 9 | 4 |

**PCB Mass per Sediment Solid**

| Water Column Segment | Active Sediment Segment | Total PCB (ug/g) | BZ#4 (ug/g) | BZ#28 (ug/g) | BZ#52 (ug/g) | BZ#101 +90 (ug/g) | BZ#138 (ug/g) |
|---|---|---|---|---|---|---|---|
| 1 | 14 | 67.654 | 11.846 | 1.320 | 1.093 | 0.353 | 0.134 |
| 2 | 15 | 32.848 | 7.157 | 1.666 | 0.803 | 0.219 | 0.067 |
| 3 | 16 | 36.426 | 7.161 | 0.795 | 0.801 | 0.293 | 0.101 |
| 4 | 17 | 6.717 | 1.414 | 0.169 | 0.195 | 0.066 | 0.035 |
| 5 | 18 | 11.400 | 1.896 | 0.645 | 0.319 | 0.095 | 0.029 |
| 6 | 19 | 4.935 | 0.717 | 0.347 | 0.151 | 0.050 | 0.018 |
| 7 | 20 | 9.248 | 1.148 | 0.617 | 0.232 | 0.063 | 0.023 |
| 8 | 21 | 3.577 | 0.361 | 0.190 | 0.114 | 0.044 | 0.025 |
| 9 | 22 | 1.530 | 0.119 | 0.148 | 0.046 | 0.017 | 0.006 |
| 10 | 23 | 1.746 | 0.136 | 0.091 | 0.059 | 0.026 | 0.012 |
| 11 | 24 | 15.876 | 1.592 | 1.331 | 0.701 | 0.262 | 0.070 |
| 12 | 25 | 7.532 | 0.755 | 0.191 | 0.144 | 0.045 | 0.023 |
| 13 | 26 | 0.434 | 0.044 | 0.031 | 0.020 | 0.009 | 0.004 |

Source: Processed from General Electric data in TAMS/Gradient Database.

**Table 4-9**
**Definition and HUDTOX Solids Model Process-related Parameters**

| Symbol | Definition | Units | Source |
|---|---|---|---|
| $v_s$ | Gross solids settling velocity; assumed constant. | m/day | Literature |
| $v_r$ | Solids resuspension velocity; spatially variable, enhanced during flood events. | m/day | Literature; Calibration |
| $v_b$ | Sediment soilds burial velocity; assumed constant. | m/day | Literature; Program Data |
| $D_s$ | Vertical diffusion coefficient for pore water DOC. | $m^2$/sec | Literature |
| $D_{sw}$ | Vertical active sediment-water interface diffusion coefficient for pore water DOC. | $m^2$/sec | Literature |
| $D_L$ | Longitudinal dispersion. | $m^2$/sec | Estimated |
| $k_d$ | Sediment solids degradation rate. | $day^{-1}$ | Calibration |
| Y (TS to DOC) | Yield of TS to DOC from sediment solids degradation. | Dimen-sionless | Applied as 100% |
| GPP | Internal water column solids generation rate by gross primary production. | $g/m^2$-day | Literature |
| $q_{gpp}$ | Arrhenius temperature correction factor for gross primary production. | Dimen-sionless | Literature |

**Table 4-10**
**Definition and HUDTOX PCB Model Process-related Parameters**

| Symbol | Definition | Units | Source |
|---|---|---|---|
| $K_{poc}$ | Partition coefficient for sorbate on POC based on three-phase equilibrium partitioning model; chemical specific. | L/kg carbon | Analysis of Phase 2 data (TAMS, 1994a) |
| $K_{doc}$ | Partition coefficient for sorbate on DOC based on three-phase equilibrium partitioning model; chemical specific. | L/kg carbon | Analysis of Phase 2 data (TAMS, 1994a) |
| *tsf* | Temperature slope factor constant effecting partitioning; chemical specific. | °K | Analysis of Phase 2 data (TAMS, 1994a) |
| $u_x$ | Particle concentration effect constant for three-phase equilibrium partitioning model; chemical specific. | dimension-less | Not utilized for HUDTOX calibration |
| $D_{si}$ | Vertical diffusion coefficient for pore water DOC. | $m^2$/sec | Literature |
| $D_{swi}$ | Vertical active sediment-water interface diffusion coefficient for pore water DOC. | $m^2$/sec | Literature |
| $H_T$ | Henry's Law Constant; chemical specific, and temperature dependent. | atm $m^3$/mole | H at 25 °C from Andren (1992?) compilation |
| MW | Molecular Weight; chemical specific. | g/mole | Andren (1992?) compilation |
| $f_{oc}$ | Fraction organic carbon on particulate solids. | dimension-less | Analysis of Phase 2 data (TAMS, 1994a) |

**Table 4-11**
**Phase 2 Monitoring Program Sampling Stations in Relation to the HUDTOX Model Segmentation**

| Sample Station | Geographic Location | River Mile | Notes | HUDTOX Segment |
|---|---|---|---|---|
| 1 | Glens Falls | 200.5 | Background | -- |
| 2 | Fenimore Bridge | 197.3 | Background | -- |
| 3 | Remnants | 195.8 | Background | -- |
| 4 | Rt. 197 | 194.4 | | Upstream |
| 5 | TID | 188.5 | | 3 |
| 6 | Schuylerville | 181.3 | | 6 |
| 7 | Stillwater | 168.2 | | 8 |
| 8 | Waterford | 156.6 | | 12 |
| 9 | Saratoga Springs | -- | Used as Blank | -- |
| 10 | Lock 7 | 194 | | -- |
| 11 | Batten Kill | -- | Tributary | -- |
| 12 | Hoosic River | -- | Tributary | -- |
| 13 | Mohawk River | -- | Tributary | -- |
| 14 | Green Island Bridge | 153 | Tidal fresh water | 13 |
| 15 | Coxsackie | 110 | Tidal fresh water | -- |
| 16 | Cementon | 102 | Tidal fresh water | -- |
| 17 | Highland | 77 | Tidal fresh water | -- |
| 19 | Mechanicville | 165.2 | TSS only | 10 |

Source: TAMS/Gradient Database.

## Table 4-12
## 1993 HUDTOX Solids Model Calibration Parameter Values

| Parameter | Units | Value | Source |
|---|---|---|---|
| $v_s$ | m/day | 2.0 | Literature |
| $v_r$ | m/day | 3.65E-06 to 5.48E-06 | (1.3 to 2.0 mm/year) Literature; Calibration |
| $v_b$ | m/day | 6.0E-06 | (2.2 mm/year) Literature; Assessment of Phase 2 data |
| $D_s$ | $m^2$/sec | 2.0E-09 | Literature |
| $D_{sw}$ | $m^2$/sec | 2.0E-10 (active) 1.0E-10 (deep) | Literature |
| $D_L$ | $m^2$/sec | 11.6; 0.0 at dam interfaces | Estimaated |
| $k_d$ | day$^{-1}$ | 1.1E-06 | Calibration |
| Y (TS to DOC) | dimensionless | 1.0 | Applied at 100% |
| GPP | g/$m^2$-day | 1.20 at 20 C | Cole at el (1992). Assuming 50% carbon content in biotic solids |
| $q_{gpp}$ | dimensionless | 1.066 | Thomann (1987) |

**Table 4-13**
**Paired Two Sample t-Test for Means of HUDTOX Model Output vs. Data**
**Total Suspended Solids (mg/l) - 1993 Calibration Period**

| HUDTOX | | Mean | | Variance | | | | | $\alpha$=0.05 |
|---|---|---|---|---|---|---|---|---|---|
| Segment | Parameter | Data | Model | Data | Model | Count | R | P (T<=t) | P>$\alpha$ ? |
| 3 | TSS | 4.3 | 4.5 | 33.8 | 40.7 | 12 | 0.521 | 0.920 | pass |
| 6 | TSS | 8.2 | 26.7 | 128.7 | 2239.5 | 6 | 0.461 | 0.343 | pass |
| 8 | TSS | 34.9 | 33.9 | 1268.0 | 751.1 | 23 | 0.781 | 0.844 | pass |
| 10 | TSS | 2.8 | 3.1 | 3.6 | 0.1 | 119 | 0.050 | 0.055 | pass |
| 11 | TSS | 12.6 | 19.0 | 269.7 | 634.1 | 79 | 0.852 | 0.000 | fail |
| 12 | TSS | 25.1 | 35.4 | 1321.2 | 2018.5 | 41 | 0.611 | 0.157 | pass |
| | | | | | | | | % Pass = | 83% |

## Table 4-14
## 1993 HUDTOX PCB Model Calibration Parameter Values

| Parameter | Units | Calibration Value | | | | | | Source |
|---|---|---|---|---|---|---|---|---|
| | | Total PCB | BZ#4 | BZ#28 | BZ#52 | BZ#101+90 | BZ#138 | |
| log $K_{poc}$ | log (L/kg C) | 5.6[1] | 5.108 | 5.868 | 5.821 | 6.165 | 6.605 | Median value from Phase 2 data analysis (TAMS, 1994a) |
| log $K_{doc}$ | log (L/kg C) | 4.6[1] | 4.954 | 4.299 | 4.216 | 4.149 | 5.243 | Median value from Phase 2 data analysis (TAMS, 1994a) |
| *tsf* | °K | 1195.7[2] | 1463.1 | 920.1 | 116.7 | 1195.7 | 1599.0 | Phase 2 data analysis (TAMS, 1994a) |
| $u_x$ | dimension-less | -- | -- | -- | -- | -- | -- | Site-specific data insufficient. |
| $D_{si}$ | $m^2$/sec | 4.40E-09 | 5.30E-09 | 4.94E-09 | 4.64E-09 | 4.40E-09 | 4.18E-09 | Literature |
| $D_{swi}$ (active) | $m^2$/sec | 4.40E-10 | 5.30E-10 | 4.94E-10 | 4.64E-10 | 4.40E-10 | 4.18E-10 | Literature |
| $D_{swi}$ (deep) | $m^2$/sec | 2.20E-10 | 2.65E-10 | 2.47E-10 | 2.32E-10 | 2.20E-10 | 2.09E-10 | Literature |
| $H_{25}$ | atm $m^3$/mole | 2.26E-04[1] | 5.50E-04 | 2.25E-04 | 5.25E-04 | 3.23E-04 | 1.09E-04 | Andren (1992?) compilation |
| MW | g/mole | 292.0[1] | 223.1 | 257.6 | 292.0 | 326.4 | 360.9 | Andren (1992?) compilation |
| $f_{oc}$ | dimension-less | 0.22 in water (mean of Phase 2 data - TAMS, 1994a)<br>0.009 to 0.084 in sediment (1991 sediment data - GE, 1993b) | | | | | | |

[1]Estimated based on PCB apparent congener distribution.

[2]Representative value across PCB congeners (TAMS, 1994a).

[2]Representative value across PCB congeners (TAMS, 1994a).

## Table 4-15
## Paired Two Sample t-Test for Means of HUDTOX Model Output vs. Data
## Total PCBs (ng/l) - 1993 Calibration Period

| HUDTOX | | Mean | | Variance | | | | α=0.05 |
|---|---|---|---|---|---|---|---|---|
| Segment | Parameter | Data | Model | Data | Model | Count | P (T<=t) | P>α ? |
| 3 | BZ#4 | 38.00 | 25.01 | 491.48 | 141.55 | 11 | 0.101 | pass |
| | BZ#28 | 4.30 | 5.22 | 3.31 | 20.12 | 11 | 0.341 | pass |
| | BZ#52 | 3.24 | 3.40 | 1.20 | 7.09 | 11 | 0.830 | pass |
| | BZ#101+90 | 0.84 | 1.04 | 0.09 | 0.66 | 11 | 0.325 | pass |
| | BZ#138 | 0.29 | 0.38 | 0.01 | 0.07 | 11 | 0.228 | pass |
| | ΣPCBs | 146.36 | 144.34 | 3714 | 8965 | 11 | 0.947 | pass |
| 6 | BZ#4 | 18.03 | 17.27 | 258.43 | 67.66 | 6 | 0.899 | pass |
| | BZ#28 | 7.20 | 6.05 | 95.69 | 61.95 | 6 | 0.215 | pass |
| | BZ#52 | 3.84 | 3.25 | 16.38 | 13.97 | 6 | 0.087 | pass |
| | BZ#101+90 | 1.11 | 1.00 | 1.57 | 1.61 | 6 | 0.002 | fail |
| | BZ#138 | 0.46 | 0.35 | 0.26 | 0.17 | 6 | 0.034 | fail |
| | ΣPCBs | 127.41 | 122.81 | 11976 | 10983 | 6 | 0.642 | pass |
| 8 | BZ#4 | 7.51 | 11.76 | 51.90 | 40.97 | 3 | 0.623 | pass |
| | BZ#28 | 8.98 | 7.16 | 146.84 | 92.55 | 3 | 0.355 | pass |
| | BZ#52 | 4.43 | 3.63 | 30.18 | 21.77 | 3 | 0.311 | pass |
| | BZ#101+90 | 1.37 | 1.20 | 2.49 | 2.77 | 3 | 0.362 | pass |
| | BZ#138 | 0.53 | 0.40 | 0.33 | 0.30 | 3 | 0.139 | pass |
| | ΣPCBs | 128.36 | 121.19 | 20851 | 18007 | 3 | 0.749 | pass |
| 12 | BZ#4 | 14.80 | 20.13 | 90.11 | 78.32 | 10 | 0.025 | fail |
| | BZ#28 | 5.71 | 4.55 | 34.19 | 6.19 | 10 | 0.402 | pass |
| | BZ#52 | 3.50 | 2.58 | 6.17 | 1.46 | 10 | 0.118 | pass |
| | BZ#101+90 | 1.08 | 0.83 | 1.09 | 0.28 | 11 | 0.317 | pass |
| | BZ#138 | 0.58 | 0.32 | 0.51 | 0.04 | 10 | 0.203 | pass |
| | ΣPCBs | 102.95 | 105.54 | 4681 | 1532 | 10 | 0.891 | pass |
| | | | | | | | % Pass = | 88% |

## Table 4-16
## Paired Two Sample t-Test for Means of HUDTOX Model Output vs. Data Apparent Dissolved PCBs (ng/l) - 1993 Calibration Period

| HUDTOX | | Mean | | Variance | | | | α = 0.05 |
|---|---|---|---|---|---|---|---|---|
| Segment | Parameter | Data | Model | Data | Model | Count | P (T<=t) | P > α ? |
| 3 | BZ#4 | 34.10 | 23.08 | 550.27 | 93.45 | 12 | 0.119 | pass |
| | BZ#28 | 3.32 | 2.94 | 1.55 | 1.45 | 12 | 0.257 | pass |
| | BZ#52 | 2.54 | 1.97 | 0.99 | 0.44 | 12 | 0.018 | fail |
| | BZ#101+90 | 0.503 | 0.463 | 0.046 | 0.084 | 12 | 0.482 | pass |
| | BZ#138 | 0.113 | 0.140 | 0.003 | 0.009 | 12 | 0.202 | pass |
| | ΣPCBs | 123.27 | 102.06 | 3579 | 1533 | 12 | 0.098 | pass |
| 6 | BZ#4 | 16.92 | 14.05 | 267.23 | 89.69 | 6 | 0.648 | pass |
| | BZ#28 | 3.49 | 1.90 | 5.62 | 1.53 | 6 | 0.050 | pass |
| | BZ#52 | 2.06 | 1.15 | 1.42 | 0.46 | 6 | 0.029 | fail |
| | BZ#101+90 | 0.394 | 0.225 | 0.036 | 0.029 | 6 | 0.002 | fail |
| | BZ#138 | 0.121 | 0.065 | 0.004 | 0.002 | 6 | 0.022 | fail |
| | ΣPCBs | 78.83 | 63.56 | 2036 | 1577 | 6 | 0.257 | pass |
| 8 | BZ#4 | 4.95 | 8.48 | 59.01 | 32.92 | 3 | 0.693 | pass |
| | BZ#28 | 2.67 | 1.81 | 5.65 | 3.63 | 3 | 0.176 | pass |
| | BZ#52 | 1.40 | 0.99 | 1.09 | 1.02 | 3 | 0.224 | pass |
| | BZ#101+90 | 0.282 | 0.171 | 0.023 | 0.033 | 3 | 0.222 | pass |
| | BZ#138 | 0.073 | 0.042 | 0.001 | 0.001 | 3 | 0.159 | pass |
| | ΣPCBs | 44.73 | 50.02 | 617 | 2164 | 3 | 0.803 | pass |
| 12 | BZ#4 | 12.52 | 17.83 | 108.26 | 84.36 | 11 | 0.028 | fail |
| | BZ#28 | 2.69 | 2.13 | 2.03 | 1.03 | 11 | 0.261 | pass |
| | BZ#52 | 1.90 | 1.29 | 0.59 | 0.36 | 11 | 0.017 | fail |
| | BZ#101+90 | 0.356 | 0.270 | 0.034 | 0.019 | 12 | 0.228 | pass |
| | BZ#138 | 0.097 | 0.072 | 0.001 | 0.002 | 11 | 0.059 | pass |
| | ΣPCBs | 58.74 | 68.39 | 559 | 1087 | 11 | 0.200 | pass |
| | | | | | | | % Pass = | 71% |

**Table 4-17**
**Paired Two Sample t-Test for Means of HUDTOX Model Output vs. Data Particulate PCBs (ug/g solid) - 1993 Calibration Period**

| HUDTOX | | Mean | | Variance | | | | α=0.05 |
|---|---|---|---|---|---|---|---|---|
| Segment | Parameter | Data | Model | Data | Model | Count | P (T<=t) | P>α ? |
| 3 | BZ#4 | 0.395 | 0.461 | 0.123 | 0.027 | 11 | 0.571 | pass |
| | BZ#28 | 0.425 | 0.478 | 0.021 | 0.029 | 11 | 0.174 | pass |
| | BZ#52 | 0.333 | 0.296 | 0.012 | 0.006 | 11 | 0.292 | pass |
| | BZ#101+90 | 0.170 | 0.153 | 0.005 | 0.005 | 11 | 0.370 | pass |
| | BZ#138 | 0.087 | 0.073 | 0.001 | 0.002 | 11 | 0.108 | pass |
| | ΣPCBs | 8.503 | 8.099 | 8.692 | 6.835 | 11 | 0.647 | pass |
| 6 | BZ#4 | 0.219 | 0.308 | 0.012 | 0.023 | 6 | 0.149 | pass |
| | BZ#28 | 0.370 | 0.326 | 0.044 | 0.046 | 6 | 0.245 | pass |
| | BZ#52 | 0.238 | 0.184 | 0.011 | 0.011 | 6 | 0.121 | pass |
| | BZ#101+90 | 0.115 | 0.077 | 0.[illegible] | .002 | 6 | 0.086 | pass |
| | BZ#138 | 0.065 | 0.034 | 0.001 | 0.000 | 6 | 0.019 | fail |
| | ΣPCBs | 6.548 | 5.397 | 8.962 | 8.567 | 6 | 0.275 | pass |
| 8 | BZ#4 | 0.162 | 0.195 | 0.019 | 0.021 | 3 | 0.421 | pass |
| | BZ#28 | 0.208 | 0.288 | 0.037 | 0.074 | 3 | 0.242 | pass |
| | BZ#52 | 0.113 | 0.148 | 0.008 | 0.017 | 3 | 0.312 | pass |
| | BZ#101+90 | 0.053 | 0.057 | 0.002 | 0.003 | 3 | 0.860 | pass |
| | BZ#138 | 0.028 | 0.022 | 0.001 | 0.000 | 3 | 0.627 | pass |
| | ΣPCBs | 3.295 | 4.101 | 5.788 | 11.680 | 3 | 0.303 | pass |
| 12 | BZ#4 | 0.107 | 0.340 | 0.010 | 0.022 | 11 | 0.000 | fail |
| | BZ#28 | 0.210 | 0.328 | 0.010 | 0.016 | 11 | 0.009 | fail |
| | BZ#52 | 0.161 | 0.179 | 0.006 | 0.005 | 11 | 0.377 | pass |
| | BZ#101+90 | 0.090 | 0.081 | 0.002 | 0.001 | 11 | 0.404 | pass |
| | BZ#138 | 0.046 | 0.036 | 0.000 | 0.000 | 11 | 0.036 | fail |
| | ΣPCBs | 3.623 | 5.078 | 2.432 | 3.968 | 11 | 0.007 | fail |
| | | | | | | | % Pass = | 79% |

**Table 5-1**
**Comparison of Manning's 'n' from Previous Studies**

| | Main Channel 'n' | Floodplain 'n' |
|---|---|---|
| **Zimmie** | 0.027 | 0.065 |
| **FEMA** | 0.028 - 0.035 | 0.075 |

Source: Zimmie, 1985; FEMA, 1982

**Table 5-2**
**Modeled Hudson River Flows in the TIP**

| Flow Description | River Discharge, (cfs) |
|---|---|
| Peak flow during spring and fall surveys, 1991 | 8,000 |
| Peak flow for GE high flow survey, April 23-24, 1992 | 19,000 |
| Peak flow for TAMS Phase 2 survey, April 12, 1993 | 20,300 |
| Peak flow for spring 1994 (Bopp, 1994) | 28,000 |
| Peak flow in 1983 | 35,000 |
| 5-year high flow | 30,126 |
| 25-year high flow | 39,883 |
| 100-year high flow | 47,330 |

Source: USGS Gaging Records, Butcher, 1993

**Table 5-3**
**Comparison of Model Results with Rating Curve Data**

| Flow (cfs) | Downstream Boundary Condition (NGVD) | Model Predicted Upstream Elevations (NGVD) | Rating Curve Gauge 119 (Upstream) Elevations (NGVD) |
|---|---|---|---|
| **10,000** | 120.6 | 121.5 | 121.2 |
| **20,000** | 122.2 | 123.8 | 123.6 |
| **30,000** | 123.8 | 126.1 | 126.1 |

Source: Pierce, 1994, RMA-2V Model Results

**Table 5-4**
**Effect of Manning's 'n' on Model Results**
**for 100 Year Flow Event**

| | Main Channel (NGVD) | Floodplain (NGVD) | River Elevation at Roger's Island (NGVD) |
|---|---|---|---|
| **Baseline** | 0.020 | 0.060 | 129.1 |
| **High 'n'** | 0.035 | 0.075 | 131.1 |
| **Low 'n' Main Channel** | 0.015 | 0.060 | 128.6 |
| **Low 'n' Floodplain** | 0.020 | 0.040 | 128.9 |
| **High 'n' Floodplain** | 0.020 | 0.080 | 129.3 |

Source: RMA-2V Model Results

**Table 5-5**
**Effect of Turbulent Exchange Coefficients on Model Results**

| | Turbulent Exchange Coefficients | River Elevation Roger's Island (NGVD) |
|---|---|---|
| **Baseline** | 100 | 129.1 |
| **Low Turbulent Exchange Coefficients** | 50 | 128.8 |
| **High Turbulent Exchange Coefficients** | 200 | 129.7 |

Source: RMA-2V Model Results

## Table 6-1
## Thompson Island Pool Erodability Study Data Requirements

| | Data / Process | Data Description | Purpose | Origin | Form | Ref. |
|---|---|---|---|---|---|---|
| **Hydrodynamic Sub-Model** | Stage-discharge relationships | USGS rating curves | For specifying boundary conditions and for calibration | USGS | Paper | Memo dated 9/20/93 |
| | Flood frequency analysis | Recurrence intervals for flood events | Develop estimates for Velocities for various recurrence | Analyses of Hydrologic data by John Butcher | Paper | Memo dated 6/18/93 |
| | Bottom elevations | Bathymetric surveys | To develop FEM grid | GE | Disk | O'Brien & Gere Rep. 5/1/93 |
| | Overflow areas | Characterizing flood plains | To develop FEM grid | USGS typographic maps | Paper | |
| **Depth of Scour Sub-Model** | Bottom sediment distribution | Sediment type distribution - coarse/fine | To map TIP sediments by erosional behavior | Side-scan sonar studies by R. Flood | GIS Cov. | Report dated 10/29/93 |
| | Critical shear stress | Laboratory flume studies at different shear stresses and settling times | To assign critical shear stress for erosion and deposition time-related parameters | GE | Paper | HydroQual (1995) |
| | Resuspension function (cohesive) | Shaker studies | To quantify mass resuspended as a function of applied shear stress | GE | Paper | HydroQual (1995) |
| **PCB Erosion Sub-Model** | Sediment PCB distribution | PCB concentration distributions as a function of depth | To estimate quantity of PCBs remobilized from cohesive sediment due to a resuspension event | Historical (1984 NYSDEC Survey) and project[2] (Phase 2) | Disk | |

1. Extrapolated from other sites (no in-situ data available)
2. High resolution cores and Grab samples

**Table 6-2**
**Summary of Inputs for Depth of Scour Model at Each High Resolution Core**

| Core Name | 100 Year Flood Shear Stress (dynes/cm$^2$) | Bulk Density (g/cm$^3$) |
|---|---|---|
| HR-19 | 16.095 | 1.223 |
| HR-20 | 35.86 | 1.123 |
| HR-23 | 14.106 | 1.441 |
| HR-25 | 57.029 | 1.404 |
| HR-26 | 24.876 | 1.152 |

**Table 6-3**

**Predicted Depth of Scour Range for 100 Year Flood at Each High Resolution Core**

| Core Name | Depth of Scour (cm) | | | |
|---|---|---|---|---|
| | **Median** | **5th Percentile** | **95th Percentile** | **Depth of PCB Peak (cm)** |
| HR-19 | 0.047 | 0.009 | 0.236 | 20-24 |
| HR-20 | 0.587 | 0.094 | 3.656 | 24-28 |
| HR-23 | 0.027 | 0.005 | 0.13 | 28-32 |
| HR-25 | 1.865 | 0.253 | 13.743 | 2-4 |
| HR-26 | 0.191 | 0.034 | 1.058 | 12-16 |

## Table 6-4
## Summary of Design Flows

| Event | Flow (cfs) | Mean velocities in TIP (fps) | Mean shear stresses in cohesive areas of TIP ($dynes/cm^2$) | Mean shear stresses in non-cohesive areas of TIP ($dynes/cm^2$) | GIS map of velocities | GIS map of shear stresses |
|---|---|---|---|---|---|---|
| **100 year** | 47330 | 3.67 | 19.50 | 29.20 | Plate 6-3 | Plate 6-4 |
| **1983** | 34800 | 0.55 | 13.98 | 21.22 | Plate 6-8 | Plate 6-9 |
| **1994 Spring** | 28000 | 0.49 | 12.67 | 18.93 | Plate 6-13 | Plate 6-14 |
| **1992 Spring** | 19000 | 0.38 | 8.04 | 12.33 | Plate 6-18 | Plate 6-19 |
| **1991** | 8000 | 0.18 | 2.48 | 4.03 | Plate 6-23 | Plate 6-24 |

**Table 6-5**
**Mass of Solids and PCBs Eroded from Cohesive Sediments in TIP**

| Event | Flow (cfs) | Mass of Solids eroded (MT/event) | Mass of PCBs eroded (kg/event) | % of 1984 PCB reservoir eroded [1] | Depth of Scour (cm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | Median | 5th Percentile | 95th Percentile |
| **100 year** | 47330 | 834 | 25.00 | 0.78 | 0.16 | 0.03 | 0.97 |
| **1983** | 34800 | 304 | 8.75 | 0.27 | 0.06 | 0.01 | 0.32 |
| **1994 Spring** | 28000 | 220 | 6.58 | 0.21 | 0.04 | 0.01 | 0.22 |
| **1992 Spring** | 19000 | 55.3 | 1.57 | 0.05 | 0.01 | 0.00 | 0.05 |
| **1991** | 8000 | 1.68 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |

1 Mass reservoirs based on the Kriging analysis of 1984 NYSDEC data (Butcher et al., 1994)

## Table 7-1
## Component Analysis - Exposure Model

| Exposure Model Segment | Component | Maximum Magnitude (ug/l/day) | Year |
|---|---|---|---|
| 2 | Loading | 0.00608 | 1970 |
| 15 | Loading | 0.00524 | 1970 |
| 17 | Loading | 0.00121 | 1970 |
| 28 | Loading | 0.00014 | 1970 |
| 2 | Net Advection | 0.08174 | 1972 |
| 15 | Net Advection | 0.02035 | 1974 |
| 17 | Net Advection | 0.00017 | 1974 |
| 28 | Net Advection | -2.00E-06 | 1970 |
| 2 | Net Dispersion | 0.00065 | 1972 |
| 15 | Net Dispersion | 0.01279 | 1974 |
| 17 | Net Dispersion | -0.00107 | 1970 |
| 28 | Net Dispersion | 0.00003 | 1970 |
| 2 | Net Settling | 4 | 1972 |
| 15 | Net Settling | 0.00734 | 1974 |
| 17 | Net Settling | 0.00029 | 1970 |
| 28 | Net Settling | 0.0001 | 1970 |
| 2 | Volatilization | 0.05823 | 1972 |
| 15 | Volatilization | 0.00403 | 1974 |
| 17 | Volatilization | 0.0003 | 1974 |
| 28 | Volatilization | 0.00011 | 1970 |

Source: LTI 1994

## Table 7-2
## Component Analysis - Bioaccumulation Model

| Foodchain Model Segment | Year Class | Component Magnitude, 1974 (ug/g/day) | | | |
|---|---|---|---|---|---|
| | | Uptake | Consumption | Loss | Total Loss |
| 2 | 0 | 0.098 | 1.534 | 1.126 | 1.486 |
| 2 | 2 | 0.018 | 0.500 | 0.160 | 0.332 |
| 2 | 6 | 0.016 | 0.398 | 0.142 | 0.183 |
| 2 | 17 | 0.014 | 0.350 | 0.047 | 0.052 |
| 3 | 0 | 0.008 | 0.166 | 0.280 | 0.421 |
| 3 | 2 | 0.006 | 0.112 | 0.199 | 0.256 |
| 3 | 6 | 0.003 | 0.084 | 0.080 | 0.092 |
| 3 | 17 | NA | NA | NA | NA |
| 4 | 0 | 0.009 | 0.177 | 0.328 | 0.454 |
| 4 | 2 | 0.007 | 0.127 | 0.300 | 0.356 |
| 4 | 6 | 0.003 | 0.078 | 0.093 | 0.104 |
| 4 | 17 | NA | NA | NA | NA |
| 5 | 0 | 0.000 | 0.000 | 0.070 | 0.075 |
| 5 | 2 | 0.000 | 0.000 | 0.069 | 0.074 |
| 5 | 6 | NA | NA | NA | NA |
| 5 | 17 | NA | NA | NA | NA |

Source: LTI, 1994

## Table 7-3
## Sensitivity Analysis - Exposure Model

| Exposure Model Segment | Parameter | Dissolved or Total | Parameter Range | Brief Result |
|---|---|---|---|---|
| 2 | Settling | D | +/- 50% of Excess | Not Sensitive |
| 2 | Settling | T | +/- 50% of Excess | Not Sensitive |
| 15 | Settling | D | +/- 50% of Excess | Not Sensitive |
| 15 | Settling | T | +/- 50% of Excess | Not Sensitive |
| 17 | Settling | D | +/- 50% of Excess | Not Sensitive |
| 17 | Settling | T | +/- 50% of Excess | Not Sensitive |
| 28 | Settling | D | +/- 50% of Excess | Not Sensitive |
| 28 | Settling | T | +/- 50% of Excess | Not Sensitive |
| 2 | Biodegradation | D | High, 0.1*high | Sensitive, same for H and L |
| 2 | Biodegradation | T | High, 0.1*high | Sensitive, same for H and L |
| 15 | Biodegradation | D | High, 0.1*high | Very Sensitive |
| 15 | Biodegradation | T | High, 0.1*high | Very Sensitive |
| 17 | Biodegradation | D | High, 0.1*high | Quite Sensitive |
| 17 | Biodegradation | T | High, 0.1*high | Quite Sensitive |
| 28 | Biodegradation | D | High, 0.1*high | Quite Sensitive |
| 28 | Biodegradation | T | High, 0.1*high | Quite Sensitive |
| 2 | Loadings | D | +/- 50% | Not Sensitive |
| 2 | Loadings | T | +/- 50% | Not Sensitive |
| 15 | Loadings | D | +/- 50% | Slightly Sensitive |
| 15 | Loadings | T | +/- 50% | Slightly Sensitive |
| 17 | Loadings | D | +/- 50% | Quite Sensitive |
| 17 | Loadings | T | +/- 50% | Quite Sensitive |
| 28 | Loadings | D | +/- 50% | Quite Sensitive |
| 28 | Loadings | T | +/- 50% | Quite Sensitive |
| 2 | Upstream Load | D | +/- 50% | Quite Sensitive |
| 2 | Upstream Load | T | +/- 50% | Quite Sensitive |
| 15 | Upstream Load | D | +/- 50% | Quite Sensitive |
| 15 | Upstream Load | T | +/- 50% | Quite Sensitive |
| 17 | Upstream Load | D | +/- 50% | Slightly Sensitive |
| 17 | Upstream Load | T | +/- 50% | Slightly Sensitive |
| 28 | Upstream Load | D | +/- 50% | Slightly Sensitive |
| 28 | Upstream Load | T | +/- 50% | Slightly Sensitive |
| 2 | Volatilization | D | +/- 50% | Not Sensitive |
| 2 | Volatilization | T | +/- 50% | Not Sensitive |
| 15 | Volatilization | D | +/- 50% | Quite Sensitive |
| 15 | Volatilization | T | +/- 50% | Quite Sensitive |
| 17 | Volatilization | D | +/- 50% | Quite Sensitive |
| 17 | Volatilization | T | +/- 50% | Quite Sensitive |
| 28 | Volatilization | D | +/- 50% | Quite Sensitive |
| 28 | Volatilization | T | +/- 50% | Quite Sensitive |

## Table 7-4
## Sensitivity Analysis - Foodchain Model

| | Foodchain Model Segment | Parameter | Parameter Range | Brief Result |
|---|---|---|---|---|
| | 2 | BCF's | +/- 50% | Very Sensitive |
| | 3 | BCF's | +/- 50% | Very Sensitive |
| | 4 | BCF's | +/- 50% | Very Sensitive |
| | 5 | BCF's | +/- 50% | Very Sensitive |
| | 2 | Respiration | +/- 50% | Quite Sensitive |
| | 3 | Respiration | +/- 50% | Quite Sensitive |
| | 4 | Respiration | +/- 50% | Quite Sensitive |
| | 5 | Respiration | +/- 50% | Quite Sensitive |
| Note | 2 | Growth Rates | +/- 10% | Slightly Sensitive |
| " | 3 | Growth Rates | +/- 10% | Slightly Sensitive |
| " | 4 | Growth Rates | +/- 10% | Slightly Sensitive |
| " | 5 | Growth Rates | +/- 10% | Moderately Sensitive |
| | 2 | PCB Assim Eff | +/- 0.2 from base fraction | Very Sensitive |
| | 3 | PCB Assim Eff | +/- 0.2 from base fraction | Very Sensitive |
| | 4 | PCB Assim Eff | +/- 0.2 from base fraction | Very Sensitive |
| | 5 | PCB Assim Eff | +/- 0.2 from base fraction | Very Sensitive |
| | 2 | Dissolved Conc. | +/- 50% | Quite Sensitive |
| | 3 | Dissolved Conc. | +/- 50% | Quite Sensitive |
| | 4 | Dissolved Conc. | +/- 50% | Quite Sensitive |
| | 5 | Dissolved Conc. | +/- 50% | Quite Sensitive |

Note: Due to error in Thomann inputs, done with corrected baseline

Table 8-1
Variables Used in Probabilistic Food Chain Model

| Variable | Symbol | Units |
|---|---|---|
| water exposure concentration | $W_{conc}$ | ugPCB/gPOC |
| sediment exposure concentration | $S_{conc}$ | ugPCB/gTOC |
| water-invertebrate accumulation factor | PWAF | unitless ratio: lipid-normalized concentrations |
| sediment-invertebrate accumulation factor | BSAF | unitless ratio: lipid-normalized concentrations |
| pelagic organisms - concentration | $P_{ccnc}$ | ugPCB/g lipid |
| benthic organisms - concentration | $B_{conc}$ | ugPCB/g lipid |
| fraction pelagic invertebrates in diet | $P_{frac}$ | unitless |
| fraction benthic invertebrates in diet | $B_{frac}$ | unitless |
| forage fish:diet accumulation factor | FFAF | unitless ratio: lipid-normalized concentrations |
| fish level I: forage fish concentration | $FF_{conc}$ | ugPCB/g lipid |
| forage fish % lipid | $FF_{lip}$ | % |
| forage fish fillet concentration | $FF_{wwconc}$ | ug PCB wet weight |
| % forage fish in piscivorous fish diet | $FF_{frac}$ | unitless |
| 1-$FF_{frac}$: contribution to piscivorous fish diet from invertebrates | $INV_{frac}$ | unitless |
| fraction benthic invertebrates in piscivorous diet | $BP_{frac}$ | unitless |
| fish level II: piscivorous fish concentration | $PF_{conc}$ | ugPCB/g lipid |
| piscivorous fish % lipid | $PF_{lip}$ | % |
| piscivorous fish fillet concentration | $PF_{wwconc}$ | ug PCB |

## Table 8-2
## Relationship Between Fish Species and Compartments

| Compartment | Media | Contributing Compartments |
|---|---|---|
| Water | Water (PCBs associated with POC | none |
| Sediments | Sediment (PCBs normalized to sediment TOC) | none |
| Water Invertebrates | Water | Water |
| Sediment Invertebrates | Sediment | Sediment |
| Forage Fish | Water and Sediment | Water invertebrates, Sediment invertebrates |
| Pumpkinseed | Water | Water invertebrates |
| Spottail Shiner | Water and Sediment | Water invertebrates, Sediment invertebrates |
| Brown Bullhead | Sediment | Sediment invertebrates |
| Yellow Perch | Water and Sediment | Water invertebrates, Sediment invertebrates, Forage fish |
| White Perch | Water and Sediment | Water invertebrates, Sediment invertebrates, Forage fish |
| Largemouth Bass | Water and Sediment | Water invertebrates, Sediment invertebrates, Forage fish |

Table 8-3
Three-Phase Partition Coefficient Estimates

| PCB Congener | Dissolved Fraction | DOC Fraction | POC Fraction |
|---|---|---|---|
| BZ#4 | 0.62 | 0.27 | 0.11 |
| BZ#38 | 0.50 | 0.01 | 0.49 |
| BZ#52 | 0.53 | 0.01 | 0.46 |
| BZ#101 | 0.29 | 0.04 | 0.67 |
| BZ#138 | 0.20 | 0.07 | 0.73 |

Source: TAMS/Gradient Database Rel. 3.1 except for BZ#4, which is based on unvalidated database release 2.4. Following data validation, BZ#4 was dropped from the three-phase partition coefficient analyses due to high non-detects.

**Table 9-1. Count of NYSDEC Fish Samples, Hudson River Mile 142 to 195.**

| | Sample Prep. | Brown Bullhead | Cyprinids | Large-mouth Bass | Pumpkin-seed | Yellow Perch | Other Species |
|---|---|---|---|---|---|---|---|
| 1975 | NS | 0 | 0 | 0 | 0 | 1 | 9 |
| | Other | 1 | 0 | 0 | 0 | 0 | 2 |
| | SF | 4 | 0 | 3 | 0 | 0 | 20 |
| | WH | 0 | 0 | 2 | 0 | 5 | 2 |
| 1976 | SF | 0 | 0 | 1 | 0 | 0 | 2 |
| | WH | 1 | 17 | 18 | 1 | 3 | 6 |
| 1977 | NS | 0 | 2 | 4 | 0 | 0 | 4 |
| | SF | 60 | 14 | 16 | 0 | 50 | 40 |
| 1978 | SF | 11 | 60 | 30 | 7 | 4 | 30 |
| 1979 | SF | 52 | 0 | 31 | 0 | 0 | 52 |
| | WH | 0 | 0 | 0 | 38 | 0 | 0 |
| 1980 | NS | 2 | 4 | 2 | 0 | 2 | 5 |
| | Other | 0 | 2 | 0 | 0 | 2 | 1 |
| | SF | 51 | 30 | 26 | 0 | 7 | 54 |
| | WH | 0 | 0 | 0 | 50 | 0 | 0 |
| 1981 | SF | 30 | 0 | 0 | 0 | 0 | 32 |
| | WH | 0 | 0 | 0 | 49 | 0 | 0 |
| 1982 | SF | 30 | 20 | 20 | 0 | 2 | 42 |
| | WH | 0 | 0 | 0 | 80 | 0 | 0 |
| 1983 | SF | 46 | 26 | 23 | 2 | 5 | 27 |
| | WH | 0 | 0 | 0 | 98 | 0 | 0 |
| 1984 | SF | 39 | 11 | 50 | 50 | 7 | 78 |
| | WH | 0 | 0 | 0 | 0 | 0 | 16 |
| 1985 | SF | 37 | 18 | 41 | 29 | 0 | 40 |
| | WH | 0 | 0 | 0 | 1 | 0 | 0 |
| 1986 | SF | 59 | 11 | 39 | 45 | 0 | 50 |
| 1987 | SF | 40 | 0 | 8 | 25 | 0 | 66 |
| 1988 | SF | 63 | 20 | 59 | 0 | 0 | 14 |
| | WH | 0 | 0 | 0 | 73 | 0 | 17 |
| 1989 | WH | 0 | 0 | 0 | 45 | 0 | 0 |
| 1990 | SF | 41 | 13 | 43 | 0 | 0 | 33 |
| | WH | 0 | 0 | 0 | 4 | 0 | 0 |
| 1991 | NS | 46 | 1 | 33 | 47 | 34 | 226 |
| 1992 | Other | 1 | 0 | 0 | 6 | 7 | 66 |
| | SF | 45 | 6 | 61 | 43 | 37 | 215 |
| | | | | | | | |
| Totals: | | 659 | 255 | 510 | 693 | 166 | 1149 |

Notes: SF: Standard Filet
WH: Whole Fish
NS: Not specified
Other: Roe, muscle, hepatopancreas, etc.

Source: TAMS/Gradient Database, Release 3.1.

**Table 9-2. Lipid-Based Aroclor Concentrations by Species in NYSDEC Fish Samples from River Miles 142 through 195 in the Hudson River, 1975-1992**

| Species | Number of Samples with PCB data | Average Percent Lipid | Aroclor 1016 (as μg/g-lipid) converted to 1983 quantitation basis (see text) | | | Aroclor 1254 (as μg/g-lipid) converted to 1983 quantitation basis (see text) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Mean | Median | Standard Deviation | Mean | Median | Standard Deviation |
| Brown Bullhead | 657 | 2.94 | 265.5 | 164.0 | 309.1 | 281.7 | 164.2 | 376.4 |
| Cyprinids (Carp) | 255 | 10.01 | 684.7 | 147.1 | 2855.7 | 413.4 | 263.7 | 933.8 |
| Largemouth Bass | 499 | 1.25 | 561.5 | 364.4 | 598.8 | 623.2 | 509.8 | 450.6 |
| Pumpkinseed | 693 | 2.64 | 191.6 | 140.9 | 157.4 | 133.6 | 107.5 | 101.7 |
| Yellow Perch | 166 | 0.84 | 634.3 | 373.1 | 724.62 | 447.7 | 279.8 | 462.7 |

Source: TAMS/Gradient Database, Release 3.1

Table 9-3. Mean Aroclor 1016 Concentrations as µg/g-lipid in NYSDEC Samples of Fish from Hudson River Miles 142 to 195

**River Mile 142 to 155**

| Year | Brown Bullhead | Cyprinids | Largemouth Bass | Pumpkin seed | Yellow Perch |
|---|---|---|---|---|---|
| 1977 | 349.1 | | 351.5 | | 750.0 |
| 1978 | 184.0 | 366.5 | | 267.6 | 1248.8 |
| 1979 | 161.0 | | 565.4 | 191.8 | |
| 1980 | 74.7 | 101.9 | 478.9 | 128.4 | 41.4 |
| 1981 | 55.3 | | | | |
| 1982 | 40.3 | | | 60.0 | |
| 1983 | 66.4 | 23.4 | | 89.6 | 13.8 |
| 1984 | 51.1 | | | 83.4 | |
| 1985 | 23.2 | | | 58.6 | |
| 1986 | 16.2 | | | 28.9 | |
| 1988 | 31.9 | | 52.8 | 32.6 | |
| 1989 | | | | 51.9 | |
| 1990 | 73.0 | | 162.4 | | |
| 1991 | 13.6 | 24.2 | 76.0 | 40.0 | 47.6 |
| 1992 | 76.7 | 49.8 | 186.6 | 78.8 | 199.8 |

**River Mile 160**

| Year | Brown Bullhead | Cyprinids | Largemouth Bass | Pumpkin seed | Yellow Perch |
|---|---|---|---|---|---|
| 1987 | 18.8 | | 64.4 | 58.9 | |
| 1991 | 85.0 | | 126.7 | 57.4 | 35.7 |
| 1992 | | | 153.4 | 189.0 | 255.7 |

Note: Data corrected to 1983 quantitation basis (see text)

Source: TAMS/Gradient Database, Release 3.1

**River Mile 175**

| Year | Brown Bullhead | Cyprinids | Largemouth Bass | Pumpkin seed | Yellow Perch |
|---|---|---|---|---|---|
| 1977 | 1006.6 | 3050.3 | 2101.9 | | 1209.3 |
| 1978 | | 2762.8 | 1652.2 | | |
| 1979 | 667.4 | | 432.1 | 640.9 | |
| 1980 | 646.4 | 502.8 | 778.8 | 453.2 | 386.8 |
| 1981 | | | | 287.9 | |
| 1982 | 147.0 | 77.3 | 389.6 | 192.9 | 136.1 |
| 1983 | 202.3 | 81.4 | 331.4 | 279.5 | |
| 1984 | 206.4 | 87.4 | 259.1 | 209.7 | 262.1 |
| 1985 | 207.0 | 60.2 | 350.4 | 174.4 | |
| 1986 | 161.2 | 159.5 | 220.6 | 132.0 | |
| 1988 | 125.2 | | 151.3 | 102.6 | |
| 1989 | | | | 191.1 | |
| 1990 | 156.9 | 27.1 | 189.6 | | |
| 1991 | 100.3 | | 342.5 | 124.4 | 128.5 |
| 1992 | 253.1 | 546.5 | 309.7 | 366.4 | 351.9 |

**River Mile 1[illegible] to 193**

| Year | Brown Bullhead | Cyprinids | Largemouth Bass | Pumpkin seed | Yellow Perch |
|---|---|---|---|---|---|
| 1980 | 236.4 | 442.0 | 316.6 | | 315.4 |
| 1983 | 202.1 | 162.0 | 201.5 | 122.9 | 459.2 |
| 1984 | | | 766.9 | | |
| 1985 | | | 573.5 | | |
| 1986 | 494.0 | 178.8 | 357.6 | | |
| 1987 | 255.4 | | | 107.9 | |
| 1988 | 343.4 | 73.4 | 330.9 | 161.2 | |
| 1989 | | | | 522.7 | |
| 1990 | 422.5 | 78.5 | 795.5 | 202.6 | |
| 1991 | 254.9 | | 1026.7 | 385.8 | 859.5 |
| 1992 | 482.7 | 411.9 | 1191.2 | 412.3 | 917.6 |

**Table 9-4. Mean Aroclor 1254 Concentrations as $\mu$g/g-lipid in NYSDEC Samples of Fish from Hudson River Miles 142 to 195**

**River Mile 142 to 155**

| Year | Brown Bullhead | Cyprinids | Largemouth Bass | Pumpkin seed | Yellow Perch |
|---|---|---|---|---|---|
| 1977 | 186.1 | | 528.6 | | 475.2 |
| 1978 | 100.6 | 177.5 | | 165.8 | 838.8 |
| 1979 | 144.5 | | 649.5 | 110.9 | |
| 1980 | 107.0 | 232.6 | 533.7 | 263.5 | 159.0 |
| 1981 | 106.3 | | | | |
| 1982 | 104.9 | | | 147.3 | |
| 1983 | 106.1 | 124.0 | | 96.5 | 91.9 |
| 1984 | 62.2 | | | 53.4 | |
| 1985 | 48.1 | | | 42.4 | |
| 1986 | 36.7 | | | 45.5 | |
| 1988 | 35.0 | | 236.5 | 19.5 | |
| 1989 | | | | 39.1 | |
| 1990 | 97.4 | | 344.8 | | |
| 1991 | 18.1 | 15.9 | 113.9 | 47.4 | 61.1 |
| 1992 | 29.6 | 27.2 | 281.5 | 47.5 | 195.3 |

**River Mile 160**

| Year | Brown Bullhead | Cyprinids | Largemouth Bass | Pumpkin seed | Yellow Perch |
|---|---|---|---|---|---|
| 1987 | 121.4 | | 727.7 | 295.1 | |
| 1991 | 76.4 | | 200.5 | 50.0 | 37.4 |
| 1992 | | | 127.8 | 106.9 | 171.9 |

**River Mile 175**

| Year | Brown Bullhead | Cyprinids | Largemouth Bass | Pumpkin seed | Yellow Perch |
|---|---|---|---|---|---|
| 1977 | 382.5 | 831.9 | 1069.7 | | 851.8 |
| 1978 | | 992.8 | 896.2 | | |
| 1979 | 602.8 | | 425.2 | 361.3 | |
| 1980 | 710.3 | 607.0 | 845.9 | 184.2 | 703.4 |
| 1981 | | | | 129.0 | |
| 1982 | 206.3 | 200.5 | 539.6 | 144.7 | 260.3 |
| 1983 | 257.0 | 212.0 | 560.5 | 173.5 | |
| 1984 | 203.6 | 247.3 | 472.8 | 87.6 | 237.2 |
| 1985 | 210.9 | 218.4 | 492.1 | 98.9 | |
| 1986 | 353.7 | 61.6 | 490.8 | 138.1 | |
| 1988 | 157.7 | | 568.4 | 82.6 | |
| 1989 | | | | 129.6 | |
| 1990 | 162.9 | 108.7 | 443.9 | | |
| 1991 | 65.7 | | 308.0 | 79.7 | 71.3 |
| 1992 | 147.7 | 360.4 | 149.0 | 160.3 | 170.9 |

**River Mile 189 to 193**

| Year | Brown Bullhead | Cyprinids | Largemouth Bass | Pumpkin seed | Yellow Perch |
|---|---|---|---|---|---|
| 1980 | 510.7 | 847.9 | 583.7 | | 746.5 |
| 1983 | 495.4 | 684.1 | 567.0 | 325.4 | 1021.1 |
| 1984 | | | 951.9 | | |
| 1985 | | | 639.9 | | |
| 1986 | 663.6 | 229.6 | 868.7 | | |
| 1987 | 662.6 | | | 65.7 | |
| 1988 | 502.8 | 240.0 | 687.3 | 97.5 | |
| 1989 | | | | 207.0 | |
| 1990 | 349.9 | 212.3 | 1053.0 | 89.7 | |
| 1991 | 236.5 | | 551.5 | 242.7 | 282.0 |
| 1992 | 916.3 | 392.1 | 940.8 | 337.8 | 610.5 |

Note: Data corrected to 1983 quantitation basis (see text)

Source: TAMS/Gradient Database, Release 3.1.

**Table 9-5. Packed-Column Peaks and Associated PCB Congeners Used in the NYSDEC Fish Sample Aroclor Quantitation**

| Year | Aroclor | Packed-Column Peaks (RRT) | Associated PCB Congeners (BZ #) |
|---|---|---|---|
| 1977 | 1016 | 37 | 25,26,28,29,31 |
| | | 47 | 47,48,49,52,75 |
| | 1254 | 104 | 77,110 |
| | | 125 | 82,107,118,135, 144,149,151 |
| | | 146 | 105,132,146,153 |
| | | 174 | 129,138,158,175,178 |
| 1979 | 1016 | 32 | 16,24,27,32 |
| | | 37 | 25,26,28,29,31 |
| | 1254 | 98 | 85,87,97,119,136 |
| | | 104 | 77,110 |
| | | 125 | 82,107,118,135, 144,149,151 |
| | | 146 | 105,132,146,153 |
| | | 174 | 129,138,158,175,178 |
| 1983 | 1016 | 37 | 25,26,28,29,31 |
| | | 40 | 20,22,33,45,51,53 |
| | 1254 | 125 | 82,107,118,135, 144,149,151 |
| | | 146 | 105,132,146,153 |
| | | 174 | 129,138,158,175,178 |

Source: Gauthier (1994), based on personal communication from John F. Brown, Jr. Congener assignments refined based on personal communication from R.F. Bopp to T. Gauthier.

**Table 9-6. Weight Percents of Congeners in Packed-Column Peaks Used for NYSDEC Aroclor Quantitation Schemes, based on Capillary Column Analyses of Aroclor Standards**

| Year | Aroclor | Weight Percent of PCB Congeners in Quantitation Peaks (%) |
|---|---|---|
| 1977 | 1016 | 32.258 |
| | 1254 | 42.776 |
| 1979 | 1016 | 27.667 |
| | 1254 | 51.405 |
| 1983 | 1016 | 34.368 |
| | 1254 | 30.652 |

Source: TAMS/Gradient Database, Release 3.1 (April 1994 analysis).

**Table 9-7. Relationships Used to Correct Older NYSDEC Aroclor Quantitations in Fish (ppb) to 1983 Basis**

| Aroclor | Quantitation Method | Constant | Coefficient on Observation | $R^2$ of Regression |
|---|---|---|---|---|
| 1016 | 1977 | -243.1 | 0.531 | 97.5 |
| | 1979 | -22.3 | 0.937 | 99.5 |
| 1254 | 1977 | 114.0 | 0.976 | 99.6 |
| | 1979 | 155.0 | 0.913 | 99.2 |

**Table 9-8**
**Summer (June-Sept.) Average Water Column Concentrations of Total PCBs (µg/L) from USGS Monitoring in the Upper Hudson River**

| Year | Waterford, River Mile 156.5 | Stillwater, River Mile 168 | Schuylerville, River Mile 181 | Fort Edward, River Mile 194.2 |
|---|---|---|---|---|
| 1975 | 0.40 | | | |
| 1976 | 0.70 | | | |
| 1977 | 0.38 | 0.73 | 0.64 | |
| 1978 | 0.49 | 0.56 | 0.73 | 0.21 |
| 1979 | 0.39 | 0.60 | 0.80 | 0.17 |
| 1980 | 0.29 | 0.33 | 0.37 | 0.18 |
| 1981 | 0.14 | 0.18 | 0.14 | 0.08 |
| 1982 | 0.13 | 0.11 | 0.13 | 0.09 |
| 1983 | 0.12 | 0.12 | 0.16 | 0.07 |
| 1984 | 0.10 | 0.18 | 0.17 | 0.09 |
| 1985 | 0.09 | 0.12 | 0.16 | 0.11 |
| 1986 | 0.05 | 0.09 | 0.06 | 0.07 |
| 1987 | 0.06 | 0.06 | 0.01 | 0.05 |
| 1988 | 0.03 | 0.03 | 0.01 | 0.04 |
| 1989 | 0.03 | 0.05 | 0.01 | 0.03 |
| 1990 | 0.01 | 0.10 | | 0.01 |
| 1991 | 0.08 | 0.12 | | 0.17 |
| 1992 | 0.07 | 0.15 | | 0.21 |

Note: Table shows arithmetic averages with non-detects included at one-half the detection limit. Detection limits for total PCBs were 0.1 µg/L through Oct. 1986 and 0.01 µg/L thereafter.

Source: TAMS/Gradient Database, Release 3.1

**Table 9-9. Models of Mean PCB Aroclor Concentration in NYSDEC Upper Hudson Fish Samples Based on Water Column Concentration Only (mg/kg-Lipid)**

| Aroclor | Species | Coefficients | | $R^2$ (%) | Standard Error | Log BAF (L/kg) |
|---|---|---|---|---|---|---|
| | | Constant | Water (ppb) | | | |
| Sum of 1016 + 1254 | Pumpkinseed | 162.82 | 1395.76 | 51.5 | 305.7 | 6.15 |
| | Largemouth Bass | 566.55 | 3301.73 | 57.1 | 893.8 | 6.52 |
| | Brown Bullhead | 258.97 | 1641.62 | 37.5 | 693.8 | 6.22 |
| | Cyprinids | -380.42 | 5988.80 | 87.4 | 765.9 | 6.78 |
| | Yellow Perch | 354.66 | 2567.03 | 54.8 | 763.9 | 6.41 |
| 1016 | Pumpkinseed | 79.58 | 957.67 | 50.1 | 215.7 | NA |
| | Largemouth Bass | 110.74 * | 2480.93 | 68.9 | 524.2 | NA |
| | Brown Bullhead | 63.59 * | 1164.34 | 65.9 | 278.9 | NA |
| | Cyprinids | -473.91 | 4715.78 | 86.1 | 421.6 | NA |
| | Yellow Perch | 194.74 * | 1462.18 | 46.4 | 511.0 | NA |
| 1254 | Pumpkinseed | 83.24 | 438.10 | 31.2 | 144.3 | NA |
| | Largemouth Bass | 455.81 | 820.80 | 21.9 | 464.5 | NA |
| | Brown Bullhead | 195.37 | 477.28 | 8.7 | 453.8 | NA |
| | Cyprinids | 93.49 * | 1273.03 | 68.2 | 270.36 | NA |
| | Yellow Perch | 159.92 * | 1104.85 | 50.0 | 360.4 | NA |

Notes: * Not statistically different from zero at 95% confidence level.
NA BAF is only appropriate for total PCBs, since water column measurements are totals. Estimates based on 1977-1992 samples from River Miles 142 to 195, converted to 1983 quantitation basis.

Source: TAMS/Gradient Database, Release 3.1.

**Table 9-10. Models of Mean PCB Aroclor Concentration in NYSDEC Upper Hudson Fish Samples Based on Water Column Concentration and Constant Sediment Concentration Normalized to Organic Carbon (mg/kg-Lipid)**

| Aroclor | Species | Coefficients | | | $R^2$ (%) | Standard Error | Log BAF (L/kg) |
|---|---|---|---|---|---|---|---|
| | | Constant | Sediment (mg/kg OC) | Water (ppb) | | | |
| Sum of 1016 + 1254 | Pumpkinseed | 50.07 * | 0.122 | 1366.2 | 73.3 | 227.0 | 6.14 |
| | Largemouth Bass | 81.68 * | 0.370 | 3260.5 | 73.4 | 704.2 | 6.51 |
| | Brown Bullhead | -47.63* | 0.312 | 1538.8 | 76.0 | 430.1 | 6.19 |
| | Cyprinids | -816.1 | 0.292 | 6184.9 | 90.0 | 680.8 | 6.79 |
| | Yellow Perch | 183.8 * | 0.185 * | 2457.4 | 57.6 | 740.7 | 6.39 |
| 1016 | Pumpkinseed | -3.40 * | 0.090 | 913.8 | 74.6 | 153.8 | NA |
| | Largemouth Bass | -117.7 * | 0.174 | 2461.5 | 76.1 | 459.2 | NA |
| | Brown Bullhead | -51.77 * | 0.118 | 1125.7 | 84.2 | 190.0 | NA |
| | Cyprinids | -693.3 | 0.147 * | 4814.5 | 86.7 | 623.7 | NA |
| | Yellow Perch | 103.80 * | 0.099 * | 1403.8 | 47.1 | 507.6 | NA |
| 1254 | Pumpkinseed | 53.47 | 0.032 | 422.4 | 39.3 | 135.5 | NA |
| | Largemouth Bass | 199.4 | 0.196 | 413.2 | 59.6 | 301.9 | NA |
| | Brown Bullhead | 4.20 * | 0.195 | 413.2 | 59.6 | 301.9 | NA |
| | Cyprinids | -122.80 * | 0.145 | 1370.4 | 80.9 | 224.9 | NA |
| | Yellow Perch | 80.00 * | 0.087 * | 1053.6 | 52.9 | 349.8 | NA |

Notes: * Not statistically different from zero at 95% confidence level.
NA BAF is only appropriate for total PCBs, since water column measurements are totals. Estimates based on 1977-1992 samples from River Miles 142 to 195, converted to 1983 quantitation basis.

Source: TAMS/Gradient Database, Release 3.1.

**Table 9-11. Estimated Proportion of Variability Explained by Bivariate BAF Relationships Attributed to Water and Sediment Pathways in NYSDEC Fish Samples from Hudson River Miles 142 through 195**

| Species | Proportion of Variability (%) | | | |
|---|---|---|---|---|
| | Aroclor 1016 | | Aroclor 1254 | |
| | Water (%) | Sediment (%) | Water (%) | Sediment (%) |
| Brown Bullhead | 73.2 | 26.8 | 13.7 | 86.3 |
| Cyprinids | 99.7 | 0.03 | 94.7 | 5.3 |
| Largemouth Bass | 88.5 | 11.5 | 41.5 | 58.5 |
| Pumpkinseed | 61.4 | 38.6 | 71.6 | 28.4 |
| Yellow Perch | 83.9 | 16.1 | 80.7 | 19.3 |

Source: TAMS/Gradient Database, Release 3.1.

Table 10-1
TAMS/Gradient Phase II Ecological and Water Column Sampling Locations

| Ecological Phase II Station Location | River Mile | Water Column Sampling Station | River Mile | Description |
|---|---|---|---|---|
| 1 | 203.3 | | | Background |
| 20 | 196.9 | 0001 thru 0003 | 199.5 thru 195.5 | Upper River |
| 2 | 194.1 | 0004 & 0010 | 194.6 and 193.7 | Upper River |
| 3 | 191.5 | 0010 & 0005 | 193.7 and 188.5 | Upper River |
| 4 | 189.5 | 0010 & 0005 | 193.7 and 188.5 | Upper River |
| 5 | 189 | 0010 & 0005 | 193.7 and 188.5 | Upper River |
| 6 | 188.7 | 0010 & 0005 | 193.7 and 188.5 | Upper River |
| 7 | 188.5 | 0005 | 188.5 | Upper River |
| 8 | 169.5 | 0006 & 0007 | 181.3 and 168.3 | Upper River |
| 9 | 159 | 0007 & 0008 | 168.3 and 156.5 | Upper River |
| 10 | 143.5 | 0014 & 0015 | 151.7 and 125 | Lower River |
| 11 | 137.2 | 0014 & 0015 | 151.7 and 125 | Lower River |
| 12 | 122.4 | 0015 & 0017 | 125 and 77 | Lower River |
| 13 | 113.8 | 0015 & 0017 | 125 and 77 | Lower River |
| 14 | 100 | 0015 & 0017 | 125 and 77 | Lower River |
| 15 | 88.9 | 0015 & 0017 | 125 and 77 | Lower River |
| 16 | 58.7 | | | Lower River |
| 17 | 47.3 | | | Lower River |
| 18 | 25.8 | | | Lower River |





Source: TAMS/Gradient Database

Table 10-2
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1016 | 197.6 | 7 | 1980 | 0.16 | 5.21 | 0.84 | 13.39 | 15.86 |
| Aroclor 1016 | 197.6 | 8 | 1980 | 0.17 | 4.27 | 0.74 | 37.58 | 50.58 |
| Aroclor 1016 | 197.6 | 9 | 1980 | 0.18 | 3.12 | 0.55 | 16.76 | 30.73 |
| Aroclor 1016 | 197.6 | 9 | 1980 | 0.18 | 3.12 | 0.55 | 9.41 | 17.25 |
| Aroclor 1016 | 197.6 | 7 | 1981 | 0.22 | 5.21 | 1.15 | 6.82 | 5.94 |
| Aroclor 1016 | 197.6 | 8 | 1981 | 0.25 | 4.27 | 1.08 | 4.17 | 3.84 |
| Aroclor 1016 | 197.6 | 9 | 1981 | 0.32 | 3.12 | 1.00 | 1.88 | 1.89 |
| Aroclor 1016 | 197.6 | 7 | 1982 | 1.46 | 5.21 | 7.61 | 6.10 | 0.80 |
| Aroclor 1016 | 197.6 | 8 | 1982 | 3.36 | 4.27 | 14.34 | 32.61 | 2.27 |
| Aroclor 1016 | 197.6 | 9 | 1982 | 1.00 | 3.12 | 3.12 | 9.14 | 2.93 |
| Aroclor 1016 | 197.6 | 9 | 1983 | 0.49 | 3.12 | 1.54 | 30.57 | 19.89 |
| Aroclor 1016 | 197.6 | 7 | 1984 | 0.50 | 5.21 | 2.61 | 18.18 | 6.98 |
| Aroclor 1016 | 197.6 | 7 | 1984 | 0.50 | 5.21 | 2.61 | 21.88 | 8.39 |
| Aroclor 1016 | 197.6 | 7 | 1984 | 0.50 | 5.21 | 2.61 | 13.99 | 5.37 |
| Aroclor 1016 | 197.6 | 7 | 1984 | 0.50 | 5.21 | 2.61 | 11.19 | 4.30 |
| Aroclor 1016 | 197.6 | 8 | 1984 | 0.20 | 4.27 | 0.85 | 33.60 | 39.35 |
| Aroclor 1016 | 197.6 | 8 | 1984 | 0.20 | 4.27 | 0.85 | 21.26 | 24.90 |
| Aroclor 1016 | 197.6 | 8 | 1984 | 0.20 | 4.27 | 0.85 | 11.28 | 13.21 |
| Aroclor 1016 | 197.6 | 9 | 1984 | 0.20 | 3.12 | 0.62 | 17.07 | 27.38 |
| Aroclor 1016 | 197.6 | 9 | 1984 | 0.20 | 3.12 | 0.62 | 29.31 | 47.01 |
| Aroclor 1016 | 197.6 | 9 | 1984 | 0.20 | 3.12 | 0.62 | 31.06 | 49.82 |
| Aroclor 1016 | 197.6 | 7 | 1985 | 0.40 | 5.21 | 2.09 | 10.53 | 5.05 |
| Aroclor 1016 | 197.6 | 7 | 1985 | 0.40 | 5.21 | 2.09 | 18.45 | 8.85 |
| Aroclor 1016 | 197.6 | 8 | 1985 | 0.40 | 4.27 | 1.71 | 40.29 | 23.59 |
| Aroclor 1016 | 197.6 | 8 | 1985 | 0.40 | 4.27 | 1.71 | 38.31 | 22.44 |
| Aroclor 1016 | 197.6 | 8 | 1985 | 0.40 | 4.27 | 1.71 | 32.50 | 19.03 |
| Aroclor 1016 | 197.6 | 9 | 1985 | 0.10 | 3.12 | 0.31 | 9.29 | 29.79 |
| Aroclor 1016 | 193.9 | 7 | 1978 | 6.83 | 5.04 | 34.45 | 180.98 | 5.25 |

Table 10-2
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1016 | 193.9 | 7 | 1980 | 1.12 | 5.04 | 5.65 | 34.86 | 6.17 |
| Aroclor 1016 | 193.9 | 7 | 1980 | 1.12 | 5.04 | 5.65 | 79.49 | 14.07 |
| Aroclor 1016 | 193.9 | 8 | 1980 | 1.12 | 3.17 | 3.55 | 30.16 | 8.50 |
| Aroclor 1016 | 193.9 | 8 | 1980 | 1.12 | 3.17 | 3.55 | 47.49 | 13.38 |
| Aroclor 1016 | 193.9 | 9 | 1980 | 0.31 | 2.58 | 0.80 | 9.47 | 11.86 |
| Aroclor 1016 | 193.9 | 9 | 1980 | 0.31 | 2.58 | 0.80 | 36.88 | 46.16 |
| Aroclor 1016 | 193.9 | 7 | 1981 | 6.92 | 5.04 | 34.90 | 61.58 | 1.76 |
| Aroclor 1016 | 193.9 | 8 | 1981 | 2.93 | 3.17 | 9.28 | 52.36 | 5.64 |
| Aroclor 1016 | 193.9 | 8 | 1981 | 2.93 | 3.17 | 9.28 | 62.91 | 6.78 |
| Aroclor 1016 | 193.9 | 8 | 1981 | 2.93 | 3.17 | 9.28 | 43.42 | 4.68 |
| Aroclor 1016 | 193.9 | 9 | 1981 | 2.74 | 2.58 | 7.06 | 74.59 | 10.56 |
| Aroclor 1016 | 193.9 | 7 | 1982 | 6.22 | 5.04 | 31.37 | 133.94 | 4.27 |
| Aroclor 1016 | 193.9 | 7 | 1982 | 6.22 | 5.04 | 31.37 | 206.25 | 6.57 |
| Aroclor 1016 | 193.9 | 8 | 1982 | 4.39 | 3.17 | 13.91 | 107.01 | 7.69 |
| Aroclor 1016 | 193.9 | 8 | 1982 | 4.39 | 3.17 | 13.91 | 209.92 | 15.09 |
| Aroclor 1016 | 193.9 | 9 | 1982 | 3.80 | 2.58 | 9.79 | 63.00 | 6.43 |
| Aroclor 1016 | 193.9 | 9 | 1983 | 2.53 | 2.58 | 6.52 | 85.25 | 13.07 |
| Aroclor 1016 | 193.9 | 9 | 1983 | 2.52 | 2.58 | 6.49 | 73.98 | 11.39 |
| Aroclor 1016 | 193.9 | 7 | 1984 | 10.10 | 5.04 | 50.94 | 262.15 | 5.15 |
| Aroclor 1016 | 193.9 | 7 | 1984 | 10.10 | 5.04 | 50.94 | 241.30 | 4.74 |
| Aroclor 1016 | 193.9 | 8 | 1984 | 8.35 | 3.17 | 26.46 | 125.36 | 4.74 |
| Aroclor 1016 | 193.9 | 8 | 1984 | 8.35 | 3.17 | 26.46 | 128.99 | 4.87 |
| Aroclor 1016 | 193.9 | 8 | 1984 | 8.35 | 3.17 | 26.46 | 134.29 | 5.08 |
| Aroclor 1016 | 193.9 | 8 | 1984 | 8.35 | 3.17 | 26.46 | 103.81 | 3.92 |
| Aroclor 1016 | 193.9 | 8 | 1984 | 8.35 | 3.17 | 26.46 | 103.40 | 3.91 |
| Aroclor 1016 | 193.9 | 8 | 1984 | 8.35 | 3.17 | 26.46 | 87.10 | 3.29 |
| Aroclor 1016 | 193.9 | 8 | 1984 | 8.35 | 3.17 | 26.46 | 126.13 | 4.77 |
| Aroclor 1016 | 193.9 | 9 | 1984 | 4.71 | 2.58 | 12.14 | 138.05 | 11.37 |
| Aroclor 1016 | 193.9 | 9 | 1984 | 4.71 | 2.58 | 12.14 | 60.06 | 4.95 |

Table 10-2
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1016 | 193.9 | 9 | 1984 | 4.71 | 2.58 | 12.14 | 104.38 | 8.60 |
| Aroclor 1016 | 193.9 | 9 | 1984 | 4.71 | 2.58 | 12.14 | 97.18 | 8.01 |
| Aroclor 1016 | 193.9 | 9 | 1984 | 4.71 | 2.58 | 12.14 | 103.95 | 8.56 |
| Aroclor 1016 | 193.9 | 7 | 1985 | 4.34 | 5.04 | 21.89 | 334.37 | 15.28 |
| Aroclor 1016 | 193.9 | 7 | 1985 | 4.34 | 5.04 | 21.89 | 195.98 | 8.95 |
| Aroclor 1016 | 193.9 | 7 | 1985 | 4.34 | 5.04 | 21.89 | 192.59 | 8.80 |
| Aroclor 1016 | 193.9 | 7 | 1985 | 4.34 | 5.04 | 21.89 | 213.17 | 9.74 |
| Aroclor 1016 | 193.9 | 8 | 1985 | 4.92 | 3.17 | 15.59 | 130.68 | 8.38 |
| Aroclor 1016 | 193.9 | 8 | 1985 | 4.92 | 3.17 | 15.59 | 235.77 | 15.12 |
| Aroclor 1016 | 193.9 | 8 | 1985 | 4.92 | 3.17 | 15.59 | 150.82 | 9.67 |
| Aroclor 1016 | 193.9 | 9 | 1985 | 5.27 | 2.58 | 13.58 | 290.64 | 21.40 |
| Aroclor 1016 | 189.4 | 7 | 1978 | 18.86 | 4.34 | 81.80 | 479.86 | 5.87 |
| Aroclor 1016 | 189.4 | 7 | 1978 | 19.13 | 4.34 | 82.97 | 479.86 | 5.78 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 4.16 | 4.18 | 17.40 | 27.14 | 1.56 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 4.16 | 4.18 | 17.40 | 42.69 | 2.45 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 4.16 | 4.18 | 17.40 | 41.40 | 2.38 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 4.16 | 4.18 | 17.40 | 15.27 | 0.88 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 2.44 | 4.18 | 10.20 | 27.14 | 2.66 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 2.44 | 4.18 | 10.20 | 42.69 | 4.18 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 2.44 | 4.18 | 10.20 | 41.40 | 4.06 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 2.44 | 4.18 | 10.20 | 15.27 | 1.50 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 11.90 | 4.18 | 49.76 | 27.14 | 0.55 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 11.90 | 4.18 | 49.76 | 42.69 | 0.86 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 11.90 | 4.18 | 49.76 | 41.40 | 0.83 |
| Aroclor 1016 | 189.4 | 6 | 1980 | 11.90 | 4.18 | 49.76 | 15.27 | 0.31 |
| Aroclor 1016 | 189.4 | 7 | 1980 | 1.81 | 4.34 | 7.85 | 38.41 | 4.89 |
| Aroclor 1016 | 189.4 | 7 | 1980 | 1.81 | 4.34 | 7.85 | 33.01 | 4.21 |
| Aroclor 1016 | 189.4 | 8 | 1980 | 0.90 | 3.00 | 2.69 | 50.74 | 18.88 |
| Aroclor 1016 | 189.4 | 8 | 1980 | 0.90 | 3.00 | 2.69 | 36.72 | 13.67 |

Table 10-2
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1016 | 189.4 | 9 | 1980 | 0.42 | 2.70 | 1.12 | 13.85 | 12.36 |
| Aroclor 1016 | 189.4 | 9 | 1980 | 0.42 | 2.70 | 1.12 | 17.32 | 15.46 |
| Aroclor 1016 | 189.4 | 7 | 1981 | 9.15 | 4.34 | 39.68 | 111.03 | 2.80 |
| Aroclor 1016 | 189.4 | 7 | 1981 | 9.15 | 4.34 | 39.68 | 122.36 | 3.08 |
| Aroclor 1016 | 189.4 | 8 | 1981 | 4.02 | 3.00 | 12.07 | 78.43 | 6.50 |
| Aroclor 1016 | 189.4 | 8 | 1981 | 4.02 | 3.00 | 12.07 | 46.73 | 3.87 |
| Aroclor 1016 | 189.4 | 8 | 1981 | 4.02 | 3.00 | 12.07 | 127.34 | 10.55 |
| Aroclor 1016 | 189.4 | 9 | 1981 | 3.71 | 2.70 | 10.01 | 117.92 | 11.78 |
| Aroclor 1016 | 189.4 | 9 | 1981 | 3.71 | 2.70 | 10.01 | 84.34 | 8.42 |
| Aroclor 1016 | 189.4 | 9 | 1981 | 3.71 | 2.70 | 10.01 | 57.96 | 5.79 |
| Aroclor 1016 | 189.4 | 7 | 1982 | 26.10 | 4.34 | 113.20 | 159.64 | 1.41 |
| Aroclor 1016 | 189.4 | 7 | 1982 | 26.10 | 4.34 | 113.20 | 130.77 | 1.16 |
| Aroclor 1016 | 189.4 | 7 | 1982 | 26.10 | 4.34 | 113.20 | 99.19 | 0.88 |
| Aroclor 1016 | 189.4 | 7 | 1982 | 26.10 | 4.34 | 113.20 | 136.77 | 1.21 |
| Aroclor 1016 | 189.4 | 8 | 1982 | 6.36 | 3.00 | 19.09 | 139.53 | 7.31 |
| Aroclor 1016 | 189.4 | 8 | 1982 | 6.36 | 3.00 | 19.09 | 119.87 | 6.28 |
| Aroclor 1016 | 189.4 | 8 | 1982 | 6.36 | 3.00 | 19.09 | 117.14 | 6.14 |
| Aroclor 1016 | 189.4 | 8 | 1982 | 6.36 | 3.00 | 19.09 | 107.97 | 5.66 |
| Aroclor 1016 | 189.4 | 9 | 1982 | 2.87 | 2.70 | 7.74 | 77.64 | 10.02 |
| Aroclor 1016 | 189.4 | 9 | 1982 | 2.87 | 2.70 | 7.74 | 61.79 | 7.98 |
| Aroclor 1016 | 189.4 | 9 | 1983 | 3.08 | 2.70 | 8.31 | 118.18 | 14.22 |
| Aroclor 1016 | 189.4 | 9 | 1983 | 3.08 | 2.70 | 8.31 | 154.37 | 18.57 |
| Aroclor 1016 | 189.4 | 7 | 1984 | 5.60 | 4.34 | 24.29 | 184.96 | 7.62 |
| Aroclor 1016 | 189.4 | 7 | 1984 | 5.60 | 4.34 | 24.29 | 331.06 | 13.63 |
| Aroclor 1016 | 189.4 | 7 | 1984 | 5.60 | 4.34 | 24.29 | 333.33 | 13.72 |
| Aroclor 1016 | 189.4 | 8 | 1984 | 11.40 | 3.00 | 34.22 | 64.38 | 1.88 |
| Aroclor 1016 | 189.4 | 8 | 1984 | 11.40 | 3.00 | 34.22 | 62.11 | 1.82 |
| Aroclor 1016 | 189.4 | 8 | 1984 | 11.40 | 3.00 | 34.22 | 104.35 | 3.05 |
| Aroclor 1016 | 189.4 | 8 | 1984 | 11.40 | 3.00 | 34.22 | 107.25 | 3.13 |

Table 10-2
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concentration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1016 | 189.4 | 8 | 1984 | 11.40 | 3.00 | 34.22 | 93.20 | 2.72 |
| Aroclor 1016 | 189.4 | 9 | 1984 | 3.96 | 2.70 | 10.69 | 108.20 | 10.13 |
| Aroclor 1016 | 189.4 | 9 | 1984 | 3.96 | 2.70 | 10.69 | 125.52 | 11.75 |
| Aroclor 1016 | 189.4 | 9 | 1984 | 3.96 | 2.70 | 10.69 | 110.77 | 10.37 |
| Aroclor 1016 | 189.4 | 9 | 1984 | 3.96 | 2.70 | 10.69 | 92.04 | 8.61 |
| Aroclor 1016 | 189.4 | 7 | 1985 | 3.07 | 4.34 | 13.31 | 151.04 | 11.34 |
| Aroclor 1016 | 189.4 | 7 | 1985 | 3.07 | 4.34 | 13.31 | 167.21 | 12.56 |
| Aroclor 1016 | 189.4 | 7 | 1985 | 3.07 | 4.34 | 13.31 | 138.48 | 10.40 |
| Aroclor 1016 | 189.4 | 7 | 1985 | 3.07 | 4.34 | 13.31 | 146.03 | 10.97 |
| Aroclor 1016 | 189.4 | 7 | 1985 | 3.07 | 4.34 | 13.31 | 133.14 | 10.00 |
| Aroclor 1016 | 189.4 | 8 | 1985 | 3.03 | 3.00 | 9.10 | 84.46 | 9.29 |
| Aroclor 1016 | 189.4 | 8 | 1985 | 3.03 | 3.00 | 9.10 | 125.83 | 13.83 |
| Aroclor 1016 | 189.4 | 8 | 1985 | 3.03 | 3.00 | 9.10 | 106.35 | 11.69 |
| Aroclor 1016 | 181.8 | 7 | 1981 | 5.38 | 5.61 | 30.18 | 96.03 | 3.18 |
| Aroclor 1016 | 169 | 7 | 1978 | 9.53 | 4.78 | 45.51 | 47.20 | 1.04 |
| Aroclor 1016 | 169 | 7 | 1978 | 11.90 | 4.78 | 56.83 | 47.20 | 0.83 |
| Aroclor 1016 | 169 | 7 | 1978 | 14.79 | 4.78 | 70.63 | 47.20 | 0.67 |
| Aroclor 1016 | 169 | 7 | 1980 | 2.00 | 4.78 | 9.55 | 65.52 | 6.86 |
| Aroclor 1016 | 169 | 7 | 1980 | 2.00 | 4.78 | 9.55 | 42.40 | 4.44 |
| Aroclor 1016 | 169 | 8 | 1980 | 1.63 | 4.25 | 6.92 | 65.52 | 9.46 |
| Aroclor 1016 | 169 | 8 | 1980 | 1.63 | 4.25 | 6.92 | 123.90 | 17.90 |
| Aroclor 1016 | 169 | 9 | 1980 | 0.68 | 4.55 | 3.09 | 70.12 | 22.71 |
| Aroclor 1016 | 169 | 9 | 1980 | 0.68 | 4.55 | 3.09 | 28.12 | 9.11 |
| Aroclor 1016 | 169 | 7 | 1981 | 6.16 | 4.78 | 29.42 | 60.81 | 2.07 |
| Aroclor 1016 | 169 | 7 | 1981 | 6.16 | 4.78 | 29.42 | 71.07 | 2.42 |
| Aroclor 1016 | 169 | 7 | 1981 | 6.16 | 4.78 | 29.42 | 141.29 | 4.80 |
| Aroclor 1016 | 169 | 7 | 1981 | 6.16 | 4.78 | 29.42 | 124.85 | 4.24 |
| Aroclor 1016 | 169 | 8 | 1981 | 4.87 | 4.25 | 20.69 | 151.90 | 7.34 |
| Aroclor 1016 | 169 | 8 | 1981 | 4.87 | 4.25 | 20.69 | 147.56 | 7.13 |

Table 10-2
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1016 | 169 | 8 | 1981 | 4.87 | 4.25 | 20.69 | 139.27 | 6.73 |
| Aroclor 1016 | 169 | 8 | 1981 | 4.87 | 4.25 | 20.69 | 39.41 | 1.91 |
| Aroclor 1016 | 169 | 7 | 1982 | 18.50 | 4.78 | 88.35 | 99.45 | 1.13 |
| Aroclor 1016 | 169 | 7 | 1982 | 18.50 | 4.78 | 88.35 | 65.55 | 0.74 |
| Aroclor 1016 | 169 | 8 | 1982 | 3.94 | 4.25 | 16.74 | 123.70 | 7.39 |
| Aroclor 1016 | 169 | 8 | 1982 | 3.94 | 4.25 | 16.74 | 124.00 | 7.41 |
| Aroclor 1016 | 169 | 9 | 1982 | 3.34 | 4.55 | 15.21 | 88.38 | 5.81 |
| Aroclor 1016 | 169 | 9 | 1983 | 3.01 | 4.55 | 13.71 | 136.42 | 9.95 |
| Aroclor 1016 | 169 | 9 | 1983 | 3.01 | 4.55 | 13.71 | 142.77 | 10.42 |
| Aroclor 1016 | 169 | 9 | 1983 | 3.01 | 4.55 | 13.71 | 142.01 | 10.36 |
| Aroclor 1016 | 169 | 7 | 1984 | 3.52 | 4.78 | 16.81 | 328.88 | 19.56 |
| Aroclor 1016 | 169 | 7 | 1984 | 3.52 | 4.78 | 16.81 | 297.18 | 17.68 |
| Aroclor 1016 | 169 | 7 | 1984 | 3.52 | 4.78 | 16.81 | 223.99 | 13.32 |
| Aroclor 1016 | 169 | 7 | 1984 | 3.52 | 4.78 | [illegible].81 | 182.50 | 10.86 |
| Aroclor 1016 | 169 | 7 | 1984 | 3.52 | 4.78 | [illegible].81 | 169.01 | 10.05 |
| Aroclor 1016 | 169 | 7 | 1984 | 3.52 | 4.78 | [illegible].81 | 163.64 | 9.73 |
| Aroclor 1016 | 169 | 8 | 1984 | 2.94 | 4.25 | 12.49 | 101.22 | 8.11 |
| Aroclor 1016 | 169 | 8 | 1984 | 2.94 | 4.25 | 12.49 | 42.92 | 3.44 |
| Aroclor 1016 | 169 | 8 | 1984 | 2.94 | 4.25 | 12.49 | 12.50 | 1.00 |
| Aroclor 1016 | 169 | 8 | 1984 | 2.94 | 4.25 | 12.49 | 375.54 | 30.07 |
| Aroclor 1016 | 169 | 8 | 1984 | 2.94 | 4.25 | 12.49 | 109.38 | 8.76 |
| Aroclor 1016 | 169 | 8 | 1984 | 2.94 | 4.25 | 12.49 | 97.73 | 7.83 |
| Aroclor 1016 | 169 | 9 | 1984 | 2.60 | 4.55 | 11.84 | 153.21 | 12.94 |
| Aroclor 1016 | 169 | 9 | 1984 | 2.60 | 4.55 | 11.84 | 175.25 | 14.80 |
| Aroclor 1016 | 169 | 9 | 1984 | 2.60 | 4.55 | 11.84 | 181.33 | 15.32 |
| Aroclor 1016 | 169 | 9 | 1984 | 2.60 | 4.55 | 11.84 | 188.67 | 15.94 |
| Aroclor 1016 | 169 | 7 | 1985 | 3.36 | 4.78 | 16.05 | 129.85 | 8.09 |
| Aroclor 1016 | 169 | 7 | 1985 | 3.36 | 4.78 | 16.05 | 63.33 | 3.95 |
| Aroclor 1016 | 169 | 7 | 1985 | 3.36 | 4.78 | 16.05 | 122.11 | 7.61 |

Table 10-2
Ratio of Lipid-Normalized PCB Concentrations in ıdividual Species
on Multiplate Samplers to Particulate Organic Carbc in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1016 | 169 | 8 | 1985 | 3.89 | 4.25 | 16.52 | 113.35 | 6.86 |
| Aroclor 1016 | 169 | 8 | 1985 | 3.89 | 4.25 | 16.52 | 81.63 | 4.94 |
| Aroclor 1016 | 169 | 8 | 1985 | 3.89 | 4.25 | 16.52 | 95.13 | 5.76 |
| Aroclor 1016 | 169 | 9 | 1985 | 4.05 | 4.55 | 18.44 | 138.48 | 7.51 |
| Aroclor 1016 | 169 | 9 | 1985 | 4.05 | 4.55 | 18.44 | 99.62 | 5.40 |
| Aroclor 1016 | 169 | 9 | 1985 | 4.50 | 4.55 | 20.49 | 138.48 | 6.76 |
| Aroclor 1016 | 169 | 9 | 1985 | 4.50 | 4.55 | 20.49 | 99.62 | 4.86 |
| Aroclor 1016 | 158 | 7 | 1980 | 0.92 | 4.94 | 4.54 | 34.08 | 7.51 |
| Aroclor 1016 | 158 | 7 | 1980 | 0.92 | 4.94 | 4.54 | 40.00 | 8.82 |
| Aroclor 1016 | 158 | 9 | 1980 | 0.59 | 5.73 | 3.40 | 35.12 | 10.33 |
| Aroclor 1016 | 158 | 9 | 1980 | 0.59 | 5.73 | 3.40 | 27.81 | 8.18 |
| Aroclor 1016 | 158 | 7 | 1982 | 5.72 | 4.94 | 28.26 | 60.45 | 2.14 |
| Aroclor 1016 | 158 | 7 | 1982 | 5.72 | 4.94 | 28.26 | 71.50 | 2.53 |
| Aroclor 1016 | 158 | 8 | 1982 | 1.63 | 5.34 | 8.71 | 48.69 | 5.59 |
| Aroclor 1016 | 158 | 8 | 1982 | 1.63 | 5.34 | 8.71 | 65.45 | 7.52 |
| Aroclor 1016 | 158 | 9 | 1982 | 1.54 | 5.73 | 8.83 | 90.77 | 10.28 |
| Aroclor 1016 | 158 | 9 | 1983 | 2.14 | 5.73 | 12.27 | 131.25 | 10.70 |
| Aroclor 1016 | 158 | 9 | 1983 | 2.14 | 5.73 | 12.27 | 132.21 | 10.78 |
| Aroclor 1016 | 158 | 9 | 1983 | 2.14 | 5.73 | 12.27 | 120.78 | 9.85 |
| Aroclor 1016 | 158 | 8 | 1984 | 2.07 | 5.34 | 11.06 | 99.44 | 8.99 |
| Aroclor 1016 | 158 | 8 | 1984 | 2.07 | 5.34 | 11.06 | 107.82 | 9.75 |
| Aroclor 1016 | 158 | 8 | 1984 | 2.07 | 5.34 | 11.06 | 89.37 | 8.08 |
| Aroclor 1016 | 158 | 8 | 1984 | 2.07 | 5.34 | 11.06 | 126.80 | 11.47 |
| Aroclor 1016 | 158 | 9 | 1984 | 1.39 | 5.73 | 7.97 | 135.19 | 16.97 |
| Aroclor 1016 | 158 | 9 | 1984 | 1.39 | 5.73 | 7.97 | 120.97 | 15.18 |
| Aroclor 1016 | 158 | 9 | 1984 | 1.39 | 5.73 | 7.97 | 132.04 | 16.57 |
| Aroclor 1016 | 158 | 9 | 1984 | 1.39 | 5.73 | 7.97 | 95.04 | 11.93 |
| Aroclor 1016 | 158 | 7 | 1985 | 0.95 | 4.94 | 4.67 | 94.21 | 20.18 |
| Aroclor 1016 | 158 | 7 | 1985 | 0.95 | 4.94 | 4.67 | 82.18 | 17.60 |

Table 10-2
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1016 | 158 | 7 | 1985 | 0.95 | 4.94 | 4.67 | 4.14 | 0.89 |
| Aroclor 1016 | 158 | 7 | 1985 | 0.95 | 4.94 | 4.67 | 2.90 | 0.62 |
| Aroclor 1016 | 158 | 7 | 1985 | 0.95 | 4.94 | 4.67 | 126.16 | 27.02 |
| Aroclor 1016 | 158 | 7 | 1985 | 0.95 | 4.94 | 4.67 | 88.60 | 18.98 |
| Aroclor 1016 | 158 | 8 | 1985 | 1.33 | 5.34 | 7.10 | 89.61 | 12.62 |
| Aroclor 1016 | 158 | 8 | 1985 | 1.33 | 5.34 | 7.10 | 91.24 | 12.84 |
| Aroclor 1016 | 153.3 | 7 | 1981 | 1.84 | 7.31 | 13.44 | 65.00 | 4.83 |
| Aroclor 1016 | 153.3 | 8 | 1982 | 4.66 | 7.31 | 34.05 | 48.67 | 1.43 |

Table 10-3
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1254 | 197.6 | 7 | 1980 | 0.22 | 5.21 | 1.15 | 7.87 | 6.83 |
| Aroclor 1254 | 197.6 | 8 | 1980 | 0.20 | 4.27 | 0.86 | 61.21 | 70.98 |
| Aroclor 1254 | 197.6 | 9 | 1980 | 0.26 | 3.12 | 0.80 | 16.57 | 20.76 |
| Aroclor 1254 | 197.6 | 9 | 1980 | 0.26 | 3.12 | 0.80 | 7.69 | 9.64 |
| Aroclor 1254 | 197.6 | 7 | 1981 | 0.29 | 5.21 | 1.51 | 13.84 | 9.16 |
| Aroclor 1254 | 197.6 | 8 | 1981 | 0.27 | 4.27 | 1.13 | 12.82 | 11.33 |
| Aroclor 1254 | 197.6 | 9 | 1981 | 0.27 | 3.12 | 0.84 | 0.95 | 1.13 |
| Aroclor 1254 | 197.6 | 7 | 1982 | 1.91 | 5.21 | 9.96 | 9.76 | 0.98 |
| Aroclor 1254 | 197.6 | 8 | 1982 | 21.90 | 4.27 | 93.50 | 39.93 | 0.43 |
| Aroclor 1254 | 197.6 | 9 | 1982 | 1.00 | 3.12 | 3.12 | 6.99 | 2.24 |
| Aroclor 1254 | 197.6 | 9 | 1983 | 0.20 | 3.12 | 0.62 | 4.46 | 7.22 |
| Aroclor 1254 | 197.6 | 7 | 1984 | 1.70 | 5.21 | 8.86 | 79.55 | 8.98 |
| Aroclor 1254 | 197.6 | 7 | 1984 | 1.70 | 5.21 | 8.86 | 99.22 | 11.20 |
| Aroclor 1254 | 197.6 | 7 | 1984 | 1.70 | 5.21 | 8.86 | 61.68 | 6.96 |
| Aroclor 1254 | 197.6 | 7 | 1984 | 1.70 | 5.21 | 8.86 | 22.39 | 2.53 |
| Aroclor 1254 | 197.6 | 8 | 1984 | 1.45 | 4.27 | 6.19 | 16.80 | 2.71 |
| Aroclor 1254 | 197.6 | 8 | 1984 | 1.45 | 4.27 | 6.19 | 18.11 | 2.93 |
| Aroclor 1254 | 197.6 | 8 | 1984 | 1.45 | 4.27 | 6.19 | 5.26 | 0.85 |
| Aroclor 1254 | 197.6 | 9 | 1984 | 0.25 | 3.12 | 0.78 | 12.20 | 15.65 |
| Aroclor 1254 | 197.6 | 9 | 1984 | 0.25 | 3.12 | 0.78 | 14.66 | 18.80 |
| Aroclor 1254 | 197.6 | 9 | 1984 | 0.25 | 3.12 | 0.78 | 14.03 | 18.00 |
| Aroclor 1254 | 197.6 | 7 | 1985 | 0.51 | 5.21 | 2.67 | 10.53 | 3.94 |
| Aroclor 1254 | 197.6 | 7 | 1985 | 0.51 | 5.21 | 2.67 | 18.45 | 6.90 |
| Aroclor 1254 | 197.6 | 8 | 1985 | 0.37 | 4.27 | 1.59 | 17.27 | 10.84 |
| Aroclor 1254 | 197.6 | 8 | 1985 | 0.37 | 4.27 | 1.59 | 11.49 | 7.22 |
| Aroclor 1254 | 197.6 | 8 | 1985 | 0.37 | 4.27 | 1.59 | 27.09 | 17.01 |
| Aroclor 1254 | 197.6 | 9 | 1985 | 0.15 | 3.12 | 0.47 | 6.96 | 14.89 |
| Aroclor 1254 | 193.9 | 7 | 1978 | 3.93 | 5.04 | 19.82 | 90.80 | 4.58 |
| Aroclor 1254 | 193.9 | 7 | 1978 | 5.41 | 5.04 | 27.28 | 90.80 | 3.33 |

Table 10-3
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concentration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1254 | 193.9 | 7 | 1978 | 9.52 | 5.04 | 48.01 | 90.80 | 1.89 |
| Aroclor 1254 | 193.9 | 7 | 1980 | 3.11 | 5.04 | 15.68 | 60.55 | 3.86 |
| Aroclor 1254 | 193.9 | 7 | 1980 | 3.11 | 5.04 | 15.68 | 120.51 | 7.68 |
| Aroclor 1254 | 193.9 | 8 | 1980 | 1.60 | 3.17 | 5.07 | 31.75 | 6.26 |
| Aroclor 1254 | 193.9 | 8 | 1980 | 1.60 | 3.17 | 5.07 | 51.01 | 10.06 |
| Aroclor 1254 | 193.9 | 9 | 1980 | 0.88 | 2.58 | 2.26 | 30.26 | 13.39 |
| Aroclor 1254 | 193.9 | 9 | 1980 | 0.87 | 2.58 | 2.24 | 30.26 | 13.50 |
| Aroclor 1254 | 193.9 | 9 | 1980 | 0.88 | 2.58 | 2.26 | 53.97 | 23.88 |
| Aroclor 1254 | 193.9 | 9 | 1980 | 0.87 | 2.58 | 2.24 | 53.97 | 24.07 |
| Aroclor 1254 | 193.9 | 7 | 1981 | 1.90 | 5.04 | 9.58 | 15.84 | 1.65 |
| Aroclor 1254 | 193.9 | 8 | 1981 | 0.95 | 3.17 | 3.01 | 17.24 | 5.73 |
| Aroclor 1254 | 193.9 | 8 | 1981 | 0.95 | 3.17 | 3.01 | 16.33 | 5.42 |
| Aroclor 1254 | 193.9 | 8 | 1981 | 0.95 | 3.17 | 3.01 | 13.89 | 4.62 |
| Aroclor 1254 | 193.9 | 9 | 1981 | 0.83 | 2.58 | 2.15 | 40.32 | 18.78 |
| Aroclor 1254 | 193.9 | 7 | 1982 | 4.94 | 5.04 | 24.91 | 61.01 | 2.45 |
| Aroclor 1254 | 193.9 | 7 | 1982 | 4.94 | 5.04 | 24.91 | 68.75 | 2.76 |
| Aroclor 1254 | 193.9 | 8 | 1982 | 3.93 | 3.17 | 12.45 | 180.25 | 14.47 |
| Aroclor 1254 | 193.9 | 8 | 1982 | 3.93 | 3.17 | 12.45 | 299.17 | 24.02 |
| Aroclor 1254 | 193.9 | 9 | 1982 | 1.60 | 2.58 | 4.12 | 80.00 | 19.40 |
| Aroclor 1254 | 193.9 | 9 | 1982 | 1.38 | 2.58 | 3.56 | 80.00 | 22.49 |
| Aroclor 1254 | 193.9 | 9 | 1983 | 1.17 | 2.58 | 3.02 | 20.90 | 6.93 |
| Aroclor 1254 | 193.9 | 9 | 1983 | 1.05 | 2.58 | 2.71 | 20.90 | 7.72 |
| Aroclor 1254 | 193.9 | 9 | 1983 | 1.12 | 2.58 | 2.89 | 20.90 | 7.24 |
| Aroclor 1254 | 193.9 | 9 | 1983 | 1.08 | 2.58 | 2.78 | 20.90 | 7.51 |
| Aroclor 1254 | 193.9 | 9 | 1983 | 1.17 | 2.58 | 3.02 | 18.27 | 6.06 |
| Aroclor 1254 | 193.9 | 9 | 1983 | 1.05 | 2.58 | 2.71 | 18.27 | 6.75 |
| Aroclor 1254 | 193.9 | 9 | 1983 | 1.12 | 2.58 | 2.89 | 18.27 | 6.33 |
| Aroclor 1254 | 193.9 | 9 | 1983 | 1.08 | 2.58 | 2.78 | 18.27 | 6.56 |
| Aroclor 1254 | 193.9 | 7 | 1984 | 4.10 | 5.04 | 20.68 | 93.42 | 4.52 |

Table 10-3
Ratio of Lipid-Normalized PCB Concentrations in Individual Species on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1254 | 193.9 | 7 | 1984 | 4.10 | 5.04 | 20.68 | 241.30 | 11.67 |
| Aroclor 1254 | 193.9 | 8 | 1984 | 4.29 | 3.17 | 13.59 | 34.42 | 2.53 |
| Aroclor 1254 | 193.9 | 8 | 1984 | 4.29 | 3.17 | 13.59 | 38.41 | 2.83 |
| Aroclor 1254 | 193.9 | 8 | 1984 | 4.29 | 3.17 | 13.59 | 30.07 | 2.21 |
| Aroclor 1254 | 193.9 | 8 | 1984 | 4.29 | 3.17 | 13.59 | 29.90 | 2.20 |
| Aroclor 1254 | 193.9 | 8 | 1984 | 4.29 | 3.17 | 13.59 | 24.76 | 1.82 |
| Aroclor 1254 | 193.9 | 8 | 1984 | 4.29 | 3.17 | 13.59 | 24.33 | 1.79 |
| Aroclor 1254 | 193.9 | 8 | 1984 | 4.29 | 3.17 | 13.59 | 31.06 | 2.28 |
| Aroclor 1254 | 193.9 | 9 | 1984 | 1.63 | 2.58 | 4.20 | 52.30 | 12.45 |
| Aroclor 1254 | 193.9 | 9 | 1984 | 1.63 | 2.58 | 4.20 | 17.36 | 4.13 |
| Aroclor 1254 | 193.9 | 9 | 1984 | 1.63 | 2.58 | 4.20 | 28.06 | 6.68 |
| Aroclor 1254 | 193.9 | 9 | 1984 | 1.63 | 2.58 | 4.20 | 21.86 | 5.21 |
| Aroclor 1254 | 193.9 | 9 | 1984 | 1.63 | 2.58 | 4.20 | 25.76 | 6.13 |
| Aroclor 1254 | 193.9 | 7 | 1985 | 2.02 | 5.04 | 10.19 | 122.14 | 11.99 |
| Aroclor 1254 | 193.9 | 7 | 1985 | 2.02 | 5.04 | 10.19 | 65.53 | 6.43 |
| Aroclor 1254 | 193.9 | 7 | 1985 | 2.02 | 5.04 | 10.19 | 94.65 | 9.29 |
| Aroclor 1254 | 193.9 | 7 | 1985 | 2.02 | 5.04 | 10.19 | 97.94 | 9.61 |
| Aroclor 1254 | 193.9 | 8 | 1985 | 1.86 | 3.17 | 5.89 | 37.53 | 6.37 |
| Aroclor 1254 | 193.9 | 8 | 1985 | 1.86 | 3.17 | 5.89 | 62.69 | 10.64 |
| Aroclor 1254 | 193.9 | 8 | 1985 | 1.86 | 3.17 | 5.89 | 65.24 | 11.07 |
| Aroclor 1254 | 193.9 | 8 | 1985 | 1.86 | 3.17 | 5.89 | 49.07 | 8.33 |
| Aroclor 1254 | 193.9 | 9 | 1985 | 1.42 | 2.58 | 3.66 | 77.93 | 21.30 |
| Aroclor 1254 | 193.88 | 7 | 1980 | 1.89 | 17.35 | 32.80 | 60.55 | 1.85 |
| Aroclor 1254 | 193.88 | 7 | 1980 | 1.89 | 17.35 | 32.80 | 120.51 | 3.67 |
| Aroclor 1254 | 193.88 | 8 | 1980 | 1.47 | 12.97 | 19.06 | 31.75 | 1.67 |
| Aroclor 1254 | 193.88 | 8 | 1980 | 1.47 | 12.97 | 19.06 | 51.01 | 2.68 |
| Aroclor 1254 | 193.88 | 8 | 1981 | 1.91 | 12.97 | 24.77 | 17.24 | 0.70 |
| Aroclor 1254 | 193.88 | 8 | 1981 | 1.91 | 12.97 | 24.77 | 16.33 | 0.66 |
| Aroclor 1254 | 193.88 | 8 | 1981 | 1.91 | 12.97 | 24.77 | 13.89 | 0.56 |

Table 10-3
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1254 | 193.88 | 9 | 1981 | 1.30 | 12.97 | 16.86 | 40.32 | 2.39 |
| Aroclor 1254 | 193.88 | 7 | 1982 | 4.60 | 17.35 | 79.82 | 61.01 | 0.76 |
| Aroclor 1254 | 193.88 | 7 | 1982 | 4.60 | 17.35 | 79.82 | 68.75 | 0.86 |
| Aroclor 1254 | 193.88 | 8 | 1982 | 4.30 | 12.97 | 55.77 | 180.25 | 3.23 |
| Aroclor 1254 | 193.88 | 8 | 1982 | 4.30 | 12.97 | 55.77 | 299.17 | 5.36 |
| Aroclor 1254 | 193.88 | 9 | 1983 | 1.07 | 12.97 | 13.88 | 18.27 | 1.32 |
| Aroclor 1254 | 193.88 | 9 | 1983 | 1.07 | 12.97 | 13.88 | 18.27 | 1.32 |
| Aroclor 1254 | 193.88 | 7 | 1984 | 3.05 | 17.35 | 52.92 | 93.42 | 1.77 |
| Aroclor 1254 | 193.88 | 7 | 1984 | 3.05 | 17.35 | 52.92 | 241.30 | 4.56 |
| Aroclor 1254 | 193.88 | 8 | 1984 | 2.00 | 12.97 | 25.94 | 34.42 | 1.33 |
| Aroclor 1254 | 193.88 | 8 | 1984 | 2.00 | 12.97 | 25.94 | 38.41 | 1.48 |
| Aroclor 1254 | 193.88 | 8 | 1984 | 2.00 | 12.97 | 25.94 | 30.07 | 1.16 |
| Aroclor 1254 | 193.88 | 8 | 1984 | 2.00 | 12.97 | 25.94 | 29.90 | 1.15 |
| Aroclor 1254 | 193.88 | 8 | 1984 | 2.00 | 12.97 | 25.94 | 24.76 | 0.95 |
| Aroclor 1254 | 193.88 | 8 | 1984 | 2.00 | 12.97 | 25.94 | 24.33 | 0.94 |
| Aroclor 1254 | 193.88 | 8 | 1984 | 2.00 | 12.97 | 25.94 | 31.06 | 1.20 |
| Aroclor 1254 | 193.88 | 9 | 1984 | 1.31 | 12.97 | 16.99 | 52.30 | 3.08 |
| Aroclor 1254 | 193.88 | 9 | 1984 | 1.31 | 12.97 | 16.99 | 17.36 | 1.02 |
| Aroclor 1254 | 193.88 | 9 | 1984 | 1.31 | 12.97 | 16.99 | 28.06 | 1.65 |
| Aroclor 1254 | 193.88 | 9 | 1984 | 1.31 | 12.97 | 16.99 | 21.86 | 1.29 |
| Aroclor 1254 | 193.88 | 9 | 1984 | 1.31 | 12.97 | 16.99 | 25.76 | 1.52 |
| Aroclor 1254 | 193.88 | 7 | 1985 | 1.73 | 17.35 | 30.02 | 122.14 | 4.07 |
| Aroclor 1254 | 193.88 | 7 | 1985 | 1.73 | 17.35 | 30.02 | 65.53 | 2.18 |
| Aroclor 1254 | 193.88 | 7 | 1985 | 1.73 | 17.35 | 30.02 | 94.65 | 3.15 |
| Aroclor 1254 | 193.88 | 7 | 1985 | 1.73 | 17.35 | 30.02 | 97.94 | 3.26 |
| Aroclor 1254 | 193.88 | 8 | 1985 | 1.33 | 12.97 | 17.25 | 37.53 | 2.18 |
| Aroclor 1254 | 193.88 | 8 | 1985 | 1.33 | 12.97 | 17.25 | 62.69 | 3.63 |
| Aroclor 1254 | 193.88 | 8 | 1985 | 1.33 | 12.97 | 17.25 | 65.24 | 3.78 |
| Aroclor 1254 | 193.88 | 8 | 1985 | 1.33 | 12.97 | 17.25 | 49.07 | 2.84 |

Table 10-3
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1254 | 193.88 | 9 | 1985 | 1.30 | 12.97 | 16.86 | 77.93 | 4.62 |
| Aroclor 1254 | 189.4 | 7 | 1978 | 8.30 | 4.34 | 36.00 | 253.24 | 7.03 |
| Aroclor 1254 | 189.4 | 7 | 1978 | 10.55 | 4.34 | 45.76 | 253.24 | 5.53 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 6.12 | 4.18 | 25.59 | 48.03 | 1.88 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 6.12 | 4.18 | 25.59 | 80.22 | 3.13 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 6.12 | 4.18 | 25.59 | 80.35 | 3.14 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 6.12 | 4.18 | 25.59 | 49.66 | 1.94 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 16.10 | 4.18 | 67.33 | 48.03 | 0.71 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 16.10 | 4.18 | 67.33 | 80.22 | 1.19 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 16.10 | 4.18 | 67.33 | 80.35 | 1.19 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 16.10 | 4.18 | 67.33 | 49.66 | 0.74 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 17.20 | 4.18 | 71.93 | 48.03 | 0.67 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 17.20 | 4.18 | 71.93 | 80.22 | 1.12 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 17.20 | 4.18 | 71.93 | 80.35 | 1.12 |
| Aroclor 1254 | 189.4 | 6 | 1980 | 17.20 | 4.18 | 71.93 | 49.66 | 0.69 |
| Aroclor 1254 | 189.4 | 7 | 1980 | 2.64 | 4.34 | 11.45 | 56.08 | 4.90 |
| Aroclor 1254 | 189.4 | 7 | 1980 | 2.64 | 4.34 | 11.45 | 52.67 | 4.60 |
| Aroclor 1254 | 189.4 | 8 | 1980 | 0.72 | 3.00 | 2.16 | 54.87 | 25.35 |
| Aroclor 1254 | 189.4 | 8 | 1980 | 0.72 | 3.00 | 2.16 | 65.97 | 30.48 |
| Aroclor 1254 | 189.4 | 9 | 1980 | 1.26 | 2.70 | 3.40 | 24.90 | 7.32 |
| Aroclor 1254 | 189.4 | 9 | 1980 | 1.26 | 2.70 | 3.40 | 55.79 | 16.41 |
| Aroclor 1254 | 189.4 | 7 | 1981 | 2.10 | 4.34 | 9.11 | 32.83 | 3.60 |
| Aroclor 1254 | 189.4 | 7 | 1981 | 2.10 | 4.34 | 9.11 | 41.61 | 4.57 |
| Aroclor 1254 | 189.4 | 8 | 1981 | 1.13 | 3.00 | 3.39 | 22.00 | 6.49 |
| Aroclor 1254 | 189.4 | 8 | 1981 | 1.13 | 3.00 | 3.39 | 16.28 | 4.80 |
| Aroclor 1254 | 189.4 | 8 | 1981 | 1.13 | 3.00 | 3.39 | 38.28 | 11.29 |
| Aroclor 1254 | 189.4 | 9 | 1981 | 1.03 | 2.70 | 2.78 | 48.58 | 17.48 |
| Aroclor 1254 | 189.4 | 9 | 1981 | 1.03 | 2.70 | 2.78 | 34.85 | 12.54 |
| Aroclor 1254 | 189.4 | 9 | 1981 | 1.03 | 2.70 | 2.78 | 29.87 | 10.75 |

Table 10-3
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1254 | 189.4 | 7 | 1982 | 57.50 | 4.34 | 249.38 | 94.58 | 0.38 |
| Aroclor 1254 | 189.4 | 7 | 1982 | 57.50 | 4.34 | 249.38 | 81.20 | 0.33 |
| Aroclor 1254 | 189.4 | 7 | 1982 | 57.50 | 4.34 | 249.38 | 59.11 | 0.24 |
| Aroclor 1254 | 189.4 | 7 | 1982 | 57.50 | 4.34 | 249.38 | 73.09 | 0.29 |
| Aroclor 1254 | 189.4 | 8 | 1982 | 11.30 | 3.00 | 33.92 | 153.49 | 4.52 |
| Aroclor 1254 | 189.4 | 8 | 1982 | 11.30 | 3.00 | 33.92 | 95.51 | 2.82 |
| Aroclor 1254 | 189.4 | 8 | 1982 | 11.30 | 3.00 | 33.92 | 101.43 | 2.99 |
| Aroclor 1254 | 189.4 | 8 | 1982 | 11.30 | 3.00 | 33.92 | 100.72 | 2.97 |
| Aroclor 1254 | 189.4 | 9 | 1982 | 1.05 | 2.70 | 2.83 | 57.33 | 20.23 |
| Aroclor 1254 | 189.4 | 9 | 1982 | 1.05 | 2.70 | 2.83 | 41.93 | 14.80 |
| Aroclor 1254 | 189.4 | 9 | 1983 | 1.22 | 2.70 | 3.29 | 45.70 | 13.88 |
| Aroclor 1254 | 189.4 | 9 | 1983 | 1.22 | 2.70 | 3.29 | 59.42 | 18.05 |
| Aroclor 1254 | 189.4 | 7 | 1984 | 2.63 | 4.34 | 11.41 | 116.81 | 10.24 |
| Aroclor 1254 | 189.4 | 7 | 1984 | 2.63 | 4.34 | 11.41 | 205.92 | 18.05 |
| Aroclor 1254 | 189.4 | 7 | 1984 | 2.63 | 4.34 | 11.41 | 213.88 | 18.75 |
| Aroclor 1254 | 189.4 | 8 | 1984 | 6.28 | 3.00 | 18.85 | 30.27 | 1.61 |
| Aroclor 1254 | 189.4 | 8 | 1984 | 6.28 | 3.00 | 18.85 | 29.07 | 1.54 |
| Aroclor 1254 | 189.4 | 8 | 1984 | 6.28 | 3.00 | 18.85 | 38.31 | 2.03 |
| Aroclor 1254 | 189.4 | 8 | 1984 | 6.28 | 3.00 | 18.85 | 41.84 | 2.22 |
| Aroclor 1254 | 189.4 | 8 | 1984 | 6.28 | 3.00 | 18.85 | 49.25 | 2.61 |
| Aroclor 1254 | 189.4 | 9 | 1984 | 1.36 | 2.70 | 3.67 | 40.57 | 11.06 |
| Aroclor 1254 | 189.4 | 9 | 1984 | 1.36 | 2.70 | 3.67 | 59.96 | 16.34 |
| Aroclor 1254 | 189.4 | 9 | 1984 | 1.36 | 2.70 | 3.67 | 41.31 | 11.26 |
| Aroclor 1254 | 189.4 | 9 | 1984 | 1.36 | 2.70 | 3.67 | 40.58 | 11.06 |
| Aroclor 1254 | 189.4 | 7 | 1985 | 1.20 | 4.34 | 5.20 | 83.46 | 16.04 |
| Aroclor 1254 | 189.4 | 7 | 1985 | 1.20 | 4.34 | 5.20 | 70.79 | 13.60 |
| Aroclor 1254 | 189.4 | 7 | 1985 | 1.20 | 4.34 | 5.20 | 85.24 | 16.38 |
| Aroclor 1254 | 189.4 | 7 | 1985 | 1.20 | 4.34 | 5.20 | 67.30 | 12.93 |
| Aroclor 1254 | 189.4 | 7 | 1985 | 1.20 | 4.34 | 5.20 | 52.10 | 10.01 |

Table 10-3
Ratio of Lipid-Normalized PCB Concentrations i Individual Species
on Multiplate Samplers to Particulate Organic Carb in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1254 | 189.4 | 8 | 1985 | 1.16 | 3.00 | 3.48 | 32.65 | 9.38 |
| Aroclor 1254 | 189.4 | 8 | 1985 | 1.16 | 3.00 | 3.48 | 53.50 | 15.36 |
| Aroclor 1254 | 189.4 | 8 | 1985 | 1.16 | 3.00 | 3.48 | 43.65 | 12.53 |
| Aroclor 1254 | 181.8 | 7 | 1981 | 1.40 | 5.61 | 7.85 | 49.27 | 6.27 |
| Aroclor 1254 | 169 | 7 | 1978 | 2.92 | 4.78 | 13.95 | 134.78 | 9.67 |
| Aroclor 1254 | 169 | 7 | 1978 | 3.93 | 4.78 | 18.77 | 134.78 | 7.18 |
| Aroclor 1254 | 169 | 7 | 1978 | 14.50 | 4.78 | 69.25 | 134.78 | 1.95 |
| Aroclor 1254 | 169 | 7 | 1980 | 3.50 | 4.78 | 16.72 | 66.09 | 3.95 |
| Aroclor 1254 | 169 | 7 | 1980 | 3.50 | 4.78 | 16.72 | 106.43 | 6.37 |
| Aroclor 1254 | 169 | 8 | 1980 | 2.37 | 4.25 | 10.07 | 100.57 | 9.99 |
| Aroclor 1254 | 169 | 8 | 1980 | 2.37 | 4.25 | 10.07 | 123.90 | 12.31 |
| Aroclor 1254 | 169 | 9 | 1980 | 0.89 | 4.55 | 4.07 | 63.49 | 15.61 |
| Aroclor 1254 | 169 | 9 | 1980 | 0.89 | 4.55 | 4.07 | 36.35 | 8.94 |
| Aroclor 1254 | 169 | 7 | 1981 | 1.38 | 4.78 | 6.59 | 16.31 | 2.47 |
| Aroclor 1254 | 169 | 7 | 1981 | 1.38 | 4.78 | 6.59 | 24.75 | 3.76 |
| Aroclor 1254 | 169 | 7 | 1981 | 1.38 | 4.78 | 6.59 | 40.06 | 6.08 |
| Aroclor 1254 | 169 | 7 | 1981 | 1.38 | 4.78 | 6.59 | 40.71 | 6.18 |
| Aroclor 1254 | 169 | 8 | 1981 | 1.37 | 4.25 | 5.82 | 83.54 | 14.36 |
| Aroclor 1254 | 169 | 8 | 1981 | 1.37 | 4.25 | 5.82 | 43.48 | 7.47 |
| Aroclor 1254 | 169 | 8 | 1981 | 1.37 | 4.25 | 5.82 | 38.90 | 6.69 |
| Aroclor 1254 | 169 | 8 | 1981 | 1.37 | 4.25 | 5.82 | 12.70 | 2.18 |
| Aroclor 1254 | 169 | 7 | 1982 | 38.80 | 4.78 | 185.30 | 58.01 | 0.31 |
| Aroclor 1254 | 169 | 7 | 1982 | 38.80 | 4.78 | 185.30 | 74.45 | 0.40 |
| Aroclor 1254 | 169 | 8 | 1982 | 3.12 | 4.25 | 13.25 | 95.56 | 7.21 |
| Aroclor 1254 | 169 | 8 | 1982 | 3.12 | 4.25 | 13.25 | 100.80 | 7.61 |
| Aroclor 1254 | 169 | 9 | 1982 | 1.92 | 4.55 | 8.74 | 75.50 | 8.64 |
| Aroclor 1254 | 169 | 9 | 1983 | 1.11 | 4.55 | 5.05 | 47.42 | 9.38 |
| Aroclor 1254 | 169 | 9 | 1983 | 1.11 | 4.55 | 5.05 | 50.94 | 10.08 |
| Aroclor 1254 | 169 | 9 | 1983 | 1.11 | 4.55 | 5.05 | 48.22 | 9.54 |

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Table 10-3
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1254 | 169 | 7 | 1984 | 1.38 | 4.78 | 6.59 | 152.41 | 23.12 |
| Aroclor 1254 | 169 | 7 | 1984 | 1.38 | 4.78 | 6.59 | 181.28 | 27.51 |
| Aroclor 1254 | 169 | 7 | 1984 | 1.38 | 4.78 | 6.59 | 103.08 | 15.64 |
| Aroclor 1254 | 169 | 7 | 1984 | 1.38 | 4.78 | 6.59 | 77.50 | 11.76 |
| Aroclor 1254 | 169 | 7 | 1984 | 1.38 | 4.78 | 6.59 | 83.80 | 12.72 |
| Aroclor 1254 | 169 | 7 | 1984 | 1.38 | 4.78 | 6.59 | 80.52 | 12.22 |
| Aroclor 1254 | 169 | 8 | 1984 | 1.01 | 4.25 | 4.29 | 52.87 | 12.32 |
| Aroclor 1254 | 169 | 8 | 1984 | 1.01 | 4.25 | 4.29 | 21.46 | 5.00 |
| Aroclor 1254 | 169 | 8 | 1984 | 1.01 | 4.25 | 4.29 | 6.25 | 1.46 |
| Aroclor 1254 | 169 | 8 | 1984 | 1.01 | 4.25 | 4.29 | 198.93 | 46.37 |
| Aroclor 1254 | 169 | 8 | 1984 | 1.01 | 4.25 | 4.29 | 57.94 | 13.51 |
| Aroclor 1254 | 169 | 8 | 1984 | 1.01 | 4.25 | 4.29 | 41.93 | 9.77 |
| Aroclor 1254 | 169 | 9 | 1984 | 0.87 | 4.55 | 3.94 | 56.79 | 14.40 |
| Aroclor 1254 | 169 | 9 | 1984 | 0.87 | 4.55 | 3.94 | 73.27 | 18.58 |
| Aroclor 1254 | 169 | 9 | 1984 | 0.87 | 4.55 | 3.94 | 65.93 | 16.72 |
| Aroclor 1254 | 169 | 9 | 1984 | 0.87 | 4.55 | 3.94 | 67.33 | 17.07 |
| Aroclor 1254 | 169 | 7 | 1985 | 1.32 | 4.78 | 6.30 | 52.61 | 8.35 |
| Aroclor 1254 | 169 | 7 | 1985 | 1.32 | 4.78 | 6.30 | 48.39 | 7.68 |
| Aroclor 1254 | 169 | 7 | 1985 | 1.32 | 4.78 | 6.30 | 62.00 | 9.83 |
| Aroclor 1254 | 169 | 8 | 1985 | 1.31 | 4.25 | 5.56 | 46.08 | 8.28 |
| Aroclor 1254 | 169 | 8 | 1985 | 1.31 | 4.25 | 5.56 | 27.78 | 4.99 |
| Aroclor 1254 | 169 | 8 | 1985 | 1.31 | 4.25 | 5.56 | 34.59 | 6.22 |
| Aroclor 1254 | 169 | 9 | 1985 | 1.16 | 4.55 | 5.28 | 64.59 | 12.23 |
| Aroclor 1254 | 169 | 9 | 1985 | 1.16 | 4.55 | 5.28 | 40.52 | 7.67 |
| Aroclor 1254 | 158 | 7 | 1980 | 0.98 | 4.94 | 4.85 | 35.70 | 7.37 |
| Aroclor 1254 | 158 | 7 | 1980 | 0.98 | 4.94 | 4.85 | 46.54 | 9.60 |
| Aroclor 1254 | 158 | 9 | 1980 | 0.70 | 5.73 | 4.01 | 52.85 | 13.17 |
| Aroclor 1254 | 158 | 9 | 1980 | 0.70 | 5.73 | 4.01 | 51.51 | 12.84 |
| Aroclor 1254 | 158 | 7 | 1982 | 9.39 | 4.94 | 46.39 | 33.86 | 0.73 |



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Table 10-3
Ratio of Lipid-Normalized PCB Concentrations in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | River Mile | Month | Year | PCB Concen-tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|---|
| Aroclor 1254 | 158 | 7 | 1982 | 9.39 | 4.94 | 46.39 | 80.83 | 1.74 |
| Aroclor 1254 | 158 | 8 | 1982 | 2.27 | 5.34 | 12.12 | 88.28 | 7.28 |
| Aroclor 1254 | 158 | 8 | 1982 | 2.27 | 5.34 | 12.12 | 85.45 | 7.05 |
| Aroclor 1254 | 158 | 9 | 1982 | 0.66 | 5.73 | 3.76 | 65.58 | 17.44 |
| Aroclor 1254 | 158 | 9 | 1983 | 0.74 | 5.73 | 4.24 | 44.66 | 10.54 |
| Aroclor 1254 | 158 | 9 | 1983 | 0.74 | 5.73 | 4.24 | 44.71 | 10.56 |
| Aroclor 1254 | 158 | 9 | 1983 | 0.74 | 5.73 | 4.24 | 47.66 | 11.25 |
| Aroclor 1254 | 158 | 8 | 1984 | 0.77 | 5.34 | 4.11 | 36.80 | 8.95 |
| Aroclor 1254 | 158 | 8 | 1984 | 0.77 | 5.34 | 4.11 | 40.39 | 9.82 |
| Aroclor 1254 | 158 | 8 | 1984 | 0.77 | 5.34 | 4.11 | 39.23 | 9.54 |
| Aroclor 1254 | 158 | 8 | 1984 | 0.77 | 5.34 | 4.11 | 45.49 | 11.06 |
| Aroclor 1254 | 158 | 9 | 1984 | 0.50 | 5.73 | 2.86 | 54.54 | 19.07 |
| Aroclor 1254 | 158 | 9 | 1984 | 0.50 | 5.73 | 2.86 | 47.98 | 16.78 |
| Aroclor 1254 | 158 | 9 | 1984 | 0.50 | 5.73 | 2.86 | 57.48 | 20.10 |
| Aroclor 1254 | 158 | 9 | 1984 | 0.50 | 5.73 | 2.86 | 51.90 | 18.15 |
| Aroclor 1254 | 158 | 7 | 1985 | 0.33 | 4.94 | 1.62 | 35.75 | 22.06 |
| Aroclor 1254 | 158 | 7 | 1985 | 0.33 | 4.94 | 1.62 | 42.80 | 26.41 |
| Aroclor 1254 | 158 | 7 | 1985 | 0.33 | 4.94 | 1.62 | 8.27 | 5.11 |
| Aroclor 1254 | 158 | 7 | 1985 | 0.33 | 4.94 | 1.62 | 5.81 | 3.59 |
| Aroclor 1254 | 158 | 7 | 1985 | 0.33 | 4.94 | 1.62 | 52.43 | 32.36 |
| Aroclor 1254 | 158 | 7 | 1985 | 0.33 | 4.94 | 1.62 | 36.82 | 22.72 |
| Aroclor 1254 | 158 | 8 | 1985 | 0.45 | 5.34 | 2.39 | 30.14 | 12.63 |
| Aroclor 1254 | 158 | 8 | 1985 | 0.45 | 5.34 | 2.39 | 31.36 | 13.14 |
| Aroclor 1254 | 153.3 | 7 | 1981 | 0.47 | 7.31 | 3.45 | 23.85 | 6.91 |
| Aroclor 1254 | 153.3 | 8 | 1982 | 37.20 | 7.31 | 271.80 | 69.62 | 0.26 |

Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concentration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1980 | 197.6 | 0.383 | 5.21 | 2.00 | 21.26 | 10.65 |
| Total PCBs | 1981 | 197.6 | 0.51 | 5.21 | 2.66 | 20.66 | 7.77 |
| Total PCBs | 1982 | 197.6 | 3.37 | 5.21 | 17.57 | 15.85 | 0.90 |
| Total PCBs | 1984 | 197.6 | 2.2 | 5.21 | 11.47 | 97.73 | 8.52 |
| Total PCBs | 1984 | 197.6 | 2.2 | 5.21 | 11.47 | 121.09 | 10.56 |
| Total PCBs | 1984 | 197.6 | 2.2 | 5.21 | 11.47 | 75.66 | 6.60 |
| Total PCBs | 1984 | 197.6 | 2.2 | 5.21 | 11.47 | 33.58 | 2.93 |
| Total PCBs | 1985 | 197.6 | 0.913 | 5.21 | 4.76 | 21.05 | 4.42 |
| Total PCBs | 1985 | 197.6 | 0.913 | 5.21 | 4.76 | 36.89 | 7.75 |
| Total PCBs | 1980 | 197.6 | 0.376 | 4.27 | 1.61 | 98.79 | 61.54 |
| Total PCBs | 1981 | 197.6 | 0.519 | 4.27 | 2.22 | 16.99 | 7.67 |
| Total PCBs | 1982 | 197.6 | 25.26 | 4.27 | 107.84 | 72.54 | 0.67 |
| Total PCBs | 1984 | 197.6 | 1.65 | 4.27 | 7.04 | 50.40 | 7.15 |
| Total PCBs | 1984 | 197.6 | 1.65 | 4.27 | 7.04 | 39.37 | 5.59 |
| Total PCBs | 1984 | 197.6 | 1.65 | 4.27 | 7.04 | 16.54 | 2.35 |
| Total PCBs | 1985 | 197.6 | 0.773 | 4.27 | 3.30 | 57.55 | 17.44 |
| Total PCBs | 1985 | 197.6 | 0.773 | 4.27 | 3.30 | 49.81 | 15.09 |
| Total PCBs | 1985 | 197.6 | 0.773 | 4.27 | 3.30 | 59.59 | 18.06 |
| Total PCBs | 1980 | 197.6 | 0.431 | 3.12 | 1.34 | 33.33 | 24.81 |
| Total PCBs | 1980 | 197.6 | 0.431 | 3.12 | 1.34 | 17.10 | 12.73 |
| Total PCBs | 1981 | 197.6 | 0.59 | 3.12 | 1.84 | 2.83 | 1.54 |
| Total PCBs | 1982 | 197.6 | 2 | 3.12 | 6.23 | 16.13 | 2.59 |
| Total PCBs | 1984 | 197.6 | 0.45 | 3.12 | 1.40 | 29.27 | 20.86 |
| Total PCBs | 1984 | 197.6 | 0.45 | 3.12 | 1.40 | 43.97 | 31.34 |
| Total PCBs | 1984 | 197.6 | 0.45 | 3.12 | 1.40 | 45.09 | 32.14 |
| Total PCBs | 1985 | 197.6 | 0.25 | 3.12 | 0.78 | 16.25 | 20.85 |
| Total PCBs | 1978 | 193.9 | 10.76 | 5.04 | 54.27 | 271.78 | 5.01 |
| Total PCBs | 1978 | 193.9 | 12.24 | 5.04 | 61.73 | 271.78 | 4.40 |
| Total PCBs | 1978 | 193.9 | 12.76 | 5.04 | 64.35 | 271.78 | 4.22 |

Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concen tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1978 | 193.9 | 14.24 | 5.04 | 71.82 | 271.78 | 3.78 |
| Total PCBs | 1978 | 193.9 | 16.35 | 5.04 | 82.46 | 271.78 | 3.30 |
| Total PCBs | 1978 | 193.9 | 18.35 | 5.04 | 92.54 | 271.78 | 2.94 |
| Total PCBs | 1978 | 193.9 | 20.07 | 5.04 | 101.22 | 271.78 | 2.69 |
| Total PCBs | 1978 | 193.9 | 21.55 | 5.04 | 108.68 | 271.78 | 2.50 |
| Total PCBs | 1978 | 193.9 | 25.66 | 5.04 | 129.41 | 271.78 | 2.10 |
| Total PCBs | 1978 | 193.9 | 10.76 | 5.04 | 54.27 | 271.78 | 5.01 |
| Total PCBs | 1978 | 193.9 | 12.24 | 5.04 | 61.73 | 271.78 | 4.40 |
| Total PCBs | 1978 | 193.9 | 12.76 | 5.04 | 64.35 | 271.78 | 4.22 |
| Total PCBs | 1978 | 193.9 | 14.24 | 5.04 | 71.82 | 271.78 | 3.78 |
| Total PCBs | 1978 | 193.9 | 16.35 | 5.04 | 82.46 | 271.78 | 3.30 |
| Total PCBs | 1978 | 193.9 | 18.35 | 5.04 | 92.54 | 271.78 | 2.94 |
| Total PCBs | 1978 | 193.9 | 20.07 | 5.04 | 101.22 | 271.78 | 2.69 |
| Total PCBs | 1978 | 193.9 | 21.55 | 5.04 | 108.68 | 271.78 | 2.50 |
| Total PCBs | 1978 | 193.9 | 25.66 | 5.04 | 129.41 | 271.78 | 2.10 |
| Total PCBs | 1978 | 193.9 | 10.76 | 5.04 | 54.27 | 271.78 | 5.01 |
| Total PCBs | 1978 | 193.9 | 12.24 | 5.04 | 61.73 | 271.78 | 4.40 |
| Total PCBs | 1978 | 193.9 | 12.76 | 5.04 | 64.35 | 271.78 | 4.22 |
| Total PCBs | 1978 | 193.9 | 14.24 | 5.04 | 71.82 | 271.78 | 3.78 |
| Total PCBs | 1978 | 193.9 | 16.35 | 5.04 | 82.46 | 271.78 | 3.30 |
| Total PCBs | 1978 | 193.9 | 18.35 | 5.04 | 92.54 | 271.78 | 2.94 |
| Total PCBs | 1978 | 193.9 | 20.07 | 5.04 | 101.22 | 271.78 | 2.69 |
| Total PCBs | 1978 | 193.9 | 21.55 | 5.04 | 108.68 | 271.78 | 2.50 |
| Total PCBs | 1978 | 193.9 | 25.66 | 5.04 | 129.41 | 271.78 | 2.10 |
| Total PCBs | 1980 | 193.9 | 4.23 | 5.04 | 21.33 | 95.41 | 4.47 |
| Total PCBs | 1980 | 193.9 | 4.23 | 5.04 | 21.33 | 200.00 | 9.38 |
| Total PCBs | 1981 | 193.9 | 8.82 | 5.04 | 44.48 | 77.42 | 1.74 |
| Total PCBs | 1982 | 193.9 | 11.16 | 5.04 | 56.28 | 194.95 | 3.46 |
| Total PCBs | 1982 | 193.9 | 11.16 | 5.04 | 56.28 | 275.00 | 4.89 |

Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concen tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1984 | 193.9 | 14.2 | 5.04 | 71.62 | 355.57 | 4.96 |
| Total PCBs | 1984 | 193.9 | 14.2 | 5.04 | 71.62 | 482.61 | 6.74 |
| Total PCBs | 1985 | 193.9 | 6.36 | 5.04 | 32.08 | 456.50 | 14.23 |
| Total PCBs | 1985 | 193.9 | 6.36 | 5.04 | 32.08 | 261.50 | 8.15 |
| Total PCBs | 1985 | 193.9 | 6.36 | 5.04 | 32.08 | 287.24 | 8.96 |
| Total PCBs | 1985 | 193.9 | 6.36 | 5.04 | 32.08 | 290.53 | 9.06 |
| Total PCBs | 1985 | 193.9 | 6.36 | 5.04 | 32.08 | 307.82 | 9.60 |
| Total PCBs | 1985 | 193.9 | 6.36 | 5.04 | 32.08 | 311.11 | 9.70 |
| Total PCBs | 1980 | 193.9 | 2.72 | 3.17 | 8.62 | 61.90 | 7.18 |
| Total PCBs | 1980 | 193.9 | 2.72 | 3.17 | 8.62 | 98.49 | 11.43 |
| Total PCBs | 1981 | 193.9 | 3.88 | 3.17 | 12.29 | 69.60 | 5.66 |
| Total PCBs | 1981 | 193.9 | 3.88 | 3.17 | 12.29 | 79.24 | 6.44 |
| Total PCBs | 1981 | 193.9 | 3.88 | 3.17 | 12.29 | 57.32 | 4.66 |
| Total PCBs | 1982 | 193.9 | 8.32 | 3.17 | 26.36 | 287.26 | 10.90 |
| Total PCBs | 1982 | 193.9 | 8.32 | 3.17 | 26.36 | 509.09 | 19.31 |
| Total PCBs | 1984 | 193.9 | 12.64 | 3.17 | 40.05 | 159.78 | 3.99 |
| Total PCBs | 1984 | 193.9 | 12.64 | 3.17 | 40.05 | 163.41 | 4.08 |
| Total PCBs | 1984 | 193.9 | 12.64 | 3.17 | 40.05 | 163.77 | 4.09 |
| Total PCBs | 1984 | 193.9 | 12.64 | 3.17 | 40.05 | 167.39 | 4.18 |
| Total PCBs | 1984 | 193.9 | 12.64 | 3.17 | 40.05 | 164.36 | 4.10 |
| Total PCBs | 1984 | 193.9 | 12.64 | 3.17 | 40.05 | 133.71 | 3.34 |
| Total PCBs | 1984 | 193.9 | 12.64 | 3.17 | 40.05 | 128.16 | 3.20 |
| Total PCBs | 1984 | 193.9 | 12.64 | 3.17 | 40.05 | 111.43 | 2.78 |
| Total PCBs | 1984 | 193.9 | 12.64 | 3.17 | 40.05 | 157.19 | 3.92 |
| Total PCBs | 1985 | 193.9 | 6.78 | 3.17 | 21.48 | 168.21 | 7.83 |
| Total PCBs | 1985 | 193.9 | 6.78 | 3.17 | 21.48 | 298.46 | 13.89 |
| Total PCBs | 1985 | 193.9 | 6.78 | 3.17 | 21.48 | 301.00 | 14.01 |
| Total PCBs | 1985 | 193.9 | 6.78 | 3.17 | 21.48 | 199.89 | 9.30 |
| Total PCBs | 1980 | 193.9 | 1.187 | 2.58 | 3.06 | 39.74 | 12.99 |

Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concen tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1980 | 193.9 | 1.187 | 2.58 | 3.06 | 90.85 | 29.70 |
| Total PCBs | 1981 | 193.9 | 3.573 | 2.58 | 9.21 | 114.92 | 12.48 |
| Total PCBs | 1982 | 193.9 | 5.4 | 2.58 | 13.92 | 143.00 | 10.28 |
| Total PCBs | 1982 | 193.9 | 4.71 | 2.58 | 12.14 | 143.00 | 11.78 |
| Total PCBs | 1983 | 193.9 | 3.7 | 2.58 | 9.54 | 106.15 | 11.13 |
| Total PCBs | 1983 | 193.9 | 3.57 | 2.58 | 9.20 | 106.15 | 11.54 |
| Total PCBs | 1983 | 193.9 | 3.83 | 2.58 | 9.87 | 106.15 | 10.75 |
| Total PCBs | 1983 | 193.9 | 3.51 | 2.58 | 9.05 | 106.15 | 11.73 |
| Total PCBs | 1983 | 193.9 | 3.62 | 2.58 | 9.33 | 106.15 | 11.38 |
| Total PCBs | 1983 | 193.9 | 3.7 | 2.58 | 9.54 | 92.24 | 9.67 |
| Total PCBs | 1983 | 193.9 | 3.57 | 2.58 | 9.20 | 92.24 | 10.03 |
| Total PCBs | 1983 | 193.9 | 3.83 | 2.58 | 9.87 | 92.24 | 9.35 |
| Total PCBs | 1983 | 193.9 | 3.51 | 2.58 | 9.05 | 92.24 | 10.20 |
| Total PCBs | 1983 | 193.9 | 3.62 | 2.58 | 9.33 | 92.24 | 9.89 |
| Total PCBs | 1984 | 193.9 | 6.34 | 2.58 | 16.34 | 190.35 | 11.65 |
| Total PCBs | 1984 | 193.9 | 6.34 | 2.58 | 16.34 | 77.42 | 4.74 |
| Total PCBs | 1984 | 193.9 | 6.34 | 2.58 | 16.34 | 132.44 | 8.11 |
| Total PCBs | 1984 | 193.9 | 6.34 | 2.58 | 16.34 | 119.04 | 7.29 |
| Total PCBs | 1984 | 193.9 | 6.34 | 2.58 | 16.34 | 122.94 | 7.52 |
| Total PCBs | 1984 | 193.9 | 6.34 | 2.58 | 16.34 | 125.82 | 7.70 |
| Total PCBs | 1984 | 193.9 | 6.34 | 2.58 | 16.34 | 129.72 | 7.94 |
| Total PCBs | 1985 | 193.9 | 6.69 | 2.58 | 17.24 | 368.57 | 21.38 |
| Total PCBs | 1980 | 189.4 | 10.28 | 4.18 | 42.99 | 75.17 | 1.75 |
| Total PCBs | 1980 | 189.4 | 18.54 | 4.18 | 77.53 | 75.17 | 0.97 |
| Total PCBs | 1980 | 189.4 | 29.1 | 4.18 | 121.69 | 75.17 | 0.62 |
| Total PCBs | 1980 | 189.4 | 10.28 | 4.18 | 42.99 | 122.91 | 2.86 |
| Total PCBs | 1980 | 189.4 | 18.54 | 4.18 | 77.53 | 122.91 | 1.59 |
| Total PCBs | 1980 | 189.4 | 29.1 | 4.18 | 121.69 | 122.91 | 1.01 |
| Total PCBs | 1980 | 189.4 | 10.28 | 4.18 | 42.99 | 121.75 | 2.83 |

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Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concen tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1980 | 189.4 | 18.54 | 4.18 | 77.53 | 121.75 | 1.57 |
| Total PCBs | 1980 | 189.4 | 29.1 | 4.18 | 121.69 | 121.75 | 1.00 |
| Total PCBs | 1980 | 189.4 | 10.28 | 4.18 | 42.99 | 64.93 | 1.51 |
| Total PCBs | 1980 | 189.4 | 18.54 | 4.18 | 77.53 | 64.93 | 0.84 |
| Total PCBs | 1980 | 189.4 | 29.1 | 4.18 | 121.69 | 64.93 | 0.53 |
| Total PCBs | 1978 | 189.4 | 27.16 | 4.34 | 117.79 | 733.09 | 6.22 |
| Total PCBs | 1978 | 189.4 | 27.43 | 4.34 | 118.96 | 733.09 | 6.16 |
| Total PCBs | 1978 | 189.4 | 29.41 | 4.34 | 127.55 | 733.09 | 5.75 |
| Total PCBs | 1978 | 189.4 | 29.68 | 4.34 | 128.72 | 733.09 | 5.70 |
| Total PCBs | 1978 | 189.4 | 27.16 | 4.34 | 117.79 | 733.09 | 6.22 |
| Total PCBs | 1978 | 189.4 | 27.43 | 4.34 | 118.96 | 733.09 | 6.16 |
| Total PCBs | 1978 | 189.4 | 29.41 | 4.34 | 127.55 | 733.09 | 5.75 |
| Total PCBs | 1978 | 189.4 | 29.68 | 4.34 | 128.72 | 733.09 | 5.70 |
| Total PCBs | 1980 | 189.4 | 4.45 | 4.34 | 19.30 | 94.50 | 4.90 |
| Total PCBs | 1980 | 189.4 | 4.45 | 4.34 | 19.30 | 85.68 | 4.44 |
| Total PCBs | 1981 | 189.4 | 11.25 | 4.34 | 48.79 | 143.86 | 2.95 |
| Total PCBs | 1981 | 189.4 | 11.25 | 4.34 | 48.79 | 163.98 | 3.36 |
| Total PCBs | 1982 | 189.4 | 83.6 | 4.34 | 362.58 | 254.22 | 0.70 |
| Total PCBs | 1982 | 189.4 | 83.6 | 4.34 | 362.58 | 211.97 | 0.58 |
| Total PCBs | 1982 | 189.4 | 83.6 | 4.34 | 362.58 | 158.30 | 0.44 |
| Total PCBs | 1982 | 189.4 | 83.6 | 4.34 | 362.58 | 209.87 | 0.58 |
| Total PCBs | 1984 | 189.4 | 8.23 | 4.34 | 35.69 | 301.77 | 8.45 |
| Total PCBs | 1984 | 189.4 | 8.23 | 4.34 | 35.69 | 536.97 | 15.04 |
| Total PCBs | 1984 | 189.4 | 8.23 | 4.34 | 35.69 | 539.25 | 15.11 |
| Total PCBs | 1984 | 189.4 | 8.23 | 4.34 | 35.69 | 544.94 | 15.27 |
| Total PCBs | 1984 | 189.4 | 8.23 | 4.34 | 35.69 | 547.21 | 15.33 |
| Total PCBs | 1985 | 189.4 | 4.27 | 4.34 | 18.52 | 234.51 | 12.66 |
| Total PCBs | 1985 | 189.4 | 4.27 | 4.34 | 18.52 | 238.00 | 12.85 |
| Total PCBs | 1985 | 189.4 | 4.27 | 4.34 | 18.52 | 223.72 | 12.08 |

Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concen tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1985 | 189.4 | 4.27 | 4.34 | 18.52 | 213.33 | 11.52 |
| Total PCBs | 1985 | 189.4 | 4.27 | 4.34 | 18.52 | 185.24 | 10.00 |
| Total PCBs | 1980 | 189.4 | 1.616 | 3.00 | 4.85 | 105.60 | 21.77 |
| Total PCBs | 1980 | 189.4 | 1.616 | 3.00 | 4.85 | 102.69 | 21.17 |
| Total PCBs | 1981 | 189.4 | 5.15 | 3.00 | 15.46 | 100.43 | 6.50 |
| Total PCBs | 1981 | 189.4 | 5.15 | 3.00 | 15.46 | 63.01 | 4.08 |
| Total PCBs | 1981 | 189.4 | 5.15 | 3.00 | 15.46 | 165.63 | 10.71 |
| Total PCBs | 1982 | 189.4 | 17.66 | 3.00 | 53.01 | 293.02 | 5.53 |
| Total PCBs | 1982 | 189.4 | 17.66 | 3.00 | 53.01 | 215.38 | 4.06 |
| Total PCBs | 1982 | 189.4 | 17.66 | 3.00 | 53.01 | 218.57 | 4.12 |
| Total PCBs | 1982 | 189.4 | 17.66 | 3.00 | 53.01 | 208.70 | 3.94 |
| Total PCBs | 1984 | 189.4 | 17.68 | 3.00 | 53.07 | 94.66 | 1.78 |
| Total PCBs | 1984 | 189.4 | 17.68 | 3.00 | 53.07 | 91.19 | 1.72 |
| Total PCBs | 1984 | 189.4 | 17.68 | 3.00 | 53.07 | 142.66 | 2.69 |
| Total PCBs | 1984 | 189.4 | 17.68 | 3.00 | 53.07 | 149.08 | 2.81 |
| Total PCBs | 1984 | 189.4 | 17.68 | 3.00 | 53.07 | 142.45 | 2.68 |
| Total PCBs | 1985 | 189.4 | 4.19 | 3.00 | 12.58 | 117.11 | 9.31 |
| Total PCBs | 1985 | 189.4 | 4.19 | 3.00 | 12.58 | 179.33 | 14.26 |
| Total PCBs | 1985 | 189.4 | 4.19 | 3.00 | 12.58 | 150.00 | 11.93 |
| Total PCBs | 1980 | 189.4 | 1.675 | 2.70 | 4.52 | 38.74 | 8.57 |
| Total PCBs | 1980 | 189.4 | 1.675 | 2.70 | 4.52 | 73.11 | 16.17 |
| Total PCBs | 1981 | 189.4 | 4.74 | 2.70 | 12.79 | 166.51 | 13.02 |
| Total PCBs | 1981 | 189.4 | 4.74 | 2.70 | 12.79 | 119.19 | 9.32 |
| Total PCBs | 1981 | 189.4 | 4.74 | 2.70 | 12.79 | 87.83 | 6.87 |
| Total PCBs | 1982 | 189.4 | 3.92 | 2.70 | 10.58 | 134.97 | 12.76 |
| Total PCBs | 1982 | 189.4 | 3.92 | 2.70 | 10.58 | 103.73 | 9.81 |
| Total PCBs | 1983 | 189.4 | 4.3 | 2.70 | 11.60 | 163.88 | 14.12 |
| Total PCBs | 1983 | 189.4 | 4.3 | 2.70 | 11.60 | 213.79 | 18.42 |
| Total PCBs | 1984 | 189.4 | 5.32 | 2.70 | 14.36 | 148.77 | 10.36 |

Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concen tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1984 | 189.4 | 5.32 | 2.70 | 14.36 | 185.48 | 12.92 |
| Total PCBs | 1984 | 189.4 | 5.32 | 2.70 | 14.36 | 152.08 | 10.59 |
| Total PCBs | 1984 | 189.4 | 5.32 | 2.70 | 14.36 | 132.62 | 9.24 |
| Total PCBs | 1981 | 181.8 | 6.78 | 5.61 | 38.04 | 145.30 | 3.82 |
| Total PCBs | 1978 | 169 | 12.45 | 4.78 | 59.46 | 181.99 | 3.06 |
| Total PCBs | 1978 | 169 | 13.46 | 4.78 | 64.28 | 181.99 | 2.83 |
| Total PCBs | 1978 | 169 | 14.82 | 4.78 | 70.78 | 181.99 | 2.57 |
| Total PCBs | 1978 | 169 | 15.83 | 4.78 | 75.60 | 181.99 | 2.41 |
| Total PCBs | 1978 | 169 | 17.71 | 4.78 | 84.58 | 181.99 | 2.15 |
| Total PCBs | 1978 | 169 | 18.72 | 4.78 | 89.40 | 181.99 | 2.04 |
| Total PCBs | 1978 | 169 | 24.03 | 4.78 | 114.76 | 181.99 | 1.59 |
| Total PCBs | 1978 | 169 | 26.4 | 4.78 | 126.08 | 181.99 | 1.44 |
| Total PCBs | 1978 | 169 | 29.29 | 4.78 | 139.88 | 181.99 | 1.30 |
| Total PCBs | 1980 | 169 | 5.5 | 4.78 | 26.27 | 131.61 | 5.01 |
| Total PCBs | 1980 | 169 | 5.5 | 4.78 | 26.27 | 148.83 | 5.67 |
| Total PCBs | 1981 | 169 | 7.54 | 4.78 | 36.01 | 77.12 | 2.14 |
| Total PCBs | 1981 | 169 | 7.54 | 4.78 | 36.01 | 95.83 | 2.66 |
| Total PCBs | 1981 | 169 | 7.54 | 4.78 | 36.01 | 181.35 | 5.04 |
| Total PCBs | 1981 | 169 | 7.54 | 4.78 | 36.01 | 165.56 | 4.60 |
| Total PCBs | 1982 | 169 | 57.3 | 4.78 | 273.65 | 157.46 | 0.58 |
| Total PCBs | 1982 | 169 | 57.3 | 4.78 | 273.65 | 140.00 | 0.51 |
| Total PCBs | 1984 | 169 | 4.9 | 4.78 | 23.40 | 481.28 | 20.57 |
| Total PCBs | 1984 | 169 | 4.9 | 4.78 | 23.40 | 478.45 | 20.45 |
| Total PCBs | 1984 | 169 | 4.9 | 4.78 | 23.40 | 327.07 | 13.98 |
| Total PCBs | 1984 | 169 | 4.9 | 4.78 | 23.40 | 260.00 | 11.11 |
| Total PCBs | 1984 | 169 | 4.9 | 4.78 | 23.40 | 252.82 | 10.80 |
| Total PCBs | 1984 | 169 | 4.9 | 4.78 | 23.40 | 244.16 | 10.43 |
| Total PCBs | 1985 | 169 | 4.68 | 4.78 | 22.35 | 182.46 | 8.16 |
| Total PCBs | 1985 | 169 | 4.68 | 4.78 | 22.35 | 111.72 | 5.00 |

Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concen tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1985 | 169 | 4.68 | 4.78 | 22.35 | 184.11 | 8.24 |
| Total PCBs | 1980 | 169 | 4 | 4.25 | 16.99 | 166.09 | 9.78 |
| Total PCBs | 1980 | 169 | 4 | 4.25 | 16.99 | 247.80 | 14.59 |
| Total PCBs | 1981 | 169 | 6.24 | 4.25 | 26.50 | 235.44 | 8.88 |
| Total PCBs | 1981 | 169 | 6.24 | 4.25 | 26.50 | 191.04 | 7.21 |
| Total PCBs | 1981 | 169 | 6.24 | 4.25 | 26.50 | 178.17 | 6.72 |
| Total PCBs | 1981 | 169 | 6.24 | 4.25 | 26.50 | 52.12 | 1.97 |
| Total PCBs | 1982 | 169 | 7.06 | 4.25 | 29.99 | 219.26 | 7.31 |
| Total PCBs | 1982 | 169 | 7.06 | 4.25 | 29.99 | 224.80 | 7.50 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 154.09 | 9.18 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 64.38 | 3.84 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 241.85 | 14.41 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 397.00 | 23.66 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 574.46 | 34.24 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 18.75 | 1.12 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 70.44 | 4.20 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 115.63 | 6.89 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 167.31 | 9.97 |
| Total PCBs | 1984 | 169 | 3.95 | 4.25 | 16.78 | 139.66 | 8.32 |
| Total PCBs | 1985 | 169 | 5.2 | 4.25 | 22.09 | 159.42 | 7.22 |
| Total PCBs | 1985 | 169 | 5.2 | 4.25 | 22.09 | 109.42 | 4.95 |
| Total PCBs | 1985 | 169 | 5.2 | 4.25 | 22.09 | 129.71 | 5.87 |
| Total PCBs | 1980 | 169 | 1.571 | 4.55 | 7.15 | 133.61 | 18.68 |
| Total PCBs | 1980 | 169 | 1.571 | 4.55 | 7.15 | 64.47 | 9.01 |
| Total PCBs | 1982 | 169 | 5.26 | 4.55 | 23.95 | 163.87 | 6.84 |
| Total PCBs | 1983 | 169 | 4.12 | 4.55 | 18.76 | 183.84 | 9.80 |
| Total PCBs | 1983 | 169 | 4.12 | 4.55 | 18.76 | 193.71 | 10.33 |
| Total PCBs | 1983 | 169 | 4.12 | 4.55 | 18.76 | 190.24 | 10.14 |
| Total PCBs | 1984 | 169 | 3.466 | 4.55 | 15.78 | 210.00 | 13.31 |

Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concentration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1984 | 169 | 3.466 | 4.55 | 15.78 | 248.51 | 15.75 |
| Total PCBs | 1984 | 169 | 3.466 | 4.55 | 15.78 | 247.27 | 15.67 |
| Total PCBs | 1984 | 169 | 3.466 | 4.55 | 15.78 | 248.67 | 15.76 |
| Total PCBs | 1984 | 169 | 3.466 | 4.55 | 15.78 | 254.60 | 16.13 |
| Total PCBs | 1984 | 169 | 3.466 | 4.55 | 15.78 | 256.00 | 16.22 |
| Total PCBs | 1985 | 169 | 5.21 | 4.55 | 23.72 | 203.07 | 8.56 |
| Total PCBs | 1985 | 169 | 5.66 | 4.55 | 25.77 | 203.07 | 7.88 |
| Total PCBs | 1985 | 169 | 5.21 | 4.55 | 23.72 | 140.13 | 5.91 |
| Total PCBs | 1985 | 169 | 5.66 | 4.55 | 25.77 | 140.13 | 5.44 |
| Total PCBs | 1980 | 158 | 1.899 | 4.94 | 9.38 | 69.78 | 7.44 |
| Total PCBs | 1980 | 158 | 1.899 | 4.94 | 9.38 | 86.54 | 9.22 |
| Total PCBs | 1982 | 158 | 15.11 | 4.94 | 74.65 | 94.32 | 1.26 |
| Total PCBs | 1982 | 158 | 15.11 | 4.94 | 74.65 | 152.33 | 2.04 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 129.96 | 20.67 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 124.98 | 19.87 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 12.41 | 1.97 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 56.57 | 8.99 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 134.44 | 21.38 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 178.59 | 28.40 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 8.71 | 1.39 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 39.72 | 6.32 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 94.41 | 15.01 |
| Total PCBs | 1985 | 158 | 1.273 | 4.94 | 6.29 | 125.42 | 19.94 |
| Total PCBs | 1982 | 158 | 3.9 | 5.34 | 20.83 | 136.97 | 6.58 |
| Total PCBs | 1982 | 158 | 3.9 | 5.34 | 20.83 | 150.91 | 7.24 |
| Total PCBs | 1984 | 158 | 2.84 | 5.34 | 15.17 | 148.21 | 9.77 |
| Total PCBs | 1984 | 158 | 2.84 | 5.34 | 15.17 | 128.60 | 8.48 |
| Total PCBs | 1984 | 158 | 2.84 | 5.34 | 15.17 | 172.29 | 11.36 |
| Total PCBs | 1984 | 158 | 2.84 | 5.34 | 15.17 | 189.72 | 12.51 |

Table 10-4
Ratio of Lipid-Normalized PCB Concentration in Individual Species
on Multiplate Samplers to Particulate Organic Carbon in the Water Column

| Parameter | Year | River Mile | PCB Concen tration (mg/kg) | TSS/POC | mg PCB per kg OC | Lipid-Normalized Individual Species Concentration (mg/kg) | Ratio of Species to PCB - OC |
|---|---|---|---|---|---|---|---|
| Total PCBs | 1985 | 158 | 1.777 | 5.34 | 9.49 | 119.76 | 12.62 |
| Total PCBs | 1985 | 158 | 1.777 | 5.34 | 9.49 | 120.98 | 12.75 |
| Total PCBs | 1985 | 158 | 1.777 | 5.34 | 9.49 | 121.38 | 12.79 |
| Total PCBs | 1985 | 158 | 1.777 | 5.34 | 9.49 | 122.61 | 12.92 |
| Total PCBs | 1980 | 158 | 1.293 | 5.73 | 7.41 | 87.97 | 11.87 |
| Total PCBs | 1980 | 158 | 1.293 | 5.73 | 7.41 | 79.32 | 10.70 |
| Total PCBs | 1982 | 158 | 2.196 | 5.73 | 12.59 | 156.35 | 12.42 |
| Total PCBs | 1982 | 158 | 2.196 | 5.73 | 12.59 | 175.91 | 13.98 |
| Total PCBs | 1983 | 158 | 2.879 | 5.73 | 16.50 | 175.96 | 10.66 |
| Total PCBs | 1983 | 158 | 2.879 | 5.73 | 16.50 | 176.88 | 10.72 |
| Total PCBs | 1983 | 158 | 2.879 | 5.73 | 16.50 | 176.92 | 10.72 |
| Total PCBs | 1983 | 158 | 2.879 | 5.73 | 16.50 | 168.44 | 10.21 |
| Total PCBs | 1983 | 158 | 2.879 | 5.73 | 16.50 | 136.24 | 8.26 |
| Total PCBs | 1984 | 158 | 1.889 | 5.73 | 10.83 | 168.95 | 15.60 |
| Total PCBs | 1984 | 158 | 1.889 | 5.73 | 10.83 | 189.51 | 17.50 |
| Total PCBs | 1984 | 158 | 1.889 | 5.73 | 10.83 | 146.94 | 13.57 |
| Total PCBs | 1984 | 158 | 1.889 | 5.73 | 10.83 | 85.63 | 7.91 |
| Total PCBs | 1981 | 153.3 | 2.312 | 7.31 | 16.89 | 88.85 | 5.26 |
| Total PCBs | 1982 | 153.3 | 41.86 | 7.31 | 305.85 | 118.29 | 0.39 |

Table 10-5
Ratio of Lipid-Normalized Pumpkinseed < 10cm to Lipid-Normalized Multiplate Samplers for Aroclor 1016

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 1979 | | 672.49 | 160.79 | 4.18 |
| 1979 | | 760.56 | 160.79 | 4.73 |
| 1979 | | 636.36 | 160.79 | 3.96 |
| 1979 | | 604.08 | 160.79 | 3.76 |
| 1979 | | 729.28 | 160.79 | 4.54 |
| 1979 | | 726.26 | 160.79 | 4.52 |
| 1979 | | 697.80 | 160.79 | 4.34 |
| 1979 | | 648.15 | 160.79 | 4.03 |
| 1979 | | 705.20 | 160.79 | 4.39 |
| 1979 | | 681.82 | 160.79 | 4.24 |
| 1979 | | 703.49 | 160.79 | 4.38 |
| 1979 | | 614.58 | 160.79 | 3.82 |
| 1979 | | 723.93 | 160.79 | 4.50 |
| 1979 | | 668.87 | 160.79 | 4.16 |
| 1979 | | 674.42 | 160.79 | 4.19 |
| 1979 | | 720.78 | 160.79 | 4.48 |
| 1980 | | 535.03 | 66.27 | 8.07 |
| 1980 | | 494.16 | 66.27 | 7.46 |
| 1980 | | 512.50 | 66.27 | 7.73 |
| 1980 | | 478.77 | 66.27 | 7.22 |
| 1980 | | 411.41 | 66.27 | 6.21 |
| 1980 | | 447.62 | 66.27 | 6.75 |
| 1980 | | 587.93 | 66.27 | 8.87 |
| 1980 | | 406.91 | 66.27 | 6.14 |
| 1980 | | 506.70 | 66.27 | 7.65 |
| 1980 | | 459.06 | 66.27 | 6.93 |
| 1980 | | 644.51 | 66.27 | 9.73 |
| 1980 | | 480.00 | 66.27 | 7.24 |
| 1980 | | 601.91 | 66.27 | 9.08 |
| 1980 | | 575.34 | 66.27 | 8.68 |
| 1980 | | 657.28 | 66.27 | 9.92 |
| 1980 | | 483.60 | 66.27 | 7.30 |
| 1980 | | 453.57 | 66.27 | 6.84 |
| 1980 | | 434.26 | 66.27 | 6.55 |
| 1980 | | 414.35 | 66.27 | 6.25 |
| 1980 | | 378.21 | 66.27 | 5.71 |
| 1980 | | 384.16 | 66.27 | 5.80 |
| 1980 | | 425.22 | 66.27 | 6.42 |
| 1980 | | 430.51 | 66.27 | 6.50 |
| 1980 | | 469.26 | 66.27 | 7.08 |
| 1980 | | 441.56 | 66.27 | 6.66 |
| 1981 | 83 | 346.15 | 556.60 | 0.62 |
| 1981 | 90 | 14.47 | 556.60 | 0.03 |
| 1981 | 92 | 258.41 | 556.60 | 0.46 |
| 1981 | 92 | 300.90 | 556.60 | 0.54 |
| 1981 | 93 | 283.23 | 556.60 | 0.51 |

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Source: NYSDOH; NYSDEC

Table 10-5
Ratio of Lipid-Normalized Pumpkinseed < 10cm to Lipid-Normalized Multiplate Samplers for Aroclor 1016

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 1981 | 97 | 252.66 | 556.60 | 0.45 |
| 1981 | 97 | 372.37 | 556.60 | 0.67 |
| 1981 | 98 | 241.88 | 556.60 | 0.43 |
| 1981 | 99 | 316.72 | 556.60 | 0.57 |
| 1981 | 99 | 322.98 | 556.60 | 0.58 |
| 1982 | 82 | 158.54 | 227.75 | 0.70 |
| 1982 | 84 | 220.24 | 227.75 | 0.97 |
| 1982 | 85 | 233.22 | 227.75 | 1.02 |
| 1982 | 85 | 148.85 | 227.75 | 0.65 |
| 1982 | 87 | 263.72 | 227.75 | 1.16 |
| 1982 | 87 | 208.48 | 227.75 | 0.92 |
| 1982 | 88 | 216.55 | 227.75 | 0.95 |
| 1982 | 89 | 194.00 | 227.75 | 0.85 |
| 1982 | 91 | 158.80 | 227.75 | 0.70 |
| 1982 | 92 | 215.09 | 227.75 | 0.94 |
| 1982 | 92 | 265.25 | 227.75 | 1.16 |
| 1982 | 93 | 230.83 | 227.75 | 1.01 |
| 1982 | 93 | 243.86 | 227.75 | 1.07 |
| 1982 | 93 | 228.45 | 227.75 | 1.00 |
| 1982 | 93 | 209.26 | 227.75 | 0.92 |
| 1982 | 95 | 267.81 | 227.75 | 1.18 |
| 1982 | 96 | 231.58 | 227.75 | 1.02 |
| 1982 | 98 | 236.43 | 227.75 | 1.04 |
| 1983 | 79 | 212.80 | 452.86 | 0.47 |
| 1983 | 81 | 217.86 | 452.86 | 0.48 |
| 1983 | 81 | 253.70 | 452.86 | 0.56 |
| 1983 | 81 | 259.45 | 452.86 | 0.57 |
| 1983 | 81 | 173.85 | 452.86 | 0.38 |
| 1983 | 83 | 121.17 | 452.86 | 0.27 |
| 1983 | 85 | 230.40 | 452.86 | 0.51 |
| 1983 | 85 | 249.40 | 452.86 | 0.55 |
| 1983 | 85 | 183.75 | 452.86 | 0.41 |
| 1983 | 85 | 246.18 | 452.86 | 0.54 |
| 1983 | 86 | 273.84 | 452.86 | 0.60 |
| 1983 | 86 | 215.93 | 452.86 | 0.48 |
| 1983 | 86 | 256.62 | 452.86 | 0.57 |
| 1983 | 95 | 146.12 | 452.86 | 0.32 |
| 1984 | 83 | 150.69 | 384.21 | 0.39 |
| 1984 | 84 | 173.44 | 384.21 | 0.45 |
| 1984 | 84 | 193.06 | 384.21 | 0.50 |
| 1984 | 86 | 318.80 | 384.21 | 0.83 |
| 1984 | 87 | 206.92 | 384.21 | 0.54 |
| 1984 | 87 | 290.43 | 384.21 | 0.76 |
| 1984 | 88 | 245.60 | 384.21 | 0.64 |
| 1984 | 88 | 172.14 | 384.21 | 0.45 |
| 1984 | 90 | 204.67 | 384.21 | 0.53 |





Source: NYSDOH; NYSDEC

Table 10-5

Ratio of Lipid-Normalized Pumpkinseed < 10cm to Lipid-Normalized Multiplate Samplers for Aroclor 1016

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 1984 | 90 | 147.58 | 384.21 | 0.38 |
| 1984 | 91 | 210.00 | 384.21 | 0.55 |
| 1984 | 91 | 433.91 | 384.21 | 1.13 |
| 1984 | 92 | 241.25 | 384.21 | 0.63 |
| 1984 | 92 | 121.72 | 384.21 | 0.32 |
| 1984 | 94 | 247.92 | 384.21 | 0.65 |
| 1984 | 94 | 159.58 | 384.21 | 0.42 |
| 1984 | 94 | 141.60 | 384.21 | 0.37 |
| 1984 | 94 | 228.70 | 384.21 | 0.60 |
| 1984 | 95 | 234.29 | 384.21 | 0.61 |
| 1984 | 95 | 186.36 | 384.21 | 0.49 |
| 1984 | 95 | 162.42 | 384.21 | 0.42 |
| 1984 | 97 | 175.24 | 384.21 | 0.46 |
| 1984 | 97 | 225.00 | 384.21 | 0.59 |
| 1984 | 98 | 145.65 | 384.21 | 0.38 |
| 1984 | 99 | 224.83 | 384.21 | 0.59 |
| 1985 | 85 | 20.30 | 226.06 | 0.09 |
| 1985 | 85 | 148.75 | 226.06 | 0.66 |
| 1985 | 91 | 110.33 | 226.06 | 0.49 |
| 1985 | 93 | 236.00 | 226.06 | 1.04 |
| 1985 | 94 | 232.73 | 226.06 | 1.03 |
| 1985 | 94 | 149.70 | 226.06 | 0.66 |
| 1985 | 94 | 148.15 | 226.06 | 0.66 |
| 1985 | 94 | 165.00 | 226.06 | 0.73 |
| 1985 | 95 | 179.43 | 226.06 | 0.79 |
| 1985 | 95 | 197.86 | 226.06 | 0.88 |
| 1985 | 95 | 160.97 | 226.06 | 0.71 |
| 1985 | 95 | 135.94 | 226.06 | 0.60 |
| 1985 | 96 | 128.18 | 226.06 | 0.57 |
| 1985 | 96 | 126.30 | 226.06 | 0.56 |
| 1985 | 98 | 247.78 | 226.06 | 1.10 |
| 1985 | 98 | 133.55 | 226.06 | 0.59 |
| 1985 | 99 | 191.74 | 226.06 | 0.85 |
| 1985 | 99 | 107.10 | 226.06 | 0.47 |





Source: NYSDOH; NYSDEC

Table 10-6

Ratio of Lipid-Normalized Pumpkinseed < 10cm to Lipid-Normalized Multiplate Samplers for Aroclo. 1254

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 1979 | | 433.62 | 206.35 | 2.10 |
| 1979 | | 432.39 | 206.35 | 2.10 |
| 1979 | | 395.45 | 206.35 | 1.92 |
| 1979 | | 347.76 | 206.35 | 1.69 |
| 1979 | | 416.57 | 206.35 | 2.02 |
| 1979 | | 355.31 | 206.35 | 1.72 |
| 1979 | | 413.74 | 206.35 | 2.00 |
| 1979 | | 313.43 | 206.35 | 1.52 |
| 1979 | | 401.73 | 206.35 | 1.95 |
| 1979 | | 356.82 | 206.35 | 1.73 |
| 1979 | | 387.21 | 206.35 | 1.88 |
| 1979 | | 349.48 | 206.35 | 1.69 |
| 1979 | | 386.50 | 206.35 | 1.87 |
| 1979 | | 359.60 | 206.35 | 1.74 |
| 1979 | | 401.40 | 206.35 | 1.95 |
| 1979 | | 428.57 | 206.35 | 2.08 |
| 1980 | | 172.61 | 105.71 | 1.63 |
| 1980 | | 253.31 | 105.71 | 2.40 |
| 1980 | | 234.38 | 105.71 | 2.22 |
| 1980 | | 176.18 | 105.71 | 1.67 |
| 1980 | | 180.18 | 105.71 | 1.70 |
| 1980 | | 182.22 | 105.71 | 1.72 |
| 1980 | | 152.76 | 105.71 | 1.45 |
| 1980 | | 129.52 | 105.71 | 1.23 |
| 1980 | | 173.44 | 105.71 | 1.64 |
| 1980 | | 154.39 | 105.71 | 1.46 |
| 1980 | | 200.00 | 105.71 | 1.89 |
| 1980 | | 185.09 | 105.71 | 1.75 |
| 1980 | | 213.69 | 105.71 | 2.02 |
| 1980 | | 256.85 | 105.71 | 2.43 |
| 1980 | | 246.48 | 105.71 | 2.33 |
| 1980 | | 293.65 | 105.71 | 2.78 |
| 1980 | | 221.07 | 105.71 | 2.09 |
| 1980 | | 174.10 | 105.71 | 1.65 |
| 1980 | | 139.12 | 105.71 | 1.32 |
| 1980 | | 187.50 | 105.71 | 1.77 |
| 1980 | | 170.38 | 105.71 | 1.61 |
| 1980 | | 209.09 | 105.71 | 1.98 |
| 1980 | | 192.88 | 105.71 | 1.82 |
| 1980 | | 198.71 | 105.71 | 1.88 |
| 1980 | | 207.79 | 105.71 | 1.97 |
| 1981 | 83 | 135.58 | 58.30 | 2.33 |
| 1981 | 90 | 4.72 | 58.30 | 0.08 |
| 1981 | 92 | 120.63 | 58.30 | 2.07 |
| 1981 | 92 | 129.82 | 58.30 | 2.23 |
| 1981 | 93 | 122.05 | 58.30 | 2.09 |

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Source: NYSDOH; NYSDEC

Table 10-6

Ratio of Lipid-Normalized Pumpkinseed < 10cm to Lipid-Normalized Multiplate Samplers for Aroclor 1254

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 1981 | 97 | 128.84 | 58.30 | 2.21 |
| 1981 | 97 | 139.04 | 58.30 | 2.38 |
| 1981 | 98 | 96.70 | 58.30 | 1.66 |
| 1981 | 99 | 129.33 | 58.30 | 2.22 |
| 1981 | 99 | 139.44 | 58.30 | 2.39 |
| 1982 | 82 | 104.43 | 180.35 | 0.58 |
| 1982 | 84 | 153.44 | 180.35 | 0.85 |
| 1982 | 85 | 114.01 | 180.35 | 0.63 |
| 1982 | 85 | 91.98 | 180.35 | 0.51 |
| 1982 | 87 | 144.79 | 180.35 | 0.80 |
| 1982 | 87 | 166.07 | 180.35 | 0.92 |
| 1982 | 88 | 98.20 | 180.35 | 0.54 |
| 1982 | 89 | 119.20 | 180.35 | 0.66 |
| 1982 | 91 | 97.00 | 180.35 | 0.54 |
| 1982 | 92 | 175.47 | 180.35 | 0.97 |
| 1982 | 92 | 137.71 | 180.35 | 0.76 |
| 1982 | 93 | 157.50 | 180.35 | 0.87 |
| 1982 | 93 | 127.72 | 180.35 | 0.71 |
| 1982 | 93 | 123.71 | 180.35 | 0.69 |
| 1982 | 93 | 143.33 | 180.35 | 0.79 |
| 1982 | 95 | 141.10 | 180.35 | 0.78 |
| 1982 | 96 | 121.05 | 180.35 | 0.67 |
| 1982 | 98 | 138.66 | 180.35 | 0.77 |
| 1983 | 79 | 114.00 | 173.17 | 0.66 |
| 1983 | 81 | 175.00 | 173.17 | 1.01 |
| 1983 | 81 | 179.17 | 173.17 | 1.03 |
| 1983 | 81 | 185.83 | 173.17 | 1.07 |
| 1983 | 81 | 119.43 | 173.17 | 0.69 |
| 1983 | 83 | 109.91 | 173.17 | 0.63 |
| 1983 | 85 | 162.11 | 173.17 | 0.94 |
| 1983 | 85 | 172.11 | 173.17 | 0.99 |
| 1983 | 85 | 112.27 | 173.17 | 0.65 |
| 1983 | 85 | 163.05 | 173.17 | 0.94 |
| 1983 | 86 | 201.74 | 173.17 | 1.17 |
| 1983 | 86 | 160.18 | 173.17 | 0.92 |
| 1983 | 86 | 149.34 | 173.17 | 0.86 |
| 1983 | 95 | 189.32 | 173.17 | 1.09 |
| 1984 | 83 | 81.38 | 141.00 | 0.58 |
| 1984 | 84 | 65.63 | 141.00 | 0.47 |
| 1984 | 84 | 69.44 | 141.00 | 0.49 |
| 1984 | 86 | 86.00 | 141.00 | 0.61 |
| 1984 | 87 | 81.92 | 141.00 | 0.58 |
| 1984 | 87 | 90.00 | 141.00 | 0.64 |
| 1984 | 88 | 87.60 | 141.00 | 0.62 |
| 1984 | 88 | 77.50 | 141.00 | 0.55 |
| 1984 | 90 | 68.67 | 141.00 | 0.49 |





Source: NYSDOH; NYSDEC

Table 10-6

Ratio of Lipid-Normalized Pumpkinseed < 10cm to Lipid-Normalized Multiplate Samplers for Aroclor 1254

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 1984 | 90 | 77.27 | 141.00 | 0.55 |
| 1984 | 91 | 114.23 | 141.00 | 0.81 |
| 1984 | 91 | 83.48 | 141.00 | 0.59 |
| 1984 | 92 | 115.83 | 141.00 | 0.82 |
| 1984 | 92 | 86.55 | 141.00 | 0.61 |
| 1984 | 94 | 86.67 | 141.00 | 0.61 |
| 1984 | 94 | 99.17 | 141.00 | 0.70 |
| 1984 | 94 | 81.20 | 141.00 | 0.58 |
| 1984 | 94 | 107.83 | 141.00 | 0.76 |
| 1984 | 95 | 85.00 | 141.00 | 0.60 |
| 1984 | 95 | 101.82 | 141.00 | 0.72 |
| 1984 | 95 | 90.30 | 141.00 | 0.64 |
| 1984 | 97 | 93.81 | 141.00 | 0.67 |
| 1984 | 97 | 87.86 | 141.00 | 0.62 |
| 1984 | 98 | 82.61 | 141.00 | 0.59 |
| 1984 | 99 | 87.59 | 141.00 | 0.62 |
| 1985 | 85 | 78.4[illegible] | 82.23 | 0.95 |
| 1985 | 85 | 104.58 | 82.23 | 1.27 |
| 1985 | 91 | 76.33 | 82.23 | 0.93 |
| 1985 | 93 | 98.33 | 82.23 | 1.20 |
| 1985 | 94 | 117.73 | 82.23 | 1.43 |
| 1985 | 94 | 106.97 | 82.23 | 1.30 |
| 1985 | 94 | 97.04 | 82.23 | 1.18 |
| 1985 | 94 | 99.33 | 82.23 | 1.21 |
| 1985 | 95 | 86.57 | 82.23 | 1.05 |
| 1985 | 95 | 123.21 | 82.23 | 1.50 |
| 1985 | 95 | 94.52 | 82.23 | 1.15 |
| 1985 | 95 | 76.88 | 82.23 | 0.93 |
| 1985 | 96 | 73.94 | 82.23 | 0.90 |
| 1985 | 96 | 77.41 | 82.23 | 0.94 |
| 1985 | 98 | 138.33 | 82.23 | 1.68 |
| 1985 | 98 | 89.35 | 82.23 | 1.09 |
| 1985 | 99 | 93.48 | 82.23 | 1.14 |
| 1985 | 99 | 69.35 | 82.23 | 0.84 |





Source: NYSDOH; NYSDEC

Table 10-7

Ratio of Lipid-Normalized Pumpkinseed (all sizes) to Lipid-Normalized Multiplate Samplers for Total PCBs

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 79 | | 1106.11 | 368.16 | 3.00 |
| 79 | | 1192.96 | 368.16 | 3.24 |
| 79 | | 1031.82 | 368.16 | 2.80 |
| 79 | | 951.84 | 368.16 | 2.59 |
| 79 | | 1145.86 | 368.16 | 3.11 |
| 79 | | 1081.56 | 368.16 | 2.94 |
| 79 | | 1111.54 | 368.16 | 3.02 |
| 79 | | 961.57 | 368.16 | 2.61 |
| 79 | | 1106.94 | 368.16 | 3.01 |
| 79 | | 1038.64 | 368.16 | 2.82 |
| 79 | | 1090.70 | 368.16 | 2.96 |
| 79 | | 964.06 | 368.16 | 2.62 |
| 79 | | 1110.43 | 368.16 | 3.02 |
| 79 | | 1028.48 | 368.16 | 2.79 |
| 79 | | 1075.81 | 368.16 | 2.92 |
| 79 | | 1149.35 | 368.16 | 3.12 |
| 80 | | 707.64 | 172.16 | 4.11 |
| 80 | | 747.47 | 172.16 | 4.34 |
| 80 | | 746.88 | 172.16 | 4.34 |
| 80 | | 654.95 | 172.16 | 3.80 |
| 80 | | 591.59 | 172.16 | 3.44 |
| 80 | | 629.84 | 172.16 | 3.66 |
| 80 | | 740.68 | 172.16 | 4.30 |
| 80 | | 536.44 | 172.16 | 3.12 |
| 80 | | 680.13 | 172.16 | 3.95 |
| 80 | | 613.45 | 172.16 | 3.56 |
| 80 | | 844.51 | 172.16 | 4.91 |
| 80 | | 665.09 | 172.16 | 3.86 |
| 80 | | 815.61 | 172.16 | 4.74 |
| 80 | | 832.19 | 172.16 | 4.83 |
| 80 | | 903.76 | 172.16 | 5.25 |
| 80 | | 777.25 | 172.16 | 4.51 |
| 80 | | 674.64 | 172.16 | 3.92 |
| 80 | | 608.37 | 172.16 | 3.53 |
| 80 | | 553.47 | 172.16 | 3.21 |
| 80 | | 565.71 | 172.16 | 3.29 |
| 80 | | 554.55 | 172.16 | 3.22 |
| 80 | | 634.31 | 172.16 | 3.68 |
| 80 | | 623.39 | 172.16 | 3.62 |
| 80 | | 667.96 | 172.16 | 3.88 |
| 80 | | 649.35 | 172.16 | 3.77 |
| 81 | 83 | 481.73 | 265.53 | 1.81 |
| 81 | 90 | 19.18 | 265.53 | 0.07 |
| 81 | 92 | 379.05 | 265.53 | 1.43 |
| 81 | 92 | 430.72 | 265.53 | 1.62 |
| 81 | 93 | 405.28 | 265.53 | 1.53 |

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Source: NYSDOH; NYSDEC

Table 10-7

Ratio of Lipid-Normalized Pumpkinseed (all sizes) to Lipid-Normalized Multiplate Samplers for Total PCBs

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 81 | 97 | 381.50 | 265.53 | 1.44 |
| 81 | 97 | 511.41 | 265.53 | 1.93 |
| 81 | 98 | 338.58 | 265.53 | 1.28 |
| 81 | 99 | 446.04 | 265.53 | 1.68 |
| 81 | 99 | 462.42 | 265.53 | 1.74 |
| 81 | 101 | 365.28 | 265.53 | 1.38 |
| 81 | 101 | 433.64 | 265.53 | 1.63 |
| 81 | 101 | 515.61 | 265.53 | 1.94 |
| 81 | 102 | 426.53 | 265.53 | 1.61 |
| 81 | 102 | 473.54 | 265.53 | 1.78 |
| 81 | 103 | 488.57 | 265.53 | 1.84 |
| 81 | 104 | 391.23 | 265.53 | 1.47 |
| 81 | 104 | 415.73 | 265.53 | 1.57 |
| 81 | 104 | 482.23 | 265.53 | 1.82 |
| 81 | 105 | 579.25 | 265.53 | 2.18 |
| 81 | 105 | 471.88 | 265.53 | 1.78 |
| 81 | 105 | 355.26 | 265.53 | 1.34 |
| 81 | 107 | 439.46 | 265.53 | 1.66 |
| 81 | 111 | 439.25 | 265.53 | 1.65 |
| 81 | 113 | 430.69 | 265.53 | 1.62 |
| 81 | 118 | 475.70 | 265.53 | 1.79 |
| 81 | 118 | 539.35 | 265.53 | 2.03 |
| 81 | 119 | 605.25 | 265.53 | 2.28 |
| 81 | 121 | 496.30 | 265.53 | 1.87 |
| 81 | 122 | 499.03 | 265.53 | 1.88 |
| 81 | 124 | 545.20 | 265.53 | 2.05 |
| 81 | 127 | 458.45 | 265.53 | 1.73 |
| 81 | 131 | 582.45 | 265.53 | 2.19 |
| 81 | 133 | 638.06 | 265.53 | 2.40 |
| 81 | 138 | 543.75 | 265.53 | 2.05 |
| 81 | 141 | 463.61 | 265.53 | 1.75 |
| 81 | 143 | 541.36 | 265.53 | 2.04 |
| 81 | 144 | 587.45 | 265.53 | 2.21 |
| 81 | 144 | 532.36 | 265.53 | 2.00 |
| 81 | 150 | 532.72 | 265.53 | 2.01 |
| 81 | 152 | 538.60 | 265.53 | 2.03 |
| 81 | 154 | 15.30 | 265.53 | 0.06 |
| 81 | 161 | 17.89 | 265.53 | 0.07 |
| 81 | 161 | 22.00 | 265.53 | 0.08 |
| 81 | 170 | 492.89 | 265.53 | 1.86 |
| 81 | 171 | 646.61 | 265.53 | 2.44 |
| 81 | 172 | 327.72 | 265.53 | 1.23 |
| 81 | 176 | 369.81 | 265.53 | 1.39 |
| 81 | 185 | 711.17 | 265.53 | 2.68 |
| 82 | 82 | 262.97 | 1311.25 | 0.20 |
| 82 | 84 | 373.68 | 1311.25 | 0.28 |





Source: NYSDOH; NYSDEC

Table 10-7
Ratio of Lipid-Normalized Pumpkinseed (all sizes) to Lipid-Normalized Multiplate Samplers for Total PCBs

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 82 | 85 | 347.23 | 1311.25 | 0.26 |
| 82 | 85 | 240.84 | 1311.25 | 0.18 |
| 82 | 87 | 408.52 | 1311.25 | 0.31 |
| 82 | 87 | 374.55 | 1311.25 | 0.29 |
| 82 | 88 | 314.75 | 1311.25 | 0.24 |
| 82 | 89 | 313.20 | 1311.25 | 0.24 |
| 82 | 91 | 255.81 | 1311.25 | 0.20 |
| 82 | 92 | 390.57 | 1311.25 | 0.30 |
| 82 | 92 | 402.97 | 1311.25 | 0.31 |
| 82 | 93 | 388.33 | 1311.25 | 0.30 |
| 82 | 93 | 371.58 | 1311.25 | 0.28 |
| 82 | 93 | 352.16 | 1311.25 | 0.27 |
| 82 | 93 | 352.59 | 1311.25 | 0.27 |
| 82 | 95 | 408.90 | 1311.25 | 0.31 |
| 82 | 96 | 352.63 | 1311.25 | 0.27 |
| 82 | 98 | 375.09 | 1311.25 | 0.29 |
| 82 | 100 | 542.77 | 1311.25 | 0.41 |
| 82 | 101 | 339.42 | 1311.25 | 0.26 |
| 82 | 103 | 394.83 | 1311.25 | 0.30 |
| 82 | 103 | 315.69 | 1311.25 | 0.24 |
| 82 | 103 | 216.62 | 1311.25 | 0.17 |
| 82 | 103 | 336.36 | 1311.25 | 0.26 |
| 82 | 104 | 397.45 | 1311.25 | 0.30 |
| 82 | 119 | 421.11 | 1311.25 | 0.32 |
| 82 | 121 | 383.98 | 1311.25 | 0.29 |
| 82 | 121 | 716.43 | 1311.25 | 0.55 |
| 82 | 122 | 306.10 | 1311.25 | 0.23 |
| 82 | 129 | 434.22 | 1311.25 | 0.33 |
| 82 | 146 | 364.91 | 1311.25 | 0.28 |
| 82 | 148 | 257.53 | 1311.25 | 0.20 |
| 82 | 149 | 332.57 | 1311.25 | 0.25 |
| 82 | 151 | 206.92 | 1311.25 | 0.16 |
| 82 | 166 | 454.09 | 1311.25 | 0.35 |
| 82 | 175 | 433.02 | 1311.25 | 0.33 |
| 82 | 175 | 408.38 | 1311.25 | 0.31 |
| 82 | 178 | 453.76 | 1311.25 | 0.35 |
| 82 | 180 | 338.30 | 1311.25 | 0.26 |
| 82 | 181 | 155.81 | 1311.25 | 0.12 |
| 82 | 182 | 143.70 | 1311.25 | 0.11 |
| 82 | 184 | 417.14 | 1311.25 | 0.32 |
| 82 | 186 | 350.00 | 1311.25 | 0.27 |
| 83 | 79 | 326.80 | 626.16 | 0.52 |
| 83 | 81 | 392.86 | 626.16 | 0.63 |
| 83 | 81 | 432.87 | 626.16 | 0.69 |
| 83 | 81 | 445.28 | 626.16 | 0.71 |
| 83 | 81 | 293.29 | 626.16 | 0.47 |

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Source: NYSDOH; NYSDEC

Table 10-7
Ratio of Lipid-Normalized Pumpkinseed (all sizes) to Lipid-Normalized Multiplate Samplers for Total PCBs

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 83 | 83 | 231.08 | 626.16 | 0.37 |
| 83 | 85 | 392.51 | 626.16 | 0.63 |
| 83 | 85 | 421.51 | 626.16 | 0.67 |
| 83 | 85 | 296.03 | 626.16 | 0.47 |
| 83 | 85 | 409.24 | 626.16 | 0.65 |
| 83 | 86 | 475.58 | 626.16 | 0.76 |
| 83 | 86 | 376.11 | 626.16 | 0.60 |
| 83 | 86 | 405.96 | 626.16 | 0.65 |
| 83 | 95 | 335.44 | 626.16 | 0.54 |
| 83 | 104 | 594.63 | 626.16 | 0.95 |
| 83 | 109 | 646.43 | 626.16 | 1.03 |
| 83 | 111 | 466.34 | 626.16 | 0.74 |
| 83 | 115 | 449.71 | 626.16 | 0.72 |
| 83 | 116 | 504.62 | 626.16 | 0.81 |
| 83 | 117 | 522.40 | 626.16 | 0.83 |
| 83 | 117 | 536.21 | 626.16 | 0.86 |
| 83 | 118 | 478.36 | 626.16 | 0.76 |
| 83 | 119 | 596.76 | 626.16 | 0.95 |
| 83 | 119 | 467.26 | 626.16 | 0.75 |
| 83 | 121 | 517.45 | 626.16 | 0.83 |
| 83 | 121 | 422.41 | 626.16 | 0.67 |
| 83 | 122 | 589.40 | 626.16 | 0.94 |
| 83 | 124 | 544.00 | 626.16 | 0.87 |
| 83 | 131 | 474.44 | 626.16 | 0.76 |
| 83 | 132 | 447.74 | 626.16 | 0.72 |
| 83 | 132 | 372.83 | 626.16 | 0.60 |
| 83 | 135 | 634.43 | 626.16 | 1.01 |
| 83 | 136 | 499.52 | 626.16 | 0.80 |
| 83 | 136 | 461.67 | 626.16 | 0.74 |
| 83 | 136 | 411.57 | 626.16 | 0.66 |
| 83 | 136 | 502.88 | 626.16 | 0.80 |
| 83 | 136 | 532.20 | 626.16 | 0.85 |
| 83 | 137 | 455.76 | 626.16 | 0.73 |
| 83 | 138 | 488.98 | 626.16 | 0.78 |
| 83 | 142 | 433.24 | 626.16 | 0.69 |
| 83 | 143 | 605.08 | 626.16 | 0.97 |
| 83 | 146 | 431.32 | 626.16 | 0.69 |
| 83 | 155 | 334.19 | 626.16 | 0.53 |
| 83 | 159 | 376.00 | 626.16 | 0.60 |
| 83 | 167 | 351.18 | 626.16 | 0.56 |
| 84 | 83 | 232.07 | 525.43 | 0.44 |
| 84 | 84 | 239.06 | 525.43 | 0.45 |
| 84 | 84 | 262.50 | 525.43 | 0.50 |
| 84 | 86 | 404.80 | 525.43 | 0.77 |
| 84 | 87 | 288.85 | 525.43 | 0.55 |
| 84 | 87 | 380.43 | 525.43 | 0.72 |





Source: NYSDOH; NYSDEC

Table 10-7

Ratio of Lipid-Normalized Pumpkinseed (all sizes) to Lipid-Normalized Multiplate Samplers for Total PCBs

| Year | Length (mm) | Pumpkinseed Lipid-Normalized Conc (ug/g) | Multiplate Concentration (ug/g) | Ratio |
|---|---|---|---|---|
| 84 | 88 | 333.20 | 525.43 | 0.63 |
| 84 | 88 | 249.64 | 525.43 | 0.48 |
| 84 | 90 | 273.33 | 525.43 | 0.52 |
| 84 | 90 | 224.85 | 525.43 | 0.43 |
| 84 | 91 | 324.23 | 525.43 | 0.62 |
| 84 | 91 | 517.39 | 525.43 | 0.98 |
| 84 | 92 | 357.08 | 525.43 | 0.68 |
| 84 | 92 | 208.28 | 525.43 | 0.40 |
| 84 | 94 | 334.58 | 525.43 | 0.64 |
| 84 | 94 | 258.75 | 525.43 | 0.49 |
| 84 | 94 | 222.80 | 525.43 | 0.42 |
| 84 | 94 | 336.52 | 525.43 | 0.64 |
| 84 | 95 | 319.29 | 525.43 | 0.61 |
| 84 | 95 | 288.18 | 525.43 | 0.55 |
| 84 | 95 | 252.73 | 525.43 | 0.48 |
| 84 | 97 | 269.05 | 525.43 | 0.51 |
| 84 | 97 | 312.86 | 525.43 | 0.60 |
| 84 | 98 | 228.26 | 525.43 | 0.43 |
| 84 | 99 | 312.41 | 525.43 | 0.59 |
| 85 | 85 | 98.79 | 308.47 | 0.32 |
| 85 | 85 | 253.33 | 308.47 | 0.82 |
| 85 | 91 | 186.67 | 308.47 | 0.61 |
| 85 | 93 | 334.33 | 308.47 | 1.08 |
| 85 | 94 | 350.45 | 308.47 | 1.14 |
| 85 | 94 | 256.67 | 308.47 | 0.83 |
| 85 | 94 | 245.19 | 308.47 | 0.79 |
| 85 | 94 | 264.33 | 308.47 | 0.86 |
| 85 | 95 | 266.00 | 308.47 | 0.86 |
| 85 | 95 | 321.07 | 308.47 | 1.04 |
| 85 | 95 | 255.48 | 308.47 | 0.83 |
| 85 | 95 | 212.81 | 308.47 | 0.69 |
| 85 | 96 | 202.12 | 308.47 | 0.66 |
| 85 | 96 | 203.70 | 308.47 | 0.66 |
| 85 | 98 | 386.11 | 308.47 | 1.25 |
| 85 | 98 | 222.90 | 308.47 | 0.72 |
| 85 | 99 | 285.22 | 308.47 | 0.92 |
| 85 | 99 | 176.45 | 308.47 | 0.57 |
| 85 | 101 | 347.08 | 308.47 | 1.13 |
| 85 | 102 | 504.00 | 308.47 | 1.63 |
| 85 | 102 | 167.84 | 308.47 | 0.54 |
| 85 | 108 | 472.50 | 308.47 | 1.53 |





Source: NYSDOH; NYSDEC

**Table 10-8**
**Bioaccumulation Factors for Brown Bullhead**

| Station | Accumulation Factor | | |
|---|---|---|---|
| | BBAF | BSAF | LUTZ |
| BZ#4 | 0.82 | 0.58 | |
| BZ#28 | 2.67 | 0.59 | |
| BZ#52 | 1.48 | 1.42 | 0.88 |
| BZ#101 WITH BZ#90 | 2.64 | 2.91 | |
| BZ#138 | 11.36 | 8.26 | 1.64 |
| Total PCBS | 3.77 | 1.81 | 1.48 |

BSAF: Biota: Sediment Accumulation Factor
BBAF: Biota: Benthic Accumulation Factor

Source: TAMS/Gradient Database; Lutz et al., 1994

## Table 10-9
## Look-Up Table for the 15th Percentile Yellow Perch Model

| Concentration Water<br>Sediment | 1 | 5 | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|---|
| **10** | 22.10 | 78.40 | 148.65 | 298.53 | 430.50 | 577.03 | 720.31 |
| **25** | 34.60 | 90.95 | 161.69 | 298.08 | 440.12 | 584.31 | 722.85 |
| **50** | 55.94 | 111.44 | 179.30 | 327.08 | 463.24 | 606.66 | 753.24 |
| **75** | 77.55 | 135.54 | 199.32 | 345.96 | 484.26 | 622.90 | 777.87 |
| **100** | 97.82 | 153.94 | 224.51 | 366.32 | 505.24 | 647.70 | 800.79 |
| **150** | 136.01 | 194.78 | 265.02 | 413.96 | 547.62 | 686.79 | 830.18 |
| **200** | 178.06 | 235.82 | 304.84 | 438.07 | 607.07 | 738.28 | 867.83 |
| **300** | 263.01 | 318.04 | 391.94 | 523.47 | 665.15 | 801.73 | 950.89 |
| **400** | 343.90 | 396.97 | 465.21 | 619.04 | 752.74 | 896.09 | 1,039.09 |
| **500** | 422.81 | 485.27 | 553.19 | 691.36 | 826.15 | 984.44 | 1,125.18 |
| **600** | 509.97 | 563.45 | 634.25 | 770.40 | 934.32 | 1,061.45 | 1,214.06 |
| **700** | 592.25 | 646.08 | 723.45 | 856.73 | 998.77 | 1,147.75 | 1,270.68 |
| **800** | 668.37 | 738.30 | 801.06 | 933.91 | 1,088.32 | 1,223.59 | 1,350.68 |
| **900** | 748.33 | 815.37 | 882.68 | 1,036.05 | 1,152.23 | 1,322.27 | 1,462.49 |
| **1000** | 823.35 | 895.74 | 971.46 | 1,099.87 | 1,261.46 | 1,402.53 | 1,528.02 |
| **1100** | 938.78 | 971.80 | 1,052.98 | 1,182.29 | 1,309.80 | 1,460.55 | 1,618.23 |
| **1200** | 997.58 | 1,055.31 | 1,139.01 | 1,284.43 | 1,434.03 | 1,543.17 | 1,676.27 |

## Table 10-10
## Look-Up Table for Mean Concentrations for Yellow Perch Model

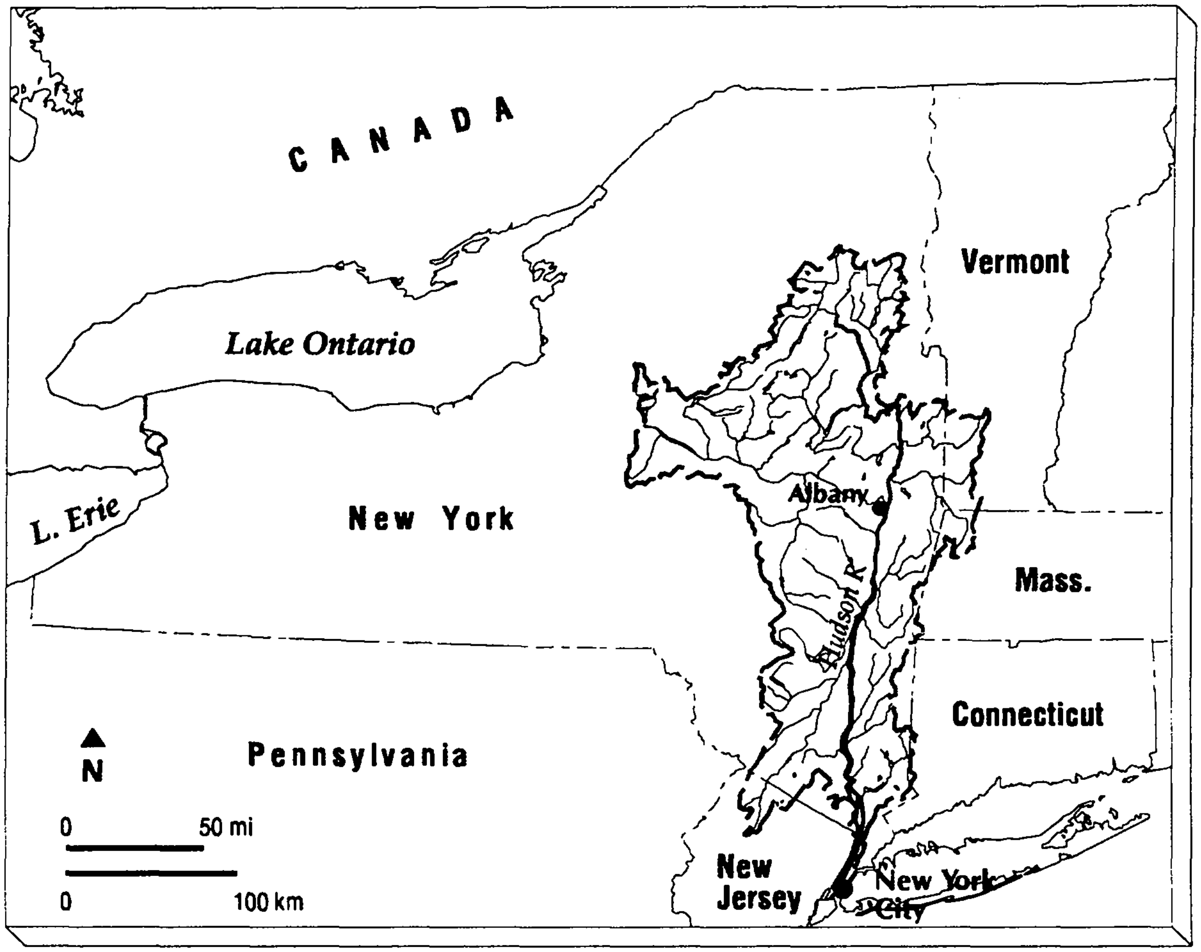
| Concentration Water | 1 | 5 | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|---|
| Sediment | | | | | | | |
| 10 | 35.65 | 125.01 | 236.89 | 468.70 | 686.20 | 916.90 | 1,145.29 |
| 25 | 55.36 | 145.46 | 257.20 | 479.90 | 696.28 | 944.11 | 1,150.46 |
| 50 | 88.78 | 176.45 | 290.41 | 520.52 | 744.11 | 954.95 | 1,193.61 |
| 75 | 121.26 | 214.72 | 319.03 | 551.77 | 755.26 | 1,009.71 | 1,225.00 |
| 100 | 153.61 | 244.93 | 357.55 | 584.37 | 811.28 | 1,028.87 | 1,266.14 |
| 150 | 216.51 | 311.33 | 419.66 | 647.79 | 868.88 | 1,083.94 | 1,309.48 |
| 200 | 283.92 | 373.74 | 487.65 | 709.18 | 951.83 | 1,153.13 | 1,390.52 |
| 300 | 420.41 | 501.68 | 617.56 | 827.76 | 1,054.29 | 1,270.94 | 1,520.75 |
| 400 | 546.56 | 639.49 | 742.50 | 988.68 | 1,196.74 | 1,416.79 | 1,648.11 |
| 500 | 670.24 | 766.05 | 879.01 | 1,101.63 | 1,314.09 | 1,559.16 | 1,781.69 |
| 600 | 803.24 | 894.88 | 1,010.95 | 1,237.95 | 1,462.37 | 1,678.48 | 1,938.25 |
| 700 | 943.61 | 1,039.13 | 1,148.68 | 1,356.56 | 1,593.91 | 1,801.73 | 2,034.01 |
| 800 | 1,057.31 | 1,172.65 | 1,268.39 | 1,484.80 | 1,718.69 | 1,924.71 | 2,180.30 |
| 900 | 1,198.39 | 1,307.85 | 1,389.91 | 1,654.70 | 1,858.84 | 2,059.30 | 2,324.95 |
| 1000 | 1,327.91 | 1,428.76 | 1,569.20 | [illegible] | 1,994.61 | 2,221.92 | 2,435.63 |
| 1100 | 1,484.26 | 1,556.51 | 1,686.15 | 1,876.18 | 2,100.02 | 2,321.37 | 2,557.89 |
| 1200 | 1,592.02 | 1,678.69 | 1,811.32 | 2,021.10 | 2,284.44 | 2,479.57 | 2,681.02 |

## Table 10-11
## Look-Up Table for the 75th Percentile for Yellow Perch Model

| Concentration Water | 1 | 5 | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|---|
| Sediment | | | | | | | |
| 10 | 43.93 | 154.36 | 291.87 | 578.91 | 850.26 | 1,147.59 | 1,426.10 |
| 25 | 68.44 | 179.83 | 317.60 | 599.26 | 862.70 | 1,164.64 | 1,422.22 |
| 50 | 109.97 | 217.31 | 357.44 | 645.97 | 933.61 | 1,172.61 | 1,473.50 |
| 75 | 150.36 | 267.53 | 393.36 | 680.03 | 960.16 | 1,246.17 | 1,514.38 |
| 100 | 190.90 | 304.04 | 438.44 | 718.99 | 1,004.64 | 1,269.82 | 1,554.13 |
| 150 | 269.24 | 388.48 | 517.47 | 799.04 | 1,083.78 | 1,332.07 | 1,611.94 |
| 200 | 350.64 | 463.39 | 605.32 | 880.19 | 1,172.92 | 1,424.90 | 1,729.23 |
| 300 | 523.02 | 622.81 | 763.15 | 1,027.67 | 1,312.11 | 1,588.38 | 1,890.96 |
| 400 | 674.87 | 790.58 | 917.64 | 1,214.47 | 1,466.24 | 1,747.92 | 2,043.43 |
| 500 | 829.50 | 951.46 | 1,088.45 | 1,362.14 | 1,626.29 | 1,920.30 | 2,206.03 |
| 600 | 990.97 | 1,116.03 | 1,244.05 | 1,543.51 | 1,814.26 | 2,080.87 | 2,392.84 |
| 700 | 1,168.41 | 1,309.04 | 1,427.49 | 1,695.93 | 1,982.96 | 2,206.11 | 2,506.72 |
| 800 | 1,314.08 | 1,454.31 | 1,570.53 | 1,829.50 | 2,125.05 | 2,372.52 | 2,700.87 |
| 900 | 1,477.40 | 1,607.53 | 1,714.85 | 2,038.49 | 2,309.35 | 2,540.16 | 2,861.85 |
| 1000 | 1,661.40 | 1,777.46 | 1,941.61 | 2,190.00 | 2,479.67 | 2,750.96 | 2,995.70 |
| 1100 | 1,832.50 | 1,932.57 | 2,096.01 | 2,328.05 | 2,581.41 | 2,884.99 | 3,151.59 |
| 1200 | 1,970.94 | 2,088.05 | 2,217.34 | 2,500.81 | 2,801.25 | 3,064.48 | 3,310.19 |

## Table 10-12
## Look-Up Table for 95th Percentile for Yellow Perch Model

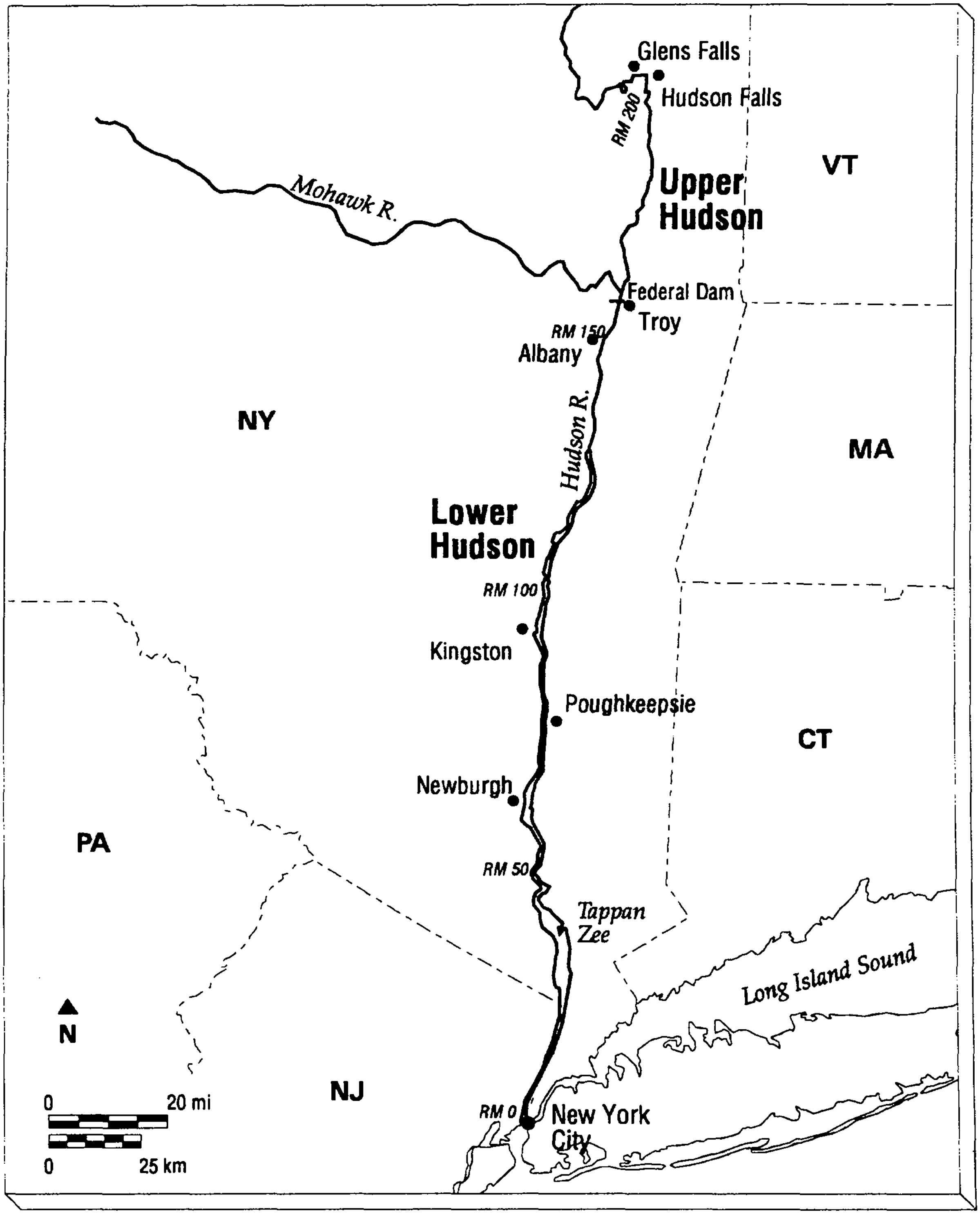
| Concentration Water | 1 | 5 | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|---|
| Sediment | | | | | | | |
| 10 | 71.93 | 252.81 | 490.55 | 928.05 | 1,391.67 | 1,835.90 | 2,287.54 |
| 25 | 111.40 | 296.57 | 516.55 | 961.65 | 1,402.84 | 1,904.98 | 2,319.03 |
| 50 | 179.12 | 352.35 | 600.03 | 1,045.43 | 1,508.31 | 1,908.22 | 2,425.23 |
| 75 | 235.22 | 432.03 | 640.95 | 1,101.02 | 1,553.96 | 2,062.02 | 2,435.34 |
| 100 | 305.24 | 488.36 | 717.81 | 1,204.78 | 1,675.42 | 2,066.04 | 2,533.72 |
| 150 | 436.62 | 623.01 | 834.72 | 1,301.17 | 1,736.37 | 2,190.46 | 2,598.64 |
| 200 | 574.91 | 748.16 | 988.96 | 1,431.25 | 1,880.55 | 2,264.97 | 2,814.13 |
| 300 | 853.69 | 1,003.16 | 1,252.31 | 1,643.05 | 2,120.93 | 2,488.68 | 3,081.66 |
| 400 | 1,109.09 | 1,293.98 | 1,475.62 | 2,005.64 | 2,437.19 | 2,818.49 | 3,277.60 |
| 500 | 1,356.89 | 1,545.08 | 1,809.16 | 2,181.91 | 2,618.29 | 3,114.67 | 3,532.67 |
| 600 | 1,624.76 | 1,818.51 | 2,057.94 | 2,445.56 | 2,866.37 | 3,345.84 | 3,934.12 |
| 700 | 1,868.73 | 2,081.92 | 2,314.85 | 2,675.96 | 3,242.56 | 3,625.94 | 4,084.91 |
| 800 | 2,114.30 | 2,348.87 | 2,565.98 | 3,040.03 | 3,475.40 | 3,885.56 | 4,417.46 |
| 900 | 2,382.27 | 2,668.01 | 2,780.69 | 3,316.69 | 3,722.55 | 4,050.80 | 4,675.31 |
| 1000 | 2,689.40 | 2,892.42 | 3,189.82 | 3,584.89 | 3,958.48 | 4,448.57 | 4,976.15 |
| 1100 | 2,968.65 | 3,153.75 | 3,447.55 | 3,735.78 | 4,286.17 | 4,708.09 | 5,140.61 |
| 1200 | 3,190.03 | 3,343.63 | 3,658.52 | 4,098.09 | 4,570.32 | 5,018.98 | 5,391.77 |




# Hudson River Watershed

Figure 1-1

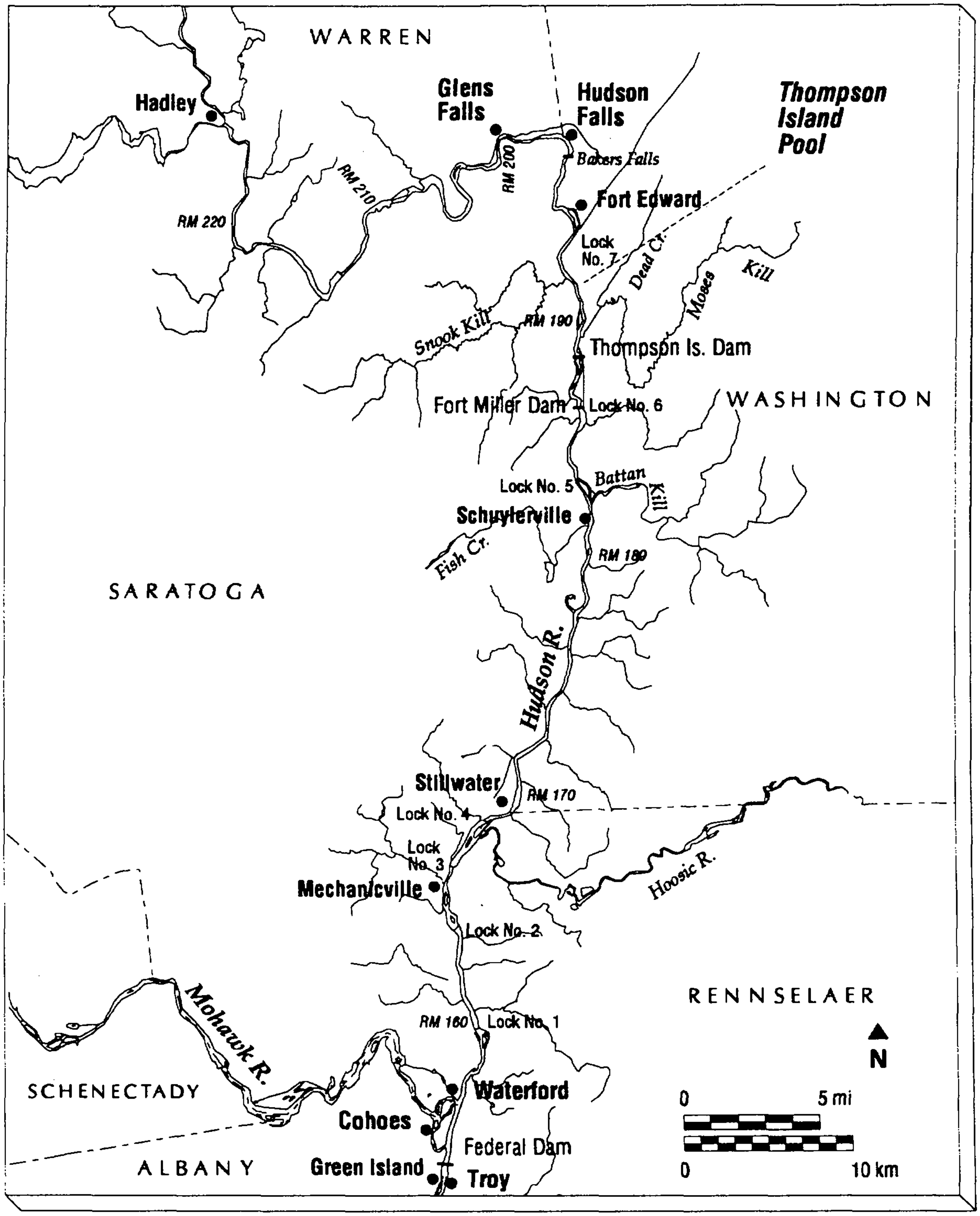
Limno-Tech, Inc.




## Upper and Lower Hudson River

Figure 1-2

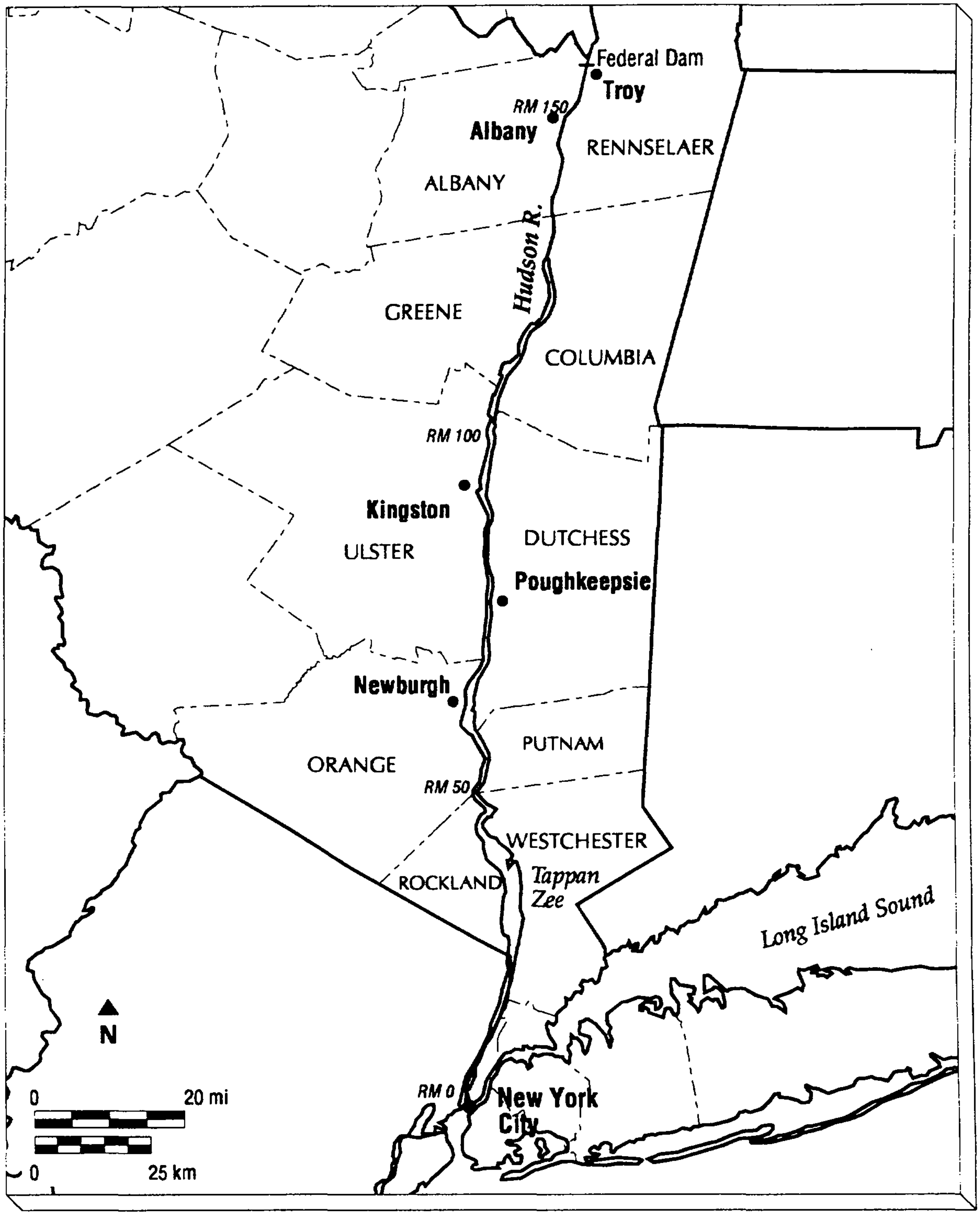
Limno-Tech, Inc.




## Upper Hudson River

**Figure 1-3**

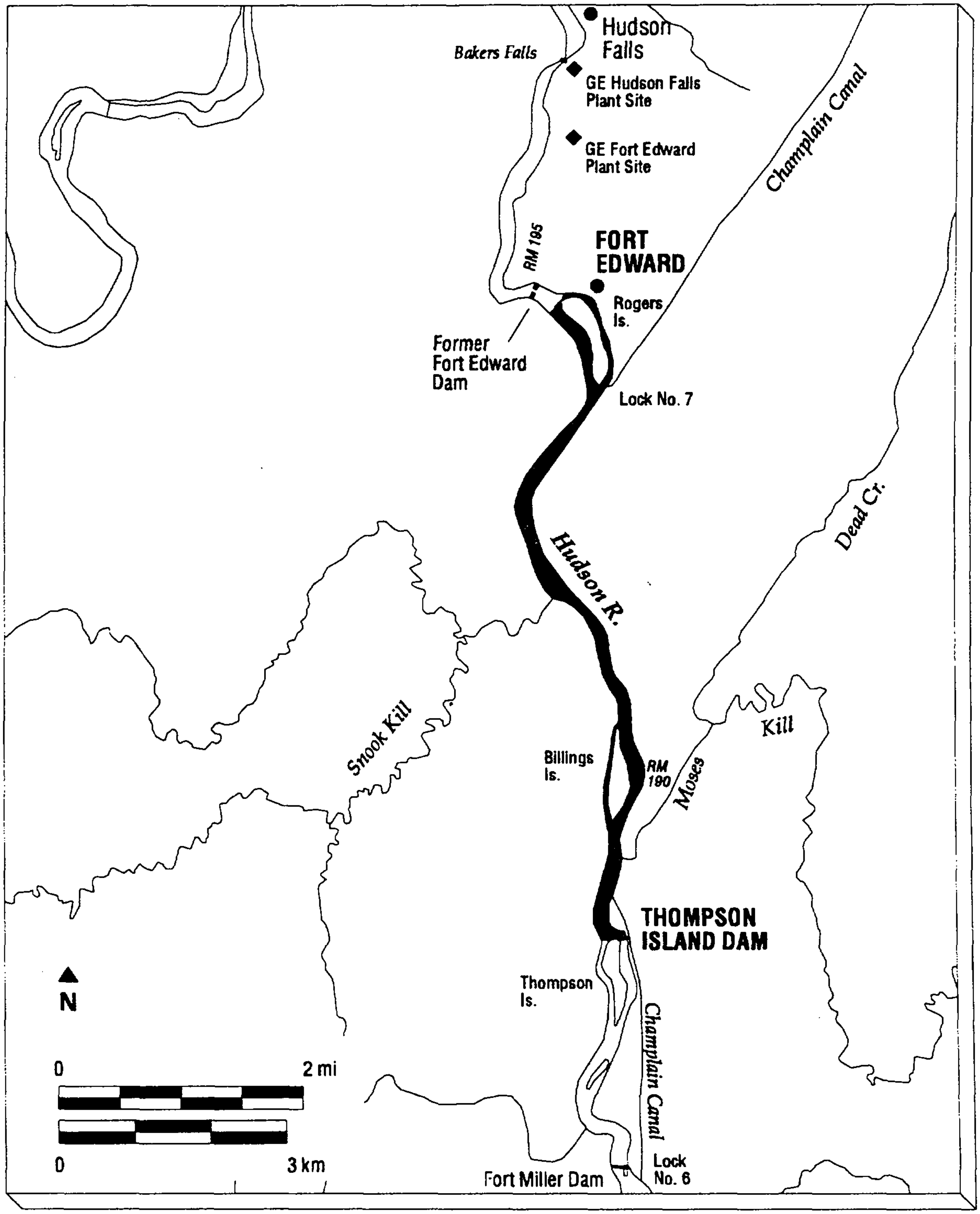
Limno-Tech, Inc.




## Lower Hudson River

**Figure 1-4**

**Limno-Tech, Inc.**

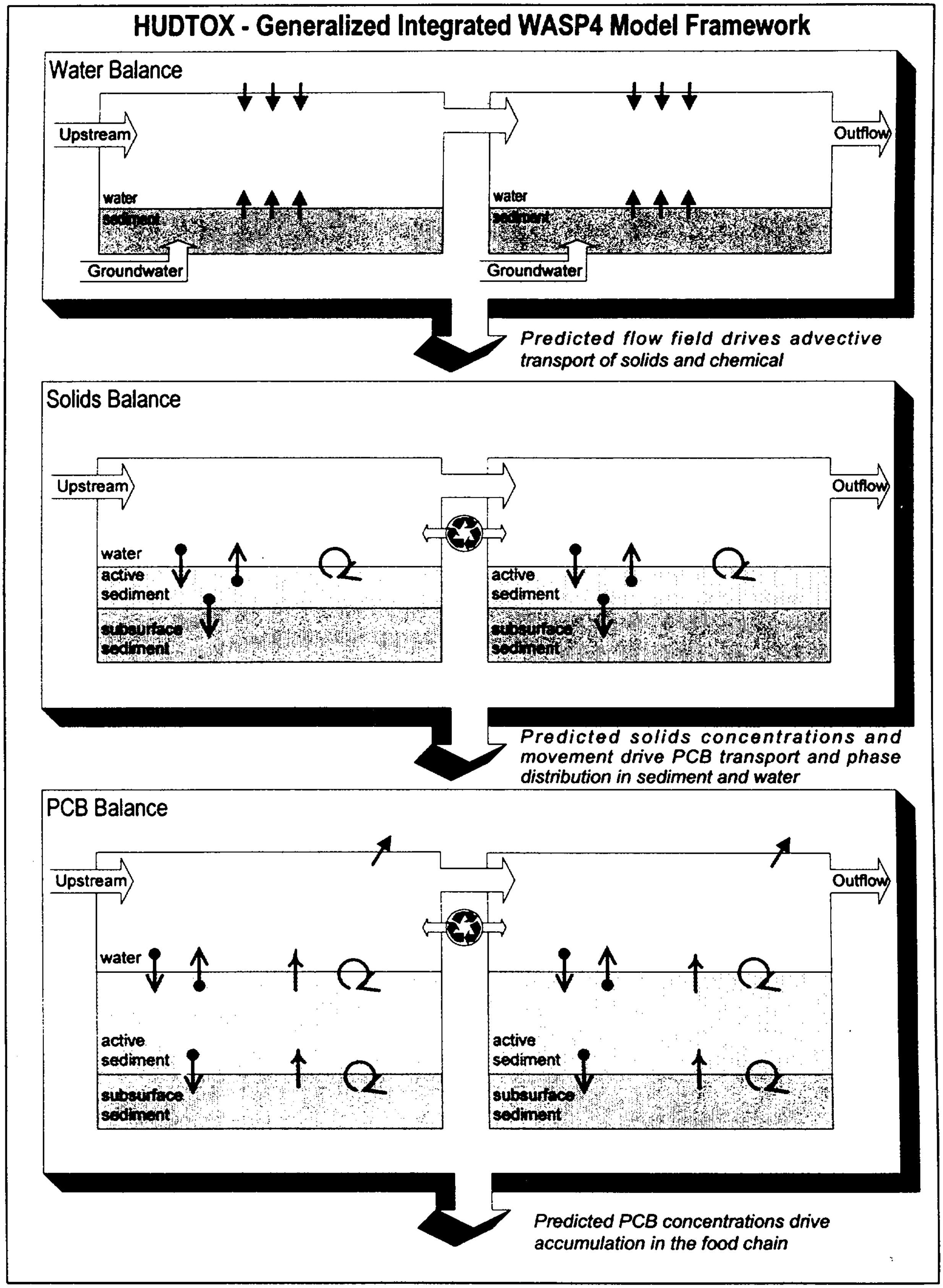



# Thompson Island Pool

**Figure 1-5**

Limno-Tech, Inc.

**Figure 3-1**
**PCB Mass Balance Model Conceptual Diagram**



## Figure 3-2
## Conceptual Framework for HUDTOX Solids Model

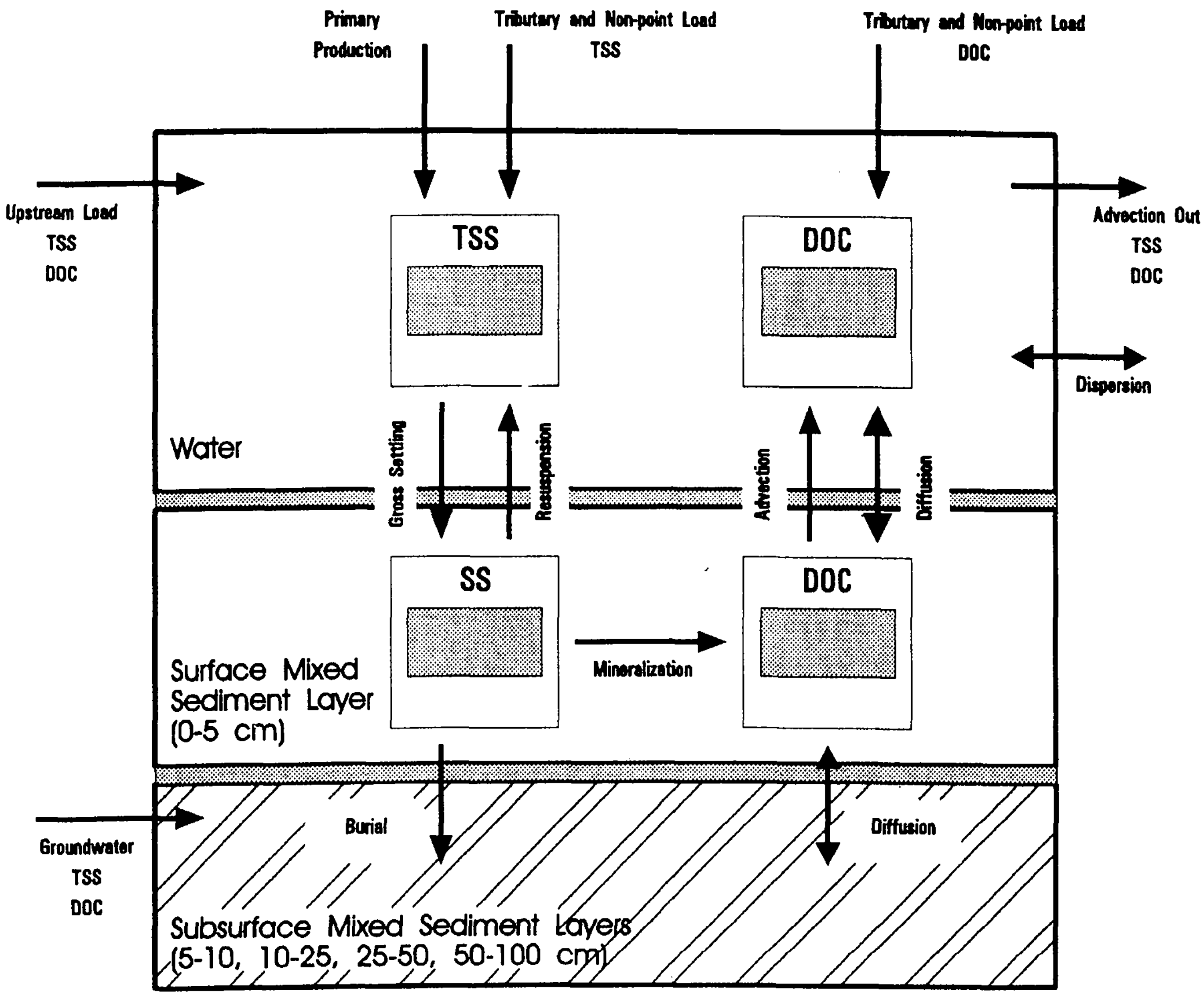


Figure 3-3
State Variables in HUDTOX Model

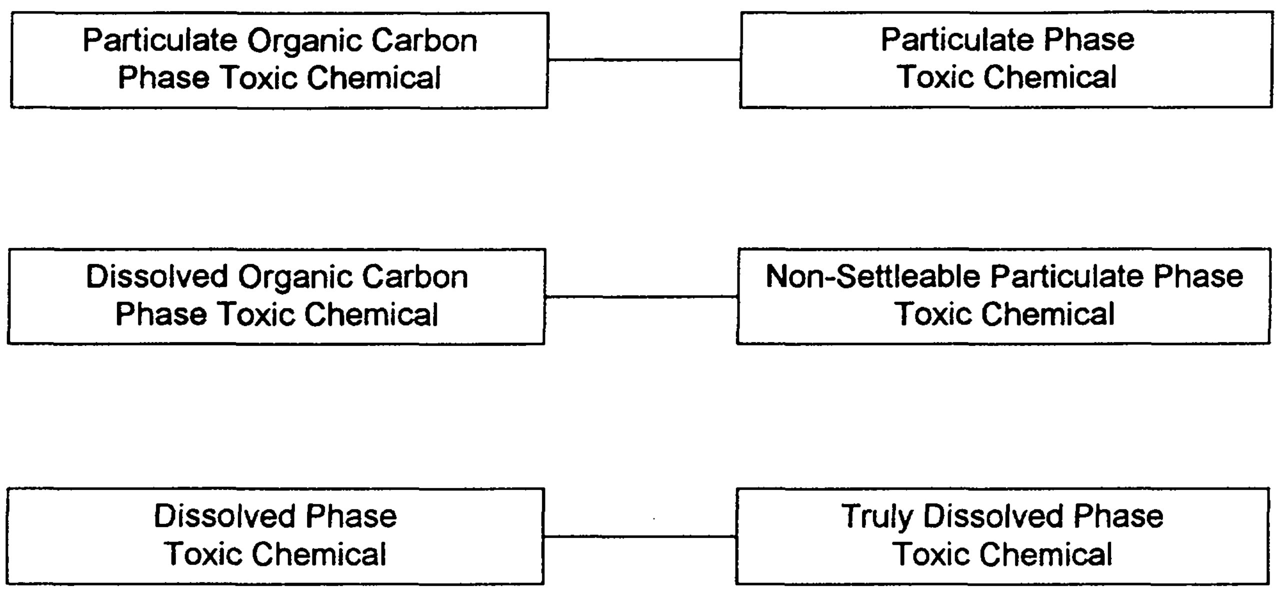


Figure 3-4
Conceptual Framework for HUDTOX PCB Model

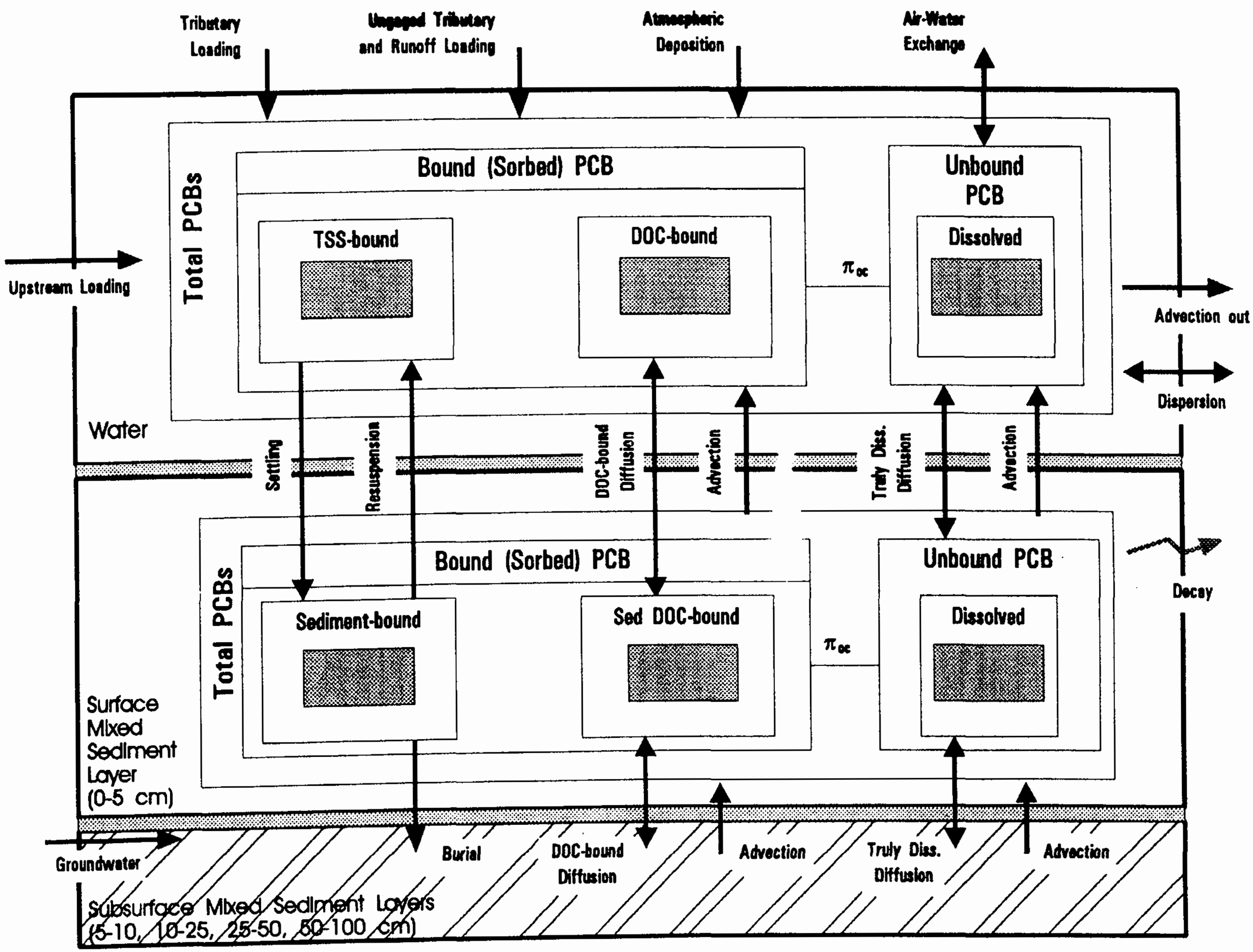


**Figure 3-5**
**Upper Hudson River Model (HUDTOX) Water Column Segmentation**

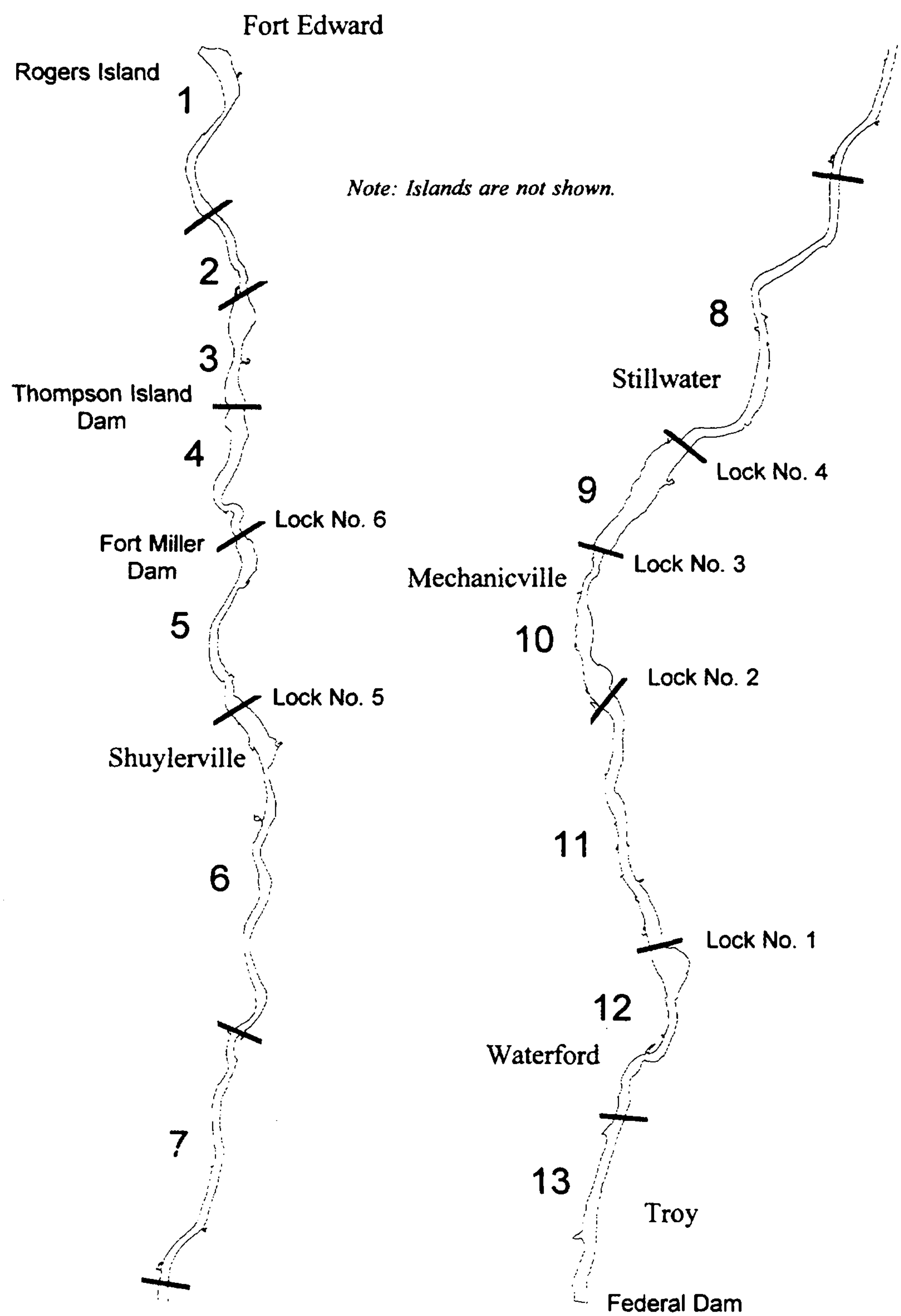


**Figure 3-6**
**Approximate Locations of GE 1991 Bathymetric Survey Cross-Sections**

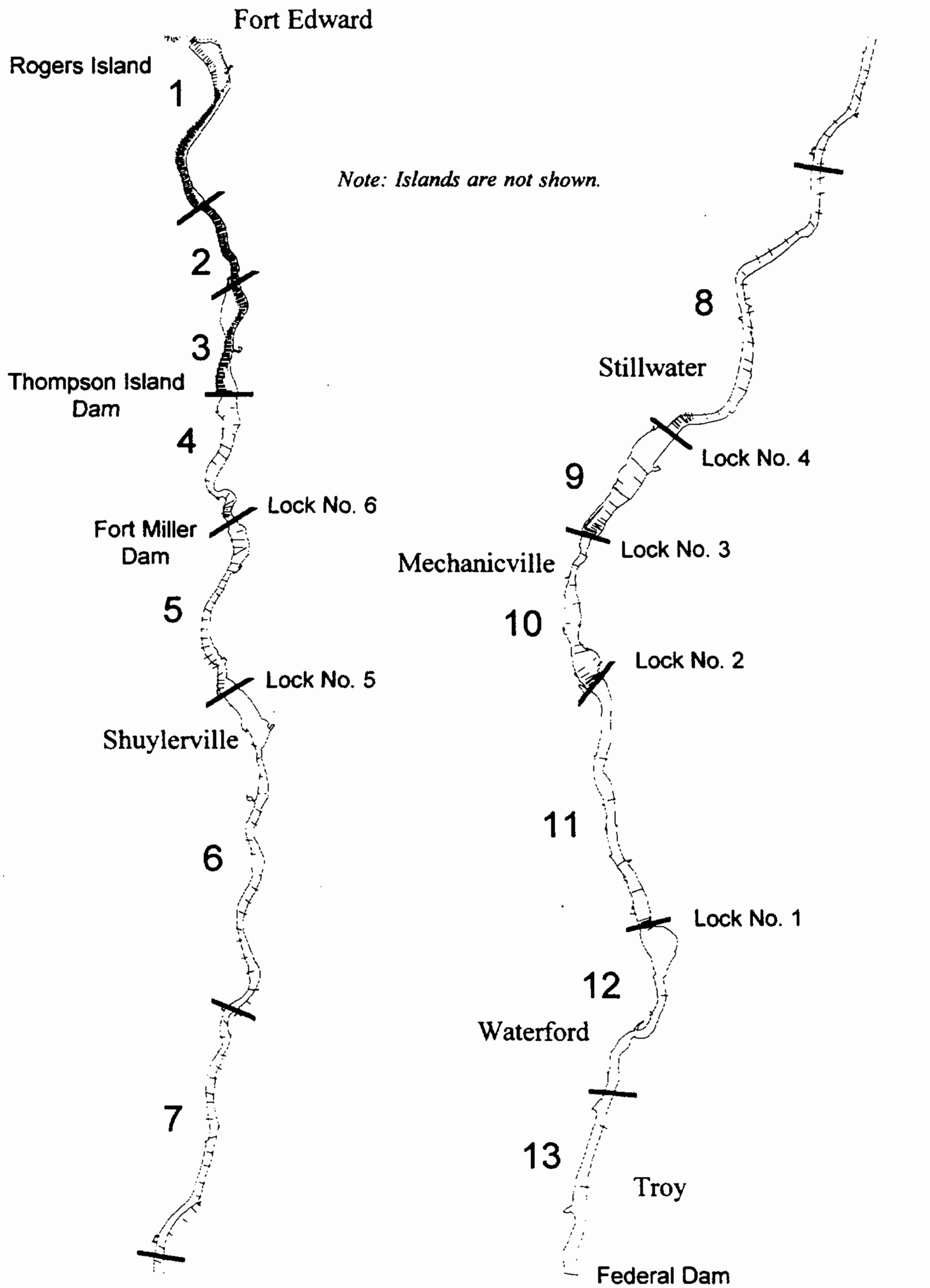
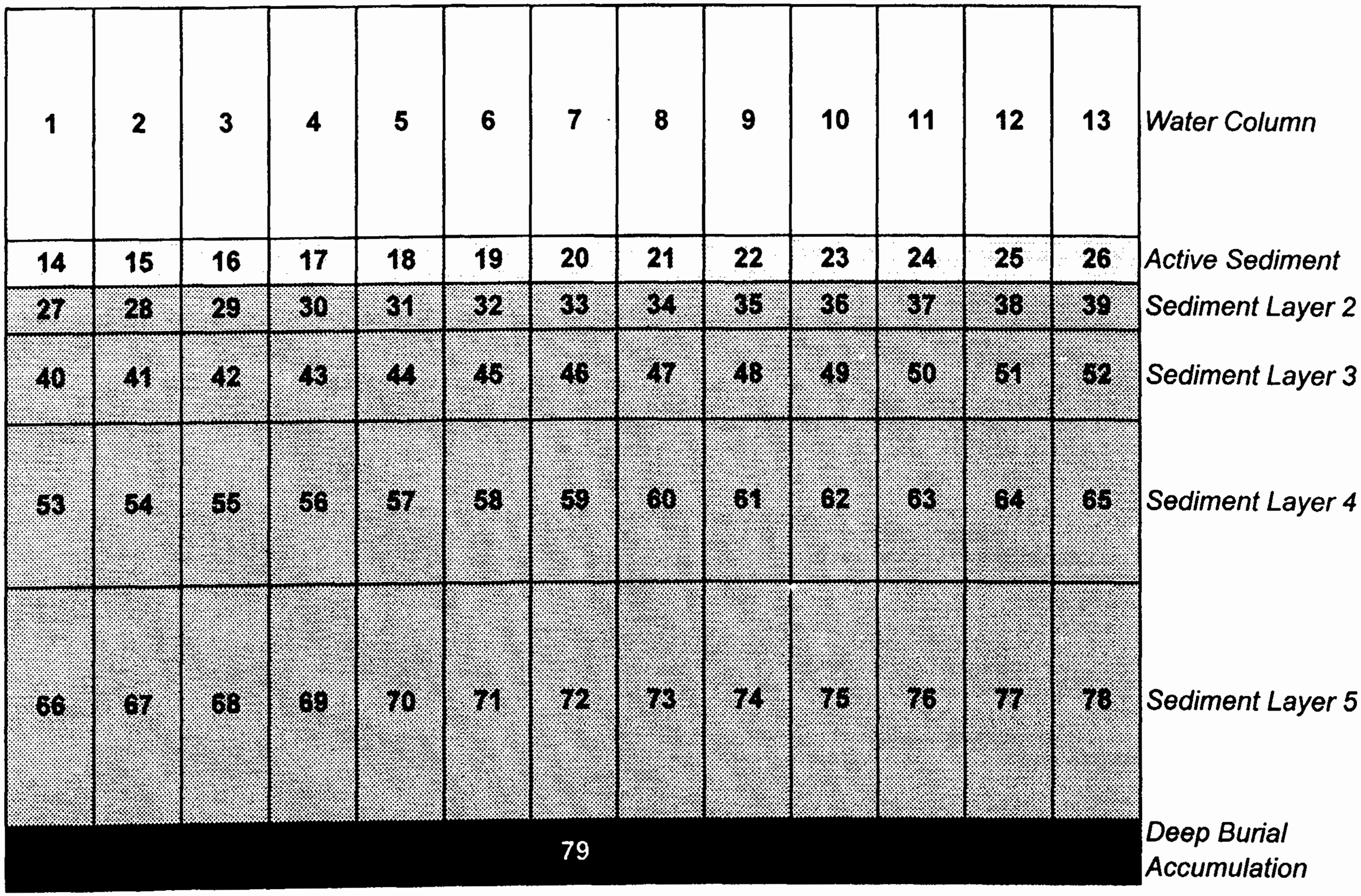
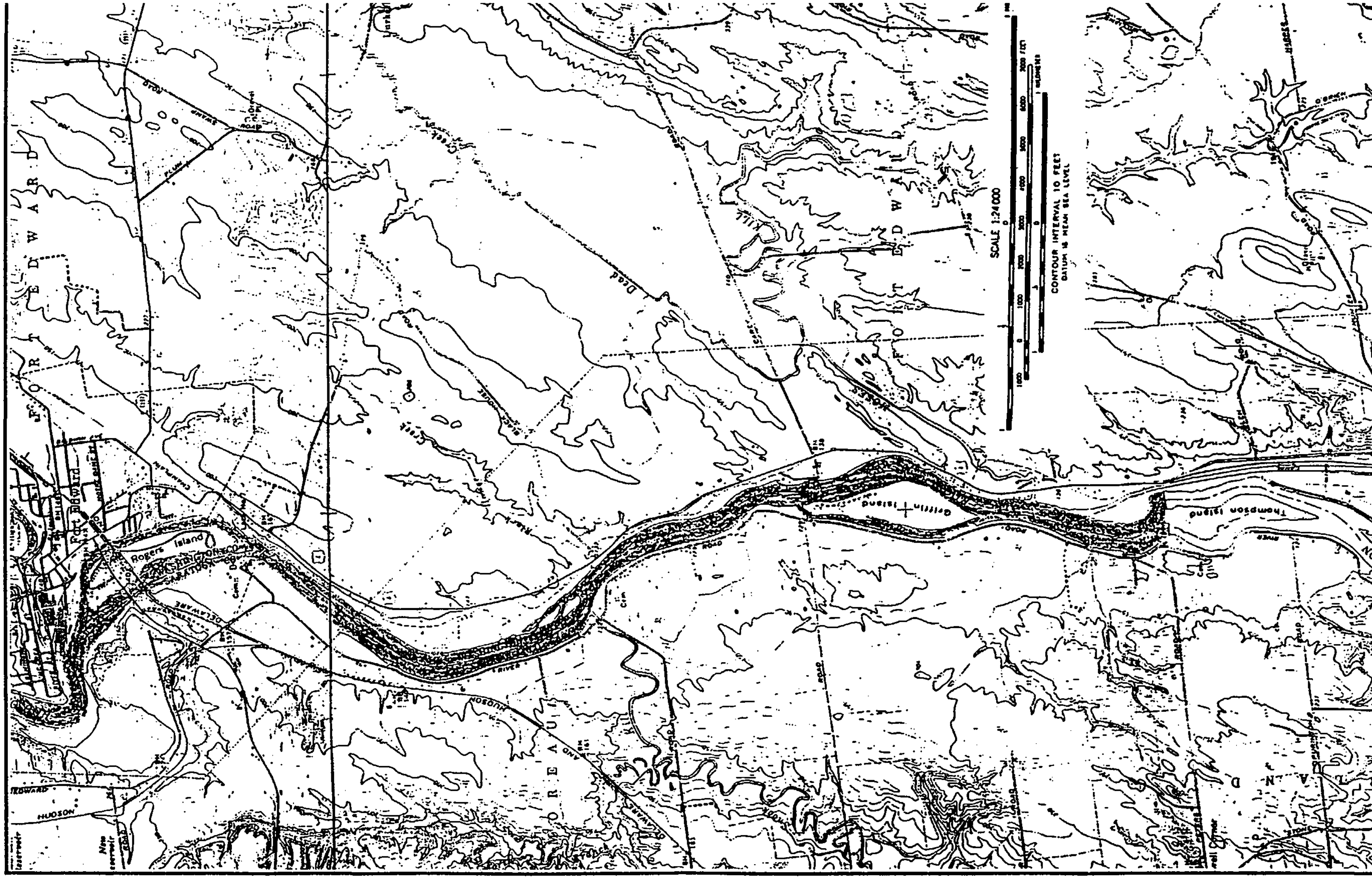


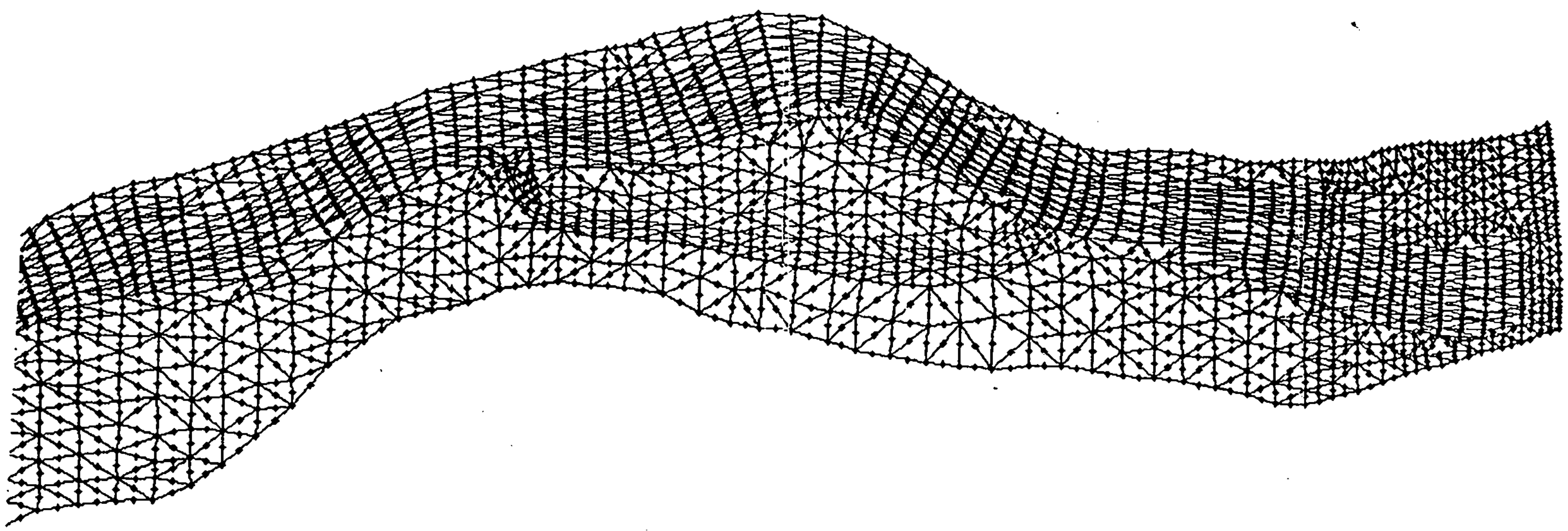
**Figure 3-7**
**HUDTOX Water Column and Sediment Segmentation Schematic**





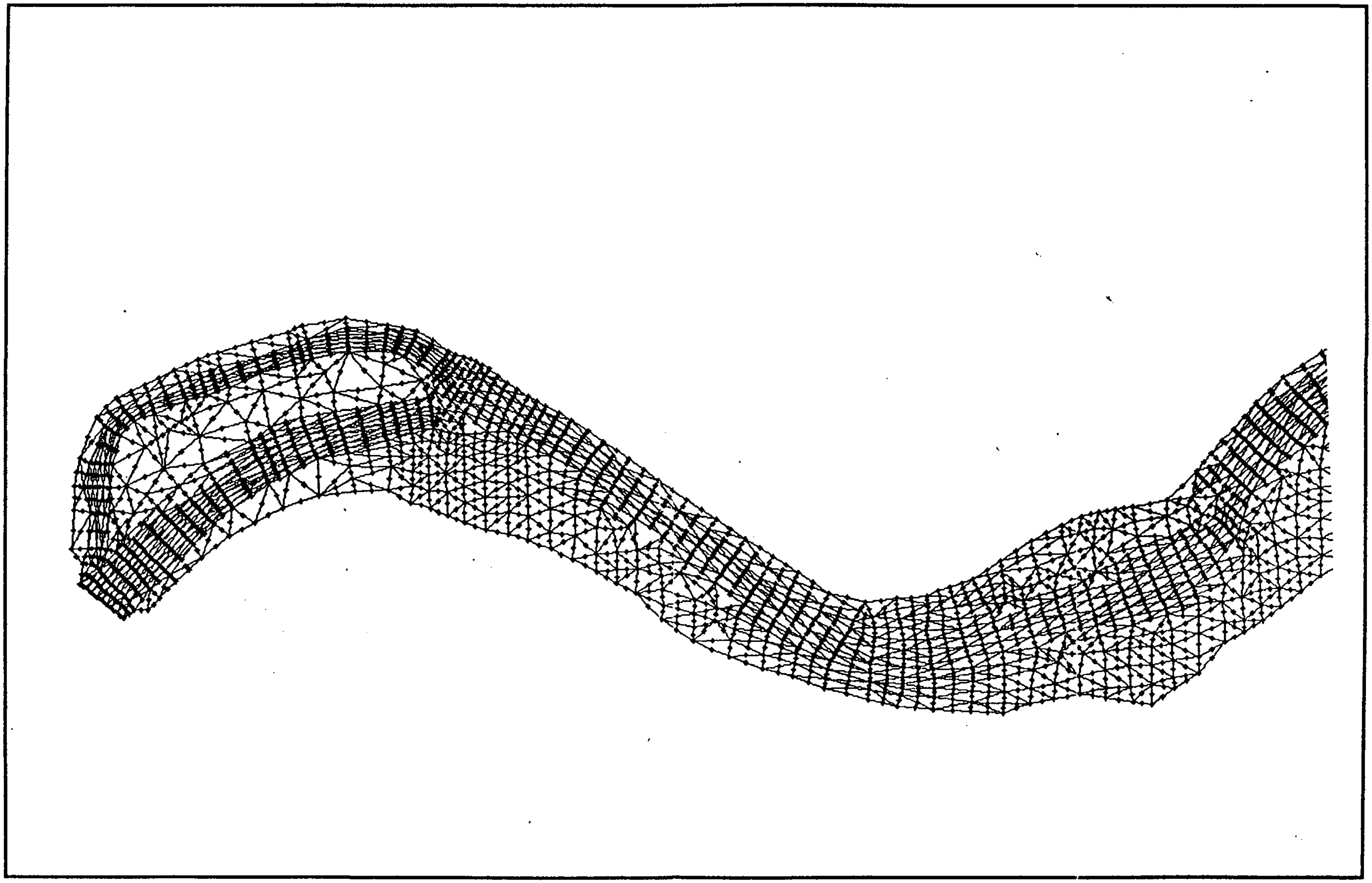

Source: USGS 15' Quadrangle Map, 1966, 1967

Finite Element Model Grid

Source: Finite Element Grid Points Based on GE 1991 Hydrographic Surv :y and USGS Topographic Maps

Figure 3-3
Finite Element Model Grid
Page 2 of 2



Source: Finite Element Grid Points Based on GE 1991 Hydrographic Survey and USGS Topographic Maps

**Figure 3-10**
**Thompson Island Pool Depth of Scour**
**Model Conceptual Approach**

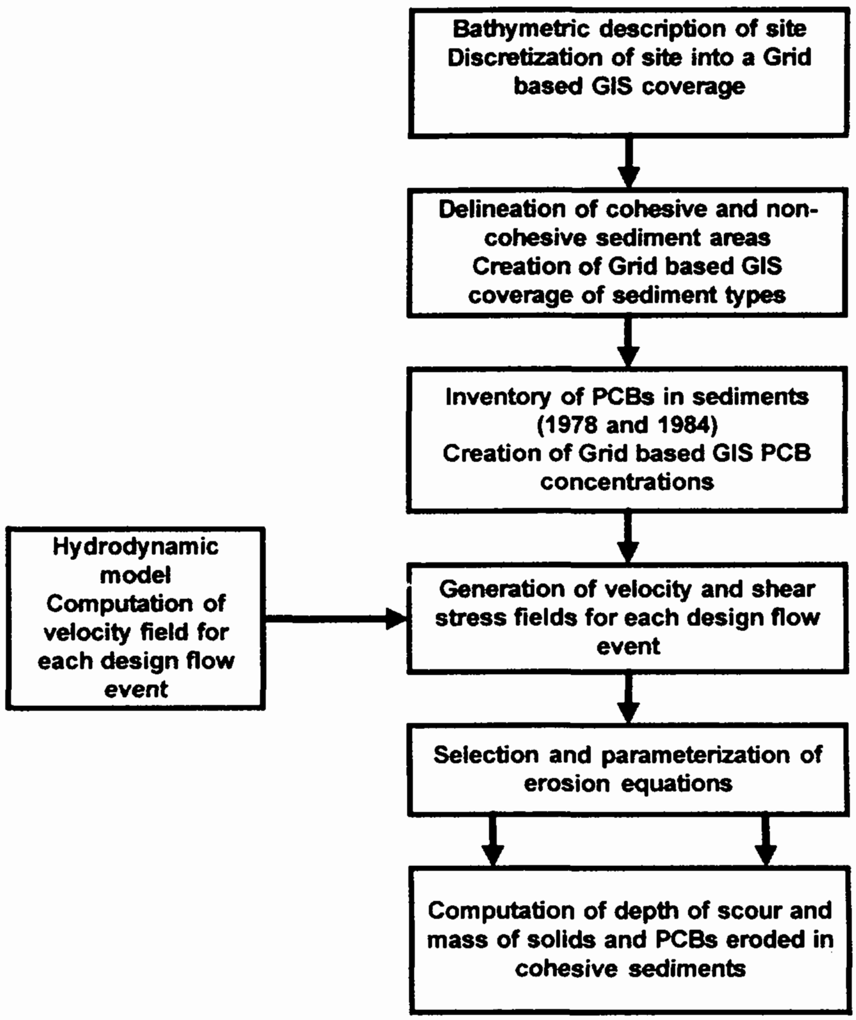
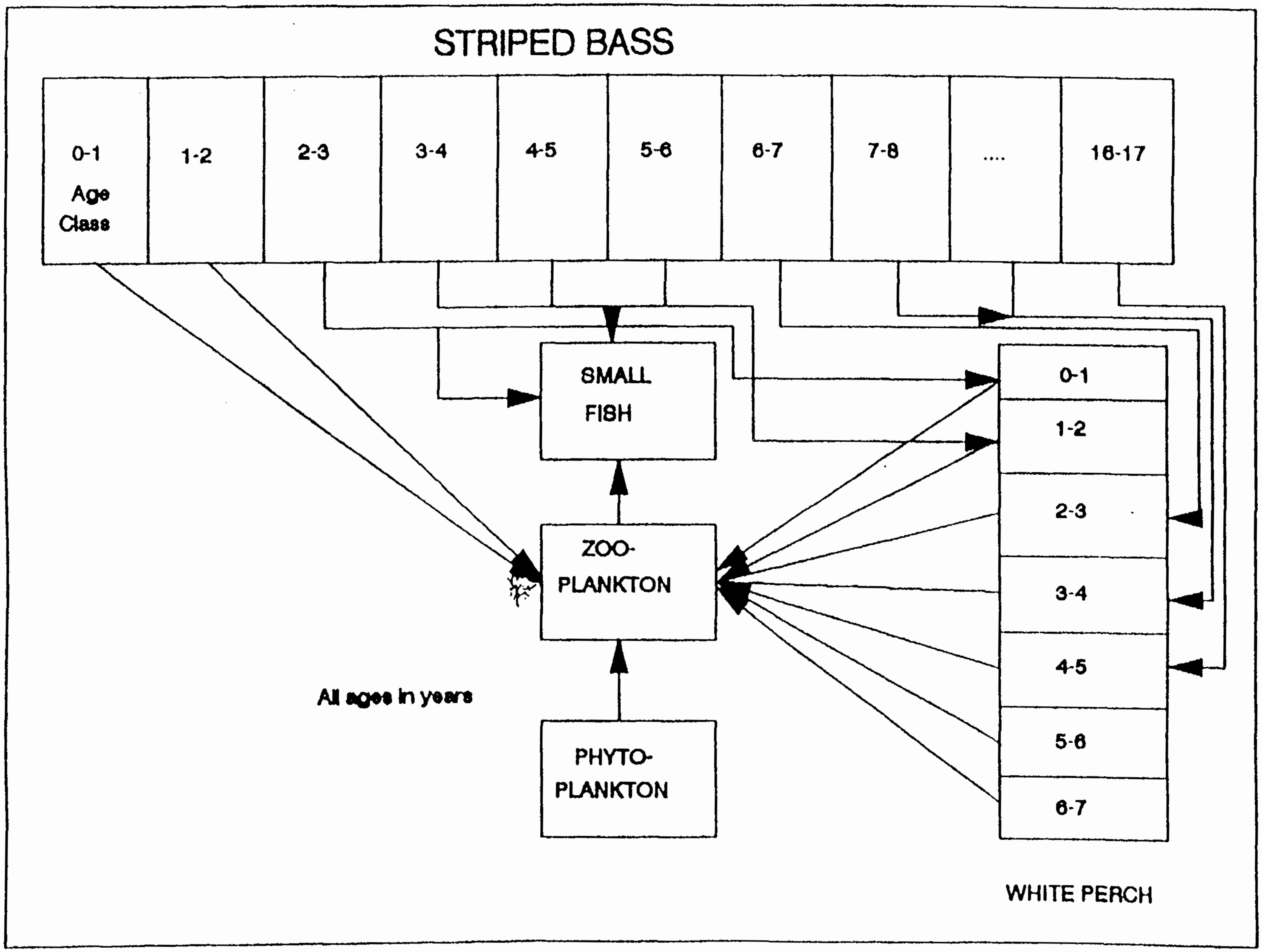
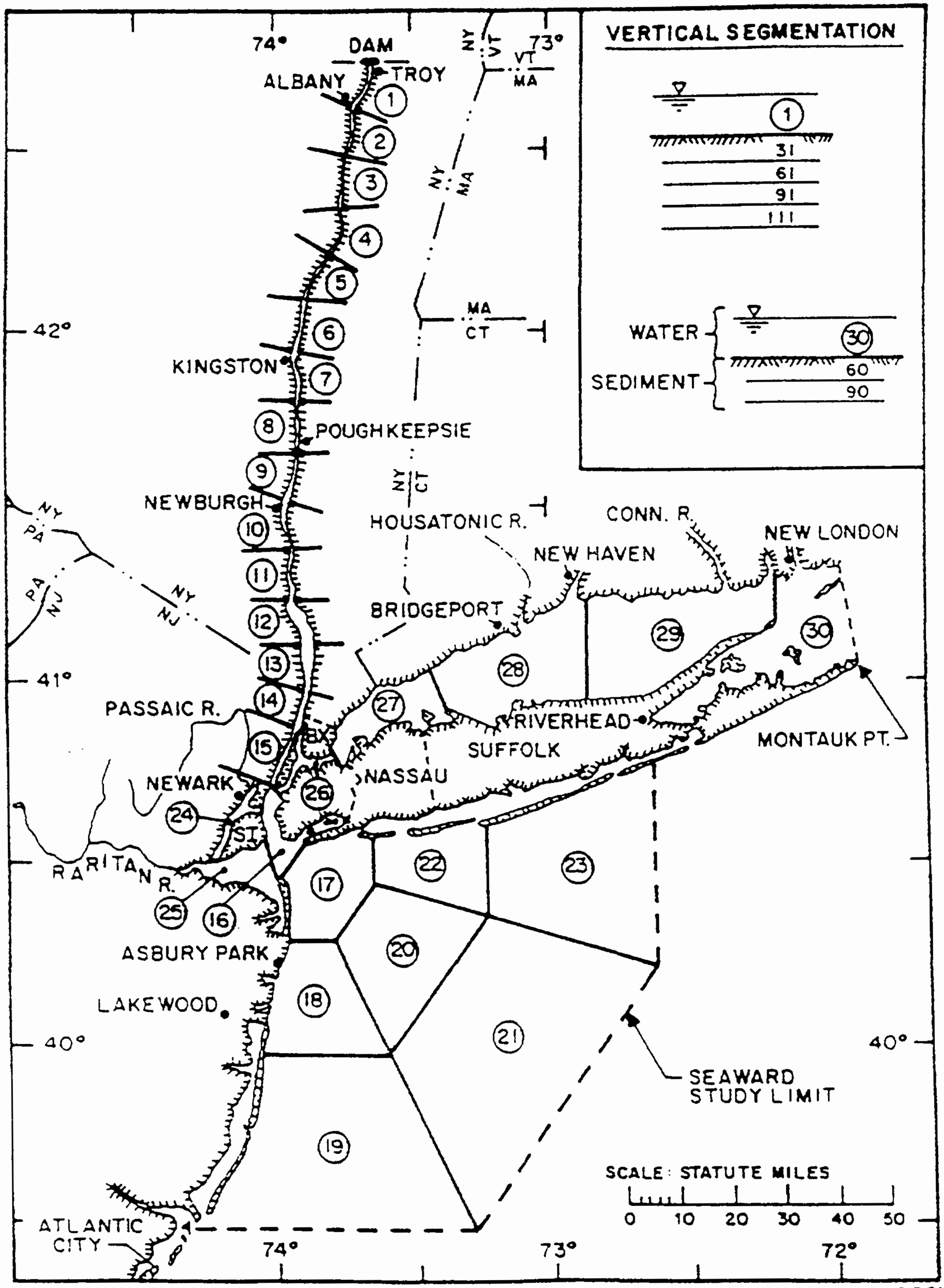


Figure 3-11
Food Web Interactions Used in Lower Hudson Food Chain Model



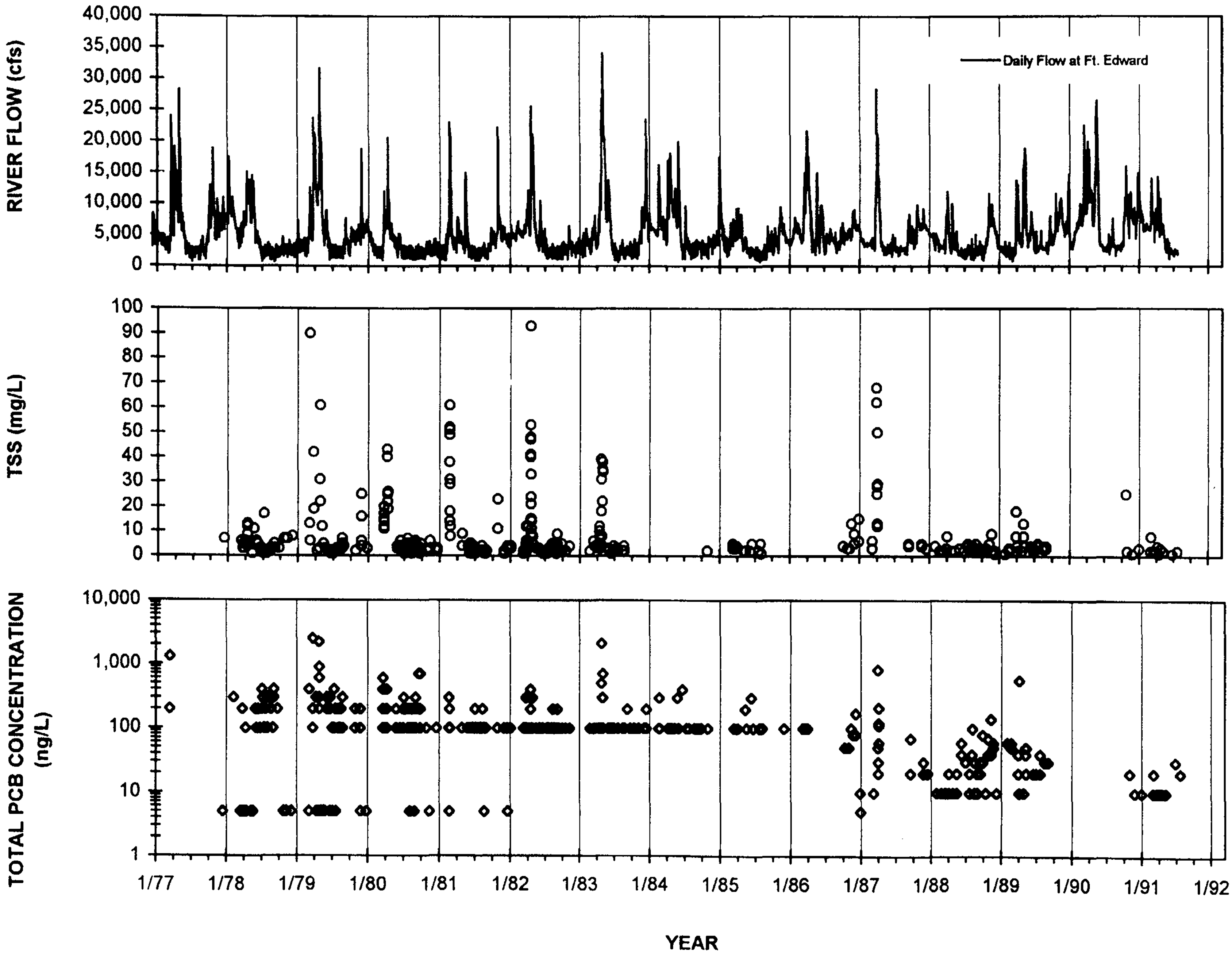

(from Thomann et al, 1989)

## Figure 3-12
## Lower Hudson Model Spatial Domain and Physicochemical Model Segmentation



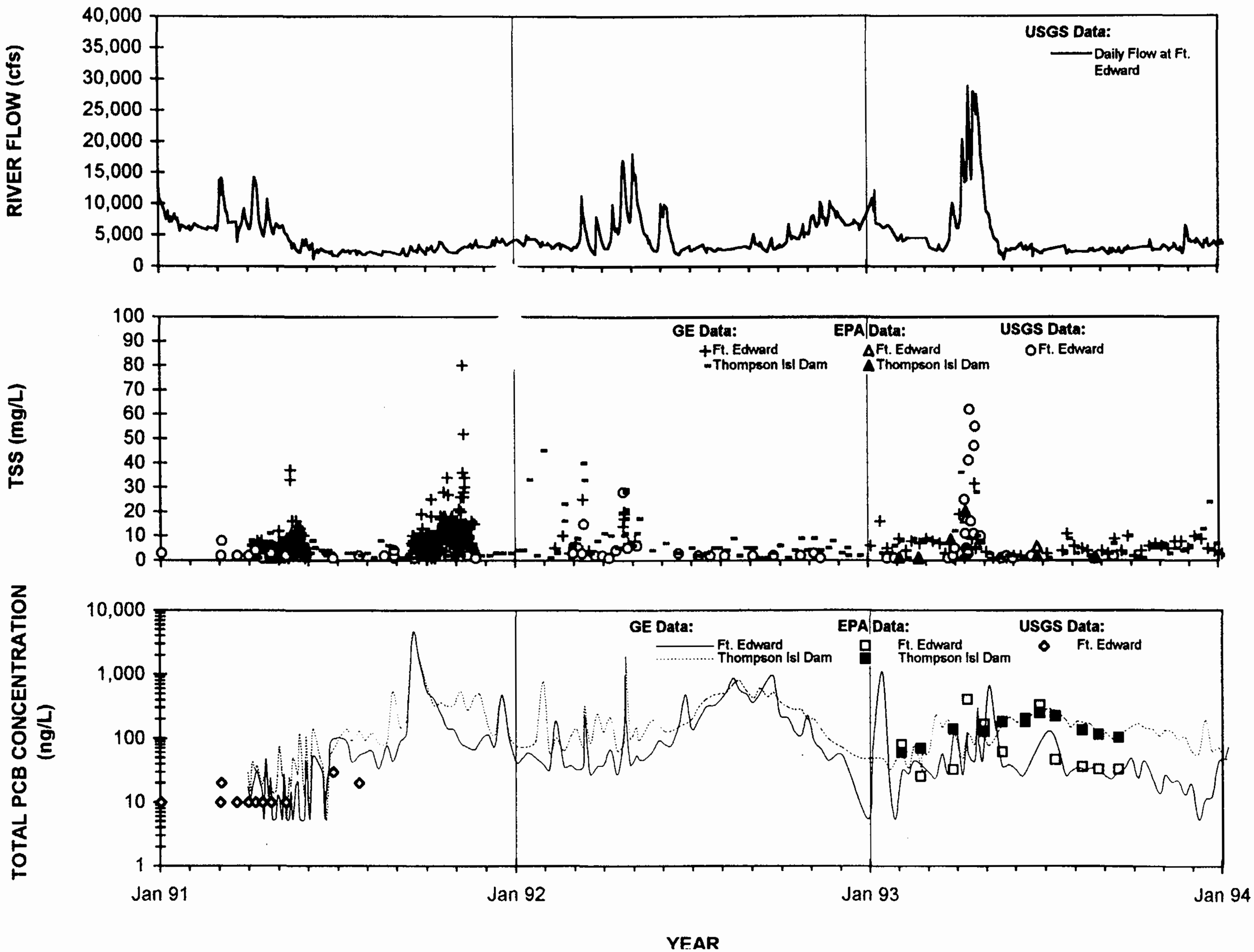

(from Thomann et al, 1989)

**Figure 4-1**
**Historical Trends of USGS Flow, TSS and Total PCBs in the Upper Hudson River at Fort Edward.**



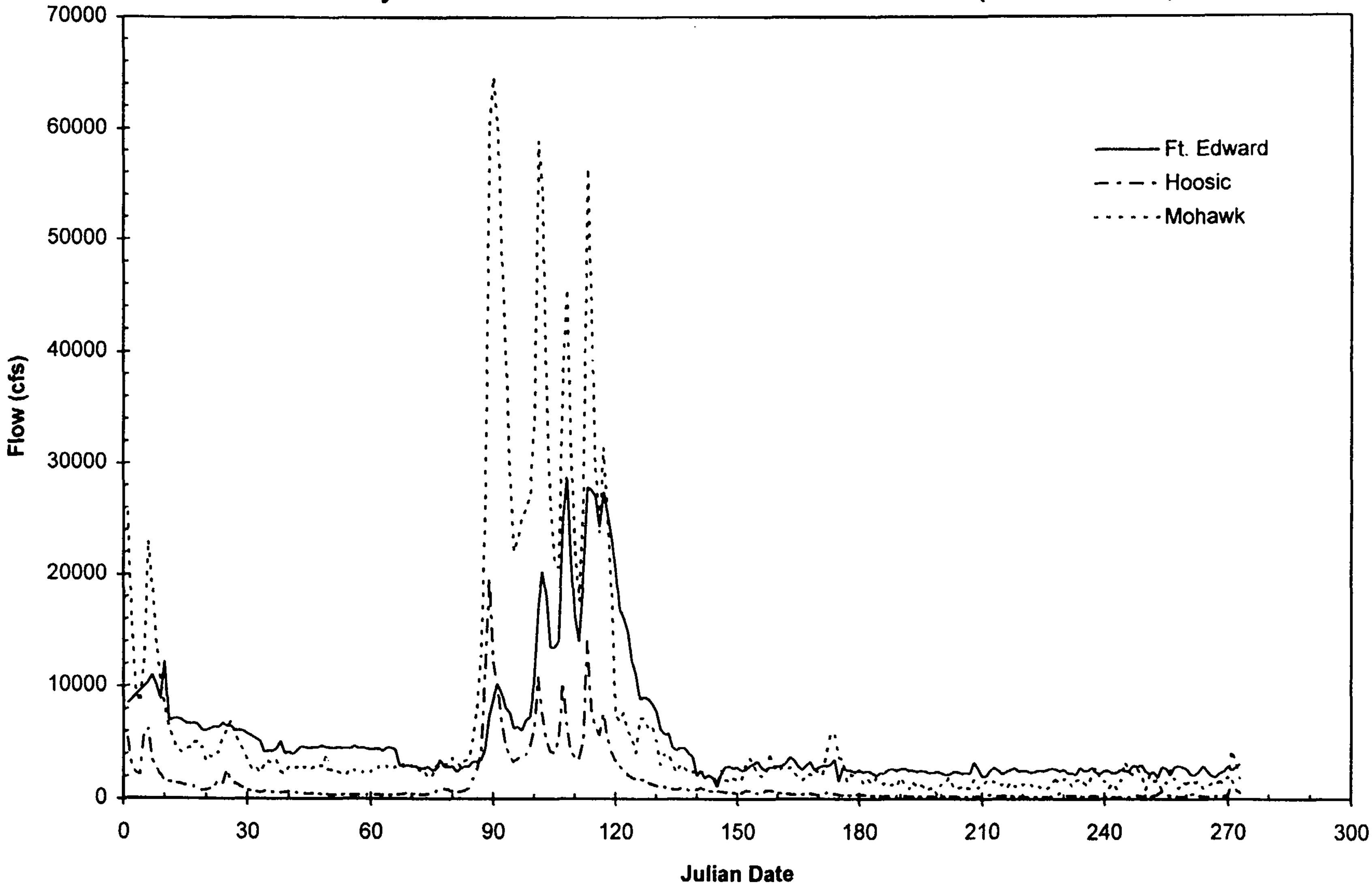

HRP 002 1340

Figure 4-2
Recent Trends of Flow, TSS and Total PCBs in the Upper Hudson River at Fort Edward and Thompson Island Dam.



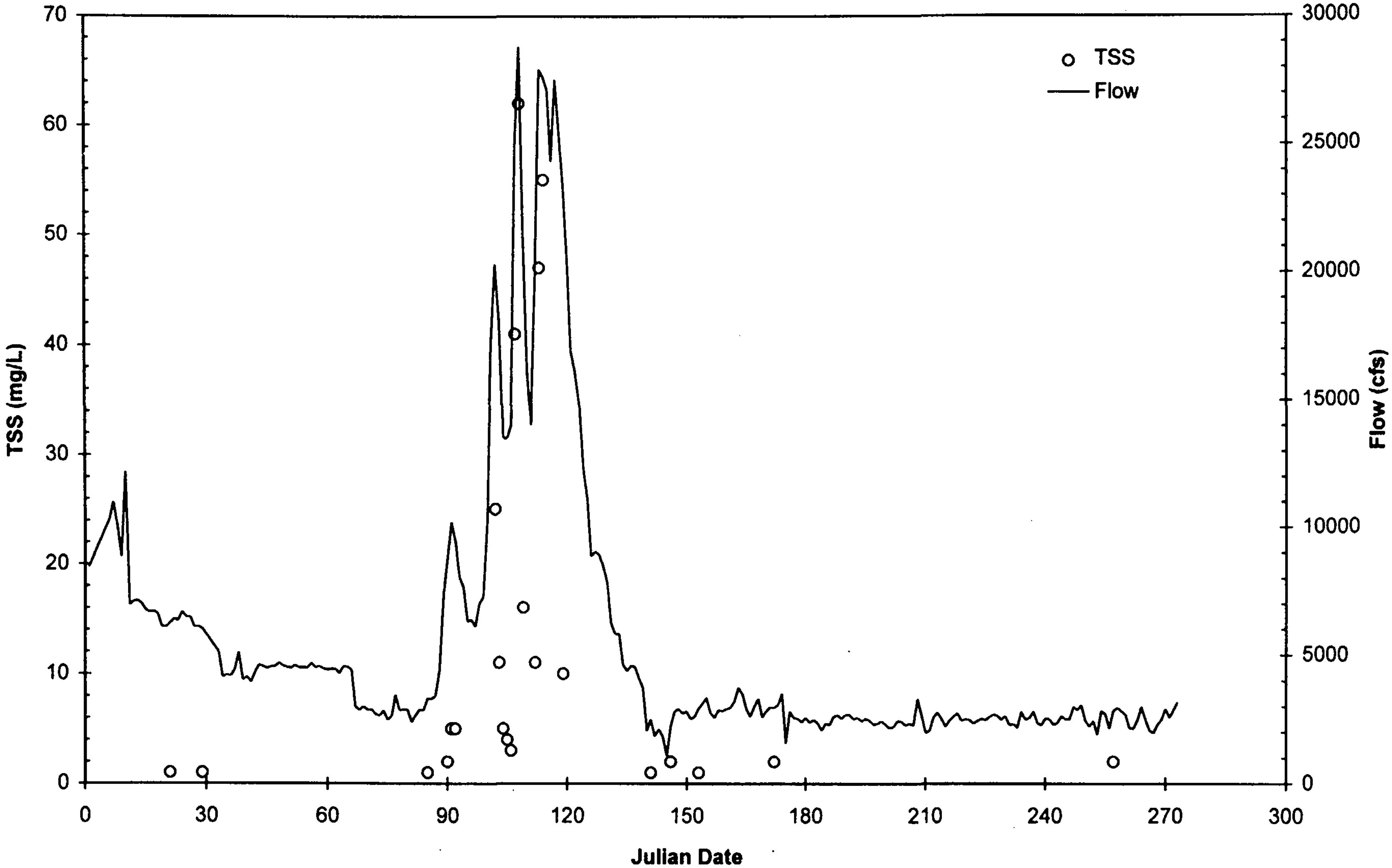

HRP 002 1341

**Figure 4-3**
**USGS Daily Flow Records for the Model Calibration Period (1/1/93 - 9/30/93)**




Source: TAMS/Gradient Database

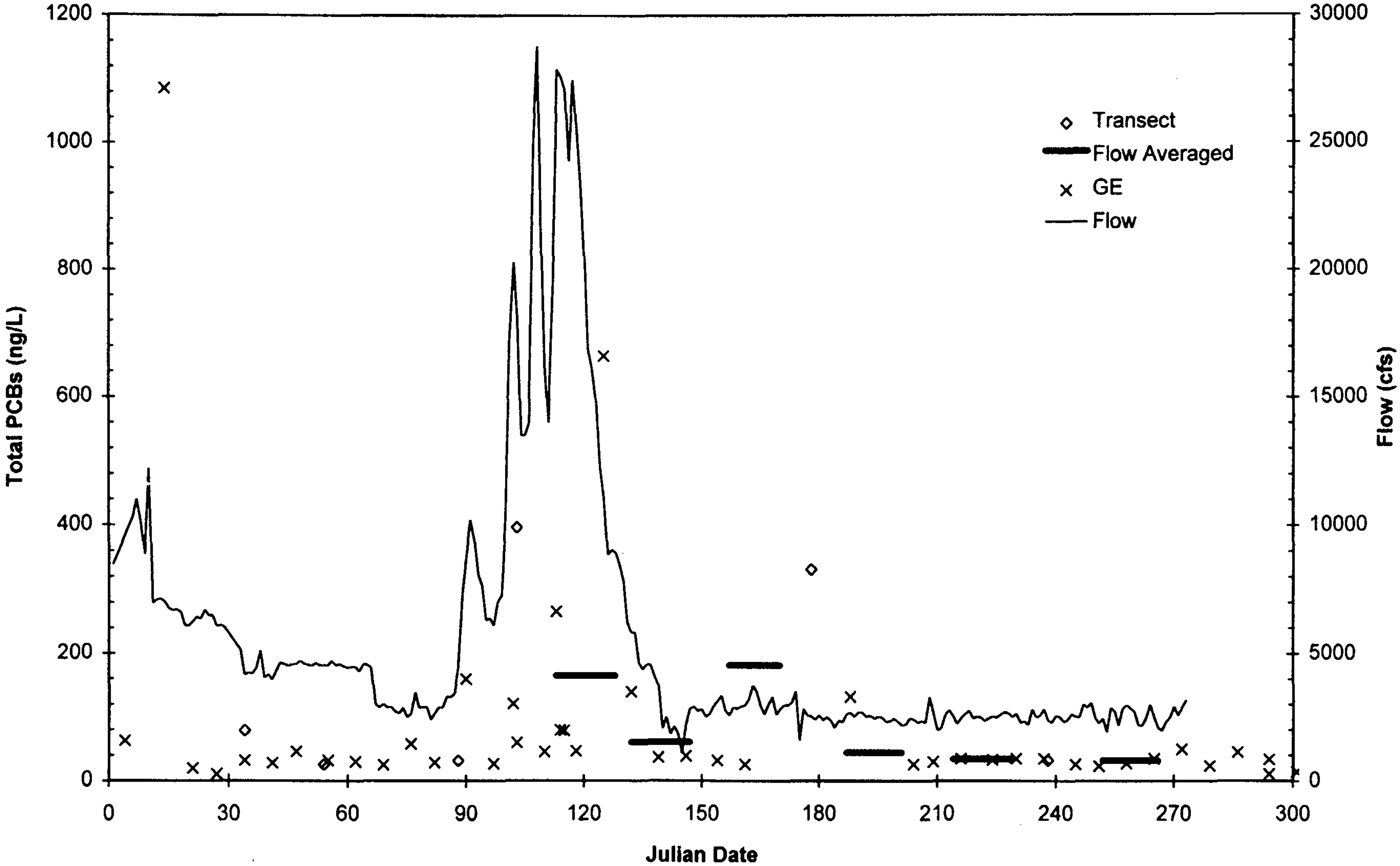
## Figure 4-4
## USGS TSS and Daily Flow at Fort Edward for the Model Calibration Period (1/1/93 - 9/30/93)




Source: TAMS/Gradient Database

HRP 002 13

**Figure 4-5**
**Total PCBs and Daily Flow at Ft. Edward for the Model Calibration Period (1/1/93 - 9/30/93)**




Source: TAMS/Gradient Database

HRP 002 1344

## Figure 4-6
## Upper Hudson River External Water, Solids and DOC Loads for HUDTOX Calibration Period (1/1/93-9/30/93)
### Spring Runoff Event Period (3/26/93 - 5/10/93)

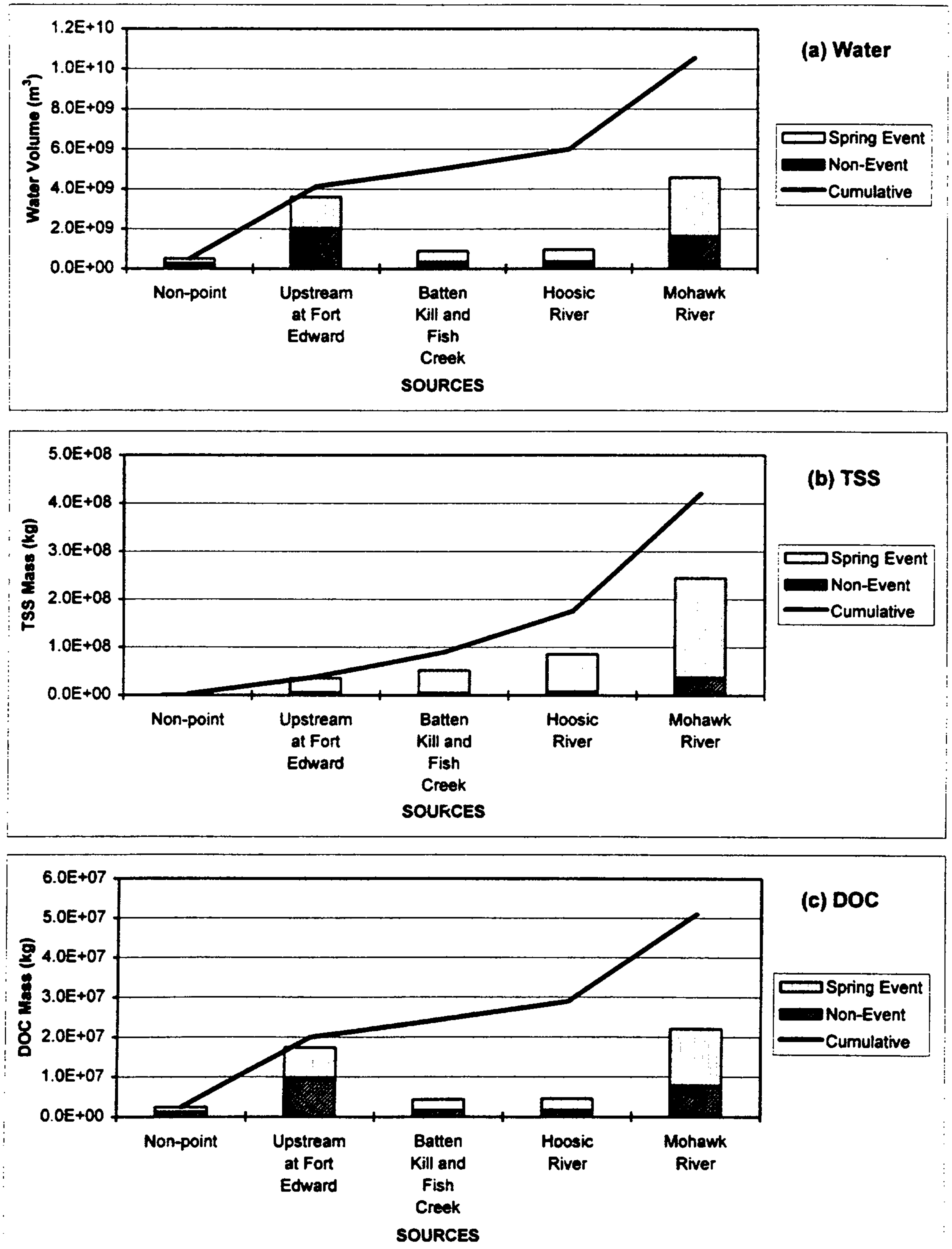
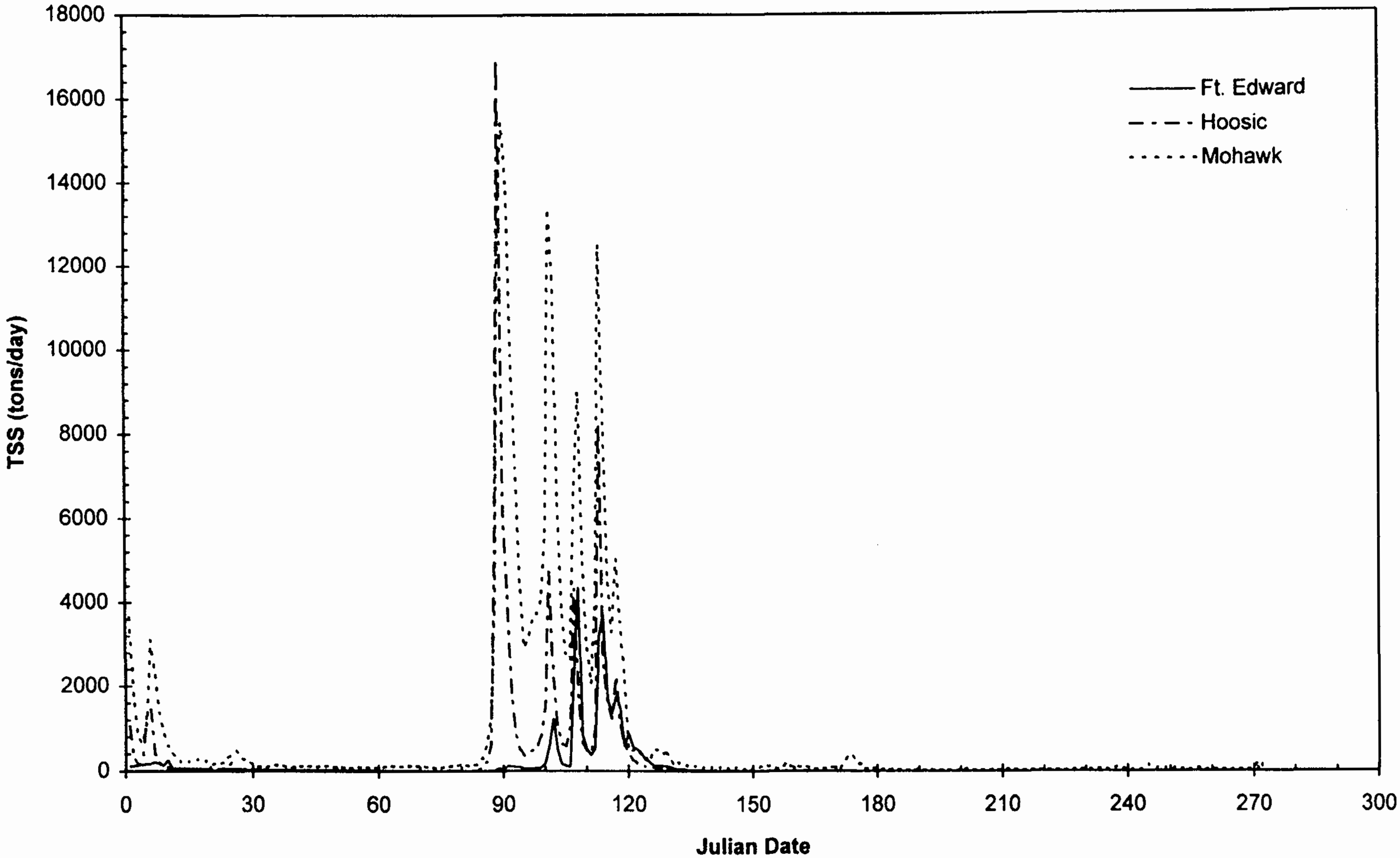
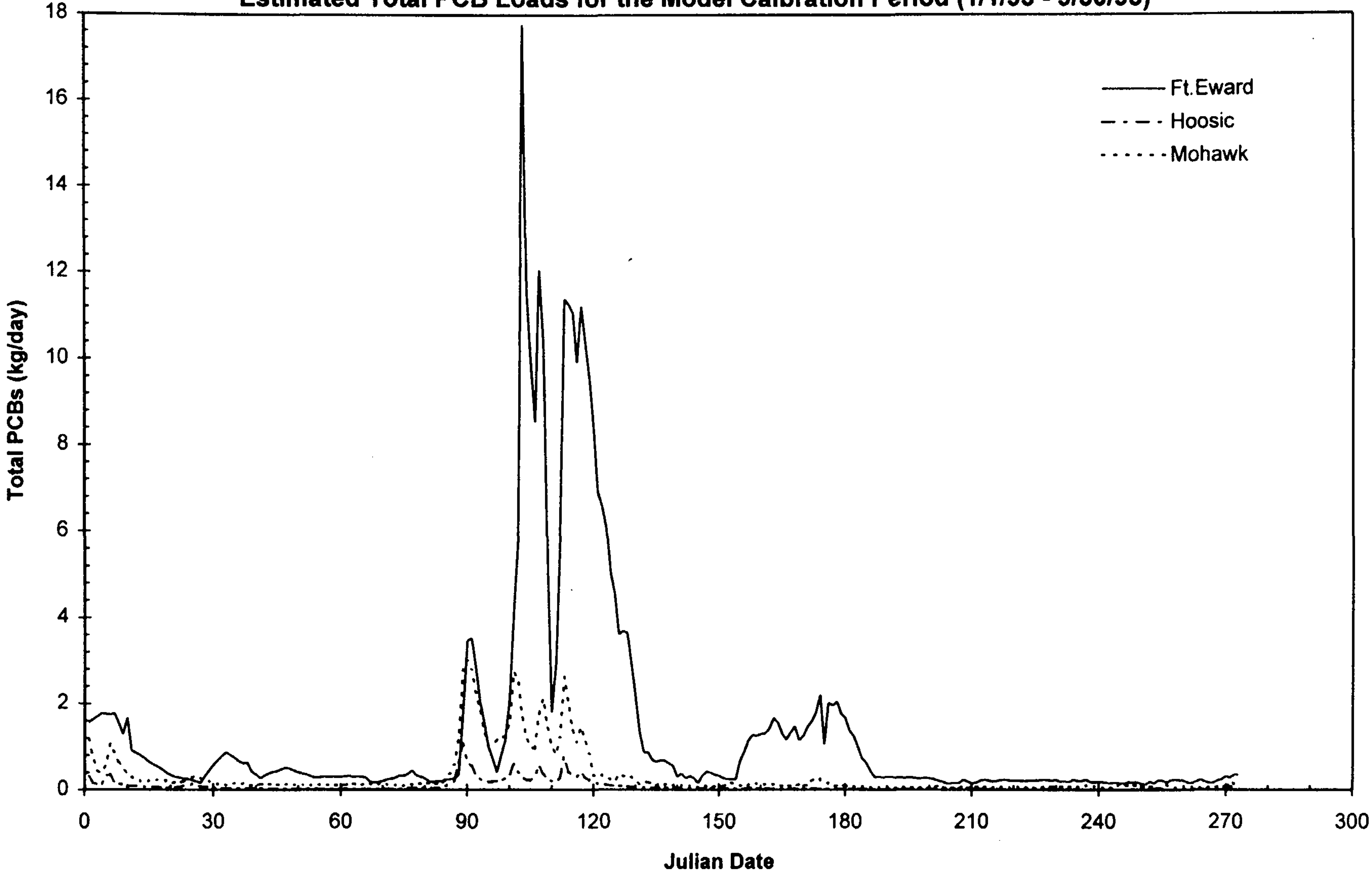


**Figure 4-7**
**Estimated Daily TSS Loads for the Model Calibration Period (1/1/93 - 9/30/93)**




Source: TAMS/Gradient Database

## Figure 4-8
## Estimated Total PCB Loads for the Model Caibration Period (1/1/93 - 9/30/93)




Source: TAMS/Gradient Database

**Figure 4-9**
**Upper Hudson River External PCB Loads for HUDTOX Calibration Period (1/1/93-9/30/93) Spring Runoff Event Period (3/26/93 - 5/10/93)**
*Page 1 of 2*

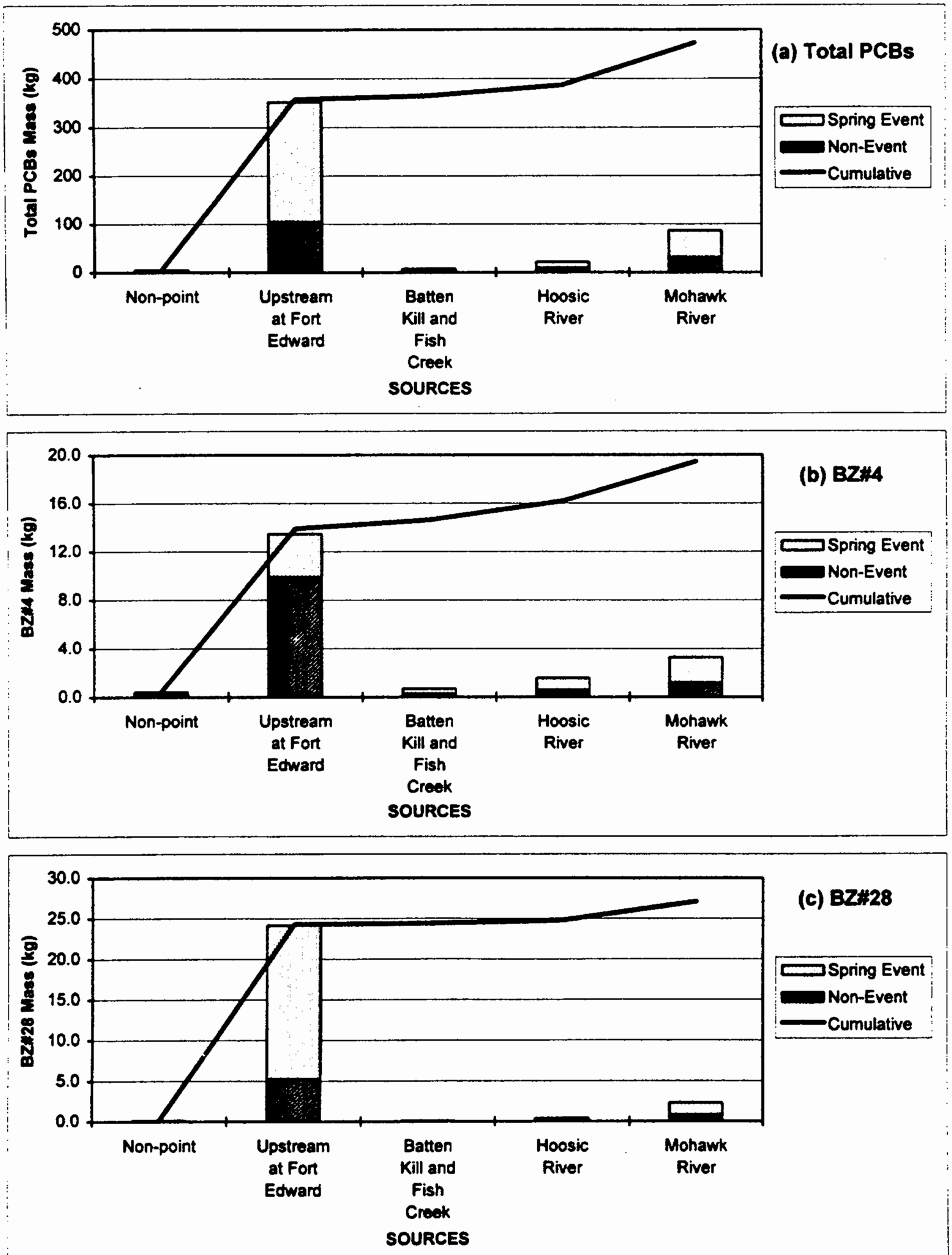
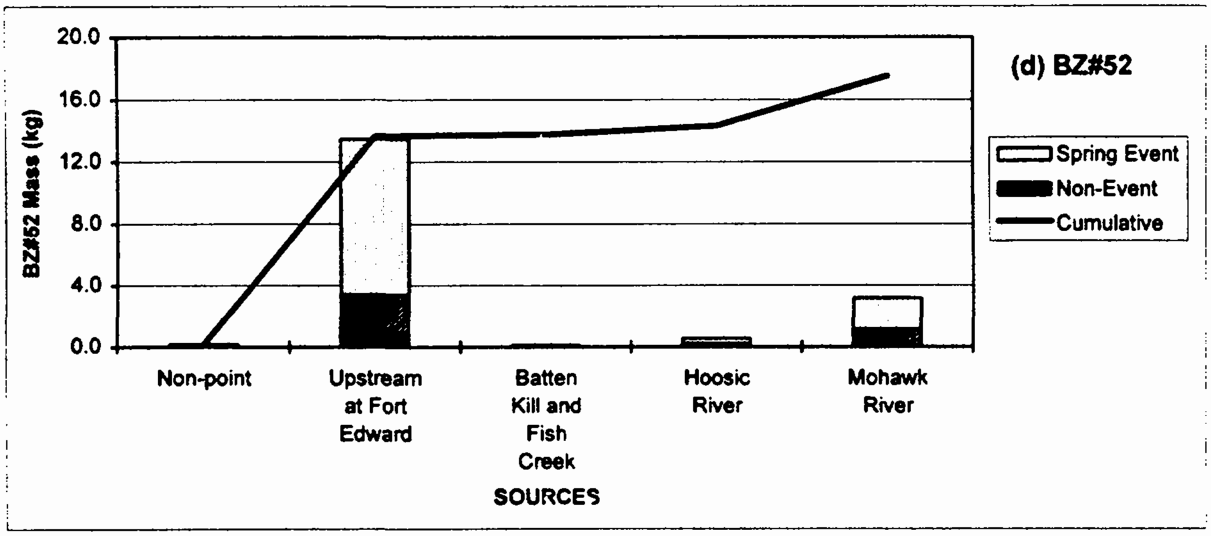
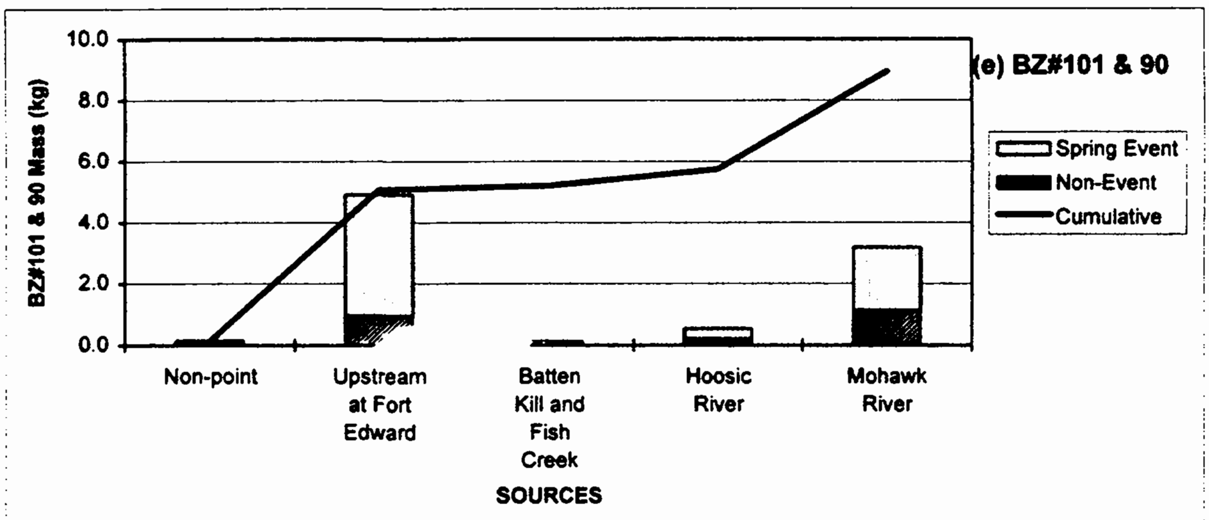
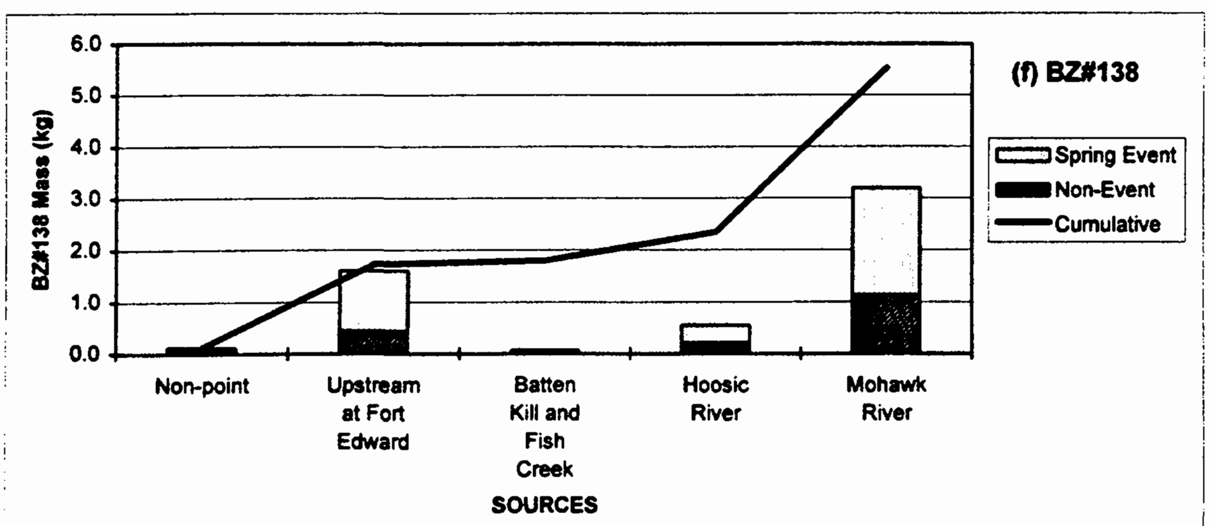


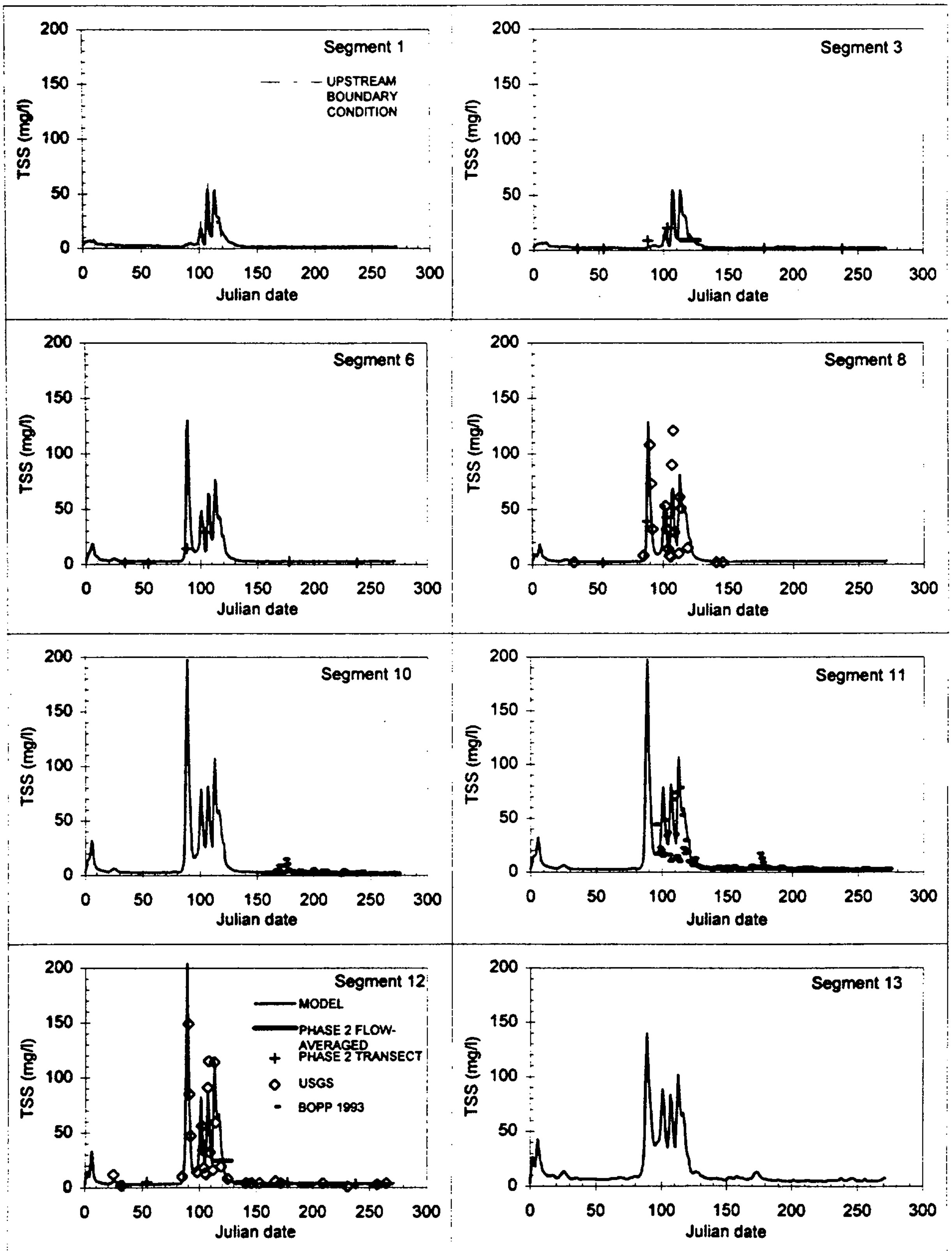
**Figure 4-9**
**Upper Hudson River External PCB Loads for HUDTOX Calibration Period (1/1/93-9/30/93)**
**Spring Runoff Event Period (3/26/93 - 5/10/93)**
***Page 2 of 2***



## Figure 4-10
## TSS Calibration for Upper Hudson River for January - September 1993



## Figure 4-11
## Hudson River TSS Calibration - Cumulative TSS Flux at USGS Stillwater Station
## January - September 1993

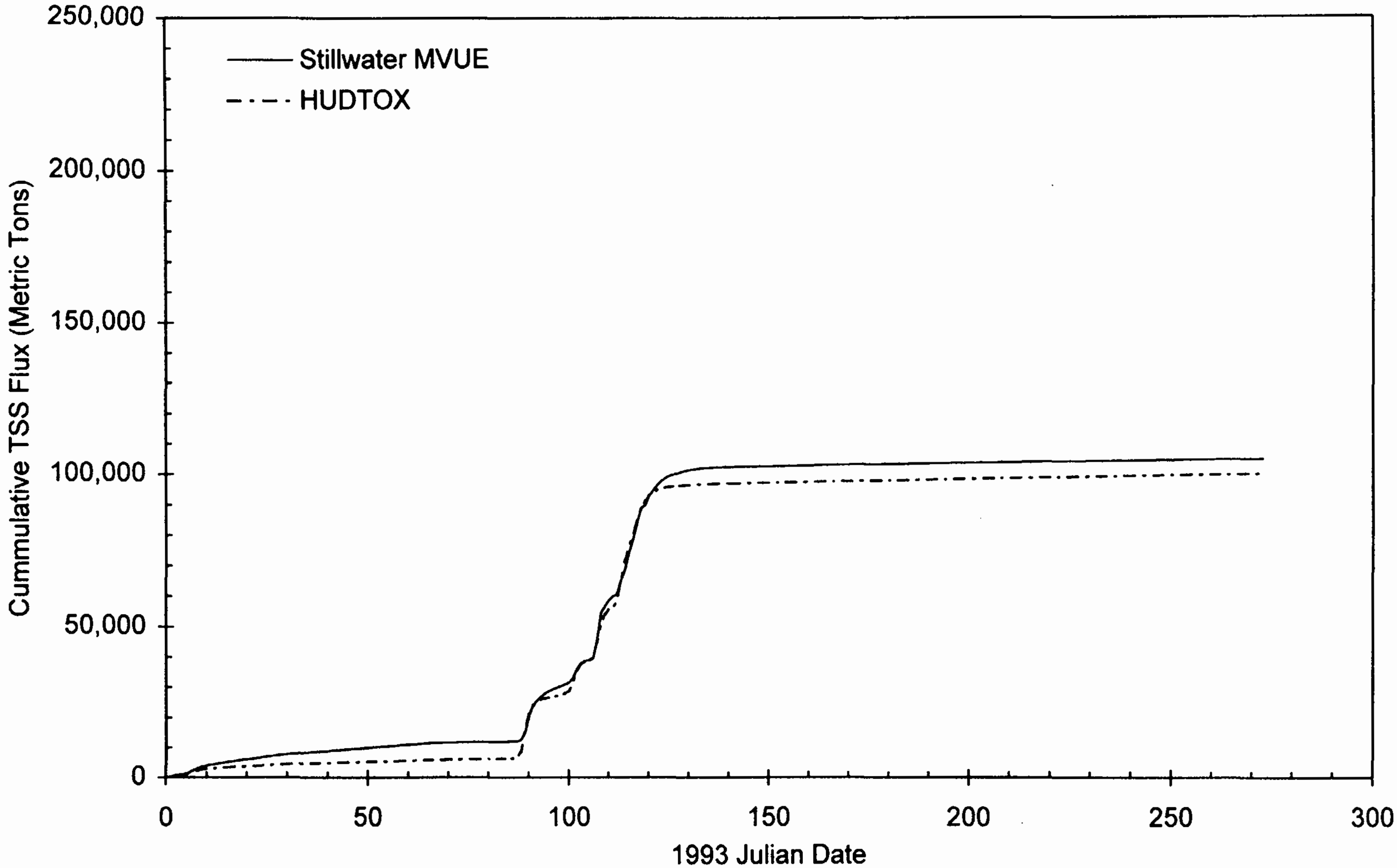



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**Figure 4-12**
**Hudson River TSS Calibration - Cumulative TSS Flux at USGS Waterford Station**
**January - September 1993**

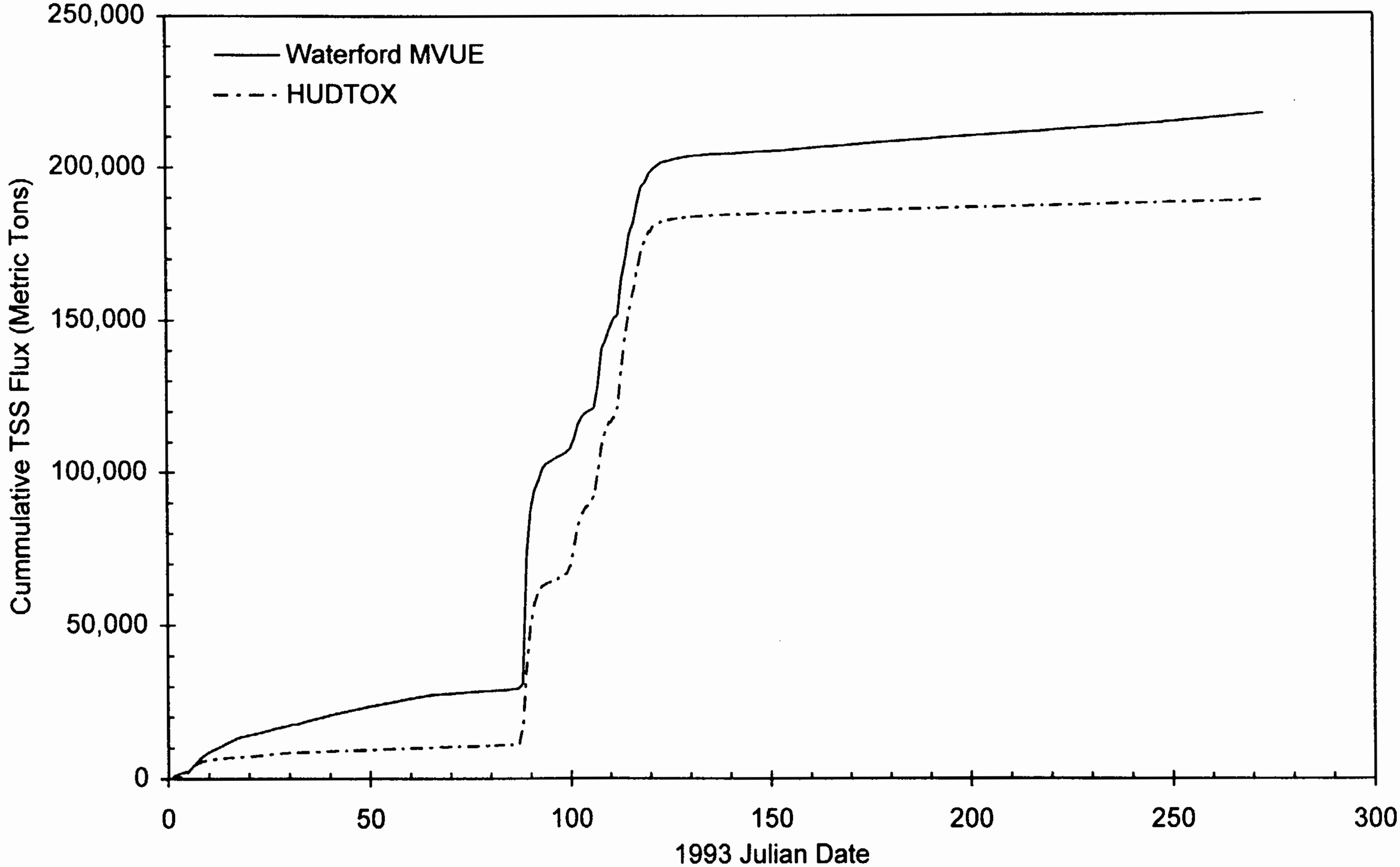


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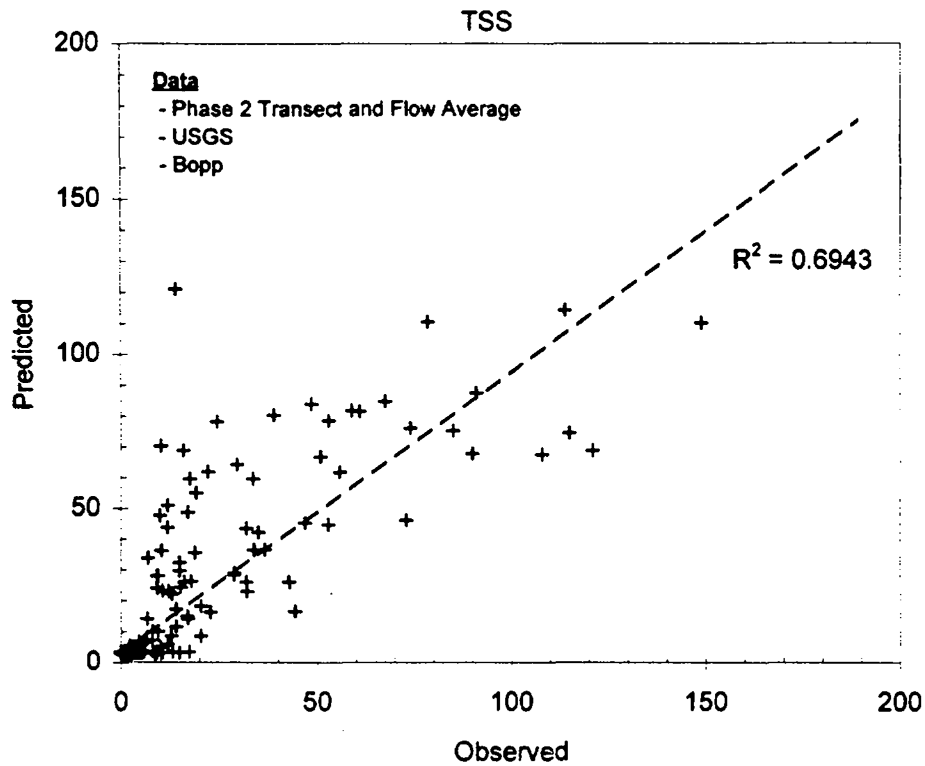
**Figure 4-13**
**HUDTOX Predicted TSS vs. Observed Values (mg/l)**
**1993 Calibration Period**



## Figure 4-14
## Total PCB Calibration - ΣPCBs for January - September 1993

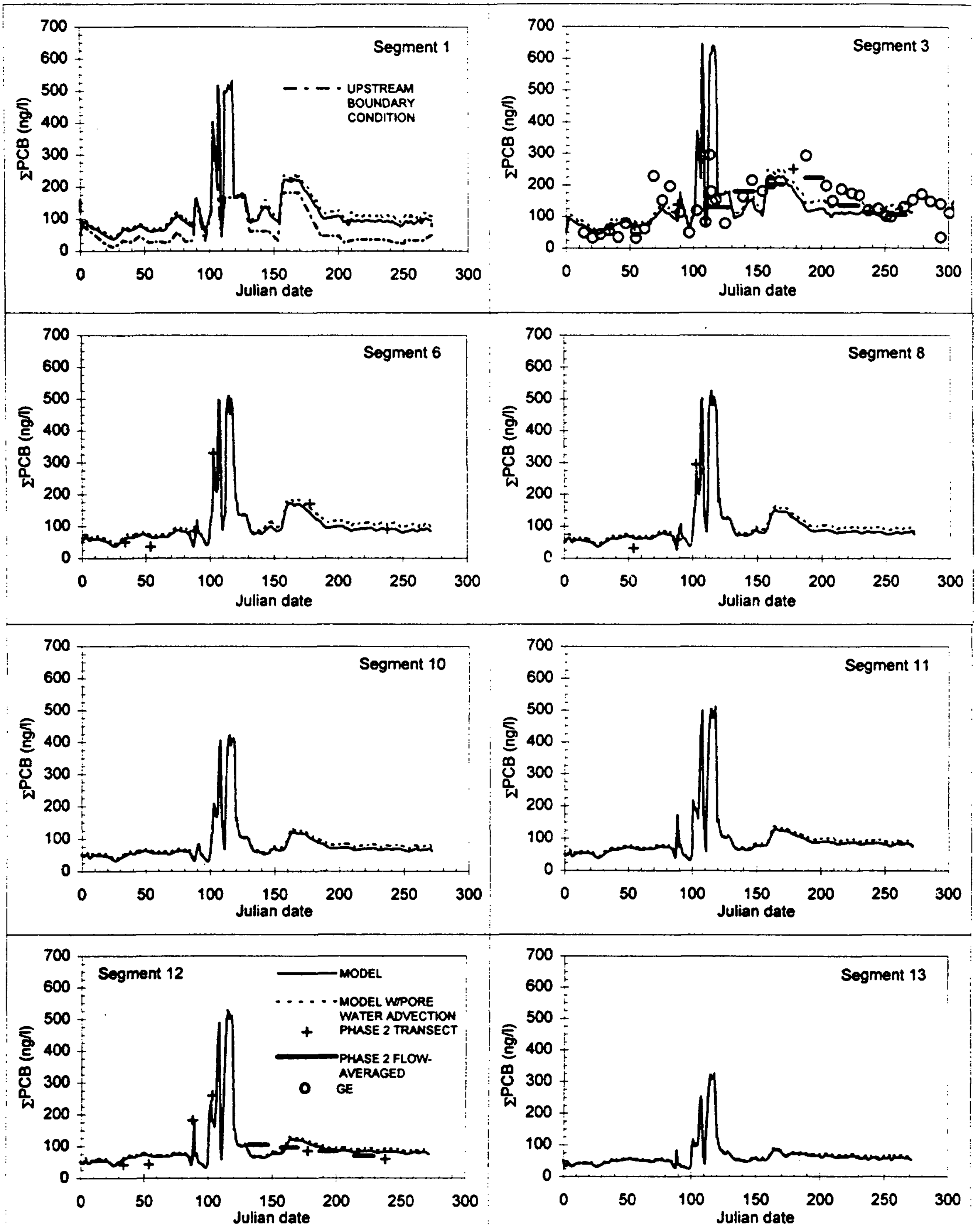
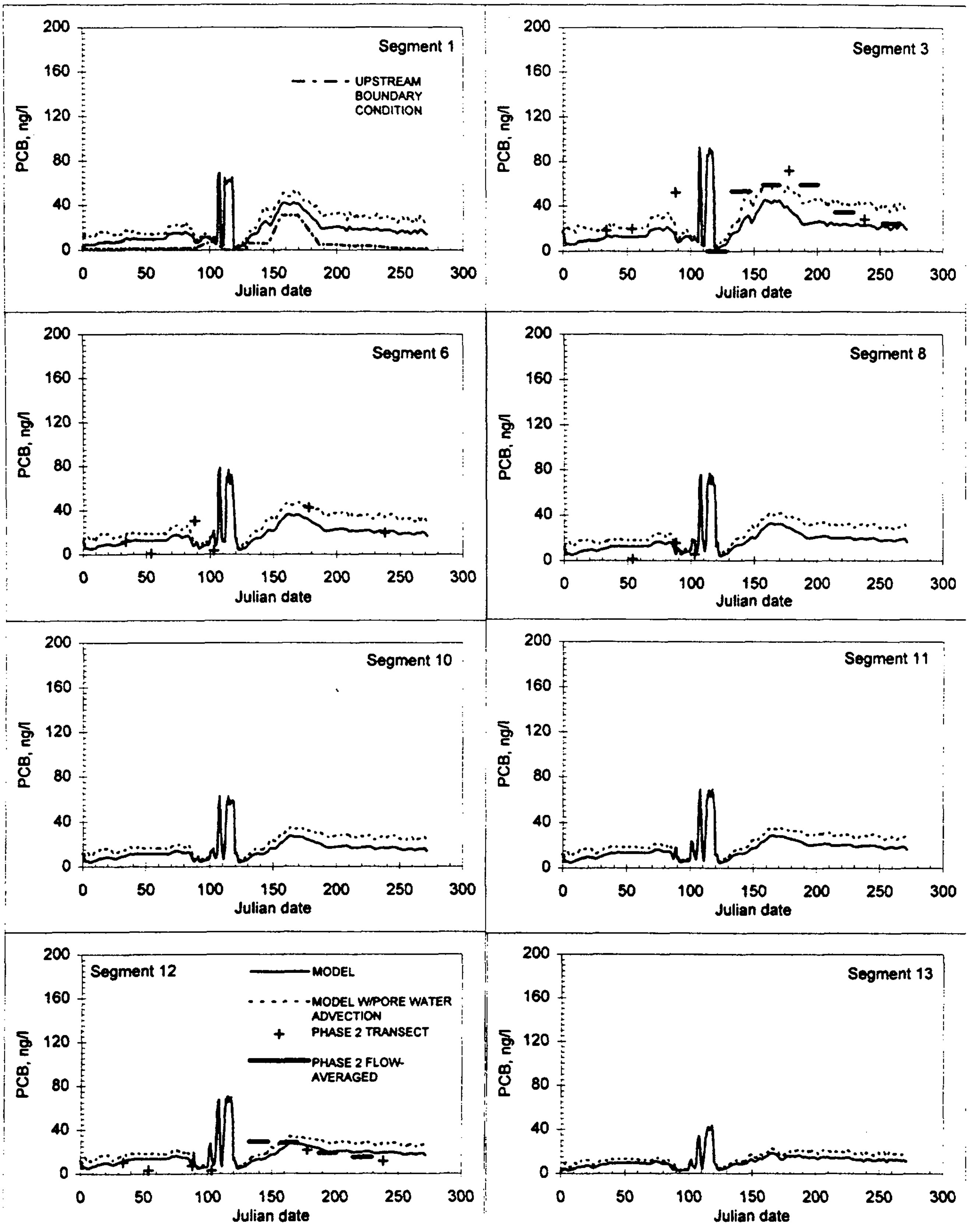
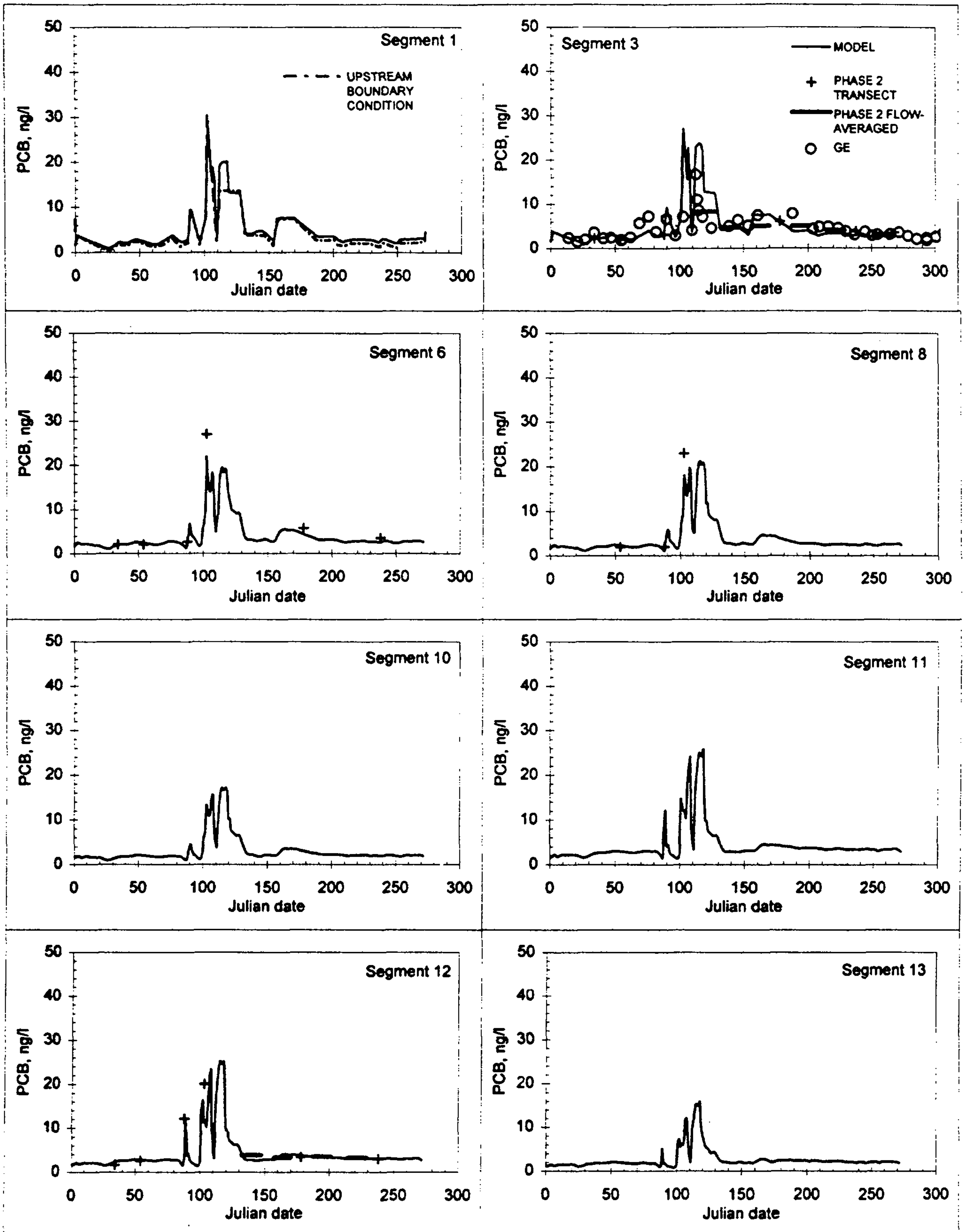


**Figure 4-15**
**Total PCB Calibration - BZ#4 for January - September 1993**



## Figure 4-16
## Total PCB Calibration - BZ#28 for January - September 1993



## Figure 4-17
## Total PCB Calibration - BZ#52 for January - September 1993

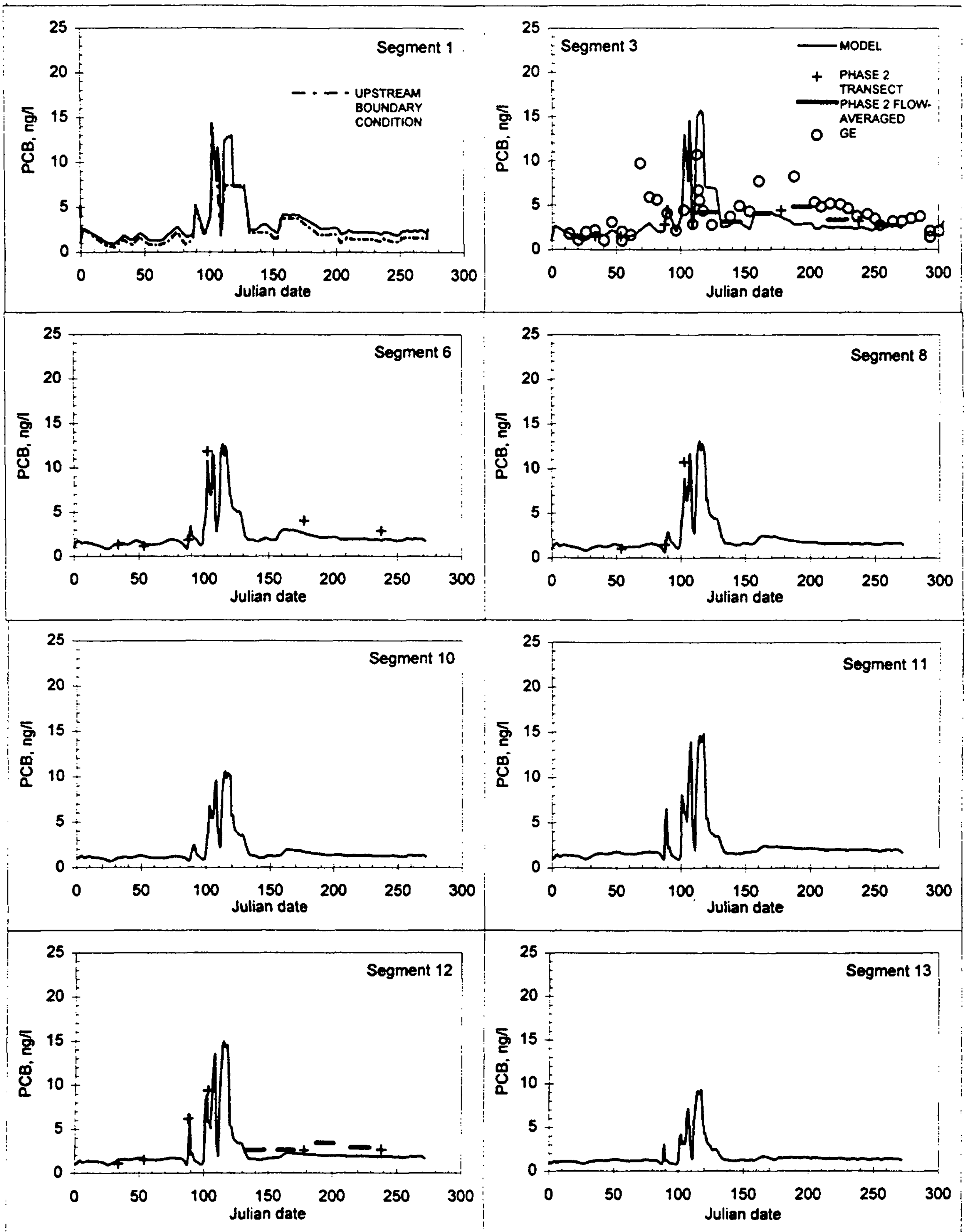


**Figure 4-18**
**Total PCB Calibration - BZ#101 and 90 for January - September 1993**

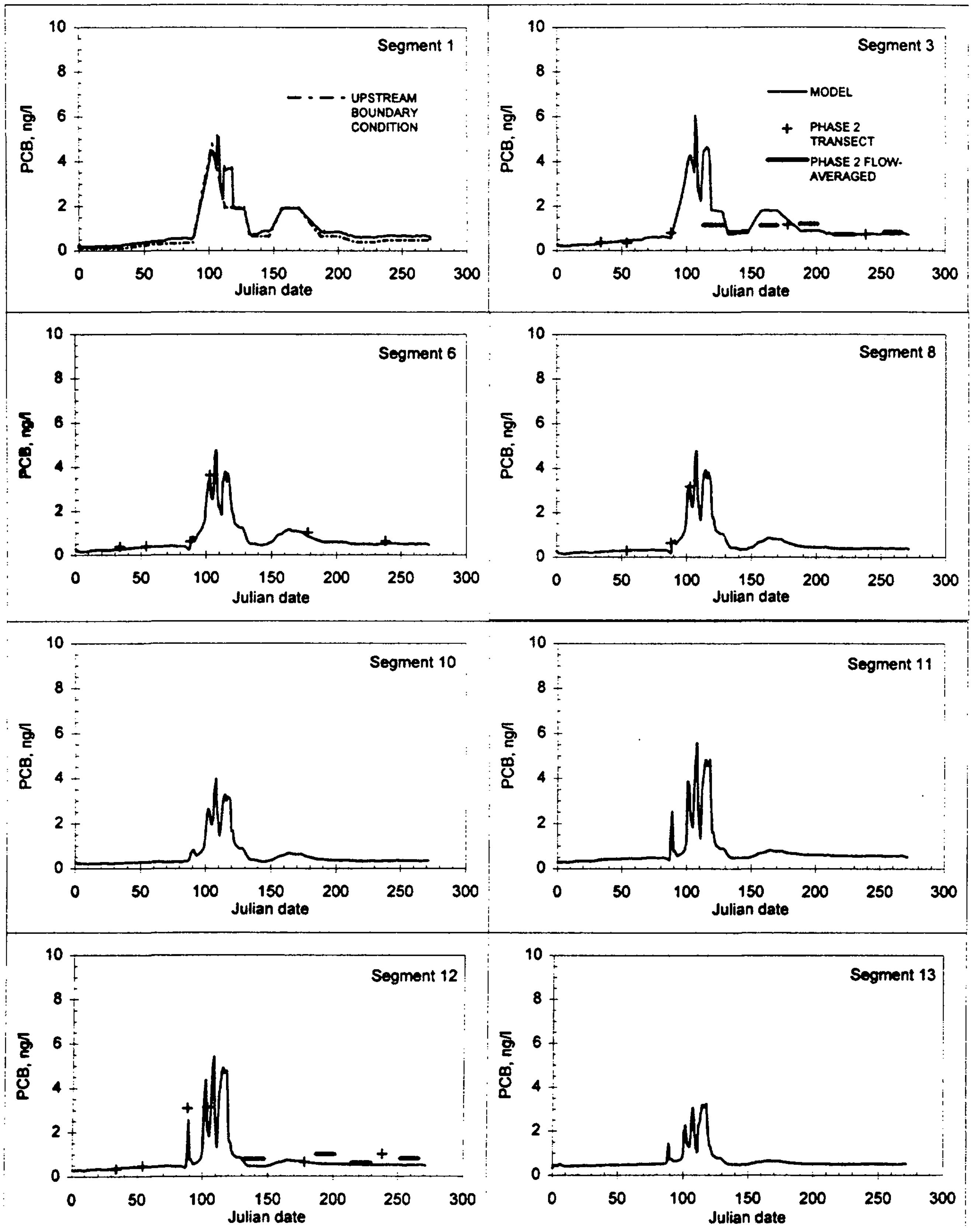


**Figure 4-19**
**Total PCB Calibration - BZ#138 for January - September 1993**

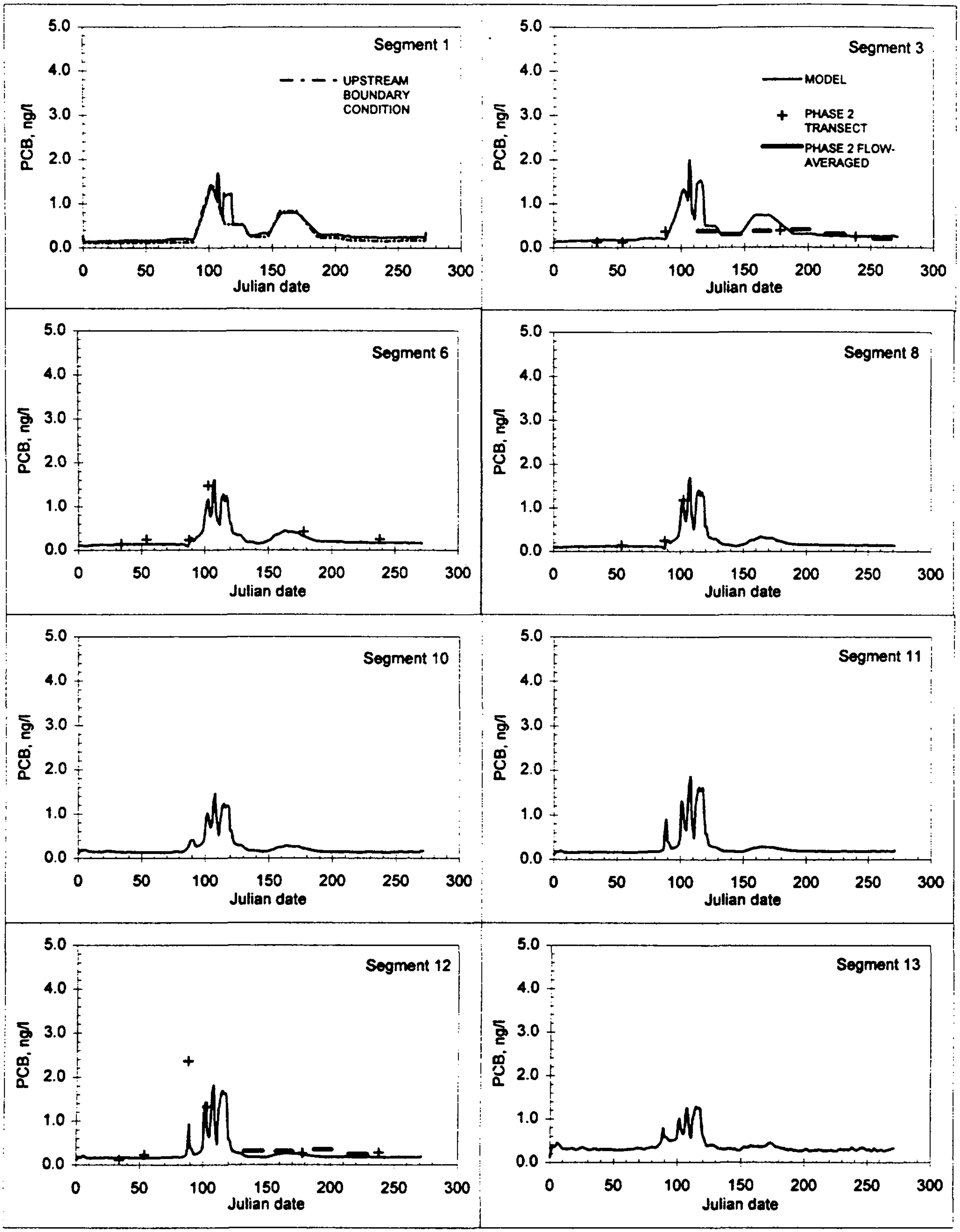



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**Figure 4-20**
**Apparent Dissolved PCB Calibration - ΣPCBs for January - September 1993**

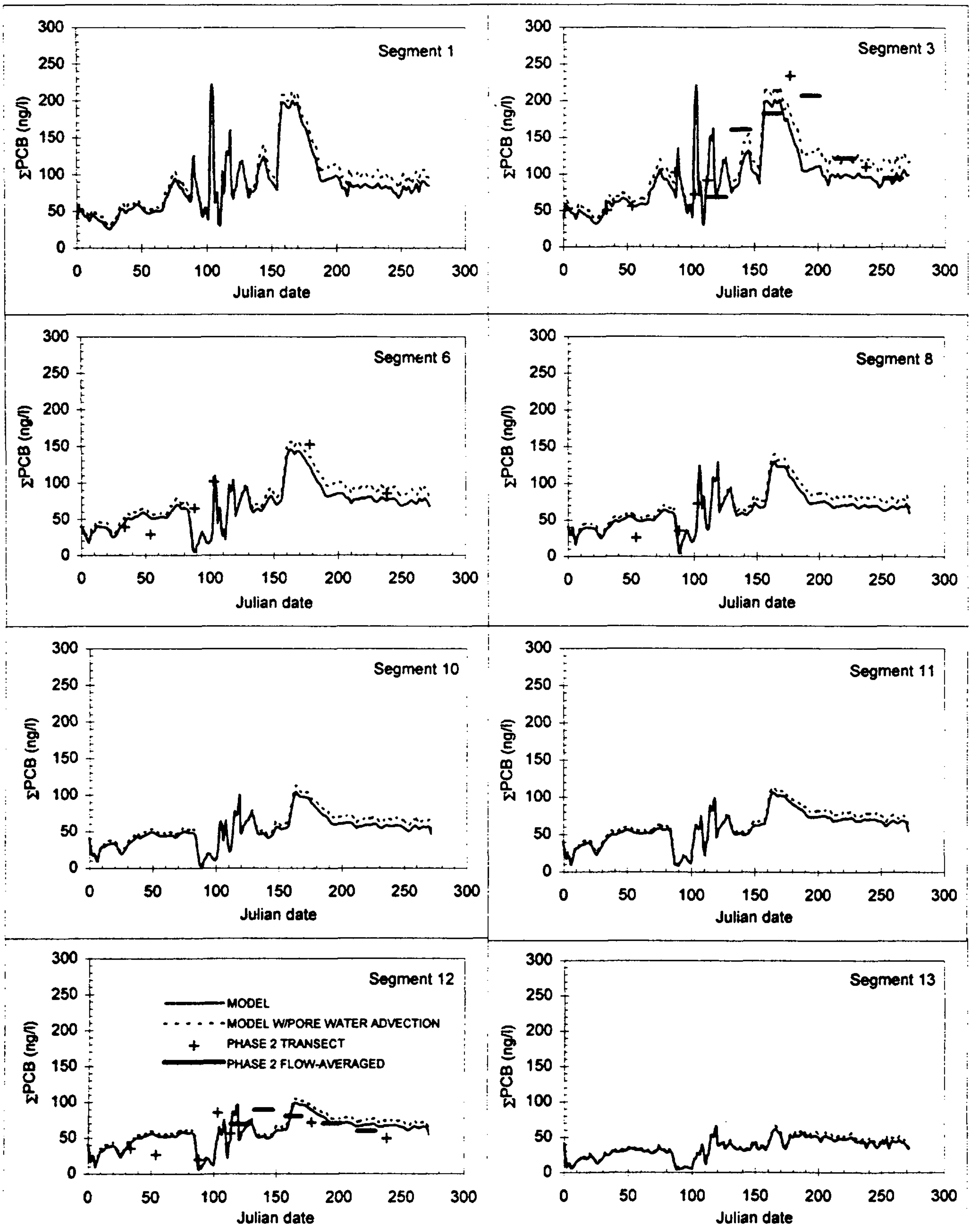
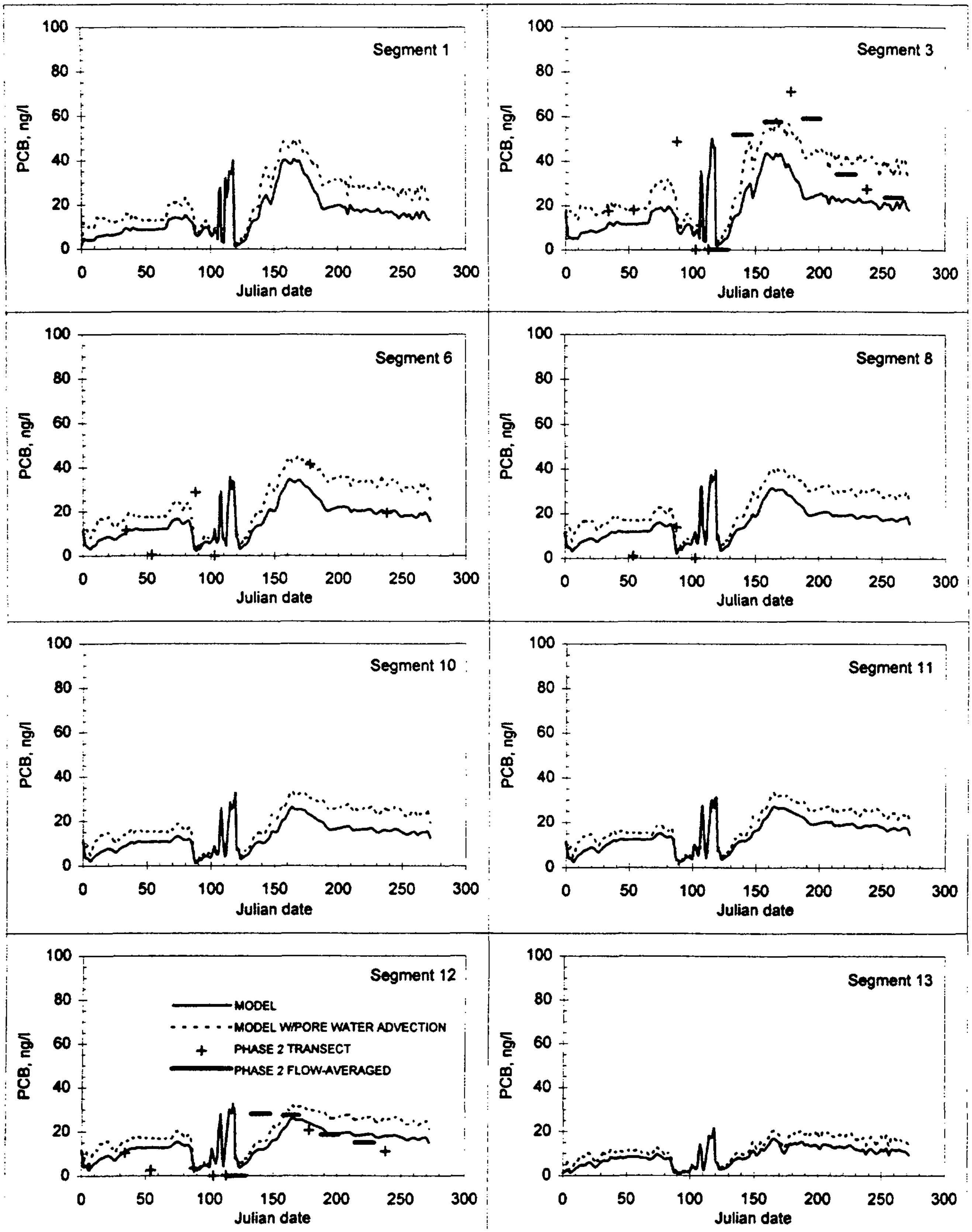


**Figure 4-21**
**Apparent Dissolved PCB Calibration - BZ#4 for January - September 1993**



## Figure 4-22
## Apparent Dissolved PCB Calibration - BZ#28 for January - September 1993

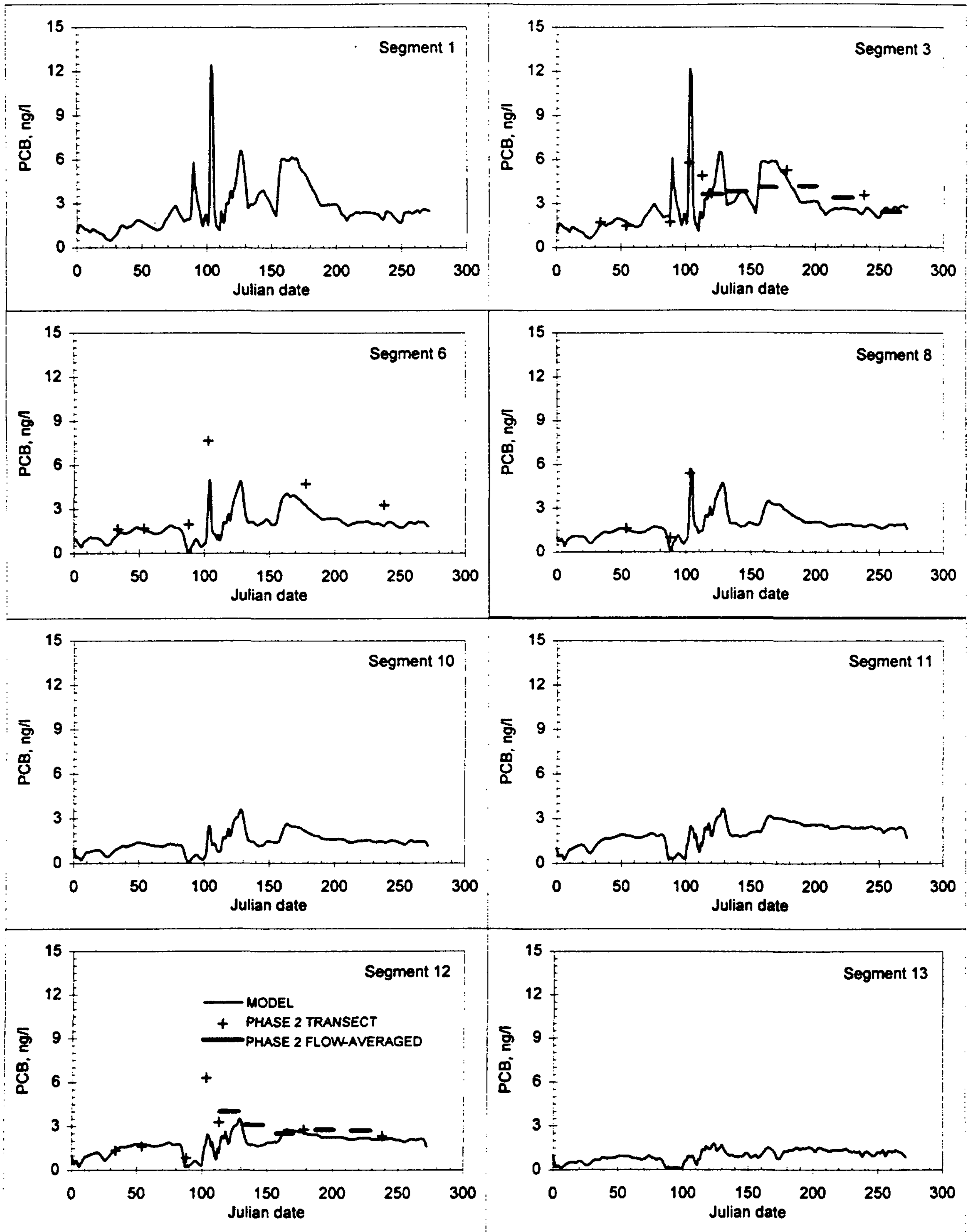
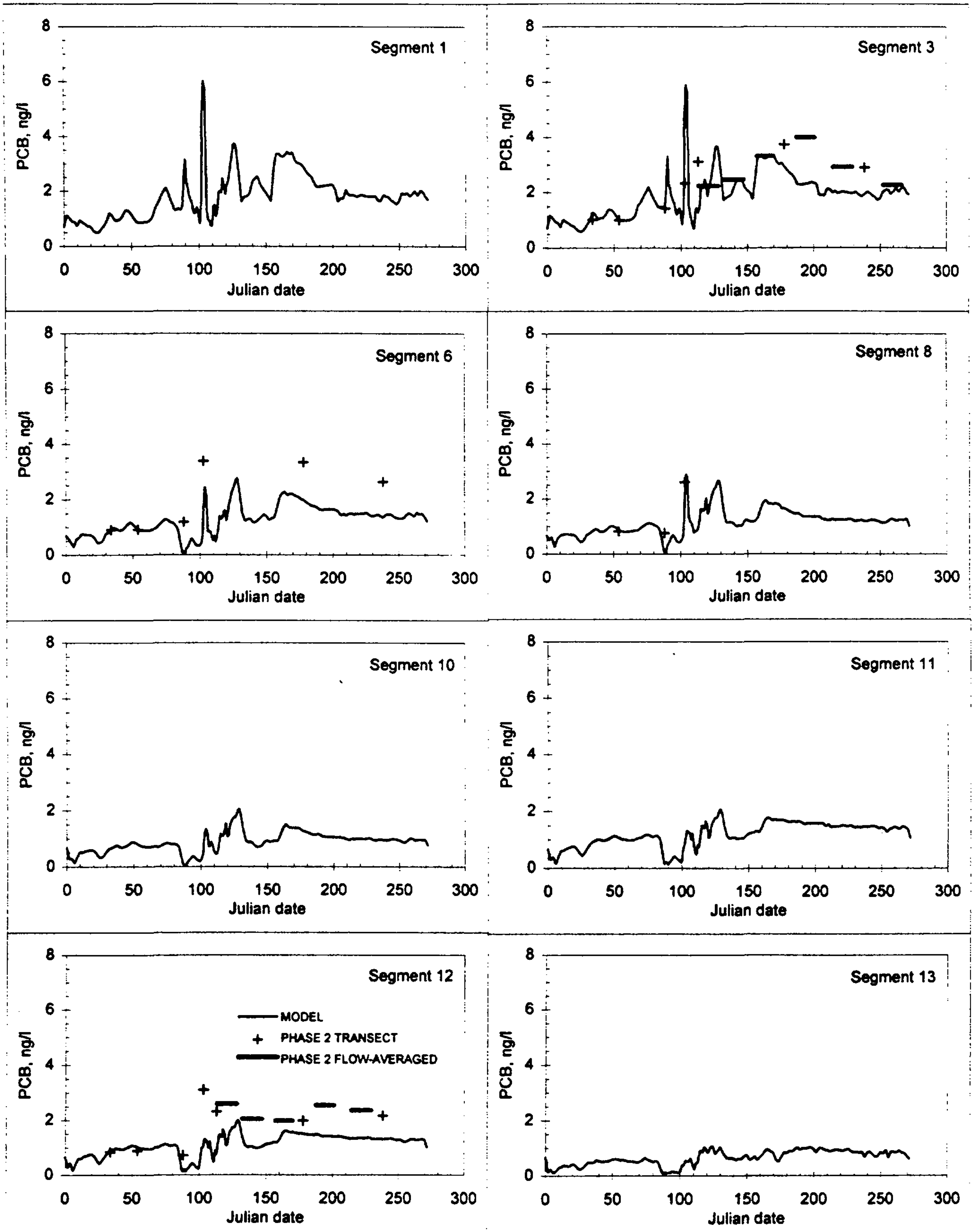
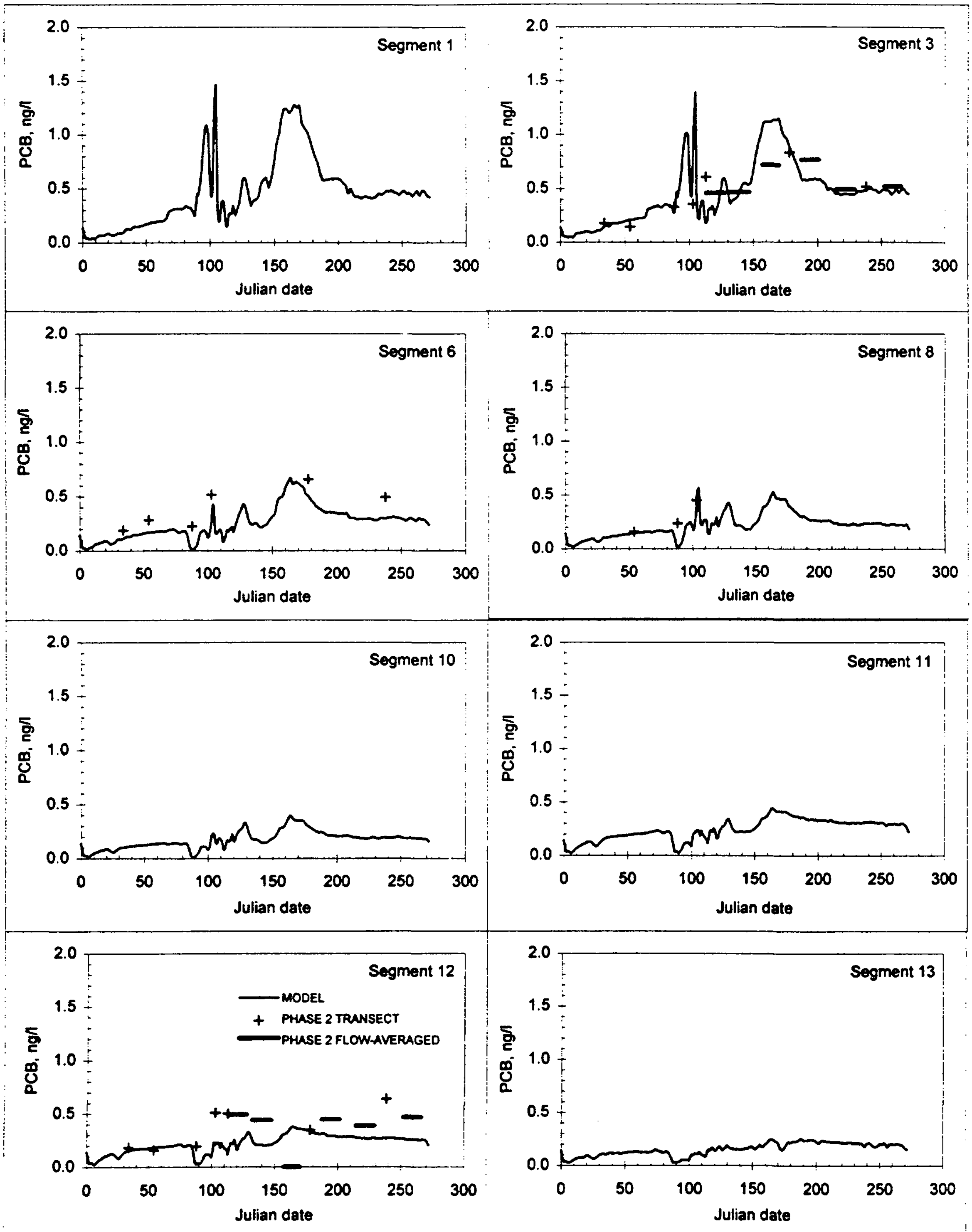


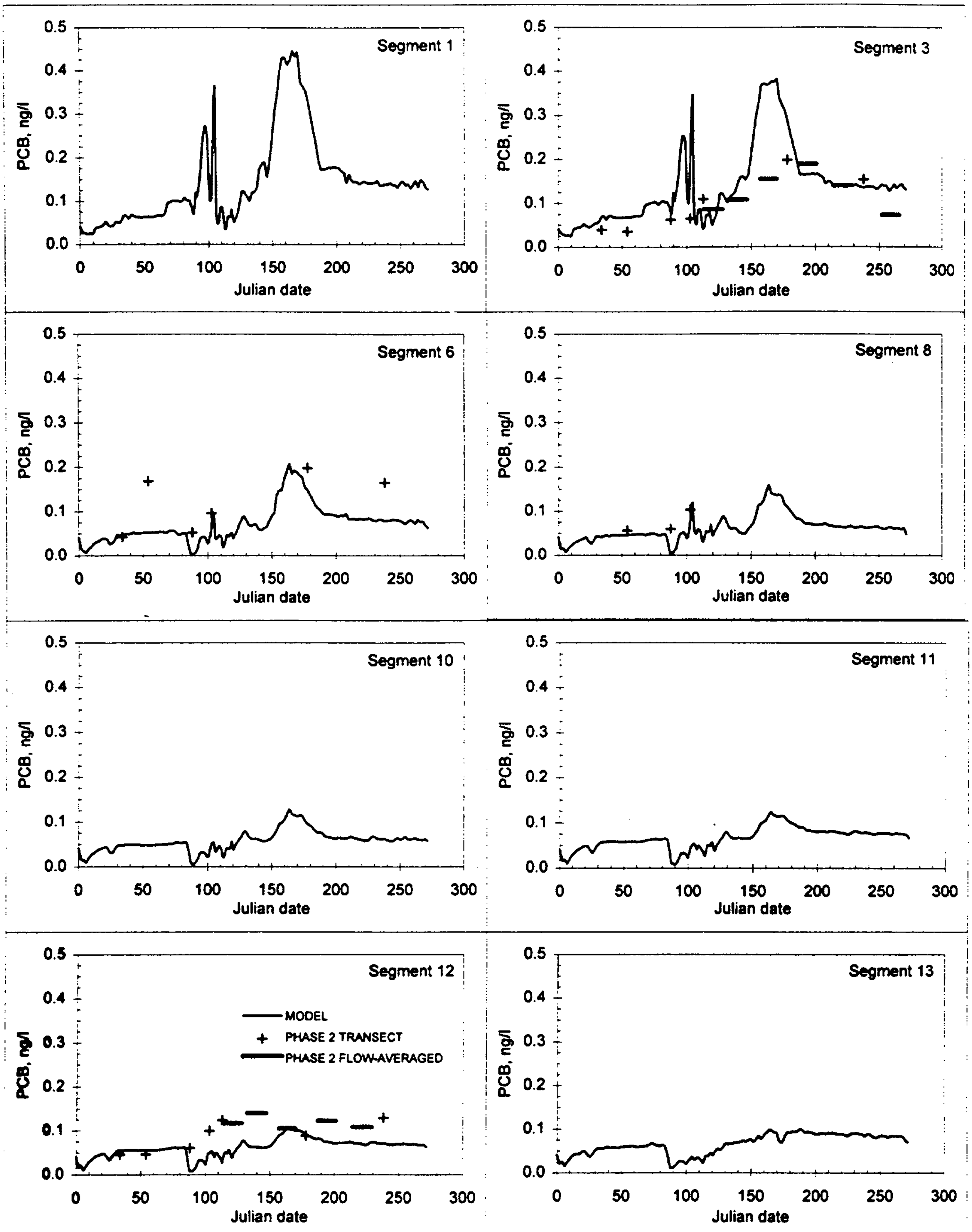
**Figure 4-23**
**Apparent Dissolved PCB Calibration - BZ#52 for January - September 1993**



## Figure 4-24
## Apparent Dissolved PCB Calibration - BZ#101 and 90 for January - September 1993



## Figure 4-25
## Apparent Dissolved PCB Calibration - BZ#138 for January - September 1993



## Figure 4-26
## TSS-Sorbed PCB Calibration - ΣPCBs for January - September 1993

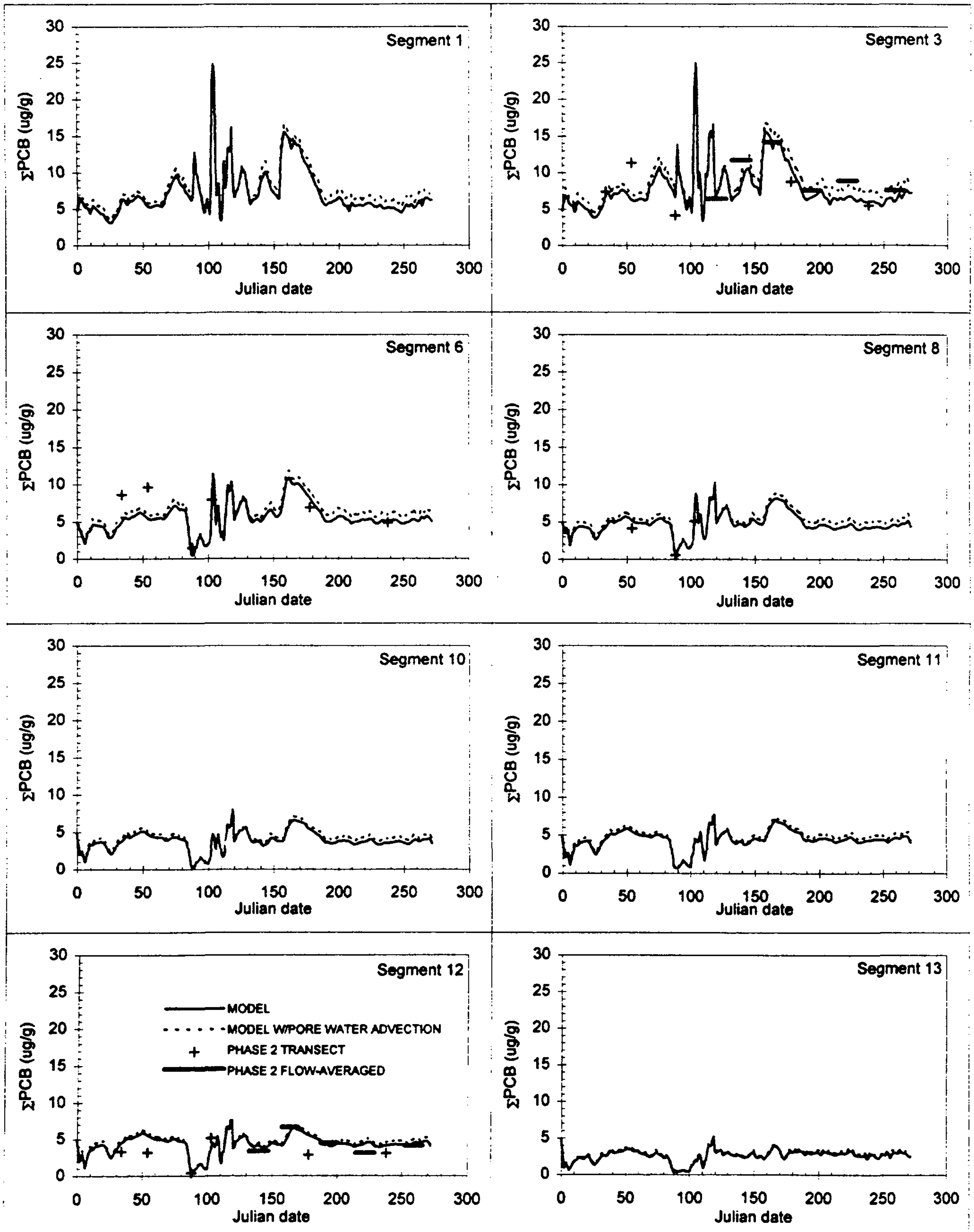
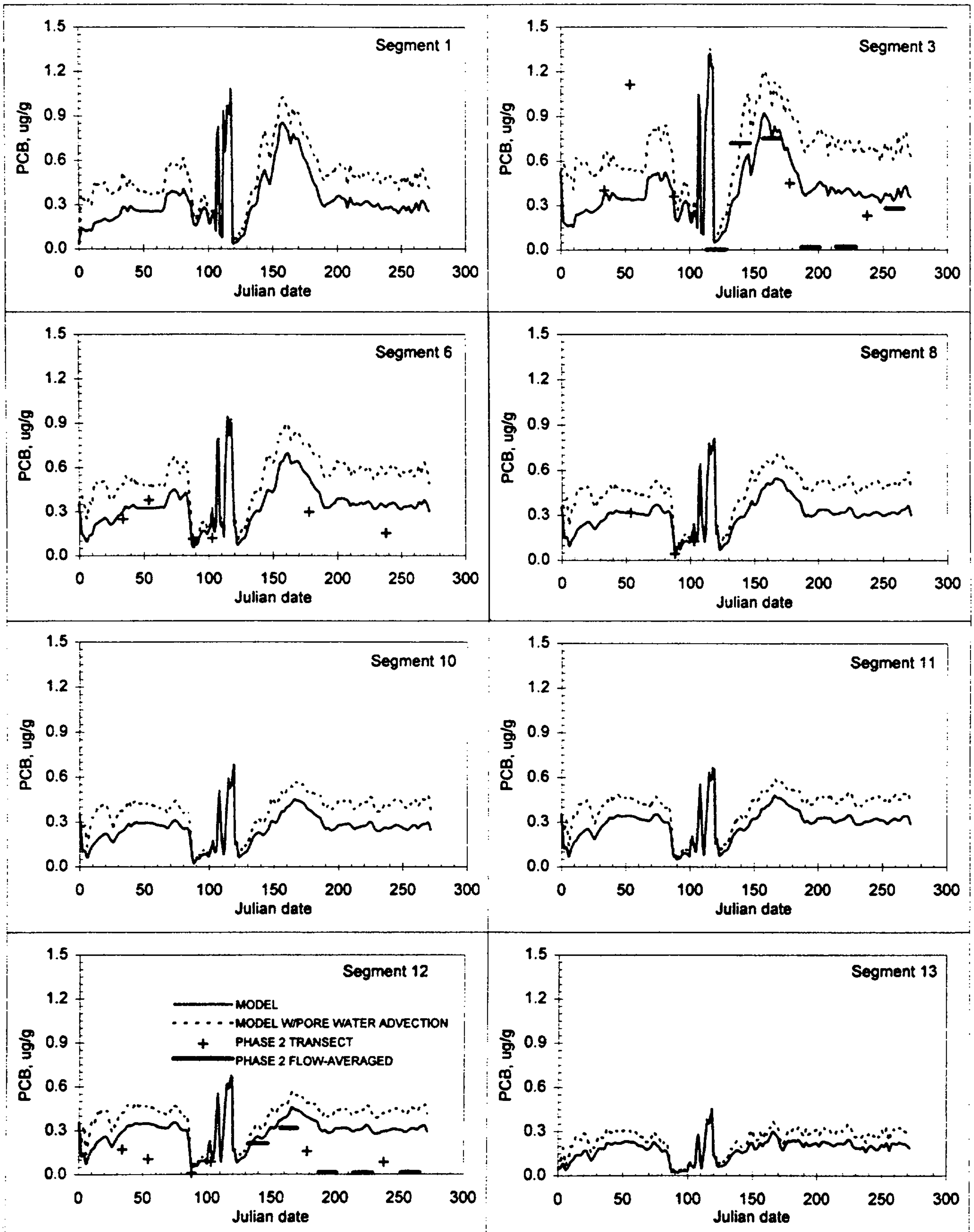


**Figure 4-27**
**TSS Sorbed PCB Calibration - BZ#4 for January - September 1993**



## Figure 4-28
## TSS-Sorbed PCB Calibration - BZ#28 for January - September 1993

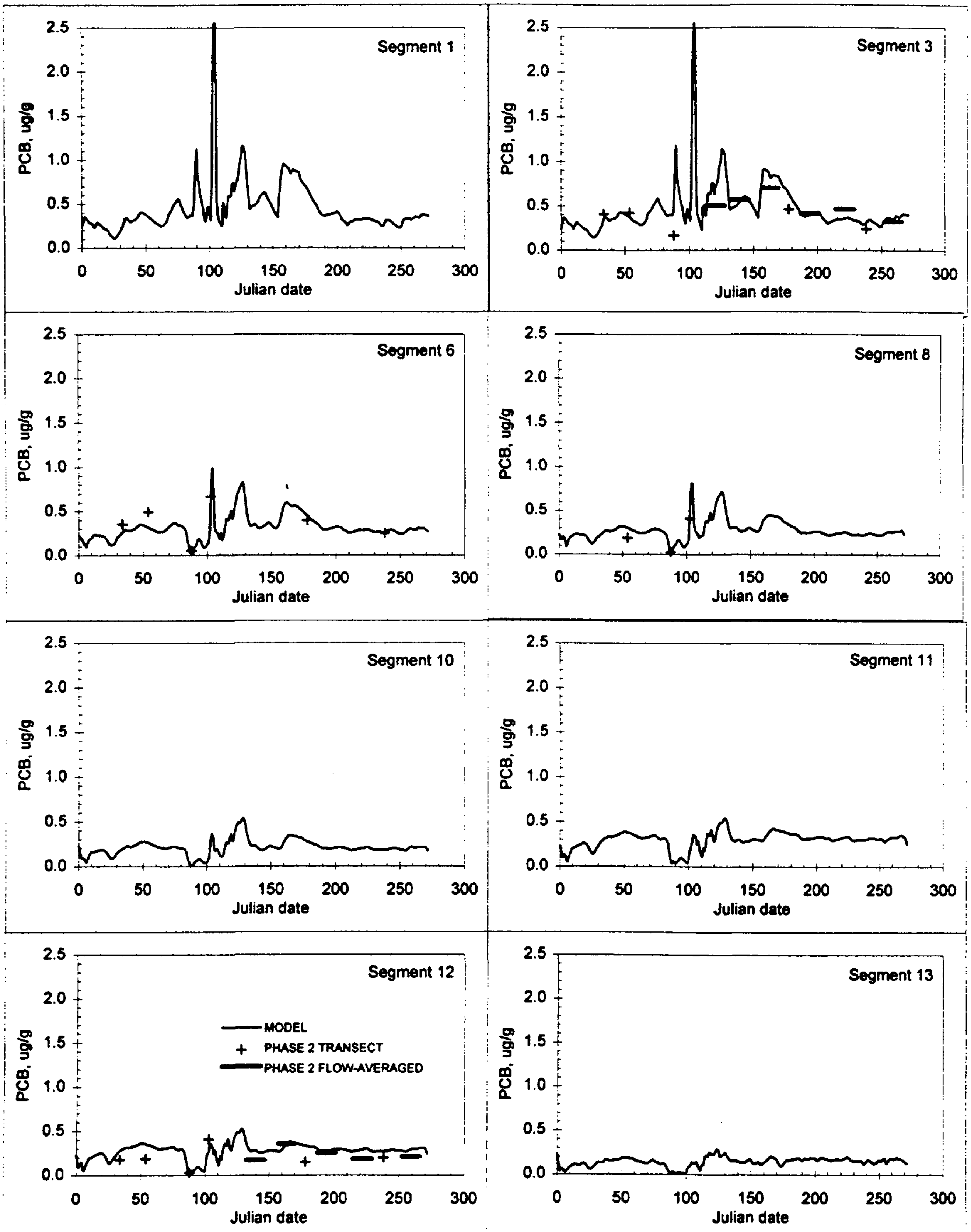


**Figure 4-29**
**TSS-Sorbed PCB Calibration - BZ#52 for January - September 1993**

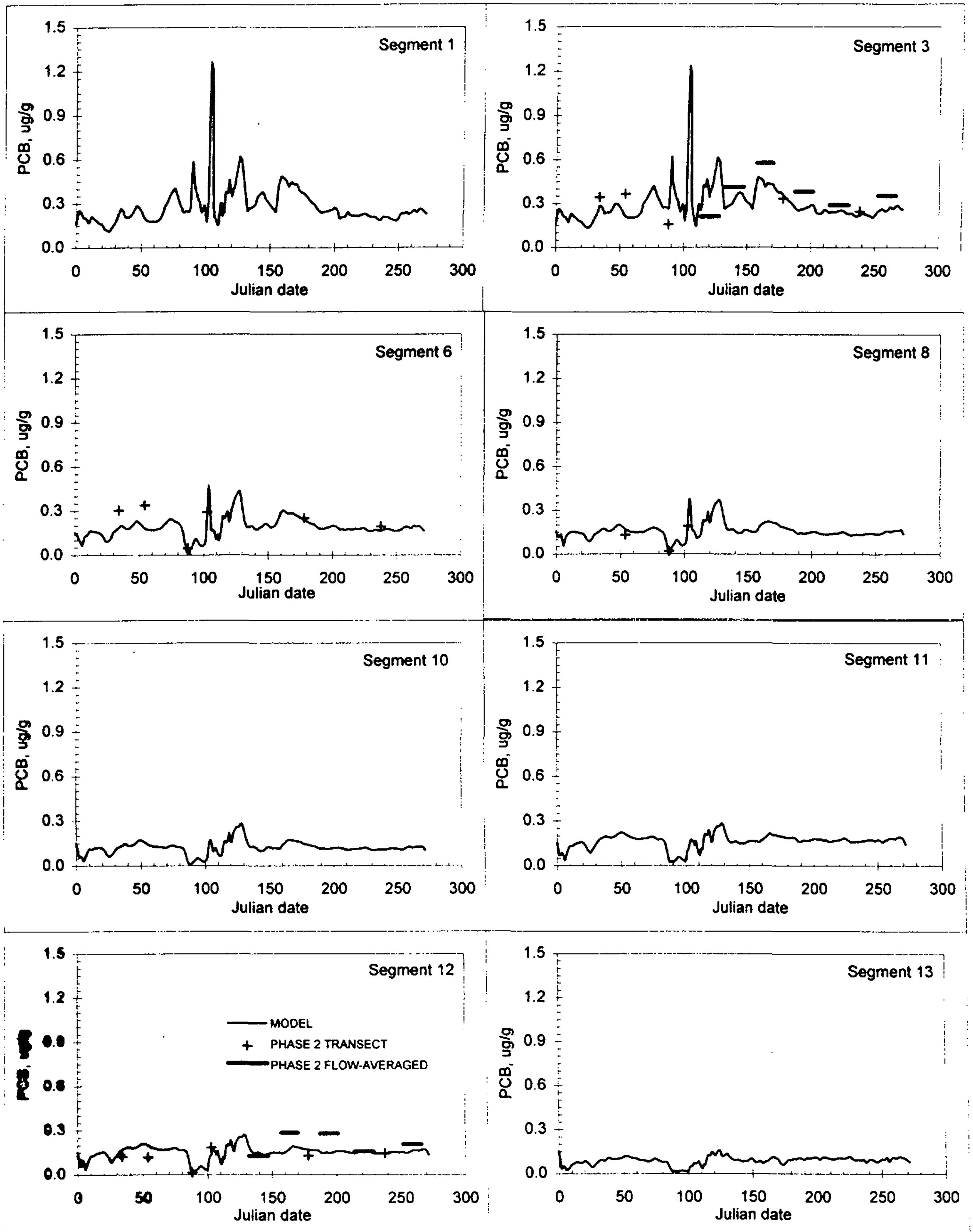
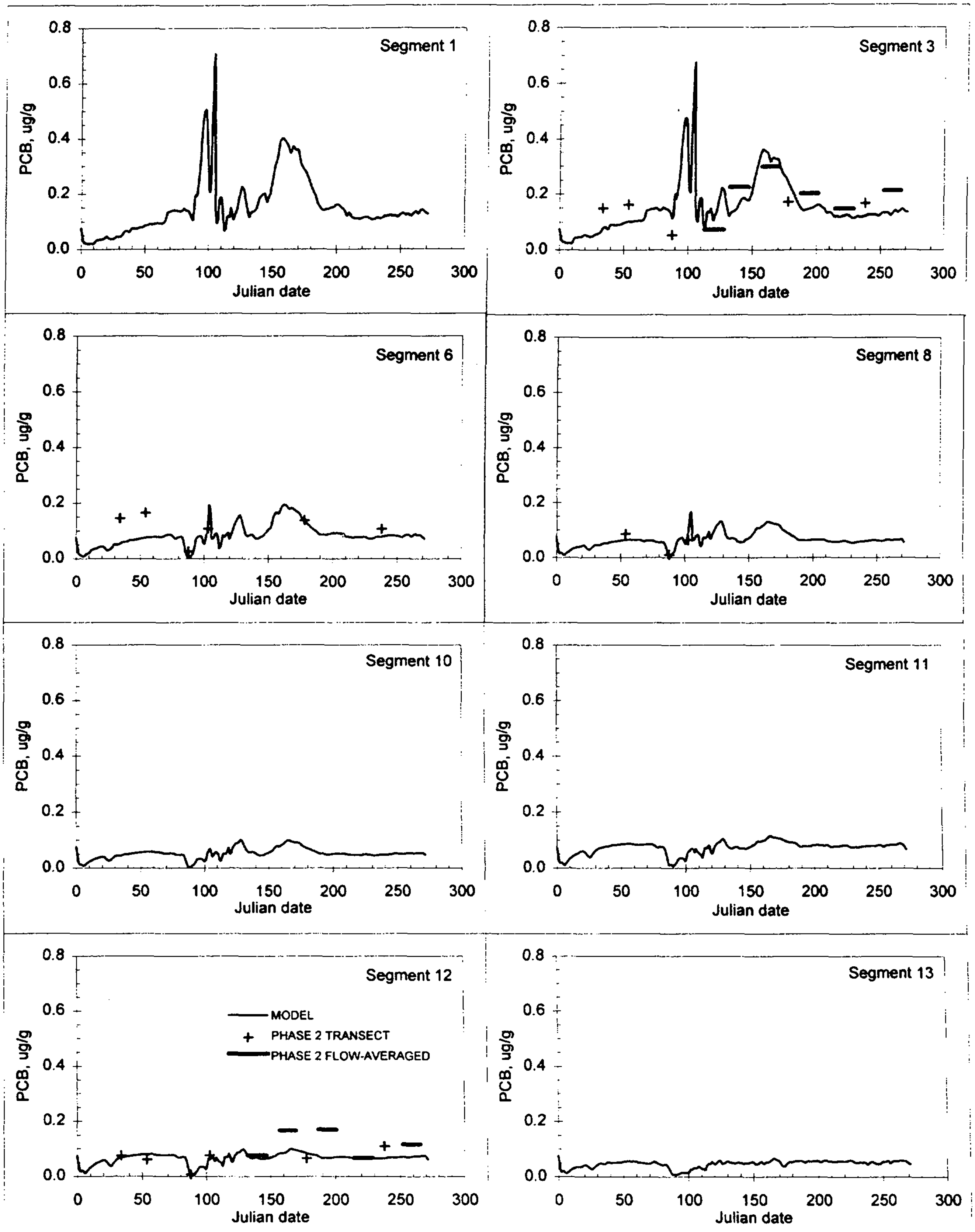


**Figure 4-30**
**TSS-Sorbed PCB Calibration - BZ#101 and 90 for January - September 1993**



## Figure 4-31
## TSS-Sorbed PCB Calibration - BZ#138 for January - September 1993

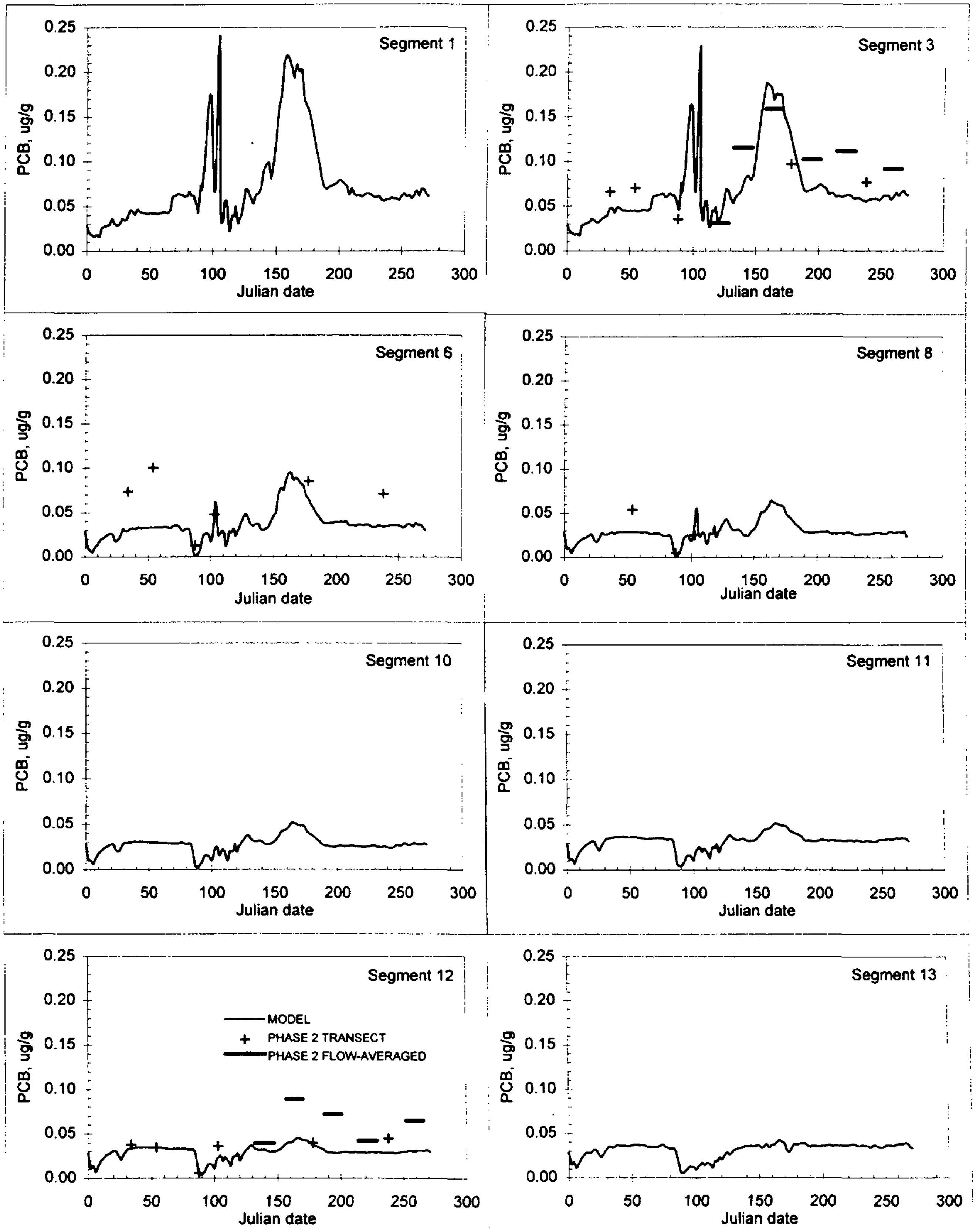
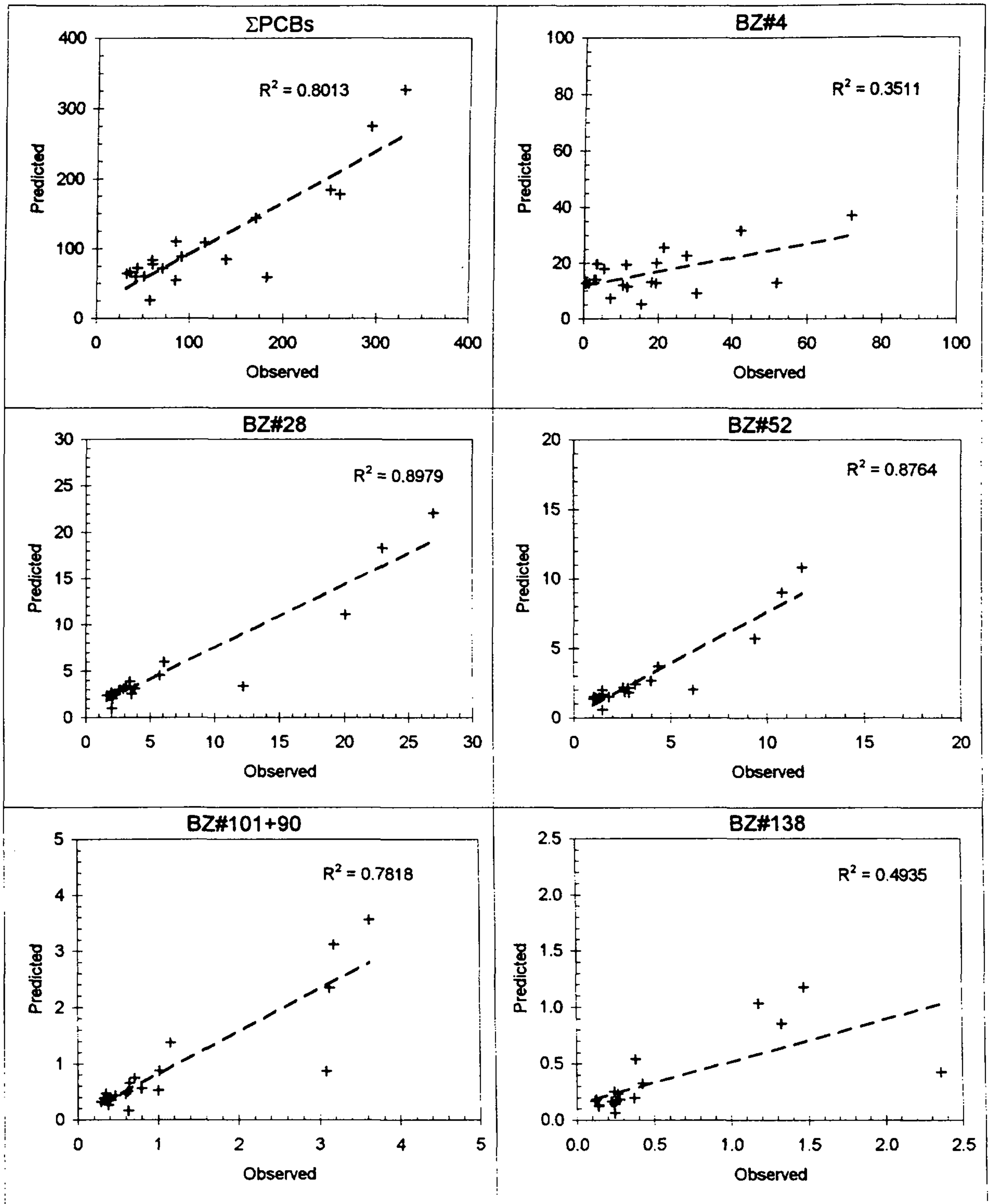


**Figure 4-32**
**HUDTOX Predicted Total PCB Concentrations vs. Observed Values (ng/L)**
**Phase 2 Transect Data**



## Figure 4-33
## HUDTOX Apparent Dissolved PCB Concentrations vs. Observed Values (ng/L)
## Phase 2 Transect Data

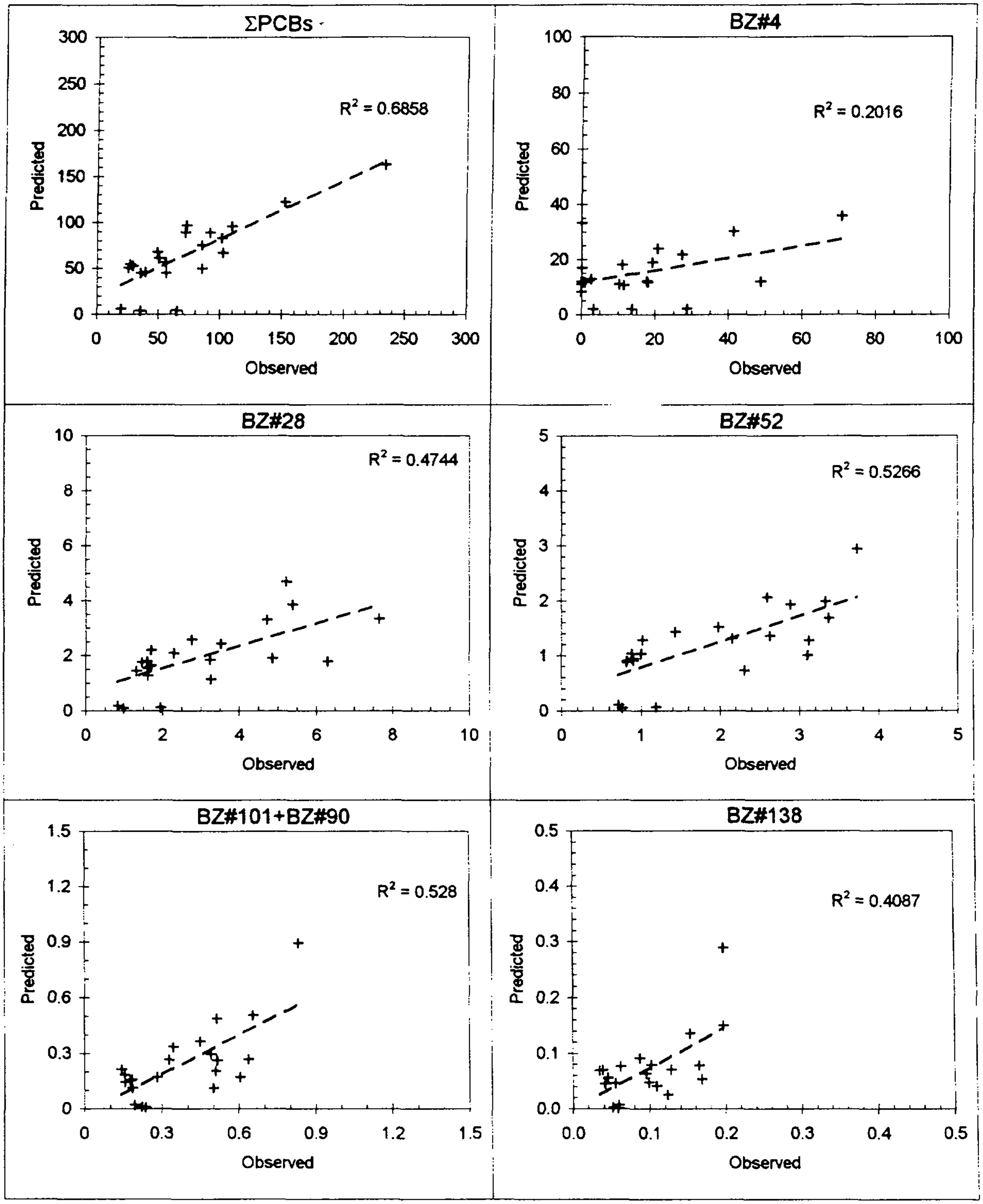
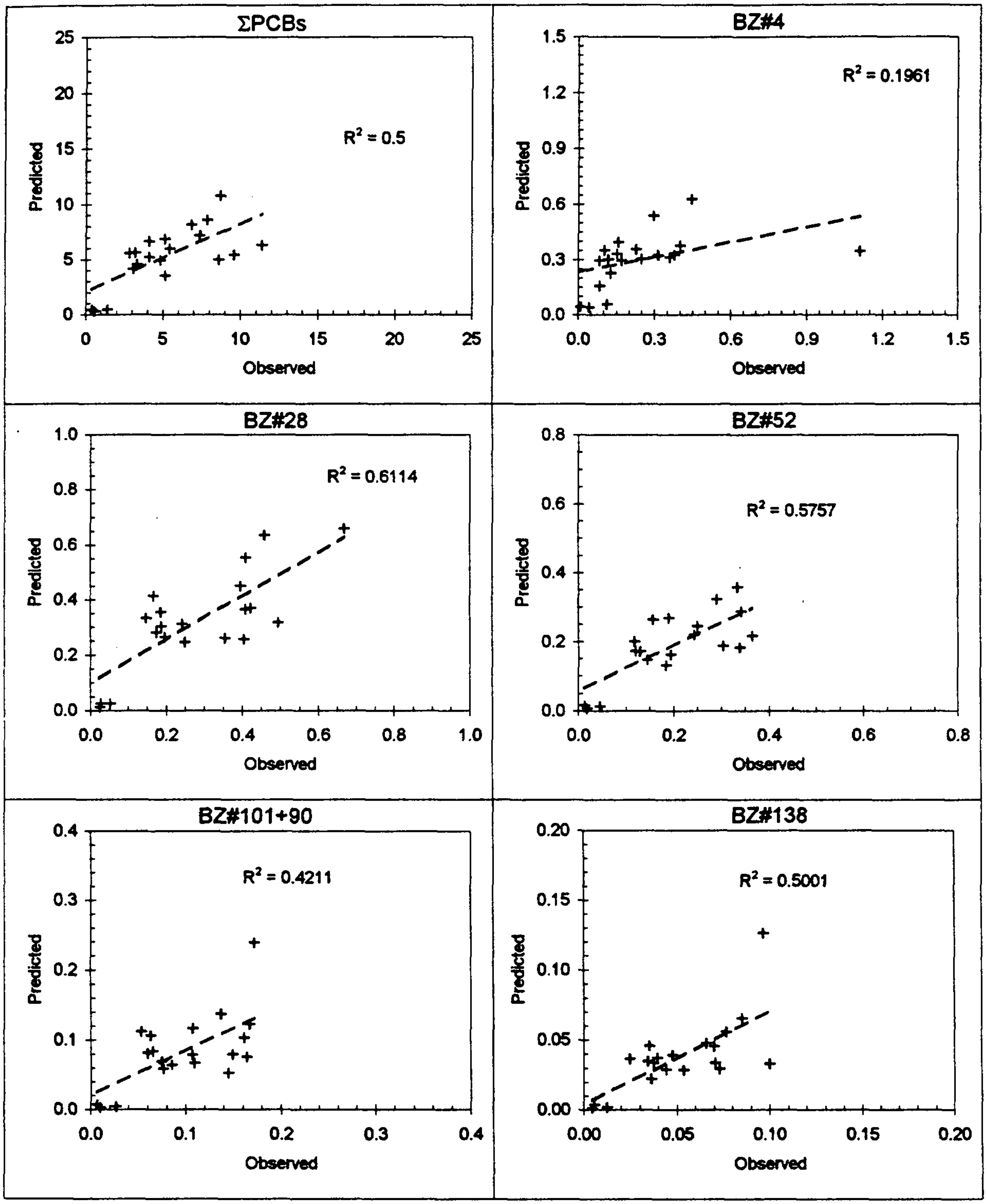
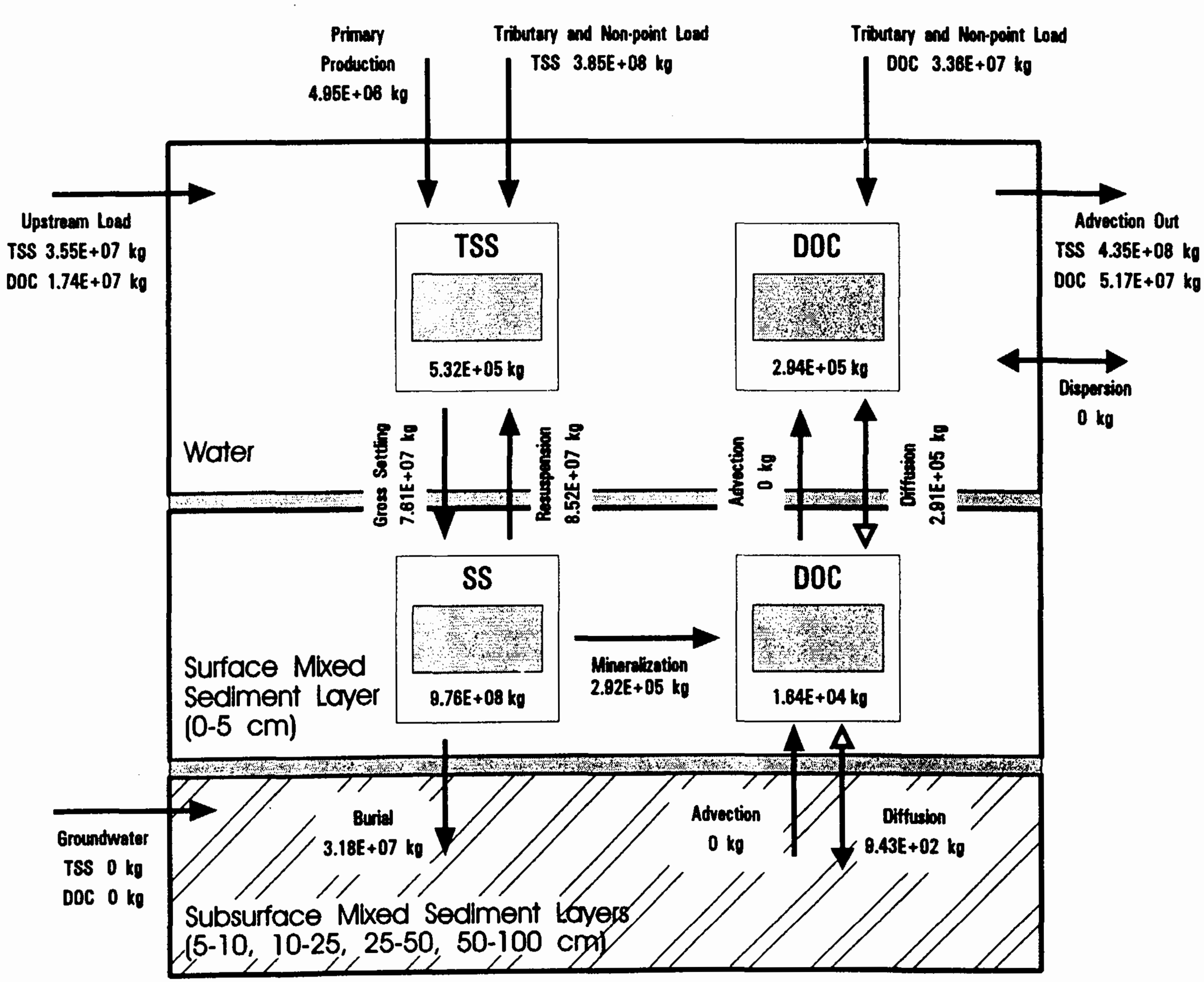


**Figure 4-34**
**HUDTOX Particulate PCB Concentrations vs. Observed Values (ug/g solid)**
**Phase 2 Transect Data**



## Figure 4-35
## Solids Component Diagram for Upper Hudson River without Pore Water Advection (1/1/93-9/30/93)

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## Figure 4-36
## Solids Component Diagram for Thompson Island Pool without Pore Water Advection (1/1/93-9/30/93)

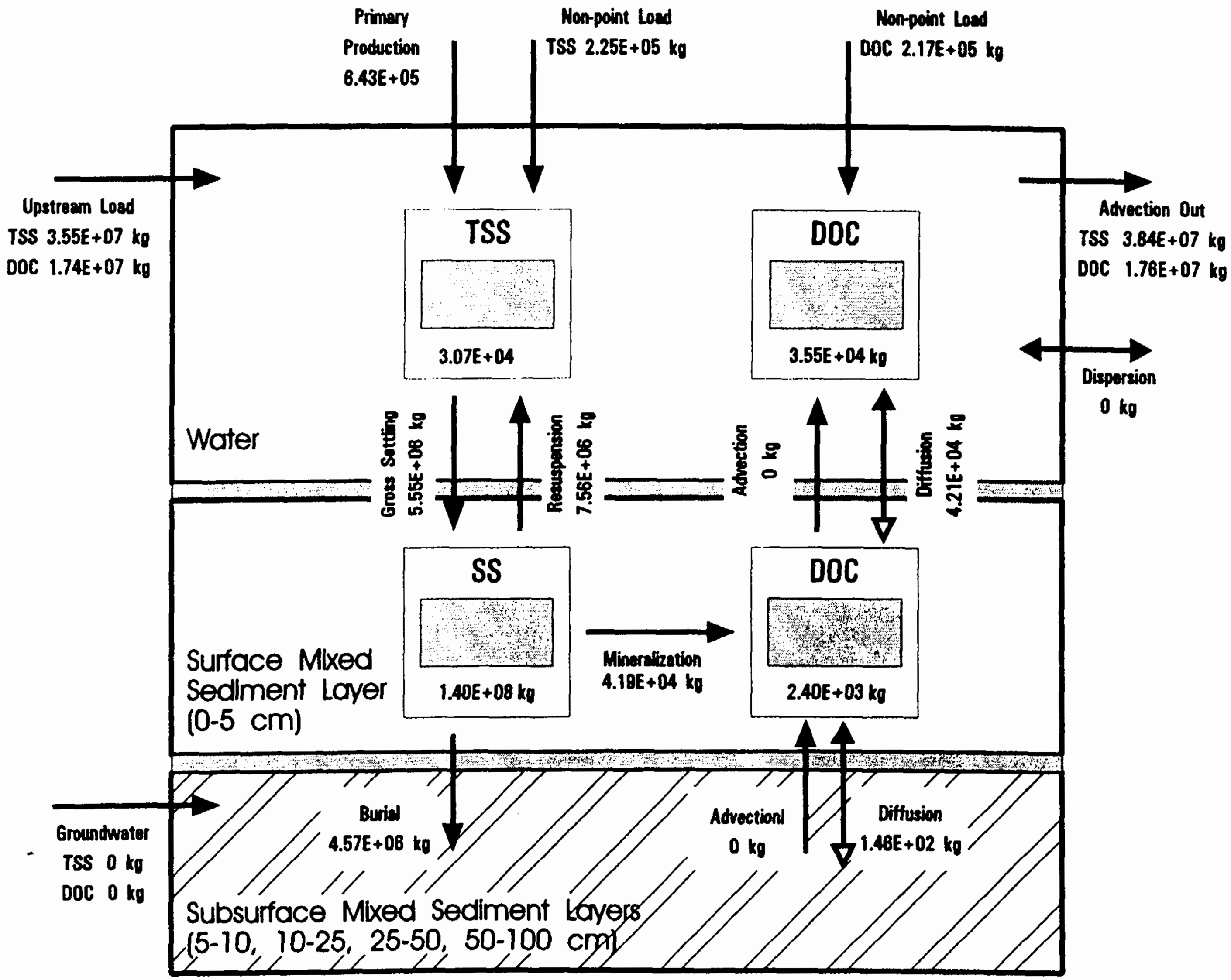
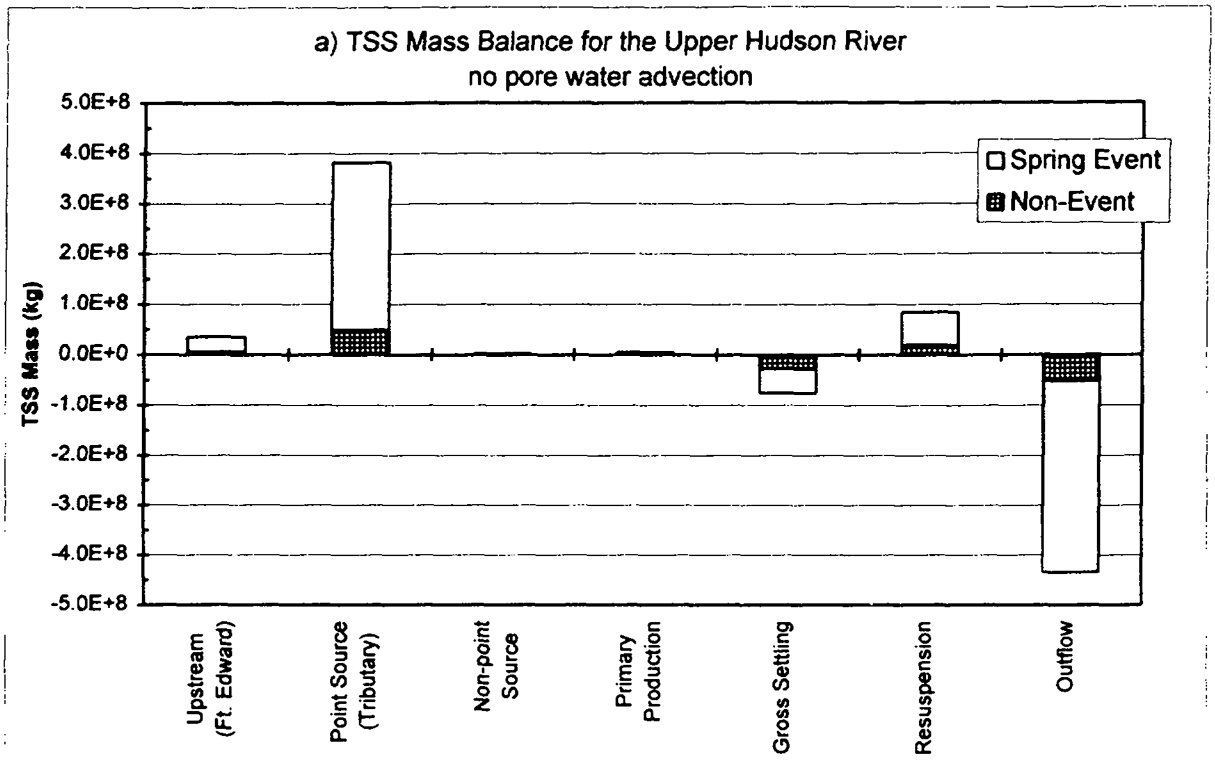


**Figure 4-37**
**TSS Mass Balance for HUDTOX Calibration Period (1/1/93-9/30/93)**
***Spring Runoff Event Period (3/26/93 - 5/10/93)***



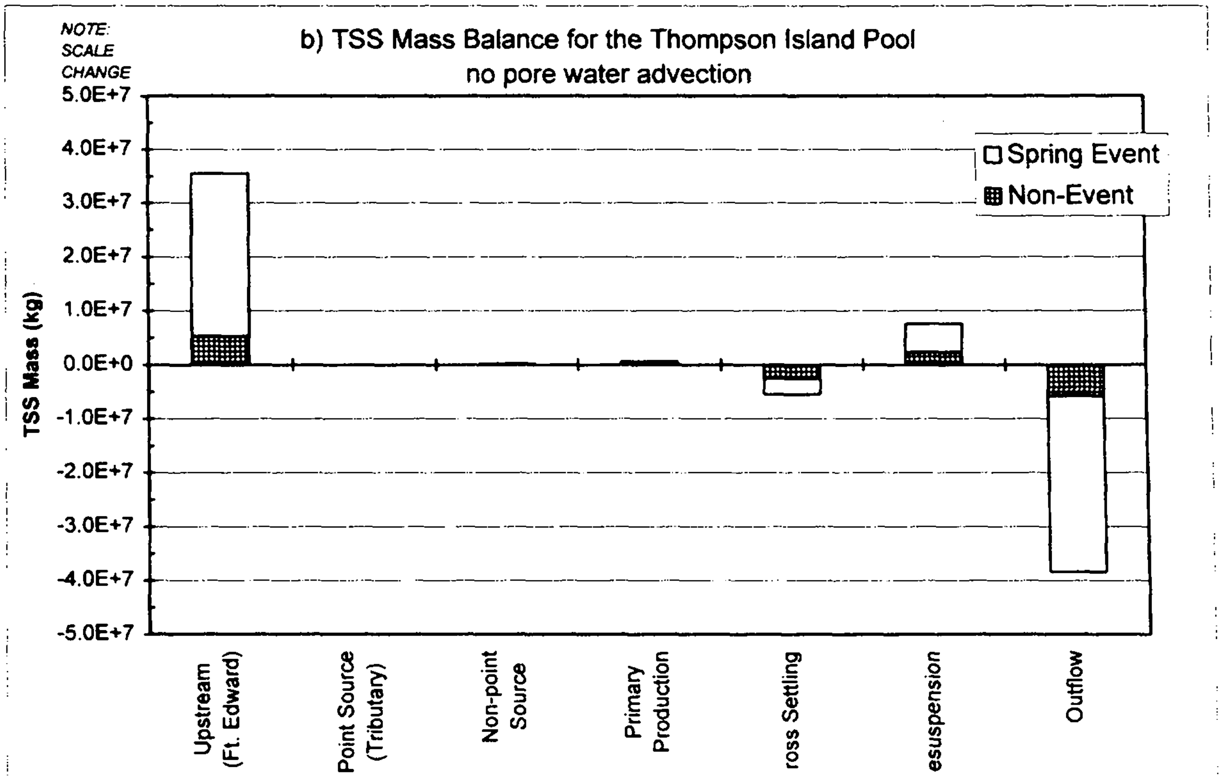
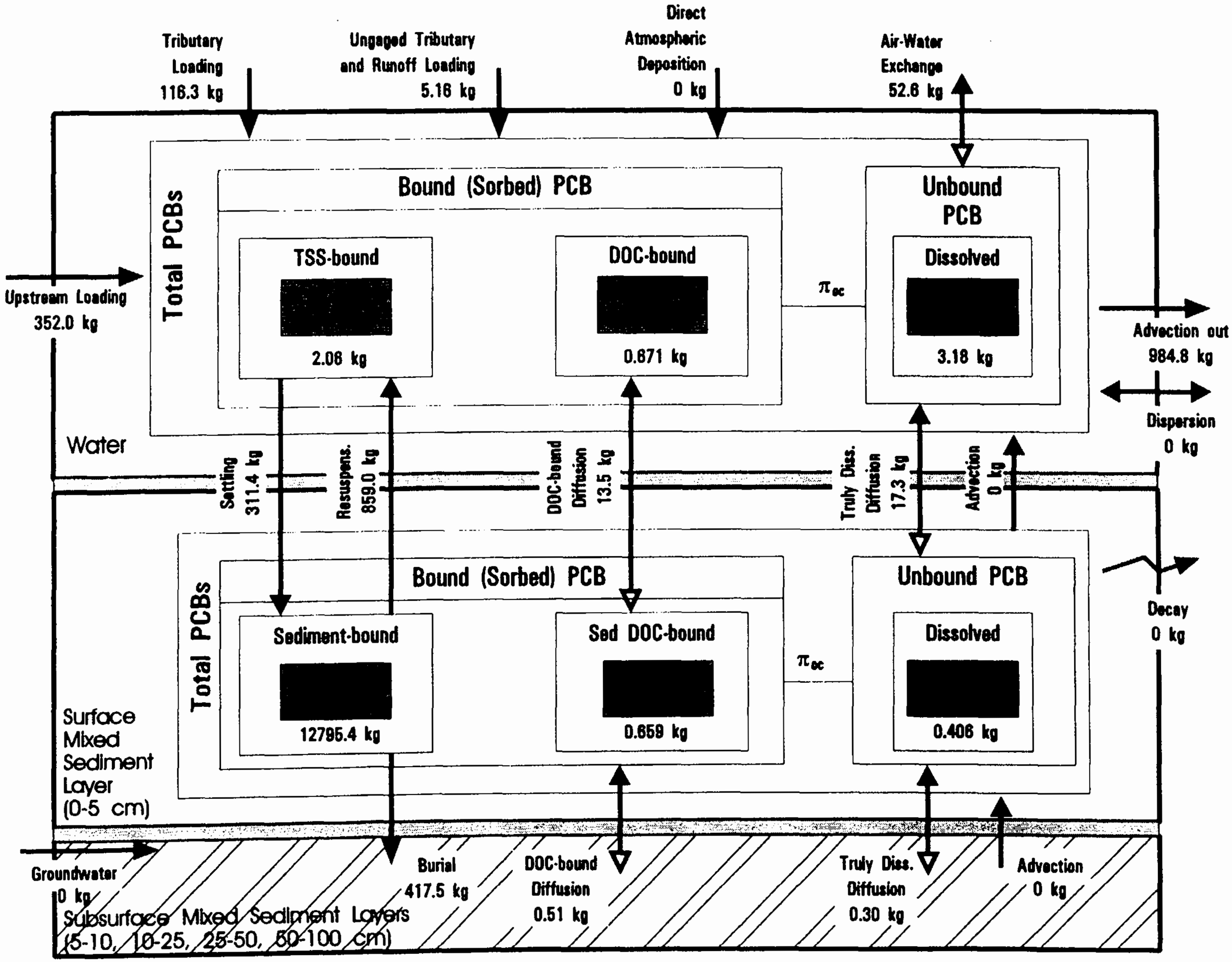



Figure 4-?5

**Total PCBs Component Diagram for Upper Hudson River without Pore Water Advection (1/1/93-9/30/93)**



## Figure 4-39
## Total PCBs Component Diagram for Thompson Island Pool without Pore Water Advection (1/1/93 - 9/30/93)

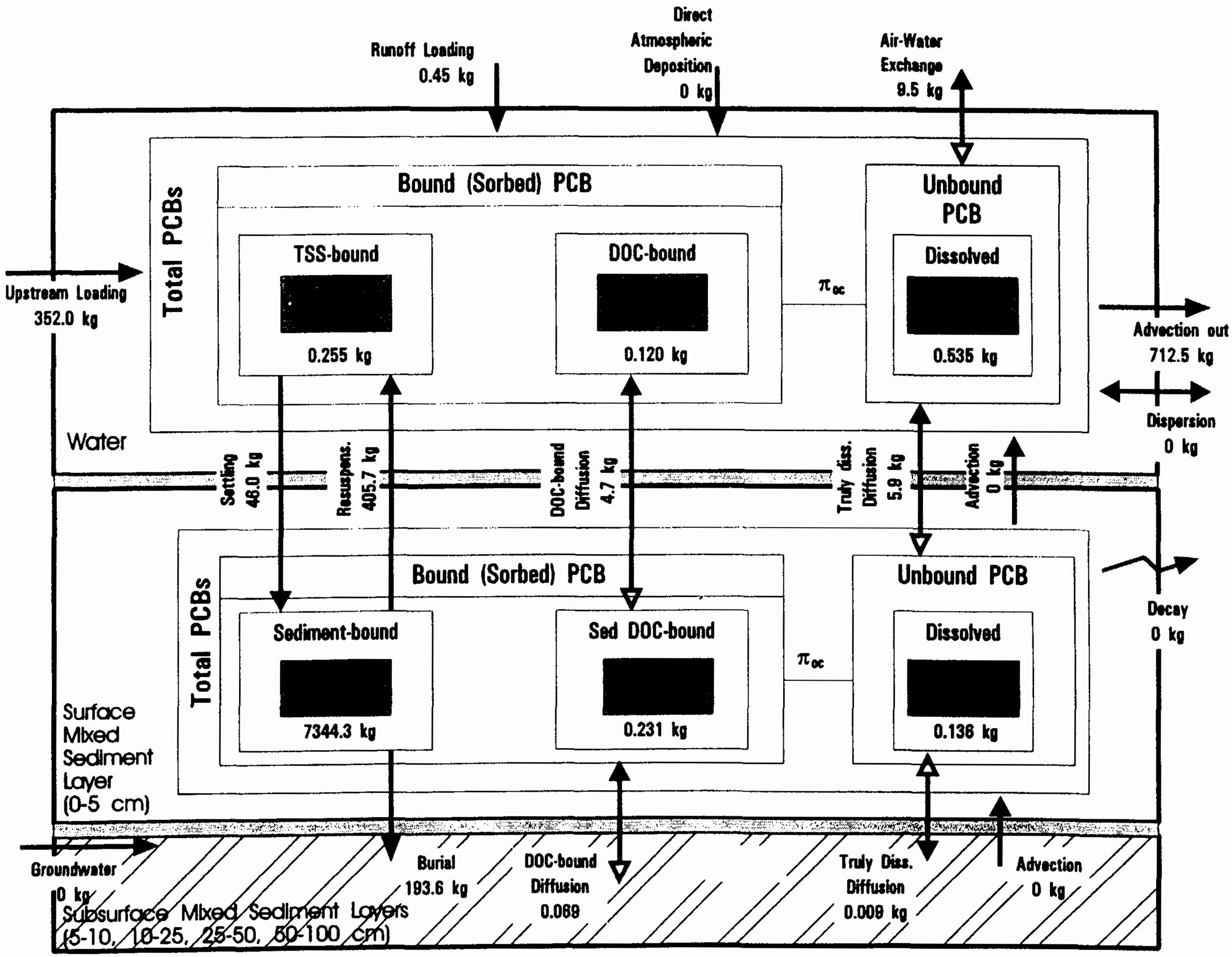
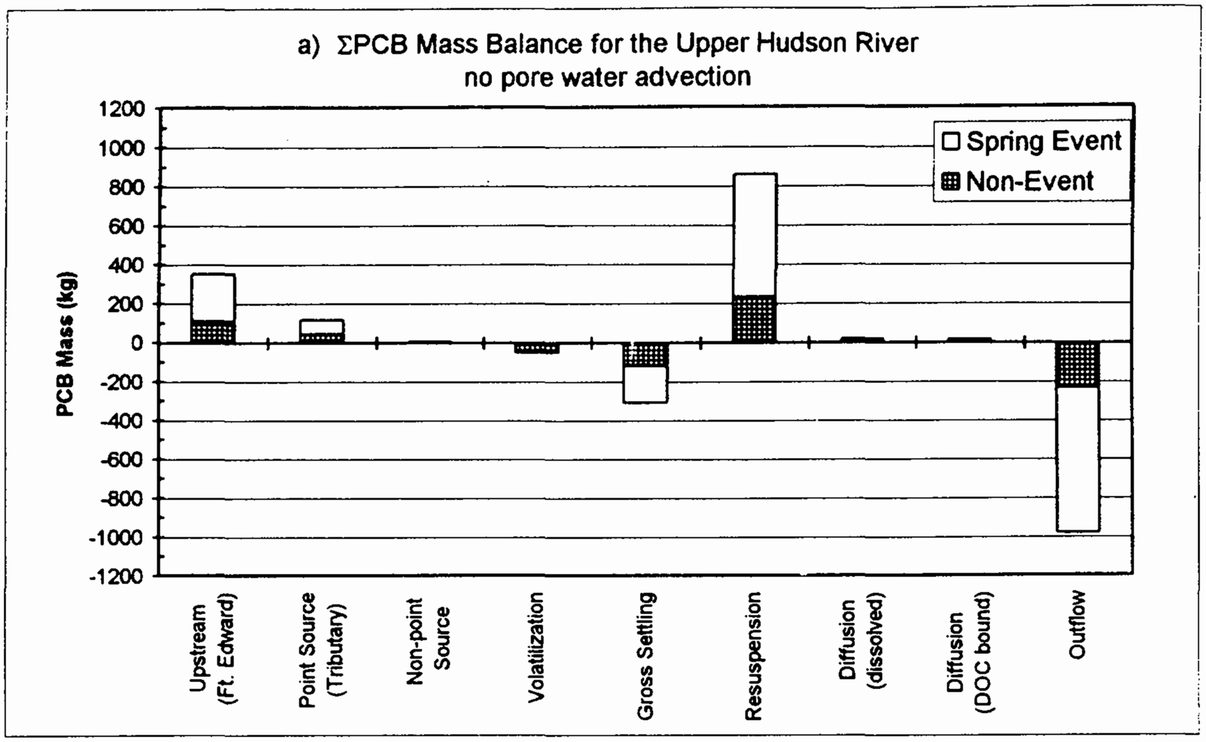
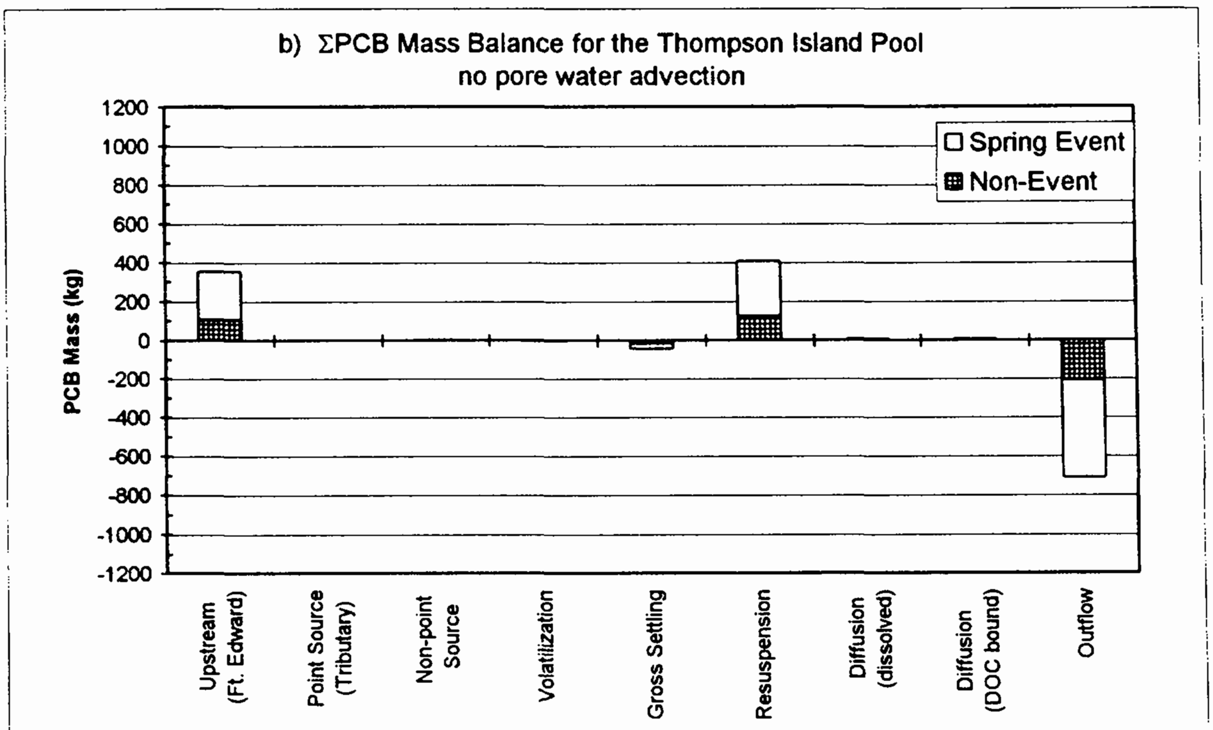
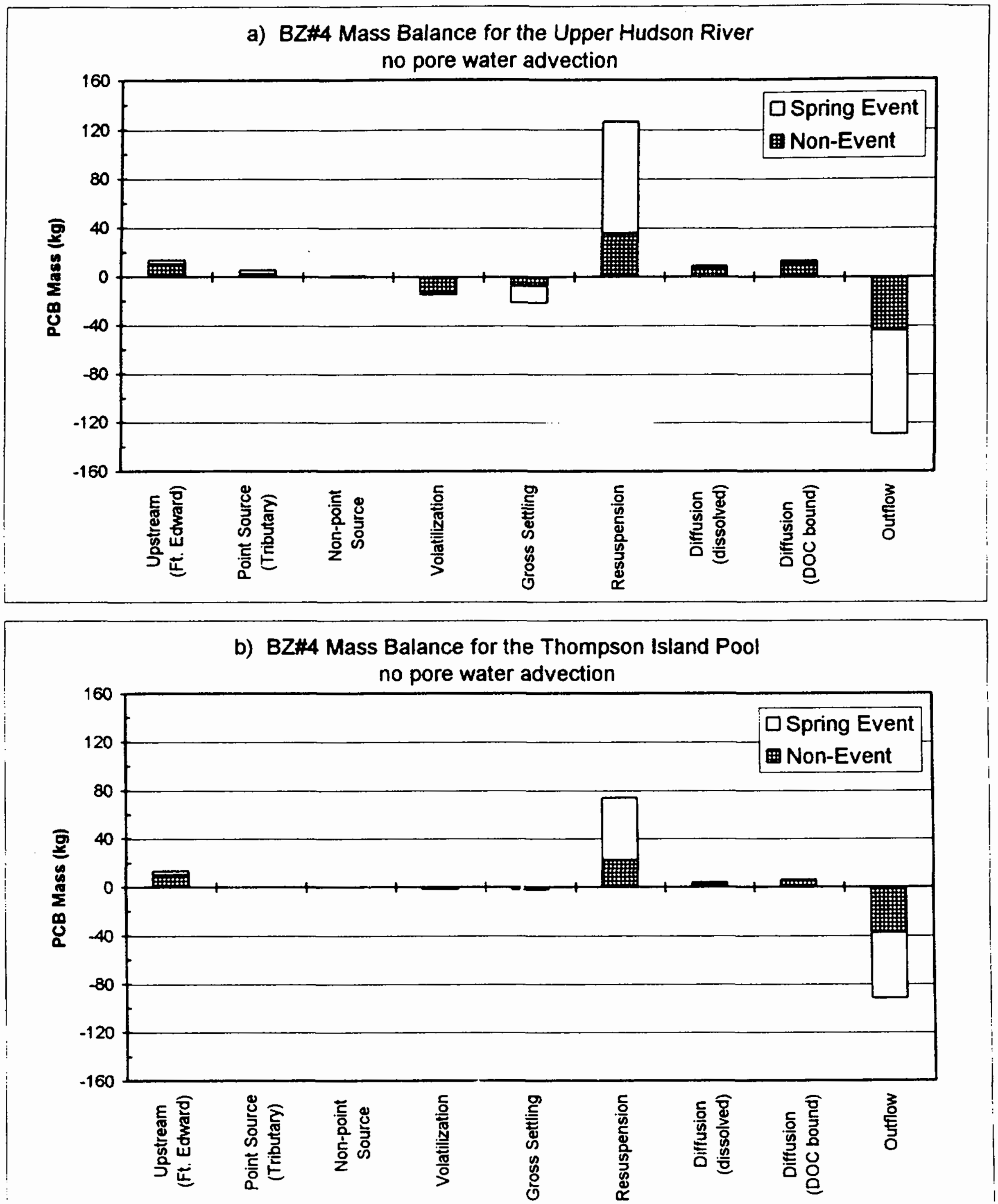


**Figure 4-40**
**ΣPCB Mass Balance for HUDTOX Calibration Period (1/1/93 - 9/30/93)**
**With No Pore Water Advection**
***Spring Runoff Event Period is 3/26/93 - 5/10/93***



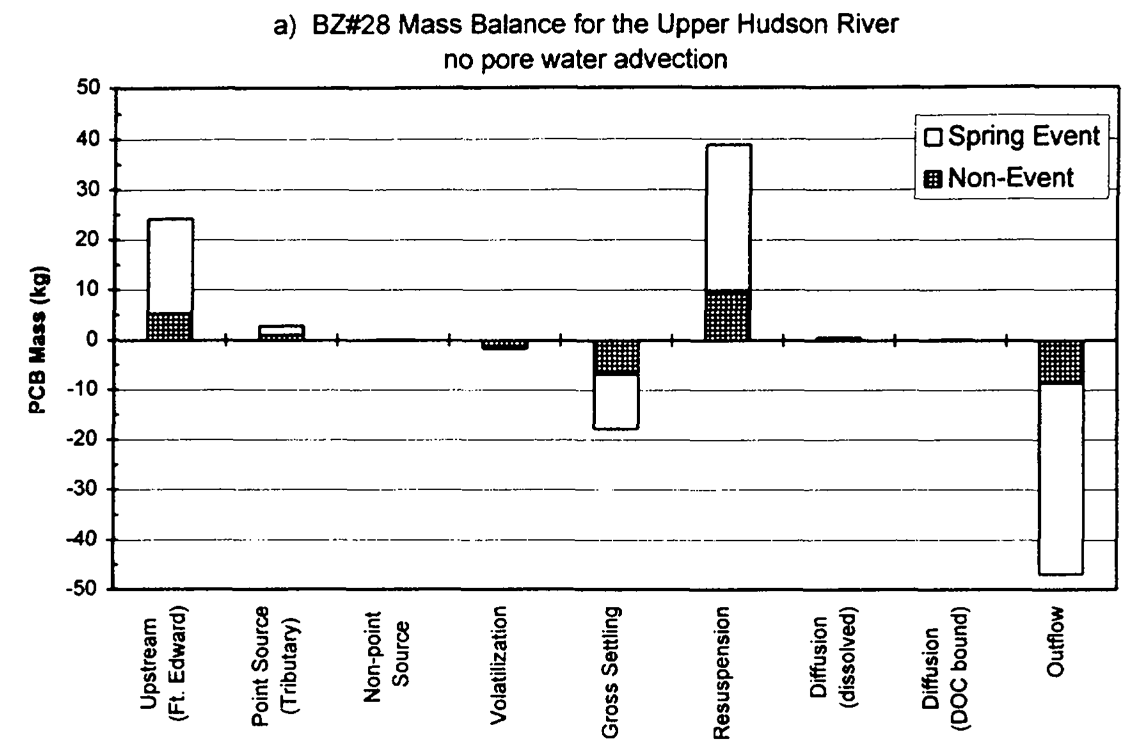



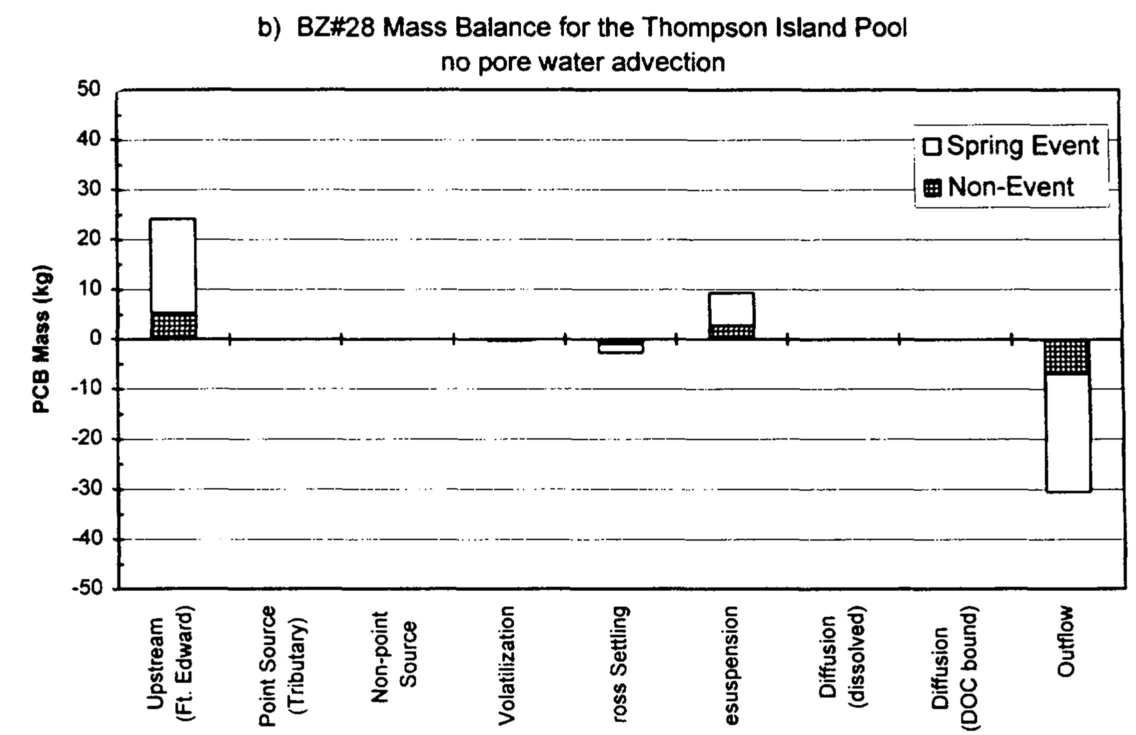
## Figure 4-41
## BZ#4 Mass Balance for HUDTOX Calibration Period (1/1/93 - 9/30/93)
## With No Pore Water Advection
*Spring Runoff Event Period is 3/26/93 - 5/10/93*



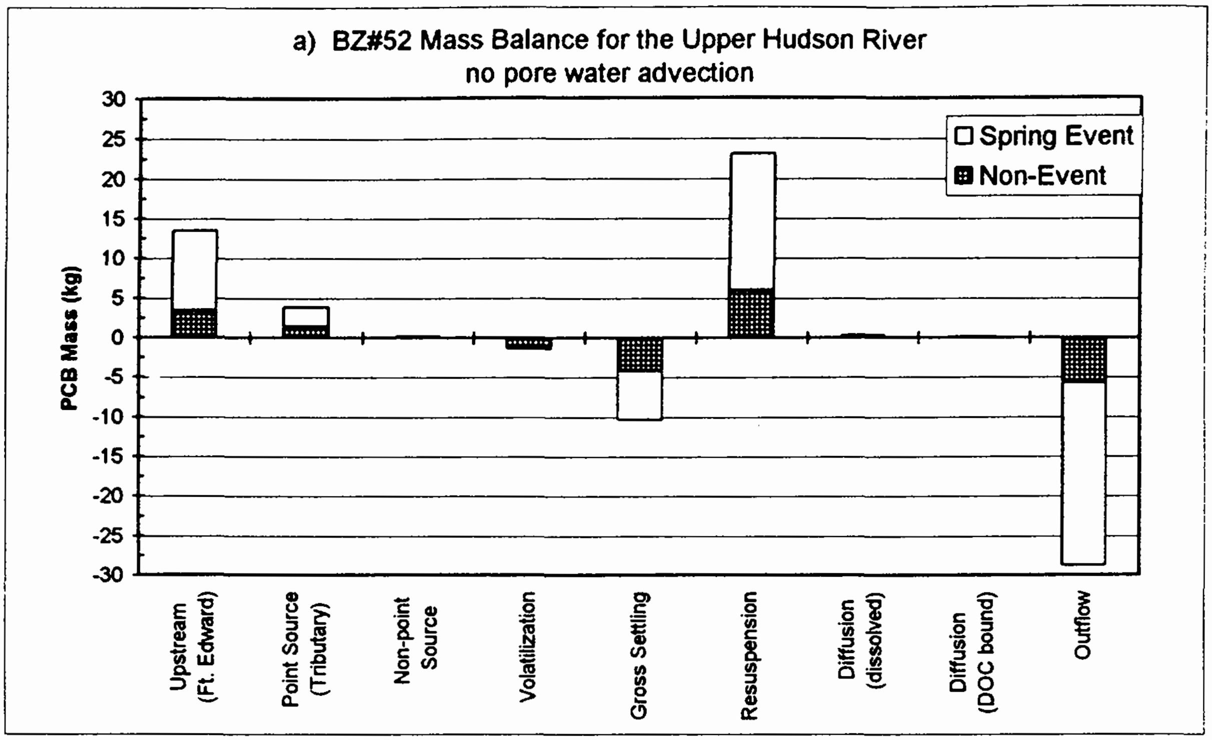
# Figure 4-42
## BZ#28 Mass Balance for HUDTOX Calibration Period (1/1/93-9/30/93) With No Pore Water Advection

*Spring Runoff Event Period (3/26/93 - 5/10/93)*



# Figure 4-43
## BZ#52 Mass Balance for HUDTOX Calibration Period (1/1/93-9/30/93)
## With No Pore Water Advection
*Spring Runoff Event Period (3/26/93 - 5/10/93)*



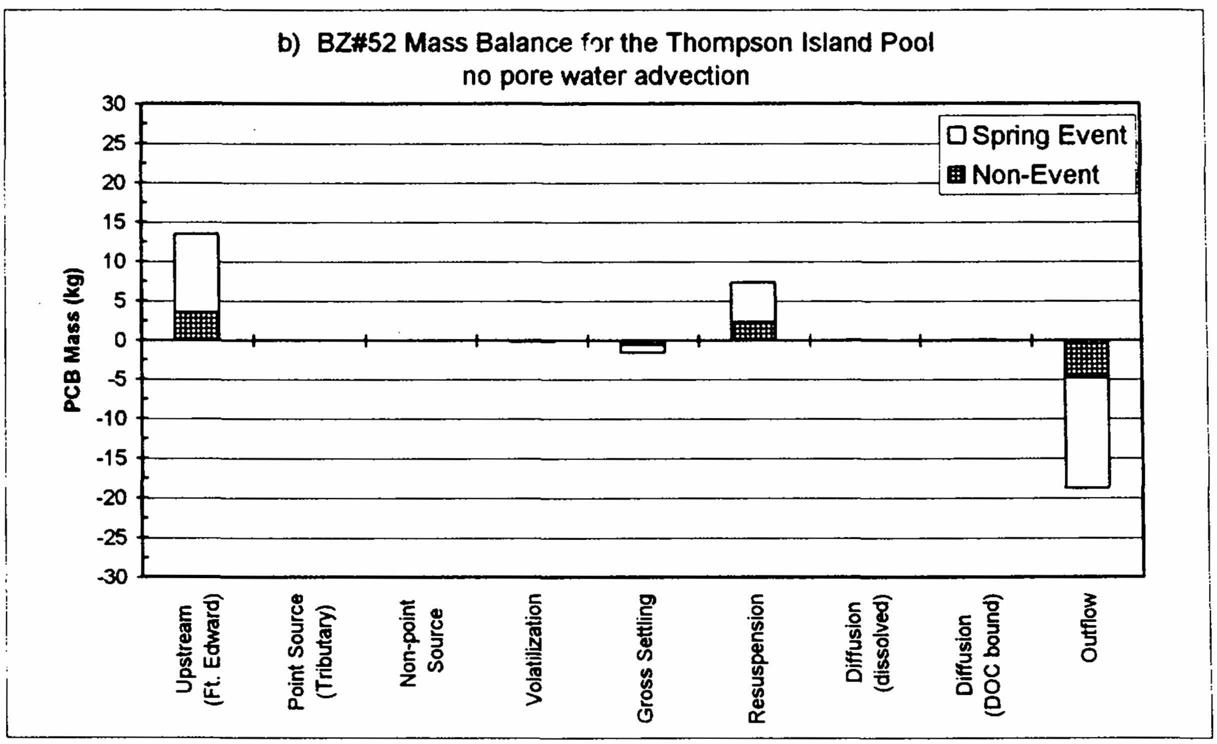
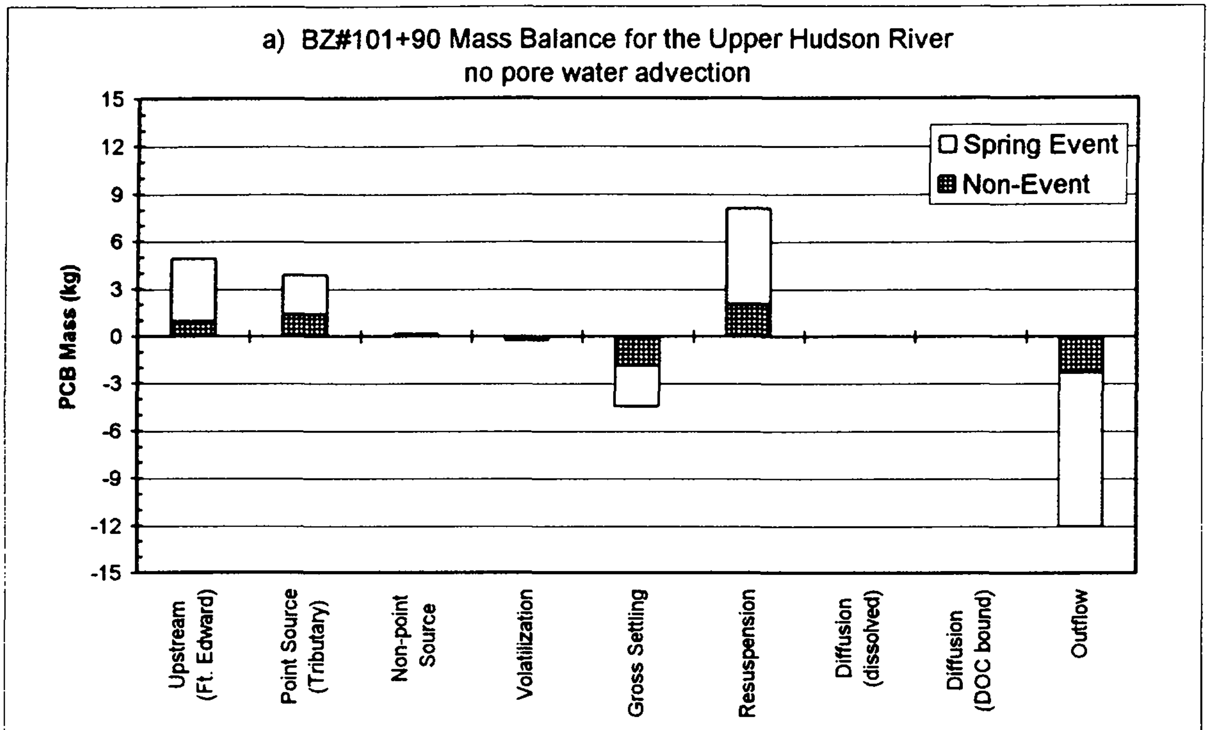



**Figure 4-44**
**BZ#101+90 Mass Balance for HUDTOX Calibration Period (1/1/93-9/30/93)**
**With No Pore Water Advection**
***Spring Runoff Event Period (3/26/93 - 5/10/93)***



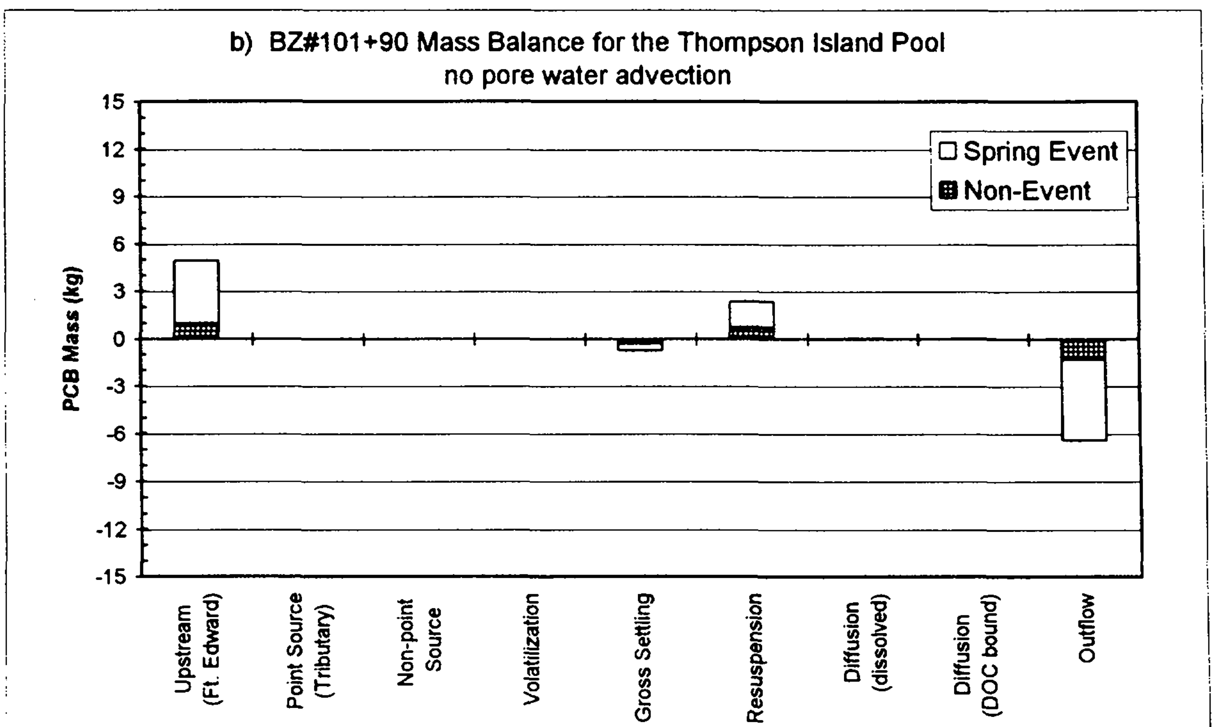
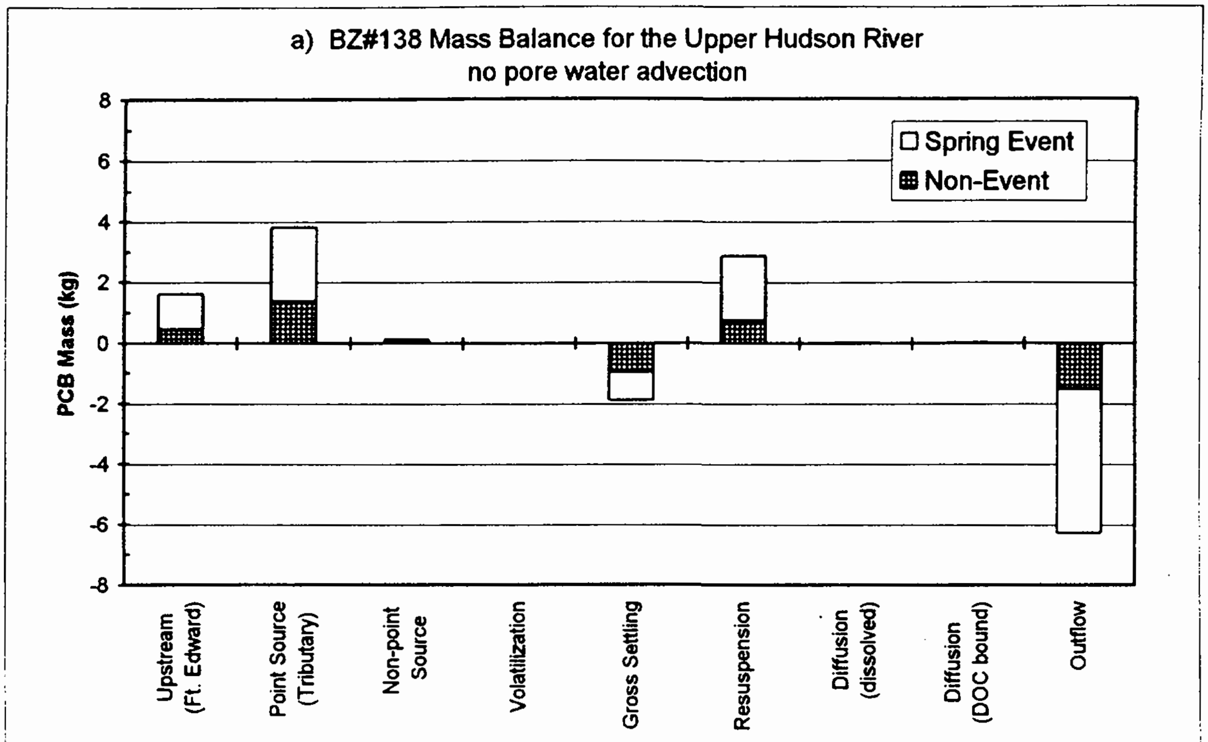
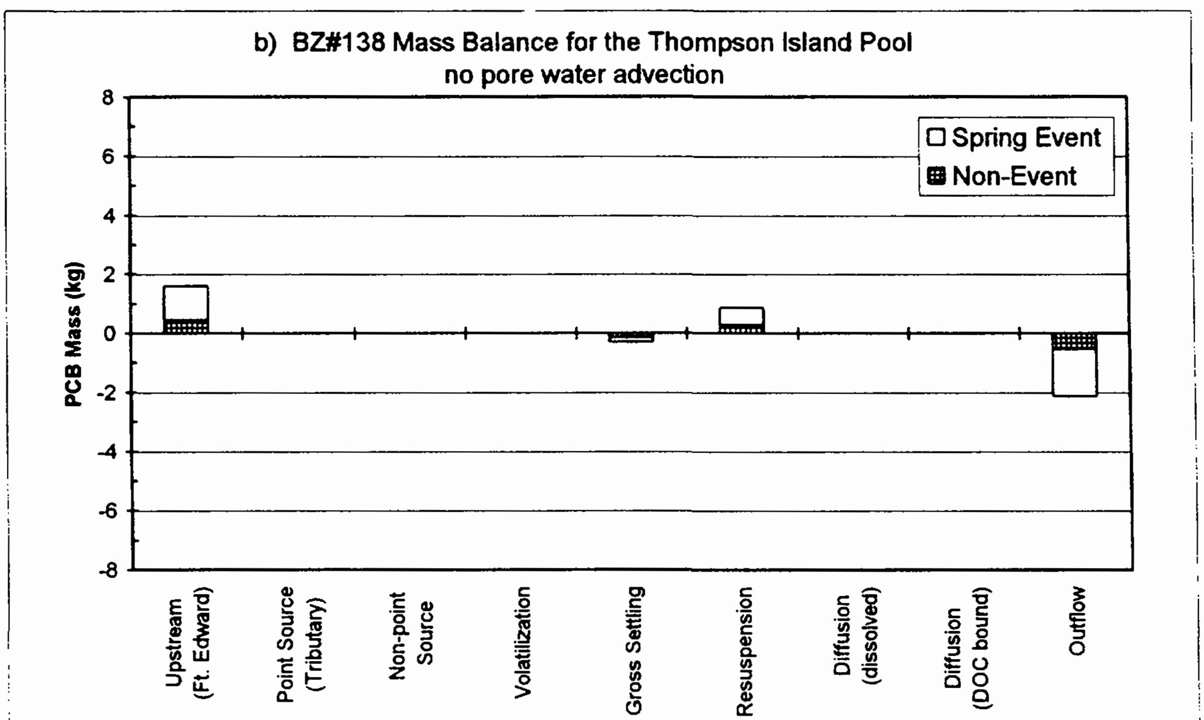
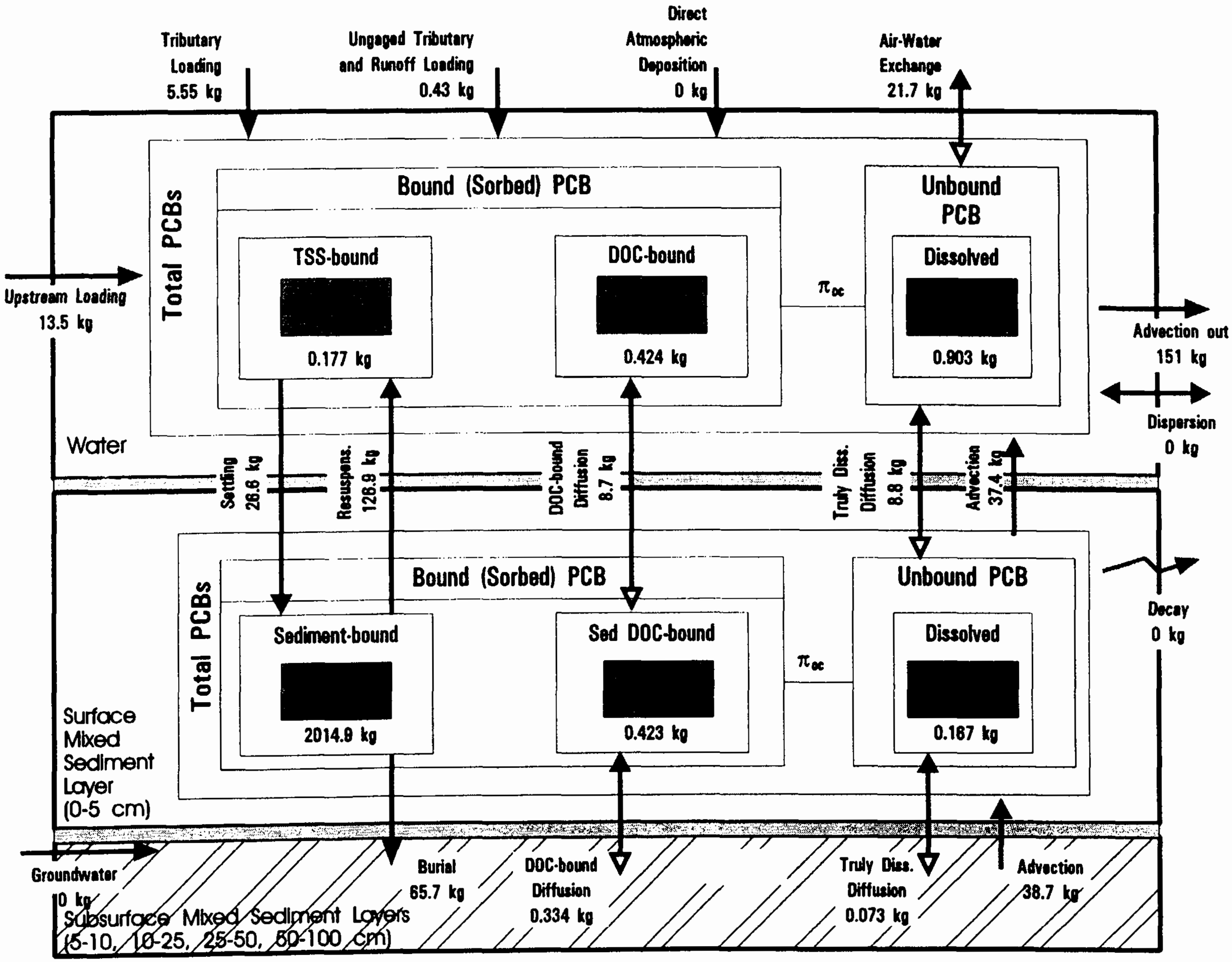



**Figure 4-45**
**BZ#138 PCB Mass Balance for HUDTOX Calibration Period (1/1/93-9/30/93)**
**With No Pore Water Advection**
***Spring Runoff Event Period (3/26/93 - 5/10/93)***



## Figure 4-46
## BZ#4 Component Diagram for Upper Hudson River with Pore Water Advection (1/1/93-9/30/93)



## BZ#4 Component Diagram for Thompson Island Pool with Pore Water Advection (1/1/93-9/30/93)

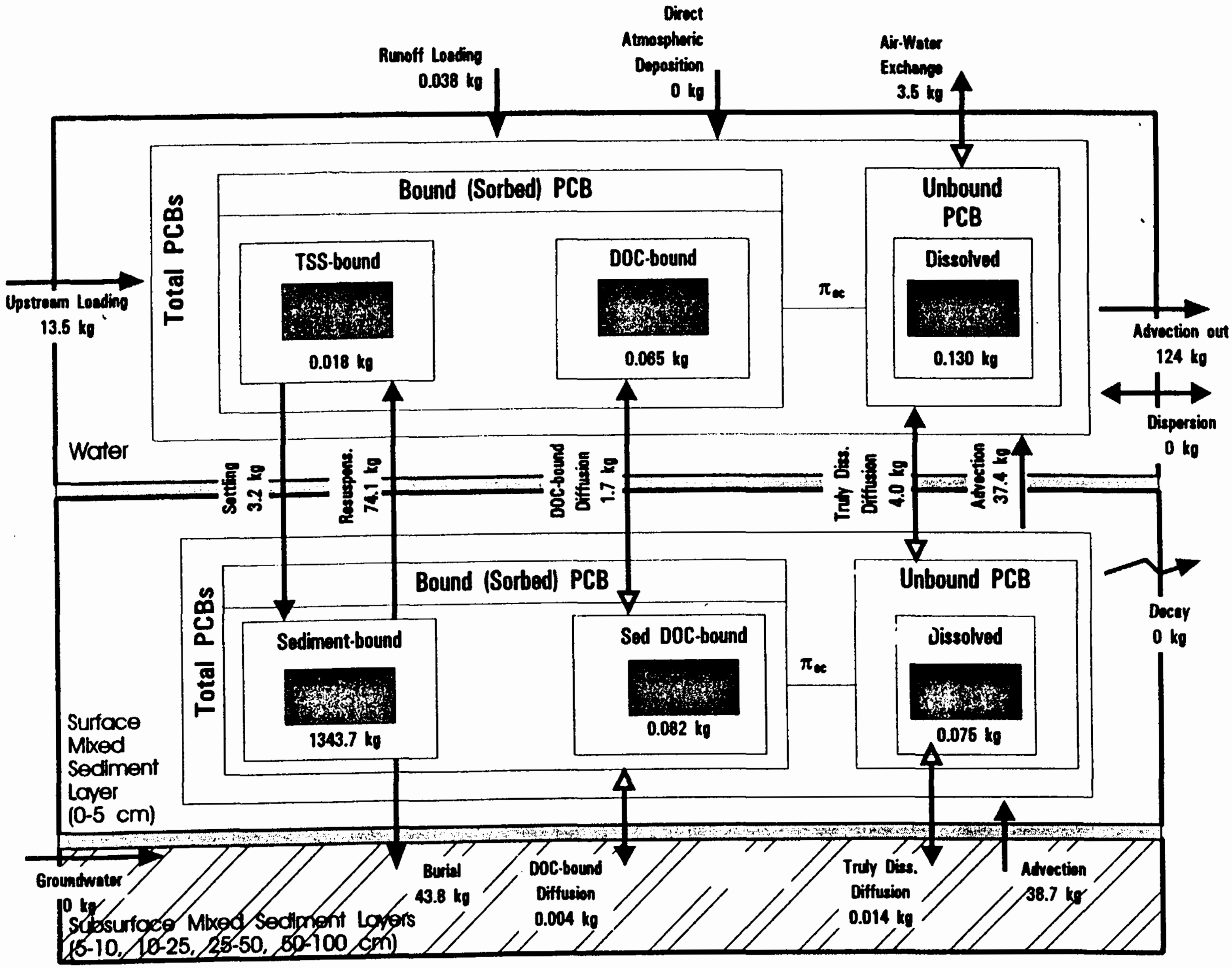



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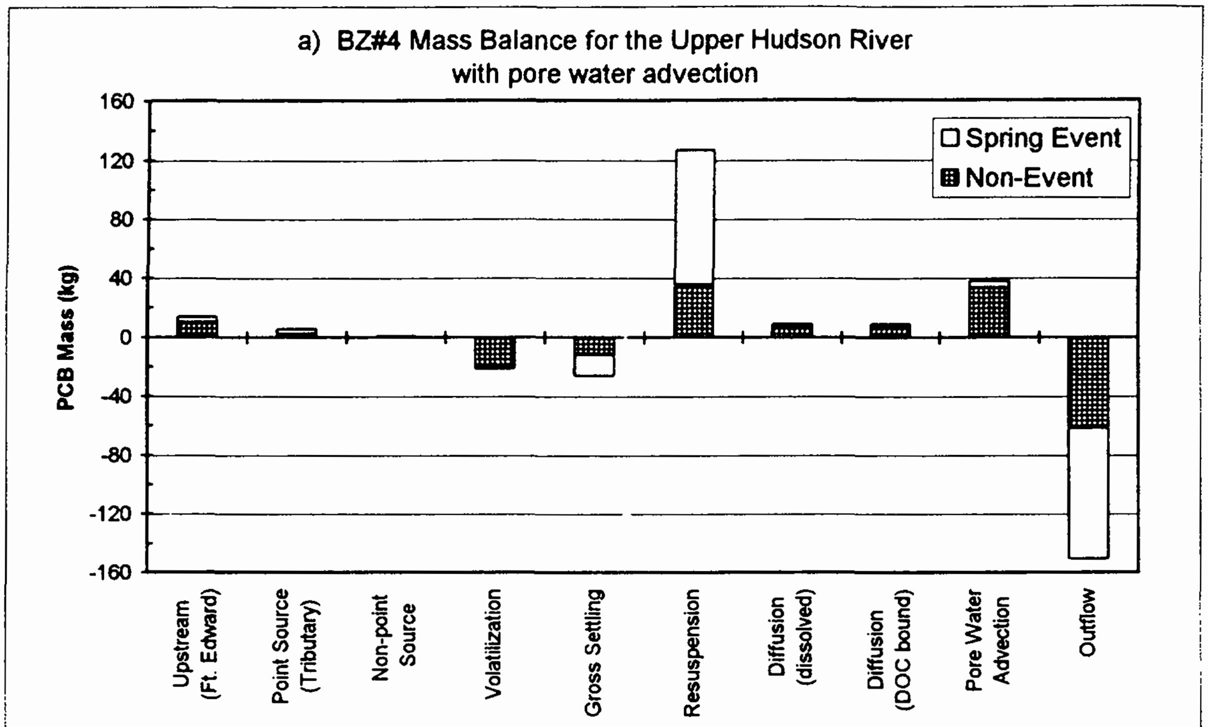
**Figure 4-48**

**BZ#4 Mass Balance for HUDTOX Calibration Period (1/1/93 - 9/30/93) With Pore Water Advection in Thompson Island Pool**

***Spring Runoff Event Period is 3/26/93 - 5/10/93***



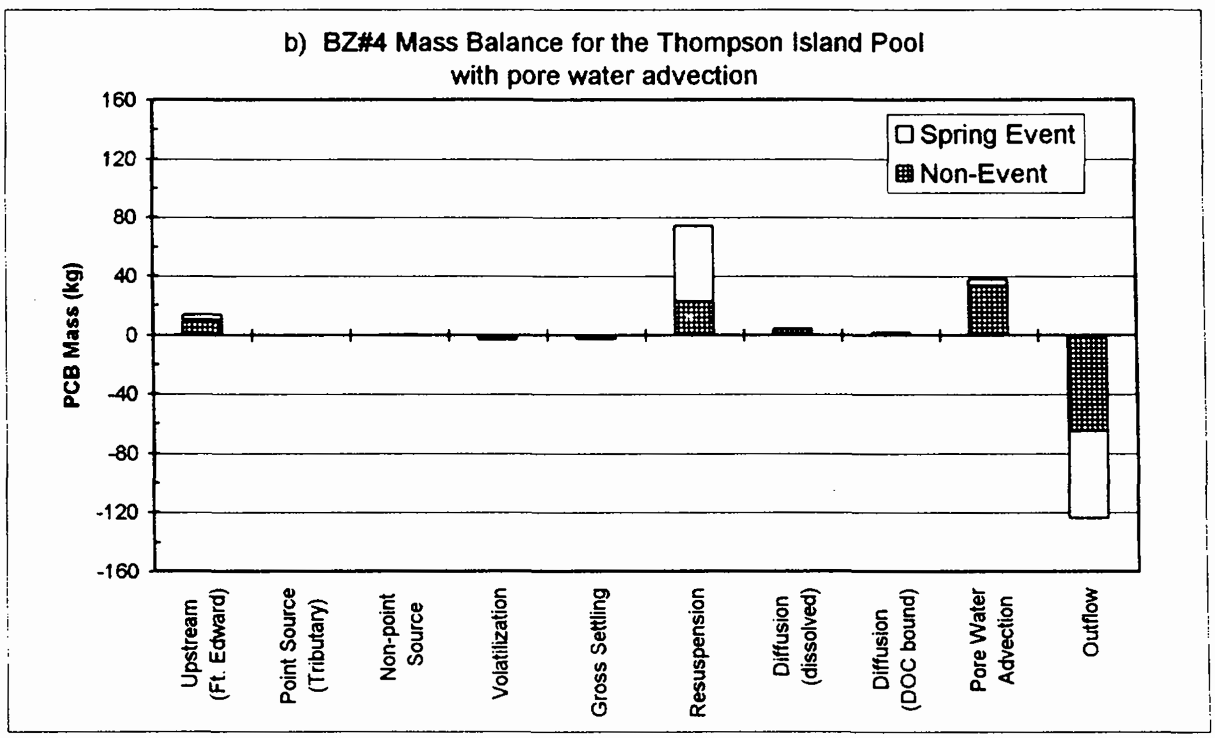



**Figure 4-49**
**Total PCBs Component Diagram for Thompson Island Pool with pore water advection (1/1/93-9/30/93)**

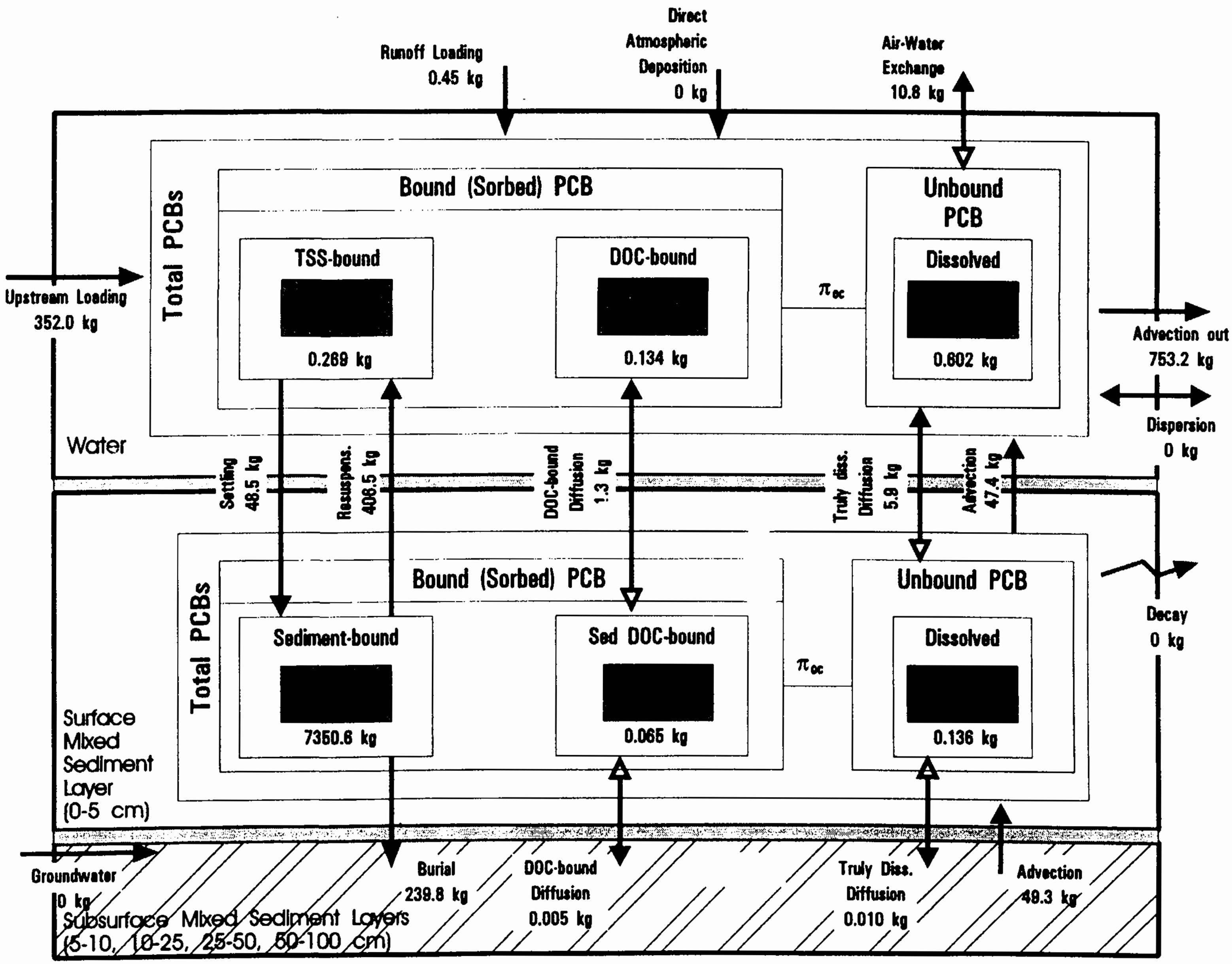
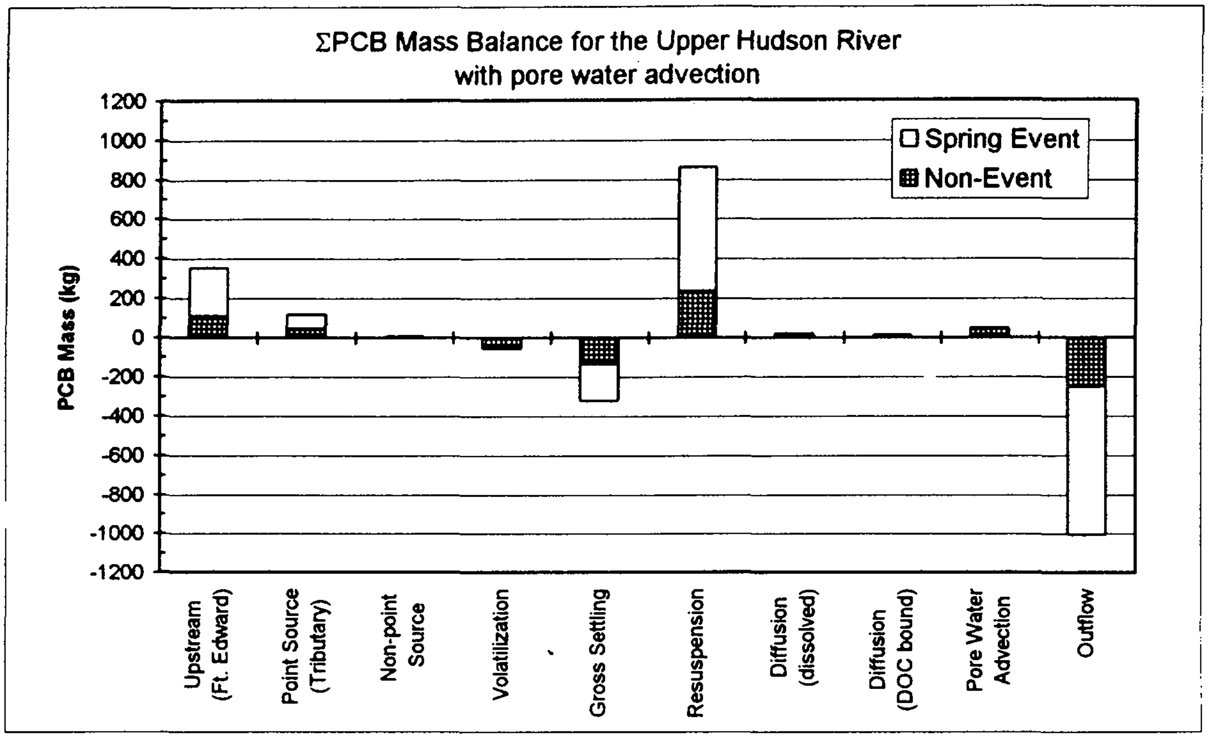
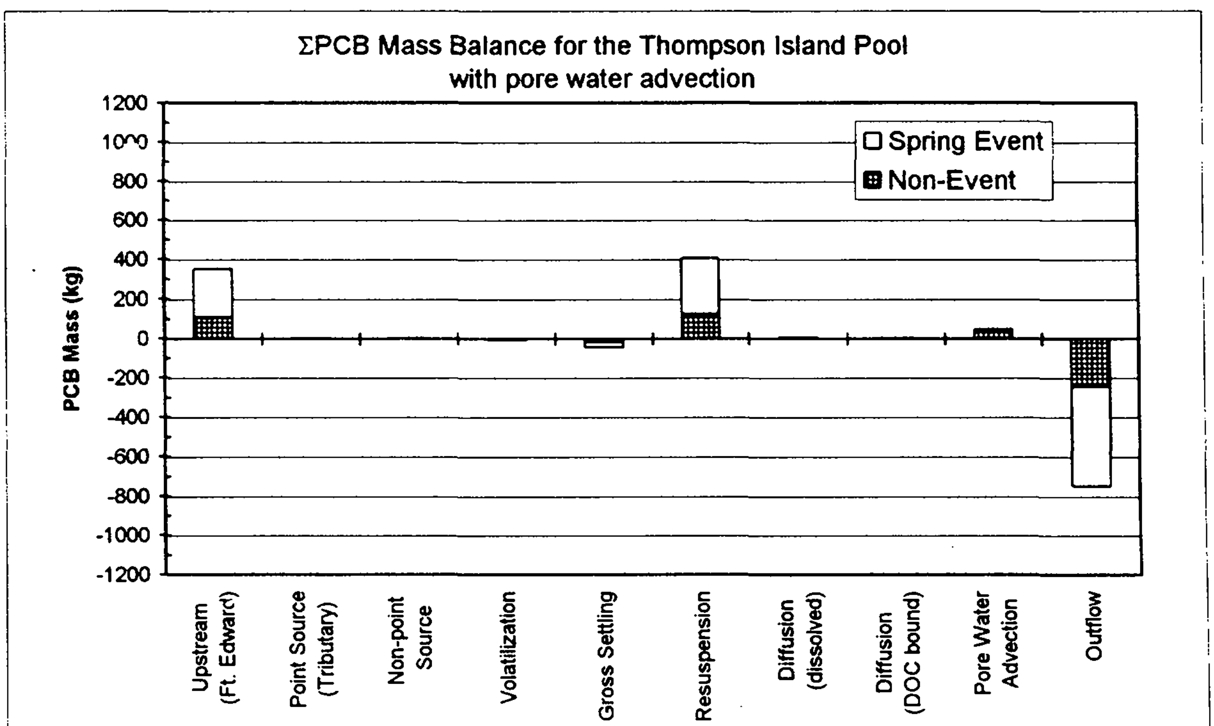


**Figure 4-50**

**ΣPCB Mass Balance for HUDTOX Calibration Period (1/1/93 - 9/30/93)**
**With Pore Water Advection in Thompson Island Pool**

***Spring Runoff Event Period is 3/26/93 - 5/10/93***



## Figure 4-51
## HUDTOX Calibration Sensitivity to Sediment Initial Conditions (+/-30%) for Total PCBs
## January - September 1993

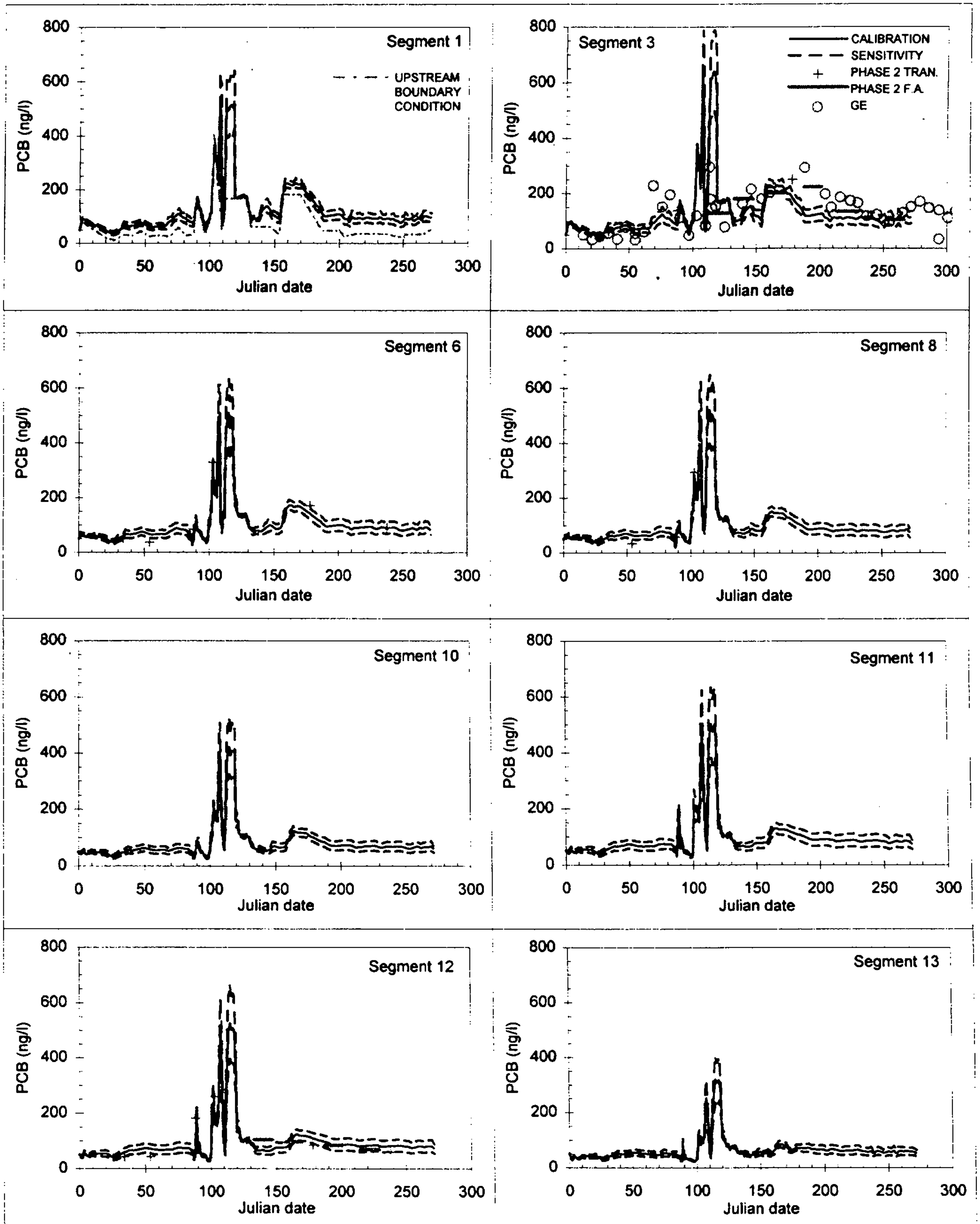


**Figure 4-52**
**HUDTOX Calibration Sensitivity to Sediment Initial Conditions (+/-30%) for BZ#4**
**January - September 1993**

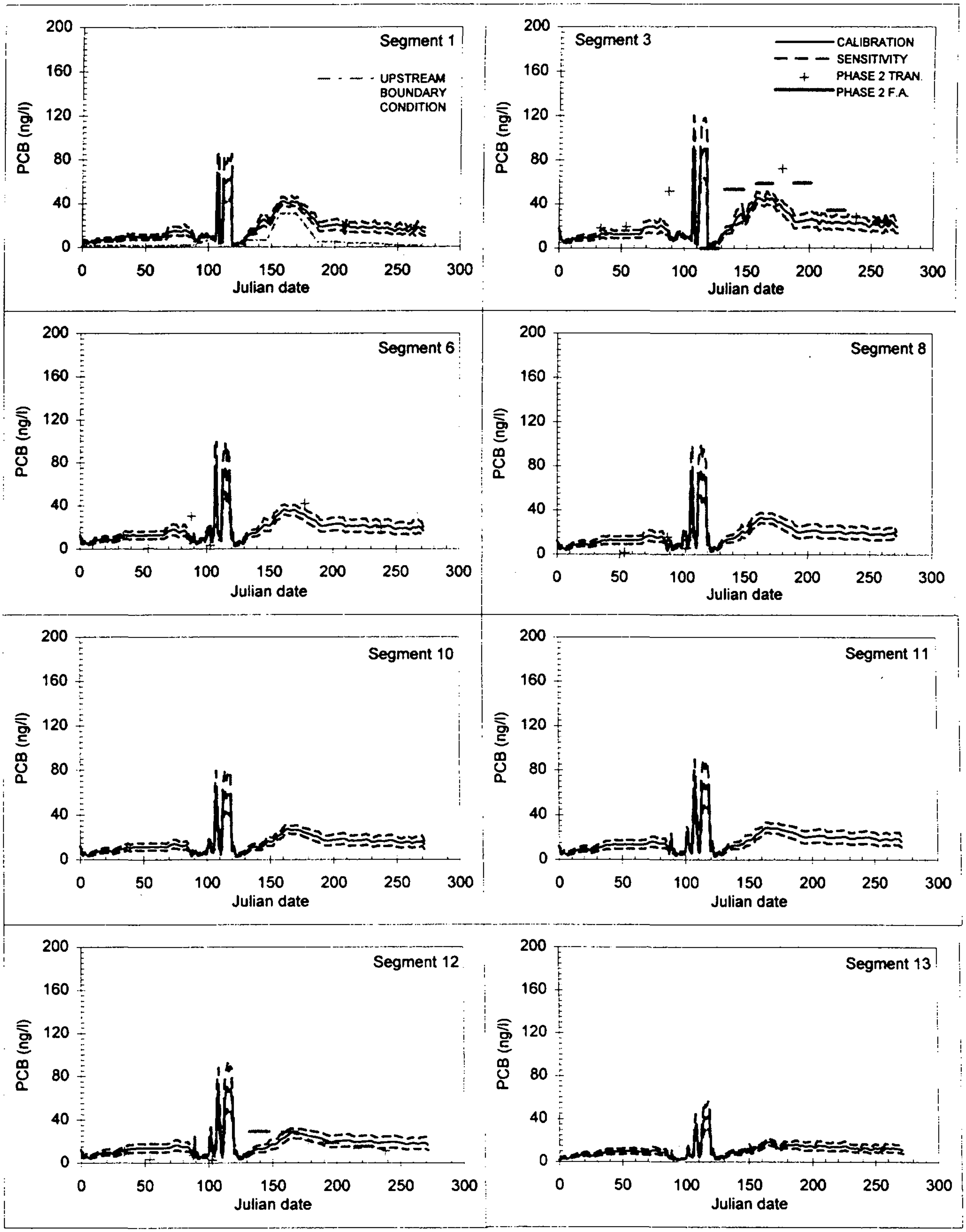
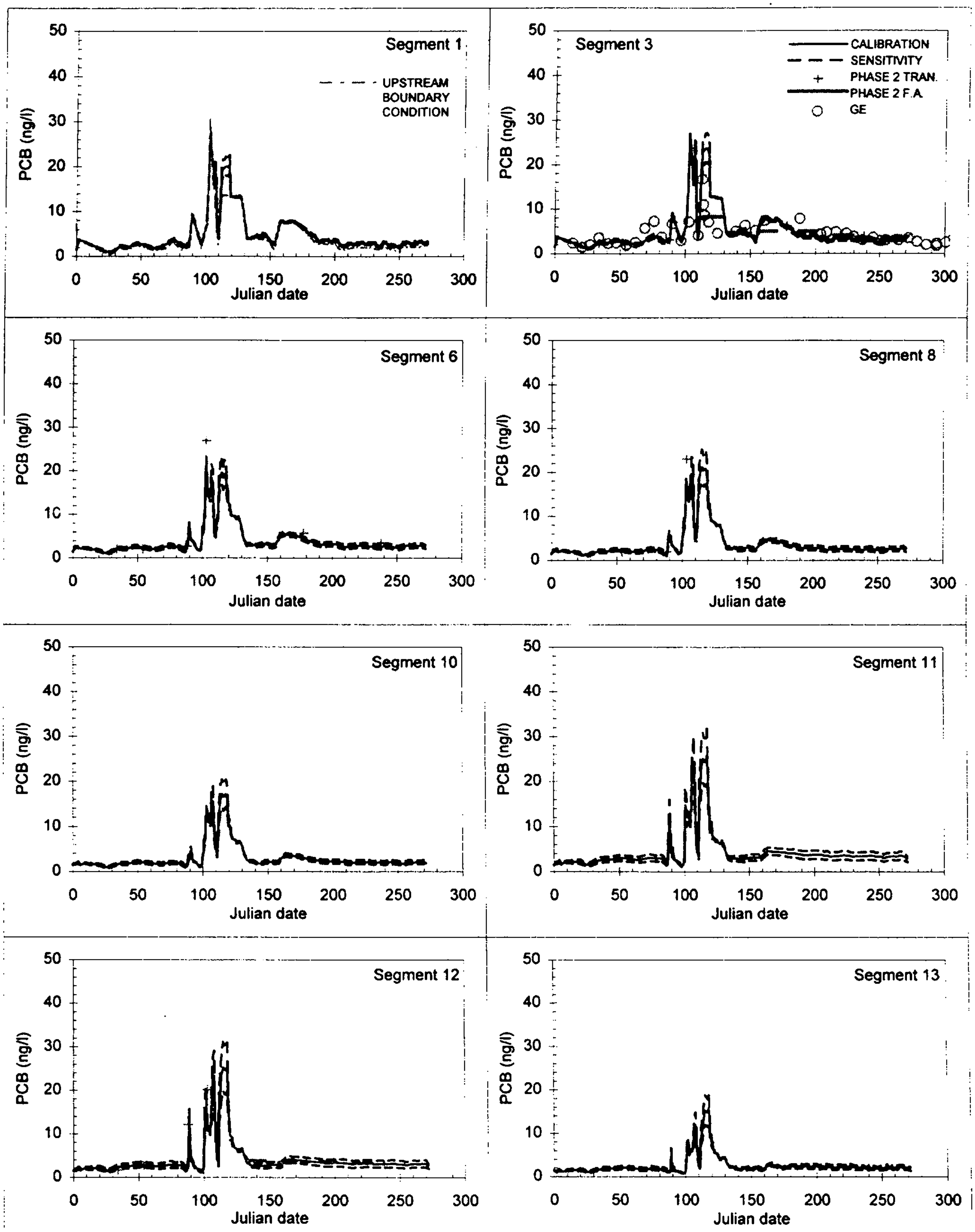
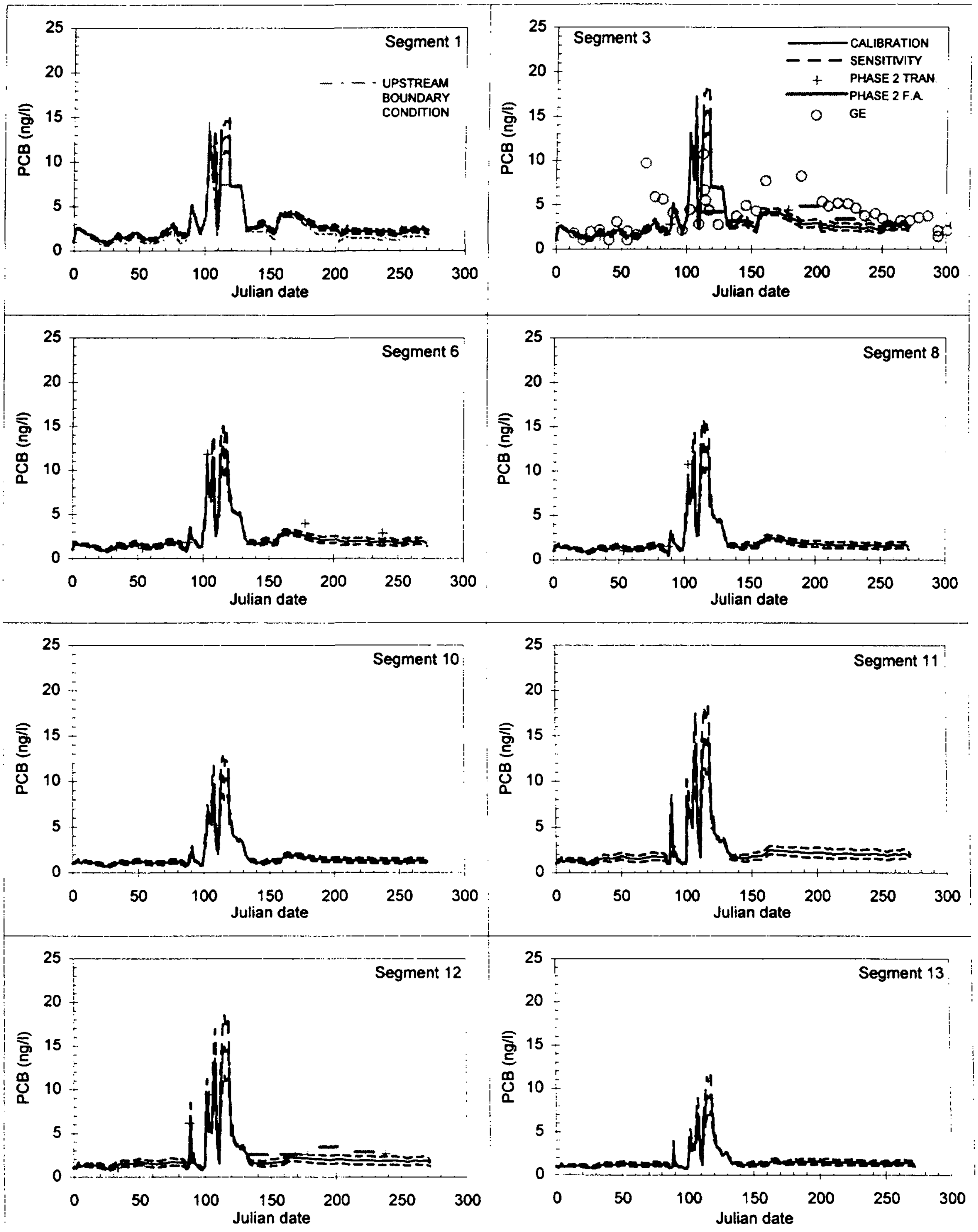


**Figure 4-53**
**HUDTOX Calibration Sensitivity to Sediment Initial Conditions (+/-30%) for BZ#28**
**January - September 1993**



## Figure 4-54
## HUDTOX Calibration Sensitivity to Sediment Initial Conditions (+/-30%) for BZ#52
## January - September 1993



## Figure 4-55

## HUDTOX Calibration Sensitivity to Sediment Initial Conditions (+/-30%) for BZ#101 90 January - September 1993

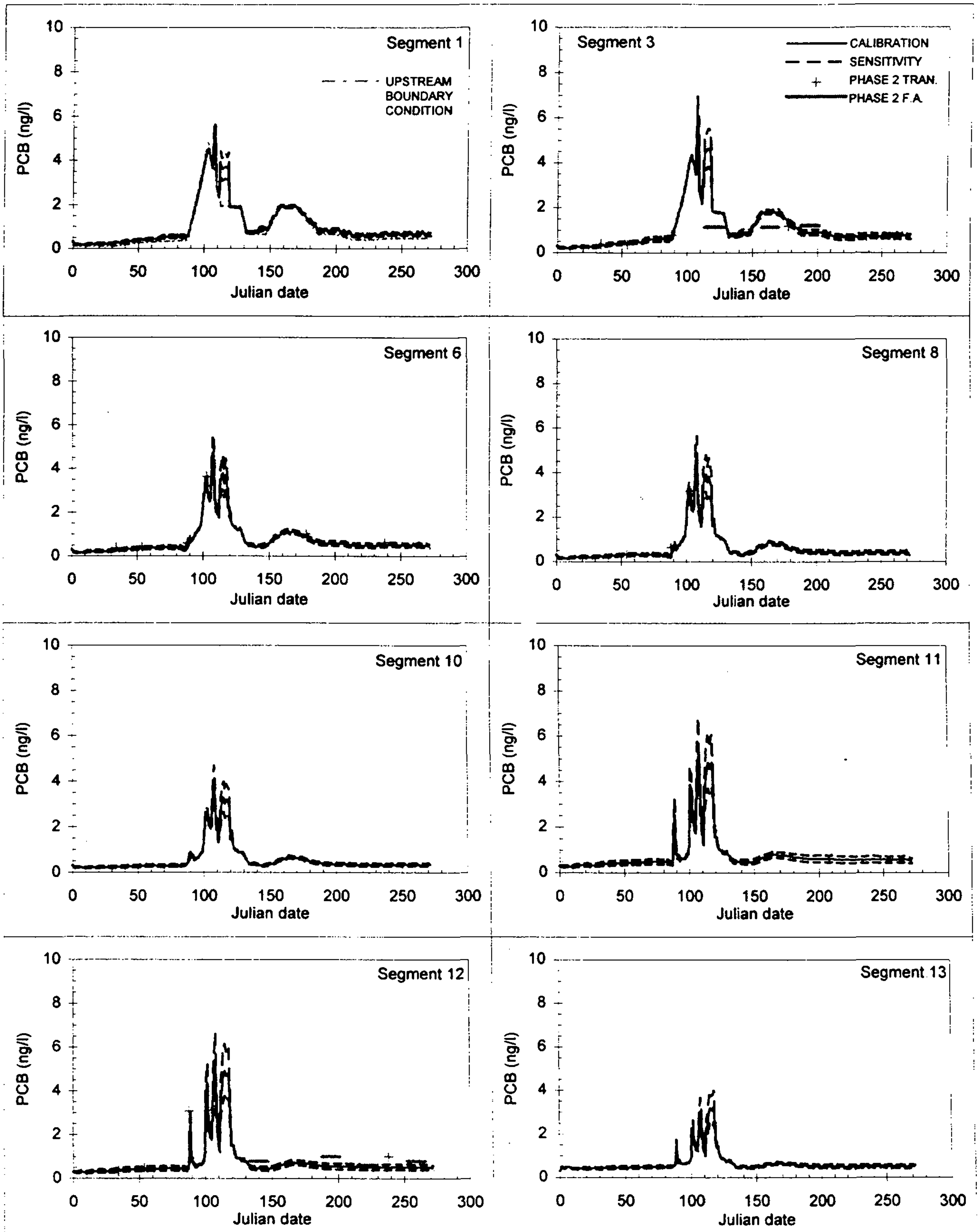
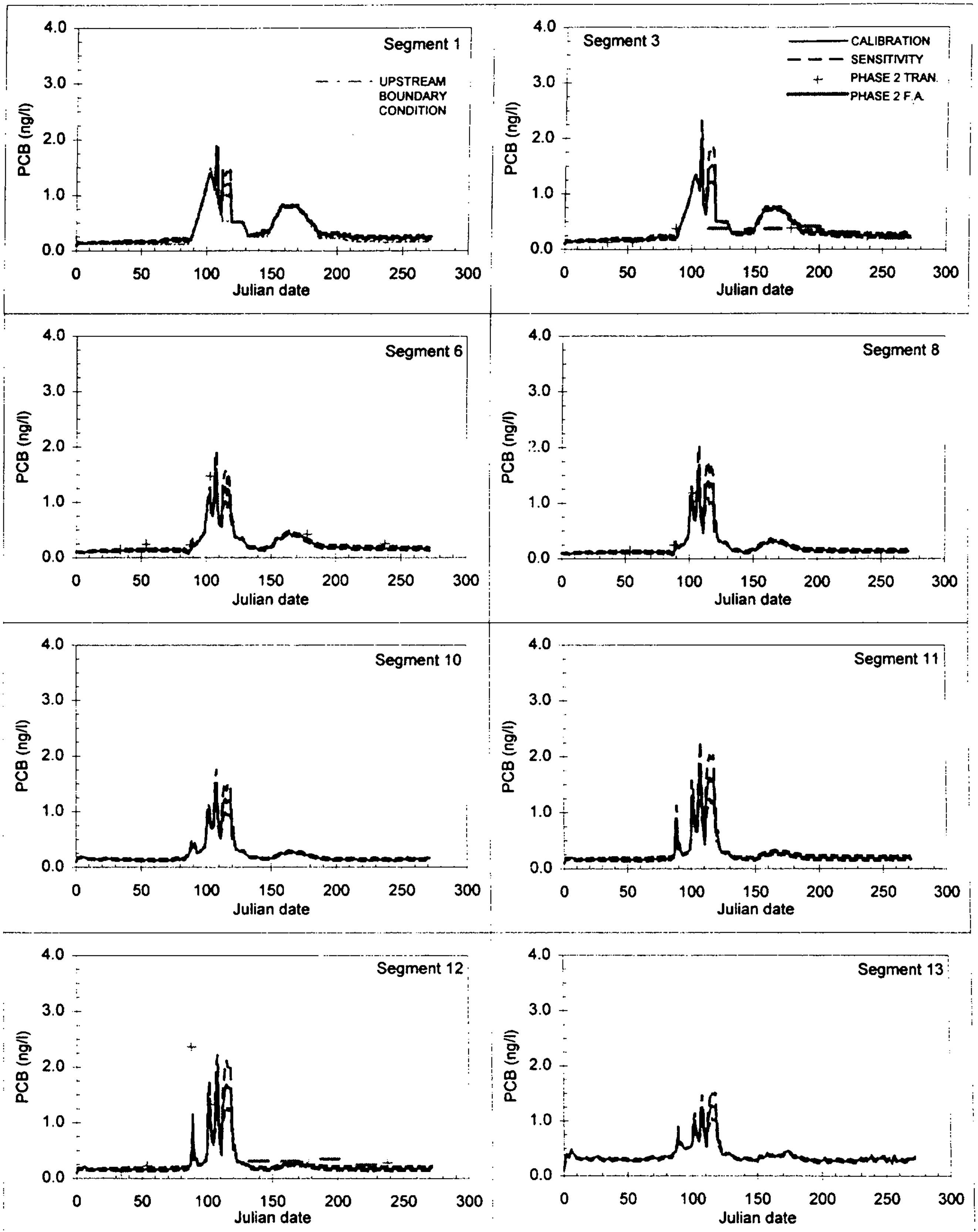


**Figure 4-56**
**HUDTOX Calibration Sensitivity to Sediment Initial Conditions (+/-30%) for BZ#138**
**January - September 1993**



## Figure 4-57
## HUDTOX Calibration Sensitivity to Upstream Boundary Conditions (+/-30%) for Total PCBs January - September 1993

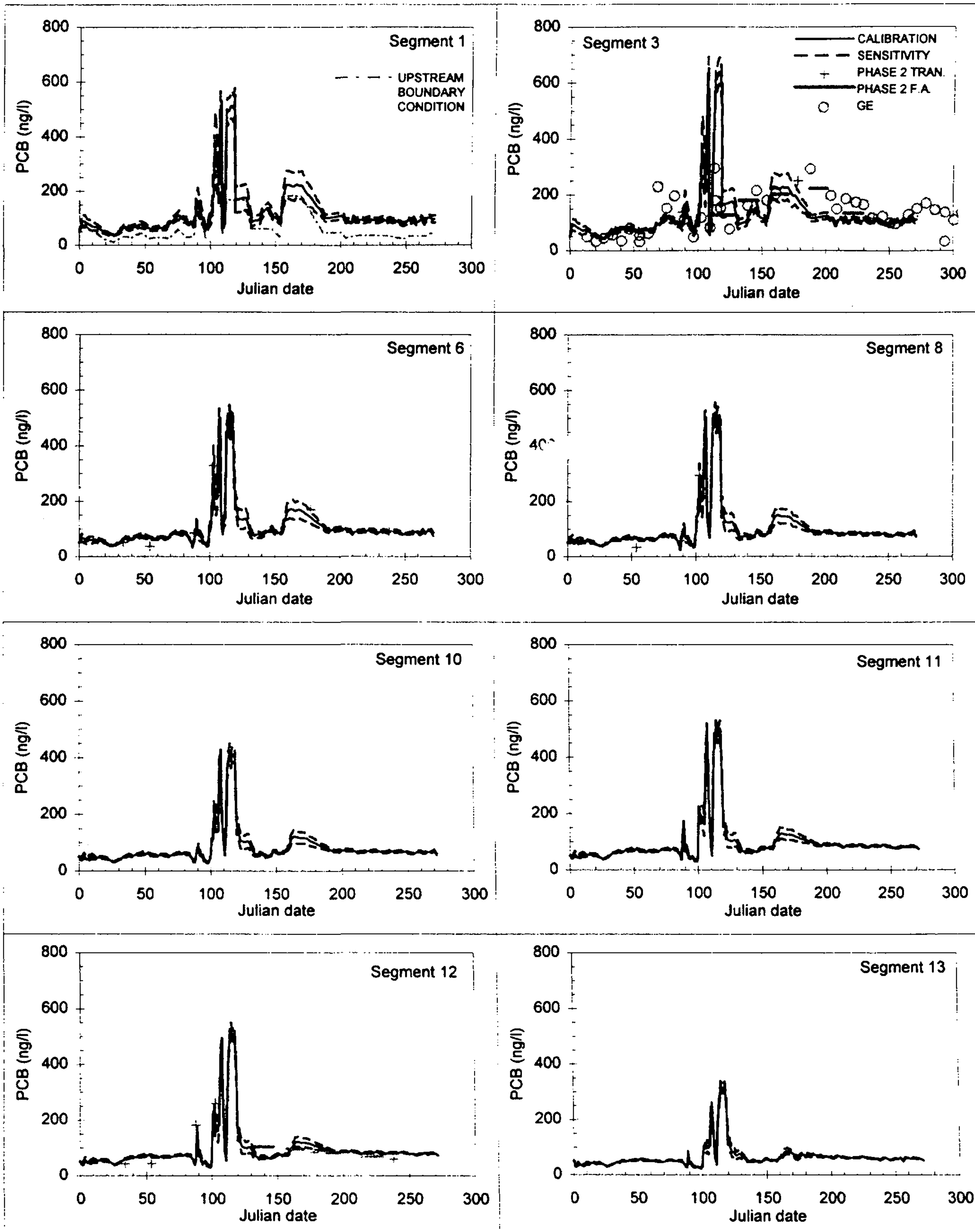


**Figure 4-58**
**HUDTOX Calibration Sensitivity to Upstream Boundary Conditions (+/-30%) for BZ#4**
**January - September 1993**

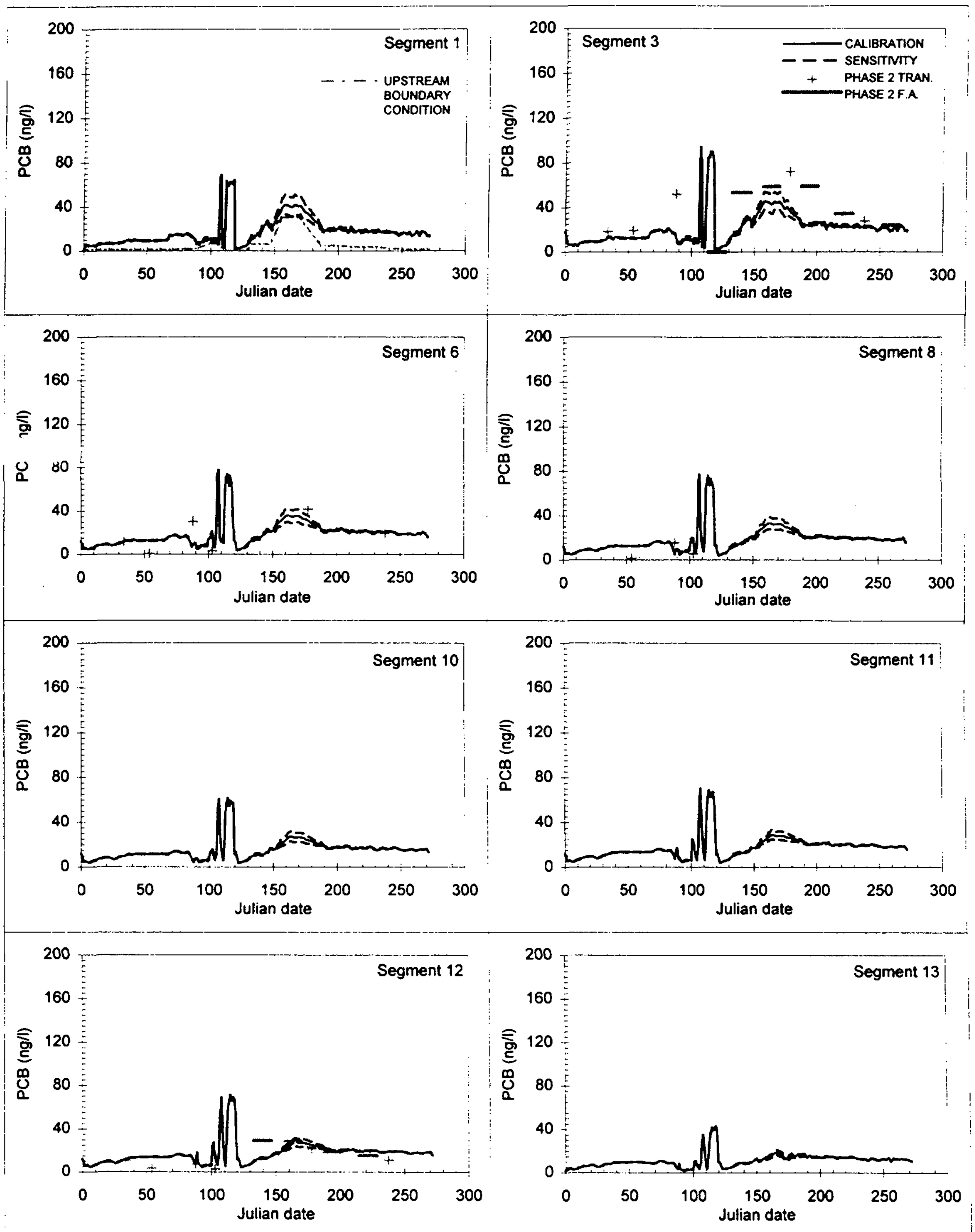


**Figure 4-59**
**HUDTOX Calibration Sensitivity to Upstream Boundary Conditions (+/-30%) for BZ#28**
**January - September 1993**

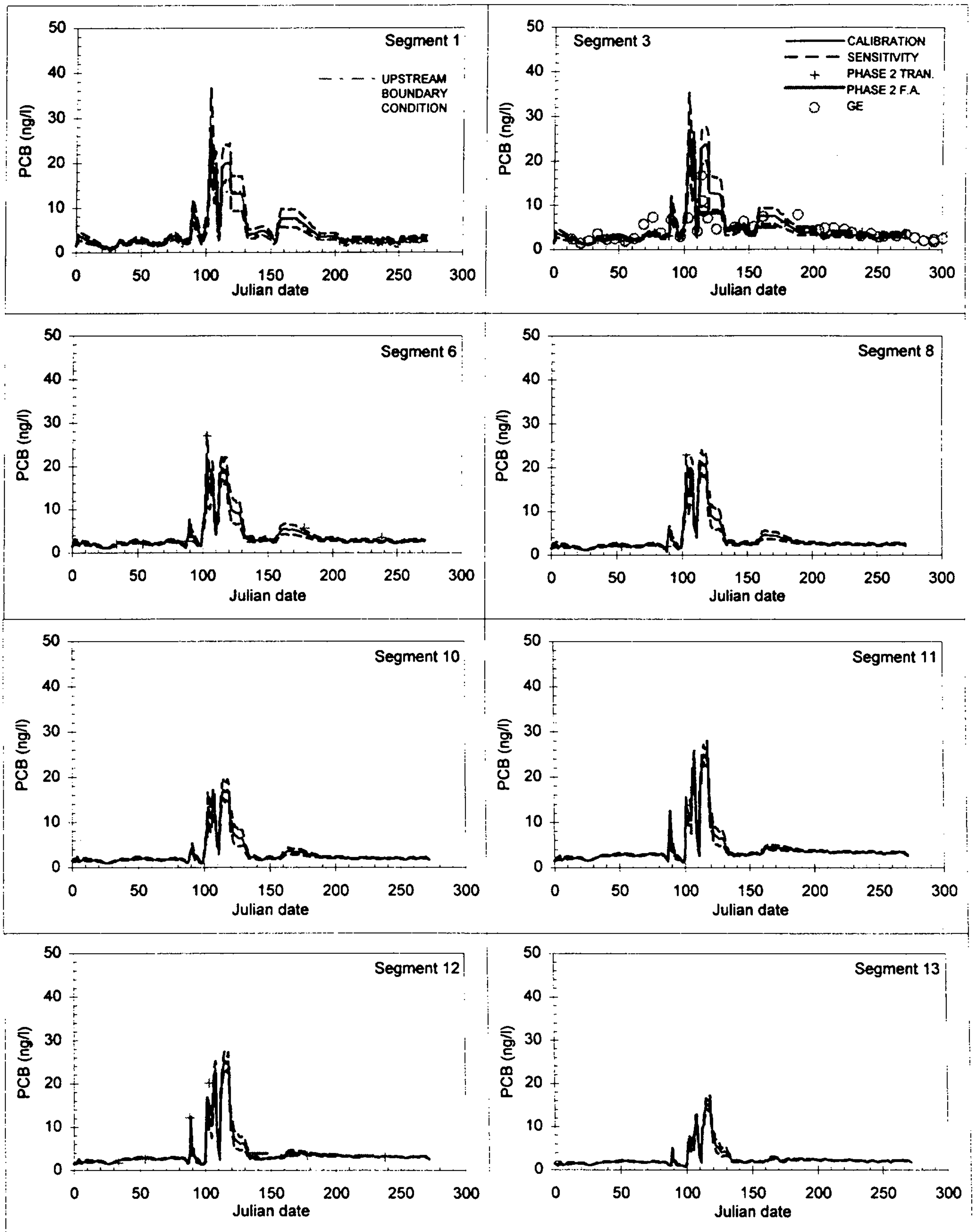
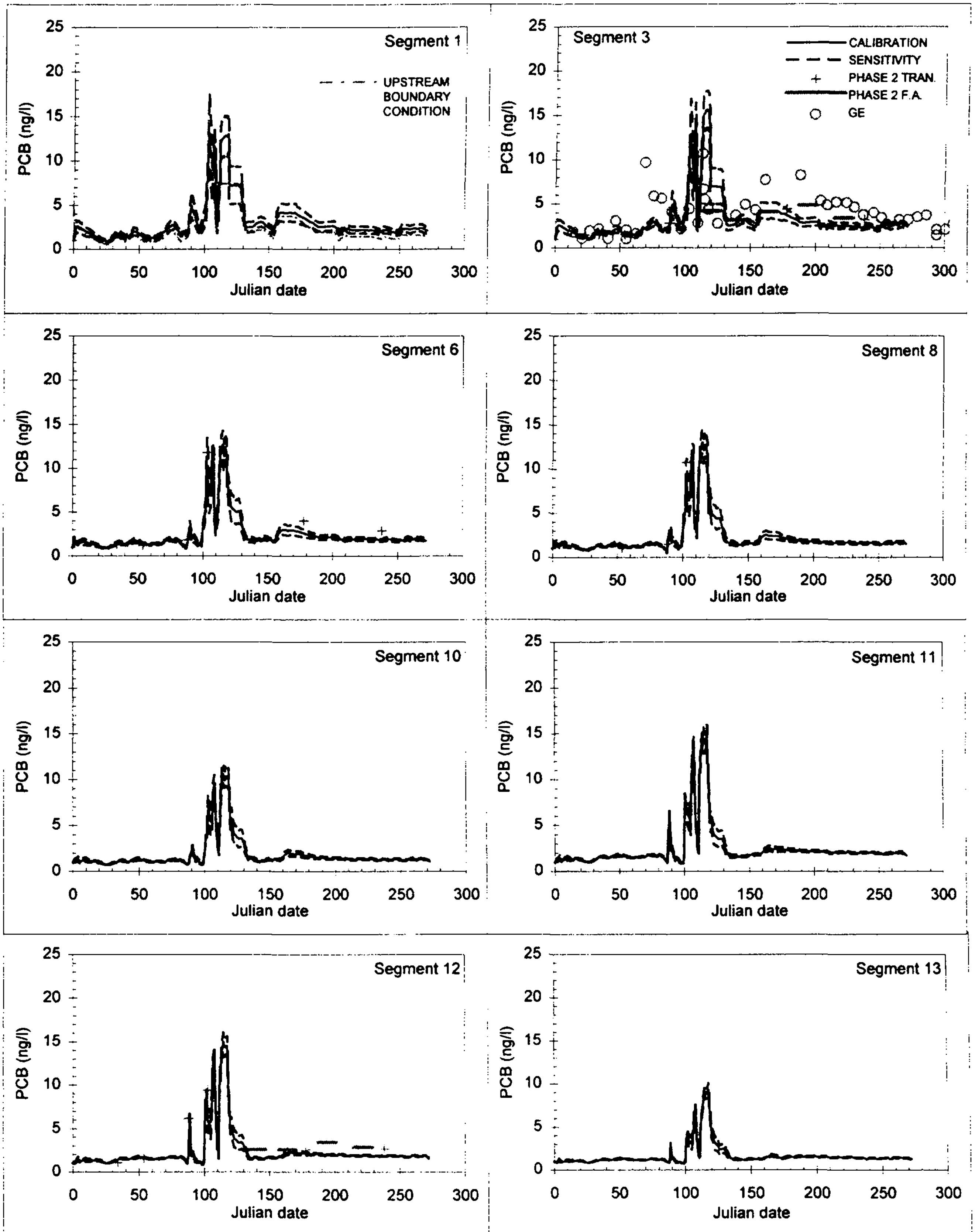
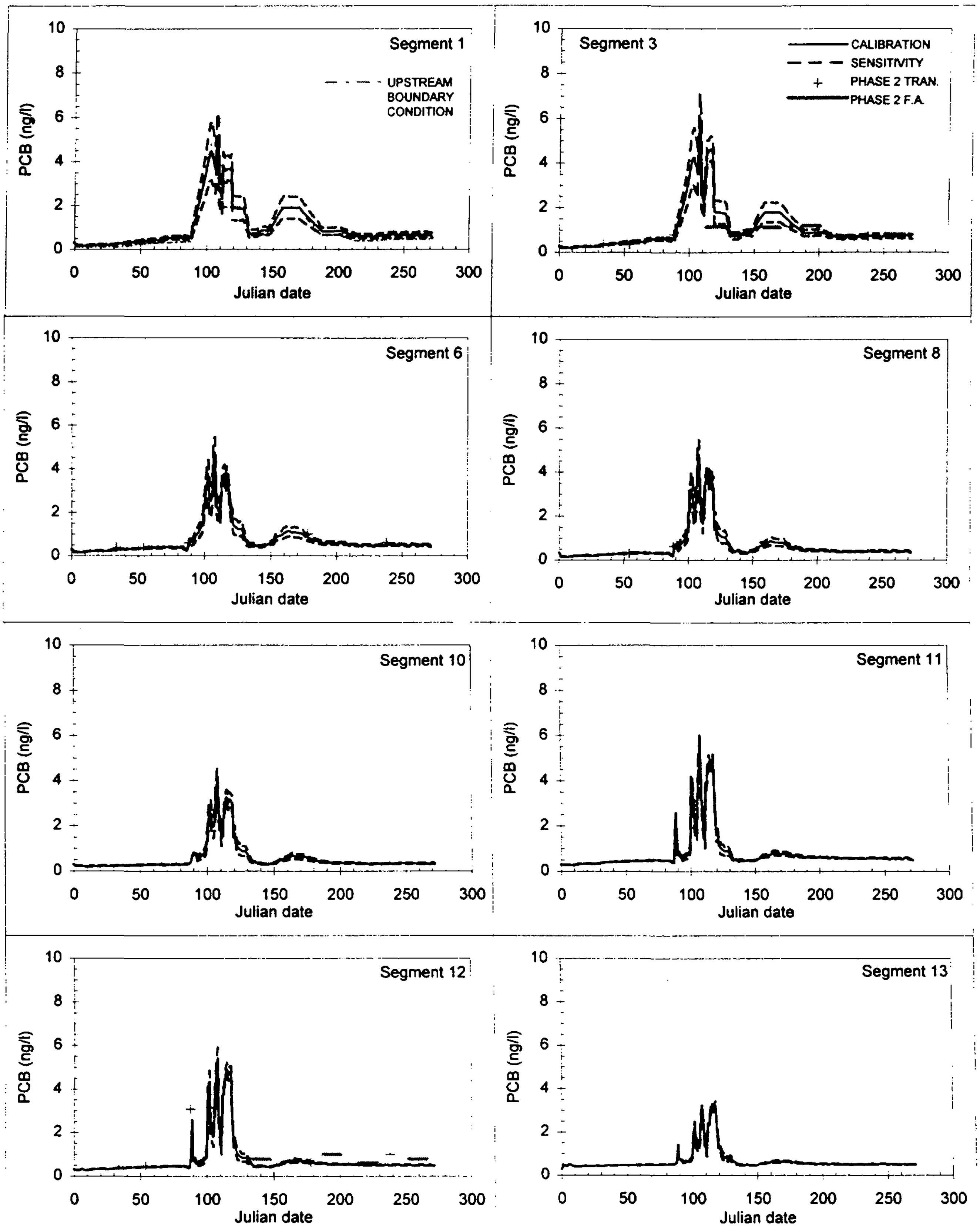


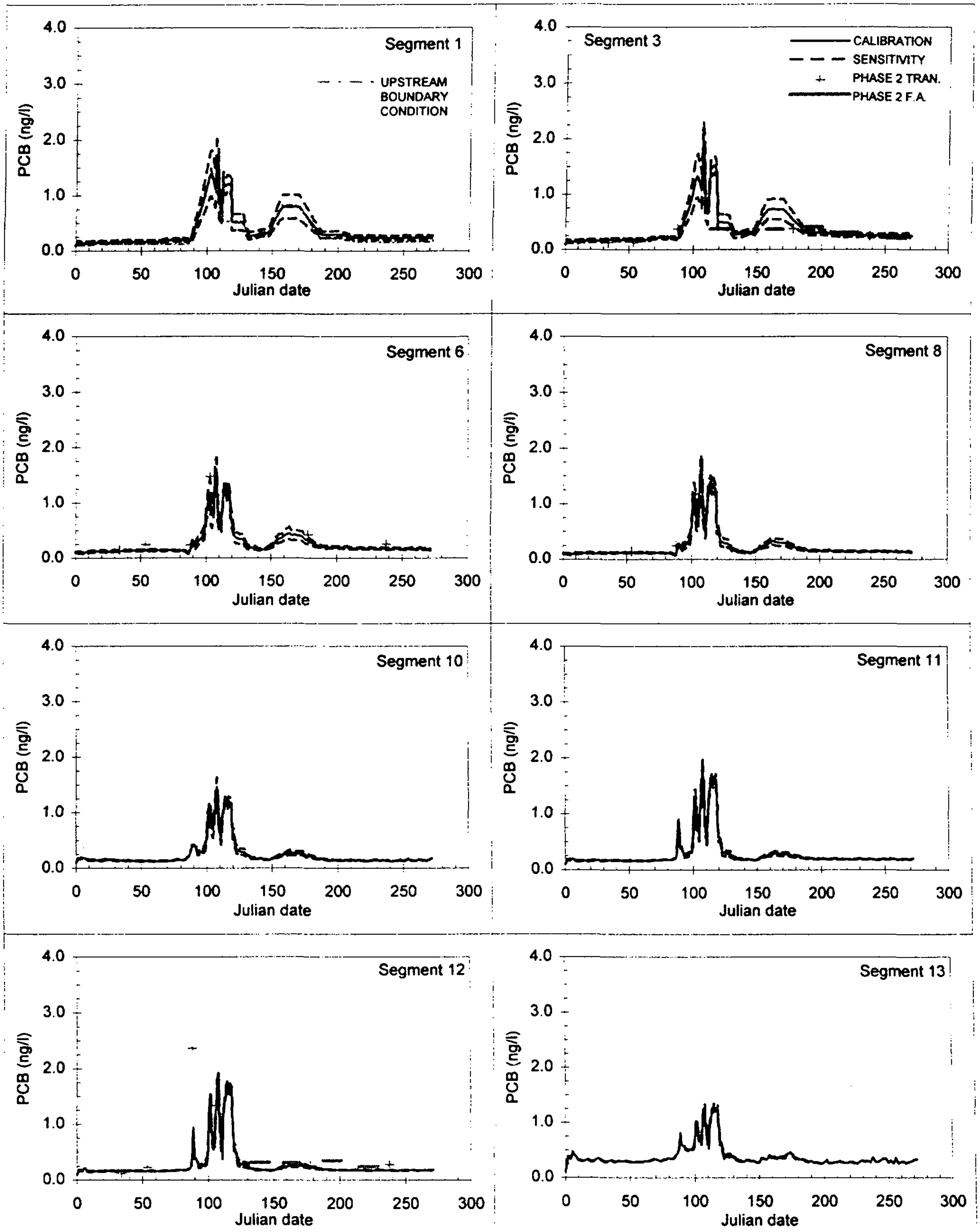
**Figure 4-60**
**HUDTOX Calibration Sensitivity to Upstream Boundary Conditions (+/-30%) for BZ#52**
**January - September 1993**



## Figure 4-61
## HUDTOX Calibration Sensitivity to Upstream Boundary Condition (+/-30%) for BZ#101 and 90 January - September 1993

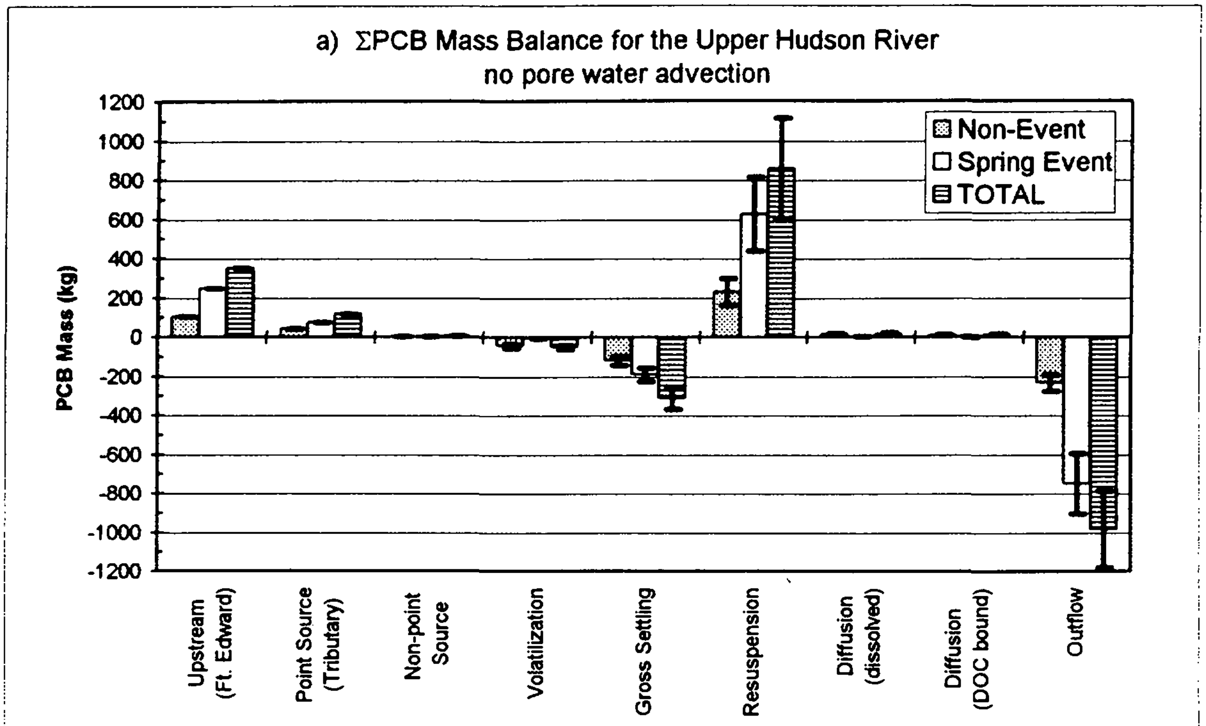


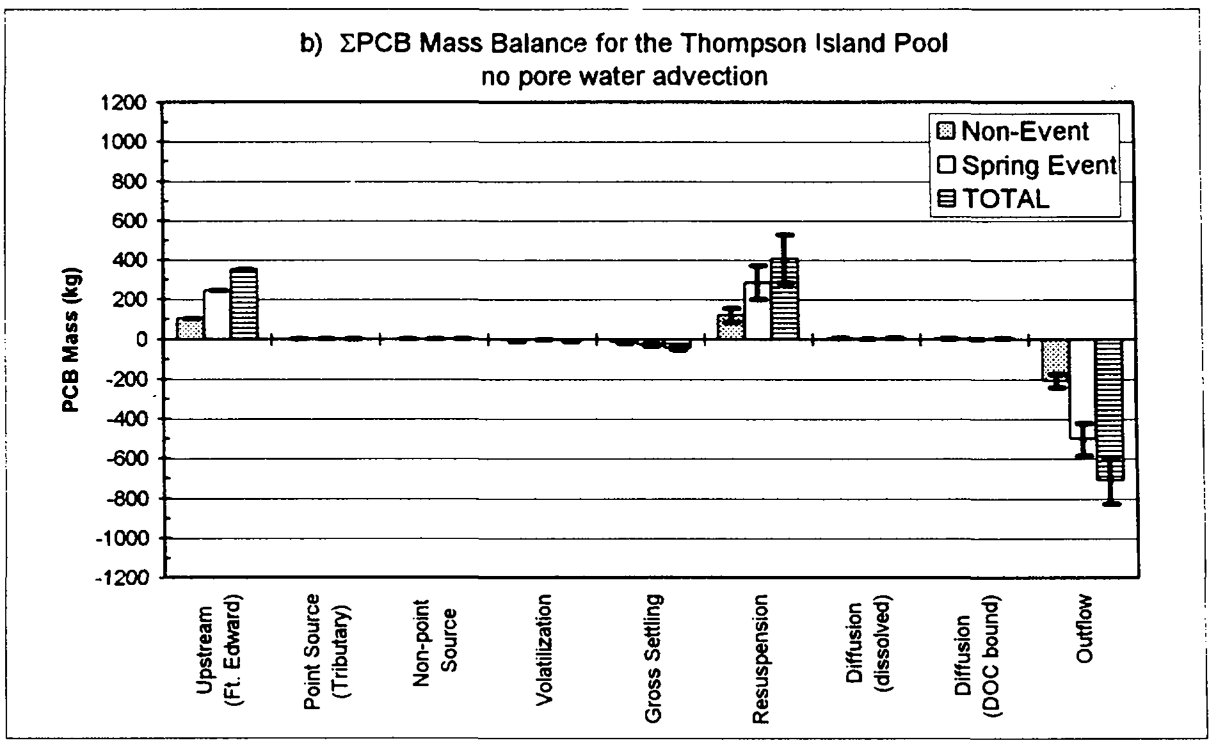
## Figure 4-62
## HUDTOX Calibration Sensitivity to Upstream Boundary Conditions (+/-30%) for BZ#138
## January - September 1993



## Figure 4-63
## ΣPCB Mass Balance for HUDTOX Calibration Sensitivity to Initial Conditions (+/-30%) for Sediment PCBs (1/1/93 - 9/30/93)

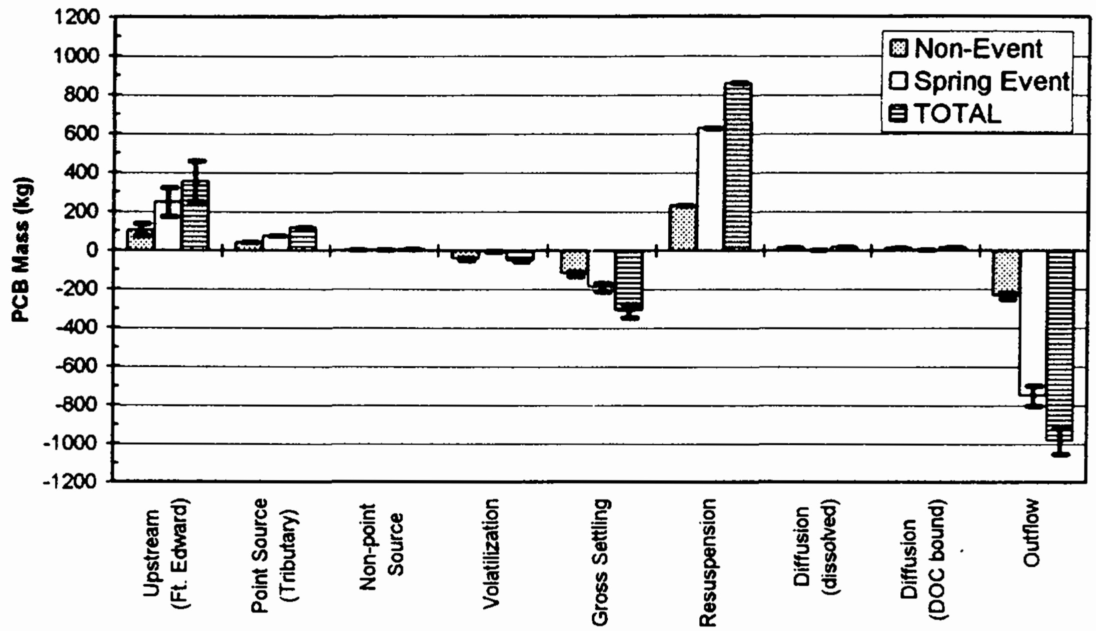
***Spring Runoff Event Period is 3/26/93 - 5/10/93***



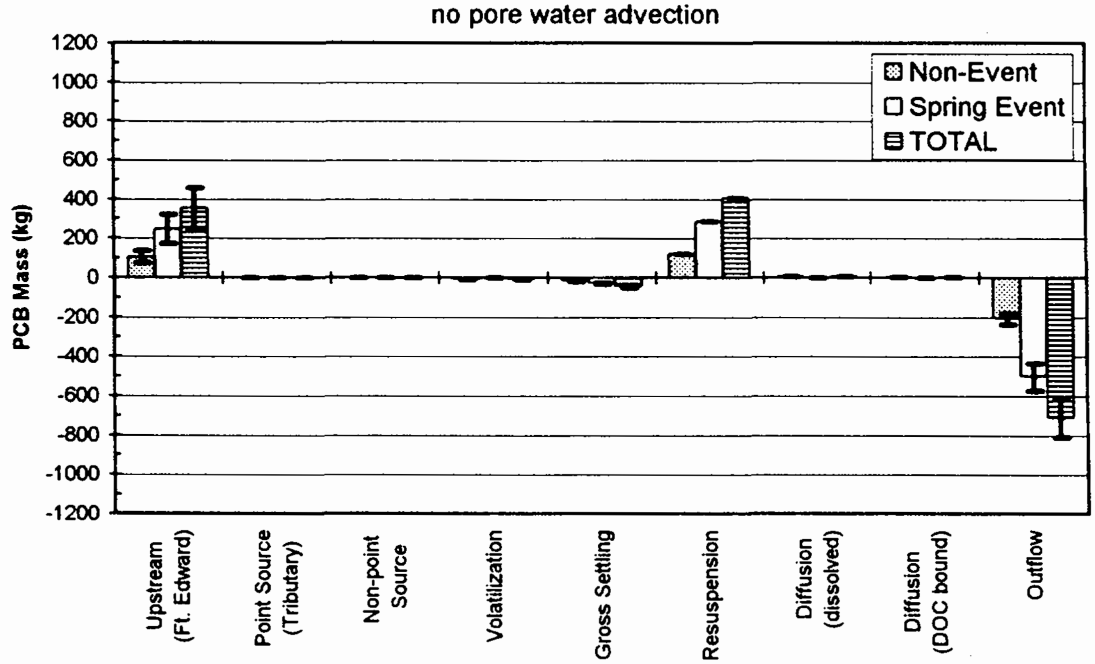



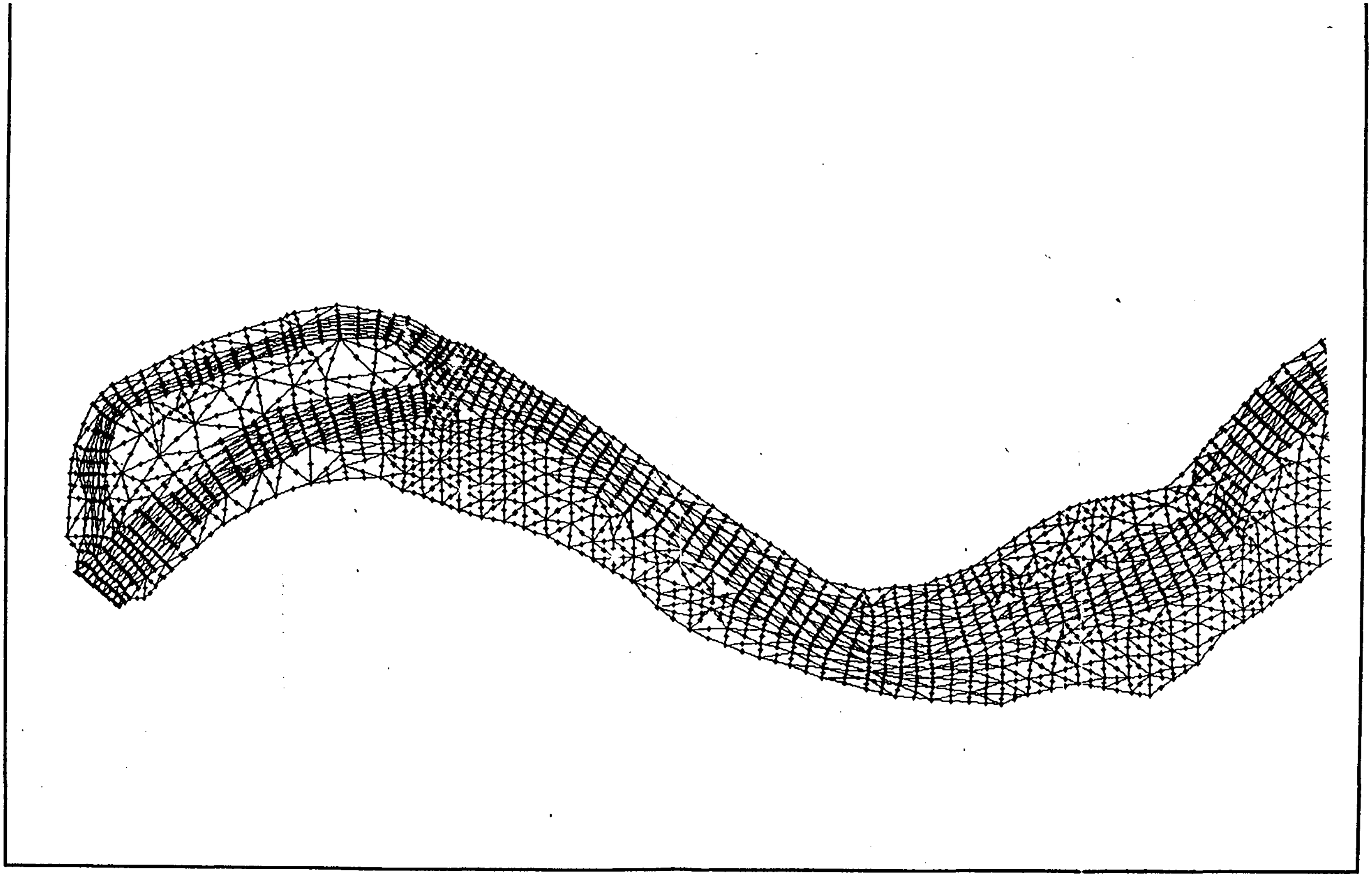
## Figure 4-64
## ΣPCB Mass Balance for HUDTOX Calibration Sensitivity to Upstream Boundary Conditions (+/-30%) for PCBs (1/1/93 - 9/30/93)
***Spring Runoff Event Period is 3/26/93 - 5/10/93***

a) ΣPCB Mass Balance for the Upper Hudson River
no pore water advection

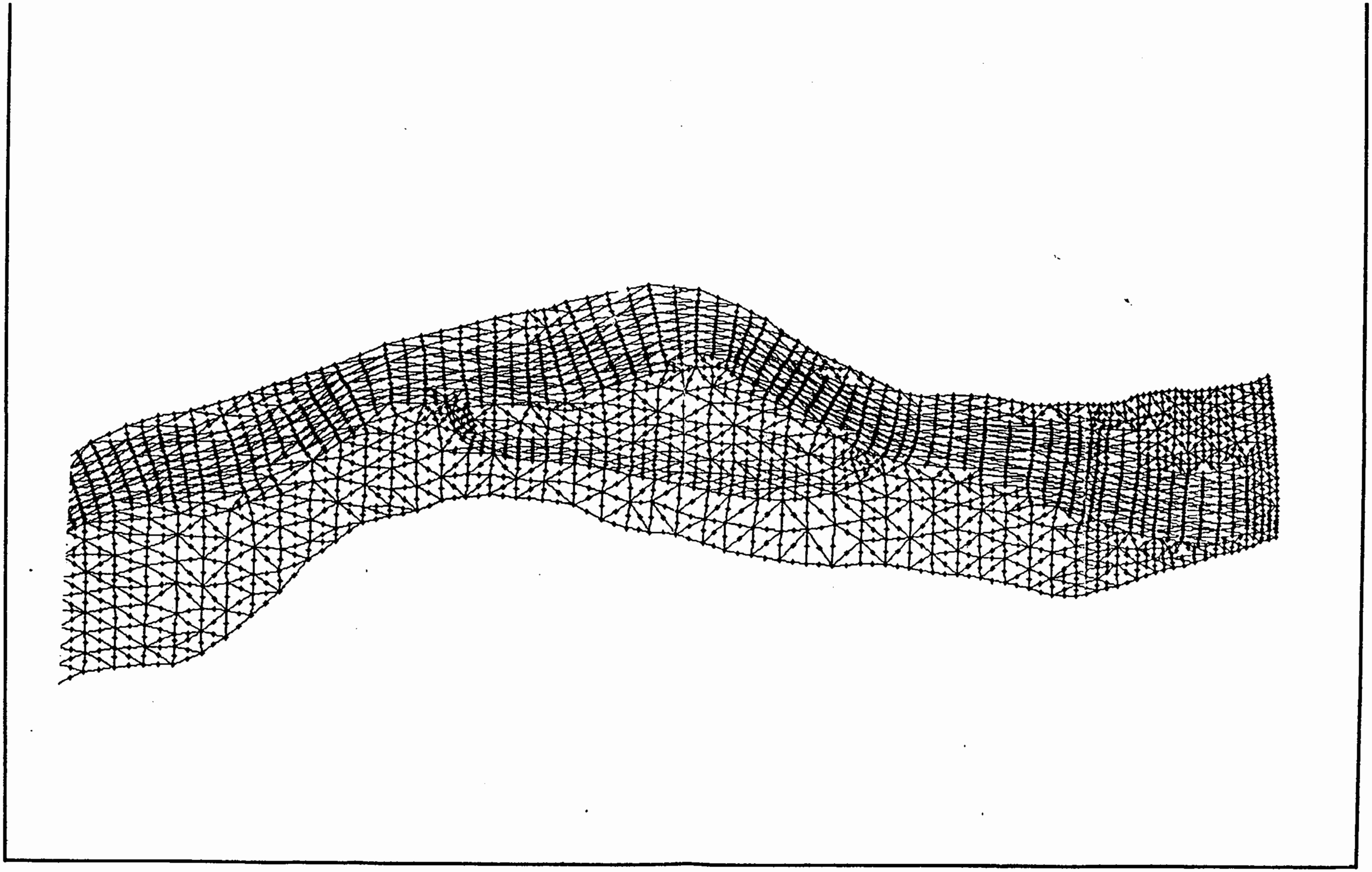



b) ΣPCB Mass Balance for the Thompson Island Pool
no pore water advection

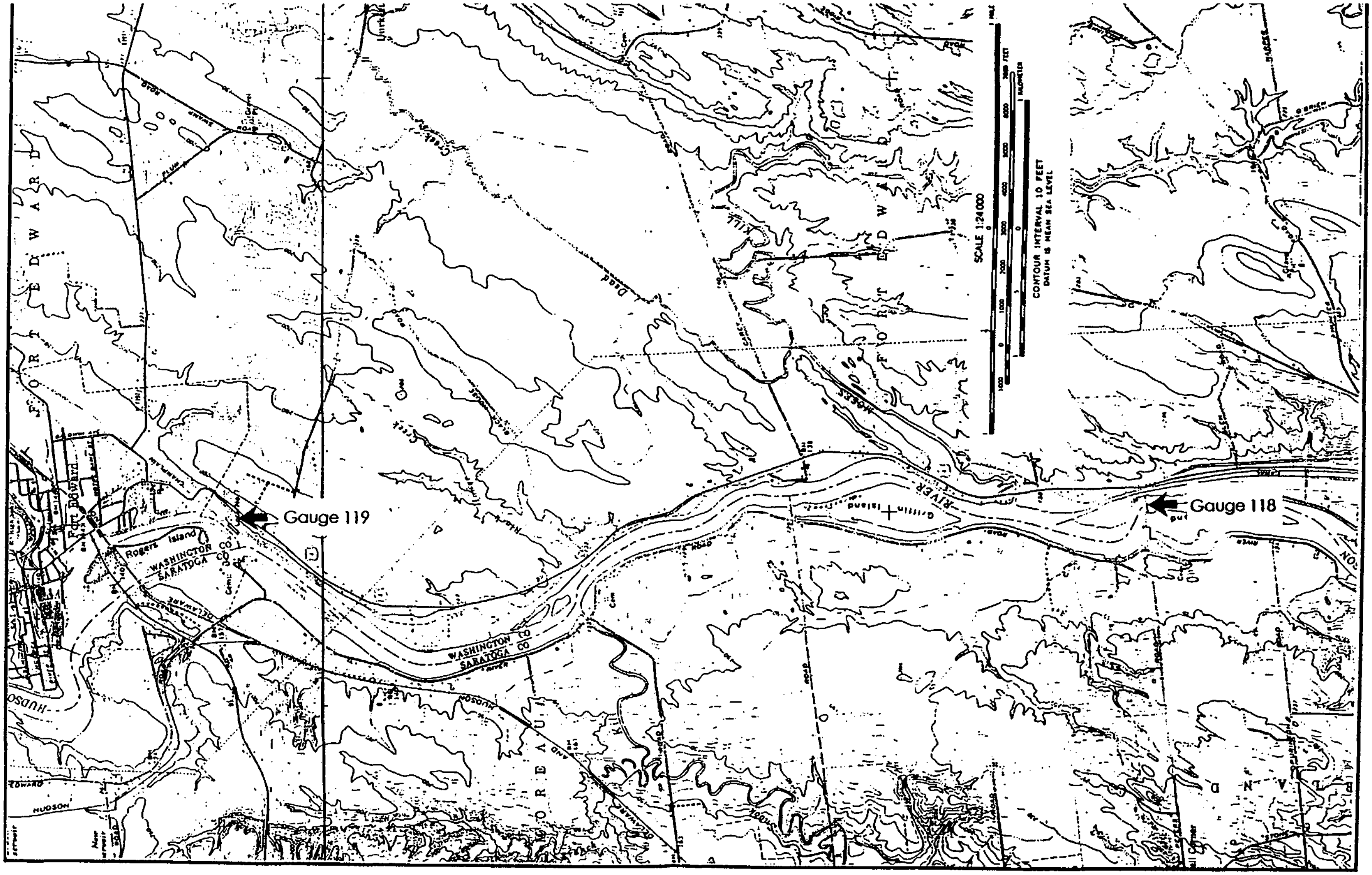




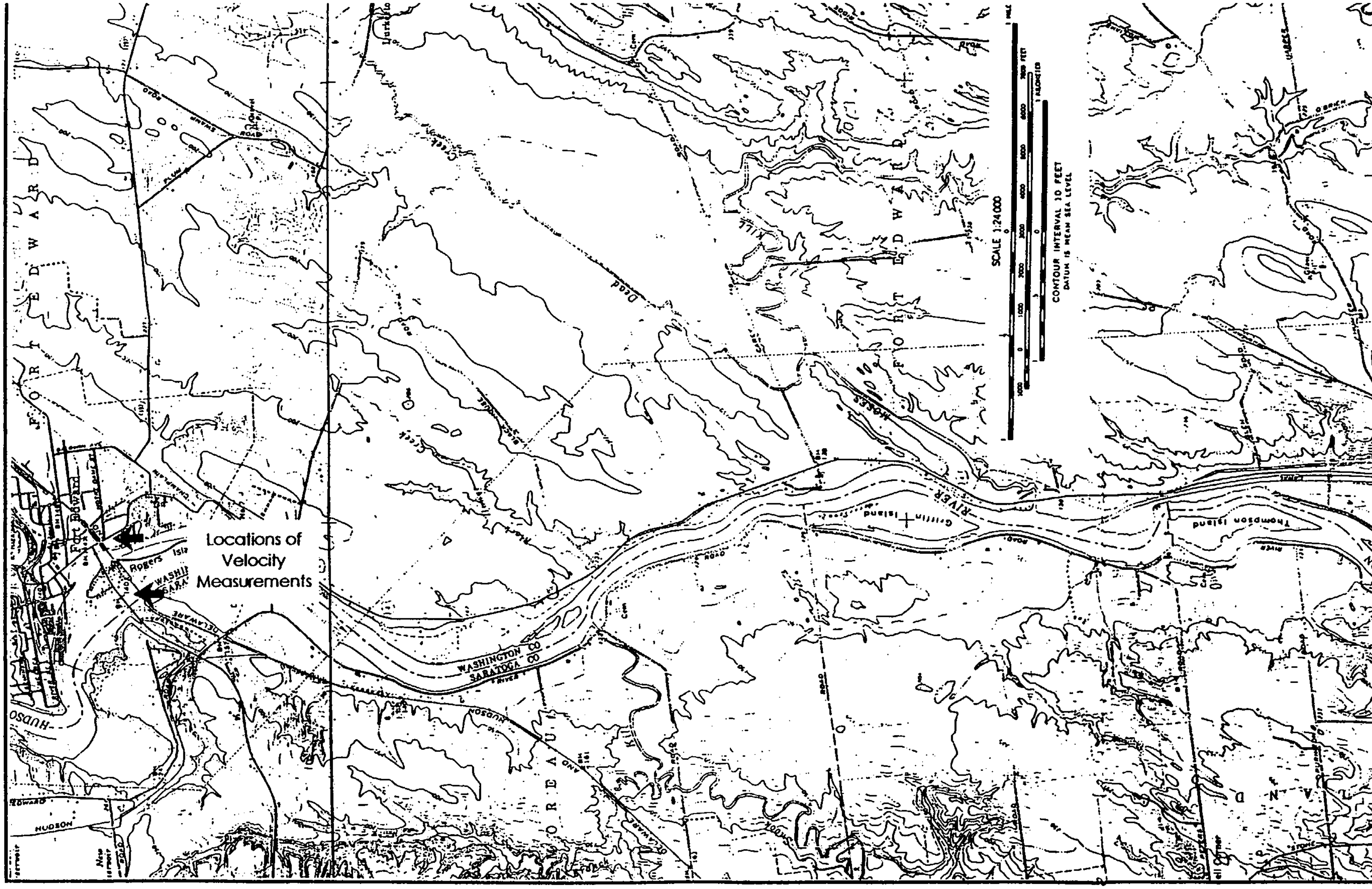
Source: Finite Element Grid Points Based on GE 1991 Hydrographic Survey and USGS Topographic Maps



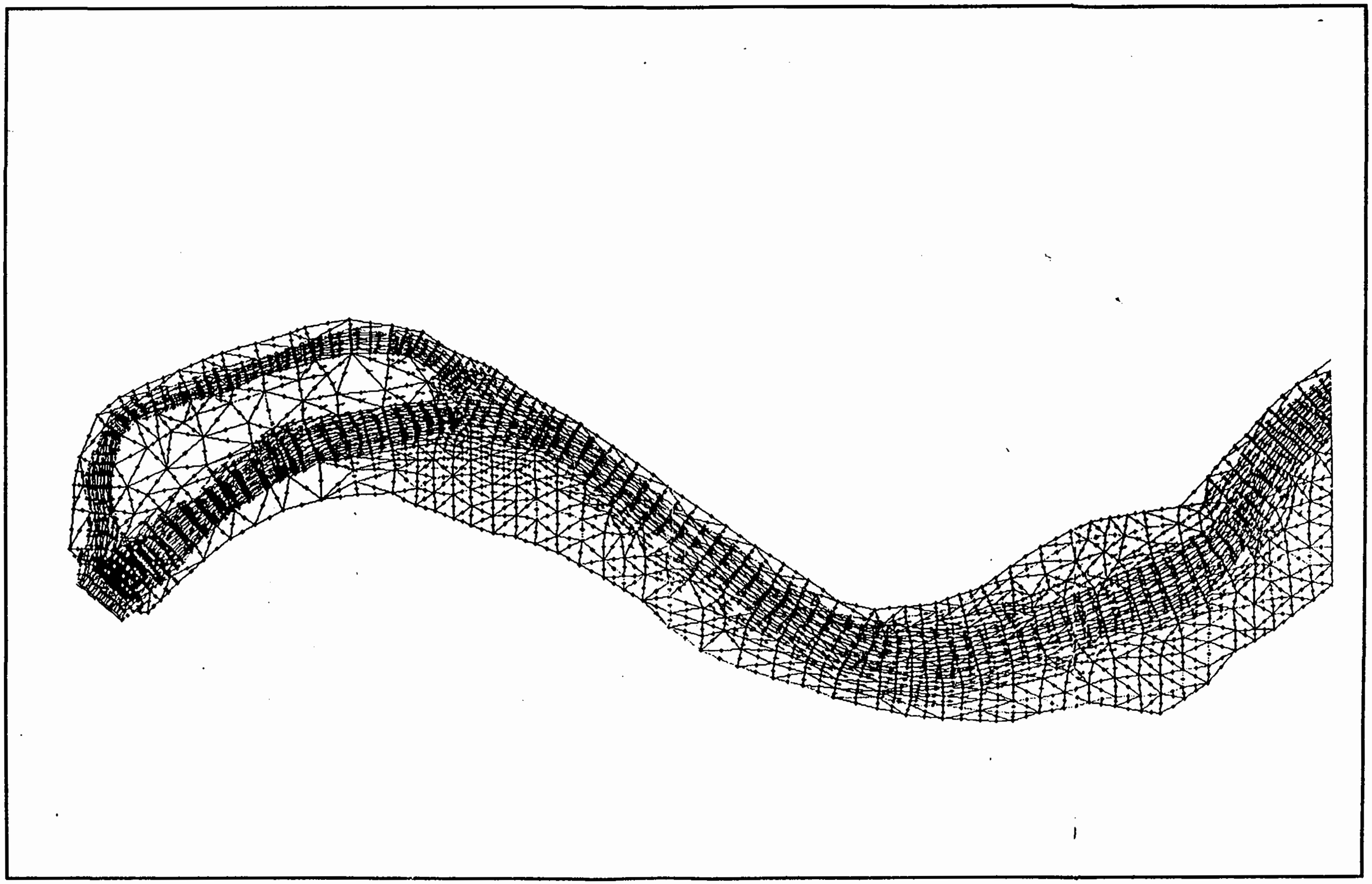
Source: Finite Element Grid Points Based on GE 1991 Hydrographic Survey and USGS Topographic Maps



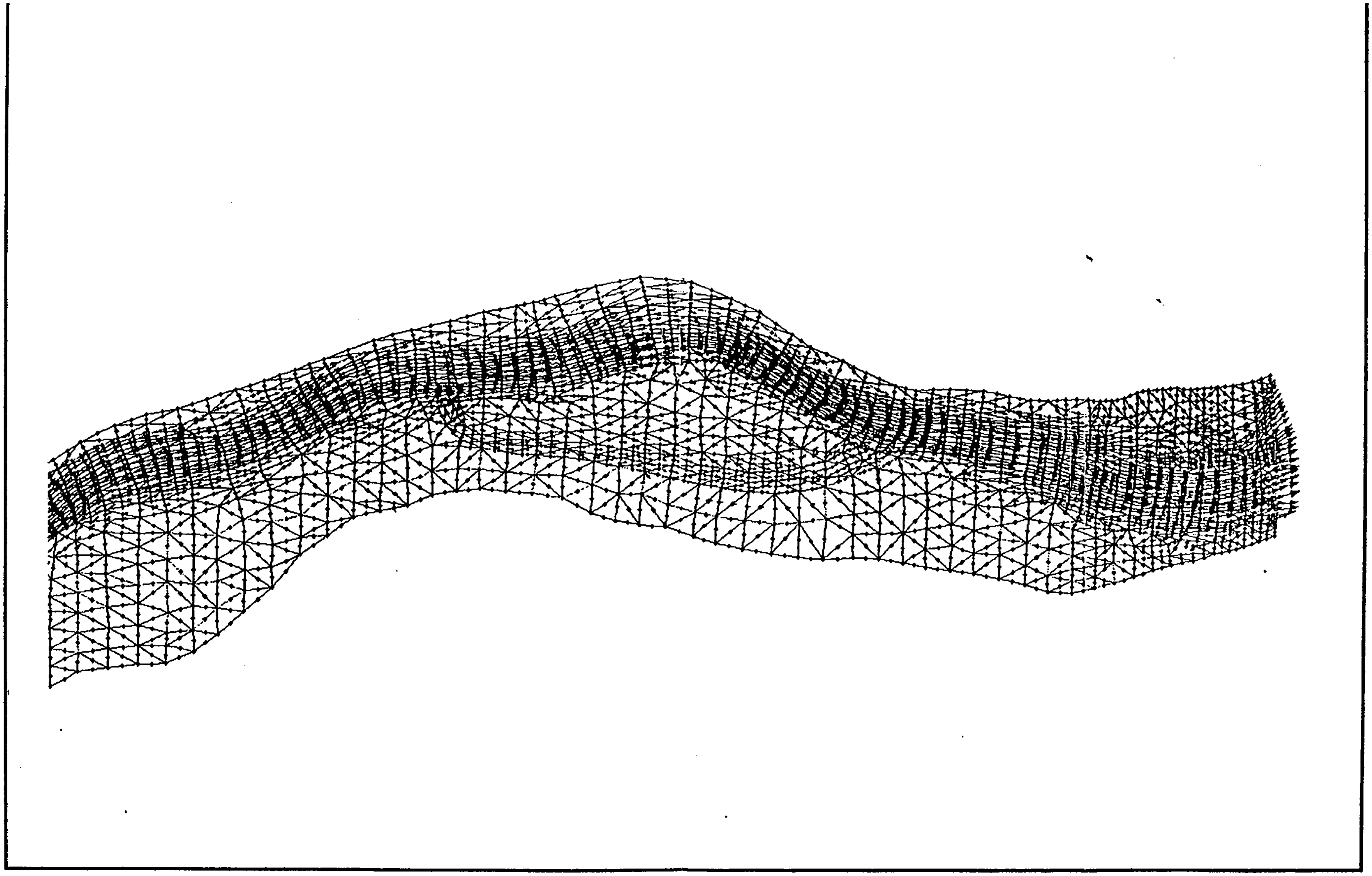

Source: USGS Maps




Source: USGS Maps and Personal Communication with the USGS

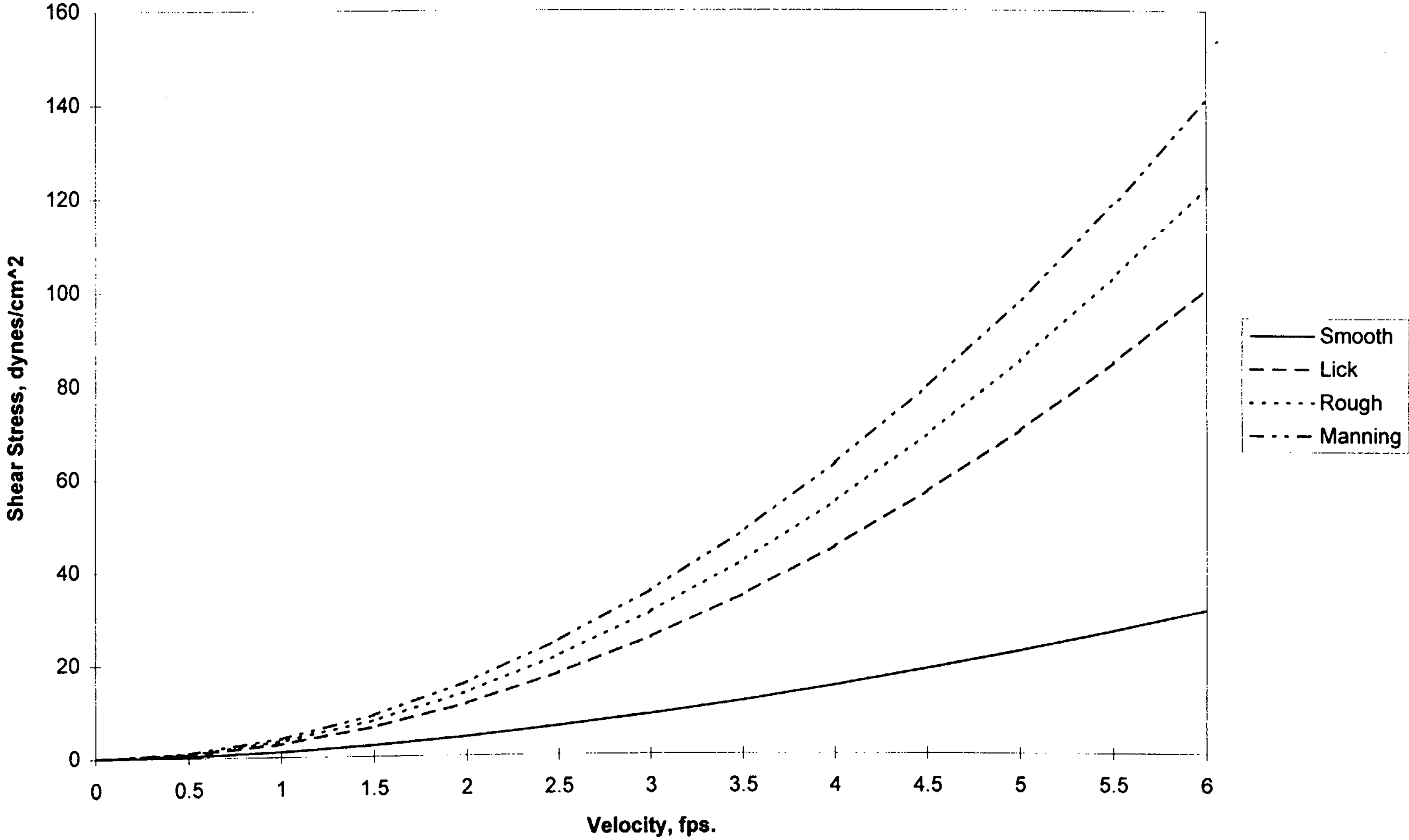


Source: Velocities Based on RMA-2V Model Results



Source: Velocities Based on RMA-2V Model Results

## Figure 5-5
## Comparison of Shear Stress Conversions for the Four Methods




Source: Shear Stresses Based on Four Different Conversion Methods

HRP 002 1411

**Figure 6-1**
**Core HR-26 : Rogers Island East**
**Likelihood of Scour**

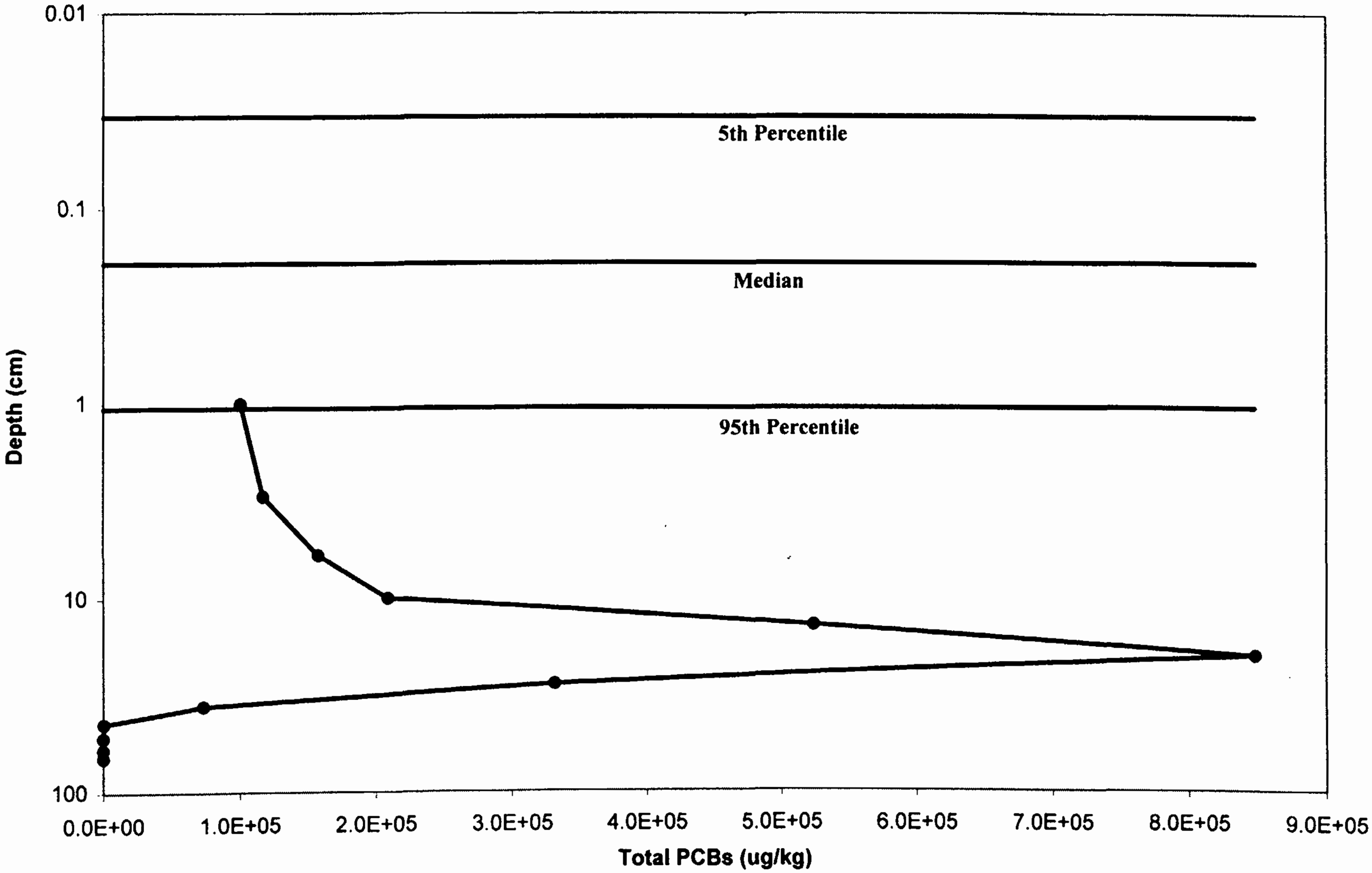


**Figure 6-2**
**Core HR-25 : Rogers Island West**
**Likelihood of Scour**

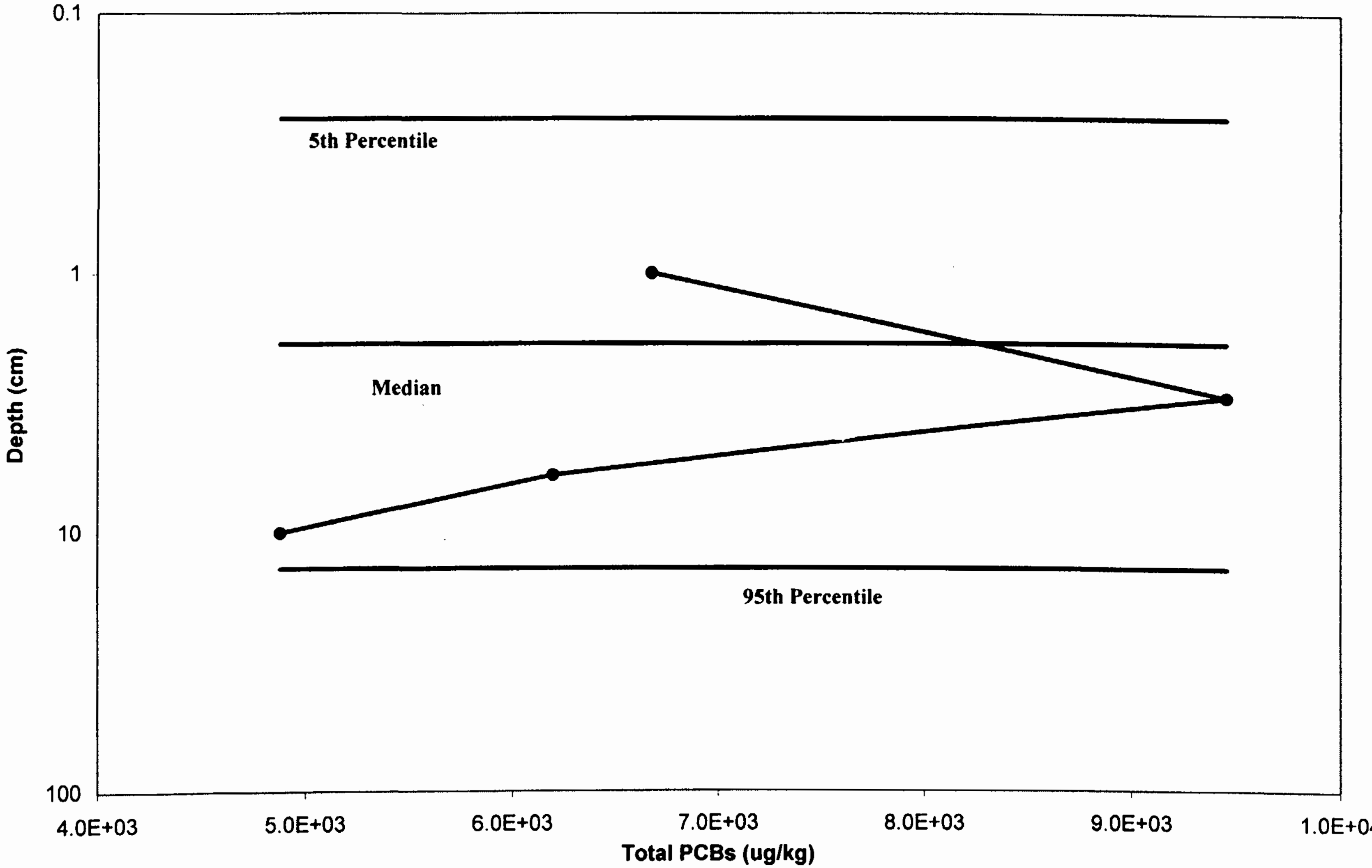


**Figure 6-3**
**Core HR-20 : Thompson Island Pool**
**Likelihood of Scour**

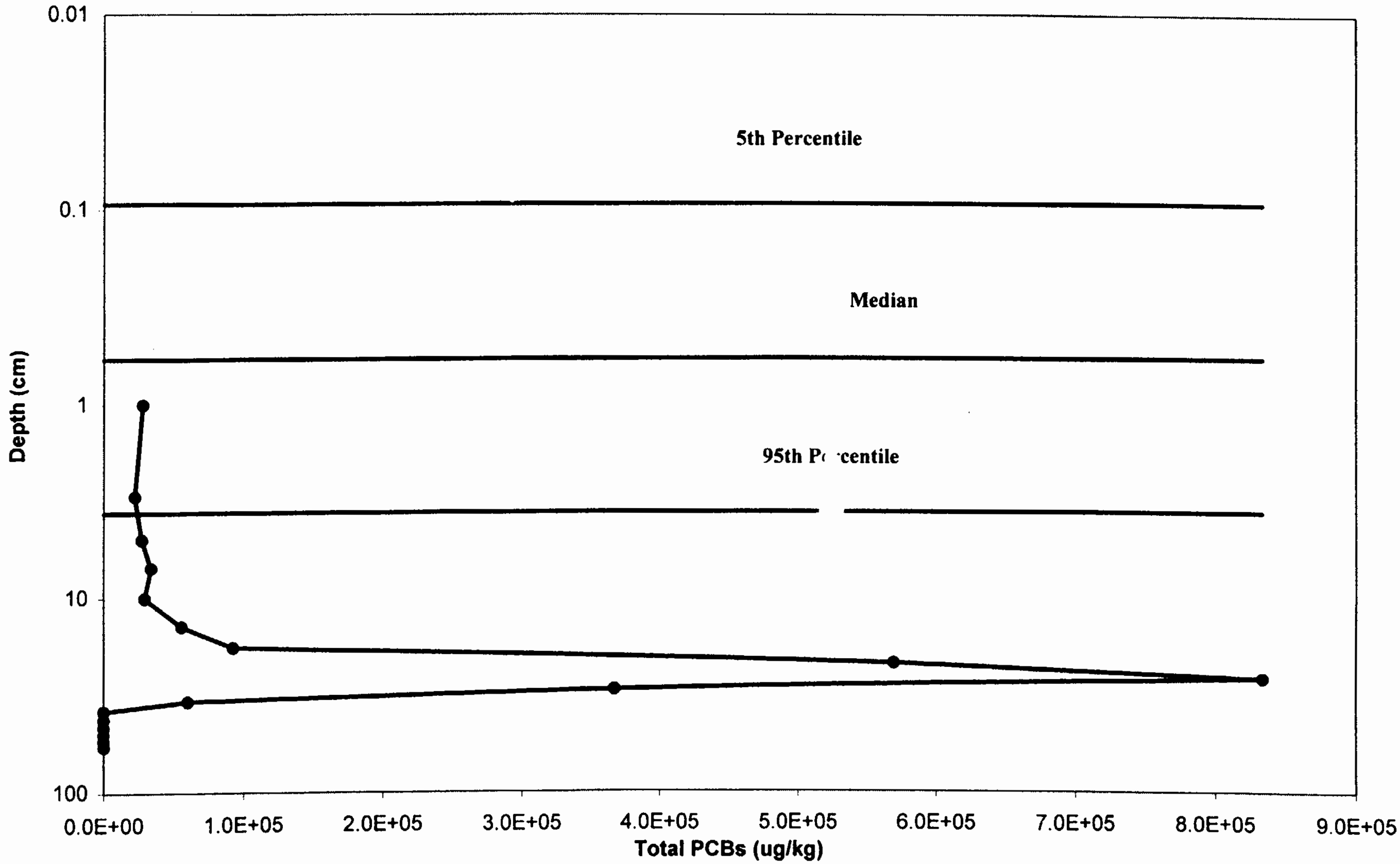
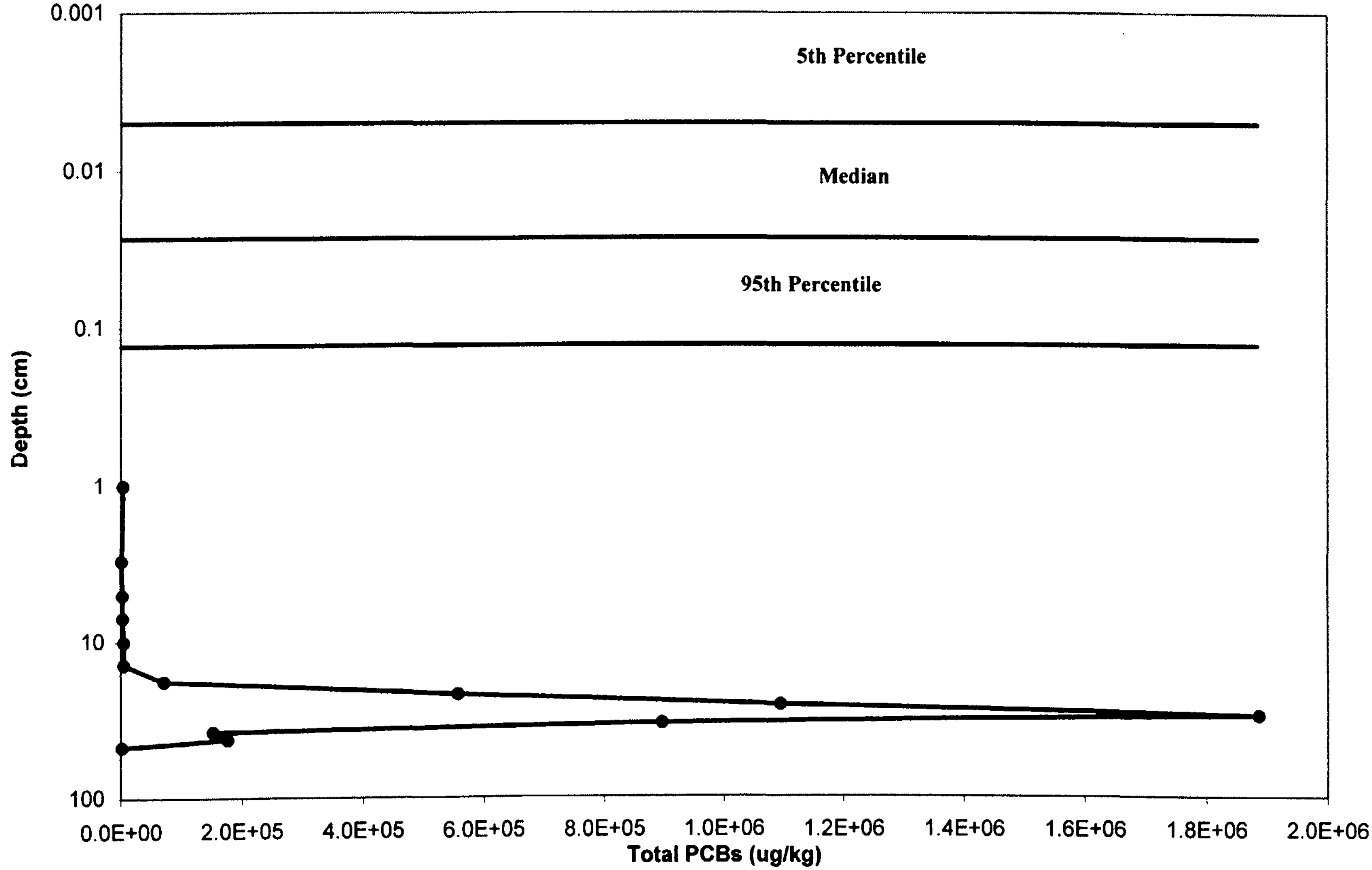


**Figure 6-4**
**Core HR-23 : Thompson Island Pool**
**Likelihood of Scour**




HRP 002 1415

**Figure 6-5**
**Core HR-19 : Thompson Island Pool**
**Likelihood of Scour**

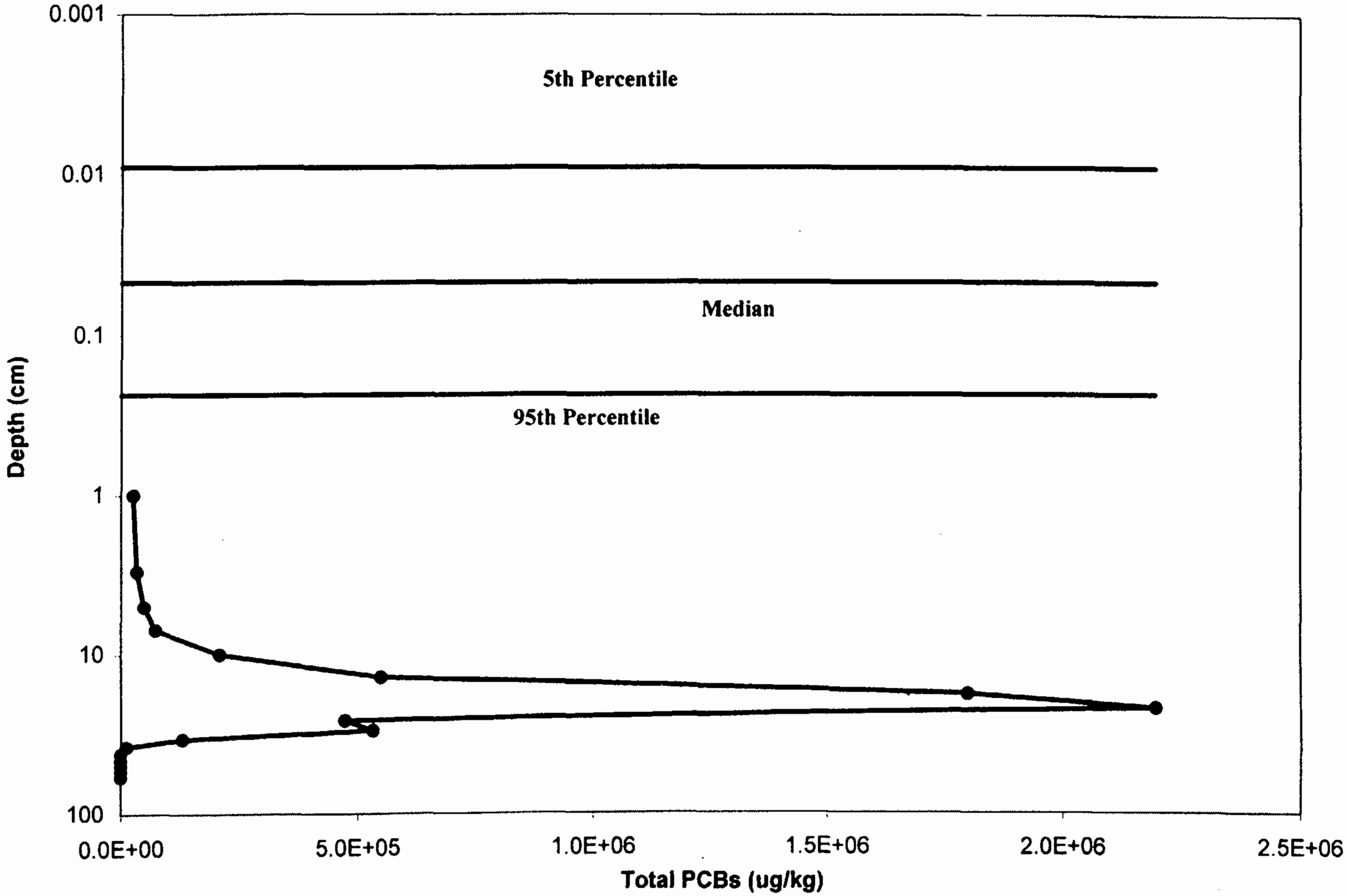


**Figure 6-6**
**Likelihood of Potential Local Scour as a Function of Applied Shear Stress**

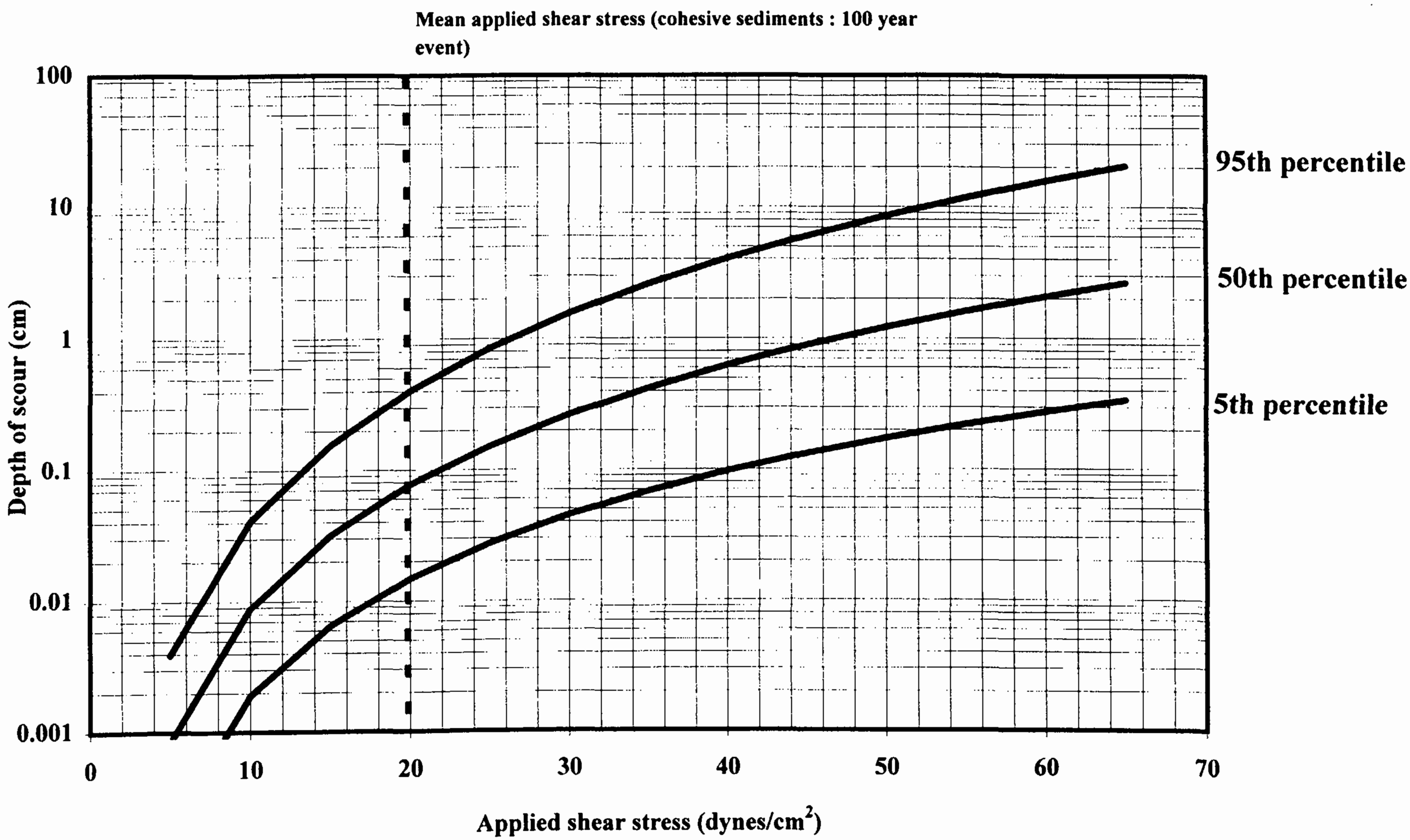


Figure 6-7
Estimating the Chances of Scour for a 100 Year Event at Selected Core Locations

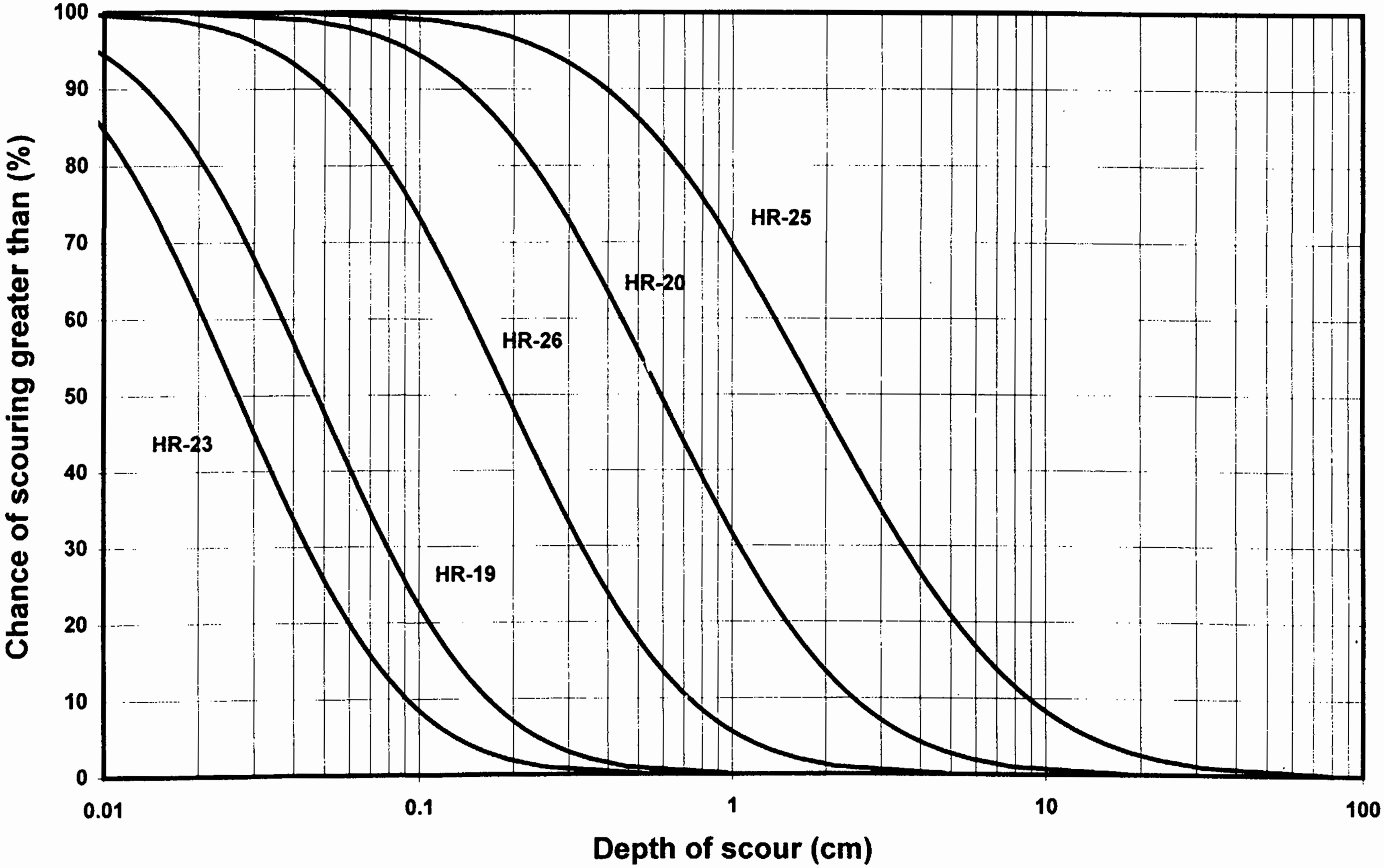
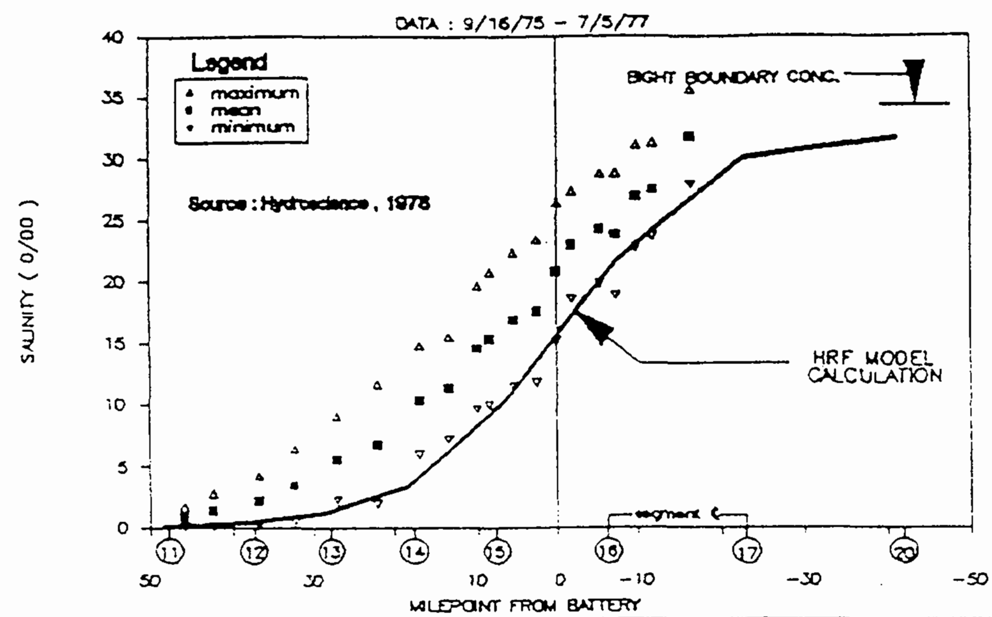
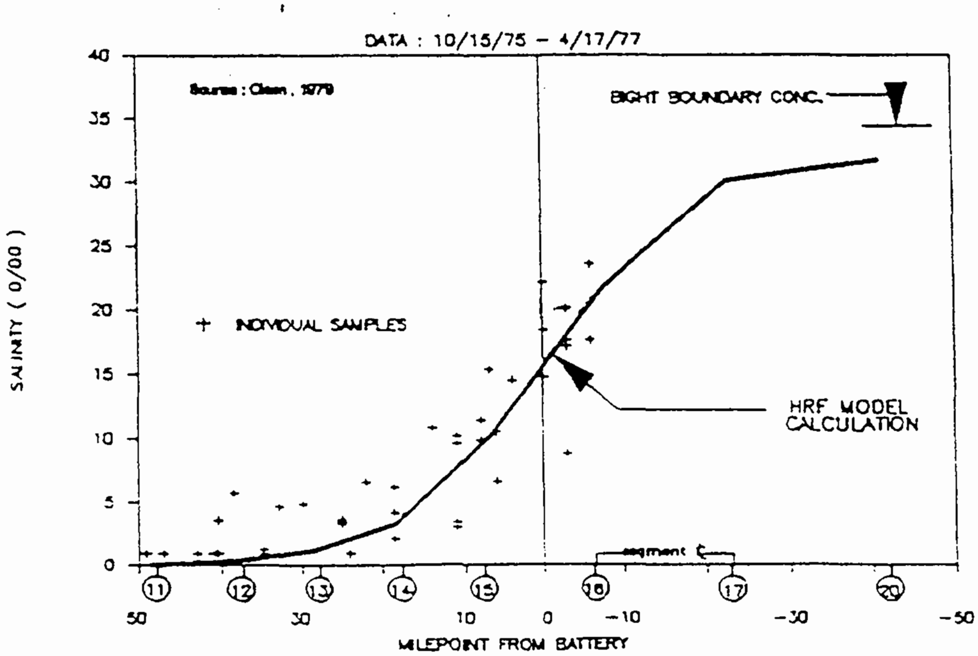


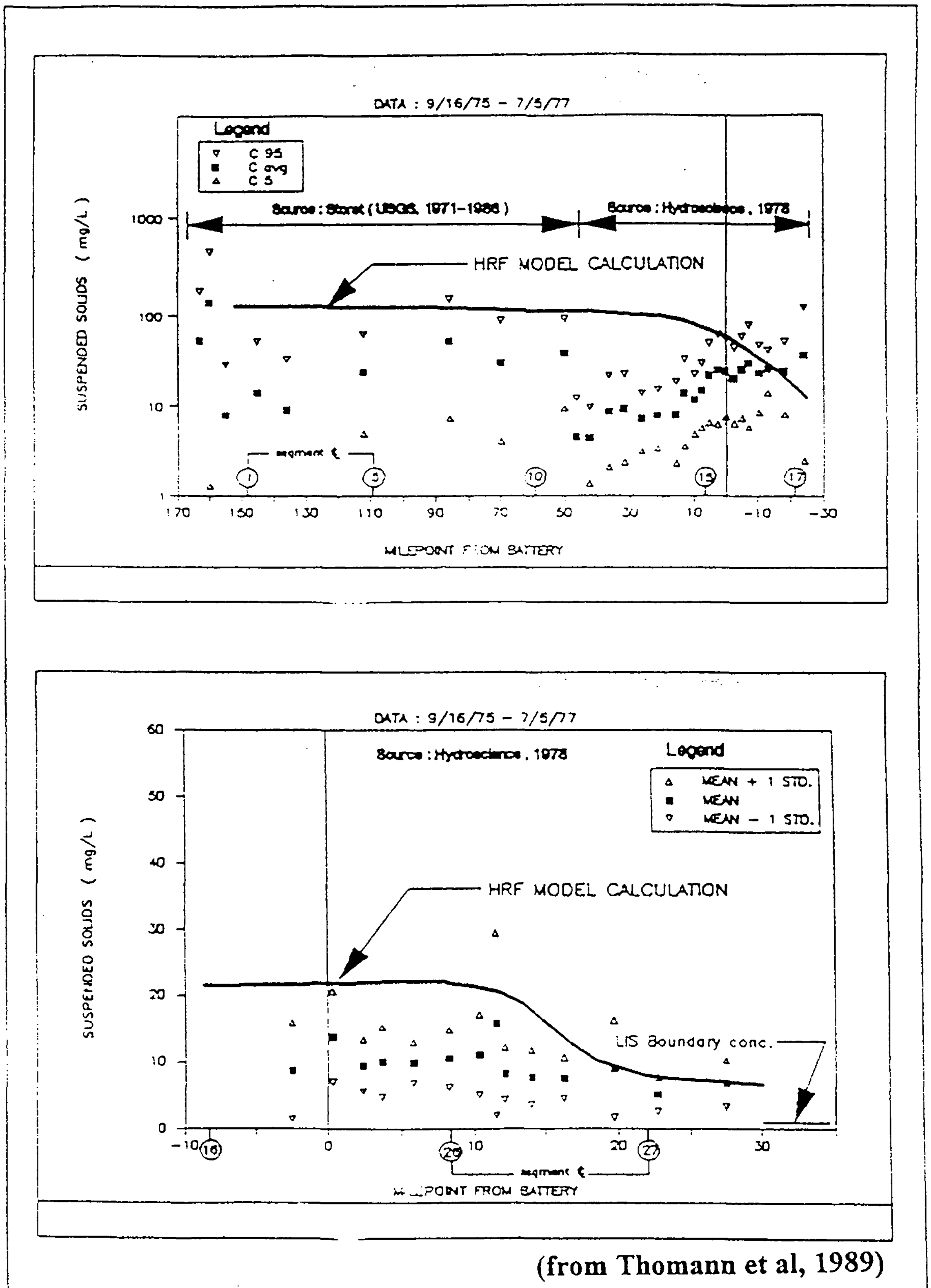
Figure 7-1
Salinity Calibration for Lower Hudson River



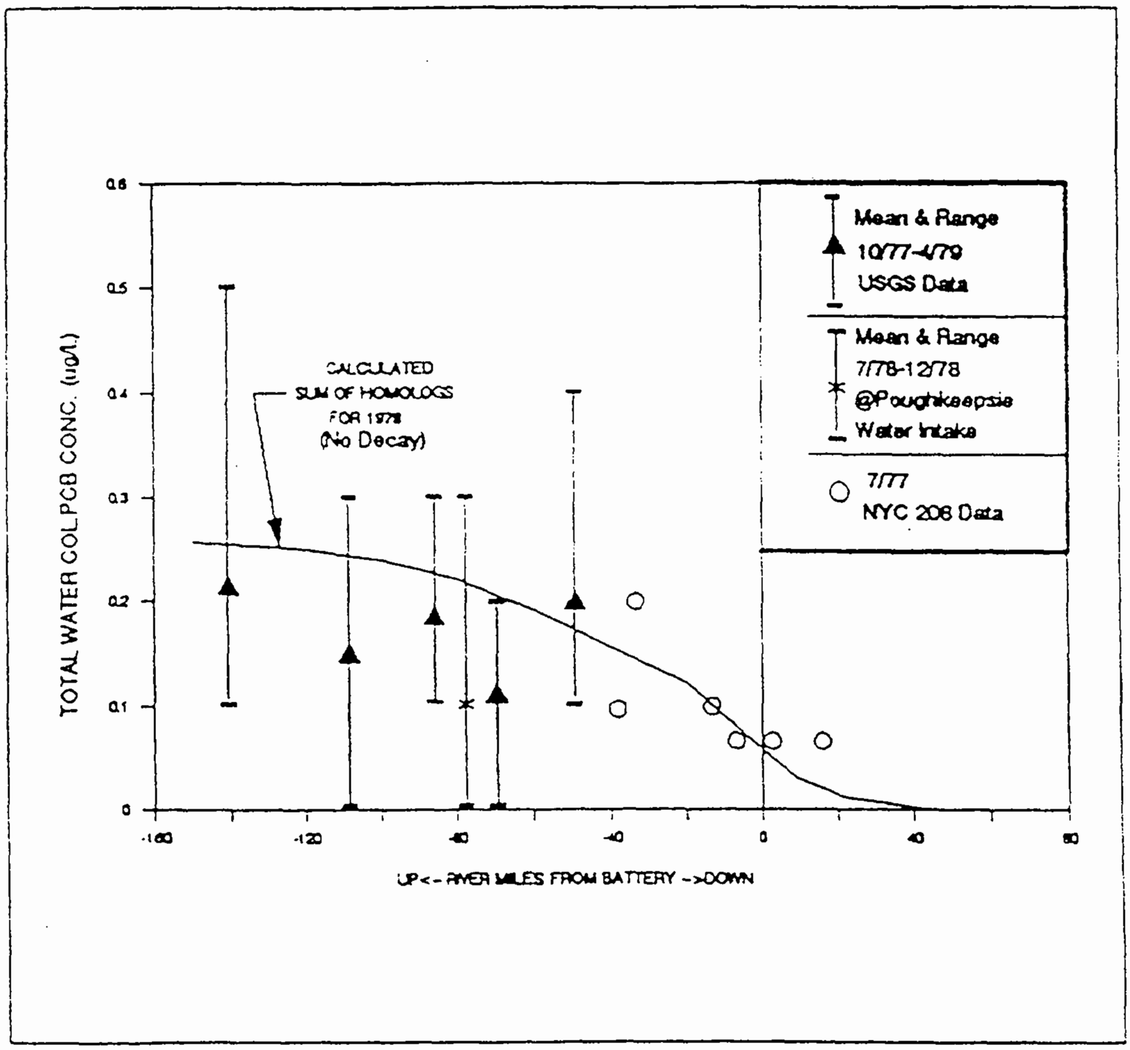

(from Thomann et al, 1989)

Figure 7-2
Suspended Solids Calibration for: (Top) Lower Hudson River, (Bottom) East River and Long Island Sound



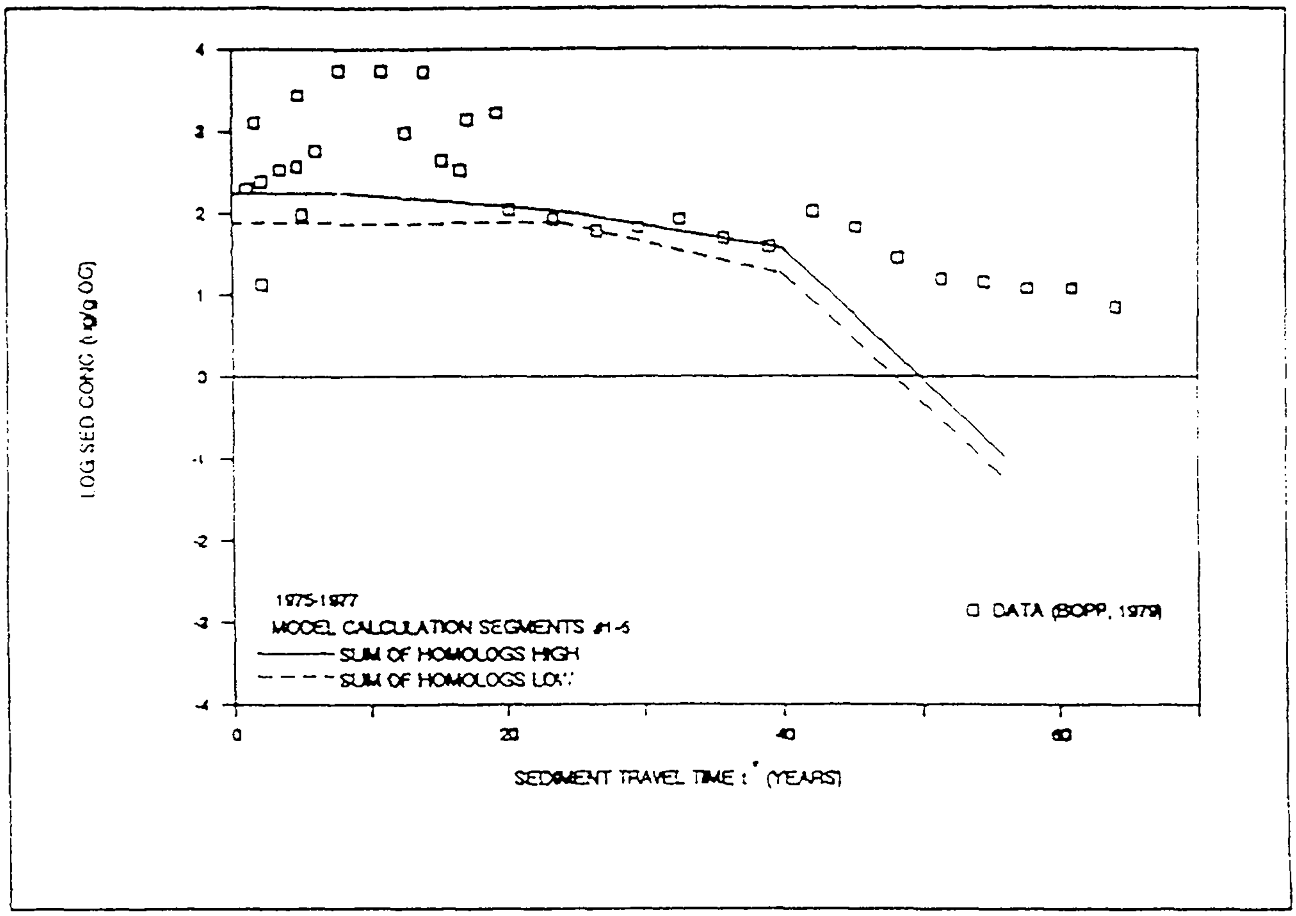

**(from Thomann et al, 1989)**

Figure 7-3
Comparison of Lower Hudson Physicochemical Model Output as Sum of Homologs for 1978 to Sum of Observed Data for Period 1977-1979



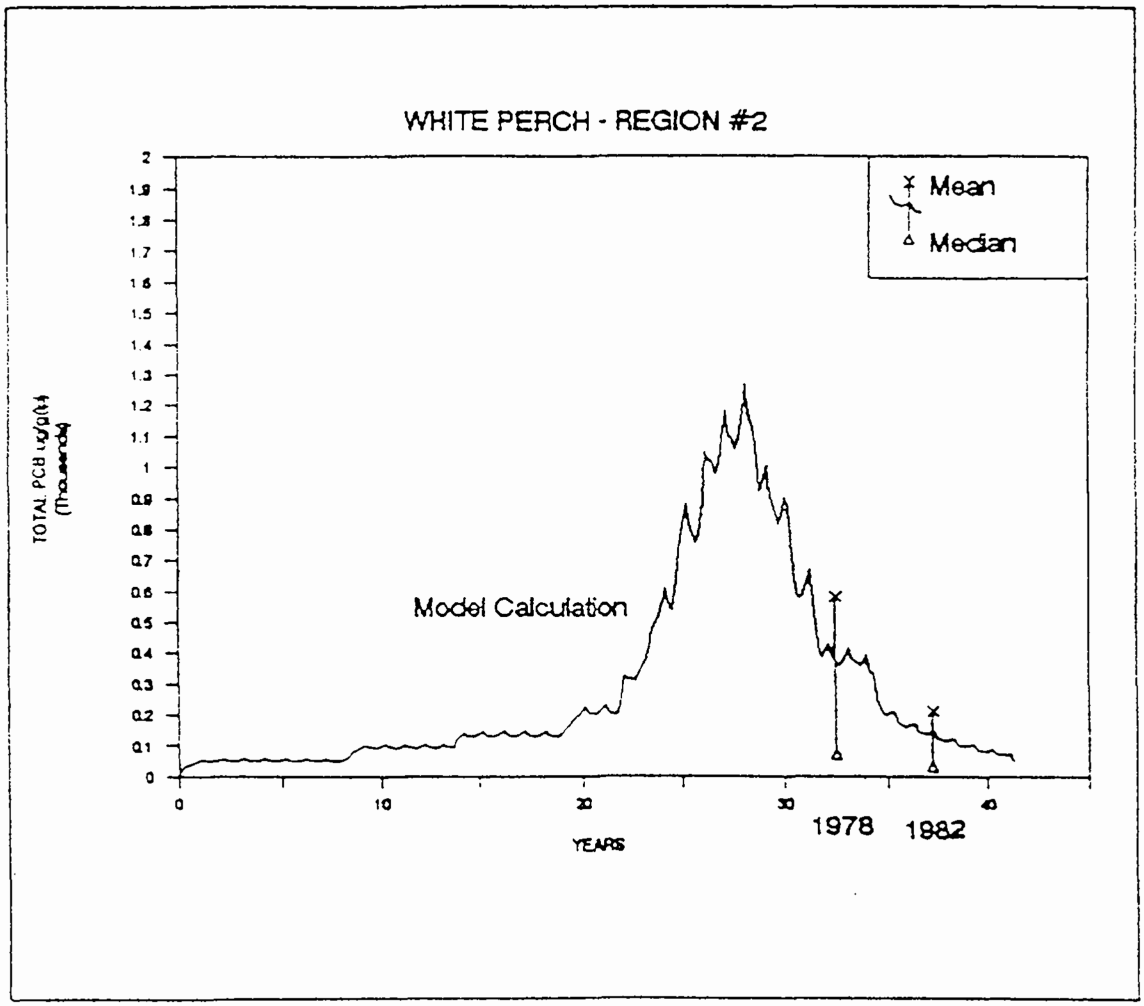

(from Thomann et al, 1989)

Figure 7-4
Lower Hudson Physicochemical Model Sediment Depth PCB Calibration, Segments #1-5



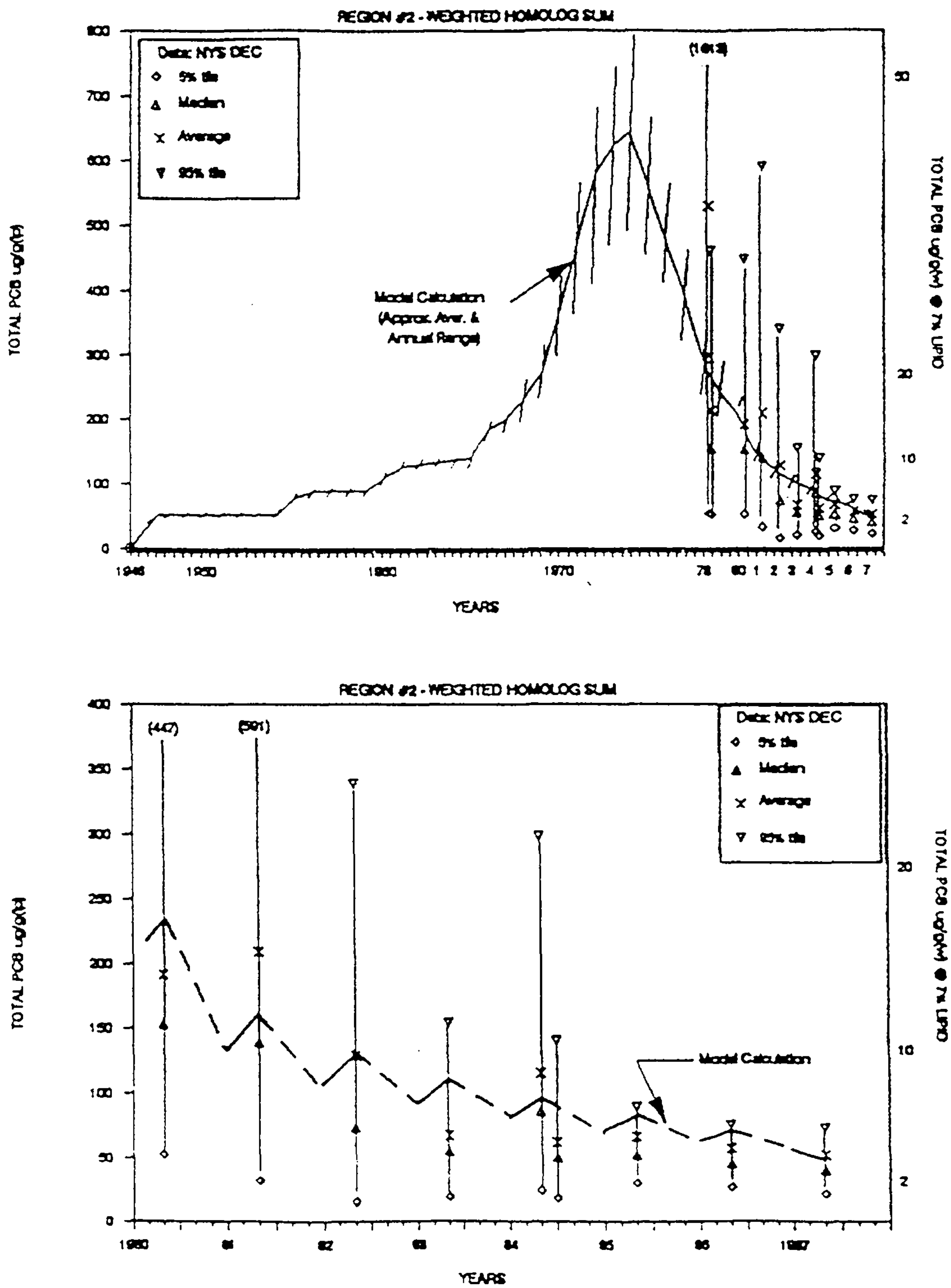

(from Thomann et al, 1989)

Figure 7-5
Calibration of Lower Hudson Food Chain Model to White Perch Data for Total PCB, Region #2



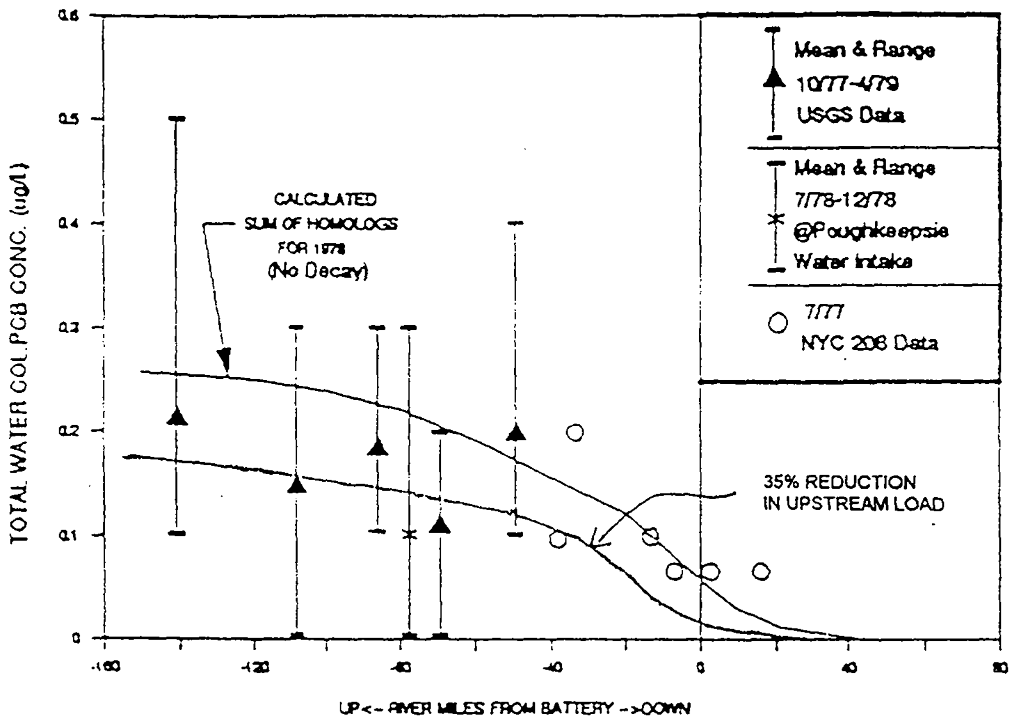

(from Thomann et al, 1989)

Figure 7-6
Lower Hudson Food Chain Model Striped Bass Total PCB Calibration, Region #2: (Top) 1946 - 1987, (Bottom) 1980 - 1987




(from Thomann et al, 1989)

Figure 7-7
Sensitivity of Lower Hudson Physicochemical Model Calibration to Alternate Assumption of Upstream Load




Adapted from Thomann et al, 1989

# Figure 8-1

## Conceptual Framework for Hudson River Probabilistic Bioaccumulation Model

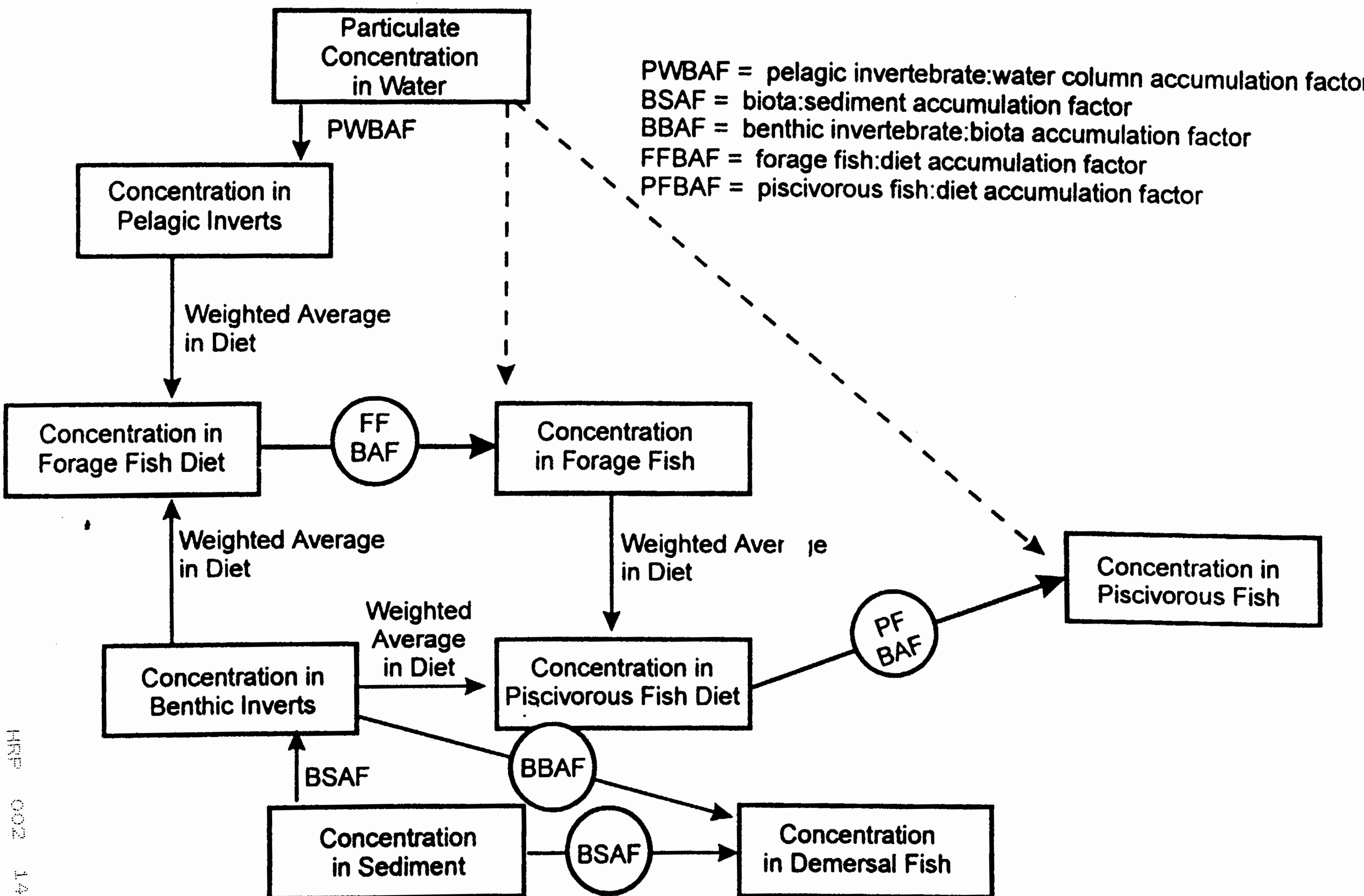
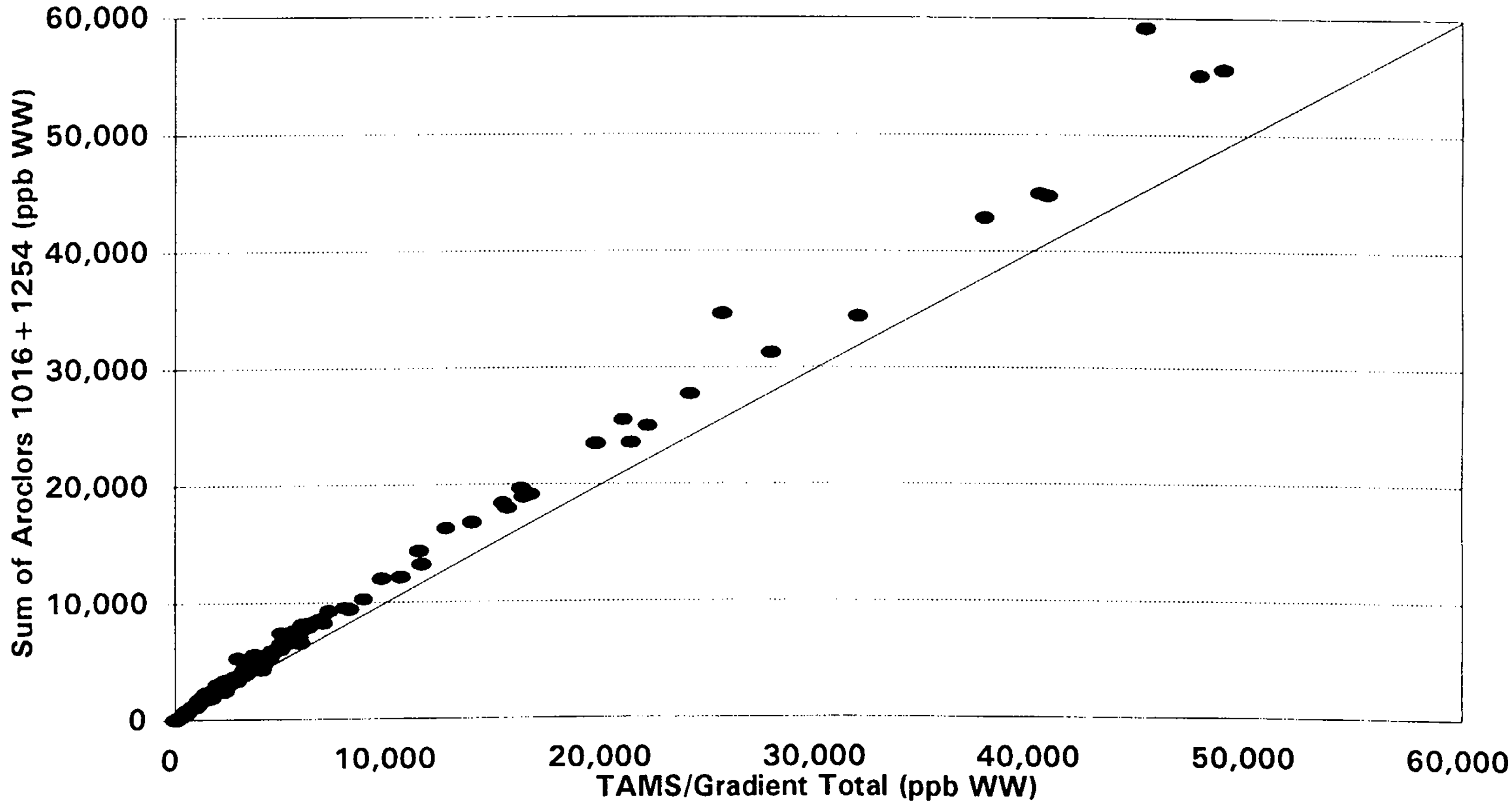


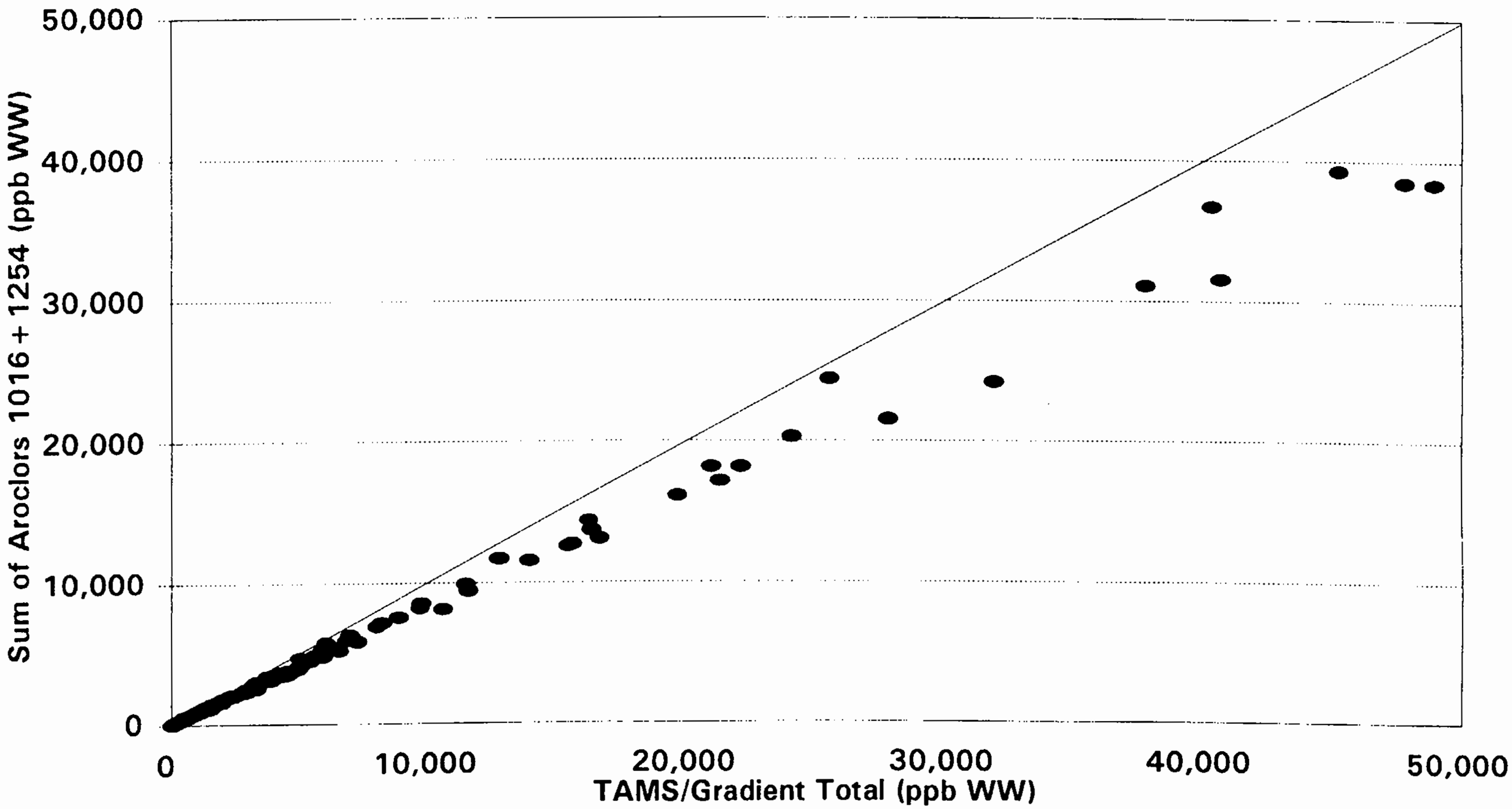
**Figure 9-1**
**Comparison of Sum of PCBs Calculated by NYSDEC 1977 Methodology and Sum of Congeners for TAMS/Gradient Phase 2 Hudson River Fish Samples**




Source: TAMS/Gradient Database, Release 3.1

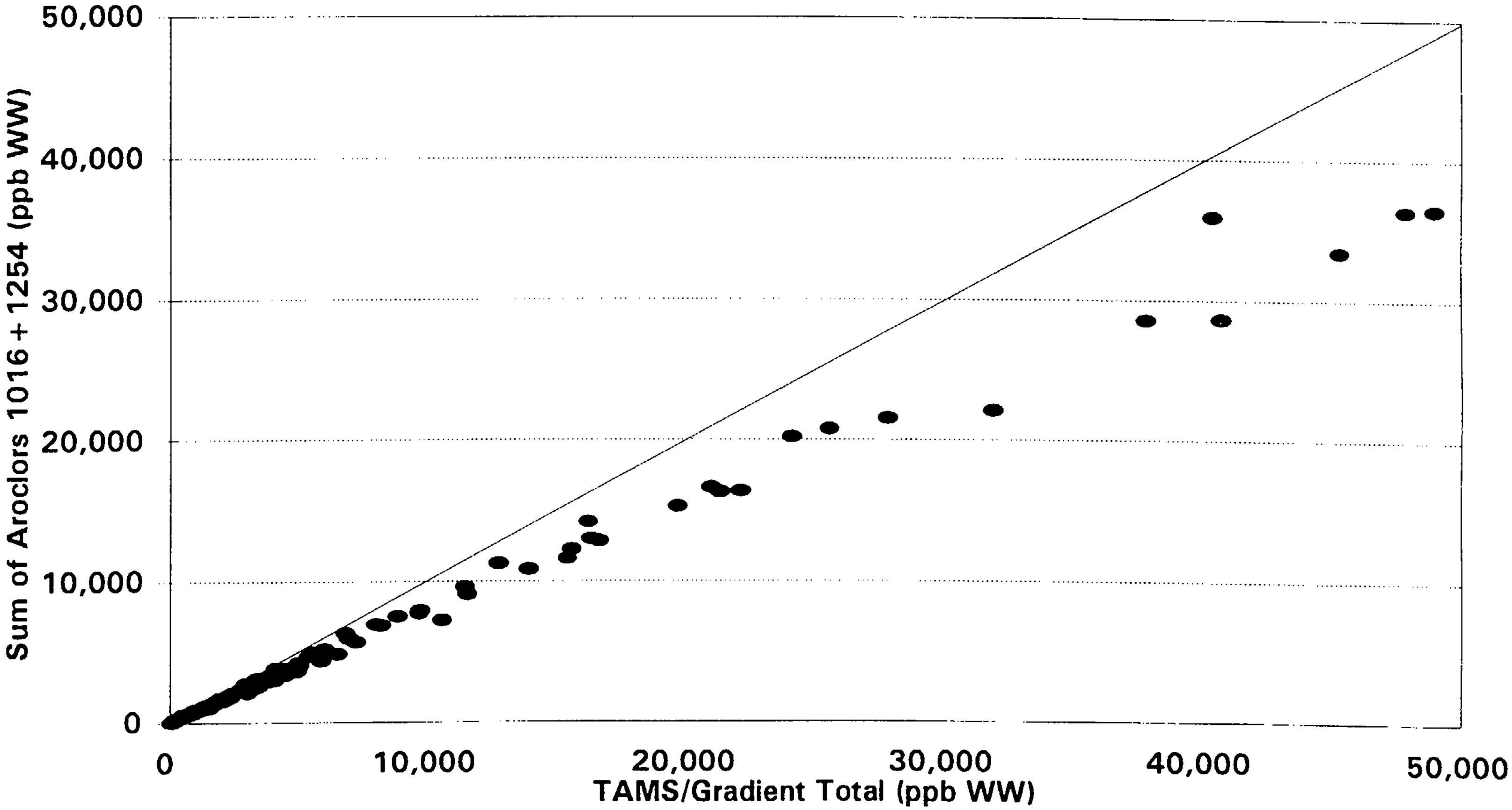
HRP 002 1427

## Figure 9-2
## Comparison of Sum of PCBs Calculated by NYSDEC 1979 Methodology and Sum of Congeners for TAMS/Gradient Phase 2 Hudson River Fish Samples




Source: TAMS/Gradient Database, Release 3.1

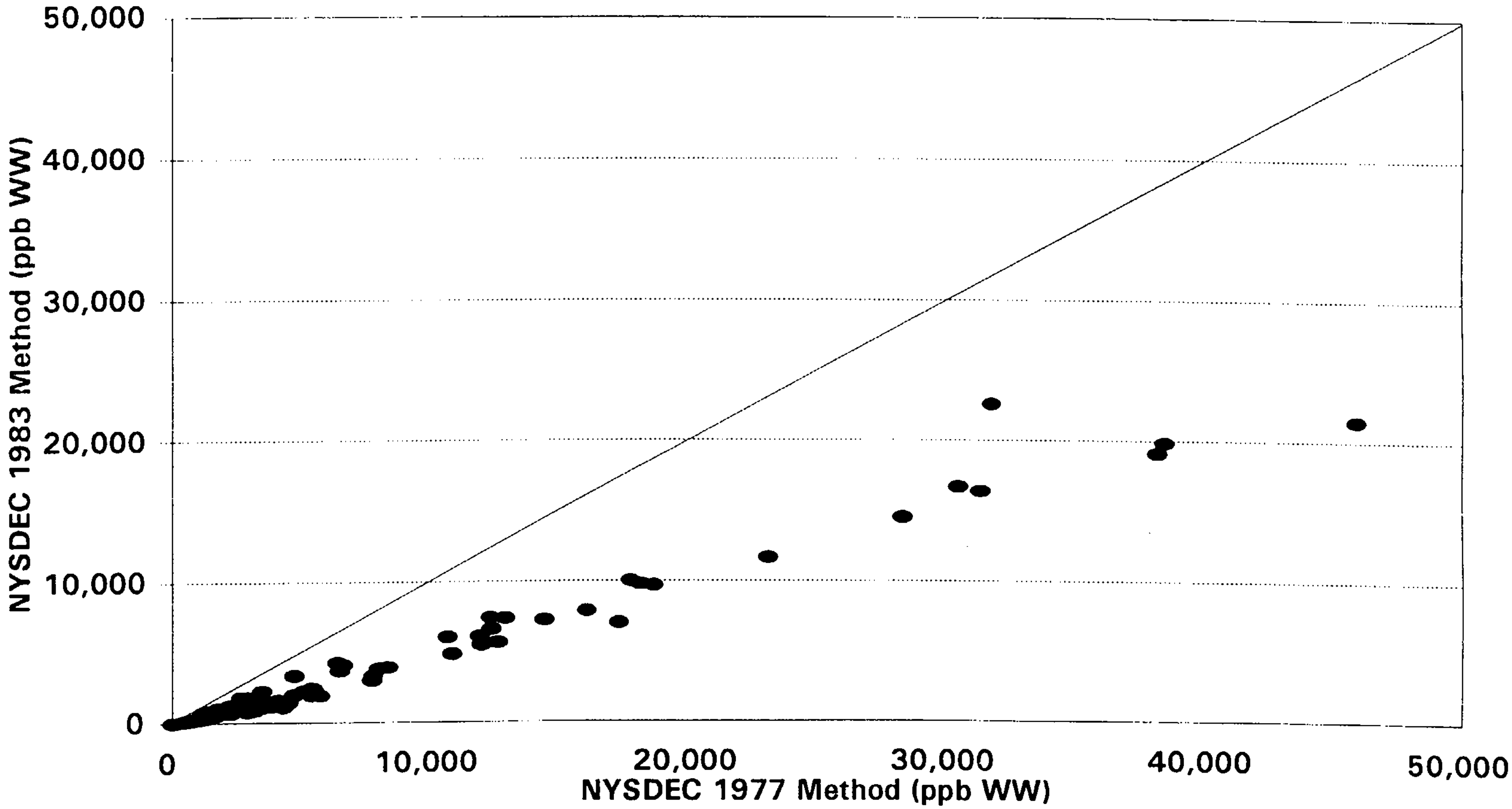
## Figure 9-3
## Comparison of Sum of PCBs Calculated by NYSDEC 1983 Methodology and Sum of Congeners for TAMS/Gradient Phase 2 Hudson River Fish Samples




Source: TAMS/Gradient Database, Release 3.1

HRP 002 1429

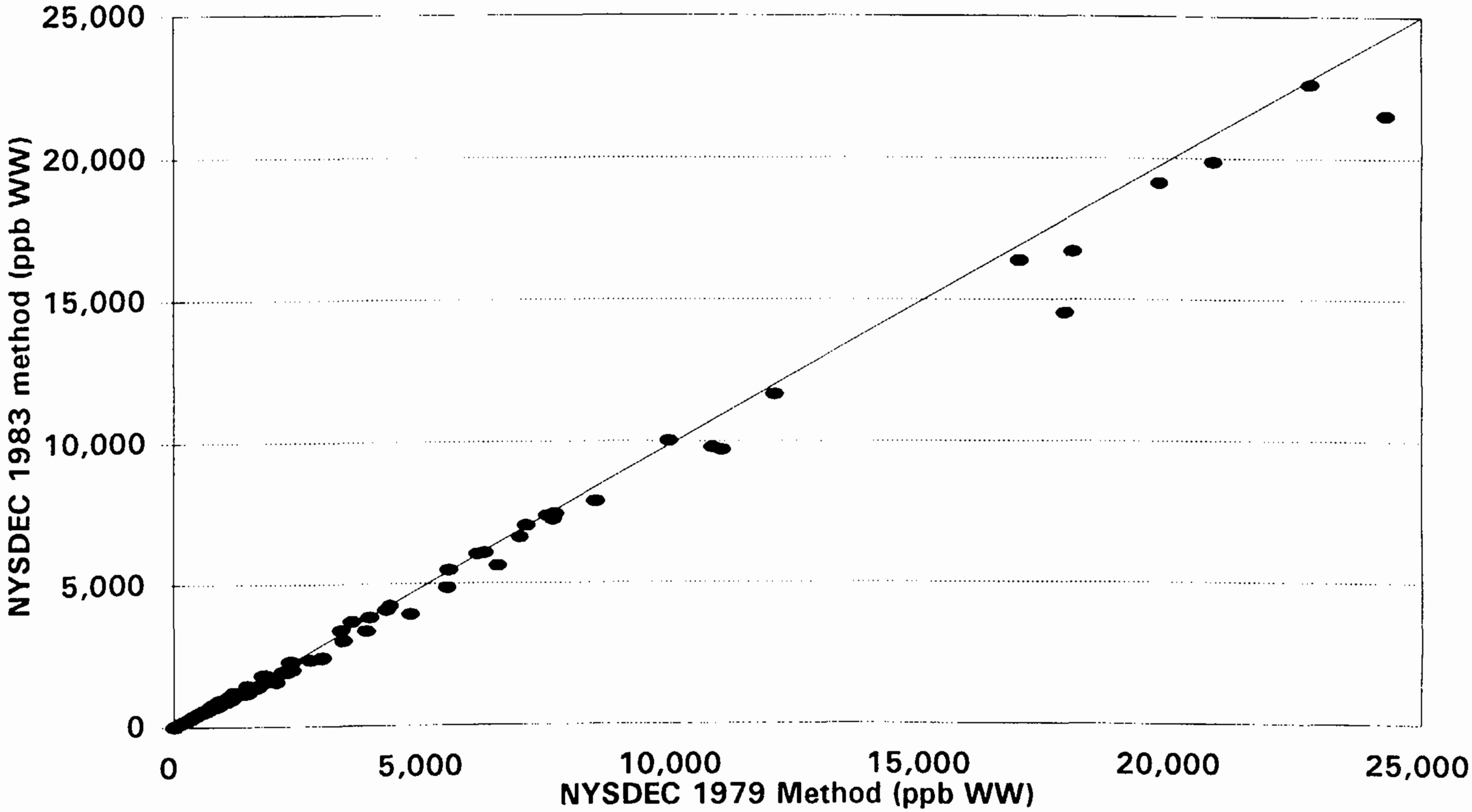
**Figure 9-4**
**Comparison of Aroclor 1016 Concentrations Calculated by NYSDEC 1983 Method and NYSDEC 1977 Method for TAMS/Gradient Phase 2 Hudson River Fish Samples**




Source: TAMS/Gradient Database, Release 3.1

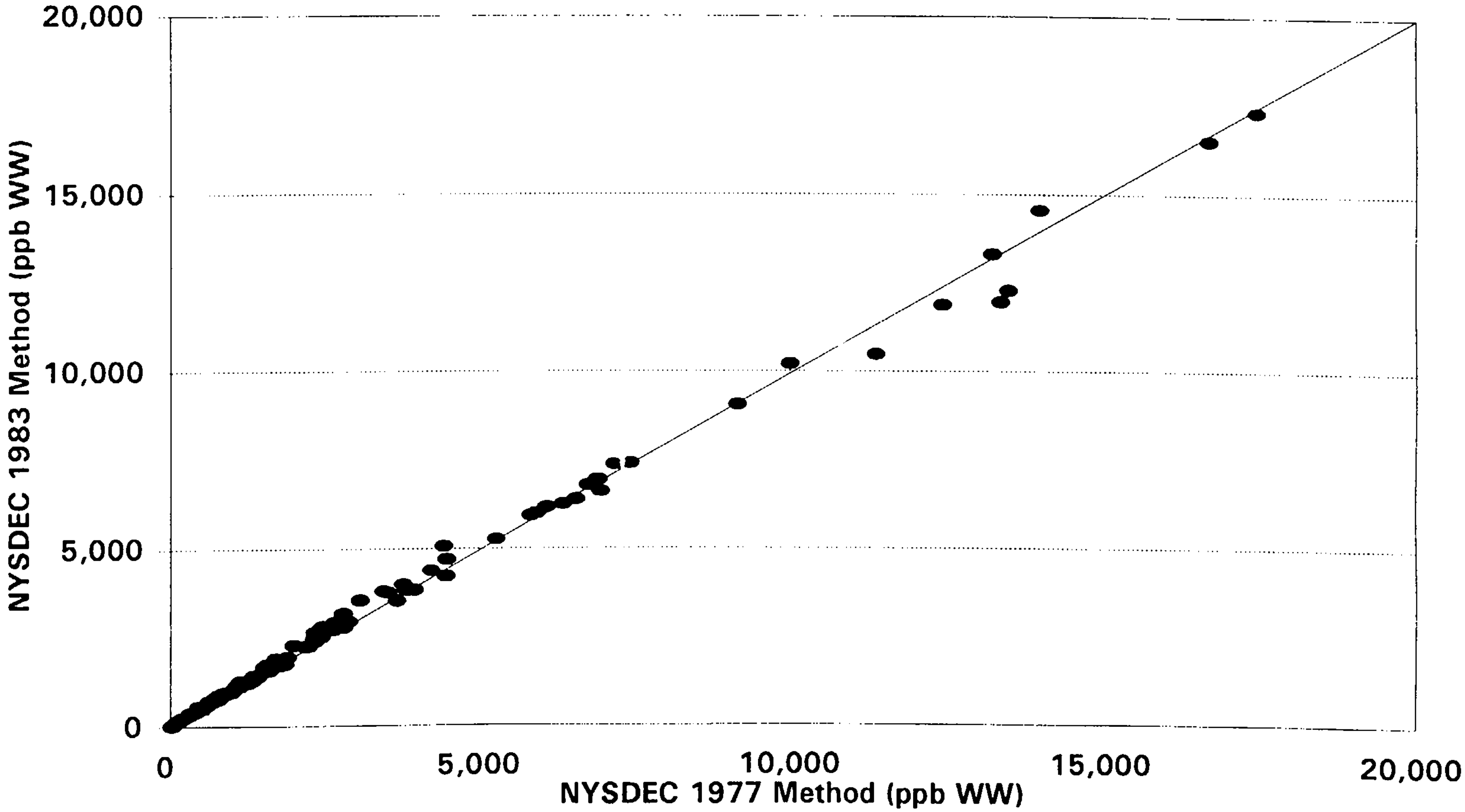
HRP 002 1430

**Figure 9-5**
**Comparison of Aroclor 1016 Concentrations Calculated by NYSDEC 1983 Method and NYSDEC 1979 Method for TAMS/Gradient Phase 2 Hudson River Fish Samples**




Source: TAMS/Gradient Database, Release 3.1

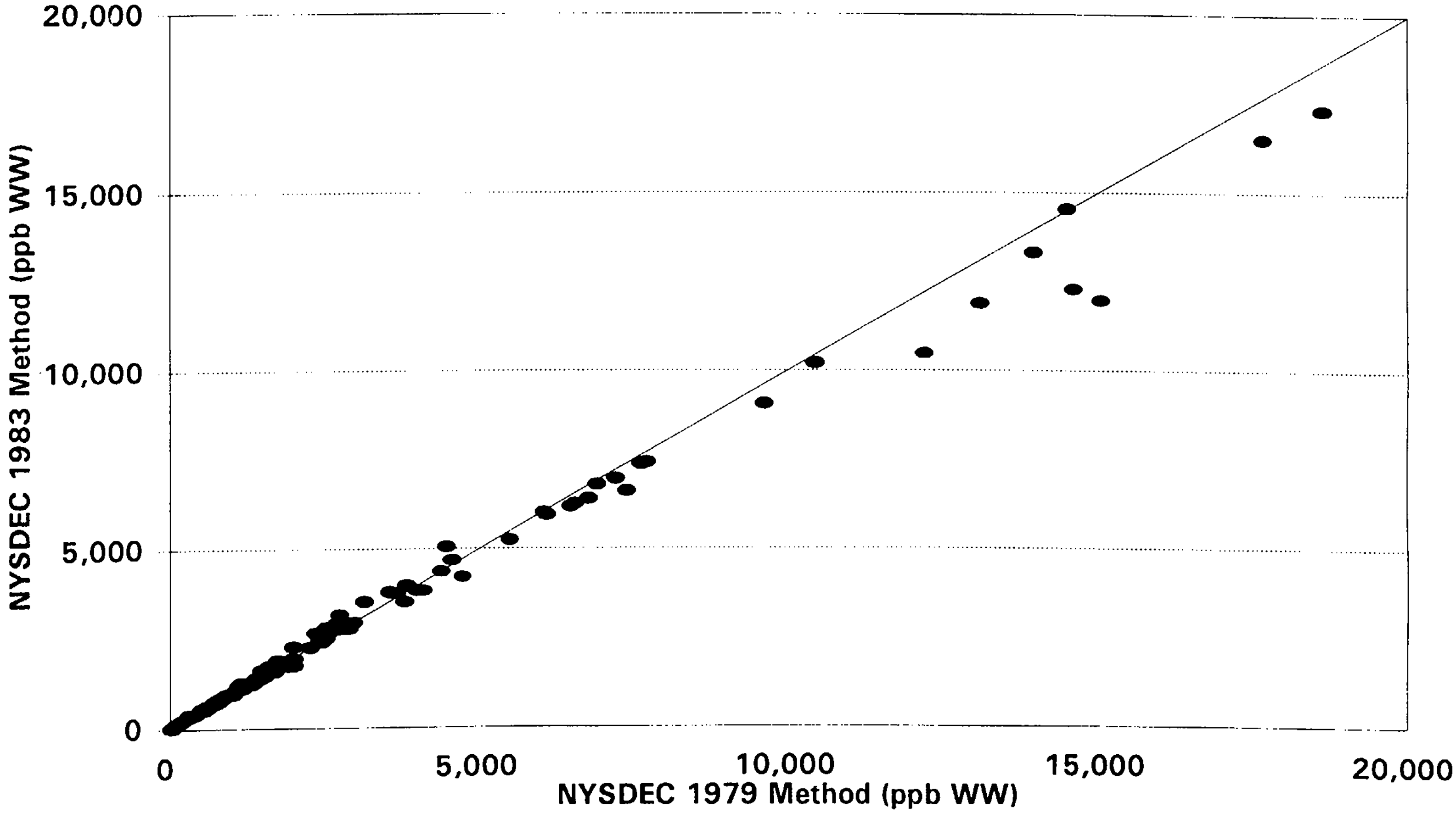
## Figure 9-6
## Comparison of Aroclor 1254 Concentrations Calculated by NYSDEC 1983 Method and NYSDEC 1977 Method for TAMS/Gradient Phase 2 Hudson River Fish Samples




Source: TAMS/Gradient Database, Release 3.1

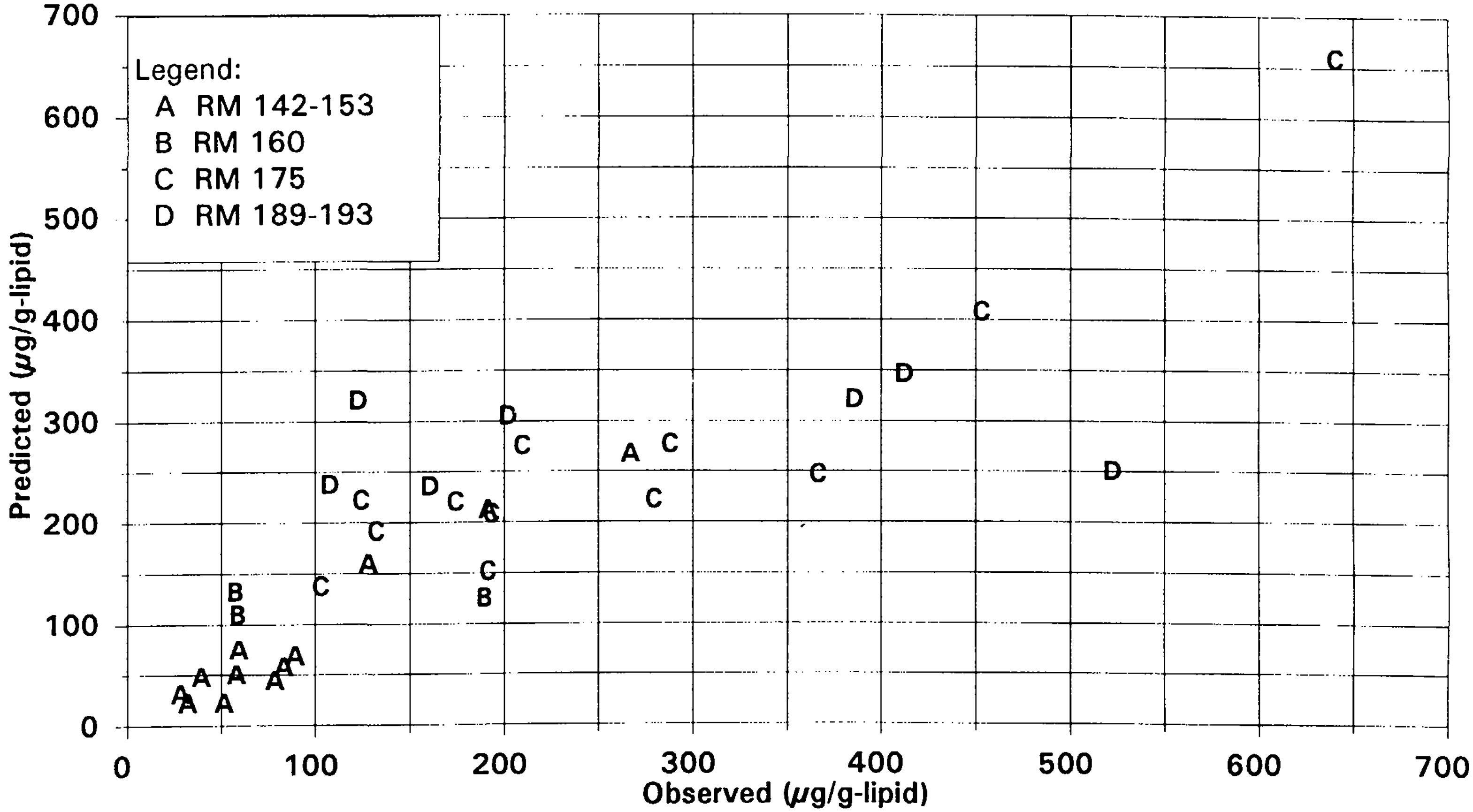
HRP 002 1432

**Figure 9-7**
**Comparison of Aroclor 1254 Concentrations Calculated by NYSDEC 1983 Method and NYSDEC 1979 Method for TAMS/Gradient Phase 2 Hudson River Fish Samples**



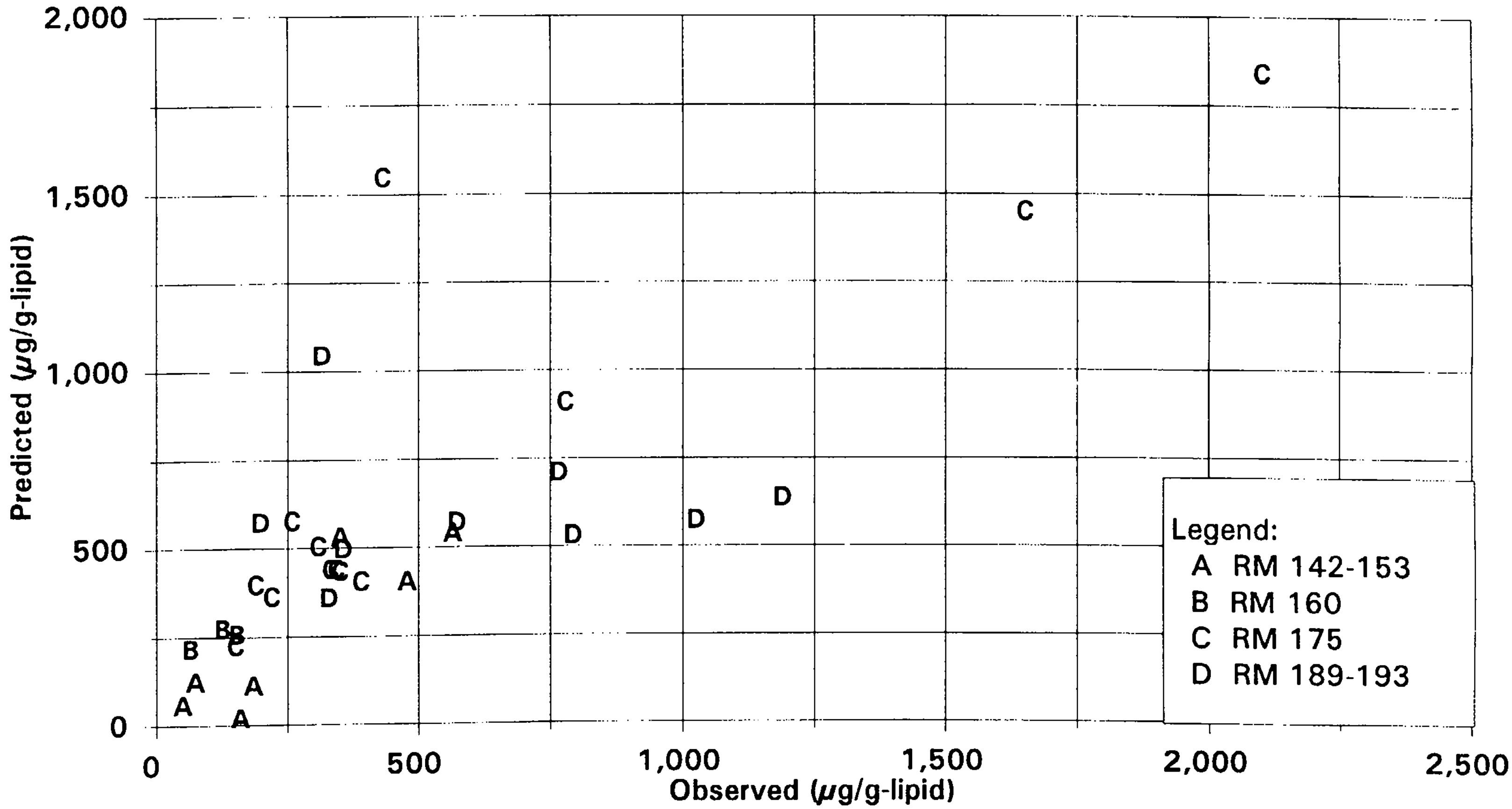

Source: TAMS/Gradient Database, Release 3.1

**Figure 9-8**
**Comparison of Observed and Predicted Aroclor 1016 Concentrations in Hudson River Pumpkinseed (Corrected to NYSDEC 1983 Quantitation Basis)**




Source: TAMS/Gradient Database, Release 3.1

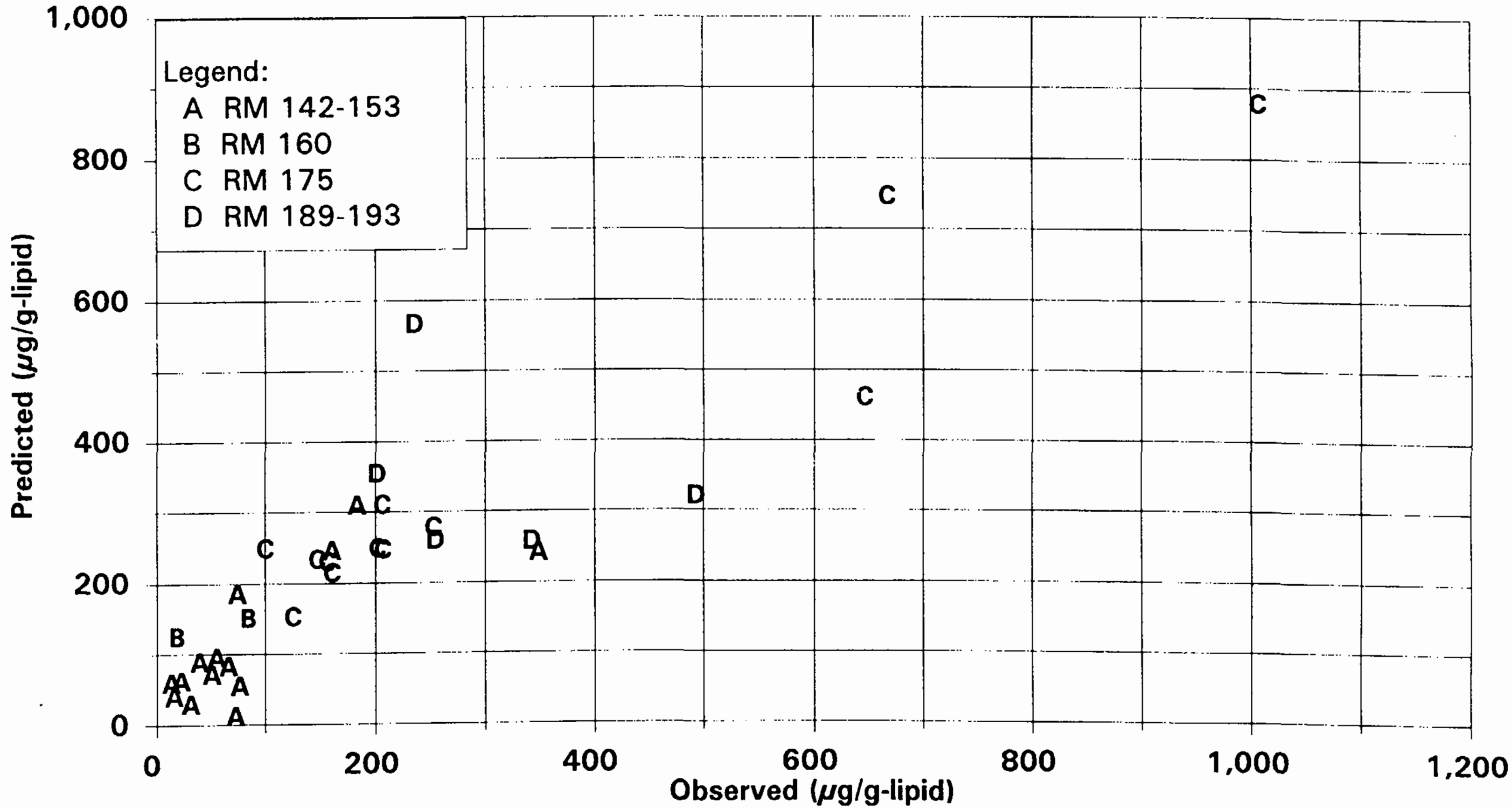
**Figure 9-9**
**Comparison of Observed and Predicted Aroclor 1016 Concentrations in Hudson River Largemouth Bass (Corrected to NYSDEC 1983 Quantitation Basis)**




Source: TAMS/Gradient Database, Release 3.1

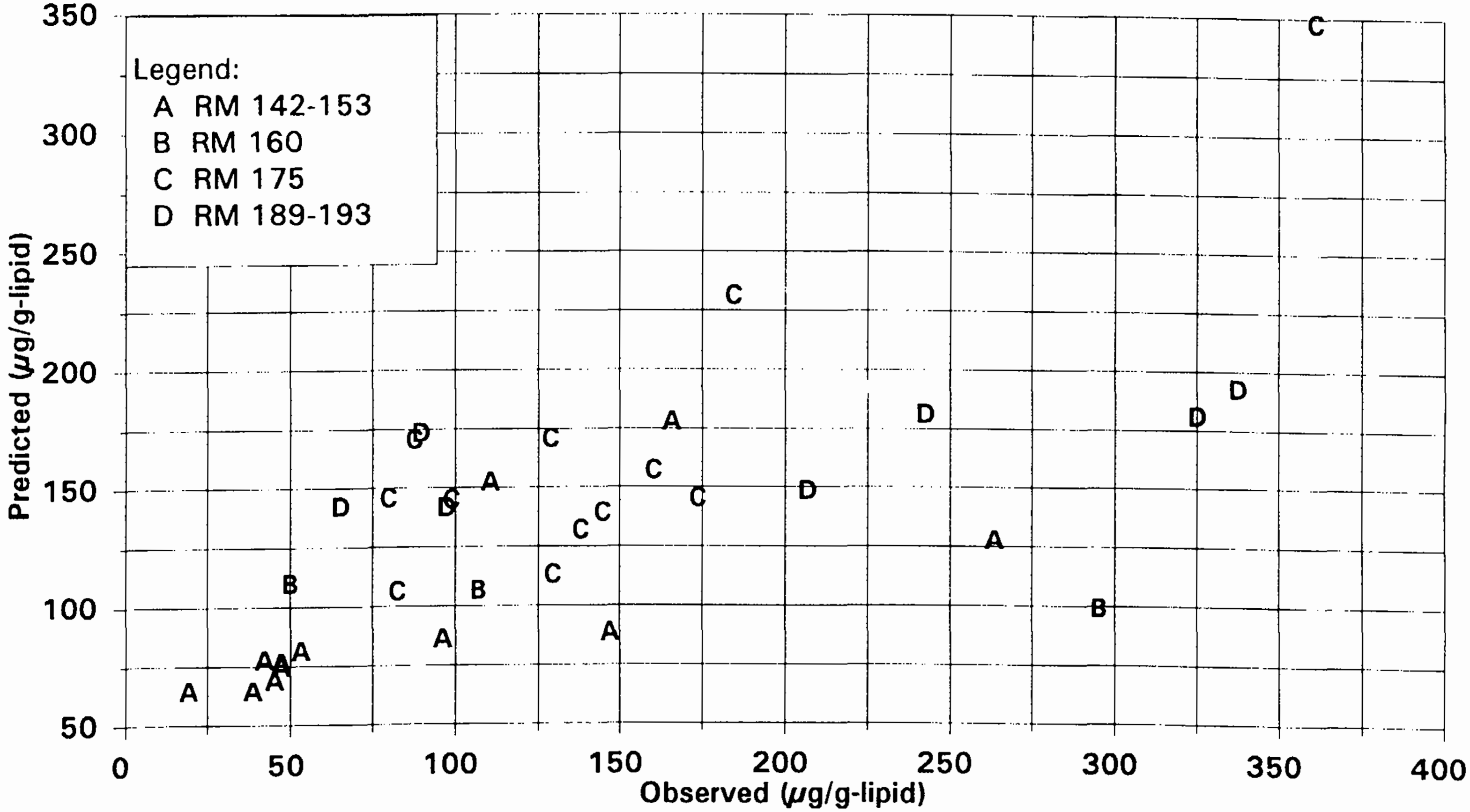
HRP 002 1435

**Figure 9-10**
**Comparison of Observed and Predicted Aroclor 1016 Concentrations in Hudson River Brown Bullhead (Corrected to NYSDEC 1983 Quantitation Basis)**




Source: TAMS/Gradient Database, Release 3.1

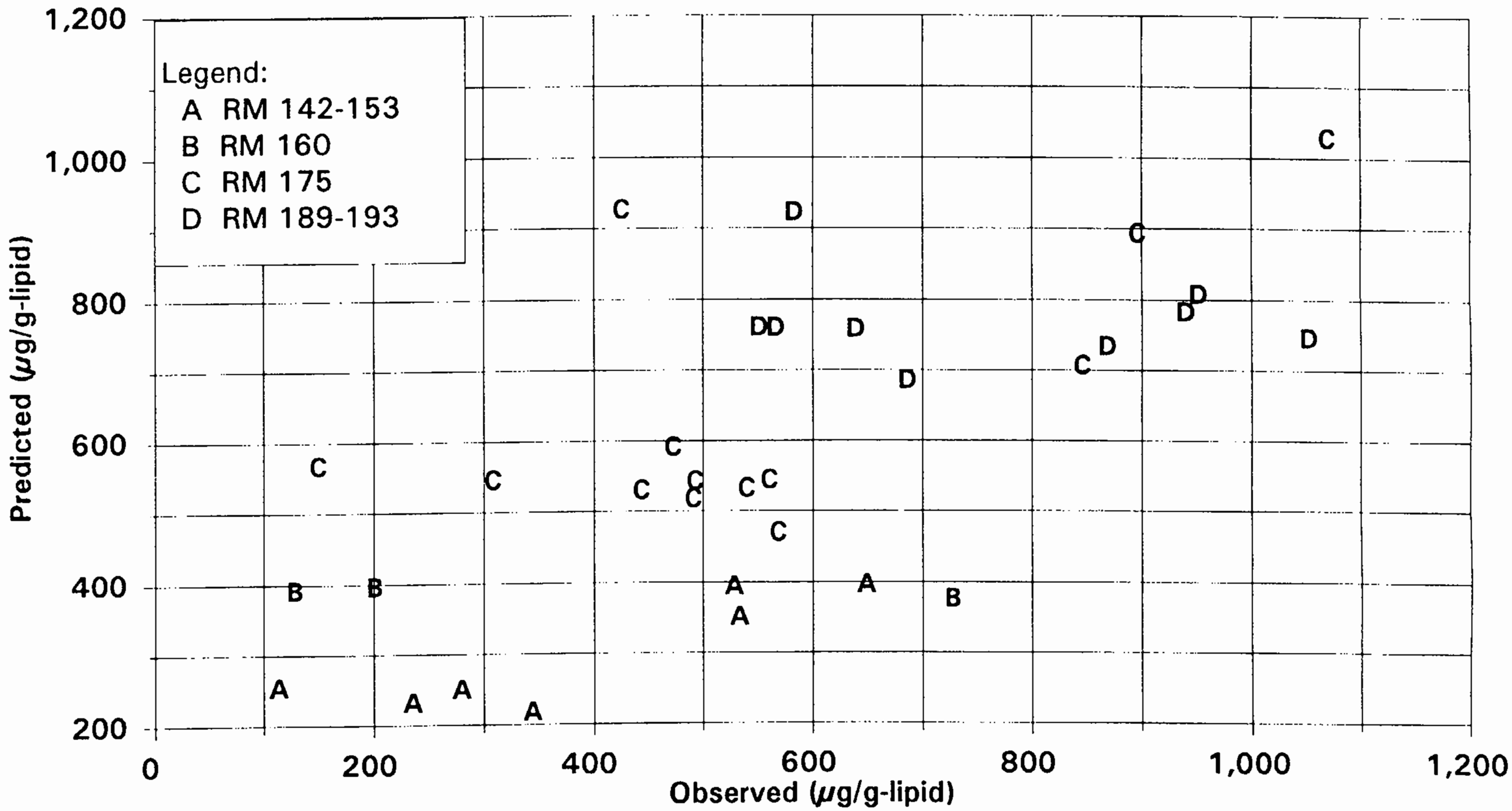
**Figure 9-11**
**Comparison of Observed and Predicted Aroclor 1254 Concentrations in Hudson River Pumpkinseed (Corrected to NYSDEC 1983 Quantitation Basis)**




Source: TAMS/Gradient Database, Release 3.1

HRP 002 1437

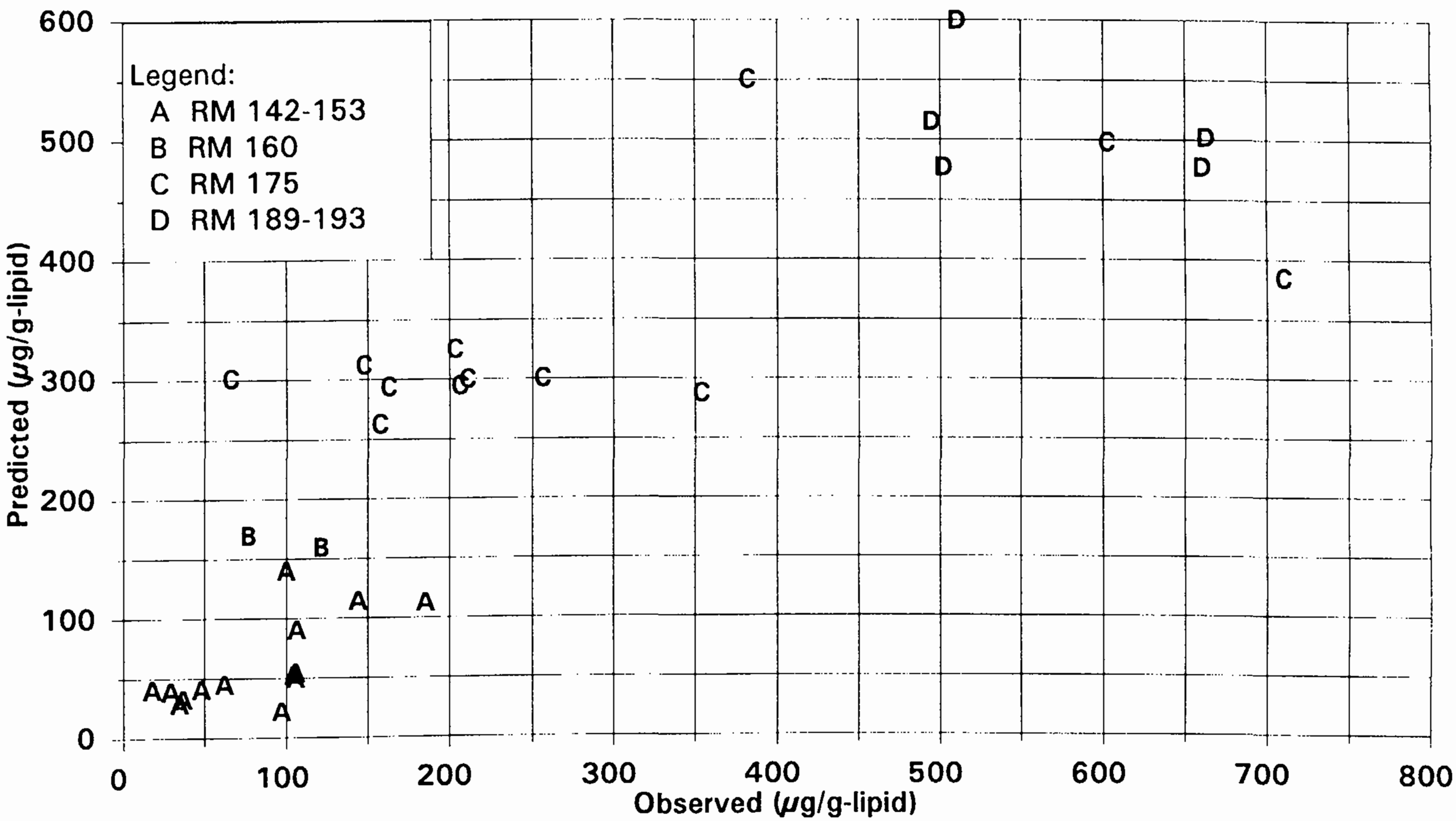
Figure 9-12
Comparison of Observed and Predicted Aroclor 1254 Concentrations in Hudson River Largemouth Bass (Corrected to NYSDEC 1983 Quantitation Basis)




Source: TAMS/Gradient Database, Release 3.1

HRP 002 1438

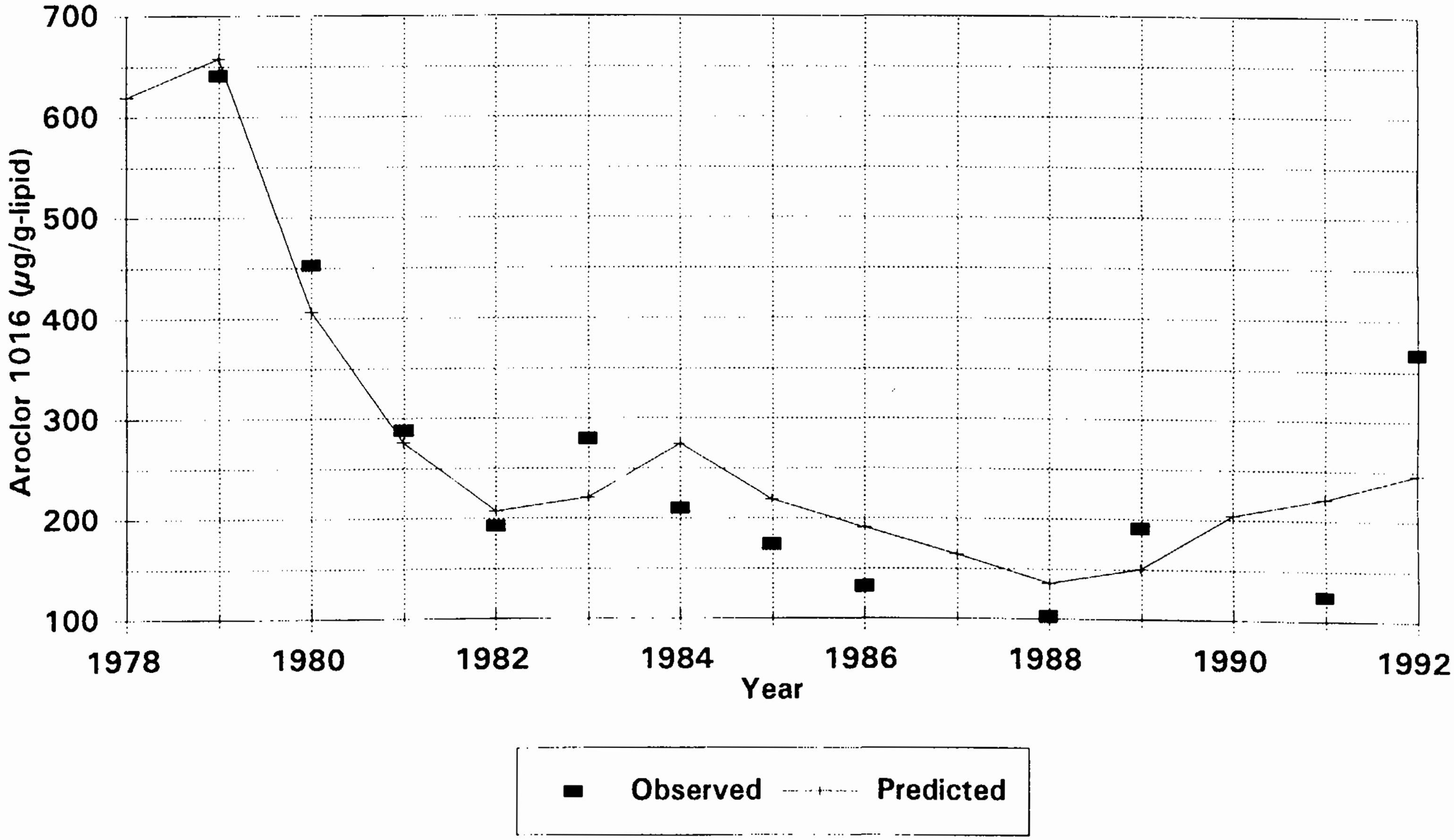
## Figure 9-13
## Comparison of Observed and Predicted Aroclor 1254 Concentrations in Hudson River Brown Bullhead (Corrected to NYSDEC 1983 Quantitation Basis)




Source: TAMS/Gradient Database, Release 3.1

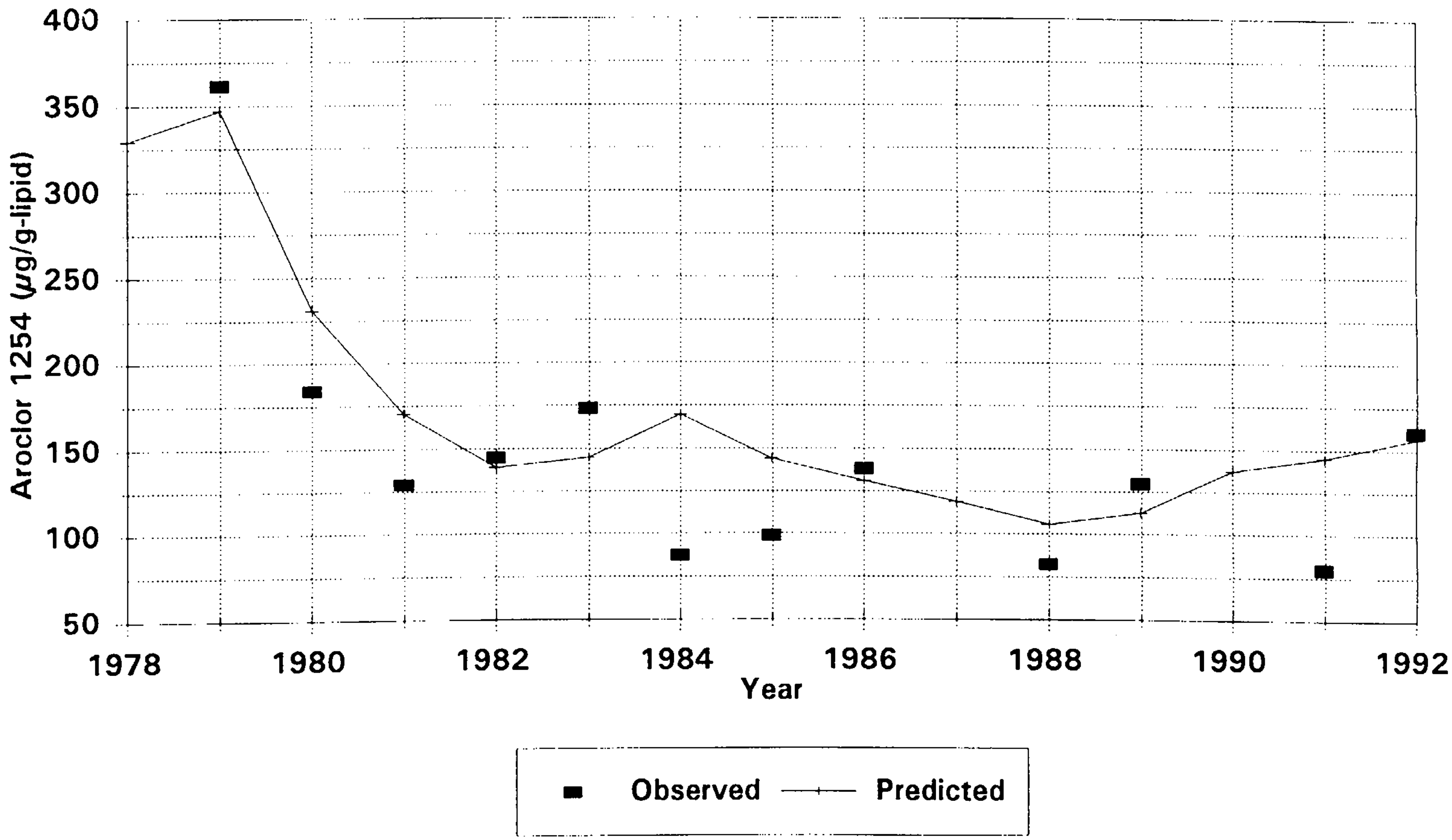
HRP 002 1439

## Figure 9-14
**Observed and Predicted Average Concentrations of Aroclor 1016 in Pumpkinseed at Hudson River Mile 175 (1983 Quantitation Basis)**




Source: TAMS/Gradient Database, Release 3.1

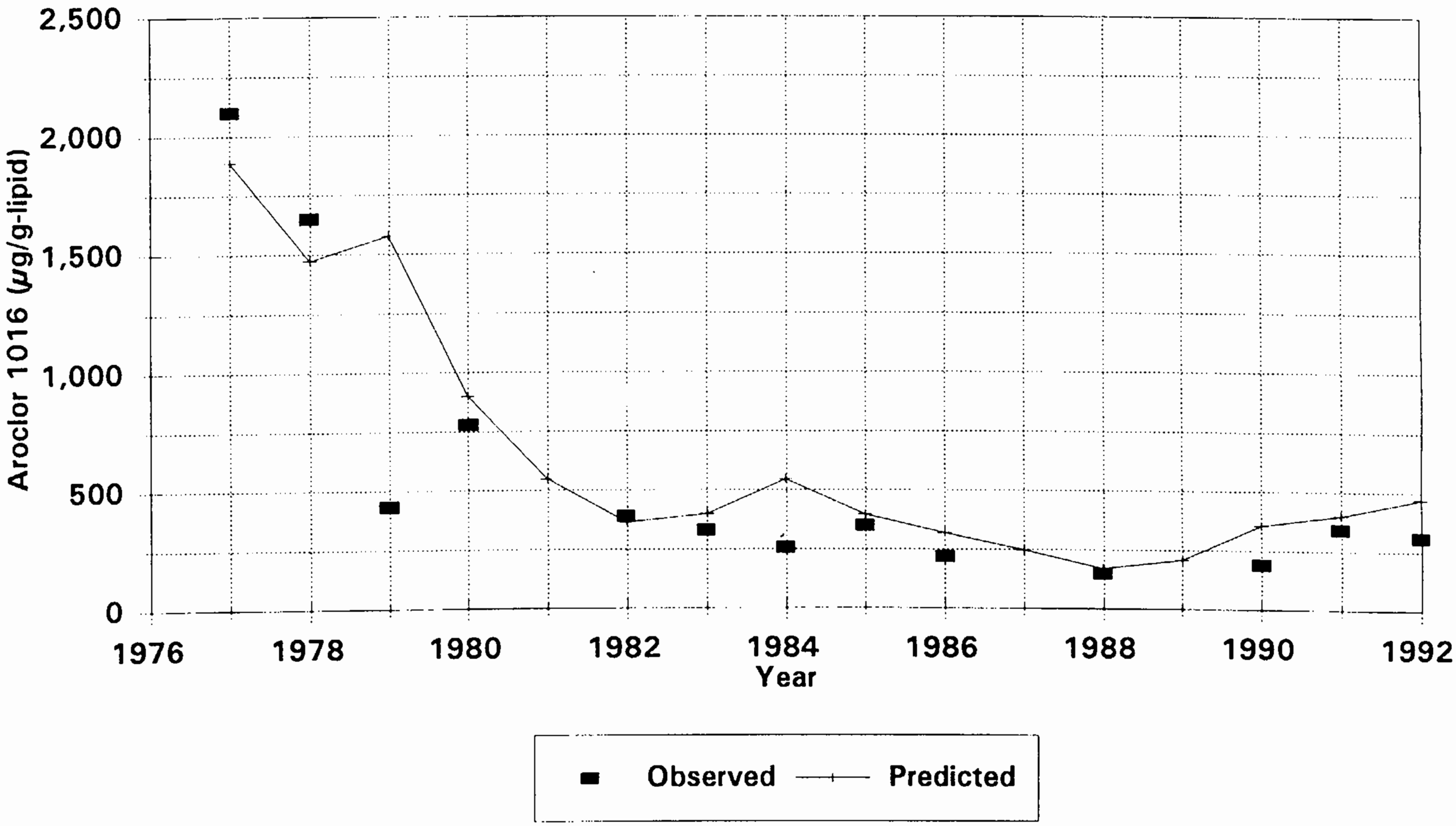
## Figure 9-15
**Observed and Predicted Average Concentrations of Aroclor 1254 in Pumpkinseed at Hudson River Mile 175 (1983 Quantitation Basis)**




Source: TAMS/Gradient Database, Release 3.1

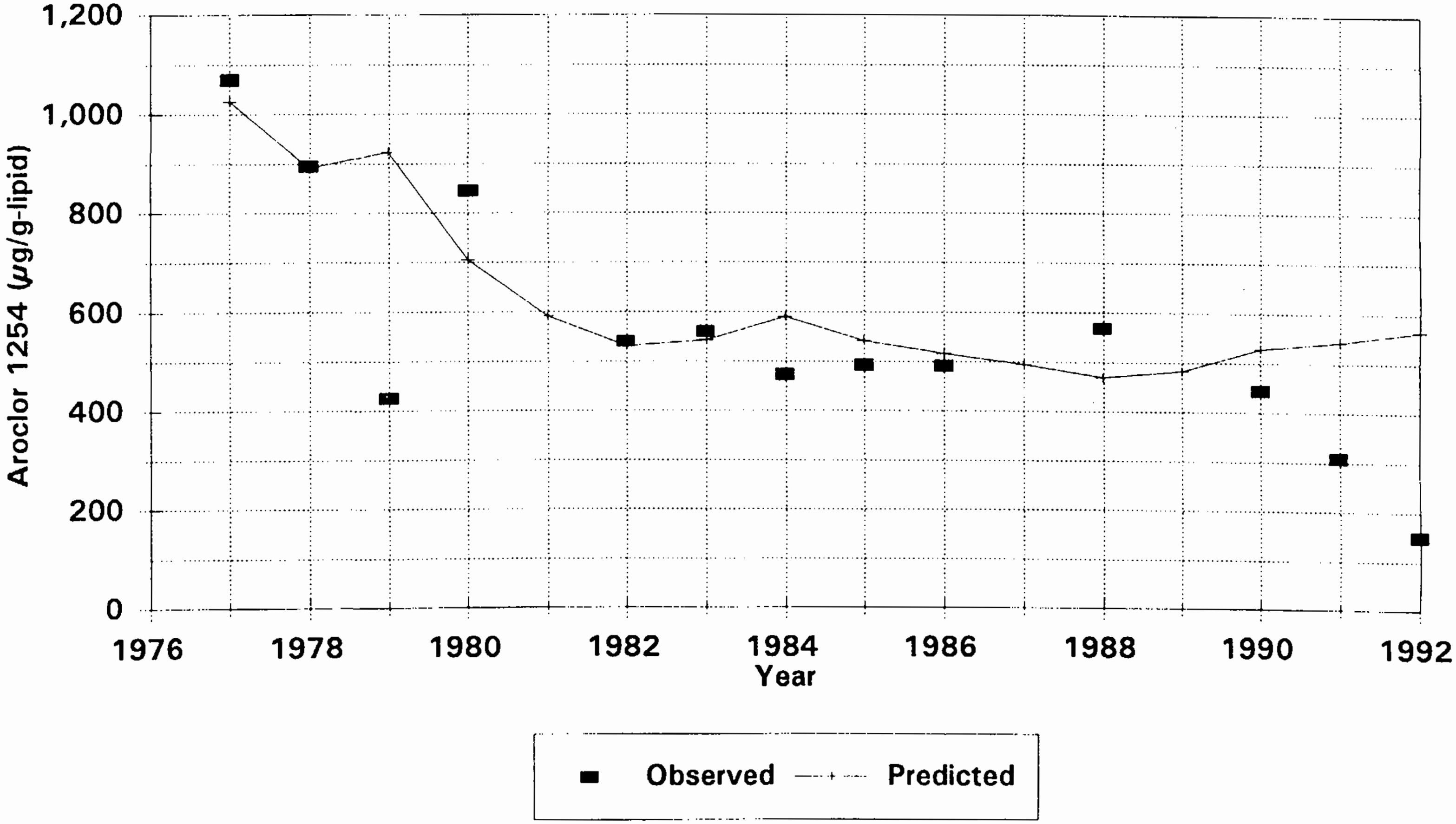
HRP 002 1441

**Figure 9-16**
**Observed and Predicted Average Concentrations of Aroclor 1016 in Largemouth Bass at Hudson River Mile 175 (1983 Quantitation Basis)**




Source: TAMS/Gradient Database, Release 3.1

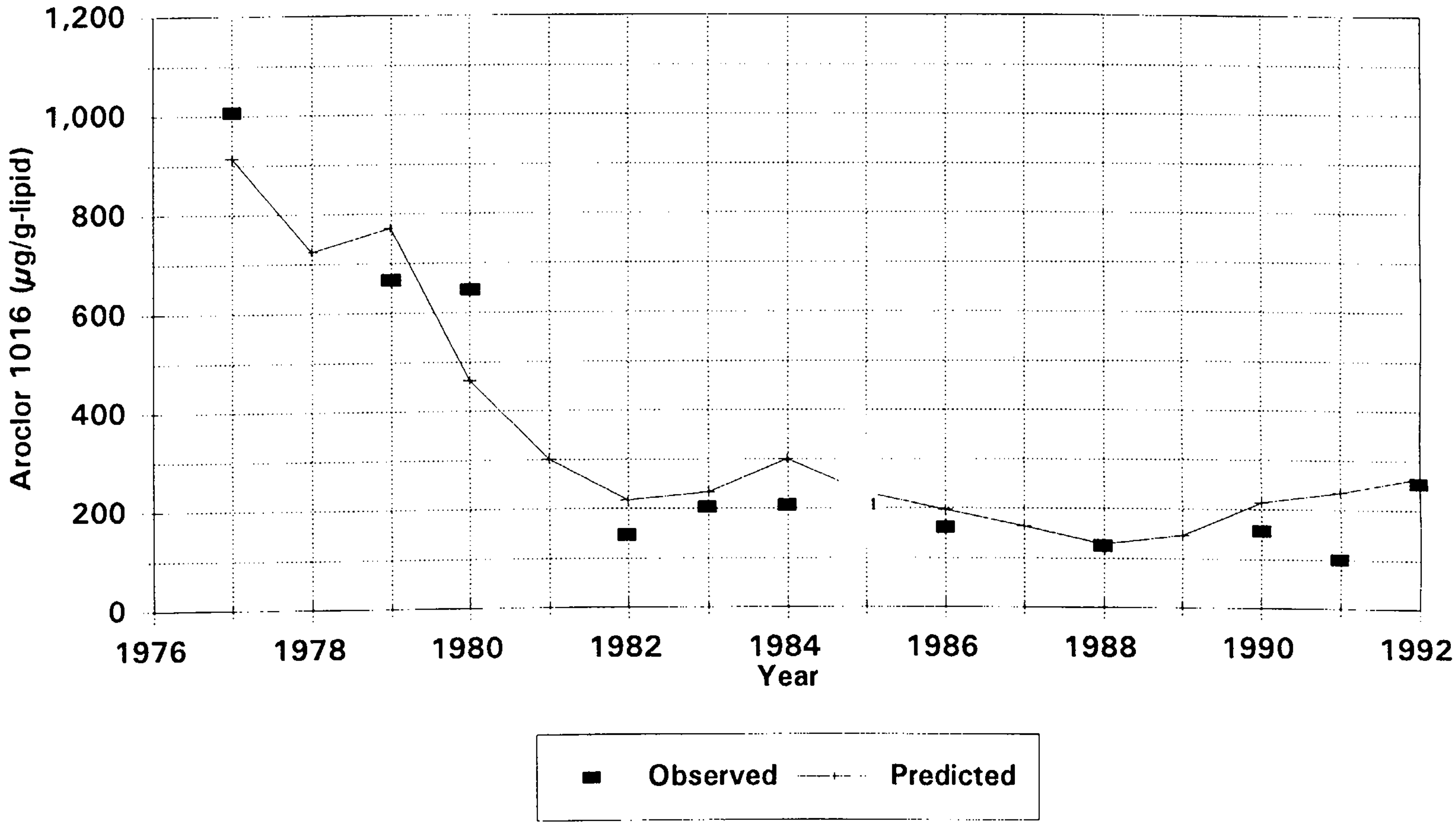
**Figure 9-17**
**Observed and Predicted Average Concentrations of Aroclor 1254 in Largemouth Bass at Hudson River Mile 175 (1983 Quantitation Basis)**




Source: TAMS/Gradient Database, Release 3.1

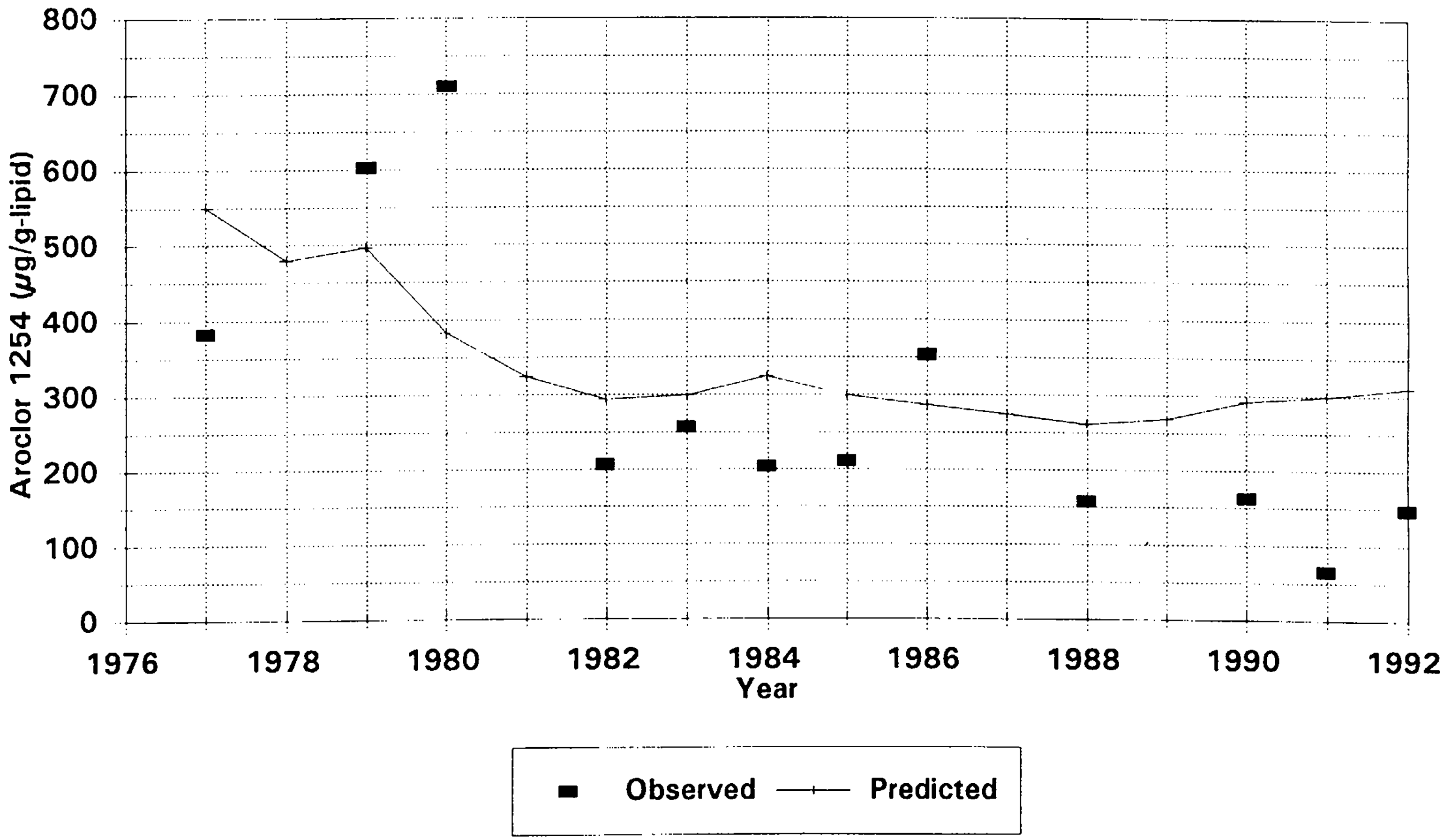
HRP 002 1443

## Figure 9-18
**Observed and Predicted Average Concentrations of Aroclor 1016 in Brown Bullhead at Hudson River Mile 175 (1983 Quantitation Basis)**




Source: TAMS/Gradient Database, Release 3.1

## Figure 9-19
## Observed and Predicted Average Concentrations of Aroclor 1254 in Brown Bullhead at Hudson River Mile 175 (1983 Quantitation Basis)

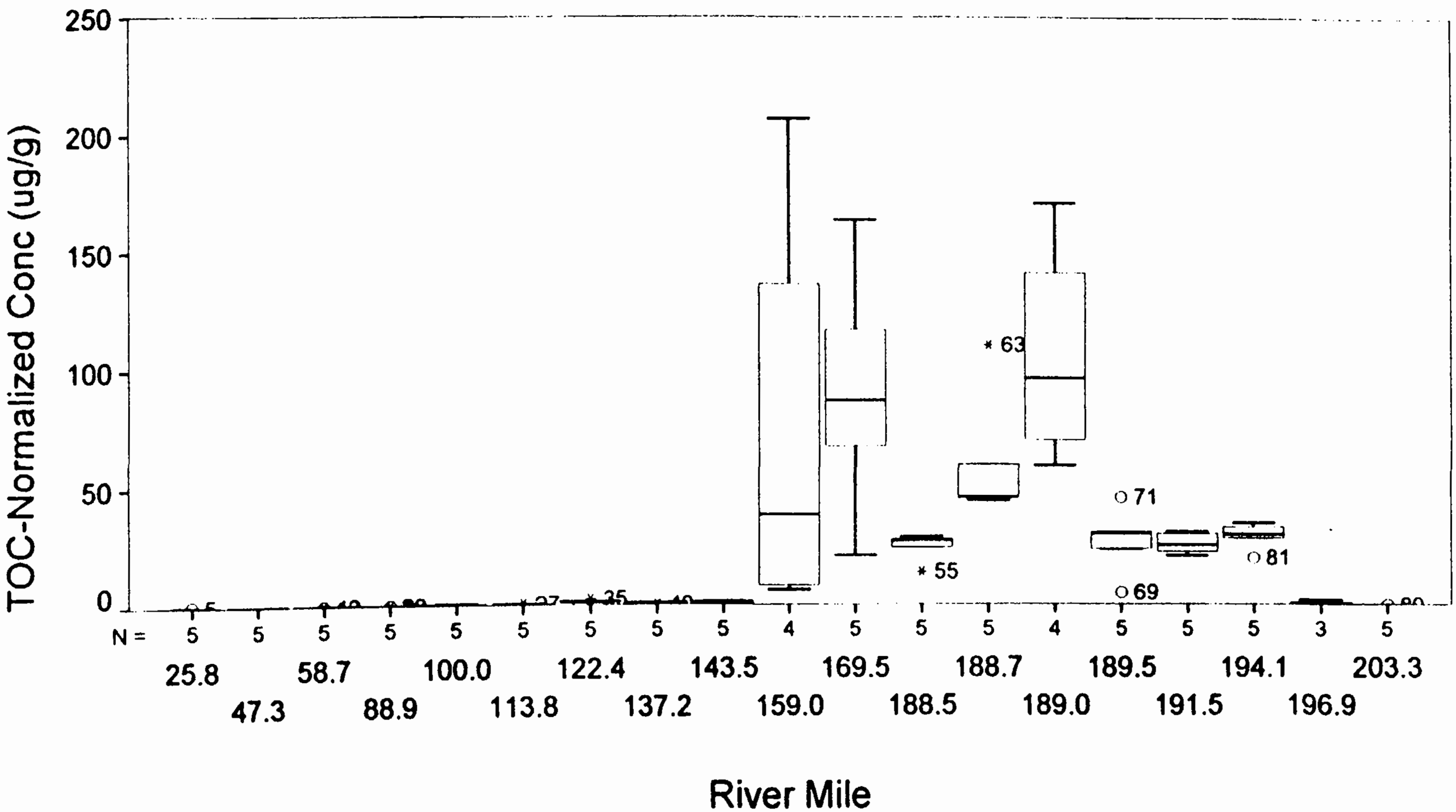



Source: TAMS/Gradient Database, Release 3.1

# Figure 10-1

## Average Sediment Concentration

## by River Mile for BZ#4




Prepared by KvS 4 Aug 96

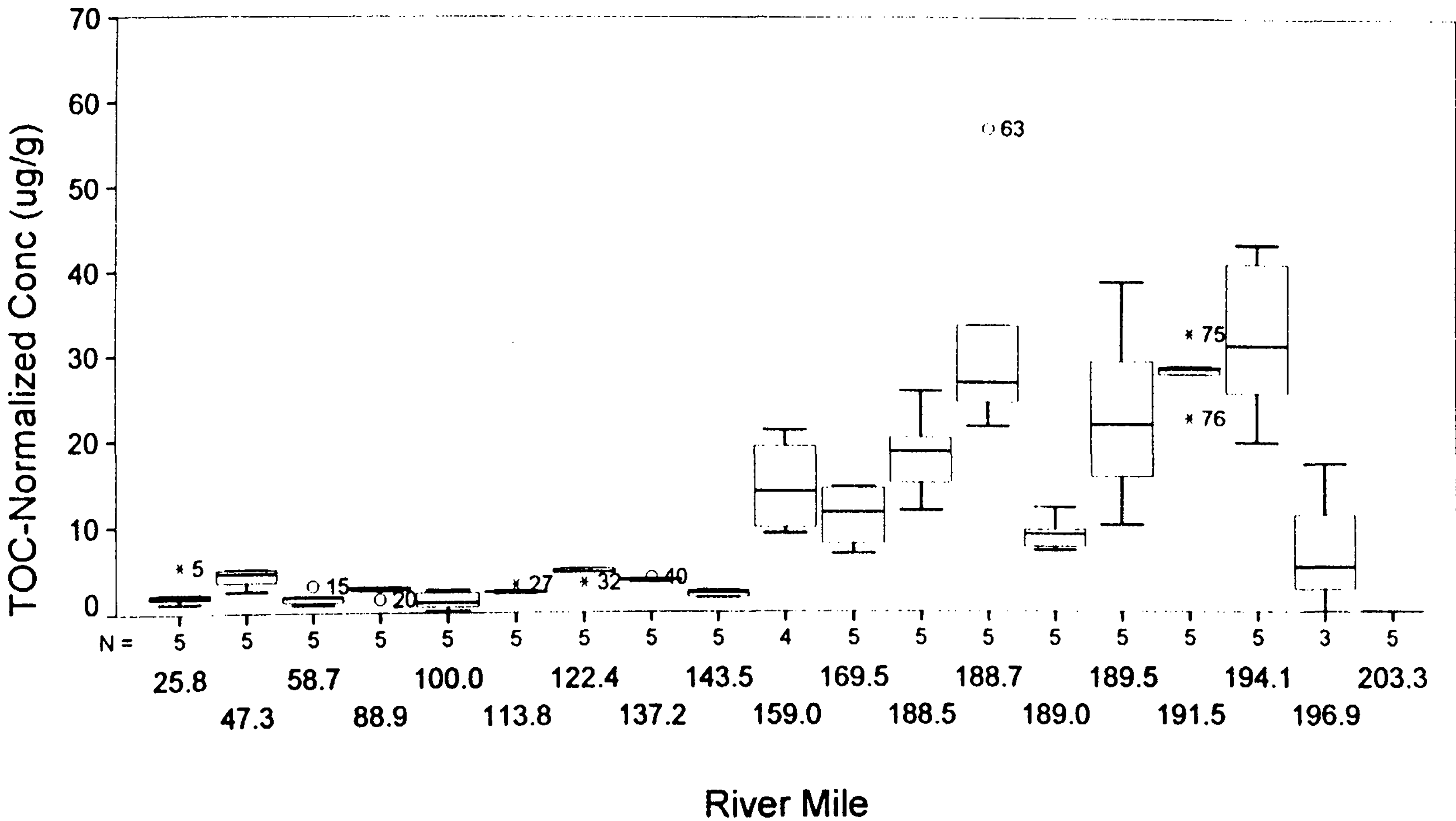
Database Release 3.1

HRP 002 1446

# Figure 10-2

## Average Sedimen Concentration

### by River Mile for BZ#28




Prepared by KvS 4 Aug 96

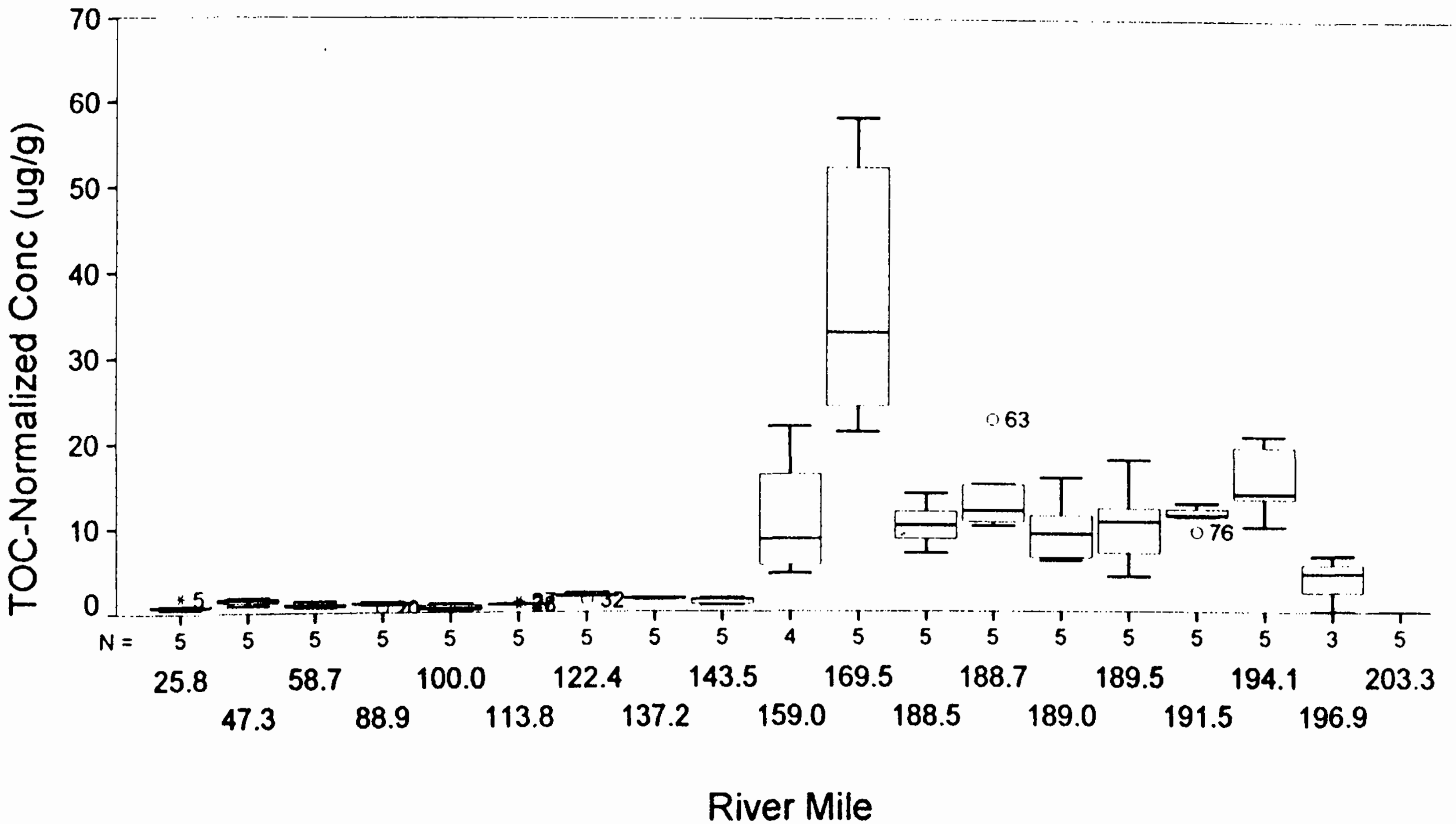
Database Release 3.1

HRP 002 1447

# Figure 10-3

## Average Sediment Concentration

## by River Mile for BZ#52




Prepared by KvS 7 Aug 96

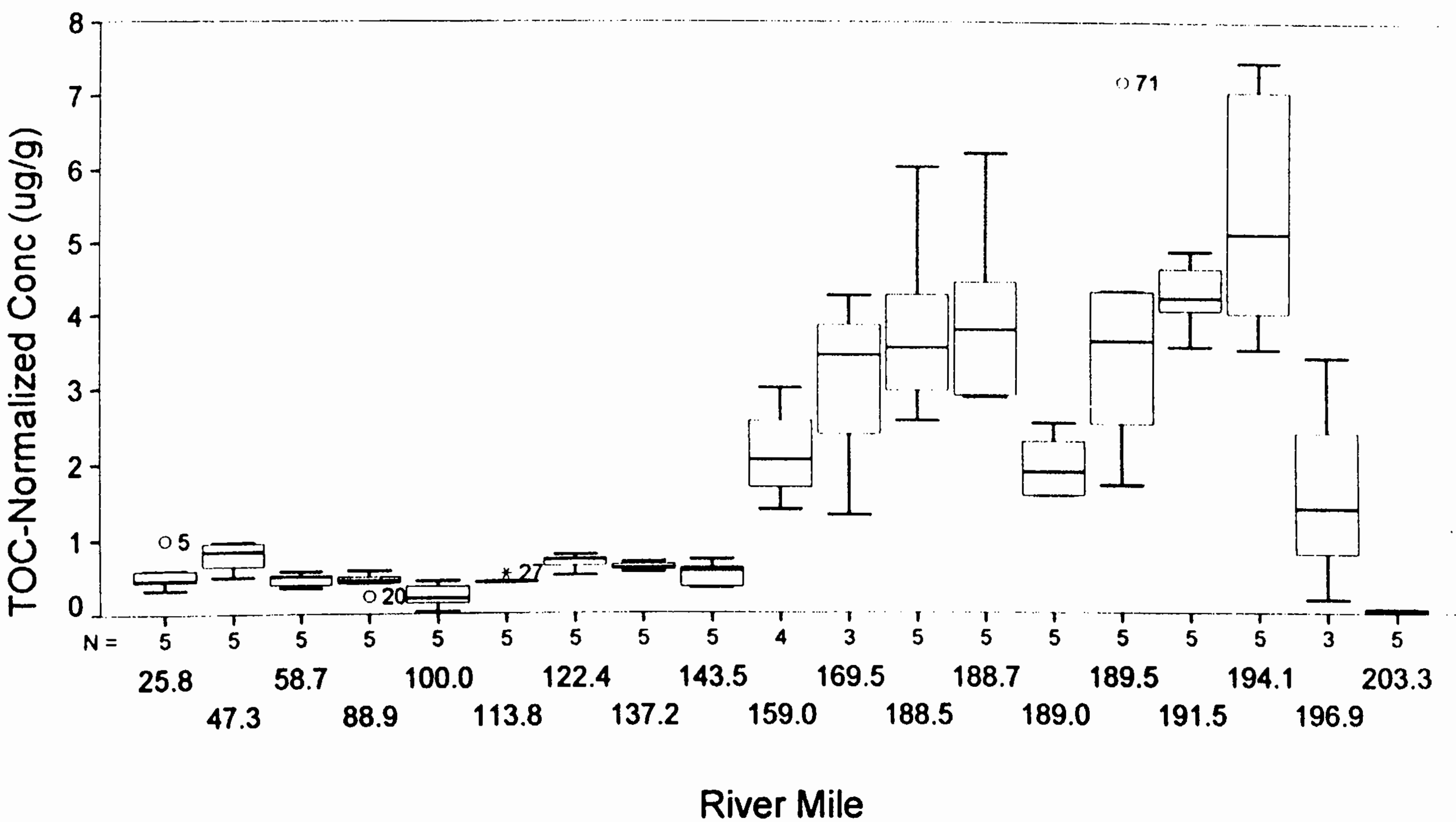
Database Release 3.1

HRP 002 1448

# Figure 10-4

## Average Sediment Concentration

## by River Mile for BZ#101 and BZ#90



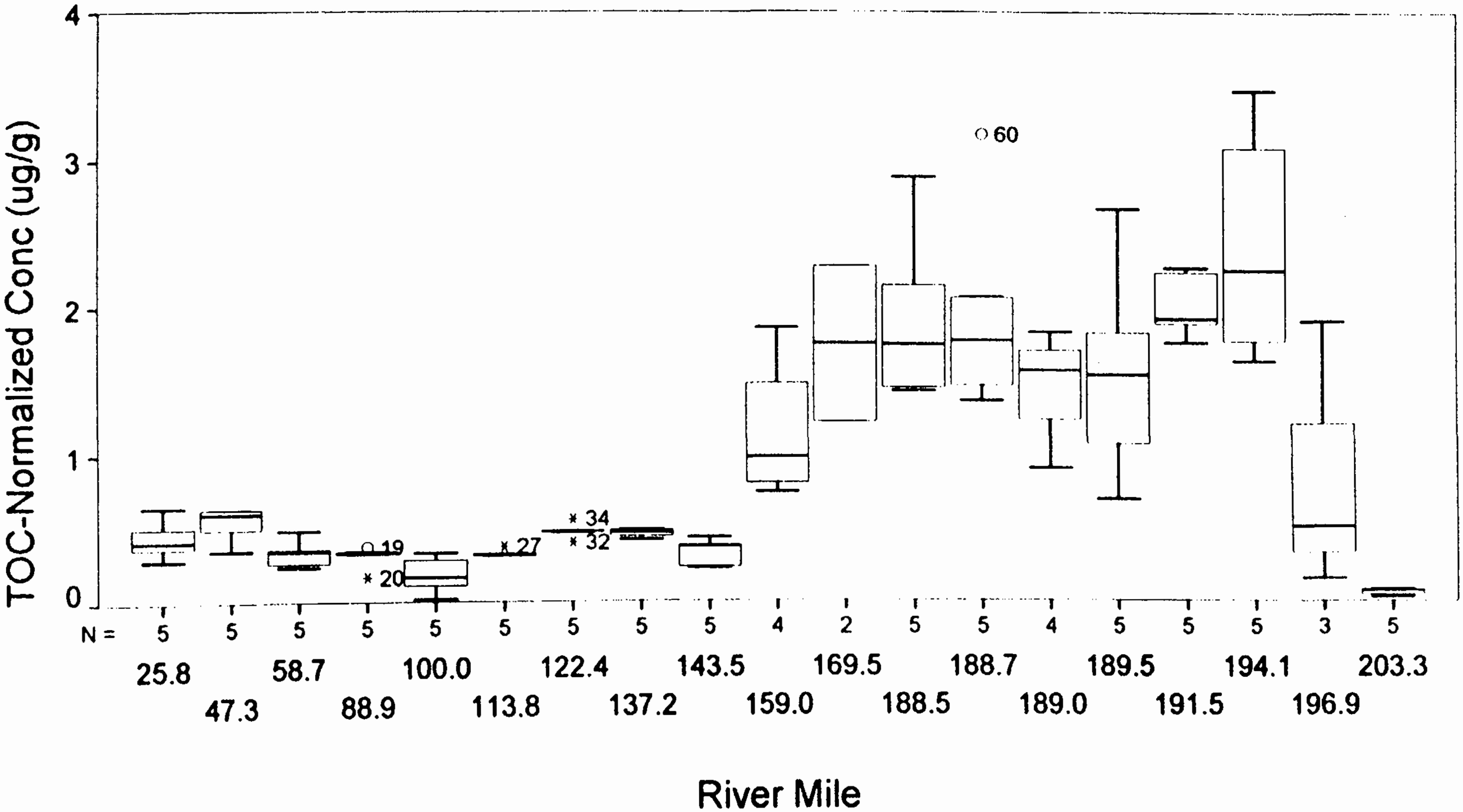

**Prepared by KvS 6 Aug 96**

**Database Release 3.1**

# Figure 10-5

## Average Sediment Concentration

### by River Mile for BZ#138

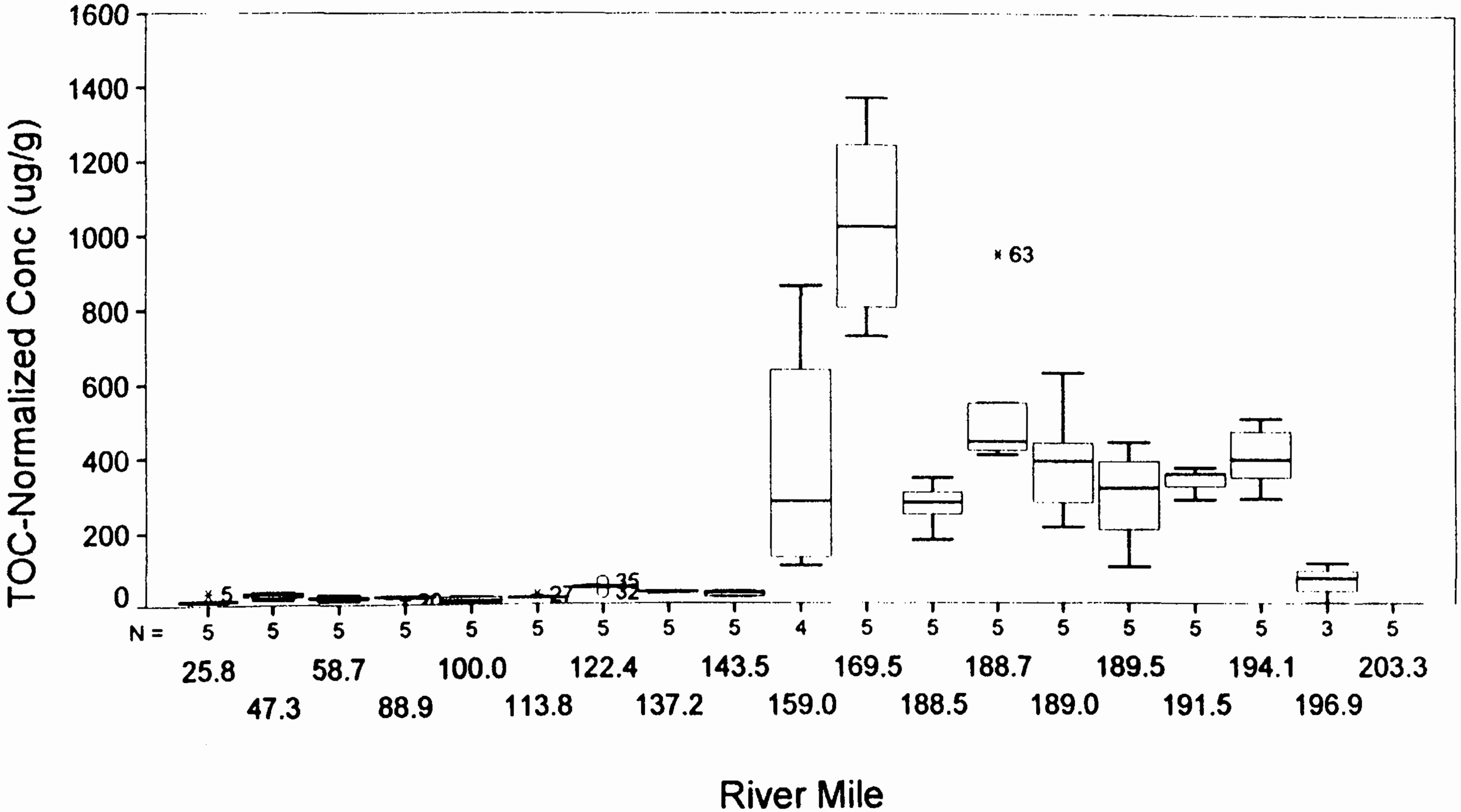



Prepared by KvS 6 Aug 96

Database Release 3.1

# Figure 10.6

## Average Sediment Concentration by River Mile for Aroclor 1016



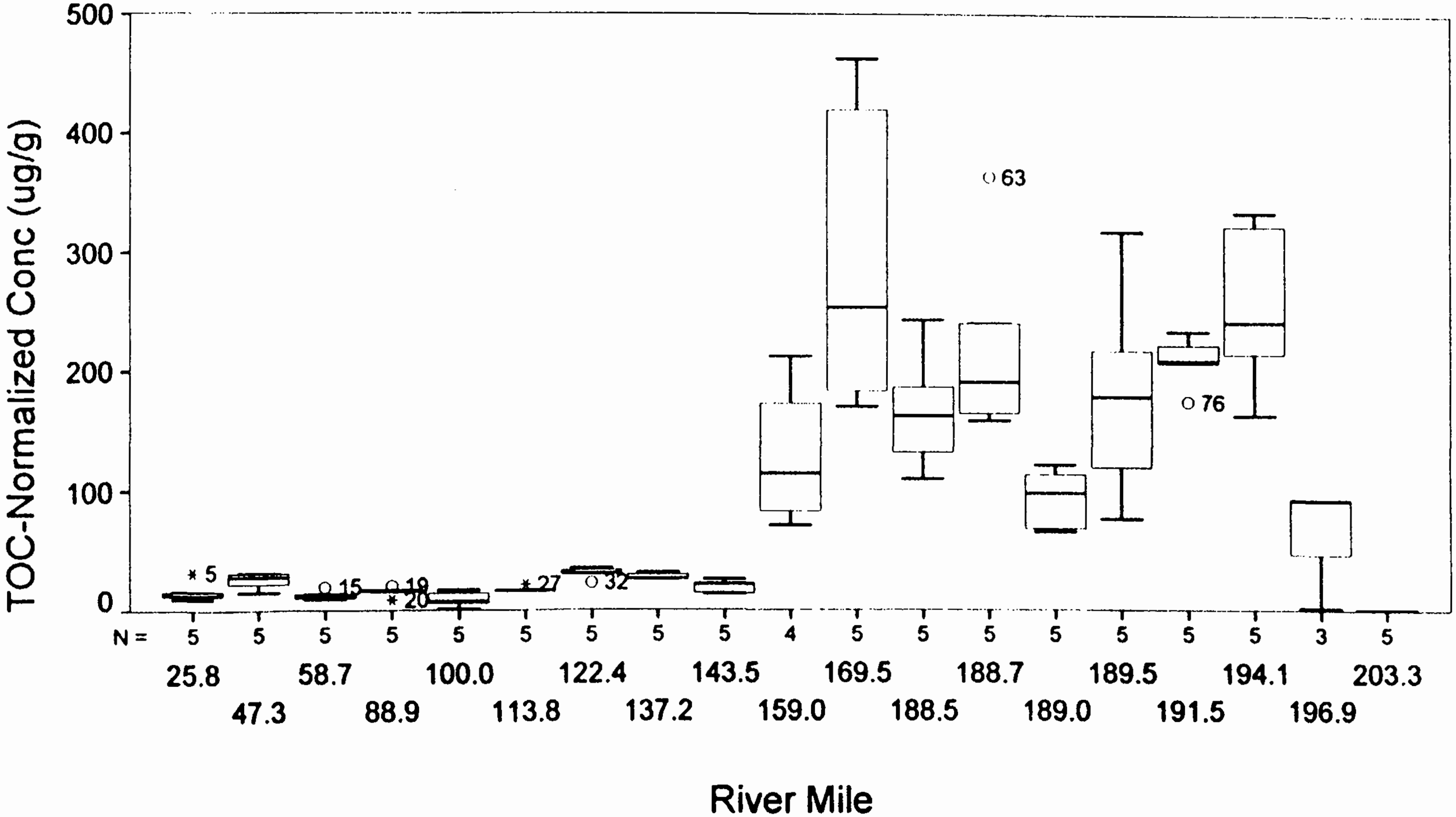

Prepared by KvS 4 Aug 96

Database Release 3.1

# Figure 10-7

## Average Sediment Concentration

### by River Mile for Aroclor 1254




Prepared by KvS 5 Aug 96

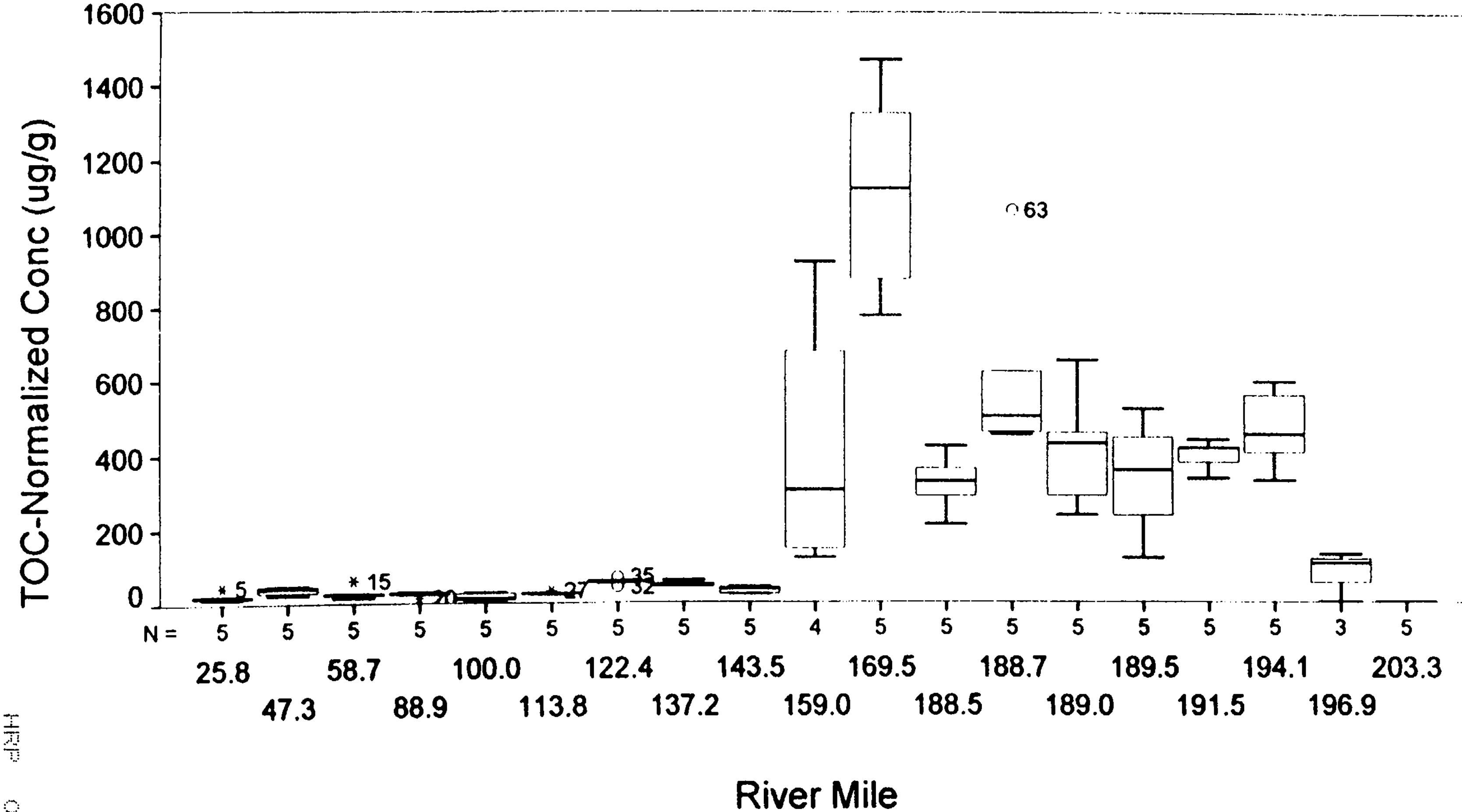
Database Release 3.1

HRP 002 1452

# Figure 10-8

## Average Sediment Concentration

## by River Mile for Total PCBs




Prepared by KvS 6 Aug 96

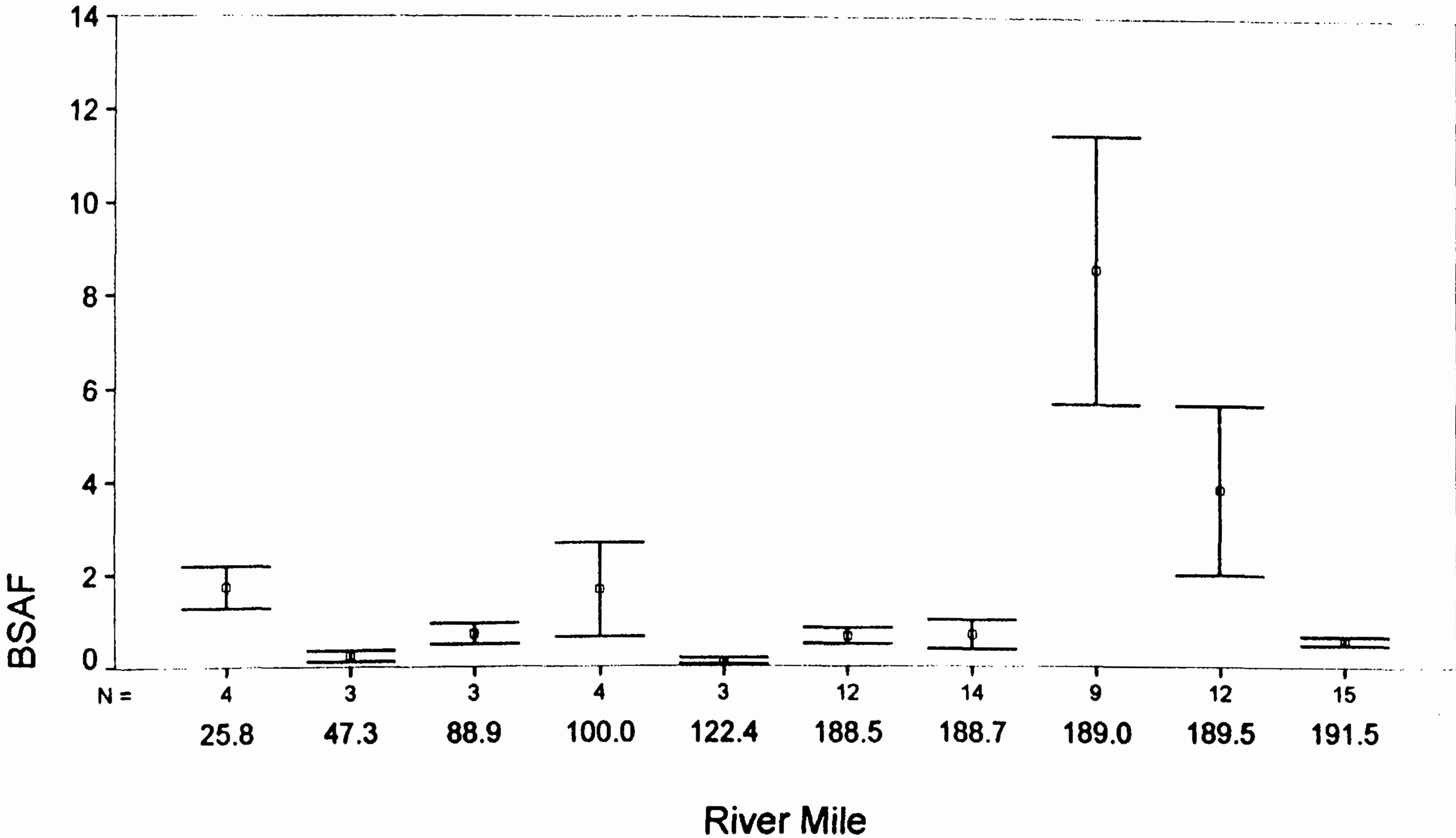
Database Release 3.1

HRP 002 1453

# Figure 10-9

## Mean +- 1 SE Benthic:Sediment Ratios

## by River Mile for BZ#4




Prepared by KvS 15 Jul 96

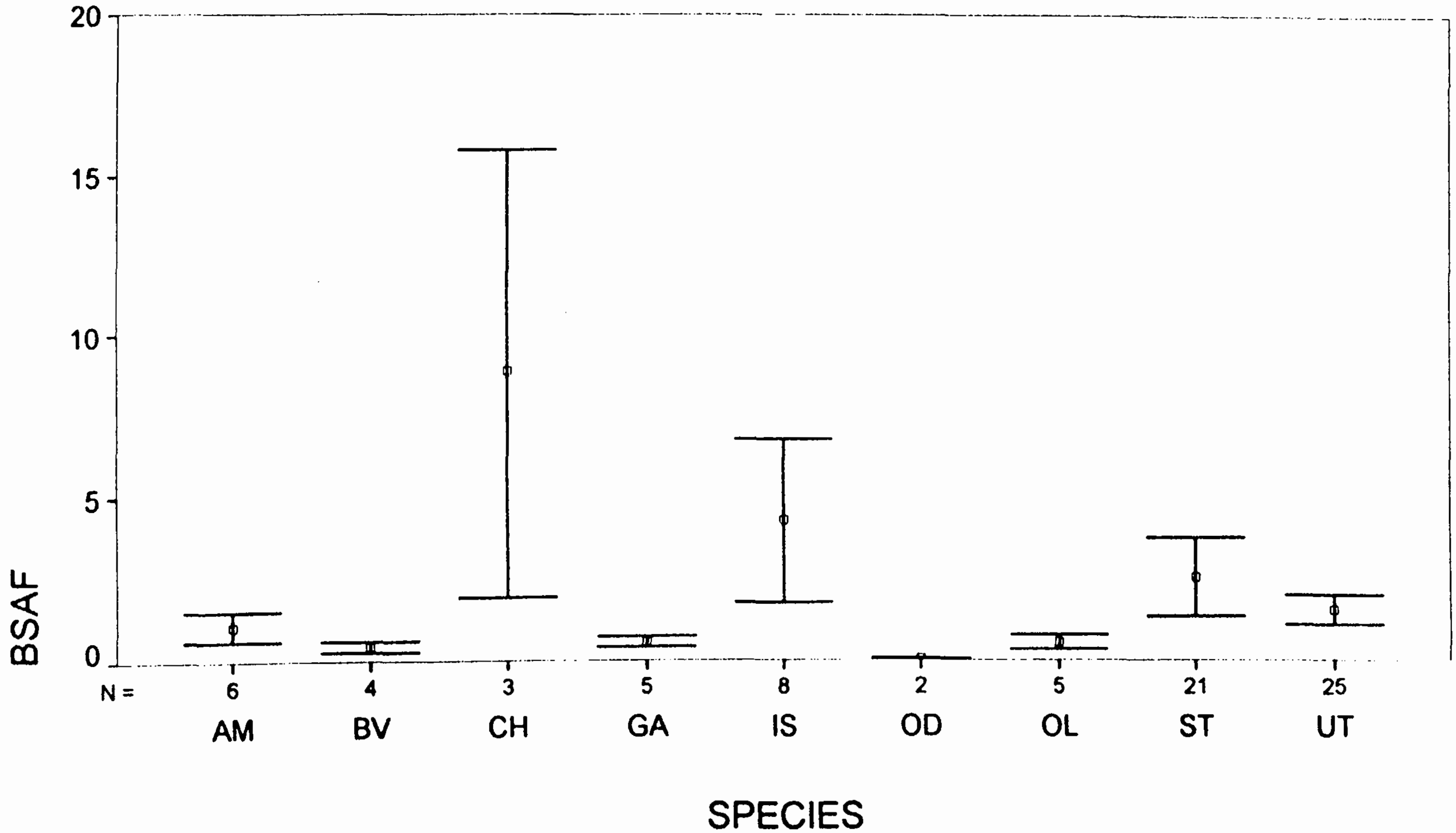
Database Release 3.1

HRP 002 1454

# Figure 10-10

## Mean +- 1 SE Benthic:Sediment Ratios

## by Species for BZ#4



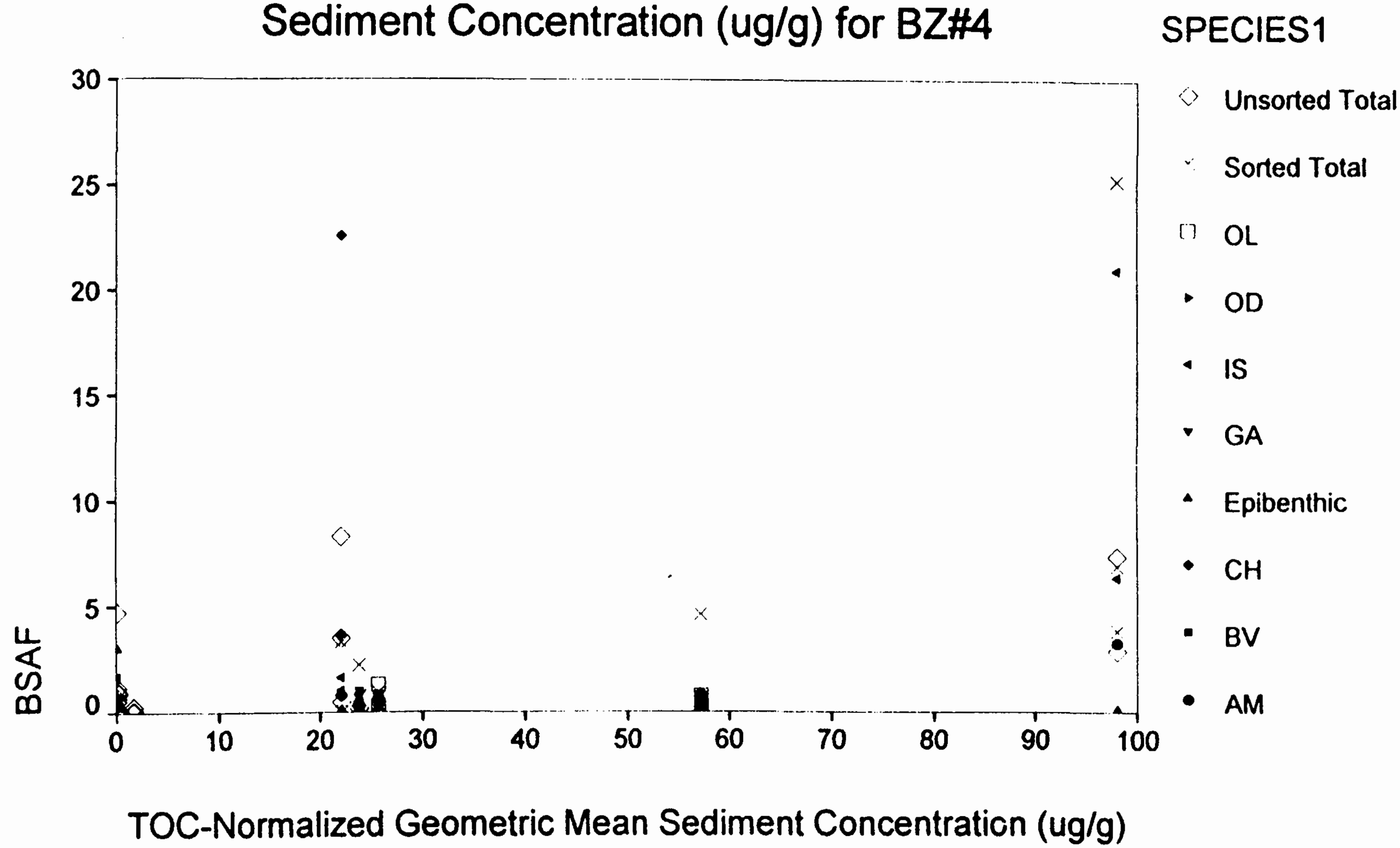

Prepared by KvS 15 Jul 96

Database Release 3.1

# Figure 10-11

## BSAF versus Geometric Mean

## Sediment Concentration (ug/g) for BZ#4



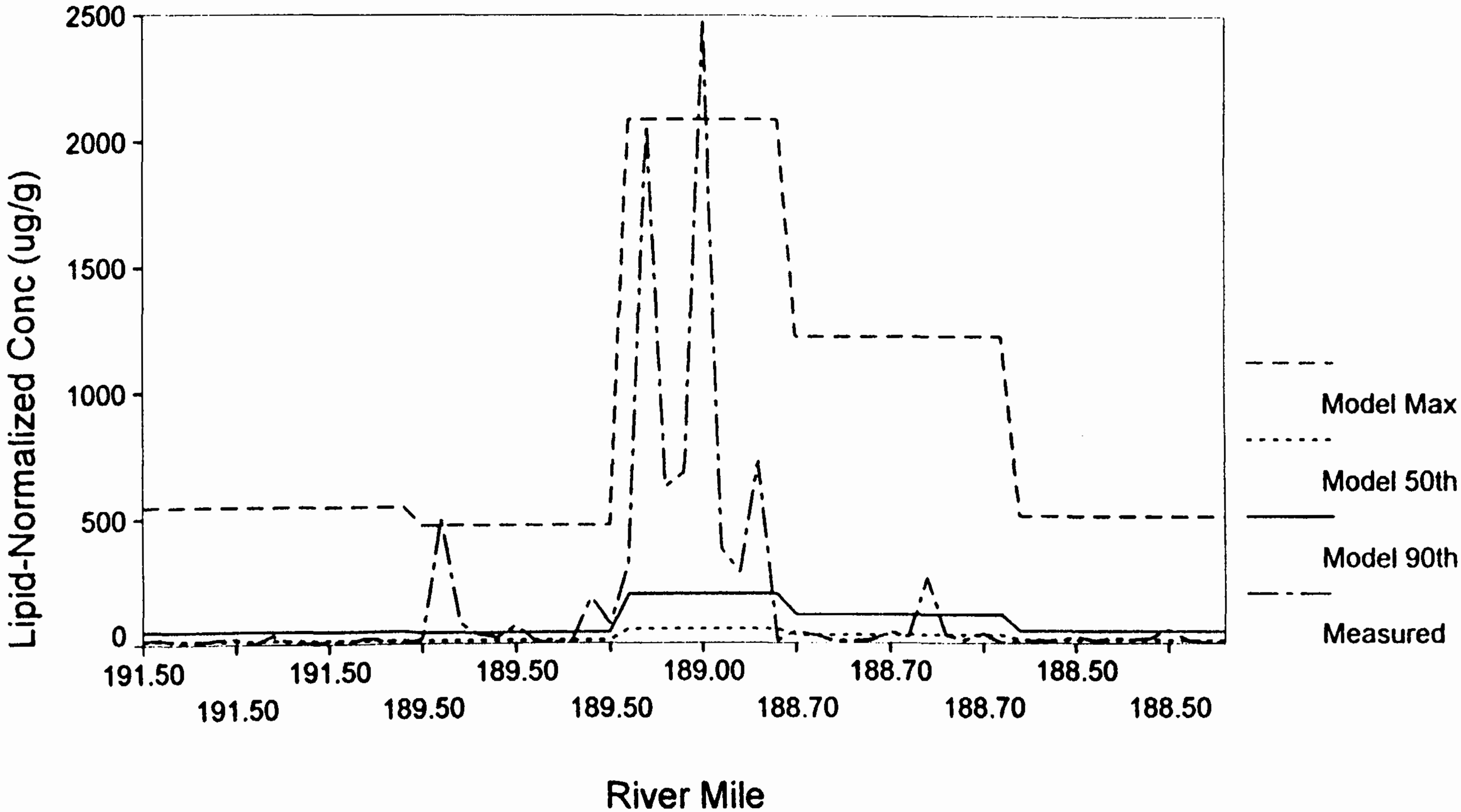

Prepared by KvS 1 Aug 96

Database Release 3.1

# Figure 10-12

## Goodness-of-Fit Statistics for

## BZ#4 in Benthic Invertebrates



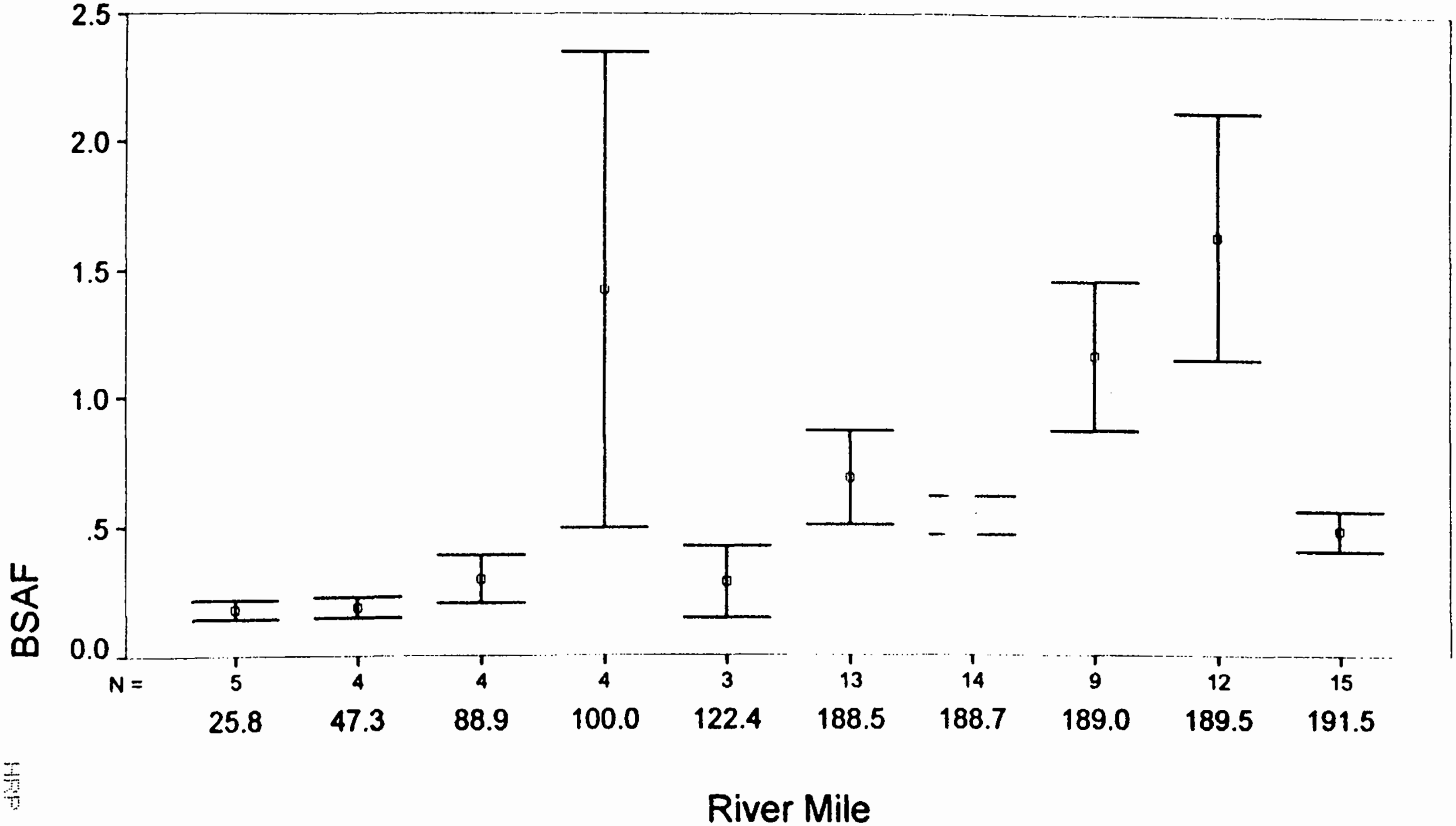

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-13

## Mean +- 1 SE Benthic:Sediment Ratios

## by River Mile for BZ#28




Prepared by KvS 8 Aug 96

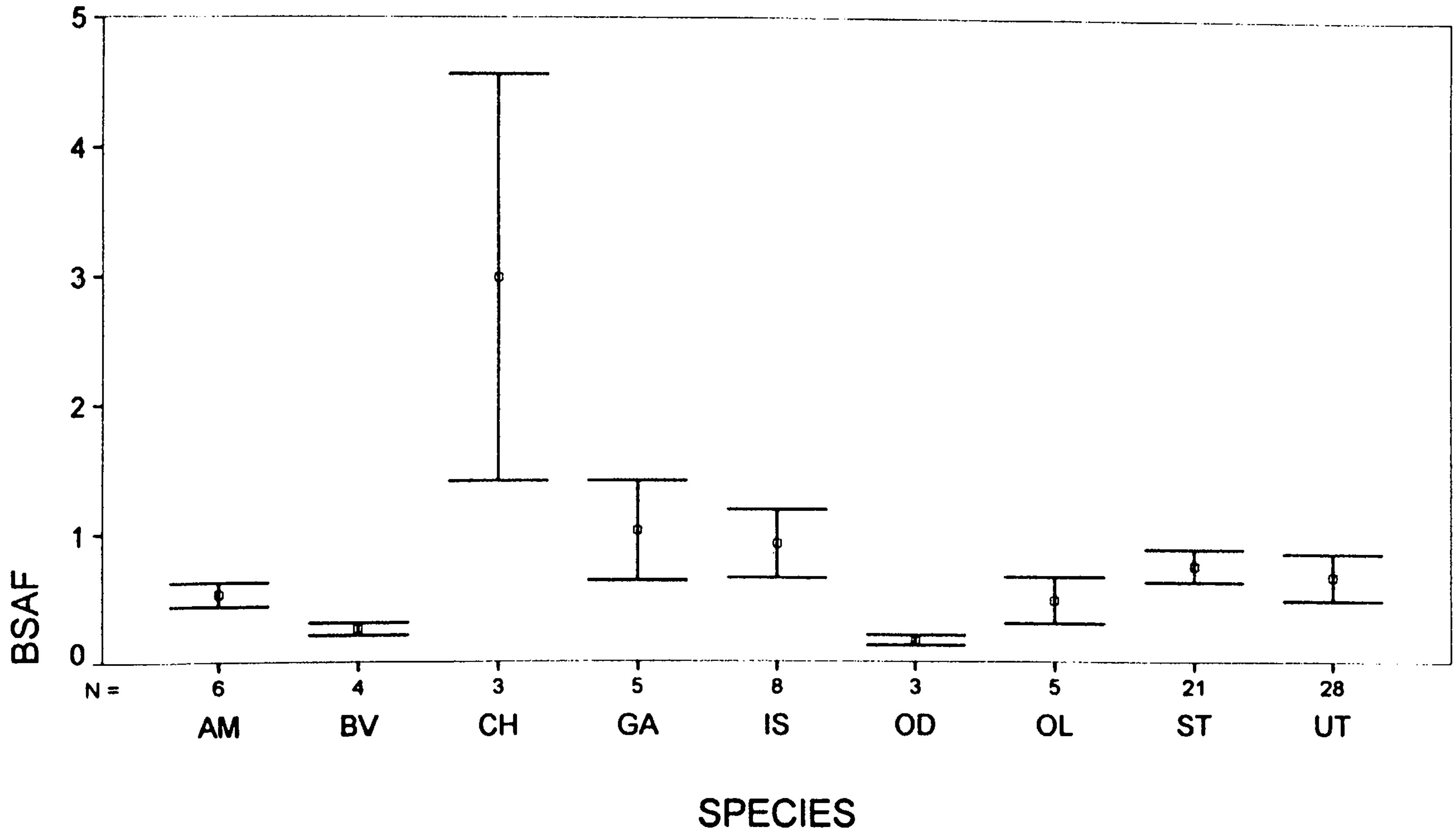
Database Release 3.1

HRP 002 1459

# Figure 10-14

## Mean +- 1 SE Benthic:Sediment Ratios

## by Species for BZ#28



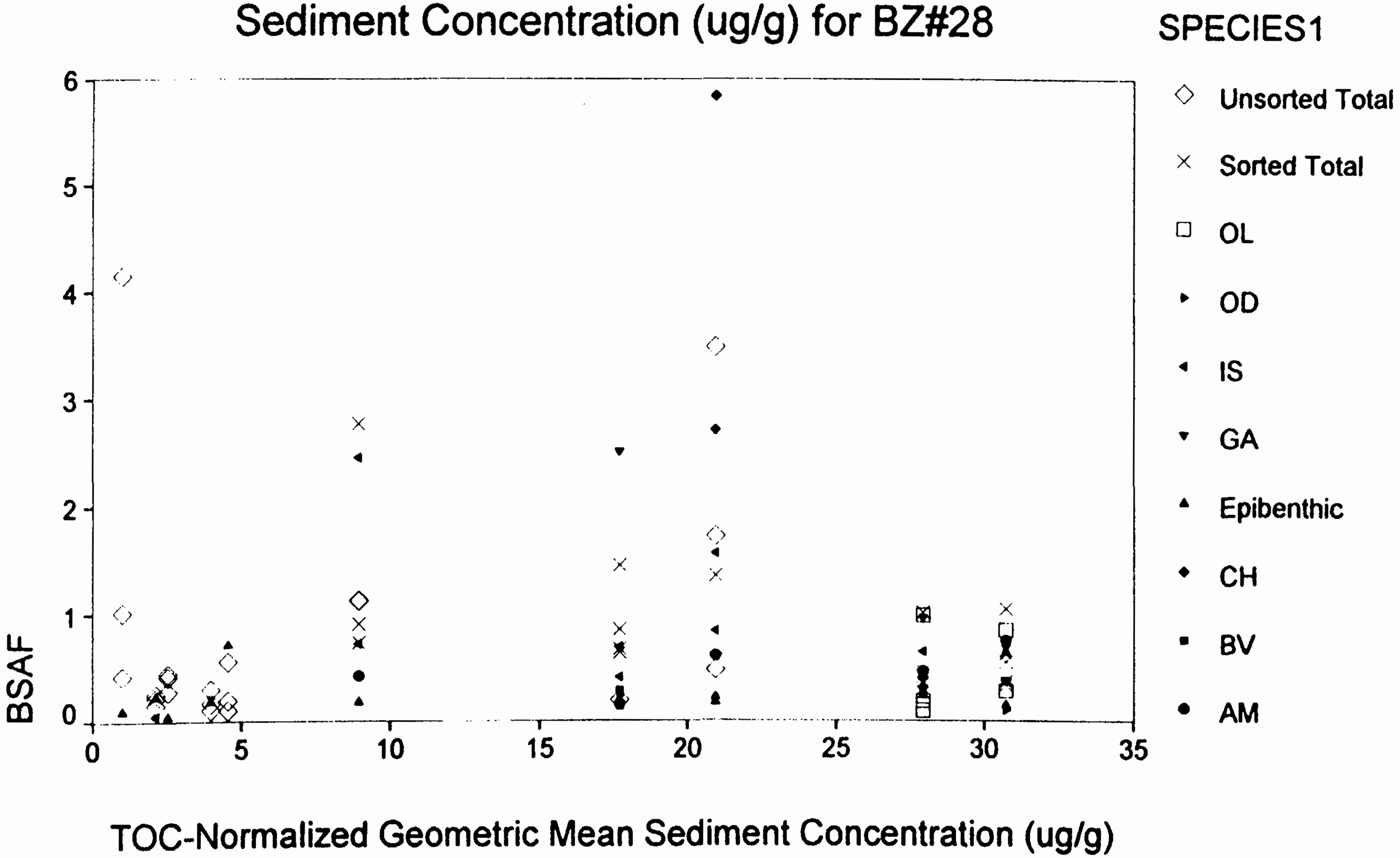

**Prepared by KvS 8 Aug 96**

**Database Release 3.1**

# Figure 10-15

## BSAF versus Geometric Mean

## Sediment Concentration (ug/g) for BZ#28




Prepared by KvS 1 Aug 96

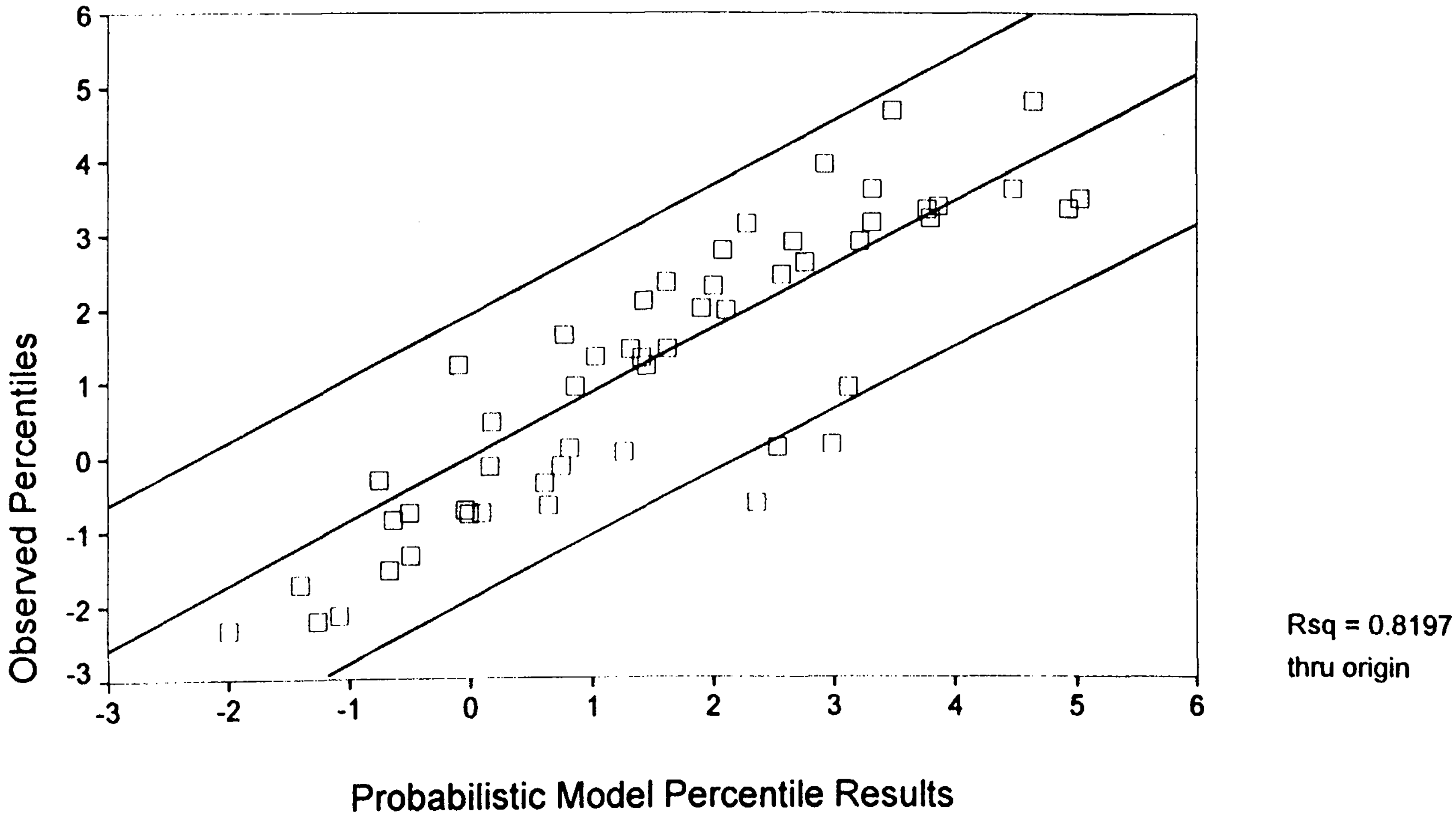
Database Release 3.1

HRP 002 1460

# Figure 10-16

## Goodness-of-Fit Statistics for

## BZ#28 in Benthic Invertebrates



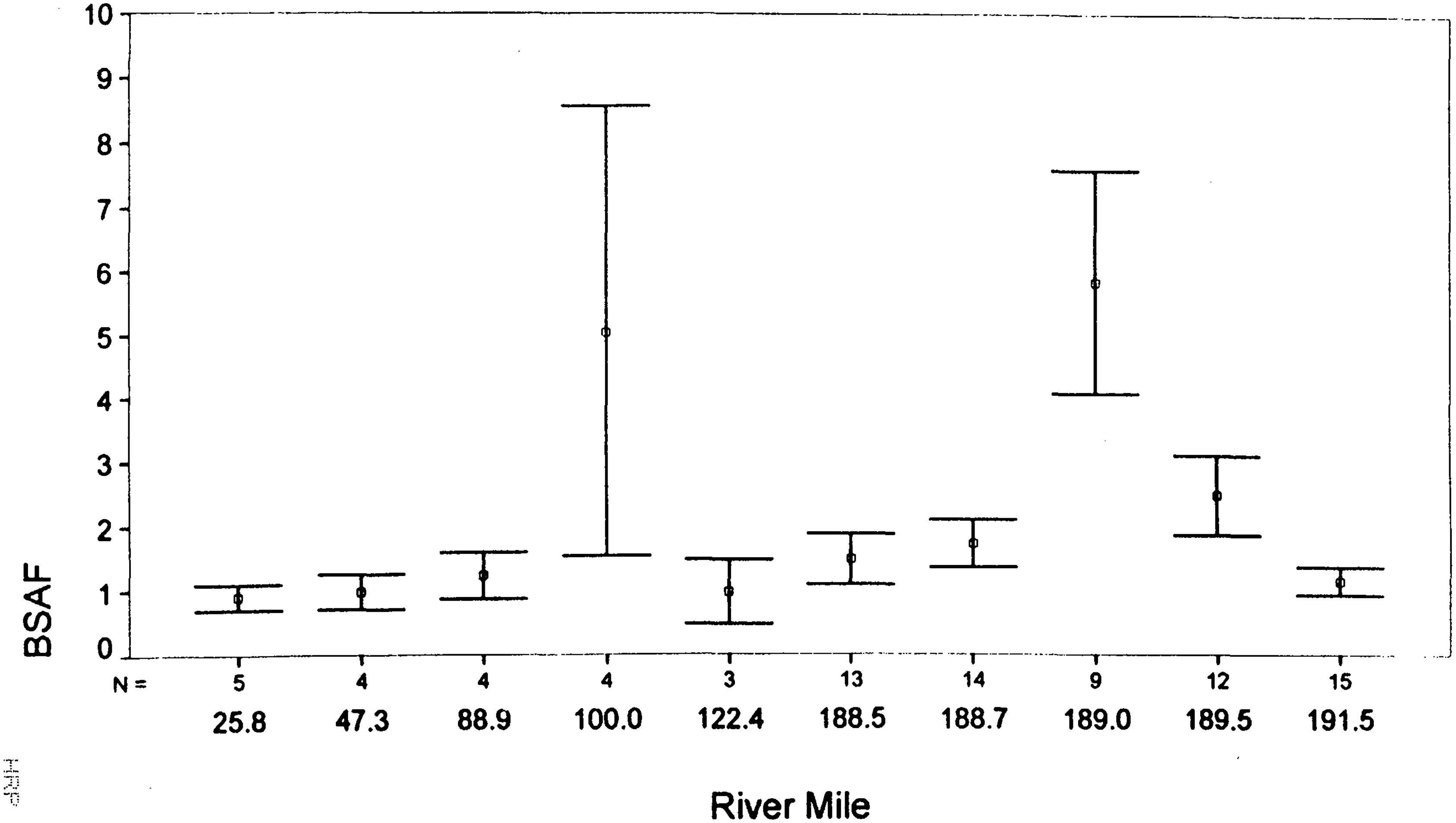

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-17

## Mean +- 1 SE Benthic:Sediment Ratios

## by River Mile for BZ#52




Prepared by KvS 8 Aug 96

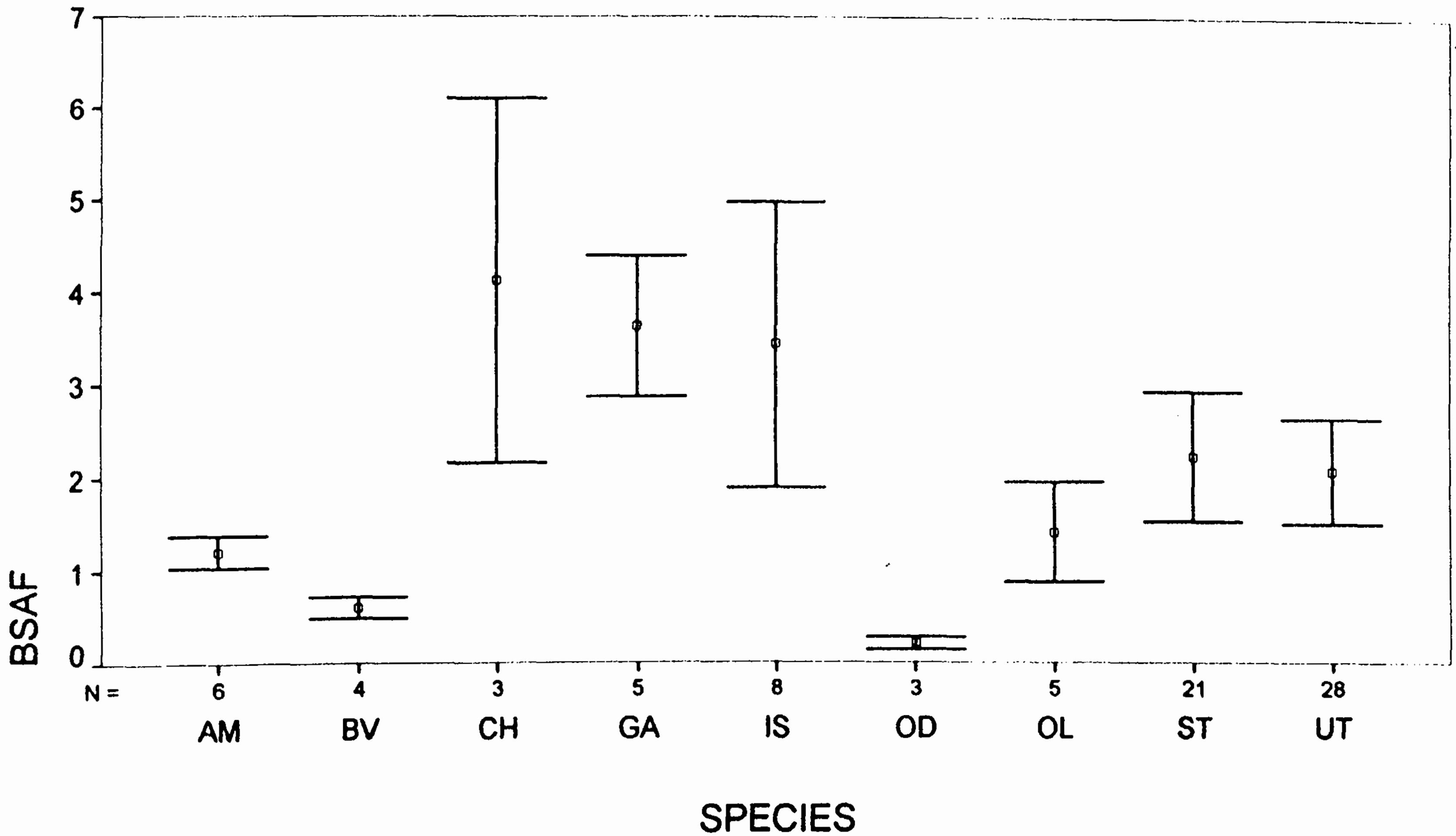
Database Release 3.1

HRP 002 1462

# Figure 10-18

## Mean +- 1 SE Benthic:Sediment Ratios

## by Species for BZ#52



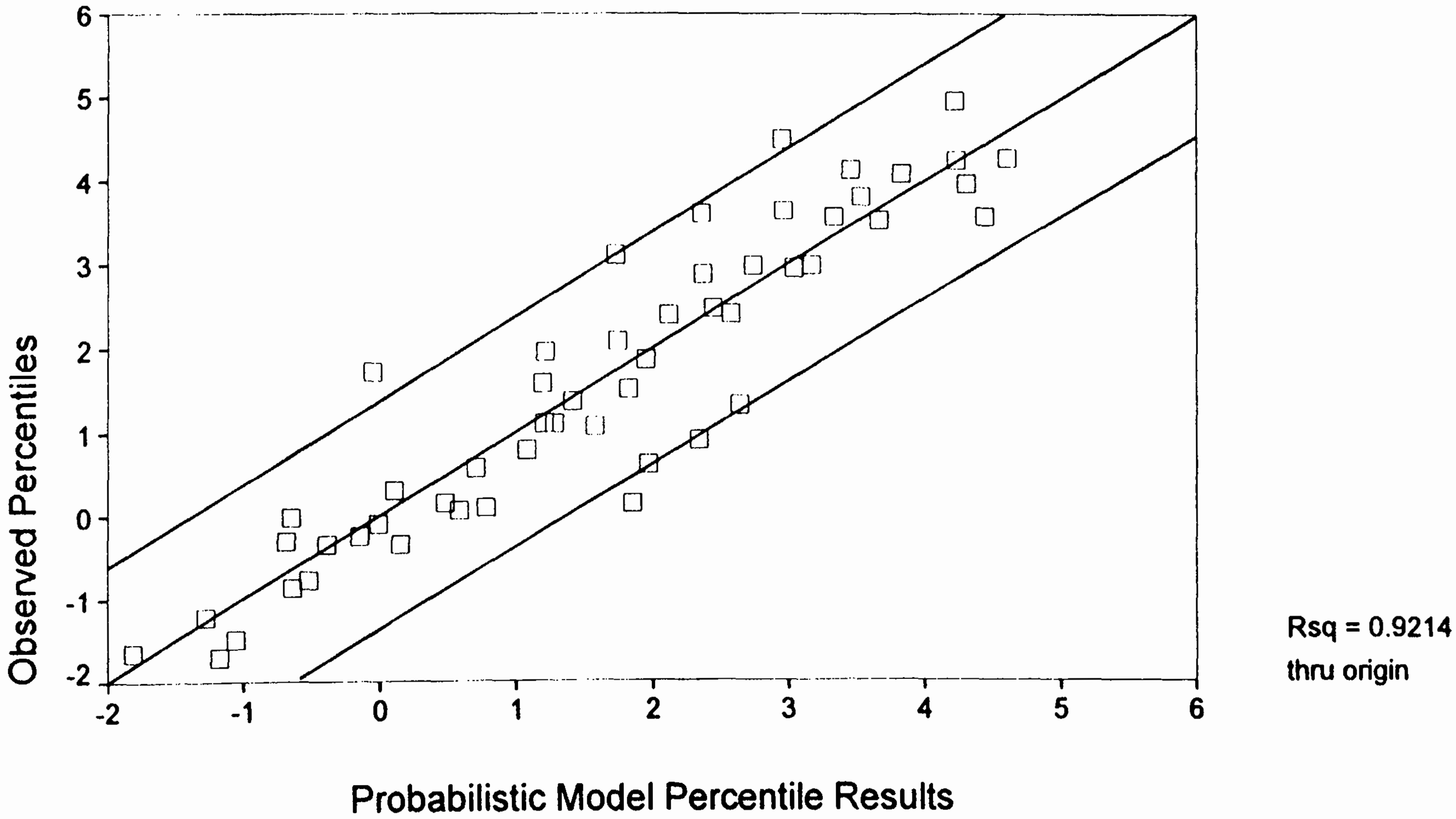

Prepared by KvS 8 Aug 96

Database Release 3.1

# Figure 10-20

## Goodness-of-Fit Statistics for

## BZ#52 in Benthic Invertebrates




Prepared by KvS 10 Aug 96

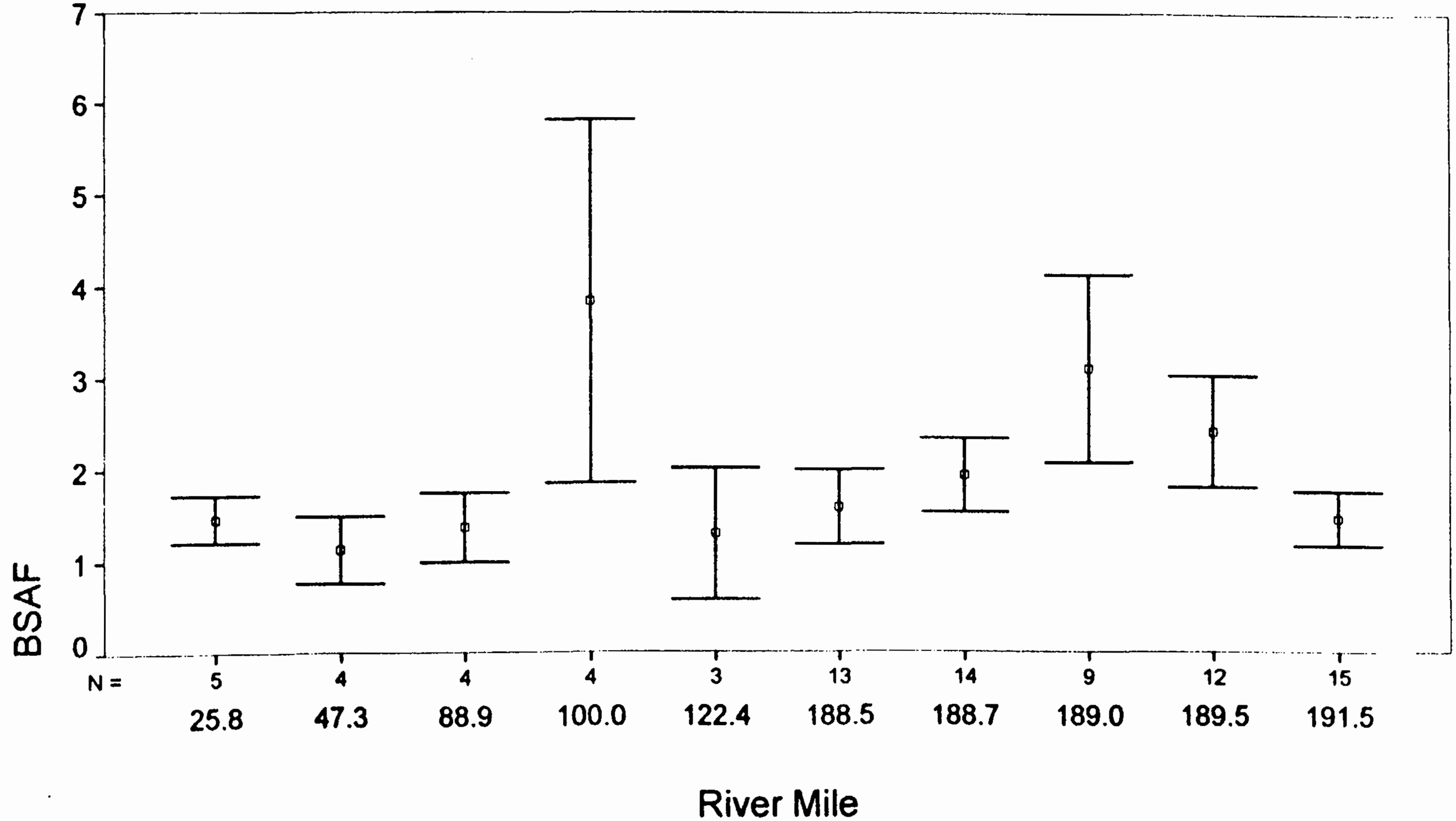
Database Release 3.1

HRP 002 1464

# Figure 10-21

## Mean +- 1 SE Benthic:Sediment Ratios

## by River Mile for BZ#101 and BZ#90



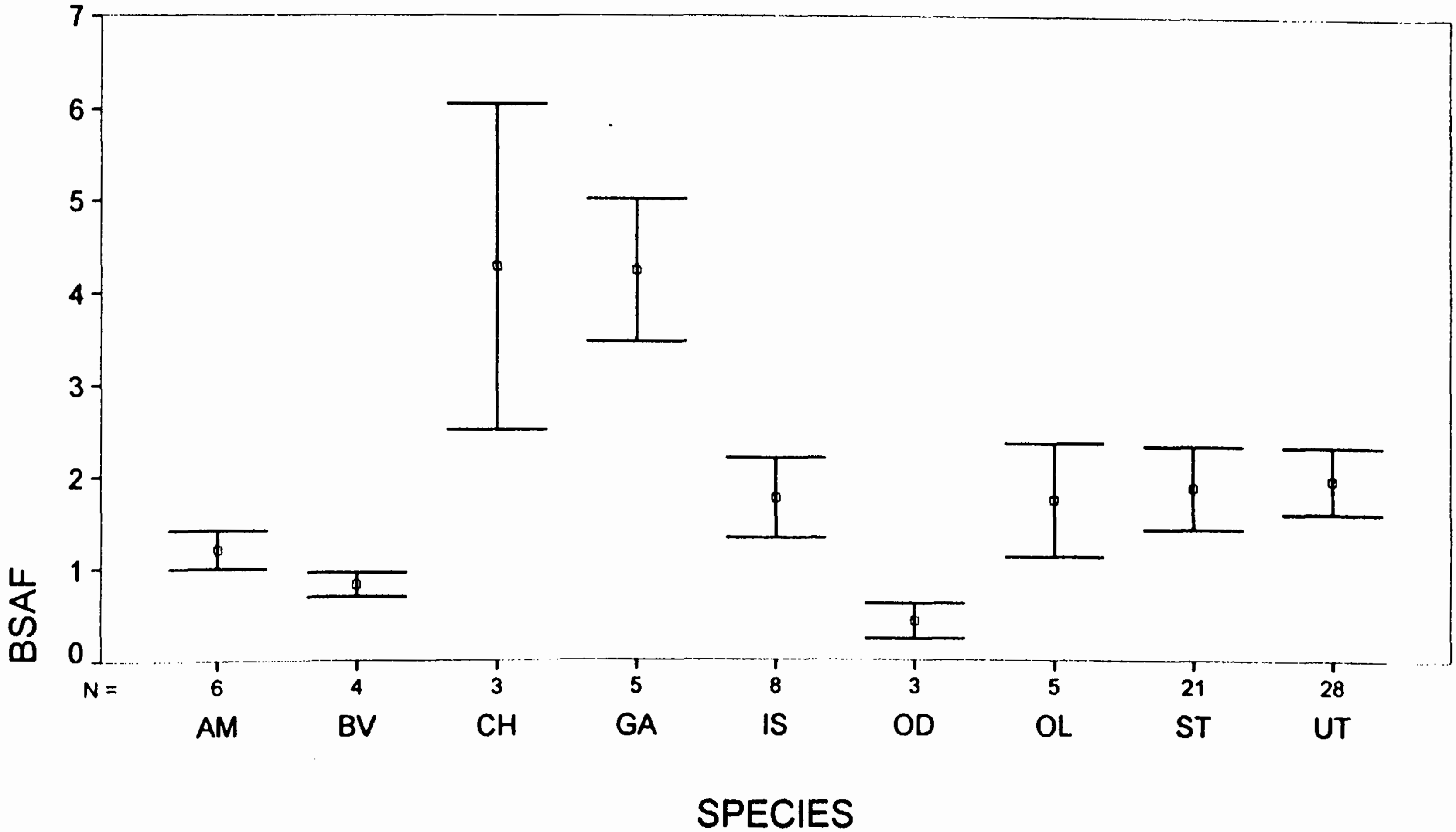

Prepared by KvS 8 Aug 96

Database Release 3.1

# Figure 10-22

## Mean +- 1 SE Benthic:Sediment Ratios

## by Species for BZ#101 & BZ#90




Prepared by KvS 8 Aug 96

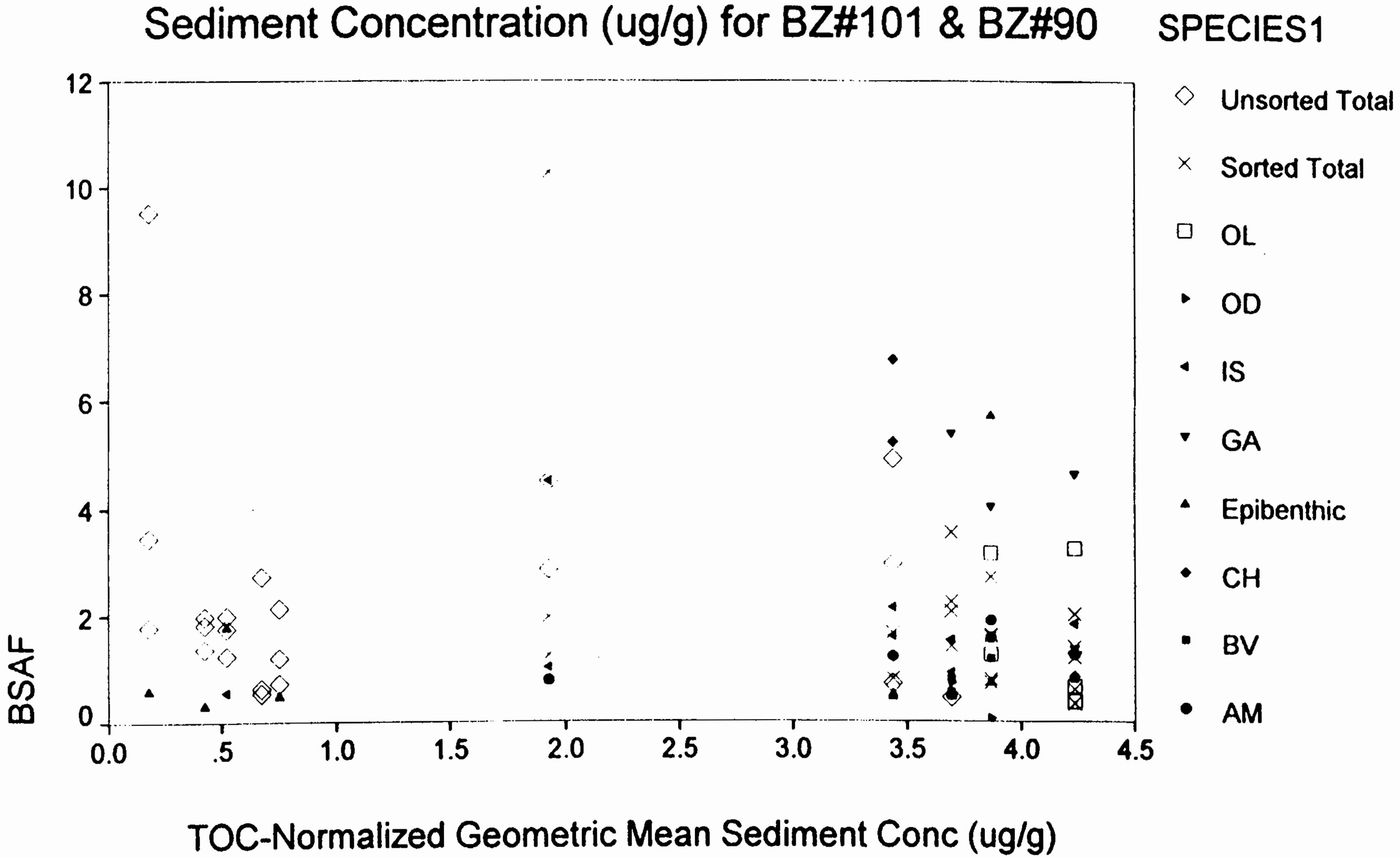
Database Release 3.1

HRP 002 1466

# Figure 10-23

## BSAF versus Geometric Mean

## Sediment Concentration (ug/g) for BZ#101 & BZ#90



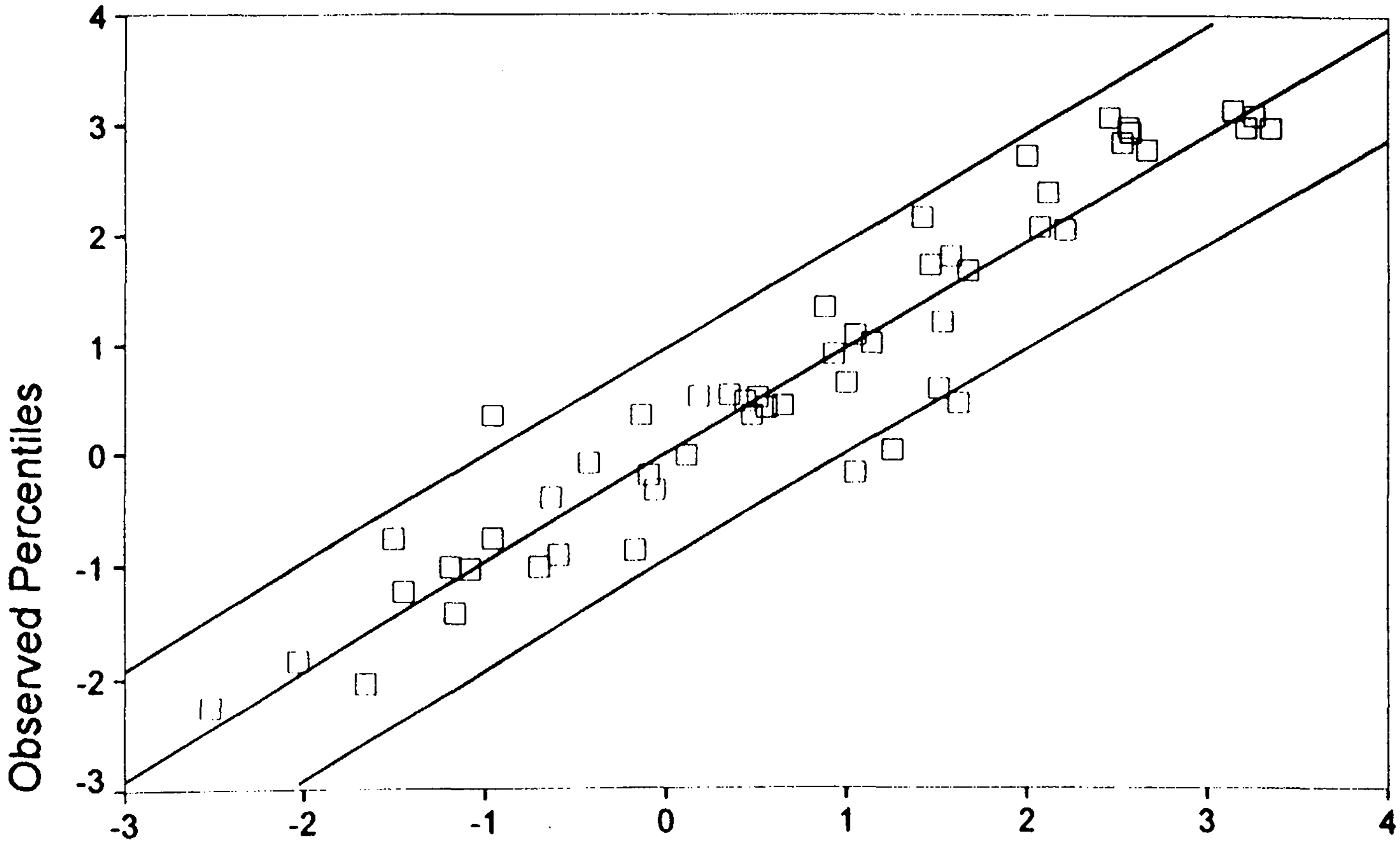

Prepared by KvS 1 Aug 96

Database Release 3.1

# Figure 10-24

## Goodness-of-Fit Statistics for

## BZ#101 & BZ#90 in Benthic Invertebrates




Rsq = 0.9189
thru origin

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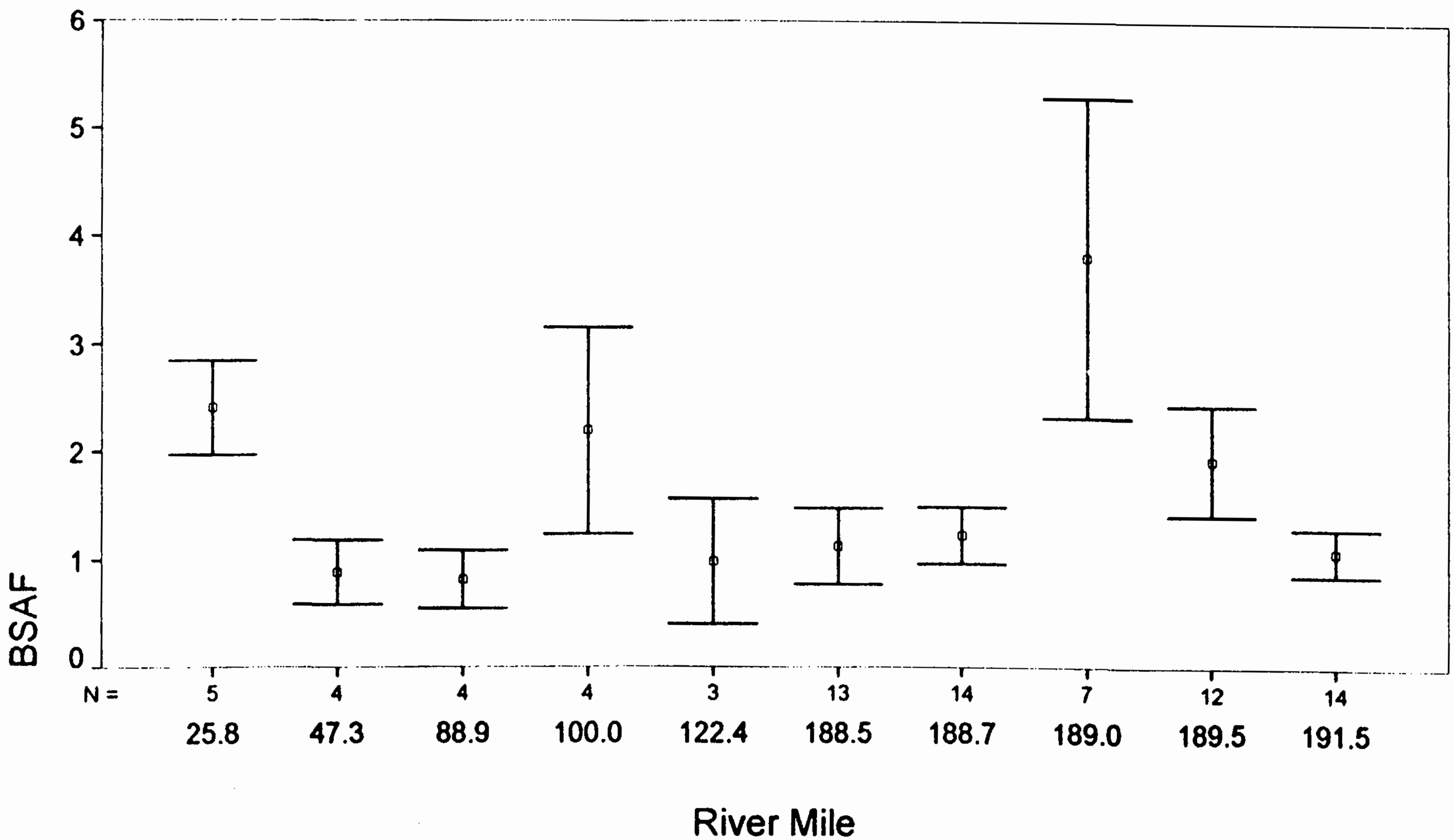
HRP 002 1468

# Figure 10-25

## Mean +- 1 SE Benthic:Sediment Ratios

## by River Mile for BZ#138




Prepared by KvS 15 Jul 96

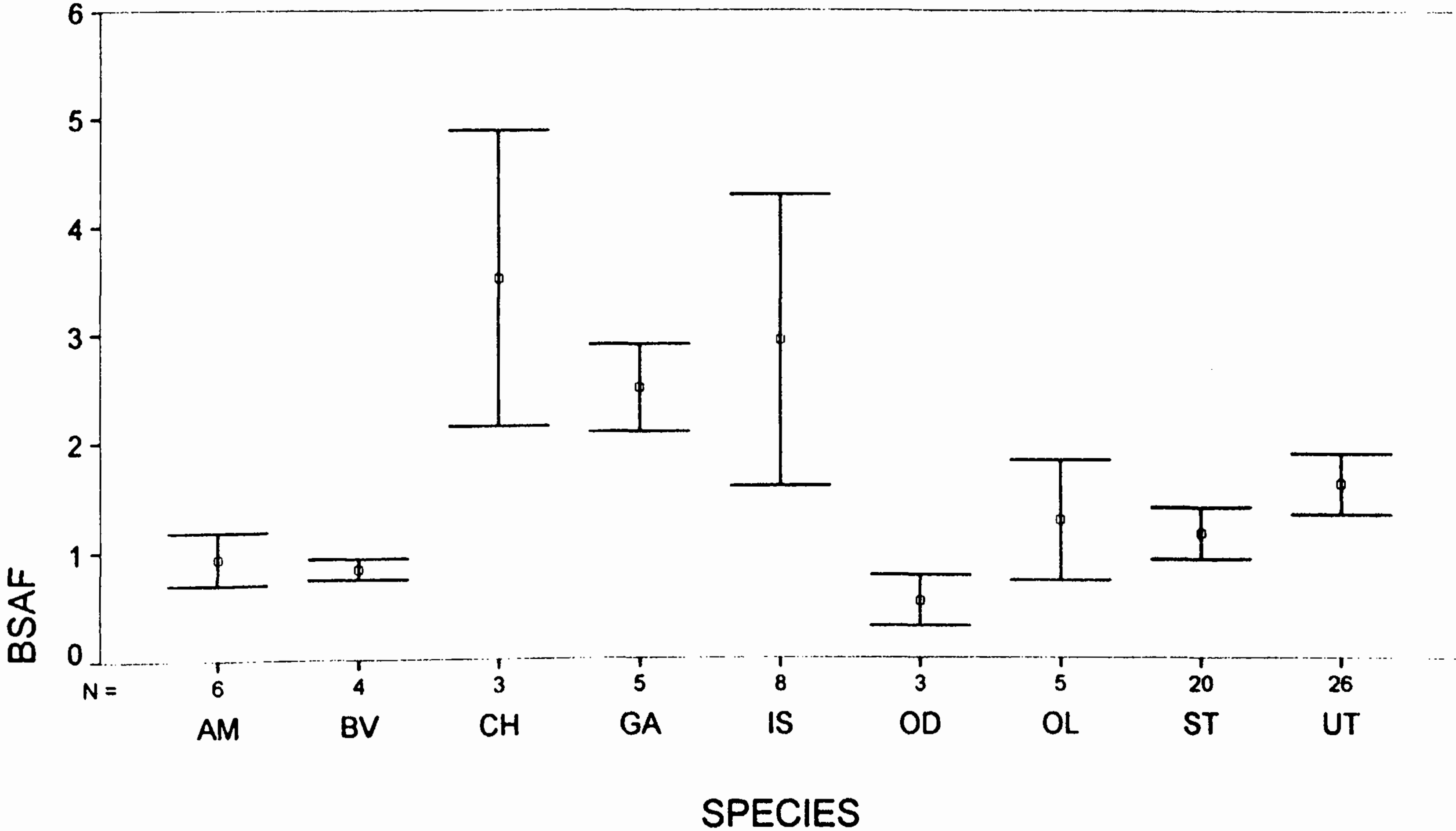
Database Release 3.1

HRP 002 1469

# Figure 10-26

## Mean +- 1 SE Benthic:Sediment Ratios

## by Species for BZ#138



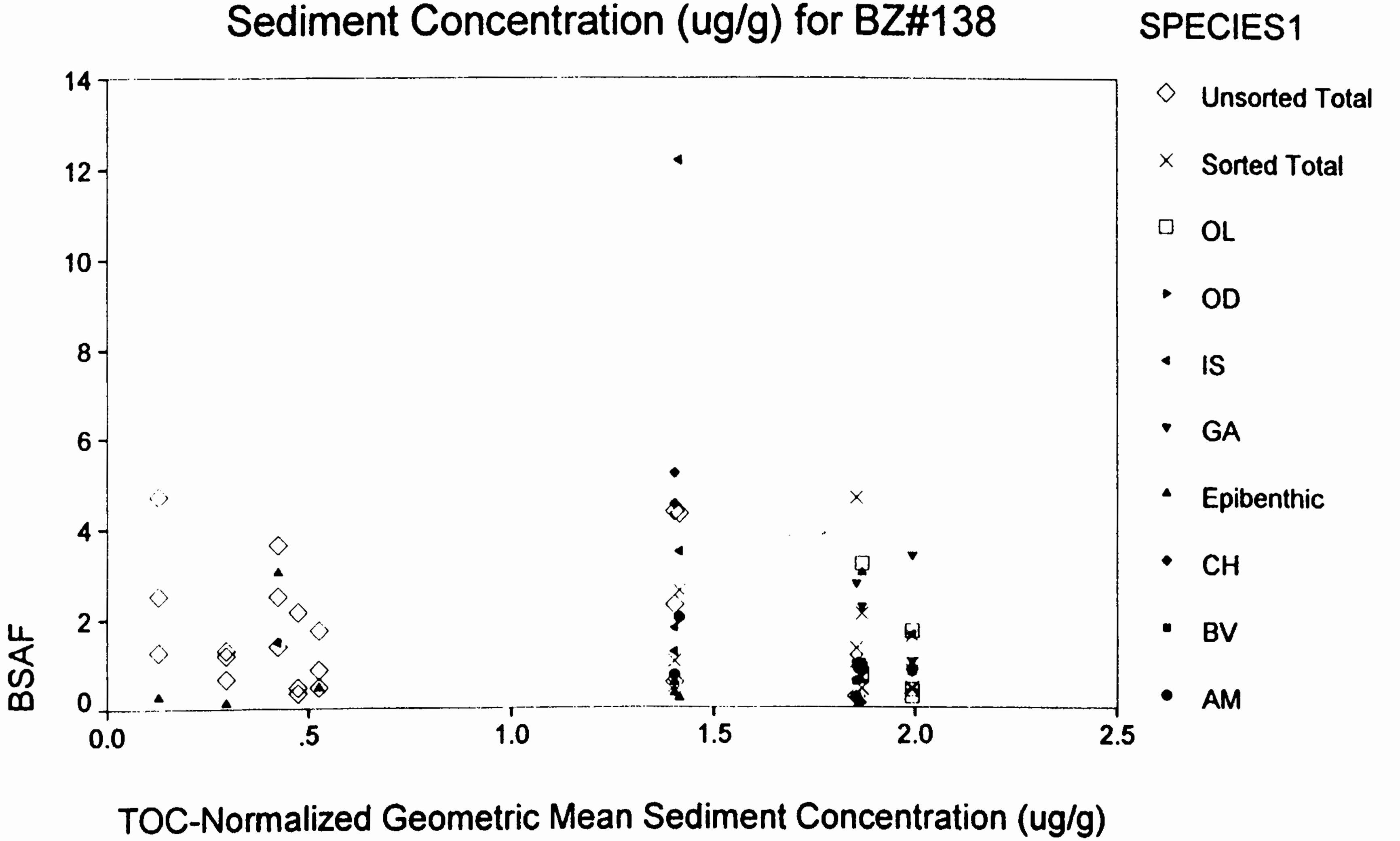

Prepared by KvS 15 Jul 96

Database Release 3.1

# Figure 10-27

## BSAF versus Geometric Mean

## Sediment Concentration (ug/g) for BZ#138



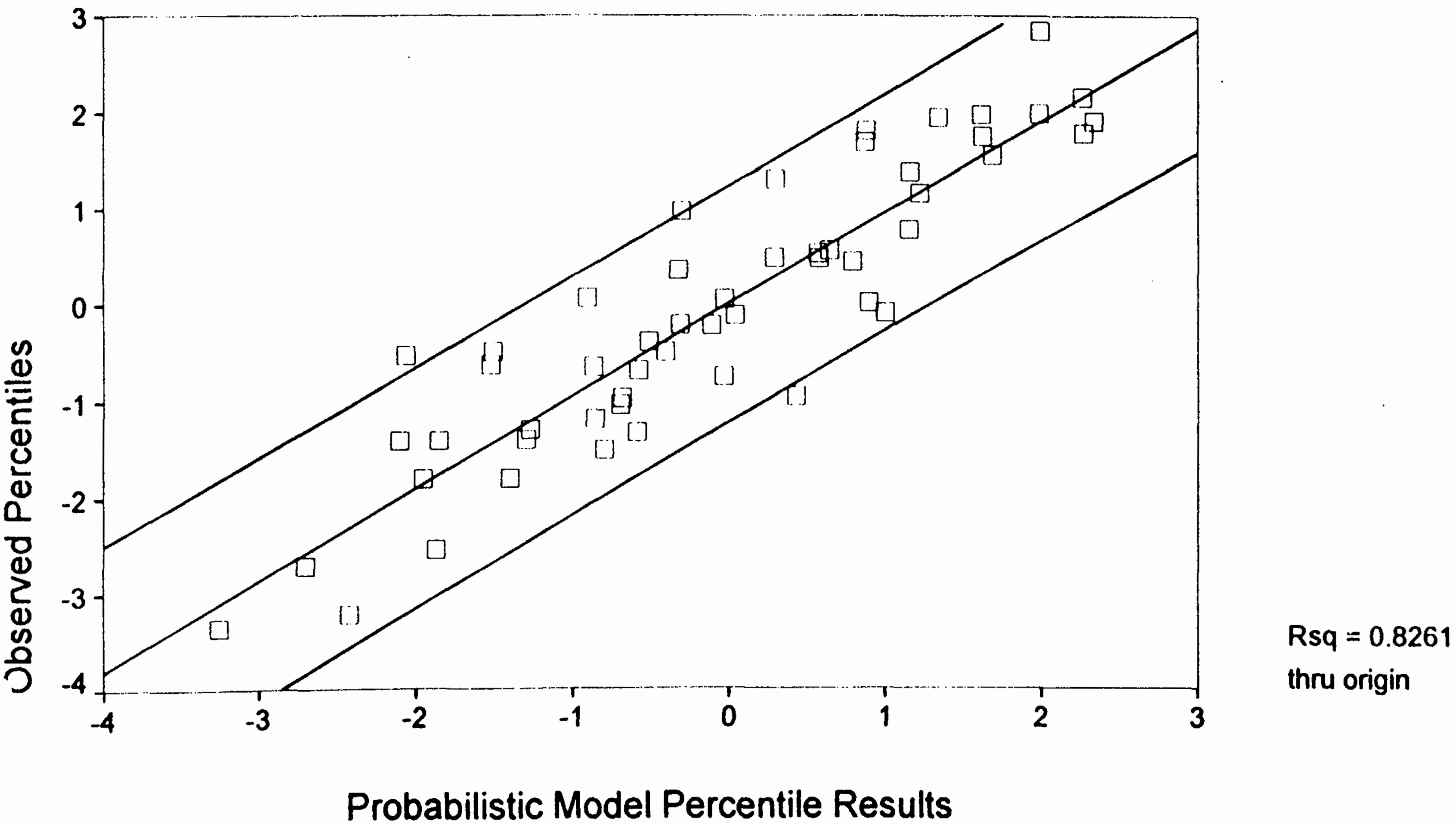

Prepared by KvS 1 Aug 96

Database Release 3.1

# Figure 10-28

## Goodness-of-Fit Statistics for

## BZ#138 in Benthic Invertebrates




Prepared by KvS 10 Aug 96

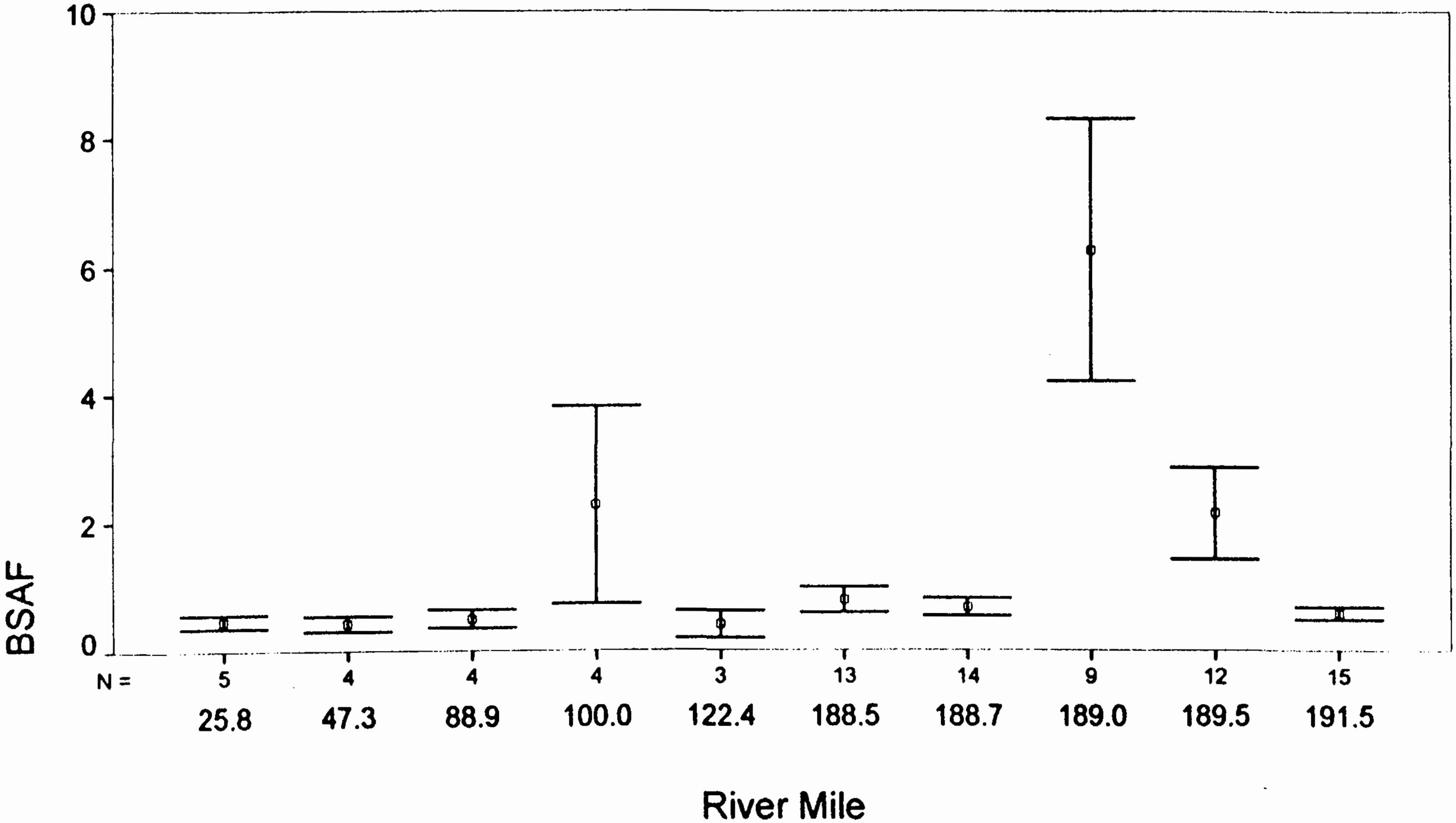
Database Release 3.1

HRP 002 1472

# Figure 10-29

## Mean +- 1 SE Benthic:Sediment Ratios

## by River Mile for Aroclor 1016



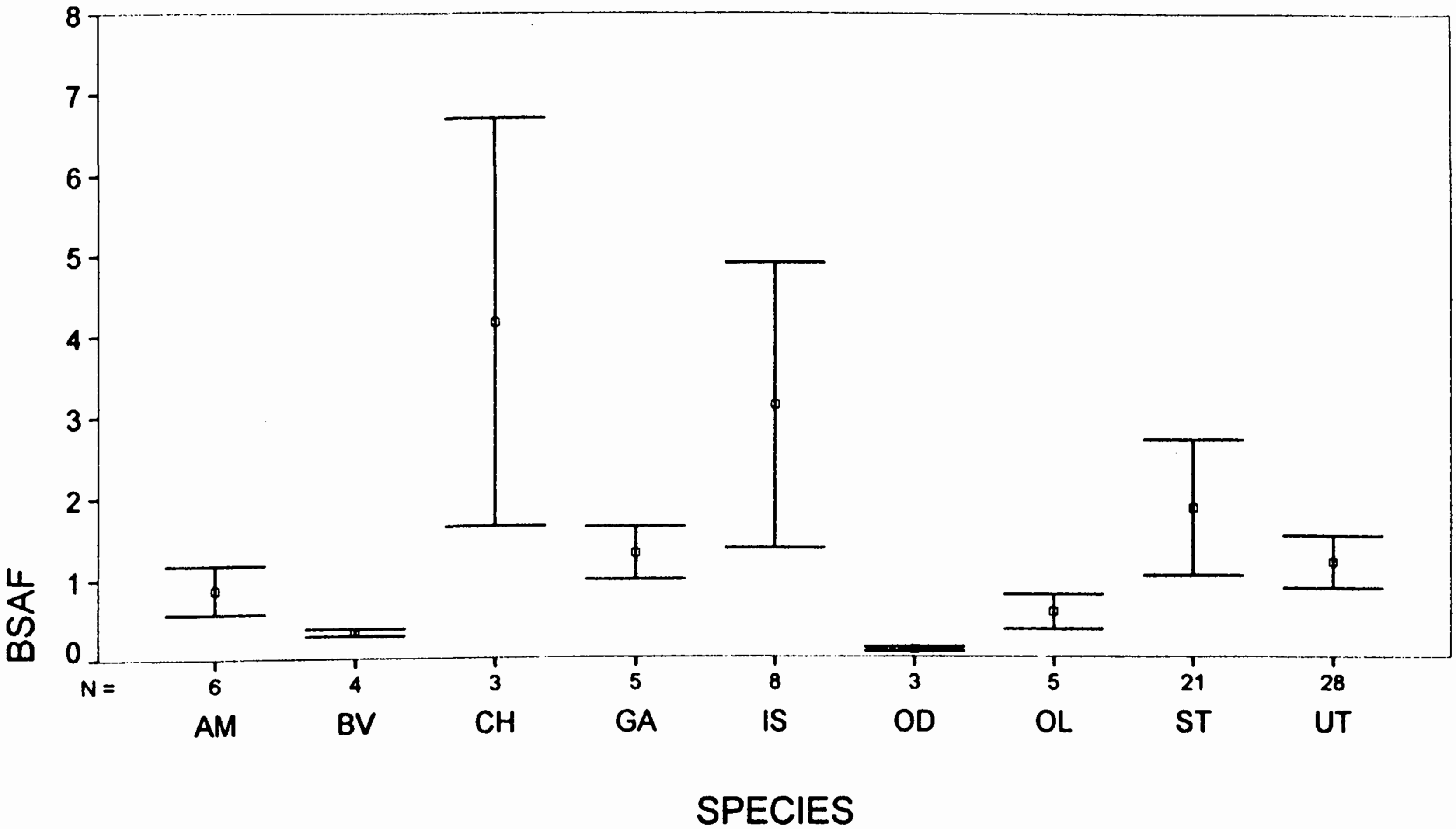

Prepared by KvS 15 Jul 96

Database Release 3.1

# Figure 10-30

## Mean +- 1 SE Benthic:Sediment Ratios

## by Species for Aroclor 1016




Prepared by KvS 15 Jul 96

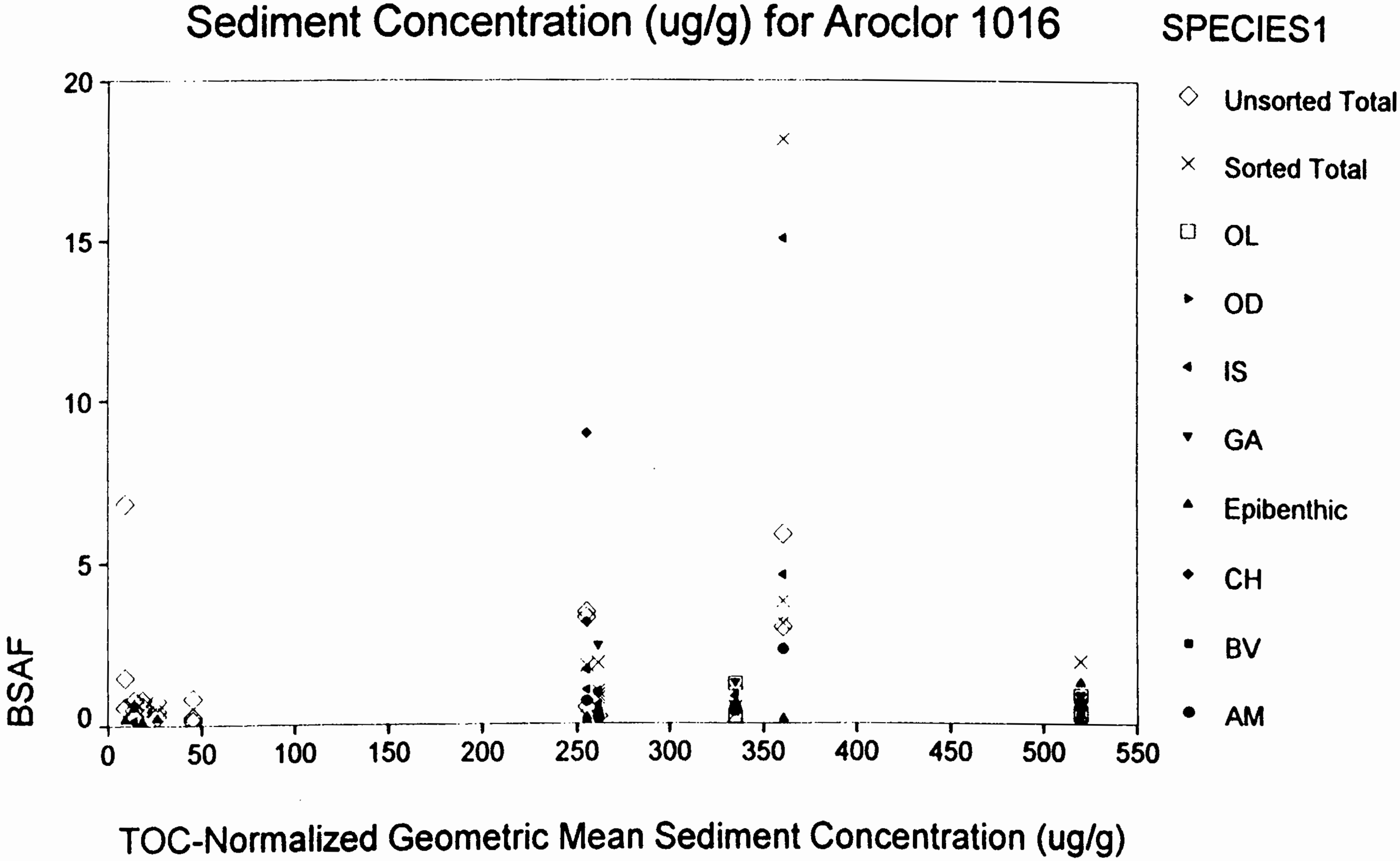
Database Release 3.1

HRP 002 1474

# Figure 10-31

## BSAF versus Geometric Mean

## Sediment Concentration (ug/g) for Aroclor 1016




Prepared by KvS 1 Aug 96

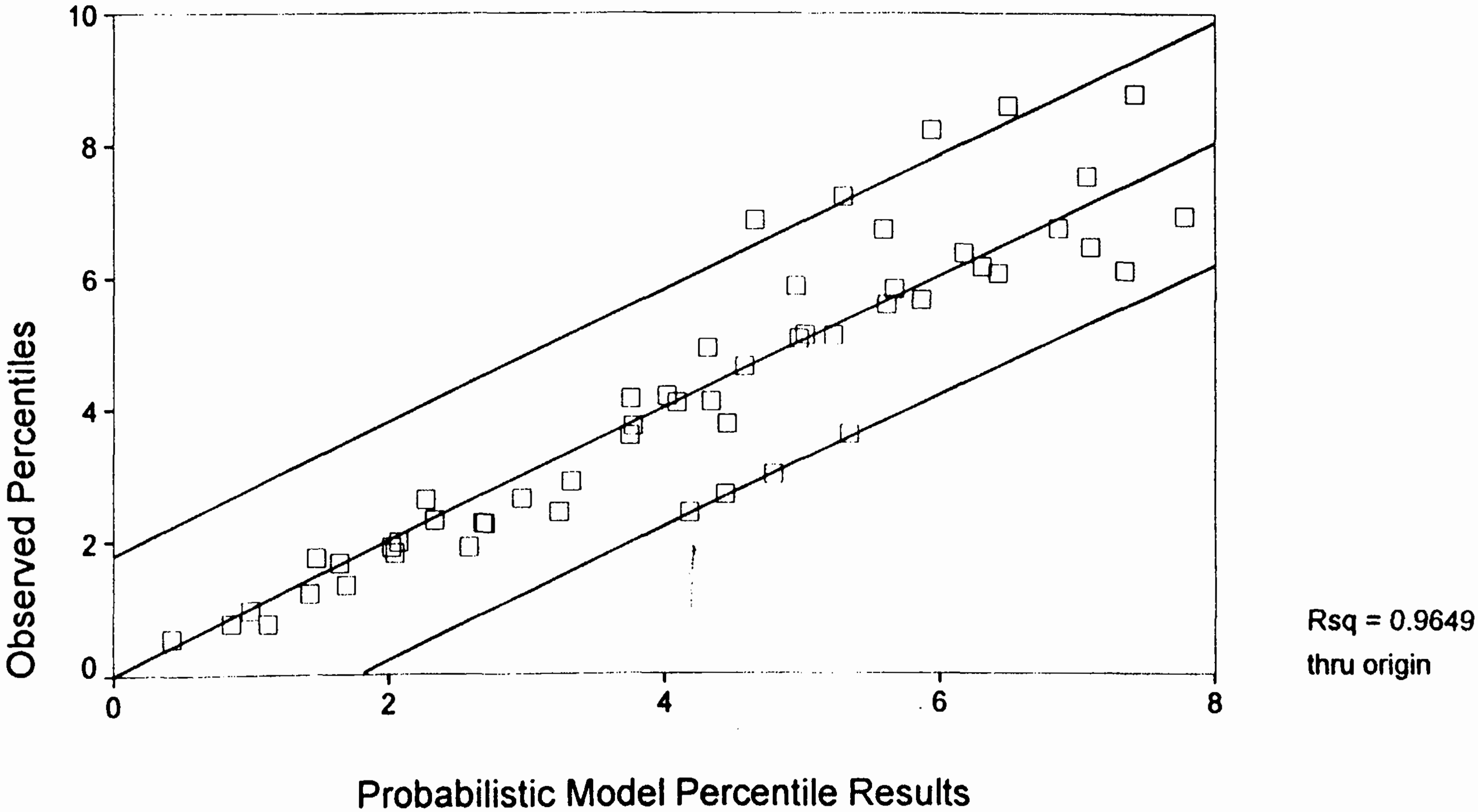
Database Release 3.1

HRP 002 1475

# Figure 10-32

## Goodness-of-Fit Statistics for

## Aroclor 1016 in Benthic Invertebrates




Prepared by KvS 10 Aug 96

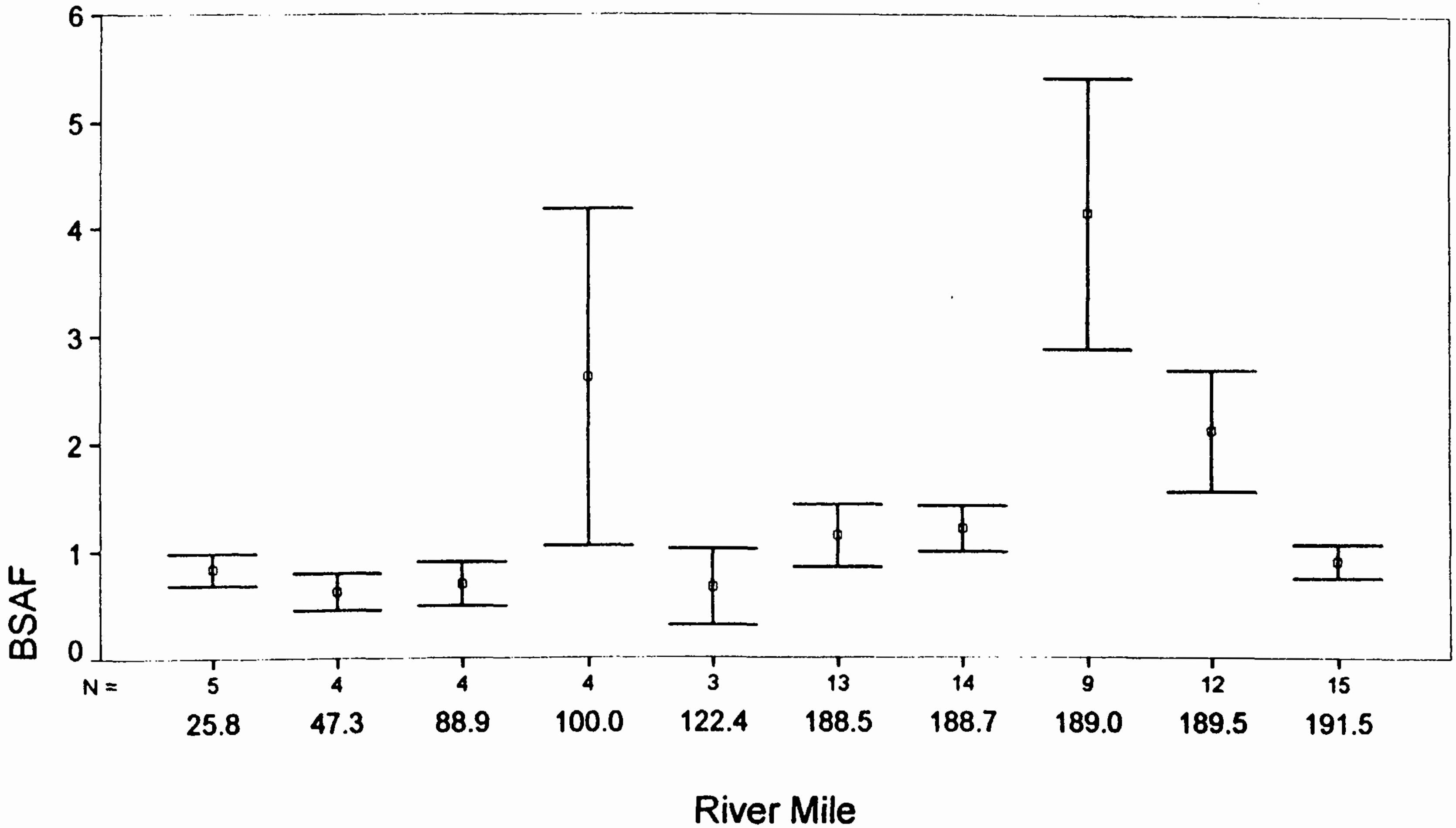
Database Release 3.1

HRP 002 1476

# Figure 10-33

## Mean +- 1 SE Benthic:Sediment Ratios

## by River Mile for Aroclor 1254




Prepared by KvS 15 Jul 96

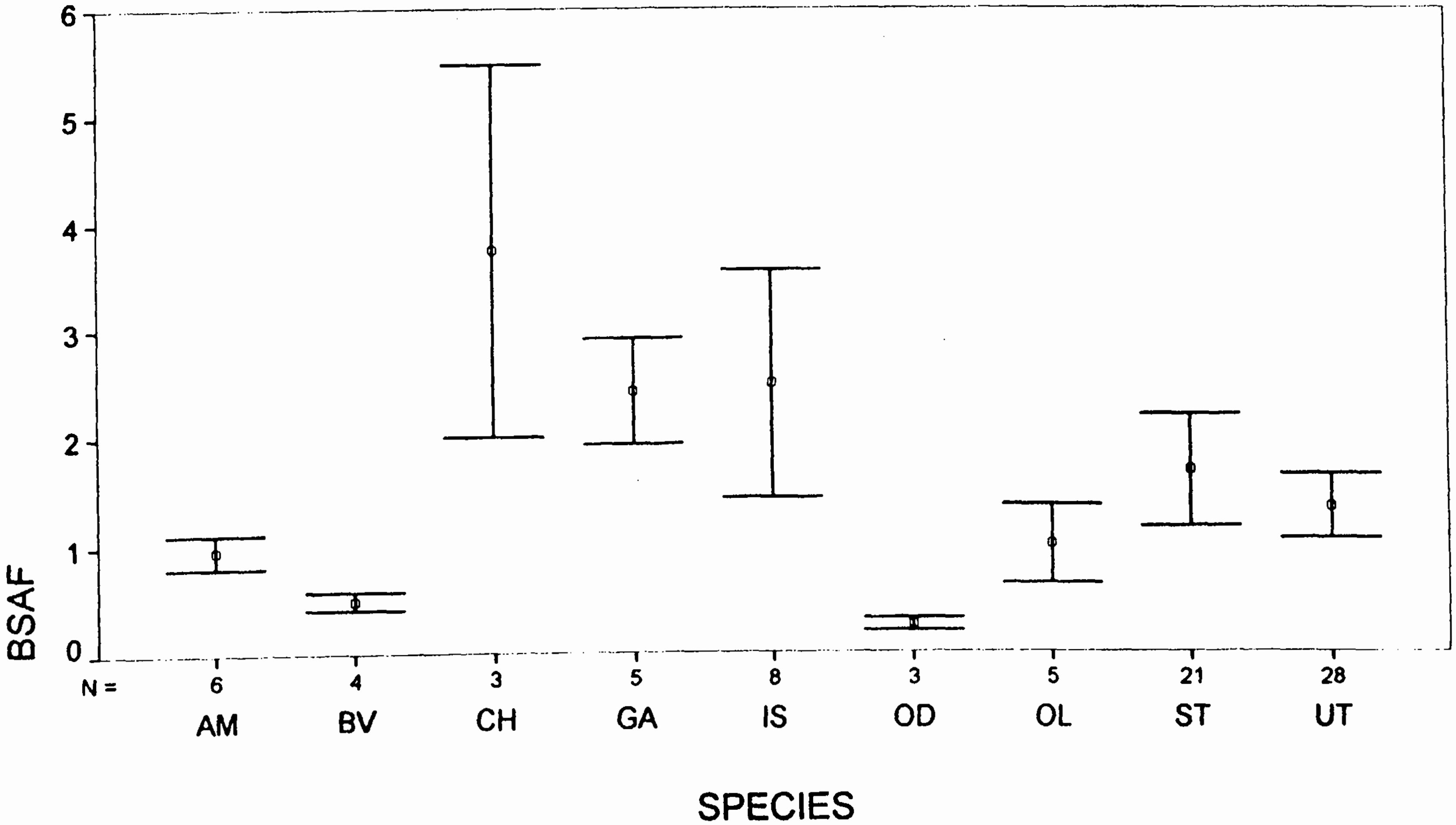
Database Release 3.1

HRP 002 1477

# Figure 10-34

## Mean +- 1 SE Benthic:Sediment Ratios

## by Species for Aroclor 1254



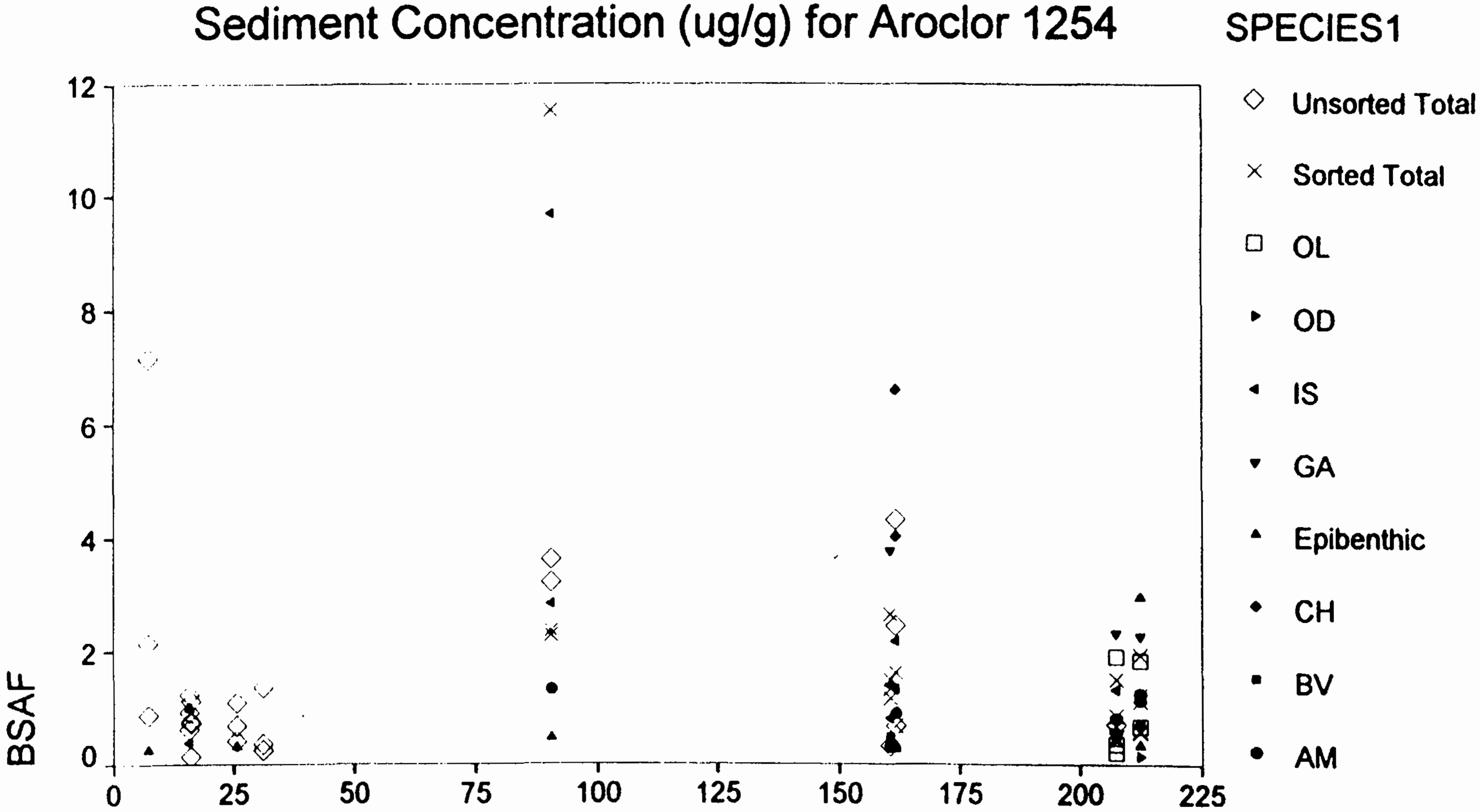

Prepared by KvS 15 Jul 96

Database Release 3.1

# Figure 10-35

## BSAF versus Geometric Mean

## Sediment Concentration (ug/g) for Aroclor 1254




TOC-Normalized Geometric Mean Sediment Concentration (ug/g)

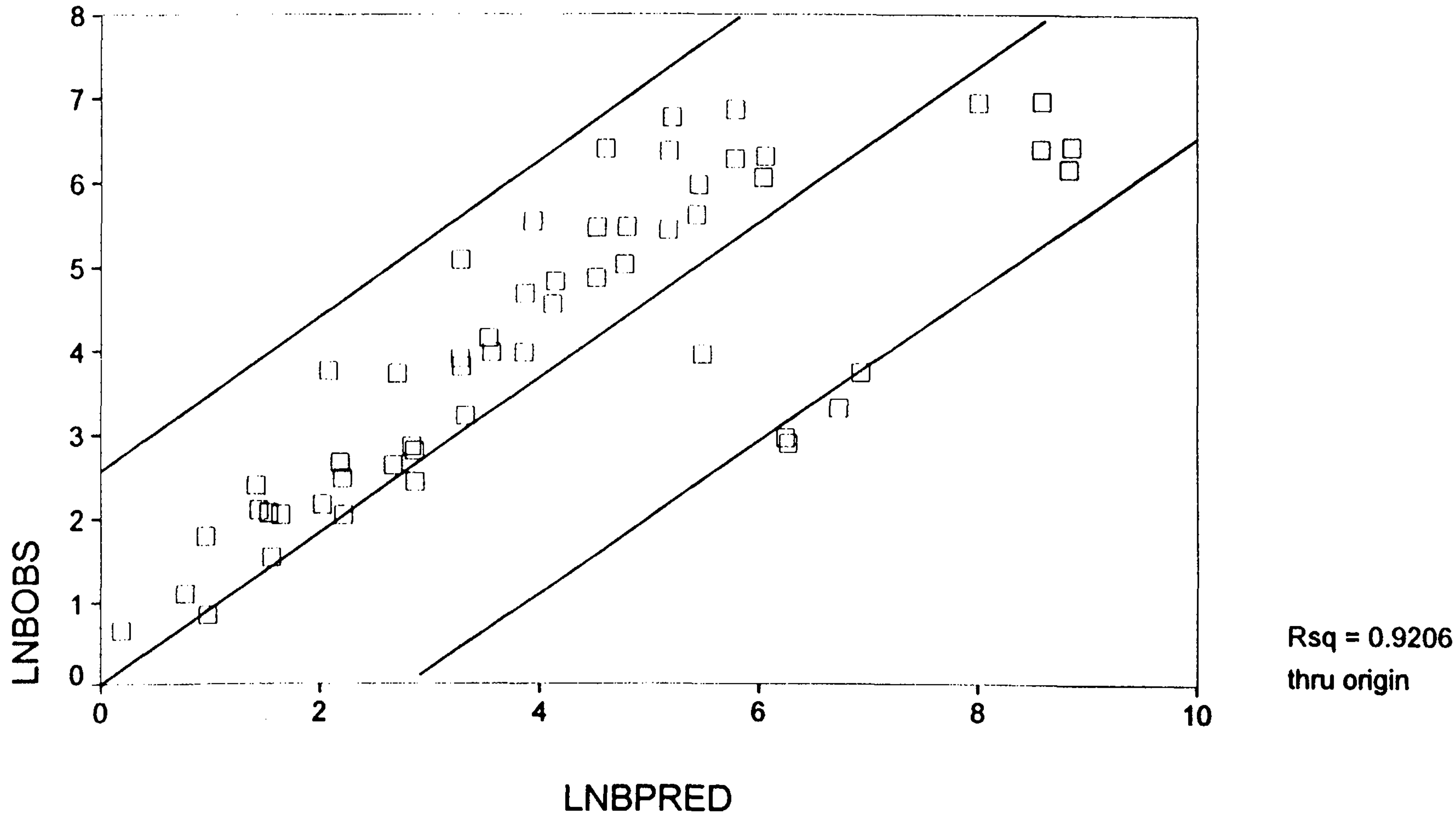
Prepared by KvS 1 Aug 96

Database Release 3.1

# Figure 10-36

## Goodness-of-Fit Statistics for

## Aroclor 1254 in Benthic Invertebrates




Prepared by KvS 10 Aug 96

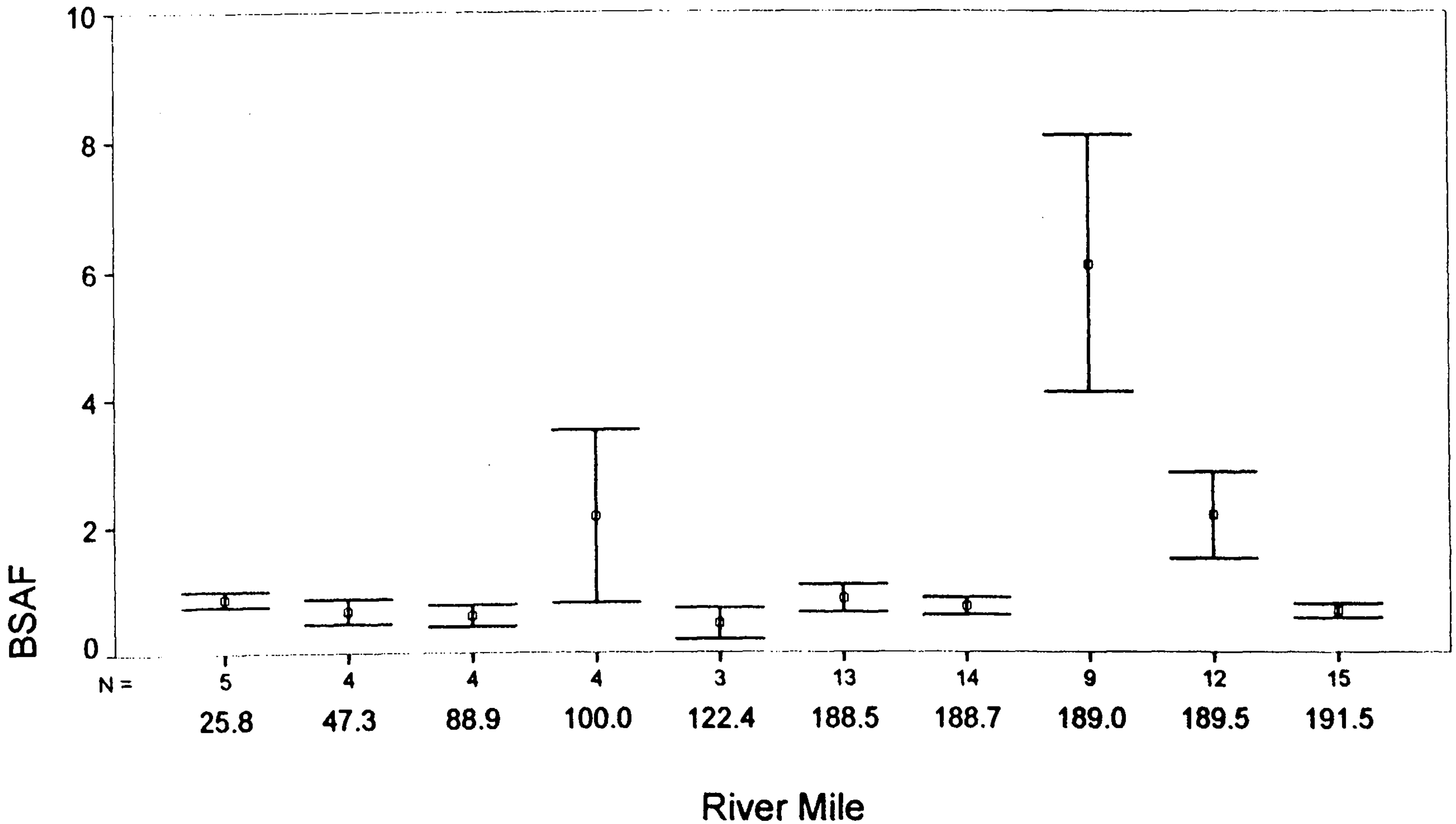
Database Release 3.1

HRP 002 1480

# Figure 10-37

## Mean +- 1 SE Benthic:Sediment Ratios

## by River Mile for Total PCBs




Prepared by KvS 15 Jul 96

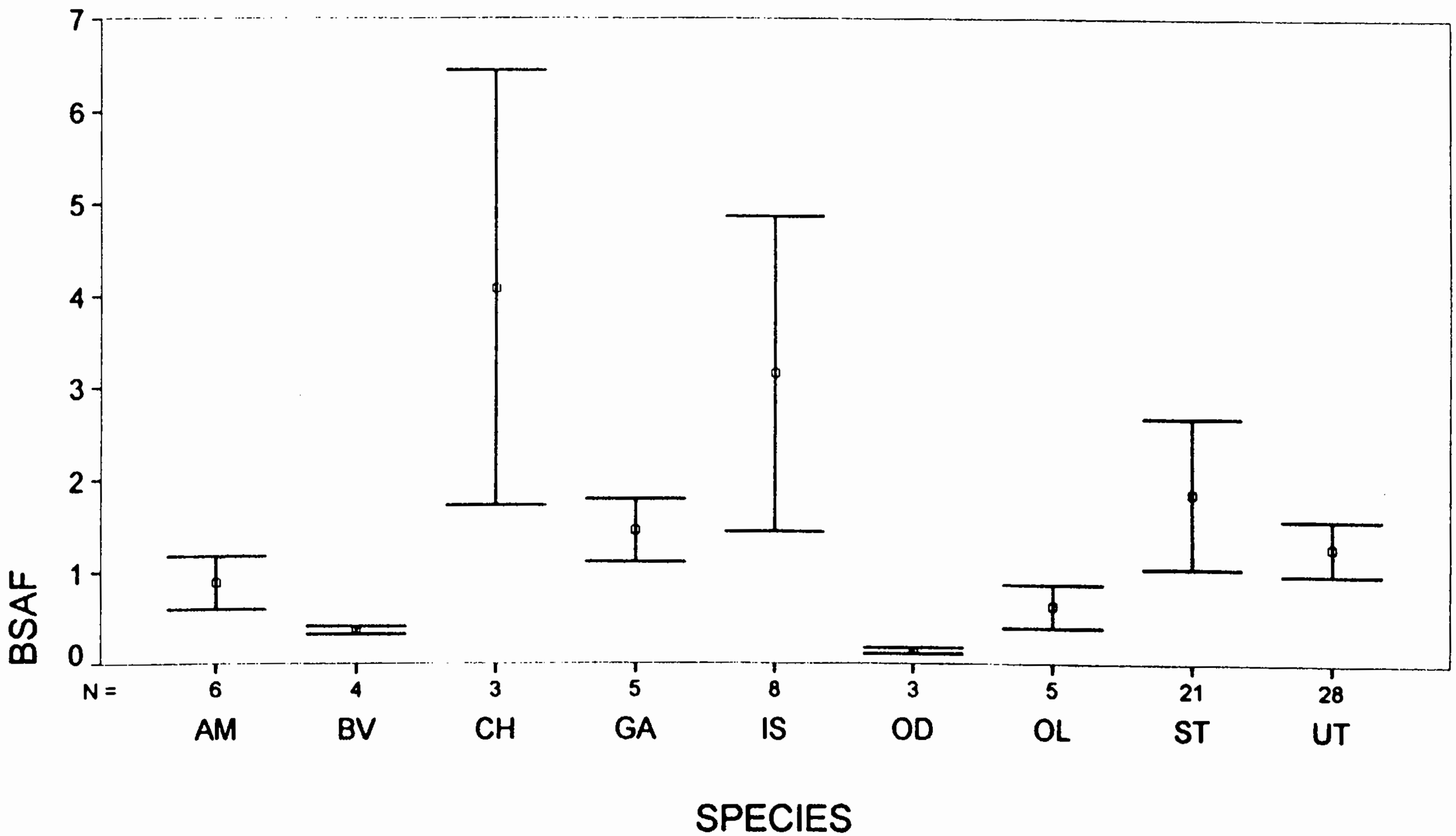
Database Release 3.1

HRP 002 1481

# Figure 10-38

## Mean +- 1 SE Benthic:Sediment Ratios

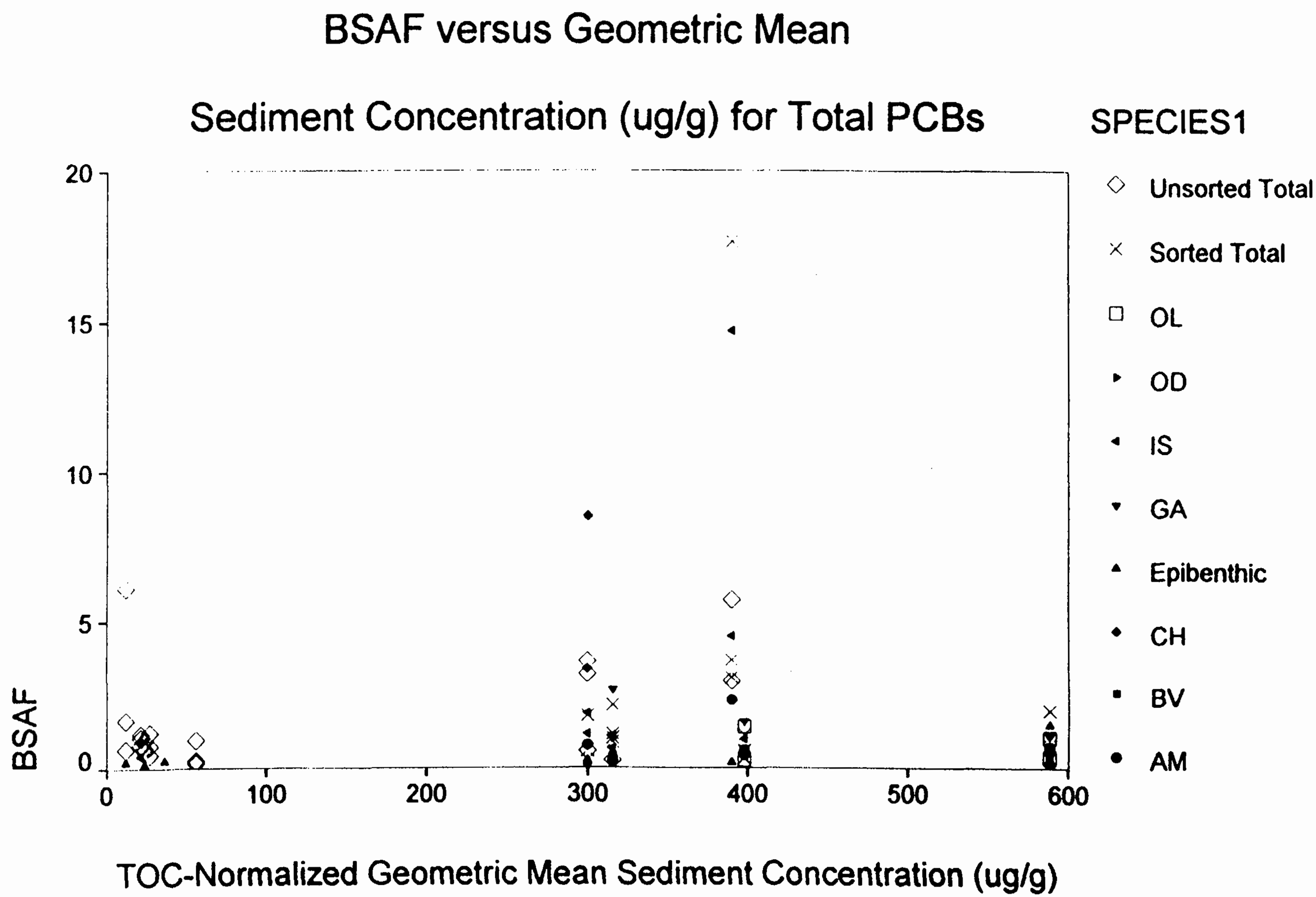
## by Species for Total PCBs




Prepared by KvS 8 Aug 96

Database Release 3.1

# Figure 10-39



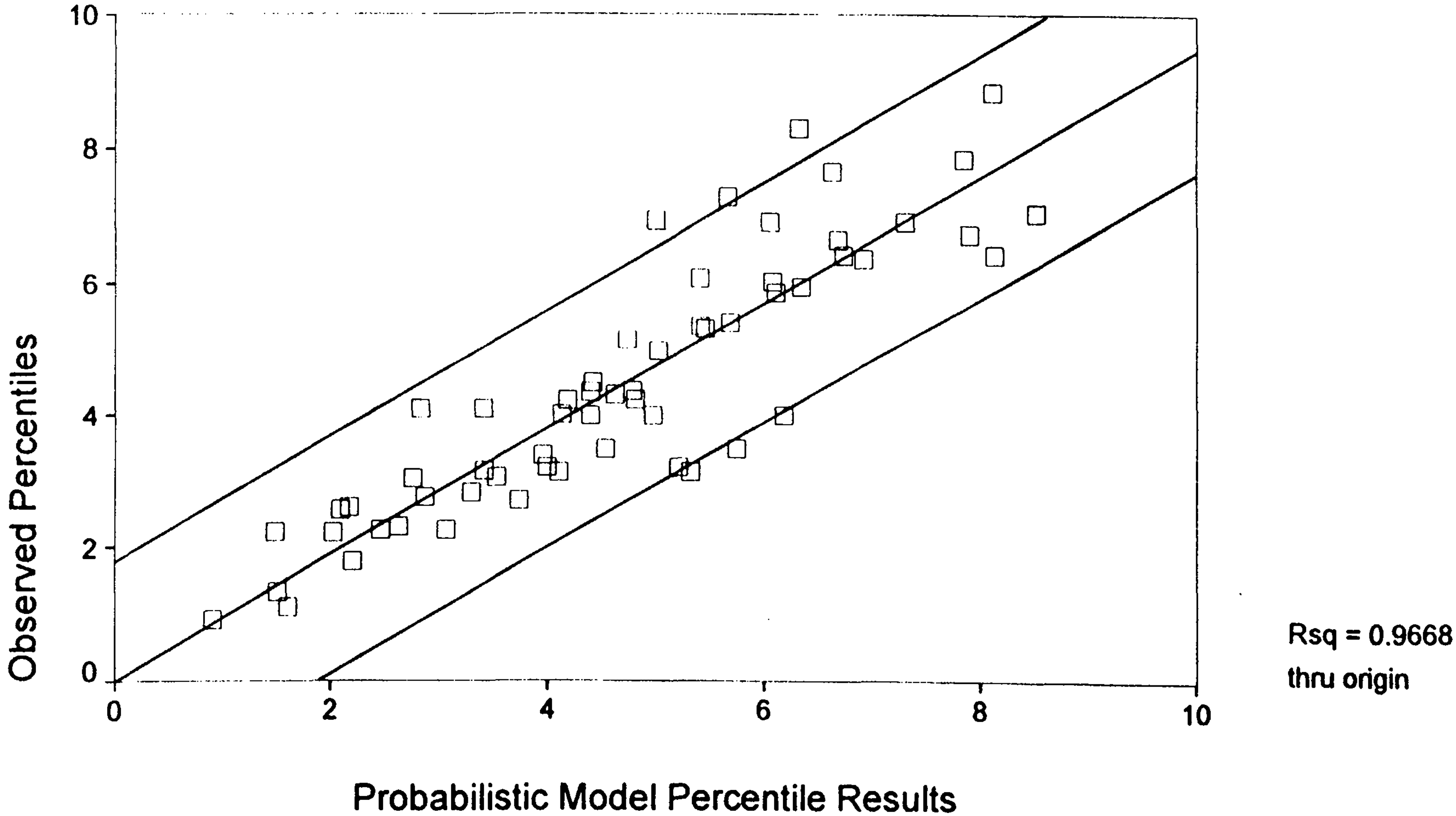

Prepared by KvS 1 Aug 96

Database Release 3.1

# Figure 10-40

## Goodness-of-Fit Statistics for

## Total PCBs in Benthic Invertebrates

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HRP 002 1484

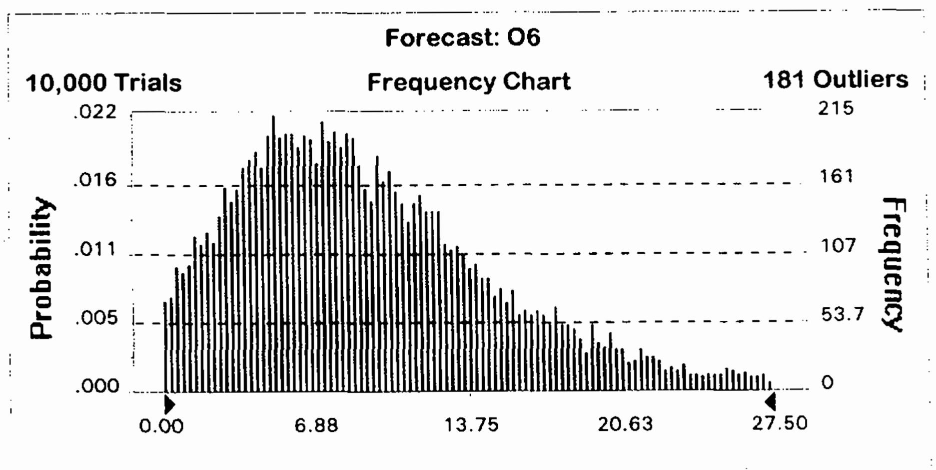
Figure 10-41
Distributional Analysis for Aroclor 1016

**Crystal Ball Report**
Aroclor 1016

**Forecast: Water Column BAF for Aroclor 1016** **Cell: O6**

Summary:
Display Range is from 0.00 to 27.50
Entire Range is from 0.00 to 56.21
After 10,000 Trials, the Std. Error of the Mean is 0.06

| Statistics: | Value |
|---|---|
| Trials | 10000 |
| Mean | 9.71 |
| Median | 8.50 |
| Mode | --- |
| Standard Deviation | 6.48 |
| Variance | 42.01 |
| Skewness | 1.27 |
| Kurtosis | 5.63 |
| Coeff. of Variability | 0.67 |
| Range Minimum | 0.00 |
| Range Maximum | 56.21 |
| Range Width | 56.20 |
| Mean Std. Error | 0.06 |




HRP 002 1485

Figure 10-41
Distributional Analysis for Aroclor 1016

**Forecast: O6 (cont'd)** **Cell: O6**

Percentiles:

| Percentile | Value |
|---|---|
| 0% | 0.00 |
| 10% | 2.64 |
| 25% | 5.04 |
| 50% | 8.50 |
| 75% | 12.94 |
| 90% | 18.23 |
| 100% | 56.21 |

End of Forecast

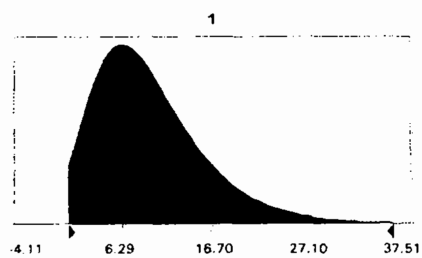
**Assumptions**

**Assumption: 1** **Cell: N6**

Extreme Value distribution with parameters:

| | |
|---|---|
| Mode | 6.29 |
| Scale | 5.20 |

Selected range is from 0.00 to +Infinity
Mean value in simulation was 9.71




End of Assumptions



HRP 002 1486

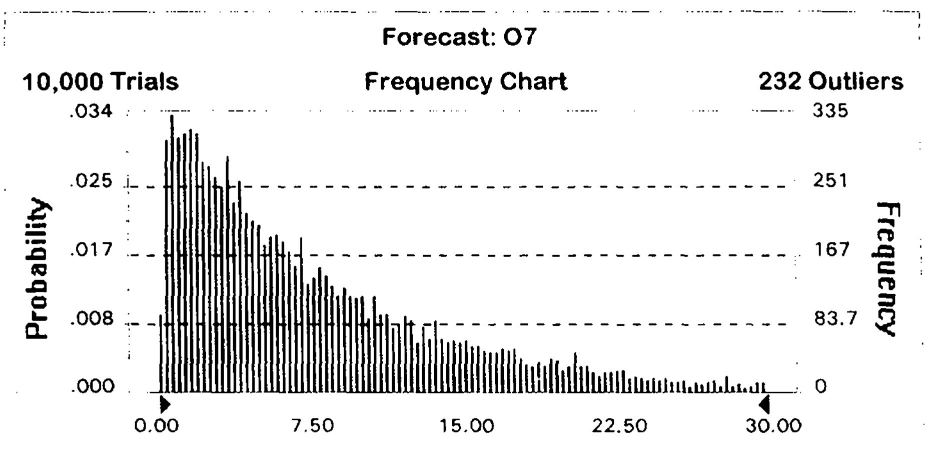
Figure 10-42
Distributional Analysis for Aroclor 1254

**Crystal Ball Report**
Aroclor 1254

**Forecast: Water Column BAF for Aroclor 1254** **Cell: O7**

Summary:
Display Range is from 0.00 to 30.00
Entire Range is from 0.21 to 70.02
After 10,000 Trials, the Std. Error of the Mean is 0.08

| Statistics: | Value |
|---|---|
| Trials | 10000 |
| Mean | 8.37 |
| Median | 5.93 |
| Mode | --- |
| Standard Deviation | 7.95 |
| Variance | 63.18 |
| Skewness | 1.89 |
| Kurtosis | 8.14 |
| Coeff. of Variability | 0.95 |
| Range Minimum | 0.21 |
| Range Maximum | 70.02 |
| Range Width | 69.81 |
| Mean Std. Error | 0.08 |






HRP 002 1487

Figure 10-42
Distributional Analysis for Aroclor 1254

**Forecast: O7 (cont'd)** **Cell: O7**

Percentiles:

| Percentile | Value |
|---|---|
| 0% | 0.21 |
| 10% | 1.15 |
| 25% | 2.63 |
| 50% | 5.93 |
| 75% | 11.61 |
| 90% | 18.90 |
| 100% | 70.02 |

End of Forecast

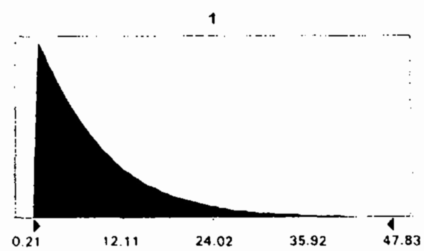
**Assumptions**

**Assumption: 1** **Cell: N7**

Weibull distribution with parameters:

| | |
|---|---|
| Location | 0.21 |
| Scale | 8.39 |
| Shape | 1.030937444 |

Selected range is from 0.21 to +Infinity
Mean value in simulation was 8.37




End of Assumptions



HRP 002 1488

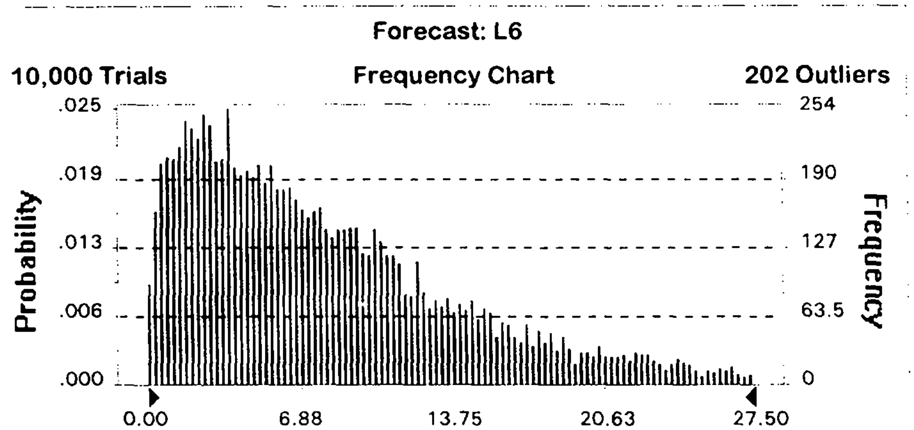
Figure 10-43
Distributional Analysis for Total PCBs

**Crystal Ball Report**
Total PCBs

**Forecast: Water Column BAF for Total PCBs** **Cell: L6**

Summary:
Display Range is from 0.00 to 27.50
Entire Range is from 0.00 to 58.24
After 10,000 Trials, the Std. Error of the Mean is 0.07

| Statistics: | Value |
|---|---|
| Trials | 10000 |
| Mean | 8.53 |
| Median | 6.80 |
| Mode | --- |
| Standard Deviation | 6.91 |
| Variance | 47.69 |
| Skewness | 1.40 |
| Kurtosis | 5.52 |
| Coeff. of Variability | 0.81 |
| Range Minimum | 0.00 |
| Range Maximum | 58.24 |
| Range Width | 58.24 |
| Mean Std. Error | 0.07 |




HRP 002 1489

Figure 10-43
Distributional Analysis for Total PCBs

**Forecast: L6 (cont'd)** **Cell: L6**

Percentiles:

| Percentile | Value |
|---|---|
| 0% | 0.00 |
| 10% | 1.52 |
| 25% | 3.30 |
| 50% | 6.80 |
| 75% | 11.81 |
| 90% | 18.03 |
| 100% | 58.24 |

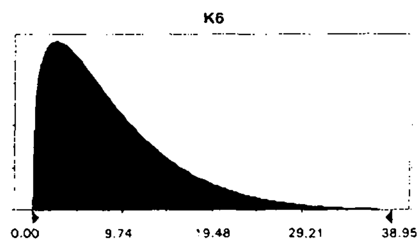
End of Forecast

**Assumptions**

**Assumption: K6** **Cell: K6**

Beta distribution with parameters:

| | |
|---|---|
| Alpha | 1.36 |
| Beta | 18.31 |
| Scale | 124.31 |



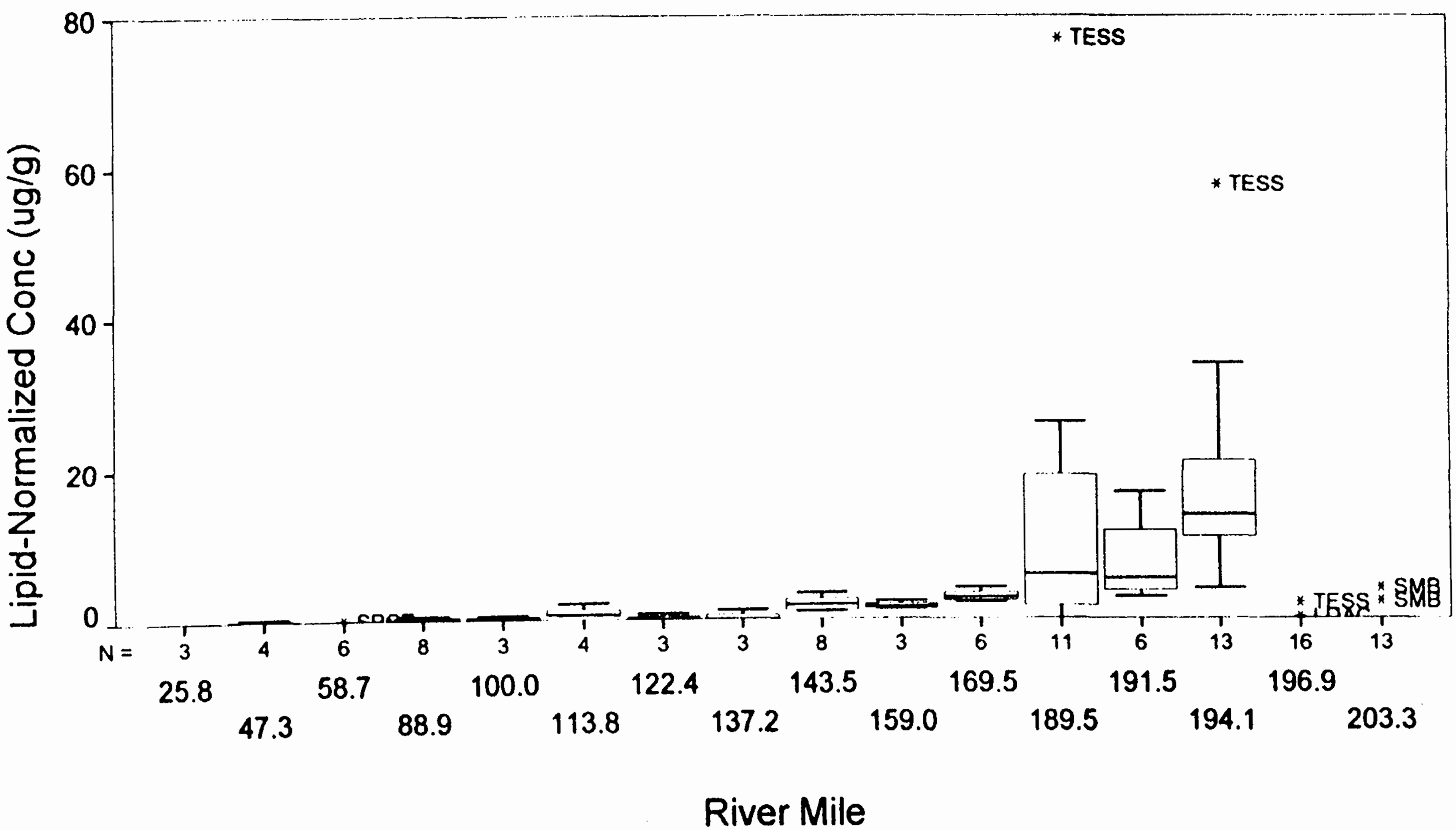

Selected range is from 0.00 to +Infinity
Mean value in simulation was 8.53

End of Assumptions

# Figure 10-44

## Forage Fish Lipid-Normalized

## BZ#4 Concentrations by River Mile



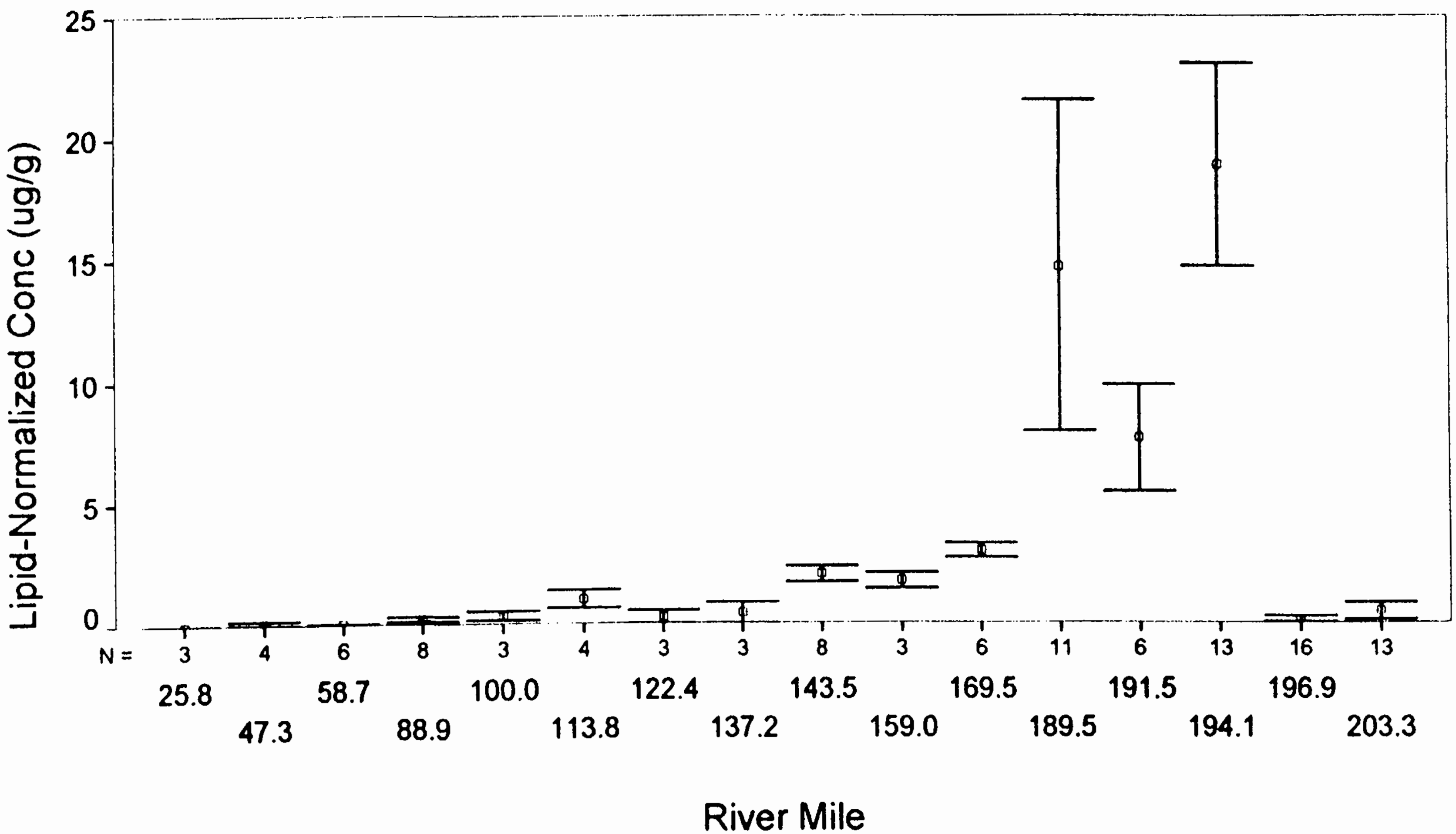

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-45

## Mean +- 1 SE Forage Fish Concentrations

## by River Mile for BZ#4



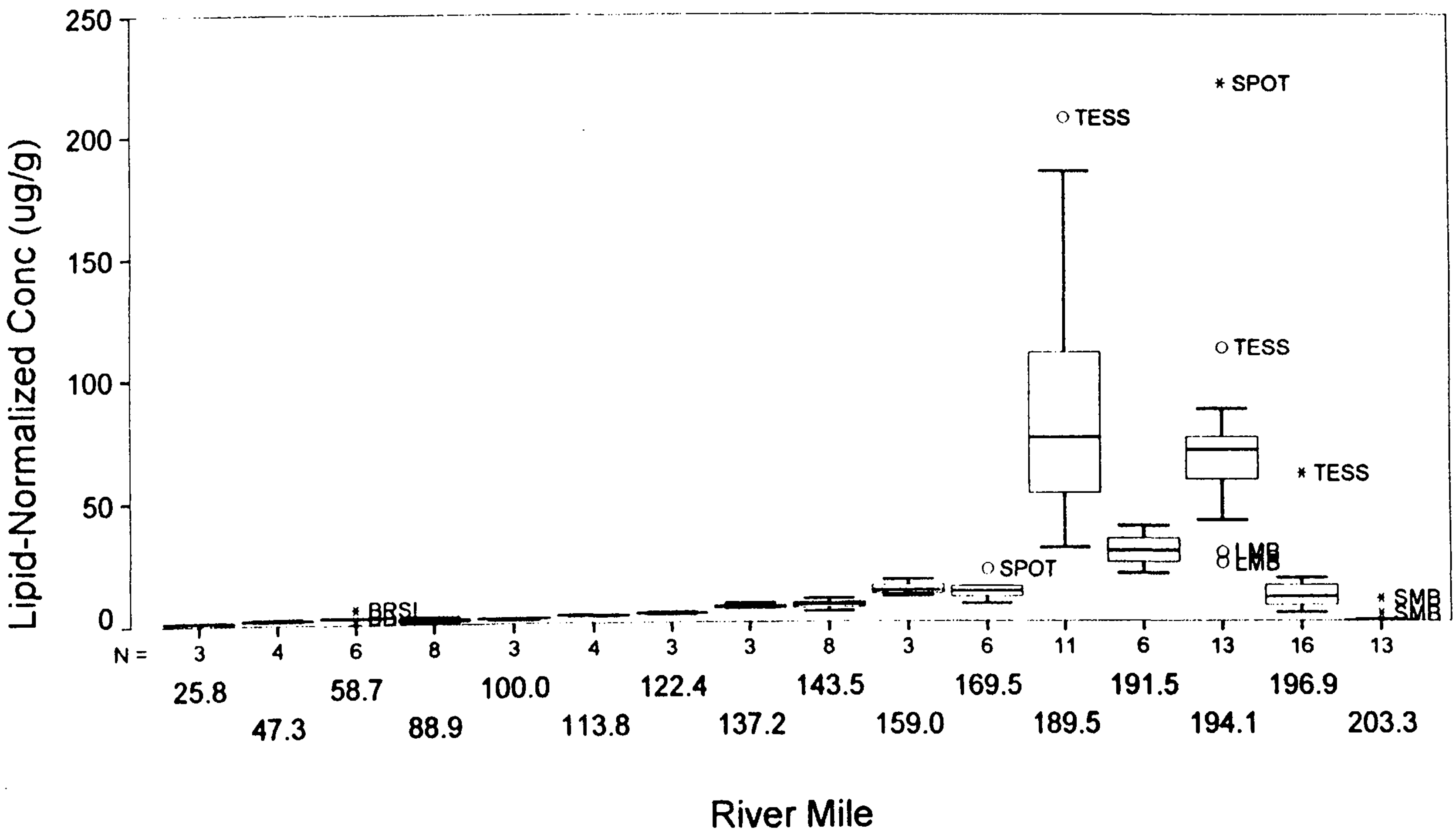

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-46

## Forage Fish Lipid-Normalized

## BZ#28 Concentrations by River Mile



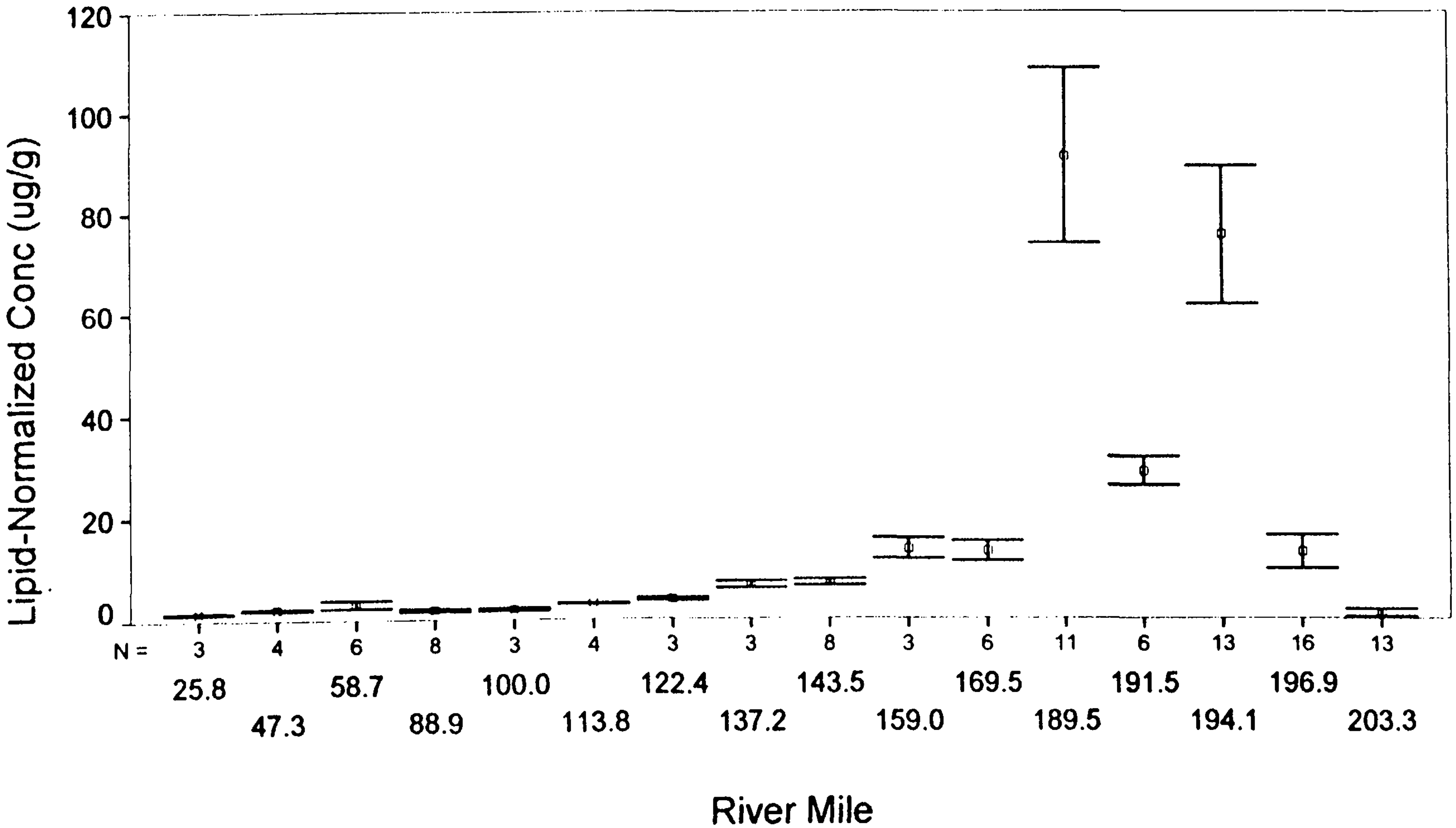

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-47

## Mean +- 1 SE Forage Fish Concentrations

## by River Mile for BZ#28



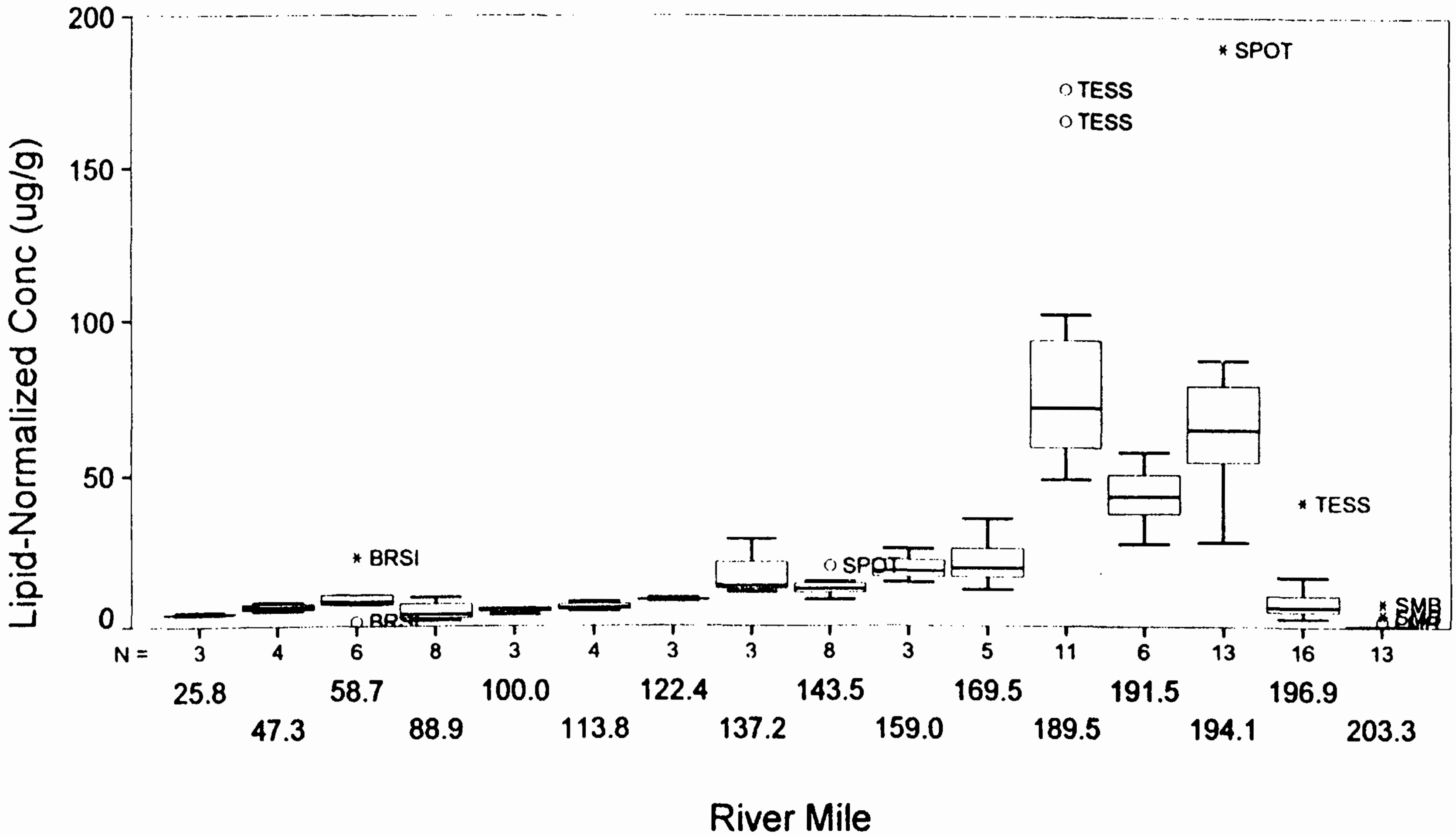

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-48

## Forage Fish Lipid-Normalized

## BZ#52 Concentrations by River Mile




Prepared by KvS 10 Aug 96

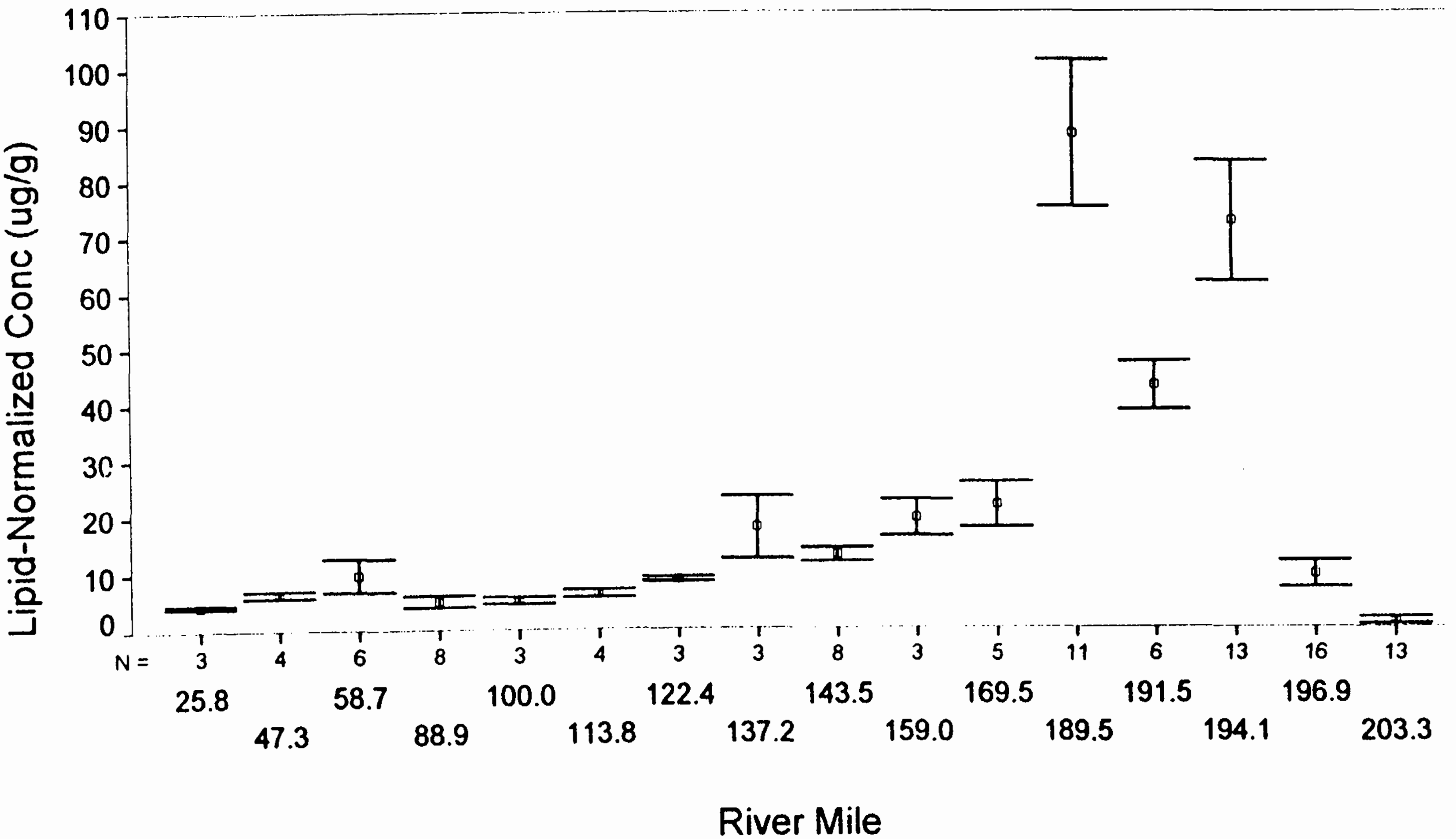
Database Release 3.1

HRP 002 1495

# Figure 10-49

## Mean +- 1 SE Forage Fish Concentrations

## by River Mile for BZ#52




Prepared by KvS 10 Aug 96

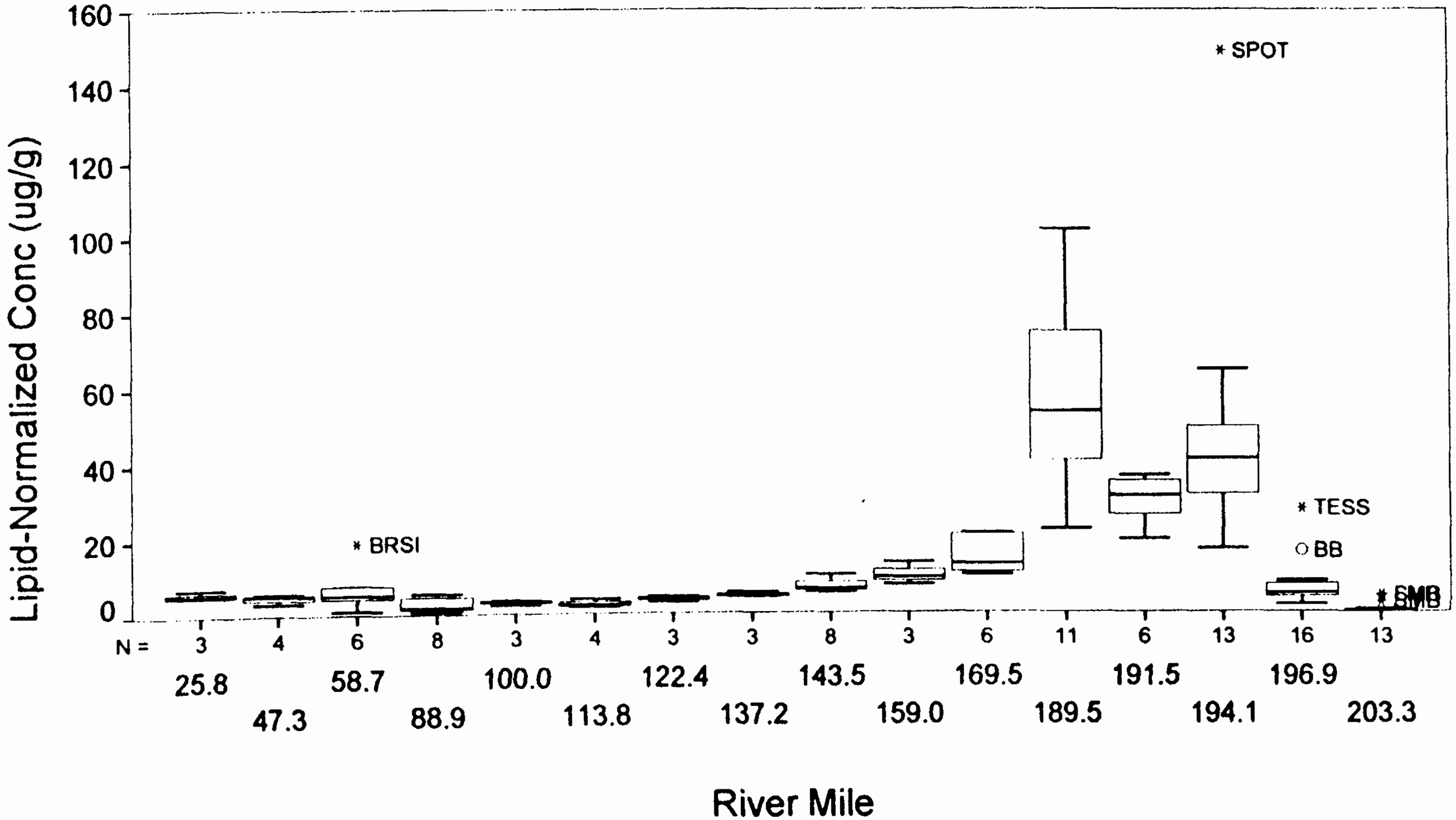
Database Release 3.1

HRP 002 1496

# Figure 10-50

## Forage Fish Lipid-Normalized

## BZ#101 & BZ#90 Concentrations by River Mile




Prepared by KvS 10 Aug 96

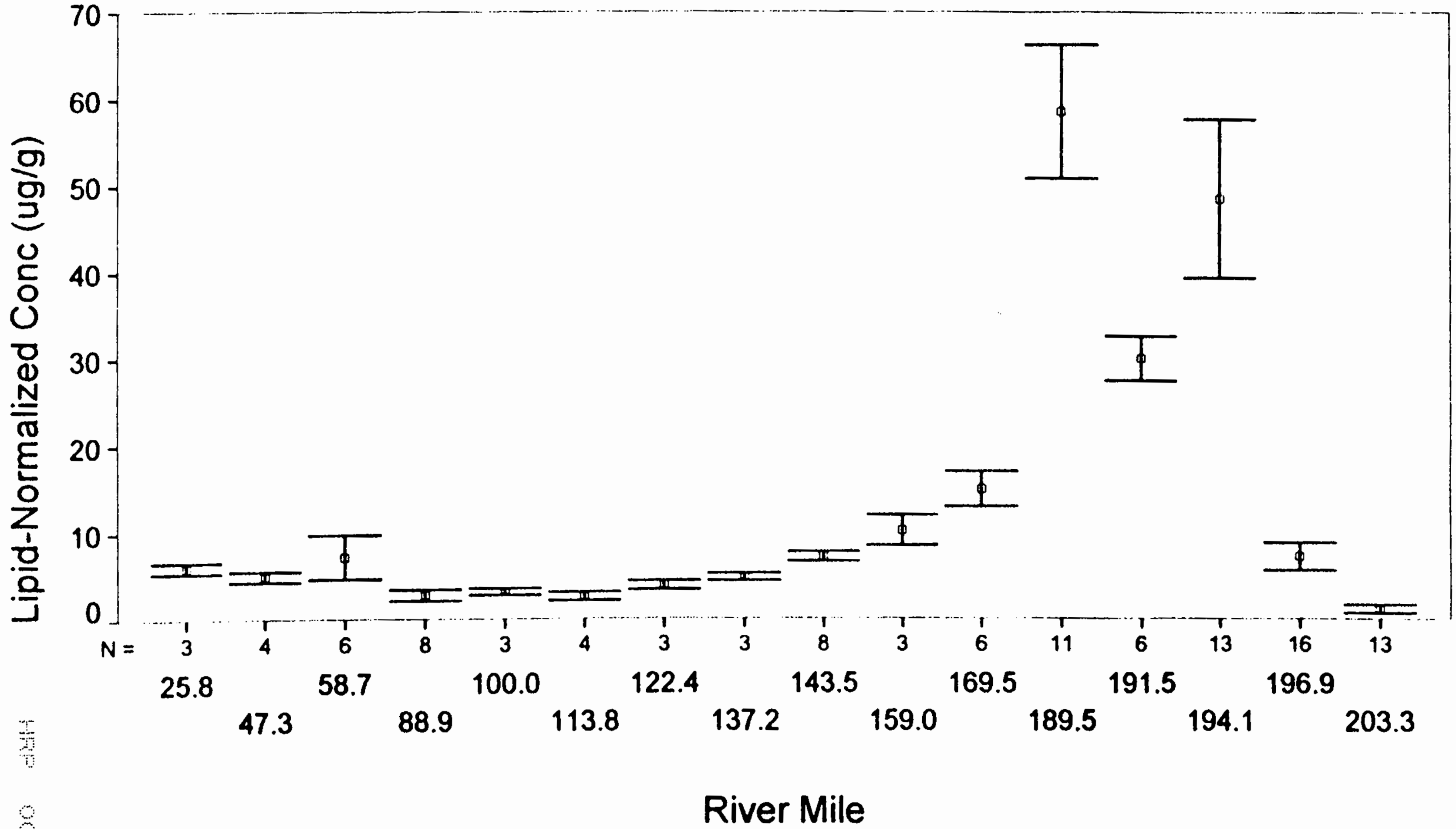
Database Release 3.1

HRP 002 1497

# Figure 10-51

## Mean +- 1 SE Forage Fish Concentrations

## by River Mile for BZ#101 & BZ#90




Prepared by KvS 10 Aug 96

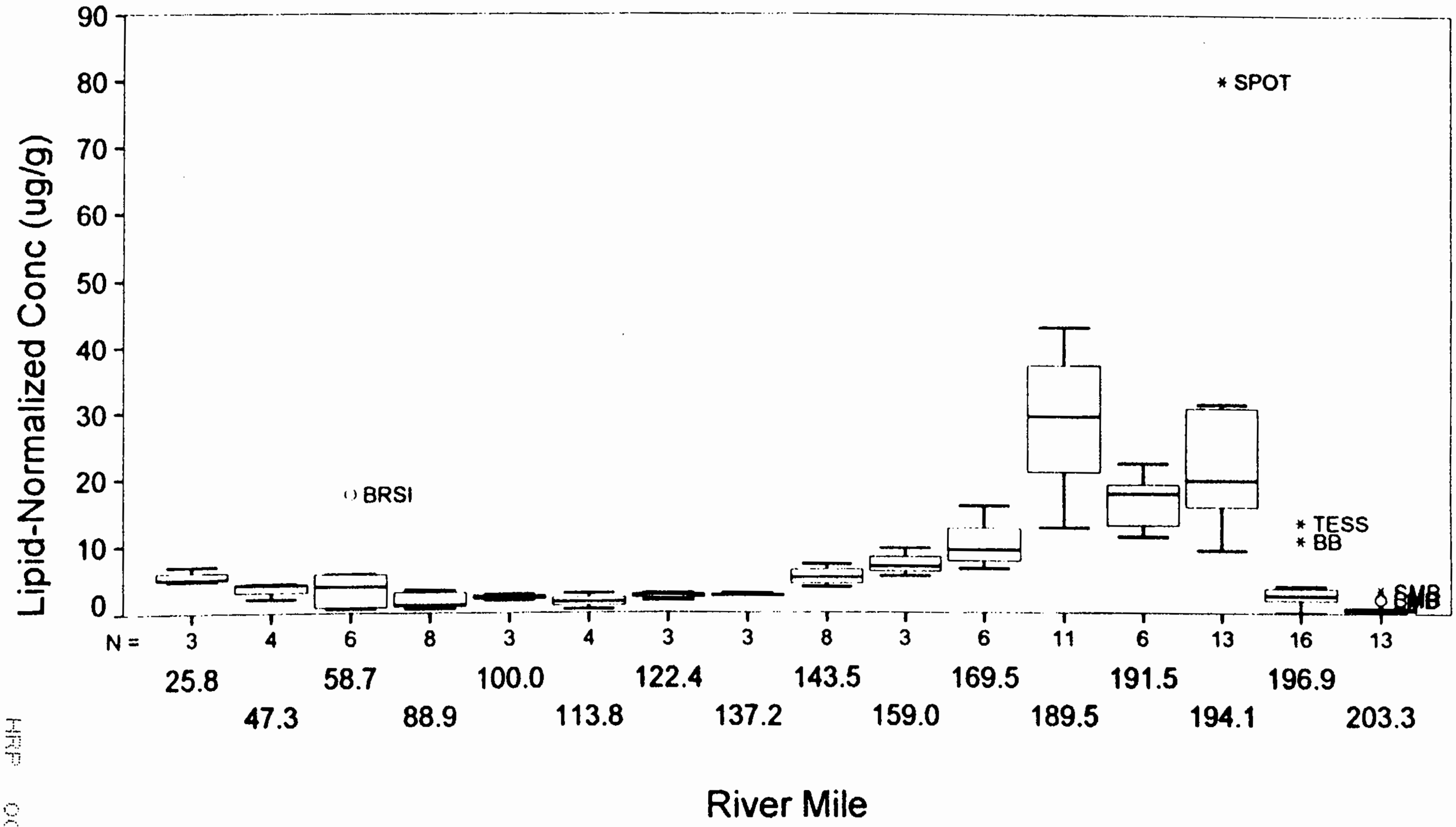
Database Release 3.1

HRP 002 1498

# Figure 10-52

## Forage Fish Lipid-Normalized

## BZ#138 Concentrations by River Mile




Prepared by KvS 10 Aug 96

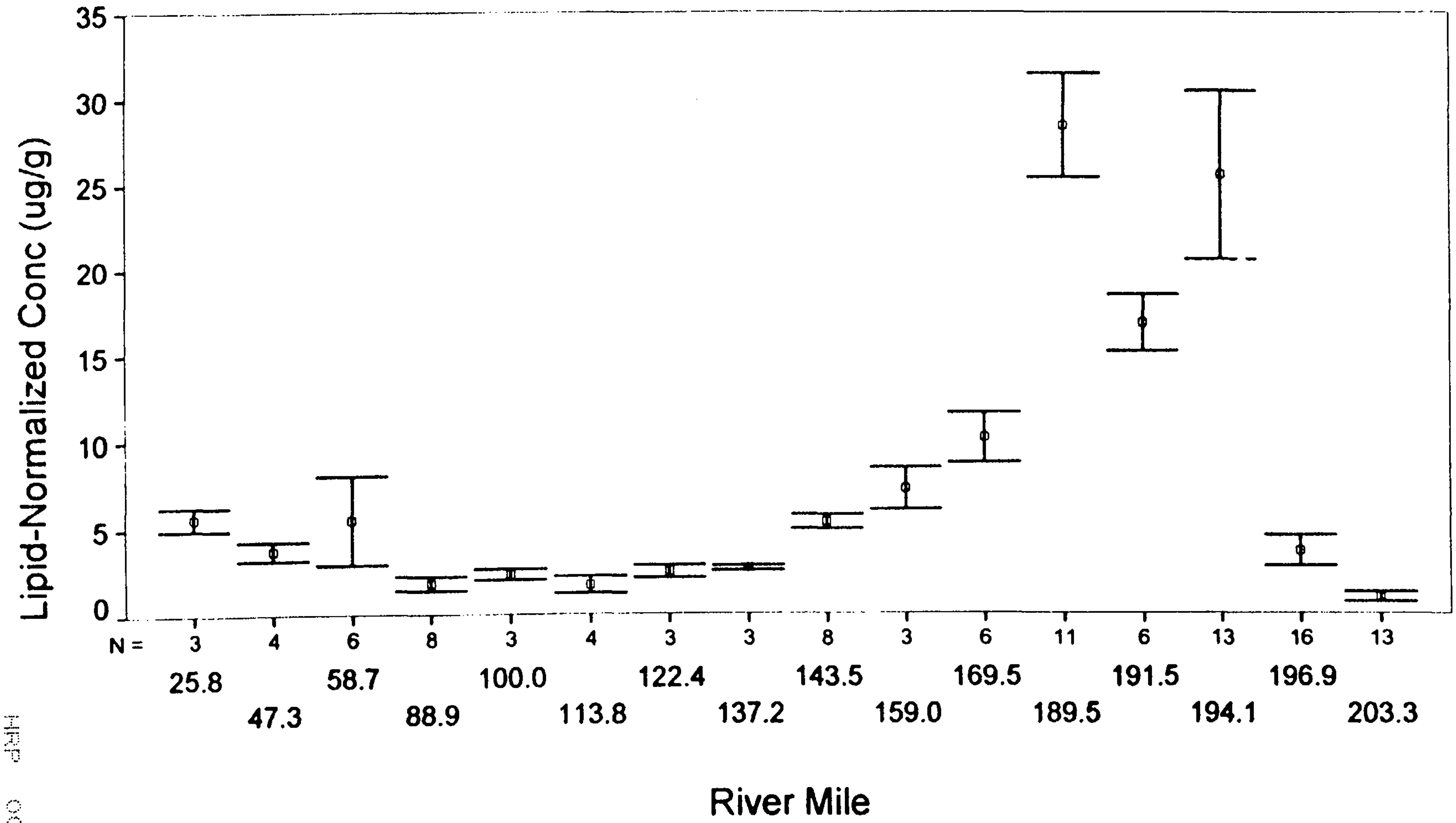
Database Release 3.1

HRP 002 1499

# Figure 10-{ 3

## Mean +- 1 SE Forage Fish Concentrations

## by River Mile for BZ#138



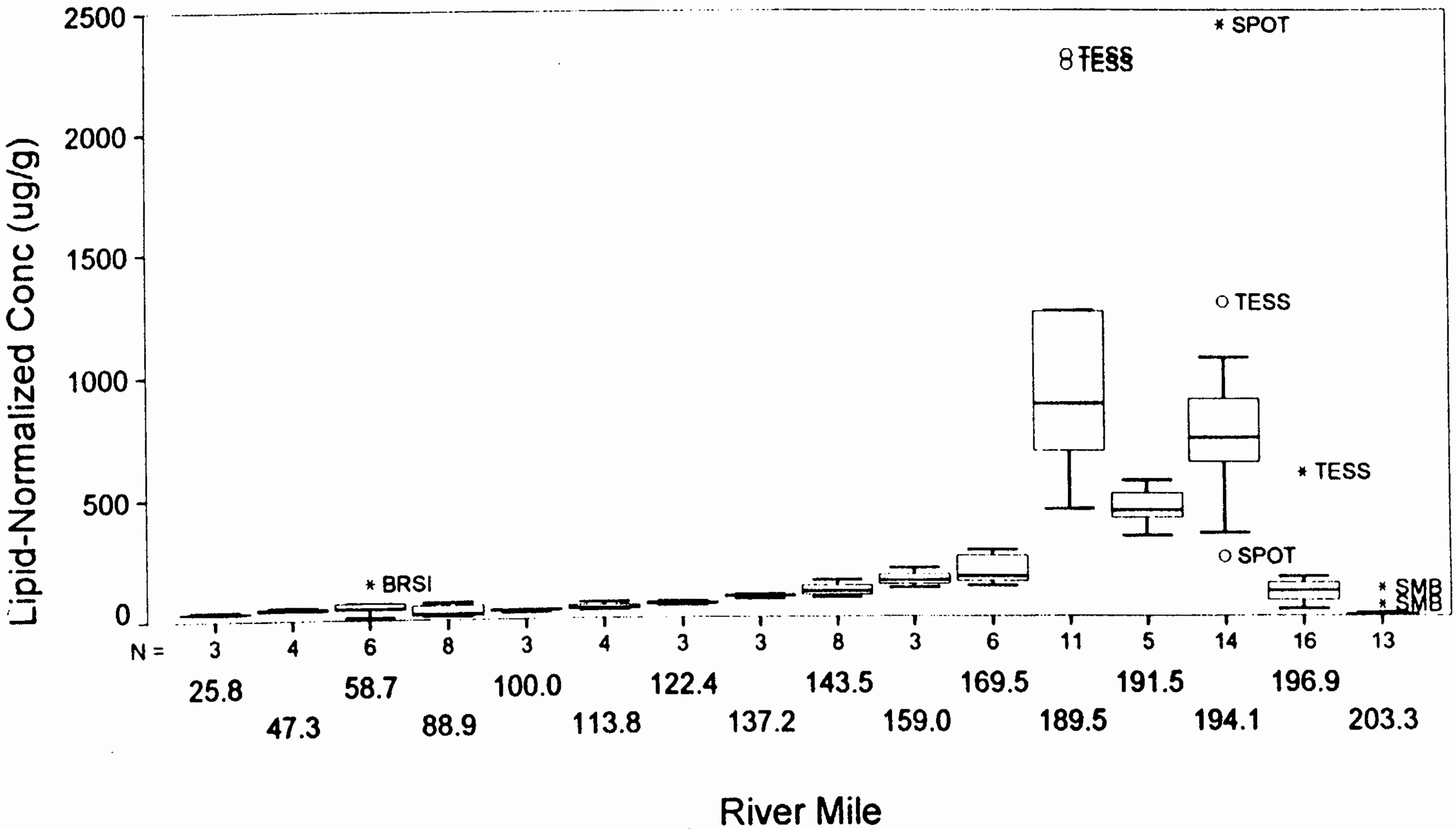

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-54

## Forage Fish Lipid-Normalized

## Aroclor 1016 Concentrations by River Mile




Prepared by KvS 10 Aug 96

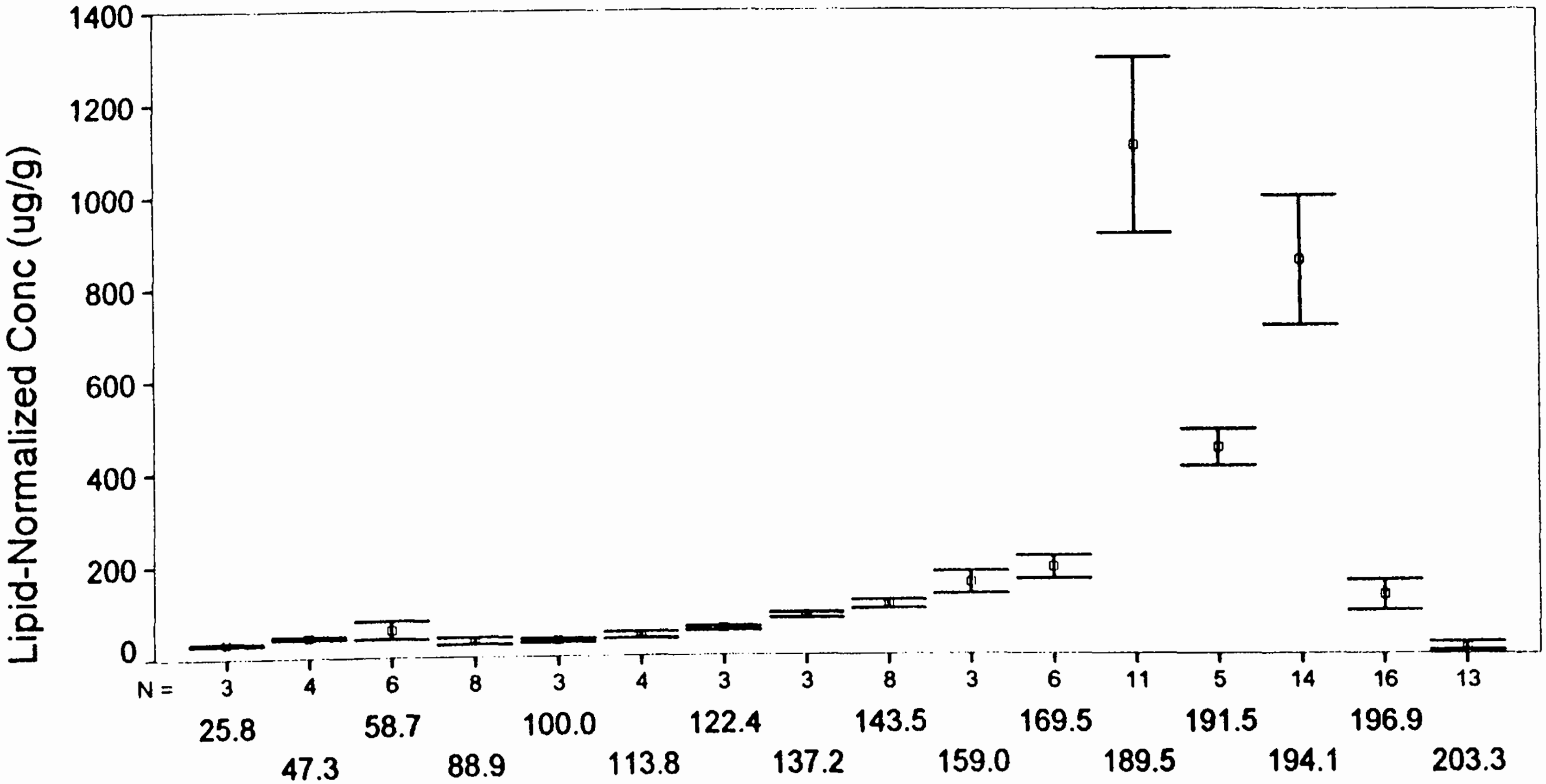
Database Release 3.1

HRP 002 1501

# Figure 10-55

## Mean +- 1 SE Forage Fish Concentrations

## by River Mile for Aroclor 1016



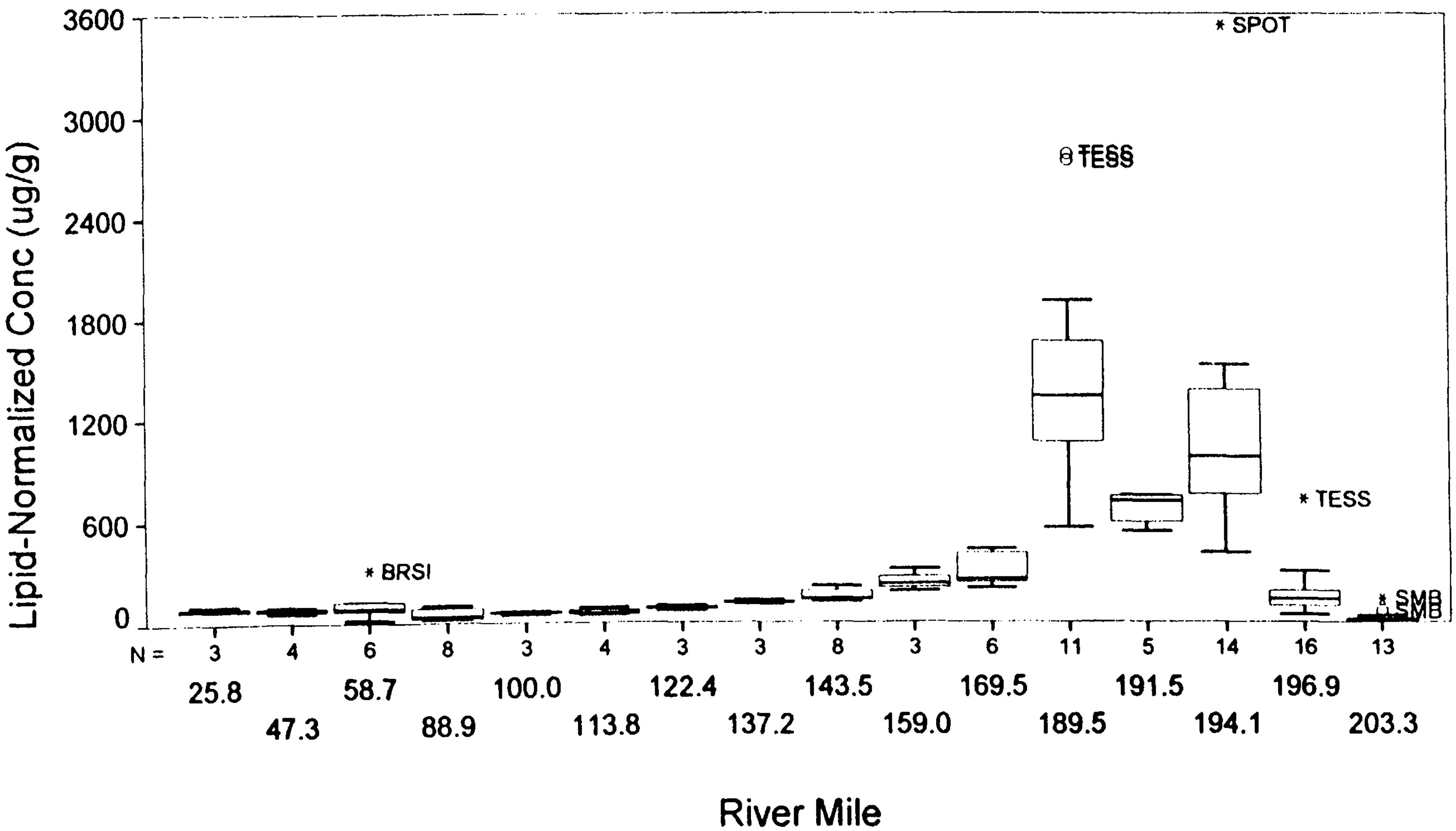

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-56

## Forage Fish Lipid-Normalized

## Aroclor 1254 Concentrations by River Mile




Prepared by KvS 10 Aug 96

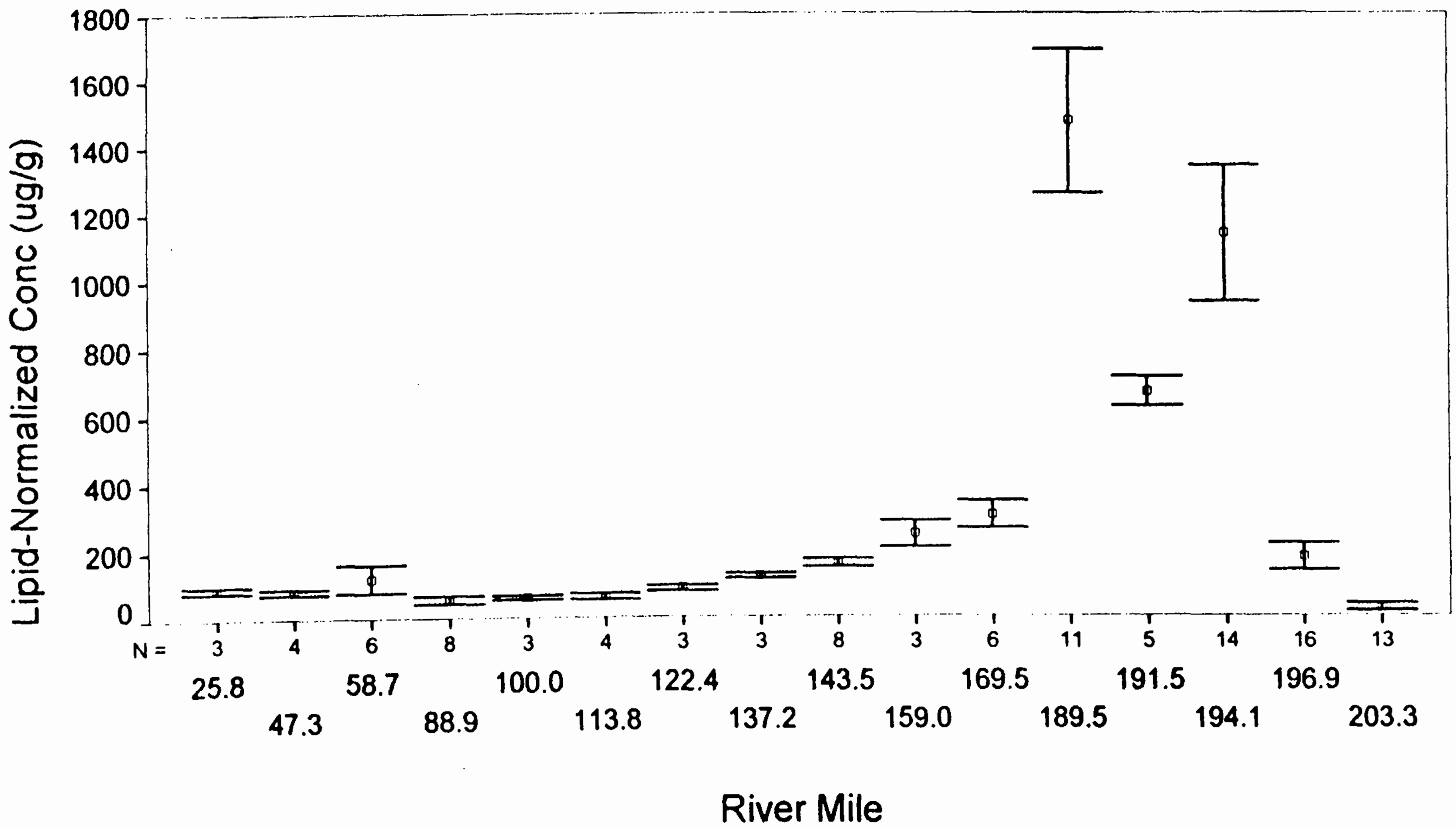
Database Release 3.1

HRP 002 1503

# Figure 10-57

## Mean +- 1 SE Forage Fish Concentrations

## by River Mile for Aroclor 1254



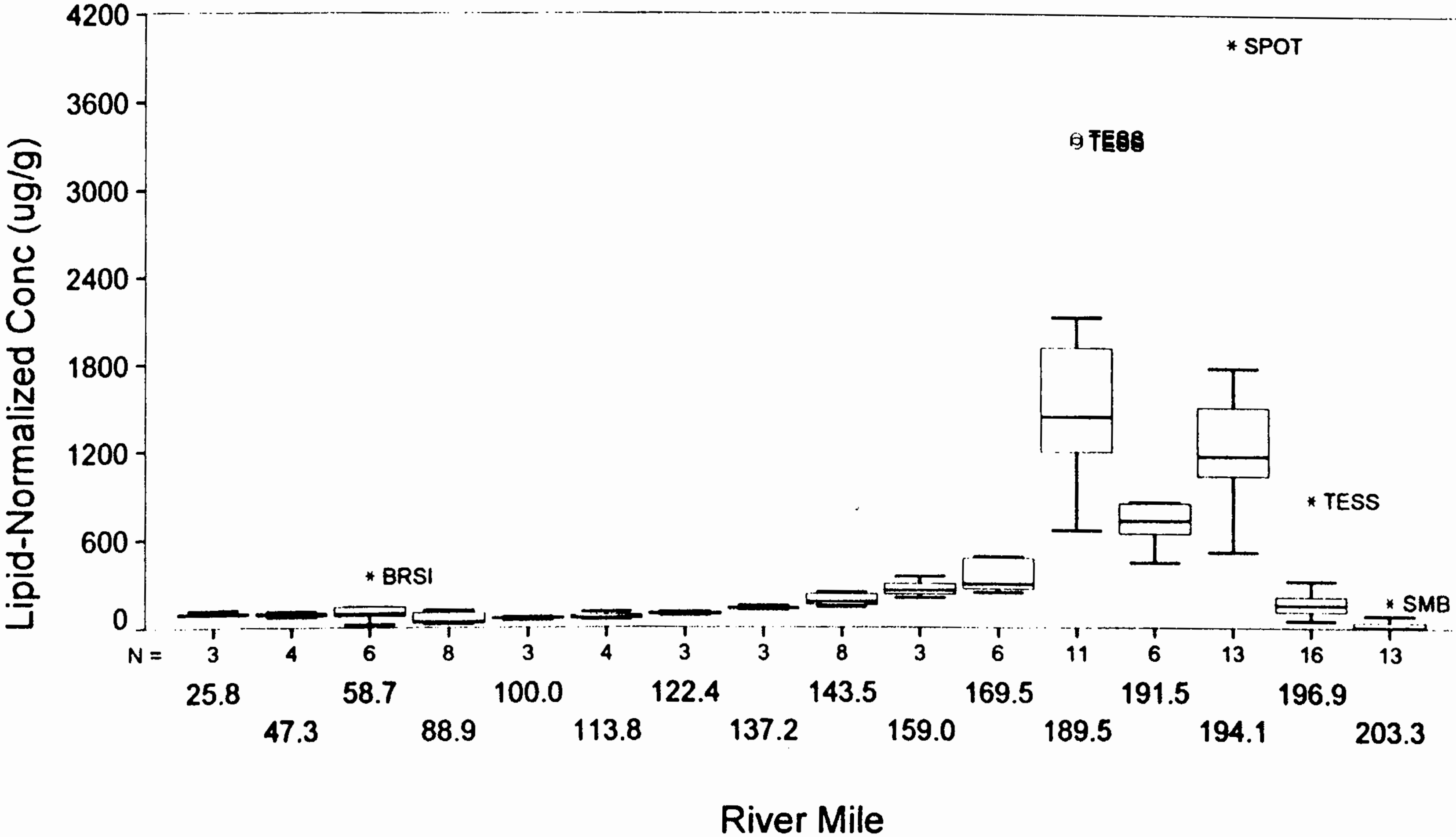

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-58

## Forage Fish Lipid-Normalized

## Total PCB Concentrations by River Mile




Prepared by KvS 10 Aug 96

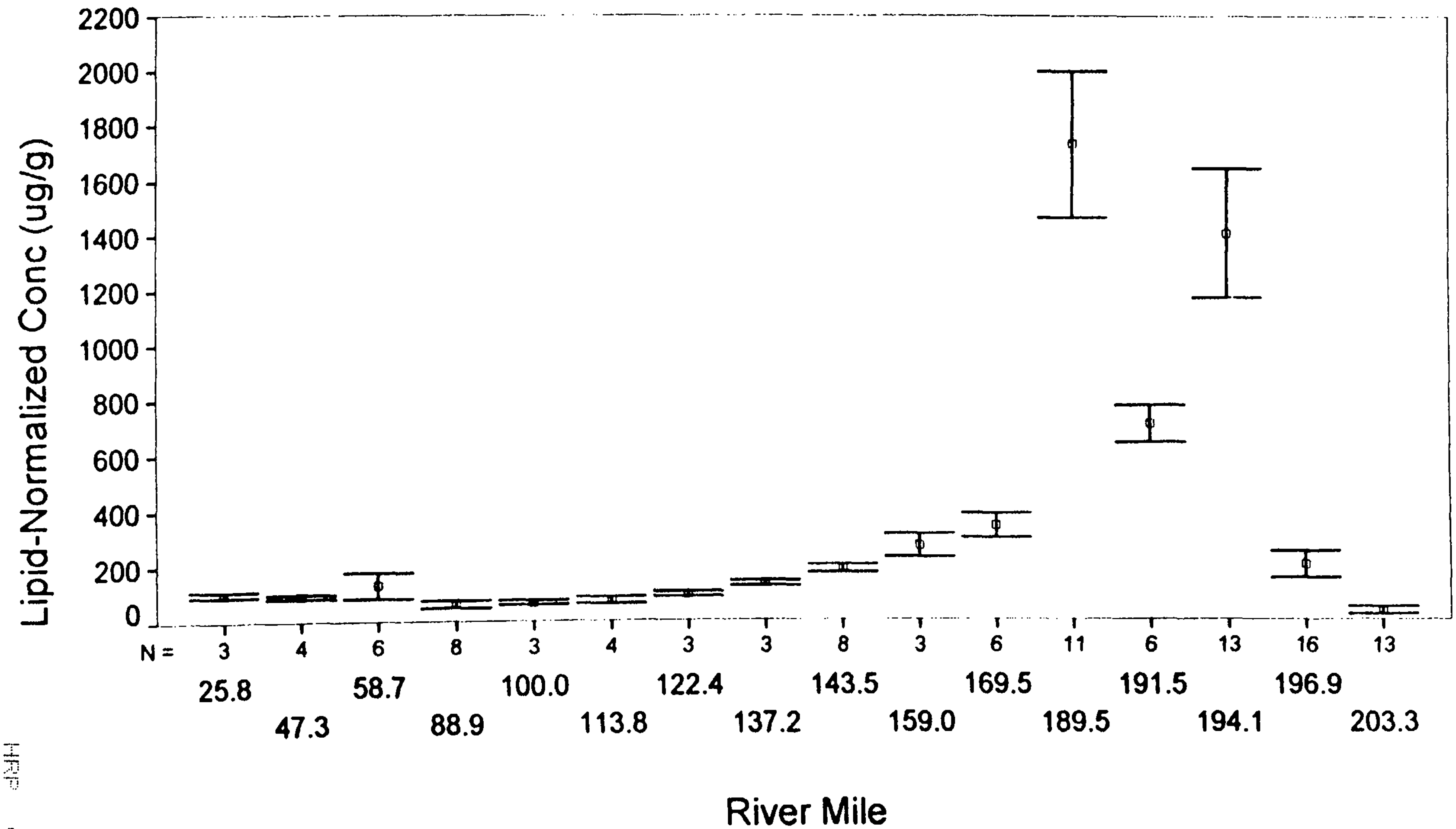
Database Release 3.1

HRP 002 1505

# Figure 10-59

## Mean +- 1 SE Forage Fish Concentrations

## by River Mile for Total PCBs




Prepared by KvS 10 Aug 96

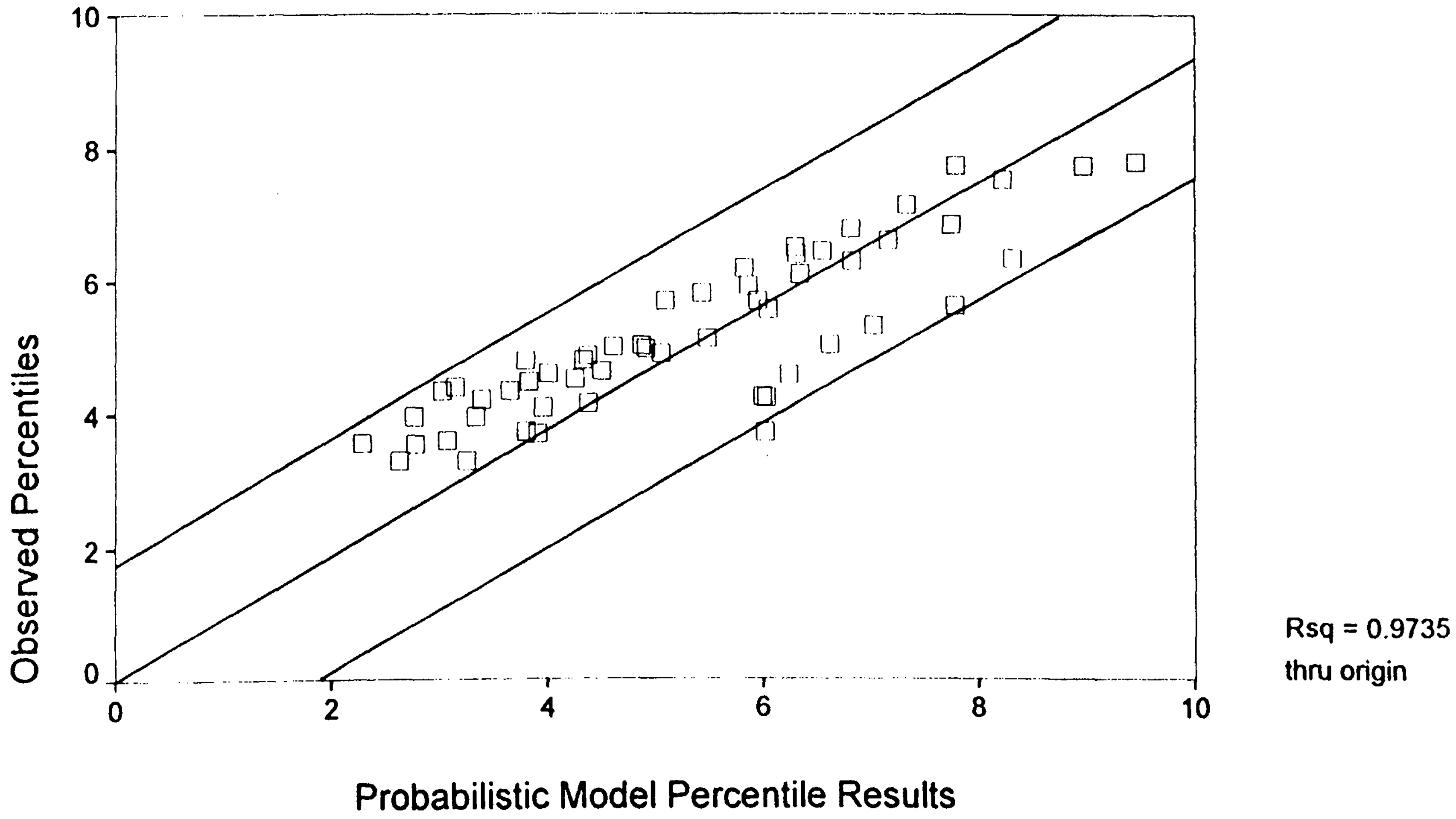
Database Release 3.1

HRP 002 1506

# Figure 10-60

## Goodness-of-Fit Statistics for

## Aroclor 1016 in Forage Fish



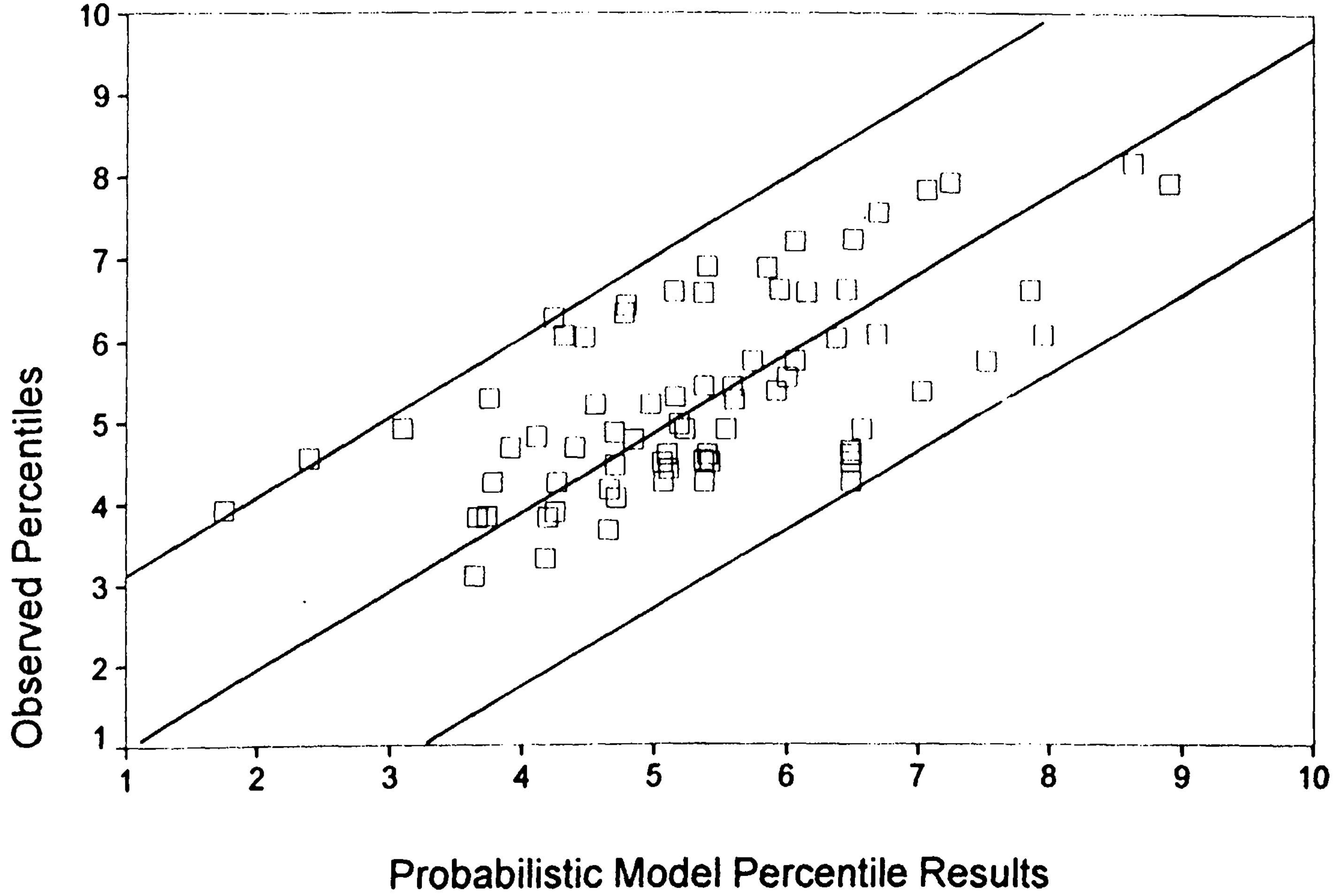

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-61

## Goodness-of-Fit Statistics for

## Aroclor 1254 in Forage Fish




Rsq = 0.9619
thru origin

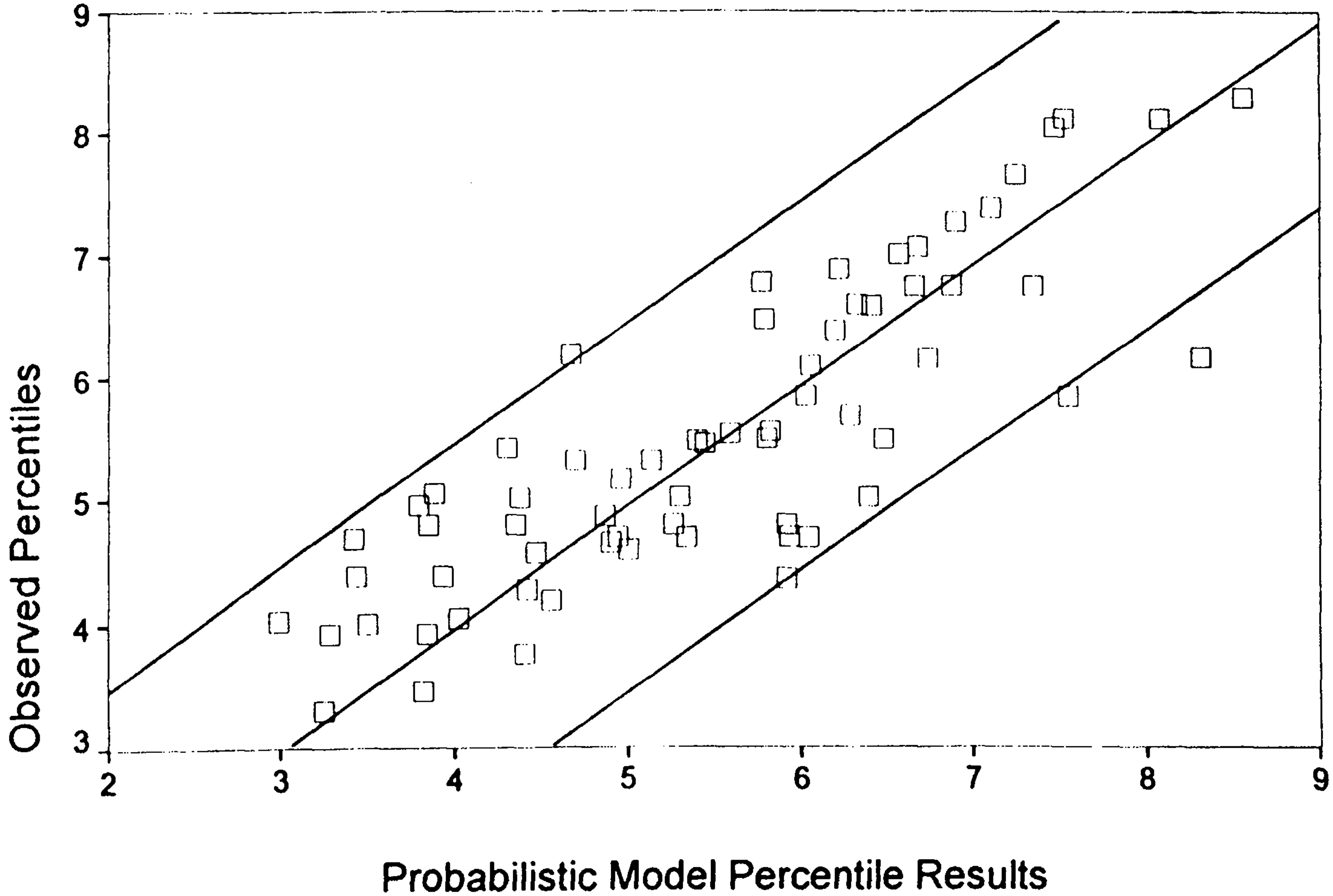
Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-62

## Goodness-of-Fit Statistics for

## Total PCBs in Forage Fish

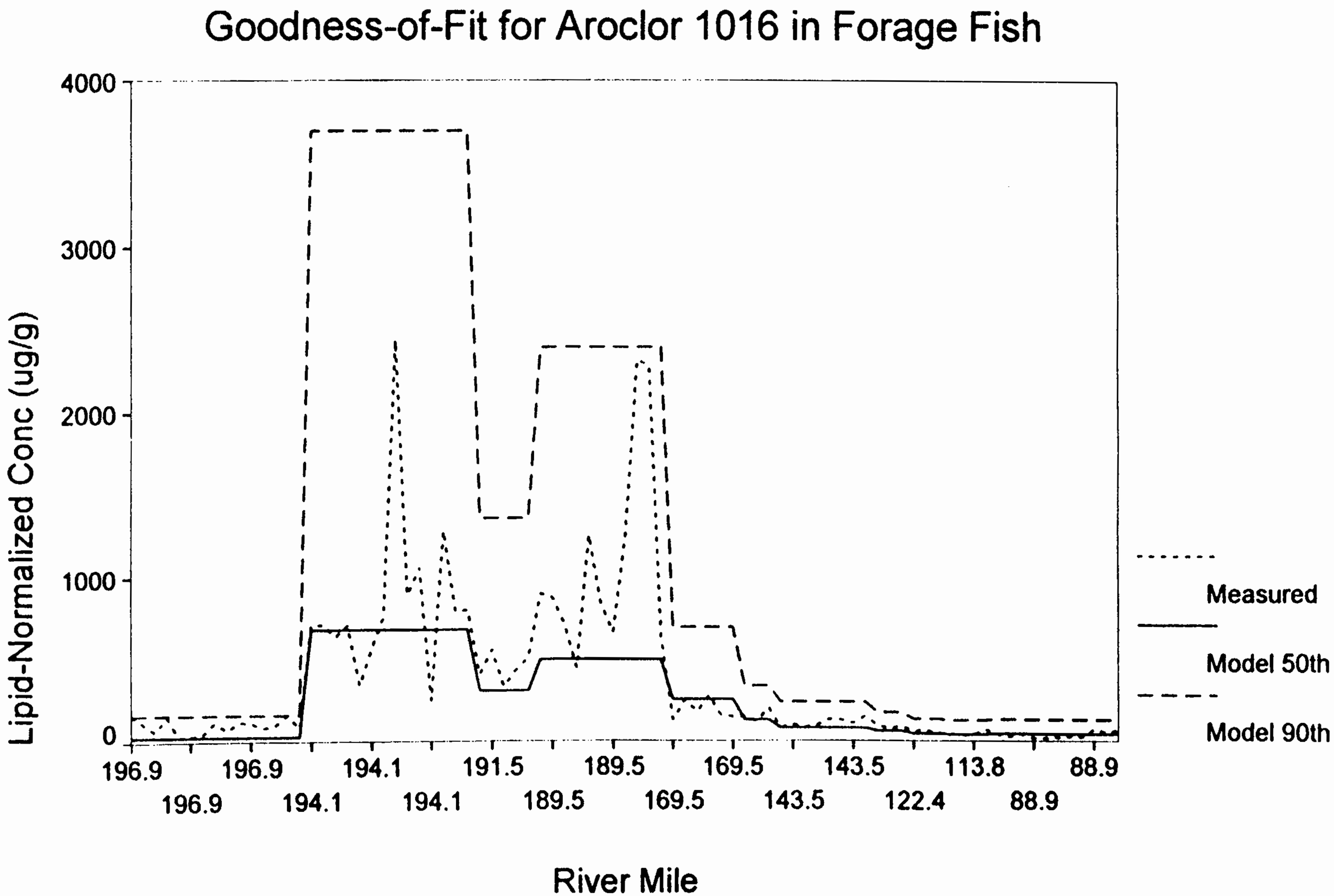



Rsq = 0.9827
thru origin

Prepared by KvS 10 Aug 96

Database Release 3.1

# Figure 10-63




Prepared by KvS 10 Aug 96

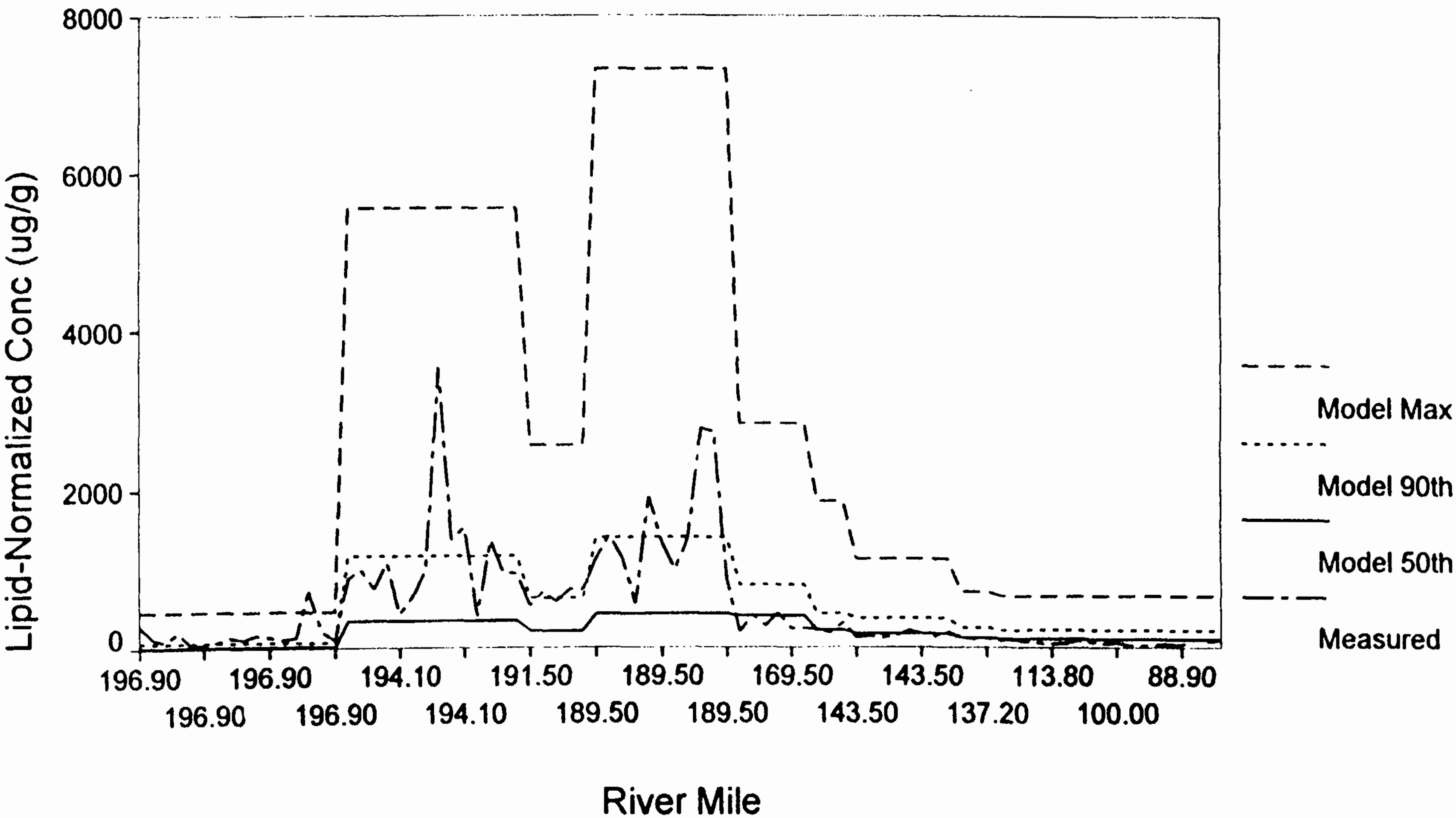
Database Release 3.1

HRP 002 1510

# Figure 10-64

## Goodness-of-Fit Statistics for

## Aroclor 1254 in Forage Fish




Prepared by KvS 10 Aug 96

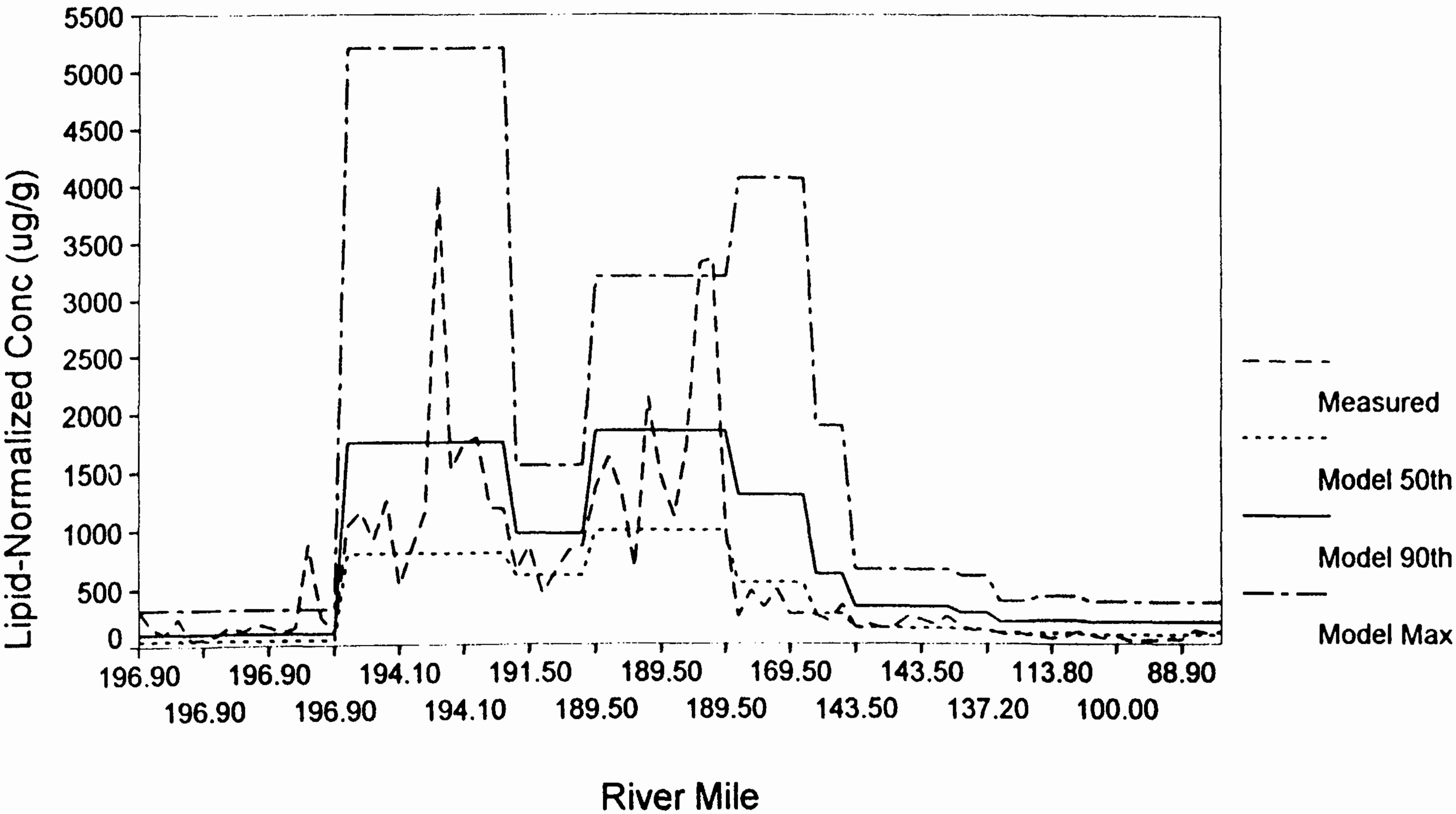
Database Release 3.1

HRP 002 1511

# Figure 10-65

## Goodness-of-Fit Statistics for

## Total PCBs in Forage Fish




Prepared by KvS 10 Aug 96

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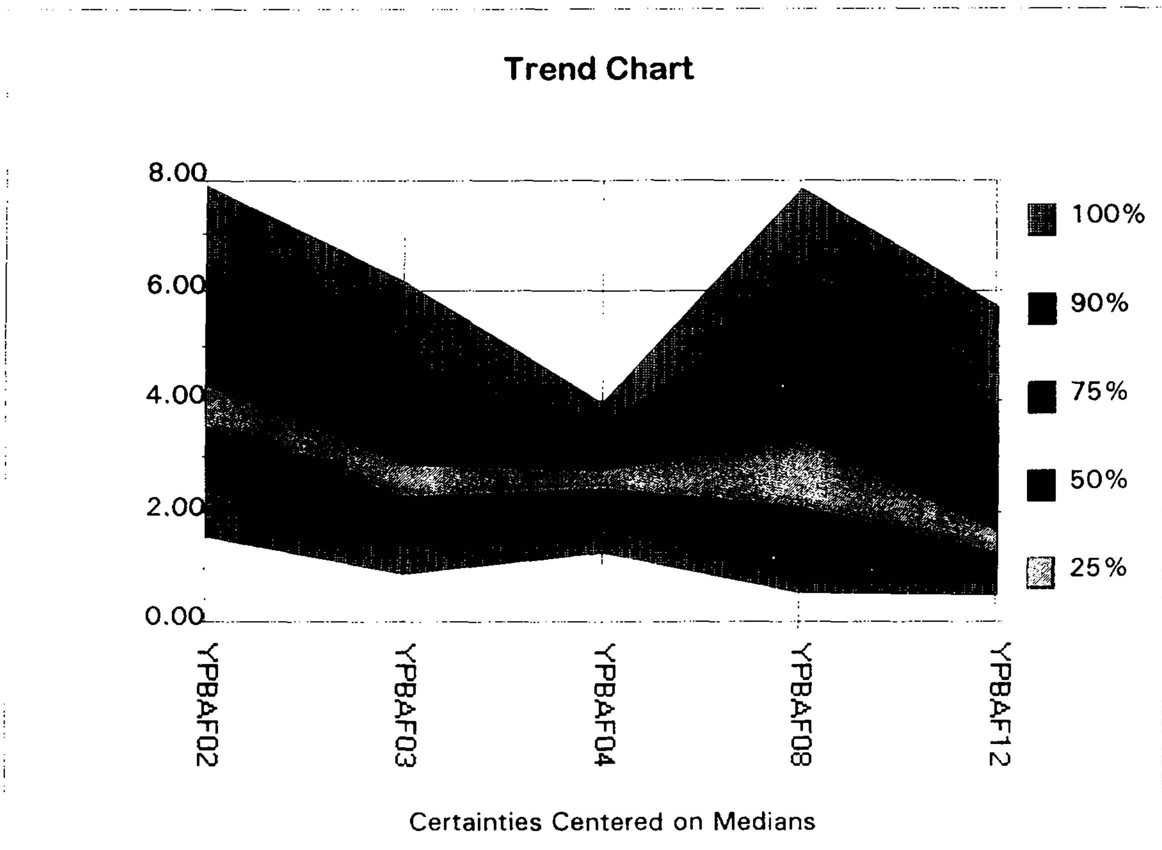
HRP 002 1512

Figure 10-66

**Modeled Yellow Perch Bioaccumulation Factors for Total PCBs**

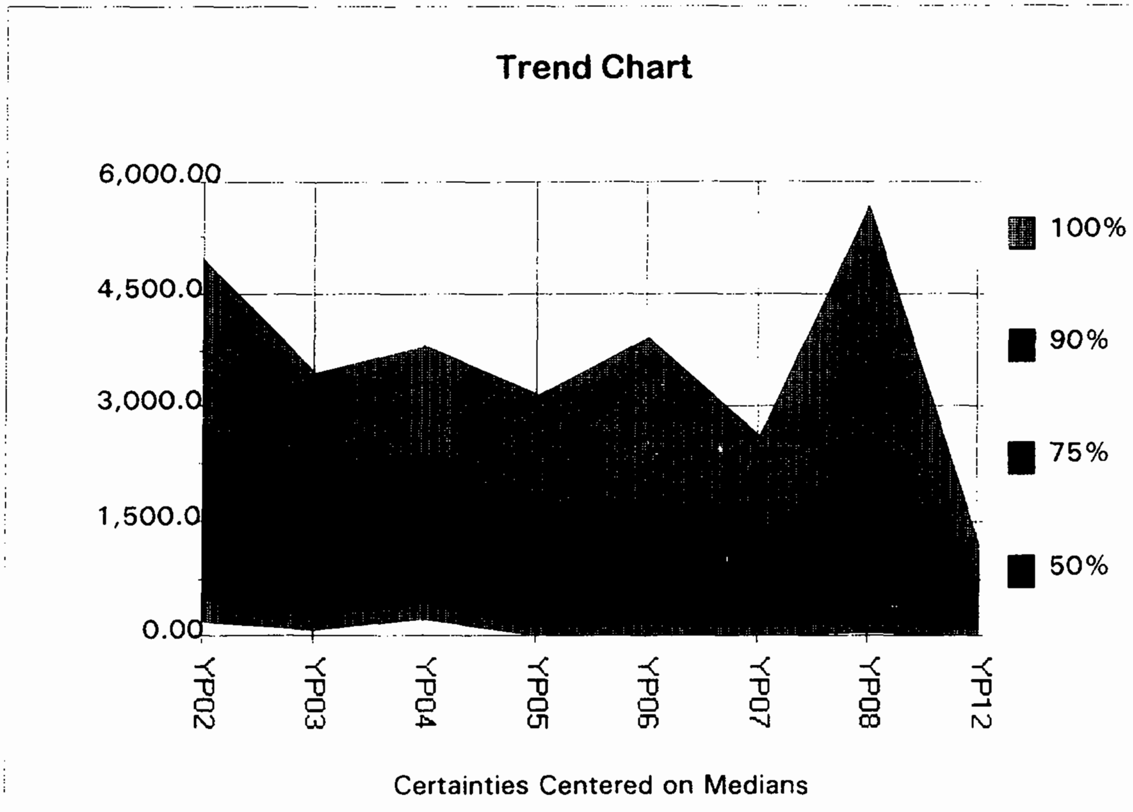



The geometric mean bioaccumulation factor = 2.88, standard deviation = 1.55

HRP 002 1513

Figure 10-67

**Modeled Concentrations for Yellow Perch**
**Total PCBs**

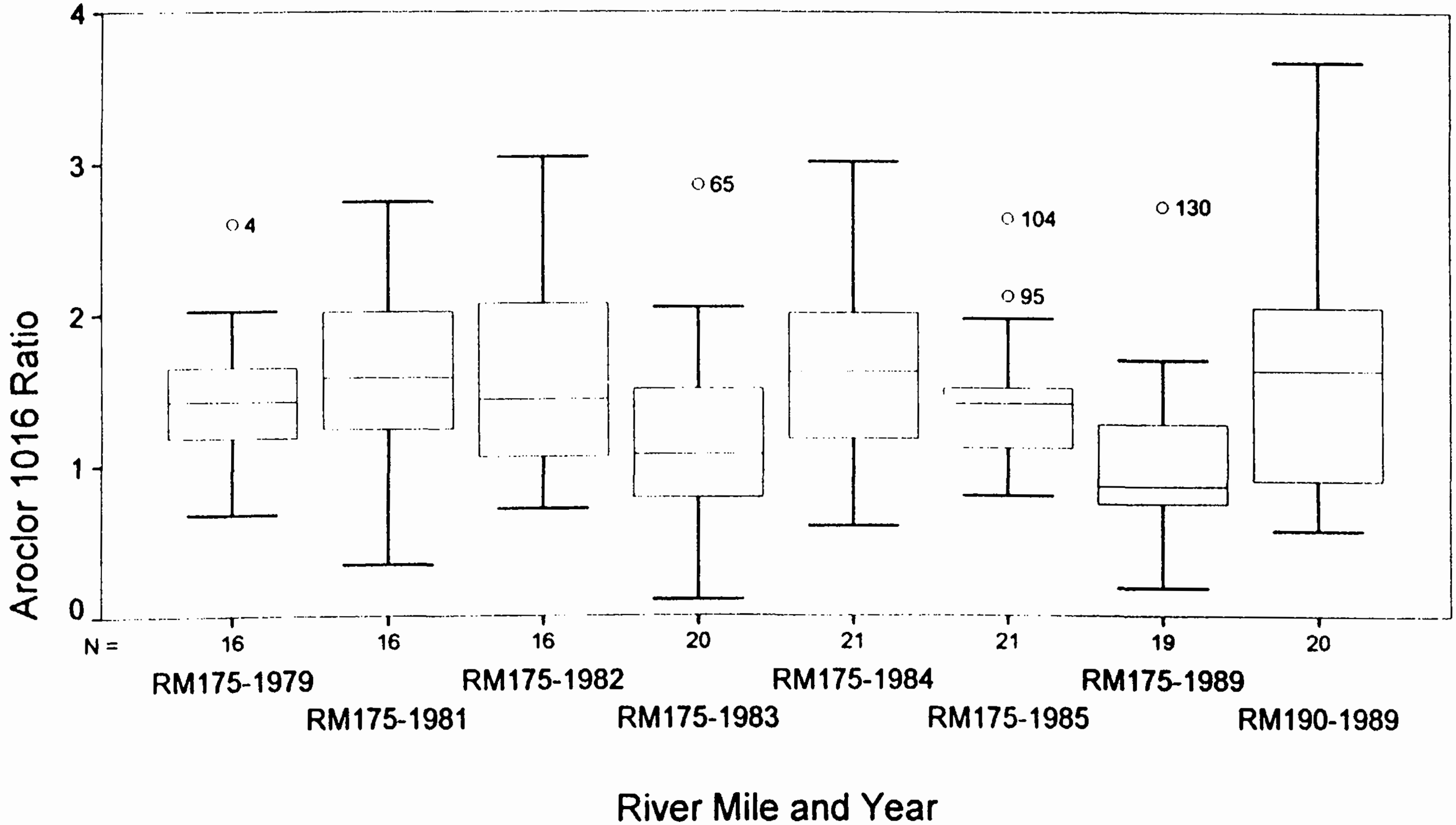



| Station | Known GeoMean Concentration ug/g |
|---|---|
| 1 | 7.91 |
| 2 | 1,769.58 |
| 3 | 713.49 |
| 4 | 1,084.96 |
| 5 | |
| 6 | |
| 7 | |
| 8 | 620.10 |
| 9 | |
| 10 | 292.77 |
| 11 | |
| 12 | 128.80 |
| 13 | |
| 14 | |
| 15 | 87.81 |
| 16 | |
| 17 | |
| 18 | |

# Figure 10-68

## Ratio of Largemouth Bass to Pumpkinseed

## by River Mile and Year for Aroclor 1016




Prepared by KvS 5 Aug 96

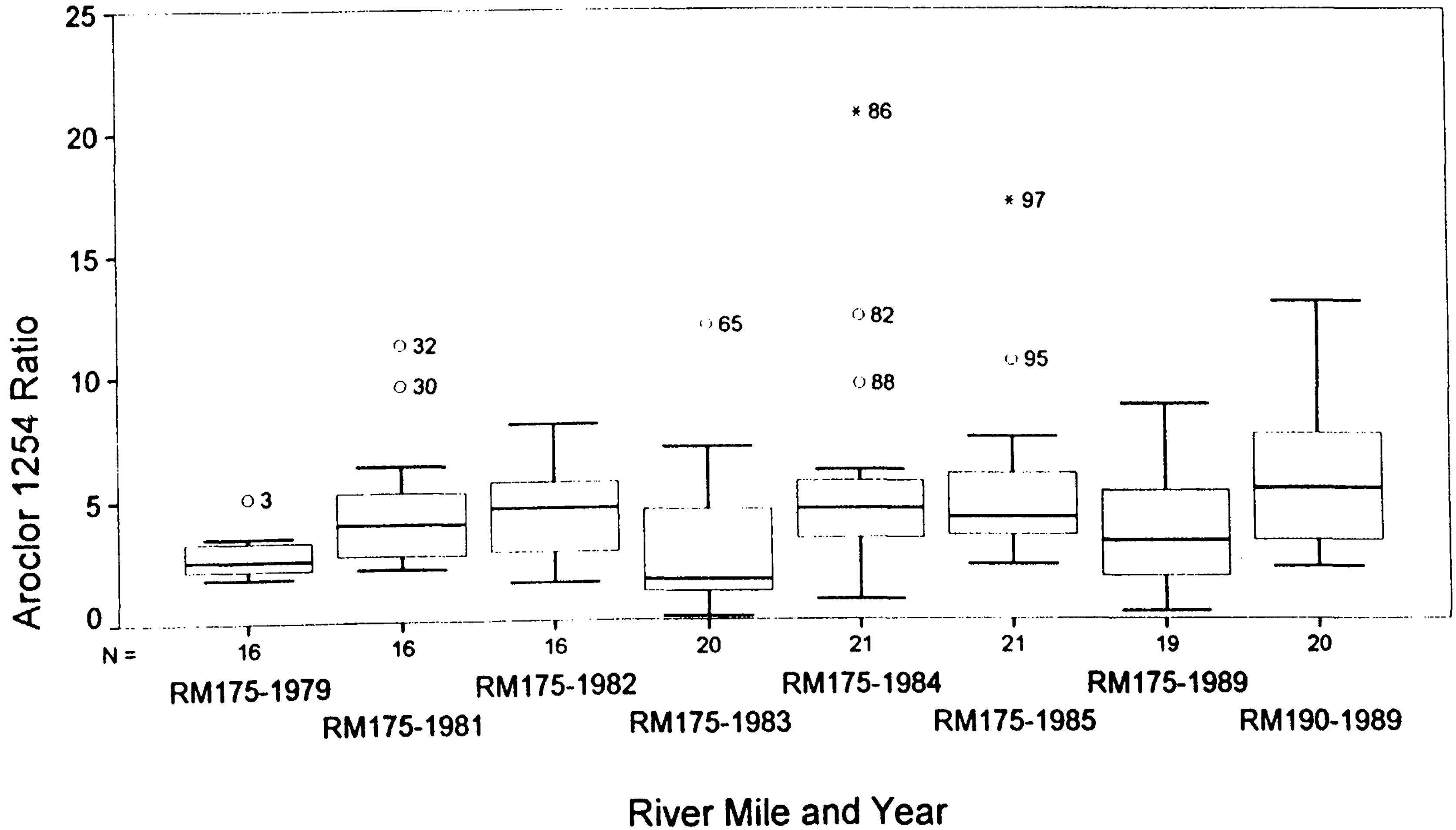
Database Release 3.1

HRP 002 1515

# Figure 10-69

## Ratio of Largemouth Bass to Pumpkinseed

## by River Mile and Year for Aroclor 1254



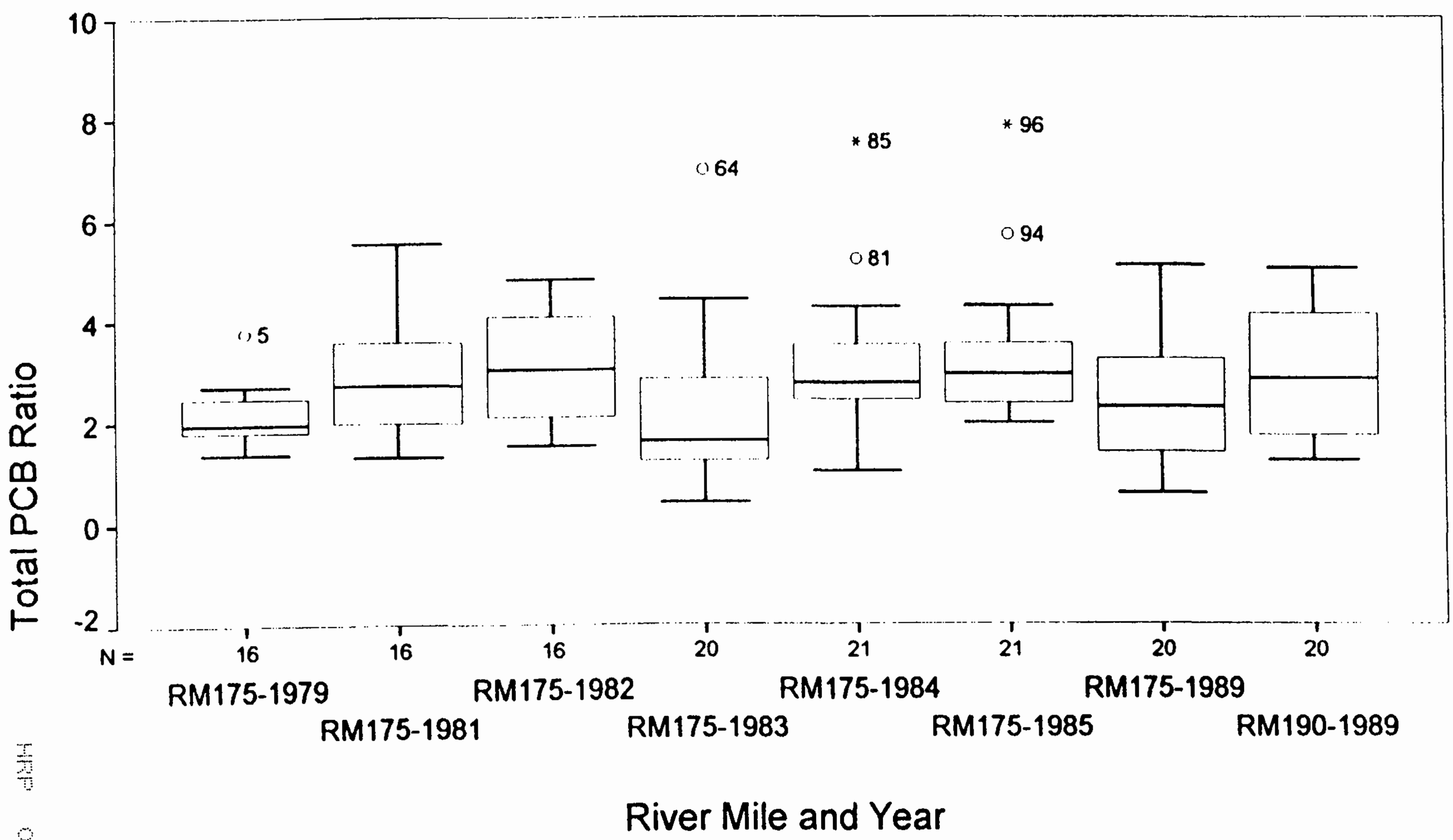

Prepared by KvS 4 Aug 96

Database Release 3.1

# Figure 10-70

## Ratio of Largemouth Bass to Pumpkinseed

## by River Mile and Year - Total PCBs




Prepared by KvS 4 Aug 96

Database Release 3.1

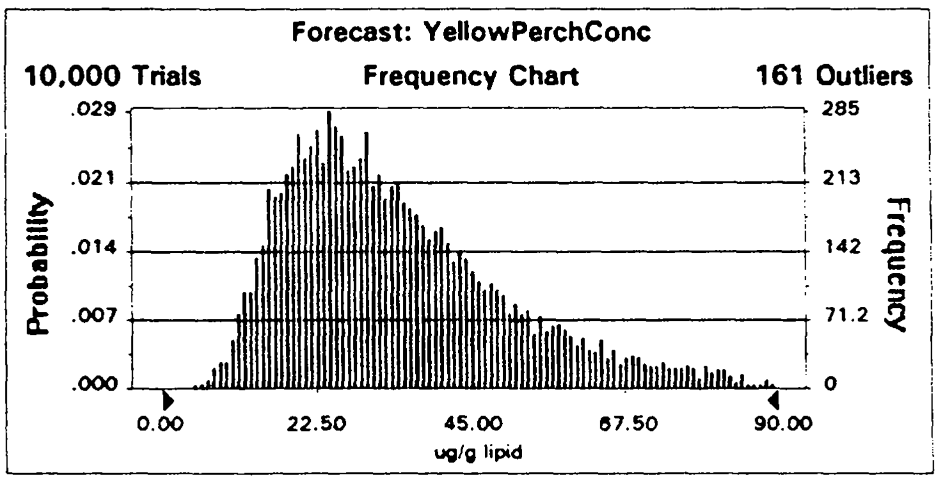
HRP 002 1517

Figure 10-71
Sample Yellow Perch Bioaccumulation Model Application:
Monte Carlo Output

**Forecast: Yellow Perch Concentration** **Cell: K5**

Summary:
Display Range is from 0.00 to 90.00 ug/g lipid
Entire Range is from 4.70 to 159.11 ug/g lipid
After 10,000 Trials, the Std. Error of the Mean is 0.19

| Statistics: | Value |
|---|---|
| Trials | 10000 |
| Mean | 35.56 |
| Median | 31.42 |
| Mode | --- |
| Standard Deviation | 18.58 |
| Variance | 345.09 |
| Skewness | 1.51 |
| Kurtosis | 6.63 |
| Coeff. of Variability | 0.52 |
| Range Minimum | 4.70 |
| Range Maximum | 159.11 |
| Range Width | 154.41 |
| Mean Std. Error | 0.19 |




HRP 002 1518

Figure 10-71
Sample Yellow Perch Bioaccumulation Model Application:
Monte Carlo Output

**Forecast: YellowPerchConc (cont'd)** **Cell: K5**

Percentiles:

| Percentile | ug/g lipid |
|---|---|
| 0% | 4.70 |
| 10% | 16.56 |
| 25% | 22.39 |
| 50% | 31.42 |
| 75% | 44.14 |
| 90% | 59.61 |
| 100% | 159.11 |

End of Forecast

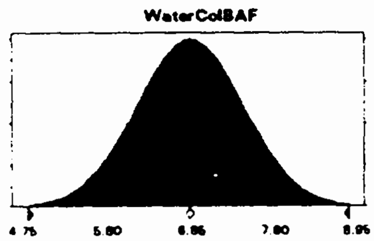
## Assumptions

**Assumption: WaterColBAF** **Cell: C4**

Normal distribution with parameters:

| | |
|---|---|
| Mean | 6.85 |
| Standard Dev. | 0.70 |

Selected range is from -Infinity to +Infinity
Mean value in simulation was 6.86

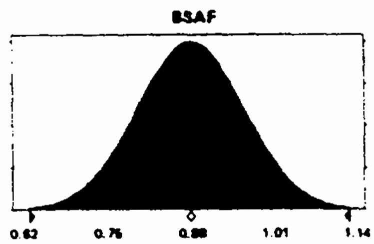



**Assumption: BSAF** **Cell: C6**

Normal distribution with parameters:

| | |
|---|---|
| Mean | 0.88 |
| Standard Dev. | 0.09 |

Selected range is from -Infinity to +Infinity
Mean value in simulation was 0.88




NOTE: the standard error is used rather than the standard deviation to incorporate uncertainty about the mean estimate. These distributions are considered normal.

HRP 002 1519

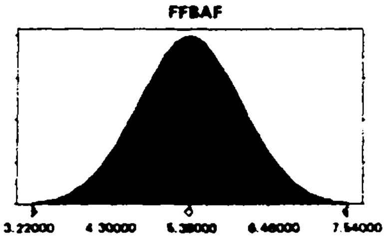
Figure 10-71
Sample Yellow Perch Bioaccumulation Model Application:
Monte Carlo Output

**Assumption: FFBAF** **Cell: G5**

Normal distribution with parameters:

| | |
|---|---|
| Mean | 5.38000 |
| Standard Dev. | 0.72000 |

Selected range is from -Infinity to +Infinity
Mean value in simulation was 5.37095

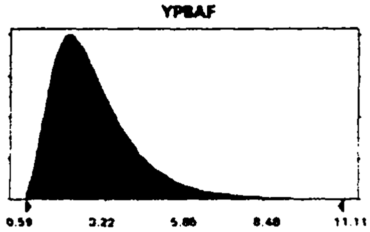



**Assumption: YPBAF** **Cell: J5**

Lognormal distribution with parameters:

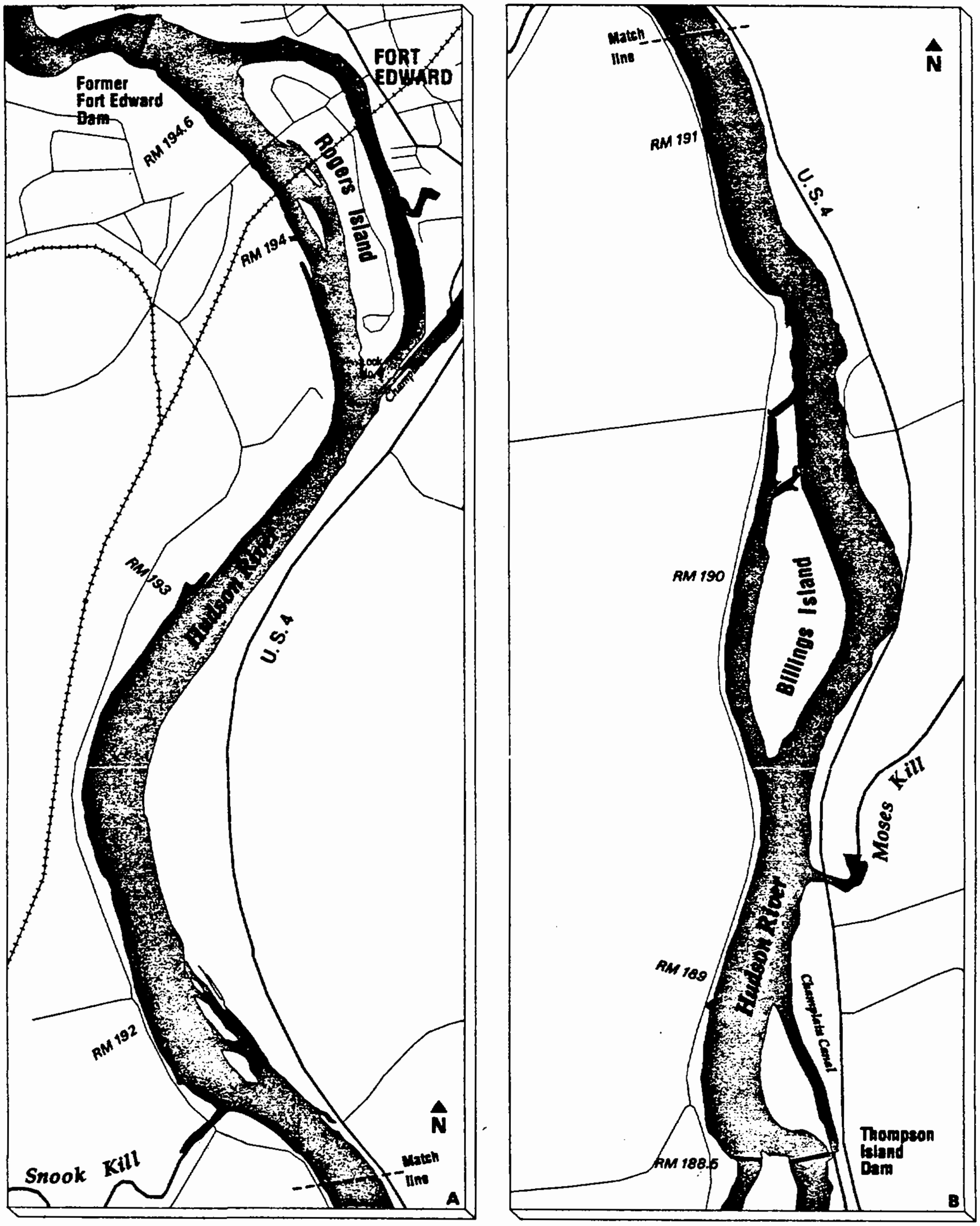
| | |
|---|---|
| Mean | 2.88 |
| Standard Dev. | 1.50 |

Selected range is from 0.00 to +Infinity
Mean value in simulation was 2.88




End of Assumptions

HRP 002 1520




## Thompson Island Pool

# Study Site

Stream
Road
Railroad
River miles approximate.

0 — 1/2 mile
0 — 500 meters

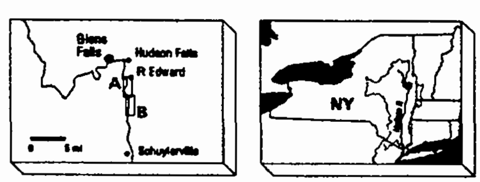
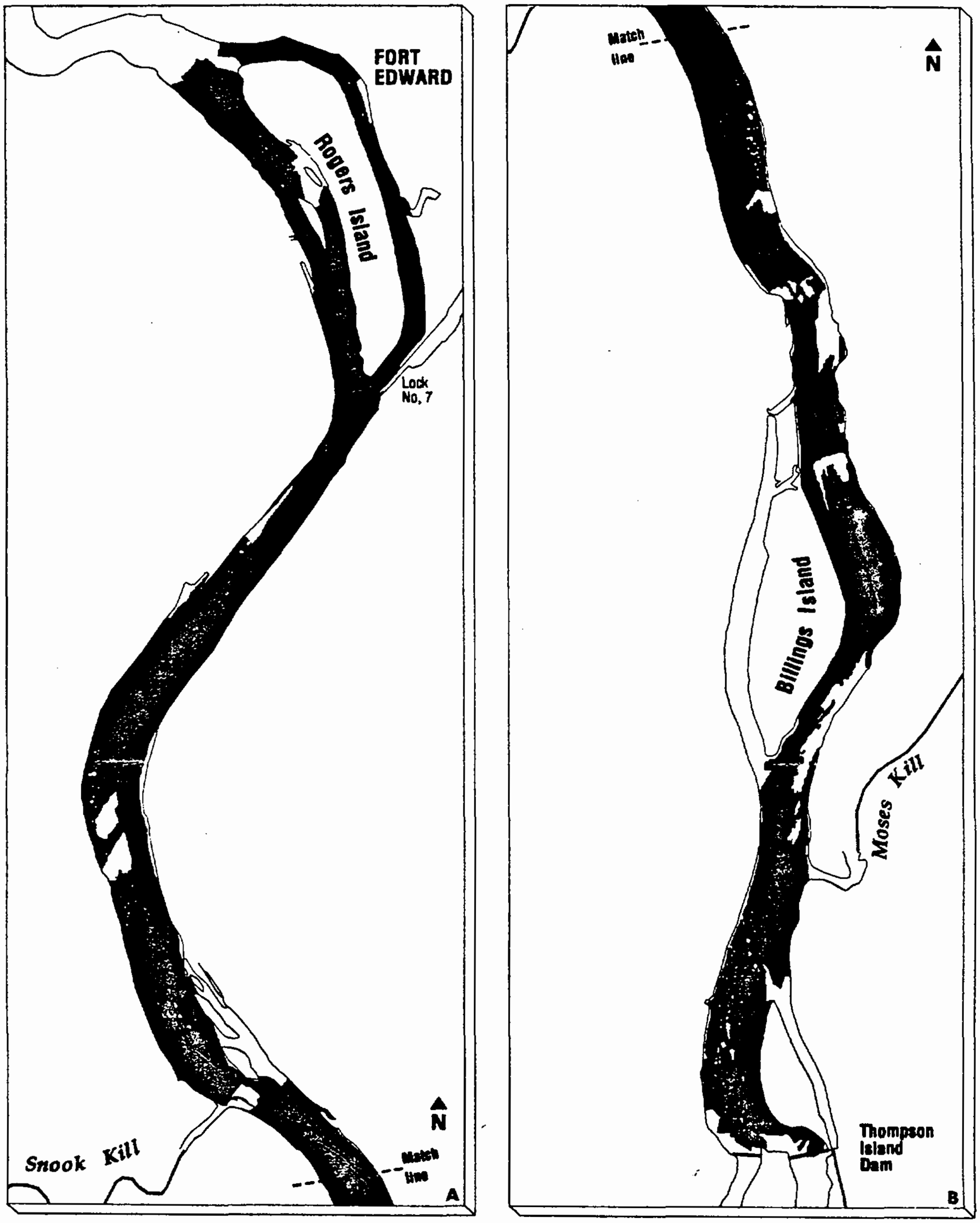



**Plate 6-1** Limno-Tech, Inc.




## Thompson Island Pool

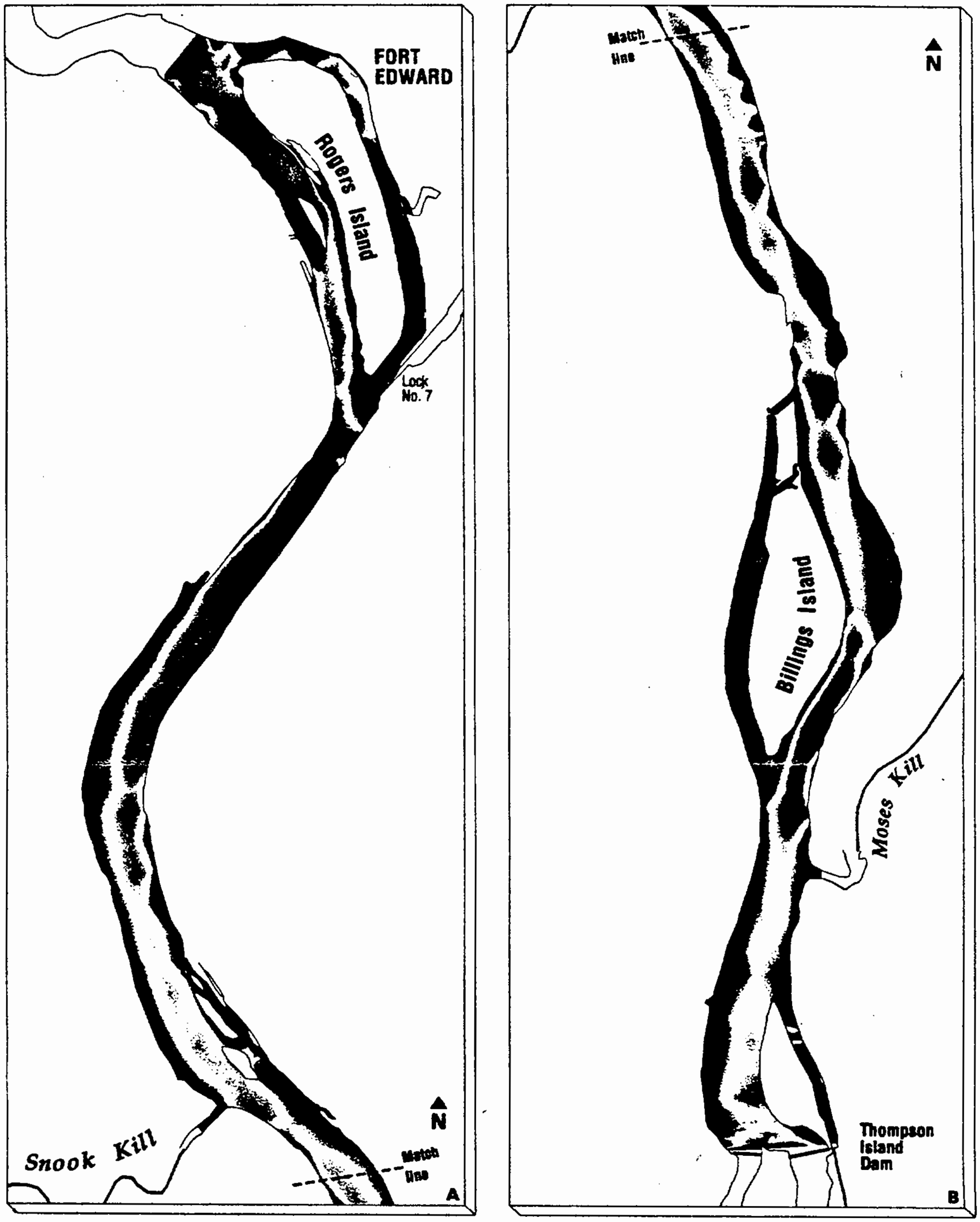
# Sediment Distribution

0 1/2 mile

0 500 meters

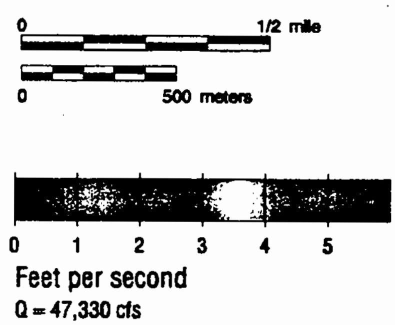
Cohesive

Non-cohesive




## Thompson Island Pool

# 100-year Event Velocity




# Thompson Island Pool

# 100-year Event Shear Stress

0 1/2 mile

0 500 meters

0 20 40 60 80 100

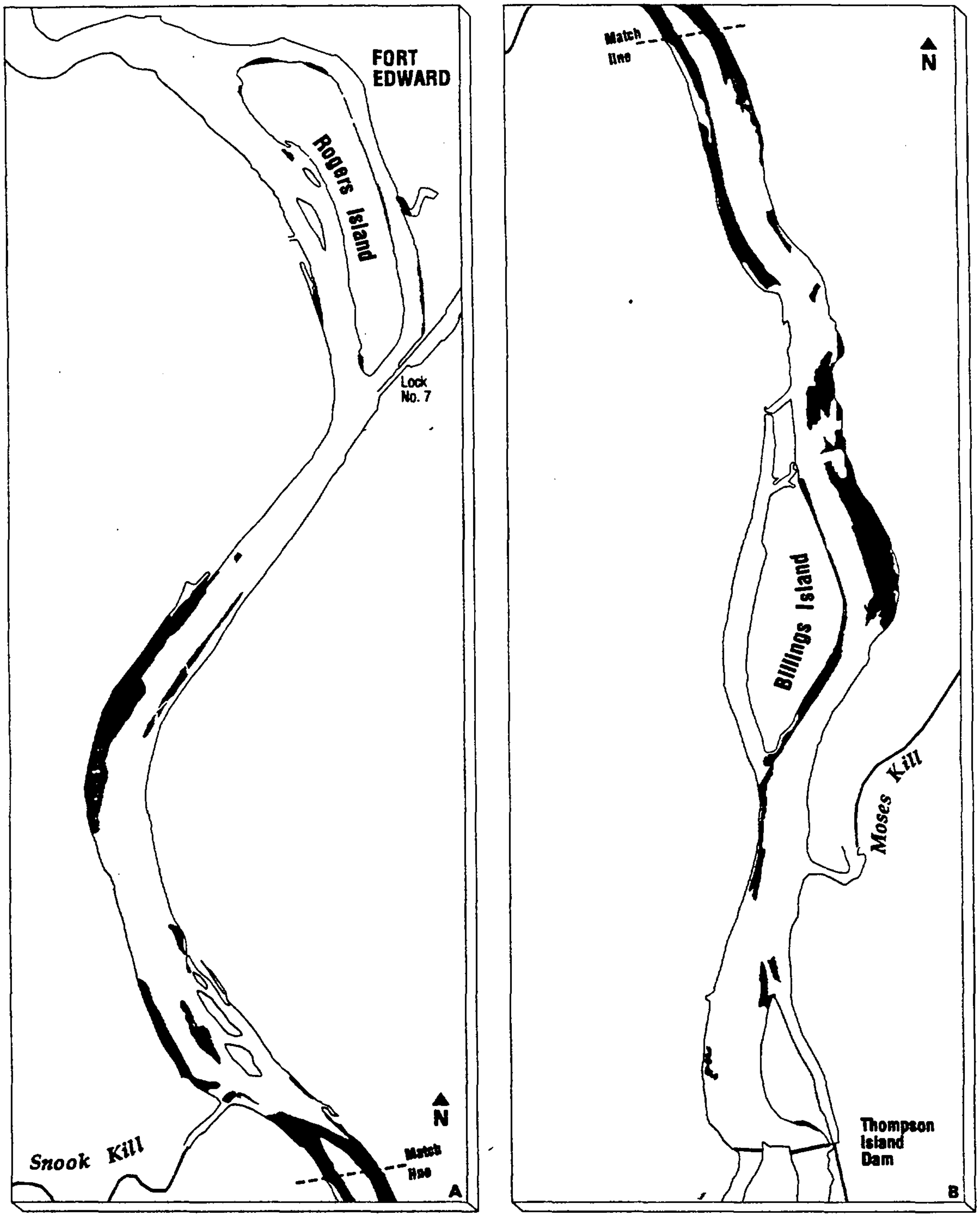
Dynes per square centimeter

Q = 47,330 cfs

HRP 002 1524

Plate 6-4

Limno-Tech, Inc.




## Thompson Island Pool

# 100-year Event
# Cohesive Sediments
# Mass Eroded

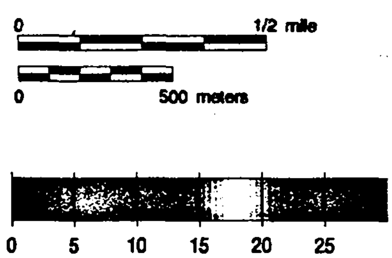
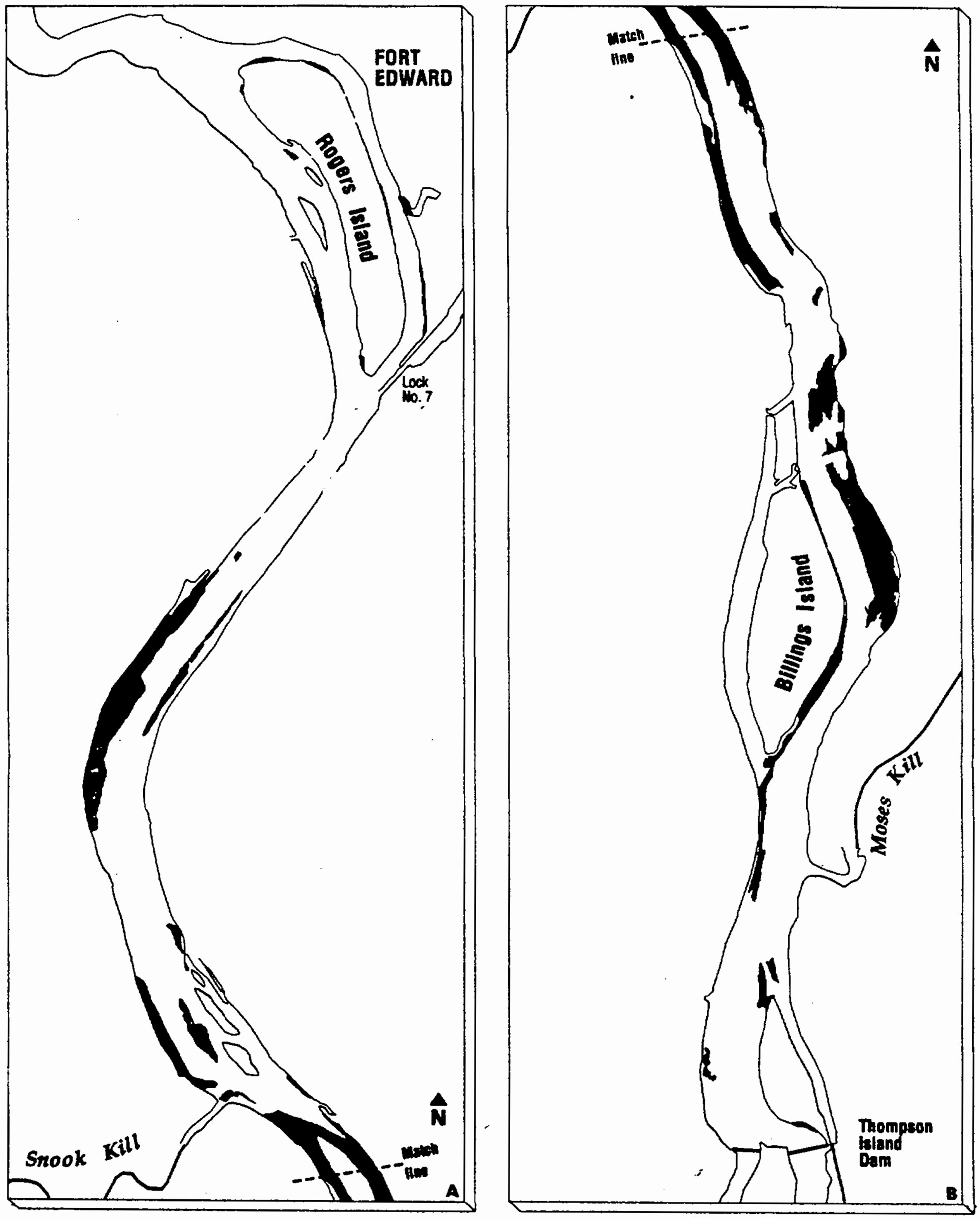



Plate 6-5

Limno-Tech, Inc.




**Thompson Island Pool**

# 100-year Event Cohesive Sediments Depth of Scour

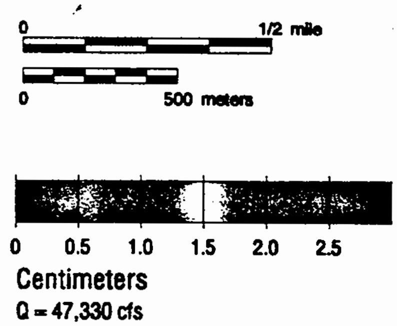
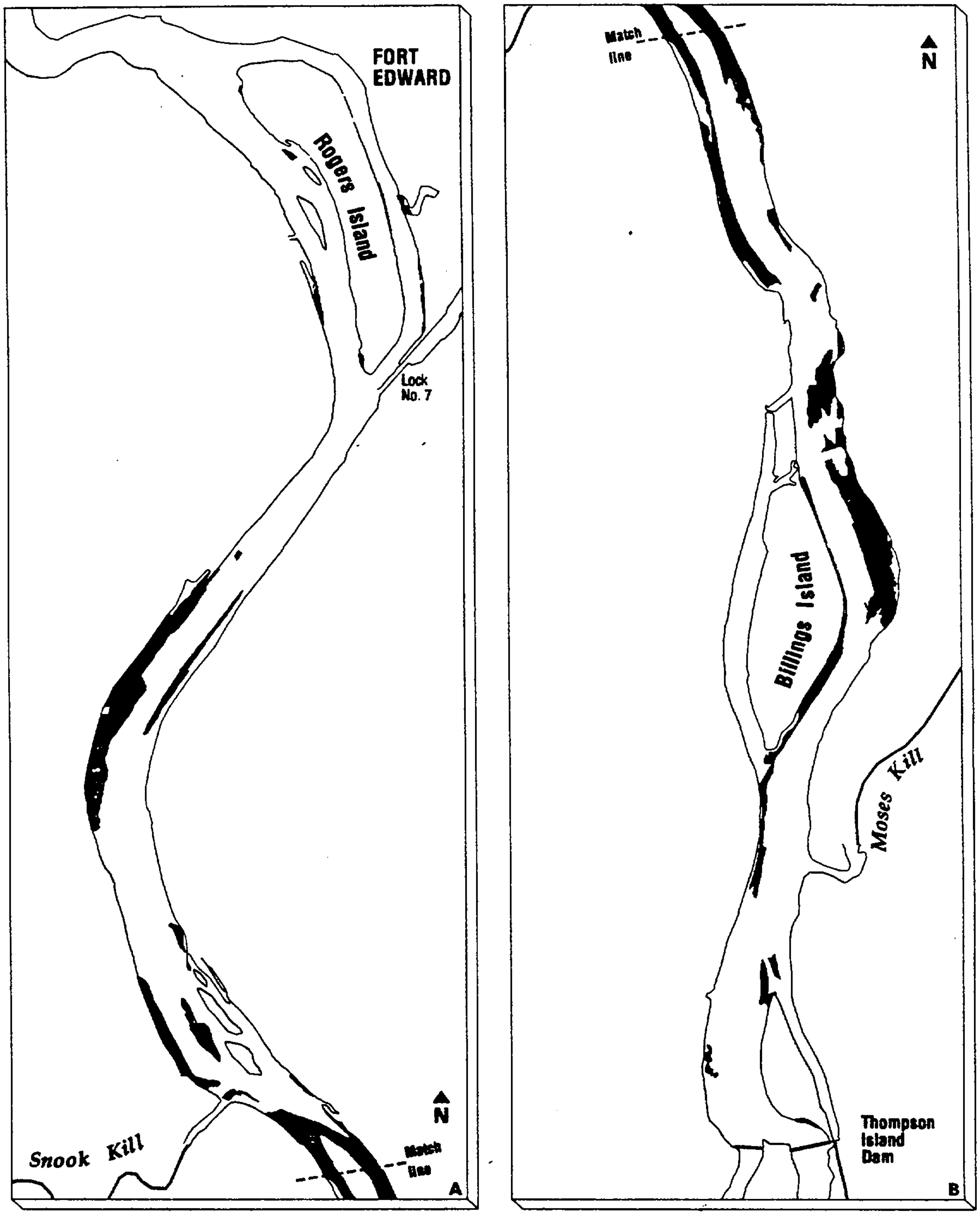



Plate 6-6

Limno-Tech, Inc.




0 1/2 mile

0 500 meters

0 0.25 0.50 0.75 1.00 1.25

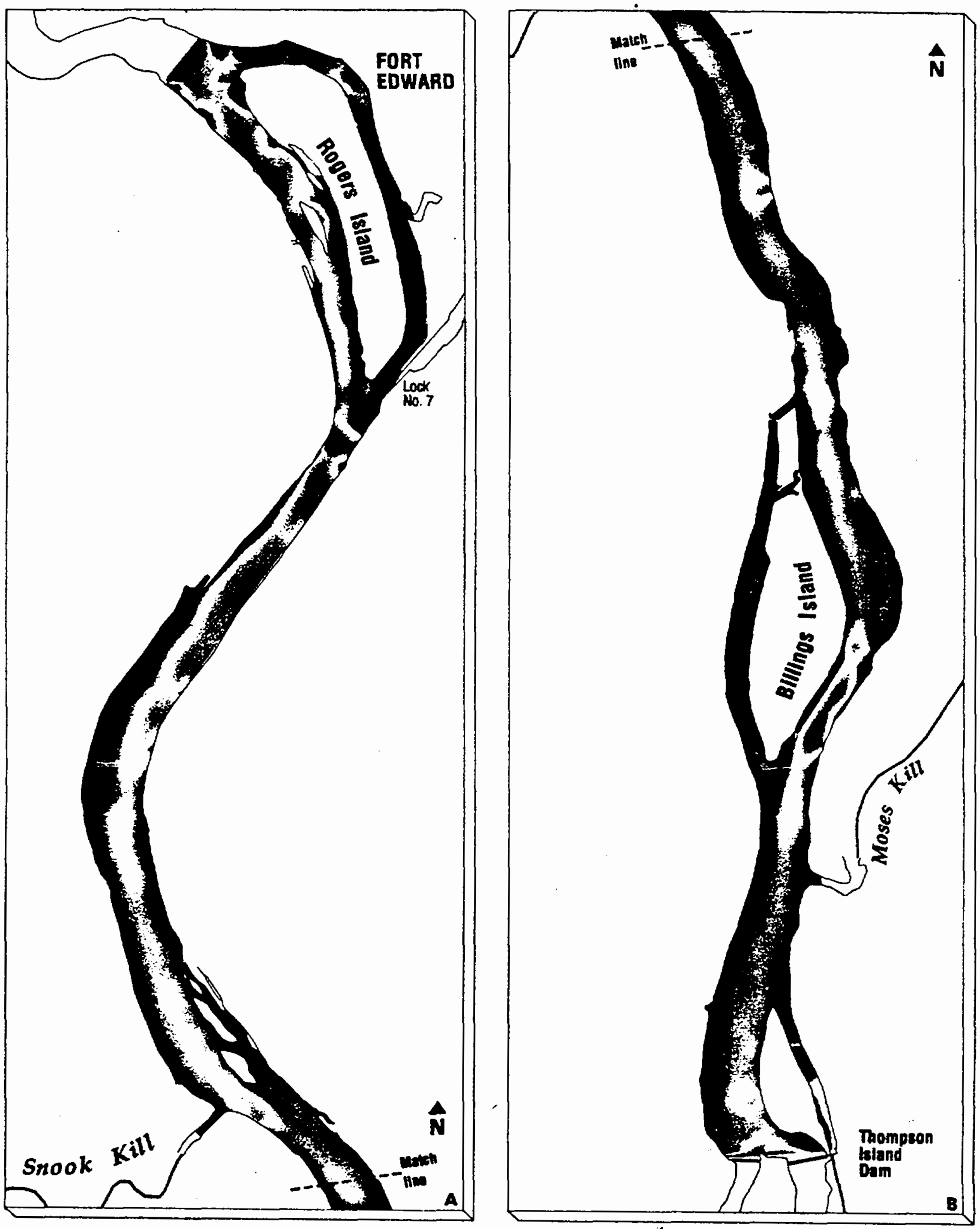
Grams per square meter

Q = 47,330 cfs

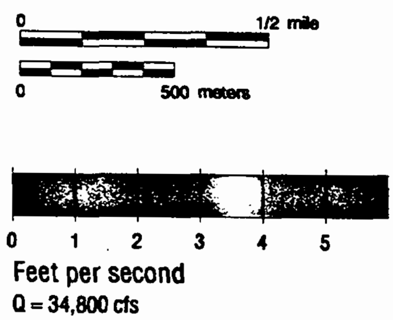
**Thompson Island Pool**

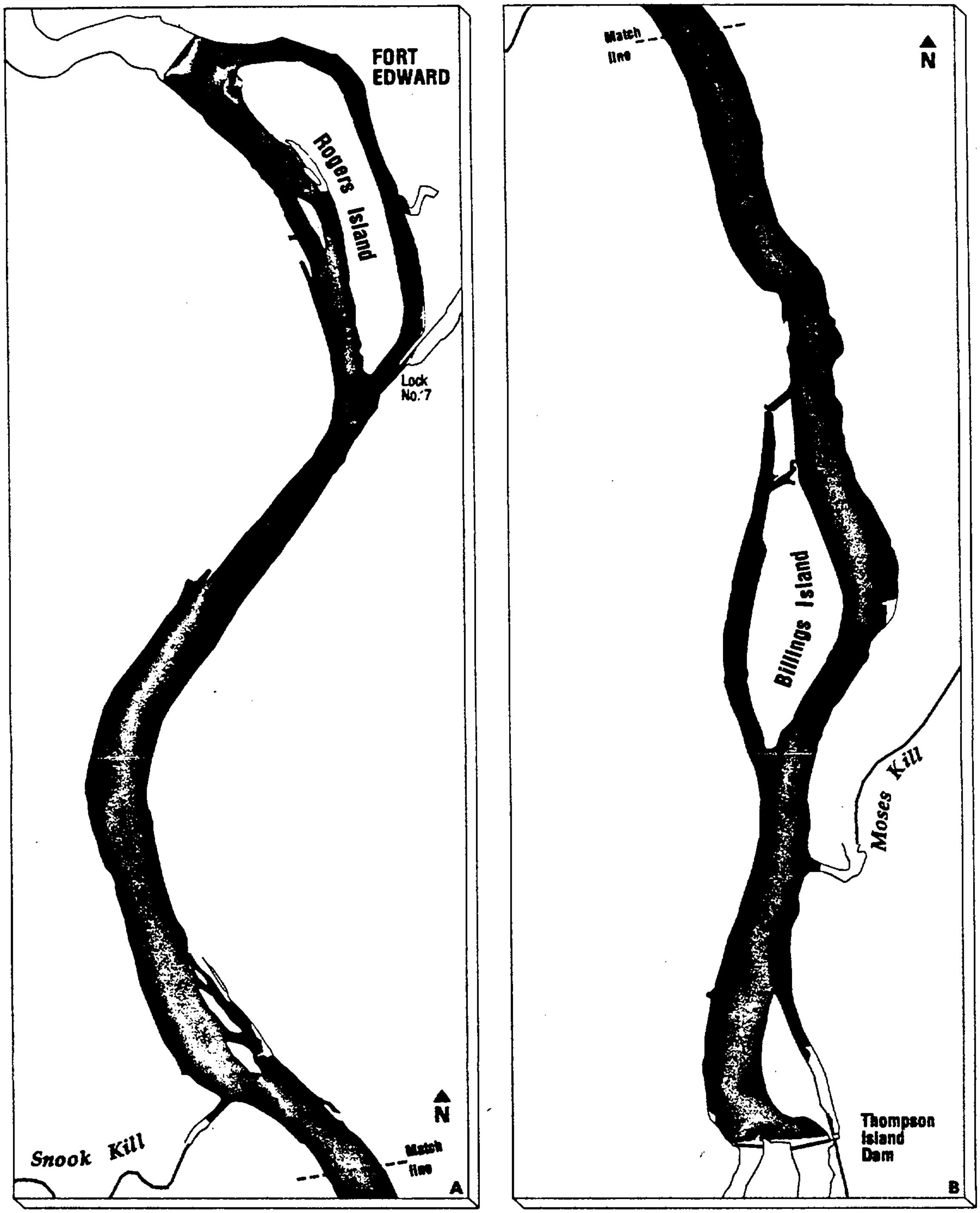
# 100-year Event Cohesive Sediments Mass of PCBs Eroded

Plate 6-7 Limno-Tech, Inc.




# Thompson Island Pool
## 1983 Event Velocity






# Thompson Island Pool

## 1983 Event
## Shear Stress

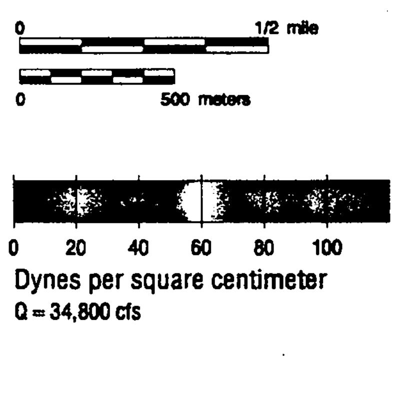
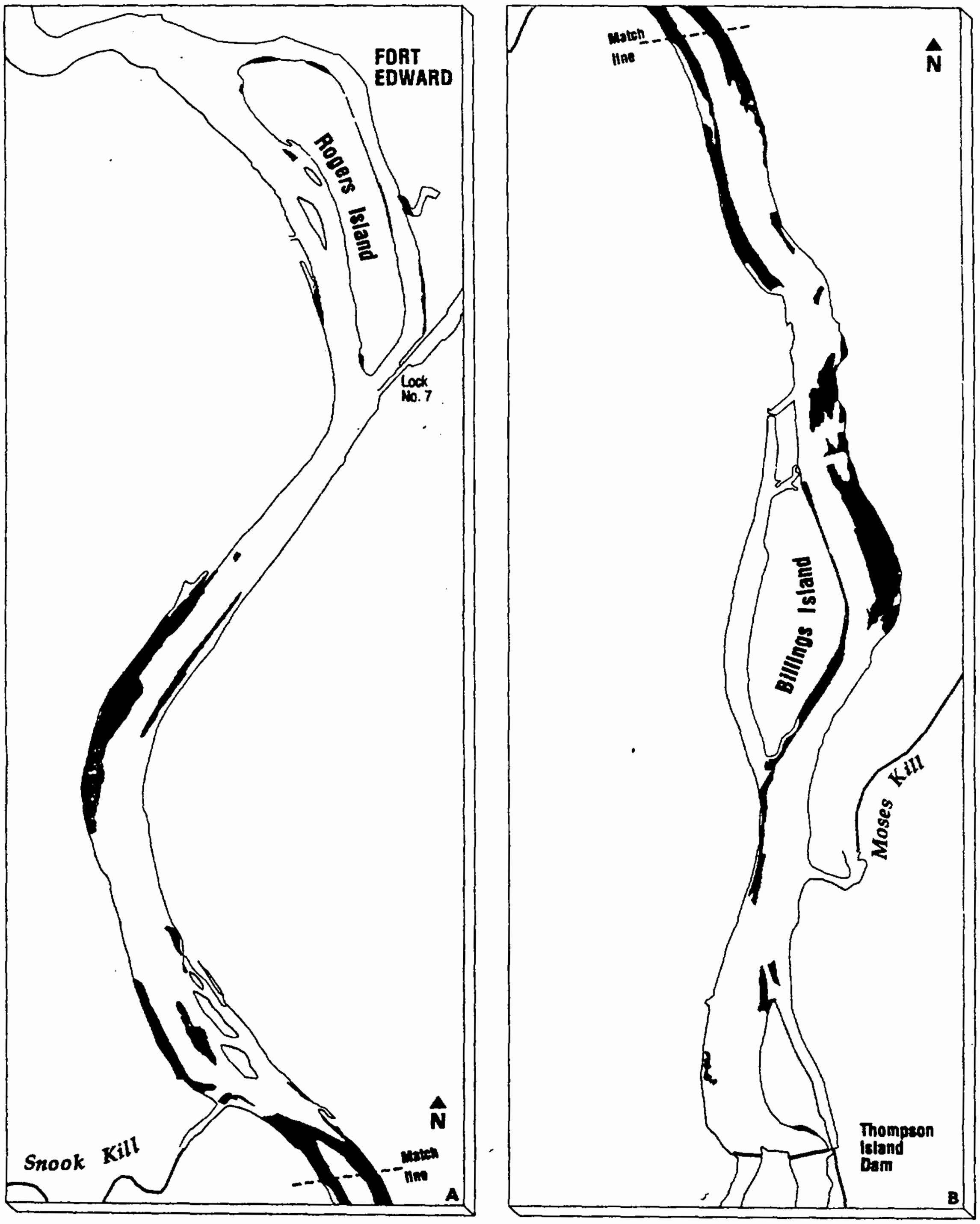



Plate 6-9

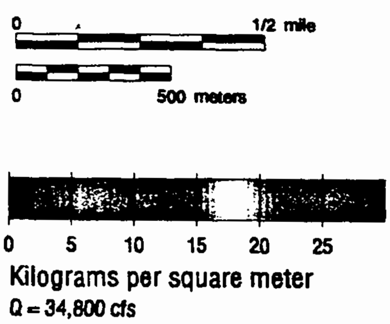
Limno-Tech, Inc.

HRP 002 1529




**Thompson Island Pool**

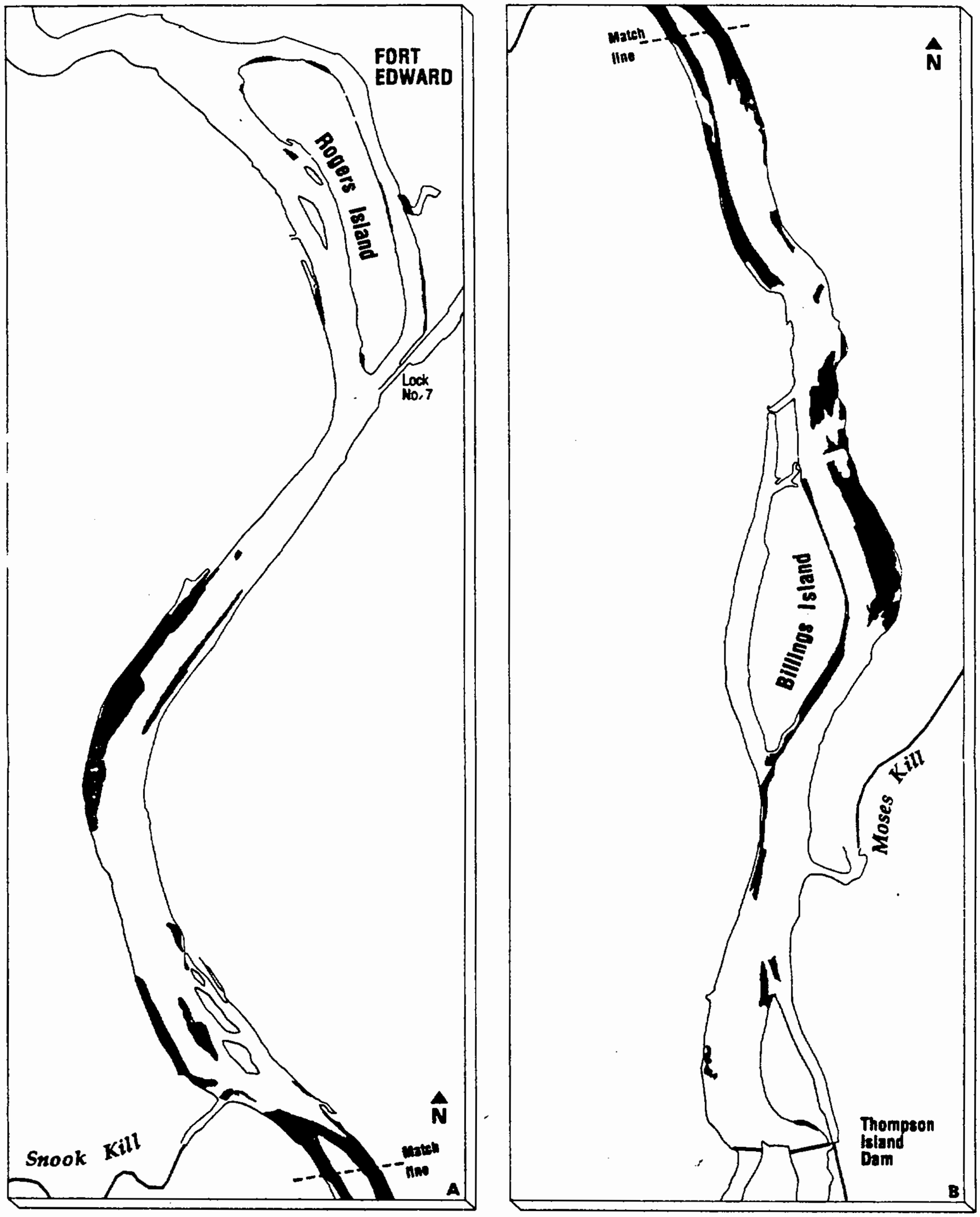
# 1983 Event
# Cohesive Sediments
# Mass Eroded

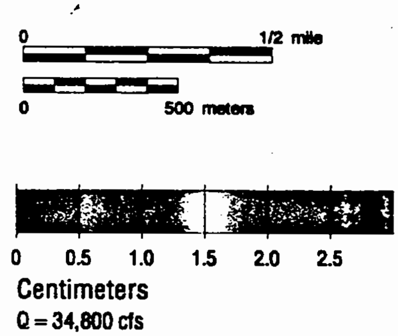



HRP 002 1530

Plate 6-10

Limno-Tech, Inc.



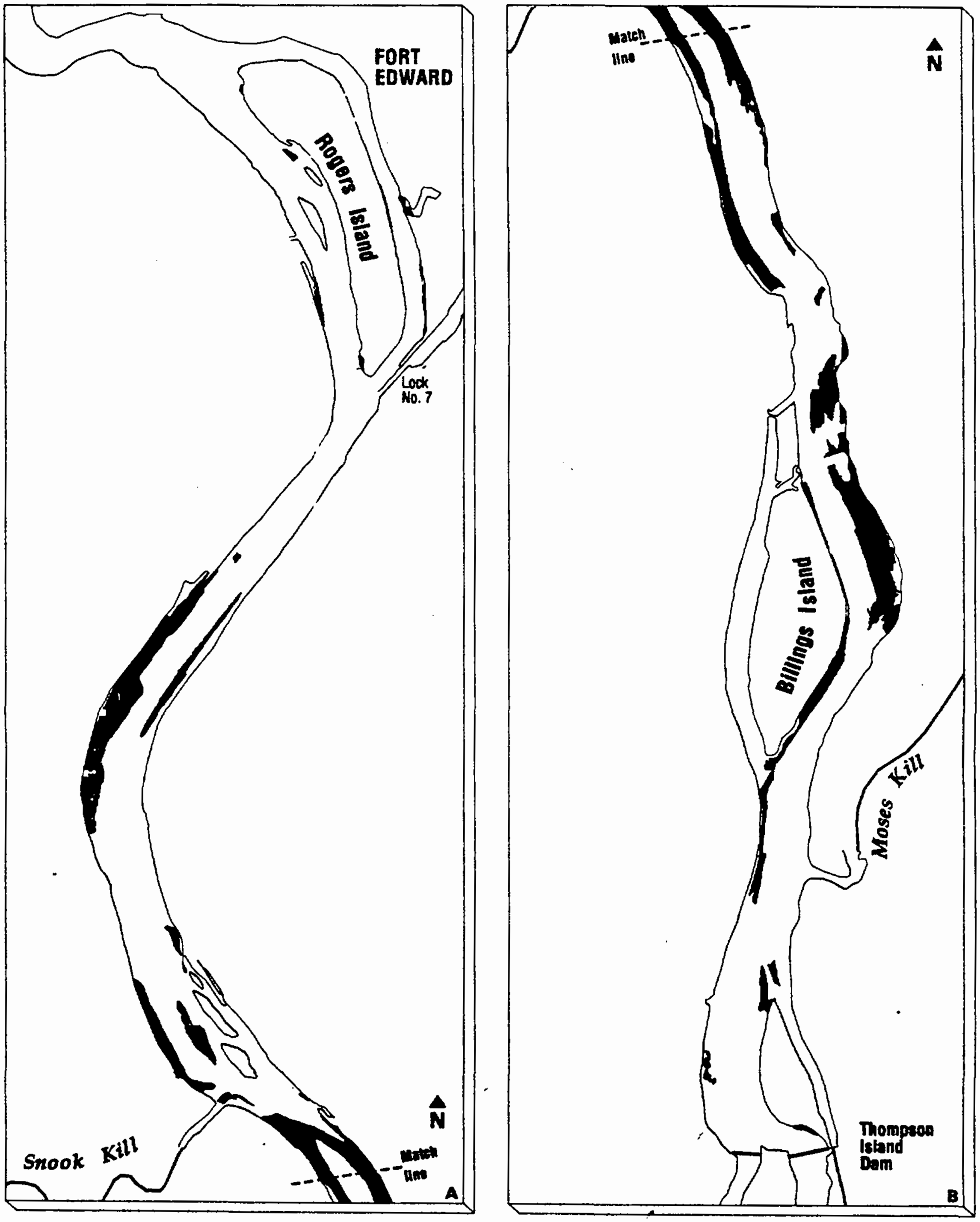




## Thompson Island Pool

# 1983 Event
# Cohesive Sediments
# Depth of Scour

Plate 6-11

Limno-Tech, Inc.

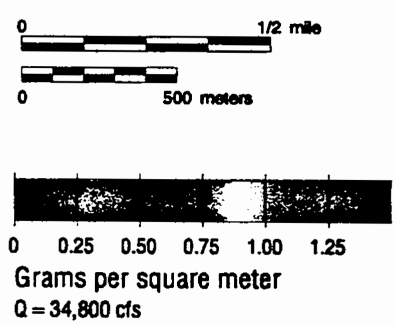



Thompson Island Pool

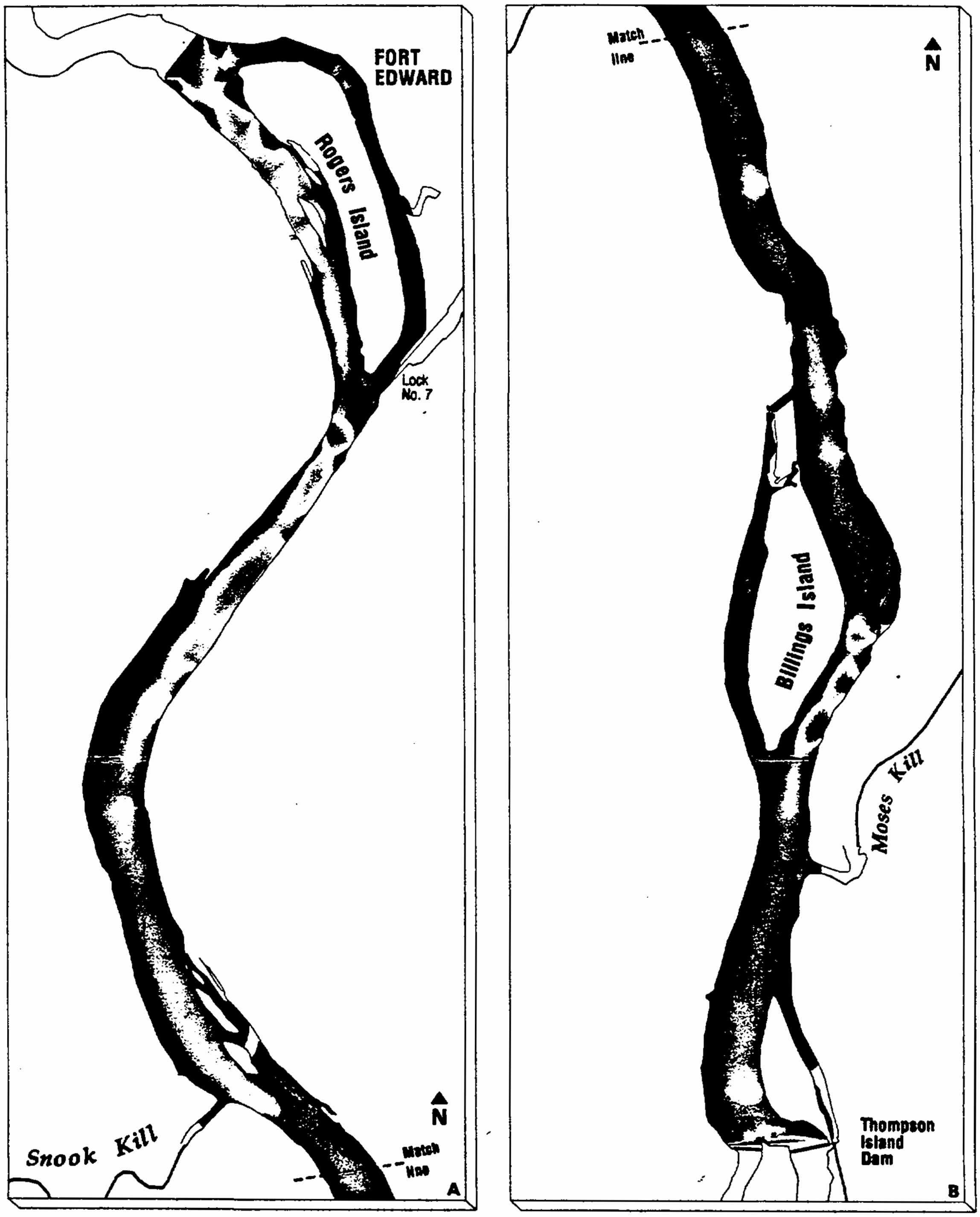
# 1983 Event
# Cohesive Sediments
# Mass of PCBs Eroded

Plate 6-12

Limno-Tech, Inc.

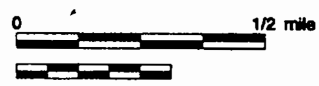



HRP 002 1532




## Thompson Island Pool

# Spring 1994 Event Velocity

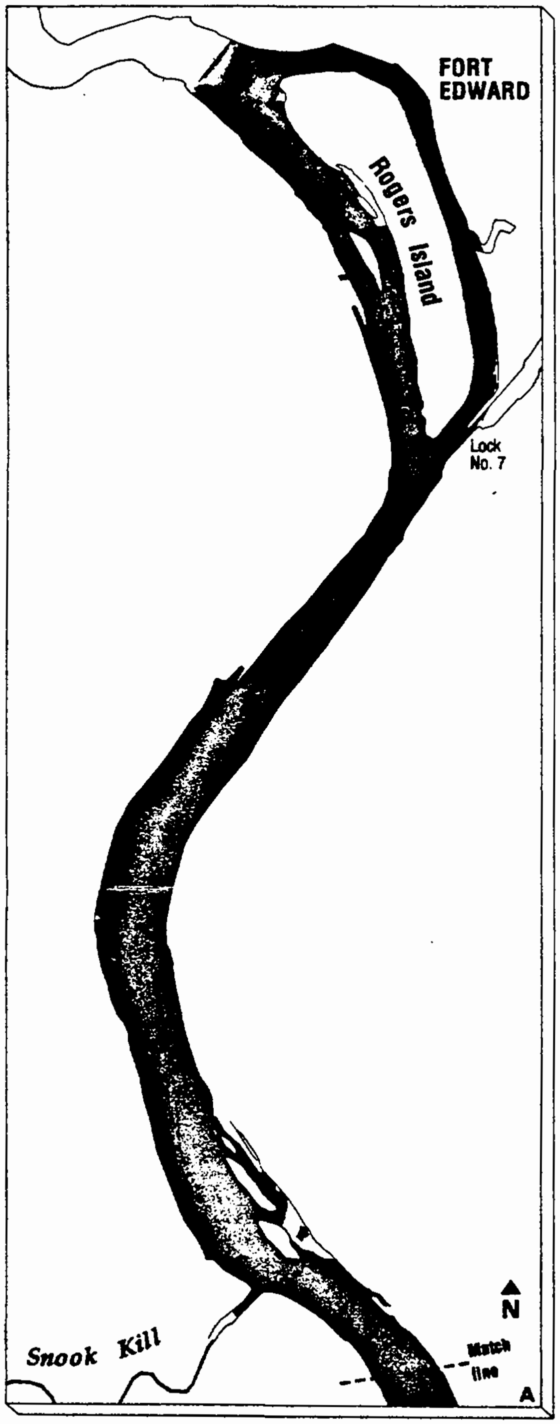


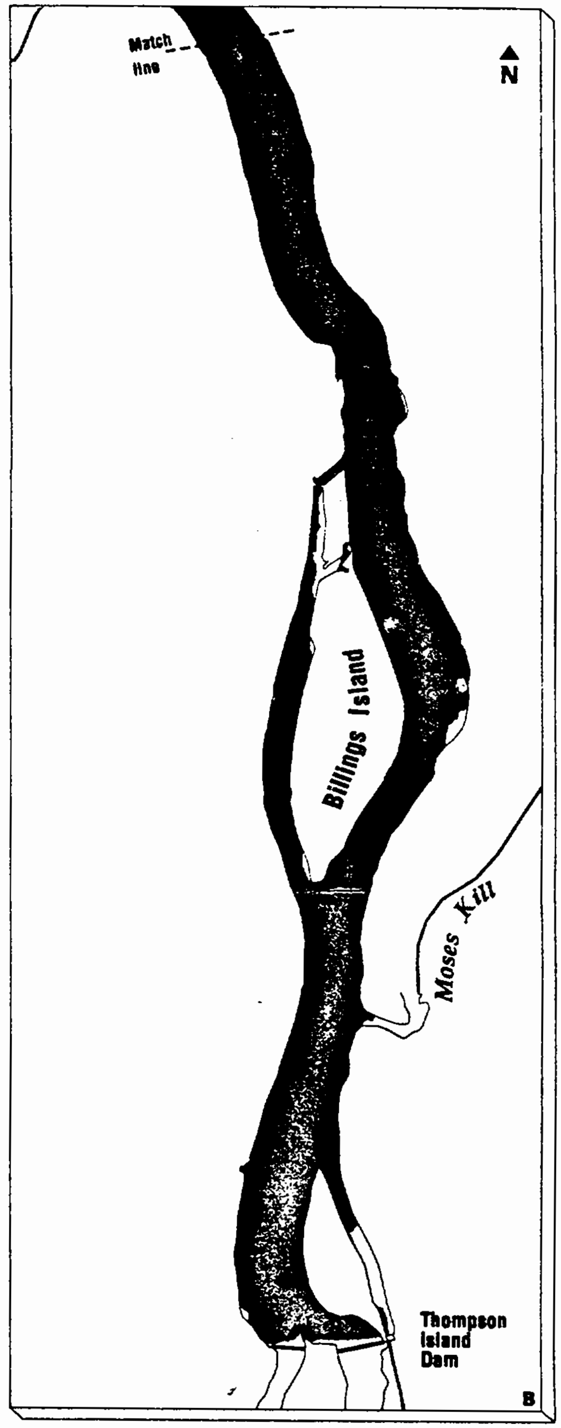


HRP 002 1533

Plate 6-13

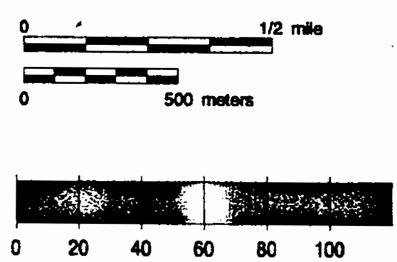
Limno-Tech, Inc.




## Thompson Island Pool

# Spring 1994 Event
# Shear Stress

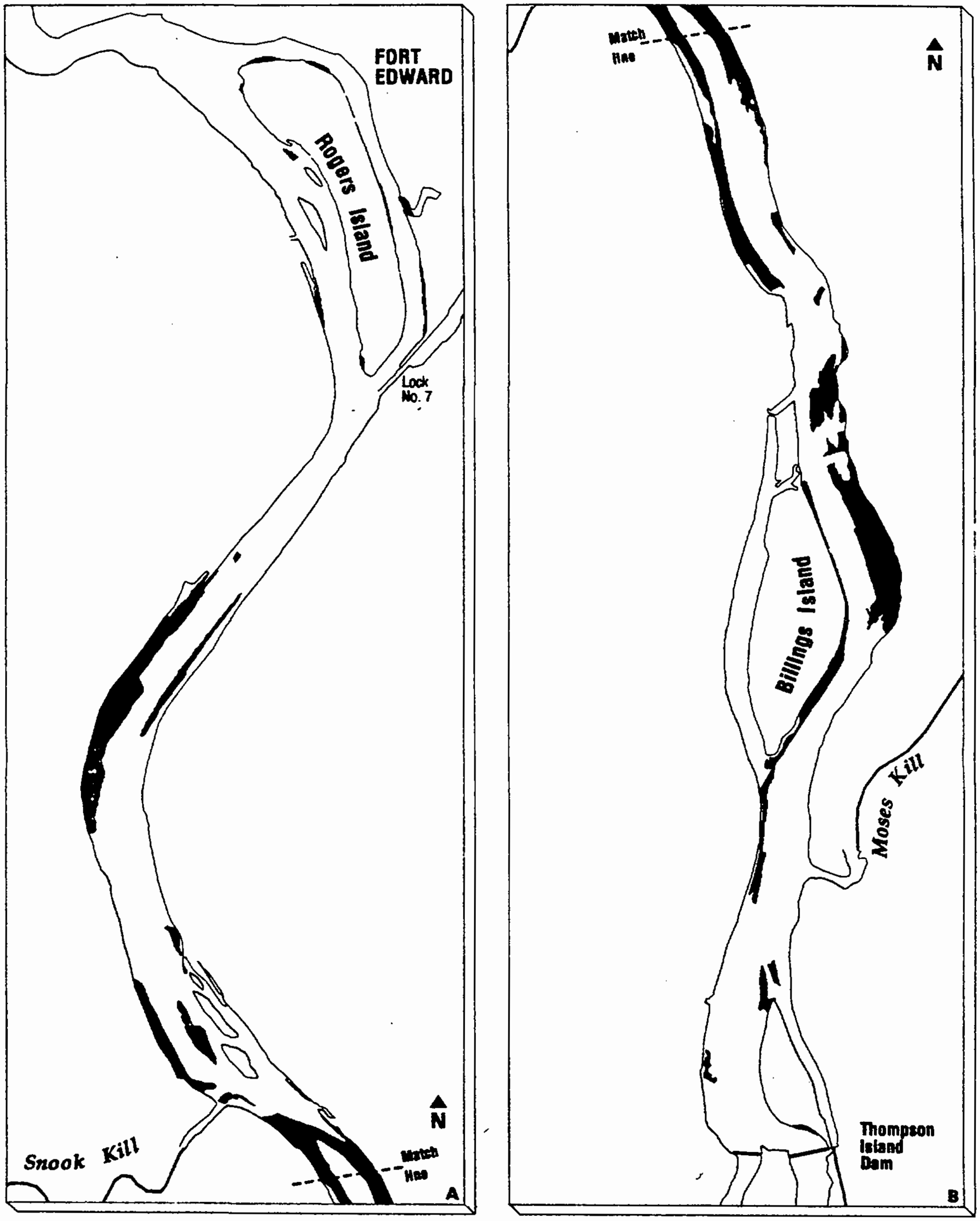


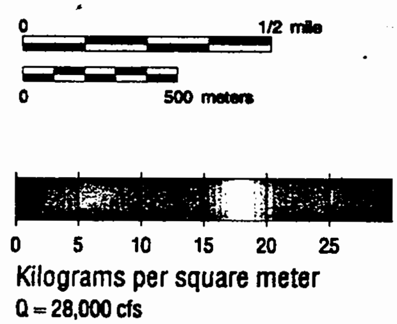

Dynes per square centimeter
Q = 28,000 cfs

Plate 6-14

Limno-Tech, Inc.

HRF 002 1534



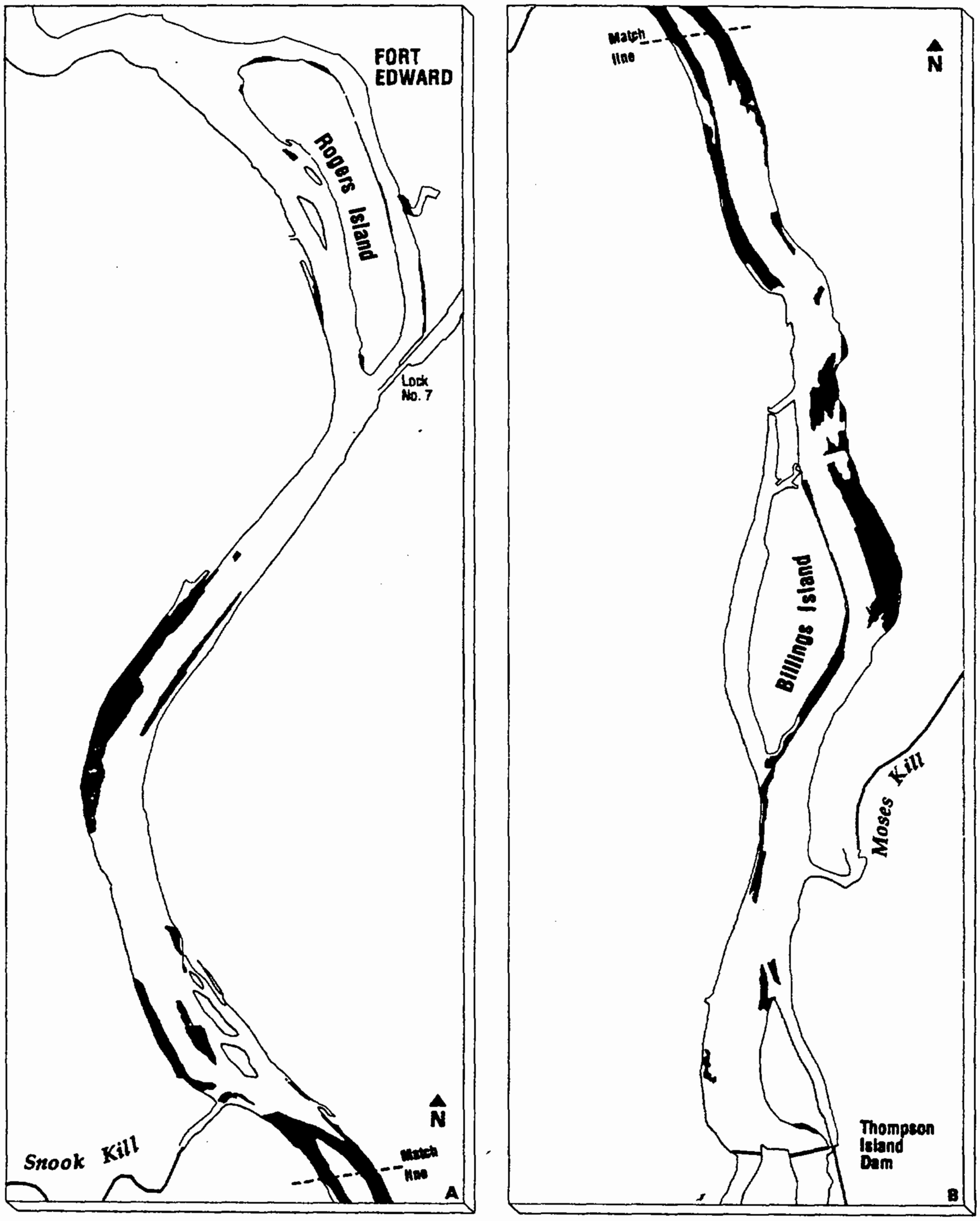

Thompson Island Pool

# Spring 1994 Event Cohesive Sediments Mass Eroded

Plate 6-15

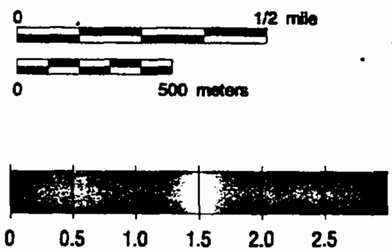
Limno-Tech, Inc.

HRP 002 1535




## Thompson Island Pool

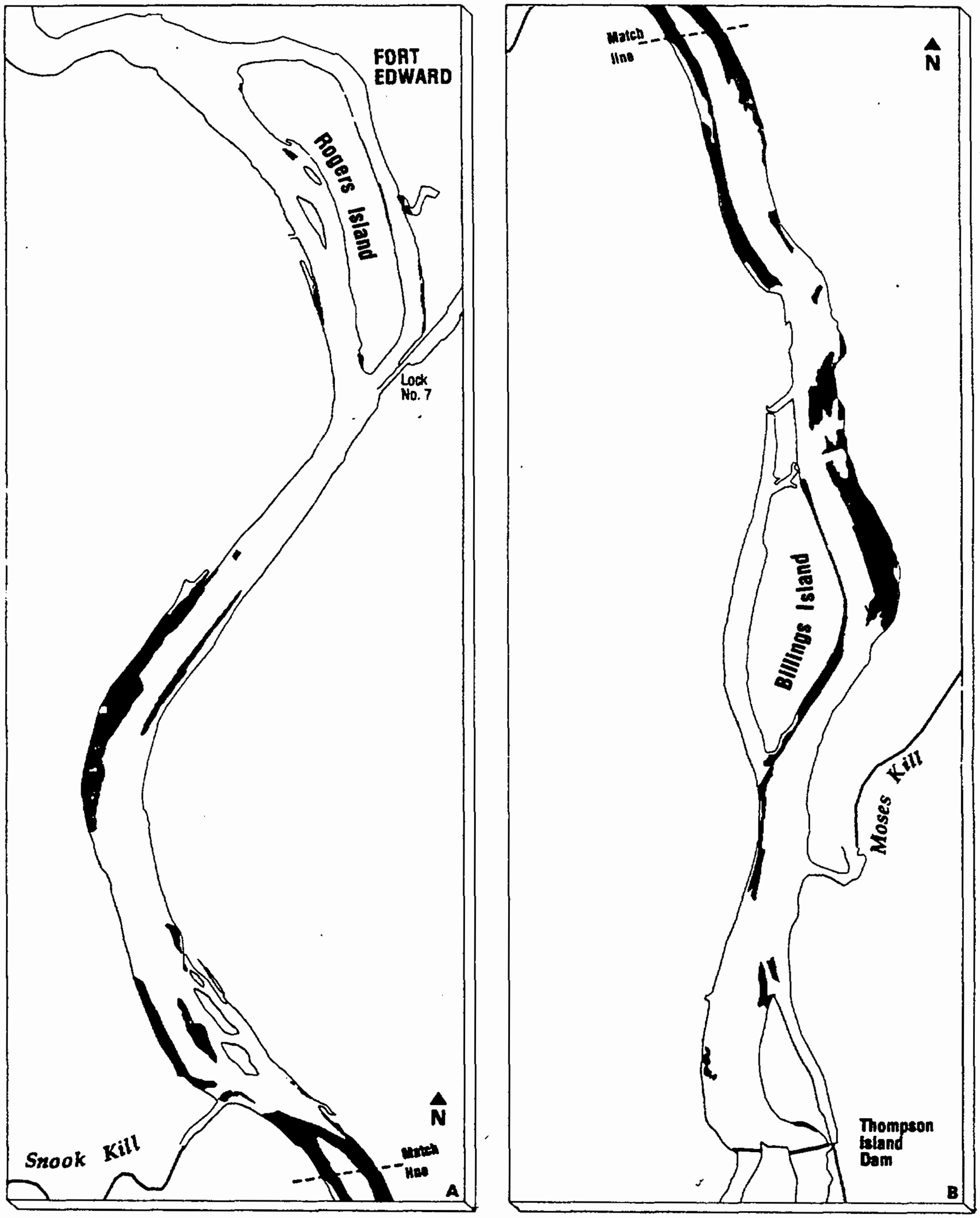
# Spring 1994 Event Cohesive Sediments Depth of Scour




Centimeters
Q = 28,000 cfs

Plate 6-16

Limno-Tech, Inc.




## Thompson Island Pool

# Spring 1994 Event
# Cohesive Sediments
# Mass of PCBs Eroded

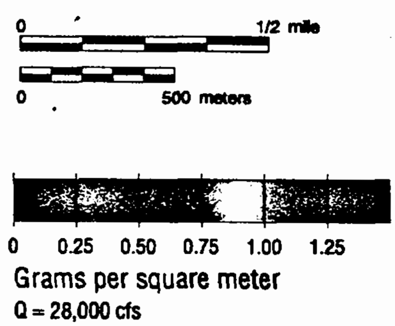



Plate 6-17

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HRP 002 1537


## Thompson Island Pool

# Spring 1992 Event Velocity

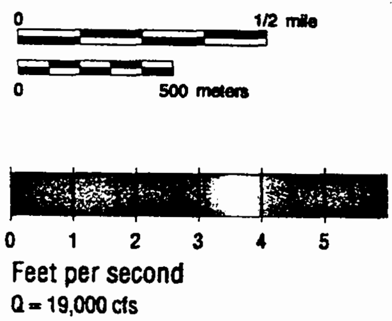
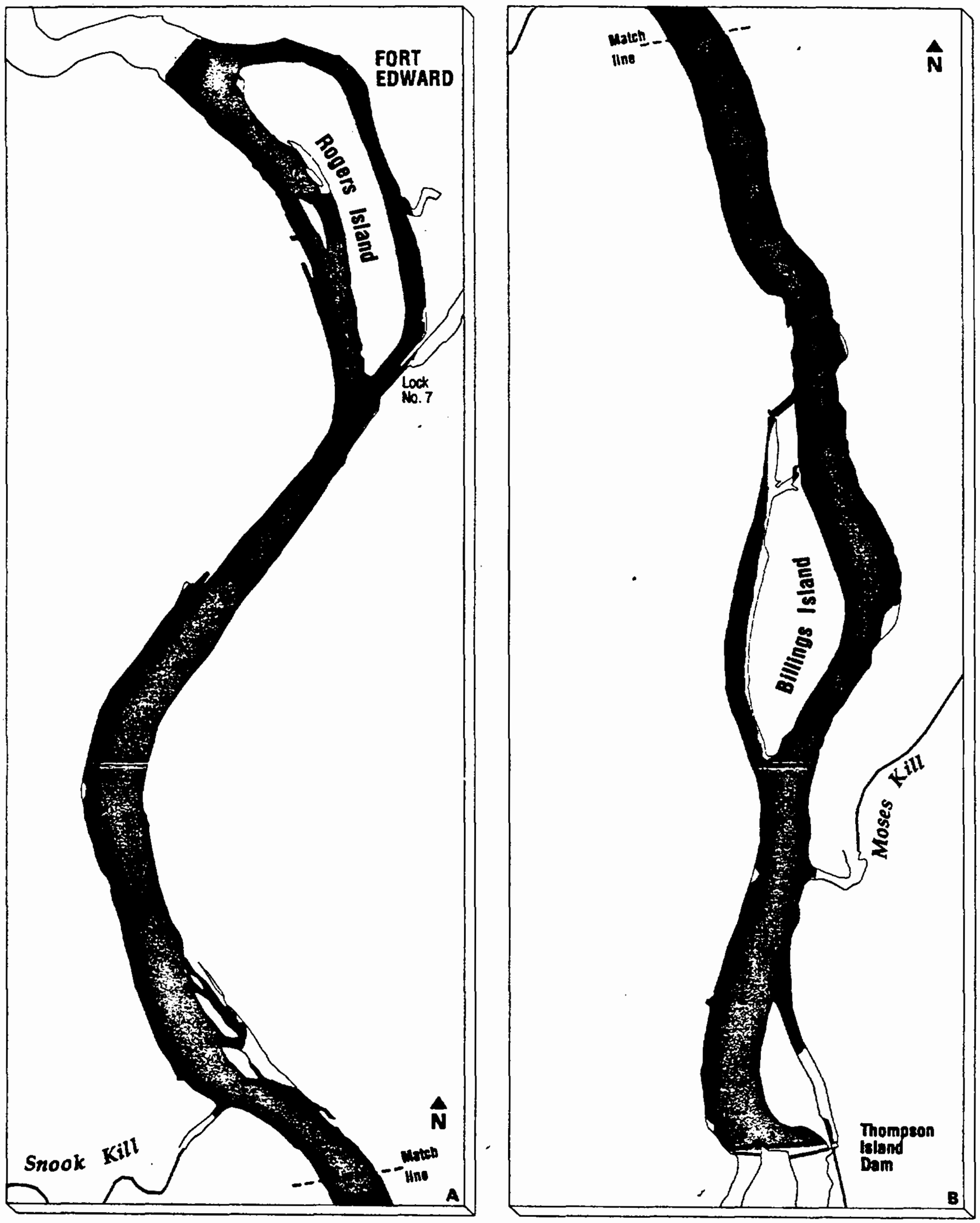



Plate 6-18

Limno-Tech, Inc.

HRP 002 1538




# Thompson Island Pool

# Spring 1992 Event
# Shear Stress

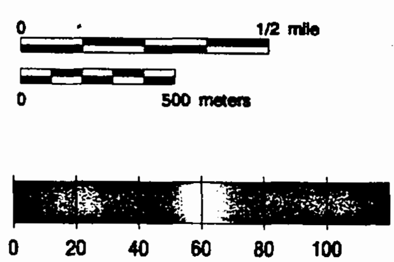
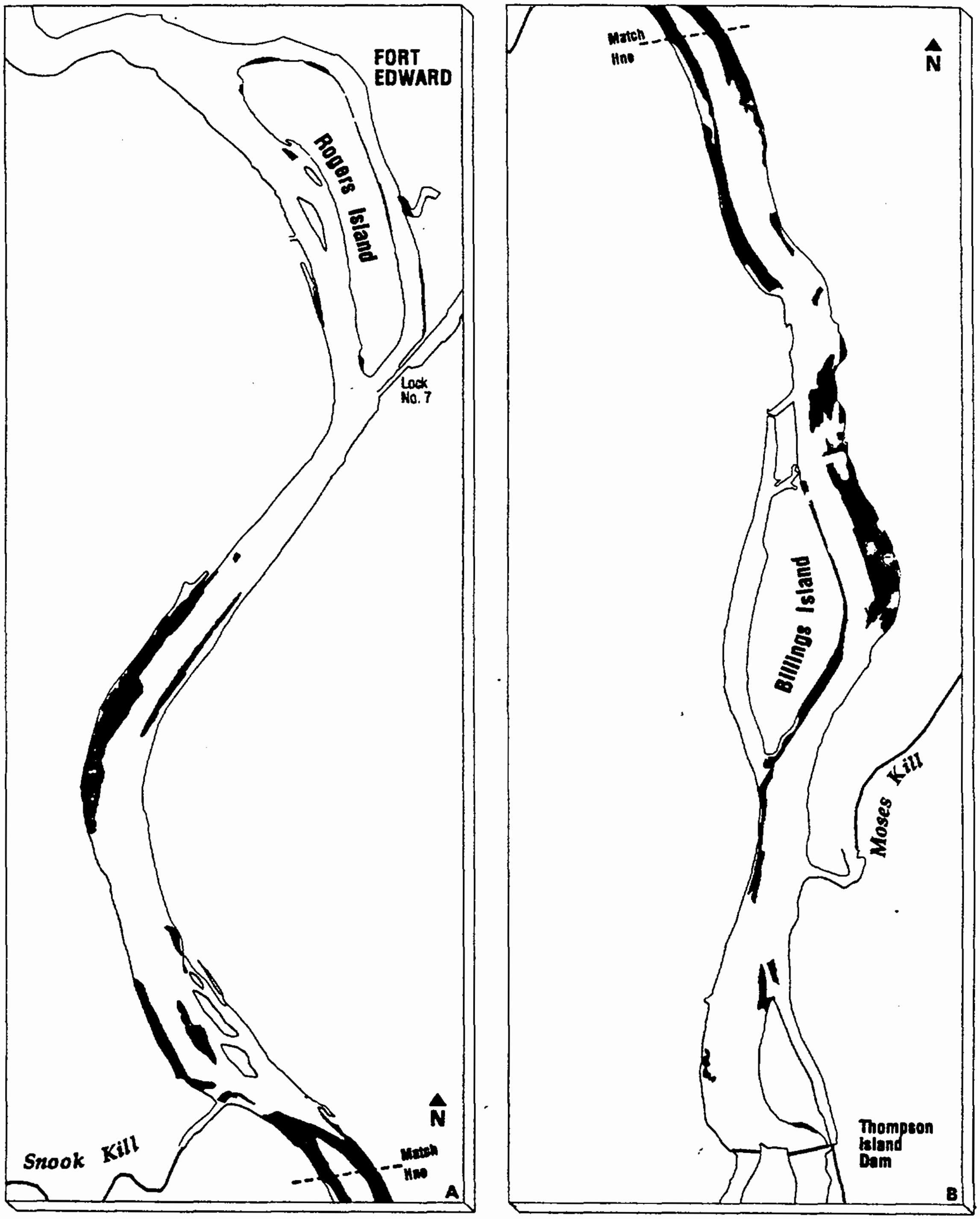



Plate 6-19

Limno-Tech, Inc.

HRP 002 1539




## Thompson Island Pool

# Spring 1992 Event Cohesive Sediments Mass Eroded

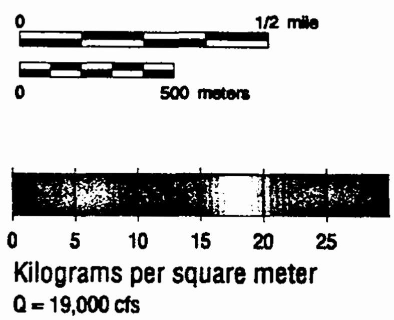
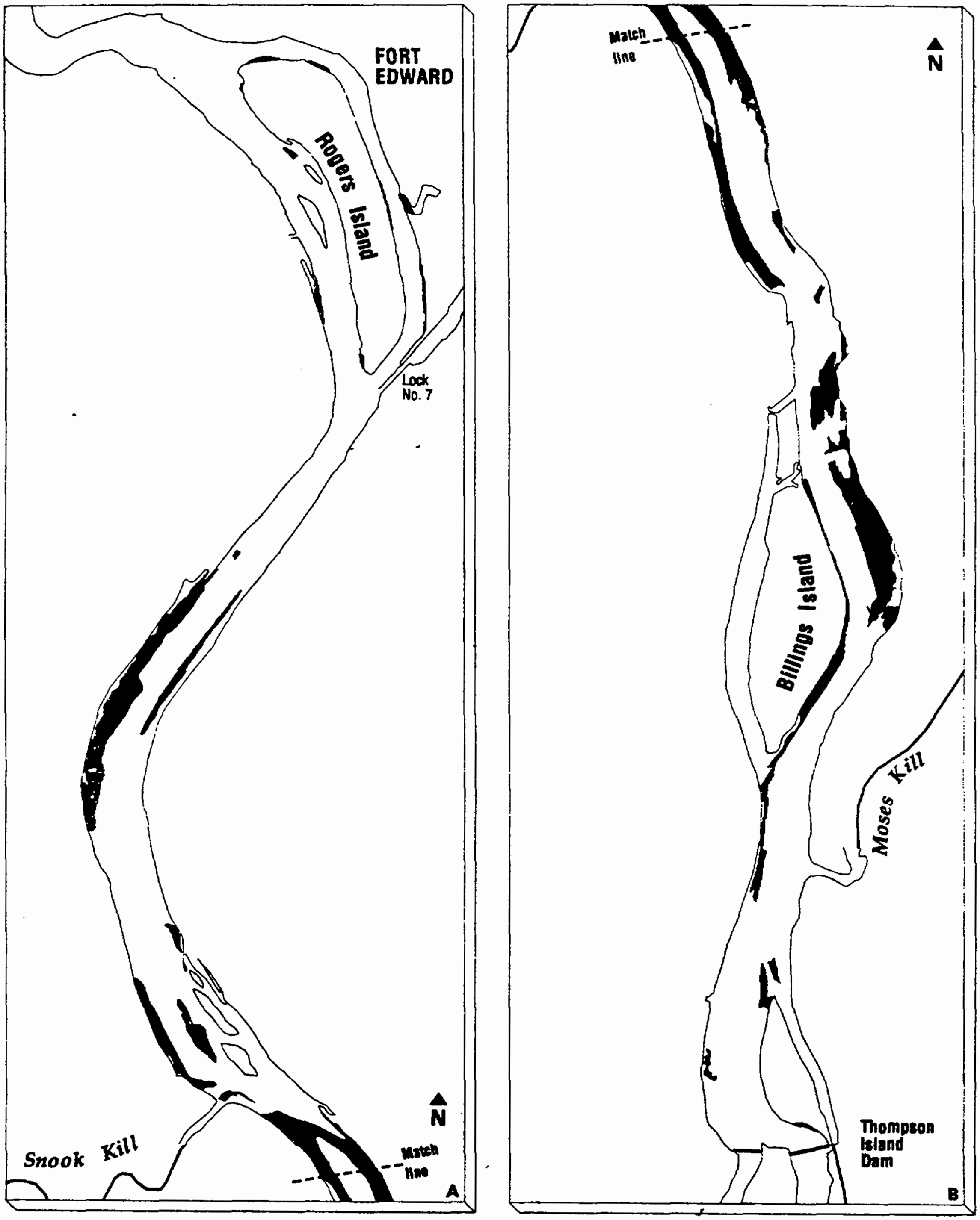



Plate 6-20

Limno-Tech, Inc.




## Thompson Island Pool

# Spring 1992 Event
# Cohesive Sediments
# Depth of Scour

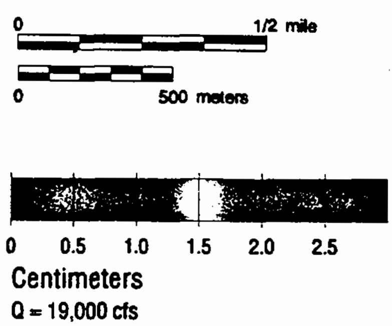
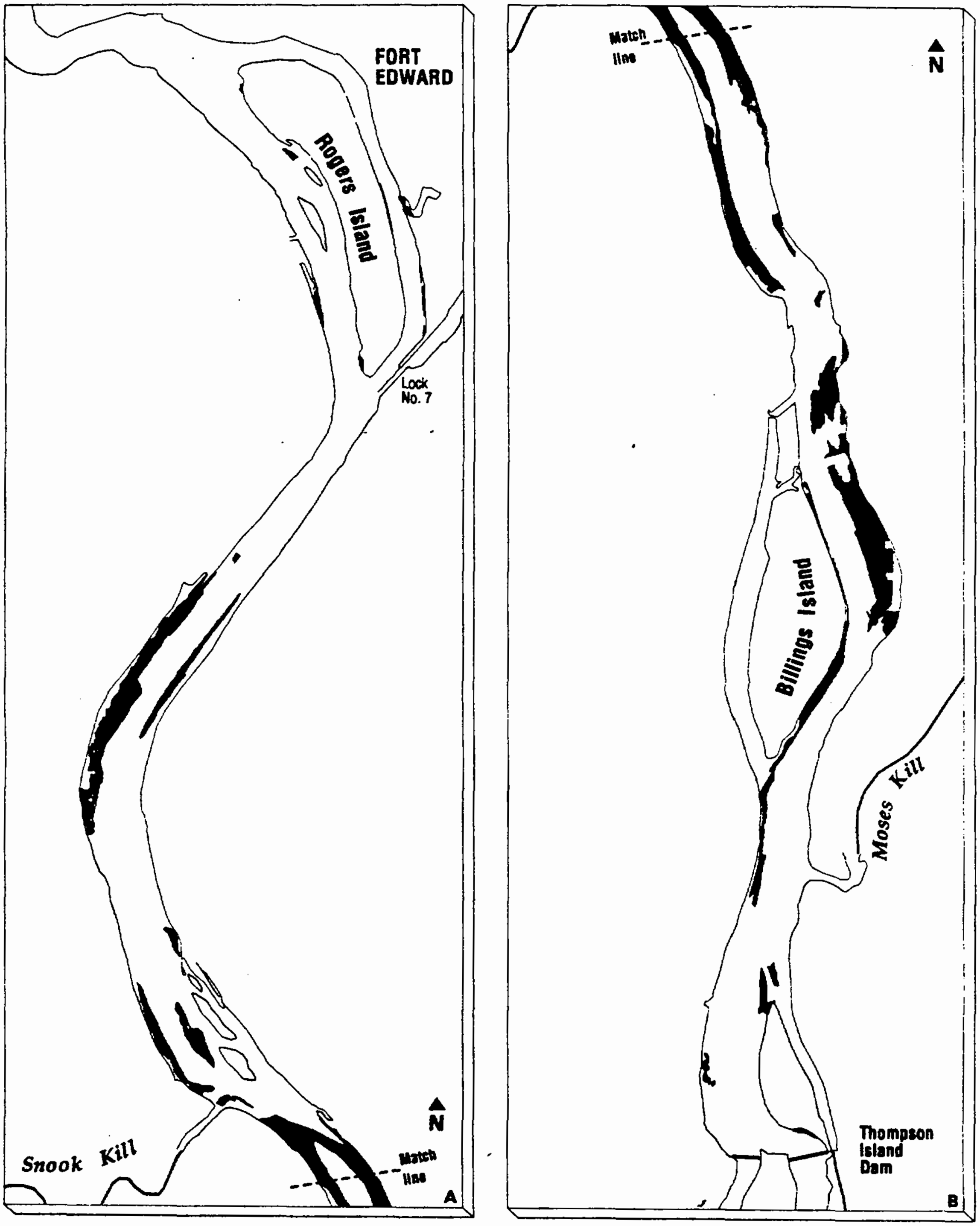
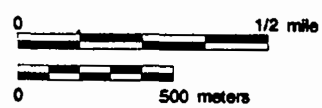



Plate 6-21 Limno-Tech, Inc.




## Thompson Island Pool

# Spring 1992 Event Cohesive Sediments Mass of PCBs Eroded

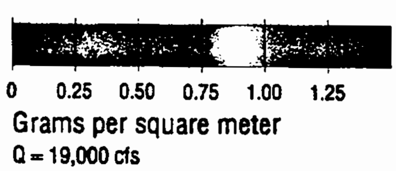
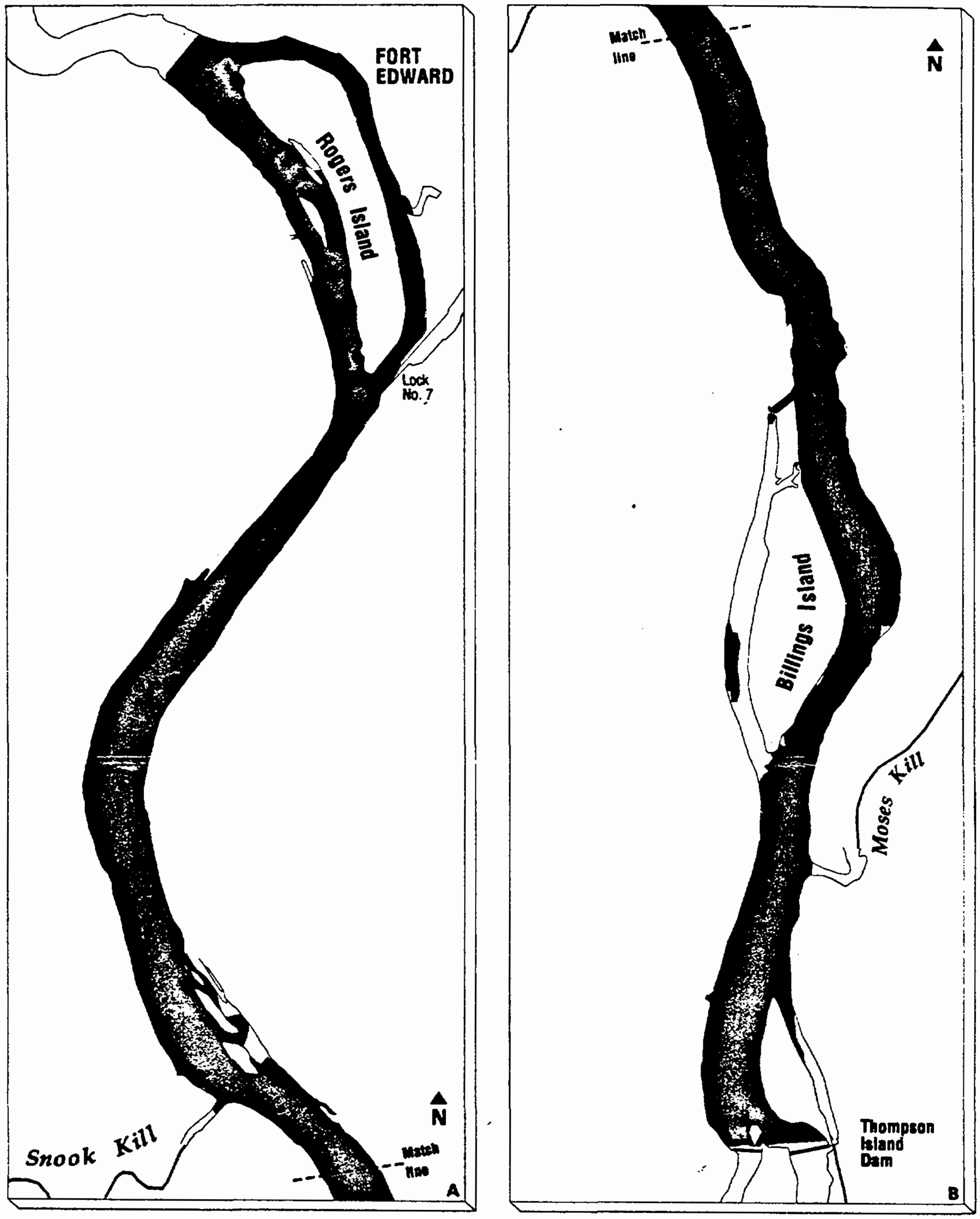



Plate 6-22

Limno-Tech, Inc.




## Thompson Island Pool

# 1991 Event Velocity

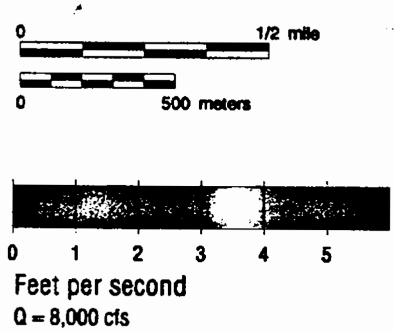
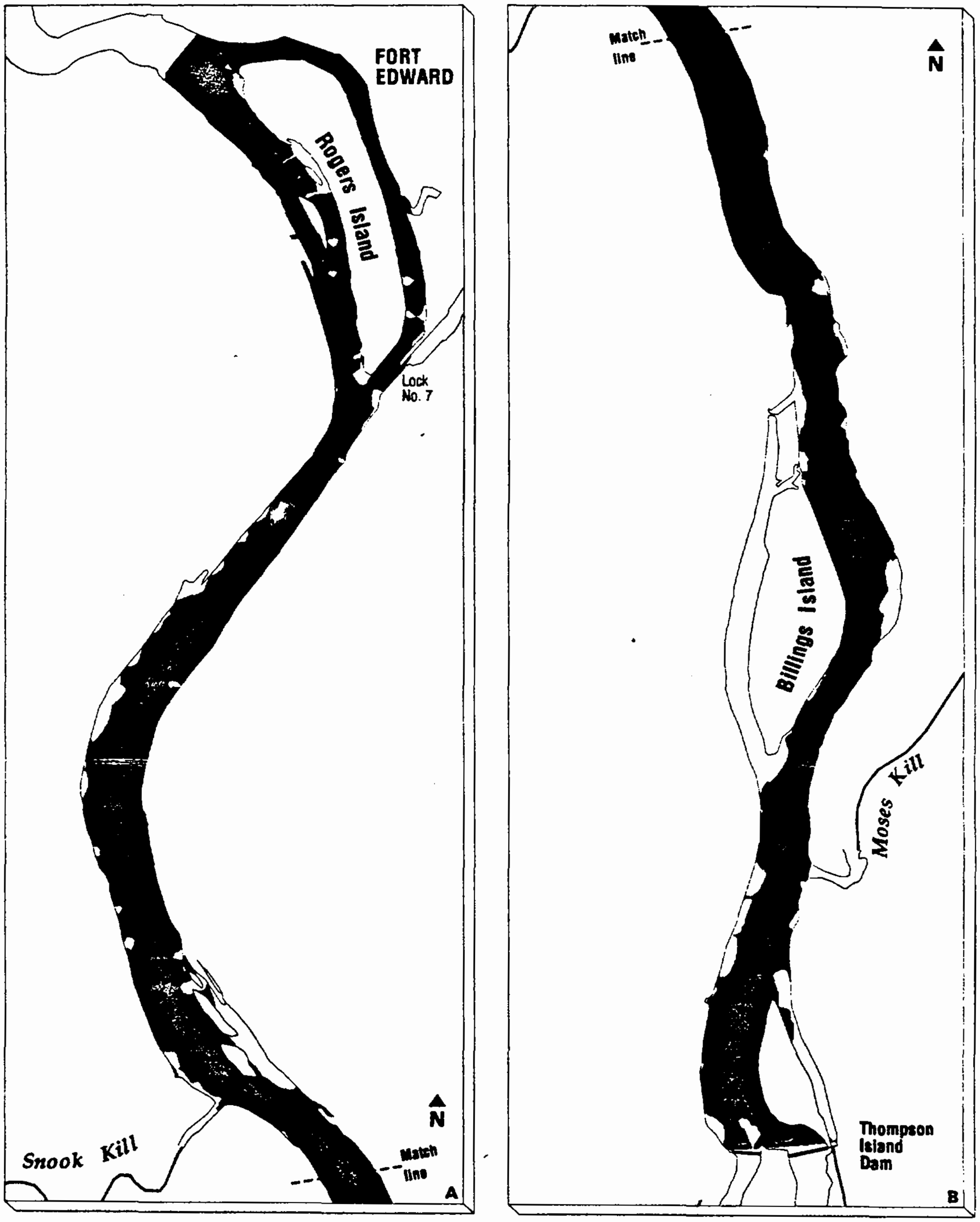


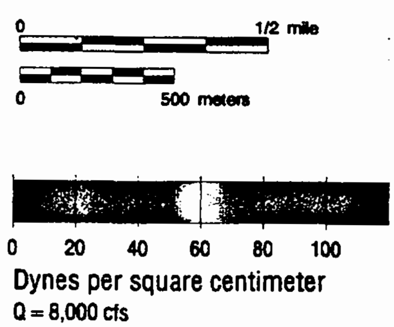

Plate 6-23

Limno-Tech, Inc.



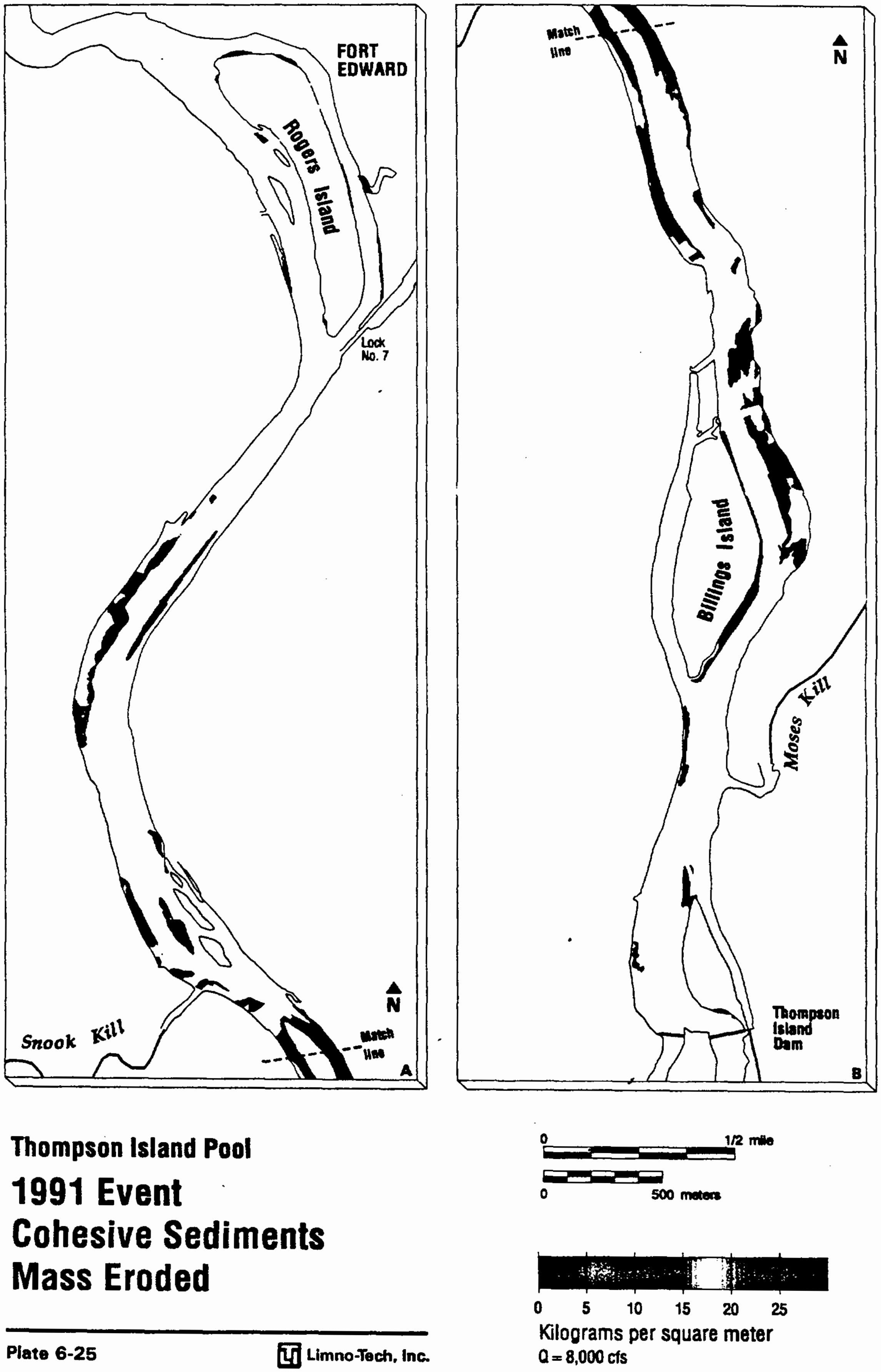

## Thompson Island Pool

# 1991 Event Shear Stress






Limno-Tech, Inc.




**Thompson Island Pool**

# 1991 Event Cohesive Sediments Mass Eroded

Plate 6-25

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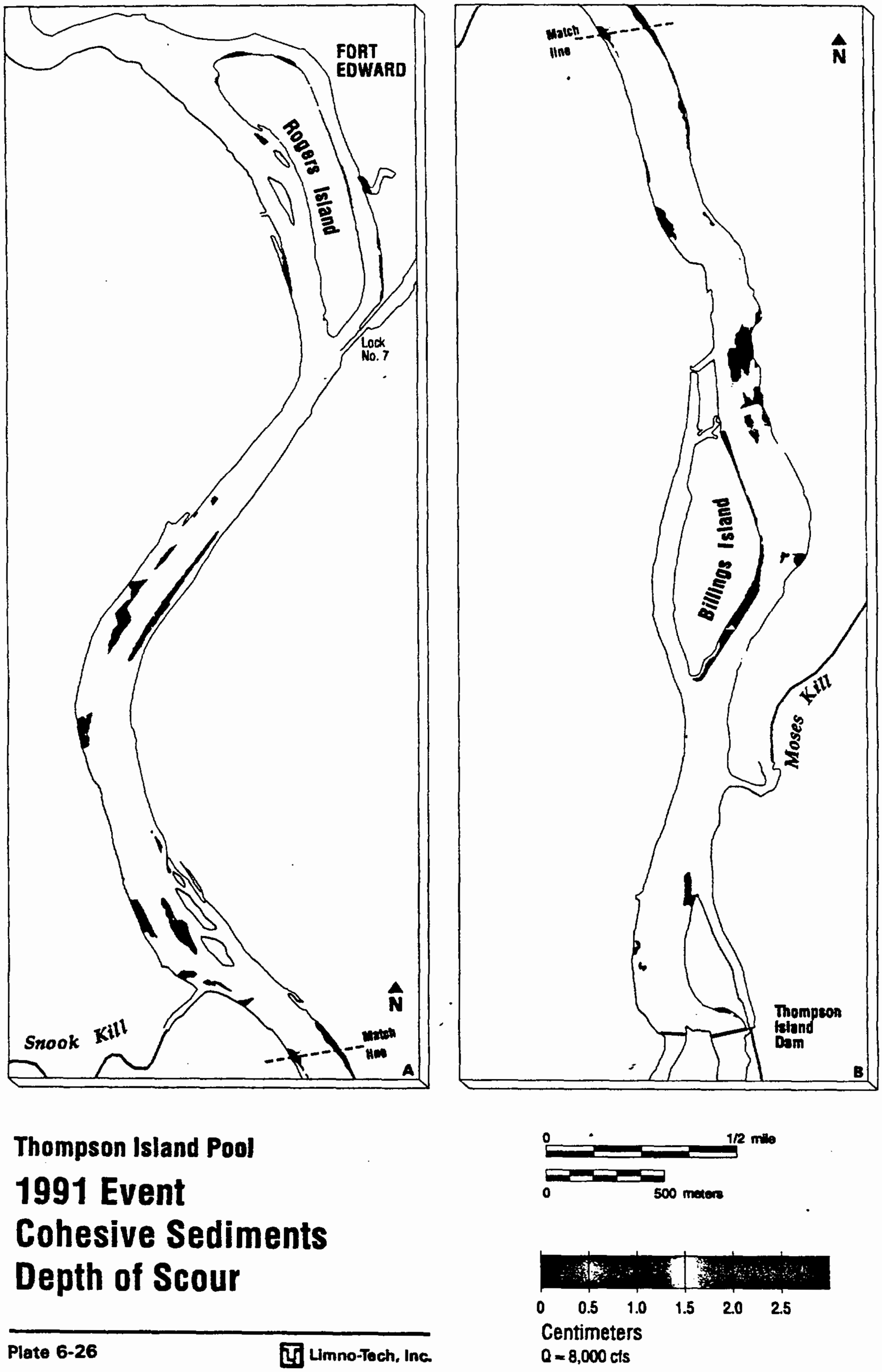
HRP 002 1545



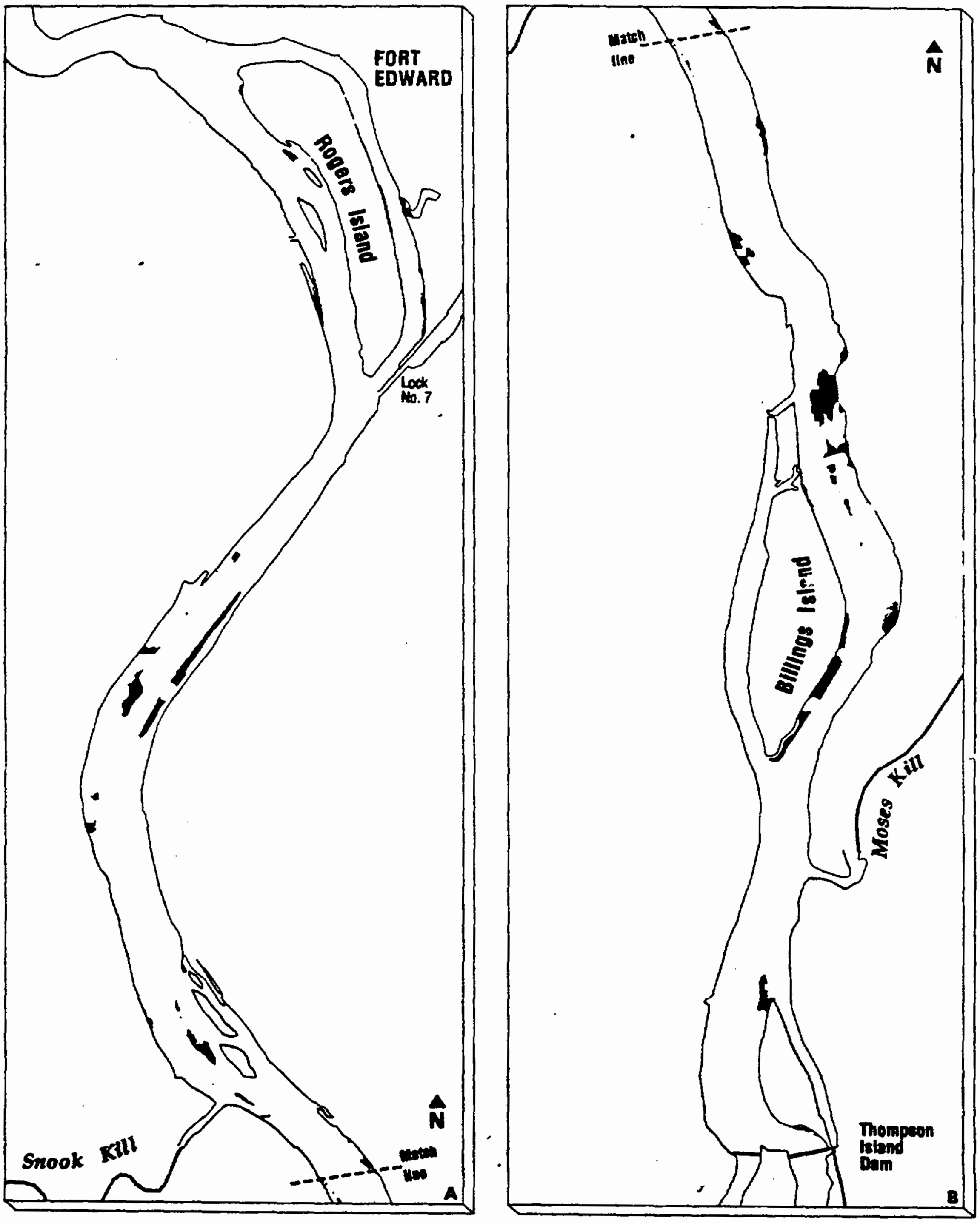

Thompson Island Pool

# 1991 Event Cohesive Sediments Depth of Scour

Plate 6-26

Limno-Tech, Inc.

HRP 002 1546




## Thompson Island Pool

# 1991 Event
# Cohesive Sediments
# Mass of PCBs Eroded

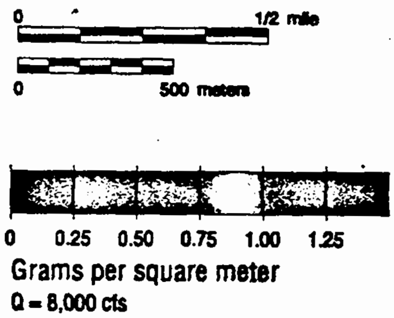



Plate 6-27 Limno-Tech, Inc.

# APPENDIX A
# FISH PROFILES

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# A1. FISH PROFILES

## A1.1 Introduction

This section presents the life histories of the fish species selected for closer study in the Hudson River. Profiles of the species focus on the foraging behavior, range and movement, and reproduction of the fish species as they relate to PCB exposures in the Hudson River.

Species of interest include largemouth bass, white perch, yellow perch, brown bullhead, pumpkinseed, spottail shiner, striped bass, and shortnose sturgeon. These species represent fish that experience a wide variety of exposures, including pelagic and demersal feeders, stationary and migratory species, and various trophic levels.

### A1.1.1 Habitats in the Upper Hudson River

Several 1983 reports (MPI, 1984 New York State Barge Canal; Makarewicz, 1983 Champlain Canal fisheries study; Makarewicz, 1987 Hudson River fisheries study) provided primary information concerning habitat types and relative abundance in the Upper Hudson River. These reports provided the results of a fish survey conducted for New York State from the Federal Dam past Thompson Island. The reports identified nine habitat types in the lock pools, beginning with the Federal Dam, in the Hudson River:

Stream mouth habitats are adjacent to the outlets of small to large streams but within the Hudson River itself. They have slow to strong currents, depending on seasonal flow. Bottom types range from silt in slower zones to sand and gravel in faster zones. Aquatic macrcphytes are generally absent. The shoreline has a mixture of tree cover, including willows, aspens, and maples, with numerous areas of overhang. Depths range from 0.3 to 5 meters.

Main channel habitats are in the designated ship channel of the river. They have moderate to strong currents depending on the specific lock pool. Aquatic macrophytes are generally absent. The shoreline has a mixture of trees (willows, aspens, maples) with areas of overhang. Depths range from 5 to 6 meters.

Shallows are areas adjacent to the main channel, without visible wetland vegetation. Currents are mostly slow with some moderate to strong areas. Bottom types range from organic sediment in slower zones to sand, gravel, and cobbles in the faster zones. Emergent and submergent vegetation line most areas of the shoreline. The same mixture of trees with areas of overhang plus significant growth of aquatic macrophytes provide excellent habitat areas for fish species. Depths range from 0.3 to 2.1 meters.

Rapids contain a fast current with numerous zones of white water. The bottom is covered with cobbles and gravel as a result of scouring action. Outcrops of bedrock are located adjacent to steep embankment areas. Emergent and submerged vegetation areas are absent. Depths range from 1.2 to 3.1 meters.

Embayments are coves along the shoreline. Cove water is mostly stagnant with areas of slight current. The bottom contains mostly organic sediment with numerous patches of bottom debris such as logs and submerged trees. Large areas of emergent and submerged vegetation dominate. Substantial growth of water lilies, water chestnuts, and cattails choke selected areas, particularly in late summer. Shoreline has a mixture of hardwoods, some partially submerged. Observed schools of larval fish and adult spawning individuals demonstrate the importance of the area as a sensitive fish habitat. Depths range from 0.2 to 2.4 meters.

Wetlands are shallow areas with emergent, floating, or submerged vegetation. Current is slow with selected areas of stagnant water. The bottom consists of organic sediment and bottom debris. Shoreline is partially flooded with numerous submerged willows and maples. Cattails dominate emergent vegetation by forming extensive marsh areas. Like the embayment areas, the wetlands represent a sensitive fish habitat. Water is shallow with a depth range of 0.3 to 1 meter.

Alternate channels are natural side channels are separated from the main channel by an island. The current is variable ranging from imperceptible to fast. The bottom contains organic material with a mixture of sand and gravel. The slower current areas are dominated by organic sediment. Cattails dominate the emergent and submerged vegetation. Shorelines contain willows and maples with areas of overhang. Depths range from 0.3 to 4.3 meters.

Artificial cuts are landcut portions of the canal/river. Currents vary from slight to moderate. The bottom is mostly organic sediment with bedrock outcrops along some portions of the shoreline. A sparse growth of emergent vegetation exists. The shoreline has numerous areas of riprap, sand, and cobbles. A mixture of hardwoods provides overhang in some areas. Depths range from 0.2 meters in shore areas to 4.9 meters in midchannel.

Wet dumpsites are areas designated on the NOAA charges or NYSDOT 10-year management plan as wet dumping grounds. These areas are variable with respect to physical features and flora. Currents tend to be moderate in summer and strong in spring. Bottom types range from organic material and gravel to silt in slower moving zones. Macrophytes are absent from most areas. Water is shallow, with depths ranging from 0.3 to 3 meters.

The shallow and wetland areas provide ideal fish habitats with slower currents and an abundance of floral cover.

### A1.1.2 Habitats in the Hudson River Estuary

In 1986, NYSDEC conducted a survey of fish and their habitats in the lower Hudson River Estuary below Federal Dam. The study area consisted of three reaches encompassing 51 miles:

- Upper reach: Troy to Coxsackie; River Miles 153-125
- Middle reach: Coxsackie to Germantown; River Miles 124-107
- Lower reach: Below Germantown; River Miles 106-102

This study showed the upper reach is narrow with very few tidal flats while the middle reach is wide and shallow, containing major tributaries, islands, and numerous tidal flats. The lower reach is characterized by moderate depth and many tidal flats. A greater proportion of lentic backwaters and tributaries are present in the lower two reaches. Substrates through the study area consist of fine and silty sand, with a few areas of bedrock, gravel, and boulder channel markers. Aquatic vegetation is common in this segment of the estuary, and is mostly restricted to and abundant in the backwaters, marshes and tributary mouths (Carlson, 1986 Fish and their habits in). Carlson identified seven distinct habitats:

Vegetated backwaters are shallow side channels or bays with silty bottoms and abundant vegetation such as milfoil *Myriophyllum* spp. or wild celery, *Vallisneria americana*. Typical areas include Inbocht Bay, Stockport Marsh, Schodack Creek and east of Green Island.

Major tributaries include the tidal portion of streams with rocky or muddy substrates and sparse vegetation. Typical areas include Roeliff Jansen Kill, Stockport Creek, and Island Creek.

Rock piles are the bases of navigation markers constructed of large boulders positioned near the channel or sometimes in more shallow shoal areas. The boulders provide shelter in areas exposed to strong currents. Most rock piles are located downriver of River Mile 149.

Shore areas are generalized shallow areas with gradual slopes, muddy or rocky substrates, and sparse cover. This category is less specific than others and often has characteristics common to backwaters and tributaries.

Channel border or shoal areas include areas where the bottom is shallower than the 32-foot navigation channel but generally deeper than 10 feet. Rooted vegetation is usually lacking.

Channel areas are within the navigation channel with substrates of sand, sand and pebbles, and sand and silt.

Tailwater habitats are areas within 0.4 miles of Federal Dam with substrates composed mostly of gravel and bedrock. Tidal fluctuations and flows extend to the base of the dam at all times except during high runoff periods.

### A1.2 Largemouth Bass

The largemouth bass, *Micropterus salmoides*, is a relatively large, robust fish that has a tolerance for high temperatures and slight turbidity (Scott and Crossman 1973, Freshwater fishes of Canada). It occupies waters with abundant aquatic vegetation. Largemouth bass show a low tolerance for low oxygen conditions. The largemouth bass represents a top predator in the aquatic food web, consuming primarily fish but also benthic invertebrates.

#### A1.2.1 Foraging

Young largemouth bass feed on algae, zooplankton, insect larvae, and microcrustaceans (Boreman, 1981 Life histories of seven fish). Largemouth bass can grow to 136 grams on a diet consisting of insects and plankton. Larger prey are needed to continue growth after reaching a total length of 20 mm. Young largemouth bass compete for food with a variety of other warmwater and bottom-feeding fishes.

Johnson (1983, Summer diet of juvenile fish) found that the diets of juvenile fish foraging in the St. Lawrence River varied somewhat by location and length of the fish. Fish, insects including corixids, and other invertebrates made up the diets in varying proportions.

Largemouth bass longer that 50 mm total length usually forage exclusively on fish. Prey species include gizzard shad, carp, bluntnose minnow, silvery minnow, golden shiner, yellow perch, pumpkinseed, bluegill, largemouth bass, and silversides turbidity (Scott and Crossman, 1973 Freshwater fishes of Canada). Cannibalism is more prevalent among largemouth bass than among many species. Ten percent of the food of largemouth bass 203 mm and longer is made up of their own fry (Scott and Crossman, 1973 Freshwater fishes of Canada).

Largemouth bass take their food at the surface during morning and evening, in the water column during the day, and from the bottom at night. They feed by sight, often in schools, near shore, and almost always close to vegetation. Feeding is restricted at water temperatures below 10°C and decreases in winter and during spawning. Largemouth bass do not feed during spawning.

#### A1.2.2 Range, Movement and Habitat within the Hudson River

Largemouth bass have distinct home ranges and are generally found between 8 and 9 kilometers of their preferred range (Kramer and Smith, 1960 Utilization of nests of largemouth). Kramer and Smith found that 96 percent of the fish remained within 91 meters of their nesting range. Fish and Savitz (1983 Variations in home ranges of) found that bass in Cedar Lake, Illinois, have home ranges from 1,800 to 20,700 square meters. The average home range was 9,245 square meters and the average primary occupation area, defined as that area within the home range in which the fish spends the majority of its time, including foraging, was 6,800 square meters.

Largemouth bass are almost universally associated with soft bottoms, stumps, and extensive growths of a variety of emergent and submerged vegetation, particularly water lilies, cattails, and various species of pond weed. It is unusual to find largemouth bass in rocky areas. Largemouth bass are rarely caught at depths over 20 feet, although they often move closer to the bottom of the river during the winter.

Mobility of largemouth bass also varies seasonally. Daily movements increase with temperature from March through June, but decrease sharply during the hottest months (Mesing and Wicker, 1986 Home range of Florida largemouth). Activity during warmer seasons occurs primarily near dawn and dusk, while cool-water activity is most extensive in the afternoon.

A 1984 Malcolm-Pirnie report prepared for New York State describes the results of a fish survey taken that same year. The results are reported as number of fish by habitat type as well as number of fish by lock pool for the upper Hudson River and associated canals. The numbers shown are not significant in terms of absolute numbers, but rather provide a qualitative indication as to the relative distribution of fish within each habitat area and within each lock pool. Largemouth bass were found in each of the lock pools (see Table A-1).

Largemouth bass were found throughout the Upper Hudson River in significant numbers. Major concentrations of fish were within areas where submerged and emergent vegetation, overhang, and bottom debris provided adequate cover (MPI, 1984 New York State Barge Canal). Largemouth bass were not found in the main, natural channel of the river nor in the rapids (see Table A-2).

In the Lower Hudson River Estuary, Carlson (1986 Fish and Their Habitats in) found that largemouth bass preferentially winter in five major areas:

- Coxsackie Bay (roughly River Mile 130)
- The mouth of the Catskill Creek (River Mile 115)
- The mouth of the Esopus Creek (River Mile 103)
- The mouth of the Rondout Creek (River Mile 92)
- The mouth of the Wappinger Creek (River Mile 67)

Largemouth bass prefer to establish habitats near dense vegetation not just during winter, primarily near milfoil *Myriophyllum verticillatum* (Carlson, 1992 Importance of wintering refugia to). A study of largemouth bass in two freshwater lakes in central Florida found a positive correlation between the use of specific habitats in proportion to the availability of those habitats to the fish (Mesing and Wicker, 1986 Home Range, Spawning Migrations and). Vegetative habitat covers included *Panicum* spp., cattails *Typha* spp., and water lilies *Nuphar* spp.

In a 1982 survey of the Lower Hudson River Estuary (Carlson, 1986 Fish and Their Habitats in), largemouth bass were found to prefer vegetated backwater and tributary locations, with a few fish caught in rock piles and tailwater.

### A1.2.3 Reproduction

Largemouth bass mature at age five and spawn from late spring to mid-summer, in some cases as late as August. Male largemouth bass construct nests in sand and/or gravel substrates in areas of nonflowing clear water containing aquatic vegetation (Nack and Cook, 1986 Characterization of spawning and nursery). This aquatic vegetation generally consists of water chestnut, *Trapa natans*, milfoil, *Myriophyllum verticillatum*, and water celery, *Valisneria americana*.

Females produce 2,000 to 7,000 eggs per pound of body weight (Smith, 1985). Females leave the nest after spawning.

## A1.3 White Perch

White perch, *Morone americana*, are resident throughout the Hudson River Estuary below Federal Dam. They are semi-anadromous and migrate to the lower lock pools of the Upper Hudson River to spawn. They are one of the most abundantly collected species in the region and are the dominant predatory fish in the Lower Hudson River (Bath and O'Connor, 1981 The biology of the white; Wells et al., 1992 Abundance trends in Hudson River).

### A1.3.1 Foraging

Adult white perch are benthic predators, with older white perch becoming increasingly piscivorous (Setzler-Hamilton, 1991 White perch habitat requirements for). Insect larvae and fishes comprise the principal food of white perch, and dipteran larvae, especially chironomids, represent the most important insect prey. White perch have two peak feeding periods: midnight and noon. Midnight is the most important foraging time.

In a study of Hudson River larvae, Hjorth (1988 Feeding selection of larval striped) found that white perch larvae fed almost exclusively upon microzooplankton. Adults and copepodids of *Eurytemora affinis* were the preferred food, but when they were not present, white perch larvae consumed rotifers, cladocerans, and other seasonal zooplankters.

From August through October, young-of-the-year white perch in the Hudson River feed predominantly on amphipods supplemented by copepods and mysids (NOAA, 1984 Emergency striped bass study). In a study of white perch taken from the Hudson River between Haverstraw and Bear Mountain (Bath and O'Connor, 1982 Food of white perch), gammarid amphipods occurred most frequently in the stomachs of immature and mature white perch. Mature fish ate a higher proportion of isopods and annelid worms than did immature fish during the spring and summer. During May and June, mature fish contained between 2 and 8.6 percent by occurrence, while gammarid amphipods were the predominant food item in July, 64 percent, and November, 75 percent. Insect larvae occurred in fewer than 2 percent of mature fish during May and June, and were not found again during the remainder of the sampling year. White perch in this oligohaline sector of the river fed primarily at or near the sediment-water interface. Their preferred prey items consisted of epibenthic crustaceans and insects.

A small subset of the white perch samples taken as part of the TAMS/Gradient Phase 2 activities were analyzed for gut contents. A large number of chironomid were found and identified to evaluate the relative contribution of sediment and water sources to the diet of white perch resident in the Hudson River. Table A-3 shows the results of these analyses. Spaces in the table were left blank when the habitat and association of a prey item were unknown.

Table A-3 shows that white perch in the Hudson River generally consume chironomid equally associated with both the water column and sediment. Particular individual fish (i.e., Fish No. 5) appear to feed exclusively on water column sources, while others (Fish No. 1) show a greater sediment influence. Chironomid represent a significant proportion of the available benthos in the Hudson River. Based on the table shown above, it appears white perch consume organisms from both the water column and benthos in relatively even proportions.

### A1.3.2 Range, Movement and Habitat within the Hudson River

White perch prefer shallow areas and tributaries, generally staying close to rooted vegetation. The position of this fish relative to the water surface varies somewhat based on size (Selzer-Hamilton, 1991). White perch are bottom oriented fish that accumulate in areas with dissolved oxygen of at least 6 mgL-1 (Selzer-Hamilton, 1991).

Because white perch make spawning migrations, they are considered semianadromous. Spawning occurs in the upper reaches of the Lower Hudson River. Eggs, larvae, and juveniles gradually disperse downstream throughout the summer. Young-of-the-year white perch often congregate in the Tappan Zee and

Croton-Haverstraw regions, with a smaller peak from Saugerties to Catskill (Lawler, Matusky & Skelly Engineers, 1992 1990 year class report of).

During the summer, white perch move randomly within the local area. Adult white perch tend to accumulate at 4.6-6 meters depth during the day and move back to the surface during the night (Selzer-Hamilton, 1991). White perch spend the winter in depths of 12-18 meters, but occasionally can be found at depths as low as 42 meters. Hudson River white perch are acclimated at 27.8°C and avoid temperatures that are below 9.5°C or above 34.5°C.

White perch prefer shallow and wetland areas to other habitats, but undertake extensive migrations within the estuary (Carlson, 1986 Fish and Their Habitats in). White perch were most often found in tributaries, vegetated backwaters, and shore areas in the Lower Hudson River. Carlson observed the greatest increase in summertime abundance between River Mile 102 and 131. By winter, the majority of white perch move downriver, although some overwinter in the upper estuary in areas over 32 feet deep (Texas Instruments, 1980 1978 year class report for).

In the Upper Hudson River, white perch were taken in the lower two lock pools (MPI, 1984).

They were taken primarily in shallow and wetland habitats (see Tables A-4 and A-5).

All ages of white perch are adversely affected by high levels of suspended solids. Adult white perch can be found in water with pH ranges between 6.0 and 9.0 and avoid areas with moderate turbidity at 45 NTU, although they can be found in either clear or highly turbid areas (Selzer-Hamilton, 1991).

### A1.3.3 Reproduction

Spawning is episodic, usually occurring in a two week period from mid-May to early June when the water temperatures are between 16° and 20°C. Hudson River white perch tend to spawn beginning in April when the water temperature reaches 10° to 12°C, and continue spawning through June. In years when the water temperature increases gradually, the peak spawning period lasts from four to six weeks (Klauda et al., 1988 Life history of white perch in).

White perch prefer to spawn in shallow water, such as flats or embankments, and tidal creeks. They generally spawn over any bottom type (Scott and Crossman, 1973). Spawning is greatest in the fresh water regions around Albany, and between River Mile 86 and 124 (McFadden et al., 1978 Influence of the proposed Cornwall; Texas Instruments, 1980).

Fecundity of Hudson River white perch age 2 to 7, the maximum age of white perch in the river, ranges from less than 15,000 to more than 160,000 eggs per female (Bath and O'Connor, 1981). Mean fecundity in that study was 50,678 eggs per female and was dependent upon size.

### A1.4 Yellow Perch

Yellow perch, *Perca flavescens*, are gregarious fish that travel in schools of 50-200. They feed on bottom organisms and in the water column. Yellow perch are important freshwater sport fish.

#### A1.4.1 Foraging

Yellow perch feed actively early in the morning or late in the evening, with less feeding taking place later in the day. At night the fish are inactive and rest on the bottom (Scott and Crossman, 1973).

Young fish feed primarily upon cladocerans, ostracods, and chironomid larvae (Smith, 1985). As they grow, they shift to insects. Chabot and Maly (1986 Variation in diet of yellow) found that fish that were one to one and a half years old preferred large zooplankton species. Larger fish eat crayfish, small fish, and odonate nymphs (Smith, 1985). Piavis (1991 Yellow perch habitat requirements for) found that approximately 25 percent of the diet of yearling yellow perch was made up of other perch. From May through August, chironomids generally comprise between 30 percent and 60 percent of the diet. Piavis noted that adult yellow perch forage on midge larvae, anchovies, killifish, silversides, scuds, and caddsisfly larvae. Adults also forage on pumpkinseed.

#### A1.4.2 Range, Movement and Habitat within the Hudson River

Yellow perch are most abundant in waters that are clear and have moderate vegetation and sand, gravel or mucky bottoms. Abundance decreases with increases in turbidity or with decreases in abundance of vegetation. Adult perch prefer slow moving waters near the shore areas where there is moderate cover.

Yellow perch studied in the freshwater Cedar Lake in Illinois stayed within a 5 to 20 kilometer home range (Fish and Savitz, 1983). The fish preferred heavy and light weeded as well as sandy areas, and were virtually never seen in open water (see Table A-6).

Yellow perch are found throughout the Upper Hudson River (MPI, 1984), particularly near River Mile 153 (Federal Dam) and again up near the Thompson' Island Pool area (see Table A-7).

Yellow perch prefer wetlands, embayments and shallow areas to other habitats, but can be found in all types of habitats to some degree. They primarily inhabit the freshwater portion of the estuary with an apparently even distribution of early life stage abundance from river mile 77 through 153 (Texas Instruments, 1976 Hudson River ecological study in the; Carlson, 1986).

Yellow perch require a minimum dissolved oxygen concentration for all life stages of 5 mg/L-1. Seasonal lethal dissolved oxygen is 0.2 mg/L-1 in winter and 1.5 mg/L-1 in summer. Yellow perch are poikilothermic, requiring less oxygen in winter. Suboptimal dissolve oxygen may have acute implications, in that if a preferred habitat contains less dissolved oxygen than necessary, then fish may leave the area, subjecting them to predation, or they may experience retarded growth, impacting survivability (Piavis, 1991).

### A1.4.3 Reproduction

Yellow perch are among the earliest spring spawners, with spawning occurring near vegetated areas and in upstream, tidal tributaries (Carlson, 1986). In the Chesapeake River, adult yellow perch migrate from downstream stretches of tidal waters to spawning areas in less saline upper reaches in mid February through March (Piavis, 1991). Spawning occurs when water temperatures reach 45-52°F in April and May in New York waters (Smith, 1985). Males arrive at the spawning ground first. Spawning occurs in 5 to 10 feet of water over sand, rubble, or vegetation. Eggs are often draped over logs or vegetation.

## A1.5 Brown Bullhead

The brown bullhead, *Ictalurus nebulosus*, is a demersal species occurring near or on the bottom in shallow, warmwater situations with abundant aquatic vegetation and sand to mud bottoms. Brown bullhead are sometimes found as deep as 40 feet, and are very tolerant of conditions of temperature, oxygen, and pollution (Scott and Crossman, 1973).

### A1.5.1 Foraging

The brown bullhead feeds on or near the bottom, mainly at night. Adult brown bullhead are truly omnivorous, consuming offal, waste, molluscs, immature insects, terrestrial insects, leeches, crustaceans including crayfish and plankton, worms, algae, plant material, fishes, and fish eggs. Raney and Webster (1940 The food and growth of) found that young bullheads in Cayuga Lake near Ithaca, New York fed upon crustaceans, primarily ostracods and cladocerans, and dipterans, mostly chironomids. For brown bullhead in the Ottawa River, algae have also been noted as a significant food source (Gunn et al., 1977 Filamentous algae as a food source for)

### A1.5.2 Range, Movement and Habitat within the Hudson River

Brown bullhead, a freshwater demersal fish, resides in water conditions that are shallow, calm and warm. In the summer, bullheads can be found in coves with ooze bottoms and lush vegetation, especially water clover, spatterdock and several species of pond weed (Raney, 1967 Some catfish of New York). Carlson (1986) found that the vegetated backwaters and offshore areas are the most common habitats for brown bullheads. McBride (1985 Distribution and relative abundance of) found bullhead abundant in river canal pools (see Table A-8).

Brown bullhead were most frequently taken in wetland and embayment habitats (MPI, 1984) (see Table A-9).

Brown bullhead prefer wetlands, embayments, and shallow habitats. Carlson (1986) found bullheads most frequently in backwaters, but also in other, deeper areas such as the channel border. This species prefers silty bottoms, slow currents, and deeper waters.

### A1.5.3 Reproduction

Brown bullhead reach maturity at two years and spawn for two weeks in the late spring and early summer. Smith (1985) noted that in New York, brown bullhead spawn when water temperatures reach 27°C in May and June.

They prefer to spawn among roots of aquatic vegetation, usually near the protection of a stump, rock or tree, near shores or creek mouths. Males, sometimes aided by females, build nests under overhangs or obstructions (Smith, 1985). Eggs are guarded.

## A1.6 Pumpkinseed

The pumpkinseed, *Lepomis gibbosus*, is the most abundant and widespread fish in New York State (Smith, 1985). In the Hudson River, they feed exclusively upon epiphytic water column organisms. Pumpkinseed are important forage for predatory fishes.

### A1.6.1 Foraging

Pumpkinseed are diurnal feeders in areas with low light intensity and migrating to cooler, deeper water at night. They do not feed in winter and only begin to feed when the water temperature rises above 8.5° C. Pumpkinseed forage on hard shelled gastropods and are able to exploit food sources not available to other fish, particularly mollusks (Sadzikowski and Wallace, 1976 A comparison of food habits of). Food is mainly a variety of insects and, secondarily, other invertebrates. Small fish or other vertebrates, e.g., larval salamanders, can also contribute significantly to the pumpkinseed diet (Scott and Crossman, 1973).

Early juvenile pumpkinseed prefer chironomid larvae, amphipods, cladocerans, and, to a lesser extent, copepods as food items (Sadzikowski and Wallace, 1976). Juvenile pumpkinseed in the Connecticut River feed primarily upon benthic organisms (Domermuth and Reed, 1980 Food of juvenile American shad). A study conducted in the St. Lawrence River near Massena found that juvenile pumpkinseed between 77 and 113 mm in length consumed 94 percent chironomids (Johnson, 1983). Feldman (1992 PCB accumulation in Hudson River pumpkinseed) found that juvenile pumpkinseed taken from Thompson Island Pool in the Hudson River consumed zooplankton such as cladocerans, copepods, ostracods, chironomids and talitrids. Adults consumed mostly gastropods on plants. No *sediment source of food was noted.*

Adult pumpkinseed primarily prefer insects and secondarily prefer other invertebrates. As the fish age and increase in size, other fish and invertebrates other than insects constitute a larger portion of the diet, up to 50 percent of the diet.

A small subset of the pumpkinseed samples taken as part of the TAMS/Gradient Phase 2 activities were analyzed for gut contents. A large number of chironomid were found and identified to evaluate the relative contribution of sediment and water sources to the diet of white perch resident in the Hudson River. Table A-10 shows the results of these analyses.

Spaces in the table were left blank when information on habitat and association were unknown.

These gut content analyses demonstrate that pumpkinseed in the Hudson River appear to feed largely upon epiphytic, water column species.

**A1.6.2 Range, Movement and Habitat within the Hudson River**

Pumpkinseed are restricted to freshwater and are found in shallow quiet areas with slow moving water. Pumpkinseed are usually found in clear water with submerged vegetation, brush or debris as cover. They rely on the littoral zone as a refuge from predators and for foraging material (Feldman, 1992).

Several investigators have noted the ability of pumpkinseed to return to a home range, even after significant displacement (Hasler and Wisby, 1958 The return of displaced largemouth; Fish and Savitz, 1983; Shoemaker, 1952 Fish home areas of Lake Myosotis; Gerking, 1958 The restricted movements of fish).

Pumpkinseed are found throughout the Upper Hudson River above Federal Dam (MPI, 1984) (see Table A-11).

They are found primarily in wetland, stream mouth, and embayment habitats (see Table A-12).

### A1.6.3 Reproduction

Spawning occurs during early spring and summer although it can extend into late summer (Scott and Crossman, 1973). Nests are built in water that is 6 to 12 inches deep, forming colonies close to aquatic vegetation and other pumpkinseed nesting areas. Nesting occurs when the water temperature reaches 60°F and lasts approximately 11 days. Nesting substrates include sand, sandy clay, mud, limestone, shells and gravel. Females lay from 600 to 5,000 eggs (Smith, 1985). Males guard the nest for one week after hatching.

## A1.7 Spottail Shiner

The spottail shiner, *Notropis hudsonius*, consumes plankton, aquatic insects, and some bottom-dwelling organisms, and is therefore exposed to sediment and water column. The spottail shiner is consumed by virtually all other fish, including larger spottail shiners.

### A1.7.1 Foraging

Spottail shiners are morphologically suited for bottom foraging in that they have rounded snouts that hang slightly over their mouths. They do not however feed exclusively upon benthic organisms. Spottail shiners are considered omnivorous and opportunistic feeders, feeding upon cladocerans, ostracods, aquatic and terrestrial insects, spiders, mites, fish eggs and larvae, plant fibers, seeds, and algae (Texas Instruments, 1980 1978 Year Class Report; Scott and Crossman, 1973 Freshwater Fishes of Canada; Smith, 1987 Trophic Status of the Spottail).

In Lake Nipigon, Ontario (Scott and Crossman, 1973 Freshwater Fishes of Canada), 40 percent of the diet was made up of *Daphnia* spp. Other cladocerans were also present, and aquatic insect larvae, including chironomids and ephemeropterids, comprised another 40 percent of the spottail shiner diet.

In Lake Michigan, Anderson and Brazo (1978 Abundance, feeding habits and degree) found that terrestrial dipterians and fish eggs represented the major components of the spottail shiner's diet in the spring and summer. In the fall, chironomid larvae and terrestrial insects represent the major diet components.

### A1.7.2 Range, Movement and Habitat within the Hudson River

Spottail shiners prefer clear water and can be found at depths up to 60 feet (Smith, 1987 Trophic Status of Spottail), but tend to congregate in larger numbers in shallow areas (Anderson and Brazo, 1978 Abundance, feeding habits and degree) (see Table A-13).

Spottail shiners in the Upper Hudson River were primarily taken in wet dumpsite habitat areas (MPI, 1984 New York State Barge Canal) (see Table A-14).

### A1.7.3 Reproduction

Spottail shiners spawn in the spring and early summer in habitats with sandy bottoms and algae (Scott and Crossman, 1973). In New York waters, spawning usually occurs at the mouths of streams in June or July. Ovarian egg counts range from 100 to 2,600 eggs per female, depending upon total size (Smith, 1985).

## A1.8 Striped Bass

The striped bass, *Morone saxatilis*, is an anadromous species that enters the Hudson River to spawn throughout the estuarine portion of the river, but particularly upstream from the saltfront. While most adults return to the sea after spawning, some remain within the estuary for a period. Young of the year gradually move downstream during the summer months and move out of the river during the winter.

Historically, striped bass were an important Hudson River fisheries species, but high polychlorinated biphenyl levels closed the fishery in 1976.

### A1.8.1 Foraging

Striped bass are voracious, carnivorous fish that feed in groups or schools and alternate periods of intense feeding activity with periods of digestion (Raney, 1952 The life history of the). Peak foraging time for juveniles is at twilight. Adults feed throughout the day, but forage most vigorously just after dark and just before dawn. Adults typically gorge themselves in surface waters, then drop down into deeper waters to digest their food. Seasonally, adult feeding intensity lessens in the late spring and summer. Feeding ceases during spawning.

Striped bass feed primarily upon invertebrates when they are young, consuming larger invertebrates and fish as they grow larger. Post yolk-sac larvae feed upon zooplankton. Hjorth (1988 Feeding selection of larval striped), in a study of Hudson River striped bass larvae, found that copepodids and adults of the calanoid copepod *Eurytemora affinis* were the most frequently selected prey item. Hudson River striped bass larvae also fed upon cladocerans, especially *Bosmina* spp. Copepods and cladocerans are the most common zooplankters in the Hudson River during times that striped bass larvae are present (Texas Instruments, 1980 1978 Year Class Report for).

A study by the Hudson River power authorities (Texas Instruments, 1976 Hudson River Ecological Study) found that striped bass up to 75 mm preferred amphipods *Gammarus* spp., calanoid copepods, and chironomid larvae. Fish from 76-125 mm preferred *Gammarus* and calanoid copepods. Those from 126-200 mm preferred a fish prey Microgadus tomcod.

Fish are generally considered to make up the bulk of the diet of adult striped bass. Researchers commonly find engraulids and clupeids the most the most common prey (summarized in Setzler et al., 1980 Synopsis of biological data on). Because striped bass feed in schools, schooling species of fish generally comprise a large portion of the diet. Striped bass are known to gorge themselves upon schooling clupeids and engraulids, concentrating their feeding activity upon whatever species is most abundant. Many other species have also been noted in striped bass diets, for example, mummichogs, mullet, white perch and tomcod. Invertebrates also may persist in the diet of adult striped bass. Schaefer (1970 Feeding habits of striped bass) found that in Long Island Sound, fish from 275-399 mm fork length fed primarily (85 percent by volume) upon invertebrates, primarily the amphipods *Gammarus* spp. and *Haustorius canadensis* and the mysid shrimp *Neomysis americana*. Fish from 400-599 mm divided their diet between fish (46 percent) (bay anchovy, Atlantic silverside, and scup) and amphipods. Sixty percent of the diet of fish from 600-940 mm in length was made up of fish, but even these larger animals consumed amphipods, mysids, and lady crabs. Schaefer hypothesized that the continued importance of invertebrates in larger fishes diets may have resulted from turbidity in the surf zone making it difficult to pursue fast-swimming fish.

### A1.8.2 Range, Movement and Habitat within the Hudson River

Striped bass are anadromous, spawning in tidal rivers, then migrating to coastal waters to mature. Abundant data on distribution and abundance of early life history stages of striped bass are available, because the Hudson River utilities have conducted annual surveys of the distribution of striped bass in the Hudson River since 1973. Field sampling has been conducted from New York City, the George Washington Bridge at River Mile 12, to the Federal Dam. Since 1981 the sampling programs have been adjusted to emphasize collection of striped bass. Additionally, the utilities have sponsored mark-recapture studies of striped bass (e.g., McLaren et al., 1981 Movements of Hudson River striped). These studies documented movement of the species within and outside the river.

The upstream spring migration of adult striped bass begins in March and April and ranges up to the Federal Dam. As young striped bass grow during the summer, they move downstream. Even at the egg stage, striped bass can be found throughout the Hudson River Estuary, although peak abundances of eggs and larvae are usually found from the Indian Point to Kingston reaches of the river, approximately River Miles 43-90 (Lawler, Matusky & Skelly Engineers, 1992 1990 Year class report for). Downstream movement is partially determined by flow rate.

At approximately 13 mm total length, striped bass form schools and move into shallow waters (Raney, 1952). In the Hudson River, young-of-the-year striped bass begin to appear in catches during early July. They move shoreward as well as downstream throughout the summer and are usually found over sandy or gravel bottoms (Setzler et al., 1980). The utilities' studies typically find peak catches of young-of-the-year fish at River Mile 35, at the southern end of Croton-Haverstraw Bay (Lawler, Matusky & Skelly, 1992).

Some young-of-the year fish leave the estuary during the summer and fall (Dovel, 1992 Movements of immature striped bass). Dovel (1992) summarized movements of young striped bass within the river based upon studies conducted by the utilities and others. He found that young striped bass congregate in the vicinity of the salt front during the winter, although movements in the Lower Hudson River continue throughout the winter. During the spring, some yearling striped bass continue to emigrate from the river, while other move upstream. By their second year, most striped bass have left the river, except for their returns during spawning migrations.

### A1.8.3 Reproduction

In the Hudson River, striped bass spawn above the salt front and potentially as far upstream as the Federal Dam At River Mile 153. On average, however, they do not spawn as far upstream as white perch. During periods of low freshwater flow, striped bass spawn further upstream than in years of high flow. Age at sexual maturity of striped bass depends upon water temperature (Setzler et al., 1980). Males mature at approximately two years, and females mature later. Spawning is triggered by sudden rises in temperature and occurs at or near the surface. Spawning occurs in brief, explosive episodes. Eggs are broadcast into the water, where a single female may be surrounded by as many as 50 males.

## A1.9 Shortnose Sturgeon

The shortnose sturgeon, *Acipenser brevirostrum*, is the smaller of two sturgeons that occur in the Hudson River. Both the shortnose and Atlantic sturgeons have been prized for their flesh and their eggs for caviar, but sturgeons were also purposely destroyed when they became entangled in the shad nets that were once common on the Hudson River. The shortnose sturgeon has been listed on the federal endangered species list since 1967. Because it is rare and because historical data often link it with the Atlantic sturgeon, only limited data are available to describe its natural history.

### A1.9.1 Foraging

No field studies have documented the diets of larval shortnose sturgeon. Buckley and Kynard (1981 Spawning and rearing of shortnose) observed post yolk-sac larvae that they had hatched in the laboratory to feed upon zooplankton.

Juvenile shortnose sturgeon feed mostly upon benthic crustaceans and insect larvae (summarized in Gilbert, 1989 Species profiles: life histories and). Juveniles of 20-30 cm fork length have been recorded as feeding extensively upon cladocerans. Adult fish feed indiscriminately upon bottom organisms and off emergent vegetation. Food items of juvenile and adult fish include polychaete worms, molluscs. crustaceans, aquatic insects, and small bottom-dwelling fishes (Gilbert, 1989).

Juveniles and adults generally feed by rooting along the bottom, consuming considerable mud and debris with food items. As much as 85-95 percent of their stomachs may contain mud and other non-food material. Conversely, shortnose sturgeon may also feed upon gastropods that live upon vegetation. Shortnose sturgeon from New Brunswick and South Carolina have been reported as including almost exclusively gastropods with no non-food matter.

Shortnose sturgeon mostly feed at night or when turbidity is high, when they move into shallow water to feed. Adults move into areas as shallow as 1-5 m and forage among the weeds and river banks. Feeding occurs in deeper water during the summer, possibly in response to water temperature. The relatively little feeding occurs during the winter also occurs in deeper waters.

Shortnose sturgeon are not thought to feed in groups or schools. Mark-recapture data (Dovel et al., 1992 Biology of the shortnose sturgeon) suggest, however, that fish tend to move as groups. Fish of the same group would therefore tend to eat in the same general areas.

### A1.9.2 Range, Movement and Habitat within the Hudson River

Shortnose sturgeon are found throughout the portion of the Hudson River below the Federal Dam. They are considered anadromous because they are sometimes taken by commercial fishermen at sea. However, their movements are more restricted than Atlantic sturgeon, and most of the Hudson River population probably does not leave the river. The fish does not require a marine component to its life cycle: a landlocked population in the Holyoke Pool, part of the Connecticut River system, persisted from 1848 until a fish ladder was constructed in 1955.

Adult shortnose sturgeon winter in Esopus Meadows, approximately at River Mile 90 (Dovel et al., 1992 Biology of the shortnose sturgeon), in the Croton-Haverstraw region, approximately River Mile 35 (Geoghegan et al., 1992 Distribution of the shortnose sturgeon), and possibly in other small areas not yet identified.

Adult fish migrate upstream to spawn in the upper reaches of the portion of the Hudson River south of the Federal Dam in spring and then disperse downstream to feed during the summer. They can be taken throughout the fresh waters of the tidal portion of the river during the summer months.

The size of the nursery area for shortnose sturgeon larvae and young is difficult to determine, because few specimens are collected. Based upon the utilities' collections of young of the year in Haverstraw Bay, Dovel et al. (1992) presume that the young fish occupy the same freshwater portion of the estuary as do the adults of the species.

### A1.9.3 Reproduction

Shortnose sturgeons spawn in the upper reaches of the estuarine portion of the Hudson River, approximately River Miles 130-150. Spawning is limited to the last two weeks in April and the first two weeks in May. Throughout its range, the shortnose sturgeon spawns at water temperatures of 9-14°C (summarized in Crance, 1986 Habitat suitability index models and). Dovel and his co-workers (1992) found that in 1979 and 1980, spawning in the Hudson River occurred at water temperatures of 10-18°C.

Age and size of the fish at maturity varies by latitude (Gilbert, 1989). In the Hudson River, females first spawn at approximately 9-10 years and males at 11-20 years. Spawning does not occur each year and is most likely controlled by environmental factors rather than by endocrinology.

Shortnose sturgeons produce approximately 40,000-200,000 eggs per spawning in New York waters.

### A1.10 Composite Forage Fish

The model's forage fish component uses a fish with a composite diet developed from previously collected field data. Malcolm Pirnie (1984) provides the abundance by fish species captured by electrofishing and seining in nine reaches of the Hudson River from the Troy Dam to Lock Six. The typical composite forage fish was estimated by:

- developing a list of potential forage fish species for the Hudson River from Troy Dam to Lock 7;
- ranking the species by abundance;
- calculating the relative abundance of each species to the total forage fish abundance in the summed catch;
- estimating the feeding habits of each species as percentage time that the species probably feeds off the bottom or from epiphytic plants;
- summing the products of individual relative abundance and fraction of a composite forage fish diet from the bottom to obtain the composite diet from the bottom.

### A1.10.1 Potential Forage Fish

The fish listed in Malcolm Pirnie (1984) as shown in Table A-15 represent the fish community in the reach of the Hudson between Troy Dam and Lock 7. This list does not include migratory forage fish such as blueback herring or gizzard shad because their exposure to local conditions is transient.

Note that the migratory fish may provide a significant, but unspecified fraction of a piscivorous fish's diet. The model does not account for this as a source of total PCB or PCB congeners. The effect of migratory fish as forage fish introduces an unquantified source of uncertainty into the predictions of total PCB and PCB congener body burdens.

### A1.10.2 Ranking Forage Fish By Abundance

The abundance of each species among the nine river sections from the Troy Dam to Lock 7 were summed and ranked by abundance. The assumption is that those fish most vulnerable to capture by seining and electroshocking are the most likely prey of higher order piscivores.

### A1.10.3 Calculating Relative Abundance

We calculated relative abundance of each ranked species of forage fish as:

$$RE = IA/T \qquad \text{(A-1)}$$

where:

RE = relative abundance

IA = abundance of an individual species caught between Troy Dam and Lock 7;

T = total forage fish catch between Troy Dam and Lock 7.

### A1.10.4 Estimating Feeding Habits of Forage Fish

It is assumed that forage fish have two possible feeding habits: sediment feeding and feeding off epiphytic invertebrates on submerged aquatic vegetation. For forage fish with a relative abundance greater than 2%, literature reviews and site specific data collected during the current measurement program were used to estimate feeding habits. For the remaining fish in Table A-15, it was assumed that their feeding habits were similar to the most closely related species among the more abundant.

It was assumed that the epiphytic invertebrate diet represents a surface water exposure route.

The forage fish, with a relative abundance greater than 2% include: pumpkinseed, rockbass, bluegill, redbreast sunfish, common shiner, spotfin shiner, and spottail shiner.

Pumpkinseed: Smith (1985) describes pumpkinseed as an opportunistic feeder on many kinds of insects, amphipods, mollusks, larval salamanders, and small fish. Scott and Crossman (1973) describe food taken in descending order as: dragonfly nymphs, ants, larval salamanders, amphipods, mayfly nymphs, midge larvae, roundworms, snails, water boatman, and other insect larvae. Food is taken off the bottom, at the surface and in the water column.

The examination of selected fish stomach contents from the Phase II dataset as described above (see Section A1.6.1) indicate that pumpkinseeds in the 2.9 to 4.6 cm size range fed primarily on chironomids. The species of chironomids in the stomach contents were those that live on aquatic plants. Pumpkinseed were estimated to feed 20 percent of the time on the bottom and 80 percent of the time from the water column, based on the above.

Rockbass: Smith (1985) describes rockbass as feeding mostly on the bottom, but may also take food from the surface or water column. They feed on copepods, cladocerans, and insects. Scott and Crossman (1973) indicated that the food of small rockbass (under 7 cm) in one lake to include: chironomids (in 50 percent of stomachs), Ephemeroptera (in 35 percent of stomachs), Odonata (in 30 percent of stomachs), Cladocera (in 40 percent of stomachs), Amphipoda (in 30 percent of stomachs), Isopoda (in 15 percent of stomachs), surface insects (in 30 percent of stomachs). Most of these organisms are bottom dwellers. We estimate rockbass to be feeding from the bottom approximately 90 percent of the time.

Bluegill: Smith (1989) describes bluegills as feeding throughout the water column on a wide variety of organisms including plant material. Scott and Crossman (1973) describe the diet of bluegill as generalized, and feeding off the bottom, in the water and at the surface. In one lake the major foods, based on food volume, were: chironomid larvae (in 50 percent of stomachs), Cladocera (in 30 percent of stomachs), amphipods and isopods (in 10 percent of stomachs), flying insects (in 35 percent of stomachs), Odonata nymphs (in 20 percent of stomachs), ephemeroptera nymphs (in 10 percent of stomachs), Trichoptera larvae (in 15 percent of stomachs), fish fry (in 10 percent of stomachs) and molluscs (in 15 percent of stomachs). Bluegills probably feed 50 percent of the time on the bottom and 50 percent of the time from the water column, based on the above.

Redbreast Sunfish: Smith (1973) indicates that redbreast sunfish feed on plankton and a variety of aquatic insects. Scott and Crossman describe the diet as immature aquatic insects. Adult insects, molluscs, and other bottom invertebrates make up a minor part of the diet. It was estimated that redbreast sunfish feed 50 percent from the sediments and 50 percent from the water column based on this information.

Common Shiner: Smith describes the common shiner as feeding usually near the surface, but will also feed off the bottom. Insects and insect larvae are the dominant food. Scott and Crossman also describe it as mostly insectivorous. It was estimated that the spotfin is a 75 percent surface feeder and 25 percent bottom feeder.

Spottail Shiner: Smith describes the diet of spottail shiner to include zooplankton, insect larvae, and algae. The undershot mouth of the spottail shiner suggests that it is a benthic feeder. Scott and Crossman indicate that the spottail may be a plankton feeder because Daphnia forms 40 percent of its diet. They also feed on insect larvae and filamentous algae. We estimate that this species is 50 percent a surface water feeder and 50 percent a bottom feeder.

### A1.10.5 Estimating Composite Fish Feeding Habits

The relative abundance and feeding habits of individual forage fish were used to estimate the fraction of a composite forage fish diet from the bottom and from epiphytic plants as:

$$B_f = F_t * F_b \qquad \text{(A-2)}$$

$$S_f = 1 - B_f \qquad \text{(A-3)}$$

where:

$B_f$ = fraction of a composite fish diet from the bottom.

$F_t$ = the relative abundance of each species to the total forage fish abundance in the catch

$F_b$ = fraction of diet the forage species probably feeds off the bottom

$S_f$ = fraction of composite forage fish diet from surface.

To further refine the analysis, the TAMS/Gradient Phase 2 dataset was evaluated to determine the data available for fish less than 10 cm in length, likely to be consumed as forage fish. The data indicated that tesselated darters, spottail shiners, cyprinid species, sucker species, and young-of-year largemouth bass provided the best dataset. Young-of-year largemouth bass were assumed to be biologically similar to pumpkinseed. Table A-16 shows the results of the feeding analyses when combined with the Phase 2 dataset to derive feeding patterns appropriate for the particular species. This table also shows the composition of forage fish data and the feeding proportions assumed for each station in model calibration.

The data show that forage fish body diet is primarily from water column organisms (67 percent) when averaged over the entire Hudson River. The remaining 33 percent of diet is from sediment dwelling organisms. The model assumes that a forage fish at any given location is best represented by a prototypical forage fish constructed in the manner described above. These forage fish consume 67 percent water column invertebrates and 33 percent benthic invertebrates.

The PCB body burdens for forage fish were estimated using this 67 percent to 33 percent distribution of food sources in the diet. The result of this estimate is the expected concentration in the diet of forage fish. To derive bioaccumulation factors between forage fish and their diet, individual forage fish concentrations were divided by the average (geometric mean) concentrations in the diet for a given model segment.

The uncertainty in estimating water column invertebrate concentrations is reflected in the BAF between forage fish and dietary sources. Theoretically, the relationship between forage fish body burdens and dietary sources of PCBs should be consistent regardless of location. Biologically, this is probably true, but given the uncertainty inherent in the data representing the critical step between water column concentrations and water column invertebrates, it is possible that the derived BAFs are artifacts of the model. In other words, model application can only confidently be accomplished through a greater understanding of the water column invertebrate box, which impacts all subsequent compartments.

The weighted average composite forage fish diet is 33 percent benthic invertebrates and 67 percent water column invertebrates. The spottail shiner diet is 50 percent from each compartment. Each fish species can be analyzed separately within the model.

## Table A-1
## Distribution of Largemouth Bass by Lock Pool for Upper Hudson (MPI, 1984)

| Dam to Lock1 | Lock1 to Lock2 | Lock2 to Lock3 | Lock3 to Lock4 | Lock4 to Lock5dnst rm | Lock4 to Lock5 middle | Lock4 to Lock5upstrm | Lock5 to Lock6 | Lock6 to Lock7 |
|---|---|---|---|---|---|---|---|---|
| 17 | 5 | 24 | 3 | 41 | 11 | 15 | 15 | 4 |

## Table A-2
## Preferential Habitats for Largemouth Bass in Upper Hudson (MPI, 1984)

| artificial cut | shallow | wetland | stream mouth | wet dumpsite | alt. channel | embay-ment |
|---|---|---|---|---|---|---|
| 12 | 14 | 34 | 28 | 13 | 4 | 37 |

## Table A-3
## White Perch Chironomid Identification for the Hudson River

| Taxon | Number | Habitat | Association |
|---|---|---|---|
| Fish No. 1 | | | |
| *Ablabesmyia simpsoni* | 4 | sprawler | epiphytic |
| *Coelotanypus* | 1 | burrower | sediment |
| *Procladius (Holotanypus)* | 9 | burrower | sediment |
| *Cryptochironomus* | 1 | sprawler & burrower | both |
| *Cryptotendipes* | 86 | burrower | sediment |
| *Paralauterborniella* | 1 | clinger | epiphytic |
| *Polypedilum illinoense* grp. | 1 | clinger | epiphytic |
| *Tanytarsus* | 11 | burrower | sediment |
| Fish No. 2 | | | |
| *Polypedilum illinoense* grp. | 13 | sprawler | epiphytic |
| *Dicrotendipes neomodestus* | 9 | sprawler | epiphytic |
| Fish No. 3 | | | |
| *Ablabesmyia simpsoni* | 8 | sprawler | epiphytic |
| *Procladius (H.)* sp. | 5 | burrower | sediment |
| *Procladius (Ps.) bellus* | 1 | burrower | sediment |
| *Chironomus* | 5 | burrower | sediment |
| *Cryptochironomus* | 1 | sprawler & burrower | both |
| *Cryptotendipes* | 48 | burrower | sediment |
| *Harnischia* | 2 | clinger | epiphytic |
| *Polypedilum halterale* grp. | 1 | sprawler | epiphytic |
| *P. illinoense* grp. | 1 | sprawler | epiphytic |
| *Paralauterborniella* | 4 | clingers | epiphytic |
| *Tanytarsus* | 2 | burrower | sediment |
| Pupa | 2 | | |
| Copepoda | | | |
| Fish No. 4 | | | |
| *Meropelopia* | 1 | | |
| *Dicrotendipes neomodestus* | 4 | sprawler | epiphytic |
| *Glyptotendipes* | 1 | clingers | epiphytic |
| *Polypedilum illinoense* | 6 | sprawler | epiphytic |
| Fish No. 5 | | | |
| *Cricotopus bicinctus* grp. | 1 | clinger | epiphytic |
| *Dicrotendipes neomodestus* | 15 | sprawler | epiphytic |
| *Polypedilum illinoense* | 37 | sprawler | epiphytic |
| *P. scalaenum* | 1 | clinger | epiphytic |

Sources for chironomid identification: Merritt and Cummins, 1978 An Introduction to the; Menzie 1980, The Chironomid (Insecta:Diptera) and; Simpson and Bode, 1980 Common Larvae of Chironomidae (Diptera).

## Table A-4
## Distribution of White Perch in the Upper Hudson River (MPI, 1984)

| Dam to Lock1 | Lock1 to Lock2 | Lock2 to Lock3 | Lock3 to Lock4 | Lock4 to Lock5dnstrm | Lock4 to Lock5 middle | Lock4 to Lock5upstrm | Lock5 to Lock6 | Lock6 to Lock7 |
|---|---|---|---|---|---|---|---|---|
| 44 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

## Table A-5
## White Perch Distribution in the Upper Hudson by Habitat Type (MPI, 1984)

| artificial cut | shallow | wetland | stream mouth | wet dumpsite | alt. channel | rapids |
|---|---|---|---|---|---|---|
| 6 | 24 | 13 | 8 | 4 | 6 | 2 |

## Table A-6
## Distribution of Yellow Perch in the Upper Hudson River (MPI, 1984)

| Dam to Lock1 | Lock1 to Lock2 | Lock2 to Lock3 | Lock3 to Lock4 | Lock4 to Lock5dnstrm | Lock4 to Lock5 middle | Lock4 to Lock5upstrm | Lock5 to Lock6 | Lock6 to Lock7 |
|---|---|---|---|---|---|---|---|---|
| 23 | 1 | 12 | 12 | 6 | 8 | 20 | 36 | 24 |

## Table A-7
## Yellow Perch Distribution in the Upper Hudson by Habitat Type (MPI, 1984)

| artificial cut | shallow | wetland | stream mouth | wet dumpsite | alt. channel | embay-ment |
|---|---|---|---|---|---|---|
| 15 | 20 | 46 | 17 | 13 | 14 | 37 |

## Table A-8
## Distribution of Brown Bullhead in the Upper Hudson River (MPI, 1984)

| Dam to Lock1 | Lock1 to Lock2 | Lock2 to Lock3 | Lock3 to Lock4 | Lock4 to Lock5dnstrm | Lock4 to Lock5 middle | Lock4 to Lock5upstrm | Lock5 to Lock6 | Lock6 to Lock7 |
|---|---|---|---|---|---|---|---|---|
| 6 | 1 | 24 | 14 | 27 | 8 | 6 | 3 | 8 |

## Table A-9
## Bullhead Distribution in the Upper Hudson by Habitat Type (MPI, 1984)

| artificial cut | shallow | wetland | stream mouth | wet dumpsite | alt. channel | embay-ment |
|---|---|---|---|---|---|---|
| 0 | 5 | 43 | 10 | 5 | 13 | 30 |

## Table A-10
## Pumpkinseed Chironomid Identification from Hudson River

| Taxon | Number | Habitat | Association |
|---|---|---|---|
| Fish No. 1 | | | |
| *Crictopus bicinctus* grp. | 1 | | |
| *C. sylvestris* grp. | 1 | | |
| *Psectrocladius* | 3 | | |
| *Synorthocladius* | 1 | | |
| *Dicrotendipes nemodestus* | 3 | sprawler | epiphytic |
| *Polypedilum convictum* grp. | 3 | sprawler | epiphytic |
| *P. illinoense* grp. | 8 | sprawler | epiphytic |
| *Rheotanytarsus* | 3 | sprawler | epiphytic |
| Fish No. 2 | | | |
| *Cricotopus sylvestris* grp. | 1 | sprawler, burrower | both |
| *Psectrocladius* | 1 | sprawler | epiphytic |
| *Polypedilum convictum* grp. | 1 | sprawler | epiphytic |
| *P. illinoense* grp. | 9 | sprawler | epiphytic |
| *Paratanytarsus* | 1 | sprawler | epiphytic |
| *Rheotanytarsus* | 2 | sprawler | epiphytic |
| Chironomidae pupae | 1 | | |
| Lepidoptera larvae | 1 | | |
| Fish No. 3 | | | |
| *Ablabsesmyia simpsoni* | 1 | sprawler | epiphytic |
| *Cricotopus sylvestris* grp. | 7 | sprawler, burrower | both |
| *Psectrocladius* | 1 | sprawler | epiphytic |
| *Thienemanniella* | 1 | clinger | epiphytic |
| *Polypedilum convictum* grp | 3 | sprawler | epiphytic |
| *Polypedilum illinoense* grp. | 25 | sprawler | epiphytic |
| *Rheotanytarsus* | 1 | clinger | epiphytic |

Sources for chironomid identification: Merritt and Cummins, 1978 An Introduction to the; Menzie 1980, The Chironomid (Insecta:Diptera) and; Simpson and Bode, 1980 Common Larvae of Chironomidae (Diptera).

## Table A-11
## Distribution of Pumpkinseed in the Upper Hudson River (MPI, 1984)

| Dam to Lock1 | Lock1 to Lock2 | Lock2 to Lock3 | Lock3 to Lock4 | Lock4 to Lock5dnst rm | Lock4 to Lock5 middle | Lock4 to Lock5upstrm | Lock5 to Lock6 | Lock6 to Lock7 |
|---|---|---|---|---|---|---|---|---|
| 98 | 12 | 123 | 67 | 164 | 33 | 46 | 157 | 96 |

## Table A-12
## Pumpkinseed Distribution in the Upper Hudson by Habitat Type (MPI, 1984)

| artificial cut | shallow | wetland | stream mouth | wet dumpsite | alt. channel | embay-ment |
|---|---|---|---|---|---|---|
| 35 | 82 | 234 | 210 | 50 | 35 | 182 |

## Table A-13
## Distribution of Spottail Shiner in the Upper Hudson River (MPI, 1984)

| Dam to Lock1 | Lock1 to Lock2 | Lock2 to Lock3 | Lock3 to Lock4 | Lock4 to Lock5dnst rm | Lock4 to Lock5 middle | Lock4 to Lock5upstrm | Lock5 to Lock6 | Lock6 to Lock7 |
|---|---|---|---|---|---|---|---|---|
| 26 | 3 | 27 | 1 | 13 | 22 | 7 | 36 | 36 |

## Table A-14
## Spottail Shiner Distribution in the Upper Hudson by Habitat Type (MPI, 1984)

| artificial cut | shallow | wetland | stream mouth | wet dumpsite | alt. channel | embay-ment |
|---|---|---|---|---|---|---|
| 3 | 9 | 32 | 2 | 68 | 35 | 4 |

## Table A-15
## Estimate of Composite Forage Fish Diet

| Species | Catch Between Troy Dam and Lock 7 | | Fraction Epiphyte Diet | Fraction Sediment Diet | Hypothetical Fish Epiphyte Diet | Hypothetical Fish Sediment Diet |
|---|---|---|---|---|---|---|
| Pumpkinseed | 796 | 53.35% | 0.8 | 0.2 | 0.4268 | 0.1067 |
| Spottail Shiner | 171 | 11.46% | 0.5 | 0.5 | 0.0573 | 0.0573 |
| Bluegill | 149 | 9.99% | 0.5 | 0.5 | 0.0499 | 0.0499 |
| Rockbass | 87 | 5.83% | 0.1 | 0.9 | 0.0058 | 0.0525 |
| Spotfin Shiner | 52 | 3.49% | 0.75 | 0.25 | 0.0261 | 0.0087 |
| Redbreast Sunfish | 43 | 2.88% | 0.5 | 0.5 | 0.0144 | 0.0144 |
| Common Shiner | 33 | 2.21% | 0.75 | 0.25 | 0.0166 | 0.0055 |
| Emerald Shiner | 24 | 1.61% | 0.75 | 0.25 | 0.0121 | 0.0040 |
| Bluntnose Minnow | 22 | 1.47% | 0.5 | 0.5 | 0.0074 | 0.0074 |
| White Crappie | 20 | 1.34% | 0.5 | 0.5 | 0.0067 | 0.0067 |
| Black Crappie | 13 | 0.87% | 0.75 | 0.25 | 0.0065 | 0.0022 |
| Steel Color Shiner | 13 | 0.87% | 0.75 | 0.25 | 0.0065 | 0.0022 |
| Satinfin Shiner | 12 | 0.80% | 0.75 | 0.25 | 0.0060 | 0.0020 |
| Johnny Darter | 10 | 0.67% | 0.5 | 0.5 | 0.0034 | 0.0034 |
| Bigmouth Shiner | 7 | 0.47% | 0.75 | 0.25 | 0.0035 | 0.0012 |
| Mimic Shiner | 7 | 0.47% | 0.75 | 0.25 | 0.0035 | 0.0012 |
| Silvery Minnow | 7 | 0.47% | 0.5 | 0.5 | 0.0023 | 0.0023 |
| Comely Shiner | 5 | 0.34% | 0.75 | 0.25 | 0.0025 | 0.0008 |
| Pugnose Shiner | 4 | 0.27% | 0.75 | 0.25 | 0.0020 | 0.0007 |
| Rosyface Shiner | 4 | 0.27% | 0.75 | 0.25 | 0.0020 | 0.0007 |
| Bridle Shiner | 3 | 0.20% | 0.75 | 0.25 | 0.0015 | 0.0005 |
| Eastern Banded Killifish | 2 | 0.13% | 0.75 | 0.25 | 0.0010 | 0.0003 |
| Fall Fish | 2 | 0.13% | 0.75 | 0.25 | 0.0010 | 0.0003 |
| Blackchin Shiner | 1 | 0.07% | 0.75 | 0.25 | 0.0005 | 0.0002 |
| Central Mudminnow | 1 | 0.07% | 0.5 | 0.5 | 0.0003 | 0.0003 |
| Creek Chub | 1 | 0.07% | 0.5 | 0.5 | 0.0003 | 0.0003 |
| Fathead Minnow | 1 | 0.07% | 0.5 | 0.5 | 0.0003 | 0.0003 |
| Logperch | 1 | 0.07% | 0.75 | 0.25 | 0.0005 | 0.0002 |
| Troutperch | 1 | 0.07% | 0.75 | 0.25 | 0.0005 | 0.0002 |
| | | | | | 0.6676 | 0.3324 |
| Total Fish | 1492 | | | | | |

| Species | Catch Between Troy Dam and Lock 7 | | Fraction Epiphyte Diet | Fraction Sediment Diet | Hypothetical Fish Epiphyte Diet | Hypothetical Fish Sediment Diet |
|---|---|---|---|---|---|---|
| Pumpkinseed | 796 | 69.95% | 0.8 | 0.2 | 0.5596 | 0.1399 |
| Spottail Shiner | 171 | 15.03% | 0.5 | 0.5 | 0.0751 | 0.0751 |
| Rockbass | 87 | 7.64% | 0.1 | 0.9 | 0.0076 | 0.0688 |
| Redbreast Sunfish | 43 | 3.78% | 0.5 | 0.5 | 0.0189 | 0.0189 |
| Bluntnose Minnow | 22 | 1.93% | 0.75 | 0.25 | 0.0145 | 0.0048 |
| Johnny Darter | 10 | 0.88% | 0.75 | 0.25 | 0.0066 | 0.0022 |
| Silvery Minnow | 7 | 0.62% | 0.75 | 0.25 | 0.0046 | 0.0015 |
| Central Mudminnow | 1 | 0.09% | 0.75 | 0.25 | 0.0007 | 0.0002 |
| Fathead Minnow | 1 | 0.09% | 0.75 | 0.25 | 0.0007 | 0.0002 |
| | | | | | 0.6883 | 0.3117 |
| Total Fish | 1138 | | | | | |





Source: Malcolm-Pirnie, 1984

Table A-16
Sampling Locations, Composite Forage Fish and Feeding Strategies

| Ecological Phase II Station Location | Water Column Sampling Station | Forage Fish (<10 cm) Species Represented | Sediment Feeding Sources | Epiphytic Feeding Sources |
|---|---|---|---|---|
| 1 | | CYPD, LMB, RBRS, TESS | | |
| 2 | 0004 | CYPD, LMB, SPOT, TESS | 69% | 31% |
| 3 | 0010 | SPOT | 50% | 50% |
| 4 | 0005 | LMB, RBRS, SPOT, TESS | 69% | 31% |
| 5 | 0005 | | | |
| 6 | 0005 | | | |
| 7 | 0005 | | | |
| 8 | 0012 | LMB, SPOT | 69% | 31% |
| 9 | 0008 | SPOT | 50% | 50% |
| 10 | | SPOT | | |
| 11 | | SPOT | | |
| 12 | 0015 | SPOT | 50% | 50% |
| 13 | | SPOT | | |
| 14 | | SPOT | | |
| 15 | | SPOT, LMB | | |
| 16 | | SPOT | | |
| 20 | 0002 | CYPD, SKSP, TESS | 69% | 31% |

Notes:
LMB = juvenile Largemouth Bass
CYPD = Cyprinid Species
TESS = Tesselated Darter
SPOT = Spottail Shiner
SKSP = Sucker Species

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# APPENDIX B

## MATHEMATICAL MODELING OF PCB FATE AND TRANSPORT FOR HUDSON RIVER PCB REASSESSMENT RI/FS

## TECHNICAL SCOPE OF WORK

*Prepared for:*

TAMS Consultants, Inc.
Bloomfield, New Jersey

*Prepared by:*

Limno-Tech, Inc.

and

Menzie-Cura & Associates, Inc.

and

The CADMUS Group, Inc.

October 1996

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# 1. LIMNO-TECH, INC.

## BACKGROUND

In December 1989 U.S. EPA decided to reassess the No Action decision for Hudson River sediments. This reassessment consists of three phases: Interim Characterization and Evaluation (Phase 1); Further Site Characterization and Analysis (Phase 2); and Feasibility Study (Phase 3). Limno-Tech, Inc. (LTI) was selected by TAMS to provide services for mathematical modeling activities identified in the Phase 2 Work Plan.

## OBJECTIVES

The objectives of the original LTI Technical Scope of Work (March 25, 1993) were the following:

1. Develop and apply a predictive model for PCB levels in water and sediments over long-term (decadal), quasi-steady state conditions in the Upper Hudson River.

2. Evaluate the impacts of PCB loadings from the Upper Hudson River on fish body burdens in the freshwater portion of the Lower Hudson River.

3. Evaluate the potential for resuspension of contaminated sediments from the Thompson Island Pool (Upper Hudson River) in response to flood events, and evaluate potential downstream impacts in terms of PCB levels in water and sediments.

4. Evaluate and apply quantitative relationships between PCB water and sediment concentrations and fish body burdens in the Upper and Lower Hudson River.

5. Apply the Hudson River PCB models to predict river response to select remedial alternatives in terms of resulting PCB levels in sediment, water and fish.

## PROGRESS TO DATE

During the first part of the project, LTI developed mass balance models for PCB transport and fate in the Upper Hudson River water column and sediments, and applied a previously-developed model for PCB transport and fate in the Lower Hudson River which also included bioaccumulation in striped bass. The Cadmus Group, Inc. (CADMUS) developed statistical models relating PCB concentrations in water and sediments to fish body burdens in the Upper and Lower Hudson Rivers. CADMUS also conducted several important data analysis activities including kriging of sediment PCB data, estimation of long-term flows and loadings to the Upper Hudson River, determination of PCB phase partitioning relationships and investigation of relationships among congener groups, total PCBs and Aroclors. Finally, Menzie-Cura & Associates (MCA) developed a probabilistic bioaccumulation model to describe exposure-body burden relationships in fish using a mechanistic approach.

## REVISED TASKS

The following revised tasks are necessary towards completion of the original project objectives on this Hudson River PCB Reassessment RI/FS. The structure of these tasks follows the format of the Hudson River PCB Reassessment RI/FS project tasks developed by TAMS.

### TASK 9 - Baseline Modeling

***Subtask 9-A: Upper Hudson River Modeling.***

*Subtask 9-A.1: Calibration of revised HUDTOX model to Spring 1994 high-flow surveys.*

The purpose of this task is to reduce uncertainties in specification of model parameters for gross solids settling and resuspension velocities. As part of Subtask C.3 the spatial segmentation grid for HUDTOX will be revised to better represent horizontal differences in sediment physical-chemical properties in TIP. The revised model will then be calibrated to daily suspended solids data for April 1994, the peak flow period for the year. The maximum flow during this month corresponded to approximately a 5-year flood and represents the most useful solids data available for wet weather resuspension calibration.

This task will also include an assessment of all available flow and suspended solids concentration data for the Upper Hudson River from 1973 to the present. The purpose of this assessment will be to develop site-specific, empirical relationships that can be used to help parameterize gross settling and resuspension velocities as functions of flow. In addition, available sediment data for TIP will be used to help parameterize resuspension velocities as functions of segment-specific, physical-chemical properties. These data will include side-scan sonar, confirmatory measurements of particle sizes and sediment types, and data from the Phase 2 low-resolution coring effort.

To ensure cost-effective conduct of this task, required data sets must be delivered to LTI in complete, validated and final form before work can be initiated.

*Subtask 9-A.2: Calibration of revised HUDTOX model using Phase 2 low-resolution sediment coring data.*

The purpose of this task is to reduce uncertainty in the existing HUDTOX model calibration which was conducted using unvalidated Phase 2 monitoring data, and which did not include results from the Phase 2 low-resolution sediment coring effort. The time period for this application will be January 1 to September 30, 1993. The scientific credibility of the HUDTOX calibration will be improved for three principal reasons: (1) the revised spatial segmentation grid in TIP (Subtask C.3) will better represent horizontal differences in sediment-water interactions in TIP; (2) calibration of the revised HUDTOX model to daily suspended solids data for April 1994 (Subtask A.1) will reduce uncertainties in solids settling and resuspension velocities; and (3) the low-resolution sediment coring data will allow more accurate specification of sediment PCB initial concentrations than the 1991 GE sediment data used in the existing HUDTOX model calibration.

The HUDTOX model calibration will be conducted for total PCBs and three PCB congeners. Calibration of HUDTOX to three PCB congeners, which cover a range of sorption properties, is sufficient to demonstrate the ability of the model to simulate most, if not all, PCB congeners. However, the HUDTOX model applications described in Subtask 9-A will be conducted for total PCBs, three PCB congeners and up to two other indicators represented as specific PCB congeners, homologues, or Aroclor mixtures.

To ensure cost-effective conduct of this task, required data sets must be delivered to LTI in complete, validated and final form before work can be initiated.

*Subtask 9-A.3:* *Sensitivity analyses with revised HUDTOX model.*

This Subtask will include model sensitivity evaluations similar to those analyses presented in the Draft Copy of the Phase 2 Preliminary Model Calibration Report.. The purpose of this task is to gain a better quantitative understanding of PCB dynamics in the Upper Hudson River and to strengthen the scientific credibility of the overall model calibration. Model parameters to be evaluated using sensitivity analysis will include external solids and PCB loadings, sediment PCB initial concentrations, solids settling and resuspension velocities, PCB partitioning, PCB pore water concentrations, sediment-water diffusion rates and assumed pore water advection.

*Subtask 9-A.4:* *Long-term hindcasting calibration of revised HUDTOX model for total PCBs.*

The purpose of this task is to reduce prediction uncertainty by ensuring that model output for water column and sediment PCB concentrations are consistent with observed changes over a decadal time scale (1984-1993) in the Upper Hudson River. Two principal data tasks must be conducted before this long-term hindcasting calibration: (1) assessment of available data for different PCB forms and selection of the most appropriate state variable for a long-term mass balance; and (2) determination of monthly external loadings for water, solids and the chosen PCB state variable, especially at Fort Edward. It is proposed that TAMS and/or CADMUS conduct these data synthesis tasks.

To ensure cost-effective conduct of this task, required data sets must be delivered to LTI in complete, validated and final form before work can be initiated.

*Subtask 9-A.5:* *Use of calibrated HUDTOX model to estimate impacts of No Action and major floods.*

The calibrated, revised version of HUDTOX will be used to simulate impacts due to No Action and major flood scenarios. For the No Action scenario, HUDTOX will be run for a decadal-scale simulation period sufficiently long to establish quasi-steady state conditions. Design specifications for this scenario must be determined jointly among EPA, TAMS/Gradient, LTI, CADMUS and MCA. In particular, long-term time series must be constructed for hydraulic flows and external loadings of solids and PCBs. PCB water column and sediment concentrations from this No Action simulation will be delivered to CADMUS and MCA for use in their fish body burden models.

Major flood scenarios will include hydrographs corresponding to the high flow events during April 1993, April 1994 and a computed 100-year flood. For each of these flood scenarios, HUDTOX will be run for a seasonal-scale simulation period sufficiently long to estimate perturbations in pre-event PCB water column and sediment concentrations. PCB water column and sediment concentrations from these flood scenarios will be delivered to CADMUS and MCA for use in their fish body burden models.

*Subtask 9-A.6: Linkage of revised HUDTOX model with Thomann model.*

To investigate potential downstream impacts in the freshwater portion of the Lower Hudson River, exposure outputs from HUDTOX must be linked as exposure inputs to the Thomann model for the Lower Hudson River. Exposure outputs from HUDTOX are in the form of total PCBs and three to five individual congeners or co-eluting congener groups. The PCB state variables in the Thomann model are in the form of PCB homologs. In order to link these two models, output from HUDTOX must be converted from total PCBs and/or PCB congeners to PCB homologs at Federal Dam. It is proposed that TAMS process HUDTOX model output at this location and conduct appropriate PCB conversions to satisfy the input requirements of the Thomann model.

***Subtask 9-B: Lower Hudson River Modeling.***

*Subtask 9-B.1: Estimation of downstream impacts of No Action and major floods.*

The purpose of this task is twofold: (1) estimate the relative contribution of PCB loadings at Federal Dam to PCB water column and sediment concentrations in the freshwater portion of the Lower Hudson River; and (2) estimate impacts on striped bass populations using the food chain component of the model. These estimates will be developed for the base calibration period, and for the No Action and major flood scenarios described in Subtask 9-A.5.

*Subtask 9-B.2: Delivery of PCB water column and sediment exposure fields to CADMUS and MCA.*

The CADMUS and MCA fish body burden models must be linked with PCB concentrations in the water column and sediment. LTI will deliver model outputs for these PCB exposures in the freshwater portion of the Lower Hudson River to CADMUS and MCA. These PCB exposures will be in the form of daily, weekly or monthly average concentrations for each of the water column and sediment segments. PCB exposure outputs from the Thomann model are in the form of PCB homologs. If exposures are required in terms of different PCB forms, it is proposed that TAMS process these exposure outputs and conduct appropriate PCB conversions to satisfy the input requirements of the fish body burden models.

NOTE: EPA understands that as of September 1996, the Thomann model is being updated under a grant from the Hudson River Foundation, and that certain corrections have been made to the published model. EPA is evaluating whether the updated model will be available or appropriate for use in this Hudson River RI/FS.

***Subtask 9-C: Thompson Island Pool Modeling.***

*Subtask 9-C.1: Revision of the TIP resuspension model to include cohesive and non-cohesive sediment areas.*

The purpose of this task is to develop a more complete and internally consistent representation of potential resuspension of contaminated sediments from TIP in response to major flood events. The existing TIP resuspension model represents sediment areas consisting of only "cohesive" sediment types. Although sediments in these areas are considered to encompass most of the known PCB "hotspots" in TIP, these spatially limited areas represent only approximately 29 percent of the total PCB mass reservoir in TIP. The remaining 71 percent is located in larger sediment areas consisting of "non-cohesive" sediment types, thus necessitating a revised modeling approach.

This task will include a detailed characterization of TIP sediments in terms of particle type, particle size distributions, clay content, porosity, and total PCB concentration. Results from this characterization will be used to develop a finer-scale horizontal segmentation grid for both cohesive and non-cohesive sediment areas. Each of the sediment segments in this grid will be characterized by a unique set of values for a suite of physical-chemical parameters, including the proportional distribution of total solids mass into multiple particle size classes.

Using the best available information from the scientific literature, critical shear stresses will be estimated as a function of the physical characteristics and particle size classes in each sediment segment. For a flood event with a given maximum flow, applied shear stresses will be estimated for each sediment segment using water velocities from the existing fine-scale hydrodynamic model of TIP. Given these segment-specific physical-chemical properties and applied shear stresses, maximum solids/PCB masses resuspended and depths of scour will be estimated for cohesive and non-cohesive sediment types in each segment. These results can be summed to form cumulative gross resuspension estimates for TIP, or they can be used to characterize different areas in TIP with respect to erodability.

The revised TIP resuspension model will be used to estimate solids and total PCBs resuspended during peak flow events in April 1993, April 1994 and an assumed 100-year flood. For the 1993 and 1994 flow events, cumulative gross resuspension estimates from the TIP resuspension model will be compared with cumulative gross resuspension results from the TIP portion of the revised HUDTOX model. Finally, statistical uncertainty analyses will be conducted to quantify ranges of uncertainty in solids/PCB resuspension estimates as a function of principal model parameters.

To ensure cost-effective conduct of this task, required data sets must be delivered to LTI in complete, validated and final form before work can be initiated.

*Subtask 9-C.2: Application of revised TIP resuspension model to results from the Phase 2 low-resolution sediment coring effort.*

The purpose of this task is to reduce uncertainties in estimated solids and PCB resuspension in TIP due to uncertainties in specification of sediment physical-chemical characteristics. The existing TIP model was applied to sediment data acquired in the 1984 NYSDEC sediment survey. More

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recent sediment data were acquired as part of the Phase 2 low-resolution sediment coring effort. Results from this effort will be used to update and/or revise assignments of sediment physical-chemical characteristics in the TIP spatial segmentation grid.

To ensure cost-effective conduct of this task, required data sets must be delivered to LTI in complete, validated and final form before work can be initiated.

*Subtask 9-C.3: Revision of TIP portion of HUDTOX spatial segmentation.*

The purpose of this task is to develop a more finely-resolved spatial segmentation grid for TIP that more accurately represents horizontal differences in sediment physical-chemical characteristics. This revised grid will consist of 20-30 spatial segments and it will replace the three TIP segments in the existing version of HUDTOX. The grid will represent cohesive and non-cohesive sediment areas, and will be internally consistent with and fully coupled to the overall HUDTOX model.

This task will build upon the detailed characterizations of TIP sediments, water velocities and applied shear stresses as part of Subtask 9-C.1. It is expected that the revised spatial segmentation grid for the TIP portion of HUDTOX will be a superset of the fine-scale horizontal segmentation grid for the TIP resuspension model in Subtask 9-C.1.

***Subtask 9-D: Ecological Data Tabulation, Statistics and Modeling.***

Under this Subtask, the TAMS team will perform the primary ecological interpretation and modeling aspects of the program. LTI will be providing support to MCA, the primary investigator in this Subtask. LTI will also provide support for the additional ecological analyses being performed by CADMUS. The support LTI will provide is described by the following subtask.

*Subtask 9-D.1: Internal review of bioaccumulation models.*

CADMUS and MCA will continue to develop models relating PCB water column and sediment exposures to PCB body burdens in fish in the Upper and Lower Hudson Rivers. LTI will continue to provide guidance and internal review for these modeling efforts. This will include review of model assumptions, parameterization, calibration/verification and predictive performance/reliability. Emphasis will be placed on confirming that these modeling efforts are designed to provide the best possible answers to the principal questions in the Reassessment RI/FS.

***Subtask 9-E: Combined Geochemical and Ecological Data Interpretation and Modeling..***

This subtask represents the integration of the various modeling efforts by the TAMS team. In particular, model results provided by LTI will be used by other team members to estimate PCB body burdens in fish using the biological models developed in Subtask D under the no action and flood event future scenarios described in Subtask A. The following subtasks describe the LTI technical support related to this integration of the modeling efforts.

*Subtask 9-E.1: Delivery of PCB water column and sediment exposure fields to CADMUS and MCA.*

The CADMUS and MCA fish body burden models must be linked with PCB concentrations in the water column and sediment. These PCB exposure concentrations for forecast simulations will be determined by the LTI transport and fate models for the Upper and Lower Hudson Rivers. LTI will deliver model outputs for PCB exposures to CADMUS and MCA for use in the PCB fish body burden models. These PCB exposures will be in the form of daily, weekly or monthly average concentrations for each of the water column and sediment segments in the Upper and Lower Hudson River transport and fate models. These exposures will correspond to model simulations for the No Action, and major flood scenarios described in Subtask A.5.

Exposure outputs from HUDTOX (Upper Hudson River) are in the form of total PCBs and three to five individual congeners or co-eluting congener groups. Exposure outputs from the Thomann model (Lower Hudson River) are in the form of PCB homologs. If exposures are required in terms of different PCB forms, it is proposed that TAMS process the HUDTOX and/or Thomann model exposure outputs and conduct appropriate PCB conversions to satisfy the input requirements of the fish body burden models.

*Subtask 9-E.2: Phase 2 geochemical, ecological, and modeling review.*

LTI will participate in a series of discussions led by TAMS which will be focused on developing an overall perspective of the geochemical, ecological, and modeling aspects of the Phase 2 program. These discussions will be reflected in the summary and conclusions of the baseline modeling report.

***Subtask 9-F: Assemble, Review, and Finalize the Document.***

LTI will contribute resource materials to the Draft Copy of the baseline modeling report. This will include, as appropriate, involvement in development of a report outline, data synthesis and interpretation, preparation of modeling results, and preparation of other relevant work products from the proposed modeling of PCB fate and transport.

***Subtask 9-G: Prepare the Review Copy.***

LTI will contribute resource materials and provide technical review, as appropriate, for preparation of the Review Copy of the baseline modeling report for the Reassessment RI/FS. LTI will assist in revising the Draft Copy of the report to respond to review comments as directed by TAMS.

# 2. MENZIE-CURA & ASSOCIATES, INC.

## BACKGROUND

The scope of work described below is part of a team effort involving TAMS Consultants, Limno-Tech, Inc., Cadmus Group and Menzie-Cura & Associates, Inc. This effort is part of the US EPA December 1989 decision to reassess the No Action decision for the Hudson River. Specific components relative to the analysis of PCB stores in river sediments, fate and transport of PCBs in the Hudson, and bioaccumulation of PCBs in fish were contained in TAMS Consultants, Inc. request for proposal (RFP) No. 5200-108, under ARCS Region II EPA Contract No. 68--S9-2001, released in August, 1992. In response to a proposal submitted in September, 1992, Menzie-Cura & Associates, Inc. was selected to provide support on the bioaccumulation component of the overall project. The initial work plan for these activities was provided in the March 24, 1993 Scope of Work document. This scope of work outlines the proposed Menzie-Cura & Associates, Inc. work plan for the continuing effort on the Hudson River PCB Reassessment RI/FS.

## OBJECTIVES AND RECOMMENDATIONS

The original objectives of the Menzie-Cura & Associates, Inc. scope of work submitted on March 24, 1993 were as follows:

1. Evaluate and apply quantitative relationships between PCB water and sediment concentrations and fish body burdens in the upper and lower Hudson River.

2. Develop and apply a bioaccumulation model to predict fish responses to select remedial alternatives based on predicted sediment and water concentrations from the LTI models.

3. Review and incorporate the bivariate statistical model developed by Cadmus to evaluate fish responses to changing sediment and water concentrations in the upper and lower Hudson River.

4. Provide estimates of PCB body burdens under specific scenarios for use in the human health and ecological risk assessments.

During the first part of the project, Menzie-Cura & Associates, Inc. reviewed available Phase 1 and Phase 2 data and developed a framework for relating body burdens of PCBs in fish to exposure concentrations in Hudson River water and sediments. This framework is used to understand historical and current relationships as well as to predict fish body burdens for future conditions. The Cadmus Group, Inc. developed statistical models relating PCB concentrations (on an Aroclor basis) in water and sediments to fish body burdens in the upper and lower Hudson Rivers. Menzie-Cura & Associates, Inc. developed preliminary probabilistic bioaccumulation models to describe exposure-body burden relationships using a mechanistic approach. These probabilistic food chain models provide information on the fractions of the fish populations that are at or above particular PCB levels and explicitly incorporate variability inherent in the underlying data to complement the single population statistics provided by the statistical models.

The models are designed to be implemented in one of three forms: a Monte Carlo spreadsheet model, equations combining individual distributions into cumulative distributions, and a nomograph or look-up table.

Progress to date in accomplishing these objectives is summarized in the Phase 2 Preliminary Model Calibration Report of September, 1996..

**TASKS**

Each of the following proposed tasks is designed to address one or more of the recommendations above. The proposed work plan follows a similar format to the original March 24, 1993 scope of work. The task numbers correspond to the task numbers used for billing and reporting purposes in part one of model development and calibration.

**Task 1: Planning and Coordination**

Menzie-Cura & Associates, Inc. will coordinate project planning activities with TAMS and other subcontractors on the project team. These activities include delineation of data requirements for proposed modeling activities, and a discussion of the management questions to be addressed by the modeling effort.

**Task 2: Progress Meetings**

Details not applicable.

**Task 3: Public Meetings**

Details not applicable.

**Task 4: Ecological Data Tabulation, Statistics, and Modeling**

***Subtask 4.1: Correlation of fish PCB burdens to environmental concentrations in both sediment and water via a bivariate BAF approach.***

Menzie-Cura & Associates, Inc. will continue to provide guidance and internal review of the statistical regression analyses being conducted by Cadmus Group, Inc. This task also involves tabulating values from the literature on relationships for PCBs between water, sediment and fish.

***Subtask 4.2: Development of probabilistic bioaccumulation models.***

These models are designed to identify the relative contribution of PCBs in Hudson River sediments and water to body burdens of six selected fish species. These species include largemouth bass, yellow perch, white perch, spottail shiner, pumpkinseed, and brown bullhead. Because forage fish (spottail shiner and pumpkinseed) comprise the bulk of the diet for piscivorous fish such as the largemouth bass, these forage fish are evaluated in terms of a *composite* forage fish.

Preliminary models have been developed based on Phase 2 data and data from other agencies (New York State Department of Environmental Conservation, New York State Department of Health, United States Geological Survey, and General Electric). These models incorporate information on the physiological capacity for accumulating PCBs, dietary habits, food sources, general behavior, and trophic level. The bioaccumulation factors between trophic levels are expressed as distributions rather than single point estimates to incorporate the observed variability in the underlying data and uncertainty about feeding preferences. This provides information on the fraction of the fish populations that are at or above particular PCB levels (*i.e.*, 90% of the fish population is expected to be at or below a particular concentration).

The models require validation datasets, which are not available for all fish species. Consequently, a multifaceted approach is being taken. The bivariate statistical model and the probabilistic model represent two approaches; use of a third model, such as the Gobas (1993) gastrointestinal biomagnification model is also being explored.

**Water Column to Water Column Invertebrate Component**

Results from the preliminary models indicate that the water column to water column invertebrate pathway represents a significant exposure pathway. There are no water column invertebrate data from the Phase 2 dataset. Further analysis on this pathway is required and included in this task.

There are a number of alternate approaches presented in the Phase 2 report. These approaches will be explored in greater detail as part of this task.

**Largemouth Bass and Other Piscivorous Fish Models**

The model for the largemouth bass needs to be refined. There are no data available from the Phase 2 dataset for largemouth bass of a size suitable for human consumption. Consequently, the bioaccumulation relationship between largemouth bass and its primary food sources rely on data from the New York State Department of Environmental Conservation Phase 1 data. There are additional NYSDEC data available for 1995 which were not used in model development. It is anticipated that the HUDTOX model will generate water and sediment exposure concentrations for use with the probabilistic model, which will be validated against these 1995 data.

Further analysis needs to be done to incorporate a benthic invertebrate pathway in the largemouth bass model. Some of the data used in the bivariate statistical model may be appropriate for this purpose. The use of this sediment data will be explored.

The yellow perch model has been developed based on unvalidated Phase 2 data. This model will be recalibrated using validated Phase 2 data, and verified by hindcasting using NYSDEC data.

The approach for white perch, similar to largemouth bass, will rely on NYSDEC data through 1993. The model will be validated using 1995 NYSDEC data and any other biological data that becomes available.

The primary concerns in using the NYSDEC data have been somewhat elaborated upon in the development of the bivariate statistical model. One concern is the quantitation techniques between and among sampling programs, and the other is the appropriate sediment exposure data to be used. There is great uncertainty in sediment concentrations, as the only data available are from two different programs at different times.

It is anticipated that the HUDTOX model hindcasting will be useful in defining exposure concentrations for use with the historical NYSDEC data. This will be explored in this task.

**Congener Profiles: Exploring NOAA and NYSDEC Analyses**

NOAA and NYSDEC are currently exploring PCB patterns in Hudson River fish by comparing congener patterns over a geographic gradient. The pattern of congener uptake between and among fish species provides important information on the nature of PCB uptake generally. Initial exploration into congener profiles reveals that this approach can provide a clearer understanding of how fish are exposed to PCBs and the relative importance of sediment versus water pathways.

**Model Implementation**

The models are designed to be implemented in three ways: Monte Carlo spreadsheet models, equations combining individual distributions into cumulative distributions, and as nomographs or look-up tables. The Monte Carlo spreadsheet models have been developed. Final equations combining individual distributions into cumulative distributions still need to be derived, and the final nomograph or look-up tables created based on validated data. The look-up tables can also be expressed as equations.

**Use of Other Modeling Approaches, i.e., Gobas**

Based on data availability and to insure that the results from the probabilistic model are consistent with other modeling approaches, use of the Gobas model (1993) is being explored. This model has recently been revised and incorporates both sediment and water column food sources, as well as a Monte-Carlo based uncertainty analysis. This model is based on the fugacity, or chemical potential theory. In this model, biomagnification of organic contaminants is primarily a function of digestion and gastrointestinal absorption. Several meetings with the author of the Gobas model are planned.

***Subtask 4.3: Evaluation of models through yearly hindcasting.***

The probabilistic bioaccumulation models are developed by evaluating relationships between particular trophic levels (as represented by specific species) and their food sources (taking into account information on the physiological capacity for accumulating PCBs, dietary habits, food sources, and general behavior). The models need to be validated by "predicting" historically observed levels of PCBs, and/or comparison to data from ongoing field studies (*i.e.*, General Electric, New York State Department of Environmental Conservation, and United States Geological Survey). This hindcasting will be done on an annual basis for each of the years that data are available and for those species for which data are available (primarily forage fish).

Note that in the case of the largemouth bass, the historical dataset has already been used to develop the model. In addition, all the models would benefit from additional synoptic sampling of sediment, benthic invertebrates, water column, water column invertebrates, and fish. Currently, there are numerous data gaps (*i.e.*, locations where benthic invertebrates were collected but no forage fish, there are no Phase II congener water column invertebrate data, there are no data for largemouth bass of a size suitable for consumption, and so on).

**Task 5: Combined Data Interpretation and Modeling**

***Subtask 5.1: Coordination of Task 4 with Task 5 modeling efforts of Limno-Tech.***

Exposure outputs from the Limno-Tech, Inc. models will be used as starting concentrations for the probabilistic models. These exposure outputs are in the form of total PCBs and five individual congeners or coeluting congener groups. Exposure outputs from the Thomann model (lower Hudson River) are in the form of PCB homologues. These exposure outputs will need to be converted to run the probabilistic models. This is because the probabilistic models will be used for the human health and ecological risk assessments, which require selected Aroclors and total PCB concentrations. Note that the human health risk assessors require a distribution of predicted fish concentrations.

This task requires interaction with other project team members, particularly Limno-Tech, Inc. and Cadmus Group to insure that PCB concentrations are expressed in a form that is useful to other aspects of the project.

***Subtask 5.2: Estimate body burdens of PCBs under No Action, major flood, and various remedial scenarios.***

The HUDTOX model will be used to simulate impacts due to No Action and major flood scenarios for the upper Hudson River. The HUDTOX model and the Thomann model will be used to simulate impacts in the lower Hudson River. PCB water column and sediment concentrations from the No Action and major flood simulations will drive the food chain models (both statistical and probabilistic). The probabilistic models require annual averages on an Aroclor and total PCB basis in support of the human health and ecological risk assessments.

This task will also include conducting up to four predictive model simulations for various remedial scenarios. These scenarios could include evaluation of selected dredging and/or containment scenarios in the upper Hudson River between Fort Edward and the Federal Dam. Design specifications for these scenarios will be determined jointly between project team members.

**Task 6: Preparation of Draft Phase 2 report**

Not applicable.

**Task 7: Preparation of Final Phase 2 Report**

Not applicable.

**Task 8: Preparation of Draft Feasibility Study Report**

Menzie-Cura & Associates, Inc., together with other subcontractors on the project, will contribute resource materials to the Draft Feasibility Study Report. This will include, as appropriate, report outline development, data synthesis and interpretation, preparation of modeling results, and preparation of other relevant work products.

This task will include the results of up to four predictive model simulations for various remedial scenarios as described in Subtask 5.2.

**Task 9: Preparation of Final Feasibility Study Report**

Menzie-Cura & Associates, Inc. will review the comments on the draft report and revise the report as directed by TAMS in response to the review comments. This task includes revisions to the predictive modeling simulations.

**Task 10: Responsiveness Summary**

Menzie-Cura & Associates, Inc. will contribute resource materials, as appropriate, to the Responsive Summary to be prepared as part of the Reassessment RI/FS.

# 3. THE CADMUS GROUP, INC.

## BACKGROUND

Cadmus prepared a Technical Scope of Work on March 29, 1993 for support of the Phase II modeling effort for the Hudson River PCBs Reassessment RI/FS, as well as other activities related to the Reassessment. This Scope of Work was submitted to TAMS Consultants to address a portion of the work described in TAMS request for proposal (RFP) No. 5200-108, under ARCS Region II EPA Contract No. 68-S9-2001, released in August 1992. Cadmus' Scope of Work was subsequently incorporated into TAMS Scope of Work for continuing work on the Hudson River PCBs Reassessment, submitted to Kansas City District, U.S. Army Corps of Engineers on April 25, 1996, under Contract No. DACW41-96-D-9002.

## TASK 9

Under Task 9, Cadmus will continue to provide support to TAMS and the Reassessment team in accordance with the task area originally identified as Subtask 2a in Cadmus' Scope of Work of March 29, 1993: *Correlation of Fish PCB Burdens to Environmental Concentrations in Both Sediment and Water via a Multivariate BAF Approach*. As part of Task 4 under USACE Contract No. DACW41-96-D-9002 (Phase 2 Preliminary Model Calibration Report), Cadmus has submitted a draft analysis and multivariate BAF model based on currently available data. Additional work on this subtask will be incorporated into Task 9 (Baseline Modeling).

Cadmus' proposed Scope of Work for completing Task 9 includes the following subtasks:

***Subtask 9-D: Ecological Data Tabulation, Statistics and Modeling.***

Cadmus will extend and recalibrate the Multivariate BAF approach to include additional data as they become available. Important new data anticipated to be useful to the model include:

*NYSDEC 1995 Fish Data and USGS 1995 Water Column Data*: The Multivariate BAF approach currently utilizes NYSDEC fish analyses for 1977 through 1992. NYSDEC fish results for 1995 have recently been released, but have not yet been included in the analysis because USGS has not yet released the corresponding water column data. These data should be available in September, 1996.

*GE 1990 Fish Analyses*: GE collected approximately 100 fish samples in 1990; however, the initial PCB results were rejected during QA. GE reports that the sample extracts have now been reanalyzed using NEA capillary column methods and the results are being provided to EPA.

*NOAA Fish Analyses*: Results predicted by this method will be compared to results of fish samples collected by NOAA in addition to those collected as part of EPA's Phase II sampling effort.

*Sediment Data*: Cadmus will also evaluate any new sediment PCB data which become available for use in the model. We will also re-examine potential use of 1977-78 sediment sampling results.

In addition, Cadmus will work closely with MCA to coordinate interpretation and application of the Multivariate BAF results and the Probabilisitic Bioaccumulation Model. As part of this effort, Cadmus will review and comment on application of the Gobas model proposed by MCA.

***Subtask 9-E: Combined Geochemical and Ecological Data Interpretation and Modeling.***

This subtask represents the integration of the various modeling efforts by the Reassessment team. As part of this effort, Cadmus will provide model results and interpretation for the Multivariate BAF approach. In particular, Cadmus will use results of sediment compartment hindcasting provided by LTI to analyze and potentially refine the sediment pathway representation in the Multivariate BAF approach. Also as a part of this effort, Cadmus will participate in a series of discussions led by TAMS to obtain an overall perspective on the geochemical, ecological and modeling aspects of the Phase 2 program.

***Subtask 9-F: Assembly, Internal Review and Finalization of the Document.***

Cadmus will participate in the internal review of the baseline modeling document, with particular emphasis on review of the bioaccumulation modeling and integration of the Multivariate BAF and bioaccumulation approaches.

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