

**RESPONSIVENESS SUMMARY
HUDSON RIVER PCBs SITE RECORD OF DECISION**

JANUARY 2002



For

**U.S. Environmental Protection Agency
Region 2**

and

**U.S. Army Corps of Engineers
Kansas City District**

BOOK 3 OF 3

FIGURES, TABLES & APPENDICES

TAMS Consultants, Inc.

CONTAMINANT RISKS AND GEOCHEMISTRY

Contaminant Risks and Geochemistry

PCB Carcinogenicity
362702

No Figures or Tables

Contaminant Risks and Geochemistry

PCB Non-Cancer Health Effects 362704

No Figures or Tables

Contaminant Risks and Geochemistry

Relationship Between Tri + and Total PCBs 424694

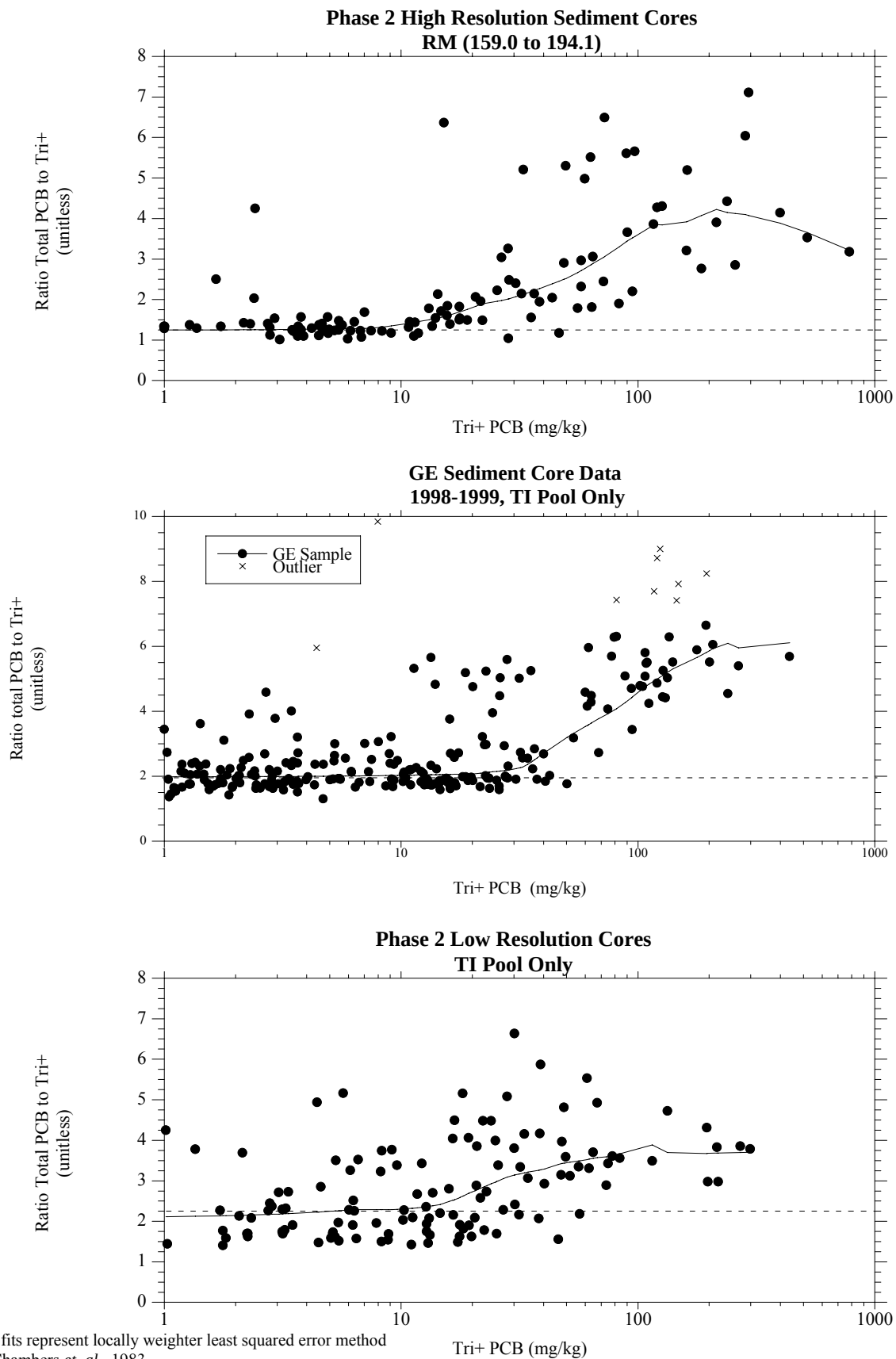


Figure 424694-1
Relationship Between Ratio of Total PCBs to Tri+ and Tri+
Concentration in HR, LRC and GE Cores

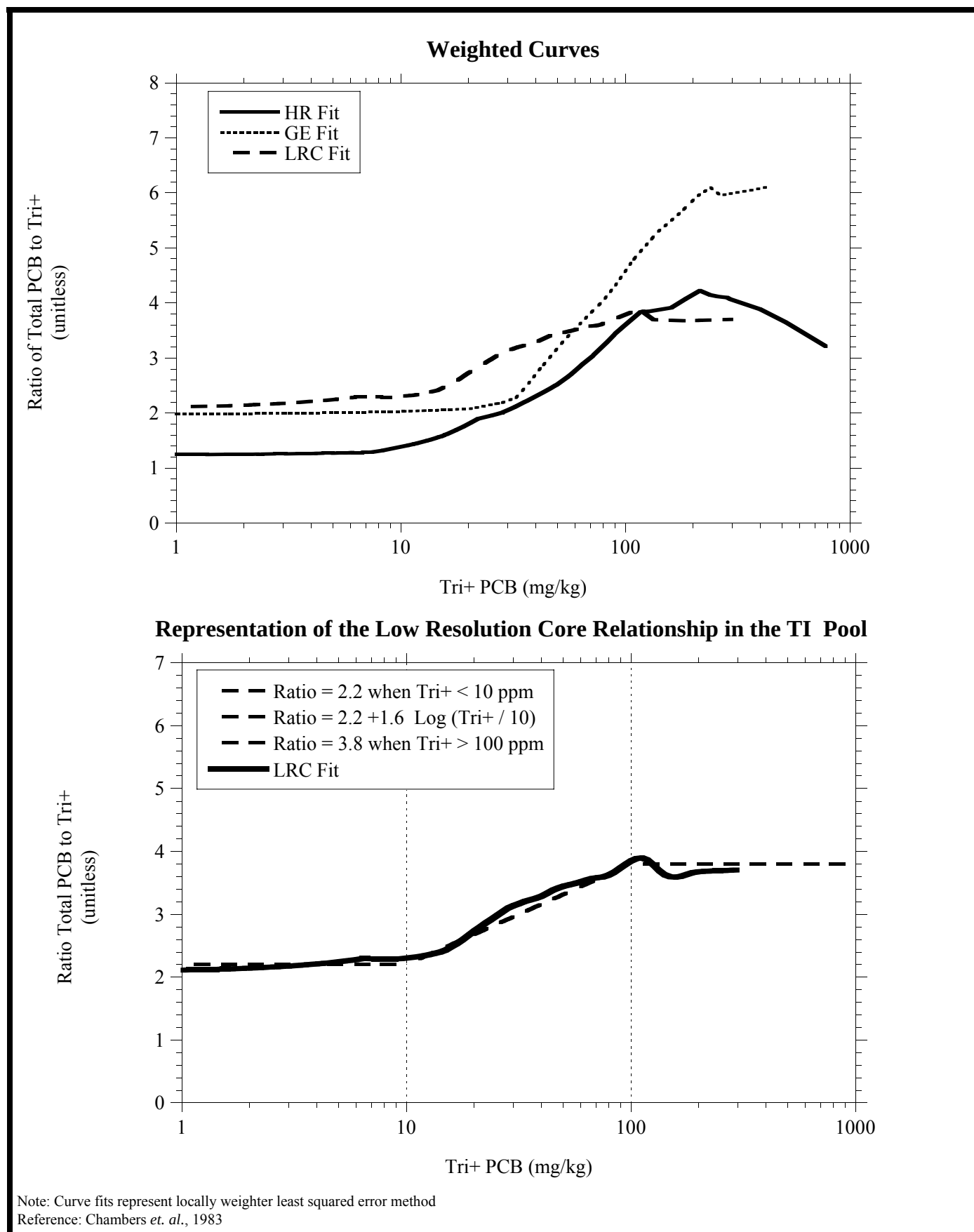


Figure 424694-2
Estimation of Relationship Between the Ratio of
Total PCBs to Tri+ and Tri+ Concentration

Table 424694-1

Total PCB to Tri+ for Upper Hudson Water Column Samples

Station		Ratio Total PCB to Tri+			
		Minimum	Maximum	Average	No. of Samples
Phase 2	Rogers Island ¹	1.06	1.61	1.2	11
	TI Dam (+Schuylerville)	1.14	2.94	2.0	19
	Waterford (+Stillwater)	1.07	2.03	1.4 ³	20
GE	Rogers Island 1991-99	1.0	1.85	1.1	390
	TI Dam West 1997-99	1.07	4.18	2.3 ⁴	228
	TI PRW2	1.07	3.8	2.2 ⁴	117
	Schuylerville ²	1.13	4.02	2.2 ⁴	146
Notes: - Two Phase 2 samples were excluded due to concerns over sampling problems. - This station was originally used for the estimate of Total PCB to Tri+ at the Waterford Dam in the calculations in the FS. This was revised downward to 1.4 (1.45) after further review. Note that this revision only effects the estimate of Total PCB delivered to the Lower Hudson. The estimates of Tri+ and the time to various thresholds for the various scenarios are unaffected by this revision since they are all derived on a Tri+ basis. - This value was used for estimating the Total PCB load to the Lower Hudson. - The mean value for these stations, 2.2 was taken as the ratio for the TI Dam load					

Table 424694-2
Total PCB to Tri+ Ratios for the Sediments of the Upper Hudson

River Section	Sediment Area	Basis for Tri+ Estimate ¹	Basis for Total PCB Estimate ¹	Total PCB/Tri+	Basis for Ratio Estimate ¹
1	Remediated Sediments	1984 Survey	LRC Relationship	3.4	Integration of 1984 Length - Weighted Averages and the LRC Relationship.
	All Sediments	1984 Survey	LRC Relationship	3.1	
2	Cohesive/Remediated Sediments ²	1994 Low Resolution Cores	1994 Low Resolution Cores	3.4	1994 Low Resolution Cores ³
	Noncohesive/ Unremediated Sediments ²	1991 GE Composites	1991 GE Composites	2.1	1991 GE Composites ⁴
3	Cohesive/ Remediated Sediments ²	1994 Low Resolution Cores	1994 Low Resolution Cores	2.7	1994 Low Resolution Cores ³
	Noncohesive/ Unremediated Sediments ²	1991 GE Composites	1991 GE Composites	1.9	1991 GE Composites ⁵

Notes:

1. Unless otherwise noted, the basis for the Total PCB and Tri+ concentrations, inventories and ratios were determined from sample data collected within the specific river section.
2. Ratios and inventories in Section 2 and 3 were developed from the remedial boundaries which generally coincided with sediment type. The low resolution cores were used to estimate the values for the remediated/cohesive areas and the GE composite samples were used to estimate values for the unremediated/noncohesive sediments.
3. The inventories of Total PCB and Tri+ were independently estimated from the low resolution core data. The mass estimate was first derived then the estimate of concentration was derived from the quotient of the mass in situ and the mass of contaminated sediments. A similar calculation was performed for the Tri+ values. Thus the Total PCB to Tri+ ratio given here is effectively a mass-weighted average. The average of the individual sample ratios would be approximately 2.4 in Section 2 and 2.1 in Section 3.
4. The locations of the 1991 GE composite samples were not well differentiated by sediment type. Specifically, there was only one of the 10 GE composite samples obtained in Section 2 which did not extend into the remediation areas. As a result, the Total PCB to Tri+ ratio (as well as the inventory and concentrations) are based on a single sample in Section 2. This ratio is not very different from the the mean ratio for all 10 composites (*i.e.* , 2.3), however.
5. Independent information on sediment texture was not available in Section 3. In this section as in Section 2, only the GE composite cores which did not extend into the remediation areas were used for the Total PCB and Tri+ estimates. In this instance the ratio, concentrations and inventories were based on 45 of the 58 GE composite samples collected in this section.

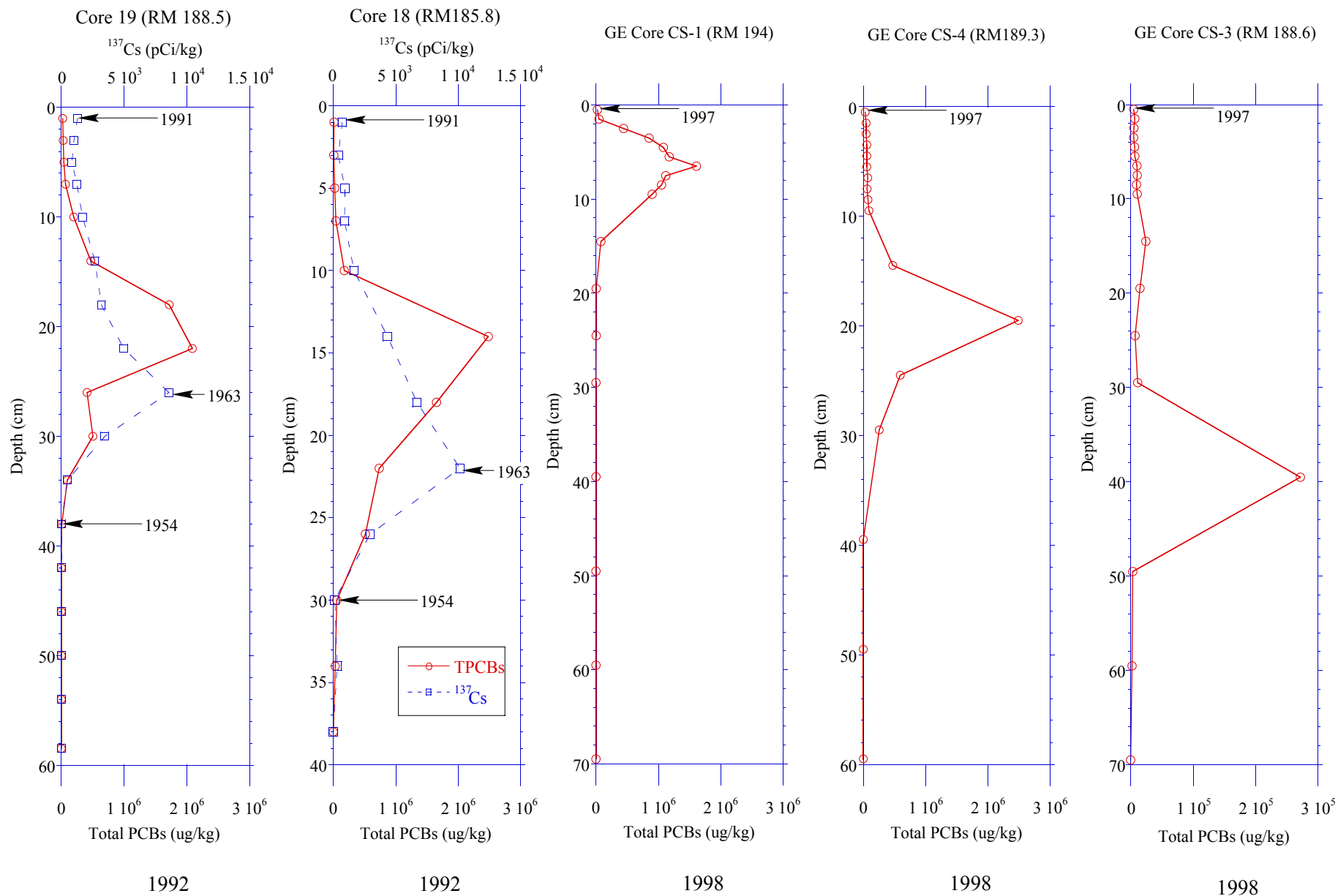
Table 424694-3
Homologue Fractions in 1993 Phase 2 Fish Results

River Mile	River Section	Homologue Mass Fraction ¹		Total PCB to Tri+ Ratio	Number of Unique Species/ Station Pairs ²	Total Number of Samples
		Mono + Di	Tri+			
154-197	Upper Hudson Freshwater	0.020	0.980	1.020	29	98
60-154	Lower Hudson Saline Lower	0.012	0.988	1.012	24	82
0-60	Hudson	0.002	0.998	1.002	7	27
Mean		0.015	0.985	1.015		
Total Samples					60	207
Minimum ³		0.000	0.937	1.067		
Maximum ³		0.063	1.000	1.000		

Notes:

1. Homologue mass fractions represent the mean value for all unique species/station pairs. For example, five white perch at a single station would be averaged to a single value. Three sunfish from the same station would yield an additional value.
2. The value in this column represents the number of unique values used to estimate the mean homologue fractions and Total PCB to Tri+ ratio. Replicate samples from the same station were averaged before inclusion in the calculation of the mean for the region.
3. The minimum and maximum values were determined from all samples (*i.e.*, 207).

Relationship Between PCB Concentrations in Surface Sediments and
Upstream Sources
255353



Note: The sediment/water interface for the GE cores are offset by 6 years from the EPA cores.

Figure 255353-1
PCB Concentration in High Resolution Sediment Cores in the Upper Hudson

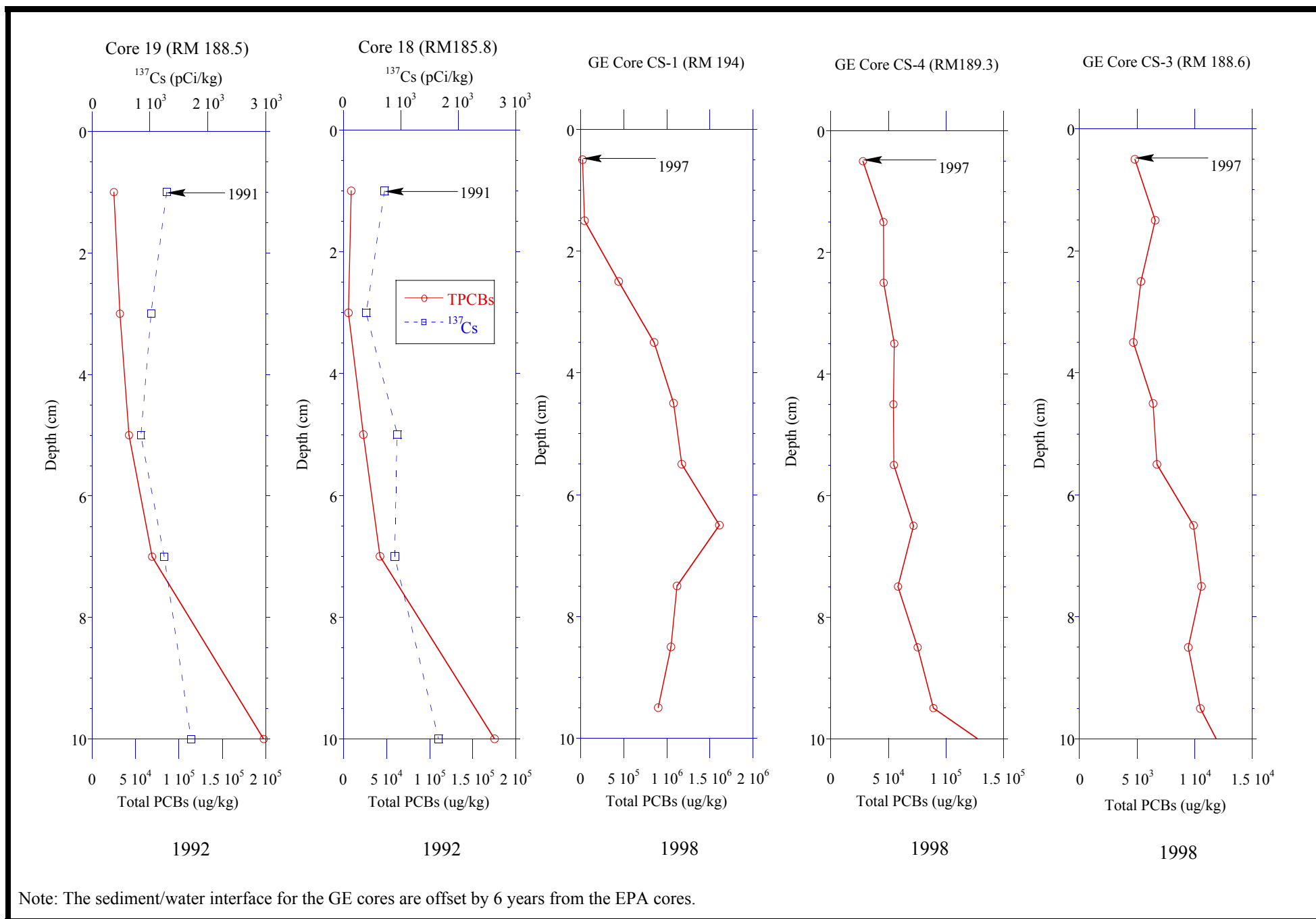


Figure 255353-2
Expanded Scale PCB Concentration in High Resolution Sediment Cores in the Upper Hudson

Contaminant Risks and Geochemistry

Sediment PCB Inventory Estimates 363334

Table 363334-1
PCB Mass Estimates using 1984 Thiessen Polygons, 1994 Phase 2 LRC and GE 1991 Composite Samples

Total PCB Contaminant (PCB) Mass (kg)	Remediated			Not Remediated			Reach Wide			Percent Remediated ⁽⁷⁾		
	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All
River Section 1 (> 3 g/m ²) ⁽¹⁾	26,600	9,500	36,000 ⁽²⁾	1,400	7,800	9,200 ⁽²⁾	28,000	17,200	45,200	95%	55%	80%
River Section 2 (> 10 g/m ²) ⁽¹⁾	-	-	24,300 ⁽³⁾	-	-	3,800 ⁽⁴⁾	-	-	28,200			86%
River Section 3 (Select) ⁽¹⁾	-	-	9,500 ⁽³⁾	-	-	24,500 ⁽⁵⁾	-	-	34,000			28%
Total	-	-	69,800	-	-	37,500	-	-	107,300			65%

Tri+ Contaminant (PCB) Mass (kg)	Remediated			Not Remediated			Reach Wide			Percent Remediated ⁽⁷⁾		
	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All
River Section 1 (> 3 g/m ²) ⁽¹⁾	7,700	3,400	11,100 ⁽⁶⁾	500	2,900	3,400 ⁽⁶⁾	8,200	6,300	14,500 ⁽⁶⁾	94%	54%	77%
River Section 2 (> 10 g/m ²) ⁽¹⁾	-	-	7,100 ⁽³⁾	-	-	1,800 ⁽⁴⁾	-	-	8,900			80%
River Section 3 (Select) ⁽¹⁾	-	-	3,500 ⁽³⁾	-	-	12,700 ⁽⁵⁾	-	-	16,200			22%
Total	-	-	21,700	-	-	17,900	-	-	39,600			55%

Notes

1. Includes channel area to be dredged.
2. Total PCB based on 1984 data as reported by NYSDEC. Various factors were applied to Tri+ values to obtain Total PCB estimates, based on individual concentrations. See text and white paper entitled Relationship Between Tri+ and Total PCB Concentrations in the Hudson for further explanation.
3. Mass estimated from MVUE values calculated from 1994 LRC coring data.
4. Mass estimate based on GE 1991 composite samples falling outside the remediation boundaries. (exclusion for Rocky Areas).
5. Mass estimate based on GE 1991 composite samples falling outside the remediation boundaries. (no exclusion for Rocky Areas).
6. Mass estimate based on 1984 Thiessen Polygons. A factor of 0.944 is applied to the sum of Aroclors values to obtain estimates of Tri+ PCB values.
7. The percent remediated represents the percent by sediment type of the reachwide mass that will be remediated (*i.e.* The percent remediated for Total PCBs associated with fine grain sediments, 95% is calculated from the 26,600 kg of PCB mass remediated divided by 28,000 kg of reachwide fine grained PCB mass).

Table 363334-2
Mean Length-Weighted Average Concentration Estimates using 1984 Thiessen Polygons, 1994 LRC
and GE 1991 Composite Samples

Total PCB Average Concentration (mg/kg) ⁽¹⁾	Remediated			Not Remediated			Reach Wide		
	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All
River Section 1 ($> 3 \text{ g/m}^2$) ⁽²⁾	164.5	35.2	92.1 ⁽³⁾	39.4	23.8	25.4 ⁽³⁾	145.3	28.9	63.0 ⁽³⁾
River Section 2 ($> 10 \text{ g/m}^2$) ⁽²⁾	146.5	-	146.5 ⁽⁴⁾	-	14.8	14.8 ⁽⁵⁾	59.3	12.1	40.4 ⁽⁷⁾
River Section 3 (Select) ⁽²⁾	-	-	31.7 ⁽⁴⁾	-	-	9.6 ⁽⁶⁾	-	-	9.8 ⁽⁷⁾

Tri+ Average Concentration (mg/kg) ⁽¹⁾	Remediated			Not Remediated			Reach Wide		
	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All
River Section 1 ($> 3 \text{ g/m}^2$) ⁽²⁾	46.2	12.4	27.2 ⁽⁸⁾	12.7	8.9	9.3 ⁽⁸⁾	41.1	10.4	19.4 ⁽⁸⁾
River Section 2 ($> 10 \text{ g/m}^2$) ⁽²⁾	43.1	-	43.1 ⁽⁹⁾	-	6.9	6.9 ⁽⁵⁾	-	-	17.3 ⁽⁷⁾
River Section 3 (Select) ⁽²⁾	-	-	11.7 ⁽¹⁰⁾	-	-	5.1 ⁽⁶⁾	-	-	5.4 ⁽⁷⁾

Notes

1. Average concentrations were constructed using Thiessen polygons and Length-Weighted Average values for the individual sampling locations.
2. Includes channel area to be dredged.
3. Total PCB based on 1984 data as reported by NYSDEC. Various factors were applied to Tri+ values to obtain Total PCB estimates, based on individual concentrations. If Tri+ concentration $< 10 \text{ mg/kg}$, factor = 2.2. If Tri+ concentration $> 100 \text{ mg/kg}$, factor = 3.8. If Tri+ concentration > 10 and $< 100 \text{ mg/kg}$, factor = $2.2 + 1.6 * \text{LOG}(\text{Tri+ value}/10)$. The effective ratio of Total PCB to Tri+ is 3.4 for remediated sediments.
4. Mean MVUE values estimated from 1994 coring data from Hot Spots 25, 28, 31, 34, 35 for Section 2 and from Hot Spots 37 and 39 for Section 3 (Table 4-7 Low Resolution Coring Report).
5. composite sample)
6. LWA concentration estimate based on GE 1991 composite samples falling outside the remediation boundaries (no exclusion for Rocky Areas). (Estimated from 45 composite samples)
7. LWA concentration estimate based on all GE 1991 Composite samples in the section.
- 8.
9. Tri+ values based on Tri+ PCB estimates from 1994 coring data. The effective ratio of Total PCB to Tri+ is 3.4.
10. Tri+ values based on Tri+ estimates from 1994 coring data. The effective ratio of Total PCB to Tri+ is 2.7.

Table 363334-3
REM 0/0/3, In situ Mass

Total PCB Contaminant (PCB) Mass (kg)	Remediated			Not Remediated			Reach Wide			Percent Remediated ⁽⁶⁾		
	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All
River Section 1 (> 0 g/m ²) ⁽¹⁾	27,500	15,100	42,600 ⁽²⁾	500	2,100	2,600 ⁽²⁾	28,000	17,200	45,200 ⁽²⁾	98%	88%	94%
River Section 2 (> 0 g/m ²) ⁽¹⁾	-	-	28,000 ⁽³⁾	-	-	200 ⁽⁴⁾	-	-	28,200			99%
River Section 3 (> 3 g/m ²) ⁽¹⁾	-	-	13,500 ⁽³⁾	-	-	20,500 ⁽⁵⁾	-	-	34,000			40%
Total	-	-	84,100	-	-	23,300	-	-	107,400			78%

Tri + Contaminant (PCB) Mass (kg)	Remediated			Not Remediated			Reach Wide			Percent Remediated ⁽⁶⁾		
	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All
River Section 1 (> 0 g/m ²) ⁽¹⁾	8,100	5,500	13,600 ⁽²⁾	100	800	900 ⁽²⁾	8,200	6,300	14,500 ⁽²⁾	99%	87%	94%
River Section 2 (> 0 g/m ²) ⁽¹⁾	-	-	8,840 ⁽⁷⁾	-	-	60 ⁽⁷⁾	-	-	8,900			99%
River Section 3 (> 3 g/m ²) ⁽¹⁾	-	-	5,000 ⁽⁸⁾	-	-	11,200 ⁽⁹⁾	-	-	16,200			31%
Total	-	-	27,440	-	-	12,160	-	-	39,600			69%

Notes

1. Includes channel area to be dredged.
2. Total PCB based on 1984 data as reported by NYSDEC. Various factors were applied to Tri+ values to obtain Total PCB estimates, based on individual concentrations. See text and white paper entitled Relationship Between Tri+ and Total PCB Concentrations in the Hudson for further explanation.
3. Mass estimate based on 1984 Thiessen Polygons. A factor of 0.944 is applied to the sum of Aroclors values to obtain estimates of Tri+ PCB values.
4. Mass estimate based on GE 1991 composite samples falling outside the remediation boundaries. (exclusion for Rocky Areas).
5. Mass estimate based on GE 1991 composite samples falling outside the remediation boundaries. (no exclusion for Rocky Areas).
6. The percent remediated represents the percent by sediment type of the reachwide mass that will be remediated (i.e. The percent remediated for Total PCBs associated with fine grain sediments, 95% is calculated from the 26,600 kg of PCB mass remediated divided by 28,000 kg of reachwide fine grained PCB mass).
7. Tri+ Inventory is estimated using the Total PCB to Tri+ ratio for the section as a whole (3.2).
8. Tri+ Inventory is estimated using the Total PCB to Tri+ ratio for the mass removed under the selected remedy (2.7).
9. Tri+ Inventory is estimated as the difference between the integrated inventory for the whole section and that removed under the scenario.

Table 363334-4
REM 0/0/3 in Section 1, In Situ Average Concentration

Total PCB Average Concentration (mg/kg) ⁽¹⁾	Remediated			Not Remediated			Reach Wide		
	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All
River Section 1 (> 0 g/m ²) ⁽²⁾	145.3	27.2	63.3 ⁽³⁾	143.5	50.0	58.9 ⁽³⁾	145.3	28.9	63.0 ⁽³⁾

Tri + Average Concentration (mg/kg) ⁽¹⁾	Remediated			Not Remediated			Reach Wide		
	Fine	Coarse	All	Fine	Coarse	All	Fine	Coarse	All
River Section 1 (> 0 g/m ²) ⁽²⁾	41.0	9.8	19.3 ⁽⁴⁾	41.7	18.3	20.5 ⁽⁴⁾	41.1	10.4	19.4 ⁽⁴⁾

Notes

1. Average concentrations were constructed using Thiessen polygons and Length-Weighted Average values for the individual sampling locations.
2. Includes channel area to be dredged.
3. Total PCB based on 1984 data as reported by NYSDEC. Various factors were applied to Tri+ values to obtain Total PCB estimates, based on individual concentrations. If Tri+ concentration < 10 mg/kg, factor = 2.2. If Tri+ concentration > 100 mg/kg, factor = 3.8. If Tri+ concentration >10 and < 100 mg/kg, factor = 2.2 + 1.6 * LOG (Tri+ value /10). The effective ratio of Total PCB to Tri+ is 3.4 for remediated sediments.
4. LWA concentration estimate based on 1984 Thiessen Polygons. A factor of 0.944 is applied to the sum of Aroclors values to obtain estimates of Tri+ PCB values.

Table 363334-5
Average Surface Concentration Estimates
of Cohesive Sediments

Type of Data	Tri+ PCB (mg/kg)	Total PCB (mg/kg)
1984 data (0-30 cm)	51 (cohesive) (1)	170 [*] (cohesive) (2)
1991 GE data (0-5 cm)	16 (3)	32 (3)

Notes

1. Surface Average Concentration of dredge area are calculated weighting the surface concentration (0-25 cm) by the area of each polygon: *Area Weighted Average Concentration = [S (area x LWA for individual samples)] / Total Area*
2. Based on Tri+ to total PCB ratio of 3.4
3. Arithmetic average of surface concentrations (0-5 cm) for all 1991 composite lines by section (excluding composite samples outside the river).

Table 363334-6
Dredge Material Average Concentration Estimates

Total PCB	Remediated		
Average Concentration (mg/kg) ⁽¹⁾	Fine	Coarse	All
River Section 1 ($> 3 \text{ g/m}^2$) ⁽²⁾	53	11	27
River Section 2 ($> 10 \text{ g/m}^2$) ⁽²⁾	-	-	62
River Section 3 (Select) ⁽²⁾	-	-	29
All	50	-	34

Tri+	Remediated		
Average Concentration (mg/kg) ⁽¹⁾	Fine	Coarse	All
River Section 1 ($> 3 \text{ g/m}^2$) ⁽²⁾	15	4.1	8.4
River Section 2 ($> 10 \text{ g/m}^2$) ⁽²⁾	-	-	18
River Section 3 (Select) ⁽²⁾	-	-	11
All	15	-	11

Notes

1. Average concentrations are calculated from the mass of sediments removed and the mass in situ as presented in Table 363334-1.
2. Includes channel area to be dredged.

Contaminant Risks and Geochemistry

Metals Contamination 253002

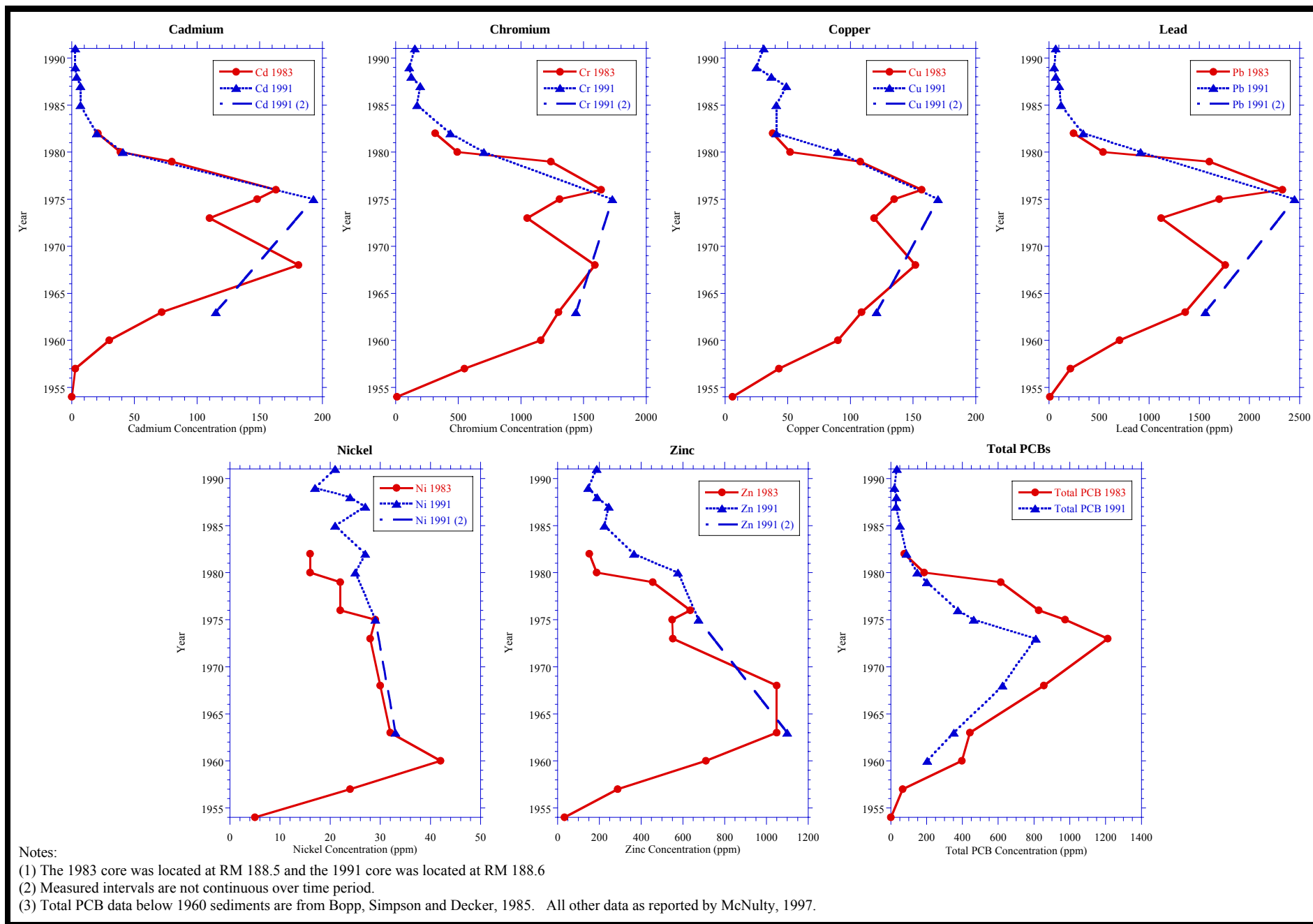


Figure 253002-1

Metals and Total PCBs in Two Dated Cores in Thompson Island Pool

Figure 253002-2. Metal Concentrations in Fish

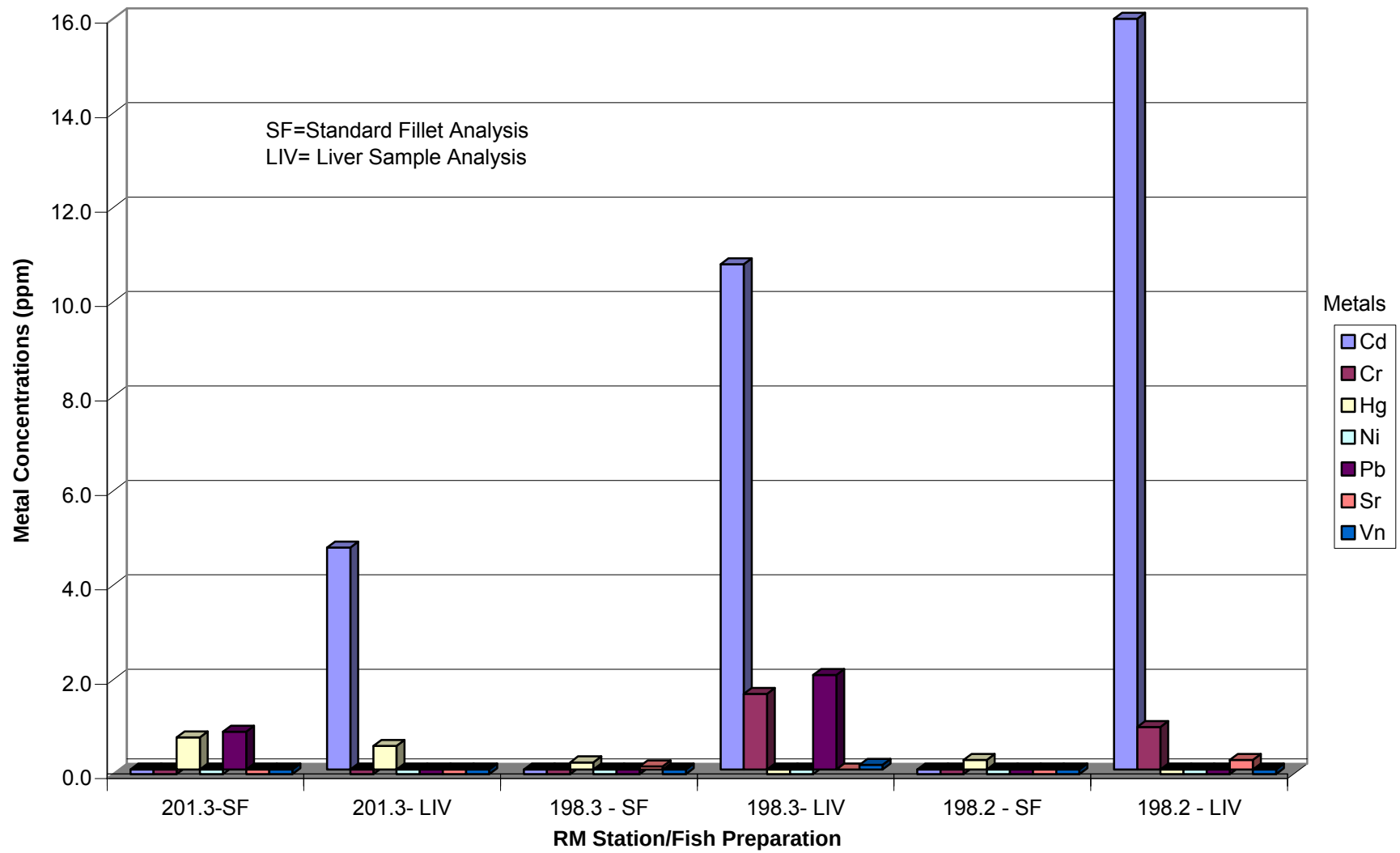


Table 253002-1
Summary of Metal Levels in 1977 NYSDOH Sediment Samples (Tofflemire & Quinn, 1979) (mg/kg)

Parmeter	No. Samples	No. Detections	Average Detection Limit	Min Detection	Max Detection	Mean (Detects Only)	Mean (with 1/2 DL)	Max Background Conc³	No. of Exceedences	Frequency of Exceedence
Calcium	23	23		18,000.	60,000.	37,696.	37,696.	5,850.0	23	100%
Chromium	23	22	50	20.0	7,000.	735.	704.	18.0	23	100%
Copper	23	16	12	10.0	160.	62.1	45.1	35.3	16	70%
Iron	23	23		15,000.	76,000.	40,783.	40,783.	19,500.0	22	96%
Lead	23	23		30.0	2,200.	387.	387.	65.8	21	91%
Manganese	23	23		390.	2,270.	1,083.	1,083.	342.0	23	100%
Nickel	23	16	17	10.0	60.0	34.4	26.5	19.4	18	78%
Potassium	23	23		3,000.	88,000.	48,928.	48,928.	2,470.0	23	100%
Rubidium	23	23		10.0	145.	94.1	94.1	ND ⁴		
Strontium	23	23		160.	440.	295.	295.	ND		
Titanium	23	23		1,000.	40,000.	13,809.	13,809.	ND		
Zinc	23	22	10	15.0	1,580.	227.	217.	421.0	3	13%
Total PCBs	20	20		5.3	240.	51.6	51.6			

Note:

- (1) Shaded values indicate the mean concentrations exceeded background levels.
- (2) Calcium, iron and potassium are considered major soil elements and are not compared to background.
- (3) Background concentrations are from the 1993 sediment survey at RM 203.3 (upgradient of known anthropogenic metal inputs).
- (4) ND indicates a Non-Detect below the Contract Required Detection Limit (CRDL).

Table 253002-2
Summary of Metal Levels in Upper Hudson 1984 Cores (as reported by Brown *et al.*, 1988) (mg/kg)

Parmeter	No. Samples	No. Detects	Detection Limit	Maximum¹	Mean (Detects Only)	Mean (with 1/2 DL)	Max Background Conc⁴
Arsenic	80	76	1		6.4	6.1	ND
Cadmium	159	80	4	30	21.6	11.9	ND
Chromium	79	71	20	1,900	475.	428.	18.0
Hexavalent Chromium	79	0	4	-	-	2.0	
Copper	79	78	10	100	53.2	52.6	35.3
Lead	217	206	20	700	217.	207.	65.8
Mercury	79	59	0.08	7	2.0	1.5	ND
Nickel	79	75	10	68	28.8	27.6	19.4
Selenium	79	0	1	-	-	0.5	ND
Silver	79	0	4	-	-	2.0	ND
Thallium	79	0	2	-	-	1.0	ND
Total PCBs ²	9	9		273 (min=71)	171.	171.	

Notes:

- (1) Maximum values were not reported for the entire data set. The maximum values reported here were obtained from a single core at RM 192.7 as reported in Brown *et al.*, 1988. Thus the actual maximum values are equal to or greater than the values reported here.
- (2) Total PCB values represent the nine samples selected for TCLP analysis.
- (3) Shaded values indicate the mean concentrations exceeded background levels.
- (4) Background concentrations are from the 1993 sediment survey at RM 203.3 (upgradient of known anthropogenic metal inputs).

Table 253002-3
Summary of Metal Levels in 1986 and 1987 Hot Spot 3, 8 and 20 Cores (as reported by Brown, *et al.* 1988) (mg/kg)

Parmeter	No. Samples	No. Detections	Average Detection Limit	Min (Detects Only)	Max (Detects Only)	Mean (Detects Only)	Mean (with 1/2 DL)	Max Background Conc³	No. of Exceedences	Frequency of Exceedence
Aluminum	12	12		2,000.	18,400.	6,584.	6,584.	14,900.0	2	17%
Antimony	12	5	5	5.5	11.0	8.3	4.9	ND	5	42%
Arsenic	6	6		1.2	2.0	1.7	1.7	ND	6	100%
Barium	12	12		24.0	187.	77.8	77.8	75.0	5	42%
Beryllium	12	11	0.1	0.1	0.7	0.3	0.3	1.7	0	0%
Cadmium	12	11	0.5	0.5	47.0	14.0	12.9	ND	11	92%
Calcium	12	12		700.	8,900.	2,958.	2,958.	5,850.0	2	17%
Chromium	12	12		7.0	699.	182.	182.	18.0	10	83%
Cobalt	12	12		2.0	11.0	4.3	4.3	12.6	0	0%
Copper	12	12		12.0	88.0	41.8	41.8	35.3	4	33%
Cyanide (Total)	6	5	1	1.8	6.1	4.6	3.9			
Iron	12	12		3,100.	20,200.	8,718.	8,718.	19,500.0	1	8%
Lead	12	12		34.0	784.	255.	255.	65.8	11	92%
Magnesium	12	12		590.	3,720.	1,946.	1,946.	2,690.0	4	33%
Manganese	6	6		25.0	94.0	41.0	41.0	342.0	0	0%
Mercury	6	6		0.2	0.9	0.5	0.5	ND	6	100%
Nickel	12	11	4	5.0	29.0	12.0	11.2	19.4	2	17%
Potassium	6	0	500	-	-	-	250.	2,470.0	0	0%
Selenium	12	2	0.49	1.0	3.1	2.1	0.5	ND	2	17%
Silver	12	0	0.75	-	-	-	0.4	ND	0	0%
Sodium	6	1	50	60.0	60.0	60.0	30.8	755.0	0	0%
Strontium	6	6		3.0	24.0	8.2	8.2			
Sulfide (Total)	6	2	0.5	0.6	4.9	2.8	1.1			
Thallium	12	0	0.9	-	-	-	0.5	ND	0	0%
Tin	12	6	6	3.3	17.0	12.4	7.7			
Vanadium	12	12		8.0	73.0	23.9	23.9	34.5	3	25%
Zinc	12	12		33.0	599.	167.	167.	421.0	1	8%
Total PCBs	12	11	0.04	12.0	560.	176.	161.			

Notes:

- (1) Shaded values indicate the mean concentrations exceeded background levels
- (2) Aluminum, calcium, iron, magnesium, potassium and sodium are considered major soil elements and are not compared to background.
- (3) Background concentrations are from the 1993 sediment survey at RM 203.3 (upgradient of known anthropogenic metal inputs).

Table 253002-4
Metal and PCB Concentrations in Bopp Sediment Cores (mg/kg)

Upper Depth (cm)	Lower Depth (cm)	Year (¹³⁷ Cs)	Total PCB	Cd	Cr	Cu	Pb	Ni	Zn
1983 Core - RM 188.5									
0	2	1982	75	21	317	38	247	16	153
2	4	1980	187	39	493	52	541	16	188
4	8	1979	615	80	1240	108	1600	22	456
8	12	1976	827	163	1640	157	2330	22	636
12	16	1975	974	148	1310	135	1700	29	549
16	20	1973	1212	110	1050	119	1120	28	552
20	24	1968	855	181	1590	152	1760	30	1050
24	28	1963	442	72	1300	109	1360	32	1050
28	32	1960	397	30	1160	90	704	42	711
32	36	1957	67	3	549	43	215	24	711
36	40	1954	1.2	0.2	11	6	5	5	288
Core Avg.			514	77	969	92	1053	24	577
1991 Core - RM 188.6									
0	2	1991	34	3	154	31	69	21	188
2	4	1989	21	3	109	25	53	17	147
4	6	1988	32	4	126	37	67	24	190
6	8	1987	30	7	197	49	104	27	245
8	12	1985	52	7	172	41	121	21	225
12	16	1982	88	20	438	41	342	27	366
16	20	1980	148	41	706	90	914	25	577
28	32	1975	464	193	1730	170	2450	29	675
40	44	1963	352	115	1440	121	1560	33	1100
Core Avg.			136	44	564	67	631	25	413

Notes:

Bold values indicate relative maximum concentrations.

— . . . — indicates a break in core segment.

Table 253002-4a
Comparison of Surface Concentrations Between 1991 (RM 188.6) and 1993 (RM 203.3) data (mg/kg)

	Cd	Cr	Cu	Pb	Ni	Zn
1991 Core - RM 188.6 (0-2 cm)	3	154	31	69	21	188
RM 203.3 - Background levels (1993) (0-5 cm)	ND	18.0	35.3	65.8	19.4	421.0

Note:

(1) ND indicates a Non-Detect below the Contract Required Detection Limit (CRDL).

Table 253002-5
1983 and 1991 Thompson Island Pool Cores (as reported by McNulty, 1997) (mg/kg)

Parmeter	No. Samples	Min	Max	Mean	Max Background	No. of Exceedences	Frequency of Exceedence
Cadmium	18	3	193	69	ND	18	100%
Chromium	18	109	1730	843	18.0	18	100%
Copper	18	25	170	87	35.3	16	89%
Lead	18	53	2450	947	65.8	17	94%
Nickel	18	16	42	26	19.4	15	83%
Zinc	18	147	1100	503	421.	10	56%
Total PCB	18	21	1212	378			

Notes:

(1) The 1983 core was located at 188.5 and the 1991 core was located at 188.6.

(2) Shaded values indicate the mean concentrations exceeded background levels.

(3) ND indicates a Non-Detect below the Contract Required Detection Limit (CRDL).

Table 253002-6
Comparison of Metals Concentrations to Background Levels in 1993 Samples (mg/kg)

	Baseline		Rogers Island		Lower Thompson Island Pool	
	Avg. Bkgd	Max. Bkgd	Average	Maximum	Average	Maximum
	RM 203.3	RM 203.3	RM 194.1	RM 194.1	RM 191.5-188.5	RM 191.5-188.5
Metals	n=3	n=3	n=3	n=3	n=25	n=25
Aluminum	13,166.7	14,900.0	14,200.0	15,700.0	11,906.8	23,100.0
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	1.5	2.3	1.3	3.9
Barium	66.7	75.0	123.0	128.0	100.3	180.0
Beryllium	1.1	1.7	1.1	1.7	0.7	2.2
Cadmium	ND	ND	ND	ND	3.9	12.3
Calcium	5,136.7	5,850.0	5,520.0	5,670.0	4,174.0	6,430.0
Chromium	12.8	18.0	60.0	72.0	100.4	234.0
Cobalt	10.4	12.6	10.0	12.0	8.1	16.0
Copper	26.4	35.3	R	R	29.3	52.5
Iron	18,766.7	19,500.0	23,367.0	25,900.0	17,136.0	27,900.0
Lead	55.4	65.8	87.0	95.0	78.8	264.0
Magnesium	2,536.7	2,690.0	4,283.0	4,810.0	3,264.4	5,570.0
Manganese	291.7	342.0	257.0	279.0	269.8	525.0
Mercury	ND	ND	ND	ND	0.6	2.5
Nickel	17.8	19.4	22.0	25.0	16.7	36.1
Potassium	1,194.3	2,470.0	1,647.0	1,930.0	1,556.8	2,910.0
Selenium	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND
Sodium	633.0	755.0	596.0	717.0	392.6	629.0
Thallium	ND	ND	ND	ND	0.8	2.2
Vanadium	31.5	34.5	35.0	36.0	26.4	48.2
Zinc	321.7	421.0	193.0	213.0	152.4	292.0

Notes:

- (1) **Bold** values indicate exceedance over background levels.
- (2) Aluminum, calcium, iron, magnesium, potassium and sodium are considered major soil elements and are not compared to background.
- (3) ND indicates a Non-Detect below the Contract Required Detection Limit (CRDL).
- (4) R indicates a rejected sample.

Table 253002-7
Selected Physical Parameters and Mean Metal Concentrations (1993 Data)

	Baseline	Rogers Island	Lower Thompson Island Pool				
	RM 203.3	RM 194.1	RM 191.5	RM 189.6	RM 189.0	RM 188.7	RM 188.5
Contaminants							
Cadmium (ppm)	ND	ND	4.0	0.8	8.8	2.1	3.7
Chromium (ppm)	12.8	60.0	62.7	51.5	191.6	74.7	121.4
Lead (ppm)	55.4	87.0	49.7	43.8	186.6	32.8	80.9
Mercury (ppm)	ND	ND	0.5	0.2	1.9	0.1	0.1
PCBs (ppb)	71.7	20,626.1	9,291.7	10,491.2	29,320.4	14,325.4	18,514.7
Other Parameters							
TOC (%)	8.3	4.9	2.4	3.5	7.4	2.6	5.8
Grain Size							
Clay (%)	1.0	4.3	1.6	3.2	3.0	2.3	3.4
Silt (%)	42.8	54.2	32.0	36.2	56.3	29.5	55.4
Fine Sand (%)	47.2	33.5	36.2	55.1	27.6	63.2	30.4
Medium Sand (%)	5.1	5.8	23.9	3.3	6.3	3.7	5.6
Coarse Sand (%)	3.9	2.3	6.4	2.2	6.7	1.4	5.1

Notes:

(1) ND indicates a Non-Detect below the Contract Required Detection Limit (CRDL).

Table 253002-8
1993 Ecological Risk Assessment Sediment Samples (0-5 cm) (mg/kg)

Parameter	No. Samples	No. Detections	Average Detection Limit	Min (Detects Only)	Max (Detects Only)	Mean (Detects Only)	Mean (with 1/2 DL)	Max Background Conc	No. of Exceedences	Frequency of Exceedence
Aluminum	28	28		6,020.	23,100.	12,116.	12,116.	14,900.0	10	36%
Antimony	28	0	16.7	-	-	-	8.4	ND	0	0%
Arsenic	28	8	1.8	1.3	3.9	2.3	1.3	ND	8	29%
Barium	28	28		46.5	180.	102.	102.	75.0	20	71%
Beryllium	28	9	0.8	1.0	2.2	1.4	0.7	1.7	1	4%
Cadmium	28	19	1.3	0.9	12.3	4.9	3.5	ND	19	68%
Calcium	28	28		2,710.	6,430.	4,390.	4,390.	5,850.0	2	7%
Chromium	28	28		40.0	234.	95.8	95.8	18.0	28	100%
Cobalt	28	28		4.1	16.0	8.3	8.3	12.6	2	7%
Copper	25	25		16.1	52.5	29.3	29.3	35.3	9	36%
Iron	28	28		10,000.	27,900.	17,759.	17,759.	19,500.0	12	43%
Lead	28	28		22.9	264.	80.2	80.2	65.8	14	50%
Magnesium	28	28		1,860.	5,570.	3,363.	3,363.	2,690.0	17	61%
Manganese	28	28		146.	525.	267.	267.	342.0	6	21%
Mercury	28	7	0.21	0.4	2.5	1.7	0.5	ND	7	25%
Nickel	28	28		8.1	36.1	17.1	17.1	19.4	9	32%
Potassium	28	28		520.	2,910.	1,558.	1,558.	2,470.0	5	18%
Selenium	28	0	1.1	-	-	-	0.6	ND	0	0%
Silver	28	0	2.8	-	-	-	1.4	ND	0	0%
Sodium	28	28		263.	717.	408.	408.	755.0	0	0%
Thallium	28	3	1.4	1.3	2.2	1.7	0.8	ND	3	11%
Vanadium	28	28		12.4	48.2	27.2	27.2	34.5	8	29%
Zinc	28	28		85.3	292.	157.	157.	421.0	0	0%
Total PCB	28	28		6.3	44.6	16.8	16.8			

Note:

- (1) Shaded values indicate the mean concentrations exceeded background levels
- (2) Aluminum, calcium, iron, magnesium, potassium and sodium are considered major soil elements and are not compared to background.
- (3) ND indicates a Non-Detect below the Contract Required Detection Limit (CRDL).

Table 253002-9
Results of Toxicity Characteristic Leaching Procedure (TCLP) on 1984 and 1986 Sediment Samples

	Station No.	PCB (ug/g)	Ar TCLP (mg/L)	Ba TCLP (mg/L)	Cd TCLP (mg/L)	Cr TCLP (mg/L)	Pb TCLP (mg/L)	Hg TCLP (mg/L)	Se TCLP (mg/L)	Ag TCLP (mg/L)
1984	210	184	<0.01	<1.0	<0.1	<0.5	<0.5	<0.002	<0.005	<0.5
	603	118	<0.01	<1.0	<0.1	<0.5	<0.5	<0.002	<0.005	<0.5
	235	108	<0.01	<1.0	0.106	<0.5	<0.5	<0.002	<0.005	<0.5
	328	273	<0.01	<1.0	<0.1	<0.5	<0.5	<0.002	<0.005	<0.5
	360	71	<0.01	<1.0	<0.1	<0.5	<0.5	<0.002	<0.005	<0.5
	500	133	<0.01	<1.0	0.138	<0.5	<0.5	<0.002	<0.005	<0.5
	640	230	<0.01	<1.0	<0.1	<0.5	<0.5	<0.002	<0.005	<0.5
	651	250	<0.01	<1.0	<0.1	<0.5	<0.5	<0.002	<0.005	<0.5
	655	169	<0.01	<1.0	<0.1	<0.5	<0.5	<0.002	<0.005	<0.5
1986	Core 1 <i>HS 20</i>	332	<0.01	<2.0	<0.1	<0.05	<0.5	<0.002	<0.005	<0.5
	Core 2 <i>HS 20</i>	560	<0.01	<2.0	<0.1	<0.05	<0.5	<0.002	<0.005	<0.5
	Core 3 <i>HS 8</i>	36	<0.01	<2.0	<0.1	<0.05	<0.5	<0.002	<0.005	<0.5
	Core 4 <i>HS 8</i>	325	<0.01	<2.0	<0.1	<0.05	<0.5	<0.002	<0.005	<0.5
	Core 5 <i>HS 3</i>	505	<0.01	<2.0	<0.1	<0.05	<0.5	<0.002	<0.005	<0.5
	Core 6 <i>HS 3</i>	<0.04	<0.01	<2.0	<0.1	<0.05	<0.5	<0.002	<0.005	<0.5
Standard Toxicity Characteristic			5	100	1	5	5	0.2	1	5

Table 253002-10
NYSDEC 1988 Fish Data - Selected Metals (ppm)
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LOCATION	RM	SPP	PREP	Cd		Cr		Hg		Ni		Pb		Sr		Vn	
ABOVE FEEDER (CIBA CONTROL)	201.3	BASS	SF	0	U	0	U	1		1	U	2		0	U	0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	BASS	SF	0	U	0	U	1		1	U	2		0	U	0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	BASS	SF	0	U	0	U	1		1	U	2		0		0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	BASS	SF	0	U	0	U	1		1	U	2		0		0	U
BASS ONLY AVERAGE		N=	4	0	U	0	U	1		1	U	2		0		0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	SF	0	U	0	U	1		1	U	0	U	0	U	0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	SF	0	U	0	U	1		1	U	0	U	0	U	0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	SF	0	U	0	U	1		1	U	0	U	0	U	0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	SF	0	U	0	U	0		1	U	0	U	0	U	0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	SF	0	U	0	U	0		1	U	0	U	0	U	0	U
CARP ONLY AVERAGE		N=	5	0	U	0	U	0.6		1	U	0	U	0	U	0	U
TOTAL STANDARD FILLET AVERAGE		N=	9	0	U	0	U	0.8		1	U	0.9		0	U	0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	LIV	7		0	U	2		1	U	2	U	1		1	
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	LIV	5		0	U	1		1	U	2	U	0	U	0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	LIV	4		0	U	0		1	U	2	U	0		0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	LIV	5		0	U	0		1	U	2	U	0	U	0	U
ABOVE FEEDER (CIBA CONTROL)	201.3	CARP	LIV	3		0	U	0		1	U	2	U	0		0	U
TOTAL LIVER (CARP ONLY) AVERAGE		N=	5	5		0	U	0.6		1	U	2	U	0.2		0.2	
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0	U	0		1	U	2	U	0	U	0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0	U	0		1	U	2	U	1		0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0	U	0		1	U	2	U	0	U	0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0	U	1		1	U	2	U	0	U	0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0		0		1	U	2	U	0	U	0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0	U	0		1	U	2	U	0	U	0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0	U	1		1	U	2	U	1		0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0	U	0		1	U	2	U	0	U	0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0	U	0		1	U	2	U	0	U	0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	SF	0	U	0	U	0		1	U	2	U	0	U	0	U
CARP ONLY AVERAGE		N=	10	0	U	0	U	0.2		1	U	2	U	0.2		0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	SMB	SF	0	U	0	U	0		1	U	2	U	0		0	U
CIBA-GEIGY PLANT AT STATION 5	198.3	SMB	SF	0	U	0	U	1		1	U	2	U	0	U	0	U
SMALLMOUTH BASS ONLY AVERAGE		N=	2	0	U	0	U	0.3		1	U	2	U	0		0	U
TOTAL STANDARD FILLET AVERAGE		N=	12	0	U	0	U	0.3		1	U	2	U	0.2		0	U

Notes:

1. "U" indicates the analyte was not detected at the detection limit.
2. Non-detects were set to half the detection level to calculate averages.

Table 253002-10
NYSDEC 1988 Fish Data - Selected Metals (ppm)
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LOCATION	RM	SPP	PREP	Cd	Cr	Hg	Ni	Pb	Sr	Vn
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	14	3	0	8 U	2 U	0	0 U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	13	2	0	8 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	5	0 U	0	8 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	22	5	0	8 U	2 U	0 U	1
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	4	0 U	0	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	15	2	0	8 U	2 U	0	0 U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	4	0 U	0	8 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	9	1	0	8 U	3	0 U	0 U
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	15	4	0	8 U	2 U	0 U	1
CIBA-GEIGY PLANT AT STATION 5	198.3	CARP	LIV	7	0 U	0	1 U	2 U	1	0 U
TOTAL LIVER (CARP ONLY) AVERAGE		N=	10	11	2	0	7 U	1	0.1	0.2
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	SF	0 U	0 U	0	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	SF	0 U	0 U	0	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	SF	0 U	0 U	0	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	SF	0 U	0 U	0	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	SF	0 U	0 U	0	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	SF	0 U	0 U	0 U	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	SF	0 U	0 U	0	1 U	2 U	0 U	0 U
CARP ONLY AVERAGE		N=	7	0 U	0 U	0	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	SMB	SF	0 U	0 U	1	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	SMB	SF	0 U	0 U	1	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	SMB	SF	0 U	0 U	0	1 U	2 U	0	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	SMB	SF	0 U	0 U	0	1 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	SMB	SF	0 U	0 U	1	1 U	2 U	0 U	0 U
SMALLMOUTH BASS ONLY AVERAGE		N=	5	0 U	0 U	0.6	1 U	2 U	0	0 U
TOTAL STANDARD FILLET AVERAGE		N=	12	0 U	0 U	0.3	1 U	2 U	0 U	U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	LIV	11	2	0	8 U	2 U	0	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	LIV	5	1	0	8 U	2 U	0	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	LIV	14	2	0	8 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	LIV	7	1	0	8 U	2 U	1	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	LIV	12	0 U	0	8 U	2 U	1	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	LIV	52	2	0	8 U	2 U	0 U	0 U
CIBA-GEIGY PLANT AT STATION 1	198.2	CARP	LIV	11	2	0	8 U	2 U	0 U	0 U
		N=	7	16	1	0	8 U	2 U	0.3	0 U

Notes:

1. "U" indicates the analyte was not detected at the detection limit.
2. Non-detects were set to half the detection level to calculate averages.

Table 253002-11
Summary of All Sediment Data Sets (1977-1993) (mg/kg)

Parameter	No. Samples	No. Detections	Average Detection Limit	Min ¹	Max ¹	Mean	Max Background	No. of Exceedences ²	Possible Analyte of Concern	Frequency of Exceedence ²
Aluminum	40	40		2,000.	23,100.	10,457.	14,900.	12		30%
Antimony	40	5	14	5.5	11.0	7.3	ND ³	5	No	13%
Arsenic	114	90	1.7	1.2	3.9	4.7	ND	14	No	41%
Barium	40	40		24.0	187.	95.0	75.	25		63%
Beryllium	40	20	0.8	0.1	2.2	0.6	1.7	1		3%
Cadmium	217	128	3.7	0.5	193.	15.6	ND	48	Yes	83%
Calcium	63	63		700.	60,000.	16,276.	5,850.	27		43%
Chromium	160	151	23	7.0	7,000.	438.	18.	79	Yes	98%
Hexavalent Cr	79	0	4.0	-	-	-				
Cobalt	40	40		2.0	16.0	7.1	12.6	2		5%
Copper	157	149	12	10.0	170.	50.9	35.3	45	Yes	58%
Cyanide	6	5	1.0	1.8	6.1	3.9				
Iron	63	63		3,100.	76,000.	24,442.	19,500.	35	No	56%
Lead	298	287	20	22.9	2,450.	255.	65.8	63	Yes	78%
Magnesium	40	40		590.	5,570.	2,938.	2,690.	21		53%
Manganese	57	57		25.0	2,270.	572.	342.	29	Yes	51%
Mercury	113	72	0.1	0.2	7.0	1.2	ND	13	Yes	38%
Nickel	160	148	14	5.0	68.0	24.2	19.4	44	Yes	54%
Potassium	57	51	500	520.	88,000.	20,535.	2,470.	28		49%
Rubidium	23	23		10.0	145.	94.1				
Selenium	119	2	1.0	1.0	3.1	0.5	ND	2		5%
Silver	119	0	3.4	-	-	1.7	ND	0	No	0%
Sodium	34	29	50	60.0	717.	342.	755.	0		0%
Strontium	29	29		3.0	440.	236.				
Sulfide	6	2	0.5	0.6	4.9	1.1				
Thallium	119	3	1.8	1.3	2.2	0.9	ND	3		8%
Tin	12	6	6.0	3.3	17.0	7.7				
Titanium	23	23		1,000.	40,000.	13,809.			Yes ⁶	
Vanadium	40	40		8.0	73.0	26.2	34.5	11		28%
Zinc	81	80	10	15.0	1,580.	252.	421.	14	No	17%
Total PCB	87	86	0.04	5.3	1,212.	135.				

Notes:

- (1) The 1984 data set is not used to determine min and max since individual core data is not available, therefore it is possible for the mean to be greater than the max.
- (2) Number of exceedences and frequency do not include 1984 samples since individual core data is not available.
- (3) ND indicates a Non-Detect below the Contract Required Detection Limit (CRDL).
- (4) Shaded values indicate the mean concentrations exceeded background levels.
- (5) Aluminum, calcium, iron, magnesium, potassium and sodium are considered major soil elements and are not compared to background.
- (6) Titanium is noted for being much greater than any likely background level.

Table 253002-12

Summary of Lower Interval 1983 Core and Baseline Sample

1983 core (RM 188.5)		Cadmium		Chromium		Copper		Lead		Nickel		Zinc	
Upper Depth (cm)	Lower Depth (cm)	1983 Bopp core	Baseline avg. (RM 203.3)	1983 Bopp core	Baseline avg. (RM 203.3)	1983 Bopp core	Baseline avg. (RM 203.3)	1983 Bopp core	Baseline avg. (RM 203.3)	1983 Bopp core	Baseline avg. (RM 203.3)	1983 Bopp core	Baseline avg. (RM 203.3)
36	40	0.2	ND	11*	13	6	26	5	55	5	18	288	322
* Bold values indicate levels below the average baseline concentrations													

Contaminant Risks and Geochemistry

Dioxin Contamination 860

Table 860-1
Dioxins/Furans Concentration in the Bopp 1991 Core (RM 188.6) with Respect to TEQ Levels
and Landfill Requirements (data provided by Bill Ports of NYSDEC)

	Parameter	Unit	WHO TEF	Depth (0-2 cm)			Depth (20-24 cm)			Depth (28-32 cm)			Depth (40-44 cm)		
				Concentration	Qual	TEQ	Concentration	Qual	TEQ	Concentration	Qual	TEQ	Concentration	Qual	TEQ
Congener (TEQ)	Dioxin														
	2,3,7,8-TCDD	pg/g	1	1.1	U	1.1	59		59.00	8		8.30	12		12.00
	1,2,3,7,8-PeCDD	pg/g	1	1	U	1	320		320.00	11		11.00	28		28.00
	1,2,3,4,7,8 - HxCDD	pg/g	0.1	1.8	U	0.18	720		72.00	16		1.60	37		3.70
	1,2,3,6,7,8 - HxCDD	pg/g	0.1	10	U	1	3,200		320.00	230		23.00	200		20.00
	1,2,3,7,8,9 - HxCDD	pg/g	0.1	4.5	U	0.45	2,700		270.00	68		6.80	90		9.00
	1,2,3,4,6,7,8 - HpCDD	pg/g	0.01	210		2.1	86,000		860.00	5,400		54.00	4,900		49.00
	OCDD	pg/g	0.0001	3,800		0.38	370,000		37.00	6,300		0.63	73,000		7.30
	Furans														
	2,3,7,8 - TCDF	pg/g	0.1	9		0.9	74		7.40	60		6.00	91		9.10
	1,2,3,7,8 - PeCDF	pg/g	0.05	1.8	U	0.09	47	U	2.35	12		0.60	24		1.20
	2,3,4,7,8 - PeDCF	pg/g	0.5	4.3	U	2.15	66		33.00	47		23.50	52		26.00
	1,2,3,4,7,8 - HxCDF	pg/g	0.1	6.5	U	0.65	150		15.00	130		13.00	110		11.00
	1,2,3,6,7,8 - HxCDF	pg/g	0.1	2.4	U	0.24	78		7.80	36		3.60	34		3.40
	2,3,4,6,7,8 - HxCDF	pg/g	0.1	5.3	U	0.53	39		3.90	60		6.00	57		5.70
	1,2,3,7,8,9 - HxCDF	pg/g	0.1	0.58	U	0.058	4.7	U	0.47	5	U	0.49	7	U	0.67
	1,2,3,4,6,7,8 - HpCDF	pg/g	0.01	41		0.41	2,000		20.00	850		8.50	770		7.70
	1,2,3,4,7,8,9 - HpCDF	pg/g	0.01	3.1	U	0.031	150		1.50	64		0.64	70		0.70
	OCDF	pg/g	0.0001	110		0.011	8,100		0.81	2,600		0.26	3,400		0.34
	Total TEQ					11.28			2,030.23			167.92			194.81
Homologue (Landfill)	Dioxin														
	TCDDs (total)	pg/g	NA	3.1	U ³	NA	390	NA	84	NA	28	NA			
	PeCDDs (total)	pg/g	NA	8.7	U	NA	1,600	NA	63	NA	130	NA			
	HxCDDs (total)	pg/g	NA	63		NA	23,000	NA	1,500	NA	1,700	NA			
	HpCDDs (total)	pg/g	NA	440		NA	140,000	NA	10,000	NA	11,000	NA			
	Furans														
	TCDFs (total)	pg/g	NA	140		NA	2,000	NA	2,200	NA	2,100	NA			
	PeCDFs (total)	pg/g	NA	17	U	NA	820	NA	910	NA	830	NA			
	HxCDFs (total)	pg/g	NA	20	U	NA	2,200	NA	1,100	NA	930	NA			
	HpCDFs (total)	pg/g	NA	120		NA	9,700	NA	2,700	NA	2,700	NA			
	Sum of Tetra, Penta, Hexa and Hepta (Dioxins and Furans)	pg/g		811.8			179,710			18,557			19,418		
TPCB		ppm		34			202			464			352		

Notes:

- (1) The cut -off value of Dioxin/Furans for landfill is 0.001 ppm.
- (2) Bold values in italics exceed the landfill criteria for the homologue.
- (3) The qualifier "U" indicates that the analyte was not detected at the detection limit.

Table 860-2
Results of TCDD, TCDF, and PCB Analyses of Sediments Collected in 1983 from
the Upper Hudson River (Brown *et al.*, 1988)

		Sample Location			
Parameter	unit	RM 188.5	RM 188.5	RM 188.5	RM 191.1
Sample Depth	cm	0-2	8-12	24-28	0-2
2,3,7,8 TCDD	ng/g-dry wt.	* ¹	0.029	0.083	<0.005
Total TCDD	ng/g-dry wt.	*	0.056	0.135	<0.005
2,3,7,8 TCDF	ng/g-dry wt.	*	0.041	0.069	<0.005
Total TCDF	ng/g-dry wt.	*	0.731	0.598	<0.005
Total PCBs	ug/g-dry wt.	77.000	620.000	500.000	29.000

Notes:

(1) There was poor recovery for dioxin data at RM 188.5 (0-2 cm).

Table 860-3
Results of 1987 TCDD, TCDF and PCB Analysis of HS 20 (Sample 1&2), HS 8 (Samples 3&4),
and HS 3 (Samples 5&6) (Brown *et al.*, 1988)

Parameter	Sample					
	1	2	3	4	5	6
Total TCDF (ng/g)	ND (0.02) ¹	ND (0.018)	0.17	0.1	ND(0.012)	ND(0.014)
Total TCDD (ng/g)	ND (0.012)	ND (0.017)	ND(0.015)	ND(0.058)	ND(0.013)	ND(0.027)
Total PCB (ug/g)	17	21	55	54	14	12
Core Length (in.)	26.5	25	17	13	15.5	18

Notes:

(1) Not detected at the detection limit given in parenthesis.

Table 860-4
Hudson River Fish Dioxin/Furan Data

	Tetrachloro dibenzodioxins	Pentachloro dibenzodioxins	Hexachloro dibenzodioxins	Heptachloro dibenzodioxins	Tetrachloro dibenzofurans	Pentachloro dibenzofurans	Hexachloro dibenzofurans	Heptachloro dibenzofurans
Number of Fish Samples in Upper River	25	25	25	25	25	25	25	25
Number of Fish Samples in Lower River	50	50	50	50	50	50	50	50
Percent Detected in Upper River	26%	22%	26%	39%	91%	43%	35%	22%
Percent Detected in Lower River	84%	54%	52%	48%	94%	90%	70%	50%
Minimum Detected in Upper River (ppb)	0.09	0.09	0.13	0.19	0.4	0.053	0.07	0.12
Minimum Detected in Lower River (ppb)	0.08	0.25	0.19	0.20	0.25	0.20	0.11	0.18
Maximum Detected in Upper River (ppb)	1.90	1.55	7.70	10.00	30.00	7.30	5.20	2.10
Maximum Detected in Lower River (ppb)	3.80	1.60	4.70	11.60	26.30	16.00	4.70	2.50
Average Detected in Upper River (ppb)	0.27 (0.54)	0.20 (0.35)	0.66 (1.67)	1.04 (2.33)	3.39 (6.21)	0.72 (1.54)	0.54 (1.19)	0.12
Average Detected in Lower River (ppb)	0.85 (0.94)	0.48 (0.43)	0.60 (0.77)	0.85 (2.06)	4.82 (5.55)	3.44 (3.54)	0.86 (1.05)	0.37

Notes:

Average concentration obtained using 1/2 the detection limit for nondetect samples

Standard deviation shown in parentheses

Contaminant Risks and Geochemistry

Model Forecasts for Additional Simulations in the Upper Hudson River 363150

Figure 363150-1. Comparison Between Upper Hudson River Remediation Forecasts for Thompson Island Pool Cohesive Surficial Sediments

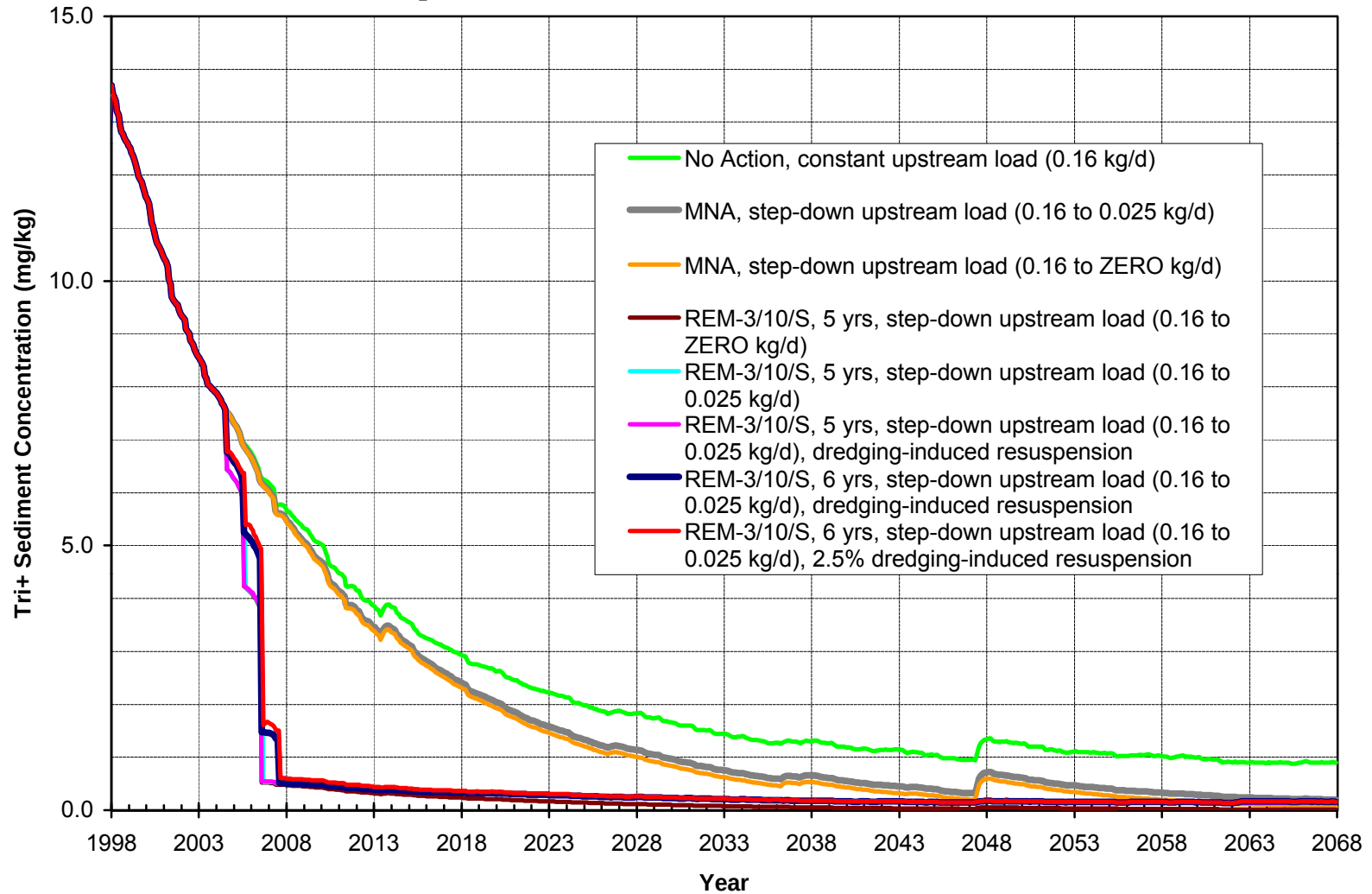


Figure 363150-2. Comparison Between Upper Hudson River Remediation Forecasts for Thompson Island Pool Non-Cohesive Surficial Sediments

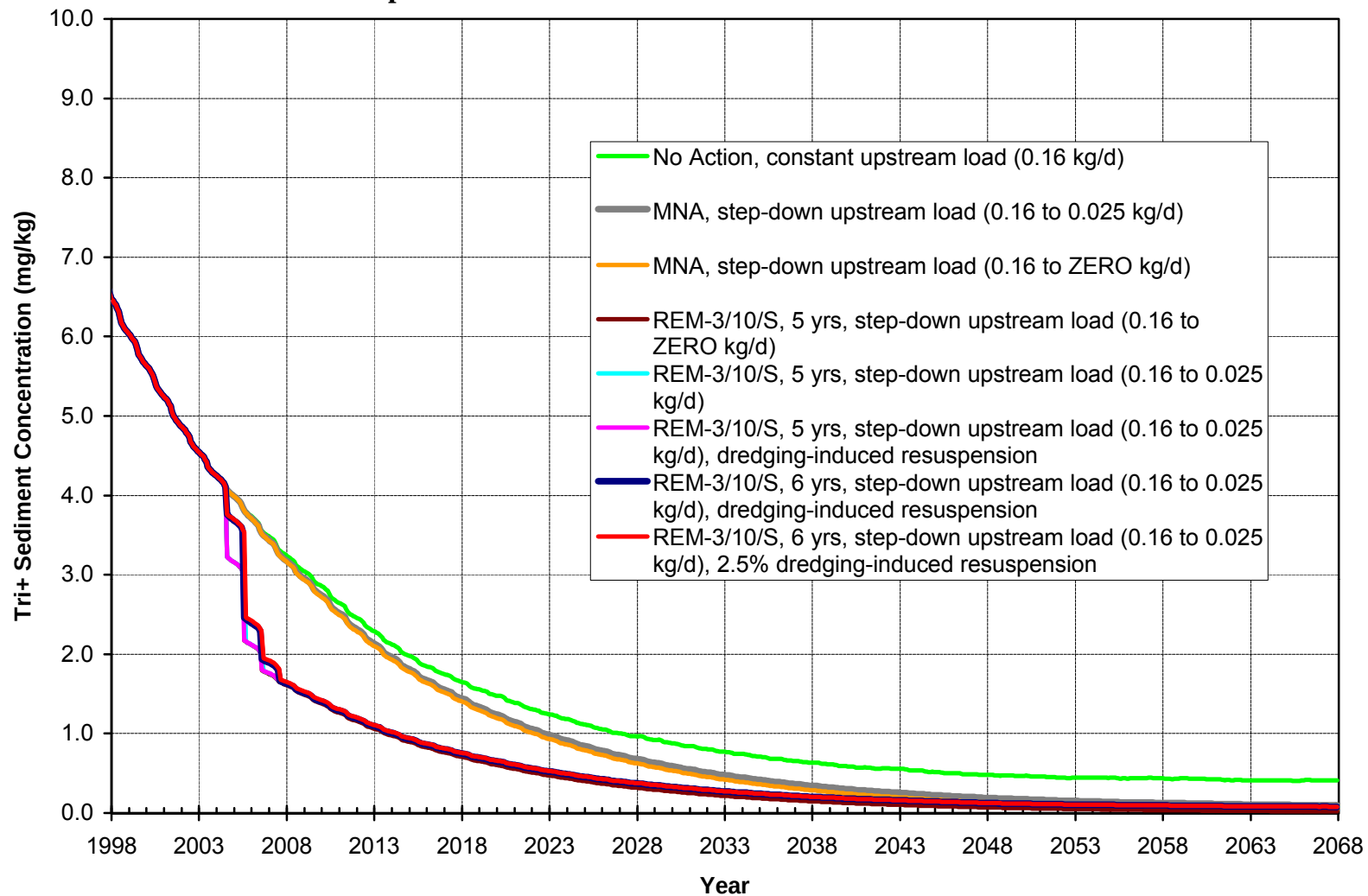


Figure 363150-3. Comparison Between Upper Hudson River Remediation Forecasts for Schuylerville Cohesive Surficial Sediments

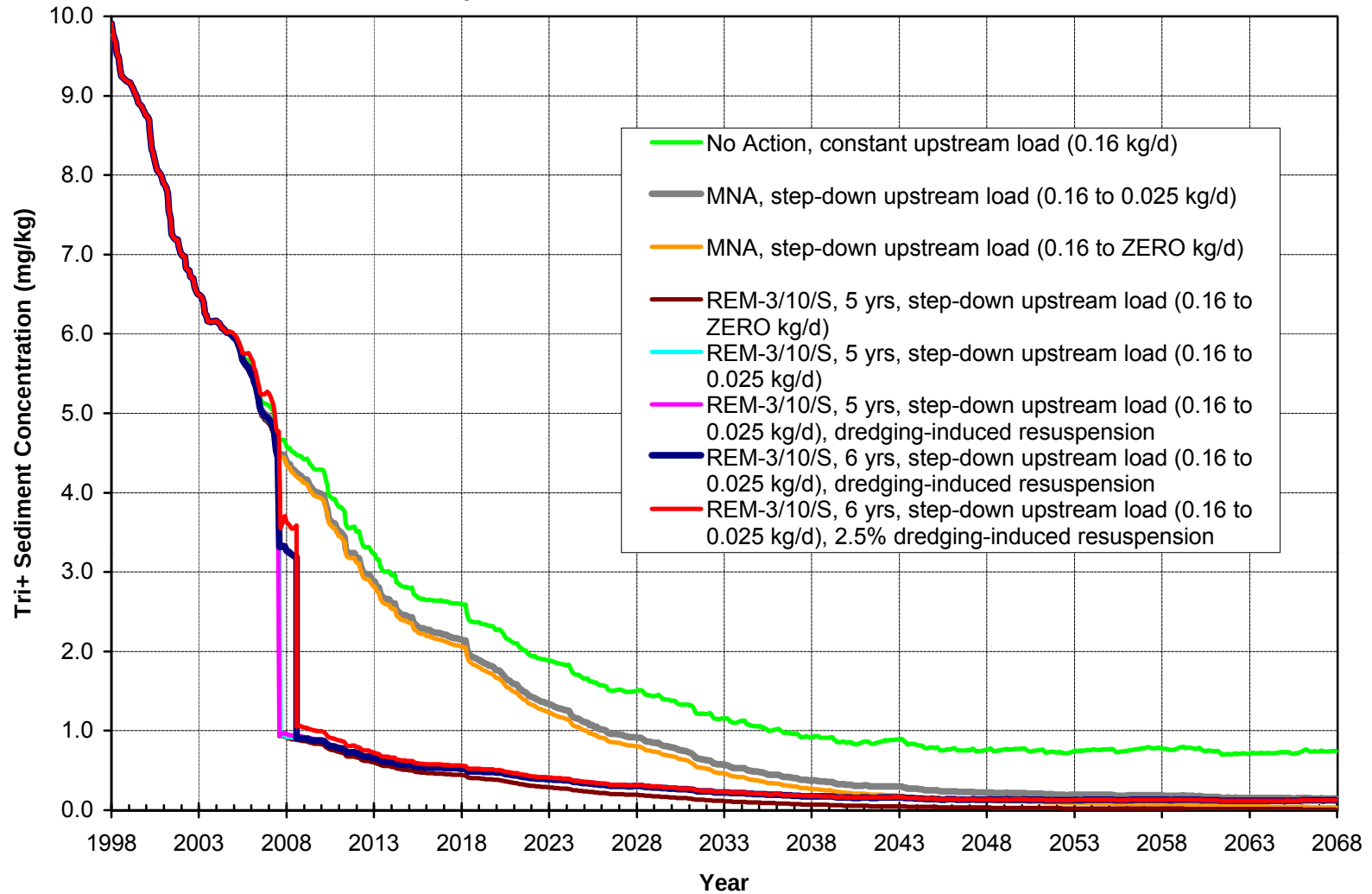


Figure 363150-4. Comparison Between Upper Hudson River Remediation Forecasts for Schuylerville Non-Cohesive Surficial Sediments

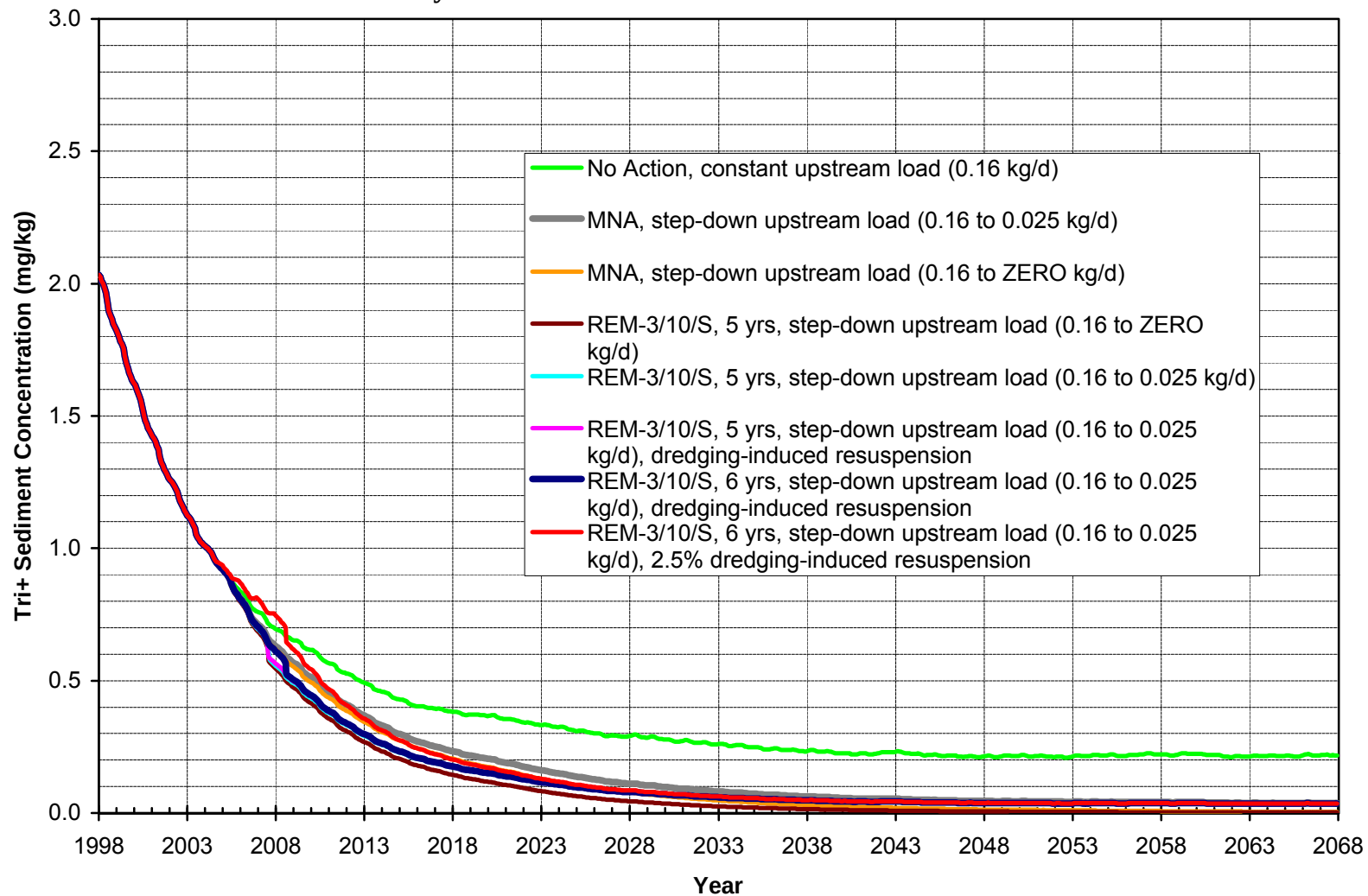


Figure 363150-5. Comparison Between Upper Hudson River Remediation Forecasts for Stillwater Cohesive Surficial Sediments

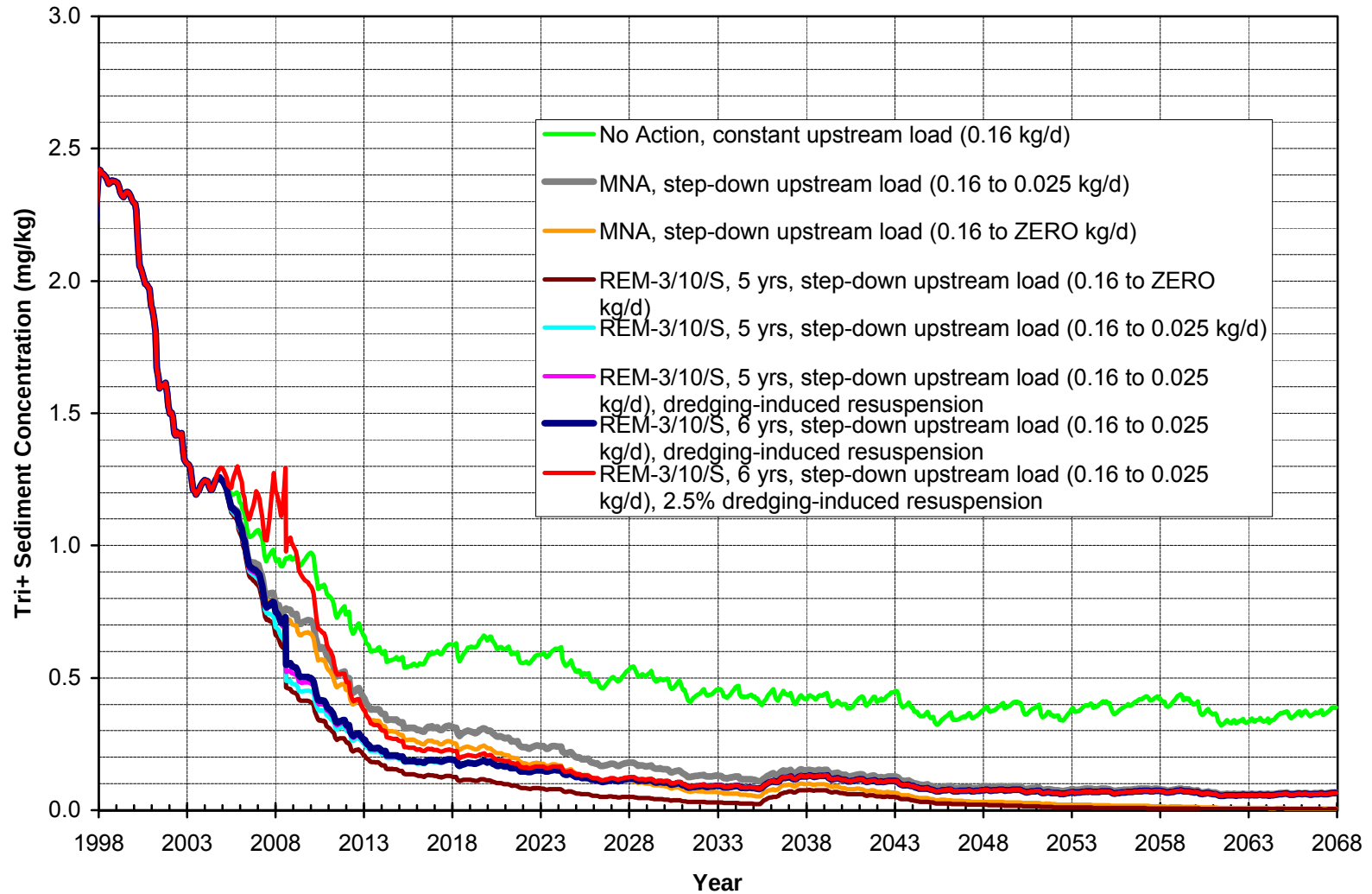


Figure 363150-6. Comparison Between Upper Hudson River Remediation Forecasts for Stillwater Non-Cohesive Surficial Sediments

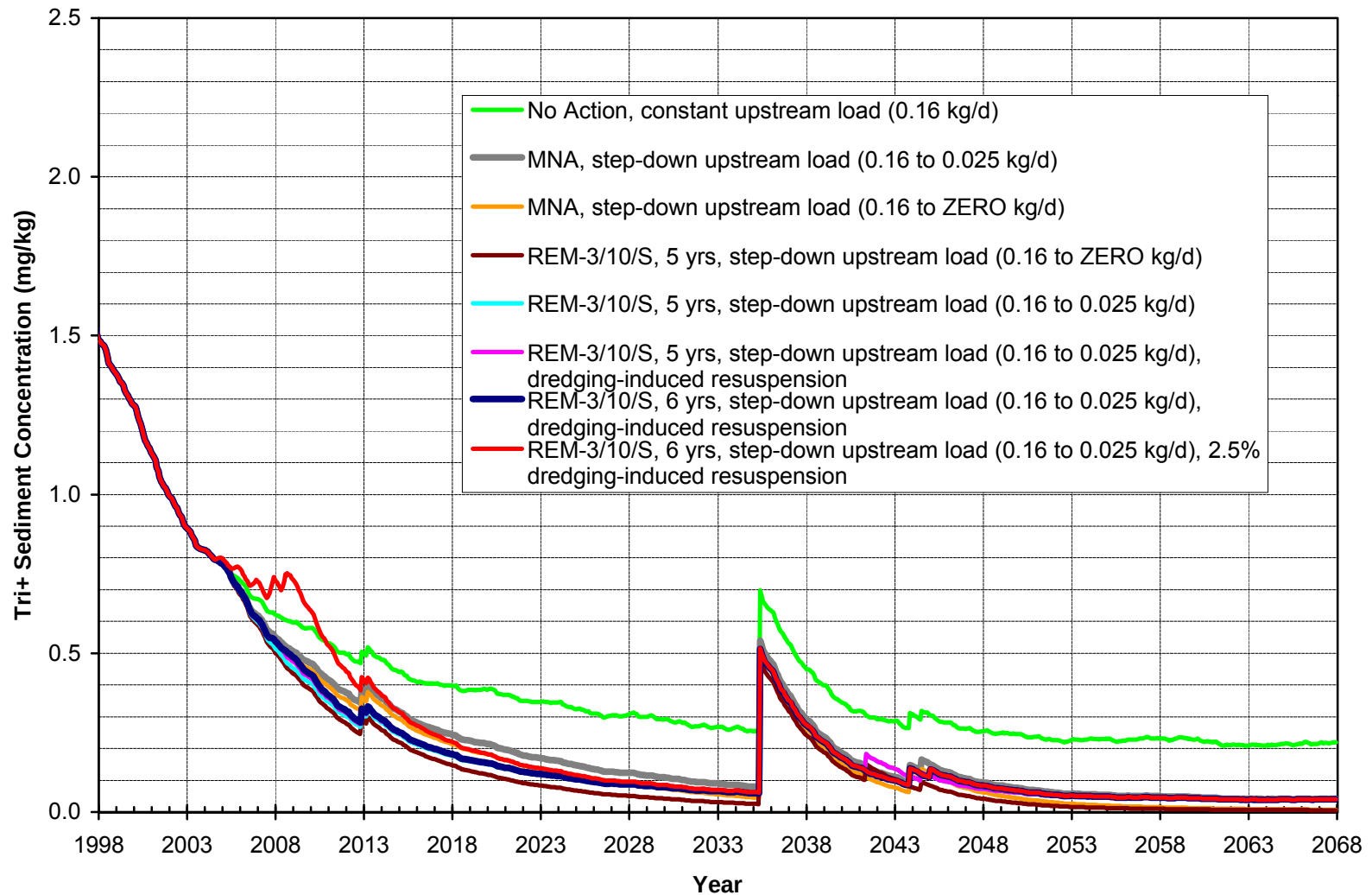


Figure 363150-7. Comparison Between Upper Hudson River Remediation Forecasts for Waterford Cohesive Surficial Sediments

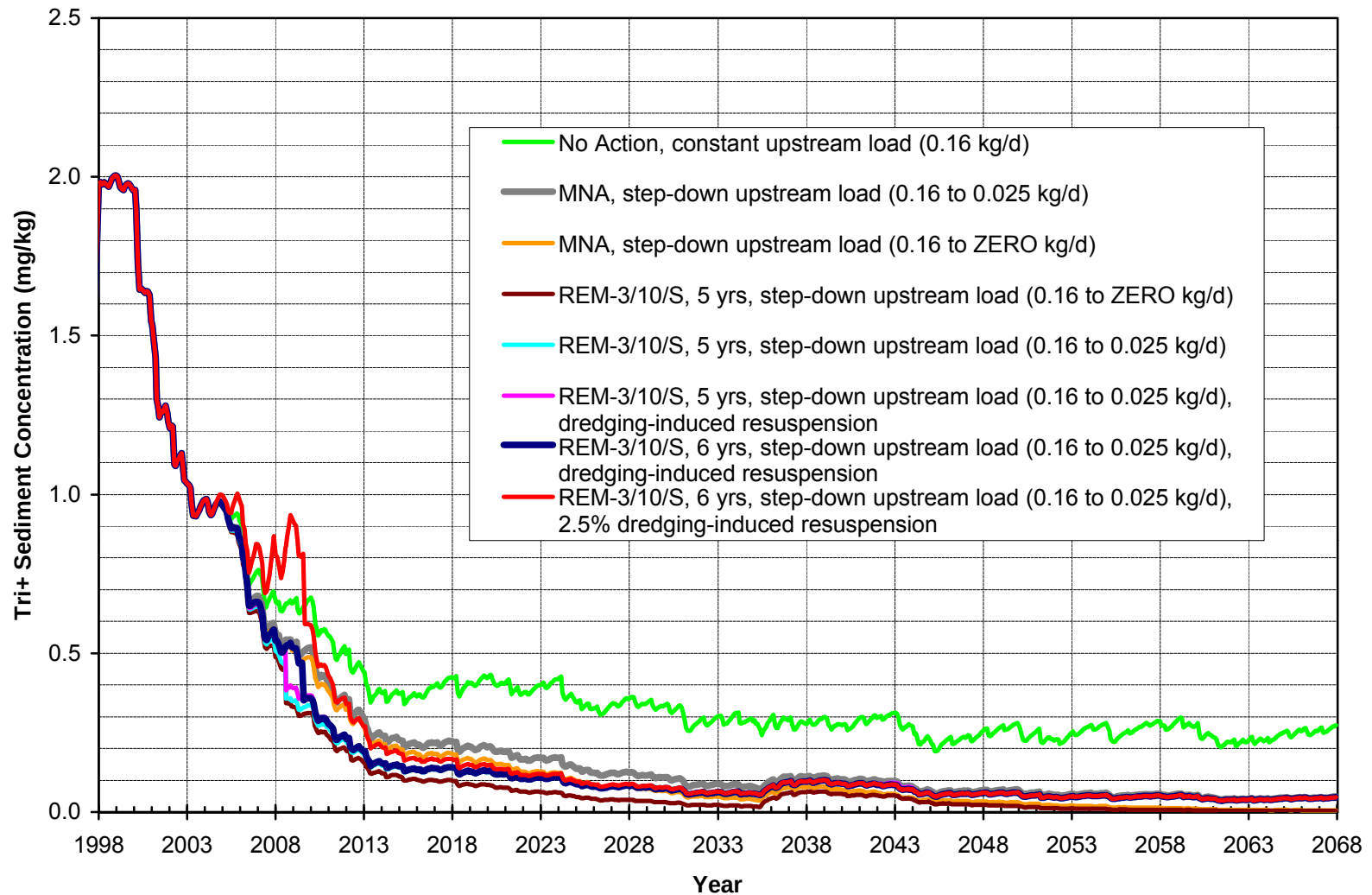


Figure 363150-8. Comparison Between Upper Hudson River Remediation Forecasts for Waterford Non-Cohesive Surficial Sediments

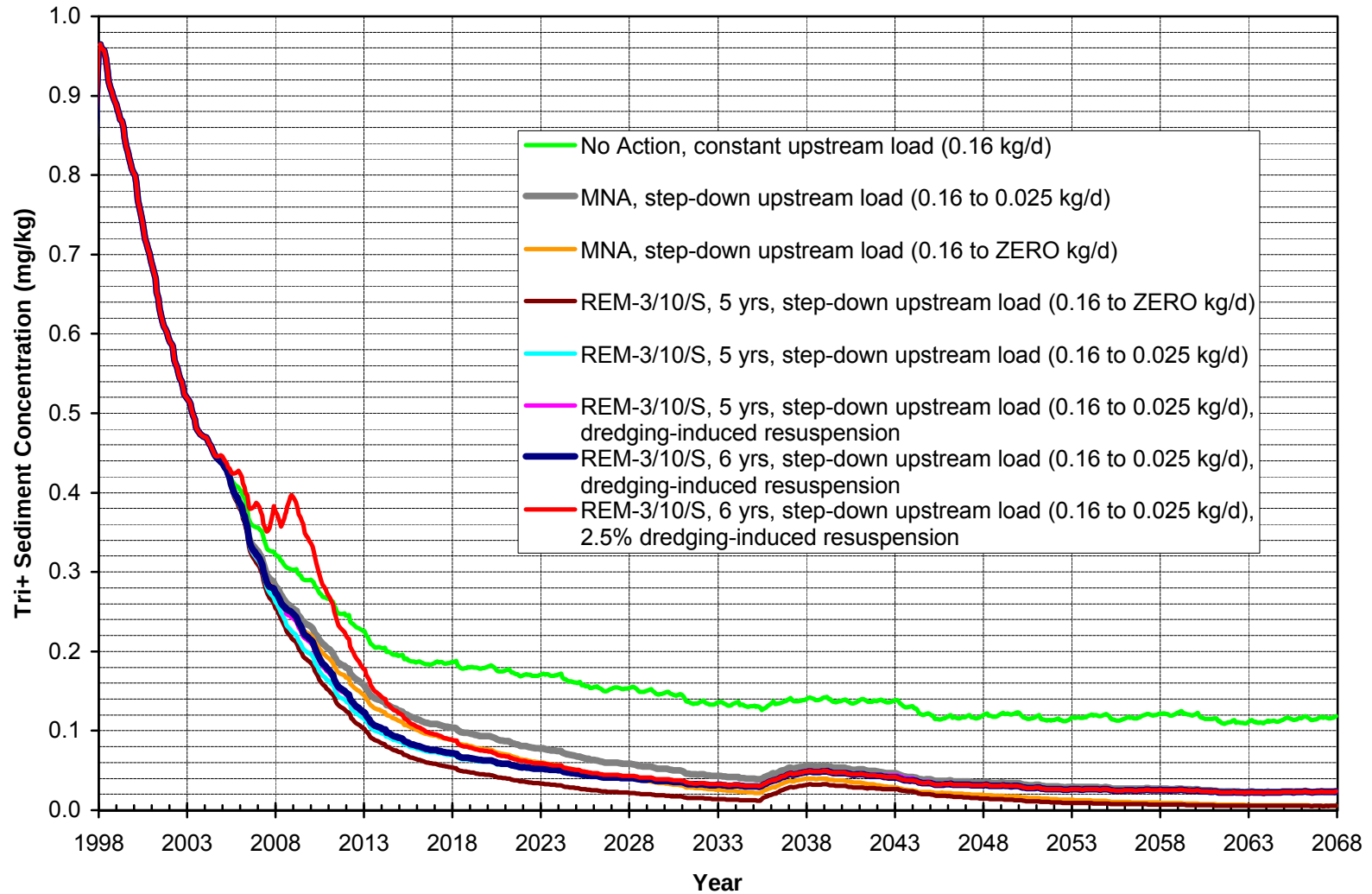


Figure 363150-9. Comparison Between Upper Hudson River Remediation Forecasts for Federal Dam Non-Cohesive Surficial Sediments

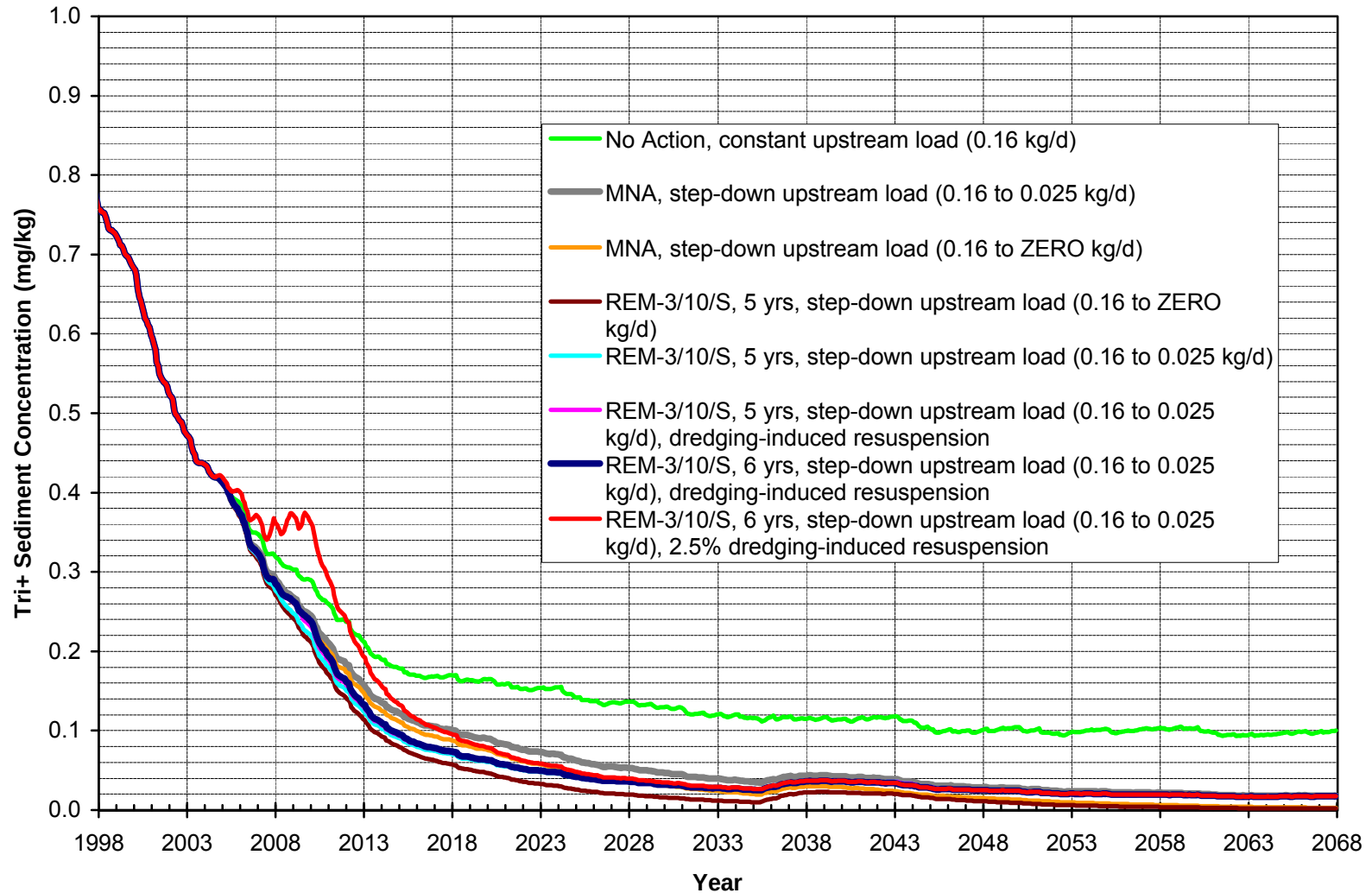


Figure 363150-10. Comparison Between Upper Hudson River Remediation Forecasts for Thompson Island Dam Annual Average Tri+ PCB Water Column Concentration

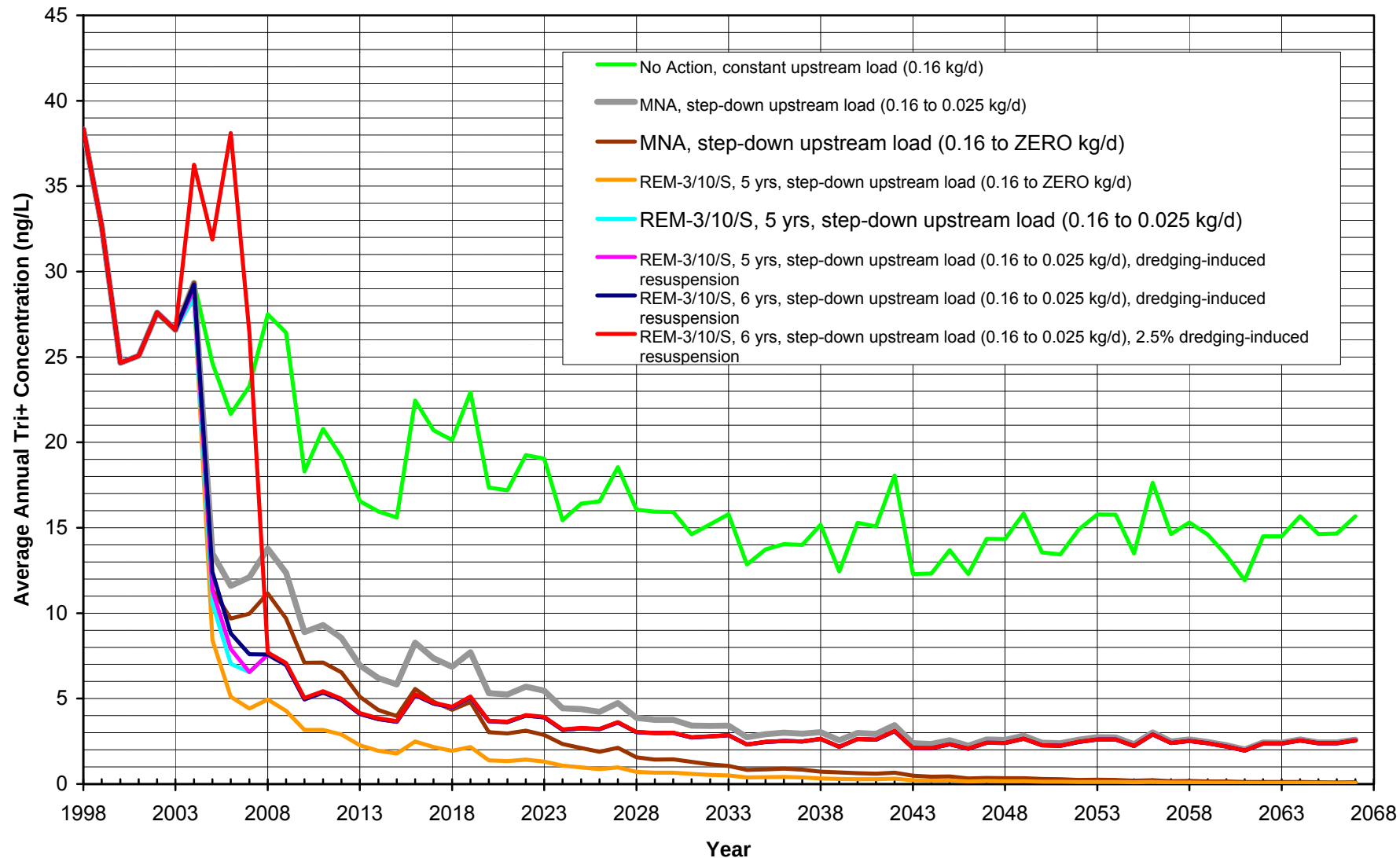
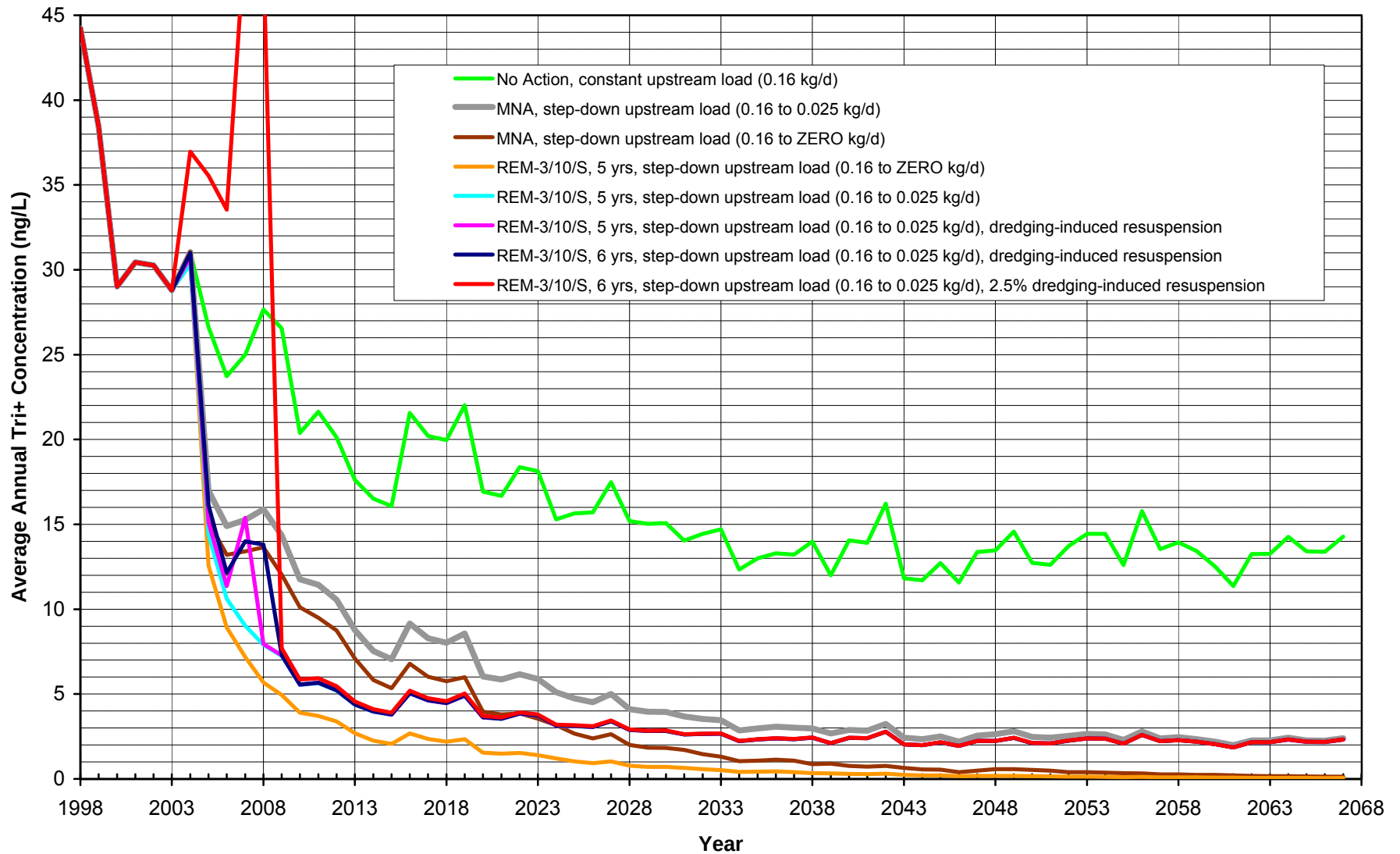
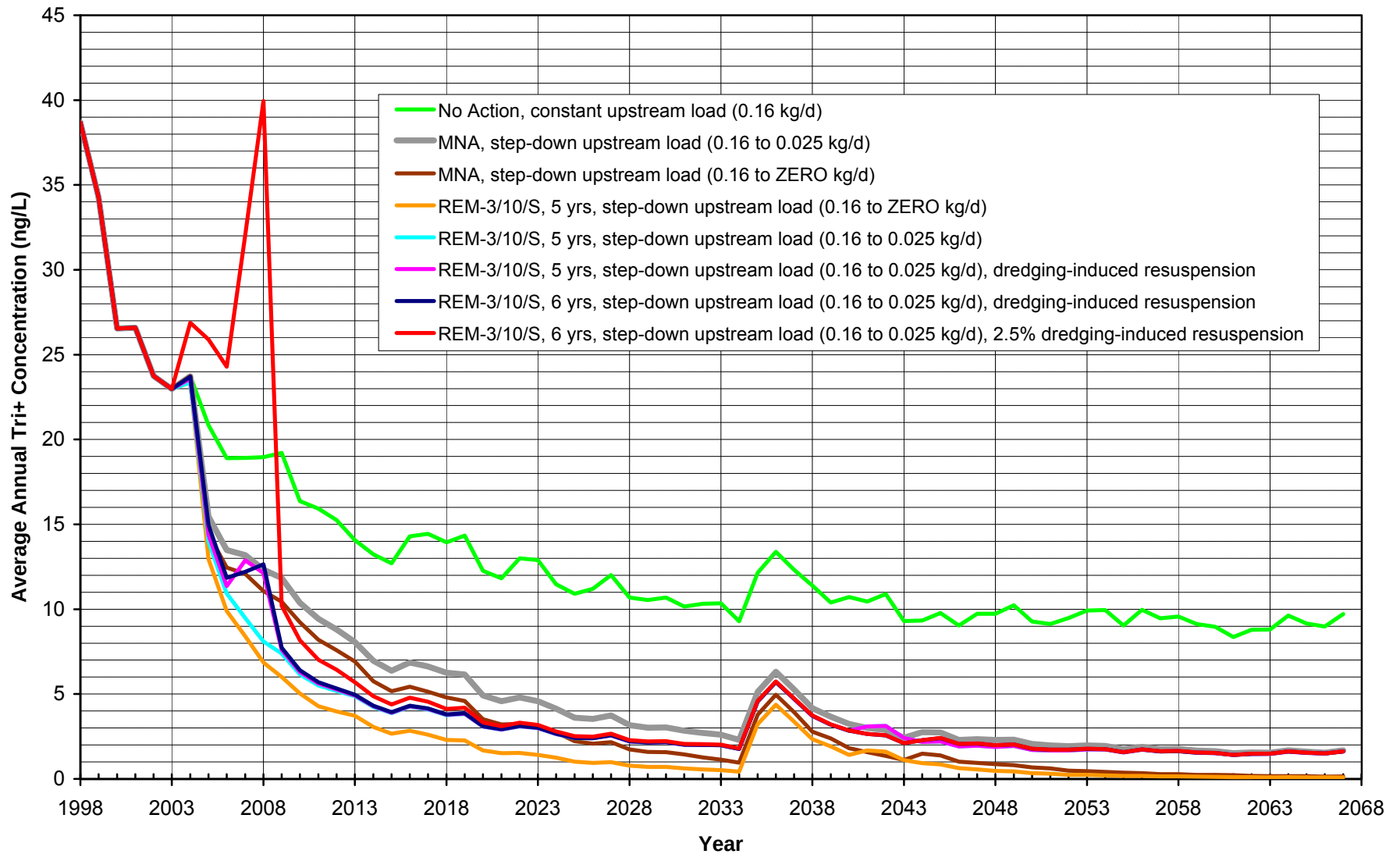


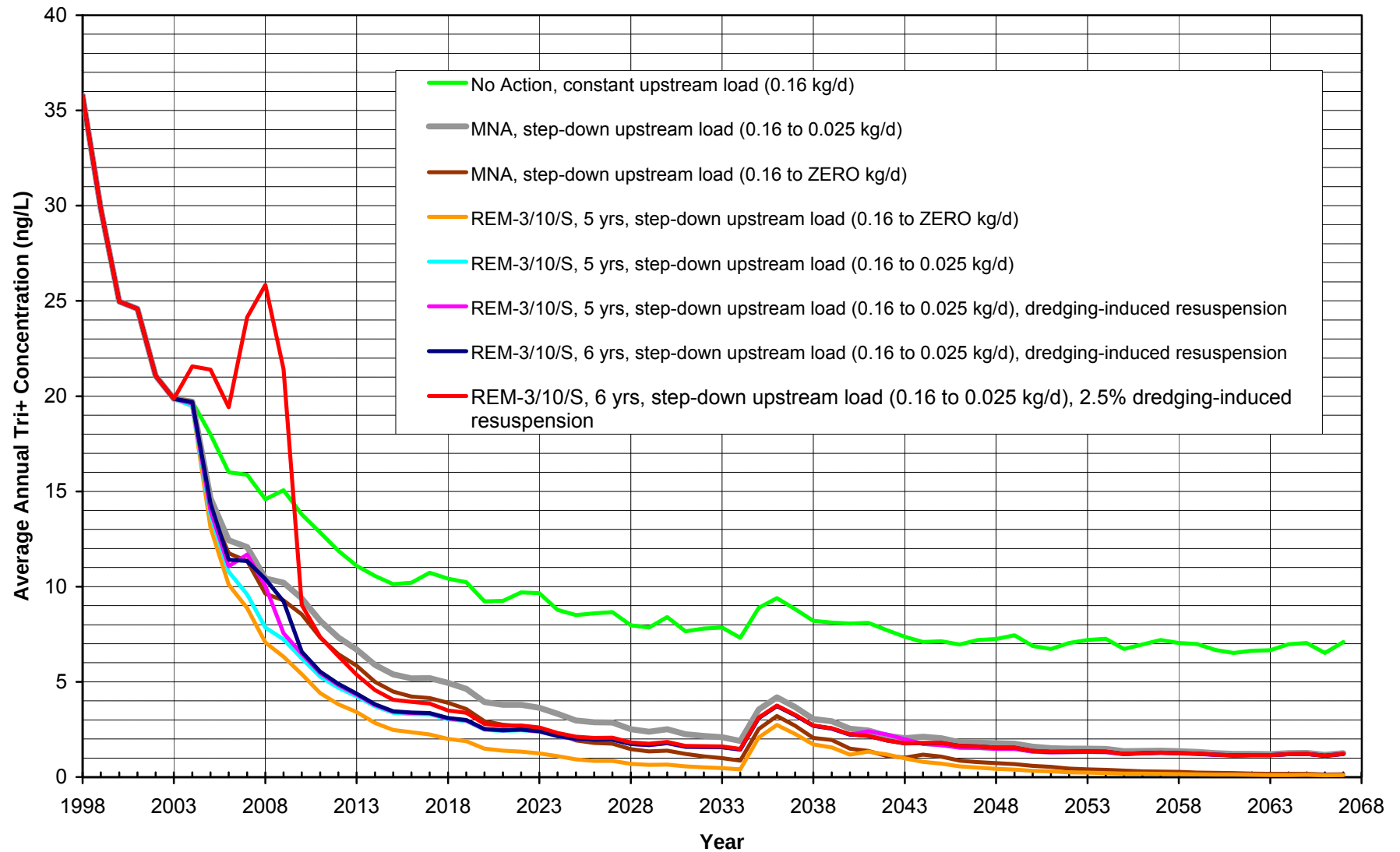
Figure 363150-11. Comparison Between Upper Hudson River Remediation Forecasts for Schuylerville Annual Average Tri+ PCB Water Column Concentration



**Figure 363150-12. Comparison Between Upper Hudson River Remediation Forecasts for Stillwater
Annual Average Tri+ PCB Water Column Concentration**



**Figure 363150-13. Comparison Between Upper Hudson River Remediation Forecasts for Waterford
Annual Average Tri+ PCB Water Column Concentration**



**Figure 363150-14. Comparison Between Upper Hudson River Remediation Forecasts for Federal Dam
Annual Average Tri+ PCB Water Column Concentration**

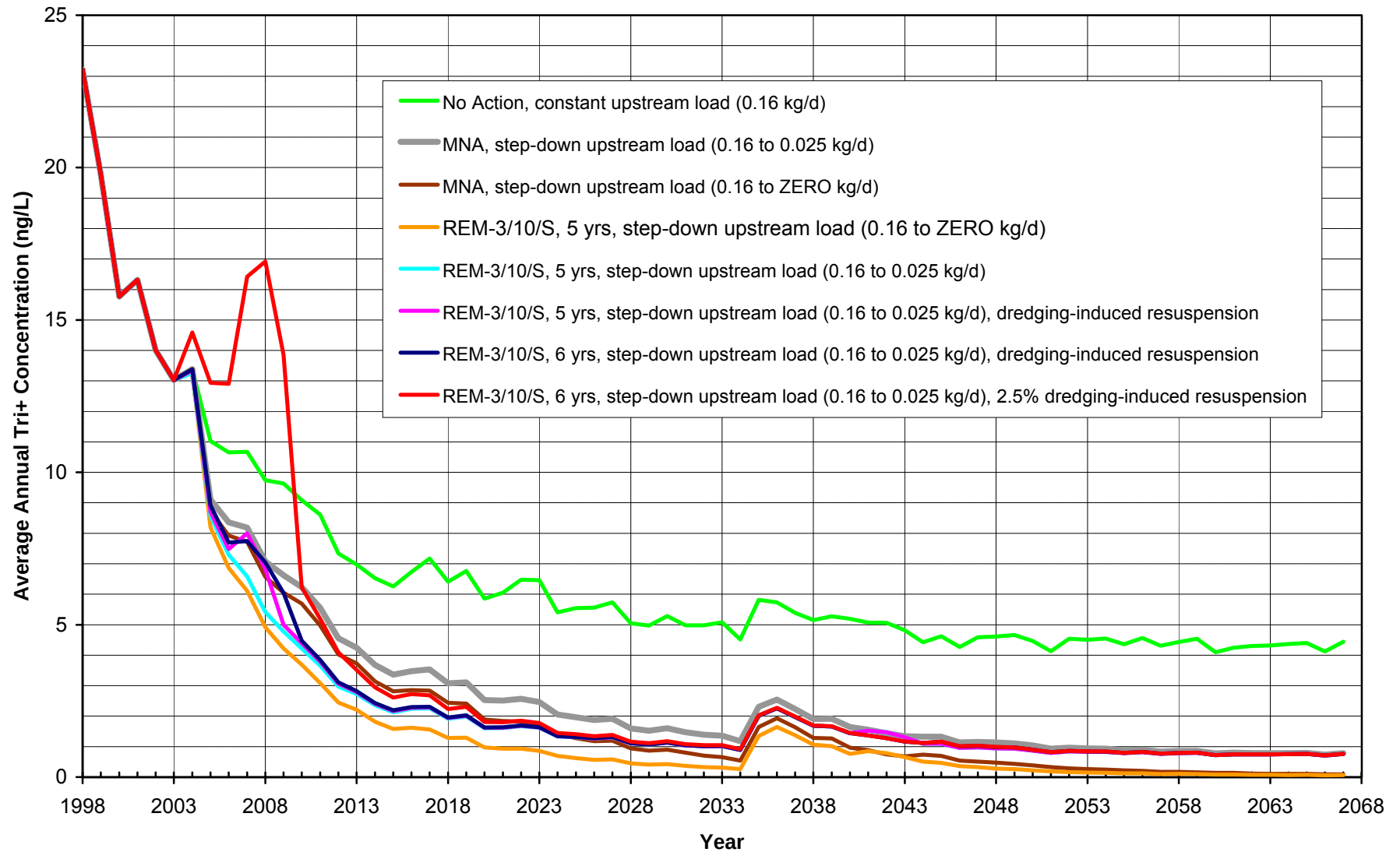


Figure 363150-15: Predicted Fish Body Burdens 2004 - 2010

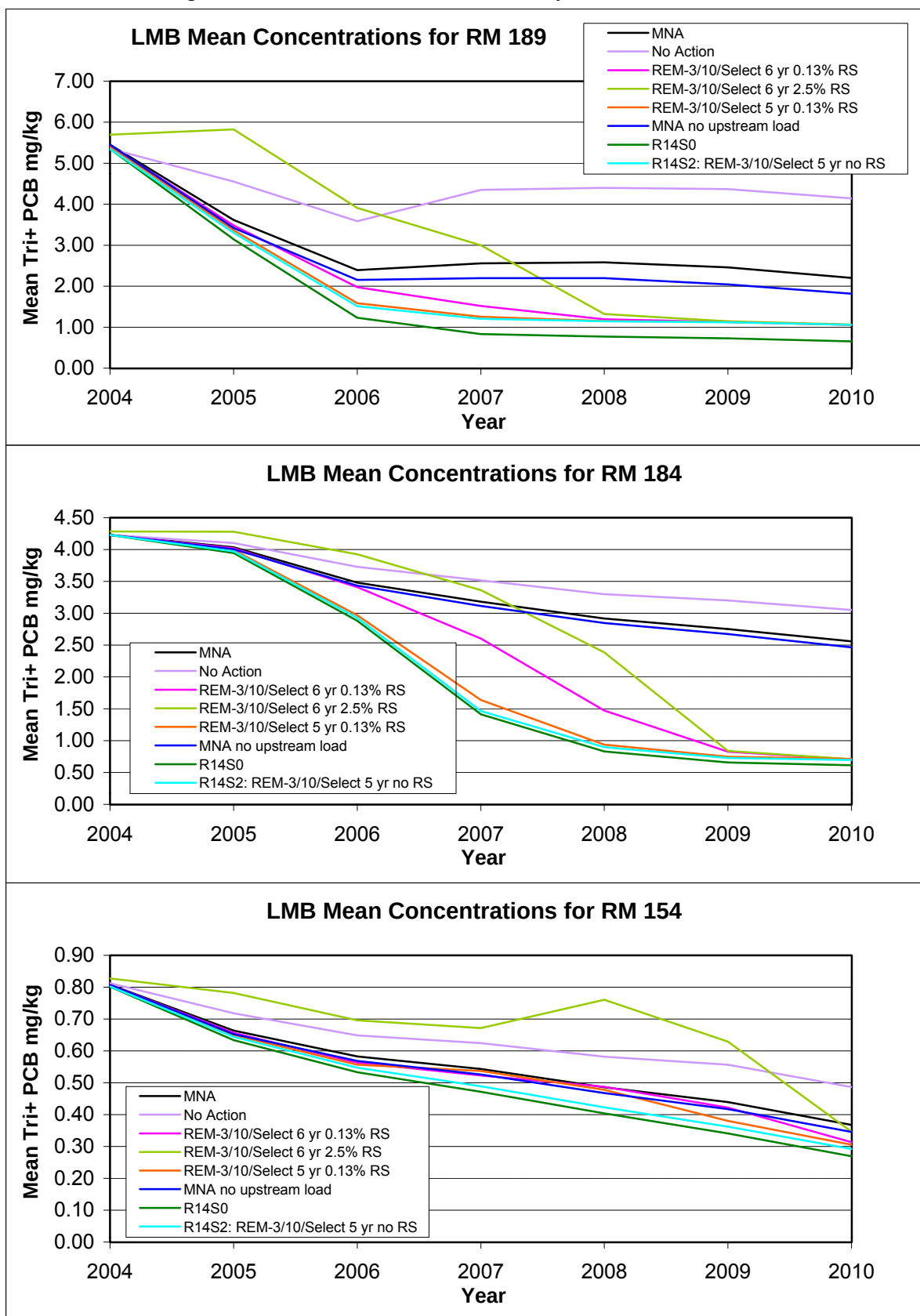


Figure 363150-15: Predicted Fish Body Burdens 2004 - 2010

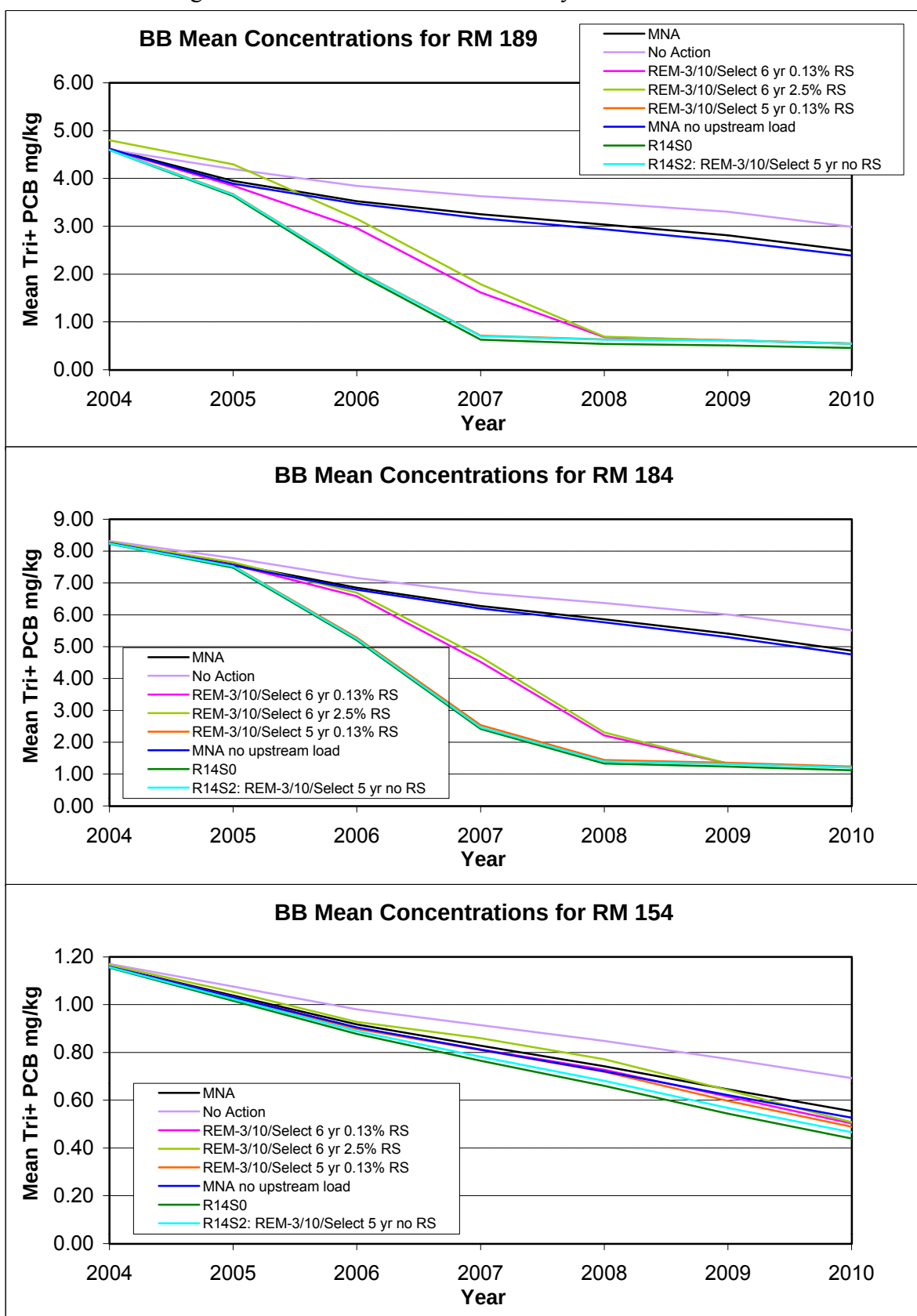


Figure 363150-15: Predicted Fish Body Burdens 2004 - 2010

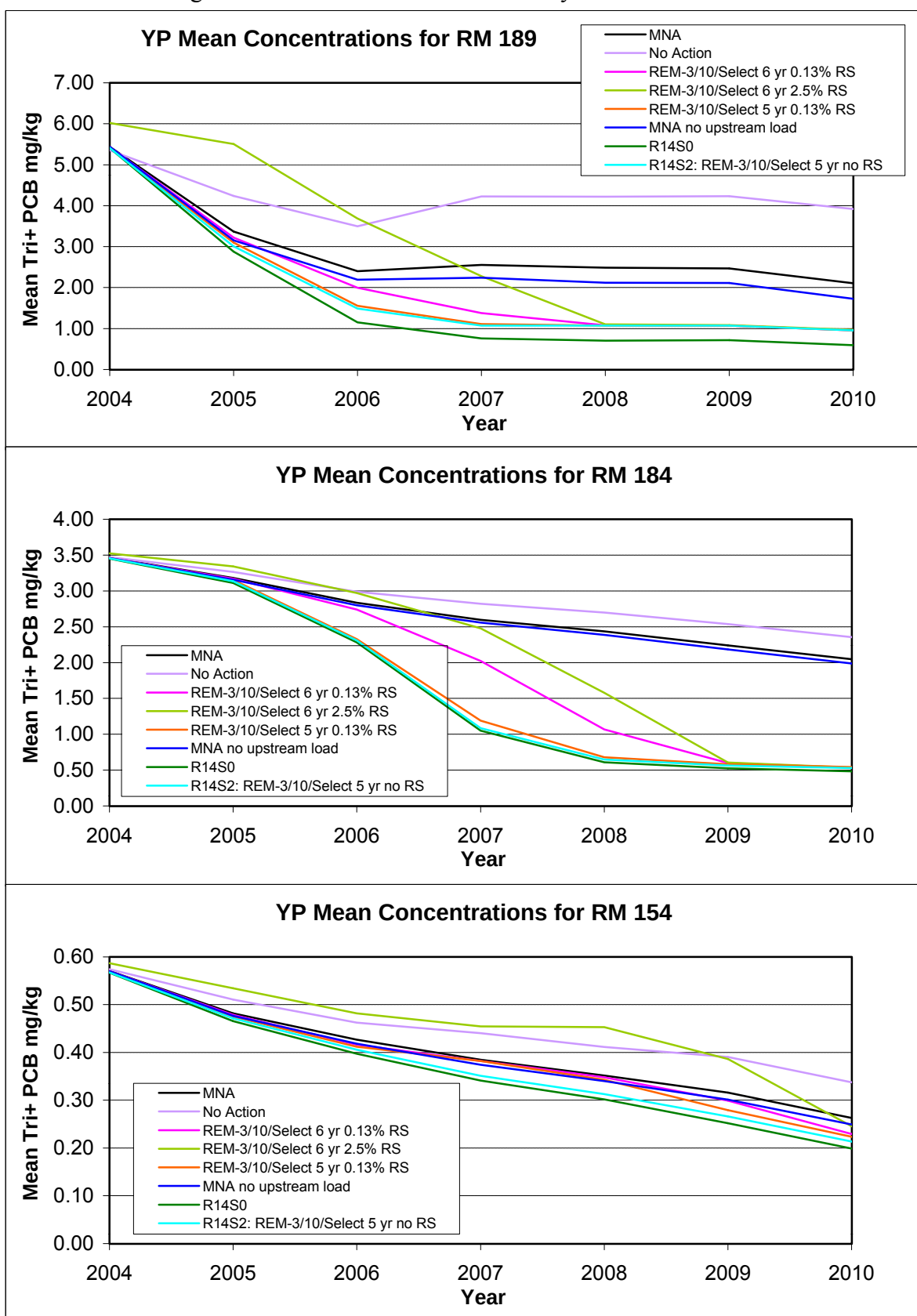


Figure 363150-16: Predicted Fish Body Burdens 2004 - 2067

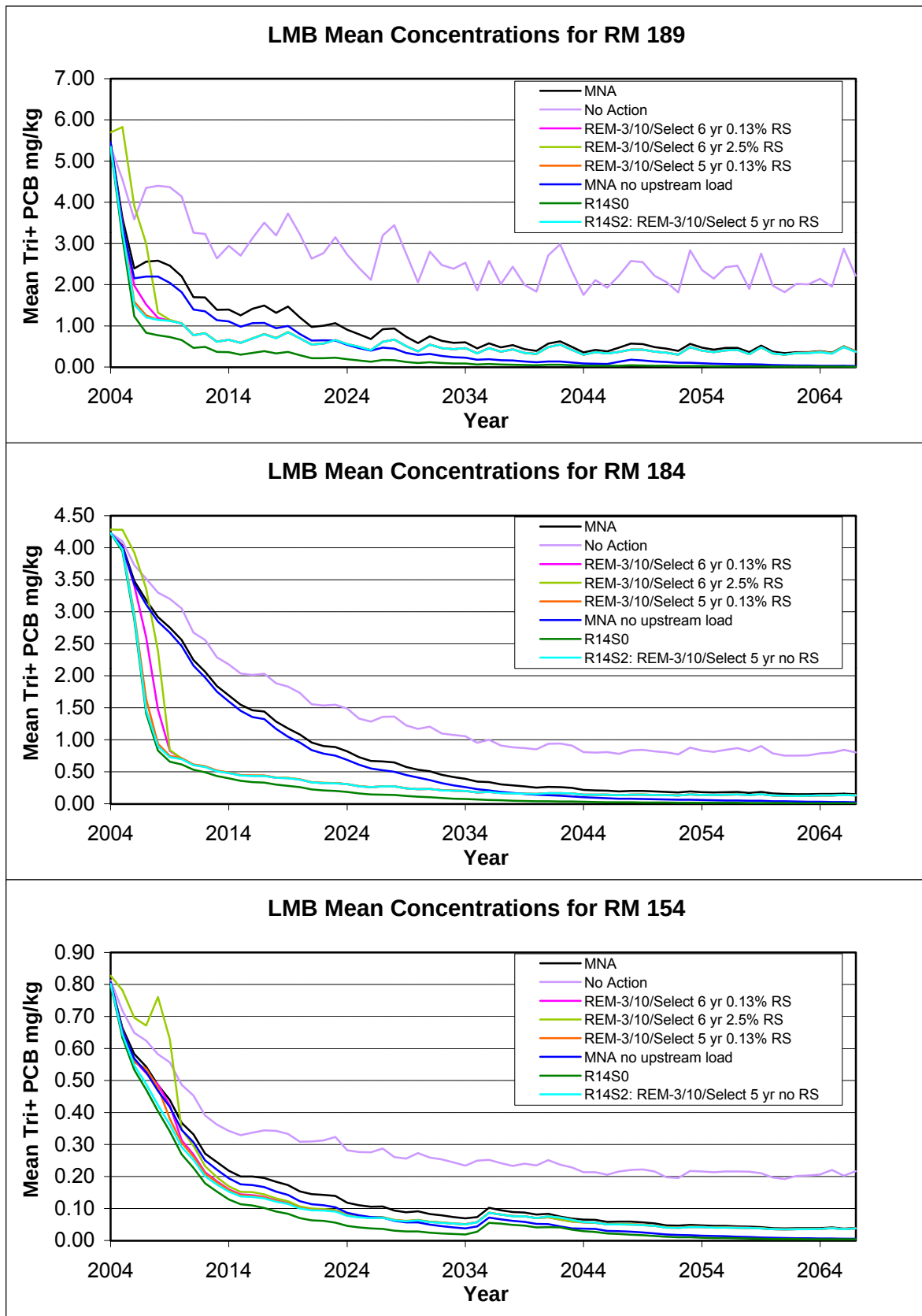


Figure 363150-16: Predicted Fish Body Burdens 2004 - 2067

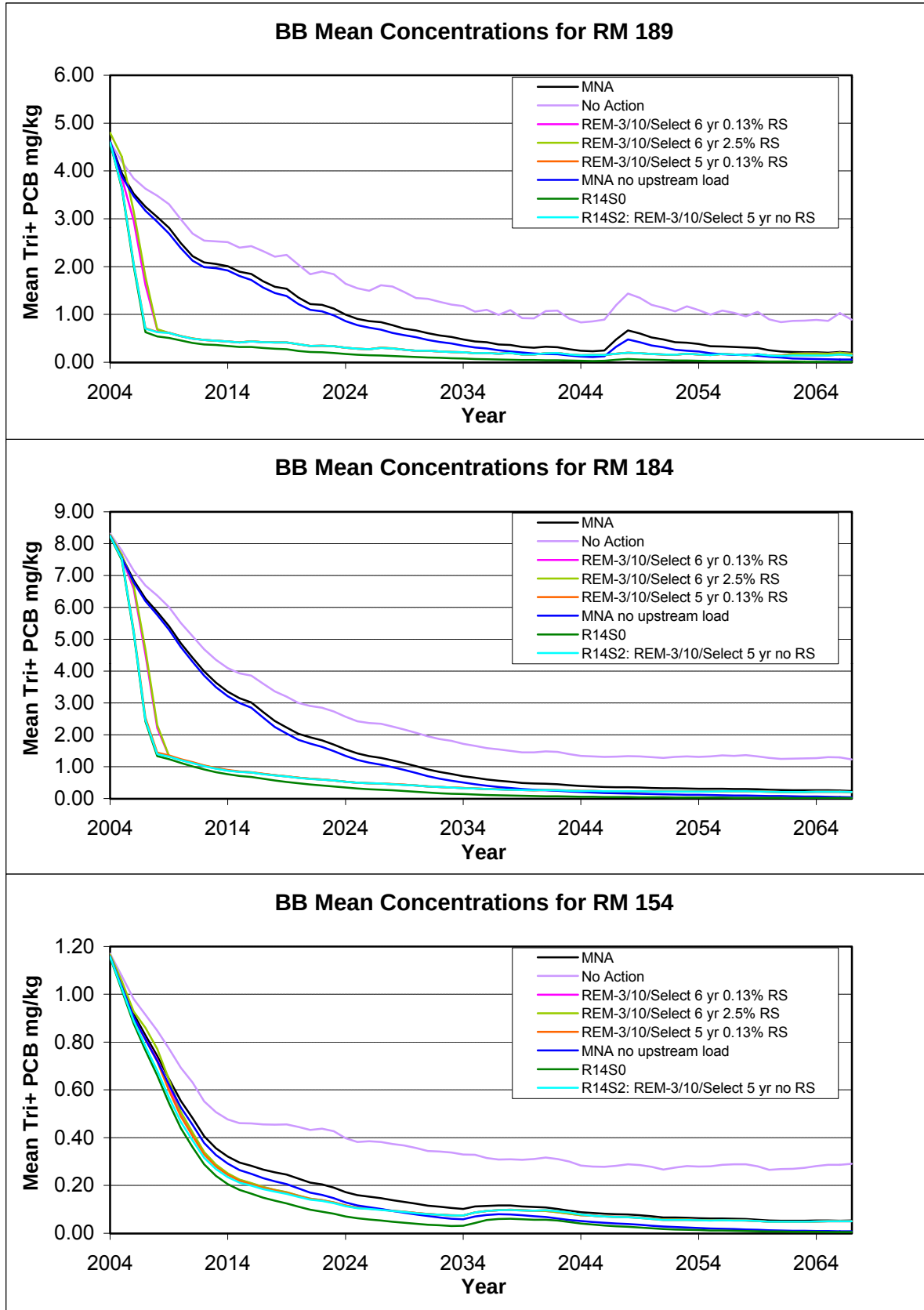


Figure 363150-16: Predicted Fish Body Burdens 2004 - 2067

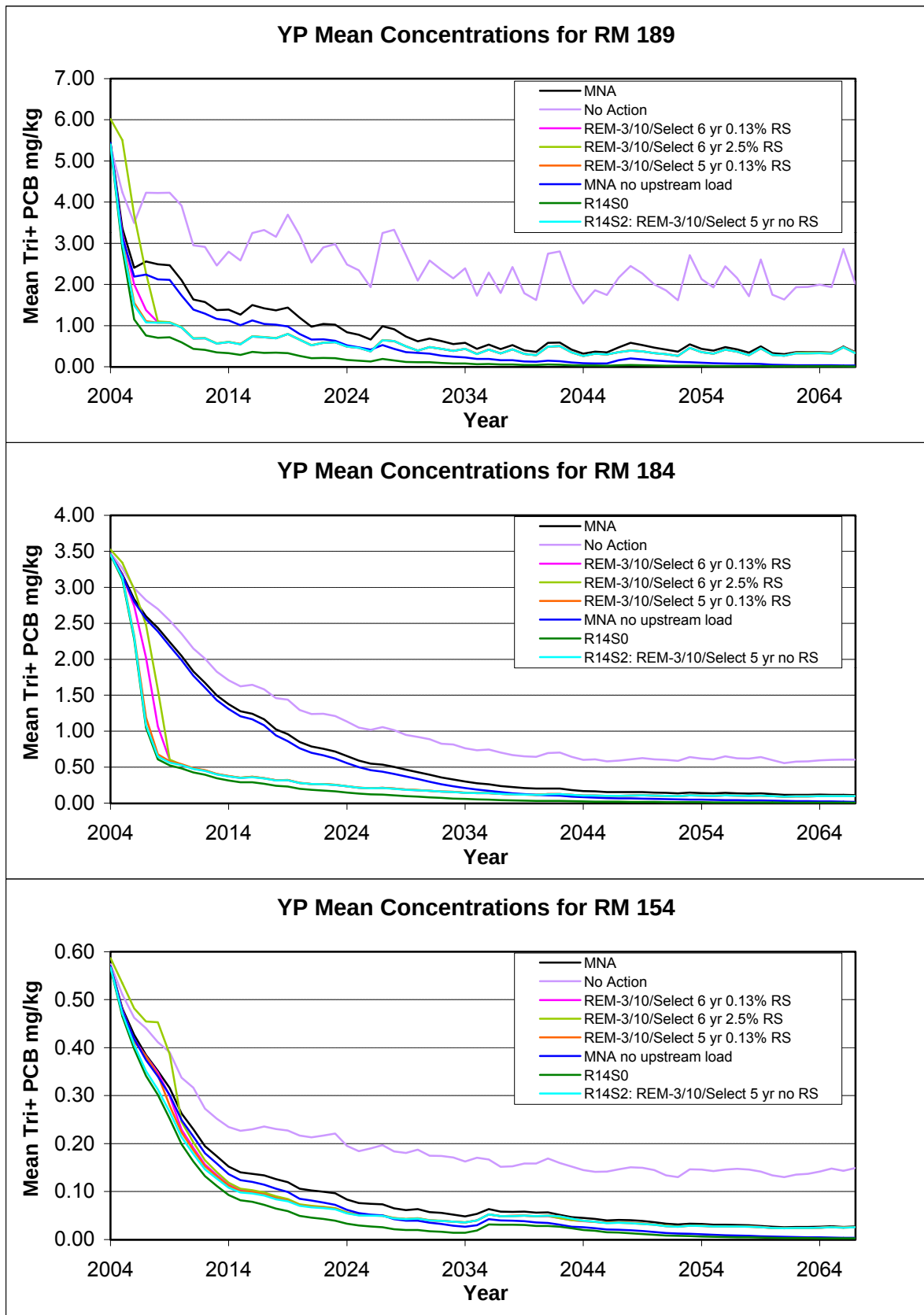


Figure 363150-17: Predicted Fish Body Burdens for White Perch

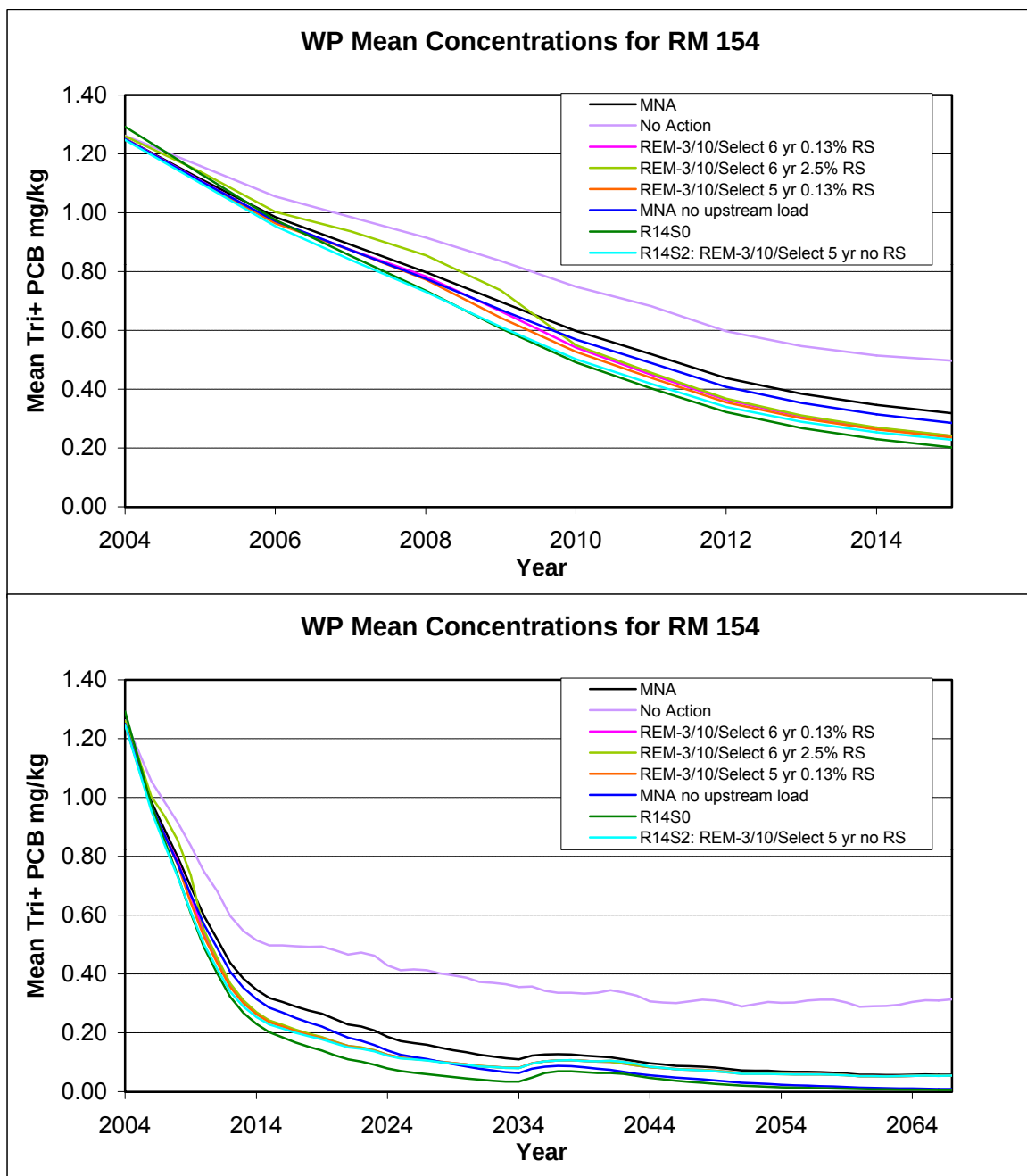


Figure 363150-18: Comparison of Predicted Species-Weighted Fish Body Burdens Across Different Assumptions of the Selected Remedy 2004 - 2064

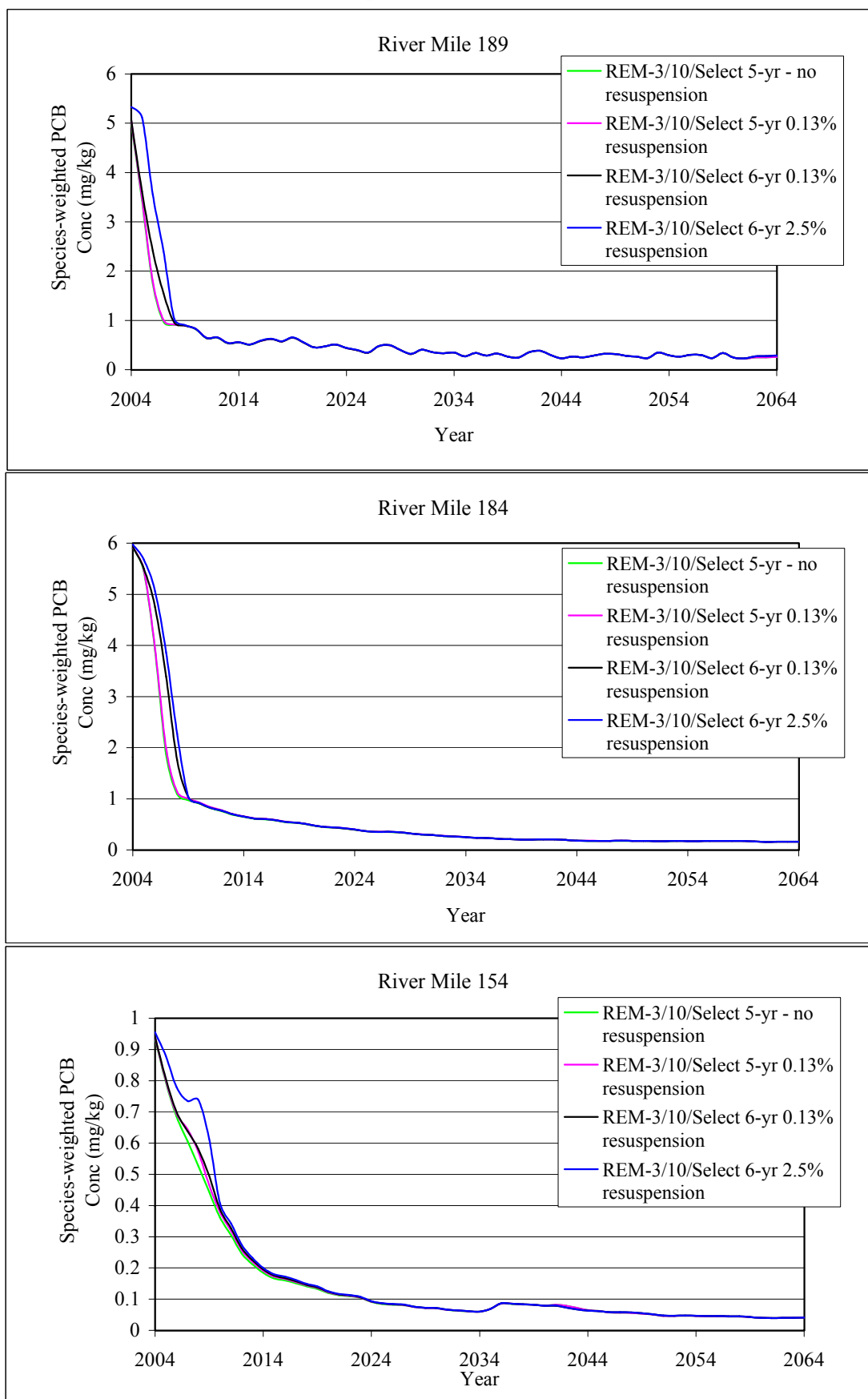


Figure 363150-19: Comparison of Predicted Species-Weighted Fish Body Burdens Across Different Scenarios 2004 - 2064

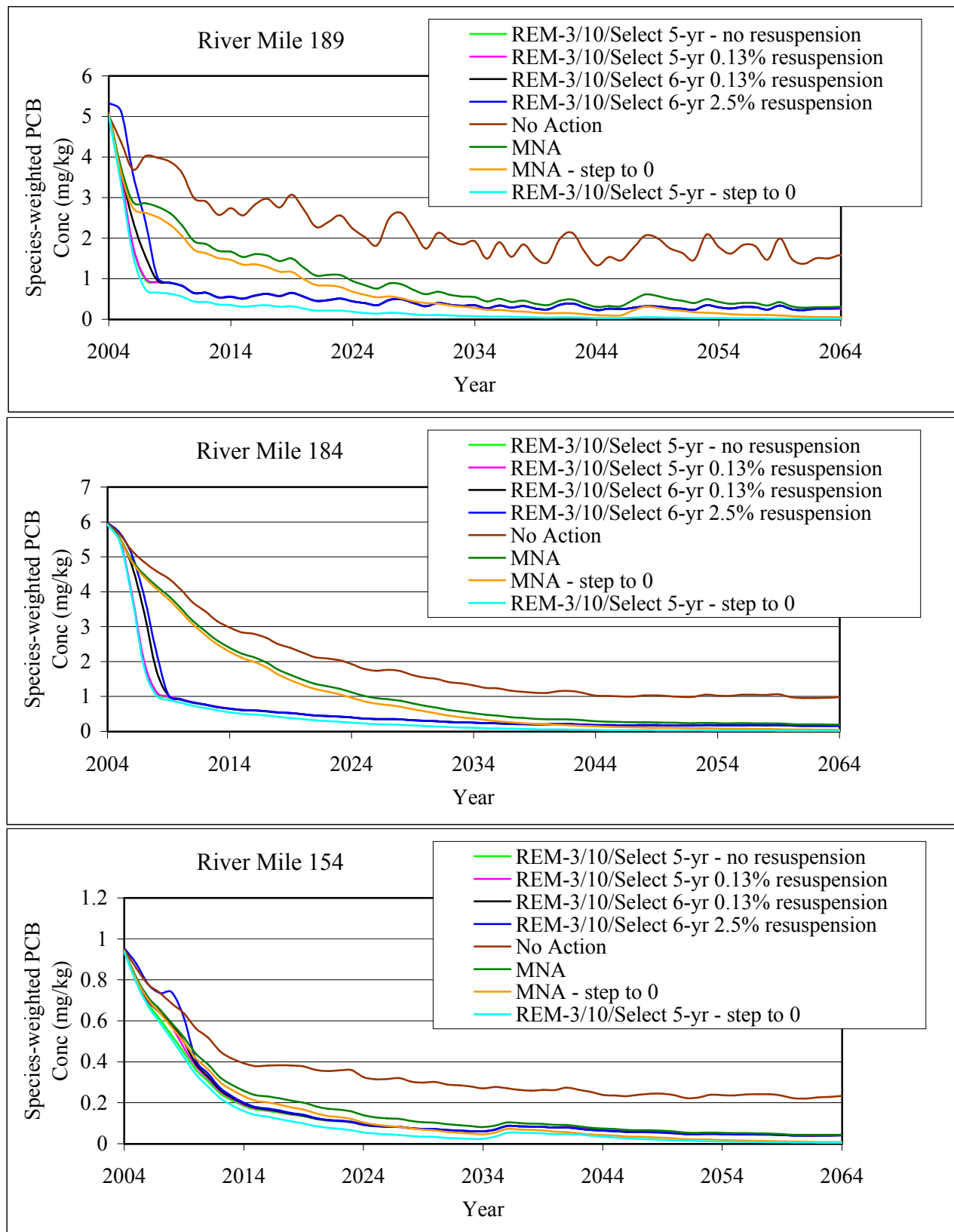


Figure 363150-20: Comparison of Predicted Species-Weighted Fish Body Burdens Across Different Scenarios 2004 - 2010 (2015 for RM 154)

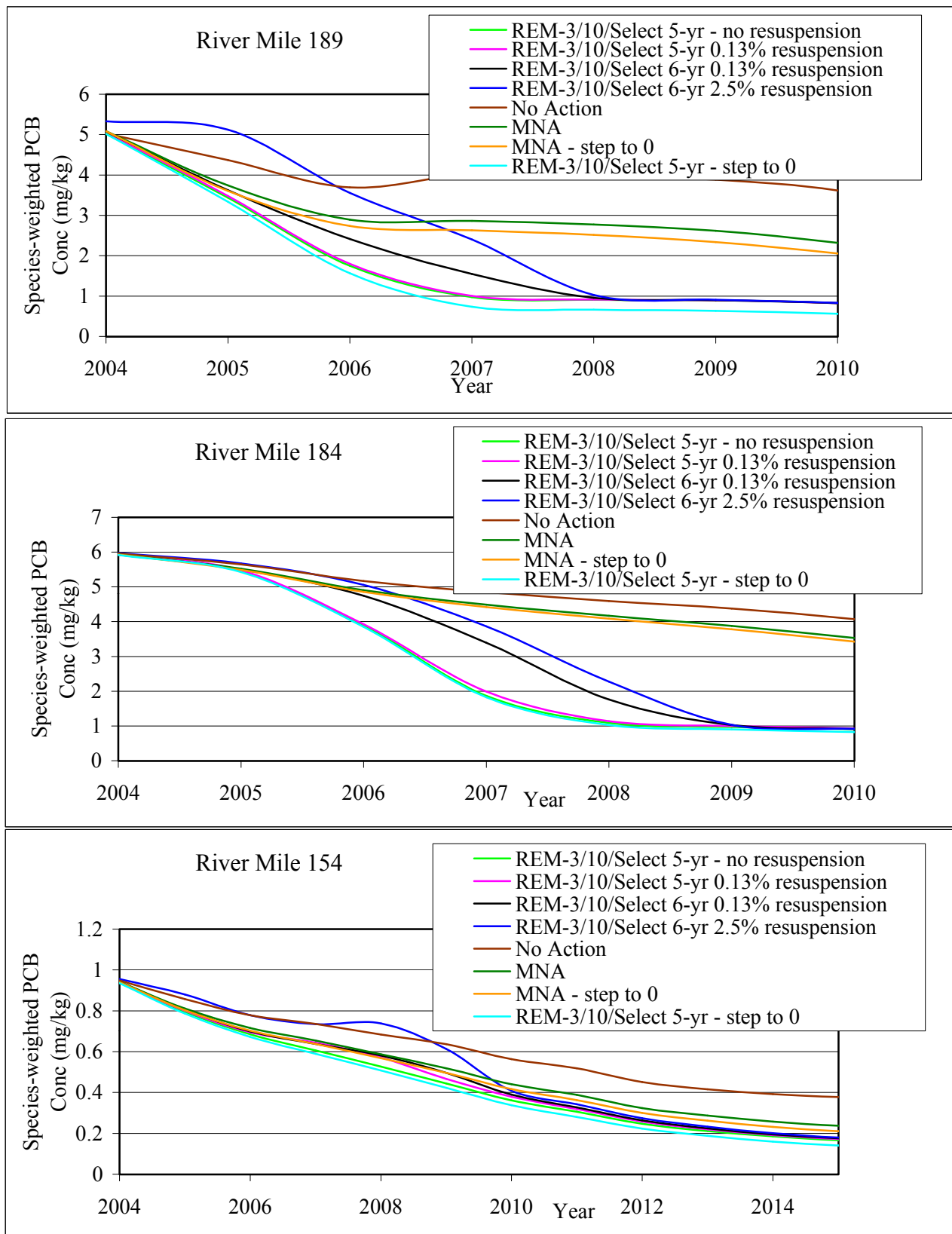


Table 363150-1. Comparison of HUDTOX Modeling Scenarios Conducted to Evaluate Alternative Selected Remedy (REM-3/10/Select) Assumptions.

Remedial Forecast Scenario	HUDTOX Run ID	HUDTOX Forecast Scenario Description	Remediation Schedule	Upstream Tri+ PCB Load Specification	Dredging-Induced Tri+ PCB Resuspension
No Action	P3NACW	No Action, constant upstream load (0.16 kg/d)	Not Applicable	Constant (0.16 kg/d)	Not Applicable
Monitored No Action (MNA)	P3NAS2	Monitored Natural Attenuation (MNA), step-down upstream load (0.16 kg/d to 0.0256 kg/d)	Not Applicable	Step-down (0.16 kg/d to 0.0256 kg/d)	Not Applicable
5-year Selected Remedy	R14S2	REM-3/10/Select, 5 years, step-down upstream load (0.16 kg/d to 0.0256 kg/d), no dredging-induced resuspension (Preferred Remedy - as presented in the FS)	5 Years (2004-2008)	Step-down (0.16 kg/d to 0.0256 kg/d)	Not Included
5-year Selected Remedy with dredging-induced resuspension	R14RS	REM-3/10/Select, 5 years, step-down upstream load (0.16 kg/d to 0.0256 kg/d), 0.13% dredging-induced resuspension	5 Years (2004-2008)	Step-down (0.16 kg/d to 0.0256 kg/d)	Section-specific resuspension loss rate of 0.13%
6-year Selected Remedy with dredging-induced resuspension	R20RS	REM-3/10/Select, 6 years, step-down upstream load (0.16 kg/d to 0.0256 kg/d), 0.13% dredging-induced resuspension (Selected Remedy - as presented in the ROD)	6 Years (2004-2009)	Step-down (0.16 kg/d to 0.0256 kg/d)	Section-specific resuspension loss rate of 0.13%
6-year Selected Remedy with a publicly requested rate of dredging-induced resuspension	R20RX	REM-3/10/Select, 6 years, step-down upstream load (0.16 kg/d to 0.0256 kg/d), 2.5% dredging-induced resuspension	6 Years (2004-2009)	Step-down (0.16 kg/d to 0.0256 kg/d)	2.5% resuspension loss rate estimate
5-year Selected Remedy with elimination of upstream load	R14S0	REM-3/10/Select, 5 years, step-down upstream load (0.16 kg/d to ZERO), no dredging-induced resuspension	5 Years (2004-2008)	Step-down (0.16 kg/d to Zero)	Not Included
MNA with elimination of upstream load	P3NAS0	MNA, step-down upstream load (0.16 kg/d to ZERO)	Not Applicable	Step-down (0.16 kg/d to Zero)	Not Applicable

Table 363150-2
REM-3/10/Select Remedial Scenario Dredging Sequence Information
Used to Develop HUDTOX Inputs for 5-Year and 6-Year Implementation Periods.

Model Segment #	5-Year Dredging Sequence	6-Year Dredging Sequence	% Remains to LTI	% of sedseg area not dredged	sediment type	PCB conc. In dredge area (ppm)
48	Aug-04	Aug-04	85.2%	88.6%	N	0.5
49	Aug-04	Aug-04	100.0%	100.0%	N	No Change
50	Aug-04	Aug-04	94.7%	93.8%	N	0.5
51	Aug-04	Aug-04	9.2%	18.0%	N	0.5
52	Aug-04	Aug-04	9.6%	20.1%	C	0.25
53	Aug-04	Aug-04	29.8%	36.2%	N	0.5
54	Aug-04	Aug-04	52.2%	57.8%	N	0.5
55	Aug-04	Aug-04	90.3%	93.5%	N	0.5
56	Aug-04	Aug-04	0.4%	0.6%	C	0.25
57	Aug-04	Aug-05	11.7%	5.3%	N	0.5
58	Aug-04	Aug-05	5.8%	3.7%	N	0.5
59	Aug-04	Aug-05	0.0%	0.0%	C	0.25
60	Aug-04	Aug-05	0.7%	0.7%	N	0.5
61	Aug-04	Aug-05	0.9%	15.2%	C	0.25
62	Aug-04	Aug-05	42.2%	60.0%	N	0.5
63	Aug-05	Aug-05	28.6%	34.4%	N	0.5
64	Aug-05	Aug-05	0.2%	0.4%	C	0.25
65	Aug-05	Aug-05	2.2%	0.2%	N	0.5
66	Aug-05	Aug-05	28.3%	60.3%	C	0.25
67	Aug-05	Aug-05	91.4%	74.6%	N	0.5
68	Aug-05	Aug-05	24.6%	55.2%	C	0.25
69	Aug-05	Aug-05	59.1%	44.7%	N	0.5
70	Aug-05	Aug-06	0.0%	0.0%	C	0.25
71	Aug-05	Aug-06	0.8%	0.4%	N	0.5
72	Aug-05	Aug-06	0.6%	2.8%	C	0.25
73	Aug-05	Aug-06	24.2%	16.4%	N	0.5
74	Aug-05	Aug-06	8.3%	8.0%	N	0.5
75	Aug-05	Aug-06	66.9%	57.5%	C	0.25
76	Aug-06	Aug-06	14.6%	23.2%	N	0.5
77	Aug-06	Aug-06	44.6%	57.6%	N	0.5
78	Aug-06	Aug-06	7.4%	6.2%	C	0.25
79	Aug-06	Aug-06	64.5%	56.6%	N	0.5
80	Aug-06	Aug-06	1.0%	5.1%	C	0.25
81	Aug-06	Aug-06	8.9%	34.5%	C	0.25
82	Aug-06	Aug-06	81.8%	69.7%	N	0.5
83	Aug-06	Aug-06	80.7%	69.6%	N	0.5
84	Aug-06	Aug-07	7.0%	10.4%	C	0.25
85	Aug-06	Aug-07	46.2%	29.9%	N	0.5
86	Aug-06	Aug-07	22.1%	55.3%	N	0.5
87	Aug-06	Aug-07	51.5%	75.8%	N	0.5
88	Aug-06	Aug-07	5.7%	32.3%	C	0.25
89	Aug-06	Aug-07	53.1%	73.7%	N	0.5
90	Aug-07	Aug-07	43.0%	52.4%	C	0.25
91	Aug-07	Aug-07	99.5%	99.8%	N	0.5
92	Aug-07	Aug-07	18.2%	49.3%	C	0.25
93	Aug-07	Aug-08	96.9%	99.6%	N	0.5
94	Aug-07	Aug-08	10.8%	58.3%	C	0.25
95	Aug-07	Aug-08	63.4%	85.6%	N	0.5
96	Aug-07	Aug-08	100.0%	100.0%	N	No Change
97	Aug-07	Aug-08	100.0%	100.0%	N	No Change
98	Aug-07	Aug-08	100.0%	100.0%	C	No Change
99	Aug-07	Aug-08	100.0%	100.0%	N	No Change
100	Aug-07	Aug-08	100.0%	100.0%	C	No Change
101	Aug-07	Aug-08	100.0%	100.0%	N	No Change
102	Aug-07	Aug-08	99.9%	99.9%	C	0.25
103	Aug-07	Aug-08	98.7%	98.2%	N	0.5
104	Aug-07	Aug-08	100.0%	100.0%	C	No Change
105	Aug-07	Aug-08	98.1%	97.4%	N	0.5
106	Aug-08	Aug-08	5.4%	29.4%	C	0.25
107	Aug-08	Aug-08	68.3%	89.8%	N	0.5
108	Aug-08	Aug-08	100.0%	100.0%	C	No Change
109	Aug-08	Aug-08	100.0%	100.0%	N	No Change
110	Aug-08	Aug-08	99.7%	99.3%	C	0.25
111	Aug-08	Aug-08	99.0%	98.7%	N	0.5
112	Aug-08	Aug-09	9.4%	61.8%	C	0.25
113	Aug-08	Aug-09	18.4%	68.0%	N	0.5
114	Aug-08	Aug-09	100.0%	100.0%	C	No Change
115	Aug-08	Aug-09	97.6%	96.7%	N	0.5
116	Aug-08	Aug-09	85.1%	95.9%	C	0.25
117	Aug-08	Aug-09	84.1%	89.3%	N	0.5
118	Aug-08	Aug-09	100.0%	100.0%	C	No Change
119	Aug-08	Aug-09	99.6%	99.4%	N	0.5
120	Aug-08	Aug-09	88.0%	88.0%	C	0.25
121	Aug-08	Aug-09	99.9%	99.9%	N	0.5
122	Aug-08	Aug-09	98.7%	98.3%	N	0.5
123	Aug-08	Aug-09	100.0%	100.0%	N	No Change

Note:
1- Some areas defined for remediation are not included in any existing model segments (for example, the west side of Griffin Island).
In TIP, 146,200 cy of sediments targeted to be removed are located outside existing model segments. This amount accounts for 9.36 % of sediment removed in TIP. In Section 2, about 50,100 cy (8.63%) of sediment are located outside existing model segments.
In Section 3, 1500 cy (0.31%) of sediments to be dredged are outise defined model segments. Combining yields 2.6 million cubic yards.

Table 363150-3

Dredging-Induced Daily Tri+ PCB Load for REM-3/10/Select and a Five-Year Implementation Schedule (Run R14RS) Input to HUDTOX Water Column Segments

Sediment Removal Season	Dredging Location	Speed	Cubic Yards of Sediment Removed	Tri+ PCB Flux @0.13% (g/day)	HUDTOX Segments
May 1 - Nov. 30, 2004	Sec. 1	Full	520K	15	5 & 7
May 1 - Nov. 30, 2005	Sec. 1	full	520K	15	14 & 16
May 1 - Nov. 30, 2006	Sec. 1	full	520K	15	23 & 25
May 1 - Nov. 30, 2007	Sec. 2	full	520K	105	30
May 1 - Nov. 30, 2008	Sec. 3	full	520K	59	38

Table 363150-4

Dredging-Induced Daily Tri+ PCB Load for REM-3/10/Select and a Six-Year Implementation Schedules (Runs R20RS @0.13% and R20RX @2.5%) Input to HUDTOX Water Column Segments

Sediment Removal Season	Dredging Location	Speed	Cubic Yards of Sediment Removed	Tri+ PCB Flux @0.13% (g/day)	Tri+ PCB Flux @2.5% (g/day)	HUDTOX Segments
May 1 - Nov. 30, 2004	Sec. 1	half	260K	7	220	5 & 7
May 1 - Nov. 30, 2005	Sec. 1	full	520K	15	440	11 & 13
May 1 - Nov. 30, 2006	Sec. 1	full	520K	15	440	20 & 22
May 1 - Aug. 15, 2007	Sec. 1 &	full	260K Sec. 1	15	440	26 & 28
Aug. 16 - Nov. 30, 2007	Sec. 2	full	260K Sec. 2	105	845	30
May 1 - Aug. 15, 2008	Sec. 2 &	full	260K Sec. 2	105	845	31
Aug. 16 - Nov. 30, 2008	Sec. 3	full	260K Sec. 3	59	417	38
May 1 - Aug. 15, 2009	Sec. 3	full	260K Sec. 3	59	417	45

Table 363150-5.
Tri+ PCB Load Over Thompson Island Dam

Year	Step-down Upstream Boundary Tri+ PCB Load Assumption (0.16 kg/day to 0.0256 kg/day)										Constant Upstream Boundary Tri+ PCB Load Assumption (0.16 kg/day)		Step-down Upstream Boundary Tri+ PCB Load Assumption (0.16 kg/day to ZERO)			
	P3NAS2 (MNA)		R14S2 (REM-3/10/Select - No resuspension) - 5 yr dredge		R14RS (REM 3/10/Select - w/ 0.13% resuspension) - 5 yr dredge		R20RS (REM 3/10/Select - w/ 0.13% resuspension) - 6 yr dredge		R20RX (REM 3/10/Select - w/ 2.5% resuspension) - 6 yr dredge		P3NACW (No Action)		P3NAS0 (MNA)		R14S0 (REM-3/10/Select - No resuspension) - 5 yr dredge	
	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load
1998	224.8	224.8	224.8	224.8	224.8	224.8	224.8	224.8	224.8	224.8	224.8	224.8	224.8	224.8	224.8	224.8
1999	109.3	334.2	109.3	334.2	109.3	334.2	109.3	334.2	109.3	334.2	109.3	334.2	109.3	334.2	109.3	334.2
2000	123.4	457.6	123.6	457.8	123.6	457.8	123.6	457.8	123.6	457.8	123.4	457.6	123.4	457.6	123.6	457.8
2001	135.1	592.7	135.2	593.0	135.2	593.0	135.2	593.0	135.2	593.0	135.1	592.7	135.1	592.7	135.2	593.0
2002	106.0	698.7	105.9	698.9	105.9	698.9	105.9	698.9	105.9	698.9	106.0	698.7	106.0	698.7	105.9	698.9
2003	103.5	802.2	103.7	802.6	103.7	802.6	103.7	802.6	103.7	802.6	103.5	802.2	103.5	802.2	103.7	802.6
2004	91.0	893.2	88.2	890.8	89.7	892.3	90.5	893.1	111.8	914.4	91.0	893.2	91.0	893.2	88.2	890.8
2005	51.8	945.0	40.6	931.4	43.3	935.6	47.8	940.9	125.7	1040.1	93.1	986.3	43.9	937.1	32.7	923.5
2006	57.2	1002.2	34.7	966.1	37.7	973.3	42.1	983.0	127.3	1167.3	99.7	1086.0	49.1	986.2	26.6	950.1
2007	56.8	1059.0	27.2	993.3	27.3	1000.5	31.8	1014.8	76.4	1243.7	98.9	1184.9	48.8	1035.0	19.2	969.3
2008	38.1	1097.1	20.2	1013.5	20.3	1020.8	20.3	1035.1	20.6	1264.3	78.7	1263.6	30.4	1065.4	12.5	981.8
2009	37.7	1134.8	19.9	1033.4	19.9	1040.7	20.0	1055.0	20.2	1284.6	79.3	1342.9	29.8	1095.1	12.0	993.8
2010	50.7	1185.5	25.6	1059.0	25.6	1066.3	25.7	1080.7	26.0	1310.6	96.1	1439.0	42.1	1137.2	17.0	1010.8
2011	43.7	1229.2	22.3	1081.3	22.3	1088.6	22.4	1103.1	22.7	1333.3	87.8	1526.9	35.3	1172.5	13.9	1024.7
2012	40.5	1269.7	21.1	1102.5	21.2	1109.8	21.2	1124.3	21.5	1354.8	85.2	1612.1	31.9	1204.5	12.6	1037.3
2013	40.4	1310.0	21.1	1123.6	21.1	1130.9	21.2	1145.5	21.4	1376.2	86.0	1698.1	31.7	1236.1	12.4	1049.8
2014	33.1	1343.2	18.4	1141.9	18.4	1149.3	18.4	1163.9	18.6	1394.8	78.4	1776.5	24.5	1260.6	9.7	1059.5
2015	31.1	1374.3	17.6	1159.6	17.6	1166.9	17.6	1181.5	17.8	1412.6	76.5	1853.0	22.4	1283.1	9.0	1068.5
2016	23.8	1398.1	14.9	1174.4	14.9	1181.8	14.9	1196.4	15.0	1427.7	66.4	1919.4	15.7	1298.8	6.7	1075.2
2017	23.2	1421.3	14.1	1188.5	14.1	1195.9	14.1	1210.5	14.2	1441.9	66.7	1986.1	15.0	1313.8	5.9	1081.0
2018	26.4	1447.7	15.3	1203.8	15.3	1211.1	15.3	1225.8	15.4	1457.4	70.6	2056.7	17.9	1331.7	6.9	1087.9
2019	20.8	1468.5	13.2	1217.0	13.2	1224.3	13.2	1239.0	13.3	1470.7	62.9	2119.6	12.7	1344.5	5.2	1093.1
2020	22.3	1490.8	14.2	1231.2	14.2	1238.6	14.3	1253.3	14.4	1485.0	67.3	2186.9	13.8	1358.2	5.6	1098.7
2021	20.5	1511.3	13.5	1244.7	13.5	1252.0	13.5	1266.8	13.6	1498.6	64.5	2251.4	12.1	1370.3	5.1	1103.8
2022	17.6	1528.8	12.0	1256.7	12.1	1264.1	12.1	1278.9	12.1	1510.8	60.4	2311.8	9.4	1379.7	3.9	1107.7
2023	16.9	1545.7	11.6	1268.3	11.6	1275.7	11.6	1290.5	11.7	1522.4	59.8	2371.7	8.7	1388.4	3.4	1111.1
2024	20.8	1566.5	13.5	1281.8	13.5	1289.2	13.5	1304.0	13.6	1536.1	67.0	2438.6	11.9	1400.3	4.7	1115.8
2025	17.0	1583.5	12.0	1293.8	12.0	1301.2	12.0	1316.0	12.0	1548.1	61.3	2499.9	8.6	1408.9	3.5	1119.3
2026	16.7	1600.2	12.0	1305.7	12.0	1313.1	12.0	1327.9	12.0	1560.1	61.4	2561.3	8.2	1417.2	3.4	1122.8
2027	15.3	1615.5	11.1	1316.8	11.1	1324.2	11.1	1339.0	11.1	1571.2	59.2	2620.5	6.9	1424.1	2.8	1125.5
2028	15.8	1631.2	11.5	1328.3	11.5	1335.7	11.5	1350.5	11.6	1582.8	60.8	2681.3	7.2	1431.2	2.9	1128.4
2029	15.2	1646.4	11.3	1339.7	11.3	1347.0	11.4	1361.9	11.4	1594.2	60.3	2741.6	6.6	1437.8	2.7	1131.1
2030	14.9	1661.4	11.3	1351.0	11.3	1358.4	11.4	1373.2	11.4	1605.6	61.5	2803.1	6.1	1443.9	2.5	1133.6
2031	16.0	1677.4	11.6	1362.6	11.6	1370.0	11.6	1384.8	11.6	1617.2	62.4	2865.5	7.2	1451.1	2.8	1136.4
2032	14.3	1691.7	10.9	1373.5	10.9	1380.9	10.9	1395.7	10.9	1628.2	59.6	2925.1	5.6	1456.8	2.2	1138.6
2033	13.3	1705.0	10.4	1383.9	10.4	1391.3	10.4	1406.2	10.5	1638.7	58.2	2983.3	4.8	1461.5	1.9	1140.5
2034	13.5	1718.5	10.8	1394.7	10.8	1402.1	10.8	1417.0	10.9	1649.5	60.1	3043.4	4.6	1466.2	1.9	1142.5
2035	13.5	1732.0	10.7	1405.5	10.7	1412.9	10.7	1427.8	10.8	1660.3	60.0	3103.3	4.6	1470.8	1.9	1144.4
2036	13.6	1745.6	10.7	1416.2	10.7	1423.6	10.7	1438.5	10.7	1671.0	60.0	3163.4	4.8	1475.6	1.8	1146.2
2037	13.7	1759.4	10.5	1426.7	10.5	1434.1	10.5	1448.9	10.5	1681.5	60.1	3223.5	4.9	1480.5	1.7	1147.9
2038	12.1	1771.4	9.9	1436.6	9.9	1444.0	9.9	1458.9	9.9	1691.5	57.1	3280.5	3.5	1484.0	1.3	1149.2
2039	14.2	1785.6	10.8	1447.4	10.8	1454.8	10.8	1469.7	10.9	1702.3	62.3	3342.9	5.0	1489.0	1.6	1150.9
2040	11.6	1797.2	9.7	1457.1	9.7	1464.5	9.7	1479.4	9.7	1712.0	56.3	3399.2	3.1	1492.1	1.1	1152.0
2041	11.5	1808.7	9.9	1467.0	9.9	1474.4	9.9	1489.3	9.9	1722.0	58.0	3457.2	2.7	1494.7	1.1	1153.0
2042	10.0	1818.7	8.9	1475.8	8.9	1483.2	8.9	1498.2	8.9	1730.8	52.6	3509.8	1.9	1496.6	0.8	1153.8
2043	12.9	1831.6	10.6	1486.4	10.6	1493.8	10.6	1508.7	10.6	1741.4	61.9	3571.7	3.6	1500.2	1.3	1155.1
2044	12.4	1844.0	10.2	1496.7	10.2	1504.1	10.2	1519.0	10.3	1751.7	60.3	3632.0	3.3	1503.5	1.1	1156.2
2045	11.6	1855.6	9.7	1506.4	9.7	1513.8	9.7	1528.7	9.7	1761.4	57.7	3689.7	2.9	1506.3	1.0	1157.1
2046	10.6	1866.3	9.5	1515.9	9.5	1523.3	9.5	1538.2	9.5	1770.9	56.4	3746.1	1.9	1508.2	0.8	1157.9
2047	10.6	1876.9	9.3	1525.2	9.3	1532.6	9.3	1547.5	9.3	1780.3	55.7	3801.8	2.0	1510.3	0.7	1158.6
2048	11.7	1888.6	9.4	1534.6	9.4	1542.0	9.4	1556.9	9.4	1789.6	56.9	3858.7	3.1	1		

Table 363150-6.
Tri+ PCB Load Over Northumberland Dam

Year	Step-down Upstream Boundary Tri+ PCB Load Assumption (0.16 kg/day to 0.0256 kg/day)										Constant Upstream Boundary Tri+ PCB Load Assumption (0.16 kg/day)		Step-down Upstream Boundary Tri+ PCB Load Assumption (0.16 kg/day to ZERO)			
	P3NAS2 (MNA)		R14S2 (REM-3/10/Select - No resuspension) - 5 yr dredge		R14RS (REM 3/10/Select - w/ 0.13% resuspension) - 5 yr dredge		R20RS (REM 3/10/Select - w/ 0.13% resuspension) - 6 yr dredge		R20RX (REM 3/10/Select - w/ 2.5% resuspension) - 6 yr dredge		P3NACW (No Action)		P3NAS0 (MNA)		R14S0 (REM-3/10/Select - No resuspension) - 5 yr dredge	
	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load
1998	274.4	274.4	274.4	274.4	274.4	274.4	274.4	274.4	274.4	274.4	274.4	274.4	274.4	274.4	274.4	274.4
1999	126.6	401.0	126.6	401.0	126.6	401.0	126.6	401.0	126.6	401.0	126.6	401.0	126.6	401.0	126.6	401.0
2000	151.9	552.9	151.9	552.9	151.9	552.9	151.9	552.9	151.9	552.9	151.8	552.8	151.9	552.9	151.9	552.9
2001	180.4	733.3	180.4	733.3	180.4	733.3	180.4	733.3	180.4	733.3	180.1	733.0	180.4	733.3	180.4	733.3
2002	122.7	856.0	122.7	856.0	122.7	856.0	122.7	856.0	122.7	856.0	123.0	856.0	122.7	856.0	122.7	856.0
2003	122.9	978.9	122.9	978.9	122.9	978.9	122.9	978.9	122.9	978.9	122.4	978.4	122.9	978.9	122.9	978.9
2004	98.7	1077.6	96.2	1075.1	97.5	1076.4	98.3	1077.1	117.2	1096.1	99.2	1077.6	98.7	1077.6	96.2	1075.1
2005	67.4	1145.0	57.5	1132.6	60.0	1136.4	64.0	1141.2	133.8	1229.8	104.7	1182.3	60.3	1137.9	50.4	1125.5
2006	77.8	1222.9	57.0	1189.6	59.7	1196.1	63.8	1205.0	141.0	1370.8	117.1	1299.3	70.4	1208.3	49.6	1175.1
2007	84.5	1307.3	51.1	1240.8	71.8	1267.9	69.8	1274.9	184.4	1555.2	123.6	1422.9	77.0	1285.3	43.7	1218.8
2008	45.1	1352.4	22.7	1263.5	22.9	1290.8	36.2	1311.1	111.8	1667.0	81.7	1504.6	38.1	1323.4	15.8	1234.7
2009	45.8	1398.2	22.4	1286.0	22.5	1313.3	22.6	1333.7	23.8	1690.8	83.4	1588.0	38.6	1362.0	15.3	1250.0
2010	73.7	1471.8	31.8	1317.7	31.9	1345.3	31.9	1365.6	33.7	1724.5	117.7	1705.7	65.3	1427.3	23.5	1273.5
2011	63.0	1534.8	27.2	1345.0	27.4	1372.6	27.4	1393.0	28.7	1753.2	105.3	1811.1	54.9	1482.2	19.3	1292.8
2012	54.1	1588.9	24.7	1369.7	24.8	1397.5	24.8	1417.8	25.9	1779.2	97.0	1908.1	45.9	1528.1	16.6	1309.4
2013	55.1	1644.0	24.9	1394.6	25.0	1422.5	25.0	1442.8	26.0	1805.2	99.4	2007.5	46.7	1574.7	16.5	1325.9
2014	41.1	1685.1	20.5	1415.1	20.6	1443.0	20.6	1463.4	21.3	1826.5	84.4	2092.0	32.8	1607.6	12.3	1338.2
2015	38.4	1723.5	19.5	1434.6	19.6	1462.6	19.6	1483.0	20.2	1846.6	82.0	2174.0	30.1	1637.7	11.2	1349.5
2016	28.1	1751.6	15.5	1450.1	15.5	1478.1	15.5	1498.5	15.9	1862.6	67.3	2241.3	20.6	1658.3	8.0	1357.4
2017	25.4	1776.9	14.6	1464.7	14.6	1492.7	14.6	1513.1	15.0	1877.6	65.6	2306.9	17.7	1676.0	7.0	1364.4
2018	34.6	1811.5	17.0	1481.7	17.1	1509.8	17.1	1530.2	17.5	1895.1	76.8	2383.7	26.5	1702.5	9.0	1373.4
2019	23.9	1835.4	13.7	1495.4	13.7	1523.5	13.7	1543.9	14.0	1909.2	63.0	2446.7	16.5	1719.0	6.2	1379.7
2020	26.5	1862.0	15.2	1510.5	15.2	1538.6	15.2	1559.1	15.5	1924.7	69.7	2516.4	18.3	1737.3	7.0	1386.6
2021	24.9	1886.9	14.3	1524.8	14.3	1552.9	14.3	1573.5	14.6	1939.3	67.1	2583.4	16.9	1754.2	6.3	1392.9
2022	19.3	1906.2	12.2	1537.1	12.2	1565.2	12.3	1585.7	12.5	1951.7	59.5	2643.0	11.7	1765.9	4.6	1397.5
2023	17.7	1923.9	11.6	1548.7	11.6	1576.8	11.6	1597.3	11.8	1963.5	57.7	2700.7	10.1	1775.9	4.0	1401.5
2024	25.6	1949.5	14.7	1563.4	14.7	1591.5	14.7	1612.1	15.0	1978.5	71.5	2772.2	16.9	1792.8	6.0	1407.5
2025	19.3	1968.8	12.3	1575.6	12.3	1603.8	12.3	1624.4	12.4	1991.0	61.5	2833.7	11.2	1804.0	4.2	1411.7
2026	19.7	1988.5	12.5	1588.1	12.5	1616.3	12.5	1636.8	12.6	2003.6	63.0	2896.7	11.4	1815.5	4.2	1415.9
2027	16.1	2004.5	11.0	1599.0	11.0	1627.3	11.0	1647.8	11.1	2014.7	57.1	2953.8	8.3	1823.7	3.2	1419.1
2028	17.6	2022.1	11.7	1610.8	11.7	1639.0	11.8	1659.6	11.9	2026.6	61.0	3014.8	9.3	1833.0	3.5	1422.5
2029	17.0	2039.0	11.6	1622.3	11.6	1650.6	11.6	1671.1	11.7	2038.2	60.7	3075.5	8.6	1841.6	3.2	1425.8
2030	16.1	2055.1	11.3	1633.7	11.3	1661.9	11.4	1682.5	11.4	2049.7	60.4	3135.9	7.6	1849.3	2.9	1428.7
2031	18.9	2074.0	12.3	1646.0	12.3	1674.2	12.3	1694.8	12.4	2062.1	65.1	3201.0	10.1	1859.4	3.5	1432.2
2032	15.9	2089.9	11.1	1657.1	11.2	1685.4	11.2	1705.9	11.2	2073.3	60.4	3261.4	7.4	1866.8	2.7	1434.8
2033	14.4	2104.3	10.5	1667.6	10.5	1695.9	10.5	1716.5	10.6	2083.9	57.6	3319.0	6.1	1872.9	2.3	1437.1
2034	14.6	2118.9	11.0	1678.6	11.0	1706.9	11.0	1727.5	11.1	2095.0	60.5	3379.5	5.9	1878.8	2.3	1439.4
2035	14.5	2133.5	10.9	1689.5	10.9	1717.8	10.9	1738.4	11.0	2105.9	60.0	3439.6	5.9	1884.7	2.2	1441.6
2036	14.9	2148.4	10.9	1700.5	10.9	1728.7	11.0	1749.3	11.0	2117.0	60.9	3500.5	6.1	1890.9	2.2	1443.8
2037	14.8	2163.1	10.7	1711.1	10.7	1739.4	10.7	1760.0	10.7	2127.7	60.4	3560.9	6.1	1896.9	2.0	1445.8
2038	12.4	2175.5	9.7	1720.9	9.7	1749.1	9.7	1769.7	9.8	2137.5	55.5	3616.5	4.1	1901.1	1.5	1447.3
2039	15.6	2191.1	11.3	1732.1	11.3	1760.4	11.3	1781.0	11.3	2148.8	64.4	3680.9	6.3	1907.4	2.0	1449.3
2040	12.0	2203.1	9.6	1741.7	9.6	1770.0	9.6	1790.6	9.6	2158.4	55.4	3736.3	3.7	1911.1	1.3	1450.6
2041	11.5	2214.6	9.6	1751.3	9.6	1779.6	9.6	1800.2	9.6	2168.0	55.6	3791.9	3.1	1914.2	1.2	1451.7
2042	9.6	2224.2	8.3	1759.6	8.3	1787.9	8.3	1808.5	8.3	2176.3	48.9	3840.8	2.1	1916.3	0.8	1452.6
2043	14.1	2238.3	11.0	1770.6	11.0	1798.9	11.0	1819.5	11.1	2187.4	64.0	3904.8	4.6	1920.9	1.5	1454.1
2044	13.3	2251.5	10.5	1781.1	10.5	1809.4	10.5	1830.0	10.5	2197.9	61.5	3966.3	4.1	1925.0	1.3	1455.4
2045	12.2	2263.8	9.8	1791.0	9.8	1819.2	9.8	1839.9	9.9	2207.8	58.0	4024.2	3.5	1928.5	1.1	1456.6
2046	10.8	2274.6	9.4	1800.3	9.4	1828.6	9.4	1849.3	9.4	2217.2	55.5	4079.7	2.3	1930.8	0.9	1457.4
2047	10.8	2285.4	9.2	1809.5	9.2	1837.8	9.2	1858.4	9.2	2226.4	54.6	4134.3	2.5	1933.3	0.8	1458.3
2048	11.8	2297.2	9.2	1818.7	9.2	1847.0										

Table 363150-7.
Tri+ PCB Load Over Federal Dam

Year	Step-down Upstream Boundary Tri+ PCB Load Assumption (0.16 kg/day to 0.0256 kg/day)										Constant Upstream Boundary Tri+ PCB Load Assumption (0.16 kg/day)		Step-down Upstream Boundary Tri+ PCB Load Assumption (0.16 kg/day to ZERO)			
	P3NAS2 (MNA)		R14S2 (REM-3/10/Select - No resuspension) - 5 yr dredge		R14RS (REM 3/10/Select - w/ 0.13% resuspension) - 5 yr dredge		R20RS (REM 3/10/Select - w/ 0.13% resuspension) - 6 yr dredge		R20RX (REM 3/10/Select - w/ 2.5% resuspension) - 6 yr dredge		P3NACW (No Action)		P3NAS0 (MNA)		R14S0 (REM-3/10/Select - No resuspension) - 5 yr dredge	
	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load	Annual Load	Cumulative Load
1998	330.3	330.3	330.3	330.3	330.3	330.3	330.3	330.3	330.3	330.3	330.3	330.3	330.3	330.3	330.3	330.3
1999	157.7	488.0	157.7	488.0	157.7	488.0	157.7	488.0	157.7	488.0	157.7	488.0	157.7	488.0	157.7	488.0
2000	205.5	693.5	205.5	693.5	205.5	693.5	205.5	693.5	205.5	693.5	205.5	693.5	205.5	693.5	205.5	693.5
2001	236.7	930.2	236.7	930.2	236.7	930.2	236.7	930.2	236.7	930.2	236.7	930.2	236.7	930.2	236.7	930.2
2002	137.8	1068.0	137.8	1068.0	137.8	1068.0	137.8	1068.0	137.8	1068.0	137.8	1068.0	137.8	1068.0	137.8	1068.0
2003	130.5	1198.5	130.5	1198.5	130.5	1198.5	130.5	1198.5	130.5	1198.5	130.5	1198.5	130.5	1198.5	130.5	1198.5
2004	95.7	1294.2	94.6	1293.2	95.2	1293.8	95.5	1294.1	104.0	1302.5	95.7	1294.2	95.7	1294.2	94.6	1293.1
2005	92.3	1386.5	87.1	1380.3	88.4	1382.2	90.6	1384.7	126.0	1428.6	111.4	1405.6	88.7	1382.9	83.5	1376.6
2006	105.0	1491.6	92.4	1472.7	93.9	1476.1	96.7	1481.3	139.7	1568.3	129.0	1534.6	100.5	1483.4	87.8	1464.4
2007	103.8	1595.3	81.4	1554.1	91.4	1567.5	91.9	1573.2	154.2	1722.4	128.9	1663.5	99.0	1582.4	76.6	1541.1
2008	50.6	1645.9	38.6	1592.7	46.8	1614.3	48.6	1621.9	107.5	1830.0	71.3	1734.8	46.6	1629.0	34.7	1575.8
2009	46.9	1692.8	32.9	1625.6	34.4	1648.7	40.2	1662.1	85.5	1915.5	67.6	1802.4	42.9	1671.9	29.0	1604.8
2010	93.7	1786.5	58.2	1683.7	60.5	1709.2	61.4	1723.5	84.8	2000.2	131.0	1933.4	86.6	1758.5	51.2	1656.0
2011	71.8	1858.3	41.7	1725.4	43.1	1752.3	43.7	1767.2	58.2	2058.5	103.8	2037.2	65.6	1824.2	35.7	1691.7
2012	65.7	1924.0	39.4	1764.8	40.6	1792.9	41.1	1808.3	53.6	2112.0	101.0	2138.2	59.0	1883.1	32.7	1724.5
2013	67.4	1991.4	39.6	1804.4	40.5	1833.4	41.0	1849.2	50.7	2162.7	104.6	2242.8	60.4	1943.5	32.6	1757.1
2014	49.2	2040.6	30.1	1834.5	30.8	1864.1	31.1	1880.3	37.7	2200.4	83.8	2326.6	42.6	1986.2	23.6	1780.7
2015	45.1	2085.7	27.3	1861.8	27.8	1891.9	28.1	1908.4	33.4	2233.8	80.3	2406.9	38.4	2024.5	20.7	1801.4
2016	26.7	2112.4	17.0	1878.8	17.3	1909.2	17.4	1925.8	20.6	2254.3	52.6	2459.5	21.8	2046.3	12.1	1813.5
2017	24.6	2137.1	16.0	1894.8	16.2	1925.4	16.3	1942.2	19.0	2273.3	51.7	2511.1	19.5	2065.8	10.8	1824.3
2018	33.5	2170.5	18.4	1913.2	18.6	1944.1	18.8	1960.9	21.3	2294.6	64.0	2575.2	27.7	2093.5	12.6	1837.0
2019	22.2	2192.7	13.9	1927.1	14.0	1958.1	14.1	1975.0	16.0	2310.6	48.7	2623.9	17.1	2110.6	8.8	1845.8
2020	28.5	2221.3	17.5	1944.6	17.6	1975.7	17.7	1992.8	19.7	2330.3	63.3	2687.2	21.9	2132.5	10.9	1856.6
2021	26.1	2247.3	15.8	1960.4	16.0	1991.7	16.0	2008.8	17.6	2347.9	60.0	2747.2	19.6	2152.1	9.4	1866.0
2022	18.3	2265.6	11.9	1972.3	12.0	2003.7	12.1	2020.9	13.2	2361.1	47.0	2794.2	12.8	2164.9	6.4	1872.5
2023	16.7	2282.3	11.1	1983.4	11.2	2014.9	11.2	2032.1	12.2	2373.2	45.2	2839.4	11.2	2176.1	5.7	1878.2
2024	29.4	2311.7	17.8	2001.2	17.9	2032.8	18.0	2050.1	19.3	2392.5	72.8	2912.2	21.2	2197.3	9.6	1887.7
2025	19.6	2331.3	12.5	2013.7	12.6	2045.4	12.7	2062.7	13.5	2406.0	53.4	2965.6	13.1	2210.4	6.1	1893.8
2026	19.4	2350.6	12.3	2026.1	12.4	2057.8	12.4	2075.2	13.1	2419.1	53.6	3019.3	12.8	2223.3	5.8	1899.6
2027	15.0	2365.6	10.2	2036.3	10.2	2068.0	10.3	2085.4	10.8	2429.9	45.3	3064.6	9.2	2232.5	4.4	1904.0
2028	17.8	2383.4	11.8	2048.1	11.9	2079.9	11.9	2097.3	12.5	2442.4	53.6	3118.2	10.9	2243.4	5.0	1909.1
2029	17.2	2400.6	11.7	2059.8	11.7	2091.6	11.7	2109.1	12.2	2454.6	53.9	3172.1	10.3	2253.7	4.7	1913.8
2030	15.9	2416.5	11.1	2070.9	11.1	2102.7	11.2	2120.2	11.6	2466.1	52.1	3224.2	9.0	2262.7	4.2	1918.0
2031	18.6	2435.1	12.1	2083.0	12.1	2114.9	12.2	2132.4	12.5	2478.7	58.2	3282.4	11.0	2273.7	4.6	1922.6
2032	15.3	2450.4	10.5	2093.5	10.5	2125.4	10.5	2142.9	10.8	2489.5	51.5	3333.9	8.4	2282.1	3.6	1926.2
2033	13.3	2463.7	9.5	2103.0	9.5	2134.9	9.5	2152.4	9.7	2499.2	47.0	3380.9	6.9	2289.0	3.1	1929.2
2034	15.4	2479.1	11.3	2114.3	11.3	2146.2	11.3	2163.8	11.6	2510.8	56.7	3437.6	7.5	2296.5	3.4	1932.7
2035	23.5	2502.6	19.6	2133.9	19.6	2165.8	19.6	2183.4	19.8	2530.6	62.6	3500.2	16.1	2312.6	12.2	1944.8
2036	33.3	2535.8	28.8	2162.7	28.8	2194.6	28.8	2212.2	29.0	2559.6	74.6	3574.8	25.4	2338.0	20.9	1965.8
2037	29.5	2565.3	25.1	2187.8	25.1	2219.7	25.1	2237.3	25.3	2584.9	69.9	3644.7	21.8	2359.8	17.4	1983.2
2038	20.7	2586.0	18.0	2205.7	18.0	2237.7	18.0	2255.3	18.1	2603.0	54.5	3699.2	14.3	2374.0	11.6	1994.7
2039	27.1	2613.1	22.5	2228.3	22.6	2260.3	22.6	2277.9	22.7	2625.7	72.7	3771.9	18.4	2392.4	13.9	2008.6
2040	16.4	2629.5	13.9	2242.2	13.9	2274.2	13.9	2291.8	14.0	2639.7	49.6	3821.4	10.1	2402.5	7.6	2016.2
2041	15.0	2644.5	14.0	2256.2	14.0	2288.2	13.1	2304.9	13.1	2652.9	49.0	3870.5	8.5	2411.0	7.5	2023.7
2042	10.4	2654.9	10.7	2266.9	10.7	2298.9	9.3	2314.1	9.3	2662.2	37.5	3908.0	5.3	2416.3	5.5	2029.3
2043	19.4	2674.4	18.1	2285.0	18.1	2317.0	16.3	2330.4	16.3	2678.5	67.3	3975.3	10.3	2426.6	9.0	2038.3
2044	19.8	2694.2	15.8	2300.8	15.8	2332.8	16.2	2346.6	16.3	2694.8	64.2	4039.5	11.4	2438.0	7.3	2045.6
2045	15.6	2709.8	12.3	2313.1	12.3	2345.2	13.0	2359.7	13.1	2707.9	52.7	4092.2	8.5	2446.6	5.3	2050.9
2046	14.2	2724.0	11.8	2324.9	11.8	2356.9	12.4	2372.1	12.5	2720.4	52.1	4144.3	7.0	2453.5	4.5	2055.4
2047	12.0	2736.0	9.8	2334.7	9.8	2366.8	10.3	2382.4	10.3	2730.8	46.0	4190.3	5.5	2459.0	3.4	2058.8
2048	12.2	2748.2	9.5	2344.2												

Application of the Depth of Scour Model (DOSM) in the Thompson
Island Pool for Alternative Flooding Assumptions
407426

Table 407426-1

**Summary of Hydrodynamic Model Predictions for RBMR (47,330 cfs) and
Estimated Upper Limit (61,835 cfs) 100-Year Peak Flows**

	Sediment Type	47,330 cfs	61,835 cfs
Average Velocity (ft/s)	Cohesive	2.54	2.93
	Non-Cohesive	3.65	4.04
Average Water Depth (ft)	Cohesive	12.65	14.41
	Non-Cohesive	17.93	19.81
Average Shear Stress (dynes/cm²)	Cohesive	16.79	21.32
	Non-Cohesive	29.15	34.65

Table 407426-2

Poolwide Thompson Island Pool Average Surficial Sediment Concentrations

Type of Data	Tri+ PCB (mg/kg)	Total PCB (mg/kg)
1984 data (0-30 cm)	51 (cohesive)	170* (cohesive)
1991 GE data (0-5 cm)	16	32
* Based on Total to Tri+ PCB ratio of 3.4		

Table 407426-3

Shear Stresses at High-Resolution Core Locations

Core Name	Shear Stress at 47,330 cfs (dynes/cm²)	Shear Stress at 61,835 cfs (dynes/cm²)
HR-19	12.7	15.0
HR-20	29.8	34.7
HR-23	19.1	31.0
HR-25	53.1	36.0
HR-26	31.7	11.2

Table 407426-4

Erosion Depth Comparison at High-Resolution Core Locations

Core Name	PCB Peak Depth (cm)	Low Erosion (5 th percentile) (cm)		Median Erosion (50 th percentile) (cm)		High Erosion (95 th percentile) (cm)	
		47,330 cfs	61,835 cfs	47,330 cfs	61,835 cfs	47,330 cfs	61,835 cfs
HR-19	22	0.016	0.026	0.074	0.126	0.356	0.619
HR-20	26	0.311	0.468	1.820	2.589	7.695	12.191
HR-23	30	0.030	0.116	0.158	0.690	0.819	4.094
HR-25	5	0.500	0.182	3.714	1.134	21.789	7.472
HR-26	18	0.275	0.014	1.643	0.068	8.262	0.318

Table 407426-5

Thompson Island Pool Expected Values of Solids Erosion and Mean Depth of Scour

Erosion Type	47,330 cfs	61,835 cfs
Depth (cm)	0.317	0.719
Solids (kg)	1,740,000	3,810,000

Table 407426-6

Thompson Island Pool (TIP) Expected Values of Tri+ PCB Erosion in Comparison to PCB Inventory Estimates

River Flow	Tri+ PCB (kg)	
	1984 Data	1991 GE Data
47,330 cfs	89	30
61,835 cfs	190	60
PCB Inventory for TIP*	8,000	8,000
* See White Paper - Sediment PCB Inventory Estimates for calculations		

Table 407426-7

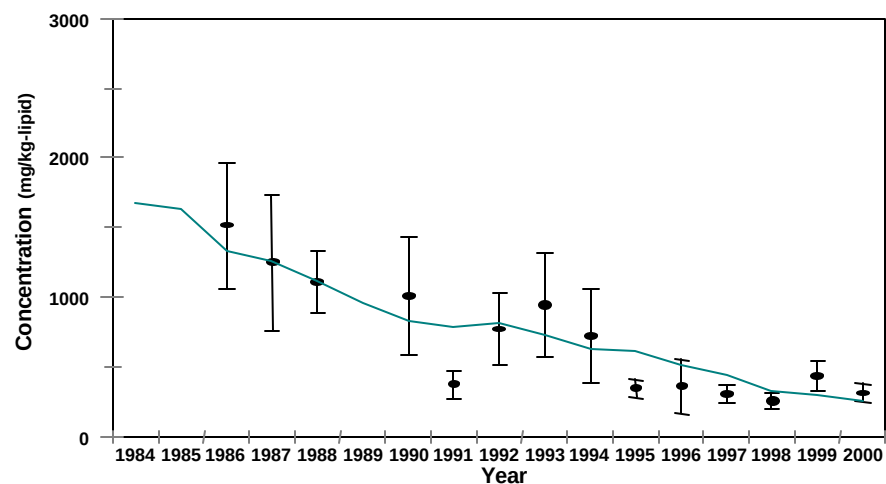
Thompson Island Pool (TIP) Expected Values of Total PCB Erosion in Comparison to PCB Inventory Estimates

River Flow	Total PCB (kg)	
	1984 Data	1991 GE Data
47,330 cfs	300 ⁺	60
61,835 cfs	650 ⁺	120
PCB Inventory for TIP*	22,000 ⁺	22,000 ⁺
* Based on Total to Tri+ PCB ratio of 3.4		
* See White Paper - Sediment PCB Inventory Estimates for calculations		

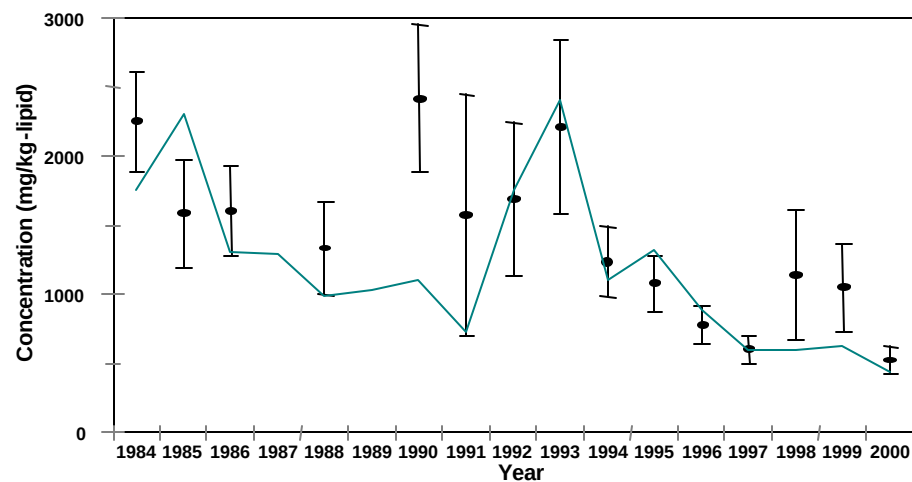
Contaminant Risks and Geochemistry

Trends in PCB Concentrations in Fish in the Upper Hudson River 312627

Brown Bullhead



Largemouth Bass



Pumpkinseed

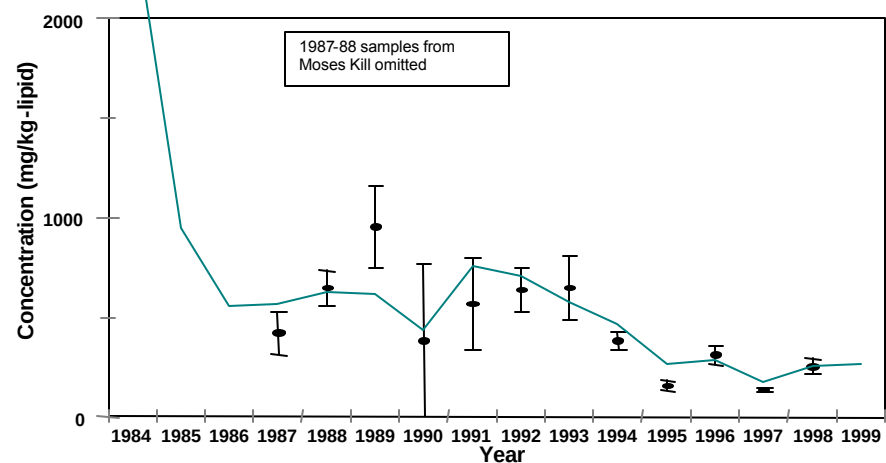


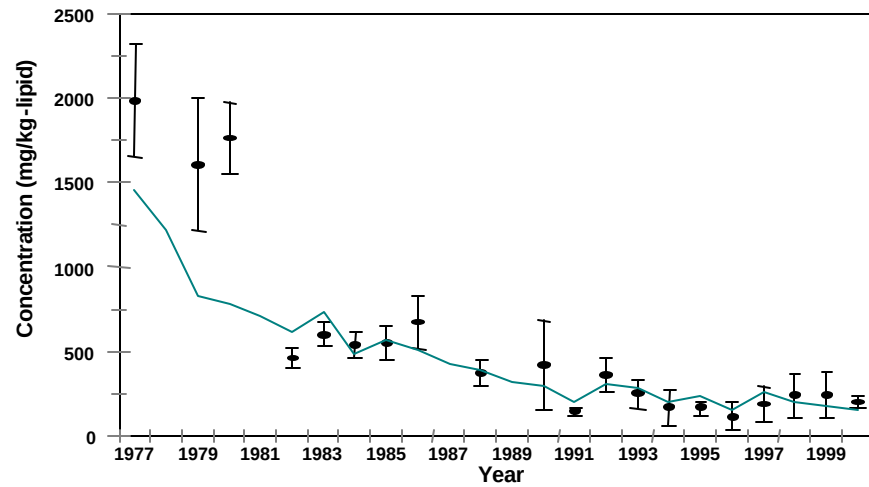
Figure 312627-1. Lipid-based Tri+ PCB Concentrations in Fish, Thompson Island Pool (RM 189) (Revised)

Vertical bars show arithmetic means and 95% confidence limits for NYSDEC observations, converted to a consistent Tri+ basis.

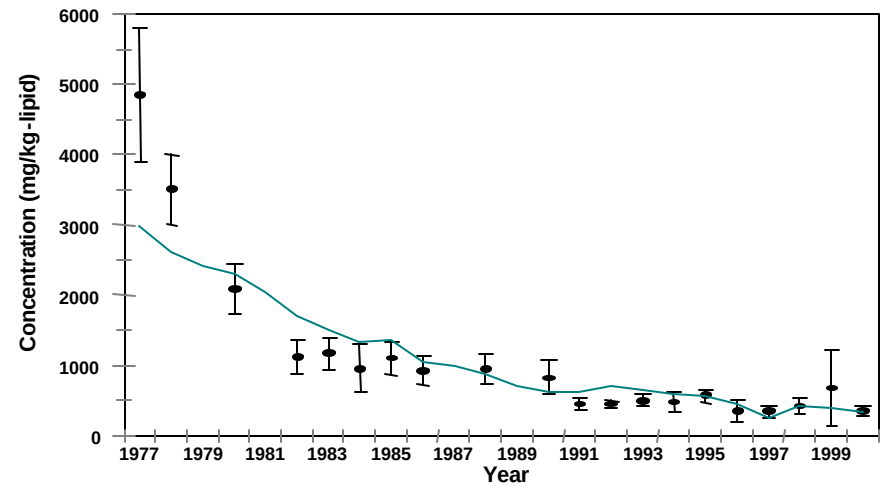
Solid line shows FISHRAND median predictions.

Note 2000 FISHRAND predictions are based on HUDTOX forecast runs rather than actual hydrology and upstream boundary loads.

Brown Bullhead



Largemouth Bass



Pumpkinseed

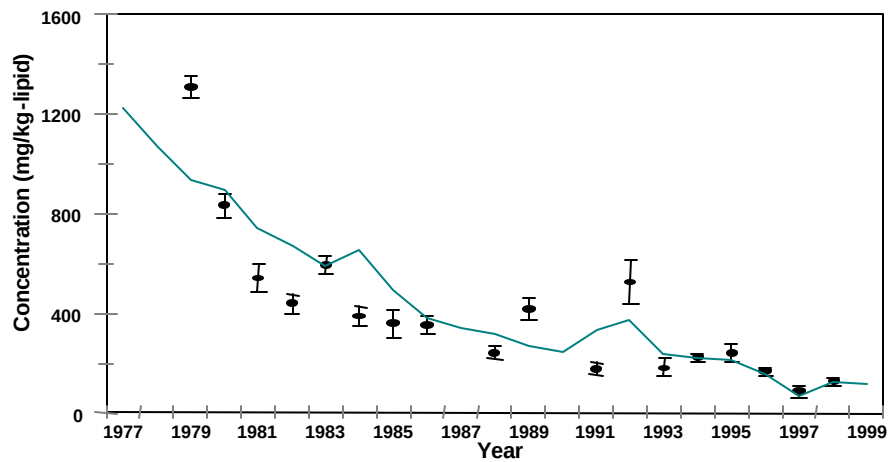


Figure 312627-2. Lipid-based Tri+ PCB Concentrations in Fish, Stillwater Reach (Revised)

Vertical bars show arithmetic means and 95% confidence limits for NYSDEC observations, converted to a consistent Tri+ basis.

Solid line shows FISHRAND median predictions.

Note: 2000 FISHRAND predictions are based on HUDTOX forecast runs rather than actual hydrology and upstream boundary loads.

Table 312627-1. Half-Life Comparison of Model and Data Lipid-Based Annual Average PCB Concentrations in Fish

		Thompson Island Pool (RM 189)					Stillwater Reach (RM 168–176)				
		1985–99	1985-91	1995-2000	1999-2004	1999-2020	1985–99	1985-91	1995-2000	1999-2004	1999-2020
Brown Bull-head	Data - Consistent Tri+	5.93 (1986-00)	3.06 (1986-91)	577.76			8.77	3.61	Increasing		
	Model	6.06	4.42	3.83	8.75	12.65	9.06	10.69	11.52	5.89	12.30
Large-mouth Bass	Data - Consistent Tri+	10.66	Increasing	11.57			10.54	6.10	356.50		
	Model	10.19	5.05	3.65	12.66	25.16	8.22	9.10	10.44	6.52	13.18
Pump-kinseed	Data - Consistent Tri+	5.91 (1987-98)	Increasing (1987-91)	Increasing (1995-98)			7.96 (1985-98)	7.43	2.66 (1995-98)		
	Model	6.52	7.44	7.07	38.62	35.38	6.52	11.40	5.64	6.06	13.09
Yellow Perch	Data - Consistent Tri+								Increasing		
	Model	6.48	5.74	4.02	14.87	25.44	10.90	9.80	Increasing	6.36	12.37

Notes:

Consistent Tri+: NYSDEC data converted to consistent Tri+ basis (see RBMR) plus NEA congener data for 1998-2000.
Model: Output of HUDTOX/FISHRAND models on lipid basis, including 1991 sediment reinitialization and 1998–99 validation using observed hydrology and upstream loads. Forecasts represent No Action simulation with constant load upstream boundary. Model trends calculated on annualized arithmetic means computed from 25th, 50th, and 95th percentile estimates.

Relative Reduction of Human Health and Ecological Risks in the
Mid- and Lower Hudson River
313699

Table 313699-1
Mid-Hudson River Species-Weighted Fish Fillet Average PCB Concentrations (mg/kg)

	No Action	MNA	CAP-3/10/Select	REM-3/10/S 5-yr 0% resuspension	REM-3/10/S 6-yr 0.13% resuspension	REM-3/10/S 6-yr 2.5% resuspension	REM-0/0/3
Year	Mid-River Average	Mid-River Average	Mid-River Average	Mid-River Average	Mid-River Average	Mid-River Average	Mid-River Average
1999	1.236	1.236	1.236	1.227	1.236	1.236	1.134
2000	1.134	1.134	1.134	1.127	1.134	1.134	1.162
2001	1.163	1.163	1.163	1.159	1.163	1.163	1.027
2002	0.971	1.027	1.027	1.022	1.027	1.027	0.899
2003	0.857	0.899	0.899	0.895	0.899	0.900	0.698
2004	0.664	0.700	0.698	0.694	0.700	0.718	0.619
2005	0.627	0.631	0.621	0.616	0.630	0.720	0.573
2006	0.683	0.616	0.585	0.584	0.602	0.792	0.466
2007	0.614	0.530	0.484	0.480	0.506	0.744	0.373
2008	0.530	0.443	0.385	0.381	0.438	0.783	0.309
2009	0.458	0.371	0.320	0.315	0.362	0.686	0.271
2010	0.496	0.375	0.296	0.289	0.318	0.502	0.260
2011	0.564	0.399	0.298	0.289	0.313	0.458	0.215
2012	0.508	0.348	0.254	0.246	0.263	0.367	0.214
2013	0.556	0.361	0.258	0.251	0.264	0.352	0.187
2014	0.500	0.320	0.227	0.220	0.231	0.296	0.161
2015	0.442	0.270	0.196	0.189	0.198	0.246	0.132
2016	0.361	0.218	0.160	0.153	0.161	0.195	0.115
2017	0.322	0.194	0.140	0.135	0.141	0.167	0.106
2018	0.311	0.183	0.129	0.124	0.129	0.150	0.090
2019	0.264	0.158	0.110	0.106	0.109	0.125	0.096
2020	0.306	0.174	0.118	0.114	0.117	0.131	0.091
2021	0.293	0.163	0.112	0.108	0.111	0.122	0.082
2022	0.263	0.143	0.099	0.097	0.099	0.108	0.075
2023	0.243	0.130	0.091	0.089	0.091	0.098	0.077
2024	0.259	0.133	0.093	0.091	0.092	0.099	0.080
2025	0.286	0.139	0.097	0.095	0.096	0.102	0.076
2026	0.276	0.129	0.091	0.089	0.090	0.095	0.067
2027	0.235	0.111	0.079	0.077	0.079	0.083	0.065
2028	0.228	0.105	0.076	0.074	0.076	0.079	0.069
2029	0.259	0.112	0.082	0.079	0.081	0.084	0.068
2030	0.263	0.108	0.080	0.077	0.079	0.082	0.064
2031	0.243	0.101	0.075	0.073	0.074	0.076	0.064
2032	0.254	0.100	0.075	0.073	0.074	0.075	0.062
2033	0.242	0.093	0.071	0.069	0.070	0.071	0.062
2034	0.237	0.091	0.070	0.069	0.070	0.071	0.082
2035	0.278	0.112	0.092	0.090	0.091	0.092	0.106
2036	0.249	0.135	0.116	0.115	0.116	0.117	0.128
2037	0.282	0.160	0.140	0.137	0.139	0.140	0.125
2038	0.286	0.156	0.136	0.134	0.136	0.137	0.114
2039	0.304	0.143	0.125	0.122	0.124	0.125	0.105
2040	0.331	0.130	0.114	0.112	0.113	0.114	0.087
2041	0.279	0.107	0.096	0.093	0.094	0.094	0.075
2042	0.241	0.091	0.086	0.084	0.081	0.081	0.080
2043	0.294	0.098	0.093	0.091	0.086	0.086	0.088
2044	0.335	0.109	0.097	0.095	0.094	0.094	0.084
2045	0.309	0.104	0.089	0.087	0.089	0.089	0.078
2046	0.289	0.094	0.081	0.080	0.082	0.083	0.078

BOLD-ITALICIZED - First occurrence of species-weighted fish fillet average PCB concentration below human health risk-based fish ingestion RG (0.05 mg/kg, 1 meal/week), and other targets (0.2 mg/kg, 1 meal/month; 0.4 mg/kg, 1 meal/2 months).

Mid-Hudson River average is weighted by river section length. RM 152 (RMs 153.5 to 123.5) = 33.3%, RM 113 (RMs 123.5 to 93.5) = 33.3%, and RM 90 (RMs 93.5 to 63.5) = 33.3%.

Responsiveness Summary

Hudson River PCBs Site Record of Decision

Table 313699-2
Long-Term Fish Ingestion Cancer Risks
Mid-Hudson River - Adult Angler

Scenario Time Frame: Long-Term Post-Remediation (2011 on)

Exposure Medium: Fish

Exposure Point: Mid-Hudson River

Exposure Route: Ingestion

Chemical of Potential Concern: PCBs

Receptor Population: Angler

Remedial Alternative	PCB Conc. in Fish (mg/kg ww)	Intake (Cancer) (mg/kg-day)	Cancer Slope Factor (mg/kg-day)	Cancer Risk
Reasonable Maximum Exposure				
Mid-Hudson Average				
No Action Alternative Start Year 2011	0.31	8.2E-05	2	1.6E-04
No Action Alternative Start Year 2012	0.30	7.9E-05	2	1.6E-04
MNA Alternative Start Year 2011	0.16	4.1E-05	2	8.2E-05
MNA Alternative Start Year 2012	0.15	3.8E-05	2	7.6E-05
CAP-3/10/S Start Year 2011	0.12	3.2E-05	2	6.4E-05
REM-3/10/S Start Year 2011	0.12	3.2E-05	2	6.4E-05
R20RS (6-yr 0.13% resusp.) SY 2011	0.12	3.2E-05	2	6.4E-05
R20RX (6-yr 2.5% resusp.) SY 2011	0.14	3.7E-05	2	7.5E-05
REM-0/0/3 Start Year 2012	0.10	2.5E-05	2	5.1E-05
Central Tendency				
Mid-Hudson Average				
No Action Alternative Start Year 2011	0.41	3.2E-06	1	3.2E-06
No Action Alternative Start Year 2012	0.36	2.9E-06	1	2.9E-06
MNA Alternative Start Year 2011	0.26	2.1E-06	1	2.1E-06
MNA Alternative Start Year 2012	0.22	1.7E-06	1	1.7E-06
CAP-3/10/S Start Year 2011	0.19	1.5E-06	1	1.5E-06
REM-3/10/S (5-yr no re.) SY 2011	0.19	1.5E-06	1	1.5E-06
REM-3/10/S (6-yr 0.13% re.) SY 2011	0.20	1.5E-06	1	1.5E-06
REM-3/10/S (6-yr 2.5% re.) SY 2011	0.26	2.0E-06	1	2.0E-06
REM-0/0/3 Start Year 2012	0.13	1.0E-06	1	1.0E-06

Notes:

Numbers have been rounded to two significant figures and therefore do not show subtle differences among scenarios.

Mid-Hudson River average is weighted by river section length. RM 152 (RMs 153.5 to 123.5) = 33.3%,

RM 113 (RMs 123.5 to 93.5) = 33.3%, and RM 90 (RMs 93.5 to 63.5) = 33.3%.

Table 313699-3
Long-Term Fish Ingestion Non-Cancer Hazard Indices
Mid-Hudson River - Adult Angler

Scenario Time Frame: Long-Term Post-Remediation (2011 on)

Exposure Medium: Fish

Exposure Point: Mid-Hudson River

Exposure Route: Ingestion

Chemical of Potential Concern: PCBs

Receptor Population: Angler

Remedial Alternative	PCB Conc. in Fish (mg/kg ww)	Intake (Non-Cancer) (mg/kg-day)	Reference Dose (mg/kg-day)	Hazard Index
Reasonable Maximum Exposure				
Mid-Hudson Average				
No Action Alternative Start Year 2011	0.49	2.2E-04	2.0E-05	11
No Action Alternative Start Year 2012	0.43	2.0E-04	2.0E-05	9.8
MNA Alternative Start Year 2011	0.33	1.5E-04	2.0E-05	7.5
MNA Alternative Start Year 2012	0.27	1.2E-04	2.0E-05	6.2
CAP-3/10/S Start Year 2011	0.24	1.1E-04	2.0E-05	5.5
REM-3/10/S Start Year 2011	0.25	1.1E-04	2.0E-05	5.6
R20RS (6-yr 0.13% resusp.) SY 2011	0.25	1.1E-04	2.0E-05	5.7
R20RX (6-yr 2.5% resusp.) SY 2011	0.35	1.6E-04	2.0E-05	7.9
REM-0/0/3 Start Year 2012	0.16	7.4E-05	2.0E-05	3.7
Central Tendency				
Mid-Hudson Average				
No Action Alternative Start Year 2011	0.41	1.9E-05	2.0E-05	0.9
No Action Alternative Start Year 2012	0.36	1.7E-05	2.0E-05	0.8
MNA Alternative Start Year 2011	0.26	1.2E-05	2.0E-05	0.6
MNA Alternative Start Year 2012	0.22	1.0E-05	2.0E-05	0.5
CAP-3/10/S Start Year 2011	0.19	8.7E-06	2.0E-05	0.4
REM-3/10/S Start Year 2011	0.19	8.9E-06	2.0E-05	0.4
R20RS (6-yr 0.13% resusp.) SY 2011	0.20	9.0E-06	2.0E-05	0.4
R20RX (6-yr 2.5% resusp.) SY 2011	0.26	1.2E-05	2.0E-05	0.6
REM-0/0/3 Start Year 2012	0.13	6.0E-06	2.0E-05	0.3

Notes:

Numbers have been rounded to two significant figures and therefore do not show subtle differences among scenarios.

Mid-Hudson River average is weighted by river section length. RM 152 (RMs 153.5 to 123.5) = 33.3%,

RM 113 (RMs 123.5 to 93.5) = 33.3%, and RM 90 (RMs 93.5 to 63.5) = 33.3%.

Table 313699-4
Modeled Times (Years) of Compliance with Human Health Risk-Based Concentrations
Mid-Hudson River

Selected Remedy	Human Health risk-based RG 0.05 mg/kg	Fish Target Concentration 0.2 mg/kg	Fish Target Concentration 0.4 mg/kg
Mid-Hudson River Average			
No Action	>2046	>2046	2016
Monitored Natural Attenuation	>2046	2017	2009
CAP-3/10/Select	>2046	2015	2008
REM-3/10/Select 5-yr 0% resuspension	>2046	2015	2008
REM-3/10/Select 6-yr 0.13% resuspension	>2046	2015	2009
REM-3/10/Select 6-yr 2.5% resuspension	>2046	2016	2012
REM-0/0/3	>2046	2013	2007

Notes:

Mid-Hudson River average is weighted by river section length. RM 152 (RMs 153.5 to 123.5) = 33.3%,
RM 113 (RMs 123.5 to 93.5) = 33.3%, and RM 90 (RMs 93.5 to 63.5) = 33.3%.

Modeling extends until 2046.

Table 313699-5

Lower Hudson River Whole Fish Largemouth Bass Average PCB Concentrations (mg/kg)

Year	No Action Lower River Ave.	MNA Lower River Ave.	CAP-3/10/Select Lower River Ave.	REM-3/10/S 5-yr 0% resuspension Lower River Ave.	REM-3/10/S 6-yr 0.13% resuspension Lower River Ave.	REM-3/10/S 6-yr 2.5% resuspension Lower River Ave.	REM-0/0/3 Lower River Ave.
1999	3.182	3.673	3.673	3.647	3.673	3.673	3.673
2000	2.941	3.296	3.296	3.277	3.296	3.296	3.296
2001	3.027	3.293	3.293	3.282	3.293	3.293	3.293
2002	2.755	2.958	2.958	2.944	2.958	2.958	2.958
2003	2.482	2.636	2.636	2.624	2.636	2.636	2.636
2004	1.983	2.114	2.112	2.101	2.114	2.141	2.112
2005	1.819	1.881	1.862	1.851	1.879	2.049	1.859
2006	1.890	1.788	1.722	1.717	1.756	2.159	1.697
2007	1.722	1.566	1.457	1.446	1.499	2.014	1.415
2008	1.520	1.349	1.199	1.190	1.322	2.119	1.168
2009	1.297	1.134	1.016	1.007	1.111	1.874	0.991
2010	1.357	1.096	0.906	0.891	0.968	1.448	0.854
2011	1.531	1.162	0.891	0.868	0.938	1.352	0.801
2012	1.381	1.025	0.764	0.745	0.796	1.112	0.672
2013	1.512	1.054	0.763	0.744	0.785	1.054	0.654
2014	1.382	0.956	0.683	0.663	0.697	0.905	0.579
2015	1.252	0.829	0.601	0.583	0.611	0.770	0.508
2016	1.054	0.694	0.507	0.490	0.513	0.629	0.428
2017	0.940	0.614	0.449	0.434	0.452	0.542	0.379
2018	0.908	0.569	0.412	0.399	0.414	0.485	0.347
2019	0.767	0.493	0.356	0.346	0.356	0.408	0.300
2020	0.849	0.514	0.364	0.353	0.363	0.409	0.303
2021	0.811	0.484	0.345	0.336	0.343	0.382	0.288
2022	0.738	0.435	0.314	0.307	0.313	0.343	0.265
2023	0.679	0.397	0.290	0.283	0.288	0.313	0.245
2024	0.705	0.392	0.286	0.280	0.283	0.304	0.242
2025	0.771	0.409	0.296	0.290	0.293	0.312	0.250
2026	0.764	0.386	0.282	0.276	0.280	0.295	0.240
2027	0.668	0.343	0.254	0.249	0.252	0.265	0.218
2028	0.637	0.322	0.242	0.237	0.240	0.250	0.209
2029	0.702	0.333	0.251	0.245	0.249	0.259	0.217
2030	0.714	0.325	0.248	0.240	0.246	0.254	0.215
2031	0.668	0.304	0.234	0.228	0.232	0.238	0.205
2032	0.702	0.304	0.234	0.229	0.232	0.236	0.206
2033	0.679	0.290	0.226	0.221	0.224	0.227	0.200
2034	0.653	0.276	0.219	0.214	0.217	0.219	0.194
2035	0.744	0.314	0.259	0.254	0.257	0.259	0.233
2036	0.664	0.366	0.314	0.311	0.312	0.315	0.286
2037	0.749	0.434	0.378	0.372	0.376	0.378	0.346
2038	0.754	0.434	0.380	0.373	0.378	0.381	0.349
2039	0.807	0.406	0.355	0.349	0.353	0.355	0.327
2040	0.890	0.384	0.337	0.331	0.335	0.337	0.312
2041	0.788	0.330	0.295	0.289	0.291	0.293	0.272
2042	0.681	0.289	0.270	0.265	0.257	0.259	0.242
2043	0.797	0.294	0.279	0.273	0.261	0.262	0.246
2044	0.898	0.317	0.286	0.280	0.277	0.278	0.261
2045	0.846	0.306	0.270	0.264	0.267	0.268	0.253
2046	0.807	0.283	0.250	0.246	0.251	0.251	0.239

BOLD-ITALICIZED - First occurrence of average PCB concentration below ecological RG range of 0.03 to 0.3 ppm in whole body fish based on the river otter.

Lower Hudson River average is weighted by river section length. RM 152 (RMs 153.5 to 123.5) = 25%, RM 113 (RMs 123.5 to 93.5) = 25%.

RM 90 (RMs 93.5 to 63.5) = 25%, and RM 50 (RMs 63.5 to 33.5) = 25%.

Table 313699-6
Lower Hudson River Whole Fish Spottail Shiner Average PCB Concentrations (mg/kg)

Year	No Action Lower River Ave.	MNA Lower River Ave.	CAP-3/10/Select Lower River Ave.	REM-3/10/S 5-yr 0% resuspension Lower River Ave.	REM-3/10/S 6-yr 0.13% resuspension Lower River Ave.	REM-3/10/S 6-yr 2.5% resuspension Lower River Ave.	REM-0/0/3 Lower River Ave.
1999	0.967	0.967	0.967	0.961	0.967	0.967	0.967
2000	0.909	0.909	0.909	0.905	0.909	0.909	0.909
2001	0.914	0.914	0.914	0.911	0.914	0.914	0.914
2002	0.806	0.806	0.806	0.804	0.806	0.806	0.806
2003	0.704	0.704	0.704	0.701	0.704	0.704	0.704
2004	<i>0.536</i>	<i>0.573</i>	<i>0.571</i>	<i>0.569</i>	<i>0.573</i>	<i>0.595</i>	<i>0.571</i>
2005	0.506	0.512	0.503	0.498	0.509	0.597	0.500
2006	0.526	0.492	0.472	0.469	0.482	0.604	0.463
2007	0.468	0.422	0.392	0.392	0.406	0.587	0.380
2008	0.411	0.362	0.321	0.319	0.355	0.571	0.313
2009	0.341	0.294	0.270	0.268	0.286	0.448	0.264
2010	0.399	0.314	0.255	0.250	0.271	0.405	0.238
2011	0.400	0.306	0.236	0.230	0.248	0.357	0.213
2012	0.384	0.286	0.213	0.207	0.221	0.305	0.186
2013	0.410	0.287	0.211	0.205	0.217	0.288	0.181
2014	0.376	0.255	0.185	0.180	0.189	0.242	0.157
2015	0.347	0.227	0.165	0.160	0.168	0.209	0.140
2016	0.284	0.187	0.137	0.133	0.139	0.170	0.116
2017	0.259	0.169	0.124	0.120	0.125	0.149	0.105
2018	0.253	0.160	0.115	0.112	0.115	0.134	0.096
2019	0.209	0.135	0.098	0.096	0.098	0.113	0.083
2020	0.239	0.144	0.103	0.100	0.102	0.115	0.086
2021	0.221	0.132	0.095	0.092	0.095	0.104	0.080
2022	0.198	0.119	0.087	0.085	0.086	0.094	0.073
2023	0.189	0.111	0.081	0.080	0.081	0.088	<i>0.069</i>
2024	0.203	0.112	0.082	0.080	0.081	0.087	0.070
2025	0.208	0.112	0.081	0.080	0.081	0.086	0.069
2026	0.207	0.105	0.077	0.075	0.076	0.080	0.066
2027	0.184	0.095	0.071	<i>0.070</i>	0.071	0.074	0.061
2028	0.191	0.094	0.071	0.069	0.071	0.074	0.062
2029	0.196	0.093	0.071	0.069	<i>0.070</i>	0.073	0.062
2030	0.194	0.090	<i>0.069</i>	0.067	0.068	0.071	0.060
2031	0.192	0.088	0.067	0.065	0.066	<i>0.068</i>	0.059
2032	0.198	0.086	0.066	0.065	0.066	0.067	0.058
2033	0.189	0.081	0.064	0.062	0.063	0.064	0.056
2034	0.189	0.078	0.062	0.061	0.062	0.063	0.056
2035	0.203	0.093	0.076	0.075	0.076	0.077	0.069
2036	0.187	0.107	0.092	0.091	0.092	0.093	0.085
2037	0.200	0.117	0.102	0.101	0.102	0.102	0.094
2038	0.200	0.114	0.101	0.099	0.100	0.101	0.093
2039	0.231	0.111	0.098	0.096	0.097	0.098	0.090
2040	0.235	0.101	0.089	0.088	0.089	0.089	0.083
2041	0.222	0.092	0.083	0.081	0.081	0.082	0.076
2042	0.191	0.080	0.076	0.074	0.072	0.072	0.068
2043	0.223	0.084	0.079	0.077	0.075	0.075	0.070
2044	0.251	0.091	0.081	0.078	0.079	0.079	0.074
2045	0.231	0.084	0.074	0.073	0.074	0.074	0.070
2046	0.228	0.080	0.070	0.069	0.071	0.071	0.067

BOLD-ITALICIZED - First occurrence of average PCB concentration below ecological risk-based concentration range of 0.07 to 0.7 ppm in whole body fish for mink. Lower Hudson River average is weighted by river section length. RM 152 (RMs 153.5 to 123.5) = 25%, RM 113 (RMs 123.5 to 93.5) = 25%, RM 90 (RMs 93.5 to 63.5) = 25%, and RM 50 (RMs 63.5 to 33.5) = 25%.

Table 313699-7
Average (25-year) PCB Toxicity Quotients - Ecological Receptors

Selected Remedy	River Otter		Mink	
	LOAEL	NOAEL	LOAEL	NOAEL
Lower Hudson River Average				
No Action Start Year 2011	5.0	50	1.1	11
No Action Start Year 2012	4.9	49	1.0	10
Monitored Natural Attenuation Start Year 2011	2.9	29	0.6	6.2
Monitored Natural Attenuation Start Year 2012	2.8	28	0.6	6.0
CAP-3/10/Select Start Year 2011	2.3	23	0.5	4.8
REM-3/10/Select 5-yr 0% Resuspension Start Year 2011	2.2	22	0.5	4.7
REM-3/10/Select 6-yr 0.13% Resuspension Start Year 2011	2.1	22	0.5	4.6
REM-3/10/Select 6-yr 2.5% Resuspension Start Year 2011	2.6	26	0.5	5.4
REM-0/0/3 Start Year 2012	1.8	18	0.4	3.8

Notes: Toxicity quotients represent a 25-year average.

Lower Hudson River average is weighted by river section length. RM 152 (RMs 153.5 to 123.5) = 25%, RM 113 (RMs 123.5 to 93.5) = 25%, RM 90 (RMs 93.5 to 63.5) = 25%, and RM 50 (RMs 63.5 to 33.5) = 25%.
 Bolded values indicate toxicity quotients greater than one.

Table 313699-8
Modeled Times of Compliance with Ecological RGs and Risk-Based Concentrations

Selected Remedy	River Otter		Mink	
	LOAEL	NOAEL	LOAEL	NOAEL
Lower Hudson River Average				
No Action	> 2046	> 2046	2004	> 2046
Monitored Natural Attenuation	2033	> 2046	2004	> 2046
CAP-3/10/Select	2023	> 2046	2004	2030
REM-3/10/Select 5-yr 0% Resuspension	2023	> 2046	2004	2027
REM-3/10/Select 6-yr 0.13% Resuspension	2023	> 2046	2004	2029
REM-3/10/Select 6-yr 2.5% Resuspension	2026	> 2046	2004	2031
REM-0/0/3	2019	> 2046	2004	2023

Notes: Modeling extends until 2046.

Lower Hudson River average is weighted by river section length. RM 152 (RMs 153.5 to 123.5) = 25%, RM 113 (RMs 123.5 to 93.5) = 25%, RM 90 (RMs 93.5 to 63.5) = 25%, and RM 50 (RMs 63.5 to 33.5) = 25%.

Ecological RG range of 0.03 - 0.3 ppm (NOAEL/LOAEL) for the river otter and
and risk-based concentration range of 0.07 - 0.7 ppm (NOAEL/LOAEL) for the mink.

Contaminant Risks and Geochemistry

Resuspension of PCBs During Dredging 336740

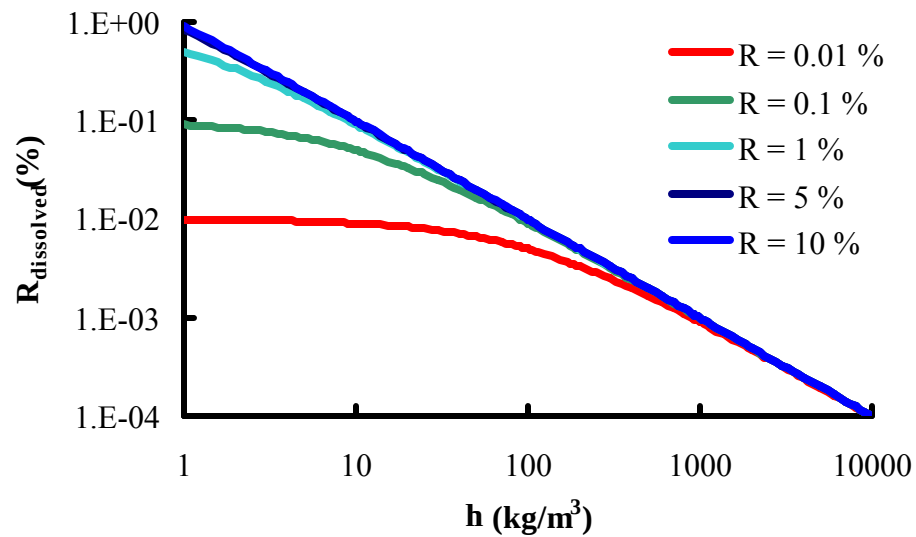


Figure 336740-1. Fraction of Total Constituent Loss in Dissolved Form ($K_d = 10^5 \text{ L/kg}$)

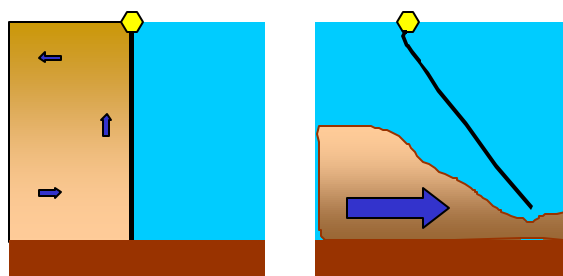


Figure 336740-2. Typical Silt Curtain Response to Current

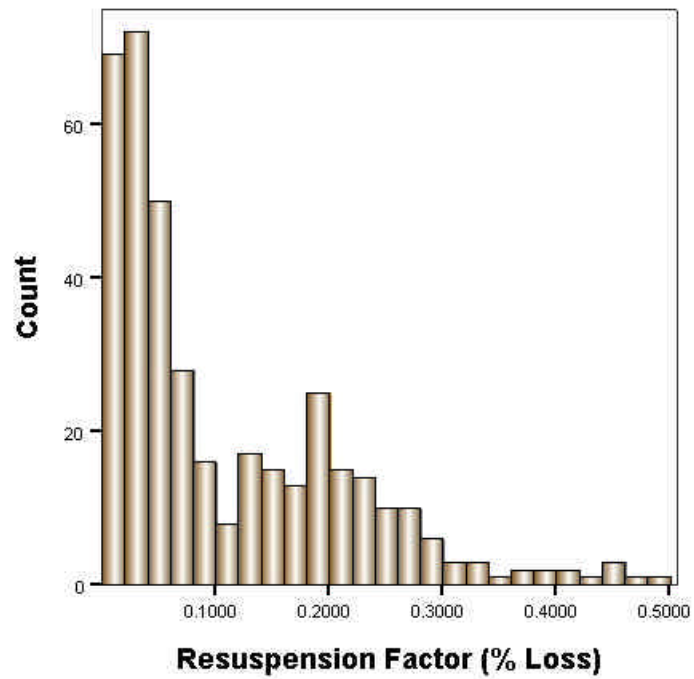


Figure 336740-3. Frequency Distribution of Resuspension Rates for Cutterhead Dredging Operations

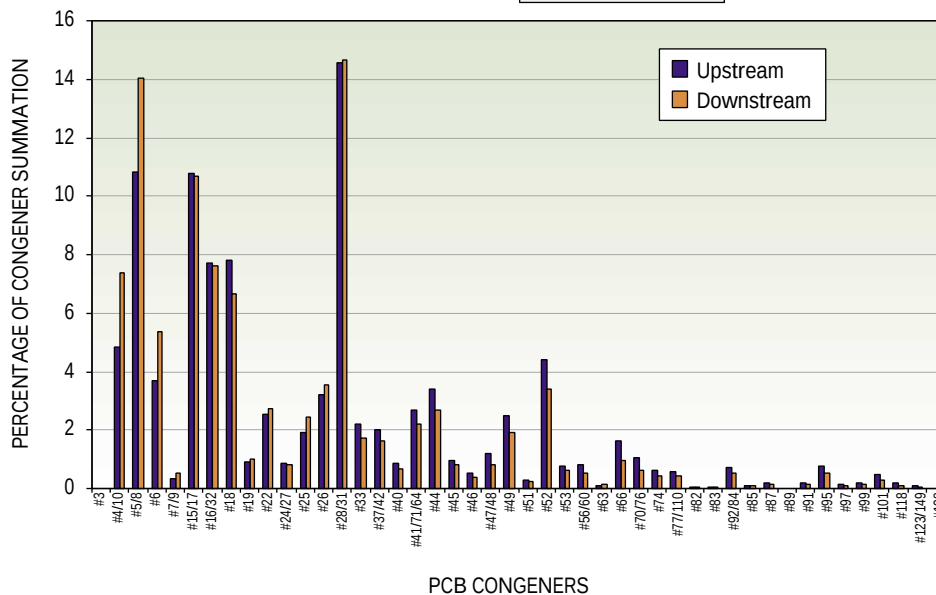
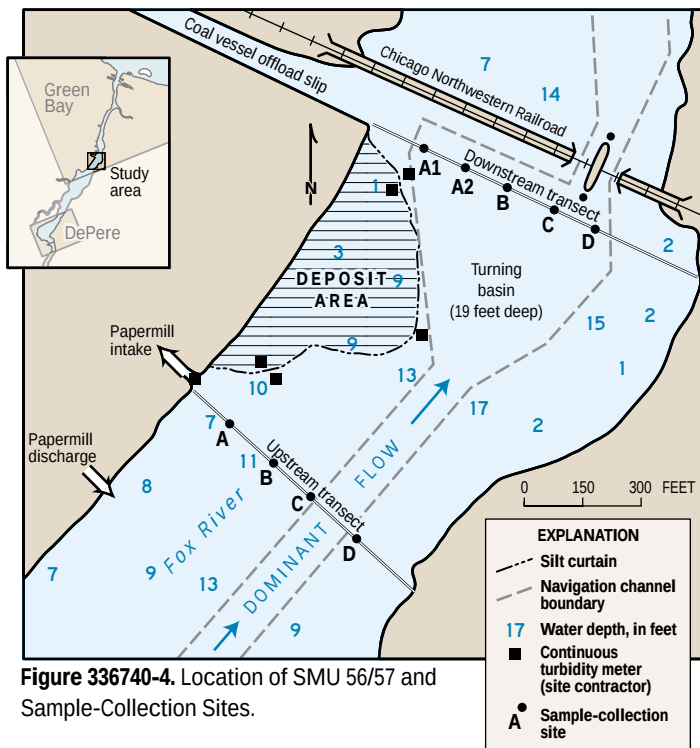


Figure 336740-5. Dissolved-Phase PCB Congener Distribution for the Upstream and Downstream Sites, Fox River, Wis.

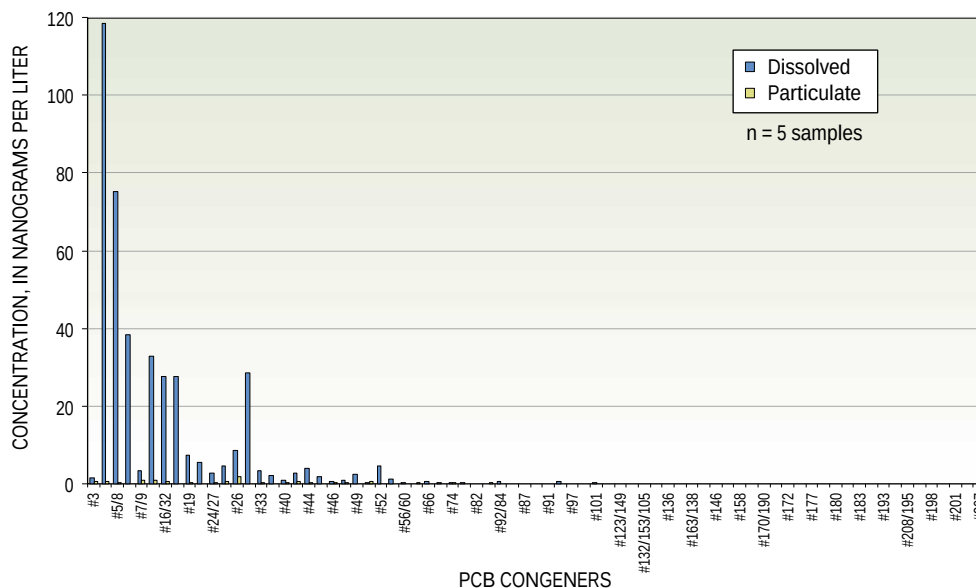


Figure 336740-6. Mean Dissolved and Particulate Effluent PCB Congener Concentrations on the Fox River, Wis.

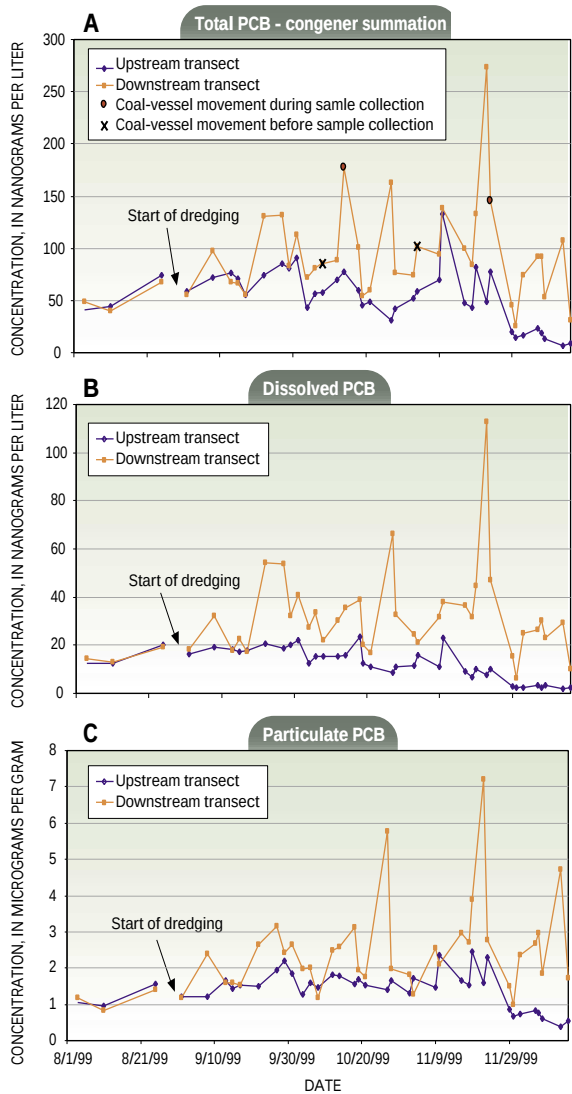


Figure 336740-7. PCB Concentrations at the Upstream and Downstream Transects Before and During Dredging Operations, Fox River, Wis.

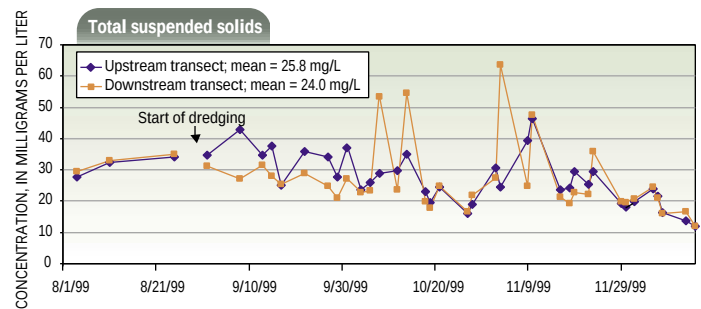


Figure 336740-8. Daily Mean Total Suspended Solids Concentrations for Upstream and Downstream Transects, Fox River, Wis.

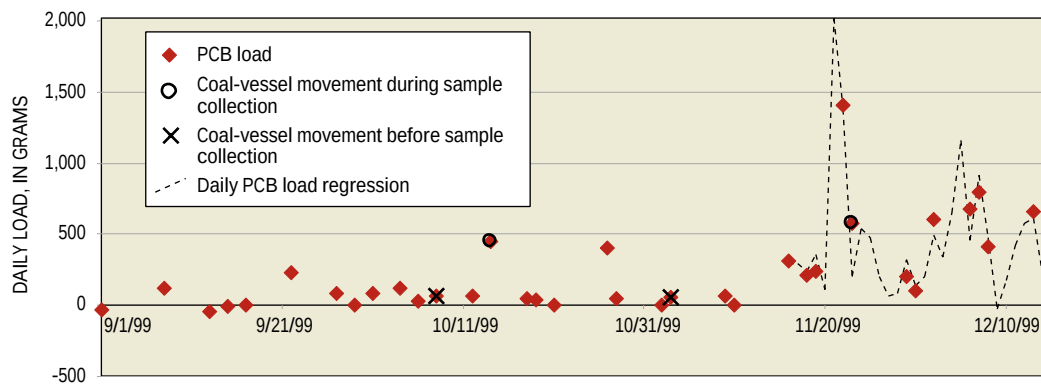
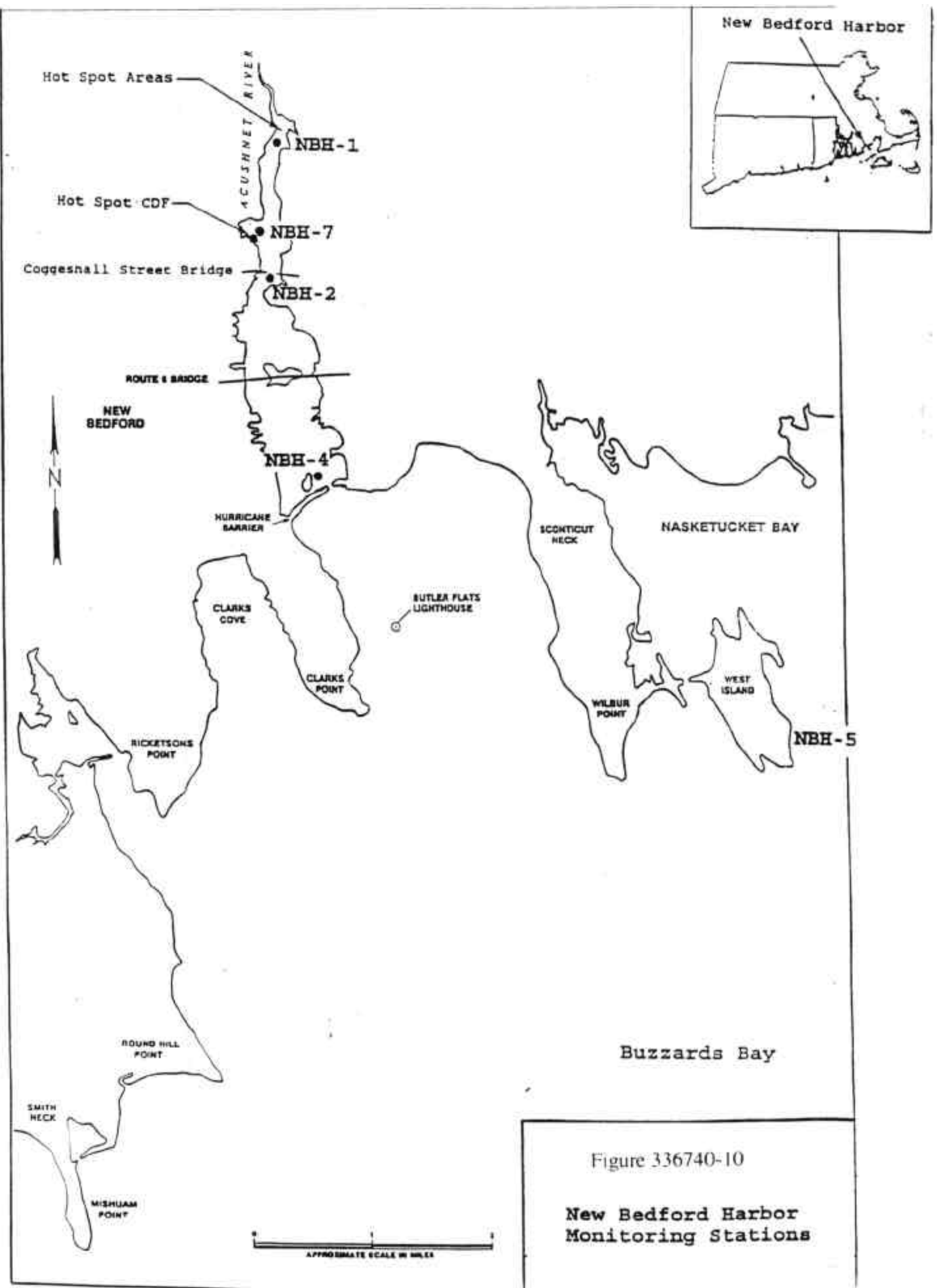


Figure 336740-9. Daily Water-Column PCB Load in the Deposit Area During the Dredging Operation on the Fox River, Wis.



GENERAL ELECTRIC COMPANY HUDSON RIVER PROJECT POST-CONSTRUCTION REMNANT DEPOSIT MONITORING PROGRAM

Figure 336740-11

PUMP HOUSE SEDIMENT REMOVAL INTERIM REMEDIAL MEASURES SITE MAP

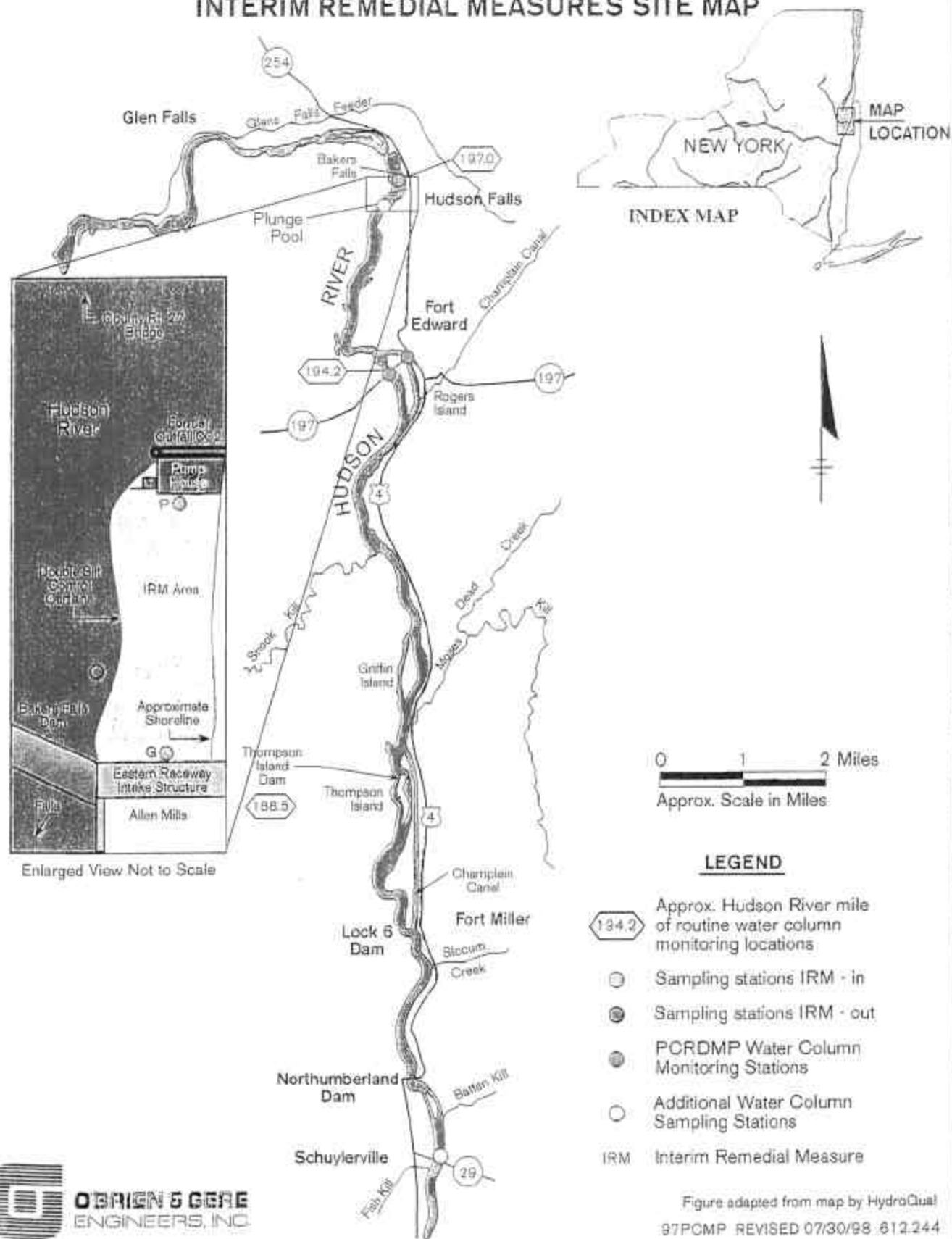
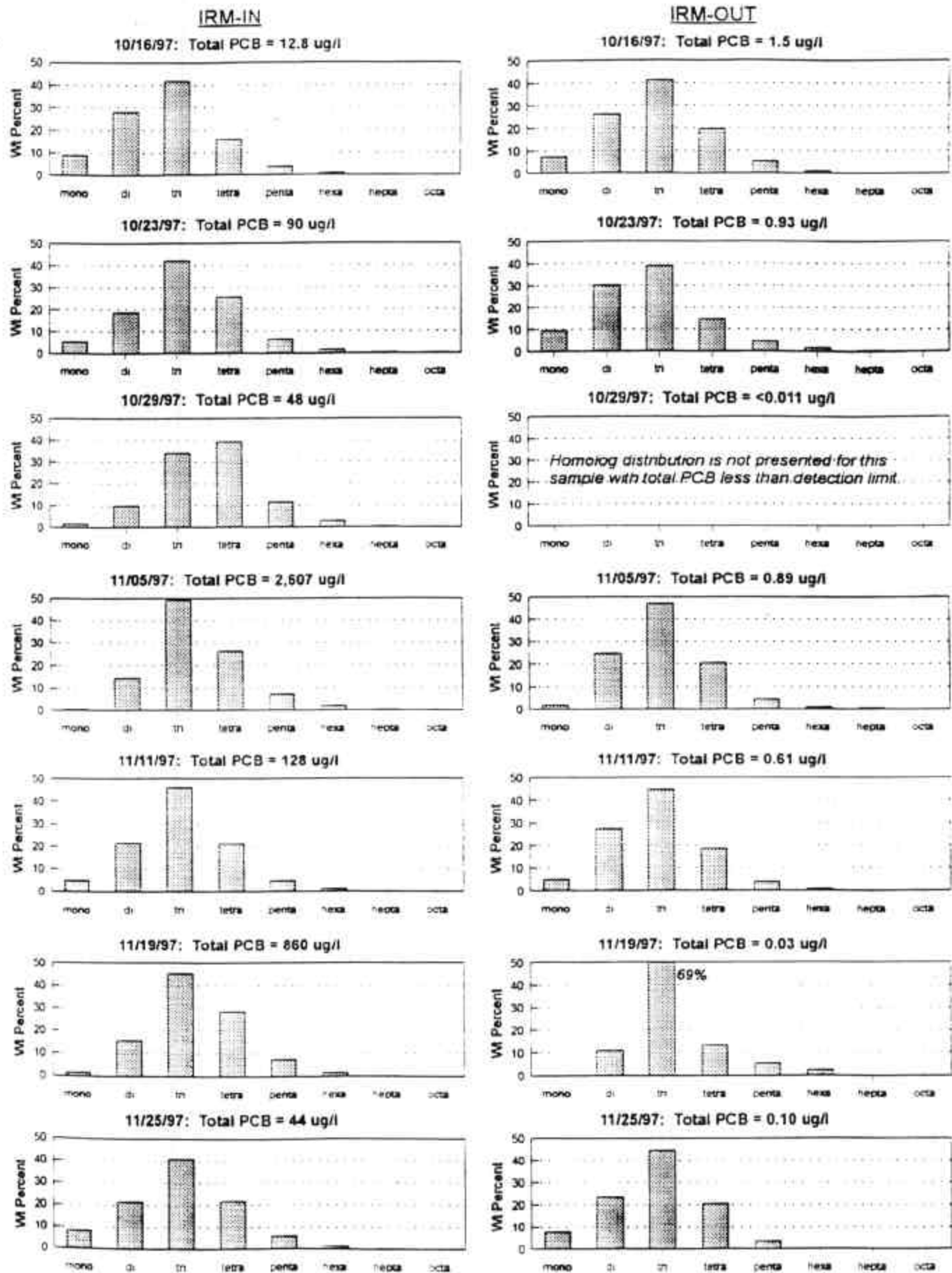


Figure 336740-12 Homolog distributions from Hudson Falls IRM monitoring activities.



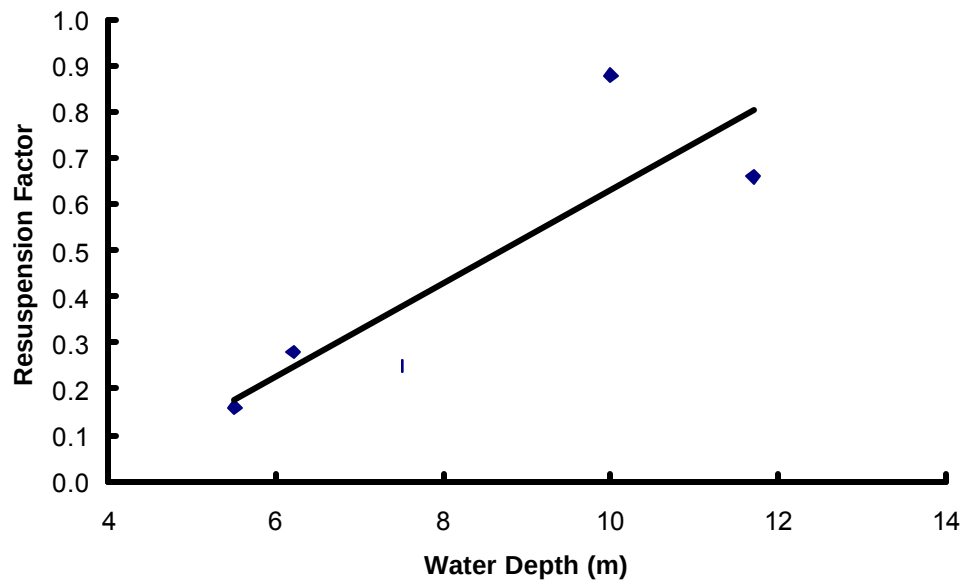


Figure 336740-13. Resuspension Rate for Open Clamshell Bucket Dredges with Water Depth

Table 336740-1
Estimation of the Rate of Downstream Transport due to Resuspension

River Section	Dredge Type							
	Environmental Bucket				Hydraulic Cutterhead			
	TSS Flux ⁽¹⁾ (g/sec)	Fraction Lost to Downstream Transport ⁽²⁾ (%)	PCB Mass Lost to Downstream Transport ⁽³⁾ (kg)		TSS Flux (g/sec)	Fraction Lost to Downstream Transport ⁽²⁾ (%)	PCB Mass Lost to Downstream Transport ⁽³⁾ (kg)	
			Tri+	Total			Tri+	Total
1	11.5	0.07	7.8	25	24.6	0.05	5.6	18
2	30.1	0.2	14	49	40.0	0.08	5.7	19.4
3	30.1	0.2	7	19	40.0	0.08	2.8	7.6
Production Rate (cy/hr)	285 ^{(4),(5)}				270 ⁽⁴⁾			
Mass-Weighted Average All Sections ⁽⁶⁾		0.13	28	91		0.065	14	45

Notes:

(1). TSS flux is for a single environmental bucket dredge.

(2). The fraction lost to downstream transport is calculated as the TSS flux at 10 m divided by the production rate expressed as mass per unit time.

(3). PCB mass loss is calculated as follows:

$$\text{PCB Mass Loss} = F_s * M_{\text{PCB}}$$

where: F_s = fraction of sediment lost to downstream transport

M_{PCB} = *in situ* mass of PCB to be removed

(4). Production rate was assumed to be 100 percent efficient. If 85 percent efficiency was taken into account, both production rate and TSS flux will be reduced accordingly.

(5). This production rate is for three environmental bucket dredges at 95 cy/hr each.

(6). Sums are not exact due to rounding.

Table 336740-2. Characteristics of Cutterhead Field Studies Used to Estimate Resuspension Rates

	James River	Back River	Calumet Harbor	Acushnet River	Lavaca Bay – Phase II
Dredge	<i>ESSEX</i>	<i>CLINTON</i>	<i>DUBUQUE</i>	<i>Ellicott 370</i>	<i>Tyro, Jr.</i>
Size	18" diam.	18" diam.	12" diam.	10" diam.	12"
Water Depth (m)	10	6.1, 11.6	8.2	0.6 - 1.5	1.1 – 2.5
Swing Width (m)	58	46, 61, 92	30	18	18
Cutter Tip Speed (m/s)	0.2 - 0.4	0.2 - 0.4	0.2 - 0.4	0.15	0.03 – 0.64
Cutter Diameter (m)	1.5	1.8	0.9	0.8	0.8
Sediment Removal (m)	1.5	~ 0.9, 6.1	0.9	0.6	0.8
Cutter Rotation Speed (rpm)	20, 28, 32, 35, 37, 40	6.6, 12, 16	15, 20, 27	20	8.5, 19
Production (m³/hr)	504 - 2252	161 - 7379	33 - 56	28	28
f₇₄	0.98	0.99	0.83	0.74	0.75
Environment	Estuary (< 1 ppt)	Estuary	Freshwater Lake	Estuary	Estuary
Type	Very soft silty clay (CH)	Soft, organic clay/silt mixture	Silty loam	Soft organic clay/silt mixture	Fat Clay
Moisture Content (%)	186	*	71.1	117-159	43
Atterberg Limits	LL > 120% PL ≅ 40%	*	LL = 25.4% PL = 25%	LL = 107-123% PL = 55-77%	LL = 58.5% PL = 26%
Debris Present?	No	No	No	Yes	No
Specific Gravity	2.73		2.71	2.46-2.55	
Organic Content	*	*	*	*	*
Ambient Currents (m/s)	0.1 – 0.8	0.03 – 0.8	0.0 - 0.07	< 0.07	0.0 – 0.07
Observations	15	28	12	51	282
Characteristics of Calculated Resuspension rates, R (%)					
Average	0.023	0.041	0.003	0.082	0.13
Standard Deviation	0.017	0.052	0.002	0.087	0.11
Minimum	0.004	0.003	0.0005	0.01	0.001
Maximum	0.054	0.21	0.006	0.33	0.51

*missing data

Table 336740-3 Summary of PCB Concentration (ppm)¹ in Sediment after Dredging
(Hot Spot Dredging Operation - New Bedford Superfund Site)

Program	Max	Min	Average
Pilot Study 1	7,700	3,800	5,667
PiLot Study 2	2,990	1,600	2,308
ACOE	14,412	492	6,167

Representative conc. **5,000 ppm**

Volume of sediment being dredged =	14,300 cyd
=	10,933 m ³
Specific weight ²	0.8 g/cc
Removed PCB Mass	43,733 kg
Escaped PCB Mass ³	57 kg
Ratio of Escaped to Removed	0.13%
Escaped PCB Mass for Hudson	130 lb
given 100,000 lb removal	59 kg

If the PCB concentration is		2300 lower end
Ratio of Escaped to Removed	=	0.28%
Escaped PCB Mass for Hudson		283 lb
		129 kg

If the PCB concentration is		6200 higher end
Ratio of Escaped to Removed	=	0.11%
Escaped PCB Mass for Hudson		105 lb
		48 kg

Note:

1. Provided by Jim Brown of EPA Region 1
2. The value is estimated based on the sediment property described in the report "fine-sandy silt with some clay". It should be noted that the higher specific weight will generate a lower ratio and thus a lower PCB loss.
3. As reported in "Report on the Effects of the Hot Spot Dredging Operations
New Bedford Harbor Superfund Site New Bedford, Massachusetts, Oct., 1997"

Responsiveness Summary

Hudson River PCBs Site Record of Decision

Table 336740-4

Cumulative PCB Mass Transport (kg)

	Bakers Falls	Rogers Island	Delta
Monthly Average 10/96 - 9/97 (kg/mo)	3	4	1
Oct-Dec 1997 (kg)	4	7	3
Aug-Nov 1998 (kg)	6	23	18
Total PCB Gain (7 months)			21
Adjusted PCB Gain (7 months)			14

Notes:

- (1) Shading indicates period of dredging
- (2) Total PCB gain was adjusted for gains not associated with dredging
- (3) Adjustment made using pre-dredge monthly average gain

Total volume removed = 1,067 tons

PCB fraction in dredged material = 0.365%

Total amount of PCBs removed = 3890kg

Percent of removed mass released into river= $14\text{kg}/3,890\text{kg} = 0.36\%$

Dredging of 150,000 lbs with a 0.36% release would yield 540lbs

Table 336740-5. Summary of Estimated Resuspension Losses from Clamshell (open) Bucket Operations.

		Thames River	St. Johns River	<u>Field Study</u> Black Rock Harbor	Calumet River	Boston Harbor
In Situ Sediment	Environment	Estuary	Estuary	Estuary	Freshwater River	Estuary
	Bucket Size (yd ³)	13	12	10	10	26
	Type	Very soft silty clay	Soft, organic clay/silt mixture	Sandy organic clay	Soft organic clay/silt mixture	Stiff clay with silt
	Moisture Content (%)	*	*	300	*	*
	Atterberg Limits (%)	*	*	LL = 170% PL = 65%	*	*
	Debris?	*	*	Yes	*	*
	Specific Gravity		2.40	2.39	*	*
	Organic Content (%)	3-4	*	*	*	*
	Water Depth (m)	12.8	5.5	6.2	7.5	11.7
	Typical Current (m/sec)	0 – 0.5	0 – 0.07	0.07 - 0.25	0 - 0.07	0.17
		Scow Overflow	Yes	Yes	Yes	No
		f ₇₄	> 0.70	*	0.90	0.83
		Production (m ³ /hr)	*	864	688	380
		Data Source	Bohlen <i>et al.</i> (1979)	Collins (1995)	Collins (1995)	Hayes, <i>et al.</i> (1988)
						Hayes and Welp (2000)
		Resuspension rate, R (%)	0.88	0.16	0.28	0.25
						0.66

* missing data

Contaminant Risks and Geochemistry

Human Health and Ecological Risk Reduction Under Phased Implementation 363176

Table 363176-1
Selected Remedy (REM-3/10/Select) Upper Hudson Species-Weighted Fish Fillet Average PCB Concentration (mg/kg)

Year	REM-3/10/Select 5-yr - no resuspension				REM-3/10/Select 5-yr 0.13% resuspension				REM-3/10/Select 6-yr 0.13% resuspension				REM-3/10/Select 6-yr 2.5% resuspension			
	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)
1998	3.353	6.774	9.659	1.529	3.353	6.774	9.659	1.529	3.353	6.774	9.659	1.529	3.353	6.774	9.659	1.529
1999	3.212	6.621	8.877	1.501	3.212	6.621	8.877	1.501	3.212	6.621	8.877	1.501	3.212	6.621	8.877	1.501
2000	2.791	5.563	8.028	1.292	2.791	5.563	8.028	1.292	2.791	5.563	8.028	1.292	2.791	5.563	8.028	1.292
2001	2.504	4.924	7.210	1.171	2.504	4.924	7.210	1.171	2.504	4.924	7.210	1.171	2.504	4.924	7.210	1.171
2002	2.301	4.705	6.571	1.047	2.301	4.705	6.571	1.047	2.301	4.705	6.571	1.047	2.301	4.705	6.571	1.047
2003	2.128	4.290	6.088	0.980	2.128	4.290	6.088	0.980	2.128	4.290	6.088	0.980	2.128	4.290	6.088	0.980
2004	2.189	5.021	5.922	0.937	2.197	5.057	5.926	0.939	2.201	5.074	5.930	0.941	2.256	5.329	5.974	0.955
2005	1.785	3.435	5.456	0.795	1.797	3.477	5.476	0.800	1.826	3.619	5.502	0.806	2.133	5.123	5.677	0.879
2006	1.250	1.753	3.893	0.685	1.268	1.797	3.928	0.694	1.469	2.412	4.745	0.700	1.742	3.558	5.057	0.779
2007	0.820	0.972	1.869	0.606	0.867	1.003	1.992	0.643	1.122	1.547	3.394	0.638	1.383	2.403	3.863	0.735
2008	0.656	0.911	1.092	0.526	0.695	0.914	1.135	0.572	0.786	0.956	1.760	0.581	0.975	1.027	2.278	0.738
2009	0.579	0.894	0.972	0.444	0.600	0.896	1.002	0.467	0.624	0.896	1.026	0.496	0.711	0.907	1.034	0.613
2010	0.501	0.824	0.906	<i>0.362</i>	0.517	0.826	0.930	<i>0.379</i>	0.522	0.825	0.913	<i>0.389</i>	0.537	0.829	0.917	0.408
2011	0.421	0.642	0.815	0.305	0.434	0.643	0.835	0.319	0.438	0.642	0.821	0.327	0.450	0.646	0.823	<i>0.343</i>
2012	<i>0.373</i>	0.652	0.759	0.247	<i>0.383</i>	0.653	0.775	0.257	<i>0.386</i>	0.653	0.765	0.263	<i>0.394</i>	0.656	0.767	0.274
2013	0.322	0.537	0.689	0.212	0.329	0.538	0.703	0.220	0.332	0.537	0.695	0.225	0.338	0.541	0.696	0.232
2014	0.299	0.555	0.645	<i>0.185</i>	0.306	0.556	0.657	<i>0.191</i>	0.307	0.555	0.650	<i>0.195</i>	0.312	0.558	0.651	0.201
2015	0.274	0.506	0.607	0.167	0.280	0.507	0.617	0.172	0.281	0.507	0.612	0.175	0.285	0.510	0.613	<i>0.180</i>
2016	0.280	0.584	0.596	0.160	0.285	0.585	0.605	0.165	0.286	0.585	0.600	0.168	0.290	0.588	0.601	0.173
2017	0.277	0.625	0.573	0.151	0.281	0.626	0.581	0.155	0.282	0.626	0.577	0.158	0.286	0.629	0.578	0.162
2018	0.257	0.573	0.537	0.141	0.261	0.574	0.545	0.145	0.262	0.574	0.542	0.146	0.265	0.577	0.543	0.150
2019	0.261	0.651	0.520	0.133	0.264	0.651	0.526	0.136	0.265	0.651	0.524	0.138	0.268	0.654	0.526	0.141
2020	0.232	0.551	0.487	0.120	0.235	0.552	0.493	0.122	0.236	0.552	0.491	0.124	0.237	0.554	0.491	0.126
2021	0.207	0.452	0.451	0.112	0.209	0.453	0.456	0.114	0.210	0.453	0.454	0.115	0.211	0.454	0.454	0.117
2022	0.206	0.472	0.437	0.109	0.208	0.473	0.441	0.111	0.208	0.473	0.439	0.112	0.210	0.474	0.440	0.114
2023	0.206	0.509	0.421	0.104	0.207	0.509	0.425	0.105	0.208	0.509	0.423	0.106	0.209	0.511	0.424	0.108
2024	<i>0.183</i>	0.438	<i>0.396</i>	0.091	<i>0.184</i>	0.439	<i>0.400</i>	0.092	<i>0.184</i>	0.439	<i>0.398</i>	0.093	<i>0.185</i>	0.440	<i>0.399</i>	0.094
2025	0.168	<i>0.397</i>	0.365	0.085	0.169	<i>0.397</i>	0.368	0.086	0.169	<i>0.397</i>	0.367	0.086	0.170	<i>0.398</i>	0.367	0.087
2026	0.156	0.345	0.351	0.082	0.157	0.345	0.354	0.083	0.157	0.345	0.352	0.083	0.158	0.346	0.353	0.084
2027	0.176	0.478	0.353	0.081	0.177	0.478	0.356	0.081	0.177	0.479	0.355	0.082	0.178	0.480	0.355	0.083
2028	0.173	0.496	0.343	0.074	0.174	0.496	0.345	0.075	0.174	0.497	0.344	0.075	0.174	0.498	0.345	0.076
2029	0.153	0.400	0.319	0.071	0.153	0.400	0.321	0.072	0.153	0.400	0.320	0.072	0.154	0.401	0.320	0.072
2030	0.138	0.319	0.302	0.070	0.138	0.319	0.304	0.071	0.138	0.319	0.303	0.071	0.139	0.320	0.303	0.072
2031	0.146	0.404	0.292	0.066	0.147	0.405	0.293	0.066	0.147	0.405	0.293	0.066	0.147	0.406	0.293	0.067
2032	0.134	0.354	0.272	0.064	0.135	0.354	0.273	0.064	0.135	0.354	0.273	0.064	0.135	0.355	0.273	0.064
2033	0.128	0.333	0.262	0.061	0.128	0.333	0.263	0.061	0.128	0.333	0.263	0.061	0.129	0.334	0.263	0.062
2034	0.128	0.347	0.250	0.060	0.128	0.347	0.251	0.060	0.128	0.347	0.251	0.060	0.128	0.348	0.251	0.060
2035	0.120	0.268	0.234	0.069	0.120	0.268	0.235	0.069	0.120	0.268	0.235	0.069	0.121	0.269	0.235	0.069
2036	0.143	0.338	0.230	0.086	0.143	0.338	0.231	0.087	0.143	0.339	0.231	0.087	0.144	0.339	0.231	0.087
2037	0.132	0.284	0.217	0.085	0.132	0.284	0.217	0.085	0.132	0.284	0.217	0.085	0.132	0.284	0.217	0.085
2038	0.136	0.325	0.208	0.083	0.136	0.326	0.209	0.083	0.136	0.326	0.208	0.083	0.136	0.326	0.208	0.084
2039	0.125	0.263	0.201	0.082	0.125	0.263	0.202	0.082	0.125	0.263	0.201	0.082	0.125	0.263	0.201	0.082
2040	0.120	0.246	<i>0.198</i>	0.079	0.120	0.246	<i>0.198</i>	0.079	0.119	0.246	<i>0.198</i>	0.079	0.120	0.246	<i>0.198</i>	0.079
2041	0.140	0.354	0.207	0.082	0.140	0.355	0.207	0.082	0.138	0.355	0.207	0.079	0.138	0.355	0.207	0.079
2042	0.142	0.385	0.205	0.079	0.142	0.385	0.205	0.079	0.138	0.385	0.205	0.073	0.138	0.386	0.205	0.073
2043	0.122	0.298	0.195	0.072	0.123	0.299	0.195	0.072	0.119	0.299	0.195	0.068	0.119	0.299	0.195	0.068
2044	0.105	0.229	0.180	0.065	0.105	0.229	0.181	0.065	0.103	0.229	0.181	0.063	0.104	0.229	0.181	0.063
2045	0.108	0.264	0.178	0.062	0.108	0.264	0.178	0.062	0.107	0.264	0.178	0.061	0.107	0.264	0.178	0.061
2046	0.102	0.249	0.175	0.058	0.102	0.249	0.176	0.058	0.102	0.249	0.176	0.058	0.102	0.249	0.176	0.058
2047	0.106	0.284	0.173	0.057	0.106	0.284	0.173	0.057	0.107	0.284	0.173	0.058	0.107	0.284	0.173	0.058
2048	0.112	0.321	0.178	0.056	0.112	0.321	0.178	0.056	0.113	0.321	0.178	0.057	0.113	0.321	0.178	0.057
2049	0.110	0.316	0.177	0.054	0.110	0.316	0.177	0.054	0.111	0.316	0.177	0.055	0.111	0.316	0.177	0.055
2050	0.101	0.280	0.173	0.051	0.101	0.280	0.173	0.051	0.102	0.280	0.173	0.052	0.102	0.280	0.173	0.052
2051	0.095	0.264	0.169	<i>0.046</i>	0.095	0.264	0.169	<i>0.046</i>	0.096	0.263	0.169	<i>0.047</i>	0.096	0.264	0.169	<i>0.047</i>
2052	0.090	0.233	0.168	0.046	0.090	0.233	0.168	0.046	0.091	0.233	0.168	0.047	0.091	0.233	0.168	0.047
2053	0.109	0.346	0.177	0.047	0.109	0.346	0.178	0.047	0.110	0.346	0.178	0.048	0.110	0.346	0.178	0.048
2054	0.100	0.292	0.172	0.046	0.100	0.292	0.173	0.046	0.100	0.292	0.172	0.047	0.100	0.292	0.172	0.047
2055	0.095	0.265	0.171	0.045	0.095	0.265	0.171	0.045	0.095	0.265	0.171	0.046	0.095	0.265	0.171	0.046
2056	0.101	0.303	0.176	0.045	0.101	0.303	0.176	0.045	0.102	0.303	0.176	0.046	0.102	0.303	0.176	0.046
2057	0.100	0.299	0.176	0.045	0.100	0.299	0.177	0.045	0.101	0.298	0.177	0.045	0.101	0.299	0.177	0.045
2058	0.090	0.236	0.174	0.044	0.090	0.236	0.174	0.044	0.090	0.236	0.174	0.045	0.090	0.236	0.174	0.045
2059	0.105	0.337	0.177	0.043	0.105	0.337	0.177	0.043	0.105	0.337	0.177	0.043	0.105	0.337	0.177	0.043
2060	0.087	0.244	0.163	0.040	0.087	0.244	0.164	0.040	0.087	0.244	0.164	0.040	0.087	0.244	0.164	0.040
2061	0.083	0.224	0.158	0.039	0.083	0.224	0.158	0.039	0.083	0.227	0.158	0.040	0.083	0.227	0.158	0.040
2062	0.087	0.249	0.158	0.040	0.087	0.249	0.158	0.040	0.090	0.270	0.158	0.040	0.090	0.270	0.158	0.040
2063	0.087	0.250	0.159	0.040	0.087	0.250	0.159	0.040	0.092	0.276	0.159	0.040	0.092	0.276	0.159	0.040
2064	0.090	0.262	0.161	0.041	0.090	0.262	0.161	0.041	0.094	0.288	0.162	0.041				

Table 363176-2
Selected Remedy (REM-3/10/Select) Scenarios
Post-Remediation PCB Concentrations in Fish - Upper Hudson River

PCB Concentrations in Fish (mg/kg wet weight)						Species-weighted (mg/kg wet weight)			
Location	Species		Min	Mean	Max	C RME (40-yr)	C CT (12-yr)	NC RME (7-yr)	NC CT (12-yr)
REM-3/10/S: 5-year with no resuspension (SY 2009)									
RM 189	Brown Bullhead	44%	0.1	0.9	6.9	0.39	0.54	0.58	0.54
	Largemouth Bass	47%	0.3	1.0	6.6				
	Yellow Perch	9%	0.3	1.0	6.7				
RM 184	Brown Bullhead	44%	0.2	1.6	13	0.31	0.50	0.57	0.50
	Largemouth Bass	47%	0.1	0.9	7.2				
	Yellow Perch	9%	0.1	0.7	5.3				
RM 154	Brown Bullhead	44%	0.0	0.3	1.9	0.08	0.12	0.14	0.12
	Largemouth Bass	47%	0.0	0.2	1.3				
	Yellow Perch	9%	0.0	0.1	1.0				
Upper Hudson River Average (River Sections 1, 2, and 3)						0.16	0.23	0.26	0.23
REM-3/10/S: 5-year with 0.13% resuspension (SY 2009)									
RM 189	Brown Bullhead	44%	0.1	0.9	6.9	0.39	0.54	0.58	0.54
	Largemouth Bass	47%	0.3	1.0	6.6				
	Yellow Perch	9%	0.3	1.0	6.7				
RM 184	Brown Bullhead	44%	0.2	1.6	13	0.31	0.51	0.57	0.51
	Largemouth Bass	47%	0.1	0.9	7.2				
	Yellow Perch	9%	0.1	0.7	5.3				
RM 154	Brown Bullhead	44%	0.0	0.3	1.9	0.08	0.12	0.14	0.12
	Largemouth Bass	47%	0.0	0.2	1.3				
	Yellow Perch	9%	0.0	0.1	1.0				
Upper Hudson River Average (River Sections 1, 2, and 3)						0.16	0.24	0.26	0.24
REM-3/10/S: 6-year with 0.13% resuspension (SY 2010)									
RM 189	Brown Bullhead	44%	0.1	0.9	6.9	0.44	0.63	0.66	0.63
	Largemouth Bass	47%	0.3	1.1	6.6				
	Yellow Perch	9%	0.3	1.0	6.7				
RM 184	Brown Bullhead	44%	0.2	1.7	13	0.37	0.64	0.72	0.64
	Largemouth Bass	47%	0.1	0.9	7.2				
	Yellow Perch	9%	0.1	0.7	5.3				
RM 154	Brown Bullhead	44%	0.0	0.3	1.9	0.10	0.18	0.22	0.18
	Largemouth Bass	47%	0.0	0.2	1.3				
	Yellow Perch	9%	0.0	0.1	1.0				
Upper Hudson River Average (River Sections 1, 2, and 3)						0.19	0.31	0.35	0.31
REM-3/10/S: 6-year with 2.5% resuspension (SY 2010)									
RM 189	Brown Bullhead	44%	0.1	0.9	6.9	0.44	0.64	0.66	0.64
	Largemouth Bass	47%	0.3	1.1	6.6				
	Yellow Perch	9%	0.3	1.1	6.7				
RM 184	Brown Bullhead	44%	0.2	1.7	13	0.38	0.64	0.72	0.64
	Largemouth Bass	47%	0.1	1.0	7.2				
	Yellow Perch	9%	0.1	0.7	5.3				
RM 154	Brown Bullhead	44%	0.0	0.3	1.9	0.11	0.18	0.22	0.18
	Largemouth Bass	47%	0.0	0.2	1.3				
	Yellow Perch	9%	0.0	0.2	1.0				
Upper Hudson River Average (River Sections 1, 2, and 3)						0.19	0.31	0.35	0.31

Notes: Start Year (SY) refers to the beginning of the time frame used to calculate concentrations.

Upper Hudson River average is weighted by river section length. River Section 1: 6.3 miles = 15.4%;

River Section 2: 5.1 miles = 12.5%; and River Section 3: 29.5 miles = 72.1%.

Table 363176-3
Selected Remedy (REM-3/10/Select) Scenarios - Long-Term Fish Ingestion
Reasonable Maximum Exposure and Central Tendency Cancer Risks
Upper Hudson River Fish - Adult Angler

Remedial Alternative	PCB Conc. in Fish (mg/kg ww)	Intake (Cancer) (mg/kg-day)	Cancer Slope Factor (mg/kg-day)	Cancer Risk
Reasonable Maximum Exposure				
Upper Hudson Average				
R14S2 (5-yr no resusp.) SY 2009	0.16	4.1E-05	2	8.2E-05
R14RS (5-yr 0.13% resusp.) SY 2009	0.16	4.1E-05	2	8.3E-05
R20RS (6-yr 0.13% resusp.) SY 2010	0.19	4.9E-05	2	9.9E-05
R20RX (6-yr 2.5% resusp.) SY 2010	0.19	5.0E-05	2	9.9E-05
River Section 1 (RM 189)				
R14S2 (5-yr no resusp.) SY 2008	0.39	1.0E-04	2	2.0E-04
R14RS (5-yr 0.13% resusp.) SY 2008	0.39	1.0E-04	2	2.0E-04
R20RS (6-yr 0.13% resusp.) SY 2009	0.44	1.1E-04	2	2.3E-04
R20RX (6-yr 2.5% resusp.) SY 2009	0.44	1.1E-04	2	2.3E-04
River Section 2 (RM 184)				
R14S2 (5-yr no resusp.) SY 2009	0.31	8.1E-05	2	1.6E-04
R14RS (5-yr 0.13% resusp.) SY 2009	0.31	8.2E-05	2	1.6E-04
R20RS (6-yr 0.13% resusp.) SY 2010	0.37	9.8E-05	2	2.0E-04
R20RX (6-yr 2.5% resusp.) SY 2010	0.38	9.8E-05	2	2.0E-04
River Section 3 (RM 154)				
R14S2 (5-yr no resusp.) SY 2010	0.08	2.2E-05	2	4.3E-05
R14RS (5-yr 0.13% resusp.) SY 2010	0.08	2.2E-05	2	4.4E-05
R20RS (6-yr 0.13% resusp.) SY 2011	0.10	2.7E-05	2	5.4E-05
R20RX (6-yr 2.5% resusp.) SY 2011	0.11	2.8E-05	2	5.5E-05
Central Tendency				
Upper Hudson Average				
R14S2 (5-yr no resusp.) SY 2009	0.23	1.8E-06	1	1.8E-06
R14RS (5-yr 0.13% resusp.) SY 2009	0.24	1.8E-06	1	1.8E-06
R20RS (6-yr 0.13% resusp.) SY 2010	0.31	2.4E-06	1	2.4E-06
R20RX (6-yr 2.5% resusp.) SY 2010	0.31	2.4E-06	1	2.4E-06
River Section 1 (RM 189)				
R14S2 (5-yr no resusp.) SY 2009	0.54	4.2E-06	1	4.2E-06
R14RS (5-yr 0.13% resusp.) SY 2009	0.54	4.2E-06	1	4.2E-06
R20RS (6-yr 0.13% resusp.) SY 2010	0.63	5.0E-06	1	5.0E-06
R20RX (6-yr 2.5% resusp.) SY 2010	0.64	5.0E-06	1	5.0E-06
River Section 2 (RM 184)				
R14S2 (5-yr no resusp.) SY 2009	0.50	3.9E-06	1	3.9E-06
R14RS (5-yr 0.13% resusp.) SY 2009	0.51	4.0E-06	1	4.0E-06
R20RS (6-yr 0.13% resusp.) SY 2010	0.64	5.0E-06	1	5.0E-06
R20RX (6-yr 2.5% resusp.) SY 2010	0.64	5.0E-06	1	5.0E-06
River Section 3 (RM 154)				
R14S2 (5-yr no resusp.) SY 2010	0.12	9.5E-07	1	9.5E-07
R14RS (5-yr 0.13% resusp.) SY 2010	0.12	9.7E-07	1	9.7E-07
R20RS (6-yr 0.13% resusp.) SY 2011	0.18	1.4E-06	1	1.4E-06
R20RX (6-yr 2.5% resusp.) SY 2011	0.18	1.4E-06	1	1.4E-06

Notes: The RME cancer exposure time frame is 40 years, while the CT time frame is 12 years.

Numbers have been rounded to two significant figures and therefore do not show subtle differences among scenarios.

Upper Hudson River average is weighted by river section length. River Section 1: 6.3 miles = 15.4%;

River Section 2: 5.1 miles = 12.5%; and River Section 3: 29.5 miles = 72.1%.

Table 363176-4
Selected Remedy (REM-3/10/Select) Scenarios - Long-Term Fish Ingestion
Reasonable Maximum Exposure and Central Tendency PCB Non-Cancer Hazard Indices
Upper Hudson River Fish - Adult Angler

Remedial Alternative	PCB Conc. in Fish (mg/kg ww)	Intake (Non-Cancer) (mg/kg-day)	Reference Dose (mg/kg-day)	Hazard Index
Reasonable Maximum Exposure				
Upper Hudson Average				
R14S2 (5-yr no resusp.) SY 2009	0.26	1.2E-04	2.0E-05	5.9
R14RS (5-yr 0.13% resusp.) SY 2009	0.26	1.2E-04	2.0E-05	6.0
R20RS (6-yr 0.13% resusp.) SY 2010	0.35	1.6E-04	2.0E-05	7.9
R20RX (6-yr 2.5% resusp.) SY 2010	0.35	1.6E-04	2.0E-05	8.1
River Section 1 (RM 189)				
R14S2 (5-yr no resusp.) SY 2008	0.58	2.6E-04	2.0E-05	13
R14RS (5-yr 0.13% resusp.) SY 2008	0.58	2.6E-04	2.0E-05	13
R20RS (6-yr 0.13% resusp.) SY 2009	0.66	3.0E-04	2.0E-05	15
R20RX (6-yr 2.5% resusp.) SY 2009	0.66	3.0E-04	2.0E-05	15
River Section 2 (RM 184)				
R14S2 (5-yr no resusp.) SY 2009	0.57	2.6E-04	2.0E-05	13
R14RS (5-yr 0.13% resusp.) SY 2009	0.57	2.6E-04	2.0E-05	13
R20RS (6-yr 0.13% resusp.) SY 2010	0.72	3.3E-04	2.0E-05	16
R20RX (6-yr 2.5% resusp.) SY 2010	0.72	3.3E-04	2.0E-05	17
River Section 3 (RM 154)				
R14S2 (5-yr no resusp.) SY 2010	0.14	6.4E-05	2.0E-05	3.2
R14RS (5-yr 0.13% resusp.) SY 2010	0.14	6.6E-05	2.0E-05	3.3
R20RS (6-yr 0.13% resusp.) SY 2011	0.22	9.8E-05	2.0E-05	4.9
R20RX (6-yr 2.5% resusp.) SY 2011	0.22	1.0E-04	2.0E-05	5.1
Central Tendency				
Upper Hudson Average				
R14S2 (5-yr no resusp.) SY 2009	0.23	1.1E-05	2.0E-05	0.5
R14RS (5-yr 0.13% resusp.) SY 2009	0.24	1.1E-05	2.0E-05	0.5
R20RS (6-yr 0.13% resusp.) SY 2010	0.31	1.4E-05	2.0E-05	0.7
R20RX (6-yr 2.5% resusp.) SY 2010	0.31	1.4E-05	2.0E-05	0.7
River Section 1 (RM 189)				
R14S2 (5-yr no resusp.) SY 2009	0.54	2.5E-05	2.0E-05	1.2
R14RS (5-yr 0.13% resusp.) SY 2009	0.54	2.5E-05	2.0E-05	1.2
R20RS (6-yr 0.13% resusp.) SY 2010	0.63	2.9E-05	2.0E-05	1.4
R20RX (6-yr 2.5% resusp.) SY 2010	0.64	2.9E-05	2.0E-05	1.5
River Section 2 (RM 184)				
R14S2 (5-yr no resusp.) SY 2009	0.50	2.3E-05	2.0E-05	1.1
R14RS (5-yr 0.13% resusp.) SY 2009	0.51	2.3E-05	2.0E-05	1.2
R20RS (6-yr 0.13% resusp.) SY 2010	0.64	2.9E-05	2.0E-05	1.5
R20RX (6-yr 2.5% resusp.) SY 2010	0.64	2.9E-05	2.0E-05	1.5
River Section 3 (RM 154)				
R14S2 (5-yr no resusp.) SY 2010	0.12	5.6E-06	2.0E-05	0.3
R14RS (5-yr 0.13% resusp.) SY 2010	0.12	5.7E-06	2.0E-05	0.3
R20RS (6-yr 0.13% resusp.) SY 2011	0.18	8.2E-06	2.0E-05	0.4
R20RX (6-yr 2.5% resusp.) SY 2011	0.18	8.4E-06	2.0E-05	0.4

Notes: The RME non-cancer exposure time frame is seven years, while the CT time frame is 12 years.

Numbers have been rounded to two significant figures and therefore do not show subtle differences between scenarios.

Upper Hudson River average is weighted by river section length. River Section 1: 6.3 miles = 15.4%;

River Section 2: 5.1 miles = 12.5%; and River Section 3: 29.5 miles = 72.1%.

Table 363176-5
Modeled Times (Years) of Compliance with Human Health Risk-Based Concentrations
Selected Remedy (REM-3/10/Select) Scenarios

Selected Remedy	R14S2 : 5- Yr No Resuspension	R14RS : 5-Yr 0.13 % Resuspension	R20RS : 6-Yr 0.13 % Resuspension	R14RX : 6-Yr 2.5 % Resuspension
Upper River Average				
Human Health risk-based RG 0.05 mg/kg	>2067	>2067	>2067	>2067
Fish Target Concentration 0.2 mg/kg	2024	2024	2024	2024
Fish Target Concentration 0.4 mg/kg	2012	2012	2012	2012
River Section 1- RM 189				
Human Health risk-based RG 0.05 mg/kg	>2067	>2067	>2067	>2067
Fish Target Concentration 0.2 mg/kg	>2067	>2067	>2067	>2067
Fish Target Concentration 0.4 mg/kg	2025	2025	2025	2025
River Section 2- RM 184				
Human Health risk-based RG 0.05 mg/kg	>2067	>2067	>2067	>2067
Fish Target Concentration 0.2 mg/kg	2040	2040	2040	2040
Fish Target Concentration 0.4 mg/kg	2024	2024	2024	2024
River Section 3- RM 154				
Human Health RG 0.05 mg/kg	2051	2051	2051	2051
Fish Target Concentration 0.2 mg/kg	2014	2014	2014	2015
Fish Target Concentration 0.4 mg/kg	2010	2010	2010	2011

Note: RG = risk-based remediation goal

Upper Hudson River average is weighted by river section length. River Section 1: 6.3 miles = 15.4%;
River Section 2: 5.1 miles = 12.5%; and River Section 3: 29.5 miles = 72.1%.

Table 363176-6
Largemouth Bass Whole Body Average PCB Concentrations (mg/kg)

Year	REM-3/10/Select 5-yr - no resuspension				REM-3/10/Select 5-yr 0.13% resuspension				REM-3/10/Select 6-yr 0.13% resuspension				REM-3/10/Select 6-yr 2.5% resuspension			
	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)
1998	7.188	16.613	18.043	3.292	7.184	16.613	18.043	3.292	7.184	16.613	18.043	3.292	7.184	16.613	18.043	3.292
1999	6.762	16.163	15.907	3.169	6.759	16.163	15.907	3.169	6.759	16.163	15.907	3.169	6.759	16.163	15.907	3.169
2000	5.740	13.089	14.566	2.639	5.736	13.089	14.566	2.639	5.736	13.089	14.566	2.639	5.736	13.089	14.566	2.639
2001	5.129	11.344	12.935	2.448	5.126	11.344	12.935	2.448	5.126	11.344	12.935	2.448	5.126	11.344	12.935	2.448
2002	4.761	11.110	11.836	2.178	4.758	11.110	11.836	2.178	4.758	11.110	11.836	2.178	4.758	11.110	11.836	2.178
2003	4.334	9.917	10.730	2.033	4.332	9.917	10.730	2.033	4.332	9.917	10.730	2.033	4.332	9.917	10.730	2.033
2004	4.826	13.367	10.569	2.006	4.854	13.526	10.568	2.014	4.867	13.591	10.568	2.018	5.021	14.238	10.711	2.069
2005	3.674	8.263	9.928	1.609	3.713	8.420	9.982	1.625	3.777	8.701	10.045	1.642	4.986	14.556	10.698	1.955
2006	2.484	3.782	7.322	1.368	2.538	3.957	7.417	1.391	2.839	4.937	8.528	1.408	3.984	9.768	9.814	1.740
2007	1.801	3.008	3.657	1.222	1.963	3.142	4.099	1.342	2.338	3.791	6.508	1.307	3.415	7.501	8.406	1.680
2008	1.483	2.861	2.240	1.057	1.596	2.870	2.339	1.195	1.796	2.978	3.677	1.218	2.625	3.312	5.961	1.902
2009	1.312	2.803	1.817	0.906	1.352	2.808	1.873	0.951	1.452	2.816	2.063	1.055	1.837	2.861	2.097	1.573
2010	1.151	2.644	1.744	0.730	1.181	2.647	1.786	0.764	1.192	2.650	1.759	0.783	1.256	2.663	1.776	0.865
2011	0.938	1.926	1.502	0.629	0.962	1.929	1.538	0.656	0.971	1.930	1.514	0.672	1.024	1.946	1.523	0.740
2012	0.857	2.046	1.435	0.502	0.876	2.049	1.465	0.523	0.882	2.053	1.445	0.534	0.919	2.067	1.457	0.581
2013	0.711	1.535	1.273	0.438	0.726	1.537	1.298	0.454	0.731	1.539	1.283	0.463	0.757	1.552	1.290	0.495
2014	0.678	1.645	1.197	0.381	0.689	1.647	1.218	0.393	0.693	1.647	1.205	0.400	0.712	1.657	1.211	0.424
2015	0.612	1.463	1.104	0.345	0.621	1.465	1.122	0.355	0.624	1.465	1.112	0.360	0.640	1.476	1.117	0.379
2016	0.648	1.730	1.087	0.340	0.656	1.732	1.103	0.349	0.659	1.733	1.094	0.354	0.678	1.745	1.100	0.377
2017	0.680	1.995	1.085	0.328	0.687	1.996	1.099	0.336	0.689	1.999	1.092	0.340	0.707	2.011	1.097	0.360
2018	0.614	1.751	1.011	0.302	0.620	1.753	1.024	0.309	0.623	1.754	1.018	0.312	0.636	1.766	1.023	0.328
2019	0.655	2.112	0.998	0.285	0.660	2.113	1.008	0.290	0.662	2.113	1.005	0.293	0.676	2.127	1.011	0.308
2020	0.565	1.737	0.942	0.250	0.570	1.738	0.952	0.254	0.571	1.740	0.950	0.256	0.580	1.751	0.953	0.265
2021	0.485	1.364	0.833	0.236	0.488	1.365	0.842	0.240	0.489	1.366	0.839	0.242	0.496	1.372	0.841	0.250
2022	0.489	1.424	0.806	0.234	0.492	1.425	0.813	0.238	0.494	1.426	0.810	0.240	0.499	1.432	0.813	0.246
2023	0.515	1.632	0.801	0.227	0.518	1.633	0.808	0.230	0.519	1.635	0.805	0.231	0.526	1.642	0.807	0.239
2024	0.448	1.390	0.764	0.192	0.451	1.391	0.771	0.194	0.451	1.392	0.768	0.196	0.456	1.397	0.771	0.201
2025	0.405	1.222	0.681	0.182	0.406	1.222	0.686	0.184	0.407	1.223	0.684	0.185	0.411	1.228	0.685	0.189
2026	0.364	1.019	0.647	0.175	0.366	1.020	0.652	0.176	0.366	1.020	0.650	0.177	0.369	1.024	0.652	0.181
2027	0.448	1.530	0.676	0.177	0.449	1.531	0.680	0.178	0.450	1.531	0.679	0.179	0.454	1.537	0.680	0.183
2028	0.453	1.660	0.676	0.157	0.454	1.660	0.679	0.158	0.455	1.661	0.678	0.159	0.458	1.667	0.679	0.161
2029	0.379	1.271	0.602	0.150	0.380	1.271	0.606	0.151	0.381	1.272	0.604	0.152	0.383	1.276	0.605	0.154
2030	0.330	0.944	0.571	0.157	0.331	0.944	0.574	0.158	0.331	0.945	0.573	0.158	0.333	0.947	0.574	0.160
2031	0.385	1.356	0.580	0.144	0.386	1.356	0.583	0.145	0.386	1.357	0.581	0.145	0.388	1.360	0.583	0.147
2032	0.342	1.142	0.526	0.139	0.342	1.143	0.528	0.139	0.343	1.143	0.527	0.140	0.344	1.145	0.528	0.141
2033	0.324	1.080	0.509	0.131	0.325	1.080	0.511	0.132	0.325	1.081	0.510	0.132	0.327	1.082	0.511	0.133
2034	0.330	1.146	0.498	0.126	0.330	1.147	0.500	0.127	0.331	1.147	0.499	0.127	0.332	1.149	0.500	0.128
2035	0.287	0.833	0.445	0.142	0.287	0.833	0.447	0.143	0.287	0.834	0.446	0.143	0.288	0.835	0.447	0.144
2036	0.390	1.141	0.463	0.217	0.390	1.141	0.464	0.217	0.390	1.141	0.464	0.217	0.391	1.143	0.464	0.218
2037	0.342	0.935	0.418	0.202	0.342	0.935	0.419	0.202	0.342	0.935	0.418	0.202	0.343	0.936	0.419	0.203
2038	0.353	1.075	0.402	0.190	0.353	1.075	0.403	0.190	0.353	1.076	0.403	0.190	0.354	1.077	0.403	0.191
2039	0.318	0.863	0.394	0.189	0.318	0.863	0.395	0.189	0.318	0.863	0.395	0.189	0.319	0.864	0.395	0.189
2040	0.296	0.790	0.382	0.176	0.296	0.790	0.383	0.176	0.296	0.791	0.383	0.175	0.296	0.792	0.383	0.176
2041	0.374	1.206	0.416	0.188	0.374	1.206	0.417	0.189	0.368	1.207	0.416	0.180	0.369	1.208	0.417	0.181
2042	0.391	1.359	0.416	0.180	0.391	1.359	0.417	0.180	0.379	1.359	0.417	0.163	0.379	1.360	0.417	0.163
2043	0.326	1.038	0.401	0.161	0.326	1.038	0.402	0.161	0.317	1.039	0.402	0.148	0.317	1.040	0.402	0.148
2044	0.263	0.748	0.354	0.143	0.263	0.748	0.355	0.143	0.261	0.748	0.354	0.141	0.261	0.749	0.354	0.141
2045	0.283	0.901	0.350	0.140	0.283	0.901	0.350	0.140	0.282	0.901	0.350	0.138	0.282	0.902	0.350	0.138
2046	0.261	0.828	0.350	0.125	0.262	0.828	0.351	0.125	0.264	0.828	0.351	0.128	0.264	0.829	0.351	0.128
2047	0.274	0.917	0.336	0.126	0.274	0.917	0.337	0.126	0.276	0.917	0.336	0.129	0.276	0.918	0.337	0.129
2048	0.295	1.050	0.357	0.123	0.295	1.050	0.357	0.123	0.298	1.050	0.357	0.127	0.298	1.051	0.357	0.127
2049	0.295	1.059	0.359	0.120	0.295	1.059	0.359	0.120	0.297	1.059	0.359	0.124	0.297	1.060	0.359	0.124
2050	0.268	0.928	0.348	0.114	0.268	0.928	0.349	0.114	0.271	0.928	0.349	0.117	0.271	0.928	0.349	0.117
2051	0.249	0.872	0.339	0.101	0.249	0.872	0.340	0.101	0.251	0.872	0.340	0.104	0.252	0.873	0.340	0.104
2052	0.227	0.746	0.326	0.099	0.227	0.746	0.326	0.099	0.229	0.746	0.326	0.101	0.229	0.747	0.326	0.101
2053	0.308	1.206	0.368	0.105	0.308	1.206	0.369	0.105	0.309	1.206	0.369	0.107	0.309	1.206	0.369	0.107
2054	0.272	0.998	0.348	0.103	0.272	0.998	0.349	0.103	0.273	0.998	0.349	0.105	0.273	0.999	0.349	0.105
2055	0.253	0.899	0.340	0.100	0.253	0.899	0.340	0.100	0.255	0.899	0.340	0.102	0.255	0.899	0.340	0.102
2056	0.272	1.014	0.352	0.100	0.272	1.014	0.352	0.100	0.273	1.014	0.352	0.102	0.274	1.014	0.352	0.102
2057	0.276	1.036	0.363	0.099	0.276	1.036	0.363	0.099	0.277	1.036	0.363	0.100	0.277	1.036	0.363	0.100
2058	0.233	0.780	0.341	0.098	0.233	0.780	0.341	0.098	0.234	0.780	0.341	0.099	0.234	0.781	0.341	0.099
2059	0.298	1.188	0.374	0.095	0.298	1.188	0.374	0.095	0.299	1.188	0.374	0.095	0.299	1.189	0.374	0.095
2060	0.232	0.830	0.326	0.088	0.232	0.830	0.326	0.088	0.233	0.830	0.326	0.089	0.233	0.830	0.326	0.089
2061	0.217	0.751	0.311	0.086	0.217	0.751	0.311	0.086	0.217	0.753	0.311	0.087	0.217	0.753	0.311	0.087
2062	0.232	0.838	0.310	0.089	0.232	0.838	0.310	0.089	0.236	0.859	0.310	0.089	0.236	0.860	0.310	0.089
2063	0.233	0.842	0.311	0.089	0.233	0.842	0.311	0.089	0.238	0.873	0.312	0.090	0.238	0.873	0.312	0.090
2064	0.244	0.902	0.323	0.090	0.244	0.902	0.323	0.090	0.249	0.933	0.323	0.091	0.249	0.933	0.323	0.091
2065	0.235	0.809	0.328	0.096	0.235	0.809	0.328	0.096	0.239	0.837	0.329	0.096	0.239			

Table 363176-7
Spottail Shiner Whole Body Average PCB Concentrations (mg/kg)

Year	REM-3/10/Select 5-yr - no resuspension				REM-3/10/Select 5-yr 0.13% resuspension				REM-3/10/Select 6-yr 0.13% resuspension				REM-3/10/Select 6-yr 2.5% resuspension			
	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	River Section 3 (RM 154)	Upper River Average	River Section 1 (RM 189)	River Section 2 (RM 184)	Section 3 (RM 154)
1998	2.179	7.452	3.913	0.752	2.179	7.452	3.913	0.752	2.179	7.452	3.913	0.752	2.179	7.452	3.913	0.752
1999	1.940	6.571	3.680	0.649	1.940	6.571	3.680	0.649	1.940	6.571	3.680	0.649	1.940	6.571	3.680	0.649
2000	1.566	4.807	3.370	0.561	1.566	4.807	3.370	0.561	1.566	4.807	3.370	0.561	1.566	4.807	3.370	0.561
2001	1.328	4.014	2.995	0.465	1.328	4.014	2.995	0.465	1.328	4.014	2.995	0.465	1.328	4.014	2.995	0.465
2002	1.383	4.632	2.767	0.449	1.383	4.632	2.767	0.449	1.383	4.632	2.767	0.449	1.383	4.632	2.767	0.449
2003	1.356	4.880	2.502	0.404	1.356	4.880	2.502	0.404	1.356	4.880	2.502	0.404	1.356	4.880	2.502	0.404
2004	1.526	6.036	2.505	0.392	1.523	6.020	2.503	0.393	1.522	6.016	2.504	0.392	1.611	6.637	2.502	0.383
2005	0.906	2.493	2.224	0.338	0.914	2.526	2.231	0.341	0.958	2.798	2.241	0.343	1.302	4.865	2.369	0.355
2006	0.637	1.342	1.792	0.286	0.650	1.407	1.797	0.290	0.739	1.845	1.955	0.292	0.981	3.262	2.079	0.303
2007	0.435	0.943	0.878	0.250	0.448	0.947	0.984	0.249	0.555	1.189	1.529	0.250	0.696	1.565	1.837	0.312
2008	0.386	1.167	0.444	0.209	0.401	1.168	0.470	0.226	0.462	1.170	0.935	0.229	0.539	1.182	1.091	0.306
2009	0.385	1.261	0.436	0.188	0.393	1.262	0.447	0.199	0.399	1.263	0.441	0.207	0.421	1.275	0.446	0.234
2010	0.285	0.833	0.384	0.150	0.291	0.834	0.393	0.158	0.294	0.835	0.387	0.162	0.304	0.843	0.390	0.175
2011	0.254	0.771	0.352	0.127	0.260	0.772	0.360	0.133	0.262	0.772	0.355	0.136	0.268	0.778	0.357	0.144
2012	0.225	0.694	0.328	0.107	0.229	0.694	0.335	0.111	0.230	0.696	0.330	0.114	0.236	0.701	0.333	0.120
2013	0.196	0.634	0.289	0.086	0.199	0.635	0.295	0.089	0.200	0.635	0.291	0.091	0.205	0.640	0.294	0.096
2014	0.185	0.616	0.277	0.078	0.188	0.617	0.281	0.080	0.189	0.617	0.278	0.082	0.192	0.621	0.280	0.085
2015	0.174	0.593	0.262	0.070	0.177	0.594	0.266	0.072	0.177	0.594	0.263	0.073	0.180	0.598	0.265	0.076
2016	0.210	0.840	0.262	0.066	0.212	0.841	0.265	0.068	0.212	0.842	0.264	0.069	0.215	0.847	0.265	0.072
2017	0.198	0.784	0.254	0.063	0.199	0.784	0.256	0.065	0.200	0.785	0.255	0.066	0.203	0.790	0.257	0.068
2018	0.205	0.851	0.244	0.061	0.207	0.852	0.247	0.062	0.207	0.853	0.246	0.063	0.210	0.858	0.246	0.065
2019	0.197	0.836	0.230	0.054	0.198	0.837	0.232	0.055	0.198	0.838	0.231	0.056	0.200	0.842	0.232	0.058
2020	0.187	0.789	0.222	0.052	0.188	0.789	0.224	0.053	0.188	0.790	0.223	0.053	0.190	0.794	0.224	0.055
2021	0.147	0.560	0.202	0.050	0.148	0.560	0.204	0.050	0.149	0.561	0.203	0.051	0.150	0.563	0.204	0.052
2022	0.159	0.668	0.195	0.044	0.160	0.669	0.197	0.045	0.160	0.669	0.196	0.046	0.162	0.672	0.197	0.046
2023	0.158	0.665	0.191	0.044	0.159	0.665	0.193	0.045	0.159	0.666	0.192	0.045	0.160	0.669	0.193	0.046
2024	0.127	0.490	0.178	0.041	0.128	0.490	0.179	0.041	0.128	0.491	0.178	0.041	0.129	0.492	0.179	0.042
2025	0.125	0.500	0.165	0.038	0.125	0.501	0.167	0.038	0.126	0.501	0.166	0.038	0.126	0.502	0.167	0.039
2026	0.121	0.498	0.156	0.035	0.122	0.498	0.157	0.035	0.122	0.498	0.156	0.035	0.123	0.500	0.157	0.036
2027	0.165	0.777	0.163	0.034	0.165	0.777	0.164	0.034	0.165	0.778	0.163	0.035	0.166	0.780	0.164	0.035
2028	0.147	0.676	0.160	0.032	0.148	0.676	0.161	0.032	0.148	0.676	0.160	0.033	0.148	0.678	0.161	0.033
2029	0.141	0.643	0.151	0.032	0.142	0.643	0.152	0.033	0.142	0.643	0.151	0.033	0.142	0.645	0.152	0.033
2030	0.121	0.532	0.136	0.031	0.121	0.531	0.137	0.031	0.121	0.532	0.136	0.031	0.122	0.533	0.137	0.031
2031	0.115	0.514	0.134	0.026	0.115	0.515	0.135	0.026	0.115	0.515	0.134	0.026	0.115	0.516	0.134	0.026
2032	0.110	0.482	0.131	0.027	0.110	0.482	0.131	0.027	0.110	0.482	0.131	0.027	0.110	0.483	0.131	0.027
2033	0.100	0.430	0.119	0.027	0.101	0.430	0.120	0.027	0.101	0.430	0.120	0.027	0.101	0.431	0.120	0.027
2034	0.100	0.431	0.116	0.026	0.100	0.431	0.116	0.026	0.100	0.432	0.116	0.027	0.100	0.433	0.116	0.027
2035	0.092	0.372	0.106	0.030	0.092	0.372	0.106	0.030	0.092	0.373	0.106	0.030	0.093	0.373	0.106	0.030
2036	0.105	0.404	0.111	0.040	0.105	0.404	0.112	0.040	0.105	0.405	0.112	0.040	0.105	0.405	0.112	0.040
2037	0.099	0.380	0.102	0.038	0.099	0.380	0.102	0.038	0.099	0.380	0.102	0.038	0.099	0.381	0.102	0.039
2038	0.125	0.555	0.102	0.037	0.125	0.555	0.102	0.037	0.125	0.555	0.102	0.038	0.125	0.556	0.102	0.038
2039	0.088	0.322	0.095	0.036	0.088	0.322	0.095	0.036	0.088	0.322	0.095	0.036	0.088	0.323	0.095	0.036
2040	0.095	0.380	0.094	0.034	0.095	0.380	0.094	0.034	0.095	0.380	0.094	0.034	0.095	0.381	0.094	0.034
2041	0.123	0.557	0.100	0.034	0.123	0.557	0.100	0.034	0.123	0.557	0.100	0.034	0.123	0.557	0.100	0.034
2042	0.121	0.545	0.099	0.035	0.121	0.545	0.100	0.035	0.120	0.545	0.100	0.032	0.120	0.546	0.100	0.032
2043	0.085	0.329	0.091	0.032	0.085	0.329	0.091	0.032	0.084	0.329	0.091	0.030	0.084	0.329	0.091	0.030
2044	0.080	0.320	0.084	0.028	0.080	0.320	0.085	0.028	0.080	0.320	0.084	0.028	0.080	0.321	0.084	0.028
2045	0.084	0.364	0.084	0.025	0.084	0.364	0.084	0.025	0.084	0.364	0.084	0.024	0.084	0.364	0.084	0.024
2046	0.081	0.335	0.083	0.026	0.081	0.335	0.083	0.026	0.081	0.335	0.083	0.027	0.081	0.335	0.083	0.027
2047	0.095	0.432	0.089	0.024	0.095	0.432	0.089	0.024	0.095	0.432	0.089	0.025	0.095	0.432	0.089	0.025
2048	0.096	0.436	0.090	0.024	0.096	0.436	0.090	0.024	0.096	0.436	0.090	0.024	0.096	0.436	0.090	0.025
2049	0.093	0.418	0.090	0.025	0.093	0.418	0.090	0.025	0.094	0.418	0.090	0.025	0.094	0.418	0.090	0.025
2050	0.084	0.376	0.086	0.022	0.084	0.376	0.086	0.022	0.085	0.376	0.086	0.022	0.085	0.376	0.086	0.022
2051	0.081	0.356	0.083	0.022	0.081	0.356	0.083	0.022	0.081	0.356	0.083	0.022	0.081	0.356	0.083	0.022
2052	0.079	0.353	0.082	0.020	0.079	0.353	0.082	0.020	0.079	0.353	0.082	0.020	0.079	0.353	0.082	0.020
2053	0.095	0.438	0.091	0.022	0.095	0.438	0.091	0.022	0.095	0.438	0.091	0.022	0.095	0.438	0.091	0.022
2054	0.089	0.406	0.087	0.021	0.089	0.406	0.088	0.021	0.089	0.406	0.087	0.022	0.089	0.406	0.088	0.022
2055	0.081	0.367	0.084	0.019	0.081	0.367	0.084	0.019	0.081	0.367	0.084	0.019	0.081	0.367	0.084	0.019
2056	0.102	0.493	0.086	0.021	0.102	0.493	0.086	0.021	0.102	0.493	0.086	0.021	0.102	0.493	0.086	0.021
2057	0.092	0.429	0.088	0.020	0.092	0.429	0.088	0.020	0.092	0.429	0.088	0.021	0.092	0.429	0.088	0.021
2058	0.075	0.330	0.084	0.020	0.075	0.330	0.084	0.020	0.076	0.330	0.084	0.020	0.076	0.330	0.084	0.020
2059	0.094	0.447	0.088	0.020	0.094	0.447	0.088	0.020	0.094	0.447	0.088	0.020	0.094	0.448	0.088	0.020
2060	0.076	0.343	0.081	0.018	0.076	0.343	0.081	0.018	0.076	0.343	0.081	0.019	0.076	0.343	0.081	0.019
2061	0.065	0.285	0.076	0.016	0.065	0.285	0.076	0.016	0.065	0.286	0.076	0.016	0.065	0.286	0.076	0.016
2062	0.082	0.381	0.079	0.018	0.082	0.381	0.079	0.018	0.083	0.387	0.079	0.019	0.083	0.387	0.079	0.019
2063	0.083	0.386	0.080	0.019	0.083	0.386	0.080	0.019	0.085	0.396	0.080	0.019	0.085	0.397	0.080	0.019
2064	0.084	0.392	0.083	0.019	0.084	0.392	0.083	0.019	0.086	0.403	0.083	0.019	0.086	0.403	0.083	0.019
2065	0.086	0.409	0.081	0.018	0.086	0.409	0.081	0.018	0.088	0.421	0.081	0.019	0			

Table 363176-8
Selected Remedy (REM-3/10/Select) Scenarios Average PCB Toxicity Quotients
Ecological Receptors (25-Year Time Frame)

Selected Remedy		R14S2 : 5- Yr No Resuspension	R14RS : 5-Yr 0.13 % Resuspension	R20RS : 6-Yr 0.13 % Resuspension	R14RX : 6-Yr 2.5 % Resuspension
Upper Hudson Average (Length-Weighted)					
Mink	LOAEL	0.2	0.2	0.2	0.2
	NOAEL	2.4	2.4	2.3	2.3
River Otter	LOAEL	1.8	1.8	1.7	1.8
	NOAEL	18	18	17	18
River Section 1 (RM 189)					
Mink	LOAEL	1.0	1.0	0.9	0.9
	NOAEL	9.5	9.6	9.2	9.2
River Otter	LOAEL	5.2	5.2	5.0	5.0
	NOAEL	52	52	50	50
River Section 2 (RM 184)					
Mink	LOAEL	0.3	0.3	0.3	0.3
	NOAEL	3.1	3.1	2.9	2.9
River Otter	LOAEL	2.9	3.0	2.8	2.8
	NOAEL	29	30	28	28
River Section 3 (RM 154)					
Mink	LOAEL	0.1	0.1	0.1	0.1
	NOAEL	0.8	0.8	0.7	0.7
River Otter	LOAEL	0.9	0.9	0.8	0.9
	NOAEL	8.6	8.8	8.1	8.5

Notes: TQs above the target level of 1.0 are bolded.

Upper Hudson average start years for toxicity quotients are 2009/2010 for 5- and 6-yr scenarios, respectively.

River Section 1 (RM 189) Start years for toxicity quotients are 2008/2009 for 5- and 6-yr scenarios, respectively.

River Section 2 (RM 184) Start years for toxicity quotients are 2009/2010 for 5- and 6-yr scenarios, respectively.

River Section 3 (RM 154) Start years for toxicity quotients are 2010/2011 for 5- and 6-yr scenarios, respectively.

Upper Hudson River average is weighted by river section length. River Section 1: 6.3 miles = 15.4%;

River Section 2: 5.1 miles = 12.5%; and River Section 3: 29.5 miles = 72.1%.

Table 363176-9
Modeled Times of Compliance with Ecological Risk-Based Concentrations
Selected Remedy (REM-3/10/Select) Scenarios

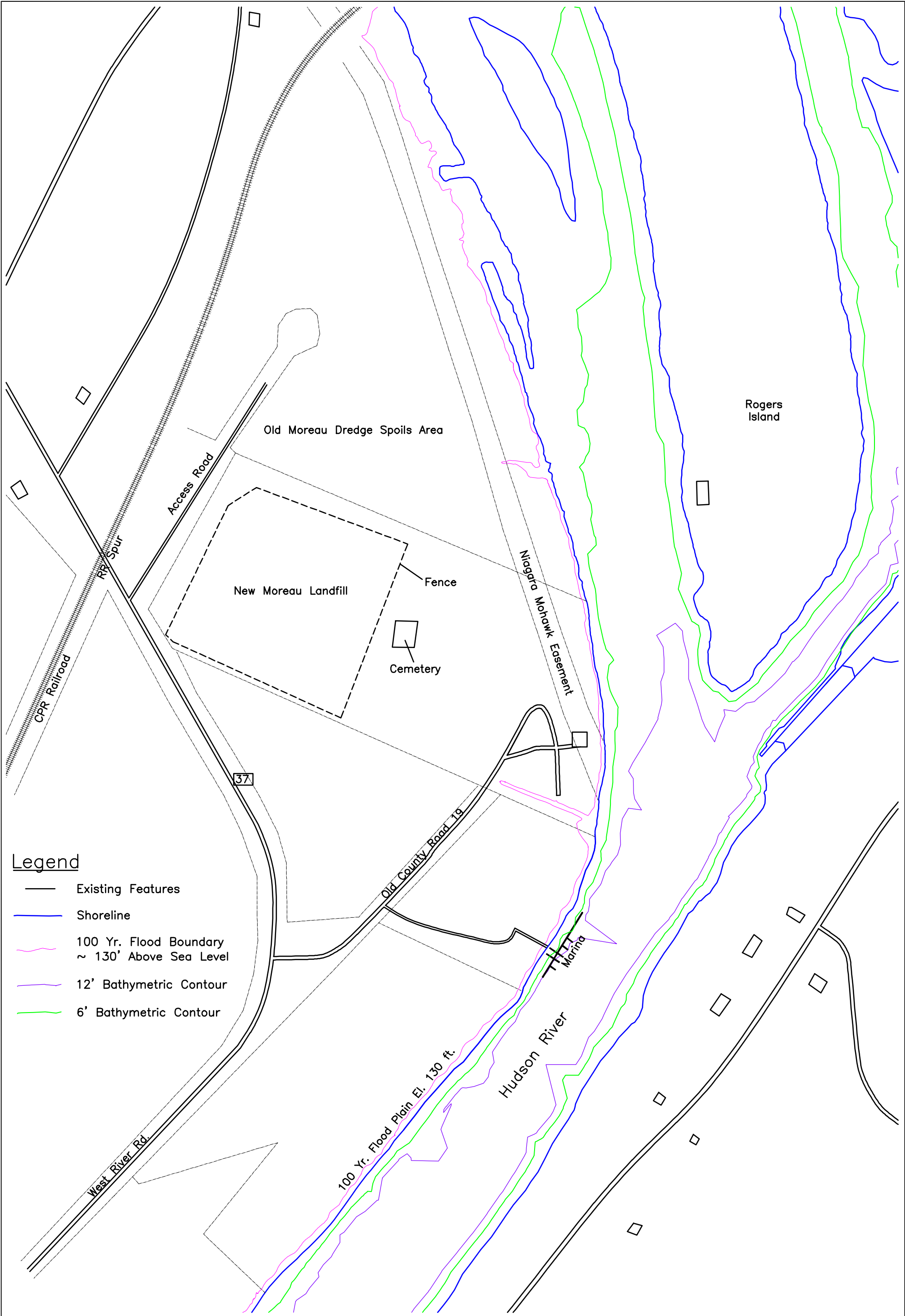
Selected Remedy		R14S2 : 5- Yr No Resuspension	R14RS : 5-Yr 0.13 % Resuspension	R20RS : 6-Yr 0.13 % Resuspension	R14RX : 6-Yr 2.5 % Resuspension
Upper Hudson Average					
Mink	LOAEL	2006	2006	2007	2007
	NOAEL	2061	2061	2061	2061
River Otter	LOAEL	2035	2035	2035	2035
	NOAEL	> 2067	> 2067	> 2067	> 2067
River Section 1 (RM 189)					
Mink	LOAEL	2012	2012	2012	2013
	NOAEL	> 2067	> 2067	> 2067	> 2067
River Otter	LOAEL	> 2067	> 2067	> 2067	> 2067
	NOAEL	> 2067	> 2067	> 2067	> 2067
River Section 2 (RM 184)					
Mink	LOAEL	2008	2008	2009	2009
	NOAEL	> 2067	> 2067	> 2067	> 2067
River Otter	LOAEL	> 2067	> 2067	> 2067	> 2067
	NOAEL	> 2067	> 2067	> 2067	> 2067
River Section 3 (RM 154)					
Mink	LOAEL	1999	1999	1999	1999
	NOAEL	2015	2016	2016	2017
River Otter	LOAEL	2019	2019	2019	2020
	NOAEL	> 2067	> 2067	> 2067	> 2067

Notes:

Modeling extends until 2067.

ENGINEERING FEASIBILITY

Example Sediment Processing/Transfer Facilities
253216



Legend

- Existing Features
- Shoreline
- 100 Yr. Flood Boundary ~ 130' Above Sea Level
- 12' Bathymetric Contour
- 6' Bathymetric Contour



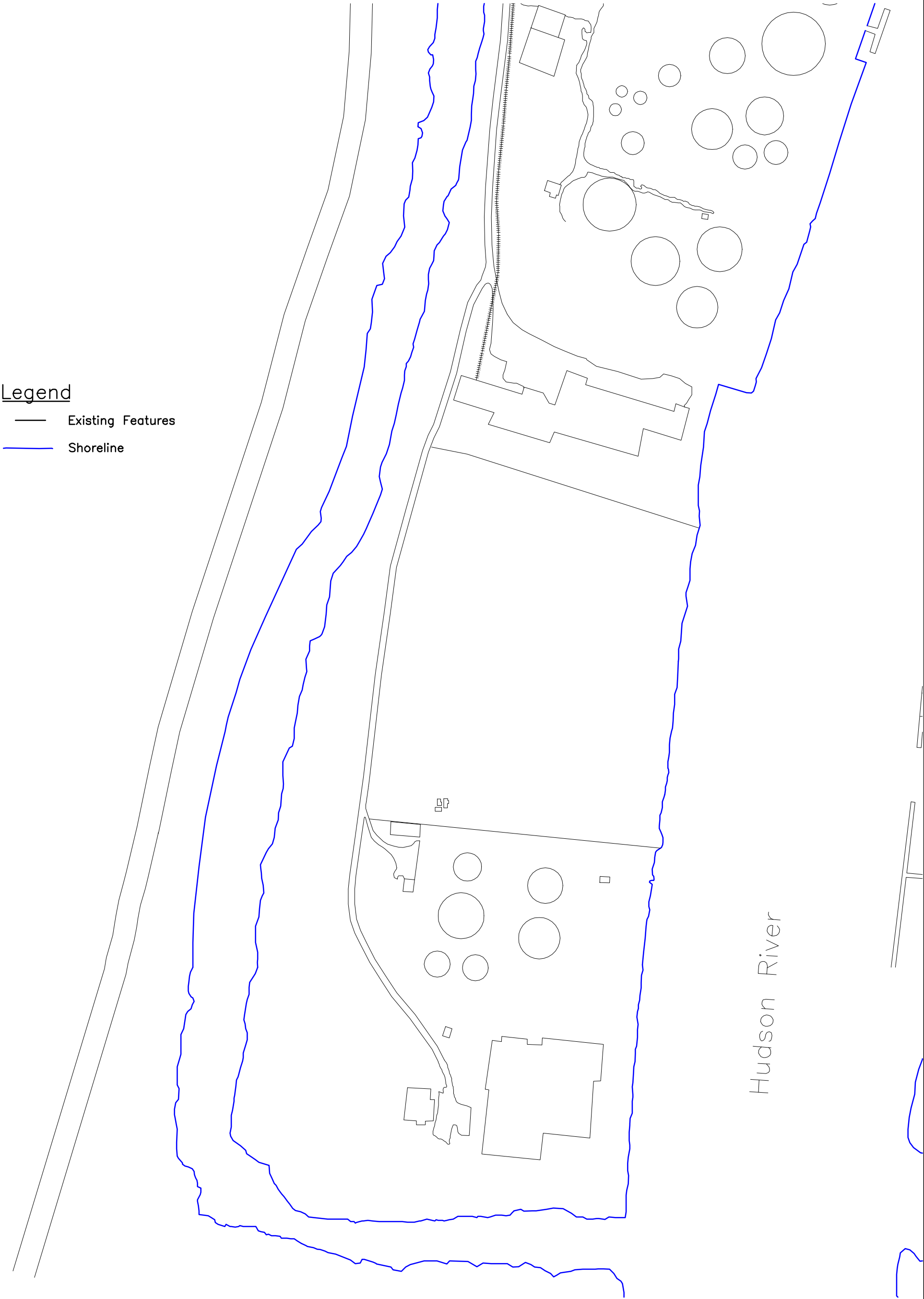
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Scale in Feet

TAMS Consultants, Inc.

Responsiveness Summary
Hudson River PCB's Site Record of Decision

Figure 253216-1

Example Northern Sediment Processing
and Transfer Facility Site -
Existing Conditions



Legend

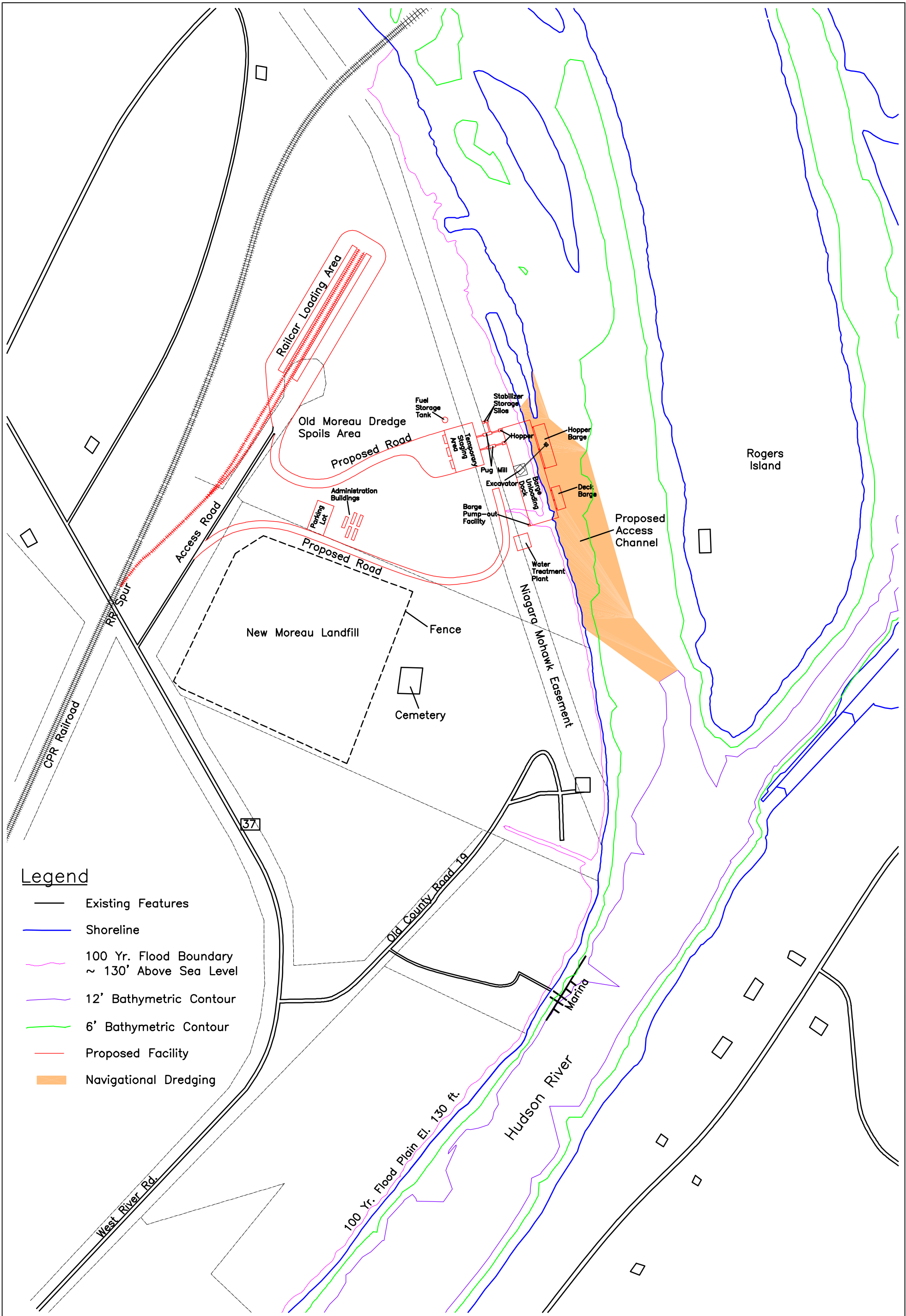
- Existing Features
- Shoreline



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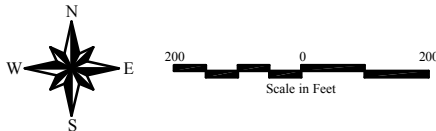
TAMS Consultants, Inc.

Responsiveness Summary Hudson River PCB's Site Record of Decision	Figure 253216-2
	Example Southern Sediment Processing and Transfer Facility Site - Existing Conditions



Legend

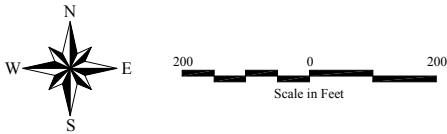
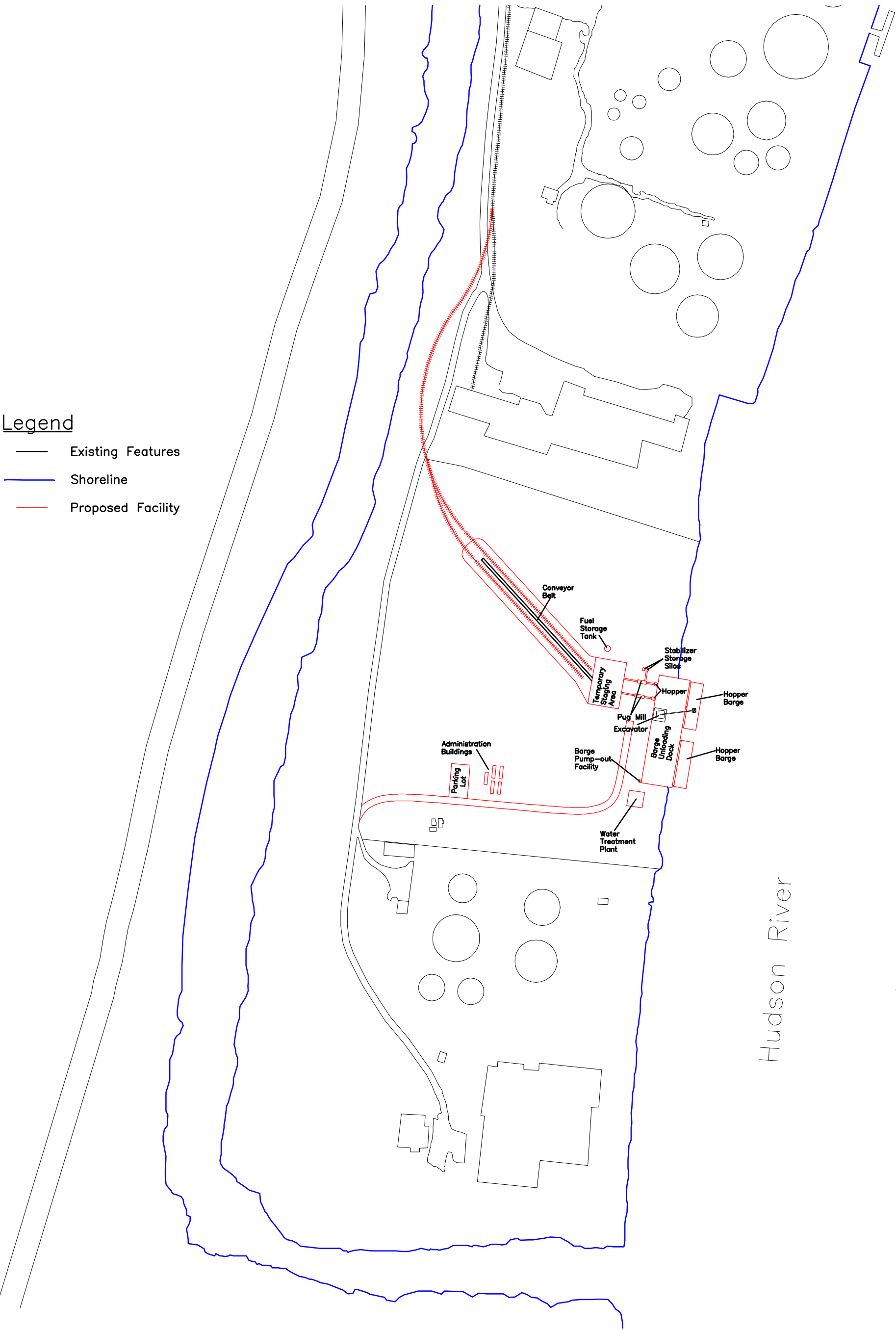
- Existing Features
- Shoreline
- 100 Yr. Flood Boundary ~ 130' Above Sea Level
- 12' Bathymetric Contour
- 6' Bathymetric Contour
- Proposed Facility
- Navigational Dredging



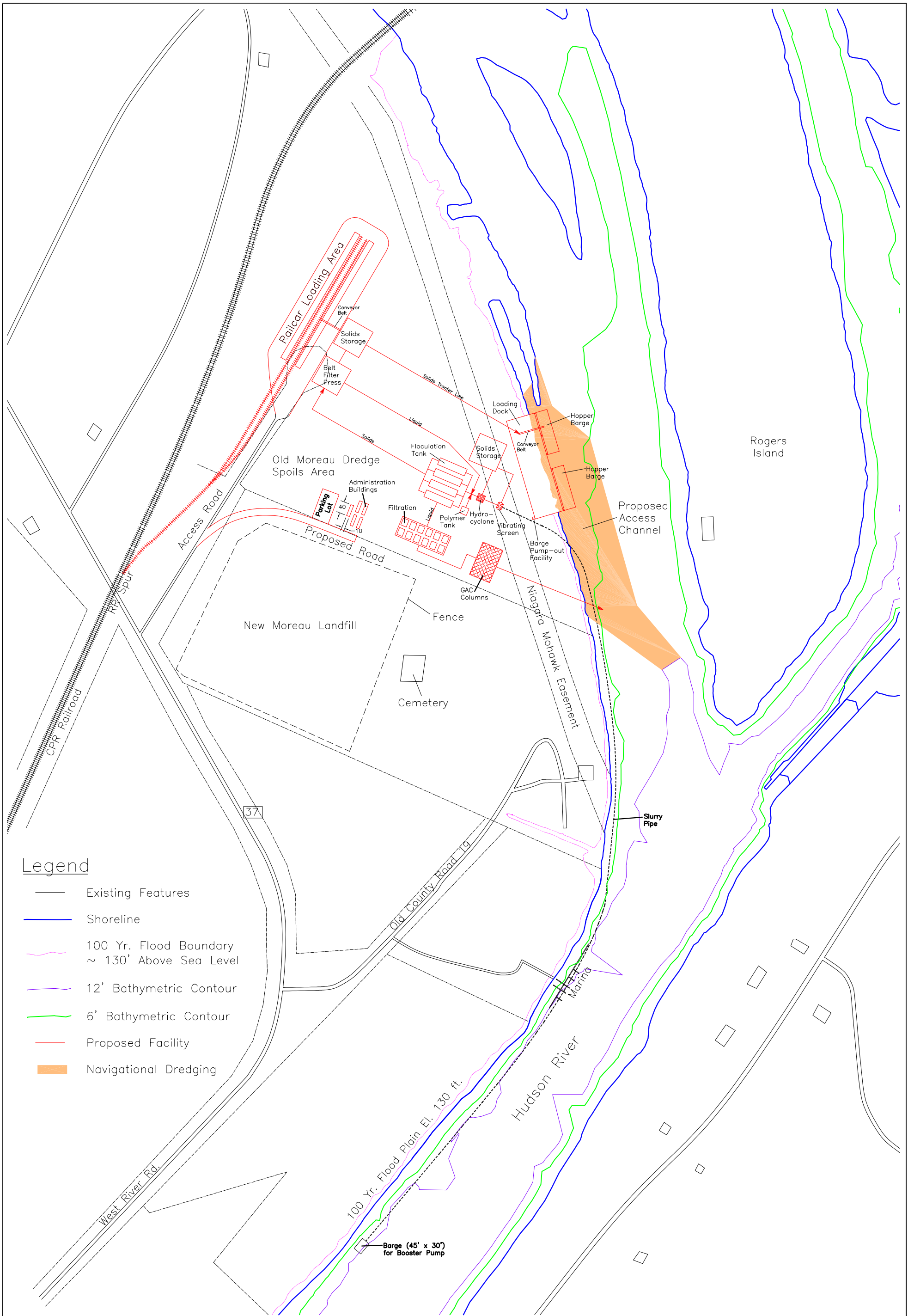
Responsiveness Summary Hudson River PCB's Site Record of Decision	Figure 253216-3
	Example Northern Sediment Processing and Transfer Facility Site - Layout for Mechanical Dredging

Legend

- Existing Features
- Shoreline
- Proposed Facility

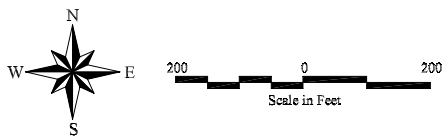


Responsiveness Summary Hudson River PCB's Site Record of Decision	Figure 253216-4
	Example Southern Sediment Processing and Transfer Facility Site - Layout for Mechanical Dredging



Legend

- Existing Features
- Shoreline
- 100 Yr. Flood Boundary ~ 130' Above Sea Level
- 12' Bathymetric Contour
- 6' Bathymetric Contour
- Proposed Facility
- Navigational Dredging



TAMS Consultants, Inc.

Responsiveness Summary
Hudson River PCB's Site Record of Decision

Figure 253216-5

Example Northern Sediment Processing
and Transfer Facility Site -
Layout for Hydraulic Dredging

Dredging Productivity and Schedule
253090

Table 253090-1

“Other Projects” (Hydraulic) Referenced in Comments

Project	Page (1)	Volume, cy	Dredge			Pipeline			cy/hr
			Type	Size	HP	Type	Size	Length	
Manistique	11	179,000	auger	?	?	?	?	?	
Fox River 1956/1957	11	49,900	auger	10	?	?	?	?	
New Bedford	14	14,000	cutter	12	370?	?	?	?	13.4
Canal Corporation	15	?	cutter	15	?	?	15	?	100 - 124
“other” (2)	16	---	?	?	?	?	?	?	50 – 75
GBA 1992 (3)	13	1,800,000	cutter	12	900	(4)	16	2,000 (5)	192 (3)
GBA 2000 (5)	---		cutter	12	600	HDPE	16	2,000 (5)	260 (3)
“?” = data <u>not</u> provided in the comments (GE Appendix B) (1) GE Data Base (2) GE questions the difference in coverage rate between the two GBA reports (GE Appendix B, page 14). GBA 1992 was based on a uniform 2 ft cut which resulted in coverage production using an 80 ft swing width and a swing line hoist speed of 45 ft/m. This gives a coverage production of 198 cy/h. An average daily production time of 17 hours was used for a range of booster combinations. For coverage production the GBA 2000 report uses a 139 ft swing width and a swing line hoist speed of 60 ft/m resulting in a coverage rate for a 2 ft cut of 260 cy/h. (3) Steel or HDPE (4) Distance to first booster pump (5) EPA Draft Feasibility Report, Appendix H									

Engineering Feasibility

Delays and Downtime
313398

Table 313398-1

Analysis of Daily Temperature Information

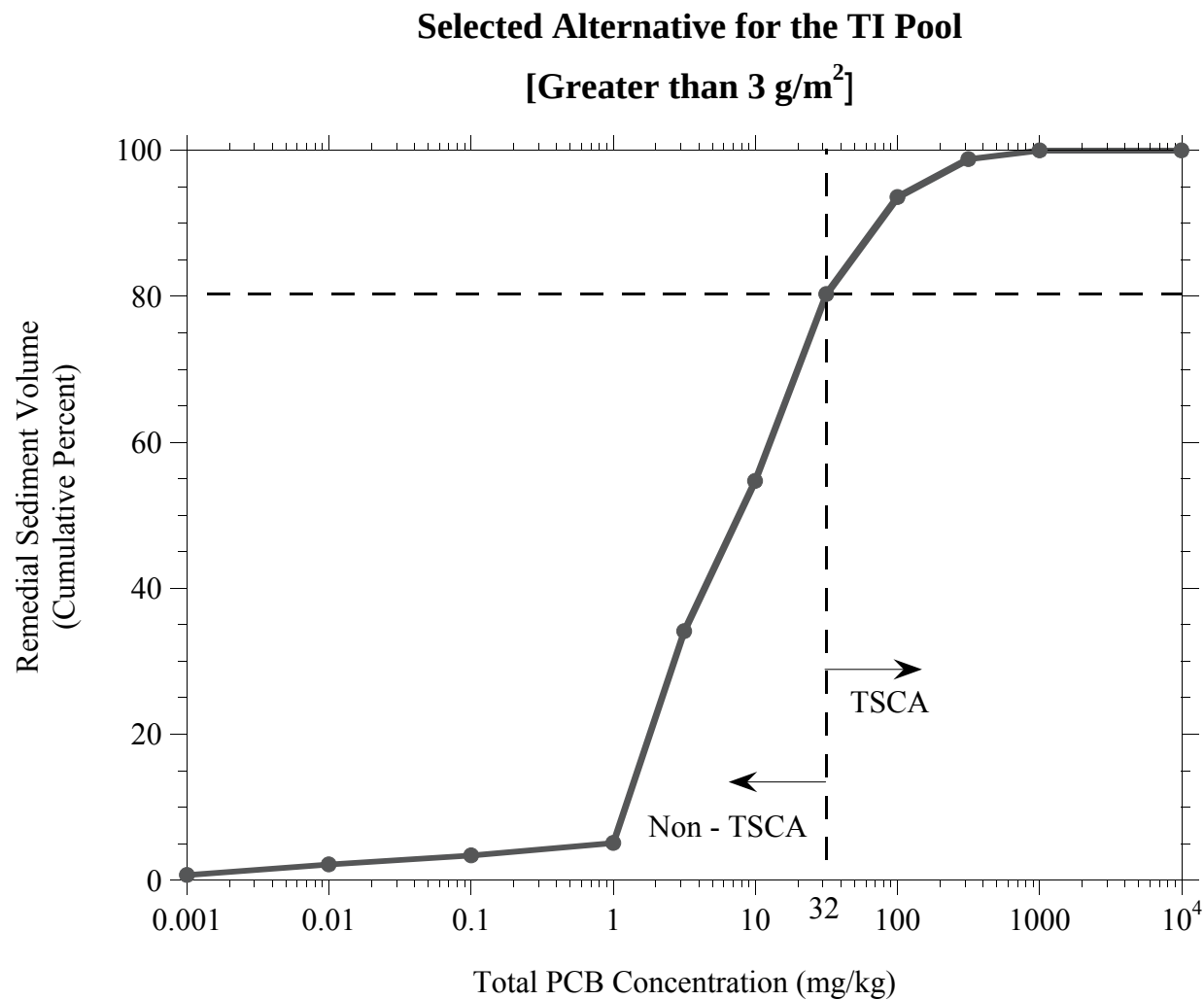
Year	Last Average Daily Freeze	Consecutive 7-Day Thaw	First Average Daily Freeze	Consecutive 7-Day Freeze
Albany Station				
1991	March 22	March 19	November 5	December 20
1992	March 25	March 10	November 8	December 11
1993	March 24	March 31	November 25	none
1994	March 21	March 1	November 23	December 17
1995	March 12	March 19	November 9	December 11
1996	March 29	March 21	November 12	November 31
1997	April 10	April 2	November 12	none
1998	March 26	February 23	December 12	none
1999	March 15	March 22	November 11	December 28
2000	April 10	March 1	November 17	November 25
Glens Falls Station				
1991	April 2	March 21	November 5	December 22
1992	March 25	April 2	November 2	December 11
1993	March 24	March 31	November 21	December 30
1994	March 21	March 28	November 23	none
1995	April 7	March 19	November 9	December 12
1996	March 29	April 5	November 3	November 30
1997	April 10	April 2	November 13	none
1998	March 26	February 25	November 6	December 30
1999	March 15	March 23	November 12	December 30
2000	March 20	February 29	NA	NA
Notes: Last Average Daily Freeze date is the day succeeding the last average freeze. Consecutive 7-Day Thaw - the eighth day following a full week of thawing conditions. Consecutive 7-Day Freeze - the eighth day following a full week of freezing conditions.				

Table 313398-2

Analysis of River Flow Delays

			GE (2)	EPA (3)	
	% (1)	total days	number of days	number of days	Remarks
April	43.0	30	12.90	0	as per FS, no April operations
May	25.0	31	7.75	7.75	
June	4.0	30	1.20	1.20	
July	.20	31	0.06	0.06	
August	.20	31	0.06	0.06	
September	.10	30	0.03	0.03	
October	4.0	31	1.24	1.24	
November	3.5	31	1.09	1.09	
Total days – GE		245	24.3		
Total days – EPA		215		11.4	
% potential downtime			10.0%	5.3%	
Source: US Geological Survey, Albany, flow-duration data for Station ID – 01327750, Hudson River at Fort Edward NY, 1978 – 2000 Notes: (1) Percentage of days each month river flow exceeded 10,000 cfs during period of record (2) Basis for GE estimate of potential days of downtime (3) EPA estimate of potential days of downtime					

Estimate of Dredged Material Exceeding TSCA Criteria
424851



Note: Total PCB concentration is obtained as the quotient of the Total PCB mass and the entire mass of dredged sediments in each Thiessen polygon. See text for further explanation.

Figure 424851-1
Cumulative Percentage of Sediment Volume Removal based on
Total PCB Concentration within TI Pool

Table 424851 - 1
Percentage of Material Exceeding TSCA Criterion of 32 mg/kg

(Volumes in Cubic Yards)

River Section	Total Remedial Sediment Volume	Sediment Volume of Remediation Areas	Sediment Volume of Channel Areas (Navigational)	Volume <32 mg/kg Total PCB ¹	Volume >32 mg/kg Total PCBs	Percent Exceeding Threshold (Contaminated Areas Only)	Percent Exceeding Threshold (All Areas)
Section 1 Original FS Estimate	1,560,000	1,500,000	66,000	1,140,000	420,000	28%	27%
Revision	1,560,000	1,500,000	66,000	1,250,000	310,000	21%	20%
Section 2 Section 2 ²	580,000	560,000	15,000	150,000	430,000	77%	75%
Section 3 Section 3 ²	510,000	390,000	117,000	250,000	260,000	66%	51%
All Sections Original FS Estimate	2,650,000	2,450,000	199,000	1,540,000	1,110,000	45%	42%
Revision	2,650,000	2,450,000	199,000	1,650,000	1,000,000	41%	38%

Notes

1. Volume includes all of the navigational dredging material.
2. Contaminated volume estimate is not adjusted for overcut.

Engineering Feasibility

Rail Operations
312991

No Figures or Tables

Off-Site Disposal of Processed Sediments
253477

No Figures or Tables

Additional Technology Evaluation
255314

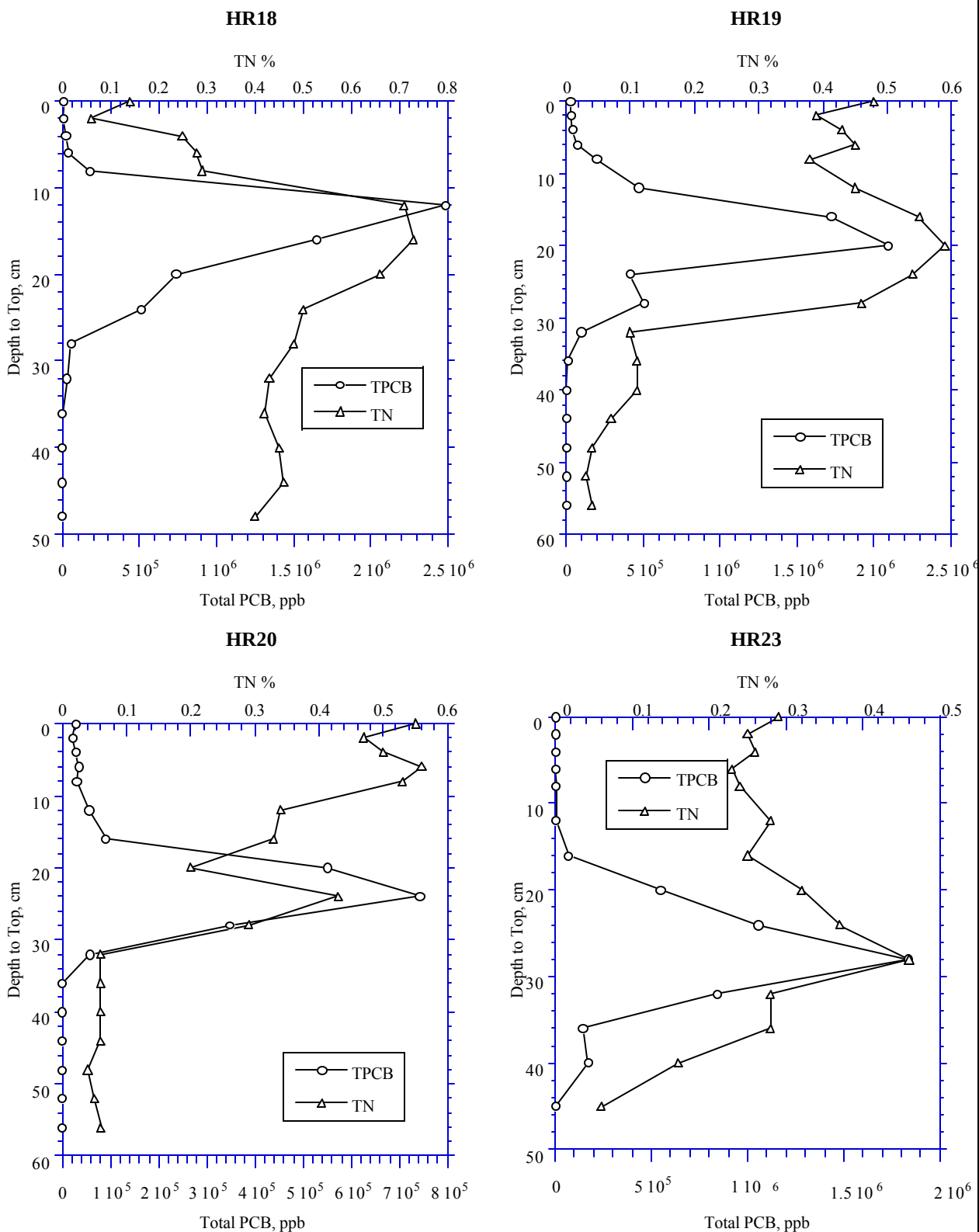
Table 255314-1
List of Process Options for Bioremediation

Process Name	Vendor Name	Applicability to Treat PCBs in Freshwater Sediments	Development Status	Hazardous or Toxic Residuals Produced	Capital or O&M Intensive	Availability	Processing Rate or Cleanup Time	Cost	Special or Unique Features
Aerobic/ Anaerobic Bioremediation/ Encapsulation Technology	Huma- Clean, LLC	Not tested for PCBs in sediments	Commercial	No	O&M	Readily available	No available information	Not available	In situ or ex situ. Utilizes microbial culture (H-101) to degrade the contamin ants.
Cogen V	TAMCO/ KATHER	Not tested for PCBs in sediments	Commercial	No	O&M	Readily available	No available information	Not available	In situ or ex situ.
Anaerobic Bioremediation Technology	Genovation	Tested for PCBs	Bench pilot	No available information	O&M	Readily available	Information under review	Not available	In situ or ex situ.

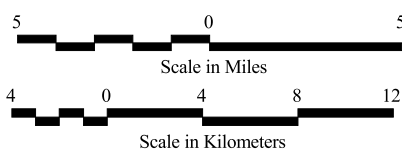
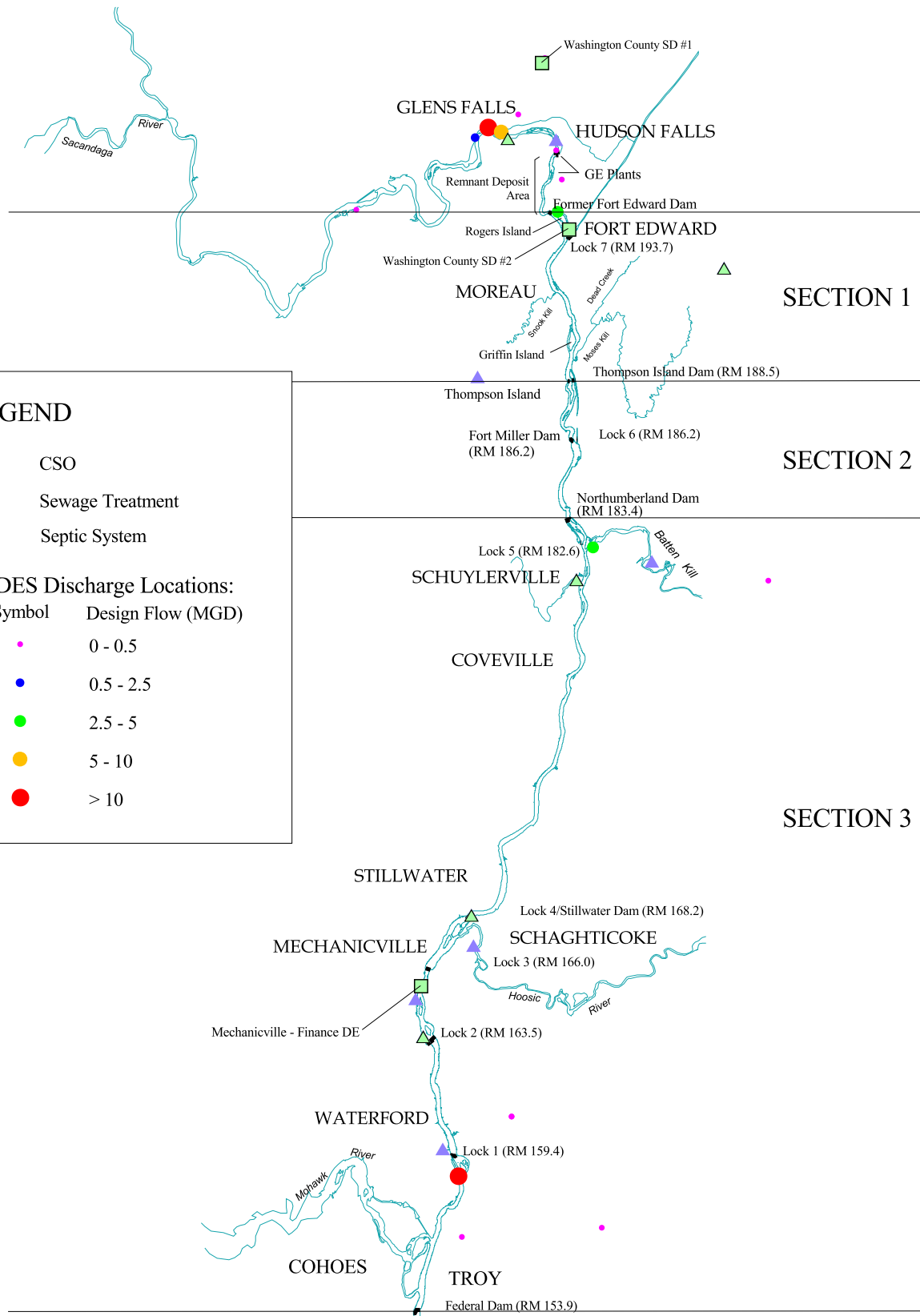
POTENTIAL IMPACTS OF THE SELECTED REMEDY

Potential Impacts of the Selected Remedy

Potential Impacts to Water Resources 312851



**Figure 312851-1 Typical Total Nitrogen and Total PCB Profiles
in the Upper Hudson River High Resolution Core Samples**



Responsiveness Summary
Hudson River PCBs Site Record of Decision

Hudson River PCBs Site
Existing Discharge Locations to the Upper Hudson

TAMS CONSULTANTS, Inc.

Figure 312851-2

Table 312851-1**Model-Based Estimates of TSS from Resuspension for the Hudson River**

Hydraulic Dredging			
Distance	Additional TSS Concentration in mg/L		
	Section 1	Section 2	Section 3
10 m downstream of single dredge head “near-field”	1.1	1.4	1.4
Fully mixed at 3,000 cfs, one dredge “far-field”	0.3	0.5	0.5
Mechanical Dredging			
Distance	Additional TSS concentration in mg/L		
	Section 1	Section 2	Section 3
10 m downstream of single dredge head “near-field”	1.0	1.2	1.2
Fully mixed at 3,000 cfs, three dredges “far-field”	0.4	1.1	1.1

Table 312851-2**Estimated Total Nitrogen Increase in the Water Column during Dredging**

	Total Nitrogen	
	Mechanical Dredging	Hydraulic Dredging
Nitrogen concentration in the sediment, mg/kg	3,000	3,000
Sediment release rate by dredging, %	0.13	0.07
Production rate (one dredge), cy/hr	95	270
Specific weight of dredged sediment, ton/cy	1.4	1.4
Sediment release (one dredge), g/s	22	33
Nitrogen release (one dredge), g/s	0.07	0.10
River flow rate, cfs	3,000	3,000
"Far field," well mixed, water column increase in nitrogen (one bucket dredge, mg/L)	0.0008	0.0012
"Far field," well mixed, water column increase in nitrogen (three bucket dredges, mg/L)	0.0023	—
River ambient nitrogen level, mg/L	1.1	1.1
Relative increase, %	0.2	0.1

Table 312851-3**Estimated Total Phosphorous Increase in the Water Column during Dredging**

	Total Phosphorous	
	Mechanical Dredging	Hydraulic Dredging
Phosphorus concentration in the sediment, mg/kg	1,500	1,500
Sediment release rate by dredging, %	0.13	0.07
Production rate (one dredge), cy/hr	95	270
Specific weight of dredged sediment, ton/cy	1.4	1.4
Sediment release (one dredge), g/s	22	33
Phosphorus release (one dredge), g/s	0.03	0.05
River flow rate, cfs	3,000	3,000
Phosphorus water column increase (one dredge, mg/L)	0.0004	0.0006
Phosphorus water column increase (three dredges, mg/L)	0.0012	—
Phosphorus ambient level, mg/L	0.05	0.05
Relative increase, %	2.3	1.2

Table 312851-4

**Estimated Flux of Metals to the Water Column,
Based on the Resuspension Model
at 10 Meters Downstream of the Dredge Head**

Parameter	Sediment Concentration ¹ (mg/kg)			Cutterhead Dredge		Enclosed Bucket	
	Min ²	Max ²	Mean ²	Metal Flux to Water Column ³ (g/day)			
				Section 1	Sections 2&3	Section 1	Sections 2&3
Cadmium	0.5	193		2	30	70	80
Chromium	7.0	7,000	44	550	880	2,100	2,200
Copper	10.0	170		6	100	240	250
Lead	22.9	2,450	25	320	510	1,200	1,300
Manganese	25.0	2,270	57	720	1,150	2,700	2,800
Mercury	0.2	7			2	6	6
Nickel	5.0	68		3	50	115	120
Avg Resuspension Rate TSS ⁴ (kg/s)				0.025	0.04	0.026	0.027
Notes:							
(1) See metals contamination white paper for sediment metal concentrations.							
(2) One of the sediment data sets was not used to determine min and max since individual sample data are not available.							
(3) The mean sediment concentration was used to calculate the release rate for each section. Differences among sections reflect the different resuspension rates for each section							
(4) See PCB Re-mobilization White Paper.							

Table 312851-5

Estimated Concentrations for Metals in the Water Column

Metal	Controlling Water Quality Standard ¹		Total to Dissolved Conc. Ratio	Regulatory Flow ²	Concentration Increase Due to Dredging ⁶	Percent of Standard
	Type	ug/L				
Cadmium	Aquatic (acute effects) ³	4.4	2.3	984	0.03	0.7%
Chromium	Health (water supply)	50	5.0	2300	0.39	0.8%
Copper	Aquatic (acute effects) ³	13.5	1.8	984	0.10	0.8%
Lead	Aquatic (chronic effects)	4.8	2.5	1968	0.26	5.5%
Manganese	Aesthetic	300	n.a. ⁴	2300	0.50	0.2%
Mercury	Health (fish consumption) ⁵	0.0012	1.7	2300	0.001	86.8%
	Wildlife	0.0044	1.7	2300	0.001	23.7%
	Aquatic (acute effects) ³	2.4	1.7	984	0.002	0.1%
Nickel	Aquatic (chronic effects)	40	1.3	1968	0.025	0.1%
Notes: 1. A hardness of 54 mg/L was applied to calculate water quality standards, when applicable (NYSDEC, 2001). 2. 7Q10 flow (1968 cfs) used for protection of aquatic life; 30Q10 flow (2300 cfs) used for human health and wildlife protection (NYSDEC, 2001). 3. A conservative assumption of 50 percent of the 7Q10 flow was used to estimate concentrations for acute aquatic exposure in mixing zones near the dredge operation (NYSDEC, 2001). 4. Not applicable. 5. The Upper Hudson is currently under a fish consumption advisory (catch and release only). 6. Concentration increase is based on mean sediment concentration for the metal as given in the Metal Contamination in the Sediments White Paper. The flux was based on the resuspension of solids derived for the mechanical dredge (the higher dredging resuspension estimate) and the regulatory flow given in this table.						

Table 312851-6
Estimated Flux of PAHs to Water Column, Based on the Resuspension Model at
10 Meters Downstream of the Dredge Head

	Conc. in sediment, ug/kg	Cutterhead Dredge		Enclosed Bucket	
		PAH Flux in Water Column (g/day)			
		Section 1	Sections 2&3	Section 1	Sections 2&3
Fluoranthene	1000	1.3	2.0	1.6	1.7
Pyrene	890	1.1	1.8	1.4	1.5
Phenanthrene	820	1.0	1.7	1.3	1.4
Chrysene	520	0.7	1.0	0.8	0.9
Benz(a)anthracene	440	0.6	0.9	0.7	0.7
Benzo(b)fluoranthene	400	0.5	0.8	0.6	0.7
Benzo(k)fluoranthene	390	0.5	0.8	0.6	0.6
Benzo(a)pyrene	320	0.4	0.6	0.5	0.5
Anthracene	300	0.4	0.6	0.5	0.5
Avg Resuspension Rate TSS (kg/sec)		0.025	0.04	0.026	0.027

Table 312851-7

Estimated Concentrations for PAHs in the Water Column at the Waterford Intake

Controlling Water Quality Standard		Regulatory flow	Highest Load due to Dredging	Concentration Increase Due to Dredging	Percent of Standard
Type	ug/L	cfs	g/day	ug/L	%
Health (water supply)	50	2300	1.7	0.00029	0.001
Aquatic effects (chronic effects)	4.6	1968	1.5	0.00031	0.01
Aquatic effects (chronic effects)	5	1968	1.4	0.00028	0.01
Health (water supply)	0.002	2300	0.9	0.00015	8
Aquatic effects (chronic effects)	0.03	1968	0.7	0.00015	1
Health (water supply)	0.002	2300	0.7	0.00012	6
Health (water supply)	0.002	2300	0.6	0.00011	6
Health (fish consumption)	0.0012	2300	0.5	0.00009	8
Aquatic effects (chronic effects)	3.8	1968	0.5	0.00010	0.003

Table 312851-8

Estimated Dissolved Oxygen Impacts Due to Dredging

TOC in sediment, %		Released TOC to the Water, mg/L		DO reduction, mg/L	
		Mechanical	Hydraulic	Mechanical	Hydraulic
mean	4.9	0.067	0.061	0.18	0.16
median	4.0	0.055	0.050	0.15	0.13
max	11.5	0.16	0.14	0.42	0.38

Iron in sediment, %		Released Iron to the Water, mg/L		DO reduction, mg/L	
		Mechanical	Hydraulic	Mechanical	Hydraulic
mean	1.8	0.025	0.022	0.004	0.003
median	1.8	0.025	0.022	0.004	0.003
max	2.8	0.038	0.035	0.005	0.005

Sulfur in sediment, %		Released Sulfur to the Water, mg/L		DO reduction, mg/L	
		Mechanical	Hydraulic	Mechanical	Hydraulic
mean	0.15	0.002	0.002	0.004	0.004
Mean Net Impact:				DO reduction, mg/L	
				Mechanical	Hydraulic
				0.19	0.17

Potential Impacts of the Selected Remedy

Coastal Zone Management
253238

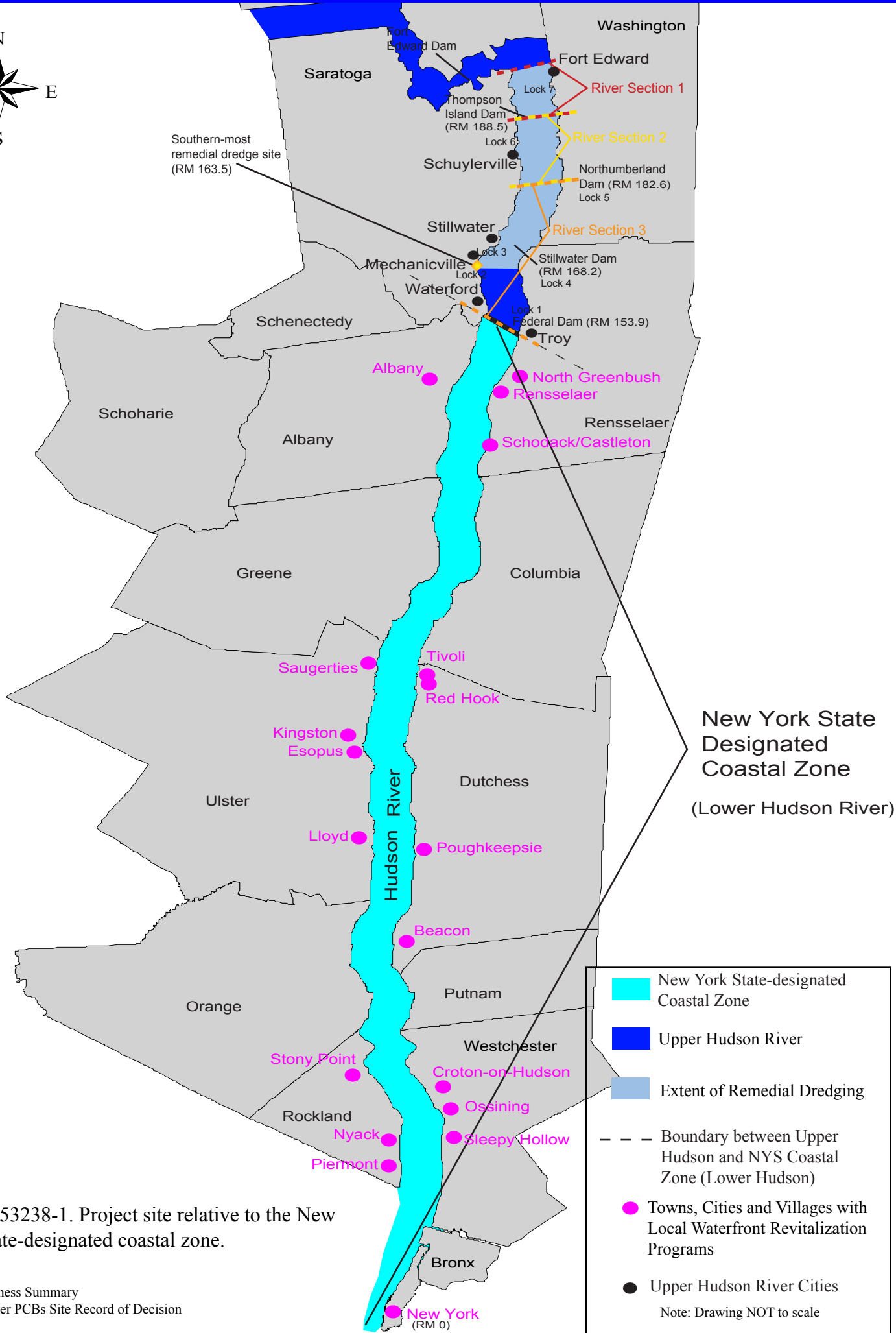
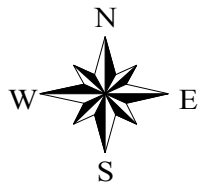


Figure 253238-1. Project site relative to the New York State-designated coastal zone.

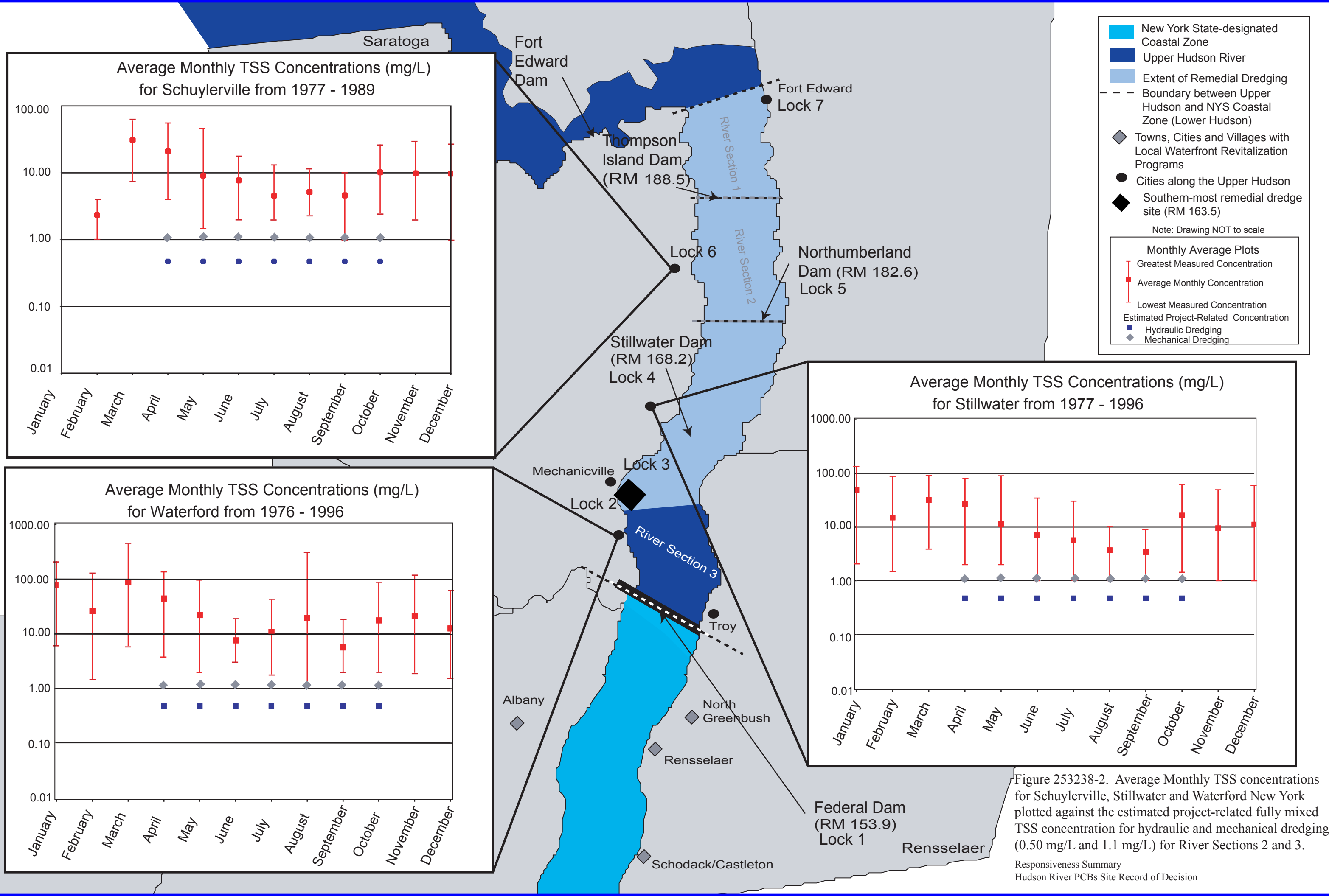


Figure 253238-2. Average Monthly TSS concentrations for Schuylerville, Stillwater and Waterford New York plotted against the estimated project-related fully mixed TSS concentration for hydraulic and mechanical dredging (0.50 mg/L and 1.1 mg/L) for River Sections 2 and 3.

Table 253238-1
Freshwater, Brackish Water, and Salt Water Habitats

Site Name	County	Community Types	Rare Species	Valuable Resources
Freshwater Habitats				
Normans Kill	Albany	Freshwater creek with shallows associated with creek mouth.	None identified.	Spawning area for anadromous fish species including alewife, white perch, and blueback herring. Large resident smallmouth bass populations.
Shad and Schermerhorn Island	Albany	Largely comprised of shallows and mudflats with lesser amounts of lower marsh, upper marsh and freshwater creek.	Heart leaf plantain and estuary beggar ticks.	Large feeding areas for herons and other wading birds, furbearers, deer and other upland game, limited waterfowl usage, important spawning and nursery grounds for American shad, blueback herring, alewife, white perch, striped bass, and resident fish species.
Papascanée Marsh and Creek	Rensselaer	Mainly upper marsh with lesser amounts of shallows, mudflats, lower marsh, and freshwater creek.	Least bittern nesting area; map turtles.	Waterfowl use during migrations. Breeding birds incl. green-backed heron, Virginia rail, several duck species, marsh wren, swamp swallow, and others. Spawning and nursery grounds for American shad, blueback herring, alewife, white catfish, black bass, white perch and other fish.
Schodack and Houghtaling Islands and Schodack Creek	Rensselaer, Columbia, Greene	Predominantly shallows, mudflats, and sandy beach with lesser amounts of lower marsh and upper marsh.	Osprey roosting and feeding; possible use by shortnose sturgeon; heart leaf plantain.	Waterfowl use during migrations and limited nesting activity, nesting by other bird species. Furbearers present. Schodack Creek provides important spawning and nursery grounds for American Shad, white perch, alewife, and blueback herring, black bass and other species. Northmost concentration of shad spawning on the Hudson.
Coeymans Creek	Albany	Predominantly shallows with smaller amounts of mudflats, lower marsh, and swamp forest.	None.	Important spawning area for anadromous fish including alewife, blueback herring, white perch, and American Shad. Limited waterfowl during migrations.
Hannacroix Creek	Albany, Greene	Predominantly freshwater creek with shallows, mudflats, lower marsh, upper marsh and swamp forest.	None identified.	Important spawning area for alewife, blueback herring, white perch, American Shad, and other fish. Resting and feeding area for migratory waterfowl. Feeding area for herons, various birds, and furbearers.
Mill Creek Wetlands	Columbia	Swamp forest with some shallows, mudflats, sandy beach, lower marsh, and upper marsh.	Estuary beggar ticks.	Limited waterfowl use during migrations. Populations of breeding birds include green-backed herons, various ducks, and many passerines.
Stuyvesant Marshes*	Columbia	Roughly equal amounts of shallows, mudflats, sandy mudflats, sandy beach, rocky shore, lower marsh, and upper marsh.	Heart leaf plantain, kidney leaf mud plantain.	Limited use by migrating waterfowl, probable heavy use by various nesting bird species.
Coxsackie Creek	Greene	Principally freshwater creek with some shallows, mudflats, sandy beach, lower marsh, upper marsh, and freshwater creek.	Estuary beggar ticks.	Spawning habitat for alewife, blueback herring, white perch, and American shad. Feeding grounds for herons and other wading birds. Small mammal and furbearer foraging.
Coxsackie Island Backwater	Greene	Shallows with peripheral mud and sand flats, rocky shore, lower marsh, and upper marsh.	Heart leaf plantain, kidney leaf mud plantain.	Important spawning and nursery ground for resident fish including brown bullhead, largemouth bass, yellow perch, and redbfin pickerel. Also feeding grounds for anadromous fish and wintering areas for largemouth bass.

Table 253238-1
Freshwater, Brackish Water, and Salt Water Habitats

Site Name	County	Community Types	Rare Species	Valuable Resources
Stockport Creek and Flats	Columbia	Shallows and mudflats with substantial areas of lower marsh, upper marsh, and woody swamp. Three miles of tidal and freshwater creek. Some deepwater and sandy beach associated with navigation channel and islands.	Heart leaf plantain, estuary beggar ticks, golden club; map turtle.	Very important spawning/nursery grounds for anadromous and freshwater fish including alewife, blueback herring, smelt, American shad, striped bass, and smallmouth bass. Very important feeding and resting habitat for migrating and overwintering waterfowl. Use by wading, shore, and passerine birds for feeding and breeding. Bank swallows nest in the vertical sand banks. Extensive stands of wild rice.
Vosburgh Swamp and Middle Ground Flats	Greene	Largely comprised of creek, deepwater, shallows, and mudflats with lesser amounts of sandy beach, lower marsh, upper marsh, and freshwater swamp.	Possible least bittern and mud turtle; heart leaf plantain, sublate arrowhead, estuary beggar ticks.	Important feeding and resting grounds for migrating waterfowl and wintering waterfowl (when open water is available). Extensive nesting area for ducks, green-backed herons, and other birds. Colony of bank swallows. Heavy use of shallows for American shad spawning and extensive spawning, nursery and feeding areas for striped bass, alewife, blueback herring and resident fish species.
Roger's Island	Columbia	Comprised of roughly equal amounts of shallows and mudflats with some sandy beach, lower marsh, upper marsh, and swamp forest.	Estuary beggar-ticks, goldenclub.	Extensive waterfowl use during migrations and overwintering, nesting sites for many birds, extensive spawning areas for anadromous fish including the American shad.
Catskill Creek	Greene	Predominantly creek with small amounts of shallows, mudflats, and lower marsh.	Wood turtle, probably in association with buffer area.	Important spawning and nursery grounds for anadromous and resident fishes including American shad, alewife, blueback herring, white perch, smallmouth and largemouth bass.
Ramshorn Marsh	Greene	Largely shallows, mudflats, lower marsh, upper marsh, and swamp forest with lesser amounts of sandy beach and rocky shore.	Least bittern nesting; estuary beggar-ticks, and heart leaf plantain.	Waterfowl use during migrations and overwintering, important heron feeding grounds, furbearer habitat, spawning and nursery grounds for American shad and black bass.
Inbocht Bay and Duck Cove	Greene	Principally shallows and mudflats with some lower marsh.	Estuary beggar-ticks.	Very extensive waterfowl concentrations during spring and fall migrations, some waterfowl overwintering, large muskrat and snapping turtle populations.
Roeliff-Jansen Kill	Columbia	Predominantly freshwater creek with limited shallows, mudflats, and lower marsh.	None identified.	Extensive use as a spawning/nursery ground for anadromous fish including American shad, blueback herring, white perch, and striped bass. Resident brown trout in upper reaches.
Smith's Landing Cementon*	Greene, Ulster	Limited mudflats, lower marsh, and upper marsh.	Heart leaf plantain, kidney leaf mud-plantain.	None identified.
Germantown/Clermont Flats	Columbia	Deepwater, shallows, mudflats, and limited lower marsh.	None identified.	Extremely important American shad spawning area, nursery areas for shad, striped bass, white perch, and resident fish. Extensive waterfowl feeding grounds during spring and fall migration periods. Some waterfowl overwintering.
Esopus Estuary	Ulster, Dutchess	Comprised of freshwater creek, deepwater, shallows, mudflats, lower marsh, upper marsh, and a small amount of tidal swamp.	Shortnose sturgeon spawning and wintering area in deepwater; migrating osprey feeding grounds; heart leaf plantain, goldenclub.	Important spawning and nursery grounds for striped bass, white perch, American shad, alewife, blueback herring, rainbow smelt, and resident fish. Feeding and resting grounds for migrating waterfowl.

Table 253238-1
Freshwater, Brackish Water, and Salt Water Habitats

Site Name	County	Community Types	Rare Species	Valuable Resources
North and South Tivoli Bays	Dutchess	Comprised of shallows, lower marsh, and upper marsh, followed by tidal swamp forest, rocky shore and creeks.	Migrating osprey feeding and resting, least bittern nesting, king rail; map turtles; heart leaf plantain, estuary beggar-ticks, goldenclub and other rare plants.	Feeding, spawning and/or nursery areas for striped bass, alewife, blueback herring, largemouth and smallmouth bass, and other fishes. Large snapping turtle population. Extensive waterfowl use for feeding and resting during migrations. Many breeding birds. Furbearer habitat.
Mudder Kill*	Dutchess	Equal amounts of mudflats, lower marsh, upper marsh, and tidal swamp forest.	Goldenclub, hirsute sedge, Davis sedge, heavy sedge, kidney leaf mud-plantain, and spongy arrowhead.	None known.
The Flats	Ulster, Dutchess	Comprised entirely of shallows.	Potential shortnose sturgeon feeding and resting area.	Primary spawning grounds for American shad and spawning and nursery area for striped bass, white perch, and resident fishes. Feeding area during migration periods for diving ducks and resting areas for all duck species.
Roundout Creek	Ulster	Predominantly creek with shallows, mudflats, rocky shore, lower marsh, and limited amounts of upper marsh in association with the creek mouth.	Osprey during migration; heart leaf plantain.	Important spawning area for anadromous fish including alewife, rainbow smelt, blueback herring, white perch, tomcod, striped bass, and American shad. Important for resident fish such as brown bullhead, yellow perch, sunfish, and black basses. Limited use by migrating waterfowl for resting and feeding, extensive feeding on mudflats by herons and other wading birds.
Kingston Deepwater Habitat	Dutchess, Ulster	Deepwater.	Shortnose sturgeon wintering area and possible spawning grounds.	Atlantic sturgeon wintering area, the northern extent of many marine fishes in the Hudson.
Vanderburgh Cove and Shallows	Dutchess	Largely shallows with smaller amounts of mudflats, lower marsh, upper marsh, tidal swamp, and freshwater creek.	Possible shortnose sturgeon feeding grounds, osprey feeding ground during migration, sharp-winged monkey flower.	Extensive waterfowl feeding and resting grounds during spring and fall migrations. Important spawning, nursery, and feeding grounds for anadromous fish (striped bass, American shad, white perch, rainbow smelt, alewife, blueback herring) and resident fish (largemouth bass, yellow perch, brown bullhead).
Esopus Meadows	Ulster	Shallows.	Important feeding area for shortnose sturgeon, especially in spring.	Spawning, nursery, and feeding grounds for anadromous fish (e.g., striped bass, American shad, and white perch) and resident fish (e.g., largemouth bass, yellow perch, brown bullhead, and shiners).
Poughkeepsie Deepwater Habitat	Dutchess, Ulster	Deepwater.	Shortnose sturgeon wintering area and possible nursery grounds.	Estuarine and marine fish including bay anchovies, silversides, bluefish, weakfish, and hogchokers.
Crum Elbow Marsh*	Dutchess	Small amount of shallows, lower marsh, upper marsh, and tidal swamp forest.	Map turtle population.	Waterfowl migration, value limited by size of the marsh.
Brackish Water Habitats				
Wappinger Creek	Dutchess	Predominantly creek with smaller amounts of shallows, mudflats, lower marsh, and upper marsh.	Osprey feeding during spring migrations. Grassleaf arrowhead, subulate arrowhead, kidney leaf mud plantain and Maryland bur-marigold.	Important spawning areas for anadromous fish including alewife, blueback herring, white perch, tomcod, and striped bass. Resident fish include largemouth bass, bluegill, brown bullhead, and red-breasted sunfish. Productive area for herons, waterfowl, and turtles.

Table 253238-1
Freshwater, Brackish Water, and Salt Water Habitats

Site Name	County	Community Types	Rare Species	Valuable Resources
Fishkill Creek	Dutchess	Mostly shallows and wooded upland with smaller amounts of mudflats, lower marsh, and upper marsh.	Important feeding site for migrating osprey and a potential osprey nesting site. Least bittern breeding. Estuary beggar-ticks, subulate arrowhead, kidney leaf mud- plantain.	Important spawning areas for anadromous fish including alewife, blueback herring, white perch, tomcod, and striped bass. Resident fish include largemouth bass, bluegill, brown bullhead, and red-breasted sunfish. Also blue claw crabs, herons and turtles.
Moodna Creek	Orange	Predominantly freshwater creek with shallows, mudflats, lower marsh, and upper marsh associated with the creek mouth.	Major feeding and resting ground for bald eagles and osprey. Limited summer feeding ground for bald eagles. Least bittern breeding area.	Important spawning areas for anadromous fish including alewife, blueback herring, smelt, white perch, tomcod, and striped bass. Resident fish include largemouth bass, bluegill, brown bullhead, and pumpkinseed. Also many herons, snapping turtles, raccoons, and muskrats.
Hudson River Miles 44-56	Orange, Rockland, Putnam, Westchester	Deepwater, shallows, and forested uplands.	Bald eagle winter feeding grounds. Possible nursery area for shortnose sturgeon.	The major spawning area along the Hudson for striped bass and white perch (about 50% of northeast striped bass stocks come from the Hudson). Narrow migration corridor for all anadromous fish spawning upriver. Marine species (e.g., bluefish, bay anchovy) live here during periods of low freshwater flow (generally July through February).
Constitution Marsh	Putnam	Approximately equal amounts of shallows, mudflats, lower marsh, and upper marsh.	Least bittern nesting site. Osprey use during migrations.	Very important nesting habitat for a variety of bird species including green-backed heron, various waterfowl, and passerine birds. Important feeding grounds for herons and other wetland and shore birds. Significant spawning and feeding grounds for anadromous and resident fish. Muskrat population.
Iona Island Marsh	Rockland	Mainly upper marsh, followed by shallows and flats, with lesser amounts of woody tidal swamp and non-tidal freshwater marsh.	Least bittern nesting, adjacent bald eagle winter roosting. Walking fern and prickly pear cactus.	Extensive breeding for many birds. Muskrat and possibly other furbearers, amphibians, snapping turtle, and blue claw crab. Heron and shorebird feeding. Spawning and/or nursery for anadromous and resident fish.
Camp Smith Marsh and Annsville Creek*	Westchester	Largely shallows and creek with smaller amounts of mudflats and upper marsh.	Spongy arrowhead.	None identified.
Salt Water Habitats				
Haverstraw Bay	Rockland, Westchester	Deepwater and shallows.	Shortnose sturgeon wintering area.	Extensive nursery for anadromous fish species. Nursery and feeding ground for marine species. Spawning and wintering grounds for Atlantic sturgeon. Waterfowl feeding and resting during migration.
Croton River and Bay	Westchester	Mostly shallows with lesser amounts of mudflats and brackish upper marsh.	Possible osprey feeding grounds during spring and fall migrations.	Productive nursery, foraging and resting area for anadromous and resident fish.
Piermont Marsh	Rockland	Predominantly shallows and brackish upper marsh with a broad transition area of mudflats.	Least bittern and sedgewren nesting. Diamondback turtle use. Osprey feeding during migration.	Extensive use of mudflats by herons and egrets. Large numbers of resident and breeding birds, blue claw crabs, resident fish, and lesser numbers of furbearers. Waterfowl, wading bird, and shorebird feeding during migration.
Notes: * Indicates areas recognized by the NYS Natural Heritage Program as containing rare/important species or communities, but not designated as significant habitats. Source: Table 2-9 from the RBERA Data (USEPA, 2000b) from NYSDOS and the Nature Conservancy, 1990.				

Potential Impacts of the Selected Remedy

PCB Releases to Air
253202

Table 253202-1

**Estimated Transfer Area Of The Components For Mechanical
Dredging At The Sediment Processing/Transfer Facility**

Component	Number	Area (ft²)	Total Area (ft²)
Hopper Barge (40' X 150')	2	6,000	12,000
Hopper, conveyor and Pug mill ^a	**	500	500
Temporary Staging Area ^a	1	15,000	7,500*
Railcar Loading Area ^a	2	15,000	15,000*
Railcar ^a	4	600	2,400
Water Treatment Plant	1	2,500	2,500
Total Transfer Area			39,900
^a temperature was assumed to be 30°C because of cement additions. *PCB transfer assumed from 50% of the area **estimated			

Table 253202-2

**Estimated Transfer Area Of The Components For Hydraulic Dredging At The
Sediment Processing/Transfer Facility**

Component	Number	Area (ft²)	Total Area (ft²)
Hopper Barge (150' X 40')	1	6,000	6,000
Vibrating Screen	3	72	216
Hydrocyclone Discharge	1	625	625
Solids Staging Area	1	10,000	10,000
Flocculation Tank	4	2,500	10,000
Filter Press	1	10,000	10,000
Railcar Loading Area	2	15,000	15,000*
Railcar	4	600	2,400
Filtration Bed	12	400	4,800
Total Transfer Area			59,041

Table 253202-3

ISCST3 Model Options

Operation	Selected Parameter
Concentration Calculation	Short-term and Annual Average
Receptor	Locations adjacent to the source or the facility
Dispersion Coefficient	Rural
Wind Speed Profile	Default
Temperature Gradient	Default
Plume Rise Calculation	Gradual
Stack Tip Downwash	Default
Building Downwash	N/A
Buoyancy Dispersion	Yes
Calm Hours	Default - omitted from calculation to yield conservative predictions
Meteorological Data (Nearest NWS Station)	Glens Falls Area: Year: 1993-1997 Surface Station: Glens Falls, NY Upper Air Station: Albany, NY Albany Area: Year: 1995-1999 Surface Station: Albany, NY Upper Air Station: Albany, NY

Table 253202-4

Calculated PCB Loss from the Sediment Treatment/Transfer Facilities

Type of Dredge	Location	Area (m ²)	PCB Mass (kg)	Total Loss (kg)	PCB remediated ² (kg)	% Loss
Mechanical	NTF	3700	11.6 ¹	23.2	69800	0.033
	STF	3700	11.6			
Hydraulic	NTF	5485	17.2	28.8	69800	0.04
	STF	3700	11.6			
¹ Sample Calculation: (2.49*3700*210*6/1000000) = 11.6 kg						
² Quantity of PCBs removed by the selected remedy						

Table 253202-5

Predicted PCB Levels at the Modeled Receptor Locations and Associated Standards

Site Location	Type Of Dredging	Averaging Period	PCB Concentration (mg/m ³)			
			Outside Facility Boundary	Ambient Standards	Within Facility Boundary	Workplace Standards
Northern Facility Transfer	Mechanical	1-hour	0.153	0.002 ¹	0.607	1000 ² , 500 ³ , 1 ⁴
		8-hour	0.069		0.294	
		24-hour	0.023		0.201	
		Annual	0.0008		0.025	
	Hydraulic	1-hour	0.199	0.002 ¹	0.676	1000 ² , 500 ³ , 1 ⁴
		8-hour	0.049		0.359	
		24-hour	0.019		0.211	
		Annual	0.0011		0.030	
Southern Facility Transfer	Mechanical	1-hour	0.043	0.002 ¹	0.568	1000 ² , 500 ³ , 1 ⁴
		8-hour	0.007		0.447	
		24-hour	0.003		0.388	
		Annual	0.00008		0.027	

¹NYS AGC, ²OSHA (42% Chlorine), ³OSHA (54% Chlorine), ⁴NIOSH (10-hr workshift),
*For both dredging options, the PCB concentrations at the STF would be the same.

Table 253202-6

**Predicted PCB Levels At The Modeled Receptor Locations near
Dredging Site and the Ambient Standard**

Area	Averaging Period	PCB Concentration (mg/m³)	Ambient Standard (mg/m³)
Northern Dredging	1-hour	0.241	0.002 ¹
	8-hour	0.160	
	24-hour	0.056	
	Annual	0.0002	
Southern Dredging	1-hour	0.247	0.002 ¹
	8-hour	0.088	
	24-hour	0.035	
	Annual	0.0002	

¹ NYS AGC

Table 253202-7
Outside Facility Boundary Cancer Risks to Residents

Type of Dredging	Location	Cancer Risk		
		Adult	Adolescent	Child
Mechanical	Northern Transfer Facility	7.5×10^{-9}	8.3×10^{-9}	1.5×10^{-8}
	Southern Transfer Facility	7.5×10^{-10}	8.3×10^{-10}	1.5×10^{-9}
	Northern Dredging Site	1.9×10^{-9}	2.1×10^{-9}	3.6×10^{-9}
	Southern Dredging Site	1.9×10^{-9}	2.1×10^{-9}	3.6×10^{-9}
Hydraulic*	Northern Transfer Facility	1.0×10^{-8}	1.1×10^{-8}	2.0×10^{-8}
*For both dredging options, the PCB cancer risk at the STF would be the same				

Table 253202-8
Outside Facility Boundary Non-Cancer Hazards to Residents

Type of Dredging	Location	Non-Cancer Hazards		
		Adult	Adolescent	Child
Mechanical	Northern Transfer Facility	0.0031	0.0034	0.0061
	Southern Transfer Facility	0.00031	0.00034	0.00061
	Northern Dredging Site	0.00078	0.00086	0.0015
	Southern Dredging Site	0.00078	0.00086	0.0015
Hydraulic*	Northern Transfer Facility	0.0043	0.0047	0.0083
*For both dredging options, the PCB non-cancer hazards at the STF would be the same				

Table 253202-9
Inside Facility Boundary Cancer Risks to Adult Workers

Type of Dredging	Location	Cancer Risk
Mechanical	Northern Transfer Facility	1.7×10^{-7}
	Southern Transfer Facility	1.8×10^{-7}
Hydraulic	Northern Transfer Facility	2.0×10^{-7}
*For both dredging options, the PCB cancer risk at the STF would be the same		

Table 253202-10
Inside Facility Boundary Non-Cancer Hazards to Adult Workers

Type of Dredging	Location	Non-Cancer Hazards
Mechanical	Northern Transfer Facility	0.07
	Southern Transfer Facility	0.075
Hydraulic	Northern Transfer Facility	0.084
*For both dredging options, the PCB non-cancer hazards at the STF would be the same		

Potential Impacts of the Selected Remedy

Air Quality Evaluation 313846

Table 313846-1

National and New York Ambient Air Quality Standards

Pollutant and Averaging Time	Primary Standard ¹	Secondary ¹
Ozone (O ₃) 1-hour Maximum	0.12 ppm ³	Same as primary standard
Carbon Monoxide (CO) 1-hour Maximum 8-hour Maximum	40,000 ² 10,000 ²	Same as primary standard
Sulfur Dioxide (SO ₂) Annual Arithmetic Mean 24-hour Maximum 3-hour Maximum	80 365 ² -	1,300 ²
Nitrogen Dioxide (NO ₂) Annual Arithmetic Mean	100	Same as primary standard
Particulate Matter (PM ₁₀): Annual Arithmetic Mean 24-hour Maximum	50 150 ⁴	Same as primary standard
Lead (Pb) Quarterly Arithmetic Mean	1.5 ⁵	Same as primary standard
Notes: ¹All concentrations are in micrograms per cubic meter of air unless designated as parts per million (ppm). ² Not to be exceeded more than once a year. ³ Expected number of exceedance days of 3year average shall not be more than once per year. ⁴ An area will attain the standard when the annual highest 99th percentile of 24-hour concentrations over 3 years is below 150 mg/m³. ⁵ Not to be exceeded in any quarter. Sources: 40 CFR 50; EPA Fact Sheets, June 1997; 1998 Annual New York State Air Quality Report, June 2000.		

Table 313846-2

Diesel Equipment Emission Rates

Equipment Type	Units (#)	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)				Peak Hourly Emission Rate (grams/hour)					Daily Average Hourly Emission Rate (grams/hour)				
				CO	NO _x	PM	SO ₂	Run Time (hour)	CO	NO _x	PM	SO ₂	Daily Run Hours	CO	NO _x	PM	SO ₂
Mechanical Dredging																	
Loader	2	275	68	0.80	5.80	0.19	0.86	1.0	299	2,169	71	322	20.0	249	1,808	59	268
Loader	2	275	68	0.80	5.80	0.19	0.86	1.0	299	2,169	71	322	20.0	249	1,808	59	268
Locomotive	1	3,000	63	2.50	11.00	0.54	0.93	0.5	2,363	10,395	510	879	1.0	197	866	43	73
Tugboat	1	350	60	3.07	14.01	0.96	0.93	0.5	322	1,471	101	98	4.5	121	552	38	37
Total									3,283	16,204	753	1,621		816	5,034	199	646
Hydraulic Dredging																	
Booster	1	1,000	74	1.10	5.80	0.13	0.93	1.0	814	4,292	96	688	17.0	577	3,040	68	487
Locomotive	1	3,000	63	2.50	11.00	0.54	0.93	0.5	2,363	10,395	510	879	1.0	197	866	43	73
Tugboat	1	1,000	60	3.07	14.01	0.96	0.93	1.0	1,842	8,404	576	558	3.0	230	1,050	72	70
Total									5,019	23,091	1,182	2,125		1,004	4,956	183	630

Table 313846-3

Truck Emission Rate

Area	Type	Equivalent Running Hour	Emission Factor (grams/running hour)				Peak Hourly Emission Rate (grams/hour)				Daily Average Hourly Emission Rate (grams/hour)			
			CO	NO _x	PM	SO ₂	CO	NO _x	PM	SO ₂	CO	NO _x	PM	SO ₂
Unloading	Idling Exhaust	2	158.0	74.6	3.5	248.0	316	149	7	496	263	124	6	413
Loading	Idling Exhaust	2	158.0	74.6	3.5	248.0	316	149	7	496	263	124	6	413
Driving on unpaved road	Exhaust and roadway dust	1	158.0	74.6	751.0	248.0	158	75	751	248	132	62	638	207
Total							790	373	765	1,240	658	310	650	1,033

Table 313846-4

Sediment Handling Emission Rate

Processing Stream (location)	Weight (tons/hour)	Number of Drop Operations per Cycle	Emission Factor (lb/ton)		Emission Rate (grams/hour)	
			PM10	TSP	PM10	TSP
Unloading Area	80	3	0.000012	0.000026	1.3	2.8
Transfer and Loading Areas	88	5	0.000012	0.000026	2.5	5.2
Total					3.8	8.0

Table 313846-5
ISCST3 Model Options

Operation	Selected Parameter	
Concentration Calculation	Short-term and Annual Average	
Receptor	Discrete at sensitive locations adjacent to the facility	
Dispersion Coefficient	Rural	
Wind Speed Profile	Default	
Temperature Gradient	Default	
Plume Rise Calculation	Gradual	
Stack Tip Downwash	Default	
Building Downwash	N/A	
Buoyancy Dispersion	Yes	
Calm Hours	Default - omitted from calculation	
Meteorological Conditions	Glens Falls Area:	Year: 1993-1997 Surface Station: Glens Falls, NY Upper Air Station: Albany, NY
	Albany Area:	Year: 1995-1999 Surface Station: Glens Falls, NY Upper Air Station: Albany, NY

Table 313846-6

Worst-Case Total Impact from Mechanical Dredging at NTF

Pollutant/Averaging Time	Background Concentration	Facility Impact	Total Impact	NAAQS
CO –				
8-hour	4,888	894	5,782	10,000
1-hour	7,429	1,430	8,859	40,000
NO ₂ – Annual Arithmetic Mean	30	9	39	100
PM10 –				
Annual Arithmetic Mean	18	2	20	50
Second Highest 24-hour	44	28	72	150
SO ₂ –				
Annual Arithmetic Mean	3	6	9	80
Second Highest 24-hour	15	80	95	365
Second Highest 3-hour	31	421	452	1,300
Notes: All concentrations are in micrograms per cubic meter of air. Background levels are provided by NYSDEC (June 2000).				

Table 313846-7

Worst Case Total Impact from Hydraulic Dredging at NTF

Pollutant/Averaging Time	Background Concentration	Facility Impact	Total Impact	NAAQS
CO –				
8-hour	4,888	455	5,343	10,000
1-hour	7,429	1,842	9,271	40,000
NO ₂ – Annual Arithmetic Mean	30	9	39	100
PM10 –				
Annual Arithmetic Mean	18	1	19	50
Second Highest 24-hour	44	6	50	150
SO ₂ –				
Annual Arithmetic Mean	3	5	8	80
Second Highest 24-hour	15	55	70	365
Second Highest 3-hour	31	260	291	1,300
Notes: All concentrations are in micrograms per cubic meter of air. Background levels are provided by NYSDEC (June 2000).				

Table 313846-8

Worst-Case Total Impact Along the Hudson River from a Stationary Booster Near Glens
Falls Area

Pollutant/Averaging Time	Background Concentration	Booster Impact	Total Impact	NAAQS
CO –				
8-hour	4,888	518	5,406	10,000
1-hour	7,429	1,777	9,206	40,000
NO ₂ – Annual Arithmetic Mean	30	32	62	100
PM10 –				
Annual Arithmetic Mean	18	1	19	50
Second-Highest 24-hour	44	27	71	150
SO ₂ –				
Annual Arithmetic Mean	3	11	14	80
Second-Highest 24-hour	15	274	289	365
Second-Highest 3-hour	31	774	805	1,300
Notes: All concentrations are in micrograms per cubic meter of air. Background levels are provided by NYSDEC (June 2000).				

Table 313846-9

Worst-Case Total Impact Along the Hudson River from a Stationary Booster Near Albany
Area

Pollutant/Averaging Time	Background Concentration	Booster Impact	Total Impact	NAAQS
CO –				
8-hour	4,888	409	5,297	10,000
1-hour	7,429	1,388	8,817	40,000
NO ₂ – Annual Arithmetic Mean	30	47	77	100
PM10 –				
Annual Arithmetic Mean	22	2	24	50
Second-Highest 24-hour	58	17	75	150
SO ₂ –				
Annual Arithmetic Mean	11	17	28	80
Second-Highest 24-hour	42	175	217	365
Second-Highest 3-hour	83	662	745	1,300
Notes: All concentrations are in micrograms per cubic meter of air. Background levels are provided by NYSDEC (June 2000).				

Table 313846-10

Calculated Metals Concentrations Associated with Airborne Suspended Particles

Metals	Sediment Conc. (ppm)	Flux (mg/m ² -d)	Concentration (mg/m ³)				Standard (mg/m ³)	
			Outside Facility Boundary (Ann.)		Within Facility Boundary (8-hr)			
			NTF	STF	NTF	STF	Annual	8-hr
Lead	255	0.0132	4.2 X 10 ⁻⁰⁶	4.2 X 10 ⁻⁰⁷	0.0015	0.0023	1.5 ¹ , 0.75 ²	50 ³
Chromium	438	0.0227	7.3 X 10 ⁻⁰⁶	7.3 X 10 ⁻⁰⁷	0.0026	0.0040	1.2 ²	1000 ³
Cadmium	15.6	0.0008	2.6 X 10 ⁻⁰⁷	2.6 X 10 ⁻⁰⁷	0.0001	0.0001	0.0005 ²	5 ³
Titanium	13809	0.7165	0.00023	2.3 X 10 ⁻⁰⁵	0.0846	0.1286	24 ²	10000 ³
Notes: ¹ National Ambient Air Quality Standards (NAAQS) (quarterly); ² New York State Annual Guideline Concentration; ³ OSHA								

Potential Impacts of the Selected Remedy

Odor Evaluation 255361

Table 255361-1
Calculated H₂S Levels and Relevant Standards

Location	Dredging Type	Outside Facility Boundary (mg/m ³)		Within Facility Boundary (mg/m ³)
		Short-term ¹	Annual ²	Short-term ¹
NTF	Mechanical	5.07	0.0265	20.12
	Hydraulic	6.59	0.0364	22.41
STF	Mechanical	1.42	0.0026	18.83
Dredging	Northern	7.98	0.0066	-
	Southern	8.18	0.0066	-
Federal/State Standard		14 ³	1 ⁴	28000 ⁵
Recognition Threshold		6.52 ⁶		
Notes: ¹ 1-hr, ² Applies to the length of dredging season, ³ NYS SGC and NY Part 257-10, ⁴ NYS AGC, ⁵ OSHA and ⁶ WEF & ASCE				

Table 255361-2

Calculated NH₃ Levels and Relevant Standards

Location	Dredging Type	Outside Facility Boundary (mg/m ³)		Within Facility Boundary (mg/m ³)
		Short-term ¹	Annual ²	Short-term ³
NTF	Mechanical	2.77	0.0145	5.33
	Hydraulic	3.61	0.0199	6.51
STF	Mechanical	0.78	0.0014	8.11
Dredging	Northern	4.37	0.0036	-
	Southern	4.48	0.0036	-
Federal/State Standard		2400 ⁴	100 ⁵	34000 ⁶
Recognition Threshold		25673 ⁷		
Notes: ¹ 1-hr, ² Applies to the length of dredging season, ³ 8-hr, ⁴ NYS SGC, ⁵ NYS AGC, ⁶ OSHA and ⁷ WEF & ASCE				

Potential Impacts of the Selected Remedy

Noise Evaluation 312685

Table 312685-1

FHWA Noise Abatement Criteria

Activity Category	L _{eq} (h)	L ₁₀ (h)	Description of Activity Category
A	57 (exterior)	60 (exterior)	Land for which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	70 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	75 (exterior)	Developed lands, properties or activities not included in Categories A or B above.
D	---	---	Undeveloped lands.
E	52 (interior)	55 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.
Note: The L_{eq} designations represent hourly A-weighted sound levels expressed in decibels (dBA). Source: US Department of Transportation, FHWA, 1995.			

Table 312685-2

Typical Peak Noise Emission Levels for Construction Equipment

Type of Equipment	Noise Level at 50 feet (dBA)
Air Compressor	81
Asphalt Spreader (paver)	89
Asphalt truck	88
Backhoe	85
Bulldozer	87
Compactor	80
Concrete Plant	83
Concrete Spreader	89
Concrete Mixer	85
Concrete Vibrator	76
Crane (derrick)	88
Delivery Truck	88
Diamond Saw	90
Dredge	88
Dump Truck	88
Front End Loader	84
Gas-Driven Vibro-compactor	76
Hoist	76
Jackhammer (Paving Breaker)	88
Line Drill	98

Table 312685-2

Typical Peak Noise Emission Levels for Construction Equipment

Type of Equipment	Noise Level at 50 feet (dBA)
Motor Crane	83
Pile Driver/Extractor	101
Pump	76
Roller	80
Shovel	82
Tug	85
Vibratory Pile Driver/Extractor	89

Source: New York City Department of Environmental Protection, December 1993.

Table 312685-3

Long-term Noise Levels from Sediment Processing And Transfer Facilities

Facility	Dredging Scenario	L _{eq} (1) (dBA)		L _{dn} (dBA)	
		Facility	FHWA NAC	Facility	USHUD Guideline
Northern	Mechanical	61		64	
	Hydraulic	55		47	
Southern	Mechanical	50	67	52	65

Table 312685-4

Long-term Noise Levels from Stationary Booster

Term	Distance from Booster (ft)	Noise Level in dBA	
		Facility	Guidelines
L _{eq} (1)	400	73	67 (FHWA)
	800	67	
L _{dn}	400	75	65 (USHUD)
	1,000	64	
Note: worst-case receptor location would be at least 400 ft from the booster, according to the land-use condition at those areas where a stationary booster may be needed			

Table 312685-5

Predicted Short-term $L_{eq}(1)$ (dBA) Noise Levels from Mechanic Dredging Process

(worst-case ten weeks)

Receptor Ring from Shoreline (ft)	Dredging Distance along the River (ft)				
	-1,000	-500	0	500	1,000
50	57	60	70	60	57
100	57	59	67	59	57
200	56	58	64	58	56

Table 312685-6

Predicted Short-term $L_{eq}(1)$ (dBA) Noise Levels from Hydraulic Dredging Process

(worst-case nine weeks)

Receptor Ring from Shoreline (ft)	Dredging Distance along the River (ft)							
	Dredge Machine	-1,000	0	1,000	2,000	3,000	4,000	5,000
	Booster	-3,000	-2,000	-1,000	0	1,000	2,000	3,000
50		57	66	65	79	65	59	56
100		57	64	65	77	65	59	56
200		57	63	65	74	65	59	56

Potential Impacts of the Selected Remedy

Project-Related Traffic
253245

Table 253245-1**Fuel Deliveries Required Per Week**

Northern Transfer Facility		
	Mechanical Dredging	Hydraulic Dredging
Total Diesel (gallons) per Season	569,170	640,374
Trucks per Season	114	128
Trucks per month	16	18
Approximate Total Trucks Per Week	4	4

Table 253245-2**Truck Deliveries for the Northern Transfer Facility**

Material/Supplies	Large Trucks Per Week	Medium Trucks Per Week
Stabilization Agent/Water Treatment	36	
Diesel Fuel	4	
Other Processing Materials		1
Water Treatment Chemicals	1	
Office/Cafeteria		6
Equipment/Lubricants		30
Dumpster Truck	1	
Total per Week:	42	37

Table 253245-3**Estimate of Traffic from Northern Transfer Facility**

Road	Annual Average Daily Traffic	Peak Traffic Volume (Vehicles/Peak Hours)	Percent Increase
US Highway 9 between Exit 17, I-87, and Rt 197	17,190	1,547	4
Rt 197 between Rt 9 and Rt 32 Junction	8,050	724	9
Rt 197 between Rt 32 Junction and Washington County Line	7,930	713	9

Potential Impacts of the Selected Remedy

River Traffic
337804

Table 337804-1**Recent Trends in Bulk Commodity Traffic on the Upper Hudson River**

Year	Jet Fuel (tons)	Jet Fuel Barge Loads	Gasoline (tons)	Gasoline Barge Loads	Total Petroleum (tons)	Total Petroleum Barge Loads
1989	108,070	72	99,155	66	224,346	150
1990	104,372	70	46,433	31	175,336	117
1991	99,425	66	6,662	5	109,570	73
1992	78,184	52	0	0	78,184	52
1993	57,178	38	0	0	57,178	38
1994	3,365	2	0	0	3,365	2

Table 337804-2**Projected Mechanical Dredging Equipment Requirements**

Total In-River Equipment Required to Support the Selected Remedy	
Quantity	Equipment Required
2	Dredges with a 2-cy bucket
2	Dredges with a 4-cy bucket
6	Deck Barges to bring dredged sediments to the northern facility
6	Hopper Barges to bring dredged sediments to the southern facility
3	Small tow boats (350 HP) - 2 associated with barge transport and 1 to aid in equipment maneuvering
3	Large Tow Boats (800 HP)
1	Debris Removal set-up - consists of a clamshell mounted on a deck barge (on average)
1	Deck Barge for debris (on average)
1	Small tow boat (350 HP) to transport debris (on average)
1	Deck Barge with telescoping conveyor for backfill placement
2	Hopper barges carrying backfill material
2	Large tow boats to transport backfill material
2	Vessels associated with habitat restoration/replacement
2	Vessels associated with river bank restoration activities
2	Fuel Barge to refuel dredges and debris collectors; all tow boats and other vessels will be refueled at the transfer facility
3	Boats for Health/Safety, Oversight, and survey/sampling crew
39	Total In-River Equipment Requirements
24	In-River Equipment Requirements to Support Operations in the TIP (the potential worst-case congestion scenario)

Table 337804-3**Projected Hydraulic Dredging Equipment Requirements**

Total In-River Equipment Required to Support the Selected Remedy	
Quantity	Equipment Required
2	Mechanical Dredge with a 2-cy bucket (part-time)
1	Mechanical Dredge with a 4-cy bucket (part-time)
1	12-inch hydraulic cutter head dredge
6	Hopper Barges to bring processed sediments to the southern facility
6	Hopper Barges to bring dredged sediments to the southern facility from mechanical dredges located in River Section 3
6	Large Tow Boats (800 HP)
1	Debris Removal set-up - consists of a clamshell mounted on a deck barge (on average)
1	Deck Barge for debris (on average)
1	Small tow boat (350 HP) to transport debris (on average)
1	Deck Barge with telescoping conveyor for backfill placement
2	Hopper barges carrying backfill material
2	Large tow boats to transport backfill material
2	Vessels associated with habitat restoration/replacement
2	Vessels associated with river bank restoration activities
2	Fuel Barge to refuel dredges and debris collectors; all tow boats and other vessels will be refueled at the transfer facility
3	Boats for Health/Safety, Oversight, and survey/sampling crew
39	Total In-River Equipment Requirements
18	In-River Equipment Requirements to Support Operations in the TIP (the potential worst-case congestion scenario)

Table 337804-4

1999 Champlain Canal Traffic Data

Lock Usage in July & August 1999				
Location	Month of July		Month of August	
	Pleasure Vessels	Commercial Vessels	Pleasure Vessels	Commercial Vessels
Lock 1	890	35	745	36
Lock 2	823	35	603	43
Lock 3	816	35	562	30
Lock 4	794	31	584	27
Lock 5	884	117	556	179
Lock 6	851	32	566	38
Note: Bold text indicates the locks associated with the greatest number of vessel passages				

Table 337804-5

**Available Lockages for 2001 Operating Season on the Hudson River
(per lock)**

Time of Year (Season)	Hours of Lock Operation	Total Number of Available Lockages per Day	Total Number of Available Lockages Total Season
May 7 - May 23	7 am - 5pm	20	320
May 24 - October 3	7 am - 10:30 pm	31	4,123
October 4 - October 27	8 am - 6 pm	20	460
October 28 - November 4	7 am - 5pm	20	160

Table 337804-6

Available Lockages Assuming 24 Hrs of Operation

Time of Year (Season)	Hours of Lock Operation	Available Lockages per Day	Available Lockages per Season, Any Lock
May 7 - November 4	24 hours	48	8,688

Table 337804-7

Daily Lockages at Lock 5 – Schuylerville-Based on Peak Month (July 1999)

Description	Commercial		Pleasure		Total Lockages Used	Lockages Available Normal Operating Hours (2001)	Lockages Available over 24 Hours
	Vessels	Lockages	Vessels	Lockages			
<u>Case 1:</u> Assume 1 pleasure craft/lockage	4	4	33	33	37	31	48
<u>Case 2:</u> Assume 2 pleasure crafts/lockage	4	4	33	17	21	31	48
<u>Case 3:</u> Assume 3 pleasure crafts/lockage	4	4	33	11	15	31	48

Table 337804-8

Daily Lockages at Lock 6 - Fort Miller-Based on Peak Month (July 1999)

Description	Commercial		Pleasure		Total Lockages Used	Lockages Available Normal Operating Hours (2001)	Lockages Available over 24 Hours
	Vessels	Lockages	Vessels	Lockages			
<u>Case 1:</u> Assume 1 pleasure craft/lockage	1	1	28	28	29	31	48
<u>Case 2:</u> Assume 2 pleasure crafts/lockage	1	1	28	14	15	31	48
<u>Case 3:</u> Assume 3 pleasure crafts/lockage	1	1	28	9	10	31	48

Table 337804-9

**Estimated Lock Traffic at Locks 5 and 6 During Mechanical Dredging
Removal Operations
Occurring in River Section 1 and River Section 2**

River Section 1				River Section 2			
Barge Type	# of Barges Passing through Locks	Lock Location	# of Lockages per 24 hours	Barge Type	# of Barges Passing through Locks	Lock Location	# of Lockages per 24 hours
Hopper	2	Lock 6 and south	4	Hopper	1	Lock 5 and south	2
Deck	0	No lock passage	0	Deck	5	Lock 6	10
Backfill	1	Lock 7 and north	only off hours	Backfill	1	Lock 5 and south	only off-hours
Fuel	0	No lock Passage	0	Fuel	1	Lock 6	2
_____	_____	_____	_____	Debris	1	Lock 6	2
Total Lockages at Lock 6	4	Total Lockages at Lock 5	4	Total Lockages at Lock 6	14	Total Lockages at Lock 5	2

Table 337804-10

**Daily Lockages (July 1999) vs. Daily Proposed Project Lockages,
Lock 6 – Mechanical Dredging**

Description	Lockages		Project Vessel Lockages	Total Lockages Incurred	Lockages Available Normal Operating Hours (2001)	Lockages Available 24 hours
	Comm ercial	Pleasure				
Case 1: Assume 1 pleasure craft/lockage	1	28	18	47	31	48
Case 2: Assume 2 pleasure craft/lockage	1	14	18	33	31	48
Case 3: Assume 3 pleasure craft/lockage	1	9	18	28	31	48

Table 337804-11

**Daily Lockages (July 1999) vs. Daily Proposed Project Lockages,
Lock 5 – Mechanical Dredging**

Description	Lockages		Project Vessel Lockages	Total Lockages Incurred	Lockages Available Normal Operating Hours (2001)	Lockages Available 24 hours
	Com merci al	Pleasure				
Case 1: Assume 1 pleasure craft/lockage	4	33	6	43	31	48
Case 2: Assume 2 pleasure craft/lockage	4	17	6	27	31	48
Case 3: Assume 3 pleasure craft/lockage	4	11	6	21	31	48

Table 337804-12**Daily Lockages (July 1999) vs. Daily Proposed Project Lockages,
Lock 6 – Hydraulic Dredging**

Description	Lockages		Project Vessel Lockages	Total Lockages Incurred	Lockages Available During Normal Operating Hours (2001)	Lockages Available over 24 Hours
	Commercial	Pleasure				
<u>Case 1:</u> Assume 1 pleasure craft/lockage	1	28	6	35	31	48
<u>Case 2:</u> Assume 2 pleasure craft/lockage	1	14	6	21	31	48
<u>Case 3:</u> Assume 3 pleasure craft/lockage	1	9	6	16	31	48

Potential Impacts of the Selected Remedy

Socioeconomics
313617

Figure 313617-1

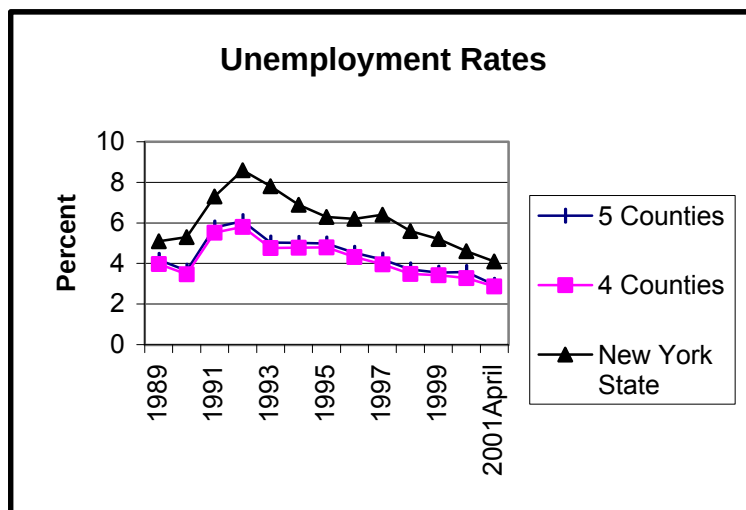


Figure 313617-2



Figure 313617-3

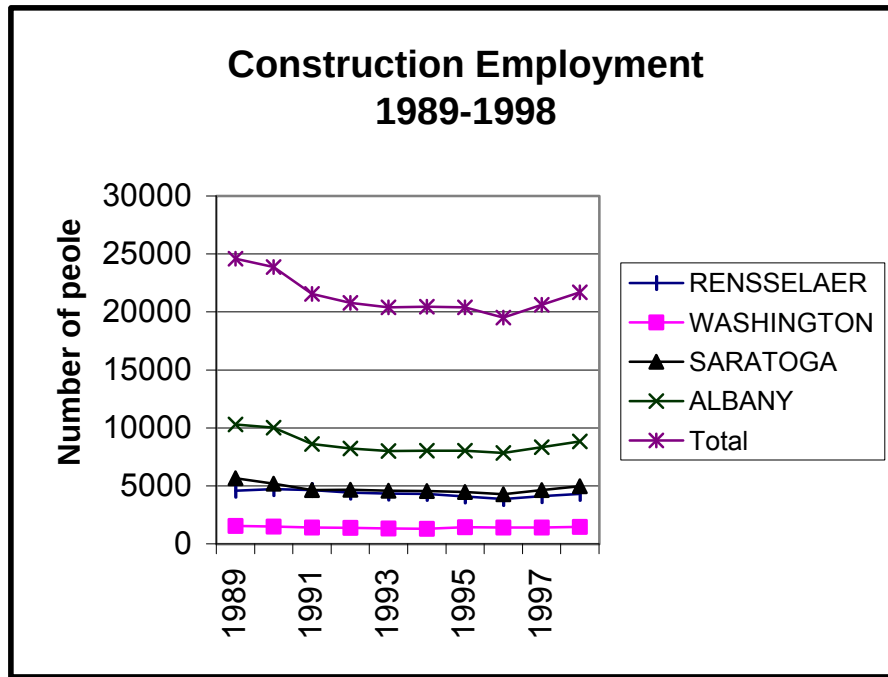


Table 313617-1**Input Expenditures**

US Bureau of Economic Analysis Industry [Code]	Dollars Expended (Year 2000) in Millions	Percent
Industrial Construction [11.08]	19.3	7.3
Other Construction [11.09]	81.2	31.0
Rail Transportation [65.01]	64.2	24.5
Water Transportation [65.04]	28.5	10.9
Engineering Services [73.02]	69.1	26.3
Total	262.2	100

Table 313617-2**Output Impacts – Five-County Region**

Industry	Output (\$ millions)	Percent of Total
Households	126.8	22.0
Construction	106.5	18.5
Transportation	105.1	18.2
Business Services	97.7	16.9
Real Estate	22.4	3.9
Retail Trade	16.4	2.8
Health Services	14.5	2.5
Misc. Services	11.5	2.0
Eating & Drinking	5.5	1.0
Wholesale Trade	9.6	1.7
Banks, etc.	9.5	1.7
Insurance	6.8	1.2
Communications	7.0	1.2
Printing & Publishing	6.0	1.0
All Other	30.9	5.4
Total	576.2	100

Table 313617-3**Earnings Impacts – Five-County Region**

Industry	Earnings \$ millions	Percent of Total
Business Services	37.1	29.3
Construction	29.3	23.1
Transportation	25.5	20.1
Health Services	6.5	5.1
Retail Trade	5.4	4.2
Misc. Services	3.5	2.8
Wholesale Trade	2.8	2.2
Banks, etc.	2.2	1.8
Insurance	2.1	1.7
Printing/Publishing	1.6	1.3
Eating & drinking	1.6	1.2
Communications	1.3	1.0
Lodgings/Recreation	1.2	1.0
All Other	6.7	5.2
Total	126.8	100

Table 313617-4

Employment Impacts – Five-County Region

Industry	Jobs	Percent of Total
Construction	794	24.7
Business Services	673	20.9
Transportation	556	17.3
Retail Trade	277	8.6
Health Services	161	5.0
Misc. Services	150	4.7
Eating & drinking	111	3.5
Wholesale Trade	58	1.8
Lodgings/Recreation	54	1.7
Real Estate	43	1.4
Personal Services	42	1.3
Insurance	42	1.3
Banks, etc.	40	1.2
All Other	213	6.6
Total	3,214	100

Table 313617-5

Tourism Employment and Wages 1988-1999

County	Employment		% Change	Wages		% Change
	1988	1999	1988-99	1988	1999	1988-99
Albany	21,644	23,399	8.1	320,572,506	522,693,064	63.0
Herkimer	1,376	1,695	23.2	10,023,146	18,261,318	82.2
Rensselaer	3,262	4,018	23.2	28,911,973	49,961,455	72.8
Saratoga	6,489	8,158	25.7	62,925,700	134,459,439	113.7
Seneca	823	927	12.6	6,759,580	13,286,271	96.6
Warren	5,514	6,094	10.5	58,883,907	94,390,922	60.3
Washington	2,067	2,048	-0.9	43,857,081	62,808,112	43.2
Cayuga	2,383	3,886	63.1	18,124,346	88,384,859	387.7
Source: US Bureau of Labor Statistics, CEW/ES-202, 2001.						

Table 313617-6
Studies on Property Value Impacts

Type of Facility	Impact						
	Highly Negative	Moderately Negative	Somewhat Negative	Neutral	Positive	Time Sensitive	Distance Sensitive
Landfill	2,	2, 3, 5	2, 3, 6	1, 4, 18	5		2, 4, 5, 6
Hazardous Waste	8, 11, 14, 15	10, 12, 13	6, 7, 9, 16, 17			7, 8, 9, 10, 11, 12, 14, 15, 16, 17	6, 8, 10, 11, 12, 13, 17
Incinerator		19	20, 21	18		19, 20	19, 20
Industrial				22			
Notes: highly negative impact = over 10% depreciation; moderately negative impact = 5-10% depreciation; somewhat negative impact = less than 5% depreciation.							
Key: 1. Bleich & Findlay (1991); 2. Nelson, Genereux, & Genereux (1992); 3. Nelson, Genereux, & Genereux (1997); 4. Cartee (1989); 5. Reichert, Small, & Mohanty (1992); 6. Thayer, Albers, & Rahmatian (1992); 7. Ketkar (1992); 8. Reichert (1997); 9. McClelland, Schulze, & Hurd (1990); 10. Kohlhase (1991); 11. Smolen, Moore, & Conway (1992); 12. Kiel (1995); 13. Greenberg & Hughes (1993); 14. Greenberg & Hughes (1992); 15. McCluskey & Rausser (1999a); 16. McCluskey & Rausser (1999b); 17. Dale, Murdoch, & Waddell (1997); 18. Zeiss & Atwater (1989); 19. Kiel & McClain (1996); 20. Kiel & McClain (1995); 21. Zeiss (1990); 22. Bui & Mayer (1999)							