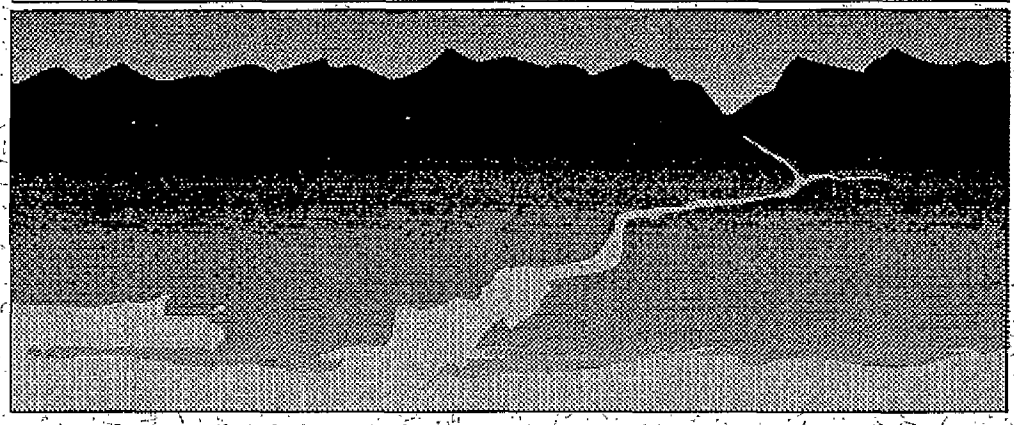
FINAL REPORT

LOWER COLUMBIA RIVER



BI-STATE PROGRAM

LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY

VOLUME 3: DATA APPENDIX

DECEMBER 1993

Prepared By:

TETRA TECH

TETRA TECH

TC 9497-06
FINAL REPORT

LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY

VOLUME 3: DATA APPENDIX

DECEMBER 1993

Prepared For:

The Lower Columbia River
Bi-State Water Quality Program

Prepared By:

TETRA TECH
15400 NE 90th, SUITE 100
REDMOND, WA 98052

TABLE OF CONTENTS

APPENDIX B.

WATER PARAMETERS DATA

B-1. BACTERIA IN WATER

B-2. WATER QUALITY FIELD DATA

B-3. WATER CONVENTIONAL PARAMETERS

B-4. NUTRIENTS IN WATER

B-5. METALS IN WATER

TABLE B-1. BACTERIA IN WATER (page 1 of 2)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	BACTERIA					
		Fecal Coliform		*Escherichia coli*		Enterococcus	
		Concentration (colonies/100ml)	Geometric Mean	Concentration (colonies/100ml)	Geometric Mean	Concentration (colonies/100ml)	Geometric Mean
RM 14	1-1-W	50		50		2 U	
RM 14	1-2-W	50	75.2	50	75.2	2	2.0
RM 14	1-3-W	170		170		2 U	
RM 21	2-1-W	22		22		2 U	
RM 21	2-2-W	50	20.6	50	20.6	4	2.7
RM 21	2-3-W	8		8		2 U	
RM 23	3-1-W	130		80		8	
RM 23	3-2-W	170	155.5	130	80.4	8	5.0
RM 23	3-3-W	170		50		2	
RM 26	4-1-W	11		11		2	
RM 26	4-2-W	27	15.7	27	13.3	4	3.2
RM 26	4-3-W	13		8		4	
RM 29	5-1-W	8		8		2 U	
RM 29	5-2-W	34	10.3	34	8.2	2 U	2.0
RM 29	5-3-W	4		2		2	
RM 36	6-1-W	17		17		2 U	
RM 36	6-2-W	7	10.9	7	10.9	2 U	2.0
RM 36	6-3-W	11		11		2 U	
RM 59	7-1-W	50		30		2 U	
RM 59	7-2-W	50	50.0	30	27.1	2 U	2.0
RM 59	7-3-W	50		22		2 U	
RM 68	8-1-W	30		17		4	
RM 68	8-2-W	17	24.0	11	17.2	2 U	2.5
RM 68	8-3-W	27		27		2 U	
RM 81	9-1-W	22		22		2 U	
RM 81	9-2-W	23	15.2	13	10.5	4	2.5
RM 81	9-3-W	7		4		2 U	
RM 88	10-1-W	80		50		8	
RM 88	10-2-W	1600	261.7	500	68.8	2 U	3.2
RM 88	10-3-W	140		13		2 U	
RM 90	11-1-W	23		8		2	
RM 90	11-2-W	50	29.8	17	10.3	2 U	2.0
RM 90	11-3-W	23		8		2	
RM 95	12-1-W	50		30		2 U	
RM 95	12-2-W	240	98.6	75	56.5	2	2.5
RM 95	12-3-W	80		80		4	
RM 120	13-1-W	30		30		2	
RM 120	13-2-W	23	25.1	17	18.8	2	2.0
RM 120	13-3-W	23		13		2	
RM 124	14-1-W	110		110		2 U	
RM 124	14-2-W	70	85.1	70	85.1	2 U	2.0
RM 124	14-3-W	80		80		2 U	
RM 141	15-1-W	30		30		4	
RM 141	15-2-W	280	74.9	50	42.2	6	4.6
RM 141	15-3-W	50		50		4	
Freshwater[1]	U.S. EPA				126		33
	Washington		100/200				
	Oregon		200/400				
Marine[2]	U.S. EPA		15/43		na*		35
	Washington		14/43				
	Oregon		14/43(200/400)				

W = Water sample.

RM = River mile.

U = Not detected. Value given is the lower quantification limit.

* Criteria are not available.

[1] Applies to all stations except Station 1 (River Mile 14). The U.S. EPA does not recommend the use of the

fecal coliform bacteria standard for water contact recreation, although the calculation of the EPA-recommended Escherichia coli and enterococcus standards are based on the previously-recommended fecal coliform standard of 200 fecal coliforms per 100mL. The EPA-recommended standard for freshwater bathing is 126 E. coli per 100 mL, based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period). No single sample should exceed a one-sided confidence limit calculated for any of four different bathing frequency levels. The EPA-recommended standard for freshwater bathing is 33 enterococcus per 100 mL, based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period). No single sample should exceed a one-sided confidence limit calculated for any of four different bathing frequency levels. (U.S. EPA 1986) The Washington Class A standard for fecal coliform is a geometric mean concentration of 100 colonies per 100 mL with not more than 10 percent of all samples obtained for calculating the geometric mean exceeding 200 colonies per 100 mL. The Oregon standard is a logarithmic mean concentration of 200 fecal coliforms per 100 mL based on a minimum of five samples collected over a 30-day period with not more than 10 percent of the samples in the 30-day period exceeding 400 fecal coliforms per 100 mL.

[2] Applies only to Station 1 (River Mile 14). The U.S. EPA has recommended an indicator bacteria standard for shellfish harvesting waters of a median concentration of 15 fecal coliforms per 100 mL and a 90th percentile standard of 43 fecal coliforms per 100 mL. The U.S. EPA-recommended standard for marine bathing is 35 enterococcus per 100 mL, based on a statistically sufficient number of samples (generally not less than five samples equally spaced over a 30-day period). No single sample should exceed a one-sided confidence limit calculated for any of four different bathing frequency levels (U.S. EPA 1986). The Washington fecal coliform standard for marine waters is a geometric mean of 14 colonies per 100 mL, and not more than 10 percent of all samples obtained exceeding 43 colonies per 100 mL. The Oregon fecal coliform standard for marine and estuarine shellfish growing waters is a median concentration of 14 organisms per 100 mL, with not more than 10 percent of the samples exceeding 43 organisms per 100 mL. The Oregon fecal coliform standard for estuarine waters other than shellfish growing waters (shown in parentheses in the table above) is a logarithmic mean of 200 fecal coliforms per 100 mL based on a minimum of 5 samples in a 30-day period, with not more than 10 percent of the samples in the 30-day period exceeding 400 fecal coliforms per 100 mL.

Note: Shaded areas indicate those concentrations which exceeded the lowest appropriate freshwater or marine chronic criterion. The freshwater fecal coliform standards are for recreational bathing areas and the marine standards are for shellfish harvesting waters.

TABLE B-2. FIELD WATER QUALITY PARAMETERS COLLECTED DURING THE SEDIMENT/WATER AND CRAYFISH FIELD EFFORTS LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 1 of 6)

River Mile	Station	Location	N. latitude	W. longitude	Date	Time	Tide	Depth (m)	Field DO (mg/L)**	DO (% sat)**	Winkler DO (mg/L)	Temp (°C)***	pH	Conductivity (mMhos/cm)****	Salinity (ppt)****	Turbidity (NTU)*****
RM 14	1-W	Youngs Bay	46° 09' 56.3"	123° 49' 39.3"	6/28/93	1000	Ebb	0.10	8.71	93.6	8.5	18.3	7.42	3.600	1.9	16
RM 14	1-W	Youngs Bay	46° 09' 56.3"	123° 49' 39.3"	6/28/93	1001	Ebb	0.10	8.77	94.2		18.3	7.48	3.610	1.9	14
RM 14	1-W	Youngs Bay	46° 09' 56.3"	123° 49' 39.3"	6/28/93	1002	Ebb	0.10	8.77	94.2		18.7	7.50	3.580	1.9	14
RM 14	1-W	Youngs Bay	46° 09' 56.3"	123° 49' 39.3"	6/28/93	1138	Ebb	0.10	9.07	98.1		18.7	7.43	3.090	1.6	17
RM 14	1-W	Youngs Bay	46° 09' 56.3"	123° 49' 39.3"	6/28/93	1139	Ebb	0.10	9.11	98.5		18.7	7.49	3.060	1.6	17
RM 14	1-W	Youngs Bay	46° 09' 56.3"	123° 49' 39.3"	6/28/93	1140	Ebb	0.10	9.10	98.4		18.3	7.49	3.050	1.6	16
RM 14	1-CF	Youngs Bay	46° 10' 06.5"	123° 49' 37.5"	7/23/93	0702	Ebb	0.50	6.99	74.5	6.64	17.7	7.46	4.880	2.7	15
RM 14	1-CF	Youngs Bay	46° 10' 06.5"	123° 49' 37.5"	7/23/93	0703	Ebb	0.50	6.58	70.3		17.8	7.41	5.310	2.9	19
RM 14	1-CF	Youngs Bay	46° 10' 06.5"	123° 49' 37.5"	7/23/93	0704	Ebb	0.50	6.69	71.2		17.8	7.41	5.330	2.9	17
RM 14	1-CF	Youngs Bay	46° 10' 06.5"	123° 49' 37.5"	7/23/93	0705	Ebb	0.50	6.70	71.7		17.8	7.42	5.460	3.0	19
RM 14	1-CF	Youngs Bay	46° 10' 06.5"	123° 49' 37.5"	7/23/93	0706	Ebb	0.50	6.74	72.3		17.8	7.43	5.380	2.9	15
RM 14	1-CF	Youngs Bay	46° 10' 06.5"	123° 49' 37.5"	7/23/93	0707	Ebb	0.50	6.78	72.5		17.8	7.43	5.450	2.9	19
RM 21	2-W	Cathlamet Bay	46° 10' 36.7"	123° 41' 59.4"	6/28/93	1420	Ebb	0.15	9.48	101.6		18.7	8.31	0.112	0.1	9
RM 21	2-W	Cathlamet Bay	46° 10' 36.7"	123° 41' 59.4"	6/28/93	1421	Ebb	0.15	9.53	102.0		18.7	8.30	0.112	0.1	9
RM 21	2-W	Cathlamet Bay	46° 10' 36.7"	123° 41' 59.4"	6/28/93	1422	Ebb	0.15	9.61	102.8		18.7	8.30	0.112	0.1	8
RM 21	2-W	Cathlamet Bay	46° 10' 36.7"	123° 41' 59.4"	6/28/93	1626	Flood	0.50	16.30R	179.7R		19.5	8.45	0.114	0.1	19
RM 21	2-W	Cathlamet Bay	46° 10' 36.7"	123° 41' 59.4"	6/28/93	1627	Flood	0.50	16.18R	176.5R		19.4	8.40	0.112	0.1	20
RM 21	2-W	Cathlamet Bay	46° 10' 36.7"	123° 41' 59.4"	6/28/93	1628	Flood	0.50	15.88R	172.7R		19.5	8.38	0.112	0.1	19
RM 21	2-W	Cathlamet Bay	46° 10' 36.7"	123° 41' 59.4"	6/28/93	1635	Flood	0.10	10.08	110.2		19.8	*	*	*	*
RM 21	2-W	Cathlamet Bay	46° 10' 36.7"	123° 41' 59.4"	6/28/93	1636	Flood	0.10	9.66	105.8		19.9	*	*	*	*
RM 21	2-W	Cathlamet Bay	46° 10' 36.7"	123° 41' 59.4"	6/28/93	1637	Flood	0.10	9.65	105.7		19.9	*	*	*	*
Freshwater[1]		U.S. EPA (1-day)							8.0 (5.0)				6.5-9.0			
		U.S. EPA (7-day)							9.5 (6.5)				6.5-9.0			
		Washington							8.0	90.0		20.0	6.5-8.5			
		Oregon								90.0			6.5-8.5			
Marine[2]		U.S. EPA											6.5-8.5			
		Washington							6.0			16.0	7.0-8.5			
		Oregon							6.0				7.0-8.5			

W = Sediment/Water Field Effort
CF = Crayfish Field Effort
RM = River Mile
R = Unuseable Data
[1] Applies to all stations except Station 1 (River Mile 14)
[2] Applies only to Station 1 (River Mile 14)
* Not Recorded

** The EPA-recommended standard is the 1-day minimum and 7-day mean DO concentration for the protection of early life stages of coldwater species of anadromous fish that should maintain the spawning-gravel DO concentration shown in parentheses. The 1-day minimum DO standard is 5.0 mg/L and the 7-day mean DO standard is 6.0 mg/L for protection of early life stages of warmwater fish.

*** The EPA-recommended temperature criteria are a mixture of narrative criteria and quantitative species-specific models that determine temperature criteria for a specified location and season (U.S. EPA 1986). The state of Washington's temperature criterion for waters designated Class A (waters of the lower Columbia River are designated Class A) is 18 °C for freshwater and 16 °C for marine water. However, a special condition has been established for the Columbia River from the mouth to river mile 309.3 which sets a temperature limit of 20.0 °C due to human activities and a limit of an increase of 0.3 °C due to a single source or 1.1 °C due to all sources or activities combined when natural conditions cause the water temperature to exceed 20.0 °C. The state of Oregon's temperature criteria are established in reference to upstream, and presumably unaffected, reference locations.

**** The U.S. EPA did not recommend criteria for the protection of aquatic life in the 1986 criteria document, although adverse effects of salinity changes on plants and animals were discussed (U.S. EPA 1986). The criteria recommended by the EPA are for the protection of public welfare; 250 mg/L of chlorides and sulfates in domestic water supplies (U.S. EPA 1986).

***** The U.S. EPA recommended a narrative criterion for solids (suspended and settleable) and turbidity for the protection of freshwater fish and other aquatic life. The narrative criterion is "Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life" (U.S. EPA 1986). The state of Washington Class A standard does not allow more than a 5 NTU increase over background turbidity when background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU. The state of Oregon turbidity standard allows no more than a 10 percent cummulative increase in natural stream turbidity due to turbidity causing activities.

TABLE B-2. FIELD WATER QUALITY PARAMETERS COLLECTED DURING THE SEDIMENT/WATER AND CRAYFISH FIELD EFFORTS LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 2 of 6)

River Mile	Station	Location	N. latitude	W. longitude	Date	Time	Tide	Depth (m)	Field DO (mg/L)**	DO (% sat)**	Winkler DO (mg/L)	Temp (°C)***	pH	Conductivity (mMhos/cm)****	Salinity (ppt)****	Turbidity (NTU)*****
RM 21	2-CF	Cathlamet Bay	46° 10' 33.6"	123° 41' 43.7"	7/23/93	0838	Ebb	0.50	8.25	87.5	7.96	18.3	7.90	0.152	0.1	10
RM 21	2-CF	Cathlamet Bay	46° 10' 33.6"	123° 41' 43.7"	7/23/93	0839	Ebb	0.50	8.24	87.4		18.3	7.90	0.152	0.1	11
RM 21	2-CF	Cathlamet Bay	46° 10' 33.6"	123° 41' 43.7"	7/23/93	0840	Ebb	0.50	8.09	85.6		18.3	7.89	0.152	0.1	11
RM 23	3-W	Svensen Island	46° 10' 29.4"	123° 39' 53.5"	6/27/93	0930	Ebb	0.15	9.45	99.1		17.7	7.81	0.110	0.1	8
RM 23	3-W	Svensen Island	46° 10' 29.4"	123° 39' 53.5"	6/27/93	0931	Ebb	0.15	9.42	98.8		17.7	7.81	0.110	0.1	9
RM 23	3-W	Svensen Island	46° 10' 29.4"	123° 39' 53.5"	6/27/93	0932	Ebb	0.15	9.38	98.3		17.7	7.81	0.110	0.1	8
RM 23	3-W	Svensen Island	46° 10' 29.4"	123° 39' 53.5"	6/27/93	0933	Ebb	0.50	15.03R	158.0R		17.7	7.80	0.110	0.1	8
RM 23	3-W	Svensen Island	46° 10' 29.4"	123° 39' 53.5"	6/27/93	0934	Ebb	0.50	14.63R	153.0R		17.7	7.80	0.110	0.1	9
RM 23	3-W	Svensen Island	46° 10' 29.4"	123° 39' 53.5"	6/27/93	0935	Ebb	0.50	14.65R	153.6R		17.7	7.80	0.110	0.1	8
RM 23	3-W	Svensen Island	46° 10' 29.4"	123° 39' 53.5"	6/27/93	0936	Ebb	1.00	14.80R	155.0R		17.7	7.80	0.110	0.1	9
RM 23	3-W	Svensen Island	46° 10' 29.4"	123° 39' 53.5"	6/27/93	0937	Ebb	1.00	14.70R	155.0R		17.7	7.80	0.110	0.1	8
RM 23	3-W	Svensen Island	46° 10' 29.4"	123° 39' 53.5"	6/27/93	0938	Ebb	1.00	14.70R	154.0R		17.7	7.80	0.110	0.1	8
RM 23	3-CF	Svensen Island	46° 10' 39.1"	123° 40' 10.5"	7/23/93	0824	Ebb	0.50	8.97	95.8	8.87	18.5	8.18	0.132	0.1	9
RM 23	3-CF	Svensen Island	46° 10' 39.1"	123° 40' 10.5"	7/23/93	0825	Ebb	0.50	9.03	96.1		18.6	8.15	0.132	0.1	10
RM 23	3-CF	Svensen Island	46° 10' 39.1"	123° 40' 10.5"	7/23/93	0826	Ebb	0.50	8.97	95.8		18.6	8.15	0.132	0.1	10
RM 26	4-W	Knappa Slough	46° 12' 00.7"	123° 35' 11.3"	6/26/93	0930	Ebb	0.50	15.00R	160.0R	10.4	18.1	8.26	0.110	0.1	5
RM 26	4-W	Knappa Slough	46° 12' 00.7"	123° 35' 11.3"	6/26/93	0931	Ebb	0.50	15.10R	160.0R		18.1	8.26	0.112	0.1	6
RM 26	4-W	Knappa Slough	46° 12' 00.7"	123° 35' 11.3"	6/26/93	0932	Ebb	0.50	15.30R	162.0R		18.1	8.26	0.110	0.1	6
RM 26	4-CF	Knappa Slough	46° 11' 55.9"	123° 35' 04.4"	7/23/93	1143	Ebb	0.50	8.57	91.7	8.46	18.7	7.80	0.122	0.1	11
RM 26	4-CF	Knappa Slough	46° 11' 55.9"	123° 35' 04.4"	7/23/93	1144	Ebb	0.50	8.57	91.7		18.7	7.80	0.122	0.1	12
RM 26	4-CF	Knappa Slough	46° 11' 55.9"	123° 35' 04.4"	7/23/93	1145	Ebb	0.50	8.53	91.2		18.7	7.81	0.122	0.1	12
Freshwater[1]		U.S. EPA (1-day)							8.0 (5.0)				6.5-9.0			
		U.S. EPA (7-day)							9.5 (6.5)				6.5-9.0			
		Washington							8.0	90.0		20.0	6.5-8.5			
		Oregon								90.0			6.5-8.5			
Marine[2]		U.S. EPA											6.5-8.5			
		Washington							6.0			16.0	7.0-8.5			
		Oregon							6.0				7.0-8.5			

W = Sediment/Water Field Effort
CF = Crayfish Field Effort
RM = River Mile
R = Unuseable Data
[1] Applies to all stations except Station 1 (River Mile 14)
[2] Applies only to Station 1 (River Mile 14)
* Not Recorded

** The EPA-recommended standard is the 1-day minimum and 7-day mean DO concentration for the protection of early life stages of coldwater species of anadromous fish that should maintain the spawning-gravel DO concentration shown in parentheses. The 1-day minimum DO standard is 5.0 mg/L and the 7-day mean DO standard is 6.0 mg/L for protection of early life stages of warmwater fish.

*** The EPA-recommended temperature criteria are a mixture of narrative criteria and quantitative species-specific models that determine temperature criteria for a specified location and season (U.S. EPA 1986). The state of Washington's temperature criterion for waters designated Class A (waters of the lower Columbia River are designated Class A) is 18 °C for freshwater and 16 °C for marine water. However, a special condition has been established for the Columbia River from the mouth to river mile 309.3 which sets a temperature limit of 20.0 °C due to human activities and a limit of an increase of 0.3 °C due to a single source or 1.1 °C due to all sources or activities combined when natural conditions cause the water temperature to exceed 20.0 °C. The state of Oregon's temperature criteria are established in reference to upstream, and presumably unaffected, reference locations.

**** The U.S. EPA did not recommend criteria for the protection of aquatic life in the 1986 criteria document, although adverse effects of salinity changes on plants and animals were discussed (U.S. EPA 1986). The criteria recommended by the EPA are for the protection of public welfare; 250 mg/L of chlorides and sulfates in domestic water supplies (U.S. EPA 1986).

***** The U.S. EPA recommended a narrative criterion for solids (suspended and settleable) and turbidity for the protection of freshwater fish and other aquatic life. The narrative criterion is "Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life" (U.S. EPA 1986). The state of Washington Class A standard does not allow more than a 5 NTU increase over background turbidity when background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU. The state of Oregon turbidity standard allows no more than a 10 percent cummulative increase in natural stream turbidity due to turbidity causing activities.

TABLE B-2. FIELD WATER QUALITY PARAMETERS COLLECTED DURING THE SEDIMENT/WATER AND CRAYFISH FIELD EFFORTS LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 3 of 6)

River Mile	Station	Location	N. latitude	W. longitude	Date	Time	Tide	Depth (m)	Field DO (mg/L)**	DO (% sat)**	Winkler DO (mg/L)	Temp (°C)***	pH	Conductivity (mMhos/cm)****	Salinity (ppt)****	Turbidity (NTU)*****
RM 29	S-W	Lewis & Clark NWR	46° 13' 25.6"	123° 33' 07.0"	6/26/93	1500	Ebb	0.15	10.80	117.0		19.0	8.80	0.112	0.1	13
RM 29	S-W	Lewis & Clark NWR	46° 13' 25.6"	123° 33' 07.0"	6/26/93	1501	Ebb	0.15	10.80	117.0		19.0	8.84	0.112	0.1	14
RM 29	S-W	Lewis & Clark NWR	46° 13' 25.6"	123° 33' 07.0"	6/26/93	1502	Ebb	0.15	10.80	117.0		19.2	8.89	0.112	0.1	13
RM 29	S-CF	Lewis & Clark NWR	46° 13' 15.1"	123° 33' 19.6"	7/23/93	1203	Ebb	0.50	9.46	101.3	9.22	18.7	8.23	0.128	0.1	12
RM 29	S-CF	Lewis & Clark NWR	46° 13' 15.1"	123° 33' 19.6"	7/23/93	1204	Ebb	0.50	9.35	100.1		18.8	8.20	0.128	0.1	14
RM 29	S-CF	Lewis & Clark NWR	46° 13' 15.1"	123° 33' 19.6"	7/23/93	1205	Ebb	0.50	9.42	100.9		18.8	8.19	0.128	0.1	16
RM 36	6-W	Elochoman Slough	*	*	6/25/93	1610	Flood	0.15	10.00	105.0		18.5	7.62	0.088	0.0	6
RM 36	6-W	Elochoman Slough	*	*	6/25/93	1611	Flood	0.15	10.10	107.0		18.5	7.86	0.102	0.0	28
RM 36	6-W	Elochoman Slough	*	*	6/25/93	1612	Flood	0.15	10.20	109.0		18.5	7.94	0.102	0.0	28
RM 36	6-CF	Elochoman Slough	46° 13' 28.3"	123° 24' 04.4"	7/15/93	1503	Ebb	0.50	10.38	109.2	10.45	18.1	8.63	0.128	0.1	14
RM 36	6-CF	Elochoman Slough	46° 13' 28.3"	123° 24' 04.4"	7/15/93	1504	Ebb	0.50	10.40	109.4		18.1	8.64	0.128	0.1	14
RM 36	6-CF	Elochoman Slough	46° 13' 28.3"	123° 24' 04.4"	7/15/93	1505	Ebb	0.50	10.31	108.8		18.1	8.64	0.128	0.1	14
RM 59	7-W	Fisher Island Slough	*	*	6/25/93	0940	Ebb	0.50	*	*		17.2	7.95	0.118	0.1	7
RM 59	7-W	Fisher Island Slough	*	*	6/25/93	0905	Ebb	0.50	*	*		17.2	7.96	0.118	0.1	8
RM 59	7-W	Fisher Island Slough	*	*	6/25/93	0906	Ebb	0.50	*	*		17.2	7.94	0.118	0.1	7
RM 59	7-W	Fisher Island Slough	*	*	6/25/93	1309	Ebb	0.15	10.00	117.0		23.5	7.64	0.126	0.1	11
RM 59	7-W	Fisher Island Slough	*	*	6/25/93	1310	Ebb	0.15	9.80	115.0		23.3	7.64	0.128	0.1	13
RM 59	7-W	Fisher Island Slough	*	*	6/25/93	1311	Ebb	0.15	9.60	113.0		23.4	7.65	0.126	0.1	14
RM 59	7-CF	Fisher Island Slough	46° 10' 11.3"	123° 04' 14.3"	7/15/93	1300	Flood	0.50	10.75	112.9	10.73	18.1	8.84	0.128	0.1	10
RM 59	7-CF	Fisher Island Slough	46° 10' 11.3"	123° 04' 14.3"	7/15/93	1301	Flood	0.50	10.71	112.7		18.0	8.85	0.128	0.1	9
RM 59	7-CF	Fisher Island Slough	46° 10' 11.3"	123° 04' 14.3"	7/15/93	1302	Flood	0.50	10.76	113.2		18.0	8.85	0.128	0.1	10
RM 59	7-CF	Fisher Island Slough	46° 10' 11.3"	123° 04' 14.3"	7/15/93	1503	Flood	0.50	10.38	109.2		18.1	8.63	0.128	0.1	14
RM 59	7-CF	Fisher Island Slough	46° 10' 11.3"	123° 04' 14.3"	7/15/93	1504	Flood	0.50	10.40	109.4		18.1	8.64	0.128	0.1	14
RM 59	7-CF	Fisher Island Slough	46° 10' 11.3"	123° 04' 14.3"	7/15/93	1505	Flood	0.50	10.31	108.8		18.1	8.64	0.128	0.1	14
Freshwater[1]		U.S. EPA (1-day)							8.0 (5.0)				6.5-9.0			
		U.S. EPA (7-day)							9.5 (6.5)				6.5-9.0			
		Washington							8.0	90.0		20.0	6.5-8.5			
		Oregon								90.0			6.5-8.5			
Marine[2]		U.S. EPA											6.5-8.5			
		Washington							6.0			16.0	7.0-8.5			
		Oregon							6.0				7.0-8.5			

W = Sediment/Water Field Effort
CF = Crayfish Field Effort
RM = River Mile
R = Unuseable Data
[1] Applies to all stations except Station 1 (River Mile 14)
[2] Applies only to Station 1 (River Mile 14)
* Not Recorded

** The EPA-recommended standard is the 1-day minimum and 7-day mean DO concentration for the protection of early life stages of coldwater species of anadromous fish that should maintain the spawning-gravel DO concentration shown in parentheses. The 1-day minimum DO standard is 5.0 mg/L and the 7-day mean DO standard is 6.0 mg/L for protection of early life stages of warmwater fish.

*** The EPA-recommended temperature criteria are a mixture of narrative criteria and quantitative species-specific models that determine temperature criteria for a specified location and season (U.S. EPA 1986). The state of Washington's temperature criterion for waters designated Class A (waters of the lower Columbia River are designated Class A) is 18 °C for freshwater and 16 °C for marine water. However, a special condition has been established for the Columbia River from the mouth to river mile 309.3 which sets a temperature limit of 20.0 °C due to human activities and a limit of an increase of 0.3 °C due to a single source or 1.1 °C due to all sources or activities combined when natural conditions cause the water temperature to exceed 20.0 °C. The state of Oregon's temperature criteria are established in reference to upstream, and presumably unaffected, reference locations.

**** The U.S. EPA did not recommend criteria for the protection of aquatic life in the 1986 criteria document, although adverse effects of salinity changes on plants and animals were discussed (U.S. EPA 1986). The criteria recommended by the EPA are for the protection of public welfare; 250 mg/L of chlorides and sulfates in domestic water supplies (U.S. EPA 1986).

***** The U.S. EPA recommended a narrative criterion for solids (suspended and settleable) and turbidity for the protection of freshwater fish and other aquatic life. The narrative criterion is "Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life" (U.S. EPA 1986). The state of Washington Class A standard does not allow more than a 5 NTU increase over background turbidity when background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU. The state of Oregon turbidity standard allows no more than a 10 percent cummulative increase in natural stream turbidity due to turbidity causing activities.

TABLE B-2. FIELD WATER QUALITY PARAMETERS COLLECTED DURING THE SEDIMENT/WATER AND CRAYFISH FIELD EFFORTS LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 4 of 6)

River Mile	Station	Location	N. latitude	W. longitude	Date	Time	Tide	Depth (m)	Field DO (mg/L)**	DO (% sat)**	Winkler DO (mg/L)	Temp (°C)***	pH	Conductivity (mMhos/cm)****	Salinity (ppt)****	Turbidity (NTU)*****
RM 68	8-W	Carrolls Channel	46° 03' 28.1"	122° 52' 05.8"	6/24/93	1330	Ebb	0.15	12.40	130.0		19.6	8.96	0.110	0.1	6
RM 68	8-W	Carrolls Channel	46° 03' 28.1"	122° 52' 05.8"	6/24/93	1331	Ebb	0.15	12.30	134.0		19.9	8.91	0.110	0.1	6
RM 68	8-W	Carrolls Channel	46° 03' 28.1"	122° 52' 05.8"	6/24/93	1332	Ebb	0.15	12.20	132.0		*	8.90	0.110	0.1	6
RM 68	8-CF	Carrolls Channel	46° 03' 33.7"	122° 52' 06.1"	7/15/93	1030	Flood	0.50	10.18	106.4	10.26	17.8	8.67	0.124	0.1	10
RM 68	8-CF	Carrolls Channel	46° 03' 33.7"	122° 52' 06.1"	7/15/93	1031	Flood	0.50	10.14	106.2		17.8	8.70	0.124	0.1	12
RM 68	8-CF	Carrolls Channel	46° 03' 33.7"	122° 52' 06.1"	7/15/93	1032	Flood	0.50	10.21	106.8		17.8	8.69	0.124	0.1	10
RM 81	9-W	Burke Slough	45° 56' 14.2"	122° 47' 12.1"	6/29/93	1000	Flood	0.10	6.79	74.9		20.2	7.33	0.126	0.1	14
RM 81	9-W	Burke Slough	45° 56' 14.2"	122° 47' 12.1"	6/29/93	1001	Flood	0.10	6.80	75.1		20.2	7.31	0.126	0.1	14
RM 81	9-W	Burke Slough	45° 56' 14.2"	122° 47' 12.1"	6/29/93	1002	Flood	0.10	6.80	75.1		20.2	7.31	0.126	0.1	14
RM 81	9-W	Burke Slough	45° 56' 14.2"	122° 47' 12.1"	6/29/93	1003	Flood	0.10	7.40	82.7	7.5	*	*	*	*	*
RM 81	9-CF	Burke Slough	45° 56' 27.1"	122° 47' 09.6"	7/16/93	1036	Ebb	0.50	5.13	54.5		18.4	7.14	0.150	0.1	14
RM 81	9-CF	Burke Slough	45° 56' 27.1"	122° 47' 09.6"	7/16/93	1037	Ebb	0.50	5.03	54.3		18.4	7.14	0.148	0.1	13
RM 81	9-CF	Burke Slough	45° 56' 27.1"	122° 47' 09.6"	7/16/93	1038	Ebb	0.50	5.11	54.2		18.4	7.14	0.148	0.1	14
RM 81	9-CF	Burke Slough	45° 56' 27.1"	122° 47' 09.6"	7/16/93	1042	Ebb	0.50	4.68	50.5	4.55	19.2	*	*	*	*
RM 88	10-W	Scappoose Bay	45° 49' 35.8"	122° 49' 56.0"	6/28/93	1656	Ebb	0.50	10.50	120.0		21.9	7.36	0.096	0.0	30
RM 88	10-W	Scappoose Bay	45° 49' 35.8"	122° 49' 56.0"	6/28/93	1657	Ebb	0.50	10.20	116.4		21.9	7.35	0.096	0.0	29
RM 88	10-W	Scappoose Bay	45° 59' 35.8"	122° 49' 56.0"	6/28/93	1658	Ebb	0.50	10.50	119.8		21.9	7.33	0.096	0.0	30
RM 88	10-CF	Scappoose Bay	45° 49' 45.9"	122° 49' 58.6"	7/20/93	1219	Ebb	0.50	8.34	91.4	8.28	19.4	7.44	0.118	0.1	16
RM 88	10-CF	Scappoose Bay	45° 49' 45.9"	122° 49' 58.6"	7/20/93	1220	Ebb	0.50	8.53	92.8		19.5	7.41	0.118	0.1	16
RM 88	10-CF	Scappoose Bay	45° 49' 45.9"	122° 49' 58.6"	7/20/93	1221	Ebb	0.50	8.51	92.3		19.5	7.40	0.118	0.1	16
Freshwater[1]		U.S. EPA (1-day)							8.0 (5.0)				6.5-9.0			
		U.S. EPA (7-day)							9.5 (6.5)				6.5-9.0			
		Washington							8.0	90.0		20.0	6.5-8.5			
		Oregon								90.0			6.5-8.5			
Marine[2]		U.S. EPA											6.5-8.5			
		Washington							6.0			16.0	7.0-8.5			
		Oregon							6.0				7.0-8.5			

W = Sediment/Water Field Effort
CF = Crayfish Field Effort
RM = River Mile
R = Unuseable Data
[1] Applies to all stations except Station 1 (River Mile 14)
[2] Applies only to Station 1 (River Mile 14)
* Not Recorded

** The EPA-recommended standard is the 1-day minimum and 7-day mean DO concentration for the protection of early life stages of coldwater species of anadromous fish that should maintain the spawning-gravel DO concentration shown in parentheses. The 1-day minimum DO standard is 5.0 mg/L and the 7-day mean DO standard is 6.0 mg/L for protection of early life stages of warmwater fish.

*** The EPA-recommended temperature criteria are a mixture of narrative criteria and quantitative species-specific models that determine temperature criteria for a specified location and season (U.S. EPA 1986). The state of Washington's temperature criterion for waters designated Class A (waters of the lower Columbia River are designated Class A) is 18 °C for freshwater and 16 °C for marine water. However, a special condition has been established for the Columbia River from the mouth to river mile 309.3 which sets a temperature limit of 20.0 °C due to human activities and a limit of an increase of 0.3 °C due to a single source or 1.1 °C due to all sources or activities combined when natural conditions cause the water temperature to exceed 20.0 °C. The state of Oregon's temperature criteria are established in reference to upstream, and presumably unaffected, reference locations.

**** The U.S. EPA did not recommend criteria for the protection of aquatic life in the 1986 criteria document, although adverse effects of salinity changes on plants and animals were discussed (U.S. EPA 1986). The criteria recommended by the EPA are for the protection of public welfare; 250 mg/L of chlorides and sulfates in domestic water supplies (U.S. EPA 1986).

***** The U.S. EPA recommended a narrative criterion for solids (suspended and settleable) and turbidity for the protection of freshwater fish and other aquatic life. The narrative criterion is "Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life" (U.S. EPA 1986). The state of Washington Class A standard does not allow more than a 5 NTU increase over background turbidity when background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU. The state of Oregon turbidity standard allows no more than a 10 percent cummulative increase in natural stream turbidity due to turbidity causing activities.

TABLE B-2. FIELD WATER QUALITY PARAMETERS COLLECTED DURING THE SEDIMENT/WATER AND CRAYFISH FIELD EFFORTS LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 5 of 6)

River Mile	Station	Location	N. latitude	W. longitude	Date	Time	Tide	Depth (m)	Field DO (mg/L)**	DO (% sat)**	Winkler DO (mg/L)	Temp (°C)***	pH	Conductivity (mMhos/cm)****	Salinity (ppt)****	Turbidity (NTU)*****
RM 90	11-W	Bachelor Is. Slough	45° 49' 29.6"	122° 45' 31.2"	6/29/93	1712	Ebb	0.10	11.30	123.0		19.5	8.89	0.118	0.1	13
RM 90	11-W	Bachelor Is. Slough	45° 49' 29.6"	122° 45' 31.2"	6/29/93	1713	Ebb	0.10	11.30	123.0		19.4	8.90	0.118	0.1	13
RM 90	11-W	Bachelor Is. Slough	45° 49' 29.6"	122° 45' 31.2"	6/29/93	1714	Ebb	0.10	11.20	122.0		19.5	8.90	0.118	0.1	12
RM 90	11-CF	Bachelor Is. Slough	45° 49' 16.9"	122° 45' 29.5"	7/18/93	1544	Flood	0.50	11.50	126.8	11.33	20.5	9.04	0.126	0.1	9
RM 90	11-CF	Bachelor Is. Slough	45° 49' 16.9"	122° 45' 29.5"	7/18/93	1545	Flood	0.50	11.48	126.4		20.5	9.04	0.126	0.1	9
RM 90	11-CF	Bachelor Is. Slough	45° 49' 16.9"	122° 45' 29.5"	7/18/93	1546	Flood	0.50	11.46	126.1		20.5	9.05	0.126	0.1	9
RM 95	12-W	Willow Bar Islands	45° 44' 25.6"	122° 46' 22.4"	6/30/93	0930	Ebb	0.10	10.46	116.5		20.1	8.29	0.144	0.1	26
RM 95	12-W	Willow Bar Islands	45° 44' 25.6"	122° 46' 22.4"	6/30/93	0931	Ebb	0.10	10.49	116.7		20.1	8.36	0.144	0.1	27
RM 95	12-W	Willow Bar Islands	45° 44' 25.6"	122° 46' 22.4"	6/30/93	0932	Ebb	0.10	10.51	117.0		20.1	8.37	0.144	0.1	26
RM 95	12-CF	Willow Bar Islands	45° 44' 26.6"	122° 46' 22.0"	7/20/93	0808	Ebb	0.50	8.77	95.4	8.16	19.5	7.72	0.134	0.1	13
RM 95	12-CF	Willow Bar Islands	45° 44' 26.6"	122° 46' 22.0"	7/20/93	0809	Ebb	0.50	8.69	94.7		19.5	7.76	0.134	0.1	13
RM 95	12-CF	Willow Bar Islands	45° 44' 26.6"	122° 46' 22.0"	7/20/93	0810	Ebb	0.50	8.63	93.9		19.5	7.80	0.136	0.1	13
RM 120	13-W	Camas Slough	*	*	7/1/93	1130	Ebb	0.10	10.45	109.8		17.3	8.36	0.112	0.1	22
RM 120	13-W	Camas Slough	*	*	7/1/93	1131	Ebb	0.10	10.47	110.0		17.3	8.37	0.112	0.1	23
RM 120	13-W	Camas Slough	*	*	7/1/93	1132	Ebb	0.10	10.42	109.5		17.3	8.36	0.114	0.1	22
RM 120	13-CF	Camas Slough	45° 34' 42.4"	122° 25' 16.1"	7/18/93	0859	Ebb	0.50	10.22	107.3	10.0	18.1	8.34	0.122	0.1	10
RM 120	13-CF	Camas Slough	45° 34' 42.4"	122° 25' 16.1"	7/18/93	0859	Ebb	0.50	10.21	107.3		18.1	8.55	0.122	0.1	10
RM 120	13-CF	Camas Slough	45° 34' 42.4"	122° 25' 16.1"	7/18/93	0900	Ebb	0.50	10.20	107.1		18.1	8.56	0.122	0.1	10
RM 120	13-CF	Camas Slough	45° 34' 42.4"	122° 25' 16.1"	7/18/93	0902	Ebb	0.50	10.20	107.3		18.1	8.60	0.122	0.1	9
RM 120	13-CF	Camas Slough	45° 34' 42.4"	122° 25' 16.1"	7/18/93	0903	Ebb	0.50	10.20	107.2		18.1	8.60	0.122	0.1	10
RM 120	13-CF	Camas Slough	45° 34' 42.4"	122° 25' 16.1"	7/18/93	0904	Ebb	0.50	10.16	106.8		18.1	8.60	0.122	0.1	11
Freshwater[1]		U.S. EPA (1-day)							8.0 (5.0)				6.5-9.0			
		U.S. EPA (7-day)							9.5 (6.5)				6.5-9.0			
		Washington							8.0	90.0		20.0	6.5-8.5			
		Oregon								90.0			6.5-8.5			
Marine[2]		U.S. EPA											6.5-8.5			
		Washington							6.0			16.0	7.0-8.5			
		Oregon							6.0				7.0-8.5			

W = Sediment/Water Field Effort
CF = Crayfish Field Effort
RM = River Mile
R = Unuseable Data
[1] Applies to all stations except Station 1 (River Mile 14)
[2] Applies only to Station 1 (River Mile 14)
* Not Recorded

** The EPA-recommended standard is the 1-day minimum and 7-day mean DO concentration for the protection of early life stages of coldwater species of anadromous fish that should maintain the spawning-gravel DO concentration shown in parentheses. The 1-day minimum DO standard is 5.0 mg/L and the 7-day mean DO standard is 6.0 mg/L for protection of early life stages of warmwater fish.

*** The EPA-recommended temperature criteria are a mixture of narrative criteria and quantitative species-specific models that determine temperature criteria for a specified location and season (U.S. EPA 1986). The state of Washington's temperature criterion for waters designated Class A (waters of the lower Columbia River are designated Class A) is 18 °C for freshwater and 16 °C for marine water. However, a special condition has been established for the Columbia River from the mouth to river mile 309.3 which sets a temperature limit of 20.0 °C due to human activities and a limit of an increase of 0.3 °C due to a single source or 1.1 °C due to all sources or activities combined when natural conditions cause the water temperature to exceed 20.0 °C. The state of Oregon's temperature criteria are established in reference to upstream, and presumably unaffected, reference locations.

**** The U.S. EPA did not recommend criteria for the protection of aquatic life in the 1986 criteria document, although adverse effects of salinity changes on plants and animals were discussed (U.S. EPA 1986). The criteria recommended by the EPA are for the protection of public welfare; 250 mg/L of chlorides and sulfates in domestic water supplies (U.S. EPA 1986).

***** The U.S. EPA recommended a narrative criterion for solids (suspended and settleable) and turbidity for the protection of freshwater fish and other aquatic life. The narrative criterion is "Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life" (U.S. EPA 1986). The state of Washington Class A standard does not allow more than a 5 NTU increase over background turbidity when background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU. The state of Oregon turbidity standard allows no more than a 10 percent cummulative increase in natural stream turbidity due to turbidity causing activities.

TABLE B-2. FIELD WATER QUALITY PARAMETERS COLLECTED DURING THE SEDIMENT/WATER AND CRAYFISH FIELD EFFORTS LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 6 of 6)

River Mile	Station	Location	N. latitude	W. longitude	Date	Time	Tide	Depth (m)	Field DO (mg/L)**	DO (% sat)**	Winkler DO (mg/L)	Temp (°C)***	pH	Conductivity (mMhos/cm)****	Salinity (ppt)****	Turbidity (NTU)*****
RM 124	14-W	Gary & Flag Islands	45° 32' 50.8"	122° 20' 21.6"	7/1/93	0745	Ebb	0.10	8.72	92.5		17.8	7.62	0.122	0.1	30
RM 124	14-W	Gary & Flag Islands	45° 32' 50.8"	120° 20' 21.6"	7/1/93	0746	Ebb	0.10	8.78	93.2		17.8	7.61	0.122	0.1	29
RM 124	14-W	Gary & Flag Islands	45° 32' 50.8"	120° 20' 21.6"	7/1/93	0747	Ebb	0.10	8.81	93.5		17.8	7.61	0.122	0.1	29
RM 124	14-CF	Gary & Flag Islands	45° 32' 26.9"	122° 20' 05.5"	7/18/93	1044	Ebb	0.50	10.49	112.3	10.39	18.9	8.77	0.126	0.1	12
RM 124	14-CF	Gary & Flag Islands	45° 32' 26.9"	122° 20' 05.5"	7/18/93	1045	Ebb	0.50	10.53	112.5		19.0	8.76	0.126	0.1	11
RM 124	14-CF	Gary & Flag Islands	45° 32' 26.9"	122° 20' 05.5"	7/18/93	1046	Ebb	0.50	10.56	113.1		19.0	8.77	0.126	0.1	10
RM 141	15-W	Skamania Landing	45° 36' 57.4"	122° 02' 00.8"	6/30/93	1615	Flood	0.10	10.78	119.0		20.0	8.74	0.120	0.1	22
RM 141	15-W	Skamania Landing	45° 36' 57.4"	122° 02' 00.8"	6/30/93	1616	Flood	0.10	10.95	120.1		19.5	8.73	0.118	0.1	20
RM 141	15-W	Skamania Landing	45° 36' 57.4"	122° 02' 00.8"	6/30/93	1617	Flood	0.10	10.88	117.7		18.6	8.64	0.118	0.1	19
RM 141	15-W	Skamania Landing	45° 36' 57.4"	122° 02' 00.8"	6/30/93	1620	Flood	0.10	10.89	117.6		18.6	8.63	0.118	0.1	19
RM 141	15-W	Skamania Landing	45° 36' 57.4"	122° 02' 00.8"	6/30/93	1621	Flood	0.10	10.90	117.9		18.7	8.64	0.118	0.1	19
RM 141	15-W	Skamania Landing	45° 36' 57.4"	122° 02' 00.8"	6/30/93	1622	Flood	0.10	10.94	118.8		18.8	8.65	0.118	0.1	20
RM 141	15-W	Skamania Landing	45° 36' 57.4"	122° 02' 00.8"	6/30/93	1805	Ebb	0.10	11.35	122.4	11.5	19.0	*	*	*	*
RM 141	15-CF	Skamania Landing	45° 36' 49.6"	122° 02' 05.4"	7/18/93	1302	Ebb	0.50	10.52	112.1		18.8	8.54	0.126	0.1	10
RM 141	15-CF	Skamania Landing	45° 36' 49.6"	122° 02' 05.4"	7/18/93	1303	Ebb	0.50	10.52	112.2		18.8	8.54	0.126	0.1	10
RM 141	15-CF	Skamania Landing	45° 36' 49.6"	122° 02' 05.4"	7/18/93	1304	Ebb	0.50	10.52	112.2		18.8	8.54	0.126	0.1	10
RM 141	15-CF	Skamania Landing	45° 36' 53.2"	122° 02' 05.4"	7/19/93	1101	Ebb	0.50	10.20	108.7	10.04	18.6	8.33	0.124	0.1	8
RM 141	15-CF	Skamania Landing	45° 36' 53.2"	122° 02' 05.4"	7/19/93	1102	Ebb	0.50	10.25	109.2		18.6	8.39	0.124	0.1	8
RM 141	15-CF	Skamania Landing	45° 36' 53.2"	122° 02' 03.1"	7/19/93	1103	Ebb	0.50	10.31	109.1		18.6	8.40	0.124	0.1	9
Freshwater[1]		U.S. EPA (1-day)							8.0 (5.0)				6.5-9.0			
		U.S. EPA (7-day)							9.5 (6.5)				6.5-9.0			
		Washington							8.0	90.0		20.0	6.5-8.5			
		Oregon								90.0			6.5-8.5			
Marine[2]		U.S. EPA											6.5-8.5			
		Washington							6.0			16.0	7.0-8.5			
		Oregon							6.0				7.0-8.5			

W = Sediment/Water Field Effort
CF = Crayfish Field Effort
RM = River Mile
R = Unuseable Data
[1] Applies to all stations except Station 1 (River Mile 14)
[2] Applies only to Station 1 (River Mile 14)
* Not Recorded

** The EPA-recommended standard is the 1-day minimum and 7-day mean DO concentration for the protection of early life stages of coldwater species of anadromous fish that should maintain the spawning-gravel DO concentration shown in parentheses. The 1-day minimum DO standard is 5.0 mg/L and the 7-day mean DO standard is 6.0 mg/L for protection of early life stages of warmwater fish.

*** The EPA-recommended temperature criteria are a mixture of narrative criteria and quantitative species-specific models that determine temperature criteria for a specified location and season (U.S. EPA 1986). The state of Washington's temperature criterion for waters designated Class A (waters of the lower Columbia River are designated Class A) is 18 °C for freshwater and 16 °C for marine water. However, a special condition has been established for the Columbia River from the mouth to river mile 309.3 which sets a temperature limit of 20.0 °C due to human activities and a limit of an increase of 0.3 °C due to a single source or 1.1 °C due to all sources or activities combined when natural conditions cause the water temperature to exceed 20.0 °C. The state of Oregon's temperature criteria are established in reference to upstream, and presumably unaffected, reference locations.

**** The U.S. EPA did not recommend criteria for the protection of aquatic life in the 1986 criteria document, although adverse effects of salinity changes on plants and animals were discussed (U.S. EPA 1986). The criteria recommended by the EPA are for the protection of public welfare; 250 mg/L of chlorides and sulfates in domestic water supplies (U.S. EPA 1986).

***** The U.S. EPA recommended a narrative criterion for solids (suspended and settleable) and turbidity for the protection of freshwater fish and other aquatic life. The narrative criterion is "Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life" (U.S. EPA 1986). The state of Washington Class A standard does not allow more than a 5 NTU increase over background turbidity when background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU. The state of Oregon turbidity standard allows no more than a 10 percent cummulative increase in natural stream turbidity due to turbidity causing activities.

TABLE B-3. WATER CONVENTIONAL PARAMETERS
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	CONVENTIONALS TSS Conc. (mg/L)	Hardness Conc. (mg CaCO3/L)	Chlorophyll Conc. (µg/L)	Phaeophytin Conc. (µg/L)	Conductivity Conc. (µmhos/cm)	Cyanide Conc. (mg/L)	TOC Conc. (mg/L)	POC Conc. (mg/L)
RM 14	1-W	20	359	10	9.3	2940	0.002 U	4.97	1.16 Z
RM 21	2-W	13	44.3	17	15	124.6	0.002 U	2.58	0.64 Z
RM 23	3-W	16	44.5	14	23	122.0	0.002 U	2.30	0.56 Z
RM 26	4-W	15	41.9	13	26	118.8	0.002 U	2.88	0.76 Z
RM 29	5-W	14	44.7	20	9.8 E	125.9	0.002 U	2.32	*
RM 36	6-W	6.4	38.9	6.7	6.8	103.3	0.002 U	2.21	0.46 Z
RM 59	7-W	15	45.9	11	9.3	131.2	0.002 U	2.47	0.68 Z
RM 68	8-W	9.4	51.7	9.6	5.7	122.3	0.002 U	2.72	1.35 Z
RM 81	9-1-W	6.8	54.9	6.9	11	139.7	0.002 U	2.99	1.12 Z
RM 81	9-2-W	7.4	53.1	9.4	7.3	138.6	0.002 U	2.93	1.05 Z
RM 81	9-3-W	7.0	53.9	10	7.9	138.5	0.002 U	2.92	0.73 Z
RM 88	10-W	63	35.7	35	31	107.4	0.002 U	9.44	4.60 Z
RM 90	11-W	12	52.9	14	9.2	131.1	0.002 U	2.75	0.64 Z
RM 95	12-W	25	85.8	32	12	159.6	0.002 U	4.95	3.09 Z
RM 120	13-W	8.0	53.1	13	2.6	125.3	0.002 U	2.44	0.63 Z
RM 124	14-W	19	51.3	16	12 E	136.5	0.002 U	3.28	0.53 Z
RM 141	15-W	20	59.9	14	2.8	131.8	0.002 U	2.36	0.85 Z
Freshwater Chronic[1]	U.S. EPA	na**	na**		na**	na**	0.0052	na**	na**
	Washington						0.0052		
	Oregon			15			0.0052		
Marine Chronic[2]	U.S. EPA	na**	na**	na**	na**	na**	0.001	na**	na**
	Washington						0.001		
	Oregon						0.001		
Consumption of Fish-Shellfish and Water	U.S. EPA	na**	na**	na**	na**	na**	700	na**	na**
	Washington						700		
	Oregon						200		

W = Water sample.
RM = River mile.
U = Compound was not detected. Value give is the lower quantification limit.
E = Estimated value.
Z = Value corrected for blank contamination.
* Sample lost by laboratory
** Criteria are not available.
[1] Applies to all stations except Station 1 (River Mile 14).
[2] Applies only to Station 1 (River Mile 14).

TABLE B-4. NUTRIENTS IN WATER (page 1 of 2)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	NUTRIENTS									
		Total Phosphorus		Soluble Reactive Phosphorus		Ammonia-N		Nitrate+Nitrite-N		Total Kjeldahl Nitrogen	
		Conc. (mg/L)		Conc. (mg/L)		Conc. (mg/L)		Conc. (mg/L)		Conc. (mg/L)	
RM 14	1-1-W	0.058		0.014		0.021		0.032		0.236	
RM 14	1-2-W	0.076		0.014		0.022		0.033		0.238	
RM 14	1-3-W	0.057		0.014		0.018		0.032		0.221	
RM 21	2-1-W	0.039		0.014		0.010	U	0.016		0.241	
RM 21	2-2-W	0.045		0.013		0.010	U	0.017		0.198	E
RM 21	2-3-W	0.059		0.018		0.010	U	0.020		0.206	
RM 23	3-1-W	0.062		0.009		0.010	U	0.024		0.309	
RM 23	3-2-W	0.043		0.016		0.010	U	0.027		0.305	
RM 23	3-3-W	0.040		0.015		0.010		0.032		0.254	
RM 26	4-1-W	0.090		0.010		0.011		0.034		0.387	
RM 26	4-2-W	0.052		0.010		0.010	U	0.029		0.292	
RM 26	4-3-W	0.048		0.010		0.014		0.035		0.257	
RM 29	5-1-W	0.045		0.014		0.010	U	0.040		0.221	
RM 29	5-2-W	0.040		0.011		0.010	U	0.040		0.209	
RM 29	5-3-W	0.052		0.012		0.011		0.042		0.310	
RM 36	6-1-W	0.048		0.009		0.017		0.179		0.144	
RM 36	6-2-W	0.054		0.010		0.024		0.178		0.149	
RM 36	6-3-W	0.129		0.009		0.024		0.186		0.175	
RM 59	7-1-W	0.066		0.012		0.013		0.037		0.191	
RM 59	7-2-W	0.040		0.012		0.010	U	0.035		0.230	
RM 59	7-3-W	0.076		0.013		0.010	U	0.035		0.183	
RM 68	8-1-W	0.312		0.011		0.010	U	0.010	U	0.264	
RM 68	8-2-W	0.044		0.011		0.010	U	0.010	U	0.242	
RM 68	8-3-W	0.060		0.011		0.010	U	0.010	U	0.217	
RM 81	9-1-W	0.045		0.001	U	0.013		0.010	U	0.177	
RM 81	9-2-W	0.037		0.003		0.010	U	0.010	U	0.180	
RM 81	9-3-W	0.045		0.002		0.010	U	0.010	U	0.184	
RM 88	10-1-W	0.159		0.013		0.026		0.010	U	0.436	
RM 88	10-2-W	0.181		0.014		0.021		0.010	U	0.487	
RM 88	10-3-W	0.177		0.013		0.010	U	0.010	U	0.498	
RM 90	11-1-W	0.042		0.009		0.010	U	0.044		0.157	
RM 90	11-2-W	0.036		0.013		0.010	U	0.042		0.142	
RM 90	11-3-W	0.049		0.009		0.010	U	0.039		0.137	
RM 95	12-1-W	0.108		0.004		0.010	U	0.010	U	0.373	
RM 95	12-2-W	0.118		0.004		0.013		0.010	U	0.362	
RM 95	12-3-W	0.113		0.005		0.010	U	0.010	U	0.419	
RM 120	13-1-W	0.026		0.007		0.010	U	0.040		0.177	
RM 120	13-2-W	0.027		0.006		0.015		0.046		0.219	
RM 120	13-3-W	0.025		0.005		0.010	U	0.042		0.184	
RM 124	14-1-W	0.056		0.010		0.010	U	0.010	U	0.304	
RM 124	14-2-W	0.058		0.009		0.010	U	0.010	U	0.349	
RM 124	14-3-W	0.063		0.008		0.010	U	0.010		0.352	
RM 141	15-1-W	0.044		0.008		0.010	U	0.037		0.179	
RM 141	15-2-W	0.042		0.008		0.010		0.042		0.166	
RM 141	15-3-W	0.041		0.008	E	0.010	U	0.038		0.216	
Freshwater[1]	U.S. EPA	na*		na*		0.32[3]		na**		na***	
	Washington					0.32[3]					
	Oregon					0.32[3]					
Marine[2]	U.S. EPA	na*		na*		2.2[3]		na**		na***	
	Washington					2.2[3]					
	Oregon					2.2[3]					

W = Water sample.

RM = River mile.

U = Compound was not detected. Value given is the lower quantification limit.

TABLE B-4. NUTRIENTS IN WATER (page 2 of 2)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

U/B = Compound was not detected due to blank contamination.

E = Estimated value due to evaluation of QC data.

[1] Applies to all stations except for Station 1 (River Mile 14).

[2] Applies only to Station 1 (River Mile 14).

[3] The standards for total ammonia nitrogen are based on the toxic effect of un-ionized ammonia at certain pH levels and water temperature. The state standards follow the standards recommended by the U.S. EPA (1986). The criteria shown are based on a temperature of 20 °C and a pH of 8.5.

* There are no recommended standards for the protection of aquatic life for phosphorus compounds, with the exception of a 0.10 µg/L standard for yellow (elemental) phosphorus for marine and estuarine waters.

** There are no recommended standards for the protection of aquatic life for nitrate plus nitrite nitrogen. However, the EPA-recommended maximum-contaminant level (MCL) for drinking water is 10,000 µg/L.

*** Total Kjeldahl nitrogen measures the sum of ammonia and organic nitrogen. There are no recommended standards for the protection of aquatic life for total Kjeldahl nitrogen.

TABLE B-5. METAL (TOTAL RECOVERABLE AND FILTERED) CONCENTRATIONS IN WATER
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 1 of 8)

River Mile	Sample Number	Aluminum Conc. (µg/L)	Antimony Conc. (µg/L)	Arsenic Conc. (µg/L)	Barium Conc. (µg/L)	Beryllium Conc. (µg/L)	Cadmium Conc. (µg/L)	Chromium[3] Conc. (µg/L)	Copper Conc. (µg/L)	Iron Conc. (µg/L)
RM 14	1-1-W-D	29.0	3.0 U	3.0 U	12.0	2.0 U	0.10 U	1.0 U	1.0 U	22.0
RM 14	1-1-W-T	395	3.0 U	3.0 U	18.0	2.0 U	0.10 U	1.0 U	5.1	495
RM 14	1-2-W-D	41.7	3.0 U	3.0 U	12.0	2.0 U	0.10 U	1.0 U	1.0 U	23.0
RM 14	1-2-W-T	259	3.0 U	3.0 U	14.0	2.0 U	0.10 U	1.0 U	5.1	525
RM 14	1-3-W-D	40.0	3.0 U	3.0 U	11.0	2.0 U	0.10 U	1.0 U	1.0 U	25.0
RM 14	1-3-W-T	447	3.0 U	3.0 U	13.0	2.0 U	0.10 U	1.0 U	3.5	576
RM 21	2-1-W-D	45.0	3.0 U	3.0 U	12.0	2.0 U	0.10 U	1.0 U	1.0 U	22.0
RM 21	2-1-W-T	376	3.0 U	3.0 U	16.0	2.0 U	0.10 U	1.0 U	2.6	459
RM 21	2-2-W-D	36.3	3.0 U	3.0 U	12.0	2.0 U	0.10 U	1.0 U	1.0 U	21.0
RM 21	2-2-W-T	428	3.0 U	3.0 U	14.0	2.0 U	0.10 U	1.0 U	2.2	475
RM 21	2-3-W-D	40.5	3.0 U	3.0 U	11.0	2.0 U	0.10 U	1.0 U	1.0 U	34.0
RM 21	2-3-W-T	323	3.0 U	3.0 U	14.0	2.0 U	0.10 U	1.0 U	1.7	328
RM 23	3-1-W-D	19.7	3.0 U	3.0 U	11.0	2.0 U	0.10 U	1.0 U	1.0 U	25.0
RM 23	3-1-W-T	429	3.0 U	3.0 U	17.0	2.0 U	0.10 U	1.0 U	2.3	5.0 U
RM 23	3-2-W-D	22.0	3.0 U	3.0 U	14.0	2.0 U	0.10 U	1.0 U	1.0 U	38.0
RM 23	3-2-W-T	468	3.0 U	3.0 U	13.0	2.0 U	0.18 U/B	1.0 U	2.0	167
RM 23	3-3-W-D	24.0	3.0 U	3.0 U	14.0	2.0 U	0.10 U	1.0 U	1.0 U	20.0
RM 23	3-3-W-T	447	3.0 U	3.0 U	15.0	2.0 U	0.10 U	1.0 U	5.1	391
RM 26	4-1-W-D	27.5 E	3.0 U/E	3.0 U	14.0	2.0 U	0.10 U	1.0 U	1.0 U	5.0 U
RM 26	4-1-W-T	297	3.0 U/E	3.0 U	17.0	2.0 U	0.10 U	1.0 U	1.6	29.0
RM 26	4-2-W-D	18.1 E	3.0 U/E	3.0 U	13.0	2.0 U	0.10 U	1.0 U	1.0 U	5.0
RM 26	4-2-W-T	343	3.0 U/E	3.0 U	17.0	2.0 U	0.10 U	1.0 U	2.4	389
RM 26	4-3-W-D	21.3 E	3.0 U/E	3.0 U	14.0	2.0 U	0.10 U	1.0 U	1.0 U	17.0
RM 26	4-3-W-T	523	3.0 U/E	3.0 U	18.0	2.0 U	0.10 U	1.0 U	2.6	494
Freshwater Chronic[1]	U.S. EPA	87	30 proposed	190	na*	5.3 LOEL	0.7	11	6.5	1000
	Washington			190			0.6	11	5.6	
	Oregon		1600 LOEL	48 LOEL		5.3 LOEL	0.7	11	6.5	1000
Marine Chronic[2]	U.S. EPA	na*	500 proposed	36	na*	na*	9.3	50	2.9	na*
	Washington			36/21			8.0	50	2.9	
	Oregon			13 LOEL			9.3	50	2.9	
Consumption of Fish-Shellfish, and Water	U.S. EPA	na*	14	0.018	1000				na*	300
	Washington		14	0.018						
	Oregon		146	0.0022	1000	0.0068	10	50		300

W-T = Whole Water Sample W-D = Filtered Water Sample LOEL = Lowest Observed Effects Level * Criteria not available.

U = Compound was not detected. The value given is the lower quantification limit. [1] Applies to all stations except for Station 1 (River Mile 14).

E = Estimated value. [2] Applies only to Station 1 (River Mile 14).

U/B = Compound was not detected due to blank contamination. [3] Criteria are for hexavalent chromium (chromium VI).

Note: A.) Shaded areas indicate those detected concentrations which exceeded the lowest appropriate freshwater or marine chronic criterion. Consumption of Fish-Shellfish, and Water criteria are provided for comparison as well.

B.) For freshwater metals (cadmium, chromium, copper, lead, nickel, and zinc) the criteria are based on hardness.

C.) The Washington freshwater and marine criteria for cadmium, copper, lead, nickel, and zinc are based on the dissolved metals concentration and apply to the filtered samples only.

TABLE B-5. METAL (TOTAL RECOVERABLE AND FILTERED) CONCENTRATIONS IN WATER
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 2 of 8)

River Mile	Sample Number	Aluminum Conc. (µg/L)		Antimony Conc. (µg/L)		Arsenic Conc. (µg/L)		Barium Conc. (µg/L)	Beryllium Conc. (µg/L)		Cadmium Conc. (µg/L)		Chromium[3] Conc. (µg/L)		Copper Conc. (µg/L)		Iron Conc. (µg/L)
RM 29	5-1-W-D	41.9	E	3.0	U/E	3.0	U	12.0	2.0	U	0.10	U	1.0	U	1.0	U	21.0
RM 29	5-1-W-T	642		3.0	U/E	3.0	U	20.0	2.0	U	0.10	U	1.0	U	1.9		718
RM 29	5-2-W-D	16.6	E	3.0	U/E	3.0	U	14.0	2.0	U	0.10	U	1.0	U	1.0	U	12.0
RM 29	5-2-W-T	836		3.0	U/E	3.0	U	24.0	2.0	U	0.10	U	1.3	U/B	2.6		1150
RM 29	5-3-W-D	19.5	E	3.0	U/E	3.0	U	13.0	2.0	U	0.10	U	1.0	U	1.0	U	19.0
RM 29	5-3-W-T	732		3.0	U/E	3.0	U	23.0	2.0	U	0.16	U/B	1.0	U	3.1		858
RM 36	6-1-W-D	18.9		3.0	U	3.0	U	8.0	2.0	U	0.35	U/B	1.0	U	1.0	U	157
RM 36	6-1-W-T	169		3.0	U	3.0	U	12.0	2.0	U	0.10	U	1.0	U	1.0	U	358
RM 36	6-2-W-D	21.8		3.0	U	3.0	U	8.0	2.0	U	0.10	U	1.0	U	1.0	U	131
RM 36	6-2-W-T	196		3.0	U	3.0	U	11.0	2.0	U	0.10	U	1.0	U	1.0		334
RM 36	6-3-W-D	20.3		3.0	U	3.0	U	9.0	2.0	U	0.10	U	1.0	U	1.0	U	122
RM 36	6-3-W-T	208		3.0	U	3.0	U	11.0	2.0	U	0.10	U	1.0	U	1.1		363
RM 59	7-1-W-D	24.9		3.0	U	3.0	U	15.0	2.0	U	0.10	U	1.0	U	1.0	U	42.0
RM 59	7-1-W-T	361		3.0	U	3.0	U	18.0	2.0	U	0.10	U	1.0	U	1.8		336
RM 59	7-2-W-D	24.9		3.0	U	3.0	U	14.0	2.0	U	0.10	U	1.0	U	1.0	U	45.0
RM 59	7-2-W-T	345		3.0	U	3.0	U	18.0	2.0	U	0.32	U/B	1.0	U	1.5		341
RM 59	7-3-W-D	24.5		3.0	U	3.0	U	14.0	2.0	U	0.10	U	1.0	U	1.0	U	38.0
RM 59	7-3-W-T	456		3.0	U	3.0	U	17.0	2.0	U	0.10	U	1.0	U	1.6		356
RM 68	8-1-W-D	7.7	E	3.0	U	3.0	U	14.0	2.0	U	0.10	U	1.0	U	1.0	U	75.0
RM 68	8-1-W-T	367		3.0	U	3.0	U	16.0	2.0	U	0.10	U	1.0	U	1.7		353
RM 68	8-2-W-D	5.4		3.0	U	3.0	U	14.0	2.0	U	0.10	U	1.0	U	1.0	U	63.0
RM 68	8-2-W-T	287		3.0	U	3.0	U	17.0	2.0	U	0.10	U	1.0	U	1.4		362
RM 68	8-3-W-D	13.0		3.0	U	3.0	U	14.0	2.0	U	0.10	U	1.0	U	1.0	U	71.0
RM 68	8-3-W-T	291		3.0	U	3.0	U	17.0	2.0	U	0.10	U	1.0	U	2.6		380
Freshwater Chronic[1]	U.S. EPA	87		30 proposed		190		na*	5.3 LOEL		0.7		11		6.5		1000
	Washington					190					0.6		11		5.6		
	Oregon			1600 LOEL		48 LOEL			5.3 LOEL		0.7		11		6.5		1000
Marine Chronic[2]	U.S. EPA	na*		500 proposed		36		na*	na*		9.3		50		2.9		na*
	Washington					36/21					8.0		50		2.9		
	Oregon					13 LOEL					9.3		50		2.9		
Consumption of Fish-Shellfish, and Water	U.S. EPA	na*		14		0.018		1000							na*		300
	Washington			14		0.018											
	Oregon			146		0.0022		1000	0.0068		10		50				300

W-T = Whole Water Sample W-D = Filtered Water Sample LOEL = Lowest Observed Effects Level * Criteria not available.

U = Compound was not detected. The value given is the lower quantification limit.

E = Estimated value.

U/B = Compound was not detected due to blank contamination.

[1] Applies to all stations except for Station 1 (River Mile 14).

[2] Applies only to Station 1 (River Mile 14).

[3] Criteria are for hexavalent chromium (chromium VI).

Note: A.) Shaded areas indicate those detected concentrations which exceeded the lowest appropriate freshwater or marine chronic criterion. Consumption of Fish-Shellfish, and Water criteria are provided for comparison as well.

B.) For freshwater metals (cadmium, chromium, copper, lead, nickel, and zinc) the criteria are based on hardness.

C.) The Washington freshwater and marine criteria for cadmium, copper, lead, nickel, and zinc are based on the dissolved metals concentration and apply to the filtered samples only.

TABLE B-5. METAL (TOTAL RECOVERABLE AND FILTERED) CONCENTRATIONS IN WATER
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 3 of 8)

River Mile	Sample Number	Aluminum Conc. (µg/L)	Antimony Conc. (µg/L)	Arsenic Conc. (µg/L)	Barium Conc. (µg/L)	Beryllium Conc. (µg/L)	Cadmium Conc. (µg/L)	Chromium[3] Conc. (µg/L)	Copper Conc. (µg/L)	Iron Conc. (µg/L)
RM 81	9-1-W-D	10.8 U/B	3.0 U	3.0 U	15.0	2.0 U	0.10 U	1.0 U	1.0 U	76.0
RM 81	9-1-W-T	147	3.0 U	3.0 U	18.0	2.0 U	0.10 U	1.0 U	1.8	446
RM 81	9-2-W-D	14.9	3.0 U	3.0 U	16.0	2.0 U	0.10 U	1.0 U	1.0 U	82.0
RM 81	9-2-W-T	163	3.0 U	3.0 U	18.0	2.0 U	0.10 U	1.0 U	1.9	446
RM 81	9-3-W-D	9.1 U/B	3.0 U	3.0 U	16.0	2.0 U	0.10 U	1.0 U	1.0 U	73.0
RM 81	9-3-W-T	167	3.0 U	3.0 U	21.0	2.0 U	0.10 U	1.0 U	1.7	522
RM 88	10-1-W-D	60.5	3.0 U	3.0 U	13.0	2.0 U	0.10 U	1.0 U	1.0 U	439
RM 88	10-1-W-T	967	3.0 U	3.0	25.0	2.0 U	0.10 U	1.6	2.8	2240
RM 88	10-2-W-D	73.2	3.0 U	3.0 U	13.0	2.0 U	0.10 U	1.0 U	1.0 U	462
RM 88	10-2-W-T	849	3.0 U	3.0 U	26.0	2.0 U	0.10 U	6.9	5.3	3580
RM 88	10-3-W-D	60.7	3.0 U	3.0 U	12.0	2.0 U	0.10 U	1.0 U	1.0 U	426
RM 88	10-3-W-T	712	3.0 U	3.0 U	22.0	2.0 U	0.10 U	1.3	3.1	1950
RM 90	11-1-W-D	42.6	3.0 U	3.0 U	17.0	2.0 U	0.10 U	1.0 U	1.0 U	9.0
RM 90	11-1-W-T	417	3.0 U	3.0 U	21.0	2.0 U	0.10 U	1.0 U	2.1	447
RM 90	11-2-W-D	40.1	3.0 U	3.0 U	17.0	2.0 U	0.10 U	1.0 U	1.0 U	6.0
RM 90	11-2-W-T	440	3.0 U	3.0 U	20.0	2.0 U	0.10 U	1.0 U	2.3	413
RM 90	11-3-W-D	39.5	3.0 U	3.0 U	15.0	2.0 U	0.10 U	1.0 U	1.0 U	5.0 U
RM 90	11-3-W-T	339	3.0 U	3.0 U	20.0	2.0 U	0.10 U	1.0 U	2.4	345
RM 95	12-1-W-D	20.7	3.0 U	3.0 U	17.0	2.0 U/E	0.10 U	1.0 U	1.0 U	18.0
RM 95	12-1-W-T	397	3.0 U	3.0 U	24.0	2.0 U/E	0.10 U	1.0 U	2.0	839
RM 95	12-2-W-D	25.8	3.0 U	3.0 U	17.0	2.0 U/E	0.10 U	1.0 U	1.0 U	25.0
RM 95	12-2-W-T	458	3.0 U	3.7	20.0	2.0 U/E	0.10 U	1.0 U	2.0	431
RM 95	12-3-W-D	21.8	3.0 U	3.0 U	17.0	2.0 U/E	0.10 U	1.0 U	1.0 U	27.0
RM 95	12-3-W-T	415	3.0 U	4.1	26.0	2.0 U/E	0.10 U	1.0 U	2.1	905
Freshwater Chronic[1]	U.S. EPA	87	30 proposed	190	na*	5.3 LOEL	0.7	11	6.5	1000
	Washington			190			0.6	11	5.6	
	Oregon		1600 LOEL	48 LOEL		5.3 LOEL	0.7	11	6.5	1000
Marine Chronic[2]	U.S. EPA	na*	500 proposed	36	na*	na*	9.3	50	2.9	na*
	Washington			36/21			8.0	50	2.9	
	Oregon			13 LOEL			9.3	50	2.9	
Consumption of Fish-Shellfish, and Water	U.S. EPA	na*	14	0.018	1000				na*	300
	Washington		14	0.018						
	Oregon		146	0.0022	1000	0.0068	10	50		300

W-T = Whole Water Sample W-D = Filtered Water Sample LOEL = Lowest Observed Effects Level * Criteria not available.

U = Compound was not detected. The value given is the lower quantification limit. [1] Applies to all stations except for Station 1 (River Mile 14).

E = Estimated value. [2] Applies only to Station 1 (River Mile 14).

U/B = Compound was not detected due to blank contamination. [3] Criteria are for hexavalent chromium (chromium VI).

Note: A.) Shaded areas indicate those detected concentrations which exceeded the lowest appropriate freshwater or marine chronic criterion. Consumption of Fish-Shellfish, and Water criteria are provided for comparison as well.

B.) For freshwater metals (cadmium, chromium, copper, lead, nickel, and zinc) the criteria are based on hardness.

C.) The Washington freshwater and marine criteria for cadmium, copper, lead, nickel, and zinc are based on the dissolved metals concentration and apply to the filtered samples only.

TABLE B-5. METAL (TOTAL RECOVERABLE AND FILTERED) CONCENTRATIONS IN WATER
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 4 of 8)

River Mile	Sample Number	Aluminum Conc. (µg/L)		Antimony Conc. (µg/L)		Arsenic Conc. (µg/L)		Barium Conc. (µg/L)	Beryllium Conc. (µg/L)		Cadmium Conc. (µg/L)		Chromium[3] Conc. (µg/L)		Copper Conc. (µg/L)		Iron Conc. (µg/L)	
RM 120	13-1-W-D	14.6	U/B	3.0	U	3.0	U	16.0	2.0	U/E	0.10	U	1.0	U	1.0	U	5.0	
RM 120	13-1-W-T	205	E	3.0	U	3.0	U	17.0	2.0	U/E	0.10	U	1.0	U	1.9	U/B	229	
RM 120	13-2-W-D	16.3	U/B	3.0	U	3.0	U	16.0	2.0	U/E	0.10	U	1.0	U	1.0	U	7.0	
RM 120	13-2-W-T	220	E	3.0	U	3.0	U	17.0	2.0	U/E	0.10	U	1.0	U	2.9	U/B	239	
RM 120	13-3-W-D	10.9	U/B	3.0	U	3.0	U	15.0	2.0	U/E	0.10	U	1.0	U	1.0	U	5.0	U
RM 120	13-3-W-T	217	E	3.0	U	3.0	U	18.0	2.0	U/E	0.10	U	1.0	U	3.0	U/B	236	
RM 124	14-1-W-D	14.8	U/B	3.0	U	3.0	U	18.0	2.0	U/E	0.10	U	1.0	U	1.0	U	60.0	E
RM 124	14-1-W-T	412	E	3.0	U	3.0	U	24.0	2.0	U/E	0.10	U	1.0	U	3.3	U/B	666	
RM 124	14-2-W-D	12.0	U/B	3.0	U	3.0	U	19.0	2.0	U/E	0.10	U	1.0	U	1.0	U	68.0	E
RM 124	14-2-W-T	492	E	3.0	U	3.0	U	21.0	2.0	U/E	0.10	U	1.0	U	2.9	U/B	666	
RM 124	14-3-W-D	10.5	U/B	3.0	U	3.0	U	17.0	2.0	U/E	0.10	U	1.0	U	1.0	U	61.0	E
RM 124	14-3-W-T	443	E	3.0	U	3.0	U	20.0	2.0	U/E	0.10	U	1.0	U	3.1	U/B	657	
RM 141	15-1-W-D	43.5		3.0	U	3.0	U	16.0	2.0	U/E	0.10	U	1.0	U	1.0	U	6.0	E
RM 141	15-1-W-T	460		3.0	U	3.0	U	21.0	2.0	U/E	0.02	U/B	1.0	U	2.2		573	
RM 141	15-2-W-D	63.0		3.0	U	3.0	U	16.0	2.0	U/E	0.10	U	1.0	U	1.0	U	5.0	U
RM 141	15-2-W-T	433		3.1		3.0	U	26.0	2.0	U/E	0.06	U/B	1.0	U	3.0		936	
RM 141	15-3-W-D	49.0		3.0	U	3.0	U	16.0	2.0	U/E	0.10	U	1.0	U	1.0	U	9.0	E
RM 141	15-3-W-T	445		3.0		3.0	U	21.0	2.0	U/E	0.04	U/B	1.0	U	2.6		468	
Freshwater Chronic[1]	U.S. EPA	87		30 proposed		190		na*	5.3 LOEL		0.7		11		6.5		1000	
	Washington					190					0.6		11		5.6			
	Oregon			1600 LOEL		48 LOEL			5.3 LOEL		0.7		11		6.5		1000	
Marine Chronic[2]	U.S. EPA	na*		500 proposed		36		na*	na*		9.3		50		2.9		na*	
	Washington					36/21					8.0		50		2.9			
	Oregon					13 LOEL					9.3		50		2.9			
Consumption of Fish-Shellfish, and Water	U.S. EPA	na*		14		0.018		1000							na*		300	
	Washington			14		0.018												
	Oregon			146		0.0022		1000	0.0068		10		50				300	

W-T = Whole Water Sample W-D = Filtered Water Sample LOEL = Lowest Observed Effects Level * Criteria not available.

U = Compound was not detected. The value given is the lower quantification limit.

E = Estimated value.

U/B = Compound was not detected due to blank contamination.

[1] Applies to all stations except for Station 1 (River Mile 14).

[2] Applies only to Station 1 (River Mile 14).

[3] Criteria are for hexavalent chromium (chromium VI).

Note: A.) Shaded areas indicate those detected concentrations which exceeded the lowest appropriate freshwater or marine chronic criterion. Consumption of Fish-Shellfish, and Water criteria are provided for comparison as well.

B.) For freshwater metals (cadmium, chromium, copper, lead, nickel, and zinc) the criteria are based on hardness.

C.) The Washington freshwater and marine criteria for cadmium, copper, lead, nickel, and zinc are based on the dissolved metals concentration and apply to the filtered samples only.

TABLE B-5. METAL (TOTAL RECOVERABLE AND FILTERED) CONCENTRATIONS IN WATER
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 5 of 8)

River Mile	Sample Number	Lead Conc. (µg/L)		Mercury Conc. (µg/L)		Nickel Conc. (µg/L)		Selenium Conc. (µg/L)		Silver Conc. (µg/L)		Thallium Conc. (µg/L)		Zinc Conc. (µg/L)	
RM 14	1-1-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 14	1-1-W-T	1.9		0.11	U	5.0	U	3.0	U	1.0	U	1.1		14.0	
RM 14	1-2-W-D	1.4	U/B	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 14	1-2-W-T	0.80	U	0.11	U	7.0		3.0	U	1.0	U	1.0	U	20.0	
RM 14	1-3-W-D	0.80	U	0.11	U	5.0	U	3.2		1.0	U	1.0		3.0	U
RM 14	1-3-W-T	0.80	U	0.11	U	6.0		3.0	U	1.0	U	1.0	U	9.0	
RM 21	2-1-W-D	0.80	U	0.11	U	7.0	E	3.0	U	1.0	U	1.1		3.0	U
RM 21	2-1-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.1		15.0	U/B
RM 21	2-2-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U	1.1		3.0	U
RM 21	2-2-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	16.0	E
RM 21	2-3-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U	1.0	U	3.0	U
RM 21	2-3-W-T	0.80	U	0.11	U	5.0	U	3.0	U	11.7		1.1		8.0	E
RM 23	3-1-W-D	0.80	U	0.10	U/E	5.0	U/E	3.0	U	1.0	U	1.1	U/B	3.0	U
RM 23	3-1-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 23	3-2-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U	1.1		3.0	U
RM 23	3-2-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0		3.0	U
RM 23	3-3-W-D	0.80	U	0.11	U	7.0	E	3.0	U	1.0	U	1.3		6.0	
RM 23	3-3-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	6.0	U/B
RM 26	4-1-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 26	4-1-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U/E	1.0	U	3.0	U
RM 26	4-2-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.1	U/B	3.0	U
RM 26	4-2-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U/E	1.0	U/B	4.0	U/B
RM 26	4-3-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 26	4-3-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U/E	1.0	U/B	3.0	U
Freshwater Chronic[1]	U.S. EPA	1.3		0.012		88		5		0.12		40 LOEL		57	
	Washington	0.9		0.012		83		5						52	
	Oregon	1.3		0.012		88		35		0.12		40 LOEL		57	
Marine Chronic[2]	U.S. EPA	8.5		0.025		8.3		71		0.92 proposed		na*		86	
	Washington	5.8		0.025		7.9		71						76.6	
	Oregon	5.6		0.025		8.3		54						86	
Consumption of Fish-Shellfish, and Water	U.S. EPA			0.14		610						1.7		na*	
	Washington			0.14		13.4						1.7			
	Oregon	50		0.144		610		10		50		13			

W-T = Whole Water Sample W-D = Filtered Water Sample LOEL = Lowest Observed Effects Level * Criteria not available.

U = Compound was not detected. The value given is the lower quantification limit.

E = Estimated value.

U/B = Compound was not detected due to blank contamination.

[1] Applies to all stations except for Station 1 (River Mile 14).

[2] Applies only to Station 1 (River Mile 14).

[3] Criteria are for hexavalent chromium (chromium VI).

Note: A.) Shaded areas indicate those detected concentrations which exceeded the lowest appropriate freshwater or marine chronic criterion. Consumption of Fish-Shellfish, and Water criteria are provided for comparison as well.

B.) For freshwater metals (cadmium, chromium, copper, lead, nickel, and zinc) the criteria are based on hardness.

C.) The Washington freshwater and marine criteria for cadmium, copper, lead, nickel, and zinc are based on the dissolved metals concentration and apply to the filtered samples only.

TABLE B-5. METAL (TOTAL RECOVERABLE AND FILTERED) CONCENTRATIONS IN WATER
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 6 of 8)

River Mile	Sample Number	Lead Conc. (µg/L)		Mercury Conc. (µg/L)		Nickel Conc. (µg/L)		Selenium Conc. (µg/L)		Silver Conc. (µg/L)		Thallium Conc. (µg/L)		Zinc Conc. (µg/L)	
RM 29	5-1-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U/B	3.0	U
RM 29	5-1-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 29	5-2-W-D	0.80	U	0.10	U/E	5.0		3.0	U	1.0	U	1.0	E	10.0	
RM 29	5-2-W-T	0.80	U	0.11	E	5.0	U	3.0	U	1.0	U/E	1.0	U	15.0	
RM 29	5-3-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	E	3.0	U
RM 29	5-3-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U/E	1.0	U/B	3.0	U
RM 36	6-1-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U/E	1.0	U	5.0	
RM 36	6-1-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 36	6-2-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U/E	1.0	U	3.0	U
RM 36	6-2-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U/B	3.0	U
RM 36	6-3-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U/E	1.0	U	3.0	U
RM 36	6-3-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 59	7-1-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U	1.0	U	3.0	U
RM 59	7-1-W-T	0.80	U	0.11	U	5.0	U/B	3.0	U	1.0	U	1.0	U	5.0	U/B
RM 59	7-2-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U/E	1.1		3.0	U
RM 59	7-2-W-T	0.80	U	0.11	U	9.0	U/B	3.0	U	1.0	U	1.0	U/B	3.0	U
RM 59	7-3-W-D	0.80	U	0.10	U/E	5.0	U/E	3.0	U	1.0	U/E	1.0	U/B	3.0	U
RM 59	7-3-W-T	0.80	U	0.11	U	8.0	U/B	3.0	U	1.0	U	1.0	U	3.0	U
RM 68	8-1-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U/E	1.0	U	3.0	U
RM 68	8-1-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 68	8-2-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U/E	1.2		3.0	
RM 68	8-2-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 68	8-3-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U/E	1.0	U	3.0	U
RM 68	8-3-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	12.0	U/B
Freshwater Chronic[1]	U.S. EPA	1.3		0.012		88		5		0.12		40 LOEL		57	
	Washington	0.9		0.012		83		5						52	
	Oregon	1.3		0.012		88		35		0.12		40 LOEL		57	
Marine Chronic[2]	U.S. EPA	8.5		0.025		8.3		71		0.92 proposed		na*		86	
	Washington	5.8		0.025		7.9		71						76.6	
	Oregon	5.6		0.025		8.3		54						86	
Consumption of Fish-Shellfish, and Water	U.S. EPA			0.14		610						1.7		na*	
	Washington			0.14		13.4						1.7			
	Oregon	50		0.144		610		10		50		13			

W-T = Whole Water Sample W-D = Filtered Water Sample LOEL = Lowest Observed Effects Level * Criteria not available.

U = Compound was not detected. The value given is the lower quantification limit.

E = Estimated value.

U/B = Compound was not detected due to blank contamination.

[1] Applies to all stations except for Station 1 (River Mile 14).

[2] Applies only to Station 1 (River Mile 14).

[3] Criteria are for hexavalent chromium (chromium VI).

Note: A.) Shaded areas indicate those detected concentrations which exceeded the lowest appropriate freshwater or marine chronic criterion. Consumption of Fish-Shellfish, and Water criteria are provided for comparison as well.

B.) For freshwater metals (cadmium, chromium, copper, lead, nickel, and zinc) the criteria are based on hardness.

C.) The Washington freshwater and marine criteria for cadmium, copper, lead, nickel, and zinc are based on the dissolved metals concentration and apply to the filtered samples only.

TABLE B-5. METAL (TOTAL RECOVERABLE AND FILTERED) CONCENTRATIONS IN WATER
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 7 of 8)

River Mile	Sample Number	Lead Conc. (µg/L)		Mercury Conc. (µg/L)		Nickel Conc. (µg/L)		Selenium Conc. (µg/L)		Silver Conc. (µg/L)		Thallium Conc. (µg/L)		Zinc Conc. (µg/L)	
RM 81	9-1-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	6.0	
RM 81	9-1-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	9.0	
RM 81	9-2-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 81	9-2-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	6.0	
RM 81	9-3-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 81	9-3-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	10.0	
RM 88	10-1-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 88	10-1-W-T	1.7		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	5.0	
RM 88	10-2-W-D	0.84		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 88	10-2-W-T	1.6		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	18.0	
RM 88	10-3-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 88	10-3-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	27.0	
RM 90	11-1-W-D	0.94		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 90	11-1-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.1		5.0	
RM 90	11-2-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 90	11-2-W-T	1.1	U/B	0.11	U	5.0		3.0	U	1.0	U	1.1		3.0	
RM 90	11-3-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 90	11-3-W-T	1.0	U/B	0.11	U	6.0		3.0	U	1.0	U	1.0	U	4.0	
RM 95	12-1-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U	1.0	U	3.0	U
RM 95	12-1-W-T	1.1	U/B	0.11	U	5.0	U	3.0	U	1.0	U	1.0		10.0	E
RM 95	12-2-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U	1.0	U	3.0	U/E
RM 95	12-2-W-T	1.9	E	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	10.0	E
RM 95	12-3-W-D	0.8	U	0.11	U	5.0	U/E	3.6		1.0	U	1.0	U	3.0	U/E
RM 95	12-3-W-T	2.0	E	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	22.0	E
Freshwater Chronic[1]	U.S. EPA	1.3		0.012		88		5		0.12		40 LOEL		57	
	Washington	0.9		0.012		83		5						52	
	Oregon	1.3		0.012		88		35		0.12		40 LOEL		57	
Marine Chronic[2]	U.S. EPA	8.5		0.025		8.3		71		0.92 proposed		na*		86	
	Washington	5.8		0.025		7.9		71						76.6	
	Oregon	5.6		0.025		8.3		54						86	
Consumption of Fish-Shellfish, and Water	U.S. EPA			0.14		610						1.7		na*	
	Washington			0.14		13.4						1.7			
	Oregon	50		0.144		610		10		50		13			

W-T = Whole Water Sample W-D = Filtered Water Sample LOEL = Lowest Observed Effects Level * Criteria not available.

U = Compound was not detected. The value given is the lower quantification limit.

E = Estimated value.

U/B = Compound was not detected due to blank contamination.

[1] Applies to all stations except for Station 1 (River Mile 14).

[2] Applies only to Station 1 (River Mile 14).

[3] Criteria are for hexavalent chromium (chromium VI).

Note: A.) Shaded areas indicate those detected concentrations which exceeded the lowest appropriate freshwater or marine chronic criterion. Consumption of Fish-Shellfish, and Water criteria are provided for comparison as well.

B.) For freshwater metals (cadmium, chromium, copper, lead, nickel, and zinc) the criteria are based on hardness.

C.) The Washington freshwater and marine criteria for cadmium, copper, lead, nickel, and zinc are based on the dissolved metals concentration and apply to the filtered samples only.

TABLE B-5. METAL (TOTAL RECOVERABLE AND FILTERED) CONCENTRATIONS IN WATER
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 8 of 8)

River Mile	Sample Number	Lead Conc. (µg/L)		Mercury Conc. (µg/L)		Nickel Conc. (µg/L)		Selenium Conc. (µg/L)		Silver Conc. (µg/L)		Thallium Conc. (µg/L)		Zinc Conc. (µg/L)	
RM 120	13-1-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U	1.0	U	3.0	U/E
RM 120	13-1-W-T	1.2	E	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	9.0	E
RM 120	13-2-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U	1.0	U	3.0	U/E
RM 120	13-2-W-T	1.0	E	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	4.0	E
RM 120	13-3-W-D	0.80	U	0.11	U	5.0	U/E	3.0	U	1.0	U	1.0	U	3.0	U/E
RM 120	13-3-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	13.0	E
RM 124	14-1-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U/E
RM 124	14-1-W-T	1.2		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	13.0	E
RM 124	14-2-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	4.0	E
RM 124	14-2-W-T	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	9.0	E
RM 124	14-3-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 124	14-3-W-T	1.1		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	13.0	E
RM 141	15-1-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 141	15-1-W-T	2.0		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	6.0	E
RM 141	15-2-W-D	0.85		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 141	15-2-W-T	2.4		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	13.0	E
RM 141	15-3-W-D	0.80	U	0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	3.0	U
RM 141	15-3-W-T	1.5		0.11	U	5.0	U	3.0	U	1.0	U	1.0	U	5.0	E
Freshwater Chronic[1]	U.S. EPA	1.3		0.012		88		5		0.12		40 LOEL		57	
	Washington	0.9		0.012		83		5						52	
	Oregon	1.3		0.012		88		35		0.12		40 LOEL		57	
Marine Chronic[2]	U.S. EPA	8.5		0.025		8.3		71		0.92 proposed		na*		86	
	Washington	5.8		0.025		7.9		71						76.6	
	Oregon	5.6		0.025		8.3		54						86	
Consumption of Fish-Shellfish, and Water	U.S. EPA			0.14		610						1.7		na*	
	Washington			0.14		13.4						1.7			
	Oregon	50		0.144		610		10		50		13			

W-T = Whole Water Sample W-D = Filtered Water Sample LOEL = Lowest Observed Effects Level * Criteria not available.

U = Compound was not detected. The value given is the lower quantification limit. [1] Applies to all stations except for Station 1 (River Mile 14).

E = Estimated value. [2] Applies only to Station 1 (River Mile 14).

U/B = Compound was not detected due to blank contamination. [3] Criteria are for hexavalent chromium (chromium VI).

Note: A.) Shaded areas indicate those detected concentrations which exceeded the lowest appropriate freshwater or marine chronic criterion. Consumption of Fish-Shellfish, and Water criteria are provided for comparison as well.

B.) For freshwater metals (cadmium, chromium, copper, lead, nickel, and zinc) the criteria are based on hardness.

C.) The Washington freshwater and marine criteria for cadmium, copper, lead, nickel, and zinc are based on the dissolved metals concentration and apply to the filtered samples only.

APPENDIX C.

SEDIMENT CHEMISTRY DATA

TABLE C-1. SEDIMENT CONVENTIONALS
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		CONVENTIONALS					
		Total Solids	TVS	TOC	Ammonia	Sulfides	TKN
River Mile	Sample Number	120° C percent	550° C percent	dry. wt. percent	dry. wt. mg/kg	dry. wt mg/kg	dry. wt mg/kg
RM 14	1-S	41.8	5.26	2.1	11.2	133.9	1,600
RM 21	2-S	48.0	5.88	1.9	24.7	21.7	1,400
RM 23	3-S	48.0	5.21	1.3	17.4	22.6	1,400
RM 26	4-S	43.6	4.71	1.5	25.4	18.4	1,500
RM 29	5-S	44.7	4.76	1.5	24.0	18.4	1,300
RM 36	6-S	43.6	7.06	3.6	9.6	64.0	1,300
RM 59	7-S	55.6	2.88	1.1	4.3	1.8 U	700
RM 68	8-S	42.8	3.37	2.1	22.5	3.4	1,600
RM 81	9-1-S	47.7	8.42	3.3	47.8	16.0	1,200
RM 81	9-2-S	45.4	8.86	3.0	46.3	19.8	1,200
RM 81	9-3-S	46.5	6.98	3.8	52.0	21.0	1,200
RM 88	10-S	36.2	8.45	2.6	19.0	15.8	2,000
RM 90	11-S	57.6	3.42	0.65	24.7	5.8	650
RM 95	12-S	39.1	6.56	1.8	41.6	19.3	1,700
RM 120	13-S	48.3	4.60	1.5	63.8	11.4	1,400
RM 124	14-S	43.1	6.17	3.7	54.1	20.8	1,800
RM 141	15-S	55.1	4.42	0.94	33.0	6.2	950

S = Sediment sample.
RM = River mile.
U = Compound was not detected. Value given is the lower quantification limit.
TVS = Total Volatile Solids
TOC = Total Organic Carbon
TKN = Total Kjeldahl Nitrogen

TABLE C-2. SEDIMENT GRAIN SIZE
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Station	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Fines* (%)
RM 14	1-S	0.2	4.4	84.5	10.6	95.1
RM 21	2-S	0.2	68.5	26.4	4.9	31.3
RM 23	3-S	0.1	26.8	68.1	4.9	73.0
RM 26	4-S	0.4	48.2	43.1	8.1	51.2
RM 29	5-S	0.9	41.8	51.5	5.8	57.3
RM 36	6-S	0.4	70.4	26.2	2.9	29.1
RM 59	7-S	0.2	60.1	37.4	2.4	39.8
RM 68	8-S	0.5	30.1	67.7	1.6	69.3
RM 81	9-1-S	0.6	56.1	40.2	2.9	43.1
RM 81	9-2-S	1.5	55.8	39.8	2.9	42.7
RM 81	9-3-S	0.8	52.1	45.0	1.2	46.2
RM 88	10-S	0.0	61.6	33.1	5.4	38.5
RM 90	11-S	0.4	62.2	35.1	2.2	37.3
RM 95	12-S	0.0	16.1	80.1	3.8	83.9
RM 120	13-S	0.8	47.1	47.1	4.8	51.9
RM 124	14-S	0.1	25.0	71.7	3.2	74.9
RM 141	15-S	0.4	33.7	62.4	3.4	65.8

* Fines = Silt + Clay (particle size < 63 μm)

TABLE C-3. PERCENT SURVIVAL OF *HYALELLA AZTECA* IN SEDIMENT LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	AMPHIPOD TOXICITY						
		Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5	Mean	S.D.
	Control	100.0	100.0	100.0	100.0	100.0	100.0	0.0
RM 14	1-S	70.0	75.0	85.0	95.0	100.0	85.0	12.7
RM 21	2-S	100.0	70.0	80.0	90.0	85.0	85.0	11.2
RM 23	3-S	100.0	100.0	100.0	100.0	100.0	100.0	0.0
RM 26	4-S	90.0	100.0	100.0	100.0	100.0	98.0	4.5
RM 29	5-S	100.0	100.0	100.0	100.0	100.0	100.0	0.0
RM 36	6-S	95.0	100.0	90.0	100.0	95.0	96.0	4.2
RM 59	7-S	70.0	90.0	80.0	100.0	75.0	83.0	12.0
RM 68	8-S	100.0	100.0	95.0	100.0	45.0	88.0	24.1
RM 81	9-1-S	100.0	100.0	100.0	100.0	100.0	100.0	0.0
RM 88	10-S	95.0	100.0	100.0	100.0	100.0	99.0	2.2
RM 90	11-S	100.0	90.0	85.0	95.0	100.0	94.0	6.5
RM 95	12-S	90.0	100.0	95.0	95.0	95.0	95.0	3.5
RM 120	13-S	100.0	95.0	20.0	100.0	85.0	80.0	34.1
RM 124	14-S	80.0	95.0	80.0	75.0	75.0	81.0	8.2
RM 141	15-S	95.0	90.0	90.0	85.0	95.0	91.0	4.2

S = Sediment sample.
RM = River mile.

TABLE C-4. SEDIMENT MICROTOX TOXICITY TESTS
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	MICROTOX EC50 (ppm sediment)
RM 14	1-S	3,587
RM 21	2-S	79,074
RM 23	3-S	40,815
RM 26	4-S	24,513
RM 29	5-S	23,690
RM 36	6-S	113,084
RM 59	7-S	94,650
RM 68	8-S	152,657
RM 81	9-1-S	45,026
RM 81	9-2-S	37,933
RM 81	9-3-S	41,076
RM 88	10-S	35,373
RM 88	10-S (duplicate)	60,764
RM 90	11-S	106,163
RM 95	12-S	56,746
RM 120	13-S	24,013
RM 124	14-S	26,730
RM 141	15-S	50,754
RM 141	15-S (duplicate)	31,744

S = Sediment sample
RM = River mile

TABLE C-5. METALS AND CYANIDE IN SEDIMENT (page 1 of 3)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	METALS													
		Aluminum		Antimony		Arsenic		Barium		Beryllium			Cadmium		
		Conc. (mg/kg)	TOC Norm.* Conc. (mg/g C)	Conc. (mg/kg)	TOC Norm.* Conc. (mg/g C)	Conc. (mg/kg)	TOC Norm.* Conc. (mg/g C)	Conc. (mg/kg)	TOC Norm.* Conc. (mg/g C)	Conc. (mg/kg)	TOC Norm.* Conc. (mg/g C)		Conc. (mg/kg)	TOC Norm.* Conc. (mg/g C)	
RM 14	1-S	21100	1005	0.35 U		4.6	0.2	59.9	2.9	0.82	0.04		0.98	0.05	
RM 21	2-S	17800	937	0.30 U		9.7	0.5	165	8.7	0.91	0.05		0.78	0.04	
RM 23	3-S	16200	1246	0.26 U		4.7	0.4	122	9.4	0.70	0.05		0.82	0.06	
RM 26	4-S	17700	1180	0.29 U		3.9	0.3	140	9.3	0.49	0.03		1.0	0.07	
RM 29	5-S	20300	1353	0.32 U		4.3	0.3	142	9.5	0.84	0.06	E	1.1	0.07	E
RM 36	6-S	33300	925	0.30 U		4.5	0.1	150	4.2	1.2	0.03		0.49	0.01	
RM 59	7-S	14200	1291	0.25 U		3.8	0.3	106	9.6	0.42	0.04		0.61	0.06	
RM 68	8-S	19900	948	0.33 U		4.3	0.2	149	7.1	0.66	0.03		1.3	0.06	
RM 81	9-1-S	16900	512	0.32 U		4.0	0.1	129	3.9	0.64	0.02		1.1	0.03	
RM 81	9-2-S	18500	617	0.28 U		4.6	0.2	152	5.1	0.85	0.03		1.1	0.04	
RM 81	9-3-S	18700	492	0.31 U		4.8	0.1	152	4.0	0.73	0.02		0.73	0.02	
RM 88	10-S	26900	1035	0.41 U		13.6	0.5	186	7.2	1.1	0.04		0.63	0.02	
RM 90	11-S	15700	2415	0.23 U		3.6	0.6	154	23.7	0.76	0.12		1.1	0.17	
RM 95	12-S	21300	1183	0.36 U		8.6	0.5	163	9.1	0.96	0.05		1.9	0.11	
RM 120	13-S	19400	1293	0.29 U		6.2	0.4	164	10.9	0.87	0.06		1.3	0.09	
RM 124	14-S	16200	438	0.31 U		4.4	0.1	E 138	3.7	0.62	0.02		1.9	0.05	
RM 141	15-S	16300	1734	0.25 U		3.7	0.4	136	14.5	0.68	0.07		1.0	0.11	
Benthos Reference Values - ER-L[1]		na**		2.0		33		na**		na**			5		
Benthos Reference Values - Ontario[2]		na**		na**		6		na**		na**			0.6		

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
U/B = Undetected due to blank contamination.
* = TOC-normalized value only given when a compound is detected.
** = Value not available.
[1] Effects Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[2] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms.

TABLE C-5. METALS AND CYANIDE IN SEDIMENT (page 2 of 3)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	Chromium Conc. (mg/kg)	Chromium TOC Norm.* Conc. (mg/g C)	Copper Conc. (mg/kg)	Copper TOC Norm.* Conc. (mg/g C)	Iron Conc. (mg/kg)	Iron TOC Norm.* Conc. (mg/g C)	Lead Conc. (mg/kg)	Lead TOC Norm.* Conc. (mg/g C)	Mercury Conc. (mg/kg)	Mercury TOC Norm.* Conc. (mg/g C)	Nickel Conc. (mg/kg)	Nickel TOC Norm.* Conc. (mg/g C)
RM 14	1-S	23.1	1.1	31.7	1.5	21500	1024	16.1	0.8	0.08	0.004 E	15.3	0.7
RM 21	2-S	21.5	1.1	20.4	1.1	21800	1147	12.7	U/B	0.09	0.005 E	16.5	0.9
RM 23	3-S	18.6	1.4	20.7	1.6	17500	1346	12.0	0.9	0.08	0.006 E	14.5	1.1
RM 26	4-S	20.0	1.3	25.3	1.7	19000	1267	14.6	1.0	0.06	0.004 E	14.7	1.0
RM 29	5-S	22.1	1.5	32.2	2.1	21100	1407	15.6	1.0	0.06	0.004 E	14.6	1.0
RM 36	6-S	31.1	0.9	49.9	1.4	39000	1083	9.5	U/B	0.08	0.002 E	24.9	0.7
RM 59	7-S	14.8	1.3	23.4	2.1	15500	1409	11.8	1.1	0.18	0.016 E	14.0	1.3
RM 68	8-S	21.8	1.0	34.0	1.6	20600	981	16.4	0.8	0.10	0.005 E	17.4	0.8
RM 81	9-1-S	20.1	0.6	25.5	0.8	19000	576	14.3	U/B	0.08	0.002 E	15.4	0.5
RM 81	9-2-S	20.0	0.7	29.2	1.0	21100	703	15.3	0.5	0.09	0.003 E	16.9	0.6
RM 81	9-3-S	19.9	0.5	28.2	0.7	21000	553	15.0	0.4	0.08	0.002 E	15.8	0.4
RM 88	10-S	26.1	1.0	28.0	1.1	27700	1065	18.1	U/B	0.14	0.005 E	18.2	0.7
RM 90	11-S	19.3	3.0	19.3	3.0	18300	2815	12.7	2.0	0.13	0.020 E	15.0	2.3
RM 95	12-S	25.8	1.4	32.5	1.8	26900	1494	26.3	1.5	0.14	0.008 E	19.4	1.1
RM 120	13-S	20.8	1.4	31.0	2.1	21100	1407	23.6	1.6	0.08	0.005 E	18.3	1.2
RM 124	14-S	18.6	0.5	24.8	0.7	18400	497	17.6	0.5	0.08	0.002 E	14.7	0.4
RM 141	15-S	18.9	2.0	21.1	2.2	18900	2011	17.4	1.9	0.07	0.007 E	14.6	1.6
Benthos Reference Values - ER-L[1]		80		70		na**		35		0.15		30	
Benthos Reference Values - Ontario[2]		26		16		20000 (2%)		31		0.2		16	

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
U/B = Undetected due to blank contamination.
* = TOC-normalized value only given when a compound is detected.
** = Value not available.
[1] Effects Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[2] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms.

TABLE C-5. METALS AND CYANIDE IN SEDIMENT (page 3 of 3)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	Selenium Conc. (mg/kg)	Selenium TOC Norm.* Conc. (mg/g C)		Silver Conc. (mg/kg)	Silver TOC Norm.* Conc. (mg/g C)		Thallium Conc. (mg/kg)	Thallium TOC Norm.* Conc. (mg/g C)		Zinc Conc. (mg/kg)	Zinc TOC Norm.* Conc. (mg/g C)	CYANIDE Conc. (mg/kg)	CYANIDE TOC Norm.* Conc. (mg/g C)	
RM 14	1-S	1.4		U/E	0.12		U	0.47		U/E	93.2	4.4	0.1		U
RM 21	2-S	1.2		U/E	0.10		U	0.40		U/E	79.8	4.2	0.1		U
RM 23	3-S	1.1		U/E	0.09		U	0.35		U/E	77.3	5.9	0.1		U
RM 26	4-S	1.2		U/E	0.11		U/B	0.39		U/E	95.9	6.4	0.1		U
RM 29	5-S	1.3		U/E	0.11		U/B	0.42		U/E	101	6.7	0.1		U
RM 36	6-S	1.2		U/E	3.10	0.09		0.40		U/E	91.8	2.6	0.172	0.005	
RM 59	7-S	1.0		U/E	0.20		U/B	0.33		U/E	68.3	6.2	0.1		U
RM 68	8-S	1.3		U/E	0.49		U/B	0.44		U/E	136	6.5	0.1		U
RM 81	9-1-S	1.3		U/E	0.11		U	0.42		U/E	89.4	2.7	0.1		U
RM 81	9-2-S	1.1		U/E	0.09		U	0.38		U/E	106	3.5	0.1		U
RM 81	9-3-S	1.2		U/E	0.10		U	0.42		U/E	98.1	2.6	0.1		U
RM 88	10-S	1.6		U/E	0.14		U	0.55		U/E	94.4	3.6	0.1		U
RM 90	11-S	0.9		U/E	0.08		U	0.30		U/E	97.3	15.0	0.1		U
RM 95	12-S	1.4		U/E	0.12		U	0.48		U/E	148	8.2	0.1		U
RM 120	13-S	1.2		U/E	0.10		U	0.39		U/E	126	8.5	0.1		U
RM 124	14-S	1.2		U/E	0.10		U	0.42		U/E	155	4.2	0.1		U
RM 141	15-S	1.0		U/E	0.11		U	0.34		U/E	117	12.4	0.1		U
Benthos Reference Values - ER-L[1]		na**			1			na**			120		na**		
Benthos Reference Values - Ontario[2]		na**			0.5			na**			120		0.1		

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
U/B = Undetected due to blank contamination.
* = TOC-normalized value only given when a compound is detected.
** = Value not available.
[1] Effects Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[2] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 1 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHENOLS											
		Phenol		2-Methylphenol		4-Methylphenol		2,4-Dimethylphenol		Pentachlorophenol		2-Chlorophenol	
		Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	37 U		18 U		18 U		37 U		92 U		18 U	
RM 21	2-S	30 U		15 U		15 U		30 U		75 U		15 U	
RM 23	3-S	31 U		16 U		16 U		31 U		78 U		16 U	
RM 26	4-S	30 U		15 U		15 U		30 U		74 U		15 U	
RM 29	5-S	32 U		16 U		16 U		32 U		81 U		16 U	
RM 36	6-S	33 U		16 U		16 U		33 U		81 U		16 U	
RM 59	7-S	26 U		13 U		13 U		26 U		64 U		13 U	
RM 68	8-S	33 U		17 U		17 U		33 U		83 U		17 U	
RM 81	9-1-S	31 U		15 U		15 U		31 U		77 U		15 U	
RM 81	9-2-S	30 U		15 U		15 U		30 U		75 U		15 U	
RM 81	9-3-S	30 U		15 U		15 U		30 U		74 U		15 U	
RM 88	10-S	40 U		20 U		20 U		40 U		100 U		20 U	
RM 90	11-S	25 U		13 U		13 U		25 U		63 U		13 U	
RM 95	12-S	36 U		18 U		18 U		36 U		89 U		18 U	
RM 120	13-S	33 U		16 U		150	10	33 U		82 U		16 U	
RM 124	14-S	33 U		17 U		17 U		33 U		83 U		17 U	
RM 141	15-S	26 U		13 U		13 U		26 U		70 U		13 U	
Benthos Reference Values	ER-L[a]	na**		na**		na**		na**		na**		na**	
	Ontario[o]	na**		na**		na**		na**		na**		na**	
	NY State[1]		0.5		0.5		0.5		0.5		40		0.6
	U.S. EPA[2]	na**		na**		na**		na**		na**		na**	
Wildlife Reference Values[3]		na**		na**		na**		na**		na**		na**	
Human Health Reference Values[¤]		na**		na**		na**		na**		na**		na**	

S = Sediment sample

RM = River mile

U = Compound was not detected. The value given is the lower quantification limit.

J = Value detected below nominal detection limit.

U/B = Compound was not detected due to blank contamination.

* = TOC-normalized data presented only when a compound is detected.

** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[¤] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 2 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHENOLS (cont.) 2,4-Dichlorophenol Conc. (µg/kg)		Norm.* Conc. (µg/g C)		4-Chloro-3-methylphenol Conc. (µg/kg)		Norm.* Conc. (µg/g C)		2,4-Dinitrophenol Conc. (µg/kg)		Norm.* Conc. (µg/g C)		2-Nitrophenol Conc. (µg/kg)		Norm.* Conc. (µg/g C)		4-Nitrophenol Conc. (µg/kg)		Norm.* Conc. (µg/g C)		2,4,5-Trichlorophenol Conc. (µg/kg)		Norm.* Conc. (µg/g C)	
RM 14	1-S	37	U			37	U			180	U			92	U			92	U			92	U		
RM 21	2-S	30	U			30	U			150	U			75	U			75	U			75	U		
RM 23	3-S	31	U			31	U			160	U			78	U			78	U			78	U		
RM 26	4-S	30	U			30	U			150	U			74	U			74	U			74	U		
RM 29	5-S	32	U			32	U			160	U			81	U			81	U			81	U		
RM 36	6-S	33	U			33	U			160	U			81	U			81	U			81	U		
RM 59	7-S	26	U			26	U			120	U			64	U			64	U			64	U		
RM 68	8-S	33	U			33	U			170	U			83	U			83	U			83	U		
RM 81	9-1-S	31	U			31	U			150	U			77	U			77	U			77	U		
RM 81	9-2-S	30	U			30	U			150	U			75	U			75	U			75	U		
RM 81	9-3-S	30	U			30	U			150	U			74	U			74	U			74	U		
RM 88	10-S	40	U			40	U			200	U			100	U			100	U			100	U		
RM 90	11-S	25	U			25	U			130	U			63	U			63	U			63	U		
RM 95	12-S	36	U			36	U			180	U			89	U			89	U			89	U		
RM 120	13-S	33	U			33	U			160	U			82	U			82	U			82	U		
RM 124	14-S	33	U			33	U			170	U			83	U			83	U			83	U		
RM 141	15-S	26	U			26	U			130	U			70	U			70	U			70	U		
Benthos Reference Values	ER-L[a]	na**				na**				na**				na**				na**				na**			
	Ontario[o]	na**				na**				na**				na**				na**				na**			
	NY State[1]			0.6				0.6				0.5				0.5				0.5				0.6	
	U.S. EPA[2]	na**				na**				na**				na**				na**				na**			
Wildlife Reference Values[3]		na**				na**				na**				na**				na**				na**			
Human Health Reference Values[□]		na**				na**				na**				na**				na**				na**			

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
J = Value detected below nominal detection limit.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized data presented only when a compound is detected.
** = Reference level not available.
[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.
[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.
[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 3 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHENOLS (cont.) 2,4,6-Trichlorophenol Conc. (µg/kg)	Norm.* Conc. (µg/g C)	4,6-Dinitro-2-methylphenol Conc. (µg/kg)	Norm.* Conc. (µg/g C)	HALOGENATED ETHERS bis(2-Chloroethyl)ether Conc. (µg/kg)	Norm.* Conc. (µg/g C)	bis(2-Chloroethoxy)methane Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	92 U		180 U		18 U		18 U	
RM 21	2-S	75 U		150 U		15 U		15 U	
RM 23	3-S	78 U		160 U		16 U		16 U	
RM 26	4-S	74 U		150 U		15 U		15 U	
RM 29	5-S	81 U		160 U		16 U		16 U	
RM 36	6-S	81 U		160 U		16 U		16 U	
RM 59	7-S	64 U		120 U		13 U		13 U	
RM 68	8-S	83 U		170 U		17 U		17 U	
RM 81	9-1-S	77 U		150 U		15 U		15 U	
RM 81	9-2-S	75 U		150 U		15 U		15 U	
RM 81	9-3-S	74 U		150 U		15 U		15 U	
RM 88	10-S	100 U		200 U		20 U		20 U	
RM 90	11-S	63 U		130 U		13 U		13 U	
RM 95	12-S	89 U		180 U		18 U		18 U	
RM 120	13-S	82 U		160 U		16 U		16 U	
RM 124	14-S	83 U		170 U		17 U		17 U	
RM 141	15-S	70 U		130 U		13 U		13 U	
Benthos Reference Values	ER-L[a]	na**		na**		na**		na**	
	Ontario[o]	na**		na**		na**		na**	
	NY State[1]		0.6		0.5	na**		na**	
	U.S. EPA[2]	na**		na**		na**		na**	
Wildlife Reference Values[3]		na**		na**		na**		na**	
Human Health Reference Values[¤]		na**		na**		na**		na**	

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
J = Value detected below nominal detection limit.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized data presented only when a compound is detected.
** = Reference level not available.
[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.
[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.
[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[¤] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 4 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	HALOGENATED ETHERS (cont.) 4-Bromophenylphenylether Conc. (µg/kg)	Norm.* Conc. (µg/g C)	4-Chlorophenylphenylether Conc. (µg/kg)	Norm.* Conc. (µg/g C)	2,2'-Oxybis(1-chloropropane) Conc. (µg/kg)	Norm.* Conc. (µg/g C)	NITROAROMATICS 2,4-Dinitrotoluene Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	18	U	18	U	18	U	92	U
RM 21	2-S	15	U	15	U	15	U	75	U
RM 23	3-S	16	U	16	U	16	U	78	U
RM 26	4-S	15	U	15	U	15	U	74	U
RM 29	5-S	16	U	16	U	16	U	81	U
RM 36	6-S	16	U	16	U	16	U	81	U
RM 59	7-S	13	U	13	U	13	U	64	U
RM 68	8-S	17	U	17	U	17	U	83	U
RM 81	9-1-S	15	U	15	U	15	U	77	U
RM 81	9-2-S	15	U	15	U	15	U	75	U
RM 81	9-3-S	15	U	15	U	15	U	74	U
RM 88	10-S	20	U	20	U	20	U	100	U
RM 90	11-S	13	U	13	U	13	U	63	U
RM 95	12-S	18	U	18	U	18	U	89	U
RM 120	13-S	16	U	16	U	16	U	82	U
RM 124	14-S	17	U	17	U	17	U	83	U
RM 141	15-S	13	U	13	U	13	U	70	U
Benthos Reference Values	ER-L[a]	na**		na**		na**		na**	
	Ontario[o]	na**		na**		na**		na**	
	NY State[1]	na**		na**		na**		na**	
	U.S. EPA[2]	na**		na**		na**		na**	
Wildlife Reference Values[3]		na**		na**		na**		na**	
Human Health Reference Values[□]		na**		na**		na**		na**	

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
J = Value detected below nominal detection limit.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized data presented only when a compound is detected.
** = Reference level not available.
[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.
[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.
[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 5 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	NITROAROMATICS (cont.)									
		2,6-Dinitrotoluene		Nitrobenzene		2-Nitroaniline		3-Nitroaniline		4-Nitroaniline	
		Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	92 U		18 U		92 U		92 U		92 U	
RM 21	2-S	75 U		15 U		75 U		75 U		75 U	
RM 23	3-S	78 U		16 U		78 U		78 U		78 U	
RM 26	4-S	74 U		15 U		74 U		74 U		74 U	
RM 29	5-S	81 U		16 U		81 U		81 U		81 U	
RM 36	6-S	81 U		16 U		81 U		81 U		81 U	
RM 59	7-S	64 U		13 U		64 U		64 U		64 U	
RM 68	8-S	83 U		17 U		83 U		83 U		83 U	
RM 81	9-1-S	77 U		15 U		77 U		77 U		77 U	
RM 81	9-2-S	75 U		15 U		75 U		75 U		75 U	
RM 81	9-3-S	74 U		15 U		74 U		74 U		74 U	
RM 88	10-S	100 U		20 U		100 U		100 U		100 U	
RM 90	11-S	63 U		13 U		63 U		63 U		63 U	
RM 95	12-S	89 U		18 U		89 U		89 U		89 U	
RM 120	13-S	82 U		16 U		82 U		82 U		82 U	
RM 124	14-S	83 U		17 U		83 U		83 U		83 U	
RM 141	15-S	70 U		13 U		70 U		70 U		70 U	
Benthos Reference Values	ER-L[a]	na**		na**		na**		na**		na**	
	Ontario[o]	na**		na**		na**		na**		na**	
	NY State[1]	na**		na**		na**		na**		na**	
	U.S. EPA[2]	na**		na**		na**		na**		na**	
Wildlife Reference Values[3]		na**		na**		na**		na**		na**	
Human Health Reference Values[o]		na**		na**		na**		na**		na**	

S = Sediment sample

RM = River mile

U = Compound was not detected. The value given is the lower quantification limit.

J = Value detected below nominal detection limit.

U/B = Compound was not detected due to blank contamination.

* = TOC-normalized data presented only when a compound is detected.

** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[o] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 6 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLYNUCLEAR AROMATIC HYDROCARBONS									
		Acenaphthene		Acenaphthylene		Anthracene		Benzo(a)anthracene		Benzo(b,k)fluoranthene	
		Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	2.20	0.10	2.20	0.10	4.9	0.2	20.0	1.0	50.0	2.4
RM 21	2-S	0.78	0.04 J	0.72	0.04 J	1.9	0.1	5.6	0.3	16.0	0.8
RM 23	3-S	1.20	0.09	0.67	0.05 J	1.2	0.1	8.7	0.7	21.0	1.6
RM 26	4-S	1.60	0.11	1.10	0.07	1.9	0.1	13.0	0.9	32.0	2.1
RM 29	5-S	1.80	0.12	1.30	0.09	2.6	0.2	16.0	1.1	38.0	2.5
RM 36	6-S	0.67	0.02 J	0.26	0.01 J	0.5	0.0 J	3.6	0.1 J	13.0	0.4
RM 59	7-S	1.30	0.12	1.70	0.15	3.2	0.3	12.0	1.1	29.0	2.6
RM 68	8-S	2.70	0.13	3.30	0.16	5.6	0.3	23.0	1.1	44.0	2.1
RM 81	9-1-S	3.40	0.10	1.20	0.04	4.9	0.1	20.0	0.6	22.0	0.7
RM 81	9-2-S	4.30	0.14	1.50	0.05	7.9	0.3	44.0	1.5	33.0	1.1
RM 81	9-3-S	3.30	0.09	1.50	0.04	3.5	0.1	21.0	0.6	26.0	0.7
RM 88	10-S	4.10	0.16	5.40	0.21	12.0	0.5	40.0	1.5	110.0	4.2
RM 90	11-S	1.30	0.20	1.00	0.15	2.3	0.4	9.1	1.4	20.0	3.1
RM 95	12-S	1.70	0.09	2.50	0.14	3.1	0.2	20.0	1.1	52.0	2.9
RM 120	13-S	1.70	0.11	0.67	0.04 J	2.1	0.1	9.0	0.6	21.0	1.4
RM 124	14-S	3.00	0.08	0.38	0.01 J	2.7	0.1	37.0	1.0	83.0	2.2
RM 141	15-S	0.72	0.08	0.65	U	1.2	0.1	5.3	0.6	12.0	1.3
Benthos Reference Values	ER-L[a]	150		na**		85		230		na**	
	Ontario[o]	na**		na**		220		320		240	
	NY State[1]		140	na**		na**		na**		na**	
	U.S. EPA[2]		140	na**		na**		na**		na**	
Wildlife Reference Values[3]		na**		na**		na**		na**		na**	
Human Health Reference Values[□]		na**		na**		na**			1.3		1.3

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
J = Value detected below nominal detection limit.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized data presented only when a compound is detected.
** = Reference level not available.
[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.
[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.
[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 7 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)									
		Benzo(a)pyrene		Benzo(ghi)perylene		Chrysene		Dibenzo(a,h)anthracene		Fluoranthene	
		Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	26.0	1.2	18.0	0.9	29.0	1.4	4.9	0.2	47.0	2.2
RM 21	2-S	8.8	0.5	7.4 U/B		9.1	0.5	1.7 J	0.1 J	13.0	0.7
RM 23	3-S	11.0	0.8	8.4	0.6	13.0	1.0	2.7	0.2 J	16.0	1.2
RM 26	4-S	16.0	1.1	11.0	0.7	19.0	1.3	3.1	0.2 J	24.0	1.6
RM 29	5-S	19.0	1.3	13.0	0.9	24.0	1.6	3.7	0.2	28.0	1.9
RM 36	6-S	4.2	0.1	3.8 U/B		8.1	0.2	1.6 J	0.0 J	8.1	0.2
RM 59	7-S	12.0	1.1	6.7 U/B		22.0	2.0	2.5	0.2	30.0	2.7
RM 68	8-S	19.0	0.9	15.0	0.7	39.0	1.9	3.7	0.2	66.0	3.1
RM 81	9-1-S	8.6	0.3	4.4 U/B		40.0	1.2	2.1 J	0.1 J	43.0	1.3
RM 81	9-2-S	15.0	0.5	6.1 U/B		100.0	3.3	3.3 J	0.1 J	37.0	1.2
RM 81	9-3-S	10.0	0.3	4.6 U/B		47.0	1.2	2.2 J	0.1 J	45.0	1.2
RM 88	10-S	61.0	2.3	40.0	1.5	55.0	2.1	8.5	0.3	76.0	2.9
RM 90	11-S	8.8	1.4	5.0 U/B		15.0	2.3	1.8 J	0.3 J	16.0	2.5
RM 95	12-S	29.0	1.6	21.0	1.2	28.0	1.6	4.8	0.3	38.0	2.1
RM 120	13-S	9.3	0.6	6.0 U/B		13.0	0.9	2.8	0.2	15.0	1.0
RM 124	14-S	35.0	0.9	22.0	0.6	50.0	1.4	9.7 J	0.3 J	39.0	1.1
RM 141	15-S	4.8	0.5	3.3 U/B		6.5	0.7	1.5 J	0.2	8.5	0.9
Benthos Reference Values	ER-L[a]	400		na**		400		60		600	
	Ontario[o]	370		170		340		60		750	
	NY State[1]	na**		na**		na**		na**			1020
	U.S. EPA[2]	na**		na**		na**		na**			1020
Wildlife Reference Values[3]		na**		na**		na**		na**		na**	
Human Health Reference Values[□]			1.3	na**			1.3	na**		na**	

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
J = Value detected below nominal detection limit.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized data presented only when a compound is detected.
** = Reference level not available.
[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.
[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.
[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 8 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)											
		Fluorene		Indeno(1,2,3-cd)pyrene		Naphthalene		Phenanthrene		Pyrene		2-Methylnaphthalene	
		Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	2.70	0.13	33.0	1.6	3.9	0.2	16.0	0.8	46.0	2.2	2.20	0.10
RM 21	2-S	0.78	0.04	9.0	0.5	1.3	0.1	5.6	0.3	14.0	0.7	0.95	0.05
RM 23	3-S	0.74	0.06 J	8.1	0.6	1.3	0.1	6.7	0.5	13.0	1.0	0.70	0.05
RM 26	4-S	1.50	0.10	22.0	1.5	1.9	0.1	10.0	0.7	20.0	1.3	1.10	0.07
RM 29	5-S	2.20	0.15	27.0	1.8	2.8	0.2	14.0	0.9	25.0	1.7	1.60	0.11
RM 36	6-S	0.85	0.02	15.0	0.4	1.5	0.0	6.6	0.2	7.0	0.2	1.30	0.04
RM 59	7-S	1.80	0.16	13.0	1.2	3.6	0.3	14.0	1.3	24.0	2.2	1.50	0.14
RM 68	8-S	4.70	0.22	14.0	0.7	9.7	0.5	26.0	1.2	67.0	3.2	3.20	0.15
RM 81	9-1-S	6.00	0.18	4.8	U/B	2.5	0.1	22.0	0.7	90.0	2.7	1.70	0.05
RM 81	9-2-S	8.10	0.27	7.1	U/B	2.5	0.1	31.0	1.0	95.0	3.2	1.90	0.06
RM 81	9-3-S	6.10	0.16	5.3	U/B	2.6	0.1	27.0	0.7	120.0	3.2	2.00	0.05
RM 88	10-S	5.90	0.23	41.0	1.6	9.8	0.4	34.0	1.3	93.0	3.6	4.20	0.16
RM 90	11-S	1.50	0.23	5.5	U/B	2.2	0.3	8.8	1.4	18.0	2.8	1.20	0.18
RM 95	12-S	3.00	0.17	20.0	1.1	4.9	0.3	17.0	0.9	43.0	2.4	2.70	0.15
RM 120	13-S	2.20	0.15	6.8	U/B	3.1	0.2	12.0	0.8	18.0	1.2	2.20	0.15
RM 124	14-S	2.50	0.07	24.0	0.6	2.2	0.1	19.0	0.5	47.0	1.3	1.90	0.05
RM 141	15-S	0.86	0.09	4.5	U/B	1.0	0.1	6.8	0.7	8.7	0.9	0.76	0.08
Benthos Reference Values	ER-L[a]	35		na**		340		225		350		65	
	Ontario[o]	190		200		na**		560		490		na**	
	NY State[1]	na**		na**		na**			120	na**		na**	
	U.S. EPA[2]	na**		na**		na**			120	na**		na**	
Wildlife Reference Values[3]		na**		na**		na**		na**		na**		na**	
Human Health Reference Values[□]		na**			1.3	na**		na**		na**		na**	

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
J = Value detected below nominal detection limit.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized data presented only when a compound is detected.
** = Reference level not available.
[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.
[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.
[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 9 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PAHs (cont.) Dibenzofuran Conc. (µg/kg)	Norm.* Conc. (µg/g C)	NAPHTHALENES 2-Chloronaphthalene Conc. (µg/kg)	Norm.* Conc. (µg/g C)	CHLORINATED BENZENES 1,3-Dichlorobenzene Conc. (µg/kg)	Norm.* Conc. (µg/g C)	1,2-Dichlorobenzene Conc. (µg/kg)	Norm.* Conc. (µg/g C)	1,4-Dichlorobenzene Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	1.90	0.09	18 U		18 U		18 U		37 U	
RM 21	2-S	0.45	0.02 J	15 U		15 U		15 U		30 U	
RM 23	3-S	0.39	0.03 J	16 U		16 U		16 U		31 U	
RM 26	4-S	0.81	0.05	15 U		15 U		15 U		30 U	
RM 29	5-S	1.30	0.09	16 U		16 U		16 U		32 U	
RM 36	6-S	0.72	0.02 J	16 U		16 U		16 U		33 U	
RM 59	7-S	1.10	0.10	13 U		13 U		13 U		26 U	
RM 68	8-S	3.70	0.18	17 U		17 U		17 U		33 U	
RM 81	9-1-S	4.30	0.13	15 U		15 U		15 U		31 U	
RM 81	9-2-S	4.70	0.16	15 U		15 U		15 U		30 U	
RM 81	9-3-S	4.20	0.11	15 U		15 U		15 U		30 U	
RM 88	10-S	4.90	0.19	20 U		20 U		20 U		40 U	
RM 90	11-S	0.86	0.13	13 U		13 U		13 U		25 U	
RM 95	12-S	1.50	0.08	18 U		18 U		18 U		36 U	
RM 120	13-S	1.70	0.11	16 U		16 U		16 U		33 U	
RM 124	14-S	1.50	0.04	17 U		17 U		17 U		33 U	
RM 141	15-S	0.62	0.07 J	13 U		13 U		13 U		26 U	
Benthos Reference Values	ER-L[a]	na**		na**		na**		na**		na**	
	Ontario[o]	na**		na**		na**		na**		na**	
	NY State[1]	na**		na**			12		12		12
	U.S. EPA[2]	na**		na**		na**		na**		na**	
Wildlife Reference Values[3]		na**		na**		na**		na**		na**	
Human Health Reference Values[□]		na**		na**		na**		na**		na**	

S = Sediment sample

RM = River mile

U = Compound was not detected. The value given is the lower quantification limit.

J = Value detected below nominal detection limit.

U/B = Compound was not detected due to blank contamination.

* = TOC-normalized data presented only when a compound is detected.

** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 10 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	CHLORINATED BENZENES (cont.) 1,2,4-Trichlorobenzene Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Hexachlorobenzene Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Hexachlorobutadiene Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Hexachloroethane Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Hexachlorocyclopentadiene Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	18 U		18 U		37 U		92 U		92 U	
RM 21	2-S	15 U		15 U		30 U		75 U		75 U	
RM 23	3-S	16 U		16 U		31 U		78 U		78 U	
RM 26	4-S	15 U		15 U		30 U		74 U		74 U	
RM 29	5-S	16 U		16 U		32 U		81 U		81 U	
RM 36	6-S	16 U		16 U		33 U		81 U		81 U	
RM 59	7-S	13 U		13 U		26 U		64 U		64 U	
RM 68	8-S	17 U		17 U		33 U		83 U		83 U	
RM 81	9-1-S	15 U		15 U		31 U		77 U		77 U	
RM 81	9-2-S	15 U		15 U		30 U		75 U		75 U	
RM 81	9-3-S	15 U		15 U		30 U		74 U		74 U	
RM 88	10-S	20 U		20 U		40 U		100 U		100 U	
RM 90	11-S	13 U		13 U		25 U		63 U		63 U	
RM 95	12-S	18 U		18 U		36 U		89 U		89 U	
RM 120	13-S	16 U		16 U		33 U		82 U		82 U	
RM 124	14-S	17 U		17 U		33 U		83 U		83 U	
RM 141	15-S	13 U		13 U		26 U		70 U		70 U	
Benthos Reference Values	ER-L[a]	na**		na**		na**		na**		na**	
	Ontario[o]	na**		na**		na**		na**		na**	
	NY State[1]		91		5570		5.5	na**			4.4
	U.S. EPA[2]	na**		na**		na**		na**		na**	
Wildlife Reference Values[3]		na**			12		4	na**		na**	
Human Health Reference Values[□]		na**			1.12	na**		na**		na**	

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
J = Value detected below nominal detection limit.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized data presented only when a compound is detected.
** = Reference level not available.
[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.
[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.
[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 11 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	BENZIDINES: 3,3'-Dichlorobenzidine Conc. (µg/kg)	Norm.* Conc. (µg/g C)	PHTHALATE ESTERS: Dimethyl phthalate Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Diethyl phthalate Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Di-n-butyl phthalate Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Benzyl butyl phthalate Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	92 U		18 U		18 U		18 U		18 U	
RM 21	2-S	75 U		15 U		15 U		15 U		15 U	
RM 23	3-S	78 U		16 U		16 U		16 U		16 U	
RM 26	4-S	74 U		15 U		15 U		15 U		15 U	
RM 29	5-S	81 U		16 U		16 U		16 U		16 U	
RM 36	6-S	81 U		16 U		16 U		16 U		16 U	
RM 59	7-S	64 U		13 U		13 U		13 U		13 U	
RM 68	8-S	83 U		17 U		17 U		17 U		17 U	
RM 81	9-1-S	77 U		15 U		15 U		15 U		15 U	
RM 81	9-2-S	75 U		15 U		15 U		15 U		15 U	
RM 81	9-3-S	74 U		15 U		15 U		15 U		15 U	
RM 88	10-S	100 U		20 U		20 U		20 U		20 U	
RM 90	11-S	63 U		13 U		13 U		13 U		13 U	
RM 95	12-S	89 U		18 U		18 U		18 U		18 U	
RM 120	13-S	82 U		16 U		16 U		16 U		16 U	
RM 124	14-S	83 U		17 U		17 U		17 U		17 U	
RM 141	15-S	70 U		13 U		13 U		13 U		13 U	
Benthos Reference Values	ER-L[a]	na**		na**		na**		na**		na**	
	Ontario[o]	na**		na**		na**		na**		na**	
	NY State[1]	na**		na**		na**		na**		na**	
	U.S. EPA[2]	na**		na**		na**		na**		na**	
Wildlife Reference Values[3]		na**		na**		na**		na**		na**	
Human Health Reference Values[□]			0.003	na**		na**		na**		na**	

S = Sediment sample

RM = River mile

U = Compound was not detected. The value given is the lower quantification limit.

J = Value detected below nominal detection limit.

U/B = Compound was not detected due to blank contamination.

* = TOC-normalized data presented only when a compound is detected.

** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 12 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHTHALATE ESTERS (cont.) bis(2-Ethylhexyl)phthalate Conc. (µg/kg)	Norm.* Conc. (µg/g C)		Di-n-octyl phthalate Conc. (µg/kg)	Norm.* Conc. (µg/g C)		MISCELLANEOUS Carbazole Conc. (µg/kg)	Norm.* Conc. (µg/g C)		Benzyl Alcohol Conc. (µg/kg)	Norm.* Conc. (µg/g C)		Benzoic Acid Conc. (µg/kg)	Norm.* Conc. (µg/g C)	
RM 14	1-S	**24.0**	**1.1**		18		U	18		U	92		U	**55.0**	**2.6**	J
RM 21	2-S	**13.0**	**0.7**	J	15		U	15		U	75		U	**40.0**	**2.1**	J
RM 23	3-S	**13.0**	**1.0**	J	16		U	16		U	78		U	160.0		U
RM 26	4-S	**25.0**	**1.7**		15		U	15		U	74		U	**45.0**	**3.0**	J
RM 29	5-S	**40.0**	**2.7**		16		U	16		U	81		U	**37.0**	**2.5**	J
RM 36	6-S	**18.0**	**0.5**		16		U	16		U	81		U	**43.0**	**1.2**	J
RM 59	7-S	**17.0**	**1.5**		13		U	13		U	64		U	**32.0**	**2.9**	J
RM 68	8-S	25.0		U/B	17		U	17		U	83		U	**49.0**	**2.3**	J
RM 81	9-1-S	**49.0**	**1.5**		15		U	15		U	77		U	**66.0**	**2.0**	J
RM 81	9-2-S	15.0		U	15		U	15		U	75		U	**38.0**	**1.3**	J
RM 81	9-3-S	15.0		U	15		U	15		U	74		U	**48.0**	**1.3**	J
RM 88	10-S	**51.0**	**2.0**		20		U	20		U	100		U	**68.0**	**2.6**	J
RM 90	11-S	**18.0**	**2.8**		13		U	13		U	63		U	**32.0**	**4.9**	J
RM 95	12-S	**18.0**	**1.0**		18		U	18		U	89		U	**38.0**	**2.1**	J
RM 120	13-S	**50.0**	**3.3**		16		U	16		U	82		U	**42.0**	**2.8**	J
RM 124	14-S	**26.0**	**0.7**		17		U	17		U	83		U	**63.0**	**1.7**	J
RM 141	15-S	11.0		U	13		U	13		U	70		U	**20.0**	**2.1**	J
Benthos Reference Values	ER-L[a]	na**			na**			na**			na**			na**		
	Ontario[o]	na**			na**			na**			na**			na**		
	NY State[1]		199.5		na**			na**			na**			na**		
	U.S. EPA[2]	na**			na**			na**			na**			na**		
Wildlife Reference Values[3]		na**			na**			na**			na**			na**		
Human Health Reference Values[□]		na**			na**			na**			na**			na**		

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
J = Value detected below nominal detection limit.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized data presented only when a compound is detected.
** = Reference level not available.
[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.
[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.
[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-6. SEMIVOLATILES IN SEDIMENTS (page 13 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	MISCELLANEOUS (cont.)			
		Isophorone		4-Chloroaniline	
		Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	18 U		55 U	
RM 21	2-S	15 U		45 U	
RM 23	3-S	16 U		47 U	
RM 26	4-S	15 U		44 U	
RM 29	5-S	16 U		48 U	
RM 36	6-S	16 U		49 U	
RM 59	7-S	13 U		39 U	
RM 68	8-S	17 U		50 U	
RM 81	9-1-S	15 U		46 U	
RM 81	9-2-S	15 U		45 U	
RM 81	9-3-S	15 U		44 U	
RM 88	10-S	20 U		60 U	
RM 90	11-S	13 U		38 U	
RM 95	12-S	18 U		54 U	
RM 120	13-S	16 U		49 U	
RM 124	14-S	17 U		50 U	
RM 141	15-S	13 U		39 U	
Benthos Reference Values	ER-L[a]	na**		na**	
	Ontario[o]	na**		na**	
	NY State[1]	na**		na**	
	U.S. EPA[2]	na**		na**	
Wildlife Reference Values[3]		na**		na**	
Human Health Reference Values[¤]		na**		na**	

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
J = Value detected below nominal detection limit.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized data presented only when a compound is detected.
** = Reference level not available.
[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.
[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.
[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[2] Reference values are from the U.S. EPA (1991) draft sediment criteria.
[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[¤] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-7. PESTICIDES AND PCBs IN SEDIMENTS
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 1 of 6)

River Mile	Sample Number	Aldrin		Dieldrin		Endrin		Endrin Ketone		Endrin Aldehyde		Alpha-BHC	
		Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)	Conc. (µg/kg)	Norm.* Conc. (µg/g C)
RM 14	1-S	0.5 U		1 U		1 U		1 U/E		1 U		0.5 U	
RM 21	2-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 23	3-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 26	4-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 29	5-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 36	6-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 59	7-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 68	8-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 81	9-1-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 81	9-2-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 81	9-3-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 88	10-S	0.5 U		1 U		1 U		1 U/E		1 U		0.5 U	
RM 90	11-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 95	12-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 120	13-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 124	14-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
RM 141	15-S	0.5 U		1 U		1 U		1 U		1 U		0.5 U	
Benthos Reference Values	ER-L[a]	na**		0.02		0.02		na**		na**		na**	
	Ontario[o]	2		2		3		na**		na**		6.0	
	NY State[1]	na**			9		4	na**		na**		na**	
	U.S. EPA[2]	na**			9		4	na**		na**		na**	
Wildlife Reference Values[3]			0.77		0.077		0.8	na**		na**		na**	
Human Health Reference Values[¤]			0.1	na**			0.8	na**		na**		na**	

S = Sediment sample RM = River mile J = Value detected below nominal detection limit.

U = Compound was not detected. The value given is the lower quantification limit. E = Estimated value based on QA evaluation.

* = TOC-normalized data presented only when a compound is detected. ** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA draft sediment criteria (1991).

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[¤] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-7. PESTICIDES AND PCBs IN SEDIMENTS
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 2 of 6)

River Mile	Sample Number	Beta-BHC Conc. (µg/kg)	Beta-BHC Norm.* Conc. (µg/g C)	Delta-BHC Conc. (µg/kg)	Delta-BHC Norm.* Conc. (µg/g C)	Lindane Conc. (µg/kg)	Lindane Norm.* Conc. (µg/g C)	Gamma-Chlordane Conc. (µg/kg)	Gamma-Chlordane Norm.* Conc. (µg/g C)	Alpha-Chlordane Conc. (µg/kg)	Alpha-Chlordane Norm.* Conc. (µg/g C)	Dicofol Conc. (µg/kg)	Dicofol Norm.* Conc. (µg/g C)
RM 14	1-S	0.5 U		0.5 U/E		0.5 U		0.5 U		0.5 U		15 U/E	
RM 21	2-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 23	3-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 26	4-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 29	5-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 36	6-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 59	7-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		11 U/E	
RM 68	8-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 81	9-1-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 81	9-2-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 81	9-3-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 88	10-S	0.5 U		0.5 U/E		0.5 U		0.5 U		0.5 U		17 U/E	
RM 90	11-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		11 U/E	
RM 95	12-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		15 U/E	
RM 120	13-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 124	14-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		14 U/E	
RM 141	15-S	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		11 U/E	
Benthos Reference Values	ER-L[a]	na**		na**		na**		0.5		0.5		na**	
	Ontario[o]	5.0		na**		3.0		na**		7.0		na**	
	NY State[1]	na**		na**		na**		na**		na**		na**	
	U.S. EPA[2]	na**		na**		na**		na**		na**		na**	
Wildlife Reference Values[3]		na**		na**		na**		0.006		0.006		na**	
Human Health Reference Values[□]		na**		na**		na**		0.001		0.001		na**	

S = Sediment sample RM = River mile J = Value detected below nominal detection limit.

U = Compound was not detected. The value given is the lower quantification limit. E = Estimated value based on QA evaluation.

* = TOC-normalized data presented only when a compound is detected. ** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA draft sediment criteria (1991).

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-7. PESTICIDES AND PCBs IN SEDIMENTS
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 3 of 6)

River Mile	Sample Number	Endosulfan I Conc. (µg/kg)	Endosulfan I Norm.* Conc. (µg/g C)	Endosulfan II Conc. (µg/kg)	Endosulfan II Norm.* Conc. (µg/g C)	Endosulfan Sulfate Conc. (µg/kg)	Endosulfan Sulfate Norm.* Conc. (µg/g C)	Heptachlor Conc. (µg/kg)	Heptachlor Norm.* Conc. (µg/g C)	Heptachlor Epoxide Conc. (µg/kg)	Heptachlor Epoxide Norm.* Conc. (µg/g C)	Methoxychlor Conc. (µg/kg)	Methoxychlor Norm.* Conc. (µg/g C)
RM 14	1-S	0.5 U		1 U		1 U/E		0.5 U		0.5 U		5 U	
RM 21	2-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 23	3-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 26	4-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 29	5-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 36	6-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 59	7-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 68	8-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 81	9-1-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 81	9-2-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 81	9-3-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 88	10-S	0.5 U		1 U		1 U/E		0.5 U		0.5 U		5 U	
RM 90	11-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 95	12-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 120	13-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 124	14-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
RM 141	15-S	0.5 U		1 U		1 U		0.5 U		0.5 U		5 U	
Benthos Reference Values	ER-L[a]	na**		na**		na**		na**		na**		na**	
	Ontario[o]	na**		na**		na**		na**		5		na**	
	NY State[1]		0.03		0.03	na**		na**		na**			0.6
	U.S. EPA[2]	na**		na**		na**		na**		na**		na**	
Wildlife Reference Values[3]		na**		na**		na**			0.03		0.03	na**	
Human Health Reference Values[□]		na**		na**		na**		na**		na**		na**	

S = Sediment sample RM = River mile J = Value detected below nominal detection limit.

U = Compound was not detected. The value given is the lower quantification limit. E = Estimated value based on QA evaluation.

* = TOC-normalized data presented only when a compound is detected. ** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA draft sediment criteria (1991).

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-7. PESTICIDES AND PCBs IN SEDIMENTS
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 4 of 6)

River Mile	Sample Number	Methyl Parathion Conc. (µg/kg)	Methyl Parathion Norm.* Conc. (µg/g C)		o,p'-DDE Conc. (µg/kg)	o,p'-DDE Norm.* Conc. (µg/g C)		o,p'-DDD Conc. (µg/kg)	o,p'-DDD Norm.* Conc. (µg/g C)		o,p'-DDT Conc. (µg/kg)	o,p'-DDT Norm.* Conc. (µg/g C)		p,p'-DDE Conc. (µg/kg)	p,p'-DDE Norm.* Conc. (µg/g C)		p,p'-DDD Conc. (µg/kg)	p,p'-DDD Norm.* Conc. (µg/g C)	
RM 14	1-S	15		U/E	0.22		U/E	0.30		U/E	0.22		U/E	1		U	1		U
RM 21	2-S	14		U/E	0.20		U/E	0.20		U/E	0.20		U/E	1		U	1		U
RM 23	3-S	14		U/E	0.20		U/E	0.20		U/E	0.20		U/E	1		U	1		U
RM 26	4-S	14		U/E	0.20		U/E	0.20		U/E	0.20		U/E	1		U	1		U
RM 29	5-S	14		U/E	0.20		U/E	0.20		U/E	0.20		U/E	1		U	1		U
RM 36	6-S	14		U/E	0.20		U/E	0.20		U/E	0.20		U/E	1		U	1		U
RM 59	7-S	11		U/E	0.16		U/E	0.16		U/E	0.16		U/E	1		U	1		U
RM 68	8-S	14		U/E	0.20		U/E	0.50		U/E	0.20		U/E	**1.2**	**0.06**	**E**	**1.6**	**0.08**	
RM 81	9-1-S	14		U/E	0.20		U/E	0.35		U/E	0.20		U/E	1		U	**0.7**	**0.02**	**E**
RM 81	9-2-S	14		U/E	0.20		U/E	0.20		U/E	0.20		U/E	1		U	**0.8**	**0.03**	**E**
RM 81	9-3-S	14		U/E	0.20		U/E	0.30		U/E	0.20		U/E	1		U	**0.8**	**0.02**	**E**
RM 88	10-S	17		U/E	0.24		U/E	0.30		U/E	0.24		U/E	**0.9**	**0.03**	**E**	**2.0**	**0.08**	
RM 90	11-S	11		U/E	0.16		U/E	0.25		U/E	0.16		U/E	1		U	**0.6**	**0.09**	**E**
RM 95	12-S	15		U/E	0.22		U/E	0.50		U/E	0.22		U/E	**0.8**	**0.04**	**E**	**1.3**	**0.07**	
RM 120	13-S	14		U/E	0.20		U/E	0.30		U/E	0.20		U/E	1		U	**0.7**	**0.05**	**E**
RM 124	14-S	14		U/E	0.20		U/E	0.20		U/E	0.20		U/E	**0.8**	**0.02**	**E**	**0.8**	**0.02**	**E**
RM 141	15-S	11		U/E	0.16		U/E	0.16		U/E	0.16		U/E	**0.5**	**0.05**	**E**	**0.9**	**0.10**	**E**
Benthos Reference Values	ER-L[a]	na**			2			2			1			2			2		
	Ontario[o]	na**			na**			na**			na**			5			8		
	NY State[1]	na**				1			1			1			1			1	
	U.S. EPA[2]	na**			na**			na**			na**			na**			na**		
Wildlife Reference Values[3]		na**				1			1			1			1			1	
Human Health Reference Values[□]		na**				0.59			0.59			0.59			0.59			0.59	

S = Sediment sample RM = River mile J = Value detected below nominal detection limit.

U = Compound was not detected. The value given is the lower quantification limit. E = Estimated value based on QA evaluation.

* = TOC-normalized data presented only when a compound is detected. ** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA draft sediment criteria (1991).

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-7. PESTICIDES AND PCBs IN SEDIMENTS
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 5 of 6)

River Mile	Sample Number	p,p'-DDT Conc. (µg/kg)	p,p'-DDT Norm.* Conc. (µg/g C)	Toxaphene Conc. (µg/kg)	Toxaphene Norm.* Conc. (µg/g C)	PCBs: Aroclor 1242/1016 Conc. (µg/kg)	Aroclor 1242/1016 Norm.* Conc. (µg/g C)	Aroclor 1221 Conc. (µg/kg)	Aroclor 1221 Norm.* Conc. (µg/g C)	Aroclor 1232 Conc. (µg/kg)	Aroclor 1232 Norm.* Conc. (µg/g C)	Aroclor 1248 Conc. (µg/kg)	Aroclor 1248 Norm.* Conc. (µg/g C)
RM 14	1-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 21	2-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 23	3-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 26	4-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 29	5-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 36	6-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 59	7-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 68	8-S	1 U		50 U		10 U		20 U		10 U		11	0.5
RM 81	9-1-S	1 U		50 U		10 U		20 U		10 U		10	U/E
RM 81	9-2-S	1 U		50 U		10 U		20 U		10 U		7.3	0.2
RM 81	9-3-S	1.2	0.03	50 U		10 U		20 U		10 U		10 U	
RM 88	10-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 90	11-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 95	12-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 120	13-S	1 U		50 U		10 U		20 U		10 U		10 U	
RM 124	14-S	1 U		50 U		10 U		20 U		10 U		10	U/E
RM 141	15-S	1 U		50 U		10 U		20 U		10 U		10 U	
Benthos Reference Values	ER-L[a]	1		na**		na**		na**		na**		na**	
	Ontario[o]	na**		na**		7		na**		na**		30	
	NY State[1]		1	na**		na**		na**		na**		na**	
	U.S. EPA[2]	na**		na**		na**		na**		na**		na**	
Wildlife Reference Values[3]			1	na**		na**		na**		na**		na**	
Human Health Reference Values[□]			0.59		0.01	na**		na**		na**		na**	

S = Sediment sample RM = River mile J = Value detected below nominal detection limit.

U = Compound was not detected. The value given is the lower quantification limit. E = Estimated value based on QA evaluation.

* = TOC-normalized data presented only when a compound is detected. ** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA draft sediment criteria (1991).

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-7. PESTICIDES AND PCBs IN SEDIMENTS
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993 (page 6 of 6)

River Mile	Sample Number	Aroclor 1254 Conc. (µg/kg)		Aroclor 1254 Norm.* Conc. (µg/g C)		Aroclor 1260 Conc. (µg/kg)		Aroclor 1260 Norm.* Conc. (µg/g C)		Total PCBs Conc. (µg/kg)		Total PCBs Norm.* Conc. (µg/g C)	
RM 14	1-S	10	U			10	U			70	U		
RM 21	2-S	10	U			10	U			70	U		
RM 23	3-S	10	U			10	U			70	U		
RM 26	4-S	10	U			10	U			70	U		
RM 29	5-S	10	U			10	U			70	U		
RM 36	6-S	10	U			10	U			70	U		
RM 59	7-S	10	U			10	U			70	U		
RM 68	8-S	10	U			10	U			11		0.5	
RM 81	9-1-S	10	U			10	U			70	U		
RM 81	9-2-S	10	U			10	U			7.3		0.2	J
RM 81	9-3-S	10	U			10	U			70	U		
RM 88	10-S	10	U			10	U			70	U		
RM 90	11-S	10	U			10	U			70	U		
RM 95	12-S	10	U			10	U			70	U		
RM 120	13-S	10	U			10	U			70	U		
RM 124	14-S	10	U			10	U			70	U		
RM 141	15-S	10	U			10	U			70	U		
Benthos Reference Values	ER-L[a]	na**				na**				50			
	Ontario[o]	60				5				70			
	NY State[1]	na**				na**						1.4	
	U.S. EPA[2]	na**				na**				na**			
Wildlife Reference Values[3]		na**				na**						0.0008	
Human Health Reference Values[□]		na**				na**				na**			

S = Sediment sample RM = River mile J = Value detected below nominal detection limit.

U = Compound was not detected. The value given is the lower quantification limit. E = Estimated value based on QA evaluation.

* = TOC-normalized data presented only when a compound is detected. ** = Reference level not available.

[a] Effect Range-Low (ER-L) values from Long and Morgan (1990) for the adverse effects on benthic organisms.

[o] Ontario values are from the Provincial Sediment Quality Guidelines (Persaud et al. 1993) for the protection of benthic organisms.

[1] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[2] Reference values are from the U.S. EPA draft sediment criteria (1991).

[3] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[□] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

Note: Shaded areas indicate those detected concentrations that exceeded the lowest appropriate reference level for potential adverse effects on benthic organisms or wildlife. Reference values for potential effects on human health are provided for comparison as well.

TABLE C-8. DIOXINS AND FURANS IN SEDIMENT (page 1 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	DIOXINS											
		2378-TCDD		12378-PeCDD		123478-HxCDD		123678-HxCDD		123789-HxCDD		1234678-HpCDD	
		Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)
RM 14	1-S	0.6 U/E		1.0 U/E		1.2 U/E		1.7 U/E		1.5 U/E		0.9 U/E	
RM 21	2-S	0.4 U/E		0.5 U/E		0.5 U/E		0.8 U/E		0.6 U/E		3.3 U/E	
RM 23	3-S	0.3 U/E		0.5 U/E		0.8 U/E		0.8 U/E		0.9 U/E		1.8 U/E	
RM 26	4-S	0.4 U/E		0.6 U/E		1.6 U/E		2.1 U/E		2.1 U/E		2.7 U/E	
RM 29	5-S	0.7 U/E		0.8 U/E		0.9 U/E		1.3 U/E		1.2 U/E		4.5 U/E	
RM 36	6-S	0.3 U/E		1.1 U/E		0.4 U/E		0.7 U/E		0.5 U/E		2.3 U/E	
RM 59	7-S	1.4 U/E		0.9 U/E		0.8 U/E		1.4 U/E		1.0 U/E		4.7 U/E	
RM 68	8-S	0.6 U/E		0.8 U/E		0.5 U/E		1.0 U/E		0.6 U/E		1.9 U/E	
RM 81	9-1-S	0.7 U/E		1.1 U/E		1.9 U/E		3.1 U/E		2.4 U/E		2.9 U/E	
RM 81	9-2-S	1.0 U/E		0.9 U/E		1.5 U/E		1.7 U/E		1.9 U/E		10.2 U/E	
RM 81	9-3-S	0.8 U/E		0.8 U/E		1.0 U/E		1.7 U/E		1.3 U/E		4.9 U/E	
RM 88	10-S	0.7 U/E		0.4 U/E		0.6 U/E		0.9 U/E		0.7 U/E		5.0	0.2
RM 90	11-S	0.4 U/E		0.6 U/E		1.1 U/E		1.4 U/E		1.3 U/E		6.9 U/E	
RM 95	12-S	0.4 U/E		1.0 U/E		0.8 U/E		1.1 U/E		1.0 U/E		3.5 U/E	
RM 120	13-S	0.5 U/E		0.7 U/E		0.7 U/E		1.1 U/E		0.9 U/E		3.1 U/E	
RM 124	14-S	0.4 U/E		0.9 U/E		1.2 U/E		1.8 U/E		1.5 U/E		3.3 U/E	
RM 141	15-S	0.4 U/E		0.8 U/E		0.6 U/E		1.1 U/E		0.8 U/E		4.3 U/E	
Benthos Reference Values[a]		na **		na **		na **		na **		na **		na **	
Wildlife Reference Values[o]			0.2	na **		na **		na **		na **		na **	
Human Health Reference Values[l]			10	na **		na **		na **		na **		na **	

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized value only given when a compound is detected.
** = Sediment criteria for New York state 1993 (draft) not available.
[a] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[o] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[l] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).
[2] Toxicity Equivalency Concentrations calculated using Barnes et al. (1989).
[3] Toxicity Equivalency Concentration calculations assumes that the concentration for undetected compounds is equal to half the lower detection limit.
[0] Toxicity Equivalency Concentration calculations assumes that the concentration for undetected compounds is equal to zero.

TABLE C-8. DIOXINS AND FURANS IN SEDIMENT (page 2 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	DIOXINS (cont.) OCDD Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)		FURANS 2378-TCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)		12378-PeCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)		23478-PeCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)		123478-HxCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)		123678-HxCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	
RM 14	1-S	13.2	0.6		0.6		U/E	1.0		U/E	1.0		U/E	2.1		U/E	1.9		U/E
RM 21	2-S	7.7		U/E	0.6		U/E	0.3		U/E	0.3		U/E	0.8		U/E	0.7		U/E
RM 23	3-S	4.5		U/E	0.6		U/E	0.4		U/E	0.4		U/E	0.9		U/E	0.9		U/E
RM 26	4-S	10.4	0.7		0.6		U/E	0.6		U/E	0.5		U/E	0.9		U/E	0.8		U/E
RM 29	5-S	11.9	0.8		1.1		U/E	0.7		U/E	0.5		U/E	1.1		U/E	1.0		U/E
RM 36	6-S	6.9		U/E	0.6		U/E	0.6		U/E	0.5		U/E	1.0		U/E	1.0		U/E
RM 59	7-S	15.2	1.4		1.3		U/E	1.1		U/E	1.3		U/E	1.1		U/E	1.1		U/E
RM 68	8-S	7.4		U/E	0.9		U/E	0.8		U/E	0.8		U/E	1.0		U/E	0.9		U/E
RM 81	9-1-S	8.0		U/E	0.7		U/E	0.5		U/E	0.6		U/E	1.4		U/E	1.3		U/E
RM 81	9-2-S	53.4		U/B	1.8		U/E	1.1		U/E	1.2		U/E	1.6		U/E	1.4		U/E
RM 81	9-3-S	19.5		U/B	1.0		U/E	0.6		U/E	0.7		U/E	1.1		U/E	1.1		U/E
RM 88	10-S	52.5	2.0		0.6		U/E	0.6		U/E	0.6		U/E	1.2		U/E	1.1		U/E
RM 90	11-S	46.9		U/B	0.7		U/E	0.4		U/E	0.5		U/E	1.1		U/E	1.1		U/E
RM 95	12-S	9.7		U/E	0.9		U/E	0.6		U/E	0.6		U/E	1.5		U/E	1.4		U/E
RM 120	13-S	8.0		U/E	1.0		U/E	0.9		U/E	1.0		U/E	1.3		U/E	1.1		U/E
RM 124	14-S	12.7	0.3	E	0.9		U/E	0.7		U/E	0.7		U/E	1.3		U/E	1.2		U/E
RM 141	15-S	34.7	3.7	E	0.9		U/E	0.8		U/E	1.0		U/E	1.5		U/E	1.5		U/E
Benthos Reference Values[a]		na **			na **			na **			na **			na **			na **		
Wildlife Reference Values[b]		na **			na **			na **			na **			na **			na **		
Human Health Reference Values[c]		na **			na **			na **			na **			na **			na **		

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized value only given when a compound is detected.
** = Sediment criteria for New York state 1993 (draft) not available.
[a] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[b] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[c] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).
[2] Toxicity Equivalency Concentrations calculated using Barnes et al. (1989).
[3] Toxicity Equivalency Concentration calculations assumes that the concentration for undetected compounds is equal to half the lower detection limit.
[0] Toxicity Equivalency Concentration calculations assumes that the concentration for undetected compounds is equal to zero.

TABLE C-8. DIOXINS AND FURANS IN SEDIMENT (page 3 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	FURANS (cont.) 123789-HxCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	234678-HxCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	1234678-HpCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	1234789-HpCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)	OCDF Conc. (ng/kg)	TOC Norm.* Conc. (ng/g C)
RM 14	1-S	2.7	U/E	2.3	U/E	7.1	U/E	1.9	U/E	3.5	U/E
RM 21	2-S	1.0	U/E	0.8	U/E	0.5	U/E	0.7	U/E	0.6	U/E
RM 23	3-S	1.2	U/E	1.0	U/E	0.8	U/E	1.0	U/E	0.4	U/E
RM 26	4-S	1.2	U/E	0.9	U/E	1.3	U/E	1.7	U/E	1.1	U/E
RM 29	5-S	1.5	U/E	1.2	U/E	1.3	U/E	1.9	U/E	1.6	U/E
RM 36	6-S	1.3	U/E	1.2	U/E	0.9	U/E	1.2	U/E	0.5	U/E
RM 59	7-S	1.5	U/E	1.3	U/E	1.5	U/E	2.1	U/E	1.7	U/E
RM 68	8-S	1.5	U/E	1.1	U/E	0.9	U/E	1.2	U/E	0.9	U/E
RM 81	9-1-S	1.8	U/E	1.5	U/E	1.1	U/E	1.5	U/E	0.7	U/E
RM 81	9-2-S	1.6	U/E	1.5	U/E	2.1	U/E	2.8	U/E	4.3	U/E
RM 81	9-3-S	1.8	U/E	1.3	U/E	1.5	U/E	2.3	U/E	2.4	U/E
RM 88	10-S	2.1	U/E	1.3	U/E	2.2	U/E	3.0	U/E	1.7	U/E
RM 90	11-S	1.7	U/E	1.2	U/E	1.9	U/E	0.3	U/E	4.0	U/E
RM 95	12-S	1.9	U/E	1.6	U/E	1.1	U/E	1.6	U/E	1.0	U/E
RM 120	13-S	1.6	U/E	1.3	U/E	1.1	U/E	1.9	U/E	1.1	U/E
RM 124	14-S	2.2	U/E	1.8	U/E	1.1	U/E	1.9	U/E	1.6	U/E
RM 141	15-S	2.2	U/E	1.8	U/E	1.5	U/E	2.2	U/E	3.5	U/E
Benthos Reference Values[a]		na **		na **		na **		na **		na **	
Wildlife Reference Values[o]		na **		na **		na **		na **		na **	
Human Health Reference Values[1]		na **		na **		na **		na **		na **	

S = Sediment sample

RM = River mile

U = Compound was not detected. The value given is the lower quantification limit.

E = Estimated value.

U/B = Compound was not detected due to blank contamination.

* = TOC-normalized value only given when a compound is detected.

** = Sediment criteria for New York state 1993 (draft) not available.

[a] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.

[o] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).

[1] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).

[2] Toxicity Equivalency Concentrations calculated using Barnes et al. (1989).

[3] Toxicity Equivalency Concentration calculations assumes that the concentration for undetected compounds is equal to half the lower detection limit.

[0] Toxicity Equivalency Concentration calculations assumes that the concentration for undetected compounds is equal to zero.

TABLE C-8. DIOXINS AND FURANS IN SEDIMENT (page 4 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	2,3,7,8-TCDD Toxicity Equivalency Concentrations[2] TECs[3] (ng/kg)	TOC Norm. TECs[3] (µg/g C)	TECs[4] (ng/kg)	TOC Norm. TECs[4] (µg/g C)
RM 14	1-S	**1.5895**	**0.00008**	**0.0132**	**0.0000006**
RM 21	2-S	**0.7269**	**0.00004**	0	0
RM 23	3-S	**0.7621**	**0.00006**	0	0
RM 26	4-S	**1.0395**	**0.00007**	**0.0104**	**0.0000007**
RM 29	5-S	**1.2087**	**0.00008**	**0.0119**	**0.0000008**
RM 36	6-S	**0.9257**	**0.00003**	0	0
RM 59	7-S	**1.8101**	**0.00016**	**0.0152**	**0.0000014**
RM 68	8-S	**1.1192**	**0.00005**	0	0
RM 81	9-1-S	**1.5244**	**0.00005**	0	0
RM 81	9-2-S	**1.8069**	**0.00006**	0	0
RM 81	9-3-S	**1.3595**	**0.00004**	0	0
RM 88	10-S	**1.1694**	**0.00004**	**0.1025**	**0.0000039**
RM 90	11-S	**1.0360**	**0.00016**	0	0
RM 95	12-S	**1.1614**	**0.00006**	0	0
RM 120	13-S	**1.1826**	**0.00008**	0	0
RM 124	14-S	**1.2575**	**0.00003**	**0.0127**	**0.0000003**
RM 141	15-S	**1.2665**	**0.00013**	**0.0347**	**0.0000037**
Benthos Reference Values[a]		na**		na**	
Wildlife Reference Values[o]			0.0002		0.0002
Human Health Reference Values[l]			0.01		0.01

S = Sediment sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
U/B = Compound was not detected due to blank contamination.
* = TOC-normalized value only given when a compound is detected.
** = Sediment criteria for New York state 1993 (draft) not available.
[a] Reference values are from the New York State draft sediment criteria (Newell and Sinnott 1993) for the protection of benthic organisms.
[o] New York State draft criteria for the protection of wildlife (Newell and Sinnott 1993).
[l] New York State draft criteria for the protection of human health (Newell and Sinnott 1993).
[2] Toxicity Equivalency Concentrations calculated using Barnes et al. (1989).
[3] Toxicity Equivalency Concentration calculations assumes that the concentration for undetected compounds is equal to half the lower detection limit.
[4] Toxicity Equivalency Concentration calculations assumes that the concentration for undetected compounds is equal to zero.

TABLE C-9. POLYBUTYL TINS IN SEDIMENT
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLY-BUTYL TINS								
		n-Butyltin trichloride			di-n-Butyltin dichloride			tri-n-Butyltin chloride		
		Conc. (µg Sn/kg)	TOC Norm. * Conc. (µg Sn/g C)		Conc. (µg Sn/kg)	TOC Norm. * Conc. (µg Sn/g C)		Conc. (µg Sn/kg)	TOC Norm. Conc. (µg Sn/g C)	
RM 14	1-S	7.2	0.8	P	2.6		U	3.2		U
RM 21	2-S	1.7		U	2.6		U	4.0	0.2	P
RM 23	3-S	8.5	0.7		7.2	0.6		13.6	1.0	
RM 26	4-S	8.1	0.5		6.6	0.4	P	12.8	0.9	P
RM 29	5-S	14.5	1.0		12.4	0.8		34.4	2.3	
RM 36	6-S	6.8	0.2		2.6		U	6.4	0.2	
RM 59	7-S	5.1	0.5		2.6		U	3.2		U
RM 68	8-S	3.4		U/B	4.6	0.2		7.2	0.3	
RM 81	9-1-S	1.7		U	2.6		U	3.2		U
RM 81	9-2-S	1.7		U	2.6		U	3.2		U
RM 81	9-3-S	1.7		U	2.6		U	7.2	0.2	
RM 88	10-S	3.0		U/B/E	2.6		U/E	4.8	0.2	E
RM 90	11-S	1.7		U	2.6		U	4.0	0.6	
RM 95	12-S	1.7		U	2.6		U	6.4	0.4	P
RM 120	13-S	1.7		U	2.6		U	2.4	0.2	P
RM 124	14-S	1.7		U	2.6		U	3.2		U
RM 141	15-S	1.7		U	2.6		U	4.8	0.5	
Effects-based Reference Levels		na **			na **			na **		

Note: Sediment data are reported on a dry-weight basis.

S = Sediment sample.
U = Compound was not detected. Value given is the lower quantification limit.
U/B = Undetected due to blank contamination.
P = Concentration difference between two columns greater than 25 percent.
E = Estimated value.
RM = River mile.

* TOC-normalized data given when compound is detected.
** Effects-based reference level not available.

TABLE C-10. RADIONUCLIDES IN SEDIMENT
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	RADIONUCLIDES																													
		Plutonium 239/240				Plutonium 238				Americium 241				Cobalt 60				Cesium 137				Europium 152		Europium 154		Europium 155	
		(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)	error	LLD		(pCi/g)		error	LLD	(pCi/g)	LLD	(pCi/g)	LLD	(pCi/g)	LLD
RM 14	1-S	**0.007**		**±0.006**	**0.005**	0.001	U	±0.001	0.014	-0.003	U	±0.007	0.012	U		0.02		**0.071**		**±0.010**	**0.02**	U	0.20	U	0.20	U	0.05
RM 21	2-S	0.004	U	±0.004	0.004	-0.001	U	±0.004	0.009	0.000	U	±0.006	0.013	U		0.02		**0.053**		**±0.008**	**0.02**	U	0.20	U	0.20	U	0.05
RM 23	3-S	0.001	U	±0.003	0.004	-0.001	U	±0.004	0.008	-0.002	U	±0.010	0.018	U		0.02		**0.065**		**±0.009**	**0.02**	U	0.20	U	0.20	U	0.05
RM 26	4-S	**0.004**		**±0.004**	**0.003**	-0.001	U	±0.005	0.010	-0.010	U	±0.010	0.02	U		0.02		**0.083**		**±0.010**	**0.02**	U	0.20	U	0.20	U	0.05
RM 29	5-S	0.003	U	±0.003	0.003	0.000	U	±0.004	0.008	0.000	U	±0.008	0.016	U		0.02		**0.078**		**±0.010**	**0.02**	U	0.20	U	0.20	U	0.05
RM 36	6-S	**0.009**		**±0.005**	**0.005**	0.002	U	±0.006	0.010	-0.003	U	±0.007	0.013	U		0.02		**0.110**		**±0.010**	**0.02**	U	0.20	U	0.20	U	0.05
RM 59	7-S	0.001	U	±0.003	0.004	-0.001	U	±0.004	0.008	-0.008	U	±0.006	0.012	U		0.02		**0.050**		**±0.009**	**0.02**	U	0.20	U	0.20	U	0.05
RM 68	8-S	**0.007**		**±0.005**	**0.003**	0.000	U	±0.006	0.011	0.003	U	±0.010	0.016	**0.022**	**±0.008**	**0.02**		**0.155**		**±0.016**	**0.02**	U	0.20	U	0.20	U	0.05
RM 81	9-1-S	**0.007**		**±0.004**	**0.004**	-0.002	U	±0.004	0.009	-0.006	U	±0.005	0.011	U		0.02		**0.164**		**±0.015**	**0.02**	U	0.20	U	0.20	U	0.05
RM 81	9-2-S	0.003	U	±0.003	0.004	0.001	U	±0.004	0.007	-0.003	U	±0.011	0.019	U		0.02		**0.174**		**±0.015**	**0.02**	U	0.20	U	0.20	U	0.05
RM 81	9-3-S	**0.005**		**±0.004**	**0.004**	-0.001	U	±0.004	0.007	-0.006	U	±0.010	0.019	U		0.02		**0.165**		**±0.014**	**0.02**	U	0.20	U	0.20	U	0.05
RM 88	10-S	**0.004**		**±0.004**	**0.003**	0.005	U	±0.006	0.009	-0.004	U	±0.009	0.017	U		0.02		**0.094**		**±0.010**	**0.02**	U	0.20	U	0.20	U	0.05
RM 90	11-S	0.001	U	±0.002	0.003	-0.001	U	±0.005	0.010	0.000	U	±0.010	0.016	U		0.02		**0.081**		**±0.012**	**0.02**	U	0.20	U	0.20	U	0.05
RM 95	12-S	**0.010**		**±0.005**	**0.003**	-0.001	U	±0.004	0.009	-0.008	U	±0.008	0.015	U		0.02		**0.176**		**±0.015**	**0.02**	U	0.20	U	0.20	U	0.05
RM 120	13-S	0.002	U	±0.003	0.004	-0.004	U	±0.004	0.008	-0.002	U	±0.012	0.021	U		0.02		**0.082**		**±0.010**	**0.02**	U	0.20	U	0.20	U	0.05
RM 124	14-S	0.003	U	±0.004	0.005	-0.001	U	±0.004	0.008	0.001	U	±0.009	0.014	**0.012**	**±0.006**	**0.02**		**0.119**		**±0.012**	**0.02**	U	0.20	U	0.20	U	0.05
RM 141	15-S	0.005	U	±0.007	0.009	-0.002	U	±0.006	0.012	**0.069**		**±0.028**	**0.026**	**0.019**	**±0.005**	**0.02**		**0.143**		**±0.013**	**0.02**	U	0.20	U	0.20	U	0.05
RM 141	15-S-1R[1]									-0.006	U	±0.013	0.026														
RM 141	15-S-2R[1]									-0.001	U	±0.013	0.024														
Effects-Based Reference Levels		na*				na*				na*				na*				na*				na*		na*		na*	

S = Sediment sample

RM = River mile

R[1] = Results of reanalysis of sample 15-S for americium-241.

U = Compound was not detected. The value is the lower quantification limit.

LLD = Lower limit of detection.

* Effects-based reference levels are not available.

APPENDIX D.

CRAYFISH TISSUE BIOACCUMULATION DATA

D-1. CRAYFISH LIPID AND SIZE DATA

D-2. METALS IN CRAYFISH WHOLE-BODY COMPOSITES

D-3. SEMIVOLATILES IN CRAYFISH WHOLE-BODY COMPOSITES

D-4. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES

D-5. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES

D-6. POLYBUTYL TINS IN CRAYFISH WHOLE-BODY COMPOSITES

D-7. RADIONUCLIDES IN CRAYFISH WHOLE-BODY COMPOSITES

TABLE D-1. CRAYFISH LIPID AND SIZE DATA
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	Latitude	Longitude	Number of Individuals in Composite	Percent Lipid	Average Weight (grams)	Minimum Weight (grams)	Maximum Weight (grams)
RM 21	2-CF	46° 10' 36.7"	123° 41' 59.4"	15	1.6	59.0	29.9	91.4
RM 23	3-CF	46° 10' 29.4"	123° 39' 53.5"	19	2.0	42.3	19.2	85.3
RM 26	4-CF	46° 12' 00.7"	123° 35' 11.3"	15	1.8	56.6	28.0	98.9
RM 29	5-CF	46° 13' 25.6"	123° 33' 07.0"	21	0.8	39.3	16.8	95.9
RM 36	6-CF	46° 13' 28.3"	123° 24' 04.4"	13	1.0	32.3	5.6	100.0
RM 59	7-CF	46° 10' 11.3"	123° 04' 14.3"	15	0.8	33.0	16.1	51.1
RM 68	8-CF	46° 03' 28.1"	122° 52' 05.8"	13	1.0	39.4	5.0	93.5
RM 81	9-CF	45° 56' 14.2"	122° 47' 12.1"	15	1.2	33.5	14.2	64.3
RM 88	10-CF	45° 49' 35.8"	122° 49' 56.0"	15	0.6	57.3	21.3	117.8
RM 90	11-CF	45° 49' 29.6"	122° 45' 31.2"	15	1.8	92.1	48.3	137.7
RM 95	12-CF	45° 44' 25.6"	122° 46' 22.4"	12	2.0	43.2	14.6	79.2
RM 120	13-1-CF	45° 34' 42.4"	122° 25' 16.1"	13	2.0	58.3	9.9	114.0
RM 120	13-2-CF	45° 34' 42.4"	122° 25' 16.1"	13	1.4	59.0	32.9	115.8
RM 120	13-3-CF	45° 34' 42.4"	122° 25' 16.1"	13	1.4	50.4	18.5	86.9
RM 124	14-CF	45° 32' 50.8"	122° 20' 21.6"	8	2.2	47.1	21.8	77.4

TABLE D-2. METALS IN CRAYFISH WHOLE-BODY COMPOSITES
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	METALS																					
		Antimony		Arsenic		Barium	Cadmium	Chromium		Copper	Lead		Mercury		Nickel		Selenium		Silver		Zinc	
		Conc. (mg/kg)		Conc. (mg/kg)		Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)		Conc. (mg/kg)	Conc. (mg/kg)		Conc. (mg/kg)		Conc. (mg/kg)		Conc. (mg/kg)		Conc. (mg/kg)		Conc. (mg/kg)	
RM 21	2-CF	0.012		0.036	U/E	31.5	0.047	0.079	E	29.3	0.148	E	0.065		0.56		0.045	E	0.103		32.3	E
RM 23	3-CF	0.012	U	0.036	U/E	31.0	0.043	0.055		31.1	0.108	E	0.049	U/B	0.83		0.036	U/E	0.057	E	28.5	E
RM 26	4-CF	0.012	U	0.036	U	38.5	0.037	0.056		21.8	0.145	E	0.029		0.10	U	0.036	U/E	0.070		30.2	E
RM 29	5-CF	0.011	U	0.033	U	8.5	0.029	0.035		20.9	0.174	E	0.048		0.24		0.033	U/E	0.062		31.4	E
RM 36	6-CF	0.012	U	0.036	U	31.2	0.027	0.089		22.3	0.113	E	0.044		0.10	U	0.036	U	0.028	E	35.5	E
RM 59	7-CF	0.012	U	0.036	U	47.2	0.038	0.089		24.2	0.096	E	0.045	U/B	1.33		0.036	U	0.018		33.9	E
RM 68	8-CF	0.012	U	0.035	U	35.6	0.0004	U	0.088		14.9	0.174	E	0.081		0.29		0.035	U	0.004	U	31.9	E
RM 81	9-CF	0.015	U	0.046	U	24.4	0.042	0.095		18.5	0.168	E	0.055		0.64	E	0.046	U	0.043	E	83.3	E
RM 88	10-CF	0.015		0.036		36.9	0.027	0.093		15.9	0.124	E	0.039		0.36		0.047	E	0.057		33.6	E
RM 90	11-CF	0.012	U	0.036	U/E	11.1	0.021	0.077		24.7	0.048	U/B	0.029		1.23		0.036	U/E	0.025		37.8	E
RM 95	12-CF	0.012	U	0.036	U	33.5	0.053	0.090		21.8	0.163	E	0.032		0.68		0.036	U/E	0.091		35.2	E
RM 120	13-1-CF	0.014		0.035	U/E	31.5	0.026	0.063		20.0	0.114	E	0.045		0.69		0.035	U/E	0.035		31.2	E
RM 120	13-2-CF	0.018		0.038	U/E	32.3	0.030	0.066		18.1	0.141	E	0.050		0.40		0.038	U/E	0.035	E	24.6	E
RM 120	13-3-CF	0.013		0.035	U/E	29.0	0.033	0.074		20.1	0.148	E	0.034		0.53		0.035	U/E	0.053		31.4	E
RM 124	14-CF	0.017		0.036	U/E	27.6	0.051	0.063		21.8	0.444	E	0.052		0.46		0.044	E	0.054		55.7	E
Wildlife Reference Value[1]		na*		na*		na*	na*	na*		na*	na*		na*		na*		na*		na*		na*	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was undetected. Value given is the lower quantification limit.
E = Estimated value
U/B = Undetected due to blank contamination.
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 1 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHENOLS															
		Phenol			2-Methylphenol			4-Methylphenol			2,4-Dimethylphenol			Pentachlorophenol			
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	94		U	94		U	94		U	94		U	470		U
RM 23	3-CF	94		U	94		U	94		U	94		U	470		U
RM 26	4-CF	94		U	94		U	94		U	94		U	470		U
RM 29	5-CF	**530**	**66.3**		94		U	94		U	94		U	470		U
RM 36	6-CF	**690**	**69.0**		96		U	96		U	96		U	480		U
RM 59	7-CF	**240**	**30.0**		99		U	99		U	99		U	500		U
RM 68	8-CF	99		U	99		U	99		U	99		U	500		U
RM 81	9-CF	**130**	**10.8**		96		U	**56**	**4.7**	**J/M**	96		U	480		U
RM 88	10-CF	**100**	**16.7**		93		U	93		U	93		U	460		U
RM 90	11-CF	98		U	98		U	98		U	98		U	490		U
RM 95	12-CF	95		U	95		U	95		U	95		U	470		U
RM 120	13-1-CF	99		U	99		U	99		U	99		U	490		U
RM 120	13-2-CF	98		U	98		U	98		U	98		U	490		U
RM 120	13-3-CF	98		U	98		U	98		U	98		U	490		U
RM 124	14-CF	99		U	99		U	99		U	99		U	500		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **			

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 2 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHENOLS (cont.)									
		2-Chlorophenol		2,4-Dichlorophenol		4-Chloro-3-methylphenol		2,4-Dinitrophenol		2-Nitrophenol	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	94 U		280 U		190 U		470 U		470 U	
RM 23	3-CF	94 U		280 U		190 U		470 U		470 U	
RM 26	4-CF	94 U		280 U		190 U		470 U		470 U	
RM 29	5-CF	94 U		280 U		190 U		470 U		470 U	
RM 36	6-CF	96 U		290 U		190 U		480 U		480 U	
RM 59	7-CF	99 U		300 U		200 U		500 U		500 U	
RM 68	8-CF	99 U		300 U		200 U		500 U		500 U	
RM 81	9-CF	96 U		290 U		190 U		480 U		480 U	
RM 88	10-CF	93 U		280 U		190 U		460 U		460 U	
RM 90	11-CF	98 U		290 U		200 U		490 U		490 U	
RM 95	12-CF	95 U		280 U		190 U		470 U		470 U	
RM 120	13-1-CF	99 U		300 U		200 U		490 U		490 U	
RM 120	13-2-CF	98 U		290 U		200 U		490 U		490 U	
RM 120	13-3-CF	98 U		290 U		200 U		490 U		490 U	
RM 124	14-CF	99 U		300 U		200 U		500 U		500 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 3 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHENOLS (cont.) 4-Nitrophenol Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	2,4,5-Trichlorophenol Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	2,4,6-Trichlorophenol Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	4,6-Dinitro-2-methylphenol Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	HALOGENATED ETHERS bis(2-Chloroethyl)ether Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	470 U		470 U		470 U		940 U		94 U	
RM 23	3-CF	470 U		470 U		470 U		940 U		94 U	
RM 26	4-CF	470 U		470 U		470 U		940 U		94 U	
RM 29	5-CF	470 U		470 U		470 U		940 U		94 U	
RM 36	6-CF	480 U		480 U		480 U		960 U		96 U	
RM 59	7-CF	500 U		500 U		500 U		990 U		99 U	
RM 68	8-CF	500 U		500 U		500 U		990 U		99 U	
RM 81	9-CF	480 U		480 U		480 U		960 U		96 U	
RM 88	10-CF	460 U		460 U		460 U		930 U		93 U	
RM 90	11-CF	490 U		490 U		490 U		980 U		98 U	
RM 95	12-CF	470 U		470 U		470 U		950 U		95 U	
RM 120	13-1-CF	490 U		490 U		490 U		990 U		99 U	
RM 120	13-2-CF	490 U		490 U		490 U		980 U		98 U	
RM 120	13-3-CF	490 U		490 U		490 U		980 U		98 U	
RM 124	14-CF	500 U		500 U		500 U		990 U		99 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 4 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	HALOGENATED ETHERS (cont.)							
		bis(2-Chloroethoxy)methane		4-Bromophenyl-phenylether		4-Chlorophenyl-phenylether		2,2'-Oxybis(1-chloropropane)	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	94 U		94 U		94 U		94 U	
RM 23	3-CF	94 U		94 U		94 U		94 U	
RM 26	4-CF	94 U		94 U		94 U		94 U	
RM 29	5-CF	94 U		94 U		94 U		94 U	
RM 36	6-CF	96 U		96 U		96 U		96 U	
RM 59	7-CF	99 U		99 U		99 U		99 U	
RM 68	8-CF	99 U		99 U		99 U		99 U	
RM 81	9-CF	96 U		96 U		96 U		96 U	
RM 88	10-CF	93 U		93 U		93 U		93 U	
RM 90	11-CF	98 U		98 U		98 U		98 U	
RM 95	12-CF	95 U		95 U		95 U		95 U	
RM 120	13-1-CF	99 U		99 U		99 U		99 U	
RM 120	13-2-CF	98 U		98 U		98 U		98 U	
RM 120	13-3-CF	98 U		98 U		98 U		98 U	
RM 124	14-CF	99 U		99 U		99 U		99 U	
Wildlife Reference Level[1]		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 5 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		NITROAROMATICS									
		2,4-Dinitrotoluene		2,6-Dinitrotoluene		Nitrobenzene		2-Nitroaniline		3-Nitroaniline	
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	470 U		470 U		94 U		470 U		470 U	
RM 23	3-CF	470 U		470 U		94 U		470 U		470 U	
RM 26	4-CF	470 U		470 U		94 U		470 U		470 U	
RM 29	5-CF	470 U		470 U		94 U		470 U		470 U	
RM 36	6-CF	480 U		480 U		96 U		480 U		480 U	
RM 59	7-CF	500 U		500 U		99 U		500 U		500 U	
RM 68	8-CF	500 U		500 U		99 U		500 U		500 U	
RM 81	9-CF	480 U		480 U		96 U		480 U		480 U	
RM 88	10-CF	460 U		460 U		93 U		460 U		460 U	
RM 90	11-CF	490 U		490 U		98 U		490 U		490 U	
RM 95	12-CF	470 U		470 U		95 U		470 U		470 U	
RM 120	13-1-CF	490 U		490 U		99 U		490 U		490 U	
RM 120	13-2-CF	490 U		490 U		98 U		490 U		490 U	
RM 120	13-3-CF	490 U		490 U		98 U		490 U		490 U	
RM 124	14-CF	500 U		500 U		99 U		500 U		500 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 6 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	NITROAROMATICS (cont.) 4-Nitroaniline Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		POLYNUCLEAR AROMATIC HYDROCARBONS Acenaphthene Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		Acenaphthylene Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		Anthracene Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		Benzo(a)anthracene Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	470	U			9.4	U			9.4	U			9.4	U			9.4	U		
RM 23	3-CF	470	U			9.4	U			9.4	U			9.4	U			9.4	U		
RM 26	4-CF	470	U			9.4	U			9.4	U			9.4	U			9.4	U		
RM 29	5-CF	470	U			9.4	U			9.4	U			9.4	U			9.4	U		
RM 36	6-CF	480	U			9.6	U			9.6	U			9.6	U			9.6	U		
RM 59	7-CF	500	U			9.9	U			9.9	U			9.9	U			9.9	U		
RM 68	8-CF	500	U			7.3	0.7	J		9.9	U			9.9	U			9.9	U		
RM 81	9-CF	480	U			9.6	U			9.6	U			9.6	U			9.6	U		
RM 88	10-CF	460	U			9.3	U			9.3	U			9.3	U			9.3	U		
RM 90	11-CF	490	U			9.8	U			9.8	U			9.8	U			9.8	U		
RM 95	12-CF	470	U			9.5	U			9.5	U			9.5	U			9.5	U		
RM 120	13-1-CF	490	U			9.9	U			9.9	U			9.9	U			9.9	U		
RM 120	13-2-CF	490	U			9.8	U			9.8	U			9.8	U			9.8	U		
RM 120	13-3-CF	490	U			9.8	U			9.8	U			9.8	U			9.8	U		
RM 124	14-CF	500	U			9.9	U			9.9	U			9.9	U			9.9	U		
Wildlife Reference Level[1]		na **				na **				na **				na **				na **			

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 7 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)									
		Benzo(b,k)fluoranthene		Benzo(a)pyrene		Benzo(ghi)perylene		Chrysene		Dibenzo(a,h)anthracene	
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	9.4 U		9.4 U		9.4 U		9.4 U		9.4 U	
RM 23	3-CF	9.4 U		9.4 U		9.4 U		9.4 U		9.4 U	
RM 26	4-CF	9.4 U		9.4 U		9.4 U		9.4 U		9.4 U	
RM 29	5-CF	9.4 U		9.4 U		9.4 U		9.4 U		9.4 U	
RM 36	6-CF	9.6 U		9.6 U		9.6 U		9.6 U		9.6 U	
RM 59	7-CF	9.9 U		9.9 U		9.9 U		9.9 U		9.9 U	
RM 68	8-CF	9.9 U		9.9 U		9.9 U		9.9 U		9.9 U	
RM 81	9-CF	9.6 U		9.6 U		9.6 U		9.6 U		9.6 U	
RM 88	10-CF	9.3 U		9.3 U		9.3 U		9.3 U		9.3 U	
RM 90	11-CF	9.8 U		9.8 U		9.8 U		9.8 U		9.8 U	
RM 95	12-CF	9.5 U		9.5 U		9.5 U		9.5 U		9.5 U	
RM 120	13-1-CF	9.9 U		9.9 U		9.9 U		9.9 U		9.9 U	
RM 120	13-2-CF	9.8 U		9.8 U		9.8 U		9.8 U		9.8 U	
RM 120	13-3-CF	9.8 U		9.8 U		9.8 U		9.8 U		9.8 U	
RM 124	14-CF	9.9 U		9.9 U		9.9 U		9.9 U		9.9 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 8 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)											
		Fluoranthene		Fluorene		Indeno(1,2,3-cd)pyrene		Naphthalene			Phenanthrene		
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	9.4	U	9.4	U	9.4	U	4.7		U/B	9.4		U
RM 23	3-CF	11.0	U	9.4	U	9.4	U	7.5		U/B	9.4		U
RM 26	4-CF	9.4	U	9.4	U	9.4	U	**15.0**	**0.8**		9.4		U
RM 29	5-CF	9.4	U	9.4	U	9.4	U	**17.0**	**2.1**		9.4		U
RM 36	6-CF	9.6	U	9.6	U	9.6	U	**13.0**	**1.3**		9.6		U
RM 59	7-CF	9.9	U	9.9	U	9.9	U	6.9		U/B	9.9		U
RM 68	8-CF	9.9	U	**5.3**	**0.5** J	9.9	U	6.4		U/B	**7.7**	**0.8**	J
RM 81	9-CF	9.6	U	9.6	U	9.6	U	**57.0**	**4.8**		9.6		U
RM 88	10-CF	9.3	U	9.3	U	9.3	U	**12.0**	**2.0**		9.3		U
RM 90	11-CF	9.8	U	9.8	U	9.8	U	4.4		U/B	9.8		U
RM 95	12-CF	9.5	U	9.5	U	9.5	U	**9.5**	**0.5**		9.5		U
RM 120	13-1-CF	9.9	U	9.9	U	9.9	U	9.9		U/B	9.9		U
RM 120	13-2-CF	10.0	U	9.8	U	9.8	U	9.8		U/B	9.8		U
RM 120	13-3-CF	9.8	U	9.8	U	9.8	U	9.8		U/B	9.8		U
RM 124	14-CF	9.9	U	9.9	U	9.9	U	**20.0**	**0.9**		9.9		U
Wildlife Reference Level[1]		na **		na **		na **		na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 9 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)									NAPHTHALENES		CHLORINATED BENZENES	
		Pyrene		2-Methylnaphthalene			Dibenzofuran				2-Chloronaphthalene		1,3-Dichlorobenzene	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)			Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	9.4	U	5.5	0.3	M	9.4		U		94	U	94	U
RM 23	3-CF	9.4	U	7.4	0.4	M	9.4		U		94	U	94	U
RM 26	4-CF	9.4	U	14.0	0.8		9.4		U		94	U	94	U
RM 29	5-CF	9.4	U	20.0	2.5		9.4		U		94	U	94	U
RM 36	6-CF	9.6	U	12.0	1.2		9.6		U		96	U	96	U
RM 59	7-CF	9.9	U	7.7	1.0		9.9		U		99	U	99	U
RM 68	8-CF	9.9	U	5.6		U/B	3.6	0.4	M		99	U	99	U
RM 81	9-CF	9.6	U	16.0	1.3		9.6		U		96	U	96	U
RM 88	10-CF	9.3	U	14.0	2.3		9.3		U		93	U	93	U
RM 90	11-CF	9.8	U	5.7		U/B	9.8		U		98	U	98	U
RM 95	12-CF	9.5	U	5.3	0.3	M	9.5		U		95	U	95	U
RM 120	13-1-CF	9.9	U	9.9	0.5		9.9		U		99	U	99	U
RM 120	13-2-CF	9.8	U	9.8	0.7		9.8		U		98	U	98	U
RM 120	13-3-CF	9.8	U	9.8	0.7		9.8		U		98	U	98	U
RM 124	14-CF	9.9	U	17.0	0.8		9.9		U		99	U	99	U
Wildlife Reference Level[1]		na **		na **			na **				na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 10 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	CHLORINATED BENZENES (cont.)									
		1,2-Dichlorobenzene		1,4-Dichlorobenzene		1,2,4-Trichlorobenzene		Hexachlorobenzene		Hexachlorobutadiene	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	94 U		94 U		94 U		94 U		94 U	
RM 23	3-CF	94 U		94 U		94 U		94 U		94 U	
RM 26	4-CF	94 U		94 U		94 U		94 U		94 U	
RM 29	5-CF	94 U		94 U		94 U		94 U		94 U	
RM 36	6-CF	96 U		96 U		96 U		96 U		96 U	
RM 59	7-CF	99 U		99 U		99 U		99 U		99 U	
RM 68	8-CF	99 U		99 U		99 U		99 U		99 U	
RM 81	9-CF	96 U		96 U		96 U		96 U		96 U	
RM 88	10-CF	93 U		93 U		93 U		93 U		93 U	
RM 90	11-CF	98 U		98 U		98 U		98 U		98 U	
RM 95	12-CF	95 U		95 U		95 U		95 U		95 U	
RM 120	13-1-CF	99 U		99 U		99 U		99 U		99 U	
RM 120	13-2-CF	98 U		98 U		98 U		98 U		98 U	
RM 120	13-3-CF	98 U		98 U		98 U		98 U		98 U	
RM 124	14-CF	99 U		99 U		99 U		99 U		99 U	
Wildlife Reference Level[1]		na **		na **		1300		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 11 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	CHLORINATED BENZENES (cont.)				BENZIDINES		PHTHALATE ESTERS			
		Hexachloroethane		Hexachlorocyclopentadiene		3,3'-Dichlorobenzidine		Dimethyl phthalate		Diethyl phthalate	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	94 U		470 U		470 U		94 U		94 U	
RM 23	3-CF	94 U		470 U		470 U		94 U		94 U	
RM 26	4-CF	94 U		470 U		470 U		94 U		94 U	
RM 29	5-CF	94 U		470 U		470 U		94 U		94 U	
RM 36	6-CF	96 U		480 U		480 U		96 U		96 U	
RM 59	7-CF	99 U		500 U		500 U		99 U		99 U	
RM 68	8-CF	99 U		500 U		500 U		99 U		99 U	
RM 81	9-CF	96 U		480 U		480 U		96 U		96 U	
RM 88	10-CF	93 U		460 U		460 U		93 U		93 U	
RM 90	11-CF	98 U		490 U		490 U		98 U		98 U	
RM 95	12-CF	95 U		470 U		470 U/E		95 U		95 U	
RM 120	13-1-CF	99 U		490 U		490 U		99 U		99 U	
RM 120	13-2-CF	98 U		490 U		490 U		98 U		98 U	
RM 120	13-3-CF	98 U		490 U		490 U		98 U		98 U	
RM 124	14-CF	99 U		500 U		500 U		99 U		99 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 12 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHTHALATE ESTERS (cont.)							
		Di-n-butyl phthalate		Benzyl butyl phthalate		bis(2-Ethyl-hexyl)phthalate		Di-n-octyl phthalate	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	2200 U		4700 U		1000 U		94 U	
RM 23	3-CF	2000 U		7400 U		970 U		94 U/E	
RM 26	4-CF	840 U		4100 U		330 U		94 U	
RM 29	5-CF	240	30	5200 U		320 U		94 U	
RM 36	6-CF	660 U		4600 U		820 U		96 U	
RM 59	7-CF	830 U		2500 U		760 U		99 U	
RM 68	8-CF	910 U		2300 U		660 U		99 U	
RM 81	9-CF	260 U		3000 U		640 U		96 U	
RM 88	10-CF	1400 U		5200 U		320 U		93 U	
RM 90	11-CF	960 U		2200 U		290 U		98 U	
RM 95	12-CF	3100 U		7100 U/E		1100 U/E		95 U/E	
RM 120	13-1-CF	730 U		1900 U		110 U		99 U	
RM 120	13-2-CF	1100 U		2700 U		480 U		98 U	
RM 120	13-3-CF	690 U		2100 U		98 U		98 U	
RM 124	14-CF	1400 U		2600 U		99 U		99 U	
Wildlife Reference Level[1]		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-3. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 13 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	MISCELLANEOUS											
		Carbazole		Benzyl Alcohol			Benzoic Acid		Isophorone		4-Chloroaniline		
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	94	U	94		U	94	U	94	U	280		U
RM 23	3-CF	94	U	94		U	94	U	94	U	280		U
RM 26	4-CF	94	U	94		U	94	U	94	U	280		U
RM 29	5-CF	94	U	94		U	94	U	94	U	280		U
RM 36	6-CF	96	U	96		U	96	U	96	U	290		U
RM 59	7-CF	99	U	99		U	99	U	99	U	300		U
RM 68	8-CF	99	U	99		U	99	U	99	U	300		U
RM 81	9-CF	96	U	59	4.9	J/M	96	U	96	U	290		U
RM 88	10-CF	93	U	93		U	93	U	93	U	280		U
RM 90	11-CF	98	U	68	3.8	J/M	98	U	98	U	290		U
RM 95	12-CF	95	U	95		U	95	U	95	U	280		U
RM 120	13-1-CF	99	U	99		U	99	U	99	U	300		U
RM 120	13-2-CF	98	U	98		U	98	U	98	U	290		U
RM 120	13-3-CF	98	U	98		U	98	U	98	U	290		U
RM 124	14-CF	99	U	99		U	99	U	99	U	300		U
Wildlife Reference Level[1]		na **		na **			na **		na **		na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-4. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 1 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES									
		Alpha-BHC		Beta-BHC		Delta-BHC		Lindane		Heptachlor	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 23	3-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 26	4-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 29	5-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 36	6-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 59	7-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 68	8-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 81	9-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 88	10-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 90	11-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 95	12-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 120	13-1-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 120	13-2-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 120	13-3-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
RM 124	14-CF	2.5	U	2.5	U	2.5	U/E	2.5	U	2.5	U
Wildlife Reference Levels[1]		100		100		100		100		na **	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-4. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 2 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.) Aldrin Conc. (µg/kg)	Aldrin Norm.* Conc. (µg/g lipid)		Heptachlor Epoxide Conc. (µg/kg)	Heptachlor Epoxide Norm.* Conc. (µg/g lipid)		Endosulfan I Conc. (µg/kg)	Endosulfan I Norm.* Conc. (µg/g lipid)		Dieldrin Conc. (µg/kg)	Dieldrin Norm.* Conc. (µg/g lipid)		p,p'-DDE Conc. (µg/kg)	p,p'-DDE Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	2.5		U	2.5		U	2.5		U	5		U	6.0	0.4	
RM 23	3-CF	2.5		U	2.5		U	2.5		U	5		U	3.8	0.2	E
RM 26	4-CF	2.5		U	2.5		U	2.5		U	5		U	3.5	0.2	E
RM 29	5-CF	2.5		U	2.5		U	2.5		U	5		U	4.5	0.6	E
RM 36	6-CF	2.5		U	2.5		U	2.5		U	5		U	3.5	0.4	E
RM 59	7-CF	2.5		U	2.5		U	2.5		U	5		U	5.0		U
RM 68	8-CF	2.5		U	2.5		U	2.5		U	5		U	2.8	0.3	E
RM 81	9-CF	2.5		U	2.5		U	2.5		U	5		U	3.0	0.3	E
RM 88	10-CF	2.5		U	2.5		U	2.5		U	5		U	2.4	0.4	E
RM 90	11-CF	2.5		U	2.5		U	2.5		U	5		U	9.3	0.5	
RM 95	12-CF	2.5		U	2.5		U	2.5		U	5		U	10.0	0.5	
RM 120	13-1-CF	2.5		U	2.5		U	2.5		U	5		U	10.0	0.5	
RM 120	13-2-CF	2.5		U	2.5		U	2.5		U	5		U	13.0	0.9	
RM 120	13-3-CF	2.5		U	2.5		U	2.5		U	5		U	12.0	0.9	
RM 124	14-CF	2.5		U	2.5		U	2.5		U	5		U	14.0	0.6	
Wildlife Reference Levels[1]		120			na **			na **			120			200		

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-4. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 3 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.)									
		Endrin		Endosulfan II		p,p'-DDD		Endosulfan Sulfate		p,p'-DDT	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 23	3-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 26	4-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 29	5-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 36	6-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 59	7-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 68	8-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 81	9-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 88	10-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 90	11-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 95	12-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 120	13-1-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 120	13-2-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 120	13-3-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 124	14-CF	5 U		5 U		5 U		5 U/E		5 U	
Wildlife Reference Levels[1]		25		na **		200		na **		200	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-4. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 4 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.) Methoxychlor Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Endrin Ketone Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Endrin Aldehyde Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Gamma-Chlordane Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Alpha-Chlordane Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 23	3-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 26	4-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 29	5-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 36	6-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 59	7-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 68	8-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 81	9-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 88	10-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 90	11-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 95	12-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 120	13-1-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 120	13-2-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 120	13-3-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
RM 124	14-CF	25	U	5	U/E	5	U	2.5	U	2.5	U
Wildlife Reference Levels[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-4. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 5 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.) Toxaphene Conc. (µg/kg)	Toxaphene Norm.* Conc. (µg/g lipid)	o,p'-DDE Conc. (µg/kg)	o,p'-DDE Norm.* Conc. (µg/g lipid)	o,p'-DDD Conc. (µg/kg)	o,p'-DDD Norm.* Conc. (µg/g lipid)	o,p'-DDT Conc. (µg/kg)	o,p'-DDT Norm.* Conc. (µg/g lipid)	Dicofol Conc. (µg/kg)	Dicofol Norm.* Conc. (µg/g lipid)
RM 21	2-CF	250	U	5	U	5	U	5	U	62	U
RM 23	3-CF	250	U	5	U	5	U	5	U	62	U
RM 26	4-CF	250	U	5	U	5	U	5	U	62	U
RM 29	5-CF	250	U	5	U	5	U	5	U	62	U
RM 36	6-CF	250	U	5	U	5	U	5	U	62	U
RM 59	7-CF	250	U	5	U	5	U	5	U	62	U
RM 68	8-CF	250	U	5	U	5	U	5	U	62	U
RM 81	9-CF	250	U	5	U	5	U	5	U	62	U
RM 88	10-CF	250	U	5	U	5	U	5	U	62	U
RM 90	11-CF	250	U	5	U	5	U	5	U	62	U
RM 95	12-CF	250	U	5	U	5	U	5	U	62	U
RM 120	13-1-CF	250	U	5	U	5	U	5	U	62	U
RM 120	13-2-CF	250	U	5	U	5	U	5	U	62	U
RM 120	13-3-CF	250	U	5	U	5	U	5	U	62	U
RM 124	14-CF	250	U	5	U	5	U	5	U	62	U
Wildlife Reference Levels[1]		na **		200		200		200		na **	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-4. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 6 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.) Methyl Parathion Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	PCBs Aroclor 1242/1016 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Aroclor 1248 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Aroclor 1254 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Aroclor 1260 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	62 U		50 U		50 U		50 U		50 U	
RM 23	3-CF	62 U		50 U		50 U		50 U		50 U	
RM 26	4-CF	62 U		50 U		50 U		50 U		50 U	
RM 29	5-CF	62 U		50 U		50 U		50 U		50 U	
RM 36	6-CF	62 U		50 U		50 U		50 U		50 U	
RM 59	7-CF	62 U		50 U		50 U		50 U		50 U	
RM 68	8-CF	62 U		50 U		50 U		50 U		50 U	
RM 81	9-CF	62 U		50 U		50 U		50 U		50 U	
RM 88	10-CF	62 U		50 U		50 U		50 U		30	1.5 J
RM 90	11-CF	62 U		50 U		50 U		50 U		50 U	
RM 95	12-CF	62 U		50 U		50 U		50 U		50 U	
RM 120	13-1-CF	62 U		50 U		50 U		50 U		50 U	
RM 120	13-2-CF	62 U		50 U		50 U		50 U		50 U	
RM 120	13-3-CF	62 U		50 U		50 U		50 U		50 U	
RM 124	14-CF	62 U		50 U		50 U		50 U		50 U	
Wildlife Reference Levels[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-4. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 7 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PCBs (cont.) Aroclor 1221 Conc. (µg/kg)		Aroclor 1221 Norm.* Conc. (µg/g lipid)		Aroclor 1232 Conc. (µg/kg)		Aroclor 1232 Norm.* Conc. (µg/g lipid)		Total PCBs Conc. (µg/kg)		Total PCBs Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	100	U			50	U			350			U
RM 23	3-CF	100	U			50	U			350			U
RM 26	4-CF	100	U			50	U			350			U
RM 29	5-CF	100	U			50	U			350			U
RM 36	6-CF	100	U			50	U			350			U
RM 59	7-CF	100	U			50	U			350			U
RM 68	8-CF	100	U			50	U			350			U
RM 81	9-CF	100	U			50	U			350			U
RM 88	10-CF	100	U			50	U			30		1.5	J
RM 90	11-CF	100	U			50	U			350			U
RM 95	12-CF	100	U			50	U			350			U
RM 120	13-1-CF	100	U			50	U			350			U
RM 120	13-2-CF	100	U			50	U			350			U
RM 120	13-3-CF	100	U			50	U			350			U
RM 124	14-CF	100	U			50	U			350			U
Wildlife Reference Levels[1]		na **				na **				110			

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-5. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES (page 1 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	DIOXINS											
		2378-TCDD		12378-PeCDD		123478-HxCDD		123678-HxCDD		123789-HxCDD		1234678-HpCDD	
		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)
RM 21	2-CF	0.4 U/E		1.1 U/E		0.7 U/E		0.8 U/E		0.9 U/E		0.5 U/E	
RM 23	3-CF	0.4 U/E		1.3 U/E		0.7 U/E		0.7 U/E		0.9 U/E		0.7 U/E	
RM 26	4-CF	0.3 U/E		0.8 U/E		0.7 U/E		1.0 U/E		1.0 U/E		0.5 U/E	
RM 29	5-CF	0.3 U/E		1.5 U/E		0.8 U/E		1.0 U/E		1.0 U/E		1.2 U/E	
RM 36	6-CF	1.0	0.10	2.3 U/E		1.9 U/E		2.1 U/E		2.5 U/E		2.3 U/E	
RM 59	7-CF	0.4 U/E		0.3 U/E		0.4 U/E		0.5 U/E		0.5 U/E		0.2 U/E	
RM 68	8-CF	0.1 U/E		0.6 U/E		0.3 U/E		0.3 U/E		0.4 U/E		0.6 U/E	
RM 81	9-CF	0.2 U/E		0.3 U/E		0.3 U/E		0.3 U/E		0.3 U/E		0.2 U/E	
RM 88	10-CF	0.1 U/E		0.1 U/E		0.7 U/E		0.7 U/E		0.9 U/E		1.9 U/E	
RM 90	11-CF	0.3 U/E		0.4 U/E		0.3 U/E		0.3 U/E		0.4 U/E		0.5 U/E	
RM 95	12-CF	0.1 U/E		1.0 U/E		0.4 U/E		0.4 U/E		0.5 U/E		0.3 U/E	
RM 120	13-1-CF	0.2 U/E		0.5 U/E		0.3 U/E		0.4 U/E		0.5 U/E		0.4 U/E	
RM 120	13-2-CF	0.2 U/E		0.8 U/E		0.5 U/E		0.5 U/E		0.6 U/E		0.3 U/E	
RM 120	13-3-CF	0.8	0.06	0.6 U/E		0.4 U/E		0.5 U/E		0.6 U/E		0.4 U/E	
RM 124	14-CF	0.7	0.03	0.9 U/E		0.6 U/E		0.6 U/E		0.8 U/E		0.4 U/E	
Wildlife Reference Value°		na **		na **		na **		na **		na **		na **	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
[a] = From second-column confirmation using a Rtx-200 column.
* = Lipid-normalized value only given when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to half the lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE D-5. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES (page 2 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	DIOXINS (cont.) OCDD Conc. (ng/kg)	OCDD Lipid Norm.* Conc. (ng/g lipid)		FURANS 2378-TCDF Conc. (ng/kg)	2378-TCDF Lipid Norm.* Conc. (ng/g lipid)	12378-PeCDF Conc. (ng/kg)	12378-PeCDF Lipid Norm.* Conc. (ng/g lipid)	23478-PeCDF Conc. (ng/kg)	23478-PeCDF Lipid Norm.* Conc. (ng/g lipid)	123478-HxCDF Conc. (ng/kg)	123478-HxCDF Lipid Norm.* Conc. (ng/g lipid)	123678-HxCDF Conc. (ng/kg)	123678-HxCDF Lipid Norm.* Conc. (ng/g lipid)	
RM 21	2-CF	1.4		U/E	**2.23[a]**	**0.14**	0.3	U/E	0.4	U/E	0.9	U/E	**0.8**		U/E
RM 23	3-CF	2.8		U/E	**1.50[a]**	**0.08**	0.8	U/E	0.9	U/E	0.8	U/E	**0.7**		U/E
RM 26	4-CF	2.3		U/E	**2.02[a]**	**0.11**	0.6	U/E	0.7	U/E	0.7	U/E	**0.6**		U/E
RM 29	5-CF	1.9		U/E	**1.58[a]**	**0.20**	0.7	U/E	0.9	U/E	1.0	U/E	**0.7**		U/E
RM 36	6-CF	1.8		U/E	**1.27[a]**	**0.13**	2.1	U/E	2.8	U/E	2.6	U/E	2.7		U/E
RM 59	7-CF	**6.7**	**0.8**		**0.78[a]**	**0.10**	0.2	U/E	0.2	U/E	0.3	U/E	0.3		U/E
RM 68	8-CF	2.7		U/E	**1.05[a]**	**0.11**	0.2	U/E	0.2	U/E	0.2	U/E	0.2		U/E
RM 81	9-CF	0.6		U/E	**0.63[a]**	**0.05**	0.1	U/E	0.1	U/E	0.1	U/E	0.1		U/E
RM 88	10-CF	**23.7**	**4.0**		**0.70[a]**	**0.12**	0.1	U/E	0.1	U/E	0.2	U/E	0.1		U/E
RM 90	11-CF	1.1		U/E	**2.24[a]**	**0.12**	0.2	U/E	0.3	U/E	0.3	U/E	0.3		U/E
RM 95	12-CF	0.5		U/E	**2.62[a]**	**0.13**	0.3	U/E	0.4	U/E	0.3	U/E	0.3		U/E
RM 120	13-1-CF	1.1		U/E	**1.30[a]**	**0.07**	0.1	U/E	0.2	U/E	0.2	U/E	0.2		U/E
RM 120	13-2-CF	1.3		U/E	**1.06[a]**	**0.08**	0.4	U/E	0.5	U/E	0.4	U/E	0.4		U/E
RM 120	13-3-CF	0.9		U/E	**1.60[a]**	**0.11**	0.5	U/E	0.7	U/E	0.8	U/E	0.7		U/E
RM 124	14-CF	1.1		U/E	**1.88[a]**	**0.09**	0.3	U/E	0.5	U/E	0.8	U/E	0.8		U/E
Wildlife Reference Value[o]		na **			na **		na **		na **		na **		na **		

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
[a] = From second-column confirmation using a Rtx-200 column.
* = Lipid-normalized value only given when a compound is detected.
** = Tissue reference value not available for this compound.
[o] Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to half the lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE D-5. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES (page 3 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	FURANS (cont.) 123789-HxCDF Conc. (ng/kg)	123789-HxCDF Lipid Norm.* Conc. (ng/g lipid)		234678-HxCDF Conc. (ng/kg)	234678-HxCDF Lipid Norm.* Conc. (ng/g lipid)		1234678-HpCDF Conc. (ng/kg)	1234678-HpCDF Lipid Norm.* Conc. (ng/g lipid)		1234789-HpCDF Conc. (ng/kg)	1234789-HpCDF Lipid Norm.* Conc. (ng/g lipid)		OCDF Conc. (ng/kg)	OCDF Lipid Norm.* Conc. (ng/g lipid)	
RM 21	2-CF	1.3		U/E	1.1		U/E	1.2		U/E	2.1		U/E	0.8		U/E
RM 23	3-CF	1.2		U/E	0.9		U/E	0.8		U/E	1.5		U/E	1.5		U/E
RM 26	4-CF	1.2		U/E	0.9		U/E	0.6		U/E	1.5		U/E	1.3		U/E
RM 29	5-CF	1.5		U/E	1.2		U/E	1.1		U/E	2.6		U/E	1.5		U/E
RM 36	6-CF	1.9		U/E	1.1		U/E	5.6		U/E	0.3		U/E	0.7		U/E
RM 59	7-CF	0.5		U/E	0.4		U/E	1.0		U/E	1.5		U/E	0.3		U/E
RM 68	8-CF	0.4		U/E	0.3		U/E	1.4		U/E	3.1		U/E	1.5		U/E
RM 81	9-CF	0.2		U/E	0.1		U/E	0.4		U/E	0.7		U/E	0.3		U/E
RM 88	10-CF	0.2		U/E	0.2		U/E	0.2		U/E	0.4		U/E	1.4		U/E
RM 90	11-CF	0.4		U/E	0.3		U/E	0.3		U/E	0.5		U/E	0.5		U/E
RM 95	12-CF	0.5		U/E	0.4		U/E	0.5		U/E	0.9		U/E	0.3		U/E
RM 120	13-1-CF	0.4		U/E	0.3		U/E	0.4		U/E	0.8		U/E	0.9		U/E
RM 120	13-2-CF	0.6		U/E	0.5		U/E	0.7		U/E	1.3		U/E	0.7		U/E
RM 120	13-3-CF	1.1		U/E	0.9		U/E	5.2	0.4		0.5		U/E	0.7		U/E
RM 124	14-CF	1.2		U/E	0.9		U/E	1.1		U/E	1.9		U/E	0.6		U/E
Wildlife Reference Value°		na **			na **			na **			na **			na **		

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
[a] = From second-column confirmation using a Rtx-200 column.
* = Lipid-normalized value only given when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to half the lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE D-5. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES (page 4 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	2,3,7,8-TCDD Toxicity Equivalency Concentrations[1] TEC[2] (pg/g)	Lipid Norm. TEC[2] (ng/g lipid)	TEC[3] (pg/g)	Lipid Norm. TEC[3] (ng/g lipid)
RM 21	2-CF	1.1506	0.1151	0.2230	0.0223
RM 23	3-CF	1.2322	0.1540	0.1500	0.0188
RM 26	4-CF	1.0618	0.1062	0.2020	0.0202
RM 29	5-CF	1.3117	0.1093	0.1580	0.0132
RM 36	6-CF	3.2368	0.1798	1.1270	0.0626
RM 59	7-CF	0.5734	0.0287	0.0847	0.0042
RM 68	8-CF	0.4926	0.0352	0.1050	0.0075
RM 81	9-CF	0.3425	0.0245	0.0630	0.0045
RM 88	10-CF	0.3594	0.0163	0.0937	0.0043
RM 90	11-CF	0.6763	0.0423	0.2240	0.0140
RM 95	12-CF	0.8184	0.0409	0.2620	0.0131
RM 120	13-1-CF	0.5320	0.0296	0.1300	0.0072
RM 120	13-2-CF	0.7285	0.0911	0.1060	0.0133
RM 120	13-3-CF	1.6048	0.2675	1.0120	0.1687
RM 124	14-CF	1.5484	0.0774	0.8880	0.0444
Wildlife Reference Value[o]		3.0		3.0	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
[a] = From second-column confirmation using a Rtx-200 column.
* = Lipid-normalized value only given when a compound is detected.
** = Tissue reference value not available for this compound.
[o] Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to half the lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE D-6. POLYBUTYL TINS FOUND IN CRAYFISH WHOLE-BODY COMPOSITES LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLYBUTYL TINS					
		n-Butyltin trichloride		di-n-Butyltin dichloride		tri-n-Butyltin chloride	
		Concentration (µg Sn/kg)		Concentration (µg Sn/kg)		Concentration (µg Sn/kg)	
RM 21	2-CF	3.4	U	5.2	U	6.4	U
RM 23	3-CF	3.4	U	5.2	U	6.4	U
RM 26	4-CF	3.4	U	5.2	U	6.4	U
RM 29	5-CF	3.4	U	5.2	U	6.4	U
RM 36	6-CF	3.4	U	5.2	U	6.4	U
RM 59	7-CF	3.4	U	5.2	U	6.4	U
RM 68	8-CF	3.4	U	5.2	U	6.4	U
RM 81	9-CF	3.4	U	5.2	U	6.4	U/B
RM 88	10-CF	3.4	U	5.2	U	6.4	U
RM 90	11-CF	3.4	U	5.2	U	6.4	U
RM 95	12-CF	3.4	U	5.2	U	6.4	U
RM 120	13-1-CF	3.4	U	5.2	U	9.6	U/B
RM 120	13-2-CF	3.4	U	5.2	U	6.4	U
RM 120	13-3-CF	3.4	U	5.2	U	6.4	U
RM 124	14-CF	3.4	U	5.2	U	6.4	U
Wildlife Reference Va		na*		na*		na*	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample.
U = Compound was not detected. Value given is the lower quantification limit.
U/B = Undetected due to blank contamination.
RM = River mile.
* = Reference value not available.
[1] Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE D-7. RADIONUCLIDES IN CRAYFISH WHOLE-BODY COMPOSITES LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	RADIONUCLIDES																					
		Plutonium 239/240				Plutonium 238				Americium 241				Cobalt 60		Cesium 137		Europium 152		Europium 154		Europium 155	
		(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)		(pCi/g)		(pCi/g)		(pCi/g)		(pCi/g)	
RM 21	2-CF	0.001	U	±0.002	0.003	-0.001	U	±0.003	0.006	0.004	U	±0.006	0.008	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 23	3-CF	-0.001	U	±0.002	0.003	0.000	U	±0.003	0.006	0.003	U	±0.005	0.007	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 26	4-CF	0.000	U	±0.001	0.003	-0.001	U	±0.003	0.006	0.000	U	±0.006	0.011	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 29	5-CF	0.000	U	±0.001	0.003	0.003	U	±0.004	0.005	0.002	U	±0.006	0.01	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 36	6-CF	0.001	U	±0.003	0.005	-0.006	U	±0.008	0.016	-0.005	U	±0.014	0.026	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 59	7-CF	0.000	U	±0.003	0.008	-0.001	U	±0.009	0.018	-0.001	U	±0.006	0.011	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 68	8-CF	0.000	U	±0.002	0.006	-0.001	U	±0.004	0.010	-0.001	U	±0.005	0.01	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 81	9-CF	0.004	U	±0.005	0.005	-0.002	U	±0.004	0.010	-0.004	U	±0.010	0.019	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 88	10-CF	0.001	U	±0.002	0.003	-0.004	U	±0.005	0.010	-0.003	U	±0.006	0.014	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 90	11-CF	0.002	U	±0.006	0.011	0.004	U	±0.009	0.015	0.002	U	±0.005	0.009	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 95	12-CF	0.001	U	±0.003	0.004	-0.001	U	±0.004	0.008	-0.003	U	±0.005	0.012	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 120	13-1-CF	0.002	U	±0.002	0.003	-0.001	U	±0.003	0.006	0.001	U	±0.005	0.008	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 120	13-2-CF	0.001	U	±0.002	0.003	-0.001	U	±0.004	0.008	-0.001	U	±0.006	0.011	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 120	13-3-CF	0.000	U	±0.001	0.003	0.001	U	±0.004	0.006	-0.001	U	±0.004	0.008	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 124	14-CF	0.000	U	±0.001	0.002	0.000	U	±0.003	0.004	0.003	U	±0.004	0.006	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
Wildlife Reference Value[1]		na*				na*				na*				na*		na*		na*		na*		na*	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
LLD = Lower limit of detection.
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

APPENDIX E.

FISH TISSUE BIOACCUMULATION DATA

TABLE E-1. FISH LIPID AND SIZE DATA
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	Latitude	Longitude	Species	Percent Lipid	Number of Individuals in Composite	Average Weight (grams)	Minimum Weight (grams)	Maximum Weight (grams)	Average Length (cm)	Minimum Length (cm)	Maximum Length (cm)
RM 14	1-LS	46° 09' 56.3"	123° 49' 39.3"	Largescale Sucker	4.6	2	1153.0	954.9	1351.0	44.5	42.0	47.0
RM 14	1-C	46° 10' 36.7"	123° 41' 59.4"	Carp	6.0	4	3275.2	2374.6	4508.5	53.1	50.5	58.5
RM 21	2-LS	46° 10' 36.7"	123° 41' 59.4"	Largescale Sucker	4.6	5	767.1	580.2	1234.7	39.8	36.0	47.5
RM 23	3-LS	46° 10' 29.4"	123° 39' 53.5"	Largescale Sucker	3.4	5	795.0	651.3	1117.9	41.5	38.0	47.0
RM 26	4-LS	46° 12' 00.7"	123° 35' 11.3"	Largescale Sucker	6.6	5	726.2	436.5	975.9	39.4	32.5	43.5
RM 29	5-LS	46° 13' 25.6"	123° 33' 07.0"	Largescale Sucker	4.8	5	857.5	677.8	1146.7	42.1	39.0	46.5
RM 36	6-LS	46° 13' 28.3"	123° 24' 04.4"	Largescale Sucker	8.4	5	375.9	93.9	674.2	30.3	20.5	37.0
RM 59	7-LS	46° 10' 11.3"	123° 04' 14.3"	Largescale Sucker	2.8	5	496.4	361.6	573.8	34.1	31.0	35.5
RM 68	8-LS	46° 03' 28.1"	122° 52' 05.8"	Largescale Sucker	1.8	5	866.7	546.0	1417.5	40.8	36.5	48.0
RM 81	9-LS	45° 56' 14.2"	122° 47' 12.1"	Largescale Sucker	0.6	5	472.7	139.9	666.4	33.7	23.5	38.5
RM 88	10-LS	45° 49' 35.8"	122° 49' 56.0"	Largescale Sucker	4.8	5	309.5	40.0	774.0	25.2	15.5	40.0
RM 90	11-LS	45° 49' 29.6"	122° 45' 31.2"	Largescale Sucker	3.8	5	632.6	523.7	862.9	37.7	34.0	42.0
RM 95	12-LS	45° 44' 25.6"	122° 46' 22.4"	Largescale Sucker	3.8	5	363.2	91.7	586.3	29.6	20.5	36.5
RM 120	13-1-LS	45° 34' 42.4"	122° 25' 16.1"	Largescale Sucker	1.4	5	702.8	452.6	1149.9	39.3	33.0	48.0
RM 120	13-2-LS	45° 34' 42.4"	122° 25' 16.1"	Largescale Sucker	1.0	5	612.3	416.7	946.6	37.2	33.0	44.5
RM 120	13-3-LS	45° 34' 42.4"	122° 25' 16.1"	Largescale Sucker	3.0	5	433.4	194.3	580.5	32.8	25.5	36.5
RM 124	14-LS	45° 32' 50.8"	122° 20' 21.6"	Largescale Sucker	2.2	5	650.7	422.3	1026.0	38.3	33.5	44.5
RM 141	15-C	45° 36' 57.4"	122° 02' 00.8"	Carp	3.0	5	1738.8	1248.1	2252.4	44.5	39.5	48.5

C = Carp sample
LS = Largescale sucker sample
RM = River mile

TABLE E-2. METALS IN FISH WHOLE-BODY COMPOSITES
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	METALS																			
		Antimony		Arsenic		Barium	Cadmium	Chromium		Copper	Lead		Mercury	Nickel		Selenium		Silver		Zinc	
		Conc. (mg/kg)		Conc. (mg/kg)		Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)		Conc. (mg/kg)	Conc. (mg/kg)		Conc. (mg/kg)	Conc. (mg/kg)		Conc. (mg/kg)		Conc. (mg/kg)		Conc. (mg/kg)	
RM 14	1-LS	0.012	U	0.036	U	0.34	0.012	0.129		0.72	0.172	E	0.245	0.10	U	0.043	E	0.004	U/E	19.3	E
RM 14	1-C	0.012	U	0.036	U	1.00	0.033	0.024	U/B	0.76	0.173	E	0.145	0.78		0.093	E	0.004	E	29.6	E
RM 21	2-LS	0.011	U	0.034	U	1.40	0.028	0.050		0.71	0.060	U/B	0.264	0.09	U	0.034	U/E	0.004	U/E	18.9	E
RM 23	3-LS	0.012	U	0.385		0.64	0.036	0.043		0.53	0.507	E	0.189	0.28	E	0.207	E	0.004	U/E	16.2	E
RM 26	4-LS	0.012	U	0.037	U	0.66	0.020	0.032	U/B	0.39	0.010	U	0.117	0.10	U	0.037	U/E	0.004	U/E	12.3	E
RM 29	5-LS	0.012	U	0.037	U	0.60	0.057	0.139		0.96	0.056	U/B	0.131	0.10	U	0.037	U/E	0.005	E	14.8	E
RM 36	6-LS	0.012	U	0.037	U	1.70	0.023	0.071		0.86	0.038	U/B	0.100	0.10	U	0.037	U	0.004	U/E	15.2	E
RM 59	7-LS	0.012	U	0.036	U	0.95	0.017	0.153	E	0.71	0.077	U/B	0.102	0.77		0.054	E	0.006	E	19.3	E
RM 68	8-LS	0.012	U	0.037	U	1.40	0.046	0.080		0.73	0.161	E	0.222	0.10	U	0.040	E	0.004	U/E	20.0	E
RM 81	9-LS	0.011	U	0.034	U	0.96	0.025	0.053		0.73	0.068	U/B	0.178	0.39		0.045	E	0.004	U/E	22.8	E
RM 88	10-LS	0.011	U	0.034	U	2.20	0.010	0.092		0.74	0.106	E	0.213	0.09	U	0.034	U	0.004	U/E	15.6	E
RM 90	11-LS	0.012	U	0.035	U	1.20	0.026	0.066		0.60	0.084	U/B	0.123	0.10	U	0.035	U	0.004	U/E	20.1	E
RM 95	12-LS	0.011	U	0.034	U	1.70	0.042	0.170		0.79	0.204	E	0.111	0.09	U	0.072	E	0.004	U/E	17.5	E
RM 120	13-1-LS	0.012	U	0.035	U	3.20	0.066	0.314		1.16	0.183	E	0.215	0.10	U	0.035	U	0.004	U/E	20.7	E
RM 120	13-2-LS	0.012	U	0.036	U	3.10	0.059	0.325		1.23	0.376	E	0.161	0.28		0.036	U	0.004	U/E	22.4	E
RM 120	13-3-LS	0.011	U	0.034	U	3.50	0.053	0.527		1.18	0.296	E	0.119	2.26		0.034	U	0.004	U/E	13.7	E
RM 124	14-LS	0.011	U	0.034	U	3.50	0.062	0.450		1.21	0.009	U	0.196	0.13		0.034	U	0.004	U/E	23.7	E
RM 141	15-C	0.012	U	0.035	U	1.20	0.039	0.078		1.26	0.116	E	0.001	0.10	U	0.035	U	0.005	E	92.1	E
Wildlife Reference Value[1]		na*		na*		na*	na*	na*		na*	na*		na*	na*		na*		na*		na*	

Note: All concentrations are reported on a wet weight basis

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
U/B = Undetected due to blank contamination.
E = Estimated value based on evaluation of QC data
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 1 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHENOLS									
		Phenol		2-Methylphenol		4-Methyl phenol		2,4-Dimethylphenol		Pentachlorophenol	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	99 U		99 U		99 U		99 U		2500 U/E	
RM 14	1-C	96 U		96 U		96 U		96 U		2400 U/E	
RM 21	2-LS	500 U		500 U		500 U		500 U		12000 U/E	
RM 23	3-LS	100 U		100 U		100 U		100 U		2500 U/E	
RM 26	4-LS	97 U		97 U		97 U		97 U		2400 U/E	
RM 29	5-LS	490 U		490 U		490 U		490 U		12000 U/E	
RM 36	6-LS	98 U		98 U		98 U		98 U		2400 U/E	
RM 59	7-LS	98 U		98 U		98 U		98 U		2400 U/E	
RM 68	8-LS	490 U		490 U		490 U		490 U		12000 U/E	
RM 81	9-LS	99 U		99 U		99 U		99 U		2500 U/E	
RM 88	10-LS	490 U		490 U		490 U		490 U		12000 U/E	
RM 90	11-LS	98 U		98 U		98 U		98 U		2400 U/E	
RM 95	12-LS	99 U		99 U		99 U		99 U		2500 U/E	
RM 120	13-1-LS	96 U		96 U		96 U		96 U		2400 U/E	
RM 120	13-2-LS	480 U		480 U		480 U		480 U		12000 U/E	
RM 120	13-3-LS	98 U		98 U		98 U		98 U		2500 U/E	
RM 124	14-LS	500 U		500 U		500 U		500 U		12000 U/E	
RM 141	15-C	500 U		500 U		500 U		500 U		12000 U/E	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 2 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHENOLS (cont.) 2-Chlorophenol Conc. (µg/kg)		2-Chlorophenol Norm.* Conc. (µg/g lipid)		2,4-Dichlorophenol Conc. (µg/kg)		2,4-Dichlorophenol Norm.* Conc. (µg/g lipid)		4-Chloro-3-methylphenol Conc. (µg/kg)		4-Chloro-3-methylphenol Norm.* Conc. (µg/g lipid)		2,4-Dinitrophenol Conc. (µg/kg)		2,4-Dinitrophenol Norm.* Conc. (µg/g lipid)		2-Nitrophenol Conc. (µg/kg)		2-Nitrophenol Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	99	U			300	U			200	U			990	U			490	U		
RM 14	1-C	96	U			290	U			190	U			960	U			480	U		
RM 21	2-LS	500	U			1500	U			1000	U			5000	U			2500	U		
RM 23	3-LS	100	U			299	U			200	U			1000	U			500	U		
RM 26	4-LS	97	U			290	U			190	U			970	U			480	U		
RM 29	5-LS	490	U			1500	U			980	U			4900	U			2400	U		
RM 36	6-LS	98	U			290	U			200	U			980	U			490	U		
RM 59	7-LS	98	U			290	U			200	U			980	U			490	U		
RM 68	8-LS	490	U			1500	U			990	U			4900	U			2500	U		
RM 81	9-LS	99	U			300	U			200	U			990	U			490	U		
RM 88	10-LS	490	U			1500	U			990	U			4900	U			2500	U		
RM 90	11-LS	98	U			290	U			200	U			980	U			490	U		
RM 95	12-LS	99	U			300	U			200	U			990	U			490	U		
RM 120	13-1-LS	96	U			290	U			190	U			960	U			480	U		
RM 120	13-2-LS	480	U			1400	U			960	U			4800	U			2400	U		
RM 120	13-3-LS	98	U			290	U			200	U			980	U			490	U		
RM 124	14-LS	500	U			1500	U			990	U			5000	U			2500	U		
RM 141	15-C	500	U			1500	U			1000	U			5000	U			2500	U		
Wildlife Reference Level[1]		na **				na **				na **				na **				na **			

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 3 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PHENOLS (cont.) 4-Nitrophenol Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		2,4,5-Trichlorophenol Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		2,4,6-Trichlorophenol Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		4,6-Dinitro-2-methylphenol Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		HALOGENATED ETHERS bis(2-Chloroethyl)ether Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	490	U			490	U			490	U			990	U			99	U		
RM 14	1-C	480	U			480	U			480	U			960	U			96	U		
RM 21	2-LS	2500	U			2500	U			2500	U			5000	U			500	U		
RM 23	3-LS	500	U			500	U			500	U			1000	U			100	U		
RM 26	4-LS	480	U			480	U			480	U			970	U			97	U		
RM 29	5-LS	2400	U			2400	U			2400	U			4900	U			490	U		
RM 36	6-LS	490	U			490	U			490	U			980	U			98	U		
RM 59	7-LS	490	U			490	U			490	U			980	U			98	U		
RM 68	8-LS	2500	U			2500	U			2500	U			4900	U			490	U		
RM 81	9-LS	490	U			490	U			490	U			990	U			99	U		
RM 88	10-LS	2500	U			2500	U			2500	U			4900	U			490	U		
RM 90	11-LS	490	U			490	U			490	U			980	U			98	U		
RM 95	12-LS	490	U			490	U			490	U			990	U			99	U		
RM 120	13-1-LS	480	U			480	U			480	U			960	U			96	U		
RM 120	13-2-LS	2400	U			2400	U			2400	U			4800	U			480	U		
RM 120	13-3-LS	490	U			490	U			490	U			980	U			98	U		
RM 124	14-LS	2500	U			2500	U			2500	U			5000	U			500	U		
RM 141	15-C	2500	U			2500	U			2500	U			5000	U			500	U		
Wildlife Reference Level[1]		na **				na **				na **				na **				na **			

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 4 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	HALOGENATED ETHERS (cont.) bis(2-Chloroethoxy)methane Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	4-Bromophenylphenylether Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	4-Chlorophenylphenylether Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	2,2'-Oxybis(1-chloropropane) Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	99 U		99 U		99 U		99 U	
RM 14	1-C	96 U		96 U		96 U		96 U	
RM 21	2-LS	500 U		500 U		500 U		500 U	
RM 23	3-LS	100 U		100 U		100 U		100 U	
RM 26	4-LS	97 U		97 U		97 U		97 U	
RM 29	5-LS	490 U		490 U		490 U		490 U	
RM 36	6-LS	98 U		98 U		98 U		98 U	
RM 59	7-LS	98 U		98 U		98 U		98 U	
RM 68	8-LS	490 U		490 U		490 U		490 U	
RM 81	9-LS	99 U		99 U		99 U		99 U	
RM 88	10-LS	490 U		490 U		490 U		490 U	
RM 90	11-LS	98 U		98 U		98 U		98 U	
RM 95	12-LS	99 U		99 U		99 U		99 U	
RM 120	13-1-LS	96 U		96 U		96 U		96 U	
RM 120	13-2-LS	480 U		480 U		480 U		480 U	
RM 120	13-3-LS	98 U		98 U		98 U		98 U	
RM 124	14-LS	500 U		500 U		500 U		500 U	
RM 141	15-C	500 U		500 U		500 U		500 U	
Wildlife Reference Level[1]		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 5 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	NITROAROMATICS									
		2,4-Dinitrotoluene		2,6-Dinitrotoluene		Nitrobenzene		2-Nitroaniline		3-Nitroaniline	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	490 U		490 U		99 U		490 U		490 U	
RM 14	1-C	480 U		480 U		96 U		480 U		480 U	
RM 21	2-LS	2500 U		2500 U		500 U		2500 U		2500 U	
RM 23	3-LS	500 U		500 U		100 U		500 U		500 U	
RM 26	4-LS	480 U		480 U		97 U		480 U		480 U	
RM 29	5-LS	2400 U		2400 U		490 U		2400 U		2400 U	
RM 36	6-LS	490 U		490 U		98 U		490 U		490 U	
RM 59	7-LS	490 U		490 U		98 U		490 U		490 U	
RM 68	8-LS	2500 U		2500 U		490 U		2500 U		2500 U	
RM 81	9-LS	490 U		490 U		99 U		490 U		490 U	
RM 88	10-LS	2500 U		2500 U		490 U		2500 U		2500 U	
RM 90	11-LS	490 U		490 U		98 U		490 U		490 U	
RM 95	12-LS	490 U		490 U		99 U		490 U		490 U	
RM 120	13-1-LS	480 U		480 U		96 U		480 U		480 U	
RM 120	13-2-LS	2400 U		2400 U		480 U		2400 U		2400 U	
RM 120	13-3-LS	490 U		490 U		98 U		490 U		490 U	
RM 124	14-LS	2500 U		2500 U		500 U		2500 U		2500 U	
RM 141	15-C	2500 U		2500 U		500 U		2500 U		2500 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 6 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	NITROAROMATICS (cont.) 4-Nitroaniline Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		POLYNUCLEAR AROMATIC HYDROCARBONS Acenaphthene Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		Acenaphthylene Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		Anthracene Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		Benzo(a)anthracene Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	490	U			9.9	U			9.9	U			9.9	U			9.9	U		
RM 14	1-C	480	U			9.6	U			9.6	U			9.6	U			9.6	U		
RM 21	2-LS	2500	U			10	U			10	U			10	U			10	U		
RM 23	3-LS	500	U			10	U			10	U			10	U			10	U		
RM 26	4-LS	480	U			9.7	U			9.7	U			9.7	U			9.7	U		
RM 29	5-LS	2400	U			9.8	U			9.8	U			9.8	U			9.8	U		
RM 36	6-LS	490	U			9.8	U			9.8	U			9.8	U			9.8	U		
RM 59	7-LS	490	U			9.8	U			9.8	U			9.8	U			9.8	U		
RM 68	8-LS	2500	U			7.8	U			7.8	U			7.8	U			7.8	U		
RM 81	9-LS	490	U			9.9	U			9.9	U			9.9	U			9.9	U		
RM 88	10-LS	2500	U			9.9	U			9.9	U			9.9	U			9.9	U		
RM 90	11-LS	490	U			9.8	U			9.8	U			9.8	U			9.8	U		
RM 95	12-LS	490	U			9.9	U			9.9	U			9.9	U			9.9	U		
RM 120	13-1-LS	480	U			9.6	U			9.6	U			9.6	U			9.6	U		
RM 120	13-2-LS	2400	U			8.5	U			8.5	U			8.5	U			8.5	U		
RM 120	13-3-LS	490	U			9.8	U			9.8	U			9.8	U			9.8	U		
RM 124	14-LS	2500	U			9.9	U			9.9	U			9.9	U			9.9	U		
RM 141	15-C	2500	U			10	U			10	U			10	U			10	U		
Wildlife Reference Level[1]		na **				na **				na **				na **				na **			

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 7 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)									
		Benzo(b,k)fluoranthene		Benzo(a)pyrene		Benzo(ghi)perylene		Chrysene		Dibenzo(a,h)anthracene	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	9.9 U		9.9 U		9.9 U		9.9 U		9.9 U	
RM 14	1-C	9.6 U		9.6 U		9.6 U		9.6 U		9.6 U	
RM 21	2-LS	10 U		10 U		10 U		10 U		10 U	
RM 23	3-LS	10 U		10 U		10 U		10 U		10 U	
RM 26	4-LS	9.7 U		9.7 U		9.7 U		9.7 U		9.7 U	
RM 29	5-LS	9.8 U		9.8 U		9.8 U		9.8 U		9.8 U	
RM 36	6-LS	9.8 U		9.8 U		9.8 U		9.8 U		9.8 U	
RM 59	7-LS	9.8 U		9.8 U		9.8 U		9.8 U		9.8 U	
RM 68	8-LS	7.8 U		7.8 U		7.8 U		7.8 U		7.8 U	
RM 81	9-LS	9.9 U		9.9 U		9.9 U		9.9 U		9.9 U	
RM 88	10-LS	9.9 U		9.9 U		9.9 U		9.9 U		9.9 U	
RM 90	11-LS	9.8 U		9.8 U		9.8 U		9.8 U		9.8 U	
RM 95	12-LS	9.9 U		9.9 U		9.9 U		9.9 U		9.9 U	
RM 120	13-1-LS	9.6 U		9.6 U		9.6 U		9.6 U		9.6 U	
RM 120	13-2-LS	8.5 U		8.5 U		8.5 U		8.5 U		8.5 U	
RM 120	13-3-LS	9.8 U		9.8 U		9.8 U		9.8 U		9.8 U	
RM 124	14-LS	9.9 U		9.9 U		9.9 U		9.9 U		9.9 U	
RM 141	15-C	10 U		10 U		10 U		10 U		10 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 8 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)											
		Fluoranthene		Fluorene		Indeno(1,2,3-cd)pyrene		Naphthalene			Phenanthrene		
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	9.9	U	9.9	U	9.9	U	**11.0**	**0.2**		9.9		U
RM 14	1-C	9.6	U	9.6	U	9.6	U	9.6		U	9.6		U
RM 21	2-LS	10	U	10	U	10	U	10.0		U	10		U
RM 23	3-LS	10	U	10	U	10	U	10.0		U	10		U
RM 26	4-LS	9.7	U	9.7	U	9.7	U	9.7		U	9.7		U
RM 29	5-LS	9.8	U	9.8	U	9.8	U	9.8		U	9.8		U
RM 36	6-LS	9.8	U	9.8	U	9.8	U	**8.3**	**0.1**	**J**	9.8		U
RM 59	7-LS	9.8	U	9.8	U	9.8	U	9.8		U	9.8		U
RM 68	8-LS	7.8	U	7.8	U	7.8	U	7.8		U	7.8		U
RM 81	9-LS	9.9	U	9.9	U	9.9	U	9.9		U	9.9		U
RM 88	10-LS	9.9	U	9.9	U	9.9	U	**13.0**	**0.3**		9.9		U
RM 90	11-LS	9.8	U	9.8	U	9.8	U	**10.0**	**0.3**		9.8		U
RM 95	12-LS	9.9	U	9.9	U	9.9	U	9.9		U	9.9		U
RM 120	13-1-LS	9.6	U	9.6	U	9.6	U	9.6		U	9.6		U
RM 120	13-2-LS	8.5	U	8.5	U	8.5	U	8.5		U	8.5		U
RM 120	13-3-LS	9.8	U	9.8	U	9.8	U	**6.6**	**0.2**	**J**	9.8		U
RM 124	14-LS	9.9	U	9.9	U	9.9	U	9.9		U	9.9		U
RM 141	15-C	10	U	10	U	10	U	10.0		U	10		U
Wildlife Reference Level[1]		na **		na **		na **		na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 9 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)						NAPHTHALENES		CHLORINATED BENZENES	
		Pyrene		2-Methylnaphthalene		Dibenzofuran		2-Chloronaphthalene		1,3-Dichlorobenzene	
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	9.9 U		10.0	0.2	9.9 U		99 U		99 U	
RM 14	1-C	9.6 U		9.6 U		9.6 U		96 U		96 U	
RM 21	2-LS	10 U		10.0 U		10 U		500 U		500 U	
RM 23	3-LS	10 U		10.0 U		10 U		100 U		100 U	
RM 26	4-LS	9.7 U		9.7 U		9.7 U		97 U		97 U	
RM 29	5-LS	9.8 U		9.8 U		9.8 U		490 U		490 U	
RM 36	6-LS	9.8 U		8.8	0.1 J	9.8 U		98 U		98 U	
RM 59	7-LS	9.8 U		9.8 U		9.8 U		98 U		98 U	
RM 68	8-LS	7.8 U		7.8 U		7.8 U		490 U		490 U	
RM 81	9-LS	9.9 U		9.9 U		9.9 U		99 U		99 U	
RM 88	10-LS	9.9 U		23.0	0.5	9.9 U		490 U		490 U	
RM 90	11-LS	9.8 U		22.0	0.6	9.8 U		98 U		98 U	
RM 95	12-LS	9.9 U		9.9 U		9.9 U		99 U		99 U	
RM 120	13-1-LS	9.6 U		9.6 U		9.6 U		96 U		96 U	
RM 120	13-2-LS	8.5 U		8.5 U		8.5 U		480 U		480 U	
RM 120	13-3-LS	9.8 U		10.0	0.3	9.8 U		98 U		98 U	
RM 124	14-LS	9.9 U		9.9 U		9.9 U		500 U		500 U	
RM 141	15-C	10 U		10.0 U		10 U		500 U		500 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 10 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	CHLORINATED BENZENES (cont.)									
		1,2-Dichlorobenzene		1,4-Dichlorobenzene		1,2,4-Trichlorobenzene		Hexachlorobenzene		Hexachlorobutadiene	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	99 U		99 U		99 U		99 U		99 U	
RM 14	1-C	96 U		96 U		96 U		96 U		96 U	
RM 21	2-LS	500 U		500 U		500 U		500 U		500 U	
RM 23	3-LS	100 U		100 U		100 U		100 U		100 U	
RM 26	4-LS	97 U		97 U		97 U		97 U		97 U	
RM 29	5-LS	490 U		490 U		490 U		490 U		490 U	
RM 36	6-LS	98 U		98 U		98 U		98 U		98 U	
RM 59	7-LS	98 U		98 U		98 U		98 U		98 U	
RM 68	8-LS	490 U		490 U		490 U		490 U		490 U	
RM 81	9-LS	99 U		99 U		99 U		99 U		99 U	
RM 88	10-LS	490 U		490 U		490 U		490 U		490 U	
RM 90	11-LS	98 U		98 U		98 U		98 U		98 U	
RM 95	12-LS	99 U		99 U		99 U		99 U		99 U	
RM 120	13-1-LS	96 U		96 U		96 U		96 U		96 U	
RM 120	13-2-LS	480 U		480 U		480 U		480 U		480 U	
RM 120	13-3-LS	98 U		98 U		98 U		98 U		98 U	
RM 124	14-LS	500 U		500 U		500 U		500 U		500 U	
RM 141	15-C	500 U		500 U		500 U		500 U		500 U	
Wildlife Reference Level[1]		na **		na **		1300		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 11 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	CHLORINATED BENZENES (cont.) Hexachloroethane Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		Hexachlorocyclopentadiene Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		BENZIDINES 3,3'-Dichlorobenzidine Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		PHTHALATE ESTERS Dimethylphthalate Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)		Diethylphthalate Conc. (µg/kg)		Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	99	U			490	U			490	U			99	U			99	U		
RM 14	1-C	96	U			480	U			480	U			96	U			96	U		
RM 21	2-LS	500	U			2500	U			2500	U			500	U			500	U		
RM 23	3-LS	100	U			500	U			500	U			100	U			100	U		
RM 26	4-LS	97	U			480	U			480	U			97	U			97	U		
RM 29	5-LS	490	U			2400	U			2400	U			490	U			490	U		
RM 36	6-LS	98	U			490	U			490	U			98	U			98	U		
RM 59	7-LS	98	U			490	U			490	U			98	U			98	U		
RM 68	8-LS	490	U			2500	U			2500	U			490	U			490	U		
RM 81	9-LS	99	U			490	U			490	U			99	U			99	U		
RM 88	10-LS	490	U			2500	U			2500	U			490	U			490	U		
RM 90	11-LS	98	U			490	U			490	U			98	U			98	U		
RM 95	12-LS	99	U			490	U			490	U			99	U			99	U		
RM 120	13-1-LS	96	U			480	U			480	U			96	U			96	U		
RM 120	13-2-LS	480	U			2400	U			2400	U			480	U			480	U		
RM 120	13-3-LS	98	U			490	U			490	U			98	U			98	U		
RM 124	14-LS	500	U			2500	U			2500	U			500	U			500	U		
RM 141	15-C	500	U			2500	U			2500	U			500	U			500	U		
Wildlife Reference Level[1]		na **				na **				na **				na **				na **			

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 12 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PHTHALATE ESTERS (cont.)								MISCELLANEOUS	
		Di-n-butyl phthalate		Benzyl butyl phthalate		bis(2-Ethylhexyl)phthalate		Di-n-octyl phthalate		Carbazole	
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	99 U		99 U		99 U		99 U		99 U	
RM 14	1-C	96 U		96 U		96 U		96 U		96 U	
RM 21	2-LS	500 U		500 U		500 U		500 U		500 U	
RM 23	3-LS	430	12.6	100 U		100 U		100 U		100 U	
RM 26	4-LS	97 U		97 U		760	11.5	97 U		97 U	
RM 29	5-LS	490 U		490 U		490 U		490 U		490 U	
RM 36	6-LS	98 U		98 U		400	4.8	98 U		98 U	
RM 59	7-LS	98 U		98 U		98 U		98 U		98 U	
RM 68	8-LS	490 U		490 U		490 U		490 U		490 U	
RM 81	9-LS	99 U		99 U		99 U		99 U		99 U	
RM 88	10-LS	490 U		490 U		490 U		490 U		490 U	
RM 90	11-LS	98 U		98 U		98 U		98 U		98 U	
RM 95	12-LS	99 U		99 U		99 U		99 U		99 U	
RM 120	13-1-LS	96 U		96 U		96 U		96 U		96 U	
RM 120	13-2-LS	480 U		480 U		480 U		480 U		480 U	
RM 120	13-3-LS	98 U		98 U		98 U		98 U		98 U	
RM 124	14-LS	500 U		500 U		500 U		500 U		500 U	
RM 141	15-C	500 U		500 U		500 U		500 U		500 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-3. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 13 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		MISCELLANEOUS (cont.)							
		Benzyl Alcohol		Benzoic Acid		Isophorone		4-Chloroaniline	
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	99 U		990 U		99 U		300 U	
RM 14	1-C	96 U		960 U		96 U		290 U	
RM 21	2-LS	500 U		5000 U		500 U		1500 U	
RM 23	3-LS	100 U		1000 U		100 U		299 U	
RM 26	4-LS	97 U		970 U		97 U		290 U	
RM 29	5-LS	490 U		4900 U		490 U		1500 U	
RM 36	6-LS	98 U		980 U		98 U		290 U	
RM 59	7-LS	98 U		980 U		98 U		290 U	
RM 68	8-LS	490 U		4900 U		490 U		1500 U	
RM 81	9-LS	99 U		990 U		99 U		300 U	
RM 88	10-LS	490 U		4900 U		490 U		1500 U	
RM 90	11-LS	98 U		980 U		98 U		290 U	
RM 95	12-LS	99 U		990 U		99 U		300 U	
RM 120	13-1-LS	96 U		960 U		96 U		290 U	
RM 120	13-2-LS	480 U		4800 U		480 U		1400 U	
RM 120	13-3-LS	98 U		980 U		98 U		290 U	
RM 124	14-LS	500 U		5000 U		500 U		990 U	
RM 141	15-C	500 U		5000 U		500 U		500 U	
Wildlife Reference Level[1]		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-4. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 1 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES									
		Alpha-BHC		Beta-BHC		Delta-BHC		Lindane		Heptachlor	
		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	2.5 U		2.5 U		8.0 U/E		2.5 U		2.5 U	
RM 14	1-C	2.5 U		2.5 U		2.5 U/E		2.5 U		2.5 U	
RM 21	2-LS	2.5 U		2.5 U		2.5 U/E		2.5 U		2.5 U	
RM 23	3-LS	2.5 U		2.5 U		5.0 U/E		2.5 U		2.5 U	
RM 26	4-LS	2.5 U		2.5 U		2.5 U/E		2.5 U		2.5 U	
RM 29	5-LS	2.5 U		2.5 U		3.0 U/E		2.5 U		2.5 U	
RM 36	6-LS	2.5 U		2.5 U		7.5 U/E		2.5 U		2.5 U	
RM 59	7-LS	2.5 U/E		2.5 U		10 U		2.5 U/E		2.5 U	
RM 68	8-LS	2.5 U/E		3.0 U		7.5 U/E		2.5 U/E		2.5 U	
RM 81	9-LS	2,5 U/E		2.5 U		2.5 U		2.5 U/E		2.5 U	
RM 88	10-LS	2.5 U/E		2.5 U		8.0 U		2.5 U/E		2.5 U	
RM 90	11-LS	2.5 U/E		2.5 U		7.0 U		2.5 U/E		2.5 U	
RM 95	12-LS	2.5 U/E		2.5 U		2.5 U		2.5 U/E		2.5 U	
RM 120	13-1-LS	2.5 U/E		2.5 U		2.5 U		2.5 U/E		2.5 U	
RM 120	13-2-LS	2.5 U/E		2.5 U		10 U/E		2.5 U/E		2.5 U	
RM 120	13-3-LS	2.5 U/E		2.5 U		7.5 U/E		2.5 U/E		2.5 U	
RM 124	14-LS	2.5 U/E		2.5 U		2.5 U/E		2.5 U/E		2.5 U	
RM 141	15-C	2.5 U/E		2.5 U		2.5 U/E		2.5 U/E		2.5 U	
Wildlife Reference Values[1]		100		100		100		100		na**	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-4. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 2 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.) Aldrin Conc. (µg/kg)	Aldrin Norm.* Conc. (µg/g lipid)	Heptachlor Epoxide Conc. (µg/kg)	Heptachlor Epoxide Norm.* Conc. (µg/g lipid)	Endosulfan I Conc. (µg/kg)	Endosulfan I Norm.* Conc. (µg/g lipid)	Dieldrin Conc. (µg/kg)	Dieldrin Norm.* Conc. (µg/g lipid)	p,p'-DDE Conc. (µg/kg)	p,p'-DDE Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	2.5	U	2.5	U	2.5	U	5	U	**110**	**2.4**	
RM 14	1-C	2.5	U	2.5	U	2.5	U	5	U	**63**	**1.1**	
RM 21	2-LS	2.5	U	2.5	U	2.5	U	5	U	**100**	**2.2**	
RM 23	3-LS	2.5	U	2.5	U	2.5	U	5	U	**110**	**3.2**	
RM 26	4-LS	2.5	U	2.5	U	2.5	U	5	U	**65**	**1.0**	
RM 29	5-LS	2.5	U	2.5	U	2.5	U	5	U	**100**	**2.1**	
RM 36	6-LS	2.5	U	2.5	U	2.5	U	5	U	**69**	**0.8**	
RM 59	7-LS	2.5	U	2.5	U	2.5	U	5	U	**76**	**2.7**	
RM 68	8-LS	2.5	U	2.5	U	2.5	U	5	U	**92**	**5.1**	
RM 81	9-LS	2.5	U	2.5	U	2.5	U	5	U	**37**	**6.2**	
RM 88	10-LS	38	U	22	U	2.5	U	65	U	**86**	**1.8**	C
RM 90	11-LS	2.5	U	6.1	U	2.5	U	5	U	**160**	**4.2**	
RM 95	12-LS	2.5	U	2.5	U	2.5	U	5	U	**93**	**2.4**	
RM 120	13-1-LS	2.5	U	2.5	U	2.5	U	5	U	**180**	**12.9**	
RM 120	13-2-LS	2.5	U	2.5	U	2.5	U	5	U	**98**	**9.8**	
RM 120	13-3-LS	2.5	U	12	U	2.5	U	5	U	**78**	**2.6**	
RM 124	14-LS	2.5	U	2.5	U	2.5	U	5	U	**98**	**4.5**	
RM 141	15-C	2.5	U	2.5	U	2.5	U	5	U	**100**	**3.3**	
Wildlife Reference Values[1]		120		na**		na**		120		200		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-4. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 3 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.) Endrin Conc. (µg/kg)	Endrin Norm.* Conc. (µg/g lipid)		Endosulfan II Conc. (µg/kg)	Endosulfan II Norm.* Conc. (µg/g lipid)		p,p'-DDD Conc. (µg/kg)	p,p'-DDD Norm.* Conc. (µg/g lipid)	Endosulfan Sulfate Conc. (µg/kg)	Endosulfan Sulfate Norm.* Conc. (µg/g lipid)		p,p'-DDT Conc. (µg/kg)	p,p'-DDT Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	5	U		5	U		31	0.7	5	U/E		12	0.3	
RM 14	1-C	5	U		5	U		20	0.3	5	U/E		3.7	0.1	J
RM 21	2-LS	5	U		5	U		18	0.4	5	U/E		16	0.3	
RM 23	3-LS	5	U		5	U		23	0.7	5	U/E		13	0.4	
RM 26	4-LS	5	U		5	U		16	0.2	5	U/E		8.8	0.1	
RM 29	5-LS	5	U		5	U		28	0.6	5	U/E		11	0.2	
RM 36	6-LS	5	U		5	U		19	0.2	5	U/E		9.9	0.1	
RM 59	7-LS	5	U/E		5	U		21	0.8	5	U		11	0.4	E
RM 68	8-LS	5	U		5	U/E		19	1.1	5	U/E		6.3	0.4	
RM 81	9-LS	5	U/E		5	U		9.4	1.6	5	U		4	0.7	J/E
RM 88	10-LS	5	U/E		5	U		31	0.6	5	U		56	1.2	C/E
RM 90	11-LS	5	U/E		5	U		47	1.2	5	U		13	0.3	E
RM 95	12-LS	5	U/E		5	U		29	0.8	5	U		8.6	0.2	E
RM 120	13-1-LS	5	U/E		5	U		31	2.2	5	U		27	1.9	E
RM 120	13-2-LS	5	U		5	U/E		21	2.1	5	U/E		7.5	0.8	
RM 120	13-3-LS	5	U		5	U/E		27	0.9	5	U/E		9.6	0.3	
RM 124	14-LS	5	U		5	U/E		27	1.2	5	U/E		10	0.5	
RM 141	15-C	5	U		5	U/E		21	0.7	5	U/E		3.9	0.1	J
Wildlife Reference Values[1]		25			na**			200		na**			200		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-4. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 4 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.) Methoxychlor Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Endrin Ketone Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Endrin Aldehyde Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Gamma-Chlordane Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Alpha-Chlordane Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	25 U		50 U/E		6 U		5 U		2.5 U	
RM 14	1-C	25 U		21 U/E		5 U		5 U		2.5 U	
RM 21	2-LS	25 U		42 U/E		6 U		4 U		2.6 U	
RM 23	3-LS	25 U		20 U/E		5 U		3.5 U		2.7 U	
RM 26	4-LS	25 U		8 U/E		5 U		3.5 U		2.5 U	
RM 29	5-LS	25 U		30 U/E		5 U		3.5 U		2.5 U	
RM 36	6-LS	25 U		30 U/E		5 U		3.5 U		2.5 U	
RM 59	7-LS	25 U		40 U		5 U		4.0 U		2.5 U	
RM 68	8-LS	25 U		25 U/E		5 U		5.0 U		2.5 U	
RM 81	9-LS	25 U		10 U		5 U		2.5 U		2.5 U	
RM 88	10-LS	25 U		200 U		5 U		44 U		6.0 U	
RM 90	11-LS	25 U		50 U		5 U		6.1 U		3.5 U	
RM 95	12-LS	25 U		5 U		5 U		4.5 U		2.6 U	
RM 120	13-1-LS	25 U		5 U		5 U		5.5 U		3.6 U	
RM 120	13-2-LS	25 U		30 U/E		5 U		3.1 U		2.5 U	
RM 120	13-3-LS	25 U		35 U/E		5 U		10 U		3.0 U	
RM 124	14-LS	25 U		25 U/E		5 U		4.0 U		2.5 U	
RM 141	15-C	25 U		35 U/E		5 U		4.6 U		2.5 U	
Wildlife Reference Values[1]		na**		na**		na**		na**		na**	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-4. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 5 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.) Toxaphene Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	o,p'-DDE Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	o,p'-DDD Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	o,p'-DDT Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Dicofol Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	250 U		130 U		260 U		210 U		26 U	
RM 14	1-C	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 21	2-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 23	3-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 26	4-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 29	5-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 36	6-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 59	7-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 68	8-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 81	9-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 88	10-LS	250 U		130 U		260 U		210 U		26 U	
RM 90	11-LS	250 U		9.5 U		5.2 U		5.2 U		26 U	
RM 95	12-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 120	13-1-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 120	13-2-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 120	13-3-LS	250 U		13 U		5.2 U		5.2 U		26 U	
RM 124	14-LS	250 U		5.2 U		5.2 U		5.2 U		26 U	
RM 141	15-C	250 U		5.2 U		5.2 U		5.2 U		26 U	
Wildlife Reference Values[1]		na**		200		200		200		na**	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-4. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 6 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PESTICIDES (cont.) Methyl Parathion Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	PCBs Aroclor 1242/1016 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Aroclor 1248 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Aroclor 1254 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Aroclor 1260 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	26 U		52 U		52 U		98	2.1	54	1.2
RM 14	1-C	26 U		52 U		52 U		65	1.1	30	0.5 J
RM 21	2-LS	26 U		52 U		52 U		84	1.8	51	1.1 J
RM 23	3-LS	26 U		52 U		52 U		70	2.1	36	1.1 J
RM 26	4-LS	26 U		52 U		52 U		47	0.7 J	52 U	
RM 29	5-LS	26 U		52 U		52 U		53	1.1	27	0.6 J
RM 36	6-LS	26 U		52 U		52 U		42	0.5 J	52 U	
RM 59	7-LS	26 U		52 U		52 U		62	2.2	52 U	
RM 68	8-LS	26 U		52 U		52 U		55	3.1	31	1.7 J
RM 81	9-LS	26 U		52 U		52 U		33	5.5 J	52 U	
RM 88	10-LS	26 U		52 U		52 U		2700	56.3	250 U	
RM 90	11-LS	26 U		52 U		52 U		86	2.3	41	1.1 J
RM 95	12-LS	26 U		52 U		52 U		52	1.4	29 U	
RM 120	13-1-LS	26 U		52 U		52 U		68	4.9	56	4.0
RM 120	13-2-LS	26 U		52 U		52 U		26	2.6 J	52 U	
RM 120	13-3-LS	26 U		52 U		52 U		170	5.7	37	1.2 J
RM 124	14-LS	26 U		52 U		52 U		38	1.7 J	52 U	
RM 141	15-C	26 U		52 U		52 U		36	1.2 J	52 U	
Wildlife Reference Values[1]		na**		na**		na**		na**		na**	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-4. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 7 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	PCBs (cont.) Aroclor 1221 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Aroclor 1232 Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Total PCBs Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	52		U	54	1.2		152	3.3	
RM 14	1-C	52		U	30	0.5	J	95	1.6	
RM 21	2-LS	52		U	51	1.1	J	135	2.9	
RM 23	3-LS	52		U	36	1.1	J	106	3.1	
RM 26	4-LS	52		U	52		U	47	0.7	J
RM 29	5-LS	52		U	27	0.6	J	80	1.7	
RM 36	6-LS	52		U	52		U	42	0.5	J
RM 59	7-LS	52		U	52		U	62	2.2	
RM 68	8-LS	52		U	31	1.7	J	86	4.8	
RM 81	9-LS	52		U	52		U	33	5.5	J
RM 88	10-LS	52		U	250		U	2700	56.3	
RM 90	11-LS	52		U	41	1.1	J	127	3.3	
RM 95	12-LS	52		U	29	0.8	J	81	2.1	
RM 120	13-1-LS	52		U	56	4.0		124	8.9	
RM 120	13-2-LS	52		U	52		U	26	2.6	J
RM 120	13-3-LS	52		U	37	1.2	J	207	6.9	
RM 124	14-LS	52		U	52		U	38	1.7	J
RM 141	15-C	52		U	52		U	36	1.2	J
Wildlife Reference Values[1]		na**			na**			110		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-5. DIOXINS AND FURANS IN FISH WHOLE-BODY COMPOSITES (page 1 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	DIOXINS 2378-TCDD Conc. (ng/kg)	2378-TCDD Lipid Norm.* Conc. (ng/g lipid)		12378-PeCDD Conc. (ng/kg)	12378-PeCDD Lipid Norm.* Conc. (ng/g lipid)		123478-HxCDD Conc. (ng/kg)	123478-HxCDD Lipid Norm.* Conc. (ng/g lipid)		123678-HxCDD Conc. (ng/kg)	123678-HxCDD Lipid Norm.* Conc. (ng/g lipid)		123789-HxCDD Conc. (ng/kg)	123789-HxCDD Lipid Norm.* Conc. (ng/g lipid)		1234678-HpCDD Conc. (ng/kg)	1234678-HpCDD Lipid Norm.* Conc. (ng/g lipid)
RM 14	1-LS	0.1		U/E	1.4		U/E	0.7		U/E	0.8		U/E	0.7		U/E	1.1	0.02
RM 14	1-C	1.1		U/E	1.1		U/E	1.6		U/E	1.6		U/E	1.7		U/E	3.8	0.06
RM 21	2-LS	0.6		U/E	0.5		U/E	0.5		U/E	0.6		U/E	0.5		U/E	0.4	0.01
RM 23	3-LS	0.8		U/E	0.7		U/E	1.1		U/E	0.5	0.02		0.1		U/E	2.6	0.08
RM 26	4-LS	0.9	0.01		0.7		U/E	0.4	0.01		0.2		U/E	0.2		U/E	0.8	0.01
RM 29	5-LS	0.9		U/E	0.8		U/E	1.7		U/E	1.7		U/E	1.8		U/E	0.7	0.01
RM 36	6-LS	1.4		U/E	1.1		U/E	0.6		U/E	0.6		U/E	0.6		U/E	1.1	0.01
RM 59	7-LS	1.8		U/E	1.0		U/E	0.8		U/E	0.8		U/E	0.8		U/E	2.1	0.08
RM 68	8-LS	0.3		U/E	0.3		U/E	0.3		U/E	0.4		U/E	0.4		U/E	1.3	0.07
RM 81	9-LS	0.4		U/E	0.8		U/E	0.3	0.13		0.4		U/E	0.4		U/E	0.8	0.13
RM 88	10-LS	0.7		U/E	1.1		U/E	1.1		U/E	1.2		U/E	1.2		U/E	1.2	0.03
RM 90	11-LS	0.7		U/E	0.7		U/E	0.4		U/E	0.6	0.02		0.4		U/E	1.2	0.03
RM 95	12-LS	0.6		U/E	0.5		U/E	0.4		U/E	0.5		U/E	0.4		U/E	0.5	0.01
RM 120	13-1-LS	0.4		U/E	0.4		U/E	0.3		U/E	0.4		U/E	0.3		U/E	0.4	0.03
RM 120	13-2-LS	0.7	0.07		0.5	0.05		0.5	0.05		0.3		U/E	0.3		U/E	0.9	0.09
RM 120	13-3-LS	0.4		U/E	0.5		U/E	0.5		U/E	0.6		U/E	0.5		U/E	0.8	0.03
RM 124	14-LS	0.4		U/E	0.3		U/E	0.2		U/E	0.2		U/E	0.2		U/E	0.4	0.02
RM 141	15-C	0.3		U/E	0.5		U/E	0.3	0.02		0.6	0.01		0.2		U/E	1.2	0.04
Wildlife Reference Value°		na **			na **			na **			na **			na **			na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on evalutation of QC data.
* = Lipid-normalized data only presented when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to half the lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE E-5. DIOXINS AND FURANS IN FISH WHOLE-BODY COMPOSITES (page 2 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	DIOXINS (cont.) OCDD Conc. (ng/kg)	OCDD Lipid Norm.* Conc. (ng/g lipid)	FURANS 2378-TCDF Conc. (ng/kg)	2378-TCDF Lipid Norm.* Conc. (ng/g lipid)		12378-PeCDF Conc. (ng/kg)	12378-PeCDF Lipid Norm.* Conc. (ng/g lipid)		23478-PeCDF Conc. (ng/kg)	23478-PeCDF Lipid Norm.* Conc. (ng/g lipid)		123478-HxCDF Conc. (ng/kg)	123478-HxCDF Lipid Norm.* Conc. (ng/g lipid)		123678-HxCDF Conc. (ng/kg)	123678-HxCDF Lipid Norm.* Conc. (ng/g lipid)	
RM 14	1-LS	5.6	0.12	4.9	0.11	E	9.9	0.22		0.9		U/E	1.3		U/E	5.2	0.11	
RM 14	1-C	7.5	0.13	3.6	0.06		2.3	0.04		0.3		U/E	0.6		U/E	0.5		U/E
RM 21	2-LS	3.3	0.07	5.0	0.11		5.6	0.12		0.7		U/E	0.3		U/E	0.3		U/E
RM 23	3-LS	36.9	1.09	3.2	0.09	E	2.7	0.08		0.6		U/E	0.6		U/E	0.6		U/E
RM 26	4-LS	5.6	0.08	2.6	0.04		1.8	0.03		0.3		U/E	0.4		U/E	0.4		U/E
RM 29	5-LS	3.6	0.08	5.2	0.11	E	0.6		U/E	0.6		U/E	0.5		U/E	0.5		U/E
RM 36	6-LS	4.9	0.06	5.9	0.07	E	1.4	0.02		1.3		U/E	0.8		U/E	0.8		U/E
RM 59	7-LS	9.9	0.35	5.4	0.19	E	2.0	0.07		0.1		U/E	0.7		U/E	0.7		U/E
RM 68	8-LS	8.9	0.49	2.6	0.14		1.5	0.08		0.2		U/E	0.2		U/E	0.2		U/E
RM 81	9-LS	3.9	0.65	1.6	0.27		0.4		U/E	1.0	0.17		0.3		U/E	0.4		U/E
RM 88	10-LS	5.4	0.11	2.1		U/E	1.2	0.03		0.5		U/E	1.0		U/E	0.9		U/E
RM 90	11-LS	2.6	0.07	6.5	0.17		3.9	0.10		1.1		U/E	0.8		U/E	0.9		U/E
RM 95	12-LS	2.2	0.06	3.8	0.10		1.7	0.04		0.3		U/E	0.3		U/E	0.3		U/E
RM 120	13-1-LS	1.5	0.11	4.8	0.34		0.3	0.02		0.5		U/E	0.3		U/E	0.3		U/E
RM 120	13-2-LS	4.3	0.43	2.7	0.27		0.6		U/E	1.8	0.18		0.7		U/E	0.7		U/E
RM 120	13-3-LS	6.0	0.20	2.2	0.07		2.2	0.07		0.2		U/E	0.3		U/E	0.3		U/E
RM 124	14-LS	3.7	0.17	4.1	0.19		0.9		U/E	0.3		U/E	0.1		U/E	0.1		U/E
RM 141	15-C	3.9	0.13	3.9	0.13		3.9	0.13		0.2	0.01		0.3		U/E	0.4		U/E
Wildlife Reference Value°		na **		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on evalutation of QC data.
* = Lipid-normalized data only presented when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to half the lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE E-5. DIOXINS AND FURANS IN FISH WHOLE-BODY COMPOSITES (page 3 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	FURANS (cont.) 123789-HxCDF Conc. (ng/kg)	123789-HxCDF Lipid Norm.* Conc. (ng/g lipid)	234678-HxCDF Conc. (ng/kg)	234678-HxCDF Lipid Norm.* Conc. (ng/g lipid)	1234678-HpCDF Conc. (ng/kg)	1234678-HpCDF Lipid Norm.* Conc. (ng/g lipid)	1234789-HpCDF Conc. (ng/kg)	1234789-HpCDF Lipid Norm.* Conc. (ng/g lipid)	OCDF Conc. (ng/kg)	OCDF Lipid Norm.* Conc. (ng/g lipid)
RM 14	1-LS	**2.4**	**0.05**	**5.2**	**0.11**	**5.5**	**0.12**	0.5 U/E		**2.7**	**0.06**
RM 14	1-C	**2.5**	**0.04**	**1.0**	**0.02**	0.3 U/E		0.5 U/E		**0.6**	U/E
RM 21	2-LS	**4.5**	**0.10**	**1.2**	**0.03**	0.3 U/E		0.6 U/E		**0.2**	U/E
RM 23	3-LS	**0.8**	**0.02**	**1.6**	**0.05**	0.7 U/E		0.4 U/E		**2.4**	**0.07**
RM 26	4-LS	**1.1**	**0.02**	0.4 U/E		0.7 U/E		1.2 U/E		**0.3**	U/E
RM 29	5-LS	**3.4**	**0.07**	**0.8**	**0.02**	0.4 U/E		0.2 U/E		**0.2**	U/E
RM 36	6-LS	**1.3**	**0.02**	**0.3**	**0.00**	0.5 U/E		0.2 U/E		**0.2**	U/E
RM 59	7-LS	**2.1**	**0.08**	**0.6**	**0.02**	**1.3**	**0.05**	0.4 U/E		**1.3**	**0.05**
RM 68	8-LS	**1.6**	**0.09**	**0.4**	**0.02**	0.8 U/E		1.2 U/E		**0.9**	**0.05**
RM 81	9-LS	**0.9**	**0.15**	**0.3**	**0.05**	0.7 U/E		0.2 U/E		**0.4**	U/E
RM 88	10-LS	1.7 U/E		1.1 U/E		1.3 U/E		2.5 U/E		**0.8**	U/E
RM 90	11-LS	**4.0**	**0.11**	**1.0**	**0.03**	**0.4**	**0.01**	0.4 U/E		**0.3**	U/E
RM 95	12-LS	**1.7**	**0.04**	**0.4**	**0.01**	0.4 U/E		0.3 U/E		**0.1**	U/E
RM 120	13-1-LS	**2.8**	**0.20**	**0.7**	**0.05**	0.3 U/E		0.2 U/E		**0.1**	U/E
RM 120	13-2-LS	**1.3**	**0.13**	**0.5**	**0.05**	**4.0**	**0.40**	0.4 U/E		**2.0**	**0.20**
RM 120	13-3-LS	**1.6**	**0.05**	**0.5**	**0.02**	0.6 U/E		0.3 U/E		**0.4**	U/E
RM 124	14-LS	**1.4**	**0.06**	0.4 U/E		0.2 U/E		0.2 U/E		**0.3**	**0.01**
RM 141	15-C	**2.3**	**0.08**	**0.7**	**0.02**	0.2 U/E		0.2 U/E		**0.2**	U/E
Wildlife Reference Value[6]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on evalutation of QC data.
* = Lipid-normalized data only presented when a compound is detected.
** = Tissue reference value not available for this compound.
[6] Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to half the lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE E-5. DIOXINS AND FURANS IN FISH WHOLE-BODY COMPOSITES (page 4 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	2,3,7,8-TCDD Toxicity Equivalency Concentrations[1] TEC[2] (pg/g)	Lipid Norm. TEC[2] (ng/g lipid)	TEC[3] (pg/g)	Lipid Norm. TEC[3] (ng/g lipid)
RM 14	1-LS	3.1418	0.0684	2.3393	0.0509
RM 14	1-C	2.0748	0.0346	0.8705	0.0145
RM 21	2-LS	2.0719	0.0451	1.3573	0.0295
RM 23	3-LS	1.6608	0.0489	0.8103	0.0238
RM 26	4-LS	1.7533	0.0267	1.4136	0.0214
RM 29	5-LS	2.0787	0.0433	0.9506	0.0198
RM 36	6-LS	2.3095	0.0275	0.8359	0.0100
RM 59	7-LS	2.3222	0.0830	0.9552	0.0341
RM 68	8-LS	0.9178	0.0513	0.5578	0.0310
RM 81	9-LS	1.3116	0.2188	0.8219	0.1370
RM 88	10-LS	1.3618	0.0286	0.0774	0.0016
RM 90	11-LS	2.3508	0.0619	1.4236	0.0375
RM 95	12-LS	1.2808	0.0337	0.6822	0.0180
RM 120	13-1-LS	1.3581	0.0971	0.8505	0.0608
RM 120	13-2-LS	2.5223	0.2524	2.4053	0.2405
RM 120	13-3-LS	1.0437	0.0348	0.5540	0.0185
RM 124	14-LS	0.9925	0.0452	0.5580	0.0254
RM 141	15-C	1.4130	0.0471	1.1109	0.0364
Wildlife Reference Value[o]		3.0		3.0	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on evalutation of QC data.
* = Lipid-normalized data only presented when a compound is detected.
** = Tissue reference value not available for this compound.
[o] Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to half the lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE E-6. POLYBUTYL TINS IN FISH WHOLE-BODY COMPOSITES LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	POLYBUTYL TINS					
		n-Butyltin trichloride		di-n-Butyltin dichloride		tri-n-Butyltin chloride	
		Concentration (µg Sn/kg)		Concentration (µg Sn/kg)		Concentration (µg Sn/kg)	
RM 14	1-LS	3.4	U	5.2	U	1.6	U/B
RM 14	1-C	3.4	U	1.3	J	28.8	
RM 21	2-LS	0.3	U/B	1.6	J	38.4	
RM 23	3-LS	3.4	U	5.2	U	16.0	
RM 26	4-LS	3.4	U	5.2	U	12.8	
RM 29	5-LS	3.4	U	1.3	J	28.8	
RM 36	6-LS	3.4	U	2.6	J	54.3	
RM 59	7-LS	3.4	U/E	1.6	J/E	6.4	J/E
RM 68	8-LS	3.4	U	5.2	U	12.8	
RM 81	9-LS	3.4	U	5.2	U	3.2	U/B
RM 88	10-LS	3.4	U	1.8	J	25.6	
RM 90	11-LS	3.4	U	5.2	U	12.8	
RM 95	12-LS	3.4	U	5.2	U	16.0	
RM 120	13-1-LS	3.4	U	5.2	U	6.4	
RM 120	13-2-LS	3.4	U/E	5.2	U/E	6.4	U/E
RM 120	13-3-LS	3.4	U	5.2	U	12.8	
RM 124	14-LS	3.4	U	5.2	U	3.2	U/B
RM 141	15-C	3.4	U	5.2	U	1.3	U/B
Wildlife Reference V		na*		na*		na*	

C = Carp sample.
LS = Largescale sucker sample.
U = Compound was not detected. Value given is the lower quantification limit.
U/B = Undetected due to blank contamination.
J = Value detected below specified detection limit.
E = Estimated value based on evaluation of QC data.
RM = River mile.
* = Reference value not available.
[1] Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-7. RADIONUCLIDES IN FISH WHOLE-BODY COMPOSITES (page 1 of 2)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	RADIONUCLIDES																				
		Plutonium 239/240				Plutonium 238				Americium 241				Cobalt 60		Cesium 137				Europium 152		
		(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)		(pCi/g)		error	LLD	(pCi/g)		
RM 14	1-LS	0.001		±0.001	0.000	0.011		±0.006	0.007	0.003	U	±0.012	0.020	0.02	U	U			0.02	0.20	U	
RM 14	1-C	0.002		±0.002	0.000	0.002	U	±0.004	0.009	-0.001	U	±0.007	0.014	0.02	U	U			0.02	0.20	U	
RM 21	2-LS	0.001		±0.001	0.000	0.000	U	±0.004	0.008	0.003	U	±0.008	0.015	0.02	U	U			0.02	0.20	U	
RM 23	3-LS	0.001		±0.001	0.000	0.001	U	±0.003	0.007	-0.004	U	±0.011	0.024	0.02	U	U			0.02	0.20	U	
RM 26	4-LS	0.000		±0.000	0.000	0.001	U	±0.004	0.007	-0.003	U	±0.005	0.010	0.02	U	U			0.02	0.20	U	
RM 29	5-LS	0.001		±0.002	0.000	0.001	U	±0.004	0.008	-0.004	U	±0.007	0.014	0.02	U	U			0.02	0.20	U	
RM 36	6-LS	0.001		±0.002	0.000	-0.001	U	±0.005	0.010	0.002	U	±0.009	0.017	0.02	U	U			0.02	0.20	U	
RM 59	7-LS	0.003		±0.003	0.000	0.003	U	±0.006	0.011	-0.002	U	±0.013	0.027	0.02	U	U			0.02	0.20	U	
RM 68	8-LS	0.001		±0.001	0.000	0.001	U	±0.004	0.007	0.001	U	±0.008	0.015	0.02	U	U			0.02	0.20	U	
RM 81	9-LS	0.001		±0.002	0.000	0.001	U	±0.004	0.008	0.003	U	±0.009	0.017	0.02	U	0.016		±0.009	0.02	0.20	U	
RM 88	10-LS	0.001		±0.001	0.000	-0.002	U	±0.006	0.011	0.002	U	±0.010	0.018	0.15	U	U			0.12	0.20	U	
RM 90	11-LS	0.002		±0.002	0.000	0.001	U	±0.005	0.010	0.004	U	±0.006	0.009	0.02	U	U			0.02	0.20	U	
RM 95	12-LS	0.001		±0.001	0.000	0.003	U	±0.004	0.007	0.007	U	±0.007	0.010	0.02	U	U			0.02	0.20	U	
RM 120	13-1-LS	0.003		±0.003	0.000	0.003	U	±0.005	0.008	0.005	U	±0.006	0.010	0.02	U	U			0.02	0.20	U	
RM 120	13-2-LS	0.001	U	±0.002	0.003	0.002	U	±0.004	0.008	0.002	U	±0.005	0.009	0.02	U	0.020		±0.009	0.02	0.20	U	
RM 120	13-3-LS	0.001		±0.001	0.000	0.002	U	±0.004	0.007	0.004	U	±0.007	0.012	0.02	U	U			0.02	0.20	U	
RM 124	14-LS	0.000	U	±0.003	0.006	0.001	U	±0.003	0.006	0.000	U	±0.005	0.010	0.02	U	U			0.02	0.20	U	
RM 141	15-C	0.001		±0.003	0.000	0.001	U	±0.008	0.017	-0.002	U	±0.006	0.013	0.02	U	U			0.02	0.20	U	
Wildlife Reference Value[1]		na*				na*				na*				na*		na*				na*		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
LLD = Lower limit of detection
U = Compound was not detected. Value given is the lower quantification limit.
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE E-7. RADIONUCLIDES IN FISH WHOLE-BODY COMPOSITES (page 2 of 2)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	Europium 154 (pCi/g)		Europium 155 (pCi/g)	
RM 14	1-LS	0.20	U	0.05	U
RM 14	1-C	0.20	U	0.05	U
RM 21	2-LS	0.20	U	0.05	U
RM 23	3-LS	0.20	U	0.05	U
RM 26	4-LS	0.20	U	0.05	U
RM 29	5-LS	0.20	U	0.05	U
RM 36	6-LS	0.20	U	0.05	U
RM 59	7-LS	0.20	U	0.05	U
RM 68	8-LS	0.20	U	0.05	U
RM 81	9-LS	0.20	U	0.05	U
RM 88	10-LS	0.25	U	0.50	U
RM 90	11-LS	0.20	U	0.05	U
RM 95	12-LS	0.20	U	0.05	U
RM 120	13-1-LS	0.20	U	0.05	U
RM 120	13-2-LS	0.20	U	0.05	U
RM 120	13-3-LS	0.20	U	0.05	U
RM 124	14-LS	0.20	U	0.05	U
RM 141	15-C	0.20	U	0.05	U
Wildlife Reference Value[1]		na*		na*	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
LLD = Lower limit of detection
U = Compound was not detected. Value given is the lower quantification limit.
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.