APPENDIX T

ECOLOGICAL RISK ASSESSMENT

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SUPPORTING DOCUMENTATION FOR DATA EVALUATION

T-1.1 SURFACE WATER SAMPLES USED IN ECOLOGICAL RISK ASSESSMENT

APPENDIX T-1.1
SURFACE WATER SAMPLES
Remedial Investigation Report
Stratford Army Engine Plant
Stratford, Connecticut

Groupings	Sample Location	Field Sample ID	Top Depth	Bottom Depth	Sample Date	Program
Tidal Flats						
SW_TF	OF-001 (SW)	01-SW	0	0	10/22/1992	1992 Phase 1 RI
SW_TF	OF-002 (SW)	02-SW	0	0	10/22/1992	1992 Phase 1 RI
SW_TF	OF-003 (SW)	03-SW	0	0	10/22/1992	1992 Phase 1 RI
SW_TF	OF-004 (SW)	04-SW	0	0	10/22/1992	1992 Phase 1 RI
SW_TF	OF-005 (SW)	05-SW	0	0	10/22/1992	1992 Phase 1 RI
SW_TF	OF-006 (SW)	06-SW	0	0	10/22/1992	1992 Phase 1 RI
SW_TF	OF-007 (SW)	07-SW	0	0	10/22/1992	1992 Phase 1 RI
SW_TF	LT1	LT1-SW	0	0	10/23/1992	1992 Phase 1 RI
SW_TF	LT2	LT2-SW	0	0	10/23/1992	1992 Phase 1 RI
SW_TF	LT3	LT3-SW	0	0	10/23/1992	1992 Phase 1 RI
Outfall 008						
SW_08_H	SW08001H	SW08001H	0	0	5/5/1999	1998-99 RI
SW_08_H	SW08002H	SW08002H	0	0	5/5/1999	1998-99 RI
SW_08_H	SW08003H	SW08003H	0	0	5/5/1999	1998-99 RI
SW_08_HD	SW08001HD	SW08001HD	0	0	5/19/1999	1998-99 RI
SW_08_HD	SW08002HD	SW08002HD	0	0	5/19/1999	1998-99 RI
SW_08_HD	SW08003HD	SW08003HD	0	0	5/19/1999	1998-99 RI
SW_08_L	SW08001L	SW08001L	0	0	5/19/1999	1998-99 RI
SW_08_L	SW08002L	SW08002L	0	0	5/19/1999	1998-99 RI
SW_08_L	SW08003L	SW08003L	0	0	5/5/1999	1998-99 RI
SW_08_LD	SW08001LD	SW08001LD	0	0	5/19/1999	1998-99 RI
SW_08_LD	SW08002LD	SW08002LD	0	0	5/19/1999	1998-99 RI
SW_08_LD	SW08002L	SW08002LR2	0	0	5/5/1999	1998-99 RI
SW_08_LD	SW08003LD	SW08003LD	0	0	5/19/1999	1998-99 RI
Marine Basin						
SW_MB_H	SWMB001H	SWMB001H	0	0	5/20/1999	1998-99 RI
SW_MB_H	SWMB002H	SWMB002H	0	0	5/20/1999	1998-99 RI
SW_MB_H	SWMB003H	SWMB003H	0	0	5/5/1999	1998-99 RI
SW_MB_H	SWMB004H	SWMB004H	0	0	5/5/1999	1998-99 RI
SW_MB_HD	SWMB001HD	SWMB001HD	0	0	5/20/1999	1998-99 RI
SW_MB_HD	SWMB001H	SWMB001HR2	0	0	5/25/1999	1998-99 RI
SW_MB_HD	SWMB002HD	SWMB002HD	0	0	5/20/1999	1998-99 RI
SW_MB_HD	SWMB003HD	SWMB003HD	0	0	5/18/1999	1998-99 RI
SW_MB_HD	SWMB004HD	SWMB004HD	0	0	5/18/1999	1998-99 RI
SW_MB_L	SWMB001L	SWMB001L	0	0	5/20/1999	1998-99 RI
SW_MB_L	SWMB002L	SWMB002L	0	0	5/20/1999	1998-99 RI
SW_MB_L	SWMB003L	SWMB003L	0	0	5/5/1999	1998-99 RI
SW_MB_L	SWMB004L	SWMB004L	0	0	5/5/1999	1998-99 RI
SW_MB_LD	SWMB001LD	SWMB001LD	0	0	5/20/1999	1998-99 RI
SW_MB_LD	SWMB002LD	SWMB002LD	0	0	5/20/1999	1998-99 RI
SW_MB_LD	SWMB003LD	SWMB003LD	0	0	5/18/1999	1998-99 RI
SW_MB_LD	SWMB004LD	SWMB004LD	0	0	5/18/1999	1998-99 RI

APPENDIX T-1.1
SURFACE WATER SAMPLES
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Stratford Army Engine Plant
Stratford, Connecticut

Groupings	Sample Location	Field Sample ID	Top Depth	Bottom Depth	Sample Date	Program
Reference Area						
SW_REF_H	SWUS001H	SWUS001H	0	0	5/5/1999	1998-99 RI
SW_REF_H	SWUS002H	SWUS002H	0	0	5/5/1999	1998-99 RI
SW_REF_H	SWUS003H	SWUS003H	0	0	5/5/1999	1998-99 RI
SW_REF_HD	SWUS001HD	SWUS001HD	0	0	5/18/1999	1998-99 RI
SW_REF_HD	SWUS002HD	SWUS002HD	0	0	5/18/1999	1998-99 RI
SW_REF_HD	SWUS003HD	SWUS003HD	0	0	5/18/1999	1998-99 RI
SW_REF_L	IBG	IBG-SW	0	0	10/23/1992	1992 Phase 1 RI
SW_REF_L	SWUS001L	SWUS001L	0	0	5/5/1999	1998-99 RI
SW_REF_L	SWUS002L	SWUS002L	0	0	5/5/1999	1998-99 RI
SW_REF_L	SWUS003L	SWUS003L	0	0	5/5/1999	1998-99 RI
SW_REF_LD	SWUS001LD	SWUS001LD	0	0	5/18/1999	1998-99 RI
SW_REF_LD	SWUS002LD	SWUS002LD	0	0	5/18/1999	1998-99 RI
SW_REF_LD	SWUS003LD	SWUS003LD	0	0	5/18/1999	1998-99 RI

T-1.2 SEDIMENT USED IN ECOLOGICAL RISK ASSESSMENT

APPENDIX T-1.2
SEDIMENT SAMPLES
Remedial Investigation Report
Stratford Army Engine Plant
Stratford, Connecticut

Groupings	Sample Location	Field Sample ID	Top Depth	Bottom Depth	Sample Date	Program
Tidal Flats						
SD_TF_ERA	OF-001 (SD)	01-0-12	0	1	10/28/1992	1992 Phase 1 RI
SD_TF_ERA	OF-002 (SD)	02-0-12	0	1	10/28/1992	1992 Phase 1 RI
SD_TF_ERA	OF-003 (SD)	03-0-12	0	1	10/28/1992	1992 Phase 1 RI
SD_TF_ERA	OF-004 (SD)	04-0-12	0	1	10/28/1992	1992 Phase 1 RI
SD_TF_ERA	OF-005 (SD)	05-0-12	0	1	10/27/1992	1992 Phase 1 RI
SD_TF_ERA	OF-006 (SD)	06-0-12	0	1	10/27/1992	1992 Phase 1 RI
SD_TF_ERA	OF-007 (SD)	07-0-12	0	1	10/28/1992	1992 Phase 1 RI
SD_TF_ERA	SDTA001A	SDTA001A	0	0.5	5/13/1999	1998-99 RI
SD_TF_ERA	SDTA003A	SDTA003A	0	0.5	5/13/1999	1998-99 RI
SD_TF_ERA	SDTA005A	SDTA005A	0	0.5	5/13/1999	1998-99 RI
SD_TF_ERA	SDTA006A	SDTA006A	0	0.5	5/13/1999	1998-99 RI
SD_TF_ERA	SDTA007A	SDTA007A	0	0.5	5/13/1999	1998-99 RI
SD_TF_ERA	SDTAR2006A2	SDTAR2006A2	0	0.5	5/13/1999	1998-99 RI
SD_TF_ERA	SDTB006A	SDTB006A	0	0.5	5/14/1999	1998-99 RI
SD_TF_ERA	SDTB007A	SDTB007A	0	0.5	5/14/1999	1998-99 RI
SD_TF_ERA	SDTC006A	SDTC006A	0	0.5	5/14/1999	1998-99 RI
SD_TF_ERA	SDTC007A	SDTC007A	0	0.5	5/14/1999	1998-99 RI
SD_TF_ERA	SDTD001A	SDTD001A	0	0.5	5/13/1999	1998-99 RI
SD_TF_ERA	SDTD003A	SDTD003A	0	0.5	5/14/1999	1998-99 RI
SD_TF_ERA	SDTD005A	SDTD005A	0	0.5	5/14/1999	1998-99 RI
SD_TF_ERA	SDTD006A	SDTD006A	0	0.5	5/14/1999	1998-99 RI
SD_TF_ERA	SDTD007A	SDTD007A	0	0.5	5/14/1999	1998-99 RI
SD_TF_ERA	SDTE001A	SDTE001A	0	0.5	5/17/1999	1998-99 RI
SD_TF_ERA	SDTE003A	SDTE003A	0	0.5	5/17/1999	1998-99 RI
SD_TF_ERA	SDTE005A	SDTE005A	0	0.5	5/17/1999	1998-99 RI
SD_TF_ERA	SDTG001A	SDTG001A	0	0.5	5/17/1999	1998-99 RI
SD_TF_ERA	SDTG002A	SDTG002A	0	0.5	5/17/1999	1998-99 RI
SD_TF_ERA	SDTG003A	SDTG003A	0	0.5	5/17/1999	1998-99 RI
SD_TF_ERA	SDTG004A	SDTG004A	0	0.5	5/18/1999	1998-99 RI
SD_TF_ERA	SDTH001A	SDTH001A	0	0.5	5/17/1999	1998-99 RI
SD_TF_ERA	SDTH002A	SDTH002A	0	0.5	5/17/1999	1998-99 RI
SD_TF_ERA	TA1	TA1-0-6	0	0.5	12/7/1994	1994-95 Phase 2 RI
SD_TF_ERA	TA2	TA2-0-6	0	0.5	12/7/1994	1994-95 Phase 2 RI
SD_TF_ERA	TA3	TA3-0-6	0	0.5	12/8/1994	1994-95 Phase 2 RI
SD_TF_ERA	TA4	TA4-0-6	0	0.5	12/8/1994	1994-95 Phase 2 RI
SD_TF_ERA	TA5	TA5-0-6	0	0.5	12/7/1994	1994-95 Phase 2 RI
SD_TF_ERA	TB1	TB1-0-6	0	0.5	12/6/1994	1994-95 Phase 2 RI

APPENDIX T-1.2
SEDIMENT SAMPLES
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Stratford Army Engine Plant
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Groupings	Sample Location	Field Sample ID	Top Depth	Bottom Depth	Sample Date	Program
Tidal Flats						
SD_TF_ERA	TB2	TB2-0-6	0	0.5	12/6/1994	1994-95 Phase 2 RI
SD_TF_ERA	TB3	TB3-0-6	0	0.5	12/6/1994	1994-95 Phase 2 RI
SD_TF_ERA	TB4	TB4-0-6	0	0.5	12/7/1994	1994-95 Phase 2 RI
SD_TF_ERA	TB5	TB5-0-6	0	0.5	12/7/1994	1994-95 Phase 2 RI
SD_TF_ERA	TC1	TC1-0-6	0	0.5	12/12/1994	1994-95 Phase 2 RI
SD_TF_ERA	TC2	TC2-0-6	0	0.5	12/8/1994	1994-95 Phase 2 RI
SD_TF_ERA	TC3	TC3-0-6	0	0.5	12/8/1994	1994-95 Phase 2 RI
SD_TF_ERA	TC4	TC4-0-6	0	0.5	12/8/1994	1994-95 Phase 2 RI
SD_TF_ERA	TC5	TC5-0-6	0	0.5	12/12/1994	1994-95 Phase 2 RI
SD_TF_ERA	TD1	TD1-0-6	0	0.5	12/12/1994	1994-95 Phase 2 RI
SD_TF_ERA	TD2	TD2-0-6	0	0.5	12/13/1994	1994-95 Phase 2 RI
SD_TF_ERA	TD3	TD3-0-6	0	0.5	12/13/1994	1994-95 Phase 2 RI
SD_TF_ERA	TD4	TD4-0-6	0	0.5	12/14/1994	1994-95 Phase 2 RI
SD_TF_ERA	TD5	TD5-0-6	0	0.5	12/13/1994	1994-95 Phase 2 RI
SD_TF_ERA	TE1	TE1-0-6	0	0.5	12/14/1994	1994-95 Phase 2 RI
SD_TF_ERA	TE2	TE2-0-6	0	0.5	12/14/1994	1994-95 Phase 2 RI
SD_TF_ERA	TE3	TE3-0-6	0	0.5	12/14/1994	1994-95 Phase 2 RI
SD_TF_ERA	TE4	TE4-0-6	0	0.5	12/14/1994	1994-95 Phase 2 RI
SD_TF_ERA	TF1	TF1-0-6	0	0.5	12/15/1994	1994-95 Phase 2 RI
SD_TF_ERA	TF2	TF2-0-6	0	0.5	12/15/1994	1994-95 Phase 2 RI
SD_TF_ERA	TF3	TF3-0-6	0	0.5	12/15/1994	1994-95 Phase 2 RI
SD_TF_ERA	TF4	TF4-0-6	0	0.5	12/14/1994	1994-95 Phase 2 RI
SD_TF_ERA	U1	U1-0-6	0	0.5	12/7/1994	1994-95 Phase 2 RI
SD_TF_ERA	SDTA006AR2	SDTA006AR2			5/13/1999	1998-99 RI
SD_TF_ERA	SDTA007AR2	SDTA007AR2			5/13/1999	1998-99 RI
SD_TF_ERA	SDTB006AR2	SDTB006AR2			5/14/1999	1998-99 RI
SD_TF_ERA	SDTC006AR2	SDTC006AR2			5/14/1999	1998-99 RI
SD_TF_ERA	SDTC007AR2	SDTC007AR2			5/14/1999	1998-99 RI
SD_TF_ERA	SDTD006AR2	SDTD006AR2			5/14/1999	1998-99 RI
SD_TF_ERA	SDTD007AR2	SDTD007AR2			5/14/1999	1998-99 RI
SD_TF_ERA	SDTG001AR2	SDTG001AR2			5/17/1999	1998-99 RI
SD_TF_ERA	SDTG002AR2	SDTG002AR2			5/17/1999	1998-99 RI
SD_TF_ERA	SDTG003AR2	SDTG003AR2			5/17/1999	1998-99 RI
SD_TF_ERA	SDTG004AR2	SDTG004AR2			5/18/1999	1998-99 RI
SD_TF_ERA	SDTH001AR2	SDTH001AR2			5/17/1999	1998-99 RI
SD_TF_ERA	SDTH002AR2	SDTH002AR2			5/17/1999	1998-99 RI

APPENDIX T-1.2
SEDIMENT SAMPLES
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Stratford, Connecticut

Groupings	Sample Location	Field Sample ID	Top Depth	Bottom Depth	Sample Date	Program
Outfall 008						
SD_08_ERA	OF-008 (SD)	08-0-12	0	1	10/27/1992	1992 Phase 1 RI
SD_08_ERA	SD08001A	SD08001A	0	0.5	5/19/1999	1998-99 RI
SD_08_ERA	SD08002A	SD08002A	0	0.5	5/19/1999	1998-99 RI
SD_08_ERA	SD08003A	SD08003A	0	0.5	5/19/1999	1998-99 RI
SD_08_ERA	SD08001AR2	SD08001AR2			5/19/1999	1998-99 RI
SD_08_ERA	SD08001AR3	SD08001AR3			5/19/1999	1998-99 RI
SD_08_ERA	SD08002AR2	SD08002AR2			5/19/1999	1998-99 RI
SD_08_ERA	SD08003AR2	SD08003AR2			5/19/1999	1998-99 RI
Marine Basin						
SD_MB_ERA	MB	MB-0-6	0	0.5	12/15/1994	1994-95 Phase 2 RI
SD_MB_ERA	SDMB001A	SDMB001A	0	0.5	6/8/1999	1998-99 RI
SD_MB_ERA	SDMB002A	SDMB002A	0	0.5	6/8/1999	1998-99 RI
SD_MB_ERA	SDMB003A	SDMB003A	0	0.5	5/18/1999	1998-99 RI
SD_MB_ERA	SDMB004A	SDMB004A	0	0.5	5/18/1999	1998-99 RI
SD_MB_ERA	SDMB002A	SDMB002A	0	0	5/20/1999	1998-99 RI
SD_MB_ERA	SDMB003AR2	SDMB003AR2			5/18/1999	1998-99 RI
SD_MB_ERA	SDMB004AR2	SDMB004AR2			5/18/1999	1998-99 RI
SD_MB_ERA	SDMB001A	SDMB001A	0	0	5/20/1999	1998-99 RI
Reference Area						
SD_REF_ERA	SDUS001A	SDUS001A	0	0.5	5/18/1999	1998-99 RI
SD_REF_ERA	SDUS002A	SDUS002A	0	0.5	5/18/1999	1998-99 RI
SD_REF_ERA	SDUS003A	SDUS003A	0	0.5	5/18/1999	1998-99 RI
SD_REF_ERA	U2	U2-0-6	0	0.5	12/12/1994	1994-95 Phase 2 RI

T-1.3 SHALLOW GROUNDWATER SAMPLES USED IN ECOLOGICAL RISK ASSESSMENT

APPENDIX T-1.3
SHALLOW GROUNDWATER SAMPLES
Remedial Investigation Report
Stratford Army Engine Plant
Stratford, Connecticut

Groupings	Sample Location	Field Sample ID	Top Depth	Bottom Depth	Sample Date	Program
Tidal Flats						
GW_TF_ERA	D-1	D1	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-10	D10	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-11	D11	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-12	D12	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-13	D1302XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-13-1	D131102XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-13-2	D132102XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-13-3	D133102XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-13-4	D134102XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-14	D14	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-15	D15	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-16	D16	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-17	D17	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-17A	D1702AXX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-18	D18	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-2	D2	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-20	D20	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-3	D3	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-4	D402XX	1.5	1.5	4/23/2002	2002 RI
GW_TF_ERA	D-4-1	D41102XX	1.5	1.5	4/23/2002	2002 RI
GW_TF_ERA	D-4-2	D42102XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-4-3	D43102XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-4-4	D44102XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-4-5	D4502XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-5	D5	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-6	D6	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-7	D7	1.5	1.5	6/15/2001	NAE Dike GW Data
GW_TF_ERA	D-8	D802XX	1.5	1.5	5/3/2002	2002 RI
GW_TF_ERA	D-9	D9	1.5	1.5	6/15/2001	NAE Dike GW Data

T-1.4 BIOTA SAMPLES USED IN ECOLOGICAL RISK ASSESSMENT

APPENDIX T-1.4
BIOTA SAMPLES
Remedial Investigation Report
Stratford Army Engine Plant
Stratford, Connecticut

Groupings	Field Sample ID	Sample Date	Program
Aquatic Worm - Tidal Flats			
AT_TF	AT9-733A	7/22/1999	1998-99 RI
AT_TF	AT9-733B	7/22/1999	1998-99 RI
AT_TF	AT9-733C	7/22/1999	1998-99 RI
AT_TF	AT9-733D	7/22/1999	1998-99 RI
AT_TF	AT9-733E	7/22/1999	1998-99 RI
AT_TF	AT9-734A	7/22/1999	1998-99 RI
AT_TF	AT9-734B	7/22/1999	1998-99 RI
AT_TF	AT9-734C	7/22/1999	1998-99 RI
AT_TF	AT9-734D	7/22/1999	1998-99 RI
AT_TF	AT9-734E	7/22/1999	1998-99 RI
AT_TF	AT9-739A	7/22/1999	1998-99 RI
AT_TF	AT9-739B	7/22/1999	1998-99 RI
AT_TF	AT9-739C	7/22/1999	1998-99 RI
AT_TF	AT9-739D	7/22/1999	1998-99 RI
AT_TF	AT9-739E	7/22/1999	1998-99 RI
AT_TF	AT9-740A	7/22/1999	1998-99 RI
AT_TF	AT9-740B	7/22/1999	1998-99 RI
AT_TF	AT9-740C	7/22/1999	1998-99 RI
AT_TF	AT9-740D	7/22/1999	1998-99 RI
AT_TF	AT9-740E	7/22/1999	1998-99 RI
AT_TF	AT9-741A	7/22/1999	1998-99 RI
AT_TF	AT9-741B	7/22/1999	1998-99 RI
AT_TF	AT9-741C	7/22/1999	1998-99 RI
AT_TF	AT9-741D	7/22/1999	1998-99 RI
AT_TF	AT9-741E	7/22/1999	1998-99 RI
AT_TF	AT9-742A	7/22/1999	1998-99 RI
AT_TF	AT9-742B	7/22/1999	1998-99 RI
AT_TF	AT9-742C	7/22/1999	1998-99 RI
AT_TF	AT9-742D	7/22/1999	1998-99 RI
AT_TF	AT9-742E	7/22/1999	1998-99 RI
AT_TF	AT9-743A	7/22/1999	1998-99 RI
AT_TF	AT9-743B	7/22/1999	1998-99 RI
AT_TF	AT9-743C	7/22/1999	1998-99 RI
AT_TF	AT9-743D	7/22/1999	1998-99 RI
AT_TF	AT9-743E	7/22/1999	1998-99 RI
AT_TF	AT9-744A	7/22/1999	1998-99 RI
AT_TF	AT9-744B	7/22/1999	1998-99 RI
AT_TF	AT9-744C	7/22/1999	1998-99 RI
AT_TF	AT9-744D	7/22/1999	1998-99 RI
AT_TF	AT9-744E	7/22/1999	1998-99 RI
AT_TF	AT9-772A	7/22/1999	1998-99 RI
AT_TF	AT9-772B	7/22/1999	1998-99 RI
AT_TF	AT9-772C	7/22/1999	1998-99 RI
AT_TF	AT9-772D	7/22/1999	1998-99 RI
AT_TF	AT9-772E	7/22/1999	1998-99 RI

APPENDIX T-1.4
BIOTA SAMPLES
Remedial Investigation Report
Stratford Army Engine Plant
Stratford, Connecticut

Groupings	Field Sample ID	Sample Date	Program
AT_TF	AT9-773A	7/22/1999	1998-99 RI
AT_TF	AT9-773B	7/22/1999	1998-99 RI
AT_TF	AT9-773C	7/22/1999	1998-99 RI
AT_TF	AT9-773D	7/22/1999	1998-99 RI
AT_TF	AT9-773E	7/22/1999	1998-99 RI
Aquatic Worm - Outfall 008			
AT_08	AT9-792A	7/22/1999	1998-99 RI
AT_08	AT9-792B	7/22/1999	1998-99 RI
AT_08	AT9-792C	7/22/1999	1998-99 RI
AT_08	AT9-792D	7/22/1999	1998-99 RI
AT_08	AT9-792E	7/22/1999	1998-99 RI
AT_08	AT9-793A	7/22/1999	1998-99 RI
AT_08	AT9-793B	7/22/1999	1998-99 RI
AT_08	AT9-793C	7/22/1999	1998-99 RI
AT_08	AT9-793D	7/22/1999	1998-99 RI
AT_08	AT9-793E	7/22/1999	1998-99 RI
AT_08	AT9-794A	7/22/1999	1998-99 RI
AT_08	AT9-794B	7/22/1999	1998-99 RI
AT_08	AT9-794C	7/22/1999	1998-99 RI
AT_08	AT9-794D	7/22/1999	1998-99 RI
AT_08	AT9-794E	7/22/1999	1998-99 RI
Aquatic Worm - Marine Basin			
AT_MB	AT9-781A	7/22/1999	1998-99 RI
AT_MB	AT9-781B	7/22/1999	1998-99 RI
AT_MB	AT9-781C	7/22/1999	1998-99 RI
AT_MB	AT9-781D	7/22/1999	1998-99 RI
AT_MB	AT9-781E	7/22/1999	1998-99 RI
AT_MB	AT9-782A	7/22/1999	1998-99 RI
AT_MB	AT9-782B	7/22/1999	1998-99 RI
AT_MB	AT9-782C	7/22/1999	1998-99 RI
AT_MB	AT9-782D	7/22/1999	1998-99 RI
AT_MB	AT9-782E	7/22/1999	1998-99 RI
AT_MB	AT9-825A	7/22/1999	1998-99 RI
AT_MB	AT9-825B	7/22/1999	1998-99 RI
AT_MB	AT9-825C	7/22/1999	1998-99 RI
AT_MB	AT9-825D	7/22/1999	1998-99 RI
AT_MB	AT9-825E	7/22/1999	1998-99 RI
AT_MB	AT9-826A	7/22/1999	1998-99 RI
AT_MB	AT9-826B	7/22/1999	1998-99 RI
AT_MB	AT9-826C	7/22/1999	1998-99 RI
AT_MB	AT9-826D	7/22/1999	1998-99 RI
AT_MB	AT9-826E	7/22/1999	1998-99 RI

APPENDIX T-1.4
BIOTA SAMPLES
Remedial Investigation Report
Stratford Army Engine Plant
Stratford, Connecticut

Groupings	Field Sample ID	Sample Date	Program
Aquatic Worm - Reference Area			
AT_REF	AT9-778A	7/22/1999	1998-99 RI
AT_REF	AT9-778B	7/22/1999	1998-99 RI
AT_REF	AT9-778C	7/22/1999	1998-99 RI
AT_REF	AT9-778D	7/22/1999	1998-99 RI
AT_REF	AT9-778E	7/22/1999	1998-99 RI
AT_REF	AT9-779A	7/22/1999	1998-99 RI
AT_REF	AT9-779B	7/22/1999	1998-99 RI
AT_REF	AT9-779C	7/22/1999	1998-99 RI
AT_REF	AT9-779D	7/22/1999	1998-99 RI
AT_REF	AT9-779E	7/22/1999	1998-99 RI
AT_REF	AT9-780A	7/22/1999	1998-99 RI
AT_REF	AT9-780B	7/22/1999	1998-99 RI
AT_REF	AT9-780C	7/22/1999	1998-99 RI
AT_REF	AT9-780D	7/22/1999	1998-99 RI
AT_REF	AT9-780E	7/22/1999	1998-99 RI
Finfish - Tidal Flats			
FFWB_TF	FF1TF01	5/15/1999	1998-99 RI
FFWB_TF	FF1TF02	5/15/1999	1998-99 RI
Finfish - Marine Basin			
FFWB_MB	FF1MB01	5/15/1999	1998-99 RI
FFWB_MB	FF1MB02	5/16/1999	1998-99 RI
FFWB_MB	FF1MB03	5/16/1999	1998-99 RI
Finfish - Reference Area			
FFWB_REF	FF1US011	5/20/1999	1998-99 RI
FFWB_REF	FF1US012	5/20/1999	1998-99 RI
FFWB_REF	FF1US013	5/20/1999	1998-99 RI
FFWB_REF	FF1US014	5/20/1999	1998-99 RI
FFWB_REF	FF1US015	5/20/1999	1998-99 RI
Oyster - Tidal Flats			
OY_TF	IFT-1-A	12/15/1994	1994-95 Phase 2 RI
OY_TF	IFT-1-B	12/15/1994	1994-95 Phase 2 RI
OY_TF	IFT-1-C	12/15/1994	1994-95 Phase 2 RI
OY_TF	IFT-2-A	12/16/1994	1994-95 Phase 2 RI
OY_TF	IFT-2-B	12/16/1994	1994-95 Phase 2 RI
OY_TF	IFT-2-C	12/16/1994	1994-95 Phase 2 RI
OY_TF	IFT-3-A	12/19/1994	1994-95 Phase 2 RI
OY_TF	IFT-3-B	12/19/1994	1994-95 Phase 2 RI
OY_TF	IFT-3-C	12/19/1994	1994-95 Phase 2 RI
OY_TF	IFT-4-A	12/19/1994	1994-95 Phase 2 RI
OY_TF	IFT-4-B	12/19/1994	1994-95 Phase 2 RI
OY_TF	IFT-4-C	12/19/1994	1994-95 Phase 2 RI
OY_TF	IFT-5-A	12/19/1994	1994-95 Phase 2 RI
OY_TF	IFT-5-B	12/19/1994	1994-95 Phase 2 RI
OY_TF	IFT-5-C	12/19/1994	1994-95 Phase 2 RI

APPENDIX T-1.4
BIOTA SAMPLES
Remedial Investigation Report
Stratford Army Engine Plant
Stratford, Connecticut

Groupings	Field Sample ID	Sample Date	Program
Oyster - Reference Area			
OY_REF	HRT-1-A	12/15/1994	1994-95 Phase 2 RI
OY_REF	HRT-1-B	12/20/1994	1994-95 Phase 2 RI
OY_REF	HRT-1-C	12/15/1994	1994-95 Phase 2 RI
Ribbed Mussel - Tidal Flats			
SF_TF	SF1TF01	5/15/1999	1998-99 RI
SF_TF	SF1TF02	5/15/1999	1998-99 RI
SF_TF	SF1TF03	5/15/1999	1998-99 RI
SF_TF	SF1TF031	5/15/1999	1998-99 RI
SF_TF	SF1TF032	5/15/1999	1998-99 RI
SF_TF	SF1TF033	5/15/1999	1998-99 RI
SF_TF	SF1TF034	5/15/1999	1998-99 RI
Ribbed Mussel - Marine Basin			
SF_MB	SF1MB01	5/17/1999	1998-99 RI
SF_MB	SF1MB012	5/17/1999	1998-99 RI
SF_MB	SF1MB013	5/17/1999	1998-99 RI
SF_MB	SF1MB014	5/17/1999	1998-99 RI
SF_MB	SF1MB015	5/17/1999	1998-99 RI
Ribbed Mussel - Reference Area			
SF_REF	SF1US01	5/16/1999	1998-99 RI
SF_REF	SF1US011	5/16/1999	1998-99 RI
SF_REF	SF1US012	5/16/1999	1998-99 RI
SF_REF	SF1US013	5/16/1999	1998-99 RI
SF_REF	SF1US014	5/16/1999	1998-99 RI

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RARE, THREATENED, AND ENDANGERED SPECIES INFORMATION

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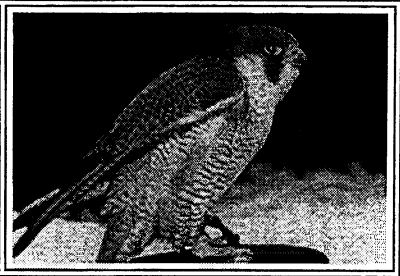
Endangered, Threatened & Special Concern Birds



T	Cooper's hawk	*Accipiter cooperii*
E	Sharp-shinned hawk	*Accipiter striatus*
SC	Northern saw-whet owl	*Aegolius acadicus*
SC	Saltmarsh Sharp-tailed sparrow	*Ammodramus caudacutus*
SC	Henslow's Sparrow *	*Ammodramus henslowii*
SC	Seaside sparrow	*Ammodramus maritimus*
E	Grasshopper sparrow	*Ammodramus savannarum*
T	Blue-wingd teal (nesting populations only)	*Anas discors*
T	Great egret	*Ardea albus*
T	Short-eared owl (wintering populations)	*Asio flammeus*
E	Long-eared owl	*Asio otus*
E	Upland sandpiper	*Bartramia longicauda*
E	American bittern	*Botaurus lentiginosus*
SC	Cattle egret	*Bubulcus ibis*
SC	Red-shouldered hawk	*Buteo lineatus*
SC	Whip-poor-will	*Caprimulgus vociferus*
SC	Willet	*Catoptrophorus semipalmatus*
T	Piping plover ^	*Charadrius melodus*
T	Common nighthawk	*Chordeiles minor*
E	Northern harrier	*Circus cyaneus*
E	Sedge wren	*Cistothorus platensis*
SC	Olive-sided flycatcher	*Contopus borealis*
SC	Common raven	*Corvus corax*
SC	Little blue heron	*Egretta caerulea*
T	Snowy egret	*Egretta thula*

SC	Alder flycatcher	*Empidonax alnorum*
T	Horned lark	*Eremophila alpestris*
E	Peregrine falcon +	*Falco peregrinus*
SC	American kestrel	*Falco sparverius*
E	Common moorhen	*Gallinula chloropus*
SC	Common loon	*Gavia immer*
SC	American oyster-catcher	*Haematopus palliatus*
E	Bald eagle +	*Haliaeetus leucocephalus*
E	Yellow-breasted chat	*Icteria virens*
T	Least bittern	*Ixobrychus exilis*
E	Black rail (nesting population only)	*Laterallus jamaicensis*
E	Red-headed woodpecker	*Melanerpes erythrocephalus*
SC	Eskimo curlew *+	*Numenius borealis*
SC	Yellow-crowned night-heron	*Nyctanassa violacea*
SC	Northern parula	*Parula americana*
SC	Savannah sparrow	*Passerculus sandwichensis*
SC	Ipswich sparrow	*Passerculus sandwichensis* ssp. *princeps*
SC	Glossy ibis	*Plegadis falcinellus*
E	Pied-billed grebe	*Podilymbus podiceps*
E	Vesper sparrow	*Pooecetes gramineus*
SC	Purple martin	*Progne subis*
E	King rail (nesting populations only)	*Rallus elegans*
T	Least tern	*Sterna antillarum*
E	Roseate tern +	*Sterna dougallii*
SC	Common tern +	*Sterna hirundo*
SC	Eastern meadowlark	*Sturnella magna*
SC	Brown thrasher	*Toxostoma rufum*
E	Barn owl	*Tyto alba*
T	Golden-winged warbler	*Vermivora chrysoptera*

* Believed Extirpated
+ Federally Endangered
^ Federally Threatened

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Endangered, Threatened & Special Concern Mammals

SC	Gray wolf *+	*Canis lupus*
E	Least shrew	*Cryptotis parva*
SC	Eastern cougar* +	*Felis concolor couguar*
SC	Gray seal	*Halichoerus grypus*
SC	Silver-haired bat	*Lasionycteris noctivagans*
SC	Red bat	*Lasiurus borealis*
SC	Hoary bat	*Lasiurus cinereus*
SC	Eastern small-footed bat*	*Myotis leibii*
E	Indiana bat+	*Myotis sodalis*
SC	Eastern woodrat *	*Neotoma floridana*
SC	Harbor porpoise	*Phocoena phocoena*
SC	Southern bog lemming	*Synaptomys cooperi*

* Extirpated
+ Federally Endangered

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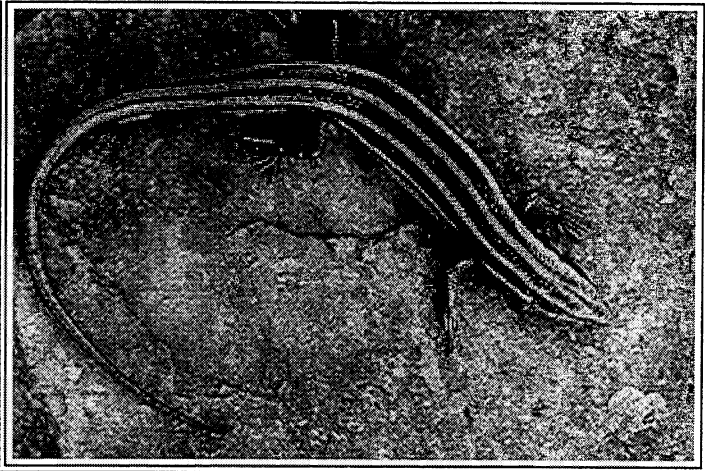
Endangered, Threatened & Special Concern Reptiles



T	Loggerhead	*Caretta caretta*
T	Atlantic green turtle ^	*Chelonia mydas*
SC	Wood turtle	*Clemmys insculpta*
E	Bog turtle	*Clemmys muhlenbergii*
E	Timber rattlesnake	*Crotalus horridus*
E	Leatherback +	*Dermochelys coriacea*
T	Five-lined skink	*Eumeces fasciatus*
SC	Eastern hognose snake	*Heterodon platirhinos*
E	Atlantic ridley +	*Lepidochelys kempii*
SC	Eastern box turtle	*Terrapene c. carolina*
SC	Eastern ribbon snake	*Thamnophis sauritus*

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^ Federally Threatened

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Endangered, Threatened & Special Concern Amphibians

SC	Jefferson salamander "complex"	*Ambystoma jeffersonianum*
SC	Blue-spotted salamander "complex"	*Ambystoma laterale*
T	Blue-spotted salamander (diploid populations)	*Ambystoma laterale*
T	Northern Spring salamander	*Gyrinophilus porphyriticus*
T	Northern Slimy salamander	*Plethodon glutinosus*
SC	Northern leopard frog	*Rana pipiens*
E	Eastern Spadefoot	*Scaphiopus holbrookii*

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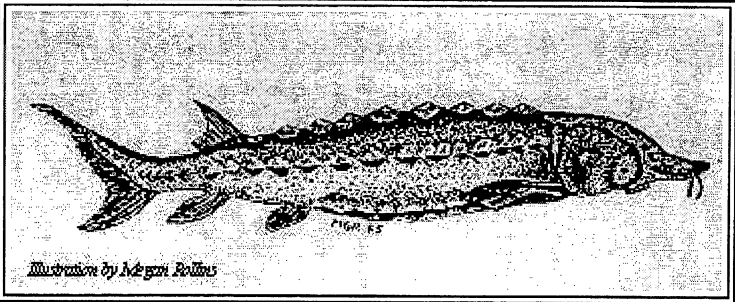
CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

Endangered, Threatened & Special Concern Fish



E	Shortnose sturgeon +	*Acipenser brevirostrum*
T	Atlantic sturgeon (in freshwater)	*Acipenser oxyrhynchus*
SC	Longnose sucker	*Catostomus catostomus*
T	Banded sunfish	*Enneacanthus obesus*
E	American brook lamprey	*Lampetra appendix*
E	Burbot	*Lota lota*

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CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

Endangered, Threatened & Special Concern Invertebrates

SC	Albarufan dagger moth *	*Acronicta albarufa*
SC	Noctuid moth *	*Acronicta lanceolaria*
SC	Ground beetle	*Agonum mutatum*
SC	Noctuid moth *	*Agrotis stigmosa*
E	Dwarf wedge mussel +	*Alasmidonta heterodon*
E	Brook floater	*Alasmidonta varicosa*
SC	Ground beetle	*Amara chalcea*
SC	Roadside skipper	*Amblyscirtes vialis*
E	Noctuid moth	*Anarta luteola*
SC	Mayfly	*Anthopotamus verticis*
SC	Noctuid moth	*Apamea burgessi*
SC	New Jersy tea inchworm	*Apodrepanulatrix liberaria*
SC	Tabanid fly	*Atylotus ohioensis*
SC	Ground beetle	*Badister transversus*
SC	Mayfly	*Baetisca laurentina*
SC	Ground beetle	*Bembidion pseudocautum*
SC	Ground beetle	*Bembidion quadratulum*
SC	Ground beetle	*Bembidion semicinctum*
SC	Ground beetle*	*Brachinus cyanipennis*
E	Northern metalmark	*Calephelis borealis*
SC	Superb jewelwing	*Calopteryx amata*
SC	Sparkling jewelwing	*Calopteryx dimidiata*
SC	Ground beetle*	*Calosoma wilcoxi*
SC	Ground beetle*	*Carabus serratus*
SC	Ground beetle*	*Carabus sylvosus*
SC	Ground beetle*	*Carabus vinctus*
SC	Herodias underwing *	*Catocala herodia gerhardi*
SC	Precious underwing moth *	*Catocala pretiosa*
SC	Appalachian blue	*Celastrina neglectamajor*

SC	Noctuid moth *	*Chaetaglaea cerata*
SC	Northeastern beach tiger beetle *^	*Cicindela dorsalis dorsalis*
T	Tiger beetle	*Cicindela formosa generosa*
SC	Tiger beetle	*Cicindela hirticollis*
SC	Tiger beetle	*Cicindela marginata*
E	Puritan tiger beetle ^	*Cicindela puritana*
SC	Tiger beetle*	*Cicindela purpurea*
SC	Tiger beetle	*Cicindela tranquebarica*
SC	Mayfly	*Cinygmula subaequalis*
SC	Regal moth *	*Citheronia regalis*
T	Tiger spiketail	*Cordulegaster erronea*
SC	Mystic Valley amphipod	*Crangonyx aberrans*
SC	Noctuid moth	*Cucullia speyeri*
SC	Imperial moth *	*Eacles imperialis*
E	Virginia River snail	*Elimia virginica*
SC	Atlantic bluet	*Enallagma doubledayi*
T	Little bluet	*Enallagma minusculum*
SC	Scarlet bluet	*Enallagma pictum*
T	Sleepy duskywing	*Erynnis brizo*
SC	Columbine duskywing	*Erynnis lucilius*
SC	Mottled duskywing *	*Erynnis martialis*
E	Persius duskywing	*Erynnis persius persius*
SC	Noctuid moth	*Eucoptocnemis fimbriaris*
SC	Clam shrimp*	*Eulimnadia agassizii*
T	Two-spotted skipper	*Euphyes bimacula*
T	Sedge skipper	*Euphyes dion*
SC	Noctuid moth *	*Euxoa pleuritica*
SC	Violet dart moth *	*Euxoa violaris*
SC	Pitcher plant moth	*Exyra rolandiana*
SC	Lymnaeid snail *	*Fossaria galbana*
SC	Lymnaeid snail	*Fossaria rustica*
SC	Ground beetle*	*Geopinus incrassatus*
SC	Midland clubtail	*Gomphus fraternus*
SC	Cobra clubtail	*Gomphus vastus*
SC	Horse fly	*Goniops chrysocoma*
SC	Phyllira tiger moth *	*Grammia phyllira*

E	Bog tiger moth	*Grammia speciosa*
SC	Aquatic snail	*Gyraulus circumstriatus*
SC	Slender clearwing *	*Hemaris gracilis*
E	Buck moth	*Hemileuca maia*
T	Horse fly	*Hybomitra frosti*
E	Horse fly	*Hybomitra longiglossa*
SC	Horse fly	*Hybomitra lurida*
SC	Horse fly	*Hybomitra trepida*
SC	Horse fly	*Hybomitra typhus*
SC	Hop vine borer moth *	*Hydraecia immanis*
SC	Henry's elfin	*Incisalia henrici*
SC	Frosted elfin	*Incisalia irus*
SC	Hoary elfin *	*Incisalia polios*
SC	Dragonfly	*Ladona deplanata*
SC	Yellow lampmussel *	*Lampsilis cariosa*
SC	Noctuid moth *	*Lepipolys perscripta*
T	Tidewater mucket	*Leptodea ochracea*
SC	Mayfly	*Leptophlebia bradleyi*
T	Crimson-ringed whiteface	*Leucorrhinia glacialis*
SC	Golden-winged skimmer	*Libellula auripennis*
SC	Eastern pond mussel	*Ligumia nasuta*
SC	Lemmer's noctuid moth *	*Lithophane lemmeri*
SC	Pale green pinion moth *	*Lithophane viridipallens*
SC	Black lordithon rove beetle *	*Lordithon niger*
SC	Ground beetle	*Loxandrus velocipes*
SC	Bog copper	*Lycaena epixanthe*
SC	Bronze copper	*Lycaena hyllus*
SC	Eastern pearlshell	*Margaritifera margaritifera*
SC	Newman's brocade *	*Meropleon ambifusca*
SC	Tabanid fly	*Merycomia whitneyi*
SC	Geometer moth *	*Metarranthis apicaria*
E	Hessel's hairstreak	*Mitoura hesseli*
SC	Syrphid fly *	*Mixogaster johnsoni*
SC	American burying beetle *+	*Nicrophorus americanus*
SC	Ground beetle*	*Omophron tesselatum*
SC	Ground beetle*	*Panagaeus fasciatus*

E	Pitcher plant borer	*Papaipema appassionata*
SC	Borer moth*	*Papaipema circumlucens*
SC	Goldenrod stem borer	*Papaipema duovata*
SC	Columbine borer	*Papaipema leucostigma*
SC	Borer moth *	*Papaipema maritima*
SC	Borer moth *	*Papaipema sciata*
SC	Giant swallowtail	*Papilio cresphontes*
SC	Mayfly	*Paraleptophlebia assimilis*
E	Labrador tea tentiform Leafminor	*Phyllonorycter ledella*
SC	Gray comma*	*Polygonia progne*
SC	Slenderwalker	*Pomatiopsis lapidaria*
SC	Whiteriver crayfish*	*Procambarus acutus*
T	Common sanddragon	*Progomphus obscurus*
SC	Noctuid moth	*Psectraglaea carnosa*
SC	Ceromatic noctuid moth *	*Pyreferra ceromatica*
SC	Orange sallow moth	*Rhodoecia aurantiago*
SC	Soldier fly	*Sargus fasciatus*
SC	Eyed brown	*Satyrodes eurydice*
SC	Ground beetle*	*Scaphinotus viduus*
SC	Noctuid moth	*Schinia spinosae*
SC	Spongillafly	*Sisyra fuscata*
SC	Ski-tailed emerald	*Somatochlora elongata*
SC	Regal fritillary *	*Speyeria idalia*
SC	Purse web spider *	*Sphodros niger*
SC	Lymnaeid snail	*Stagnicola catascopium*
SC	Tabanid fly	*Stonemyia isabellina*
SC	Piedmont groundwater amphipod	*Stygobromus tenuis tenuis*
SC	Riverine clubtail	*Stylurus amnicola*
SC	Arrow clubtail	*Stylurus spiniceps*
SC	Coastal pond amphipod	*Synurella chamberlaini*
SC	Horse fly	*Tabanus fulvicallus*
SC	Ground beetle	*Tetragonoderus fasciatus*
SC	Cicada *	*Tibicen auletes*
SC	Mosquito	*Toxorhynchites rutilus*
SC	Boreal turret snail	*Valvata sincera*
SC	Turret snail	*Valvata tricarinata*

E	Banded bog skimmer	*Williamsonia lintneri*
SC	Noctuid moth	*Zale curema*
SC	Noctuid moth	*Zale obliqua*
T	Noctuid moth	*Zale submediana*
T	Noctuid moth	*Zanclognatha martha*

* Believed Extirpated
+ Federally Endangered
^ Federally Threatened

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Endangered, Threatened & Special Concern Plants

E	Balsam fir x	*Abies balsamea*
SC	Virginia copperleaf*	*Acalypha virginica*
SC	Black maple	*Acer nigrum*
E	Sandplain gerardia +	*Agalinis acuta*
SC	Yellow giant hyssop *	*Agastache nepetoides*
E	Purple giant hyssop	*Agastache scrophulariifolia*
SC	Small-flowered agrimony	*Agrimonia parviflora*
T	Orange foxtail	*Alopecurus aequalis*
SC	Sea-beach amaranth *^	*Amaranthus pumilus*
E	Roundleaf shadbush	*Amelanchier sanguinea*
T	Bog rosemary	*Andromeda glaucophylla*
E	Canada anemone	*Anemone canadensis*
E	Sea-coast angelica	*Angelica lucida*
SC	Hairy angelica	*Angelica venenosa*
SC	Field pussytoes *	*Antennaria neglecta* var. *petaloidea*
SC	Puttyroot *	*Aplectrum hyemale*
E	Dwarf mistletoe	*Arceuthobium pusillum*
T	Smooth mountain sandwort	*Arenaria glabra*
E	Large-leaved sandwort	*Arenaria macrophylla*
E	Arethusa	*Arethusa bulbosa*
SC	Needlegrass	*Aristida longespica*
SC	Arrowfeather*	*Aristida purpurascens*

E	Beach needlegrass	*Aristida tuberculosa*
T	Virginia snakeroot	*Aristolochia serpentaria*
SC	Purple milkweed*	*Asclepias purpurascens*
E	White milkweed	*Asclepias variegata*
SC	Green milkweed *	*Asclepias viridiflora*
T	Mountain spleenwort	*Asplenium montanum*
T	Wallrue spleenwort	*Asplenium ruta-muraria*
E	Blake's aster	*Aster X blakei*
E	Bog aster	*Aster nemoralis*
SC	Crooked-stem aster *	*Aster prenanthoides*
E	Rough-leaved aster	*Aster radula*
T	Showy aster	*Aster spectabilis*
SC	Orache*	*Atriplex glabriuscula*
SC	Swamp birch	*Betula pumila*
SC	Eaton's beggar-tick	*Bidens eatonii*
SC	Downy woodmint*	*Blephilia ciliata*
SC	Hairy woodmint*	*Blephilia hirsuta*
SC	Little grape fern *	*Botrychium simplex*
E	Side-oats grama-grass	*Bouteloua curtipendula*
E	Sweet-scented indian-plaintain	*Cacalia suaveolens*
SC	Reed bentgrass	*Calamagrostis stricta* ssp. *inexpansa*
SC	Low bindweed*	*Calystegia spithamaea*
SC	Purple cress	*Cardamine douglassii*
SC	Long's bittercress*	*Cardamine longii*
SC	Summer sedge	*Carex aestivalis*
E	Broadwing sedge	*Carex alata*
SC	Foxtail sedge *	*Carex alopecoidea*
SC	Sedge	*Carex aquatilis* var. *altior*
E	Sedge	*Carex backii*
SC	Bailey's sedge *	*Carex baileyi*
E	Barratt's sedge	*Carex barrattii*
SC	Sedge	*Carex bushii*
E	Brown bog sedge	*Carex buxbaumii*
E	Chestnut-colored sedge	*Carex castanea*
SC	Collins sedge *	*Carex collinsii*
T	Crawe's sedge *	*Carex crawei*

SC	Crawford sedge *	*Carex crawfordii*
E	Clustered sedge	*Carex cumulata*
E	Davis' sedge	*Carex davisii*
E	Sedge	*Carex exilis*
SC	Bronze sedge *	*Carex foenea*
T	Handsome sedge	*Carex formosa*
SC	Sedge	*Carex hirsutella*
SC	Hitchcock's sedge	*Carex hitchcockiana*
E	Sedge	*Carex limosa*
E	False hop sedge	*Carex lupuliformis*
SC	Troublesome sedge *	*Carex molesta*
SC	Black-edge sedge *	*Carex nigromarginata*
SC	New England sedge *	*Carex novae-angliae*
E	Eastern few-fruited sedge	*Carex oligocarpa*
SC	Few-seeded sedge *	*Carex oligosperma*
SC	Few-flowered sedge *	*Carex pauciflora*
E	Sedge*	*Carex paupercula*
E	Variable sedge	*Carex polymorpha*
T	Prairie sedge	*Carex prairea*
E	Cyperus-like sedge	*Carex pseudocyperus*
E	Schweinitz's sedge	*Carex schweinitzii*
SC	Sedge	*Carex squarrosa*
SC	Dioecious sedge	*Carex sterilis*
SC	Rigid sedge	*Carex tetanica*
SC	Rigid sedge	*Carex trichocarpa*
SC	Tuckerman's sedge	*Carex tuckermanii*
SC	Sedge*	*Carex typhina*
E	Little green sedge	*Carex viridula*
SC	Willdenow's sedge *	*Carex willdenowii*
SC	Pretty sedge	*Carex woodii*
E	Indian paintbrush	*Castilleja coccinea*
SC	Eastern redbud *	*Cercis canadensis*
E	Devil's-bit	*Chamaelirium luteum*
E	Hairy lip-fern	*Cheilanthes lanosa*
E	Sickle-leaved golden aster	*Chrysopsis falcata*
E	Yellow thistle	*Cirsium horridulum*

SC	Long-bracted green orchid	*Coeloglossum viride* var. *virescens*
T	Early coralroot	*Corallorhiza trifida*
T	Yellow corydalis	*Corydalis flavula*
E	Pygmyweed	*Crassula aquatica*
SC	Elliptical rushfoil *	*Crotonopsis elliptica*
E	Slender cliff-brake	*Cryptogramma stelleri*
SC	Blue wasweed*	*Cuphea viscosissima*
SC	Hazel dodder *	*Cuscuta coryli*
SC	Wild comfrey *	*Cynoglossum virginianum*
SC	Ram's-head lady's-slipper *	*Cypripedium arietinum*
SC	Yellow lady's-slipper *	*Cypripedium parviflorum*
E	Showy lady's-slipper	*Cypripedium reginae*
E	Dew-drop	*Dalibarda repens*
SC	Tufted hairgrass	*Deschampsia caespitosa*
SC	Dillen's tick-trefoil*	*Desmodium glabellum*
SC	Trailing tick-trefoil	– *Desmodium humifusum*
SC	Sessile-leaf tick-trefoil *	*Desmodium sessilifolium*
T	Squirrel corn	*Dicentra canadensis*
SC	Persimmon	*Diospyros virginiana*
E	Saltpond Grass	*Diplachne maritima*
E	Narrow-leaved glade fern	*Diplazium pycnocarpon*
SC	Whitlow-grass	*Draba reptans*
SC	Thread-leaf sundew*	*Drosera filiformis*
E	Mountain wood-fern	*Dryopteris campyloptera*
SCtd>	Goldie's fern	*Dryopteris goldiana*
E	Bur-head	*Echinodorus tenellus* var. *parvulus*
E	Horse-tail spike-rush	*Eleocharis equisetoides*
SC	Spike-rush *	*Eleocharis microcarpa* var. *filiculmis*
E	Spike-rush	*Eleocharis quadrangulata* var. *crassior*
SC	Slender wheatgrass	*Elymus trachycaulus* ssp. *subsecundus*
SC	Wiegand's wildrice *	*Elymus wiegandii*
SC	Marsh horsetail *	*Equisetum palustre*
SC	Meadow horsetail *	*Equisetum pratense*
E	Dwarf scouring rush	*Equisetum scirpoides*
T	Parker's pipewort	*Eriocaulon parkeri*
E	Hare's tail	*Eriophorum vaginatum* var. *spissum*

E	White thoroughwort	*Eupatorium album*
E	Small white snakeroot	*Eupatorium aromaticum*
E	False mermaid-weed	*Floerkea proserpinacoides*
SC	Bog bedstraw *	*Galium labradoricum*
T	Creeping snowberry	*Gaultheria hispidula*
T	Dwarf huckleberry	*Gaylussacia dumosa* var. *bigeloviana*
E	Stiff gentian	*Gentiana quinquefolia*
SC	Bicknell's northern crane's bill *	*Geranium bicknellii*
SC	Purple cudweed *	*Gnaphalium purpureum*
SC	Dwarf rattlesnake plantain *	*Goodyera repens* var. *ophioides*
SC	Bush rockrose *	*Helianthemum dumosum*
E	Low frostweed	*Helianthemum propinquum*
E	Dwarf bulrush	*Hemicarpha micrantha*
T	Sharp-lobed hepatica	*Hepatica acutiloba*
SC	Kidneyleaf mud-plantain*	*Heteranthera reniformis*
SC	Seabeach sandwort	*Honckenya peploides* –
SC	Featherfoil	*Hottonia inflata*
E	Longleaf bluet	*Houstonia longifolia*
E	Golden-heather	*Hudsonia ericoides*
T	False beach-heather	*Hudsonia tomentosa*
SC	Green violet *	*Hybanthus concolor*
E	Golden seal	*Hydrastis canadensis*
E	Water pennywort	*Hydrocotyle umbellata*
SC	Whorled pennywort	*Hydrocotyle verticillata*
SC	Virginia waterleaf	*Hydrophyllum virginianum*
SC	Creeping St. John's-wort *	*Hypericum adpressum*
T	Great St. John's-wort	*Hypericum pyramidatum*
T	Inkberry x	*Ilex glabra*
SC	False pennyroyal *	*Isanthus brachiatus*
E	Small whorled pogonia +	*Isotria medeoloides*
SC	Weak rush *	*Juncus debilis*
SC	Two-flowered cynthia	*Krigia biflora*
E	Carolina redroot	*Lachnanthes caroliana*
T	Labrador tea	*Ledum groenlandicum*
SC	Creeping bush-clover	*Lespedeza repens*
SC	Blazing star	*Liatris scariosa* var. *novae-angliae*

E	Scotch lovage	*Ligusticum scothicum*
SC	Lilaeopsis	*Lilaeopsis chinensis*
SC	Mudwort	*Limosella subulata*
SC	Twinflower *	*Linnaea borealis* var. *americana*
SC	Sandplain flax *	*Linum intercursum*
SC	Yellow flax	*Linum sulcatum*
E	Lily-leaved twayblade	*Liparis liliifolia*
SC	Sweet gum x	*Liquidambar styraciflua*
SC	Many-fruited false-loosestrife *	*Ludwigia polycarpa*
E	Globe-fruited false-loosestrife	*Ludwigia sphaerocarpa*
SC	Foxtail clubmoss *	*Lycopodium alopecuroides*
SC	Fir clubmoss *	*Lycopodium selago*
SC	Clasping-leaved water-hourhound	*Lycopus amplectens*
SC	Climbing fern	*Lygodium palmatum*
SC	Stagger-bush *	*Lyonia mariana*
SC	Winged loosestrife*	*Lythrum alatum*
E	White adder's-mouth	*Malaxis brachypoda*
E	Green adder's-mouth	*Malaxis unifolia*
T	Water-marigold	*Megalodonta beckii*
SC	Hybrid bunchflower *	*Melanthium hybridum*
SC	Tall millet-grass *	*Milium effusum*
SC	Winged monkey-flower	*Mimulus alatus*
SC	Naked miterwort	*Mitella nuda*
E	One-flowered wintergreen	*Moneses uniflora*
E	Red mulberry	*Morus rubra*
E	Long-awn hairgrass	*Muhlenbergia capillaris*
E	Slender water-milfoil	*Myriophyllum alterniflorum*
SC	Cutleaf water-milfoil *	*Myriophyllum pinnatum*
SC	Leafless water-milfoil	*Myriophyllum tenellum*
SC	Naiad	*Najas guadalupensis*
SC	Large yellow pond lily*	*Nuphar advena*
SC	Small yellow pond lily*	*Nuphar microphylla*
SC	Water lily *	*Nymphaea odorata* var. *tuberosa*
SC	Sundrops *	*Oenothera fruticosa*
E	Gravel-weed	*Onosmodium virginianum*
T	Adder's-tongue	*Ophioglossum vulgatum*

SC	Eastern prickly pear	*Opuntia humifusa*
SC	Golden club	*Orontium aquaticum*
SC	Slender mountain-ricegrass*	*Oryzopsis pungens*
SC	Violet wood-sorrel	*Oxalis violacea*
SC	American ginseng	*Panax quinquefolius*
T	Panic grass	*Panicum amarum*
SC	Tall flat panic-grass *	*Panicum rigidulum* var. *elongatum*
E	Panic grass	*Panicum scabriusculum*
SC	Panic grass *	*Panicum sphaerocarpon*
SC	Warty panic grass *	*Panicum verrucosum*
SC	Panic grass *	*Panicum xanthophysum*
SC	Hairy forked chickweed*	*Paronychia fastigiata*
E	Field paspalum	*Paspalum laeve*
SC	Bead grass *	*Paspalum setaceum* var. *psammophilum*
SC	Swamp lousewort	*Pedicularis lanceolata*
E	Smooth cliff-brake	*Pellaea glabella*
T	Sweet coltsfoot	*Petasites frigidus* var. *palmatus*
SC	Wild kidney bean *	*Phaseolus polystachios* var. *aquilonius*
SC	Red spruce x	*Picea rubens*
E	Red pine x	*Pinus resinosa*
SC	Hoary plantain	*Plantago virginica*
E	White-fringed orchid	*Platanthera blephariglottis*
T	Yellow-fringed orchid	*Platanthera ciliaris*
SC	Tall white bog orchid *	*Platanthera dilatata*
SC	Pale green orchid	*Platanthera flava*
SC	Hooker's orchid *	*Platanthera hookeri*
SC	Large round-leaved orchid *	*Platanthera orbiculata*
SC	Threadfoot	*Podostemum ceratophyllum*
SC	Clammy-weed *	*Polanisia dodecandra*
SC	Field milkwort	*Polygala cruciata*
E	Nuttall's milkwort	*Polygala nuttallii*
E	Seneca snakeroot	*Polygala senega*
SC	Seabeach knotweed *	*Polygonum glaucum*
E	Small-flowered leafcup	*Polymnia canadensis*
E	Swamp cottonwood	*Populus heterophylla*
SC	Pondweed *	*Potamogeton confervoides*

SC	Water-thread pondweed *	*Potamogeton diversifolius*
SC	Fries' pondweed *	*Potamogeton friesii*
E	Hill's pondweed	*Potamogeton hillii*
SC	Capillary pondweed *	*Potamogeton pusillus* var. *gemmiparus*
SC	Straight-leaved pondweed	*Potamogeton strictifolius*
SC	Vasey's pondweed *	*Potamogeton vaseyi*
E	Three-toothed cinquefoil	*Potentilla tridentata*
SC	Tall cinquefoil	*Potentilla arguta*
SC	Alleghany plum *	*Prunus alleghaniensis*
E	Grave's beach plum	*Prunus maritima* var. *gravesii*
SC	Goose grass *	*Puccinellia langeana* ssp. *alaskana*
E	Basil mountain-mint	*Pycnanthemum clinopodioides*
E	Torrey mountain-mint	*Pycnanthemum torrei*
SC	One-sided pyrola *	*Pyrola secunda*
E	Bur oak	*Quercus macrocarpa*
E	Water-plantain spearwort	*Ranunculus ambigens*
E	Seaside crowfoot	*Ranunculus cymbalaria*
SC	Creeping spearwort *	*Ranunculus flammula* var. *filiformis*
SC	Bristly buttercup *	*Ranunculus pensylvanicus*
SC	Cursed crowfoot	*Ranunculus sceleratus*
SC	White water-crowfoot	*Ranunculus subrigidus*
SC	Fragrant sumac *x	*Rhus aromatica*
E	Capillary beak-rush	*Rhynchospora capillacea*
T	Beaked rush	*Rhynchospora macrostachya*
E	Long-beaked bald rush	*Rhynchospora scirpoides*
E	Skunk currant	*Ribes glandulosum*
SC	Swamp black currant *	*Ribes lacustre*
SC	Wild currant *	*Ribes rotundifolium*
E	Swamp red currant	*Ribes triste*
SC	Shining rose	*Rosa nitida*
E	Toothcup	*Rotala ramosior*
SC	Sand bramble	*Rubus cuneifolius*
SC	Sea-side dock *	*Rumex maritimus* var. *fueginus*
SC	Large marsh pink *	*Sabatia dodecandra*
E	Marsh pink	*Sabatia stellaris*
SC	Waputo *	*Sagittaria cuneata*

SC	Arrowleaf	*Sagittaria subulata*
T	Sandbar willow	*Salix exigua*
E	Bog willow	*Salix pedicellaris*
SC	Slender willow *	*Salix petiolaris*
SC	Autumn willow	*Salix serissima*
E	Lizard's tail	*Saururus cernuus*
E	Pod grass	*Scheuchzeria palustris*
SC	Purple oat	*Schizachne purpurascens*
SC	Chaffseed *+	*Schwalbea americana*
T	Hard-stemmed bulrush	*Scirpus acutus*
SC	Salt marsh bulrush	*Scirpus cylindricus*
SC	Georgia bulrush	*Scirpus georgianus*
SC	Cotton bulrush *	*Scirpus hudsonianus*
SC	Long's bulrush *	*Scirpus longii*
SC	Bayonet grass	*Scirpus paludosus* var. *atlanticus*
T	Torrey bulrush	*Scirpus torreyi*
E	Few-flowered nutrush	*Scleria pauciflora* var. *caroliniana*
E	Reticulated nutrush	*Scleria reticularis*
E	Nutrush	*Scleria triglomerata*
SC	Low nutrush *	*Scleria verticillata*
E	Hyssop skullcap	*Scutellaria integrifolia*
E	Small skullcap	*Scutellaria leonardii*
E	Ragwort	*Senecio pauperculus*
SC	Wild senna	*Senna hebecarpa*
SC	Starry champion	*Silene stellata*
E	Three-leaved Solomon's-seal	*Smilacina trifolia*
SC	Bristly greenbriar *	*Smilax hispida*
SC	Elliott's goldenrod	*Solidago elliottii*
E	Prairie goldenrod	*Solidago ptarmicoides*
E	Stiff goldenrod	*Solidago rigida*
SC	Early wrinkle-leaved goldenrod *	*Solidago rugosa* var. *sphagnophila*
E	Floating bur-reed	*Sparganium fluctuans*
SC	Small bur-reed *	*Sparganium minimum*
T	Canada sand-spurry	*Spergularia canadensis*
SC	Little ladies'-tresses *	*Spiranthes tuberosa* var. *grayi*
SC	Dropseed	*Sporobolus asper*

SC	Rough dropseed *	*Sporobolus clandestinus*
E	Sand dropseed	*Sporobolus cryptandrus*
E	Northern dropseed	*Sporobolus heterolepis*
SC	Small dropseed *	*Sporobolus neglectus*
E	Hyssop-leaf hedge-nettle	*Stachys hyssopifolia*
SC	Smooth hedge-nettle *	*Stachys tenuifolia*
SC	Northern stitchwort	*Stellaria borealis*
T	White mandarin	*Streptopus amplexifolius* var. *americanus*
E	Yellow pimpernel	*Taenidia integerrima*
T	Northern white cedar x	*Thuja occidentalis*
SC	Appalachian gametophyte	*Trichomanes intricatum*
SC	Narrow-leaved horse gentian *	*Triosteum angustifolium*
SC	Nodding pogonia *	*Triphora trianthophora*
SC	Spiked false oats *	*Trisetum spicatum* var. *molle*
E	Spreading globe-flower	*Trollius laxus*
SC	Two-flower bladderwort * –	*Utricularia biflora*
SC	Fibrous bladderwort *	*Utricularia fibrosa*
E	Bladderwort	*Utricularia resupinata*
E	Large-flowered bellwort	*Uvularia grandiflora*
SC	Velvetleaf blueberry *	*Vaccinium myrtilloides*
SC	Mountain cranberry *	*Vaccinium vitis-idaea* var. *minus*
SC	Beaked corn-salad *	*Valerianella radiata* var. *fernaldii*
SC	Narrow-leaved vervain *	*Verbena simplex*
SC	Possum haw *	*Viburnum nudum*
SC	Smooth black-haw	*Viburnum prunifolium*
E	Coast violet	*Viola brittoniana*
T	Canada violet	*Viola canadensis*
SC	Southern wood violet *	*Viola hirsutula*
SC	Northern bog violet *	*Viola nephrophylla*
SC	Kidney-leaf white violet *	*Viola renifolia* var. *brainerdii*
SC	Great-spurred violet *	*Viola selkirkii*
SC	Striped violet *	*Viola striata*
SC	New England grape	*Vitis novae-angliae*
SC	Barren strawberry *	*Waldsteinia fragarioides*
E	Northern yellow-eyed grass	*Xyris montana*
E	Small's yellow-eyed grass	*Xyris smalliana*

E	Heart leaved golden alexanders	*Zizia aptera*

* Believed Extirpated
+ Federally Endangered
^ Federally Threatened
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CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

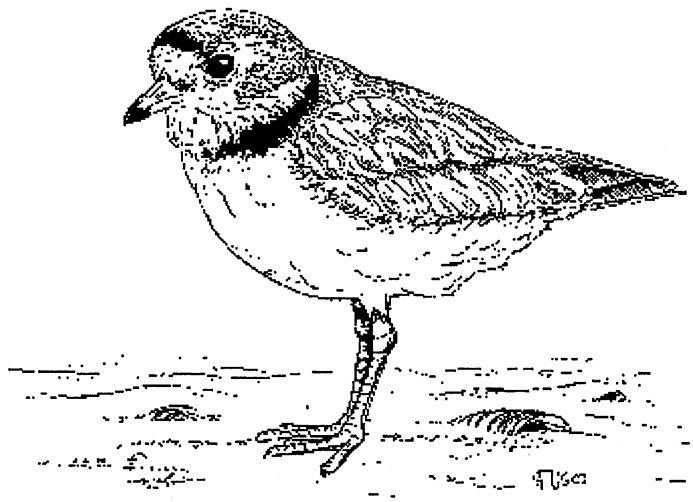
WILDLIFE IN CONNECTICUT

ENDANGERED AND THREATENED SPECIES SERIES

PIPING PLOVER

Charadrius melodus

THREATENED



THREATENED

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Habitat: Along seacoasts, on isolated, sandy beaches with little vegetation and access to mudflats for feeding.
Weight: 1.5-2.25 ounces.
Length: 6-7 inches.
Wingspan: 14-15.25 inches.

Life Expectancy: 8-14 years of age.
Food: Marine worms, fly larvae, beetles, crustaceans, mollusks, and other small marine animals and their eggs.
Status: Federally and state threatened.

Identification: Piping plovers are white below and creamy brown above, the color of dry sand. During the breeding season, they have a single black neck band that is sometimes incomplete and a black bar above the white forehead. This black neck band is completely lacking in winter. Their primary feathers are dark brown. The rump is white, contrasting with the brown back and tail, which are very conspicuous in the bird's distraction display. The bill is orange with a black tip; the feet are also orange. The voice is a clear "peep-lo"; often only the "peep" is given. The piping plover is often confused with another member of its family, the killdeer, which has 2 black bands across its chest and is larger than the plover.

Range: Piping plovers nest from Nova Scotia south to North Carolina, with a population in the Great Lakes region north into Alberta, Canada. They winter along the southern coast from North Carolina to Texas and into the Caribbean.

Reproduction: Piping plovers arrive in Connecticut to nest in late March. The first eggs are laid by late April in a shallow depression often lined with shells and placed near vegetation. The 3 to 4 eggs are cream-colored with dark brown flecks evenly distributed over the surface. Both the male and female incubate the eggs. The eggs hatch in 27 days, with the young leaving the nest within hours of hatching. The young fledge in 28 days but continue to stay with the adults through migration. Birds that lose their nests and young will renest into early July. Plovers are able to breed in their first year.

Reason for Decline: The development of the shoreline for recreation has limited the number of available piping plover nest sites. Beach stabilization projects have reduced the quality of the remaining sites, forcing the birds to nest in areas with greater vegetation and increased human disturbances. Vegetation provides cover for, and human activities encourage the

presence of, predators such as dogs, cats, rats, raccoons and skunks. In addition, human disturbances affect productivity by keeping birds off nests, thus preventing them from attending eggs and young; outright destruction of nests is also a factor.

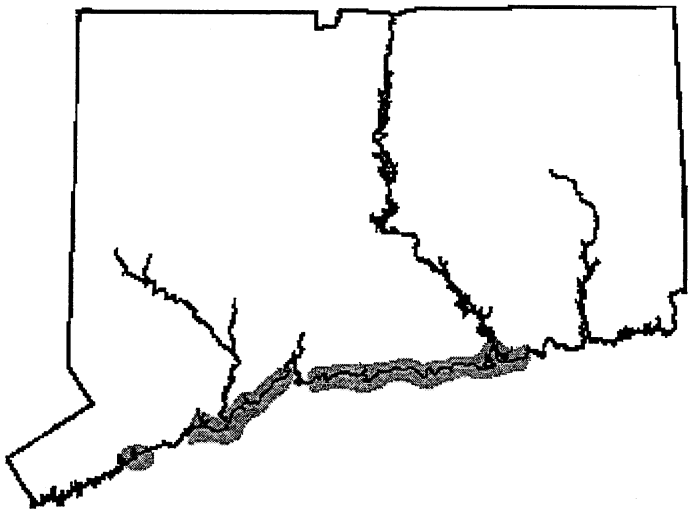
History in Connecticut: In the late 1800s, unrestricted market hunting for the millinery trade devastated the piping plover population on the Atlantic coast. Not only were the feathers used to adorn women's hats, but the birds were also used for human consumption. With protection, the species later recovered, only to decline again over the past 40 years as human development and recreational use greatly intensified on coastal habitats.

Interesting Facts: When humans or enemies come too close to a plover nest, the adults will try to distract them by flapping around like a wounded bird. This is sometimes referred to as a "broken wing" display. Plovers have a defined beachfront territory. Beachgoers are met at the beginning of the territory by the plover and escorted along by the walking bird until the territory ends. Unlike their nesting neighbors, the least terns, that fly and dive at enemies, adult plovers walk and stop, walk and stop to avoid detection by visually blending into the background.

Protective Legislation: *Federal* - Endangered Species Act of 1973, Migratory Bird Treaty Act of 1918. *State* - Connecticut General Statutes Sec. 26-311.

What You Can Do: Respect all plover nesting areas that are fenced or posted for the birds' protection. Do not approach or linger near piping plovers or their nests. If pets are permitted on beaches used by plovers, keep pets on a leash. Keep housecats in the house, especially at night, during the nesting season. Don't leave or bury trash or food scraps on beaches. Garbage attracts predators which may prey upon piping plover eggs and chicks.

Connecticut Range



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Bureau of Natural Resources - Wildlife Division

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CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

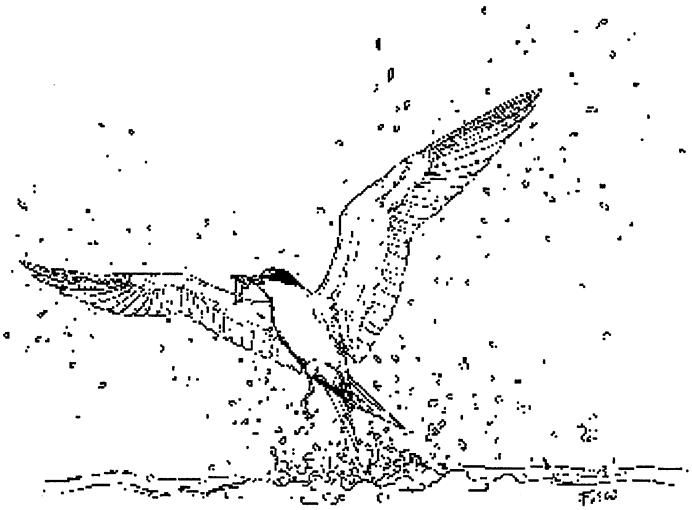
WILDLIFE IN CONNECTICUT

ENDANGERED AND THREATENED SPECIES SERIES

LEAST TERN

Sterna antillarum

THREATENED



THREATENED

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Habitat: Broad, sandy, vegetation-free beaches usually located close to an estuary.
Weight: Approximately 1 ounce.
Length: 8.5-9.5 inches.
Wingspan: 20 inches.

Life Expectancy: 15 years of age.
Food: Small fishes, like sandlances; sand eels; crustaceans, like shrimp and prawns.
Status: State threatened.

Identification: The least tern is a small, gull-like bird with long, pointed wings and a forked tail. It is white below and gray above, with black wing tips and a black cap with a white forehead. The bill and feet are yellow. Both sexes are similar; the female is smaller than the male. Least terns have three basic calls: a shrill note, "ky-dik"; a distress call, "oyt"; and a long, complex call used when fishing and for individual recognition.

Range: In the East, least terns nest along the coast from southern Maine to Mexico. There are also populations that nest in the Missouri and Mississippi River systems and on the Pacific coast. The species winters from the Gulf Coast and Central America south to Peru and Brazil.

Reproduction: Least terns arrive in Connecticut in early May and quickly form pairs that last the whole season. In mid-May, the first eggs are laid in a shallow depression in the sand. A nest consists of 1 to 3 cream-colored eggs with dark brown blotches. The eggs hatch in 21 days and the downy young are out of the nest by the second day. About 21 days later, the young are able to fly but continue to be fed by the adults into the migration period. Two years elapse before the young mature and begin to breed. If a nest is destroyed or the young die at an early age, the adults are able to produce a new clutch in 6 to 10 days.

Reason for Decline: By the early 1900s, this species was almost extinct because of market hunting for the millinery trade. Although least tern numbers have rebounded, today the development of the shoreline for recreation has limited the number of available nest sites. In addition, beach stabilization projects have reduced the quality of the remaining sites, forcing the birds to nest in areas with greater vegetation and increased human disturbances. Vegetation provides cover for, and human

activities encourage the presence of, predators such as dogs, cats, rats, skunks and raccoons. In addition, human disturbances affect productivity by keeping birds off nests, thus preventing them from properly incubating eggs or attending young. Outright destruction of nests is also a factor.

History in Connecticut: Historically, the species has been declining in Connecticut due to residential and recreational development of beaches and the channelization of rivers. Heavy losses are also caused by severe storms, flooding, and depredation by dogs, cats, rats, skunks, raccoons, black-crowned night-herons and great black-backed gulls. Recent protection measures in the Northeast, which include the fencing and posting of colonies, may have stabilized the population.

In Connecticut, least terns often share their nesting areas with the federally and state threatened piping plover. Since 1987, least terns have nested at 15 sites along the Connecticut coast from Greenwich to Groton.

Interesting Facts: The defense mechanism of adult terns when intruders enter the nesting area is to divebomb and defecate on the offender. This style of attack led them to be called "little striker." The chicks freeze to avoid detection.

Least terns get small fishes and crustaceans by skimming the surface of the water or by hovering, then diving into the water. They catch their prey in their bills.

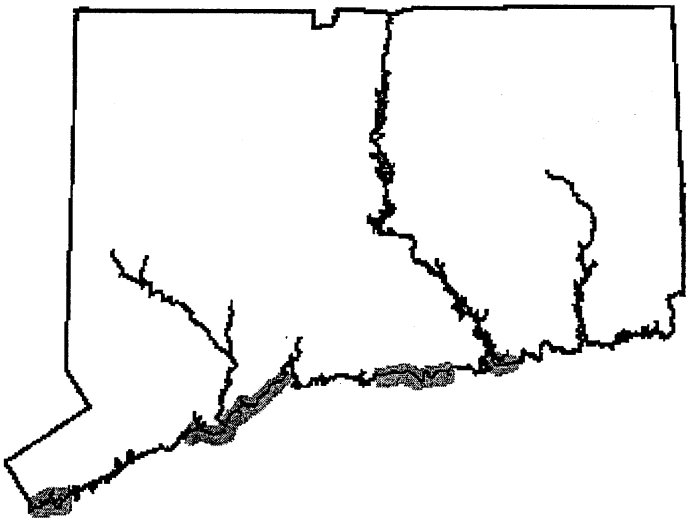
The West Coast and interior populations of least terns were classified as federally endangered as early as 1970.

Terns respond to shifting beach conditions caused by sand deposition or increased vegetation by changing nest sites as the levels of habitat quality and predation change. In a given region, only a portion of the available habitat is used, thus allowing the number of birds to vary from year to year but keeping the region-wide population stable. The tendency to renest when nesting is disrupted and the longevity of adult least terns are additional adaptations to the unstable beach environment. A survival rate of 10 to 20 percent of their young is acceptable for maintaining a stable population, and 1 or 2 years of low productivity can be offset by subsequent years of high productivity. However, low productivity over a 5 to 10 year period could pose a major threat to the population.

Protective Legislation: *Federal* - Migratory Bird Treaty Act of 1918. *State* - Connecticut General Statutes Sec. 26-311.

What You Can Do: Respect all least tern nesting areas that are fenced or posted for the birds' protection. Do not approach or linger near least terns or their nests. If pets are permitted on beaches used by terns, keep pets on a leash. Keep housecats in the house, especially at night, during the nesting season. Don't leave or bury trash or food scraps on beaches. Garbage attracts predators which may prey upon least tern eggs and chicks.

Connecticut Range



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CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

October 28, 1998

1998 Piping Plover/Least Tern Nesting Season Results

The Connecticut Department of Environmental Protection (DEP) today announced the results from the 1998 piping plover and least tern breeding season. "This has been a mixed year for piping plover and least tern breeding activities," stated Arthur J. Rocque, Jr., Commissioner of the DEP. "While piping plover numbers and productivity dipped slightly, least tern numbers and productivity increased," added Rocque. Both shorebird species are state threatened, and the piping plover has been listed as federally endangered since 1986.

Twenty-one pairs of piping plovers nested along the Connecticut coastline during the 1998 breeding season and 22 young fledged (reached the flying stage). There were four less pairs than last year's 25 pairs and the number of young fledged decreased 50 percent from the 44 chicks in 1997. "While the number of returning pairs decreased, there isn't any cause for alarm," said Julie Victoria, a Nonharvested Wildlife Program biologist for the DEP Wildlife Division. "These pairs make up a regional population and the number of piping plover pairs region wide has been increasing."

The least tern is a communal nester with the piping plover; its numbers are also monitored by the DEP Wildlife Division. Approximately 447 pairs of least terns nested in the state this season, an 11 percent increase from 1997. "What is encouraging is the 40 percent increase in the number of young fledged from 75 in 1997 to 105 in 1998," said Victoria.

Piping plovers and least terns prefer to nest on sandy beaches, but only a limited number of sites are available due to current shoreline development and recreational use. Mammalian and avian predators, attracted to beach areas by human litter, hamper nesting success, as do human disturbances which keep birds off their nests, preventing them from attending young.

The DEP Wildlife Division appreciates the cooperation of those who respected the fenced and posted areas during the spring-summer nesting season. Thanks to the public education efforts of volunteers from The Nature Conservancy, beach goers and dog owners at several sites were very cooperative. The DEP encourages volunteer assistance and hopes to continue public education and further decrease littering next season. For more information or to obtain a complete summary of the 1998 nesting season, write to Julie Victoria, DEP Franklin Wildlife Management Area, 391 Route 32, North Franklin, CT 06254.

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CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 19, 1999

1999 Piping Plover\Least Tern Nesting Season Results

The Connecticut Department of Environmental Protection (DEP) today announced the results from the 1999 piping plover and least tern breeding season. The number of piping plovers nesting in Connecticut increased slightly from last year, the number of least terns nesting along the shoreline decreased 25 percent. Both shorebird species are state threatened, and the piping plover has been listed as federally threatened since 1986.

"This has been a mixed year for piping plover and least tern breeding activities," stated Arthur J. Rocque, Jr., Commissioner of he DEP. "While we are encouraged by the piping plover numbers, we are concerned with the significant decrease in least terns."

Twenty-two pairs of piping plovers nested along the Connecticut coastline during the 1999 breeding season and 32 young fledged (reached the flying stage). There was one more pair than last year's 21 pairs and the number of young fledged increased by 10 from the 22 chicks fledged in 1998. Although the number of piping plovers nesting in Connecticut has decreased or remained stable in recent years, the number of piping plover pairs over the entire eastern region has been increasing.

The least tern is a communal nester with the piping plover. Its numbers are also monitored by the Wildlife Division. Approximately 335 pairs of least terns nested in the state this season, a considerable decrease from the 447 pairs that nested in the state last year.

The 335 least tern pairs fledged 104 chicks, with a productivity level of 0.31 chicks fledged per nesting pair. This productivity level, which is on par with the poor production of recent years, falls below the 0.5 fledglings needed to maintain a stable population. Factors that affected productivity varied from site to site, but were punctuated by human disturbance at two sites, predation by gulls, crows and cats at three sites, and high tides at one site that destroyed many nests.

Piping plovers and least terns prefer to nest on sandy beaches, but only a limited number of sites are available due to current shoreline development and recreational use. Mammalian and avian predators, attracted to beach areas by human litter, hamper nesting success, as do human disturbances which keep birds off their nests, preventing them from attending young.

"The Wildlife Division appreciates the cooperation of those who respected the fenced and posted areas during the spring-summer nesting season. Thanks to the public education efforts of volunteers from The Nature Conservancy, beach visitors and dog owners at several sites were very cooperative," said Julie Victoria of the DEP's Wildlife Division.

The Division encourages volunteer assistance and hopes to continue public education and further decrease littering next season. For more information or to obtain a complete summary of the 1999 nesting season, write to Julie Victoria, Franklin Wildlife Management Area, 391 Route 32, North Franklin, CT 06254.

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CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

October 10, 2000

2000 Piping Plover\Least Tern Nesting Season Results

The Connecticut Department of Environmental Protection (DEP) has announced the results from the 2000 piping plover and least tern breeding season. "This has been another mixed year for piping plover and least tern breeding activities," stated Dale May, Director of the Department of Environmental Protection's (DEP) Wildlife Division. "While the number of piping plovers nesting in Connecticut remained the same as last year, the number of least terns nesting along the shoreline decreased 29 percent." Both shorebird species are state threatened, and the piping plover has been listed as federally threatened since 1986.

Twenty-two pairs of piping plovers nested along the Connecticut coastline during the 2000 breeding season and 41 young fledged (reached the flying stage). The number of young fledged increased by nine from the 32 chicks fledged in 1999. The number of piping plovers nesting in Connecticut has remained stable in recent years, and the number of piping plover pairs over the entire eastern region has been increasing.

The least tern is a communal nester with the piping plover. The DEP Wildlife Division also monitors the nesting activities of least terns. Approximately 239 pairs of least terns nested in the state this season, a considerable decrease from the 335 pairs that nested in the state last year.

The 239 least tern pairs fledged 26 chicks, with a productivity level of 0.11 chicks fledged per nesting pair. This productivity level, which is below the poor production of recent years, falls below the 0.5 fledglings needed to maintain a stable population. Factors that affected productivity varied from site to site, but were punctuated by human disturbance at three sites, predation by gulls and crows at two sites, and high tides and heavy rains at three sites that destroyed many nests.

Piping plovers and least terns prefer to nest on sandy beaches, but only a limited number of sites are available due to current shoreline development and recreational use. Mammalian and avian predators, attracted to beach areas by human litter, hamper nesting success, as do human disturbances which keep birds off their nests, preventing them from attending young.

"The DEP Wildlife Division appreciates the cooperation of those who respected the fenced and posted areas during the spring-summer nesting season. Thanks to the public education efforts of volunteers from The Nature Conservancy, beach visitors and dog owners at several sites were very cooperative," said May. The DEP encourages volunteer assistance and hopes to continue public education and further decrease littering next season. For more information or to obtain a complete summary of the 2000 nesting season, write to Julie Victoria, Franklin Wildlife Management Area, 391 Route 32, North Franklin, CT 06254.

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CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

October 3, 2002

2002 Piping Plover/Least Tern Nesting Season Results

The Connecticut Department of Environmental Protection (DEP) today announced the results from the 2002 piping plover and least tern nesting season. "This has been another mixed year for piping plover and least tern breeding activities," stated Dale May, Director of DEP's Wildlife Division.. "Although the number of piping plovers nesting in Connecticut has remained fairly stable in recent years, the number of least terns nesting along the shoreline continues to decline." The number of piping plover pairs over the entire eastern region has been increasing. Both shorebird species are state threatened, and the piping plover has been listed as federally threatened since 1986.

Thirty-one pairs of piping plovers nested along the Connecticut coastline during the 2002 breeding season and 58 young fledged (reached the flying stage). The number of young fledged increased by 19 from the 39 chicks fledged in 2001. Beaches traditionally used by plovers for nesting range from Waterford to Stratford. This year, nesting plovers at Hammonasset Beach State Park in Madison, Long Beach in Stratford and a sandbar off of Milford had the greatest success.

The Wildlife Division also monitors the nesting activities of least terns. Approximately 221 pairs of least terns nested in the state this season, an increase from the 175 pairs that nested in 2001. The 221 least tern pairs fledged 38 chicks.

The DEP Wildlife Division uses specific and carefully researched procedures to protect nesting plovers and terns. Initially, beaches designated as breeding grounds are fenced off with string to discourage people and dogs from disturbing birds in the area. Educational signs, as well as "Keep Away" and "No Dog" signs, also are posted around these areas. When individual plover nests are located, a wire "enclosure" with a net top is erected around each nest. The "enclosure" is designed to keep dogs, skunks, raccoons, weasels, foxes and avian predators from reaching the eggs. The success rate for nests that were enclosed was 70 percent this year, versus a success rate of 30 percent for nests that were not.

Both piping plovers and least terns face many obstacles during the nesting season-loss of suitable habitat, predation, washouts and human disturbance all contribute to nest failures. Because of a shortage of suitable beach nesting habitat, many plovers nested below the storm high tide line, making the nests vulnerable to washouts during spring high tides. Twelve plover nests were destroyed by wash-outs this year. To counter these losses, several plovers nested within the vegetation zone of the beach this year, which may have resulted in greater predation rates. Fourteen plover nests were lost due to predation by foxes, feral cats, raccoons, rats and avian predators.

Least terns are colonial nesters and are usually found near or among piping plover nests. However, in 2002, there were no instances of plovers and terns nesting together. Terns are especially vulnerable to human disturbance-prolonged or excessive disturbance can result in the abandonment of the nesting area by the entire colony. Several cases occurred this year, one in which evidence of a large bonfire was found less than five feet from the rope fencing and "Please Keep Away" signs.

The Wildlife Division appreciates the cooperation of those who respected the fenced and posted areas during the spring-summer nesting season. Thanks to the public education efforts of volunteers from The Nature Conservancy and Connecticut Audubon Society, beach visitors and dog owners at several sites were very cooperative. The Division encourages volunteer assistance and hopes to continue public education and further decrease littering next season. For more information or to obtain a complete summary of the 2002 nesting season, write to Julie Victoria, Franklin Wildlife Management Area, 391 Route 32, North Franklin, CT 06254.

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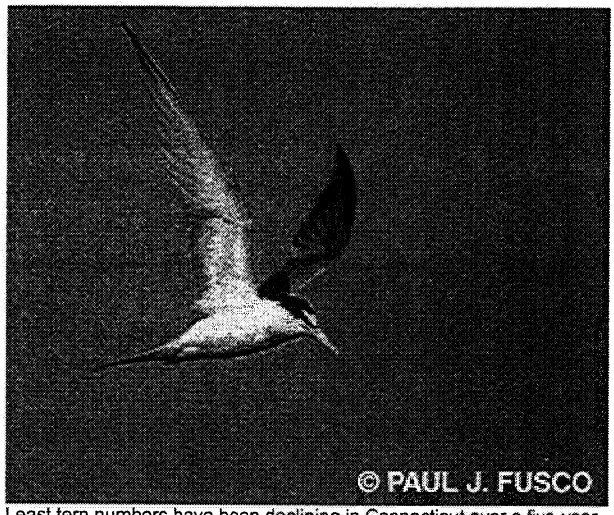
CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

Piping Plover/Least Tern Report for the 2002 Nesting Season

Adapted from an article that appeared in the September/October 2002 issue of *Connecticut Wildlife*.



Least tern numbers have been declining in Connecticut over a five-year period, beginning in 1998 with 447 pairs to the low this year of 221 pairs.

A Good Piping Plover Season

The piping plover breeding season has ended, and the birds started heading south for the winter in late August. This past season, 31 pairs of plovers attempted to nest in Connecticut, one pair less than last year. The number of successful fledges (58) increased from the number of fledges last year (39). The total fledge success for the season was extremely high at 93.5 percent, with only four chicks lost all season. This is a very encouraging result. The 2002 average of 1.87 chicks per nesting pair is similar to results from 2000 (1.86 chicks per nesting pair).

The number of plovers using the Connecticut shoreline has remained either constant or increased over each of the last five years. Beaches traditionally used by plovers range from Waterford to Stratford. In 2002, Hammonasset Beach State Park in Madison, Long Beach in Stratford and the Connecticut Audubon Coastal Center in Milford had the greatest breeding success.

Piping Plover Protection Plan

The piping plover is a state and federally threatened species and is protected under the federal Endangered Species Act of 1986 and the Connecticut Endangered Species Act. There are very specific and carefully researched procedures in place to protect these birds. Initially, beaches designated as breeding grounds are fenced off with string to encourage people and dogs from disturbing birds in the area. Educational signs, "keep away," and "no dog" signs also are posted around these areas. When individual plover nests are located, a wire "exclosure" with a net top is erected around each nest. The "exclosure" is designed to keep dogs, skunks, raccoons, weasels, foxes and avian predators from reaching the eggs. Because plovers generally walk more than fly, they are able to easily enter and exit the exclosure through the small fence openings. The success rate for nests that were exclosed was 70 percent this year, versus a success rate of 30 percent for unexclosed nests.

Plovers Face Many Challenges

Overall, 28 plover nests were not successful. Plovers require sandy, vegetation-free beach areas where they lay their eggs in a small depression in the sand. Unfortunately, there is a diminishing amount of this type of habitat available for piping plovers, and very few of the remaining areas are left undisturbed. Many plovers nested below the storm high tide line, making the nests vulnerable to wash-outs during spring high tides. Twelve nests were destroyed by wash-outs this year. To counter these losses, many plovers nested within the vegetation zone of the beach this year, which may have resulted in greater predation rates. Fourteen nests were lost due to predation by foxes, feral cats, raccoons, rats and avian predators. Of the 14 depredated nests, five were located within fairly dense beach vegetation.

Finally, human disturbance can play a role in nest failure. In 2002, plovers nesting within roped and signed areas experienced a minimal amount of human interference. All of the volunteers who assisted with public education and safeguarded nesting areas should be commended on an excellent effort.

Least Terns Didn't Fare as Well

Least tern numbers have been declining in Connecticut over a five-year period, beginning in 1998 with 447 pairs to the low this year of 221 pairs. Only 38 tern chicks had fledged by the end of the summer. However, the number of terns within the state, as well as the number of fledged chicks, was higher than in 2001. The decline in the breeding success of the least tern is alarming to many biologists and birders, as the tern is a state threatened species.

Like Plover, Like Tern

Least terns are colonial nesters and are usually found near or among piping plover nests. However, in 2002, there were no

instances of plovers and terns nesting together. Like piping plovers, nesting least terns face many obstacles--loss of suitable habitat, predation, wash-outs and human disturbance all contribute to nest failures. Terns are especially vulnerable to human disturbance--prolonged or excessive disturbance can result in the abandonment of the nesting area by the entire colony. Several cases occurred this year, one in which evidence of a large bonfire was found less than five feet from the rope-fencing and "please keep away" signs.

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T-3

FOOD CHAIN MODEL

TABLE T-3.1
SUMMARY OF RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

			RECEPTOR[a]			
		Common Name	Black duck	Spotted Sandpiper	Great blue heron	Raccoon
		Scientific Name	*Anas rubripes*	*Actitis macularia*	*Ardea herodias*	*Procyon lotor*
		Trophic Status	Herbivorous bird	Insectivorous bird	Omnivorous bird	Omnivorous mammal
		Resident Status[b]	Resident	Migrant	Migrant	Resident
Exposure Parameter	**Symbol**	**Units**				
Home Range[c]	HR	ha	540	0.25	0.60	108
Exposure Duration[d]	ED	days/year	365	213	213	365
Dietary Composition						
fish	P_{fish}	unitless	0%	0%	95%	3%
insects	P_{insect}	unitless	61%	100%	0%	47%
crustaceans	P_{crust}	unitless	13%	0%	1%	43%
amphibians	P_{amphib}	unitless	0%	0%	4%	7%
mammals	P_{mam}	unitless	0%	0%	0%	0%
seeds	P_{seed}	unitless	23%	0%	0%	0%
vegation	P_{veg}	unitless	3%	0%	0%	0%
non-fish animal prey[e]	P_{nfish}	unitless	74%	100%	5%	97%
invertebrates[f]	P_{invert}	unitless	74%	100%	1%	90%
plants[g]	P_{plant}	unitless	26%	0%	0%	0%
Food Ingestion Rate	IR_{food}	kg/day	0.23	0.0095	0.39	1.5
Water Ingestion Rate	IR_{water}	l/day	0.061	0.0076	0.10	0.51
Sediment Ingestion Rate	IR_{sed}	kg/day	0.011	0.00170	0.019	0.141
Inhalation Rate	IR_{air}	m^3/day	1.3	0.12	2.3	7.0
Surface Area	SA_{skin}	cm^2	1,031	131	1,698	3,589
Body Weight	BW	kg	1.0	0.047	2.2	6.2

TABLE T-3.1
SUMMARY OF RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

			RECEPTOR[a]			
		Common Name	Black duck	Spotted Sandpiper	Great blue heron	Raccoon
		Scientific Name	*Anas rubripes*	*Actitis macularia*	*Ardea herodias*	*Procyon lotor*
		Trophic Status	Herbivorous bird	Insectivorous bird	Omnivorous bird	Omnivorous mammal
		Resident Status[b]	Resident	Migrant	Migrant	Resident
Exposure Parameter	**Symbol**	**Units**				

Notes:
a. Please refer to Tables _ through _ for details and references for the selected indicator wildlife species. Parameters were primarily selected based on based on average reported values for adult females; check sources for alternatives (e.g., juveniles).
b. Site resident status, which is quantified in the exposure duration term, will depend on the site latitude; values for raccoon based on percentage of year that this species feeds predominantly on aquatic (animal) prey items.
d. Exposure duration will depend on site latitude.
e. Percent of diet comprised of animal prey taxa not including fish (i.e., insects, crustaceans, amphibians, and mammals). Value used in exposure modeling when taxa-specific tissue concentration data are not available.
f. Percent of diet comprised of invertebrate prey taxa (i.e., insects, crustaceans). Value used in exposure modeling when taxa-specific tissue concentration data are not available.
g. Percent of diet comprised of plant material (i.e., vegetation and seeds). Value used in exposure modeling when separate tissue concentration data are not available.

TABLE T-3.1
RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

Common Name	**Black duck**				
Scientific Name	***Anas rubripes***				
Exposure parameter	Symbol	Units	Selected Value	Reported Values/Notes	Reference[a]
Home Range	HR	ha	540	Average female mallard home ranges in Minnesota wetlands and rivers.	USEPA, 1993
Exposure Duration	ED	days/year	365	Assumed to be a year-round resident.	USEPA, 1993
Dietary Composition				Based on dietary preference for mallard. Primarily aquatic plants in winter; breeding females shift to a largely invertebrate based diet to obtain protein for egg laying. Dietary composition based on percent wet weight volume in esophagus from animals caught in south central North Dakota/prairie potholes. Values are averages of prey composition in diet for April, May, and June normalized to 100 percent[c].	USEPA, 1993; Swanson et al., 1985
fish	P_{fish}	unitless	0%		assumption
insects	P_{insect}	unitless	61%		assumption
crustaceans	P_{crust}	unitless	13%		assumption
amphibians	P_{amphib}	unitless	0%		assumption
mammals[b]	P_{mam}	unitless	0%		assumption
seeds	P_{seed}	unitless	23%		assumption
vegetation	P_{veg}	unitless	3%		assumption
Food Ingestion Rate	IR_{food}	kg/day	0.23	Calculated using regression equation for non-passerines: IR_{food} (g/day) = 0.301 * BW $^{0.751}$ (g)[c].	USEPA, 1993.
Water Ingestion Rate	IR_{water}	l/day	0.061	Calculated using regression equation for birds: IR_{water} (l/day) = 0.059 * BW $^{0.67}$ (kg) and selected body weight.	Calder and Braun, 1983
Sediment Ingestion Rate	IR_{sed}	kg/day	0.011	Assume 5 percent of daily food ingestion rate	assumption
Inhalation Rate	IR_{air}	m^3/day	1.3	Calculated using allometric relationship for birds: IR_{air} (m^3/day) = 0.4089 * BW $^{0.77}$ (kg) and selected body weight. Regression value multiplied by 3 to estimate free-living rate.	Lasiewski and Calder, 1971
Surface Area	SA_{skin}	cm^2	1031	Calculated using following regression equation for birds: SA_{skin} (cm^2) = 10 * BW $^{0.667}$ (g) and selected body weight.	Walsberg and King, 1978
Body Weight	BW	kg	1.0	Average body weight of female mallards throughout North America.	USEPA, 1993

TABLE T-3.1
RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

Common Name	**Black duck**				
Scientific Name	***Anas rubripes***				
Exposure parameter	Symbol	Units	Selected Value	Reported Values/Notes	Reference[a]

Footnotes:

a. Primary literature as cited in USEPA, 1993 unless otherwise noted. Values are for mallard (*Anas platyrhynchos*)

b. Assumed that small mammals not included in diet, however, miscellaneous mammals comprised up to 8.5% of reported diet in a study of North Dakota prairie potholes (Swanson et al., 1985).

c. Values derived from the regression equation expressed on a dry weight basis. Converted to a wet weight ingestion rate by calculating the estimated intake (kg/day) of each food item (i.e., multiply dry weight ingestion rate by percent composition), dividing by 1 minus the moisture content of that food item and summing across all food items. Assumed that fish, invertebrates, crustaceans, amphibians, mammals, seeds, and plants contain 73%, 80%, 80%, 73%, 63%, 11.5%, and 85% water content, respectively (Suter, 1993).

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TABLE T-3.1
RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

Common Name	**Spotted Sandpiper**				
Scientific Name	***Actitis macularia***				
Exposure parameter	Symbol	Units	Selected Value	Reported Values/Notes	Reference[a]
Home Range	HR	ha	0.25		USEPA, 1993
Exposure Duration	ED	days/year	213	Summer resident; April through October, although migration generally begins by July.	USEPA, 1993; NWF, 2002
Dietary Composition				Mayflies and midges; adult flying insects, crustaceans, leeches, small fish.	USEPA, 1993
fish	P_{fish}	unitless	0%		assumption
insects	P_{insect}	unitless	100%	USEPA states primarily mayflies and midges.	assumption
crustaceans	P_{crust}	unitless	0%		assumption
amphibians	P_{amphib}	unitless	0%		assumption
mammals	P_{mam}	unitless	0%		assumption
seeds	P_{seed}	unitless	0%		assumption
vegetation	P_{veg}	unitless	0%		assumption
Food Ingestion Rate	IR_{food}	kg/day	0.0095	Calculated using regression equation for wading birds: $\log(IR_{food})$ (g/day) = 0.966 * log(BW) - 0.64 (g)	Kushlan, 1978
Water Ingestion Rate	IR_{water}	l/day	0.0076	Calculated using regression equation for birds: IR_{water} (l/day) = 0.059 * $BW^{0.67}$ (kg) and selected body weight.	Calder and Braun, 1983
Sediment Ingestion Rate	IR_{sed}	kg/day	0.00170	Assume 18 percent of daily food ingestion rate.	USEPA, 1993
Inhalation Rate	IR_{air}	m^3/day	0.12	Calculated using allometric relationship for birds: IR_{air} (m^3/day) = 0.4089 * $BW^{0.77}$ (kg) and selected body weight. Regression value multiplied by 3 to estimate free-living rate.	Lasiewski and Calder, 1971
Surface Area	SA_{skin}	cm^2	131	Calculated using following regression equation for birds: SA_{skin} (cm^2) = 10 * $BW^{0.667}$ (g) and selected body weight.	Walsberg and King, 1978
Body Weight	BW	kg	0.047		USEPA, 1993

TABLE T-3.1
RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

Common Name	**Spotted Sandpiper**
Scientific Name	***Actitis macularia***

Footnotes:

a. Primary literature as cited in USEPA, 1993 unless otherwise noted.

References:

Calder, W.A., and E.J. Braun, 1983. Scaling of osmotic regulation in mammals and birds, Am. J. Physiol., 244: R601-R606.

Hartman, F.A., 1961.Locomotor mechanisms in birds; Washington, D.C.: Smithsonian Misc. Coll. 143.

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TABLE T-3.1
RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

Common Name	**Great blue heron**
Scientific Name	***Ardea herodias***

Exposure parameter	Symbol	Units	Selected Value	Reported Values/Notes	Reference[a]
Home Range	HR	ha	0.6	Feeding territory size for freshwater rookery in Oregon in fall.	Bayer, 1978
Exposure Duration	ED	days/year	213	Summer resident; most migrating herons leave breeding ground by October and return between February and April.	USEPA, 1993
Dietary Composition				Mostly fish, some amphibians, reptiles, crustaceans, insects, birds, and mammals (lower Michigan/river). Dietary composition based on percent wet weight of aquatic prey in stomach contents, normalized to 100 percent.	USEPA, 1993; Alexander, 1977
fish	P_{fish}	unitless	95%		assumption
insects	P_{insect}	unitless	0%		assumption
crustaceans	P_{crust}	unitless	1%		assumption
amphibians	P_{amphib}	unitless	4%		assumption
mammals[b]	P_{mam}	unitless	0%		assumption
seeds	P_{seed}	unitless	0%		assumption
vegetation	P_{veg}	unitless	0%		assumption
Food Ingestion Rate	IR_{food}	kg/day	0.39	Calculated using regression equation for wading birds: $\log(IR_{food})$ (g/day) = 0.966 * log(BW) - 0.64 (g)	Kushlan, 1978
Water Ingestion Rate	IR_{water}	l/day	0.10	Calculated using regression equation for birds: IR_{water} (l/day) = 0.059 * $BW^{0.67}$ (kg) and selected body weight.	Calder and Braun, 1983
Sediment Ingestion Rate	IR_{sed}	kg/day	0.019	Assume 5 percent of daily food ingestion rate.	assumption
Inhalation Rate	IR_{air}	m^3/day	2.25	Calculated using allometric relationship for birds: IR_{air} (m^3/day) = 0.4089 * $BW^{0.77}$ (kg) and selected body weight. Regression value multiplied by 3 to estimate free-living rate.	Lasiewski and Calder, 1971
Surface Area	SA_{skin}	cm^2	1698	Calculated using following regression equation for birds: SA_{skin} (cm^2) = 10 * $BW^{0.667}$ (g) and selected body weight.	Walsberg and King, 1978
Body Weight	BW	kg	2.20	Average body weight of female herons.	USEPA, 1993

Footnotes:

TABLE T-3.1
RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

Common Name	**Great blue heron**
Scientific Name	***Ardea herodias***

a. Primary literature as cited in USEPA, 1993 unless otherwise noted.
b. Assumed that small mammals not included in diet, however, birds and mammals comprised 1% of reported diet in a lower Michigan river study (Alexander, 1977).

References:

Alexander, .G., 1977. Food of vertebrate predators on trout waters in north central lower Michigan; Michigan Academician 10:181-195
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Quinney, T.E., 1982. Growth, diet, and mortality of nestling great blue herons; Wilson Bull. 94:571-577
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.
Walsberg, G.E. and J.R.King, Jr., 1978. The relationship of the external surface area of birds to skin surface area and body mass; J. Exp. Biol. 76:185-189.

TABLE T-3.1
RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

Common Name	**Raccoon**				
Scientific Name	***Procyon lotor***				
Exposure parameter	Symbol	Units	Selected Value	Reported Values/Notes	Reference[a]
Home Range	HR	ha	108	Average adult female home range size from May through December in riparian habitat in Michigan.	Stuewer, 1943
Exposure Duration	ED	days/year	365	Assumed to be present year-round	
Dietary Composition[b]				Diet varies throughout year, switching from predominantly animal to plants (especially fruits). In spring/early summer, frogs, crayfish, mussels, insects; by autumn, fleshy fruits, nuts, acorns, corn. Dietary composition derived as normalized percentages of aquatic prey in diet for spring in forested bottom land in Maryland.	USEPA, 1993; Llewllyn and Uhler, 1952
fish	P_{fish}	unitless	3%		assumption
insects	P_{insect}	unitless	47%		assumption
crustaceans	P_{crust}	unitless	43%		assumption
amphibians	P_{amphib}	unitless	7%		assumption
mammals[c]	P_{mam}	unitless	0%		assumption
seeds	P_{seed}	unitless	0%		assumption
vegetation	P_{veg}	unitless	0%		assumption
Food Ingestion Rate	IR_{food}	kg/day	1.5	Calculated using regression equation for mammals: IR_{food} (g/day) = 0.235 * BW $^{0.822}$ (g)[d].	USEPA, 1993
Water Ingestion Rate	IR_{water}	l/day	0.51	Calculated using regression equation for mammals: IR_{water} (l/day) = 0.099 * BW $^{0.90}$ (kg) and selected body weight.	Calder and Braun, 1983
Sediment Ingestion Rate	IR_{sed}	kg/day	0.141	Assume 9.4 percent of daily food ingestion rate	USEPA, 1993
Inhalation Rate	IR_{air}	m^3/day	7.0	Calculated using allometric relationship for mammals: IR_{air} (m^3/day) = 0.5458 * BW $^{0.8}$ (kg) and selected body weight. Regression value multiplied by 3 to estimate free-living rate.	Stahl, 1967
Surface Area	SA_{skin}	cm^2	3589	Calculated using following regression equation for mammals: SA_{skin} (cm^2) = 12.3 * BW $^{0.65}$ (g) and selected body weight.	Stahl, 1967
Body Weight	BW	kg	6.2	Average Illinois females (parous and nulliparous) weights	Sanderson, 1984

TABLE T-3.1
RECEPTOR-SPECIFIC EXPOSURE PARAMETERS FOR INDICATOR WILDLIFE SPECIES

Common Name	**Raccoon**				
Scientific Name	***Procyon lotor***				
Exposure parameter	Symbol	Units	Selected Value	Reported Values/Notes	Reference[a]

Footnotes:

a. Primary literature as cited in USEPA, 1993 unless otherwise noted.

b. Assumed that animals will also forage in floodplains (increasing throughout the year); dietary composition applicable to spring/early summer.

c. Assumed that small mammals not included in diet, however, rodents comprised up to 7% of reported diet in a study of forested bottomland in Maryland (Llewellyn and Uhler, 1952).

d. Values derived from the regression equation expressed on a dry weight basis. Converted to a wet weight ingestion rate by calculating the estimated intake (kg/day) of each food item (i.e., multiply dry weight ingestion rate by percent composition), dividing by 1 minus the moisture content of that food item and summing across all food items. Assumed that fish, invertebrates, crustaceans, amphibians, mammals, seeds, and plants contain 73%, 80%, 80%, 73%, 63%, 11.5%, and 85% water content, respectively (Suter, 1993).

References:

Calder, W.A., and E.J. Braun, 1983. Scaling of osmotic regulation in mammals and birds, Am. J. Physiol., 244: R601-R606.

Fritzell, E.K., 1978. Habitat use by prairie raccoons during the waterfowl breeding season; J. Wildl. Manage. 42:118-127.

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Suter, G.W., 1993. Ecological Risk Assessment; Lewis Publishers, Boca Raton.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE T-3.2
SUMMARY OF BIOACCUMULATION FACTORS FOR PREY TISSUE

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Analyte	log K_{ow} [b]		Terrestrial Plant		Terrestrial Invertebrate		Small Mammal		Small Bird		Aquatic Plant		Aquatic Invertbrate		BAF Fish	
VOLATILE ORGANICS																
1,2-Dichlorobenzene	3.4	[b1]	8.4E-02	[d]	5.0E-02	[c]	3.8E-03	[e]	3.8E-03	[f]	8.4E-02	[be]	1.1E-01	[ax]	1.1E-01	[ax]
1,3-Dichlorobenzene	3.6	[b1]	6.4E-02	[d]	5.0E-02	[c]	6.0E-03	[e]	6.0E-03	[f]	6.4E-02	[be]	1.0E-01	[ax]	1.0E-01	[ax]
1,4-Dichlorobenzene	3.5	[b1]	7.3E-02	[d]	5.0E-02	[c]	4.8E-03	[e]	4.8E-03	[f]	7.3E-02	[be]	1.0E-01	[ax]	1.0E-01	[ax]
1,1-Dichloroethene			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
1,1,2,2-Tetrachloroethane			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
1,2,3-Trichlorobenzene	4.3	[b1]	2.5E-02	[d]	5.0E-02	[c]	3.0E-02	[e]	3.0E-02	[f]	2.5E-02	[be]	1.3E-01	[ax]	1.3E-01	[ax]
1,2,4-Trichlorobenzene	4.3	[b1]	2.5E-02	[d]	5.0E-02	[c]	3.0E-02	[e]	3.0E-02	[f]	2.5E-02	[be]	1.3E-01	[ax]	1.3E-01	[ax]
1,3,5-Trichlorobenzene	4.3	[b1]	2.5E-02	[d]	5.0E-02	[c]	3.0E-02	[e]	3.0E-02	[f]	2.5E-02	[be]	1.2E-01	[ax]	1.2E-01	[ax]
Acetone			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Benzene			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Carbon disulfide			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Chlorobenzene			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Chloroform			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Methyl ethyl ketone			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Methylene chloride			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
m-Xylene/p-Xylene			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Ortho Xylene			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Tetrachloroethylene			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Toluene			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Total Xylenes			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
Trichloroethene			0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]	0.0E+00	[a]
SEMI-VOLATILE ORGANICS																
1,1'-Biphenyl	4.1	[b1]	3.3E-02	[d]	5.0E-02	[c]	1.9E-02	[e]	1.9E-02	[f]	3.3E-02	[be]	5.0E-02	[bf]	1.9E-02	[bg]
2,4,6-Tribromophenol	4.1	[b1]	3.2E-02	[d]	5.0E-02	[c]	2.0E-02	[e]	2.0E-02	[f]	3.2E-02	[be]	5.0E-02	[bf]	2.0E-02	[bg]
2,4,5-Trichlorophenol	3.7	[b1]	5.6E-02	[d]	5.0E-02	[c]	7.6E-03	[e]	7.6E-03	[f]	5.6E-02	[be]	5.0E-02	[bf]	7.6E-03	[bg]
2,4,6-Trichlorophenol	3.7	[b1]	5.6E-02	[d]	5.0E-02	[c]	7.6E-03	[e]	7.6E-03	[f]	5.6E-02	[be]	5.0E-02	[bf]	7.6E-03	[bg]
2,4-Dinitrotoluene	2.1	[b1]	4.7E-01	[d]	5.0E-02	[c]	1.9E-04	[e]	1.9E-04	[f]	4.7E-01	[be]	5.0E-02	[bf]	1.9E-04	[bg]
2,6-Dinitrotoluene	2.1	[b1]	4.7E-01	[d]	5.0E-02	[c]	1.9E-04	[e]	1.9E-04	[f]	4.7E-01	[be]	5.0E-02	[bf]	1.9E-04	[bg]
2-Methylnaphthalene	-1.9	[b1]	9.7E+01	[d]	5.0E-02	[c]	1.9E-08	[e]	1.9E-08	[f]	9.7E+01	[be]	7.3E-01	[ax]	7.3E-01	[ax]
2-Methyphenol	2	[b1]	5.4E-01	[d]	5.0E-02	[c]	1.5E-04	[e]	1.5E-04	[f]	5.4E-01	[be]	5.0E-02	[bf]	1.5E-04	[bg]
2-Nitrophenol	1.9	[b1]	6.2E-01	[d]	5.0E-02	[c]	1.2E-04	[e]	1.2E-04	[f]	6.2E-01	[be]	5.0E-02	[bf]	1.2E-04	[bg]

TABLE T-3.2
SUMMARY OF BIOACCUMULATION FACTORS FOR PREY TISSUE

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Analyte	log K_{ow} [b]		Terrestrial Plant		Terrestrial Invertebrate		Small Mammal		Small Bird		Aquatic Plant		Aquatic Invertbrate		BAF Fish	
3-Methylphenol	2	[b1]	5.4E-01	[d]	5.0E-02	[c]	1.5E-04	[e]	1.5E-04	[f]	5.4E-01	[be]	5.0E-02	[bf]	1.5E-04	[bg]
3-Nitroaniline	1.4	[b1]	1.2E+00	[d]	5.0E-02	[c]	3.8E-05	[e]	3.8E-05	[f]	1.2E+00	[be]	5.0E-02	[bf]	3.8E-05	[bg]
4-Chloroaniline	1.8	[b1]	7.1E-01	[d]	5.0E-02	[c]	9.5E-05	[e]	9.5E-05	[f]	7.1E-01	[be]	5.0E-02	[bf]	9.5E-05	[bg]
4-Chloro-3-methylphenol	3.1	[b1]	1.3E-01	[d]	5.0E-02	[c]	1.9E-03	[e]	1.9E-03	[f]	1.3E-01	[be]	5.0E-02	[bf]	1.9E-03	[bg]
4-Methylphenol	1.9	[b1]	6.2E-01	[d]	5.0E-02	[c]	1.2E-04	[e]	1.2E-04	[f]	6.2E-01	[be]	5.0E-02	[bf]	1.2E-04	[bg]
4-Nitroaniline	1.4	[b1]	1.2E+00	[d]	5.0E-02	[c]	3.8E-05	[e]	3.8E-05	[f]	1.2E+00	[be]	5.0E-02	[bf]	3.8E-05	[bg]
4-Nitrophenol	1.9	[b1]	6.2E-01	[d]	5.0E-02	[c]	1.2E-04	[e]	1.2E-04	[f]	6.2E-01	[be]	5.0E-02	[bf]	1.2E-04	[bg]
Acenaphthene	3.9	[b1]	4.3E-02	[d]	5.0E-02	[c]	1.2E-02	[e]	1.2E-02	[f]	4.3E-02	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Acenaphthylene	4.1	[b1]	3.3E-02	[d]	5.0E-02	[c]	1.9E-02	[e]	1.9E-02	[f]	3.3E-02	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Acetophenone	1.7	[b1]	8.1E-01	[d]	5.0E-02	[c]	7.6E-05	[e]	7.6E-05	[f]	8.1E-01	[be]	5.0E-02	[bf]	7.6E-05	[bg]
Anthracene	4.5	[b1]	1.9E-02	[d]	5.0E-02	[c]	4.8E-02	[e]	4.8E-02	[f]	1.9E-02	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Benzaldehyde	1.5	[b2]	1.1E+00	[d]	5.0E-02	[c]	4.2E-05	[e]	4.2E-05	[f]	1.1E+00	[be]	5.0E-02	[bf]	4.2E-05	[bg]
Benzo[a]anthracene	5.7	[b1]	3.9E-03	[d]	5.0E-02	[c]	7.6E-01	[e]	7.6E-01	[f]	3.9E-03	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Benzo[a]pyrene	6	[b1]	2.6E-03	[d]	5.0E-02	[c]	1.5E+00	[e]	1.5E+00	[f]	2.6E-03	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Benzo[b]fluoranthene	6.1	[b1]	2.3E-03	[d]	5.0E-02	[c]	1.9E+00	[e]	1.9E+00	[f]	2.3E-03	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Benzo[ghi]perylene	6.6	[b1]	1.2E-03	[d]	5.0E-02	[c]	6.0E+00	[e]	6.0E+00	[f]	1.2E-03	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Benzo[k]fluoranthene	6.1	[b1]	2.3E-03	[d]	5.0E-02	[c]	1.9E+00	[e]	1.9E+00	[f]	2.3E-03	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Benzyl alcohol	1.0	[b2]	2.0E+00	[d]	5.0E-02	[c]	1.5E-05	[e]	1.5E-05	[f]	2.0E+00	[be]	5.0E-02	[bf]	1.5E-05	[bg]
Bis(2-Ethylhexyl)phthalate	5.1	[b1]	8.7E-03	[d]	5.0E-02	[c]	1.9E-01	[e]	1.9E-01	[f]	8.7E-03	[be]	5.0E-02	[bf]	1.9E-01	[bg]
Butylbenzylphthalate	4.9	[b1]	1.1E-02	[d]	5.0E-02	[c]	1.2E-01	[e]	1.2E-01	[f]	1.1E-02	[be]	5.0E-02	[bf]	1.2E-01	[bg]
Carbazole	3.8	[b2]	5.2E-02	[d]	5.0E-02	[c]	8.7E-03	[e]	8.7E-03	[f]	5.2E-02	[be]	5.0E-02	[bf]	8.7E-03	[bg]
Chrysene	5.7	[b1]	3.9E-03	[d]	5.0E-02	[c]	7.6E-01	[e]	7.6E-01	[f]	3.9E-03	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Dibenzofuran	4.1	[b1]	3.3E-02	[d]	5.0E-02	[c]	1.9E-02	[e]	1.9E-02	[f]	3.3E-02	[be]	5.0E-02	[bf]	1.9E-02	[bg]
Dibenz[a,h]anthracene	6.5	[b1]	1.4E-03	[d]	5.0E-02	[c]	4.8E+00	[e]	4.8E+00	[f]	1.4E-03	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Diethylphthalate	3.2	[b1]	1.1E-01	[d]	5.0E-02	[c]	2.4E-03	[e]	2.4E-03	[f]	1.1E-01	[be]	5.0E-02	[bf]	2.4E-03	[bg]
Dimethylphthalate	2.1	[b1]	4.7E-01	[d]	5.0E-02	[c]	1.9E-04	[e]	1.9E-04	[f]	4.7E-01	[be]	5.0E-02	[bf]	1.9E-04	[bg]
Di-n-butylphthalate	5.2	[b1]	7.6E-03	[d]	5.0E-02	[c]	2.4E-01	[e]	2.4E-01	[f]	7.6E-03	[be]	5.0E-02	[bf]	2.4E-01	[bg]
Di-n-octylphthalate	9.2	[b1]	3.7E-05	[d]	5.0E-02	[c]	2.4E+03	[e]	2.4E+03	[f]	3.7E-05	[be]	5.0E-02	[bf]	2.4E+03	[bg]
Fluoranthene	5.0	[b3]	1.1E-02	[d]	5.0E-02	[c]	1.3E-01	[e]	1.3E-01	[f]	1.1E-02	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Fluorene	4.2	[b1]	2.9E-02	[d]	5.0E-02	[c]	2.4E-02	[e]	2.4E-02	[f]	2.9E-02	[be]	7.3E-01	[ax]	7.3E-01	[ax]

TABLE T-3.2
SUMMARY OF BIOACCUMULATION FACTORS FOR PREY TISSUE

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Analyte	log K_{ow} [b]		Terrestrial Plant		Terrestrial Invertebrate		Small Mammal		Small Bird		Aquatic Plant		Aquatic Invertbrate		BAF Fish	
Hexachloroethane	4.1	[b1]	3.1E-02	[d]	5.0E-02	[c]	2.1E-02	[e]	2.1E-02	[f]	3.1E-02	[be]	5.0E-02	[bf]	2.1E-02	[bg]
Indeno[1,2,3-cd]pyrene	6.6	[b1]	1.2E-03	[d]	5.0E-02	[c]	6.0E+00	[e]	6.0E+00	[f]	1.2E-03	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Naphthalene	3.6	[b1]	6.4E-02	[d]	5.0E-02	[c]	6.0E-03	[e]	6.0E-03	[f]	6.4E-02	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Nitrobenzene	1.9	[b1]	6.2E-01	[d]	5.0E-02	[c]	1.2E-04	[e]	1.2E-04	[f]	6.2E-01	[be]	5.0E-02	[bf]	1.2E-04	[bg]
N-Nitrosodiphenylamine	3.1	[b1]	1.3E-01	[d]	5.0E-02	[c]	1.9E-03	[e]	1.9E-03	[f]	1.3E-01	[be]	5.0E-02	[bf]	1.9E-03	[bg]
Pentachlorophenol	5.9	[b1]	3.0E-03	[d]	5.0E-02	[c]	1.2E+00	[e]	1.2E+00	[f]	3.0E-03	[be]	5.0E-02	[bf]	1.2E+00	[bg]
Phenanthrene	4.5	[b1]	1.9E-02	[d]	5.0E-02	[c]	4.8E-02	[e]	4.8E-02	[f]	1.9E-02	[be]	7.3E-01	[ax]	7.3E-01	[ax]
Phenol	1.5	[b1]	1.1E+00	[d]	5.0E-02	[c]	4.8E-05	[e]	4.8E-05	[f]	1.1E+00	[be]	5.0E-02	[bf]	4.8E-05	[bg]
Pyrene	5.3	[b1]	6.7E-03	[d]	5.0E-02	[c]	3.0E-01	[e]	3.0E-01	[f]	6.7E-03	[be]	7.3E-01	[ax]	7.3E-01	[ax]
2,4,6-Trinitrotoluene	1.6	[b1]	9.2E-01	[d]	5.0E-02	[c]	6.0E-05	[e]	6.0E-05	[f]	9.2E-01	[be]	5.0E-02	[bf]	6.0E-05	[bg]
PESTICIDES/PCBS																
4,4`-DDD	6	[b1]	1.3E-03	[h]	3.3E+00	[g]	1.2E+00	[j]	2.9E+00	[i]	1.3E-03	[be]	2.1E+01	[ay]	1.2E+00	[bg]
4,4`-DDE	5.7	[b1]	2.0E-03	[h]	1.7E+00	[g]	1.2E+00	[j]	2.9E+00	[i]	2.0E-03	[be]	2.1E+00	[ay]	1.2E+00	[bg]
4,4`-DDT	6.4	[b1]	7.7E-04	[h]	5.7E-01	[g]	1.2E+00	[j]	2.9E+00	[i]	7.7E-04	[be]	2.1E+00	[ay]	1.2E+00	[bg]
Aldrin	3	[b1]	1.4E-01	[d]	5.6E-01	[k]	2.3E-01	[ar]	1.2E+00		1.4E-01	[be]	5.6E-01	[bf]	2.3E-01	[bg]
Aroclor-1232	3.2	[b4]	3.8E-01	[m]	5.8E+00	[l]	3.8E+00	[n]	3.2E-01	[o]	3.8E-01	[be]	3.8E-02	[ax]	3.8E-02	[ax]
Aroclor-1242	4.1	[b4]	3.8E-01	[m]	5.8E+00	[l]	3.8E+00	[n]	3.2E-01	[o]	3.8E-01	[be]	3.8E-02	[ax]	3.8E-02	[ax]
Aroclor-1248	4.1	[b4]	3.8E-01	[m]	5.8E+00	[l]	3.8E+00	[n]	3.2E-01	[o]	3.8E-01	[be]	3.8E-02	[ax]	3.8E-02	[ax]
Aroclor-1254	6	[b4]	3.8E-01	[m]	5.8E+00	[l]	3.8E+00	[n]	3.2E-01	[o]	3.8E-01	[be]	3.8E-02	[ax]	3.8E-02	[ax]
Aroclor-1260	7.1	[b4]	3.8E-01	[m]	5.8E+00	[l]	3.8E+00	[n]	3.2E-01	[o]	3.8E-01	[be]	3.8E-02	[ax]	3.8E-02	[ax]
Atrazine	2.6	[b1]	1.4E-01	[bd]	5.6E-01	[bd]	2.3E-01	[bd]	1.2E+00	[bd]	1.4E-01	[bd]	5.6E-01	[bd]	5.6E-01	[bd]
alpha-BHC	3.8	[b1]	4.9E-02	[d]	2.6E+00	[p]	1.4E-01	[p]	2.1E-01		4.9E-02	[be]	2.6E+00	[bf]	1.4E-01	[bg]
beta-BHC	3.8	[b1]	4.9E-02	[d]	2.6E+00	[p]	1.4E-01	[p]	1.7E+00		4.9E-02	[be]	2.6E+00	[bf]	1.4E-01	[bg]
delta-BHC	4.1	[b1]	3.3E-02	[d]	2.6E+00	[p]	1.4E-01	[p]	1.5E-01		3.3E-02	[be]	2.6E+00	[bf]	1.4E-01	[bg]
Gamma-BHC/Lindane	4.1	[b1]	3.3E-02	[d]	2.6E+00	[k]	1.4E-01	[ar]	1.5E-01		3.3E-02	[be]	2.6E+00	[bf]	1.4E-01	[bg]
alpha-Chlordane	5.5	[b1]	5.1E-03	[d]	1.6E+00	[q]	5.5E-01	[r]	1.8E+00	[s]	5.1E-03	[be]	1.6E+00	[bf]	5.5E-01	[bg]
Beta-Chlordane	5.5	[b1]	5.1E-03	[d]	1.6E+00	[q]	5.5E-01	[r]	1.8E+00	[s]	5.1E-03	[be]	1.6E+00	[bf]	5.5E-01	[bg]
Gamma-Chlordane	5.5	[b1]	5.1E-03	[d]	1.6E+00	[t]	5.5E-01	[r]	1.8E+00	[s]	5.1E-03	[be]	1.6E+00	[bf]	5.5E-01	[bg]
Dieldrin	4.6	[b1]	1.7E-02	[d]	5.5E+00	[k]	1.5E+00	[u]	4.4E-01		1.7E-02	[be]	5.5E+00	[bf]	1.5E+00	[bg]
Endosulfan I	3.6	[b1]	6.4E-02	[d]	5.5E+00	[w]	1.1E-02	[ar]	2.9E+00	[i]	6.4E-02	[be]	5.5E+00	[bf]	1.1E-02	[bg]
Endosulfan II	3.6	[b1]	6.4E-02	[d]	5.5E+00	[w]	1.1E-02	[as]	2.9E+00	[i]	6.4E-02	[be]	5.5E+00	[bf]	1.1E-02	[bg]
Endosulfan sulfate	3.1	[b1]	1.3E-01	[d]	5.5E+00	[w]	1.1E-02	[as]	2.9E+00	[i]	1.3E-01	[be]	5.5E+00	[bf]	1.1E-02	[bg]

TABLE T-3.2
SUMMARY OF BIOACCUMULATION FACTORS FOR PREY TISSUE

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Analyte	log K_{ow} [b]		Terrestrial Plant		Terrestrial Invertebrate		Small Mammal		Small Bird		Aquatic Plant		Aquatic Invertbrate		BAF Fish	
Endrin	5.6	[b1]	4.5E-03	[d]	1.9E+00	[t]	6.2E-02	[ar]	5.9E-01	[ar]	4.5E-03	[be]	1.9E+00	[bf]	6.2E-02	[bg]
Endrin aldehyde	3.1	[b5]	1.2E-01	[d]	1.9E+00	[x]	6.2E-02	[x]	5.9E-01	[x]	1.2E-01	[be]	1.9E+00	[bf]	6.2E-02	[bg]
Endrin ketone	3.1	[b5]	1.2E-01	[d]	1.9E+00	[x]	6.2E-02	[x]	5.9E-01	[x]	1.2E-01	[be]	1.9E+00	[bf]	6.2E-02	[bg]
Heptachlor	4.3	[b1]	2.5E-02	[d]	1.0E+00	[y]	4.7E-02	[ar]	6.0E-01	[ar]	2.5E-02	[be]	1.0E+00	[bf]	4.7E-02	[bg]
Heptachlor epoxide	5.4	[b1]	5.9E-03	[d]	1.0E+00	[t]	3.5E-01	[ar]	1.38	[ar]	5.9E-03	[be]	1.0E+00	[bf]	3.5E-01	[bg]
Methoxychlor	4.8	[b1]	1.3E-02	[d]	5.7E-01	[z]	1.0E-06	[ar]	2.9E+00	[i]	1.3E-02	[be]	5.7E-01	[bf]	1.0E-06	[bg]
cis-Nonachlor	6.44	[7]	1.5E-03		1.6E+00		5.5E-01		1.8E+00		1.5E-03		1.6E+00		5.5E-01	
trans-Nonachlor	6.44	[7]	1.5E-03		1.6E+00		5.5E-01		1.8E+00		1.5E-03		1.6E+00		5.5E-01	
HERBICIDES																
2,4,5-T	4	[6]	3.8E-02	[d]	3.2E-01	[av]	8.9E-05	[ar]	8.9E-05	[f]	3.8E-02	[be]	3.2E-01	[bf]	8.9E-05	[bg]
2,4-D	2.8	[4,6]	6.2E+00	[au]	3.2E-01	[at]	2.6E-04	[ar]	2.6E-04	[f]	6.2E+00	[be]	3.2E-01	[bf]	2.6E-04	[bg]
2,4-DB	3.5	[6]	7.3E-02	[d]	3.2E-01	[av]	4.8E-03	[e]	4.8E-03	[f]	7.3E-02	[be]	3.2E-01	[bf]	4.8E-03	[bg]
Dalapon	0.8	[4,6]	2.8E+00	[d]	3.2E-01	[av]	1.4E-02	[aw]	1.3E-02		2.8E+00	[be]	3.2E-01	[bf]	1.4E-02	[bg]
Dicamba	2.2	[6]	4.1E-01	[d]	3.2E-01	[av]	5.6E-05	[ar]	5.6E-05	[f]	4.1E-01	[be]	3.2E-01	[bf]	5.6E-05	[bg]
INORGANICS/METALS																
Aluminum	-		8.0E-04	[ab]	7.5E-02	[aa]	7.5E-02	[ac]	7.5E-02	[f]	6.0E-03	[az]	7.5E-02	[bf]	7.5E-02	[bg]
Ammonia	-															
Antimony	-		4.0E-02	[ab]	5.0E-02	[aa]	5.0E-02	[ac]	5.0E-02	[f]	4.0E-02	[be]	5.0E-02	[bf]	5.0E-02	[bg]
Arsenic	-		8.0E-03	[ab]	6.6E-03	[ad]	1.0E-01	[ac]	1.0E-01	[f]	3.0E-01	[ba]	6.6E-03	[bf]	1.0E-01	[bg]
Barium	-		3.0E-02	[ab]	7.5E-03	[aa]	7.5E-03	[ac]	7.5E-03	[f]	2.5E-02	[az]	7.5E-03	[bf]	7.5E-03	[bg]
Beryllium	-		2.0E-03	[ab]	5.0E-02	[aa]	5.0E-02	[af]	5.0E-02	[f]	2.0E-03	[be]	5.0E-02	[bf]	5.0E-02	[bg]
Boron	-		8.0E-01	[ab]	4.0E-02	[aa]	4.0E-02	[ac]	4.0E-02	[f]	8.0E-01	[be]	4.0E-02	[bf]	4.0E-02	[bg]
Cadmium	-		3.3E+01	[ae]	1.1E+01	[l]	2.1E+00	[ac]	3.8E-01	[ag]	4.1E-01	[az]	1.4E+00	[ag]	2.1E+00	[bg]
Chromium	-		1.5E-03	[ab]	1.6E-01	[l]	2.8E-01	[ac]	2.8E-01	[f]	6.3E-03	[az]	1.6E-01	[bf]	2.8E-01	[bg]
Calcium	-															
Cobalt	-		4.0E-03	[ab]	1.0E+00	[aa]	1.0E+00	[ac]	1.0E+00	[f]	9.3E-03	[az]	1.0E+00	[bf]	1.0E+00	[bg]
Copper	-		7.8E-01	[ah]	1.6E-01	[l]	6.0E-01	[ae]	6.0E-01	[f]	6.0E-02	[az]	1.6E-01	[bf]	6.0E-01	[bg]
Total Cyanide	-		1.0E+00	[aj]	0.0E+00	[ai]	0.0E+00	[ai]	0.0E+00	[f]	1.0E+00	[be]	0.0E+00	[bf]	0.0E+00	[bg]
Cyanide, Free	-		1.0E+00	[aj]	0.0E+00	[ai]	0.0E+00	[ai]	0.0E+00	[f]	1.0E+00	[be]	0.0E+00	[bf]	0.0E+00	[bg]
Iron	-															
Lead	-		0.0E+00	[ae]	7.8E-02	[ak]	1.5E-02	[ac]	1.5E-02	[f]	5.6E-02	[bb]	7.8E-02	[bf]	1.5E-02	[bg]
Lithium	-		5.0E-03	[ab]	5.0E-01	[aa]	5.0E-01	[ac]	5.0E-01	[f]	5.0E-03	[be]	5.0E-01	[bf]	5.0E-01	[bg]
Magnesium	-															
Manganese	-		5.0E-02	[ab]	2.0E-02	[aa]	2.0E-02	[ac]	2.0E-02	[f]	1.3E-01	[az]	2.0E-02	[bf]	2.0E-02	[bg]

TABLE T-3.2
SUMMARY OF BIOACCUMULATION FACTORS FOR PREY TISSUE

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Analyte	log K_{ow} [b]	Terrestrial Plant		Terrestrial Invertebrate		Small Mammal		Small Bird		Aquatic Plant		Aquatic Invertbrate		BAF Fish	
Mercury	-	1.8E-01	[ab]	6.8E-02	[al]	1.0E-02	[am]	2.3E+00		2.5E-01	[az]	1.7E+01	[bc]	1.7E+01	[bc]
Methyl mercury	-	1.8E-01	[ab]	6.8E-02	[al]	1.0E-02	[am]	2.3E+00		2.5E-01	[az]	1.7E+01	[bc]	1.7E+01	[bc]
Nickel	-	1.2E-02	[ab]	2.3E-01	[an]	3.0E-01	[ac]	3.0E-01	[f]	1.4E-02	[bb]	2.3E-01	[bf]	3.0E-01	[bg]
Potassium	-														
Selenium	-	9.0E-03	[ao]	7.6E-01	[ad]	7.5E-01	[ac]	5.1E-01	[ap]	1.6E-01	[az]	7.6E-01	[bf]	7.5E-01	[bg]
Silver	-	8.0E-02	[ab]	1.5E-01	[aa]	1.5E-01	[ac]	1.5E-01	[f]	8.0E-02	[be]	1.5E-01	[bf]	1.5E-01	[bg]
Sodium	-														
Thallium	-	8.0E-03	[ab]	2.0E+00	[aa]	2.0E+00	[ac]	2.0E+00	[f]	8.0E-03	[be]	2.0E+00	[bf]	2.0E+00	[bg]
Thorium	-	1.7E-04	[ab]	3.0E-04	[aa]	3.0E-04	[ac]	3.0E-04	[f]	1.7E-04	[be]	3.0E-04	[bf]	3.0E-04	[bg]
Tin	-	6.0E-03	[ab]	1.5E+00	[aa]	1.5E+00	[ac]	1.5E+00	[f]	6.0E-03	[be]	1.5E+00	[bf]	1.5E+00	[bg]
Vanadium	-	1.1E-03	[ab]	1.3E-01	[aa]	1.3E-01	[ac]	1.3E-01	[f]	1.1E-03	[be]	1.3E-01	[bf]	1.3E-01	[bg]
Zinc	-	6.1E-01	[ah]	1.8E+00	[l]	2.1E+00	[aq]	2.1E+00	[f]	9.2E-01	[az]	1.8E+00	[bf]	2.1E+00	[bg]
Zirconium	-	4.0E-04	[ab]	2.8E-01	[aa]	2.8E-01	[ac]	2.8E-01	[f]	4.0E-04	[be]	2.8E-01	[bf]	2.8E-01	[bg]
Zirconium dioxide	-	4.0E-04	[ab]	2.8E-01	[aa]	2.8E-01	[ac]	2.8E-01	[f]	4.0E-04	[be]	2.8E-01	[bf]	2.8E-01	[bg]

NOTES:

Units for bioaccumulation factors (BAFs) are (mg/kg wet weight tissue over mg/kg dry weight soil) for invertebrates and plants, and (mg/kg wet weight tissue over mg/kg wet weigl food) for small mammals and small birds.

[a] Assumed that most VOCs do not accumulate, however BAFs for chlorlnated benzenes have been developed previously and are included here.

[b] Octanol-water partition coefficients obtained from the following sources:

[b1] Superfund Chemical Data Matrix (USEPA, 1993)

[b2] Hansch and Leo (1979)

[b3] USEPA (1992), Dermal Exposure Guidance.

[b4] USEPA (1990) - Basics of Pump-and-Treat Ground-Water Remediation Technology

[b5] Arthur D. Little, Inc. (1981).

[6] Hazardous Substances Data Bank, 1999 (http://www.tomescps.com).

[[7] SRS Interactive LogKow database, 2002 (http://www.esc.syrres.com/interkow/kowdemo.htm).

[c] Average of earthworm BAFs (Beyer, 1990) converted from dry weight to wet weight assuming earthworm is 80% water, unless otherwise noted.

[d] Plant BAF calculated using the following equation presented by Travis and Arms (1988) unless otherwise noted: log (Plant Uptake Factor)=1.588-0.578 log K_{ow}. Converted from dry weight to wet weight by multiplying by a factor of 0.2 assuming plants are 80% water.

[e] Calculated using the following equation by Travis and Arms (1988) unless otherwise noted: log (biotransfer factor) = log Kow-7.6. BTF converted to BAF by multiplying by average food ingestion rate of 12 kg/d. BAF converted from wet/dry wt to wet/wet wt assuming food is 80% water.

[f] Small mammal BAF value used unless otherwise noted.

[g] Geometric means of 4,4'-DDT [Davis (1968), Davis & Harrison (1966), Wheatley & Hardman (1968), Bailey et al. (1970), Cramp & Olney (1967), and Beyer & Gish (1980)],

TABLE T-3.2
SUMMARY OF BIOACCUMULATION FACTORS FOR PREY TISSUE

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Analyte	log K_{ow} [b]	Terrestrial Plant	Terrestrial Invertebrate	Small Mammal	Small Bird	Aquatic Plant	Aquatic Invertbrate	BAF Fish

4,4'-DDE [Davis (1968), Davis & Harrison (1966), Cramp & Olney (1967), Collett & Harrison (1968), Hunt & Sacho (1969), and Gish (1970)], and 4,4-DDD [Barker (1958), Davis (1968), Davis & Harrison (1966), Cramp & Olney (1967), Collett & Harrison (1968), Wheatley & Hardman (1968), Hunt & Sacho (1969), Bailey et al. (1970), Dimond et al. (1970), Gish (1970), and Beyer & Gish (1980)] reported for earthworms. Dry soil concentrations calculated assuming 10% moisture content in sandy-loam soils (Donahue et al., 1977).

[h] Geometric mean of 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE BAFs (fresh wt/dry wt) reported for roots (carrot, potato, sugar beet), grains (corn, oats), and legumes (alfalfa) derived from USEPA (1985) converted from dry weight to wet-weight per values provided by Suter (1993).

[i] Whole-body pheasant BAF for 4,4'-DDT presented in USEPA (1985); derived from Kenaga (1973). Used as surrogate for other pesticides for both birds and mammals.

[j] BAF for shrews and voles calculated using measured concentrations of DDT_R in stomach content and in whole body (Forsyth & Petrle, 1984).

[k] Geometric mean of reported BAFs for earthworms (Edwards & Thompson, 1973). Values provided by Gish (1970) were converted from dry weight to wet weight by multiplying by a conversion factor of 0.2 assuming 80% water composition of earthworms.

[l] BCF for earthworms from Diercxsens et al. (1985).

[m] Plant uptake value for leafy produce from MADEP (1992).

[n] BAF calculated from discussion in Eisler (1986) stating that Aroclor 1254 residues in subcutaneous fat of adult minks were up to 38 times dietary levels. Converted to whole body concentrations assuming 10% lipid content.

[o] BAF calculated from data presented in Eisler, 1986. Kestrels fed 33 mg PCB/kg diet for 62-69 days accumulated 107 mg PCB/kg lipid weight in muscle. Assuming muscle is 10% lipid content, the muscle concentration is about 10.7 mg/kg.

[p] Value for gamma-BHC used as a surrogate.

[q] Value for gamma-chlordane used as a surrogate.

[r] BAF calculated from data presented in Eisler, 1990. Rats fed 20 mg/kg diet technical chlordane (equivalent to 3.6 mg/kg diet cis- and trans-chlordane) for 350 days accumulated 20 mg/kg in lipids. Assuming 10% lipid content, the whole body concentration is about 2 mg/kg.

[s] BAF calculated from data presented in Eisler, 1990. Red-winged blackbirds fed 10 mg/kg diet technical chlordane (equivalent to 1.8 mg/kg diet cis- and trans- chlordane) for 84 days accumulated 1.8 mg/kg wet weight whole body residue.

[t] Geometric mean of reported BAFs for earthworms (Gish, 1970) converted from dry weight to wet weight assuming 80% water composition of earthworms.

[u] BAF calculated from data presented by Potter et al (1974). Based on an average dieldrin concentration in cow muscle and fat of 0.17 mg/kg (dry weight) and a dieldrin concentration of 0.11 mg/kg in the diet (dry weight).

[v] Jeffries and Davis (1968).

[w] Value for dieldrin used as a surrogate.

[x] Value for endrin used as a surrogate.

[y] Value for heptachlor epoxide used as a surrogate.

[z] Value for 4,4'-DDT used as a surrogate.

[aa] Prey-specific value not available; value shown is small mammal BAF for this chemical.

[ab] Value from Baes et al. (1984) multiplied by 0.2 to represent 80% water composition of plants.

[ac] Value derived from biotransfer factors (BTFs), presented in Baes et al. (1984) for uptake into cattle. BTF converted to BAF by multiplying by food ingestion rate of 50 kg/day wet weight.

TABLE T-3.2
SUMMARY OF BIOACCUMULATION FACTORS FOR PREY TISSUE

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Analyte	log K_{ow} [b]	Terrestrial Plant	Terrestrial Invertebrate	Small Mammal	Small Bird	Aquatic Plant	Aquatic Invertbrate	BAF Fish

[ad] Average of values for industrial soils from Beyer and Cromartie (1987) multiplied by 0.2 to represent 80% water composition in earthworms.
[ae] Mammal value for copper and plant value for cadmium from Levine et al., 1989. Lead does not accumulate in plant tissue, therefore, a BAF of zero was assigned.
[af] Mean of values reported for Sorex araneus in MacFadyen (1980).
[ag] Based on accumulation of cadmium in kidneys of European quail in Pimentel et al. (1984).
[ah] Median of values reported from Levine et al. (1989).
[ai] Cyanide has not been shown to bioaccumulate in any organisms.
[aj] Cyanide is naturally occurring in some plants; the extent to which it is taken up from soil is unknown and therefore a BAF of 1 is conservatively assumed.
[ak] Geometric mean of BAF values (fresh/dry weight) for worms and woodlice (USEPA, 1985). Fresh weight tissue concentrations calculated assuming 80% water content. Y is converted from dry weight to wet weight by multiplying Y by 0.2 (assuming worm is 80% water). This value is then divided by the lead concentration.
[al] Uptake value (fresh/dry weight) for earthworms from USEPA (1985c) sludge document. Fresh weight tissue concentrations calculated assuming 80% water content.
[am] USEPA, 1985c.
[an] Value from nickel sludge document (USEPA, 1985) multiplied by 0.2 to represent 80% water composition of earthworms.
[ao] Average of values for industrial soils from Beyer and Cromartie (1987) multiplied by 0.2 to represent 80% water composition in earthworms.
[ap] Based on average of reported ratio of selenium in diet to liver, kidney, and breast tissue of chickens (Eisler, 1985a).
[aq] Mean of values for Microtus agrestis and Apodemus sylvaticus in MacFadyen (1980).
[ar] BAF from Garten and Trabalka, multiplied by 0.1 to convert from (mg/kg of fat)/(mg/kg of diet) to (mg/kg fresh weight)/(mg/kg of diet). When possible, the value for rodents was used for small mammals; if unavailable, data for swine, sheep, cows, or dogs were used instead. When possible, the values for small birds were used; if unavailable, data for poultry were used instead.
[as] Value for Endosulfan I used as a surrogate.
[at] BAF calculated from data presented by Gile (1983). Based on the results of two experiments whereby mean 2,4-D residues in earthworm tissue (0.59 and 0.61 mg/kg) and in the top 20 cm of soil (0.58 and 0.275 mg/kg dry weight) were estimated. Value is the average of the two calculated BAFs (0.2 and 0.44), which were converted from dry weight to wet weight by multiplying by a factor of 0.2.
[au] BAF calculated from data presented by Gile (1983). Based on the results of two experiments whereby mean 2,4-D residues in plant tissue (8.91 and 12.65 mg/kg) and in the top 20 cm of soil (0.58 and 0.275 mg/kg dry weight) were estimated. Value is the average of the two calculated BAFs (3.1 and 9.2), which were converted from dry weight to wet weight by multiplying by a factor of 0.2.
[av] Value for 2,4-D used as a surrogate.
[aw] Average of BAFs calculated from data presented in Kenaga (1974) for dalapon residues in female rat organs (ppm) and residues in their diet of 300 ppm.
[ax] Freshwater sediment to biota accumulation factors (BSAFs) were calculated using data presented in the U.S. Army Corps of Engineers Waterways Experiment Station BSAF database (USCOE, 1999). BSAFs were normalized by the percent TOC and percent lipids reported in the database for specific studies to obtain unit BSAFs, expressed as ng/g lipid dry wt. tissue over ng/gOC dry wt. sediment. These unit BSAFs were then adjusted by conservative percent lipid (0.05) and percent TOC (0.01) assumptions for screening-level purposes, and then multiplied by a factor of 0.2 to adjust from dry weight tissue to wet weight tissue, assuming 80% water content of aquatic invertebrates and fish. Fluoranthene was used as a surrogate for other PAHs. Aroclor-1254 was used as a surrogate for other PCBs.
[ay] Amphipod to sediment mean biomagnification factor for total DDT in Lake Michigan and Lake Ontario (Evans et al., 1991).
[az] Aquatic plant BAFs derived from an uptake study (Cherry & Guthrie, 1979) with two sedge species, *Andropogon virginicus* and *Cyperus retrofractus* , that were exposed

TABLE T-3.2
SUMMARY OF BIOACCUMULATION FACTORS FOR PREY TISSUE

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Analyte	log K_{ow} [b]	Terrestrial Plant	Terrestrial Invertebrate	Small Mammal	Small Bird	Aquatic Plant	Aquatic Invertbrate	BAF Fish

to contaminated sediment. Values were converted from dry weight plant tissue to wet weight by applying a factor of 0.2 (assuming plants are 80% water).

[ba] Average of BAF values reported from Wang et al. (1984), Sheppard et al. (1985), and Merry et al. (1986).

[bb] Values for lead and nickel from Mudroch & Capobianco (1979) represent an average of BAFs from sediment in several lakes, rivers, and bays into water lilies. Values converted from dry weight plant tissue to wet weight by applying a factor of 0.2 (assuming plants are 80% water).

[bc] Based on the ranges of mercury concentrations in sediment and macroinvertebrates in an eight lake ecosystem in Sweden. Sediment concentrations ranged from 0.05 to 0.3 µg/g dry weight (mid point = 0.18 µg/g) and macroinvertebrate concentrations ranged from 0.02 to 6 µg/g dry weight (mid point = 3.01 µg/g). Based on these averages, a bioaccumulation factor of 16.7 was obtained.

[bd] Value for Aldrin used as surrogate

[be] Value for terrestrial plant.

[bf] Value for terrestrial invertebrate.

[g1] From Barnthouse et al. (1988) unless otherwise noted.

[g2] Fish BCFs calculated from Veith et al. (1985) using the following regression equation: log (BCF) = 0.79 log Kow - 0.40

TABLE T-3.3
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Intertidal Mudflats - Invertebrates

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

		Sediment Normalization			Tissue Normalization			BSAF [c]
	Parameter:	**SDconc**	**FOC**	**SDoc [a]**	**TISSUEconc**	**FLIPID**	**TISSUE lipid [b]**	
	Units:	mg chem / kg sed (DW)	kg sed OC / kg sed (DW)	mg chem / kg sed OC (DW)	mg chem / kg tissue (WW)	kg lipid / kg tissue (WW)	mg chem / kg lipid	kg sed OC (DW) / kg lipid (WW)
	Analyte							
	SVOCs							
91-57-6	2-Methylnaphthalene	0.37267	0.053	7.06	NA			0.894
83-32-9	Acenaphthene	0.6209	0.053	11.76	NA			0.03
208-96-8	Acenaphthylene	0.21	0.053	3.98	NA			0.762
120-12-7	Anthracene	0.38524	0.053	7.30	NA			0.108
56-55-3	Benzo[a]anthracene	0.78183	0.053	14.81	NA			0.332
50-32-8	Benzo[a]pyrene	0.62316	0.053	11.81	NA			0.207
205-99-2	Benzo[b]fluoranthene	0.60432	0.053	11.45	NA			0.416
191-24-2	Benzo[ghi]perylene	0.42025	0.053	7.96	NA			0.047
207-08-9	Benzo[k]fluoranthene	0.52313	0.053	9.91	NA			0.291
218-01-9	Chrysene	0.87245	0.053	16.53	NA			0.438
53-70-3	Dibenz[a,h]anthracene	0.08293	0.053	1.57	NA			0.377
132-64-9	Dibenzofuran	0.282	0.053	5.34	NA			0.894
206-44-0	Fluoranthene	1.60467	0.053	30.40	NA			0.894
86-73-7	Fluorene	0.28518	0.053	5.40	NA			0.964
193-39-5	Indeno[1,2,3-cd]pyrene	0.376	0.053	7.12	NA			0.281
91-20-3	Naphthalene	0.13744	0.053	2.60	NA			2.637
86-30-6	N-Nitrosodiphenylamine	0.063	0.053	1.19	NA			0.894
85-01-8	Phenanthrene	0.94979	0.053	18.00	NA			0.894
129-00-0	Pyrene	1.42256	0.053	26.95	NA			0.472
	Inorganics/Metals							
7429-90-5	Aluminum	8963.8	0.053	169839.89	87.960	0.059	1486.63	8.75E-03
7440-36-0	Antimony	4.5	0.053	84.69	0.42 **	0.059	7.10	8.38E-02
7440-38-2	Arsenic	5.1	0.053	96.54	2.754	0.059	46.55	4.82E-01
7440-39-3	Barium	49.0	0.053	928.51	4.95 **	0.059	83.66	9.01E-02
7440-41-7	Beryllium	0.7	0.053	12.35	0.16 **	0.059	2.70	2.19E-01
7440-43-9	Cadmium	2.4	0.053	45.61	5.160	0.059	87.21	1.91E+00
7440-47-3	Chromium	255.0	0.053	4831.90	2.880	0.059	48.68	1.01E-02
7440-48-4	Cobalt	11.9	0.053	225.47	1.3 **	0.059	21.97	9.74E-02
7440-50-8	Copper	385.4	0.053	7301.53	6.528	0.059	110.33	1.51E-02
74-90-8	Hydrogen Cyanide	0.5	0.053	10.23	NA	0.059	#VALUE!	0
7439-89-6	Iron	19250.5	0.053	364744.34	270.4	0.059	4570.09	1.25E-02
7439-92-1	Lead	64.2	0.053	1215.86	4.996	0.059	84.44	6.94E-02
7439-96-5	Manganese	310.0	0.053	5873.66	12.360	0.059	208.90	3.56E-02
7439-97-6	Mercury	13.9	0.053	264.18	0.326	0.059	5.51	2.09E-02
22967-92-6	Methyl mercury	0.0014	0.053	0.03	0.326 *	0.059	5.51	2.14E+02
7440-02-0	Nickel	65.2	0.053	1235.54	16.347	0.059	276.28	2.24E-01
7782-49-2	Selenium	1.2	0.053	22.01	0.574	0.059	9.70	4.41E-01
7440-22-4	Silver	37.1	0.053	702.56	0.374	0.059	6.32	8.99E-03
HLA0052	Trivalent Arsenic	688.0	0.053	13035.73	2.754 *	0.059	46.55	3.57E-03

TABLE T-3.3
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Intertidal Mudflats - Invertebrates

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

		Sediment Normalization			Tissue Normalization			BSAF [c]
	Parameter:	**SDconc**	**FOC**	**SDoc [a]**	**TISSUEconc**	**FLIPID**	**TISSUE lipid [b]**	
	Units:	mg chem / kg sed (DW)	kg sed OC / kg sed (DW)	mg chem / kg sed OC (DW)	mg chem / kg tissue (WW)	kg lipid / kg tissue (WW)	mg chem / kg lipid	kg sed OC (DW) / kg lipid (WW)
7440-62-2	Vanadium	67.0	0.053	1270.37	0.351	0.059	5.93	4.67E-03
7440-66-6	Zinc	268.2	0.053	5081.37	19.634	0.059	331.84	6.53E-02
	Pests/PCBs							
12672-29-6	Aroclor-1248	5.07331	0.053	96.13	0.031	0.059	0.52	5.38E-03
11097-69-1	Aroclor-1254	0.1378	0.053	2.61	0.827	0.059	13.97	5.35E+00
11096-82-5	Aroclor-1260	0.17049	0.053	3.23	0.0099	0.059	0.17	5.19E-02

[a] Calculated by dividing SDconc by FOC
[b] Calculated by dividing TISSUEconc by FLIPID
[c] Calculated by dividing TISSUElipid by Sdoc
* tissue was not analyzed for methylmercury or trivalent arsenic. For purposes of this evaluation, it has been assumed that all of the mercury in tissue is methylmercury and all arsenic is trivalent.
Tissue samples were not analyzed for PAHs. To evaluate food chain effects for PAHs, BSAFs from the literature were used. BSAFs reported in an Army Corps of Engineers Database.
The grand mean calculated for each analyte is presented. These BSAFs are primarily based on invertebrates, but do contain one or two fish values for some analytes.
For PAHs lacking a literature-based BSAF, the BSAF for fluoranthene was used, because this BSAF was based on the largest amount of data, and the value falls on the higher end of the range of BSAFs for PAH
This BSAF was also used for dibenzofuran and n-nitrosodiphenylamine, in absence of any other uptake factors for these analytes
** This analyte was not detected in biota at this location. In order to derive a BSAF, 1/2 the SQL for that analyte is used as the estimated tissue concentration.

TABLE T-3.3
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Outfall 8 - Invertebrates

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

		Sediment Normalization			Tissue Normalization				BSAF [c]
	Parameter:	**SDconc**	**FOC**	**SDoc [a]**	**TISSUEconc**		**FLIPID**	**TISSUE lipid [b]**	
	Units:	mg chem / kg sed (DW)	kg sed OC / kg sed (DW)	mg chem / kg sed OC (DW)	mg chem / kg tissue (WW)		kg lipid / kg tissue (WW)	mg chem / kg lipid	kg sed OC (DW) / kg lipid (WW)
	Analyte								
	SVOCs								
91-57-6	2-Methylnaphthalene	1.855	0.157	11.85	NA				0.894
83-32-9	Acenaphthene	3.960	0.157	25.29	NA				0.03
120-12-7	Anthracene	0.800	0.157	5.11	NA				0.108
56-55-3	Benzo[a]anthracene	2.051	0.157	13.10	NA				0.332
50-32-8	Benzo[a]pyrene	1.795	0.157	11.46	NA				0.207
205-99-2	Benzo[b]fluoranthene	2.030	0.157	12.97	NA				0.416
191-24-2	Benzo[ghi]perylene	1.122	0.157	7.17	NA				0.047
207-08-9	Benzo[k]fluoranthene	1.135	0.157	7.25	NA				0.291
218-01-9	Chrysene	2.077	0.157	13.26	NA				0.438
53-70-3	Dibenz[a,h]anthracene	0.244	0.157	1.56	NA				0.377
206-44-0	Fluoranthene	5.943	0.157	37.96	NA				0.894
86-73-7	Fluorene	0.384	0.157	2.45	NA				0.964
193-39-5	Indeno[1,2,3-cd]pyrene	1.291	0.157	8.24	NA				0.281
86-30-6	N-Nitrosodiphenylamine	1.300	0.157	8.30	NA				0.894
91-20-3	Naphthalene	0.299	0.157	1.91	NA				2.637
85-01-8	Phenanthrene	3.283	0.157	20.97	NA				0.894
129-00-0	Pyrene	5.097	0.157	32.56	NA				0.472
	Inorganics/Metals								
7429-90-5	Aluminum	10620	0.157	67830.82	5.1	**	0.0042	1202.64	1.77E-02
7440-36-0	Antimony	27	0.157	174.43	0.42	**	0.0042	99.04	5.68E-01
7440-38-2	Arsenic	8.8	0.157	56.05	1.66		0.0042	391.45	6.98E+00
7440-39-3	Barium	85	0.157	544.66	4.95	**	0.0042	1167.27	2.14E+00
7440-43-9	Cadmium	9.4	0.157	60.04	0.089		0.0042	20.91	3.48E-01
7440-47-3	Chromium	2599	0.157	16601.62	0.797		0.0042	187.86	1.13E-02
7440-50-8	Copper	1083	0.157	6915.61	3.753		0.0042	885.08	1.28E-01
57-12-5	Cyanide, Total	1.0	0.157	6.63	ND		0.0042	#VALUE!	0
74-90-8	Hydrogen Cyanide	4.6	0.157	29.38	ND		0.0042	#VALUE!	0
7439-89-6	Iron	26900	0.157	171812.53	52.31		0.0042	12334.54	7.18E-02
7439-92-1	Lead	130	0.157	833.19	0.471		0.0042	111.15	1.33E-01
7439-96-5	Manganese	378	0.157	2412.72	1.34	**	0.0042	315.99	1.31E-01
7439-97-6	Mercury	0.35	0.157	2.25	0.29	**	0.0042	68.39	3.04E+01
22967-92-6	Methyl mercury	0.0016	0.157	0.01	0.290	*	0.0042	68.39	6.82E+03
7440-02-0	Nickel	159	0.157	1017.94	1.47		0.0042	346.64	3.41E-01
7782-49-2	Selenium	2	0.157	12.20	0.420	**	0.0042	99.04	8.12E+00
7440-22-4	Silver	18	0.157	114.26	0.2017		0.0042	47.56	4.16E-01

TABLE T-3.3
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Outfall 8 - Invertebrates

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

HLA0052	Trivalent Arsenic	565	0.157	3610.83	1.66	*	0.0042	391.45	1.08E-01
7440-62-2	Vanadium	36	0.157	227.06	1.2	**	0.0042	282.97	1.25E+00
7440-66-6	Zinc	266	0.157	1700.56	21.29		0.0042	5019.65	2.95E+00
	Pest/PCBs								
11097-69-1	Aroclor-1254	0.279	0.157	1.78	0.007	**	0.0042	1.65	9.26E-01
11096-82-5	Aroclor-1260	0.592	0.157	3.78	0.0136		0.0042	3.21	8.50E-01

[a] Calculated by dividing SDconc by FOC
[b] Calculated by dividing TISSUEconc by FLIPID
[c] Calculated by dividing TISSUElipid by Sdoc
* tissue was not analyzed for methylmercury or trivalent arsenic. For purposes of this evaluation, it has been assumed that all of the mercury in tissue is methylmercury and all arsenic is trivalent.
Tissue samples were not analyzed for PAHs. To evaluate food chain effects for PAHs, BSAFs from the literature were used. BSAFs reported in an Army Corps of Engineers Database.
The grand mean calculated for each analyte is presented. These BSAFs are primarily based on invertebrates, but do contain one or two fish values for some analytes.
For PAHs lacking a literature-based BSAF, the BSAF for fluoranthene was used, because this BSAF was based on the largest amount of data, and the value falls on the higher end of the range of BSAFs
This BSAF was also used for dibenzofuran and n-nitrosodiphenylamine, in absence of any other uptake factors for these analytes

TABLE T-3.3
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Marine Basin - Invertebrates

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

		Sediment Normalization			Tissue Normalization				BSAF [c]
	Parameter:	**SDconc**	**FOC**	**SDoc [a]**	**TISSUEconc**		**FLIPID**	**TISSUE lipid [b]**	
	Units:	mg chem / kg sed (DW)	kg sed OC / kg sed (DW)	mg chem / kg sed OC (DW)	mg chem / kg tissue (WW)		kg lipid / kg tissue (WW)	mg chem / kg lipid	kg sed OC (DW) / kg lipid (WW)
	Analyte								
91-57-6	2-Methylnaphthalene	0.3575	0.10555	3.39	NA				0.894
83-32-9	Acenaphthene	0.8862	0.10555	8.40	NA				0.03
120-12-7	Anthracene	0.1346	0.10555	1.28	NA				0.108
56-55-3	Benzo[a]anthracene	0.536	0.10555	5.08	NA				0.332
50-32-8	Benzo[a]pyrene	0.65	0.10555	6.16	NA				0.207
205-99-2	Benzo[b]fluoranthene	0.509	0.10555	4.82	NA				0.416
191-24-2	Benzo[ghi]perylene	0.381	0.10555	3.61	NA				0.047
207-08-9	Benzo[k]fluoranthene	0.279	0.10555	2.64	NA				0.291
218-01-9	Chrysene	0.67	0.10555	6.35	NA				0.438
53-70-3	Dibenz[a,h]anthracene	0.046	0.10555	0.44	NA				0.377
206-44-0	Fluoranthene	0.804	0.10555	7.62	NA				0.894
86-73-7	Fluorene	0.0	0.10555	0.45	NA				0.964
193-39-5	Indeno[1,2,3-cd]pyrene	0.331	0.10555	3.14	NA				0.281
85-01-8	Phenanthrene	0.518	0.10555	4.91	NA				0.894
129-00-0	Pyrene	0.854	0.10555	8.09	NA				0.472
	Inorganics/Metals								
7429-90-5	Aluminum	8732.5	0.10555	82733.30	36.840		0.010	3684.00	4.45E-02
7440-38-2	Arsenic	4.44	0.10555	42.07	1.554		0.010	155.40	3.69E+00
7440-39-3	Barium	38.05	0.10555	360.49	4.95	**	0.010	495.00	1.37E+00
7440-43-9	Cadmium	1.258	0.10555	11.92	0.144		0.010	14.40	1.21E+00
7440-47-3	Chromium	81.66	0.10555	773.66	1.337		0.010	133.75	1.73E-01
7440-50-8	Copper	196.1	0.10555	1857.89	3.840		0.010	384.00	2.07E-01
7439-89-6	Iron	16835	0.10555	159497.87	89		0.010	8900.00	5.58E-02
7439-92-1	Lead	64.98	0.10555	615.63	0.828		0.010	82.80	1.34E-01
7439-97-6	Mercury	0.279	0.10555	2.64	0.290	**	0.010	29.00	1.10E+01
22967-92-6	Methyl mercury	0.002297	0.10555	0.02	0.290	*	0.010	29.00	1.33E+03
7440-02-0	Nickel	20.78	0.10555	196.87	0.302		0.010	30.20	1.53E-01
7782-49-2	Selenium	1.22	0.10555	11.51	0.552		0.010	55.20	4.80E+00
HLA0052	Trivalent Arsenic	817.5	0.10555	7745.14	1.554	*	0.010	155.40	2.01E-02
7440-62-2	Vanadium	26.6	0.10555	252.01	4.2	**	0.010	420.00	1.67E+00
7440-66-6	Zinc	170.5	0.10555	1615.35	17.195		0.010	1719.50	1.06E+00
	Pest/PCBs								
12672-29-6	Aroclor-1248	0.0320	0.10555	0.30	0.006	**	0.010	0.60	1.98E+00
11097-69-1	Aroclor-1254	0.0545	0.10555	0.52	0.042		0.010	4.18	8.10E+00
11096-82-5	Aroclor-1260	0.0824	0.10555	0.78	0.007	**	0.010	0.70	8.97E-01

TABLE T-3.3
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Marine Basin - Invertebrates

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

[a] Calculated by dividing SDconc by FOC
[b] Calculated by dividing TISSUEconc by FLIPID
[c] Calculated by dividing TISSUElipid by Sdoc
* tissue was not analyzed for methylmercury or trivalent arsenic. For purposes of this evaluation, it has been assumed that all of the mercury in tissue is methylmercury and all arsenic is trivalent.
Tissue samples were not analyzed for PAHs. To evaluate food chain effects for PAHs, BSAFs from the literature were used. BSAFs reported in an Army Corps of Engineers Database.
The grand mean calculated for each analyte is presented. These BSAFs are primarily based on invertebrates, but do contain one or two fish values for some analytes.
For PAHs lacking a literature-based BSAF, the BSAF for fluoranthene was used, because this BSAF was based on the largest amount of data, and the value falls on the higher end of the range of BSAFs f
** This analyte was not detected in biota at this location. In order to derive a BSAF, 1/2 the SQL for that analyte is used as the estimated tissue concentration.

TABLE T-3.4
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Intertidal Mudflats - Fish

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

		Sediment Normalization			Tissue Normalization				BSAF [c]
	Parameter:	**SDconc**	**FOC**	**SDoc [a]**	**TISSUEconc**		**FLIPID [d]**	**TISSUE lipid [b]**	
	Units:	mg chem / kg sed (DW)	kg sed OC / kg sed (DW)	mg chem / kg sed OC (DW)	mg chem / kg tissue (WW)		kg lipid / kg tissue (WW)	mg chem / kg lipid	kg sed OC (DW) / kg lipid (WW)
	Analyte								
	SVOCs								
91-57-6	2-Methylnaphthalene	0.37267	0.053	7.06	NA				0
83-32-9	Acenaphthene	0.6209	0.053	11.76	NA				0
208-96-8	Acenaphthylene	0.21	0.053	3.98	NA				0
120-12-7	Anthracene	0.38524	0.053	7.30	NA				0
56-55-3	Benzo[a]anthracene	0.78183	0.053	14.81	NA				0
50-32-8	Benzo[a]pyrene	0.62316	0.053	11.81	NA				0
205-99-2	Benzo[b]fluoranthene	0.60432	0.053	11.45	NA				0
191-24-2	Benzo[ghi]perylene	0.42025	0.053	7.96	NA				0
207-08-9	Benzo[k]fluoranthene	0.52313	0.053	9.91	NA				0
218-01-9	Chrysene	0.87245	0.053	16.53	NA				0
53-70-3	Dibenz[a,h]anthracene	0.08293	0.053	1.57	NA				0
132-64-9	Dibenzofuran	0.282	0.053	5.34	NA				0
206-44-0	Fluoranthene	1.60467	0.053	30.40	NA				0
86-73-7	Fluorene	0.28518	0.053	5.40	NA				0
193-39-5	Indeno[1,2,3-cd]pyrene	0.376	0.053	7.12	NA				0
91-20-3	Naphthalene	0.13744	0.053	2.60	NA				0
86-30-6	N-Nitrosodiphenylamine	0.063	0.053	1.19	NA				0
85-01-8	Phenanthrene	0.94979	0.053	18.00	NA				0
129-00-0	Pyrene	1.42256	0.053	26.95	NA				0
	Inorganics/Metals								
7429-90-5	Aluminum	8963.8	0.053	169839.89	13.2		0.050	264.00	1.55E-03
7440-36-0	Antimony	4.5	0.053	84.69	0.42	**	0.050	8.40	9.92E-02
7440-38-2	Arsenic	5.1	0.053	96.54	0.2	**	0.050	4.00	4.14E-02
7440-39-3	Barium	49.0	0.053	928.51	1.0	**	0.050	20.00	2.15E-02
7440-41-7	Beryllium	0.7	0.053	12.35	0.3	**	0.050	6.00	4.86E-01
7440-43-9	Cadmium	2.4	0.053	45.61	0.038		0.050	0.75	1.64E-02
7440-47-3	Chromium	255.0	0.053	4831.90	0.49		0.050	9.80	2.03E-03
7440-48-4	Cobalt	11.9	0.053	225.47	0.27	**	0.050	5.40	2.39E-02
7440-50-8	Copper	385.4	0.053	7301.53	2.5		0.050	51.00	6.98E-03

TABLE T-3.4
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Intertidal Mudflats - Fish

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74-90-8	Hydrogen Cyanide	0.5	0.053	10.23	NA		0.050	#VALUE!	0
7439-89-6	Iron	19250.5	0.053	364744.34	36.6		0.050	732.00	2.01E-03
7439-92-1	Lead	64.2	0.053	1215.86	0.6		0.050	11.80	9.71E-03
7439-96-5	Manganese	310.0	0.053	5873.66	5.3		0.050	107.00	1.82E-02
7439-97-6	Mercury	13.9	0.053	264.18	0.30	**	0.050	6.00	2.27E-02
22967-92-6	Methyl mercury	0.0014	0.053	0.03	0.30	*	0.050	6.00	2.33E+02
7440-02-0	Nickel	65.2	0.053	1235.54	0.4		0.050	7.70	6.23E-03
7782-49-2	Selenium	1.2	0.053	22.01	0.8		0.050	15.70	7.13E-01
7440-22-4	Silver	37.1	0.053	702.56	0.13	**	0.050	2.60	3.70E-03
HLA0052	Trivalent Arsenic	688.0	0.053	13035.73	0.2	*	0.050	4.00	3.07E-04
7440-62-2	Vanadium	67.0	0.053	1270.37	0.27	**	0.050	5.40	4.25E-03
7440-66-6	Zinc	268.2	0.053	5081.37	36.1		0.050	721.00	1.42E-01
	Pests/PCBs								
12672-29-6	Aroclor-1248	5.07331	0.053	96.13	0.026		0.050	0.52	5.41E-03
11097-69-1	Aroclor-1254	0.1378	0.053	2.61	0.13		0.050	2.60	9.96E-01
11096-82-5	Aroclor-1260	0.17049	0.053	3.23	0.11		0.050	2.22	6.87E-01

[a] Calculated by dividing SDconc by FOC
[b] Calculated by dividing TISSUEconc by FLIPID
[c] Calculated by dividing TISSUElipid by Sdoc
[d] Lipid results are suspect (% lipid > 100%), therefore, lipid concentration was assumed to be 5%.
* tissue was not analyzed for methylmercury or trivalent arsenic. For purposes of this evaluation, it has been assumed that all of the mercury in tissue is methylmercury and all arsenic is trivalent.
PAHs are not know to bioaccumulate appreciably in fish.
** This analyte was not detected in biota at this location. In order to derive a BSAF, 1/2 the SQL for that analyte is used as the estimated tissue concentration.

TABLE T-3.4
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Marine Basin - Fish

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

		Sediment Normalization			Tissue Normalization				BSAF [c]
	Parameter:	**SDconc**	**FOC**	**SDoc [a]**	**TISSUEconc**		**FLIPID [d]**	**TISSUE lipid [b]**	
	Units:	mg chem / kg sed (DW)	kg sed OC / kg sed (DW)	mg chem / kg sed OC (DW)	mg chem / kg tissue (WW)		kg lipid / kg tissue (WW)	mg chem / kg lipid	kg sed OC (DW) / kg lipid (WW)
	Analyte								
91-57-6	2-Methylnaphthalene	0.3575	0.10555	3.39	NA				0
83-32-9	Acenaphthene	0.8862	0.10555	8.40	NA				0
120-12-7	Anthracene	0.1346	0.10555	1.28	NA				0
56-55-3	Benzo[a]anthracene	0.536	0.10555	5.08	NA				0
50-32-8	Benzo[a]pyrene	0.65	0.10555	6.16	NA				0
205-99-2	Benzo[b]fluoranthene	0.509	0.10555	4.82	NA				0
191-24-2	Benzo[ghi]perylene	0.381	0.10555	3.61	NA				0
207-08-9	Benzo[k]fluoranthene	0.279	0.10555	2.64	NA				0
218-01-9	Chrysene	0.67	0.10555	6.35	NA				0
53-70-3	Dibenz[a,h]anthracene	0.046	0.10555	0.44	NA				0
206-44-0	Fluoranthene	0.804	0.10555	7.62	NA				0
86-73-7	Fluorene	0.0	0.10555	0.45	NA				0
193-39-5	Indeno[1,2,3-cd]pyrene	0.331	0.10555	3.14	NA				0
85-01-8	Phenanthrene	0.518	0.10555	4.91	NA				0
129-00-0	Pyrene	0.854	0.10555	8.09	NA				0
	Inorganics/Metals								
7429-90-5	Aluminum	8732.5	0.10555	82733.30	10.57		0.050	211.33	2.55E-03
7440-38-2	Arsenic	4.44	0.10555	42.07	0.2	**	0.050	4.00	9.51E-02
7440-39-3	Barium	38.05	0.10555	360.49	1.0	**	0.050	20.00	5.55E-02
7440-43-9	Cadmium	1.258	0.10555	11.92	0.029	**	0.050	0.58	4.87E-02
7440-47-3	Chromium	81.66	0.10555	773.66	0.41		0.050	8.20	1.06E-02
7440-50-8	Copper	196.1	0.10555	1857.89	2.63		0.050	52.67	2.83E-02
7439-89-6	Iron	16835	0.10555	159497.87	42.47		0.050	849.33	5.33E-03
7439-92-1	Lead	64.98	0.10555	615.63	0.56		0.050	11.20	1.82E-02
7439-97-6	Mercury	0.279	0.10555	2.64	0.30	**	0.050	6.00	2.27E+00
22967-92-6	Methyl mercury	0.002297	0.10555	0.02	0.30	*	0.050	6.00	2.76E+02
7440-02-0	Nickel	20.78	0.10555	196.87	0.1367		0.050	2.73	1.39E-02
7782-49-2	Selenium	1.22	0.10555	11.51	0.743		0.050	14.87	1.29E+00
HLA0052	Trivalent Arsenic	817.5	0.10555	7745.14	0.2	*	0.050	4.00	5.16E-04
7440-62-2	Vanadium	26.6	0.10555	252.01	0.27	**	0.050	5.40	2.14E-02
7440-66-6	Zinc	170.5	0.10555	1615.35	35.1		0.050	702.00	4.35E-01
	Pest/PCBs								
12672-29-6	Aroclor-1248	0.0320	0.10555	0.30	0.011	**	0.050	0.22	7.26E-01
11097-69-1	Aroclor-1254	0.0545	0.10555	0.52	0.351		0.050	7.01	1.36E+01
11096-82-5	Aroclor-1260	0.0824	0.10555	0.78	0.226		0.050	4.53	5.80E+00

[a] Calculated by dividing SDconc by FOC
[b] Calculated by dividing TISSUEconc by FLIPID
[c] Calculated by dividing TISSUElipid by Sdoc
[d] Lipid results are suspect (% lipid > 100%), therefore, lipid concentration was assumed to be 5%.
* tissue was not analyzed for methylmercury or trivalent arsenic. For purposes of this evaluation, it has been assumed that all of the mercury in tissue is methylmercury and all arsenic is trivalent.
PAHs are not know to bioaccumulate appreciably in fish.
** This analyte was not detected in biota at this location. In order to derive a BSAF, 1/2 the SQL for that analyte is used as the estimated tissue concentration.

TABLE T-3.4
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Reference Area - Fish

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

		Sediment Normalization			Tissue Normalization				BSAF [c]
	Parameter:	**SDconc**	**FOC**	**SDoc [a]**	**TISSUEconc**		**FLIPID**	**TISSUE lipid [b]**	
	Units:	mg chem / kg sed (DW)	kg sed OC / kg sed (DW)	mg chem / kg sed OC (DW)	mg chem / kg tissue (WW)		kg lipid / kg tissue (WW)	mg chem / kg lipid	kg sed OC (DW) / kg lipid (WW)
	Analyte								
	SVOCS								
91-57-6	2-Methylnaphthalene	0.08867	0.021927	4.04	NA				0
83-32-9	Acenaphthene	0.16333	0.021927	7.45	NA				0
120-12-7	Anthracene	0.04535	0.021927	2.07	NA				0
56-55-3	Benzo[a]anthracene	0.07000	0.021927	3.19	NA				0
50-32-8	Benzo[a]pyrene	0.14625	0.021927	6.67	NA				0
205-99-2	Benzo[b]fluoranthene	0.09667	0.021927	4.41	NA				0
191-24-2	Benzo[ghi]perylene	0.07633	0.021927	3.48	NA				0
207-08-9	Benzo[k]fluoranthene	0.05567	0.021927	2.54	NA				0
218-01-9	Chrysene	0.08467	0.021927	3.86	NA				0
53-70-3	Dibenz[a,h]anthracene	0.01152	0.021927	0.53	NA				0
206-44-0	Fluoranthene	0.17200	0.021927	7.84	NA				0
86-73-7	Fluorene	0.00757	0.021927	0.35	NA				0
193-39-5	Indeno[1,2,3-cd]pyrene	0.05900	0.021927	2.69	NA				0
91-20-3	Naphthalene	0.02017	0.021927	0.92	NA				0
85-01-8	Phenanthrene	0.08600	0.021927	3.92	NA				0
129-00-0	Pyrene	0.18833	0.021927	8.59	NA				0
	Inorganics/Metals								
7429-90-5	Aluminum	3870	0.021927	176494.73	30.1		0.050	602	8.31E-05
7440-36-0	Antimony	0.69	0.021927	31.47	0.42	**	0.050	8.4	5.95E-03
7440-38-2	Arsenic	1.63	0.021927	74.57	0.2	**	0.050	4.0	1.25E-02
7440-39-3	Barium	15.87	0.021927	723.61	1.0	**	0.050	20	2.50E-03
7440-41-7	Beryllium	0.16	0.021927	7.30	0.3	**	0.050	6.0	8.33E-03
7440-43-9	Cadmium	0.49	0.021927	22.23	0.030		0.050	0.60	8.33E-02
7440-47-3	Chromium	24.73	0.021927	1127.61	0.6		0.050	12.2	4.08E-03
7440-48-4	Cobalt	4.13	0.021927	188.50	0.27	**	0.050	5.4	9.26E-03
7440-50-8	Copper	82.85	0.021927	3778.45	3.4		0.050	68	7.40E-04
7439-89-6	Iron	7323	0.021927	333987.02	75.7		0.050	1514	3.30E-05
7439-92-1	Lead	15	0.021927	693.21	0.7		0.050	13.7	3.65E-03
7439-96-5	Manganese	105	0.021927	4776.46	3.6		0.050	72	6.94E-04
7439-97-6	Mercury	0.110	0.021927	5.02	0.30	**	0.050	6.0	8.33E-03
22967-92-6	Methyl mercury	0.001	0.021927	0.04	0.30	*	0.050	6.0	8.33E-03
7440-02-0	Nickel	7.575	0.021927	345.46	0.2		0.050	4.0	1.25E-02
7782-49-2	Selenium	0.667	0.021927	30.40	0.8		0.050	15.6	3.20E-03
7440-22-4	Silver	ND	0.021927	#VALUE!	0.13	**	0.050	2.6	1.92E-02
HLA0052	Trivalent Arsenic	230	0.021927	10489.35	0.2	*	0.050	4.0	1.25E-02
7440-62-2	Vanadium	10	0.021927	468.22	0.27	**	0.050	5.4	9.26E-03
7440-66-6	Zinc	60	0.021927	2732.93	31.4		0.050	628	7.96E-05
	Pest/PCBs								
12672-29-6	Aroclor-1248	0.07775	0.021927	3.55	0.011	**	0.050	0.22	2.27E-01
11097-69-1	Aroclor-1254	0.00250 **	0.021927	0.11	0.09		0.050	1.78	2.82E-02
11096-82-5	Aroclor-1260	0.03825	0.021927	1.74	0.07		0.050	1.32	3.80E-02

TABLE T-3.4
DERIVATION OF BIOTA-SEDIMENT ACCUMULATION FACTORS (BSAFs) FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
Reference Area - Fish

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

[a] Calculated by dividing SDconc by FOC
[b] Calculated by dividing TISSUEconc by FLIPID
[c] Calculated by dividing TISSUElipid by Sdoc
[d] Lipid results are suspect (% lipid > 50%), therefore, lipid concentration was assumed to be 5%.
* tissue was not analyzed for methylmercury or trivalent arsenic. For purposes of this evaluation, it has been assumed that all of the mercury in tissue is methylmercury and all arsenic is trivalent.
PAHs are not know to bioaccumulate appreciably in fish.
** This analyte was not detected in biota at this location. In order to derive a BSAF, 1/2 the SQL for that analyte is used as the estimated tissue concentration.

TABLE T-3.5
SUMMARY OF REFERENCE TOXICITY VALUES (mg/kd-d) FOR AQUATIC WILDLIFE RECEPTORS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

		Small Bird		Large Bird		Small Mammal		Large Mammal	
CAS #	Chemical Name	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
79-34-5	1,1,2,2-Tetrachloroethane	3.2E-01	3.2E+00	3.2E-01	3.2E+00	3.2E-01	3.2E+00	3.2E-01	3.2E+00
75-35-4	1,1-Dichloroethene	3.0E+01	3.0E+02	3.0E+01	3.0E+02	3.0E+01	3.0E+02	2.5E+00	2.5E+01
87-61-6	1,2,3-Trichlorobenzene	1.5E+01	1.5E+02	1.5E+01	1.5E+02	1.5E+01	1.5E+02	1.5E+01	1.5E+02
120-82-1	1,2,4-Trichlorobenzene	1.5E+01	1.5E+02	1.5E+01	1.5E+02	1.5E+01	1.5E+02	1.5E+01	1.5E+02
95-50-1	1,2-Dichlorobenzene	4.3E+02	4.3E+03	4.3E+02	4.3E+03	4.3E+02	4.3E+03	4.3E+02	4.3E+03
541-73-1	1,3-Dichlorobenzene	4.3E+02	4.3E+03	4.3E+02	4.3E+03	4.3E+02	4.3E+03	4.3E+02	4.3E+03
106-46-7	1,4-Dichlorobenzene	4.3E+02	4.3E+03	4.3E+02	4.3E+03	4.3E+02	4.3E+03	4.3E+02	4.3E+03
118-79-6	2,4,6-Tribromophenol	8.0E+00	8.0E+01	8.0E+00	8.0E+01	8.0E+00	8.0E+01	8.0E+00	8.0E+01
67-64-1	Acetone	1.0E+01	5.0E+01	1.0E+01	5.0E+01	1.0E+01	5.0E+01	1.0E+01	5.0E+01
71-43-2	Benzene	2.6E+01	2.6E+02	2.6E+01	2.6E+02	2.6E+01	2.6E+02	2.6E+01	2.6E+02
75-15-0	Carbon disulfide	1.1E+01	1.1E+02	1.1E+01	1.1E+02	1.1E+01	1.1E+02	1.1E+01	1.1E+02
108-90-7	Chlorobenzene	8.9E+00	8.9E+01	8.9E+00	8.9E+01	8.9E+00	8.9E+01	1.4E+01	1.4E+02
67-66-3	Chloroform	1.5E+01	4.1E+01	1.5E+01	4.1E+01	1.5E+01	4.1E+01	1.5E+01	4.1E+01
78-93-3	Methyl ethyl ketone	1.8E+03	4.6E+03	1.8E+03	4.6E+03	1.8E+03	4.6E+03	1.8E+03	4.6E+03
75-09-2	Methylene chloride	5.9E+00	5.0E+01	5.9E+00	5.0E+01	5.9E+00	5.0E+01	5.9E+00	5.0E+01
HLA0010	m-Xylene/p-Xylene	4.0E+01	4.0E+02	4.0E+01	4.0E+02	2.1E+00	2.6E+00	2.1E+00	2.6E+00
95-47-6	Ortho Xylene	4.0E+01	4.0E+02	4.0E+01	4.0E+02	2.1E+00	2.6E+00	2.1E+00	2.6E+00
127-18-4	Tetrachloroethylene	1.0E+01	1.0E+02	1.0E+01	1.0E+02	1.0E+01	1.0E+02	1.0E+01	1.0E+02
108-88-3	Toluene	2.6E+01	2.6E+02	2.6E+01	2.6E+02	2.6E+01	2.6E+02	2.6E+01	2.6E+02
1330-20-7	Total Xylenes	4.0E+01	4.0E+02	4.0E+01	4.0E+02	2.1E+00	2.6E+00	2.1E+00	2.6E+00
79-01-6	Trichloroethene	7.1E-01	7.1E+00	7.1E-01	7.1E+00	7.1E-01	7.1E+00	7.1E-01	7.1E+00
92-52-4	1,1'-Biphenyl	5.0E+01	5.0E+02	5.0E+01	5.0E+02	5.0E+01	5.0E+02	5.0E+01	5.0E+02
91-57-6	2-Methylnaphthalene	3.6E+00	3.6E+01	3.6E+00	3.6E+01	3.6E+00	3.6E+01	3.6E+00	3.6E+01
59-50-7	4-Chloro-3-methylphenol	7.2E-02	7.2E-01	7.2E-02	7.2E-01	7.2E-02	7.2E-01	7.2E-02	7.2E-01
106-47-8	4-Chloroaniline	1.3E+00	1.3E+01	1.3E+00	1.3E+01	1.3E+00	1.3E+01	1.3E+00	1.3E+01
106-44-5	4-Methylphenol	5.0E+01	5.0E+02	5.0E+01	5.0E+02	5.0E+01	5.0E+02	5.0E+01	5.0E+02
83-32-9	Acenaphthene	1.8E+02	3.5E+02	1.8E+02	3.5E+02	1.8E+02	3.5E+02	1.8E+02	3.5E+02
208-96-8	Acenaphthylene	6.0E+01	6.0E+02	6.0E+01	6.0E+02	6.0E+01	6.0E+02	6.0E+01	6.0E+02
98-86-2	Acetophenone	4.2E+02	4.2E+03	4.2E+02	4.2E+03	4.2E+02	4.2E+03	4.2E+02	4.2E+03
120-12-7	Anthracene	1.0E+03	1.0E+04	1.0E+03	1.0E+04	1.0E+03	1.0E+04	1.0E+03	1.0E+04
100-52-7	Benzaldehyde	1.4E+02	4.0E+02	1.4E+02	4.0E+02	1.4E+02	4.0E+02	1.4E+02	4.0E+02
56-55-3	Benzo[a]anthracene	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
50-32-8	Benzo[a]pyrene	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
205-99-2	Benzo[b]fluoranthene	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
191-24-2	Benzo[ghi]perylene	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
207-08-9	Benzo[k]fluoranthene	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
117-81-7	Bis(2-Ethylhexyl)phthalate	1.1E+00	1.1E+01	1.1E+00	1.1E+01	1.8E+01	1.8E+02	1.8E+01	1.8E+02
86-74-8	Carbazole	1.0E+01	1.0E+02	1.0E+01	1.0E+02	1.0E+01	1.0E+02	1.0E+01	1.0E+02
218-01-9	Chrysene	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
53-70-3	Dibenz[a,h]anthracene	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
132-64-9	Dibenzofuran	1.3E+01	1.3E+02	1.3E+01	1.3E+02	1.3E+01	1.3E+02	1.3E+01	1.3E+02
131-11-3	Dimethylphthalate	4.6E+03	4.6E+04	4.6E+03	4.6E+04	4.6E+03	4.6E+04	4.6E+03	4.6E+04
84-74-2	Di-n-butylphthalate	1.1E-01	1.1E+00	1.1E-01	1.1E+00	5.5E+02	1.8E+03	5.5E+02	1.8E+03
117-84-0	Di-n-octylphthalate	1.1E-01	1.1E+00	1.1E-01	1.1E+00	5.5E+02	1.8E+03	5.5E+02	1.8E+03

TABLE T-3.5
SUMMARY OF REFERENCE TOXICITY VALUES (mg/kd-d) FOR AQUATIC WILDLIFE RECEPTORS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

		Small Bird		Large Bird		Small Mammal		Large Mammal	
CAS #	Chemical Name	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
206-44-0	Fluoranthene	4.0E+01	4.0E+02	4.0E+01	4.0E+02	4.0E+01	4.0E+02	4.0E+01	4.0E+02
86-73-7	Fluorene	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
193-39-5	Indeno[1,2,3-cd]pyrene	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
91-20-3	Naphthalene	3.6E+00	3.6E+01	3.6E+00	3.6E+01	3.6E+00	3.6E+01	3.6E+00	3.6E+01
85-01-8	Phenanthrene	1.4E+01	1.4E+02	1.4E+01	1.4E+02	1.4E+01	1.4E+02	1.4E+01	1.4E+02
129-00-0	Pyrene	1.6E+01	1.6E+02	1.6E+01	1.6E+02	1.6E+01	1.6E+02	1.6E+01	1.6E+02
72-54-8	4,4`-DDD	1.4E-02	1.4E-01	1.4E-02	1.4E-01	8.0E-01	4.0E+00	1.0E+00	5.0E+00
72-55-9	4,4`-DDE	1.4E-02	1.4E-01	1.4E-02	1.4E-01	8.0E-01	4.0E+00	1.0E+00	5.0E+00
50-29-3	4,4`-DDT	1.4E-02	1.4E-01	1.4E-02	1.4E-01	8.0E-01	4.0E+00	1.0E+00	5.0E+00
309-00-2	Aldrin	2.0E-01	1.0E+00	2.0E-01	1.0E+00	2.0E-01	1.0E+00	2.0E-01	1.0E+00
319-84-6	alpha-BHC	5.6E-01	2.3E+00	5.6E-01	2.3E+00	4.0E-01	2.0E+00	1.4E-02	1.4E-01
5103-71-9	alpha-Chlordane	3.1E-02	3.1E-01	3.1E-02	3.1E-01	4.6E+00	9.2E+00	4.6E+00	9.2E+00
11141-16-5	Aroclor-1232	1.8E-01	1.8E+00	4.1E-01	4.1E+00	6.8E-02	6.8E-01	1.4E-01	6.9E-01
53469-21-9	Aroclor-1242	1.8E-01	1.8E+00	4.1E-01	4.1E+00	6.8E-02	6.8E-01	6.9E-01	6.9E-01
12672-29-6	Aroclor-1248	1.8E-01	1.8E+00	4.1E-01	4.1E+00	6.8E-02	6.8E-01	1.4E-01	6.9E-01
11097-69-1	Aroclor-1254	1.8E-01	1.8E+00	9.0E-01	9.0E+00	6.8E-02	6.8E-01	1.4E-01	6.9E-01
11096-82-5	Aroclor-1260	9.0E-02	9.0E-01	9.0E-02	9.0E-01	6.8E-02	6.8E-01	1.4E-01	6.9E-01
319-85-7	beta-BHC	5.6E-01	2.3E+00	5.6E-01	2.3E+00	4.0E-01	2.0E+00	1.4E-02	1.4E-01
319-86-8	delta-BHC	5.6E-01	2.3E+00	5.6E-01	2.3E+00	4.0E-01	2.0E+00	1.4E-02	1.4E-01
60-57-1	Dieldrin	6.0E-02	6.0E-01	7.7E-02	7.7E-01	2.0E-02	2.0E-01	5.0E-03	5.0E-02
959-98-8	Endosulfan I	6.2E-01	3.1E+01	1.0E+01	1.0E+02	1.5E-01	1.5E+00	1.5E-01	1.5E+00
33213-65-9	Endosulfan II	6.2E-01	3.1E+01	1.0E+01	1.0E+02	1.5E-01	1.5E+00	1.5E-01	1.5E+00
1031-07-8	Endosulfan sulfate	6.2E-01	3.1E+01	1.0E+01	1.0E+02	1.5E-01	1.5E+00	1.5E-01	1.5E+00
72-20-8	Endrin	3.0E-01	3.0E+00	1.0E-02	1.0E-01	9.2E-02	9.2E-01	1.0E-02	1.0E-01
7421-93-4	Endrin aldehyde	3.0E-01	3.0E+00	1.0E-02	1.0E-01	9.2E-02	9.2E-01	1.0E-02	1.0E-01
53494-70-5	Endrin ketone	3.0E-01	3.0E+00	1.0E-02	1.0E-01	9.2E-02	9.2E-01	1.0E-02	1.0E-01
58-89-9	Gamma-BHC/Lindane	2.0E+00	2.0E+01	5.6E-01	2.3E+00	4.0E-01	2.0E+00	1.4E-02	1.4E-01
5103-74-2	Gamma-Chlordane	3.1E-02	3.1E-01	3.1E-02	3.1E-01	4.6E+00	9.2E+00	4.6E+00	9.2E+00
76-44-8	Heptachlor	1.2E+00	1.2E+01	1.2E+00	1.2E+01	3.5E-02	3.5E-01	1.0E-01	1.0E+00
1024-57-3	Heptachlor epoxide	1.2E+00	1.2E+01	1.2E+00	1.2E+01	3.5E-02	3.5E-01	1.0E-01	1.0E+00
72-43-5	Methoxychlor	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01	1.0E+00	1.0E+01
5103-73-1	cis-Nonachlor	3.1E-02	3.1E-01	3.1E-02	3.1E-01	4.6E+00	9.2E+00	4.6E+00	9.2E+00
39765-80-5	trans-Nonachlor	3.1E-02	3.1E-01	3.1E-02	3.1E-01	4.6E+00	9.2E+00	4.6E+00	9.2E+00
7429-90-5	Aluminum	1.1E+02	1.1E+03	1.1E+02	1.1E+03	1.9E+00	1.9E+01	1.9E+00	1.9E+01
7664-41-7	Ammonia	9.4E+01	9.4E+02	9.4E+01	9.4E+02	9.4E+01	9.4E+02	9.4E+01	9.4E+02
7440-36-0	Antimony	1.3E-01	1.3E+00	1.3E-01	1.3E+00	1.3E-01	1.3E+00	1.3E-01	1.3E+00
7440-38-2	Arsenic	5.1E+00	1.3E+01	5.1E+00	1.3E+01	1.3E-01	1.3E+00	3.1E-01	3.1E+00
HLA0052	Trivalent Arsenic	5.1E+00	1.3E+01	5.1E+00	1.3E+01	1.3E-01	1.3E+00	3.1E-01	3.1E+00
7440-39-3	Barium	2.1E+01	4.2E+01	2.1E+01	4.2E+01	5.1E+00	5.1E+01	5.1E+00	5.1E+01
7440-41-7	Beryllium	6.6E-01	6.6E+00	6.6E-01	6.6E+00	6.6E-01	6.6E+00	6.6E-01	6.6E+00
7440-42-8	Boron	2.9E+01	1.0E+02	2.9E+01	1.0E+02	2.8E+01	9.4E+01	1.4E+01	1.4E+02
7440-43-9	Cadmium	1.5E+00	2.0E+01	1.5E+00	2.0E+01	1.0E+00	1.0E+01	7.5E-01	7.5E+00
7440-47-3	Chromium	1.0E+00	5.0E+00	1.0E+00	5.0E+00	2.7E+03	2.7E+04	2.7E+03	2.7E+04
18540-29-9	Chromium (VI)	1.0E+00	5.0E+00	1.0E+00	5.0E+00	3.3E+00	1.3E+01	3.3E+00	1.3E+01
7440-48-4	Cobalt	2.0E+00	2.0E+01	2.0E+00	2.0E+01	2.0E+00	2.0E+01	2.0E+00	2.0E+01

TABLE T-3.5
SUMMARY OF REFERENCE TOXICITY VALUES (mg/kd-d) FOR AQUATIC WILDLIFE RECEPTORS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

		Small Bird		Large Bird		Small Mammal		Large Mammal	
CAS #	Chemical Name	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
7440-50-8	Copper	4.7E+01	6.2E+01	4.7E+01	6.2E+01	1.5E+01	1.5E+02	1.2E+01	1.5E+01
57-12-7	Cyanide, Free	1.1E+00	1.1E+01	1.1E+00	1.1E+01	1.1E+01	3.0E+01	1.1E+01	3.0E+01
7439-92-1	Lead	1.1E+00	1.1E+01	3.9E+00	3.9E+01	8.0E+00	8.0E+01	3.0E-01	3.0E+00
7439-93-2	Lithium	9.4E+00	1.9E+01	9.4E+00	1.9E+01	9.4E+00	1.9E+01	9.4E+00	1.9E+01
7439-96-5	Manganese	9.8E+02	9.8E+03	9.8E+02	9.8E+03	8.8E+01	2.8E+02	8.8E+01	2.8E+02
7439-97-6	Mercury	4.5E-01	9.0E-01	4.5E-01	9.0E-01	1.3E+01	1.3E+02	1.0E+00	1.0E+01
22967-92-6	Methyl mercury	6.4E-03	6.4E-02	6.4E-03	6.4E-02	3.2E-02	1.6E-01	1.5E-02	2.5E-02
7440-02-0	Nickel	7.7E+01	1.1E+02	7.7E+01	1.1E+02	4.0E+01	8.0E+01	4.0E+01	8.0E+01
7782-49-2	Selenium	5.0E-01	1.0E+00	4.4E-01	1.5E+00	2.0E-01	3.3E-01	2.0E-01	3.3E-01
7440-22-4	Silver	1.8E+01	1.8E+02	1.8E+01	1.8E+02	1.8E+01	1.8E+02	1.8E+01	1.8E+02
7440-28-0	Thallium	6.1E-01	6.1E+00	6.1E-01	6.1E+00	2.3E-01	2.3E+00	2.3E-01	2.3E+00
7440-29-1	Thorium	3.0E+03	3.0E+04	3.0E+03	3.0E+04	3.0E+03	3.0E+04	3.0E+03	3.0E+04
57-12-5	Total Cyanide	1.1E+00	1.1E+01	1.1E+00	1.1E+01	6.9E+01	6.9E+02	6.9E+01	6.9E+02
7440-62-2	Vanadium	1.1E+01	1.1E+02	1.1E+00	1.1E+01	2.1E-01	2.1E+00	2.1E-01	2.1E+00
7440-66-6	Zinc	1.5E+01	1.3E+02	1.5E+01	1.3E+02	1.6E+02	3.2E+02	3.0E+02	3.0E+03
7440-67-7	Zirconium	1.7E+00	1.7E+01	1.7E+00	1.7E+01	1.7E+00	1.7E+01	1.7E+00	1.7E+01
1314-23-4	Zirconium dioxide	1.7E+00	1.7E+01	1.7E+00	1.7E+01	1.7E+00	1.7E+01	1.7E+00	1.7E+01

TABLE T-3.6
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - NON-PREDACEOUS AQUATIC BIRDS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
1,1,2,2-Tetrachloroethane	3.2E-01	3.2E+00	sc	food	rat	irreversible testicular damage	intermediate	tbd	ATSDR, 1988	LOAEL	3.2	3.2	27 w	7	10	1	1	
1,1-Dichloroethene	3.0E+01	3.0E+02	c	water	rat	mortality, body weight, liver histology	high	tbd	Sample et al., 1996	NOAEL	30			7	1	1	1	
1,2,3-Trichlorobenzene	1.5E+01	1.5E+02		food	rat	mortality	high	tbd	Neuhauser et al., 1985	LD_{50}	766			7	50	1	1	Value for 1,2,4-trichlorobenzene used as a surrogate.
1,2,4-Trichlorobenzene	1.5E+01	1.5E+02		food	rat	mortality	high	tbd	Neuhauser et al., 1985	LD_{50}	766			7	50	1	1	
1,2-Dichlorobenzene	4.3E+02	4.3E+03	c	gavage (oil)	rat	reproductive	high	tbd	ATSDR, 1997	NOAEL	600		2 y	5	1	1	1	Value for 1,4-dichlorobenzene use as a surrogate.
1,3-Dichlorobenzene	4.3E+02	4.3E+03	c	gavage (oil)	rat	reproductive	high	tbd	ATSDR, 1997	NOAEL	600		2 y	5	1	1	1	
1,4-Dichlorobenzene	4.3E+02	4.3E+03	c	gavage (oil)	rat	reproductive	high	tbd	ATSDR, 1997	NOAEL	600		2 y	5	1	1	1	
2,4,6-Tribromophenol	8.0E+00	8.0E+01		food	rat	mortality	high	tbd	MSDS. 2001	LD_{50}	402			7	50	1	1	
Acetone	1.0E+01	5.0E+01	sc	oral intubation	rat	liver/kidney damage	intermediate	tbd	Sample et al., 1996	NOAEL	100	500	90 d	7	1	10	1	
Benzene	2.6E+01	2.6E+02	c	gavage	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	263.6	263.6	days 6 -12 (gestation)	7	10	1	1	
Carbon disulfide	1.1E+01	1.1E+02	sc	Inhalation	rabbit	fetotoxicity/malformations	high	tbd	IRIS, 1991	NOAEL	11.0		34 w	7	1	1	1	Converted inhalation dose
Chlorobenzene	8.9E+00	8.9E+01	sc	food	mouse	increase liver weight; hepatic necrosis	intermediate	tbd	USEPA, 1984	LOAEL	89.3	89.3	13 w	7	10	1	1	
Chloroform	1.5E+01	4.1E+01	sc	oral intubation	rat	gonal atrophy	intermediate	tbd	Sample et al., 1996	NOAEL	150	410	13 w	7	1	10	1	
Methyl ethyl ketone	1.8E+03	4.6E+03	c	water	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	1771	4571	2 g	7	1	1	1	
Methylene chloride	5.9E+00	5.0E+01	c	food	rat	liver toxicity	intermediate	tbd	Sample et al., 1996	NOAEL	5.85	50	2 y	7	1	1	1	
m-Xylene/p-Xylene	4.0E+01	4.0E+02	a	oral	Japanese quail	mortality	high	tbd	Hill and Camardese, 1986	LD_{50}	2014		5 d	7	50	1	1	Value for total xylenes use as a surrogate.
Ortho Xylene	4.0E+01	4.0E+02	a	oral	Japanese quail	mortality	high	tbd	Hill and Camardese, 1986	LD_{50}	2014		5 d	7	50	1	1	Value for total xylenes use as a surrogate.
Tetrachloroethylene	1.0E+01	1.0E+02	sc	food	mouse	hepatotoxicity	intermediate	tbd	Buben and O'Flaherty, 1985	NOAEL	10	100	6 w	7	1	1	1	
Toluene	2.6E+01	2.6E+02	c	gavage	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	259.8	259.8	days 6 -12 (gestation)	7	10	1	1	
Total Xylenes	4.0E+01	4.0E+02	a	oral	Japanese quail	mortality	high	tbd	Hill and Camardese, 1986	LD_{50}	2014		5 d	7	50	1	1	LD50 value (20000 mg/kg) converted to a dose assuming a quail ingestion rate of 0.014 and body weight of 0.139.
Trichloroethene	7.1E-01	7.1E+00	sc	oral gavage	mouse	hepatoxicity	intermediate	tbd	Sample et al., 1996	LOAEL	100	100	6 w	5	10	10	1	
1,1'-Biphenyl	5.0E+01	5.0E+02		food	rat	kidney damage, reduced hemoglobin levels, decreased food intake	intermediate	tbd	IRIA, 2001	NOAEL	50			7	1	1	1	
2-Methylnaphthalene	3.6E+00	3.6E+01	sc	food	rat	decreased body weight gain	intermediate	tbd	USEPA, 1990	LOAEL	35.7	35.7	13 w	7	10	1	1	Value for naphthalene used as a surrogate.
4-Chloro-3-methylphenol	7.2E-02	7.2E-01		food	rat			tbd	Physical and Theoretical Chemistry Lab	LD_{50}	3.6			7	50	1	1	
4-Chloroaniline	1.3E+00	1.3E+01	c	food	rat	fibrosis of the splenic capsule	low	tbd	IRIS, 1993	LOAEL	12.5	12.5	102 w	7	10	1	1	

TABLE T-3.6
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - NON-PREDACEOUS AQUATIC BIRDS

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STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
4-Methylphenol	5.0E+01	5.0E+02	sc	food	rat	loss of body weight; neurotoxicity	intermediate	tbd	USEPA, 1991	NOAEL	50		90 d	7	1	1	1	
Acenaphthene	1.8E+02	3.5E+02	sc	food	mouse	liver weight increase	low	tbd	IRIS, 1990	NOAEL	175	350	90 d	7	1	1	1	
Acenaphthylene	6.0E+01	6.0E+02	sc	food	rat	physiological changes	low	tbd	USEPA, 1984	LOAEL	600		40 d	7	10	1	1	
Acetophenone	4.2E+02	4.2E+03	sc	food	rat	growth, tissue, hematological	intermediate	tbd	IRIS, 2001	NOAEL	423		17 w	7	1	1	1	
Anthracene	1.0E+03	1.0E+04	sc	food	mouse	clinical and pathological effects	low	tbd	IRIS, 1990	NOAEL	1000		90 d	7	1	1	1	
Benzaldehyde	1.4E+02	4.0E+02	sc	food	mouse	forestomach lesions and kidney toxicity	intermediate	tbd	IRIS, 2001	NOAEL	143	400	13 w	7	1	1	1	
Benzo[a]anthracene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Benzo[a]pyrene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	
Benzo[b]fluoranthene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Benzo[ghi]perylene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Benzo[k]fluoranthene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Bis(2-Ethylhexyl)phthalate	1.1E+00	1.1E+01	c	food	ringed dove	reproductive	high	tbd	Sample et al., 1996	NOAEL	1.1		4 w	7	1	1	1	
Carbazole	1.0E+01	1.0E+02		food	rat	mortality	high	tbd	USEPA, 1986	LD_{50}	500			7	50	1	1	
Chrysene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Dibenz[a,h]anthracene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Dibenzofuran	1.3E+01	1.3E+02	sc	food	rodents	mortality	high	tbd	ATSDR, 1991	LC_{10}	125		13 w	7	10	1	1	
Dimethylphthalate	4.6E+03	4.6E+04	c	food	mouse	reproduction	high	tbd	Sample et al., 1996	NOAEL	4583		105 d	7	1	1	1	Value for diethylphthalate used as s surrogate.
Di-n-butylphthalate	1.1E-01	1.1E+00	c	food	ringed dove	egg shell thickness	high	tbd	Sample et al., 1996	LOAEL	1.11	1.11	4 w	7	10	1	1	
Di-n-octylphthalate	1.1E-01	1.1E+00	c	food	ringed dove	egg shell thickness	high	tbd	Sample et al., 1996	LOAEL	1.11	1.11	4 w	7	10	1	1	Value for di-n-butylphthalate used as a surrogate.
Fluoranthene	4.0E+01	4.0E+02	a	food	rodents	mortality	high	tbd	Eisler, 1987	LD_{50}	2000			7	50	1	1	
Fluorene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Indeno[1,2,3-cd]pyrene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Naphthalene	3.6E+00	3.6E+01	sc	food	rat	decreased body weight gain	intermediate	tbd	USEPA, 1990	LOAEL	35.7	35.7	13 w	7	10	1	1	
Phenanthrene	1.4E+01	1.4E+02	a	food	rodents	mortality	high	tbd	Eisler, 1987	LD_{50}	700			7	50	1	1	
Pyrene	1.6E+01	1.6E+02	a	food	rodents	mortality	high	tbd	NIOSH, 1985	LD_{50}	800			7	50	1	1	
4,4`-DDD	1.4E-02	1.4E-01	c	food	black duck	reduced eggshell thickness	high	tbd	Longcore and Stendell, 1977	LOAEL	0.14	0.14	2 y	7	10	1	1	Value for 4,4'-DDT used as a surrogate.
4,4`-DDE	1.4E-02	1.4E-01	c	food	black duck	reduced eggshell thickness	high	tbd	Longcore and Stendell, 1977	LOAEL	0.14	0.14	2 y	7	10	1	1	Value for 4,4'-DDT used as a surrogate.

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STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
4,4`-DDT	1.4E-02	1.4E-01	c	food	black duck	reduced eggshell thickness	high	tbd	Longcore and Stendell, 1977	LOAEL	0.14	0.14	2 y	7	10	1	1	
Aldrin	2.0E-01	1.0E+00	c	food	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	0.2	1	3 g	7	1	1	1	
alpha-BHC	5.6E-01	2.3E+00	c	food	Japanese quail	reduced egg hatchability, egg volume	high	tbd	Sample et al., 1996	NOAEL	0.563	2.25	90 d	7	1	1	1	Based on BHC mixed isomers
alpha-Chlordane	3.1E-02	3.1E-01	sc	food	chicken	egg hatchability	high	tbd	Eisler, 1990	NOAEL	0.031		4 w	7	1	1	1	
Aroclor-1232	1.8E-01	1.8E+00	sc	food (capsule)	pheasant	reduced egg hatchability	high	tbd	Sample et al., 1996	LOAEL	1.8	1.8	17 w	7	10	1	1	Value for Aroclor 1254 used as a surrogate.
Aroclor-1242	1.8E-01	1.8E+00	sc	food (capsule)	pheasant	reduced egg hatchability	high	tbd	Sample et al., 1996	LOAEL	1.8	1.8	17 w	7	10	1	1	Value for Aroclor 1254 used as a surrogate.
Aroclor-1248	1.8E-01	1.8E+00	sc	food (capsule)	pheasant	reduced egg hatchability	high	tbd	Sample et al., 1996	LOAEL	1.8	1.8	17 w	7	10	1	1	Value for Aroclor 1254 used as a surrogate.
Aroclor-1254	1.8E-01	1.8E+00	sc	food (capsule)	pheasant	reduced egg hatchability	high	tbd	Sample et al., 1996	LOAEL	1.8	1.8	17 w	7	10	1	1	
Aroclor-1260	9.0E-02	9.0E-01	c	food	chicken	embryonic mortality	high	tbd	USEPA, 1976	LOAEL	0.9	0.9		7	10	1	1	
beta-BHC	5.6E-01	2.3E+00	c	food	Japanese quail	reduced egg hatchability, egg volume	high	tbd	Sample et al., 1996	NOAEL	0.563	2.25	90 d	7	1	1	1	Based on BHC mixed isomers
delta-BHC	5.6E-01	2.3E+00	c	food	Japanese quail	reduced egg hatchability, egg volume	high	tbd	Sample et al., 1996	NOAEL	0.563	2.25	90 d	7	1	1	1	Based on BHC mixed isomers
Dieldrin	6.0E-02	6.0E-01	a	food	bobwhite	mortality	high	tbd	Hill et al., 1975	LD_{50}	3		5 d	7	50	1	1	
Endosulfan I	6.2E-01	3.1E+01	a	food	mallard	mortality	high	tbd	USFWS, 1984	LD_{50}	31.2	31.2		7	50	1	1	Value for endosulfan used as a surrogate.
Endosulfan II	6.2E-01	3.1E+01	a	food	mallard	mortality	high	tbd	USFWS, 1984	LD_{50}	31.2	31.2		7	50	1	1	Value for endosulfan used as a surrogate.
Endosulfan sulfate	6.2E-01	3.1E+01	a	food	mallard	mortality	high	tbd	USFWS, 1984	LD_{50}	31.2	31.2		7	50	1	1	Value for endosulfan used as a surrogate.
Endrin	3.0E-01	3.0E+00	c	food	mallard	reproduction	high	tbd	Sample et al., 1996	NOAEL	0.3			7	1	1	1	
Endrin aldehyde	3.0E-01	3.0E+00	c	food	mallard	reproduction	high	tbd	Sample et al., 1996	NOAEL	0.3			7	1	1	1	Value for endrin used as a surrogate.
Endrin ketone	3.0E-01	3.0E+00	c	food	mallard	reproduction	high	tbd	Sample et al., 1996	NOAEL	0.3			7	1	1	1	Value for endrin used as a surrogate.
Gamma-BHC/Lindane	2.0E+00	2.0E+01	c	oral intubation	mallard	egg shell thickness, egg production	high	tbd	Sample et al., 1996	LOAEL	20	20	8 w	7	10	1	1	
Gamma-Chlordane	3.1E-02	3.1E-01	sc	food	chicken	egg hatchability	high	tbd	Eisler, 1990	NOAEL	0.031		4 w	7	1	1	1	
Heptachlor	1.2E+00	1.2E+01	a	food	chicken	mortality	high	tbd	Sax, 1984	LD_{50}	62			7	50	1	1	
Heptachlor epoxide	1.2E+00	1.2E+01	a	food	chicken	mortality	high	tbd	Sax, 1984	LD_{50}	62			7	50	1	1	Value for heptachlor used as a surrogate.
Methoxychlor	1.0E+00	1.0E+01	c	food	rat	growth retardation	intermediate	tbd	USEPA, 1985	LOAEL	10	10	2 y	7	10	1	1	
cis-Nonachlor	3.1E-02	3.1E-01	sc	food	chicken	egg hatchability	high	tbd	Eisler, 1990	NOAEL	0.031		4 w	7	1	1	1	Value for gamma-chlordane used as a surrogate
trans-Nonachlor	3.1E-02	3.1E-01	sc	food	chicken	egg hatchability	high	tbd	Eisler, 1990	NOAEL	0.031		4 w	7	1	1	1	Value for gamma-chlordane used as a surrogate
Aluminum	1.1E+02	1.1E+03	c	food	ringed dove	reproduction	high	tbd	Sample et al., 1996	NOAEL	109.7		4 m	7	1	1	1	
Ammonia	9.4E+01	9.4E+02	c	food	rat	bone loss, reduced body weight	intermediate	tbd	ATSDR, 1989	LOAEL	936	936	330 d	7	10	1	1	
Antimony	1.3E-01	1.3E+00	c	water	mouse	lifespan and longevity	intermediate	tbd	Sample et al., 1996	LOAEL	1.25	1.25	1 g	7	10	1	1	
Arsenic	5.1E+00	1.3E+01	sc	food	mallard	mortality	high	tbd	Sample et al., 1996	NOAEL	5.135	12.8375	128 d	7	1	1	1	
Barium	2.1E+01	4.2E+01	sc	food	chicken	mortality	high	tbd	Sample et al., 1996	NOAEL	208.26	416.53	4 w	7	1	10	1	

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Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
Beryllium	6.6E-01	6.6E+00	c	water	rat	longevity and weight loss	intermediate	tbd	Sample et al., 1996	NOAEL	0.66		1 g	7	1	1	1	
Boron	2.9E+01	1.0E+02	c	food	mallard	reduced egg fertility and duckling growth; increased embryo and duckling mortality	high	tbd	Sample et al., 1996	NOAEL	28.8	100	3 w prior/post rep	7	1	1	1	
Cadmium	1.5E+00	2.0E+01	c	food	mallard	egg production	high	tbd	Sample et al., 1996	NOAEL	1.45	20.03	90 d	7	1	1	1	
Chromium	1.0E+00	5.0E+00	c	food	black duck	duckling survival	high	tbd	Sample et al., 1996	NOAEL	1	5	10 m	7	1	1	1	Value for trivalent chromium.
Chromium (VI)	1.0E+00	5.0E+00	c	food	black duck	duckling survival	intermediate	tbd	Sample et al., 1996	NOAEL	1	5	1 y	7	1	1	1	Value for trivalent chromium.
Cobalt	2.0E+00	2.0E+01	sc	food	rat	testicular atrophy	intermediate	tbd	ATSDR, 1990	LOAEL	20	20	69 d	7	10	1	1	
Copper	4.7E+01	6.2E+01	c	food	chicken	growth and mortality	high	tbd	Sample et al., 1996	NOAEL	46.97	61.72	10 w	7	1	1	1	
Cyanide, Free	1.1E+00	1.1E+01	sc	food	chicken	decreased growth and food intake	intermediate	tbd	Elzubier and Davis, 1988	LOAEL	11	11	20 d	7	10	1	1	
Lead	1.1E+00	1.1E+01	c	food	Japanese quail	egg hatchability	high	tbd	Sample et al., 1996	NOAEL	1.13	11.3	12 w	7	1	1	1	
Lithium	9.4E+00	1.9E+01	c	food	rat	number of offspring, offspring weights	high	tbd	Sample et al., 1996	NOAEL	9.4	18.8	days 6-15 (gestation)	7	1	1	1	
Manganese	9.8E+02	9.8E+03	c	food	Japanese quail	growth and aggressive behavior	intermediate	tbd	Sample et al., 1996	NOAEL	977		75 d	7	1	1	1	
Mercury	4.5E-01	9.0E-01	c	food	Japanese quail	egg fertility, hatchability	high	tbd	Sample et al., 1996	NOAEL	0.45	0.9		7	1	1	1	Mercuric chloride
Methyl mercury	6.4E-03	6.4E-02	c	food	mallard	egg production, number of offspring	high	tbd	Sample et al., 1996	LOAEL	0.064	0.064	3 generations	7	10	1	1	Methyl mercury dicyandiamide
Nickel	7.7E+01	1.1E+02	c	food	mallard	mortality, growth, and behavior	high	tbd	Sample et al., 1996	NOAEL	77.4	107	90 d	7	1	1	1	
Selenium	5.0E-01	1.0E+00	c	food	mallard	duckling survival	high	tbd	Sample et al., 1996	NOAEL	0.5	1	78 d	7	1	1	1	
Silver	1.8E+01	1.8E+02	sc	food	rat	mortality	high	tbd	ATSDR, 1990	LOAEL	181	181	2 w	7	10	1	1	
Thallium	6.1E-01	6.1E+00		food	heron	egg hatchability	high	tbd	Smith et al., 1968	NOAEL	0.61			7	1	1	1	
Thorium	3.0E+03	3.0E+04	sc	food	rat	reproductive effects	high	tbd	ATSDR, 1989	NOAEL	3045		4 m	7	1	1	1	
Total Cyanide	1.1E+00	1.1E+01	sc	food	chicken	decreased growth and food intake	intermediate	tbd	Elzubier and Davis, 1988	LOAEL	11	11	20 d	7	10	1	1	
Vanadium	1.1E+01	1.1E+02	c	food	mallard	mortality, body weight, and blood chemistry	high	tbd	Sample et al., 1996	NOAEL	11.4		12 w	7	1	1	1	
Zinc	1.5E+01	1.3E+02	c	food	white longhorn hen	egg hatchability	high	tbd	Sample et al., 1996	NOAEL	14.5	131	44 w	7	1	1	1	
Zirconium	1.7E+00	1.7E+01	c	water	mouse	lifespan and longevity	intermediate	tbd	Sample et al., 1996	NOAEL	1.74		1 g	7	1	1	1	Value for zirconium sulfate used.
Zirconium dioxide	1.7E+00	1.7E+01	c	water	mouse	lifespan and longevity	intermediate	tbd	Sample et al., 1996	NOAEL	1.74		1 g	7	1	1	1	Value for zirconium sulfate used.
Total PCB Equivalent birds (½)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	
Total PCB Equivalent birds (0)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	
2,3,7,8-TCDD Equivalent birds (½)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	

TABLE T-3.6
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - NON-PREDACEOUS AQUATIC BIRDS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
2,3,7,8-TCDD Equivalent birds (0)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	
Total Dioxin Equivalent birds (½)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	
Total Dioxin Equivalent birds (0)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	

Notes:
a. Units in mg/kg-d.
b. Study types include acute, subchronic, and chronic duration studies.
c. Qualitative scoring of effect studied relative to the selected assessment endoints.
d. Degree of confidence associated with the selected study.
e. Exposure duration include (d) - days, (w) - weeks, (y) - year, (g) - generation.
f. Study results adjusted by extrapolation, uncertainty, and modifying factors.

TABLE T-3.7
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS BIRDS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
1,1,2,2-Tetrachloroethane	3.2E-01	3.2E+00	sc	food	rat	irreversible testicular damage	intermediate	tbd	ATSDR, 1988	LOAEL	3.2	3.2	27 w	7	10	1	1	
1,1-Dichloroethene	3.0E+01	3.0E+02	c	water	rat	mortality, body weight, liver histology	high	tbd	Sample et al., 1996	NOAEL	30			7	1	1	1	
1,2,3-Trichlorobenzene	1.5E+01	1.5E+02		food	rat	mortality	high	tbd	Neuhauser et al., 1985	LD_{50}	766			7	50	1	1	Value for 1,2,4-trichlorobenzene used as a surrogate.
1,2,4-Trichlorobenzene	1.5E+01	1.5E+02		food	rat	mortality	high	tbd	Neuhauser et al., 1985	LD_{50}	766			7	50	1	1	
1,2-Dichlorobenzene	4.3E+02	4.3E+03	c	gavage (oil)	rat	reproductive	high	tbd	ATSDR, 1997	NOAEL	600		2 y	5	1	1	1	Value for 1,4-dichlorobenzene use as a surrogate.
1,3-Dichlorobenzene	4.3E+02	4.3E+03	c	gavage (oil)	rat	reproductive	high	tbd	ATSDR, 1997	NOAEL	600		2 y	5	1	1	1	
1,4-Dichlorobenzene	4.3E+02	4.3E+03	c	gavage (oil)	rat	reproductive	high	tbd	ATSDR, 1997	NOAEL	600		2 y	5	1	1	1	
2,4,6-Tribromophenol	8.0E+00	8.0E+01		food	rat	mortality	high	tbd	MSDS. 2001	LD_{50}	402			7	50	1	1	
Acetone	1.0E+01	5.0E+01	sc	oral intubation	rat	liver/kidney damage	intermediate	tbd	Sample et al., 1996	NOAEL	100	500	90 d	7	1	10	1	
Benzene	2.6E+01	2.6E+02	c	gavage	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	263.6	263.6	days 6 -12 (gestation)	7	10	1	1	
Carbon disulfide	1.1E+01	1.1E+02	sc	Inhalation	rabbit	fetotoxicity/malformations	high	tbd	IRIS, 1991	NOAEL	11.0		34 w	7	1	1	1	Converted inhalation dose
Chlorobenzene	8.9E+00	8.9E+01	sc	food	mouse	increase liver weight; hepatic necrosis	intermediate	tbd	USEPA, 1984	LOAEL	89.3	89.3	13 w	7	10	1	1	
Chloroform	1.5E+01	4.1E+01	sc	oral intubation	rat	gonal atrophy	intermediate	tbd	Sample et al., 1996	NOAEL	150	410	13 w	7	1	10	1	
Methyl ethyl ketone	1.8E+03	4.6E+03	c	water	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	1771	4571	2 g	7	1	1	1	
Methylene chloride	5.9E+00	5.0E+01	c	food	rat	liver toxicity	intermediate	tbd	Sample et al., 1996	NOAEL	5.85	50	2 y	7	1	1	1	
m-Xylene/p-Xylene	4.0E+01	4.0E+02	a	oral	Japanese quail	mortality	high	tbd	Hill and Camardese, 1986	LD_{50}	2014		5 d	7	50	1	1	Value for total xylenes use as a surrogate.
Ortho Xylene	4.0E+01	4.0E+02	a	oral	Japanese quail	mortality	high	tbd	Hill and Camardese, 1986	LD_{50}	2014		5 d	7	50	1	1	Value for total xylenes use as a surrogate.
Tetrachloroethylene	1.0E+01	1.0E+02	sc	food	mouse	hepatotoxicity	intermediate	tbd	Buben and O'Flaherty, 1985	NOAEL	10	100	6 w	7	1	1	1	
Toluene	2.6E+01	2.6E+02	c	gavage	mouse	reproductive	high	tbd	Sample et al., 1996	NOAEL	259.8	259.8	days 6 -12 (gestation)	7	10	1	1	
Total Xylenes	4.0E+01	4.0E+02	a	oral	Japanese quail	mortality	high	tbd	Hill and Camardese, 1986	LD_{50}	2014		5 d	7	50	1	1	LD50 value (20000 mg/kg) converted to a dose assuming a quail ingestion rate of 0.014 and body weight of 0.139.
Trichloroethene	7.1E-01	7.1E+00	sc	oral gavage	mouse	hepatoxicity	intermediate	tbd	Sample et al., 1996	LOAEL	100	100	6 w	5	10	10	1	
1,1'-Biphenyl	5.0E+01	5.0E+02		food	rat	kidney damage, reduced hemoglobin levels, decreased food intake	intermediate	tbd	IRIA, 2001	NOAEL	50			7	1	1	1	
2-Methylnaphthalene	3.6E+00	3.6E+01	sc	food	rat	decreased body weight gain	intermediate	tbd	USEPA, 1990	LOAEL	35.7	35.7	13 w	7	10	1	1	Value for naphthalene used as a surrogate.
4-Chloro-3-methylphenol	7.2E-02	7.2E-01		food	rat			tbd	Physical and Theoretical Chemistry Lab	LD_{50}	3.6			7	50	1	1	
4-Chloroaniline	1.3E+00	1.3E+01	c	food	rat	fibrosis of the splenic capsule	low	tbd	IRIS, 1993	LOAEL	12.5	12.5	102 w	7	10	1	1	

TABLE T-3.7
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS BIRDS

REMEDIAL INVESTIGATION REPORT
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STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
4-Methylphenol	5.0E+01	5.0E+02	sc	food	rat	loss of body weight; neurotoxicity	intermediate	tbd	USEPA, 1991	NOAEL	50		90 d	7	1	1	1	
Acenaphthene	1.8E+02	3.5E+02	sc	food	mouse	liver weight increase	low	tbd	IRIS, 1990	NOAEL	175	350	90 d	7	1	1	1	
Acenaphthylene	6.0E+01	6.0E+02	sc	food	rat	physiological changes	low	tbd	USEPA, 1984	LOAEL	600		40 d	7	10	1	1	
Acetophenone	4.2E+02	4.2E+03	sc	food	rat	growth, tissue, hematological	intermediate	tbd	IRIS, 2001	NOAEL	423		17 w	7	1	1	1	
Anthracene	1.0E+03	1.0E+04	sc	food	mouse	clinical and pathological effects	low	tbd	IRIS, 1990	NOAEL	1000		90 d	7	1	1	1	
Benzaldehyde	1.4E+02	4.0E+02	sc	food	mouse	forestomach lesions and kidney toxicity	intermediate	tbd	IRIS, 2001	NOAEL	143	400	13 w	7	1	1	1	
Benzo[a]anthracene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Benzo[a]pyrene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	
Benzo[b]fluoranthene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Benzo[ghi]perylene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Benzo[k]fluoranthene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Bis(2-Ethylhexyl)phthalate	1.1E+00	1.1E+01	c	food	ringed dove	reproductive	high	tbd	Sample et al., 1996	NOAEL	1.1		4 w	7	1	1	1	
Carbazole	1.0E+01	1.0E+02		food	rat	mortality	high	tbd	USEPA, 1986	LD_{50}	500			7	50	1	1	
Chrysene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Dibenz[a,h]anthracene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Dibenzofuran	1.3E+01	1.3E+02	sc	food	rodents	mortality	high	tbd	ATSDR, 1991	LC_{10}	125		13 w	7	10	1	1	
Dimethylphthalate	4.6E+03	4.6E+04	c	food	mouse	reproduction	high	tbd	Sample et al., 1996	NOAEL	4583		105 d	7	1	1	1	Value for diethylphthalate used as s surrogate.
Di-n-butylphthalate	1.1E-01	1.1E+00	c	food	ringed dove	egg shell thickness	high	tbd	Sample et al., 1996	LOAEL	1.11	1.11	4 w	7	10	1	1	
Di-n-octylphthalate	1.1E-01	1.1E+00	c	food	ringed dove	egg shell thickness	high	tbd	Sample et al., 1996	LOAEL	1.11	1.11	4 w	7	10	1	1	Value for di-n-butylphthalate used as a surrogate.
Fluoranthene	4.0E+01	4.0E+02	a	food	rodents	mortality	high	tbd	Eisler, 1987	LD_{50}	2000			7	50	1	1	
Fluorene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Indeno[1,2,3-cd]pyrene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Naphthalene	3.6E+00	3.6E+01	sc	food	rat	decreased body weight gain	intermediate	tbd	USEPA, 1990	LOAEL	35.7	35.7	13 w	7	10	1	1	
Phenanthrene	1.4E+01	1.4E+02	a	food	rodents	mortality	high	tbd	Eisler, 1987	LD_{50}	700			7	50	1	1	
Pyrene	1.6E+01	1.6E+02	a	food	rodents	mortality	high	tbd	NIOSH, 1985	LD_{50}	800			7	50	1	1	
4,4`-DDD	1.4E-02	1.4E-01	c	food	barn owl	reduced eggshell thickness	high	tbd	Longcore and Stendell, 1977	LOAEL	0.14	0.14	2 y	7	10	1	1	Value for 4,4'-DDT used as a surrogate.
4,4`-DDE	1.4E-02	1.4E-01	c	food	barn owl	reduced eggshell thickness	high	tbd	Longcore and Stendell, 1977	LOAEL	0.14	0.14	2 y	7	10	1	1	Value for 4,4'-DDT used as a surrogate.

TABLE T-3.7
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS BIRDS

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Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
4,4`-DDT	1.4E-02	1.4E-01	c	food	barn owl	reduced eggshell thickness	high	tbd	Longcore and Stendell, 1977	LOAEL	0.14	0.14	2 y	7	10	1	1	
Aldrin	2.0E-01	1.0E+00	c	food	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	0.2	1	3 g	7	1	1	1	
alpha-BHC	5.6E-01	2.3E+00	c	food	Japanese quail	reduced egg hatchability, egg volume	high	tbd	Sample et al., 1996	NOAEL	0.563	2.25	90 d	7	1	1	1	Based on BHC mixed isomers
alpha-Chlordane	3.1E-02	3.1E-01	sc	food	chicken	egg hatchability	high	tbd	Eisler, 1990	NOAEL	0.031		4 w	7	1	1	1	
Aroclor-1232	4.1E-01	4.1E+00	c	food	screech owl	fertility, hatchling success	high	tbd	Sample et al., 1996	NOAEL	0.41		2 g	7	1	1	1	Value for Aroclor 1242 used as a surrogate.
Aroclor-1242	4.1E-01	4.1E+00	c	food	screech owl	fertility, hatchling success	high	tbd	Sample et al., 1996	NOAEL	0.41		2 g	7	1	1	1	
Aroclor-1248	4.1E-01	4.1E+00	c	food	screech owl	fertility, hatchling success	high	tbd	Sample et al., 1996	NOAEL	0.41		2 g	7	1	1	1	Value for Aroclor 1242 used as a surrogate.
Aroclor-1254	9.0E-01	9.0E+00	sc	food	kestrel	reduced sperm concentration	intermediate	tbd	Eisler, 1986	LOAEL	9	9	69 d	7	10	1	1	
Aroclor-1260	9.0E-02	9.0E-01	c	food	chicken	embryonic mortality	high	tbd	USEPA, 1976	LOAEL	0.9	0.9		7	10	1	1	
beta-BHC	5.6E-01	2.3E+00	c	food	Japanese quail	reduced egg hatchability, egg volume	high	tbd	Sample et al., 1996	NOAEL	0.563	2.25	90 d	7	1	1	1	Based on BHC mixed isomers
delta-BHC	5.6E-01	2.3E+00	c	food	Japanese quail	reduced egg hatchability, egg volume	high	tbd	Sample et al., 1996	NOAEL	0.563	2.25	90 d	7	1	1	1	Based on BHC mixed isomers
Dieldrin	7.7E-02	7.7E-01	c	food	barn owl	eggshell thickness, egg production	high	tbd	Sample et al., 1996	NOAEL	0.077		2 y	7	1	1	1	
Endosulfan I	1.0E+01	1.0E+02	c	food	gray partridge	reproduction	high	tbd	Sample et al., 1996	NOAEL	10		4 w	7	1	1	1	Value for endosulfan used as a surrogate.
Endosulfan II	1.0E+01	1.0E+02	c	food	gray partridge	reproduction	high	tbd	Sample et al., 1996	NOAEL	10		4 w	7	1	1	1	Value for endosulfan used as a surrogate.
Endosulfan sulfate	1.0E+01	1.0E+02	c	food	gray partridge	reproduction	high	tbd	Sample et al., 1996	NOAEL	10		4 w	7	1	1	1	Value for endosulfan used as a surrogate.
Endrin	1.0E-02	1.0E-01	c	food	screech owl	egg production, hatchling success	high	tbd	Sample et al., 1996	LOAEL	0.1035	0.1035	83 d	7	10	1	1	
Endrin aldehyde	1.0E-02	1.0E-01	c	food	screech owl	egg production, hatchling success	high	tbd	Sample et al., 1996	LOAEL	0.1035	0.1035	83 d	7	10	1	1	Value for endrin used as a surrogate.
Endrin ketone	1.0E-02	1.0E-01	c	food	screech owl	egg production, hatchling success	high	tbd	Sample et al., 1996	LOAEL	0.1035	0.1035	83 d	7	10	1	1	Value for endrin used as a surrogate.
Gamma-BHC/Lindane	5.6E-01	2.3E+00	c	food	Japanese quail	reduced egg hatchability, egg volume	high	tbd	Sample et al., 1996	NOAEL	0.563	2.25	90 d	7	1	1	1	Based on BHC mixed isomers
Gamma-Chlordane	3.1E-02	3.1E-01	sc	food	chicken	egg hatchability	high	tbd	Eisler, 1990	NOAEL	0.031		4 w	7	1	1	1	
Heptachlor	1.2E+00	1.2E+01	a	food	chicken	mortality	high	tbd	Sax, 1984	LD_{50}	62			7	50	1	1	
Heptachlor epoxide	1.2E+00	1.2E+01	a	food	chicken	mortality	high	tbd	Sax, 1984	LD_{50}	62			7	50	1	1	Value for heptachlor used as a surrogate.
Methoxychlor	1.0E+00	1.0E+01	c	food	rat	growth retardation	intermediate	tbd	USEPA, 1985	LOAEL	10	10	2 y	7	10	1	1	
cis-Nonachlor	3.1E-02	3.1E-01	sc	food	chicken	egg hatchability	high	tbd	Eisler, 1990	NOAEL	0.031		4 w	7	1	1	1	Value for gamma-chlordane used as a surrogate
trans-Nonachlor	3.1E-02	3.1E-01	sc	food	chicken	egg hatchability	high	tbd	Eisler, 1990	NOAEL	0.031		4 w	7	1	1	1	Value for gamma-chlordane used as a surrogate
Aluminum	1.1E+02	1.1E+03	c	food	ringed dove	reproduction	high	tbd	Sample et al., 1996	NOAEL	109.7		4 m	7	1	1	1	
Ammonia	9.4E+01	9.4E+02	c	food	rat	bone loss, reduced body weight	intermediate	tbd	ATSDR, 1989	LOAEL	936	936	330 d	7	10	1	1	

TABLE T-3.7
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS BIRDS

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Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
Antimony	1.3E-01	1.3E+00	c	water	mouse	lifespan and longevity	intermediate	tbd	Sample et al., 1996	LOAEL	1.25	1.25	1 g	7	10	1	1	
Arsenic	5.1E+00	1.3E+01	sc	food	mallard	mortality	high	tbd	Sample et al., 1996	NOAEL	5.135	12.8375	128 d	7	1	1	1	
Barium	2.1E+01	4.2E+01	sc	food	chicken	mortality	high	tbd	Sample et al., 1996	NOAEL	208.26	416.53	4 w	7	1	10	1	
Beryllium	6.6E-01	6.6E+00	c	water	rat	longevity and weight loss	intermediate	tbd	Sample et al., 1996	NOAEL	0.66		1 g	7	1	1	1	
Boron	2.9E+01	1.0E+02	c	food	mallard	reduced egg fertility and duckling growth; increased embryo and duckling mortality	high	tbd	Sample et al., 1996	NOAEL	28.8	100	3 w prior/post rep	7	1	1	1	
Cadmium	1.5E+00	2.0E+01	c	food	mallard	egg production	high	tbd	Sample et al., 1996	NOAEL	1.45	20.03	90 d	7	1	1	1	
Chromium	1.0E+00	5.0E+00	c	food	black duck	duckling survival	high	tbd	Sample et al., 1996	NOAEL	1	5	10 m	7	1	1	1	Value for trivalent chromium.
Chromium (VI)	1.0E+00	5.0E+00	c	food	black duck	duckling survival	intermediate	tbd	Sample et al., 1996	NOAEL	1	5	1 y	7	1	1	1	
Cobalt	2.0E+00	2.0E+01	sc	food	rat	testicular atrophy	intermediate	tbd	ATSDR, 1990	LOAEL	20	20	69 d	7	10	1	1	
Copper	4.7E+01	6.2E+01	c	food	chicken	growth and mortality	high	tbd	Sample et al., 1996	NOAEL	46.97	61.72	10 w	7	1	1	1	
Cyanide, Free	1.1E+00	1.1E+01	sc	food	chicken	decreased growth and food intake	intermediate	tbd	Elzubier and Davis, 1988	LOAEL	11	11	20 d	7	10	1	1	
Lead	3.9E+00	3.9E+01	c	food	kestrel	reproductive	high	tbd	Sample et al., 1996	NOAEL	3.85		7 m	7	1	1	1	
Lithium	9.4E+00	1.9E+01	c	food	rat	number of offspring, offspring weights	high	tbd	Sample et al., 1996	NOAEL	9.4	18.8	days 6-15 (gestation)	7	1	1	1	
Manganese	9.8E+02	9.8E+03	c	food	Japanese quail	growth and aggressive behavior	intermediate	tbd	Sample et al., 1996	NOAEL	977		75 d	7	1	1	1	
Mercury	4.5E-01	9.0E-01	c	food	Japanese quail	egg fertility, hatchability	high	tbd	Sample et al., 1996	NOAEL	0.45	0.9		7	1	1	1	Mercuric chloride
Methyl mercury	6.4E-03	6.4E-02	c	food	mallard	egg production, number of offspring	high	tbd	Sample et al., 1996	LOAEL	0.064	0.064	3 generations	7	10	1	1	Methyl mercury dicyandiamide
Nickel	7.7E+01	1.1E+02	c	food	mallard	mortality, growth, and behavior	high	tbd	Sample et al., 1996	NOAEL	77.4	107	90 d	7	1	1	1	
Selenium	4.4E-01	1.5E+00	c	food	screech owl	egg production, hatchling success	high	tbd	Sample et al., 1996	NOAEL	0.44	1.5	13.7 w	7	1	1	1	
Silver	1.8E+01	1.8E+02	sc	food	rat	mortality	high	tbd	ATSDR, 1990	LOAEL	181	181	2 w	7	10	1	1	
Thallium	6.1E-01	6.1E+00		food	heron	egg hatchability	high	tbd	Smith et al., 1968	NOAEL	0.61			7	1	1	1	
Thorium	3.0E+03	3.0E+04	sc	food	rat	reproductive effects	high	tbd	ATSDR, 1989	NOAEL	3045		4 m	7	1	1	1	
Total Cyanide	1.1E+00	1.1E+01	sc	food	chicken	decreased growth and food intake	intermediate	tbd	Elzubier and Davis, 1988	LOAEL	11	11	20 d	7	10	1	1	
Vanadium	1.1E+00	1.1E+01	c	food	chicken	decrease egg-laying	high	tbd	USEPA, 1988	LOAEL	11	11	6 w	7	10	1	1	
Zinc	1.5E+01	1.3E+02	c	food	white longhorn hen	egg hatchability	high	tbd	Sample et al., 1996	NOAEL	14.5	131	44 w	7	1	1	1	
Zirconium	1.7E+00	1.7E+01	c	water	mouse	lifespan and longevity	intermediate	tbd	Sample et al., 1996	NOAEL	1.74		1 g	7	1	1	1	Value for zirconium sulfate used.
Zirconium dioxide	1.7E+00	1.7E+01	c	water	mouse	lifespan and longevity	intermediate	tbd	Sample et al., 1996	NOAEL	1.74		1 g	7	1	1	1	Value for zirconium sulfate used.
Total PCB Equivalent birds (½)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	
Total PCB Equivalent birds (0)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	

TABLE T-3.7
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS BIRDS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
2,3,7,8-TCDD Equivalent birds (½)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	
2,3,7,8-TCDD Equivalent birds (0)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	
Total Dioxin Equivalent birds (½)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	
Total Dioxin Equivalent birds (0)	1.4E-05	1.4E-04	sc	interperitoneal injection	pheasant	hen mortality, weight, egg production, embryo mortality	high	tbd	Nosek et al., 1992	LOAEL	0.00098	0.00098	10 w	1	10	1	1	

Notes:
a. Units in mg/kg-d.
b. Study types include acute, subchronic, and chronic duration studies.
c. Qualitative scoring of effect studied relative to the selected assessment endoints.
d. Degree of confidence associated with the selected study.
e. Exposure duration include (d) - days, (w) - weeks, (y) - year, (g) - generation.
f. Study results adjusted by extrapolation, uncertainty, and modifying factors.

TABLE T-3.8
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS AQUATIC MAMMALS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
1,1,2,2-Tetrachloroethane	3.2E-01	3.2E+00	sc	food	rat	irreversible testicular damage	intermediate	tbd	ATSDR, 1988	LOAEL	3.2	3.2	27 w	7	10	1	1	
1,1-Dichloroethene	2.5E+00	2.5E+01	sc	oral (capsules)	dog	mortality, body weight, liver histology	high	tbd	Sample et al., 1996	NOAEL	25		97 d	7	1	10	1	
1,2,3-Trichlorobenzene	1.5E+01	1.5E+02		food	rat	mortality	high	tbd	Neuhauser et al., 1985	LD_{50}	766			7	50	1	1	Value for 1,2,4-trichlorobenzene used as a surrogate.
1,2,4-Trichlorobenzene	1.5E+01	1.5E+02		food	rat	mortality	high	tbd	Neuhauser et al., 1985	LD_{50}	766			7	50	1	1	
1,2-Dichlorobenzene	4.3E+02	4.3E+03	c	gavage (oil)	rat	reproductive	high	tbd	ATSDR, 1997	NOAEL	600		2 y	5	1	1	1	Value for 1,4-dichlorobenzene use as a surrogate.
1,3-Dichlorobenzene	4.3E+02	4.3E+03	c	gavage (oil)	rat	reproductive	high	tbd	ATSDR, 1997	NOAEL	600		2 y	5	1	1	1	
1,4-Dichlorobenzene	4.3E+02	4.3E+03	c	gavage (oil)	rat	reproductive	high	tbd	ATSDR, 1997	NOAEL	600		2 y	5	1	1	1	
2,4,6-Tribromophenol	8.0E+00	8.0E+01		food	rat	mortality	high	tbd	MSDS. 2001	LD_{50}	402			7	50	1	1	
Acetone	1.0E+01	5.0E+01	sc	oral intubation	rat	liver/kidney damage	intermediate	tbd	Sample et al., 1996	NOAEL	100	500	90 d	7	1	10	1	
Benzene	2.6E+01	2.6E+02	c	gavage	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	263.6	263.6	days 6 -12 (gestation)	7	10	1	1	
Carbon disulfide	1.1E+01	1.1E+02	sc	Inhalation	rabbit	fetotoxicity/malformations	high	tbd	IRIS, 1991	NOAEL	11.0		34 w	7	1	1	1	Converted inhalation dose
Chlorobenzene	1.4E+01	1.4E+02	sc	food	dog	histopological changes in liver	low	tbd	IRIS, 1991	LOAEL	136.3	136.3	13 w	7	10	1	1	
Chloroform	1.5E+01	4.1E+01	sc	oral intubation	rat	gonal atrophy	intermediate	tbd	Sample et al., 1996	NOAEL	150	410	13 w	7	1	10	1	
Methyl ethyl ketone	1.8E+03	4.6E+03	c	water	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	1771	4571	2 g	7	1	1	1	
Methylene chloride	5.9E+00	5.0E+01	c	food	rat	liver toxicity	intermediate	tbd	Sample et al., 1996	NOAEL	5.85	50	2 y	7	1	1	1	
m-Xylene/p-Xylene	2.1E+00	2.6E+00	c	gavage	mouse	reduced fetal weights, increased incidence of fetal abnormalities	high	tbd	Sample et al., 1996	NOAEL	2.1	2.6	days 6 -15 (gestation)	7	1	1	1	Value for total xylenes use as a surrogate.
Ortho Xylene	2.1E+00	2.6E+00	c	gavage	mouse	reduced fetal weights, increased incidence of fetal abnormalities	high	tbd	Sample et al., 1996	NOAEL	2.1	2.6	days 6 -15 (gestation)	7	1	1	1	Value for total xylenes use as a surrogate.
Tetrachloroethylene	1.0E+01	1.0E+02	sc	food	mouse	hepatotoxicity	intermediate	tbd	Buben and O'Flaherty, 1985	NOAEL	10	100	6 w	7	1	1	1	
Toluene	2.6E+01	2.6E+02	c	gavage	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	259.8	259.8	days 6 -12 (gestation)	7	10	1	1	
Total Xylenes	2.1E+00	2.6E+00	c	gavage	mouse	reduced fetal weights, increased incidence of fetal abnormalities	high	tbd	Sample et al., 1996	NOAEL	2.1	2.6	days 6 -15 (gestation)	7	1	1	1	
Trichloroethene	7.1E-01	7.1E+00	sc	oral gavage	mouse	hepatoxicity	intermediate	tbd	Sample et al., 1996	LOAEL	100	100	6 w	5	10	10	1	
1,1'-Biphenyl	5.0E+01	5.0E+02		food	rat	kidney damage, reduced hemoglobin levels, decreased food intake	intermediate	tbd	IRIA, 2001	NOAEL	50			7	1	1	1	
2-Methylnaphthalene	3.6E+00	3.6E+01	sc	food	rat	decreased body weight gain	intermediate	tbd	USEPA, 1990	LOAEL	35.7	35.7	13 w	7	10	1	1	Value for naphthalene used as a surrogate.
4-Chloro-3-methylphenol	7.2E-02	7.2E-01		food	rat			tbd	Physical and Theoretical Chemistry Lab	LD_{50}	3.6			7	50	1	1	
4-Chloroaniline	1.3E+00	1.3E+01	c	food	rat	fibrosis of the splenic capsule	low	tbd	IRIS, 1993	LOAEL	12.5	12.5	102 w	7	10	1	1	

TABLE T-3.8
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS AQUATIC MAMMALS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
4-Methylphenol	5.0E+01	5.0E+02	sc	food	rat	loss of body weight; neurotoxicity	intermediate	tbd	USEPA, 1991	NOAEL	50		90 d	7	1	1	1	
Acenaphthene	1.8E+02	3.5E+02	sc	food	mouse	liver weight increase	low	tbd	IRIS, 1990	NOAEL	175	350	90 d	7	1	1	1	
Acenaphthylene	6.0E+01	6.0E+02	sc	food	rat	physiological changes	low	tbd	USEPA, 1984	LOAEL	600		40 d	7	10	1	1	
Acetophenone	4.2E+02	4.2E+03	sc	food	rat	growth, tissue, hematological	intermediate	tbd	IRIS, 2001	NOAEL	423		17 w	7	1	1	1	
Anthracene	1.0E+03	1.0E+04	sc	food	mouse	clinical and pathological effects	low	tbd	IRIS, 1990	NOAEL	1000		90 d	7	1	1	1	
Benzaldehyde	1.4E+02	4.0E+02	sc	food	mouse	forestomach lesions and kidney toxicity	intermediate	tbd	IRIS, 2001	NOAEL	143	400	13 w	7	1	1	1	
Benzo[a]anthracene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Benzo[a]pyrene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	
Benzo[b]fluoranthene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Benzo[ghi]perylene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Benzo[k]fluoranthene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Bis(2-Ethylhexyl)phthalate	1.8E+01	1.8E+02	c	food	mouse	reproductive	high	tbd	Sample et al., 1996	NOAEL	18.3	183.3	105 d	7	1	1	1	
Carbazole	1.0E+01	1.0E+02		food	rat	mortality	high	tbd	USEPA, 1986	LD_{50}	500			7	50	1	1	
Chrysene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Dibenz[a,h]anthracene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Dibenzofuran	1.3E+01	1.3E+02	sc	food	rodents	mortality	high	tbd	ATSDR, 1991	LC_{10}	125		13 w	7	10	1	1	
Dimethylphthalate	4.6E+03	4.6E+04	c	food	mouse	reproduction	high	tbd	Sample et al., 1996	NOAEL	4583		105 d	7	1	1	1	Value for diethylphthalate used as s surrogate.
Di-n-butylphthalate	5.5E+02	1.8E+03	c	food	mouse	reproductive	high	tbd	Sample et al., 1996	NOAEL	550	1833	105 d	7	1	1	1	
Di-n-octylphthalate	5.5E+02	1.8E+03	c	food	mouse	reproductive	high	tbd	Sample et al., 1996	NOAEL	550	1833	105 d	7	1	1	1	Value for di-n-butylphthalate used as a surrogate.
Fluoranthene	4.0E+01	4.0E+02	a	food	rodents	mortality	high	tbd	Eisler, 1987	LD_{50}	2000			7	50	1	1	
Fluorene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Indeno[1,2,3-cd]pyrene	1.0E+00	1.0E+01	c	intubation	mouse	reproductive	high	tbd	Sample et al., 1996	LOAEL	10	10	days 7 -16 (gestation)	7	10	1	1	Value for benzo(a)pyrene used as a surrogate.
Naphthalene	3.6E+00	3.6E+01	sc	food	rat	decreased body weight gain	intermediate	tbd	USEPA, 1990	LOAEL	35.7	35.7	13 w	7	10	1	1	
Phenanthrene	1.4E+01	1.4E+02	a	food	rodents	mortality	high	tbd	Eisler, 1987	LD_{50}	700			7	50	1	1	
Pyrene	1.6E+01	1.6E+02	a	food	rodents	mortality	high	tbd	NIOSH, 1985	LD_{50}	800			7	50	1	1	
4,4`-DDD	1.0E+00	5.0E+00	c	food	dog	developmental	intermediate	tbd	ATSDR, 1992	NOAEL	1	5	2 g	7	1	1	1	Value for 4,4'-DDT used as a surrogate.
4,4`-DDE	1.0E+00	5.0E+00	c	food	dog	developmental	intermediate	tbd	ATSDR, 1992	NOAEL	1	5	2 g	7	1	1	1	Value for 4,4'-DDT used as a surrogate.
4,4`-DDT	1.0E+00	5.0E+00	c	food	dog	developmental	intermediate	tbd	ATSDR, 1992	NOAEL	1	5	2 g	7	1	1	1	

TABLE T-3.8
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS AQUATIC MAMMALS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
Aldrin	2.0E-01	1.0E+00	c	food	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	0.2	1	3 g	7	1	1	1	
alpha-BHC	1.4E-02	1.4E-01	c	food	mink	kit mortality and reduced kit body weight	high	tbd	Sample et al., 1996	LOAEL	0.137	0.137	331 d	7	10	1	1	BHC mixed isomers
alpha-Chlordane	4.6E+00	9.2E+00	c	food	mouse	reproductive	high	tbd	Sample et al., 1996	NOAEL	4.58	9.16	6 g	7	1	1	1	
Aroclor-1232	1.4E-01	6.9E-01	c	food	mink	reproductive	high	tbd	Sample et al., 1996	NOAEL	0.137	0.685	4.5 m	7	1	1	1	Value for Aroclor 1254 used as a surrogate.
Aroclor-1242	6.9E-01	6.9E-01	c	food	mink	reproductive	high	tbd	Sample et al., 1996	LOAEL	0.685	0.685	7 m	7	1	1	1	
Aroclor-1248	1.4E-01	6.9E-01	c	food	mink	reproductive	high	tbd	Sample et al., 1996	NOAEL	0.137	0.685	4.5 m	7	1	1	1	Value for Aroclor 1254 used as a surrogate.
Aroclor-1254	1.4E-01	6.9E-01	c	food	mink	reproductive	high	tbd	Sample et al., 1996	NOAEL	0.137	0.685	4.5 m	7	1	1	1	
Aroclor-1260	1.4E-01	6.9E-01	c	food	mink	reproductive	high	tbd	Sample et al., 1996	NOAEL	0.137	0.685	4.5 m	7	1	1	1	Value for Aroclor 1254 used as a surrogate.
beta-BHC	1.4E-02	1.4E-01	c	food	mink	kit mortality and reduced kit body weight	high	tbd	Sample et al., 1996	LOAEL	0.137	0.137	331 d	7	10	1	1	BHC mixed isomers
delta-BHC	1.4E-02	1.4E-01	c	food	mink	kit mortality and reduced kit body weight	high	tbd	Sample et al., 1996	LOAEL	0.137	0.137	331 d	7	10	1	1	BHC mixed isomers
Dieldrin	5.0E-03	5.0E-02	c	food	dog	increased liver weight; liver/body weight ratio	intermediate	tbd	IRIS, 1991	NOAEL	0.005	0.05	2 y	7	1	1	1	
Endosulfan I	1.5E-01	1.5E+00	sc	oral intubation	rat	reproduction, blood chemistry	high	tbd	Sample et al., 1996	NOAEL	1.5		30 d	7	1	10	1	Value for endosulfan used as a surrogate.
Endosulfan II	1.5E-01	1.5E+00	sc	oral intubation	rat	reproduction, blood chemistry	high	tbd	Sample et al., 1996	NOAEL	1.5		30 d	7	1	10	1	Value for endosulfan used as a surrogate.
Endosulfan sulfate	1.5E-01	1.5E+00	sc	oral intubation	rat	reproduction, blood chemistry	high	tbd	Sample et al., 1996	NOAEL	1.5		30 d	7	1	10	1	Value for endosulfan used as a surrogate.
Endrin	1.0E-02	1.0E-01	c	food	dog	decreased weght gain	intermediate	tbd	USEPA, 1985	LOAEL	0.1	0.1	19 m	7	10	1	1	
Endrin aldehyde	1.0E-02	1.0E-01	c	food	dog	decreased weght gain	intermediate	tbd	USEPA, 1985	LOAEL	0.1	0.1	19 m	7	10	1	1	Value for endrin used as a surrogate.
Endrin ketone	1.0E-02	1.0E-01	c	food	dog	decreased weght gain	intermediate	tbd	USEPA, 1985	LOAEL	0.1	0.1	19 m	7	10	1	1	Value for endrin used as a surrogate.
Gamma-BHC/Lindane	1.4E-02	1.4E-01	c	food	mink	kit mortality and reduced kit body weight	high	tbd	Sample et al., 1996	LOAEL	0.137	0.137	331 d	7	10	1	1	BHC mixed isomers
Gamma-Chlordane	4.6E+00	9.2E+00	c	food	mouse	reproductive effects	high	tbd	Sample et al., 1996	NOAEL	4.58	9.16	6 g	7	1	1	1	
Heptachlor	1.0E-01	1.0E+00	c	food	mink	reduced kit weights	high	tbd	Sample et al., 1996	LOAEL	1	1	181 d	7	10	1	1	
Heptachlor epoxide	1.0E-01	1.0E+00	c	food	mink	reduced kit weights	high	tbd	Sample et al., 1996	LOAEL	1	1	181 d	7	10	1	1	Value for heptachlor used as a surrogate.
Methoxychlor	1.0E+00	1.0E+01	c	food	rat	growth retardation	intermediate	tbd	USEPA, 1985	LOAEL	10	10	2 y	7	10	1	1	
cis-Nonachlor	4.6E+00	9.2E+00	c	food	mouse	reproductive effects	high	tbd	Sample et al., 1996	NOAEL	4.58	9.16	6 g	7	1	1	1	Value for gamma-chlordane used as a surrogate
trans-Nonachlor	4.6E+00	9.2E+00	c	food	mouse	reproductive effects	high	tbd	Sample et al., 1996	NOAEL	4.58	9.16	6 g	7	1	1	1	Value for gamma-chlordane used as a surrogate
Aluminum	1.9E+00	1.9E+01	c	water	mouse	growth in second and third generations	intermediate	tbd	Sample et al., 1996	LOAEL	19.3	19.3	3 g	7	10	1	1	
Ammonia	9.4E+01	9.4E+02	c	food	rat	bone loss, reduced body weight	intermediate	tbd	ATSDR, 1989	LOAEL	936	936	330 d	7	10	1	1	
Antimony	1.3E-01	1.3E+00	c	water	mouse	lifespan and longevity	intermediate	tbd	Sample et al., 1996	LOAEL	1.25	1.25	1 g	7	10	1	1	
Arsenic	3.1E-01	3.1E+00	c	food	dog	mortality	high	tbd	ATSDR, 1991	LOAEL	3.1	3.1	2 y	7	10	1	1	

TABLE T-3.8
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS AQUATIC MAMMALS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes
Barium	5.1E+00	5.1E+01	c	water	rat	growth, food and water consumption	intermediate	tbd	Sample et al., 1996	NOAEL	5.1		16 m	7	1	1	1	
Beryllium	6.6E-01	6.6E+00	c	water	rat	longevity and weight loss	intermediate	tbd	Sample et al., 1996	NOAEL	0.66		1 g	7	1	1	1	
Boron	1.4E+01	1.4E+02	c	food	dog	size,body weight, or appear.	high	tbd	Weir and Fisher, 1972	NOAEL	13.7		2 y	7	1	1	1	
Cadmium	7.5E-01	7.5E+00	sc	food	dog	reproductive	high	tbd	ATSDR, 1996	NOAEL	0.75		6 w	7	1	1	1	
Chromium	2.7E+03	2.7E+04	c	food	rat	reproductive and longevity	high	tbd	Sample et al., 1996	NOAEL	2737		2 y	7	1	1	1	Value for trivalent chromium.
Chromium (VI)	3.3E+00	1.3E+01	c	water	rat	body weight and food consumption	intermediate	tbd	Sample et al., 1996	NOAEL	3.28	13.14	1 y	7	1	1	1	LOAEL derived from Stevens, et al., 1976
Cobalt	2.0E+00	2.0E+01	sc	food	rat	testicular atrophy	intermediate	tbd	ATSDR, 1990	LOAEL	20	20	69 d	7	10	1	1	
Copper	1.2E+01	1.5E+01	c	food	mink	reproductive	high	tbd	Sample et al., 1996	NOAEL	11.71	15.14	357 d	7	1	1	1	
Cyanide, Free	1.1E+01	3.0E+01		food	rat	decreased weight gain and thryroxin/myelin degeneration	intermediate	tbd	IRIS, 2001	NOAEL	10.8	30		7	1	1	1	
Lead	3.0E-01	3.0E+00	sc	food	dog	anorexia and convulsions	high	tbd	Eisler, 1988	LOAEL	3	3	180 d	7	10	1	1	Assumed inorganic lead.
Lithium	9.4E+00	1.9E+01	c	food	rat	number of offspring, offspring weights	high	tbd	Sample et al., 1996	NOAEL	9.4	18.8	days 6-15 (gestation)	7	1	1	1	
Manganese	8.8E+01	2.8E+02	c	food	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	88	284	224 d	7	1	1	1	
Mercury	1.0E+00	1.0E+01	c	food	mink	fertility, kit survival	high	tbd	Sample et al., 1996	NOAEL	1.01		6 m	7	1	1	1	Mercuric chloride
Methyl mercury	1.5E-02	2.5E-02	c	food	mink	weight loss, ataxia	intermediate	tbd	Sample et al., 1996	NOAEL	0.015	0.025	93 d	7	1	1	1	Mercuric chloride
Nickel	4.0E+01	8.0E+01	c	food	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	40	80	3 g	7	1	1	1	
Selenium	2.0E-01	3.3E-01	c	water	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	0.2	0.33	2 g	7	1	1	1	
Silver	1.8E+01	1.8E+02	sc	food	rat	mortality	high	tbd	ATSDR, 1990	LOAEL	181	181	2 w	7	10	1	1	
Thallium	2.3E-01	2.3E+00	sc	food	rat	mortality, body weight gain	high	tbd	IRIS, 2002	NOAEL	0.23		90 d	7	1	1	1	
Thorium	3.0E+03	3.0E+04	sc	food	rat	reproductive effects	high	tbd	ATSDR, 1989	NOAEL	3045		4 m	7	1	1	1	
Total Cyanide	6.9E+01	6.9E+02	c	food	rat	reproductive	high	tbd	Sample et al., 1996	NOAEL	68.7			7	1	1	1	
Vanadium	2.1E-01	2.1E+00	c	intubation	rat	reproductive	high	tbd	Sample et al., 1996	LOAEL	2.1	2.1	60 d through gestation	7	10	1	1	
Zinc	3.0E+02	3.0E+03	sc	food	mink			tbd	aulerich et al., 1991	NOAEL	300		144 d	7	1	1	1	
Zirconium	1.7E+00	1.7E+01	c	water	mouse	lifespan and longevity	intermediate	tbd	Sample et al., 1996	NOAEL	1.74		1 g	7	1	1	1	Value for zirconium sulfate used.
Zirconium dioxide	1.7E+00	1.7E+01	c	water	mouse	lifespan and longevity	intermediate	tbd	Sample et al., 1996	NOAEL	1.74		1 g	7	1	1	1	Value for zirconium sulfate used.
Total PCB Equivalent mammals (½)	1.0E-06	1.0E-05	c	food	rat	decreased F1 and F2 fertility	high	tbd	Murray et al., 1979	NOAEL	0.000001	0.00001	90 d	7	1	1	1	
Total PCB Equivalent mammals (0)	1.0E-06	1.0E-05	c	food	rat	decreased F1 and F2 fertility	high	tbd	Murray et al., 1979	NOAEL	0.000001	0.00001	90 d	7	1	1	1	
2,3,7,8-TCDD Equivalent mammals (½)	1.0E-06	1.0E-05	c	food	rat	decreased F1 and F2 fertility	high	tbd	Murray et al., 1979	NOAEL	0.000001	0.00001	90 d	7	1	1	1	
2,3,7,8-TCDD Equivalent mammals (0)	1.0E-06	1.0E-05	c	food	rat	decreased F1 and F2 fertility	high	tbd	Murray et al., 1979	NOAEL	0.000001	0.00001	90 d	7	1	1	1	
Total Dioxin Equivalent mammals (½)	1.0E-06	1.0E-05	c	food	rat	decreased F1 and F2 fertility	high	tbd	Murray et al., 1979	NOAEL	0.000001	0.00001	90 d	7	1	1	1	
Total Dioxin Equivalent mammals (0)	1.0E-06	1.0E-05	c	food	rat	decreased F1 and F2 fertility	high	tbd	Murray et al., 1979	NOAEL	0.000001	0.00001	90 d	7	1	1	1	

Notes:
a. Units in mg/kg-d.
b. Study types include acute, subchronic, and chronic duration studies.

TABLE T-3.8
SUMMARY OF ORAL TOXICITY REFERENCE DOSES FOR WILDLIFE - PREDACEOUS AQUATIC MAMMALS

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

Chemical Name	Toxicity Reference Dose NOAEL[a]	Toxicity Reference Dose LOAEL[b]	Study Type[b]	Exposure Route	Test Species	Effect	Relevance[c]	Confidence[d]	Reference	Study Endpoint	Study Result	Reported LOAEL	Exposure Duration[e]	Feeding Regime (# d/w)	EF	UF	MF	Notes

c. Qualitative scoring of effect studied relative to the selected assessment endoints.
d. Degree of confidence associated with the selected study.
e. Exposure duration include (d) - days, (w) - weeks, (y) - year, (g) - generation.
f. Study results adjusted by extrapolation, uncertainty, and modifying factors.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.3E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.4E-04	1.8E-04	5.0E-01	-	5.0E-01	***38%***
Aroclor-1254		1.7E-03	3.4E-03	1.5E-01	-	1.6E-01	***12%***
Chromium	3.0E-04	1.3E-01	4.3E-03	2.2E-02	-	1.6E-01	***12%***
Zinc	5.5E-05	1.2E-02	6.0E-02	1.3E-02	-	8.6E-02	6%
Lead	1.2E-04	3.4E-02	9.9E-03	3.9E-02	-	8.3E-02	6%
Aluminum	1.9E-04	4.9E-02	1.5E-03	7.0E-03	-	5.8E-02	4%
Antimony	2.3E-03	1.8E-02	3.8E-03	2.5E-02	-	4.9E-02	4%
Aroclor-1248		1.4E-02	2.9E-02	1.3E-03	-	4.4E-02	3%
Mercury	3.6E-06	1.6E-02	2.0E-02	5.4E-03	-	4.1E-02	3%
2-Methylnaphthalene		7.2E-05	3.7E-02	1.1E-03	-	3.8E-02	3%
Cadmium	7.4E-06	8.5E-04	1.8E-03	2.7E-02	-	2.9E-02	2%
Selenium		1.4E-03	1.1E-03	9.8E-03	-	1.2E-02	1%
Copper	1.2E-05	7.2E-03	2.2E-03	1.8E-03	-	1.1E-02	1%
Cobalt		3.0E-03	1.5E-04	4.9E-03	-	8.0E-03	1%
Arsenic		5.5E-04	8.6E-04	4.3E-03	-	5.7E-03	0%
Silver		3.1E-03	1.3E-03	4.6E-04	-	4.9E-03	0%
Aroclor-1260		1.2E-03	2.4E-03	1.0E-03	-	4.6E-03	0%
Chrysene		4.5E-04	9.1E-06	3.2E-03	-	3.7E-03	0%
Vanadium	8.7E-06	3.0E-03	1.7E-05	2.3E-04	-	3.3E-03	0%
Barium	5.9E-06	1.2E-03	1.6E-04	1.8E-03	-	3.1E-03	0%
Benzo[a]anthracene		4.0E-04	8.2E-06	2.2E-03	-	2.6E-03	0%
Fluorene		1.5E-04	2.2E-05	2.3E-03	-	2.5E-03	0%
Benzo[b]fluoranthene		3.1E-04	3.7E-06	2.1E-03	-	2.4E-03	0%
Beryllium		5.0E-04	5.3E-06	1.8E-03	-	2.3E-03	0%
Nickel	1.2E-06	4.3E-04	3.1E-05	1.6E-03	-	2.0E-03	0%
Benzo[k]fluoranthene		2.7E-04	3.2E-06	1.3E-03	-	1.5E-03	0%
Benzo[a]pyrene		3.2E-04	4.4E-06	1.1E-03	-	1.4E-03	0%
Indeno[1,2,3-cd]pyrene		1.9E-04	1.2E-06	8.8E-04	-	1.1E-03	0%
Naphthalene		2.0E-05	6.6E-06	8.5E-04	-	8.8E-04	0%
Phenanthrene		3.5E-05	3.5E-06	5.1E-04	-	5.5E-04	0%
Dibenzofuran		3.4E-05	5.8E-06	5.0E-04	-	5.4E-04	0%
Benzo[ghi]perylene		2.7E-04	1.7E-06	2.1E-04	-	4.7E-04	0%
Pyrene		4.5E-05	1.6E-06	3.5E-04	-	4.0E-04	0%
Manganese	5.2E-07	1.6E-04	1.1E-04	9.4E-05	-	3.7E-04	0%
Fluoranthene		2.0E-05	1.1E-06	3.0E-04	-	3.2E-04	0%
Dibenz[a,h]anthracene		4.2E-05	3.0E-07	2.6E-04	-	3.0E-04	0%
Acenaphthylene		1.8E-06	3.1E-07	2.2E-05	-	2.4E-05	0%
Acenaphthene		1.8E-06	4.1E-07	8.9E-07	-	3.1E-06	0%
Anthracene		3.0E-07	3.0E-08	5.3E-07	-	8.5E-07	0%
Carbon disulfide	4.9E-07					4.9E-07	0%
Acetone		2.8E-07	-			2.8E-07	0%
4-Methylphenol	5.4E-08					5.4E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.0E-03**	**3.0E-01**	**1.8E-01**	**8.4E-01**	**-**	**1.3E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**23%**	**14%**	**63%**		**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.3E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.8E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.4E-05	1.8E-05	5.0E-02	-	5.0E-02	***28%***
Chromium	5.9E-05	2.6E-02	8.6E-04	4.3E-03	-	3.1E-02	***17%***
Mercury	1.8E-06	7.9E-03	1.0E-02	2.7E-03	-	2.1E-02	***11%***
Aroclor-1254		1.7E-04	3.4E-04	1.5E-02	-	1.6E-02	9%
Zinc	6.0E-06	1.4E-03	6.6E-03	1.5E-03	-	9.5E-03	5%
Copper	9.3E-06	5.4E-03	1.7E-03	1.4E-03	-	8.5E-03	5%
Lead	1.2E-05	3.4E-03	9.9E-04	3.9E-03	-	8.3E-03	5%
Selenium		6.8E-04	5.7E-04	4.9E-03	-	6.2E-03	3%
Aluminum	1.9E-05	4.9E-03	1.5E-04	7.0E-04	-	5.8E-03	3%
Antimony	2.3E-04	1.8E-03	3.8E-04	2.5E-03	-	4.9E-03	3%
Aroclor-1248		1.4E-03	2.9E-03	1.3E-04	-	4.4E-03	2%
2-Methylnaphthalene		7.2E-06	3.7E-03	1.1E-04	-	3.8E-03	2%
Arsenic		2.2E-04	3.4E-04	1.7E-03	-	2.3E-03	1%
Cadmium	5.4E-07	6.1E-05	1.3E-04	1.9E-03	-	2.1E-03	1%
Barium	3.0E-06	6.0E-04	7.8E-05	8.9E-04	-	1.6E-03	1%
Nickel	8.6E-07	3.1E-04	2.3E-05	1.1E-03	-	1.5E-03	1%
Cobalt		3.0E-04	1.5E-05	4.9E-04	-	8.0E-04	0%
Silver		3.1E-04	1.3E-04	4.6E-05	-	4.9E-04	0%
Aroclor-1260		1.2E-04	2.4E-04	1.0E-04	-	4.6E-04	0%
Chrysene		4.5E-05	9.1E-07	3.2E-04	-	3.7E-04	0%
Vanadium	8.7E-07	3.0E-04	1.7E-06	2.3E-05	-	3.3E-04	0%
Benzo[a]anthracene		4.0E-05	8.2E-07	2.2E-04	-	2.6E-04	0%
Fluorene		1.5E-05	2.2E-06	2.3E-04	-	2.5E-04	0%
Benzo[b]fluoranthene		3.1E-05	3.7E-07	2.1E-04	-	2.4E-04	0%
Beryllium		5.0E-05	5.3E-07	1.8E-04	-	2.3E-04	0%
Benzo[k]fluoranthene		2.7E-05	3.2E-07	1.3E-04	-	1.5E-04	0%
Benzo[a]pyrene		3.2E-05	4.4E-07	1.1E-04	-	1.4E-04	0%
Indeno[1,2,3-cd]pyrene		1.9E-05	1.2E-07	8.8E-05	-	1.1E-04	0%
Naphthalene		2.0E-06	6.6E-07	8.5E-05	-	8.8E-05	0%
Phenanthrene		3.5E-06	3.5E-07	5.1E-05	-	5.5E-05	0%
Dibenzofuran		3.4E-06	5.8E-07	5.0E-05	-	5.4E-05	0%
Benzo[ghi]perylene		2.7E-05	1.7E-07	2.1E-05	-	4.7E-05	0%
Pyrene		4.5E-06	1.6E-07	3.5E-05	-	4.0E-05	0%
Manganese	5.2E-08	1.6E-05	1.1E-05	9.4E-06	-	3.7E-05	0%
Fluoranthene		2.0E-06	1.1E-07	3.0E-05	-	3.2E-05	0%
Dibenz[a,h]anthracene		4.2E-06	3.0E-08	2.6E-05	-	3.0E-05	0%
Acenaphthylene		1.8E-07	3.1E-08	2.2E-06	-	2.4E-06	0%
Acenaphthene		9.1E-07	2.0E-07	4.5E-07	-	1.6E-06	0%
Anthracene		3.0E-08	3.0E-09	5.3E-08	-	8.5E-08	0%
Acetone		5.6E-08	-			5.6E-08	0%
Carbon disulfide	4.9E-08					4.9E-08	0%
4-Methylphenol	5.4E-09					5.4E-09	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.4E-04**	**5.6E-02**	**2.9E-02**	**9.6E-02**	**-**	**1.8E-01**	
PERCENTAGE OF TOTAL RISK	**0%**	**31%**	**16%**	**53%**		**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.8E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: HERON
TOTAL RISK (HI): 1.1E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.4E-03	-	3.5E-01	6.0E+00	***6.4E+00***	***59%***
Chromium	2.9E-03	1.3E+00	-	1.5E-02	4.8E-02	***1.4E+00***	***13%***
Antimony	2.3E-02	1.8E-01	-	1.7E-02	3.3E-01	5.5E-01	5%
Aluminum	1.9E-03	4.9E-01	-	4.9E-03	1.4E-02	5.1E-01	5%
Zinc	5.4E-04	1.3E-01	-	9.2E-03	3.2E-01	4.5E-01	4%
Vanadium	8.9E-04	3.1E-01	-	1.6E-03	2.4E-02	3.4E-01	3%
Mercury	3.5E-05	1.6E-01	-	3.7E-03	6.5E-02	2.3E-01	2%
Selenium		1.6E-02	-	7.7E-03	2.0E-01	2.2E-01	2%
Aroclor-1260		1.2E-02	-	7.1E-04	1.5E-01	1.6E-01	2%
Lead	3.6E-04	1.0E-01	-	7.8E-03	1.7E-02	1.3E-01	1%
Aroclor-1254		3.5E-03	-	2.1E-02	6.2E-02	8.7E-02	1%
Copper	1.2E-04	7.2E-02	-	1.2E-03	9.0E-03	8.3E-02	1%
Aroclor-1248		6.4E-02	-	3.9E-04	6.2E-03	7.0E-02	1%
Beryllium		5.1E-03	-	1.3E-03	4.4E-02	5.1E-02	0%
Cobalt		3.1E-02	-	3.4E-03	1.3E-02	4.7E-02	0%
Silver		3.1E-02	-	3.2E-04	2.1E-03	3.4E-02	0%
Cadmium	7.3E-05	8.5E-03	-	1.8E-02	2.5E-03	2.9E-02	0%
Barium	5.9E-05	1.2E-02	-	1.2E-03	4.7E-03	1.8E-02	0%
Arsenic		5.5E-03	-	3.0E-03	4.1E-03	1.3E-02	0%
Chrysene		4.5E-03	-	2.2E-03	-	6.7E-03	0%
Nickel	1.2E-05	4.3E-03	-	1.1E-03	4.8E-04	5.9E-03	0%
Benzo[a]anthracene		4.0E-03	-	1.5E-03	-	5.5E-03	0%
Benzo[b]fluoranthene		3.1E-03	-	1.5E-03	-	4.6E-03	0%
Benzo[a]pyrene		3.2E-03	-	7.5E-04	-	4.0E-03	0%
Benzo[k]fluoranthene		2.7E-03	-	8.8E-04	-	3.6E-03	0%
Fluorene		1.5E-03	-	1.6E-03	-	3.1E-03	0%
Benzo[ghi]perylene		2.7E-03	-	1.4E-04	-	2.8E-03	0%
Indeno[1,2,3-cd]pyrene		1.9E-03	-	6.1E-04	-	2.5E-03	0%
Manganese	5.2E-06	1.6E-03	-	6.5E-05	5.3E-04	2.2E-03	0%
2-Methylnaphthalene		7.3E-04	-	7.3E-04	-	1.5E-03	0%
Naphthalene		2.0E-04	-	5.9E-04	-	7.9E-04	0%
Pyrene		4.6E-04	-	2.4E-04	-	7.0E-04	0%
Phenanthrene		3.5E-04	-	3.5E-04	-	7.0E-04	0%
Dibenzofuran		3.4E-04	-	3.4E-04	-	6.8E-04	0%
Dibenz[a,h]anthracene		4.3E-04	-	1.8E-04	-	6.1E-04	0%
Fluoranthene		2.1E-04	-	2.1E-04	-	4.1E-04	0%
Acenaphthylene		1.8E-05	-	1.5E-05	-	3.3E-05	0%
Acenaphthene		1.8E-05	-	6.2E-07	-	1.9E-05	0%
Carbon disulfide	4.8E-06					4.8E-06	0%
Anthracene		3.0E-06	-	3.6E-07	-	3.4E-06	0%
Acetone		2.8E-06	-			2.8E-06	0%
4-Methylphenol	5.3E-07					5.3E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.0E-02**	**3.0E+00**	**-**	**4.8E-01**	**7.3E+00**	**1.1E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**28%**		**4%**	**68%**	**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: HERON
TOTAL RISK (HI): 1.1E+01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: HERON
TOTAL RISK (HI): 1.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.4E-04	-	3.5E-02	6.0E-01	6.4E-01	***45%***
Chromium	5.8E-04	2.6E-01	-	3.0E-03	9.5E-03	2.8E-01	***19%***
Mercury	1.8E-05	8.0E-02	-	1.9E-03	3.2E-02	1.1E-01	8%
Selenium		4.6E-03	-	2.3E-03	5.8E-02	6.5E-02	5%
Copper	9.2E-05	5.5E-02	-	9.3E-04	6.9E-03	6.3E-02	4%
Antimony	2.3E-03	1.8E-02	-	1.7E-03	3.3E-02	5.5E-02	4%
Aluminum	1.9E-04	4.9E-02	-	4.9E-04	1.4E-03	5.1E-02	4%
Zinc	6.0E-05	1.4E-02	-	1.0E-03	3.5E-02	5.0E-02	4%
Vanadium	8.9E-05	3.1E-02	-	1.6E-04	2.4E-03	3.4E-02	2%
Aroclor-1260		1.2E-03	-	7.1E-05	1.5E-02	1.6E-02	1%
Lead	3.6E-05	1.0E-02	-	7.8E-04	1.7E-03	1.3E-02	1%
Barium	2.9E-05	6.1E-03	-	6.1E-04	2.3E-03	9.0E-03	1%
Aroclor-1254		3.5E-04	-	2.1E-03	6.2E-03	8.7E-03	1%
Aroclor-1248		6.4E-03	-	3.9E-05	6.2E-04	7.0E-03	0%
Beryllium		5.1E-04	-	1.3E-04	4.4E-03	5.1E-03	0%
Arsenic		2.2E-03	-	1.2E-03	1.6E-03	5.0E-03	0%
Cobalt		3.1E-03	-	3.4E-04	1.3E-03	4.7E-03	0%
Nickel	8.4E-06	3.1E-03	-	7.9E-04	3.5E-04	4.3E-03	0%
Silver		3.1E-03	-	3.2E-05	2.1E-04	3.4E-03	0%
Cadmium	5.3E-06	6.2E-04	-	1.3E-03	1.8E-04	2.1E-03	0%
Chrysene		4.5E-04	-	2.2E-04	-	6.7E-04	0%
Benzo[a]anthracene		4.0E-04	-	1.5E-04	-	5.5E-04	0%
Benzo[b]fluoranthene		3.1E-04	-	1.5E-04	-	4.6E-04	0%
Benzo[a]pyrene		3.2E-04	-	7.5E-05	-	4.0E-04	0%
Benzo[k]fluoranthene		2.7E-04	-	8.8E-05	-	3.6E-04	0%
Fluorene		1.5E-04	-	1.6E-04	-	3.1E-04	0%
Benzo[ghi]perylene		2.7E-04	-	1.4E-05	-	2.8E-04	0%
Indeno[1,2,3-cd]pyrene		1.9E-04	-	6.1E-05	-	2.5E-04	0%
Manganese	5.2E-07	1.6E-04	-	6.5E-06	5.3E-05	2.2E-04	0%
2-Methylnaphthalene		7.3E-05	-	7.3E-05	-	1.5E-04	0%
Naphthalene		2.0E-05	-	5.9E-05	-	7.9E-05	0%
Pyrene		4.6E-05	-	2.4E-05	-	7.0E-05	0%
Phenanthrene		3.5E-05	-	3.5E-05	-	7.0E-05	0%
Dibenzofuran		3.4E-05	-	3.4E-05	-	6.8E-05	0%
Dibenz[a,h]anthracene		4.3E-05	-	1.8E-05	-	6.1E-05	0%
Fluoranthene		2.1E-05	-	2.1E-05	-	4.1E-05	0%
Acenaphthene		9.1E-06	-	3.1E-07	-	9.4E-06	0%
Acenaphthylene		1.8E-06	-	1.5E-06	-	3.3E-06	0%
Acetone		5.6E-07	-			5.6E-07	0%
Carbon disulfide	4.8E-07					4.8E-07	0%
Anthracene		3.0E-07	-	3.6E-08	-	3.4E-07	0%
4-Methylphenol	5.3E-08					5.3E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.4E-03**	**5.5E-01**	**-**	**5.5E-02**	**8.1E-01**	**1.4E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**39%**		**4%**	**57%**	**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: HERON
TOTAL RISK (HI): 1.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: HERON
TOTAL RISK (HI): 8.9E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.1E-03	-	2.6E-01	4.6E+00	***4.8E+00***	***54%***
Chromium	9.2E-04	1.3E+00	-	1.5E-02	4.8E-02	***1.4E+00***	***15%***
Antimony	1.6E-02	1.8E-01	-	1.7E-02	3.3E-01	5.4E-01	6%
Aluminum	3.8E-04	4.2E-01	-	4.1E-03	1.2E-02	4.4E-01	5%
Zinc	1.7E-04	9.5E-02	-	7.0E-03	2.4E-01	3.4E-01	4%
Vanadium	3.7E-04	3.1E-01	-	1.6E-03	2.4E-02	3.4E-01	4%
Mercury	2.2E-05	1.6E-01	-	3.7E-03	6.5E-02	2.3E-01	3%
Selenium		1.4E-02	-	6.7E-03	1.7E-01	1.9E-01	2%
Aroclor-1260		9.7E-03	-	5.7E-04	1.2E-01	1.3E-01	1%
Lead	2.1E-04	8.6E-02	-	6.7E-03	1.5E-02	1.1E-01	1%
Aroclor-1248		6.4E-02	-	3.9E-04	6.2E-03	7.0E-02	1%
Beryllium		5.1E-03	-	1.3E-03	4.4E-02	5.1E-02	1%
Copper	2.8E-05	4.2E-02	-	7.2E-04	5.3E-03	4.8E-02	1%
Cobalt		3.1E-02	-	3.4E-03	1.3E-02	4.7E-02	1%
Cadmium	6.4E-05	8.5E-03	-	1.8E-02	2.5E-03	2.9E-02	0%
Aroclor-1254		7.9E-04	-	4.7E-03	1.4E-02	2.0E-02	0%
Barium	3.2E-05	1.2E-02	-	1.2E-03	4.7E-03	1.8E-02	0%
Arsenic		5.1E-03	-	2.8E-03	3.8E-03	1.2E-02	0%
Silver		1.1E-02	-	1.1E-04	7.0E-04	1.1E-02	0%
Chrysene		4.5E-03	-	2.2E-03	-	6.7E-03	0%
Nickel	1.2E-05	4.3E-03	-	1.1E-03	4.8E-04	5.9E-03	0%
Benzo[a]anthracene		4.0E-03	-	1.5E-03	-	5.5E-03	0%
Benzo[b]fluoranthene		3.1E-03	-	1.5E-03	-	4.6E-03	0%
Benzo[a]pyrene		3.2E-03	-	7.5E-04	-	4.0E-03	0%
Benzo[k]fluoranthene		2.7E-03	-	8.8E-04	-	3.6E-03	0%
Fluorene		1.5E-03	-	1.6E-03	-	3.1E-03	0%
Indeno[1,2,3-cd]pyrene		1.9E-03	-	6.1E-04	-	2.5E-03	0%
Benzo[ghi]perylene		2.2E-03	-	1.1E-04	-	2.3E-03	0%
Manganese	5.3E-06	1.6E-03	-	6.5E-05	5.3E-04	2.2E-03	0%
2-Methylnaphthalene		5.4E-04	-	5.4E-04	-	1.1E-03	0%
Naphthalene		2.0E-04	-	5.9E-04	-	7.9E-04	0%
Pyrene		4.6E-04	-	2.4E-04	-	7.0E-04	0%
Phenanthrene		3.5E-04	-	3.5E-04	-	7.0E-04	0%
Dibenz[a,h]anthracene		4.3E-04	-	1.8E-04	-	6.1E-04	0%
Fluoranthene		2.1E-04	-	2.1E-04	-	4.1E-04	0%
Dibenzofuran		1.2E-04	-	1.2E-04	-	2.3E-04	0%
Acenaphthylene		2.2E-05	-	1.9E-05	-	4.1E-05	0%
Acenaphthene		1.8E-05	-	6.2E-07	-	1.9E-05	0%
Carbon disulfide	3.6E-06					3.6E-06	0%
Acetone		2.8E-06	-			2.8E-06	0%

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: HERON
TOTAL RISK (HI): 8.9E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Anthracene		2.0E-06	-	2.4E-07	-	2.2E-06	0%
4-Methylphenol	5.3E-07					5.3E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.9E-02**	**2.8E+00**	**-**	**3.7E-01**	**5.7E+00**	**8.9E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**32%**		**4%**	**64%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: HERON
TOTAL RISK (HI): 1.2E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.1E-04	-	2.6E-02	4.6E-01	4.8E-01	***40%***
Chromium	1.8E-04	2.6E-01	-	3.0E-03	9.5E-03	2.7E-01	***23%***
Mercury	1.1E-05	8.0E-02	-	1.9E-03	3.2E-02	1.1E-01	9%
Selenium		4.0E-03	-	2.0E-03	5.1E-02	5.7E-02	5%
Antimony	1.6E-03	1.8E-02	-	1.7E-03	3.3E-02	5.4E-02	5%
Aluminum	3.8E-05	4.2E-02	-	4.1E-04	1.2E-03	4.4E-02	4%
Zinc	1.9E-05	1.1E-02	-	7.7E-04	2.7E-02	3.8E-02	3%
Copper	2.1E-05	3.2E-02	-	5.5E-04	4.0E-03	3.7E-02	3%
Vanadium	3.7E-05	3.1E-02	-	1.6E-04	2.4E-03	3.4E-02	3%
Aroclor-1260		9.7E-04	-	5.7E-05	1.2E-02	1.3E-02	1%
Lead	2.1E-05	8.6E-03	-	6.7E-04	1.5E-03	1.1E-02	1%
Barium	1.6E-05	6.1E-03	-	6.1E-04	2.3E-03	9.0E-03	1%
Aroclor-1248		6.4E-03	-	3.9E-05	6.2E-04	7.0E-03	1%
Beryllium		5.1E-04	-	1.3E-04	4.4E-03	5.1E-03	0%
Cobalt		3.1E-03	-	3.4E-04	1.3E-03	4.7E-03	0%
Arsenic		2.0E-03	-	1.1E-03	1.5E-03	4.7E-03	0%
Nickel	8.4E-06	3.1E-03	-	7.9E-04	3.5E-04	4.3E-03	0%
Cadmium	4.6E-06	6.2E-04	-	1.3E-03	1.8E-04	2.1E-03	0%
Aroclor-1254		7.9E-05	-	4.7E-04	1.4E-03	2.0E-03	0%
Silver		1.1E-03	-	1.1E-05	7.0E-05	1.1E-03	0%
Chrysene		4.5E-04	-	2.2E-04	-	6.7E-04	0%
Benzo[a]anthracene		4.0E-04	-	1.5E-04	-	5.5E-04	0%
Benzo[b]fluoranthene		3.1E-04	-	1.5E-04	-	4.6E-04	0%
Benzo[a]pyrene		3.2E-04	-	7.5E-05	-	4.0E-04	0%
Benzo[k]fluoranthene		2.7E-04	-	8.8E-05	-	3.6E-04	0%
Fluorene		1.5E-04	-	1.6E-04	-	3.1E-04	0%
Indeno[1,2,3-cd]pyrene		1.9E-04	-	6.1E-05	-	2.5E-04	0%
Benzo[ghi]perylene		2.2E-04	-	1.1E-05	-	2.3E-04	0%
Manganese	5.3E-07	1.6E-04	-	6.5E-06	5.3E-05	2.2E-04	0%
2-Methylnaphthalene		5.4E-05	-	5.4E-05	-	1.1E-04	0%
Naphthalene		2.0E-05	-	5.9E-05	-	7.9E-05	0%
Pyrene		4.6E-05	-	2.4E-05	-	7.0E-05	0%
Phenanthrene		3.5E-05	-	3.5E-05	-	7.0E-05	0%
Dibenz[a,h]anthracene		4.3E-05	-	1.8E-05	-	6.1E-05	0%
Fluoranthene		2.1E-05	-	2.1E-05	-	4.1E-05	0%
Dibenzofuran		1.2E-05	-	1.2E-05	-	2.3E-05	0%
Acenaphthene		9.1E-06	-	3.1E-07	-	9.4E-06	0%
Acenaphthylene		2.2E-06	-	1.9E-06	-	4.1E-06	0%
Acetone		5.6E-07	-			5.6E-07	0%
Carbon disulfide	3.6E-07					3.6E-07	0%
Anthracene		2.0E-07	-	2.4E-08	-	2.2E-07	0%
4-Methylphenol	5.3E-08					5.3E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**2.0E-03**	**5.2E-01**	**-**	**4.3E-02**	**6.4E-01**	**1.2E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**43%**		**4%**	**53%**	**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: HERON
TOTAL RISK (HI): 1.2E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 2.3E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		5.9E-03	-	7.8E+00	-	***7.8E+00***	***34%***
Chromium	1.0E-02	5.4E+00	-	3.4E-01	-	***5.7E+00***	***25%***
Antimony	8.1E-02	7.5E-01	-	3.9E-01	-	***1.2E+00***	5%
Aluminum	6.6E-03	2.0E+00	-	1.1E-01	-	***2.1E+00***	9%
Aroclor-1254		1.4E-02	-	4.7E-01	-	4.9E-01	2%
Cadmium	2.6E-04	3.5E-02	-	4.1E-01	-	4.5E-01	2%
Vanadium	3.2E-03	1.3E+00	-	3.7E-02	-	***1.3E+00***	6%
Zinc	1.9E-03	5.2E-01	-	2.1E-01	-	7.2E-01	3%
Lead	1.3E-03	4.1E-01	-	1.8E-01	-	5.9E-01	3%
Mercury	1.3E-04	6.5E-01	-	8.4E-02	-	7.4E-01	3%
Selenium		6.4E-02	-	1.7E-01	-	2.4E-01	1%
Cobalt		1.3E-01	-	7.6E-02	-	2.0E-01	1%
Copper	4.3E-04	3.0E-01	-	2.8E-02	-	3.2E-01	1%
Aroclor-1248		2.6E-01	-	8.7E-03	-	2.7E-01	1%
Arsenic		2.3E-02	-	6.8E-02	-	9.0E-02	0%
Chrysene		1.8E-02	-	5.0E-02	-	6.8E-02	0%
Silver		1.3E-01	-	7.2E-03	-	1.4E-01	1%
Barium	2.1E-04	5.0E-02	-	2.8E-02	-	7.8E-02	0%
Benzo[a]anthracene		1.6E-02	-	3.4E-02	-	5.0E-02	0%
Fluorene		6.0E-03	-	3.6E-02	-	4.2E-02	0%
Benzo[b]fluoranthene		1.3E-02	-	3.3E-02	-	4.6E-02	0%
Beryllium		2.1E-02	-	2.8E-02	-	4.9E-02	0%
Aroclor-1260		5.0E-02	-	1.6E-02	-	6.6E-02	0%
Nickel	4.1E-05	1.8E-02	-	2.5E-02	-	4.2E-02	0%
Benzo[k]fluoranthene		1.1E-02	-	2.0E-02	-	3.1E-02	0%
Benzo[a]pyrene		1.3E-02	-	1.7E-02	-	3.0E-02	0%
2-Methylnaphthalene		3.0E-03	-	1.7E-02	-	1.9E-02	0%
Indeno[1,2,3-cd]pyrene		7.9E-03	-	1.4E-02	-	2.2E-02	0%
Naphthalene		8.1E-04	-	1.3E-02	-	1.4E-02	0%
Phenanthrene		1.4E-03	-	7.9E-03	-	9.3E-03	0%
Dibenzofuran		1.4E-03	-	7.7E-03	-	9.1E-03	0%
Benzo[ghi]perylene		1.1E-02	-	3.2E-03	-	1.4E-02	0%
Pyrene		1.9E-03	-	5.5E-03	-	7.4E-03	0%
Fluoranthene		8.5E-04	-	4.7E-03	-	5.5E-03	0%
Dibenz[a,h]anthracene		1.7E-03	-	4.1E-03	-	5.8E-03	0%
Manganese	1.8E-05	6.7E-03	-	1.5E-03	-	8.2E-03	0%
Acenaphthylene		7.4E-05	-	3.5E-04	-	4.2E-04	0%
Acenaphthene		7.5E-05	-	1.4E-05	-	8.9E-05	0%
Carbon disulfide	1.7E-05					1.7E-05	0%
Anthracene		1.2E-05	-	8.2E-06	-	2.0E-05	0%
Acetone		1.2E-05	-			1.2E-05	0%
4-Methylphenol	1.9E-06					1.9E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.1E-01**	**1.2E+01**	**-**	**1.1E+01**	**-**	**2.3E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**53%**		**47%**		**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 2.3E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 3.5E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		5.9E-04	-	7.8E-01	-	7.8E-01	***22%***
Chromium	2.1E-03	1.1E+00	-	6.7E-02	-	***1.1E+00***	***33%***
Mercury	6.3E-05	3.3E-01	-	4.2E-02	-	3.7E-01	***10%***
Copper	3.3E-04	2.3E-01	-	2.1E-02	-	2.5E-01	7%
Antimony	8.1E-03	7.5E-02	-	3.9E-02	-	1.2E-01	3%
Aluminum	6.6E-04	2.0E-01	-	1.1E-02	-	2.1E-01	6%
Selenium		1.9E-02	-	5.1E-02	-	7.0E-02	2%
Aroclor-1254		1.4E-03	-	4.7E-02	-	4.9E-02	1%
Vanadium	3.2E-04	1.3E-01	-	3.7E-03	-	1.3E-01	4%
Zinc	2.1E-04	5.7E-02	-	2.3E-02	-	8.0E-02	2%
Cadmium	1.9E-05	2.5E-03	-	3.0E-02	-	3.3E-02	1%
Arsenic		9.1E-03	-	2.7E-02	-	3.6E-02	1%
Lead	1.3E-04	4.1E-02	-	1.8E-02	-	5.9E-02	2%
Nickel	3.0E-05	1.3E-02	-	1.8E-02	-	3.1E-02	1%
Barium	1.0E-04	2.5E-02	-	1.4E-02	-	3.9E-02	1%
Cobalt		1.3E-02	-	7.6E-03	-	2.0E-02	1%
Aroclor-1248		2.6E-02	-	8.7E-04	-	2.7E-02	1%
Chrysene		1.8E-03	-	5.0E-03	-	6.8E-03	0%
Silver		1.3E-02	-	7.2E-04	-	1.4E-02	0%
Benzo[a]anthracene		1.6E-03	-	3.4E-03	-	5.0E-03	0%
Fluorene		6.0E-04	-	3.6E-03	-	4.2E-03	0%
Benzo[b]fluoranthene		1.3E-03	-	3.3E-03	-	4.6E-03	0%
Beryllium		2.1E-03	-	2.8E-03	-	4.9E-03	0%
Aroclor-1260		5.0E-03	-	1.6E-03	-	6.6E-03	0%
Benzo[k]fluoranthene		1.1E-03	-	2.0E-03	-	3.1E-03	0%
Benzo[a]pyrene		1.3E-03	-	1.7E-03	-	3.0E-03	0%
2-Methylnaphthalene		3.0E-04	-	1.7E-03	-	1.9E-03	0%
Indeno[1,2,3-cd]pyrene		7.9E-04	-	1.4E-03	-	2.2E-03	0%
Naphthalene		8.1E-05	-	1.3E-03	-	1.4E-03	0%
Phenanthrene		1.4E-04	-	7.9E-04	-	9.3E-04	0%
Dibenzofuran		1.4E-04	-	7.7E-04	-	9.1E-04	0%
Benzo[ghi]perylene		1.1E-03	-	3.2E-04	-	1.4E-03	0%
Pyrene		1.9E-04	-	5.5E-04	-	7.4E-04	0%
Fluoranthene		8.5E-05	-	4.7E-04	-	5.5E-04	0%
Dibenz[a,h]anthracene		1.7E-04	-	4.1E-04	-	5.8E-04	0%
Manganese	1.8E-06	6.7E-04	-	1.5E-04	-	8.2E-04	0%
Acenaphthylene		7.4E-06	-	3.5E-05	-	4.2E-05	0%
Acenaphthene		3.7E-05	-	6.9E-06	-	4.4E-05	0%
Carbon disulfide	1.7E-06					1.7E-06	0%
Anthracene		1.2E-06	-	8.2E-07	-	2.0E-06	0%
Acetone		2.3E-06	-			2.3E-06	0%
4-Methylphenol	1.9E-07					1.9E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.2E-02**	**2.3E+00**	**-**	**1.2E+00**	**-**	**3.5E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**65%**		**35%**		**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 3.5E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 2.0E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		4.5E-03	-	5.9E+00	-	***6.0E+00***	***30%***
Chromium	3.3E-03	5.4E+00	-	3.4E-01	-	***5.7E+00***	***29%***
Aluminum	1.3E-03	1.7E+00	-	9.3E-02	-	***1.8E+00***	9%
Vanadium	1.3E-03	1.3E+00	-	3.7E-02	-	***1.3E+00***	7%
Antimony	5.8E-02	7.5E-01	-	3.9E-01	-	***1.2E+00***	6%
Mercury	7.7E-05	6.5E-01	-	8.4E-02	-	7.4E-01	4%
Zinc	6.0E-04	3.9E-01	-	1.6E-01	-	5.5E-01	3%
Lead	7.5E-04	3.5E-01	-	1.5E-01	-	5.0E-01	3%
Cadmium	2.3E-04	3.5E-02	-	4.1E-01	-	4.5E-01	2%
Aroclor-1248		2.6E-01	-	8.7E-03	-	2.7E-01	1%
Selenium		5.6E-02	-	1.5E-01	-	2.1E-01	1%
Cobalt		1.3E-01	-	7.6E-02	-	2.0E-01	1%
Copper	9.8E-05	1.7E-01	-	1.6E-02	-	1.9E-01	1%
Aroclor-1254		3.2E-03	-	1.1E-01	-	1.1E-01	1%
Arsenic		2.1E-02	-	6.2E-02	-	8.3E-02	0%
Barium	1.2E-04	5.0E-02	-	2.8E-02	-	7.7E-02	0%
Chrysene		1.8E-02	-	5.0E-02	-	6.8E-02	0%
Aroclor-1260		4.0E-02	-	1.3E-02	-	5.3E-02	0%
Benzo[a]anthracene		1.6E-02	-	3.4E-02	-	5.0E-02	0%
Beryllium		2.1E-02	-	2.8E-02	-	4.9E-02	0%
Silver		4.3E-02	-	2.4E-03	-	4.6E-02	0%
Benzo[b]fluoranthene		1.3E-02	-	3.3E-02	-	4.6E-02	0%
Nickel	4.1E-05	1.8E-02	-	2.5E-02	-	4.2E-02	0%
Fluorene		6.0E-03	-	3.6E-02	-	4.2E-02	0%
Benzo[k]fluoranthene		1.1E-02	-	2.0E-02	-	3.1E-02	0%
Benzo[a]pyrene		1.3E-02	-	1.7E-02	-	3.0E-02	0%
Indeno[1,2,3-cd]pyrene		7.9E-03	-	1.4E-02	-	2.2E-02	0%
2-Methylnaphthalene		2.2E-03	-	1.2E-02	-	1.4E-02	0%
Naphthalene		8.1E-04	-	1.3E-02	-	1.4E-02	0%
Benzo[ghi]perylene		8.9E-03	-	2.6E-03	-	1.1E-02	0%
Phenanthrene		1.4E-03	-	7.9E-03	-	9.3E-03	0%
Manganese	1.9E-05	6.7E-03	-	1.5E-03	-	8.2E-03	0%
Pyrene		1.9E-03	-	5.5E-03	-	7.4E-03	0%
Dibenz[a,h]anthracene		1.7E-03	-	4.1E-03	-	5.8E-03	0%
Fluoranthene		8.5E-04	-	4.7E-03	-	5.5E-03	0%
Dibenzofuran		4.8E-04	-	2.6E-03	-	3.1E-03	0%
Acenaphthylene		9.1E-05	-	4.3E-04	-	5.2E-04	0%
Acenaphthene		7.5E-05	-	1.4E-05	-	8.9E-05	0%
Anthracene		8.1E-06	-	5.4E-06	-	1.4E-05	0%
Carbon disulfide	1.3E-05					1.3E-05	0%
Acetone		1.2E-05	-			1.2E-05	0%
4-Methylphenol	1.9E-06					1.9E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**6.6E-02**	**1.2E+01**	**-**	**8.4E+00**	**-**	**2.0E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**58%**		**42%**		**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 2.0E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 3.1E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	6.5E-04	1.1E+00	-	6.7E-02	-	***1.1E+00***	***37%***
Methyl mercury		4.5E-04	-	5.9E-01	-	6.0E-01	***19%***
Mercury	3.8E-05	3.3E-01	-	4.2E-02	-	3.7E-01	***12%***
Aluminum	1.3E-04	1.7E-01	-	9.3E-03	-	1.8E-01	6%
Copper	7.5E-05	1.3E-01	-	1.2E-02	-	1.4E-01	5%
Vanadium	1.3E-04	1.3E-01	-	3.7E-03	-	1.3E-01	4%
Antimony	5.8E-03	7.5E-02	-	3.9E-02	-	1.2E-01	4%
Selenium		1.6E-02	-	4.5E-02	-	6.1E-02	2%
Zinc	6.7E-05	4.3E-02	-	1.7E-02	-	6.1E-02	2%
Lead	7.5E-05	3.5E-02	-	1.5E-02	-	5.0E-02	2%
Barium	5.8E-05	2.5E-02	-	1.4E-02	-	3.9E-02	1%
Arsenic		8.4E-03	-	2.5E-02	-	3.3E-02	1%
Cadmium	1.6E-05	2.5E-03	-	3.0E-02	-	3.3E-02	1%
Nickel	3.0E-05	1.3E-02	-	1.8E-02	-	3.1E-02	1%
Aroclor-1248		2.6E-02	-	8.7E-04	-	2.7E-02	1%
Cobalt		1.3E-02	-	7.6E-03	-	2.0E-02	1%
Aroclor-1254		3.2E-04	-	1.1E-02	-	1.1E-02	0%
Chrysene		1.8E-03	-	5.0E-03	-	6.8E-03	0%
Aroclor-1260		4.0E-03	-	1.3E-03	-	5.3E-03	0%
Benzo[a]anthracene		1.6E-03	-	3.4E-03	-	5.0E-03	0%
Beryllium		2.1E-03	-	2.8E-03	-	4.9E-03	0%
Silver		4.3E-03	-	2.4E-04	-	4.6E-03	0%
Benzo[b]fluoranthene		1.3E-03	-	3.3E-03	-	4.6E-03	0%
Fluorene		6.0E-04	-	3.6E-03	-	4.2E-03	0%
Benzo[k]fluoranthene		1.1E-03	-	2.0E-03	-	3.1E-03	0%
Benzo[a]pyrene		1.3E-03	-	1.7E-03	-	3.0E-03	0%
Indeno[1,2,3-cd]pyrene		7.9E-04	-	1.4E-03	-	2.2E-03	0%
2-Methylnaphthalene		2.2E-04	-	1.2E-03	-	1.4E-03	0%
Naphthalene		8.1E-05	-	1.3E-03	-	1.4E-03	0%
Benzo[ghi]perylene		8.9E-04	-	2.6E-04	-	1.1E-03	0%
Phenanthrene		1.4E-04	-	7.9E-04	-	9.3E-04	0%
Manganese	1.9E-06	6.7E-04	-	1.5E-04	-	8.2E-04	0%
Pyrene		1.9E-04	-	5.5E-04	-	7.4E-04	0%
Dibenz[a,h]anthracene		1.7E-04	-	4.1E-04	-	5.8E-04	0%
Fluoranthene		8.5E-05	-	4.7E-04	-	5.5E-04	0%
Dibenzofuran		4.8E-05	-	2.6E-04	-	3.1E-04	0%
Acenaphthylene		9.1E-06	-	4.3E-05	-	5.2E-05	0%
Acenaphthene		3.7E-05	-	6.9E-06	-	4.4E-05	0%
Acetone		2.3E-06	-			2.3E-06	0%
Anthracene		8.1E-07	-	5.4E-07	-	1.4E-06	0%
Carbon disulfide	1.3E-06					1.3E-06	0%
4-Methylphenol	1.9E-07					1.9E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**7.1E-03**	**2.1E+00**	**-**	**9.8E-01**	**-**	**3.1E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**68%**		**32%**		**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 3.1E+00

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 4.2E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	7.6E-02	2.9E+01	-	2.9E+00	1.6E-02	***3.2E+01***	***76%***
Lead	3.3E-03	1.3E+00	-	1.0E+00	4.5E-03	***2.4E+00***	6%
Methyl mercury		6.3E-04	-	1.5E+00	5.1E-02	***1.6E+00***	4%
Aroclor-1254		2.3E-02	-	1.4E+00	8.2E-03	***1.5E+00***	4%
Vanadium	3.4E-03	1.7E+00	-	9.0E-02	2.5E-03	***1.8E+00***	4%
Arsenic		9.3E-02	-	5.1E-01	1.4E-03	6.1E-01	1%
Cadmium	1.0E-04	1.7E-02	-	3.7E-01	9.7E-05	3.9E-01	1%
Antimony	1.6E-02	1.9E-01	-	1.8E-01	6.5E-03	3.9E-01	1%
Copper	3.5E-04	3.0E-01	-	5.1E-02	7.2E-04	3.5E-01	1%
Selenium		3.5E-02	-	1.8E-01	8.7E-03	2.2E-01	1%
Aroclor-1248		1.9E-01	-	1.2E-02	3.7E-04	2.1E-01	0%
Barium	1.7E-04	5.1E-02	-	5.2E-02	3.8E-04	1.0E-01	0%
Mercury	1.1E-05	7.3E-02	-	1.7E-02	5.8E-04	9.0E-02	0%
Cobalt		3.1E-02	-	3.5E-02	2.6E-04	6.6E-02	0%
Nickel	1.6E-05	8.6E-03	-	2.2E-02	1.9E-05	3.1E-02	0%
Chrysene		4.6E-03	-	2.3E-02	-	2.8E-02	0%
Silver		3.2E-02	-	3.3E-03	4.1E-05	3.5E-02	0%
Benzo[a]anthracene		4.1E-03	-	1.6E-02	-	2.0E-02	0%
Manganese	4.1E-05	1.9E-02	-	7.5E-03	1.2E-04	2.6E-02	0%
Fluorene		1.5E-03	-	1.7E-02	-	1.8E-02	0%
Benzo[b]fluoranthene		3.2E-03	-	1.5E-02	-	1.8E-02	0%
Beryllium		5.2E-03	-	1.3E-02	8.8E-04	1.9E-02	0%
Aroclor-1260		8.2E-03	-	4.8E-03	2.0E-03	1.5E-02	0%
Benzo[k]fluoranthene		2.7E-03	-	9.1E-03	-	1.2E-02	0%
Benzo[a]pyrene		3.3E-03	-	7.7E-03	-	1.1E-02	0%
Zinc	1.9E-05	6.2E-03	-	4.6E-03	3.1E-04	1.1E-02	0%
2-Methylnaphthalene		7.4E-04	-	7.6E-03	-	8.3E-03	0%
Indeno[1,2,3-cd]pyrene		2.0E-03	-	6.3E-03	-	8.3E-03	0%
Naphthalene		2.0E-04	-	6.1E-03	-	6.3E-03	0%
Phenanthrene		3.6E-04	-	3.6E-03	-	4.0E-03	0%
Dibenzofuran		3.5E-04	-	3.6E-03	-	3.9E-03	0%
Benzo[ghi]perylene		2.7E-03	-	1.5E-03	-	4.2E-03	0%
Pyrene		4.7E-04	-	2.5E-03	-	3.0E-03	0%
Fluoranthene		2.1E-04	-	2.2E-03	-	2.4E-03	0%
Dibenz[a,h]anthracene		4.4E-04	-	1.9E-03	-	2.3E-03	0%
Chromium	7.7E-07	4.9E-04	-	5.6E-05	3.5E-07	5.5E-04	0%
Acenaphthylene		1.8E-05	-	1.6E-04	-	1.8E-04	0%
Acenaphthene		1.9E-05	-	6.4E-06	-	2.5E-05	0%
Anthracene		3.1E-06	-	3.8E-06	-	6.8E-06	0%
Acetone		2.9E-06	-			2.9E-06	0%
4-Methylphenol	3.8E-07					3.8E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.0E-01**	**3.3E+01**	**-**	**8.6E+00**	**1.0E-01**	**4.2E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**79%**		**21%**	**0%**	**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 4.2E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 5.5E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	7.6E-03	2.9E+00	-	2.9E-01	1.6E-03	***3.2E+00***	***58%***
Methyl mercury		3.8E-04	-	9.2E-01	3.1E-02	9.5E-01	***17%***
Aroclor-1254		4.7E-03	-	2.9E-01	1.6E-03	2.9E-01	5%
Lead	3.3E-04	1.3E-01	-	1.0E-01	4.5E-04	2.4E-01	4%
Copper	2.7E-04	2.3E-01	-	4.0E-02	5.6E-04	2.7E-01	5%
Selenium		2.1E-02	-	1.1E-01	5.3E-03	1.3E-01	2%
Vanadium	3.4E-04	1.7E-01	-	9.0E-03	2.5E-04	1.8E-01	3%
Arsenic		9.3E-03	-	5.1E-02	1.4E-04	6.1E-02	1%
Cadmium	1.0E-05	1.7E-03	-	3.7E-02	9.7E-06	3.9E-02	1%
Antimony	1.6E-03	1.9E-02	-	1.8E-02	6.5E-04	3.9E-02	1%
Aroclor-1248		3.9E-02	-	2.4E-03	7.4E-05	4.1E-02	1%
Nickel	8.1E-06	4.3E-03	-	1.1E-02	9.3E-06	1.5E-02	0%
Barium	1.7E-05	5.1E-03	-	5.2E-03	3.8E-05	1.0E-02	0%
Mercury	1.1E-06	7.3E-03	-	1.7E-03	5.8E-05	9.0E-03	0%
Manganese	1.3E-05	5.7E-03	-	2.3E-03	3.7E-05	8.1E-03	0%
Cobalt		3.1E-03	-	3.5E-03	2.6E-05	6.6E-03	0%
Chrysene		4.6E-04	-	2.3E-03	-	2.8E-03	0%
Aroclor-1260		1.6E-03	-	9.7E-04	3.9E-04	3.0E-03	0%
Silver		3.2E-03	-	3.3E-04	4.1E-06	3.5E-03	0%
Benzo[a]anthracene		4.1E-04	-	1.6E-03	-	2.0E-03	0%
Fluorene		1.5E-04	-	1.7E-03	-	1.8E-03	0%
Benzo[b]fluoranthene		3.2E-04	-	1.5E-03	-	1.8E-03	0%
Beryllium		5.2E-04	-	1.3E-03	8.8E-05	1.9E-03	0%
Benzo[k]fluoranthene		2.7E-04	-	9.1E-04	-	1.2E-03	0%
Benzo[a]pyrene		3.3E-04	-	7.7E-04	-	1.1E-03	0%
Zinc	1.9E-06	6.2E-04	-	4.6E-04	3.1E-05	1.1E-03	0%
2-Methylnaphthalene		7.4E-05	-	7.6E-04	-	8.3E-04	0%
Indeno[1,2,3-cd]pyrene		2.0E-04	-	6.3E-04	-	8.3E-04	0%
Naphthalene		2.0E-05	-	6.1E-04	-	6.3E-04	0%
Phenanthrene		3.6E-05	-	3.6E-04	-	4.0E-04	0%
Dibenzofuran		3.5E-05	-	3.6E-04	-	3.9E-04	0%
Benzo[ghi]perylene		2.7E-04	-	1.5E-04	-	4.2E-04	0%
Pyrene		4.7E-05	-	2.5E-04	-	3.0E-04	0%
Fluoranthene		2.1E-05	-	2.2E-04	-	2.4E-04	0%
Dibenz[a,h]anthracene		4.4E-05	-	1.9E-04	-	2.3E-04	0%
Chromium	7.7E-08	4.9E-05	-	5.6E-06	3.5E-08	5.5E-05	0%
Acenaphthylene		1.8E-06	-	1.6E-05	-	1.8E-05	0%
Acenaphthene		9.3E-06	-	3.2E-06	-	1.3E-05	0%
Anthracene		3.1E-07	-	3.8E-07	-	6.8E-07	0%
Acetone		5.7E-07	-			5.7E-07	0%
4-Methylphenol	3.8E-08					3.8E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.0E-02**	**3.5E+00**	**-**	**1.9E+00**	**4.2E-02**	**5.5E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**64%**		**35%**	**1%**	**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 5.5E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 3.5E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	1.5E-02	2.4E+01	-	2.4E+00	1.3E-02	***2.7E+01***	***78%***
Lead	2.0E-03	1.1E+00	-	8.9E-01	3.8E-03	***2.0E+00***	6%
Methyl mercury		4.8E-04	-	1.2E+00	3.9E-02	***1.2E+00***	3%
Vanadium	1.4E-03	1.7E+00	-	9.0E-02	2.5E-03	***1.8E+00***	5%
Arsenic		8.6E-02	-	4.8E-01	1.3E-03	5.6E-01	2%
Cadmium	8.9E-05	1.7E-02	-	3.7E-01	9.7E-05	3.9E-01	1%
Aroclor-1254		5.3E-03	-	3.2E-01	1.8E-03	3.3E-01	1%
Antimony	1.2E-02	1.9E-01	-	1.8E-01	6.5E-03	3.9E-01	1%
Selenium		3.1E-02	-	1.5E-01	7.6E-03	1.9E-01	1%
Copper	8.0E-05	1.7E-01	-	3.0E-02	4.2E-04	2.0E-01	1%
Aroclor-1248		1.9E-01	-	1.2E-02	3.7E-04	2.1E-01	1%
Barium	9.5E-05	5.1E-02	-	5.2E-02	3.8E-04	1.0E-01	0%
Mercury	6.9E-06	7.3E-02	-	1.7E-02	5.8E-04	9.0E-02	0%
Cobalt		3.1E-02	-	3.5E-02	2.6E-04	6.6E-02	0%
Nickel	1.6E-05	8.6E-03	-	2.2E-02	1.9E-05	3.1E-02	0%
Chrysene		4.6E-03	-	2.3E-02	-	2.8E-02	0%
Benzo[a]anthracene		4.1E-03	-	1.6E-02	-	2.0E-02	0%
Manganese	4.2E-05	1.9E-02	-	7.5E-03	1.2E-04	2.6E-02	0%
Fluorene		1.5E-03	-	1.7E-02	-	1.8E-02	0%
Benzo[b]fluoranthene		3.2E-03	-	1.5E-02	-	1.8E-02	0%
Beryllium		5.2E-03	-	1.3E-02	8.8E-04	1.9E-02	0%
Benzo[k]fluoranthene		2.7E-03	-	9.1E-03	-	1.2E-02	0%
Benzo[a]pyrene		3.3E-03	-	7.7E-03	-	1.1E-02	0%
Aroclor-1260		6.5E-03	-	3.9E-03	1.6E-03	1.2E-02	0%
Indeno[1,2,3-cd]pyrene		2.0E-03	-	6.3E-03	-	8.3E-03	0%
Silver		1.1E-02	-	1.1E-03	1.4E-05	1.2E-02	0%
Zinc	5.9E-06	4.7E-03	-	3.5E-03	2.3E-04	8.4E-03	0%
Naphthalene		2.0E-04	-	6.1E-03	-	6.3E-03	0%
2-Methylnaphthalene		5.5E-04	-	5.6E-03	-	6.2E-03	0%
Phenanthrene		3.6E-04	-	3.6E-03	-	4.0E-03	0%
Pyrene		4.7E-04	-	2.5E-03	-	3.0E-03	0%
Benzo[ghi]perylene		2.2E-03	-	1.2E-03	-	3.4E-03	0%
Fluoranthene		2.1E-04	-	2.2E-03	-	2.4E-03	0%
Dibenz[a,h]anthracene		4.4E-04	-	1.9E-03	-	2.3E-03	0%
Dibenzofuran		1.2E-04	-	1.2E-03	-	1.3E-03	0%
Chromium	2.4E-07	4.9E-04	-	5.6E-05	3.5E-07	5.5E-04	0%
Acenaphthylene		2.3E-05	-	2.0E-04	-	2.2E-04	0%
Acenaphthene		1.9E-05	-	6.4E-06	-	2.5E-05	0%
Anthracene		2.0E-06	-	2.5E-06	-	4.5E-06	0%
Acetone		2.9E-06	-			2.9E-06	0%
4-Methylphenol	3.8E-07					3.8E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.1E-02**	**2.8E+01**	**-**	**6.4E+00**	**8.1E-02**	**3.5E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**81%**		**18%**	**0%**	**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 3.5E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 4.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	1.5E-03	2.4E+00	-	2.4E-01	1.3E-03	***2.7E+00***	***61%***
Methyl mercury		2.9E-04	-	7.0E-01	2.3E-02	7.2E-01	***17%***
Lead	2.0E-04	1.1E-01	-	8.9E-02	3.8E-04	2.0E-01	5%
Selenium		1.8E-02	-	9.3E-02	4.6E-03	1.2E-01	3%
Vanadium	1.4E-04	1.7E-01	-	9.0E-03	2.5E-04	1.8E-01	4%
Copper	6.2E-05	1.3E-01	-	2.3E-02	3.3E-04	1.6E-01	4%
Aroclor-1254		1.1E-03	-	6.5E-02	3.7E-04	6.6E-02	2%
Arsenic		8.6E-03	-	4.8E-02	1.3E-04	5.6E-02	1%
Cadmium	8.9E-06	1.7E-03	-	3.7E-02	9.7E-06	3.9E-02	1%
Antimony	1.2E-03	1.9E-02	-	1.8E-02	6.5E-04	3.9E-02	1%
Aroclor-1248		3.9E-02	-	2.4E-03	7.4E-05	4.1E-02	1%
Nickel	8.1E-06	4.3E-03	-	1.1E-02	9.3E-06	1.5E-02	0%
Barium	9.5E-06	5.1E-03	-	5.2E-03	3.8E-05	1.0E-02	0%
Mercury	6.9E-07	7.3E-03	-	1.7E-03	5.8E-05	9.0E-03	0%
Manganese	1.3E-05	5.7E-03	-	2.3E-03	3.7E-05	8.1E-03	0%
Cobalt		3.1E-03	-	3.5E-03	2.6E-05	6.6E-03	0%
Chrysene		4.6E-04	-	2.3E-03	-	2.8E-03	0%
Aroclor-1260		1.3E-03	-	7.8E-04	3.1E-04	2.4E-03	0%
Benzo[a]anthracene		4.1E-04	-	1.6E-03	-	2.0E-03	0%
Fluorene		1.5E-04	-	1.7E-03	-	1.8E-03	0%
Benzo[b]fluoranthene		3.2E-04	-	1.5E-03	-	1.8E-03	0%
Beryllium		5.2E-04	-	1.3E-03	8.8E-05	1.9E-03	0%
Benzo[k]fluoranthene		2.7E-04	-	9.1E-04	-	1.2E-03	0%
Benzo[a]pyrene		3.3E-04	-	7.7E-04	-	1.1E-03	0%
Indeno[1,2,3-cd]pyrene		2.0E-04	-	6.3E-04	-	8.3E-04	0%
Silver		1.1E-03	-	1.1E-04	1.4E-06	1.2E-03	0%
Zinc	5.9E-07	4.7E-04	-	3.5E-04	2.3E-05	8.4E-04	0%
Naphthalene		2.0E-05	-	6.1E-04	-	6.3E-04	0%
2-Methylnaphthalene		5.5E-05	-	5.6E-04	-	6.2E-04	0%
Phenanthrene		3.6E-05	-	3.6E-04	-	4.0E-04	0%
Pyrene		4.7E-05	-	2.5E-04	-	3.0E-04	0%
Benzo[ghi]perylene		2.2E-04	-	1.2E-04	-	3.4E-04	0%
Fluoranthene		2.1E-05	-	2.2E-04	-	2.4E-04	0%
Dibenz[a,h]anthracene		4.4E-05	-	1.9E-04	-	2.3E-04	0%
Dibenzofuran		1.2E-05	-	1.2E-04	-	1.3E-04	0%
Chromium	2.4E-08	4.9E-05	-	5.6E-06	3.5E-08	5.5E-05	0%
Acenaphthylene		2.3E-06	-	2.0E-05	-	2.2E-05	0%
Acenaphthene		9.3E-06	-	3.2E-06	-	1.3E-05	0%
Anthracene		2.0E-07	-	2.5E-07	-	4.5E-07	0%
Acetone		5.7E-07	-			5.7E-07	0%
4-Methylphenol	3.8E-08					3.8E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.2E-03**	**3.0E+00**	**-**	**1.4E+00**	**3.2E-02**	**4.4E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**68%**		**31%**	**1%**	**100%**	

TABLE T-3.9
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: Tidal Flats - CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 4.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	1.8E-05	1.1E+00	3.7E-02	5.0E-03	-	***1.2E+00***	***81%***
2-Methylnaphthalene		1.3E-04	6.4E-02	4.5E-05	-	6.4E-02	4%
Antimony		3.9E-02	8.1E-03	8.7E-03	-	5.5E-02	4%
Methyl mercury		2.0E-05	2.6E-05	5.4E-02	-	5.4E-02	4%
Lead	8.4E-07	2.4E-02	6.9E-03	1.2E-03	-	3.2E-02	2%
Zinc	1.5E-06	3.6E-03	1.7E-02	4.1E-03	-	2.5E-02	2%
Copper	3.5E-07	8.2E-03	2.6E-03	4.1E-04	-	1.1E-02	1%
Aluminum	8.6E-07	8.4E-03	2.6E-04	5.9E-05	-	8.7E-03	1%
Cadmium		1.3E-03	2.8E-03	1.8E-04	-	4.3E-03	0%
Aroclor-1260		1.2E-03	2.3E-03	3.9E-04	-	3.8E-03	0%
Mercury		1.9E-04	2.4E-04	2.2E-03	-	2.6E-03	0%
Selenium		3.6E-04	3.0E-04	1.2E-03	-	1.8E-03	0%
Aroclor-1254		4.2E-04	8.4E-04	1.5E-04	-	1.4E-03	0%
Nickel	8.6E-08	1.1E-03	8.1E-05	1.5E-04	-	1.3E-03	0%
Arsenic		1.9E-04	2.9E-04	5.1E-04	-	9.9E-04	0%
Barium	3.0E-07	4.5E-04	5.9E-05	3.8E-04	-	8.9E-04	0%
Total Cyanide		1.2E-04	6.3E-04	-	-	7.5E-04	0%
Chrysene		5.1E-04	1.1E-05	8.9E-05	-	6.1E-04	0%
Benzo[b]fluoranthene		5.1E-04	6.2E-06	8.4E-05	-	6.0E-04	0%
Benzo[a]anthracene		5.2E-04	1.1E-05	6.8E-05	-	6.0E-04	0%
Benzo[a]pyrene		4.5E-04	6.2E-06	3.7E-05	-	4.9E-04	0%
Vanadium		2.7E-04	1.5E-06	1.3E-04	-	4.0E-04	0%
Benzo[k]fluoranthene		2.8E-04	3.3E-06	3.2E-05	-	3.1E-04	0%
Indeno[1,2,3-cd]pyrene		2.6E-04	1.6E-06	2.8E-05	-	2.9E-04	0%
Benzo[ghi]perylene		2.2E-04	1.3E-06	4.0E-06	-	2.2E-04	0%
Silver		1.3E-04	5.4E-05	2.1E-05	-	2.0E-04	0%
Beryllium		1.4E-04	1.4E-06		-	1.4E-04	0%
Fluorene		7.6E-05	1.2E-05	2.9E-05	-	1.2E-04	0%
Pyrene		8.2E-05	2.9E-06	1.5E-05	-	1.0E-04	0%
Manganese	1.3E-07	5.5E-05	3.7E-05	2.8E-06	-	9.5E-05	0%
Phenanthrene		4.8E-05	4.9E-06	1.7E-05	-	7.0E-05	0%
Fluoranthene		3.8E-05	2.1E-06	1.3E-05	-	5.4E-05	0%
Dibenz[a,h]anthracene		3.9E-05	2.8E-07	5.8E-06	-	4.5E-05	0%
Naphthalene		1.4E-05	4.7E-06	1.5E-05	-	3.3E-05	0%
Acenaphthene		4.4E-06	9.8E-07	5.2E-08	-	5.4E-06	0%
Acetone		2.9E-06	-		-	2.9E-06	0%
Anthracene		1.8E-07	1.8E-08	7.7E-09	-	2.1E-07	0%
Carbon disulfide		3.2E-08	-		-	3.2E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**2.2E-05**	**1.2E+00**	**1.4E-01**	**8.0E-02**	**-**	**1.4E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**84%**	**10%**	**6%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 2.7E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	3.7E-06	2.2E-01	7.4E-03	1.0E-03	-	2.3E-01	***86%***
Copper	2.7E-07	6.2E-03	1.9E-03	3.1E-04	-	8.5E-03	3%
2-Methylnaphthalene		1.3E-05	6.4E-03	4.5E-06	-	6.4E-03	2%
Antimony		3.9E-03	8.1E-04	8.7E-04	-	5.5E-03	2%
Methyl mercury		2.0E-06	2.6E-06	5.4E-03	-	5.4E-03	2%
Lead	8.4E-08	2.4E-03	6.9E-04	1.2E-04	-	3.2E-03	1%
Zinc	1.6E-07	3.9E-04	1.9E-03	4.6E-04	-	2.7E-03	1%
Mercury		9.3E-05	1.2E-04	1.1E-03	-	1.3E-03	0%
Nickel	6.2E-08	8.0E-04	5.8E-05	1.1E-04	-	9.6E-04	0%
Selenium		1.8E-04	1.5E-04	5.8E-04	-	9.1E-04	0%
Aluminum	8.6E-08	8.4E-04	2.6E-05	5.9E-06	-	8.7E-04	0%
Barium	1.5E-07	2.2E-04	2.9E-05	1.9E-04	-	4.4E-04	0%
Arsenic		7.4E-05	1.2E-04	2.0E-04	-	3.9E-04	0%
Aroclor-1260		1.2E-04	2.3E-04	3.9E-05	-	3.8E-04	0%
Cadmium		9.5E-05	2.0E-04	1.3E-05	-	3.1E-04	0%
Aroclor-1254		4.2E-05	8.4E-05	1.5E-05	-	1.4E-04	0%
Total Cyanide		1.2E-05	6.3E-05	-	-	7.5E-05	0%
Chrysene		5.1E-05	1.1E-06	8.9E-06	-	6.1E-05	0%
Benzo[b]fluoranthene		5.1E-05	6.2E-07	8.4E-06	-	6.0E-05	0%
Benzo[a]anthracene		5.2E-05	1.1E-06	6.8E-06	-	6.0E-05	0%
Benzo[a]pyrene		4.5E-05	6.2E-07	3.7E-06	-	4.9E-05	0%
Vanadium		2.7E-05	1.5E-07	1.3E-05	-	4.0E-05	0%
Benzo[k]fluoranthene		2.8E-05	3.3E-07	3.2E-06	-	3.1E-05	0%
Indeno[1,2,3-cd]pyrene		2.6E-05	1.6E-07	2.8E-06	-	2.9E-05	0%
Benzo[ghi]perylene		2.2E-05	1.3E-07	4.0E-07	-	2.2E-05	0%
Silver		1.3E-05	5.4E-06	2.1E-06	-	2.0E-05	0%
Beryllium		1.4E-05	1.4E-07		-	1.4E-05	0%
Fluorene		7.6E-06	1.2E-06	2.9E-06	-	1.2E-05	0%
Pyrene		8.2E-06	2.9E-07	1.5E-06	-	1.0E-05	0%
Manganese	1.3E-08	5.5E-06	3.7E-06	2.8E-07	-	9.5E-06	0%
Phenanthrene		4.8E-06	4.9E-07	1.7E-06	-	7.0E-06	0%
Fluoranthene		3.8E-06	2.1E-07	1.3E-06	-	5.4E-06	0%
Dibenz[a,h]anthracene		3.9E-06	2.8E-08	5.8E-07	-	4.5E-06	0%
Naphthalene		1.4E-06	4.7E-07	1.5E-06	-	3.3E-06	0%
Acenaphthene		2.2E-06	4.9E-07	2.6E-08	-	2.7E-06	0%
Acetone		5.8E-07	-		-	5.8E-07	0%
Anthracene		1.8E-08	1.8E-09	7.7E-10	-	2.1E-08	0%
Carbon disulfide		3.2E-09	-		-	3.2E-09	0%
TOTAL MEDIUM-SPECIFIC RISK	**4.5E-06**	**2.4E-01**	**2.0E-02**	**1.1E-02**	**-**	**2.7E-01**	
PERCENTAGE OF TOTAL RISK	**0%**	**89%**	**7%**	**4%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 2.7E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 5.7E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	1.8E-05	3.7E-01	1.2E-02	1.6E-03	-	3.8E-01	***67%***
2-Methylnaphthalene		1.3E-04	6.4E-02	4.5E-05	-	6.4E-02	***11%***
Methyl mercury		1.7E-05	2.2E-05	4.6E-02	-	4.6E-02	8%
Antimony		1.5E-02	3.2E-03	3.4E-03	-	2.2E-02	4%
Lead	8.4E-07	1.1E-02	3.3E-03	5.9E-04	-	1.5E-02	3%
Zinc	1.5E-06	1.7E-03	8.3E-03	2.0E-03	-	1.2E-02	2%
Aluminum	8.6E-07	6.7E-03	2.1E-04	4.7E-05	-	7.0E-03	1%
Copper	3.5E-07	2.9E-03	9.1E-04	1.5E-04	-	4.0E-03	1%
Aroclor-1260		1.2E-03	2.3E-03	3.9E-04	-	3.8E-03	1%
Cadmium		5.6E-04	1.2E-03	7.7E-05	-	1.8E-03	0%
Aroclor-1254		4.2E-04	8.4E-04	1.5E-04	-	1.4E-03	0%
Selenium		2.7E-04	2.2E-04	8.5E-04	-	1.3E-03	0%
Mercury		8.0E-05	1.0E-04	9.6E-04	-	1.1E-03	0%
Arsenic		1.3E-04	2.1E-04	3.6E-04	-	7.0E-04	0%
Chrysene		5.1E-04	1.1E-05	8.9E-05	-	6.1E-04	0%
Benzo[b]fluoranthene		5.1E-04	6.2E-06	8.4E-05	-	6.0E-04	0%
Benzo[a]anthracene		5.2E-04	1.1E-05	6.8E-05	-	6.0E-04	0%
Barium	3.0E-07	2.8E-04	3.7E-05	2.4E-04	-	5.6E-04	0%
Benzo[a]pyrene		4.5E-04	6.2E-06	3.7E-05	-	4.9E-04	0%
Total Cyanide		6.6E-05	3.4E-04	-	-	4.1E-04	0%
Nickel	8.6E-08	3.3E-04	2.4E-05	4.5E-05	-	4.0E-04	0%
Vanadium		2.2E-04	1.2E-06	1.1E-04	-	3.2E-04	0%
Benzo[k]fluoranthene		2.8E-04	3.3E-06	3.2E-05	-	3.1E-04	0%
Indeno[1,2,3-cd]pyrene		2.6E-04	1.6E-06	2.8E-05	-	2.9E-04	0%
Benzo[ghi]perylene		2.2E-04	1.3E-06	4.0E-06	-	2.2E-04	0%
Silver		8.1E-05	3.4E-05	1.3E-05	-	1.3E-04	0%
Fluorene		7.6E-05	1.2E-05	2.9E-05	-	1.2E-04	0%
Pyrene		8.2E-05	2.9E-06	1.5E-05	-	1.0E-04	0%
Beryllium		7.8E-05	8.1E-07		-	7.9E-05	0%
Phenanthrene		4.8E-05	4.9E-06	1.7E-05	-	7.0E-05	0%
Fluoranthene		3.8E-05	2.1E-06	1.3E-05	-	5.4E-05	0%
Manganese	1.3E-07	2.7E-05	1.8E-05	1.4E-06	-	4.7E-05	0%
Dibenz[a,h]anthracene		3.9E-05	2.8E-07	5.8E-06	-	4.5E-05	0%
Naphthalene		1.4E-05	4.7E-06	1.5E-05	-	3.3E-05	0%
Acenaphthene		4.4E-06	9.8E-07	5.2E-08	-	5.4E-06	0%
Acetone		2.9E-06	-		-	2.9E-06	0%
Anthracene		1.8E-07	1.8E-08	7.7E-09	-	2.1E-07	0%
Carbon disulfide		3.2E-08	-		-	3.2E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**2.2E-05**	**4.1E-01**	**9.7E-02**	**5.7E-02**	**-**	**5.7E-01**	
PERCENTAGE OF TOTAL RISK	**0%**	**73%**	**17%**	**10%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 5.7E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.0E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	3.7E-06	7.4E-02	2.4E-03	3.3E-04	-	7.7E-02	***77%***
2-Methylnaphthalene		1.3E-05	6.4E-03	4.5E-06	-	6.4E-03	6%
Methyl mercury		1.7E-06	2.2E-06	4.6E-03	-	4.6E-03	5%
Copper	2.7E-07	2.2E-03	6.9E-04	1.1E-04	-	3.0E-03	3%
Antimony		1.5E-03	3.2E-04	3.4E-04	-	2.2E-03	2%
Lead	8.4E-08	1.1E-03	3.3E-04	5.9E-05	-	1.5E-03	2%
Zinc	1.6E-07	1.9E-04	9.2E-04	2.2E-04	-	1.3E-03	1%
Aluminum	8.6E-08	6.7E-04	2.1E-05	4.7E-06	-	7.0E-04	1%
Selenium		1.3E-04	1.1E-04	4.2E-04	-	6.7E-04	1%
Mercury		4.0E-05	5.2E-05	4.8E-04	-	5.7E-04	1%
Aroclor-1260		1.2E-04	2.3E-04	3.9E-05	-	3.8E-04	0%
Nickel	6.2E-08	2.4E-04	1.8E-05	3.3E-05	-	2.9E-04	0%
Barium	1.5E-07	1.4E-04	1.9E-05	1.2E-04	-	2.8E-04	0%
Arsenic		5.3E-05	8.3E-05	1.5E-04	-	2.8E-04	0%
Aroclor-1254		4.2E-05	8.4E-05	1.5E-05	-	1.4E-04	0%
Cadmium		4.1E-05	8.6E-05	5.6E-06	-	1.3E-04	0%
Chrysene		5.1E-05	1.1E-06	8.9E-06	-	6.1E-05	0%
Benzo[b]fluoranthene		5.1E-05	6.2E-07	8.4E-06	-	6.0E-05	0%
Benzo[a]anthracene		5.2E-05	1.1E-06	6.8E-06	-	6.0E-05	0%
Benzo[a]pyrene		4.5E-05	6.2E-07	3.7E-06	-	4.9E-05	0%
Total Cyanide		6.6E-06	3.4E-05	-	-	4.1E-05	0%
Vanadium		2.2E-05	1.2E-07	1.1E-05	-	3.2E-05	0%
Benzo[k]fluoranthene		2.8E-05	3.3E-07	3.2E-06	-	3.1E-05	0%
Indeno[1,2,3-cd]pyrene		2.6E-05	1.6E-07	2.8E-06	-	2.9E-05	0%
Benzo[ghi]perylene		2.2E-05	1.3E-07	4.0E-07	-	2.2E-05	0%
Silver		8.1E-06	3.4E-06	1.3E-06	-	1.3E-05	0%
Fluorene		7.6E-06	1.2E-06	2.9E-06	-	1.2E-05	0%
Pyrene		8.2E-06	2.9E-07	1.5E-06	-	1.0E-05	0%
Beryllium		7.8E-06	8.1E-08		-	7.9E-06	0%
Phenanthrene		4.8E-06	4.9E-07	1.7E-06	-	7.0E-06	0%
Fluoranthene		3.8E-06	2.1E-07	1.3E-06	-	5.4E-06	0%
Manganese	1.3E-08	2.7E-06	1.8E-06	1.4E-07	-	4.7E-06	0%
Dibenz[a,h]anthracene		3.9E-06	2.8E-08	5.8E-07	-	4.5E-06	0%
Naphthalene		1.4E-06	4.7E-07	1.5E-06	-	3.3E-06	0%
Acenaphthene		2.2E-06	4.9E-07	2.6E-08	-	2.7E-06	0%
Acetone		5.8E-07	-		-	5.8E-07	0%
Anthracene		1.8E-08	1.8E-09	7.7E-10	-	2.1E-08	0%
Carbon disulfide		3.2E-09	-		-	3.2E-09	0%
TOTAL MEDIUM-SPECIFIC RISK	**4.5E-06**	**8.1E-02**	**1.2E-02**	**7.0E-03**	**-**	**1.0E-01**	
PERCENTAGE OF TOTAL RISK	**0%**	**81%**	**12%**	**7%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.0E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: HERON
TOTAL RISK (HI): 5.7E+02

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
Chromium	1.3E-03	8.3E+01	-	2.5E-02	4.4E+02	***5.3E+02***	***93%***
Zinc	1.1E-04	2.6E-01	-	2.1E-02	1.1E+01	***1.1E+01***	2%
Copper	2.6E-05	6.0E-01	-	2.1E-03	6.9E+00	***7.5E+00***	1%
Antimony		2.9E+00	-	4.4E-02	2.7E+00	***5.6E+00***	1%
Mercury		1.4E-02	-	1.1E-02	4.4E+00	***4.5E+00***	1%
Cadmium		9.7E-02	-	9.1E-04	3.9E+00	***4.0E+00***	1%
Aluminum	6.2E-05	6.2E-01	-	3.0E-04	8.9E-01	***1.5E+00***	0%
Methyl mercury		1.5E-03	-	2.8E-01	4.8E-01	7.6E-01	0%
Vanadium		2.1E-01	-	6.9E-03	4.9E-01	7.0E-01	0%
Lead	1.8E-05	5.1E-01	-	1.9E-03	1.5E-01	6.6E-01	0%
Benzo[a]anthracene		3.9E-02	-	3.5E-04	5.3E-01	5.7E-01	0%
Chrysene		3.8E-02	-	4.5E-04	5.3E-01	5.7E-01	0%
Benzo[b]fluoranthene		3.8E-02	-	4.3E-04	5.3E-01	5.7E-01	0%
Nickel	6.2E-06	8.2E-02	-	7.5E-04	4.7E-01	5.5E-01	0%
Benzo[a]pyrene		3.3E-02	-	1.9E-04	4.6E-01	5.0E-01	0%
Selenium		3.0E-02	-	6.7E-03	4.3E-01	4.7E-01	0%
Benzo[k]fluoranthene		2.1E-02	-	1.6E-04	2.9E-01	3.1E-01	0%
Indeno[1,2,3-cd]pyrene		1.9E-02	-	1.4E-04	2.6E-01	2.8E-01	0%
Benzo[ghi]perylene		1.6E-02	-	2.0E-05	2.2E-01	2.4E-01	0%
Aroclor-1260		8.6E-02	-	2.0E-03	6.2E-02	1.5E-01	0%
2-Methylnaphthalene		9.4E-03	-	2.3E-04	1.3E-01	1.4E-01	0%
Pyrene		6.1E-03	-	7.8E-05	8.5E-02	9.1E-02	0%
Fluorene		5.7E-03	-	1.5E-04	7.8E-02	8.4E-02	0%
Phenanthrene		3.6E-03	-	8.6E-05	4.9E-02	5.3E-02	0%
Dibenz[a,h]anthracene		2.9E-03	-	2.9E-05	4.0E-02	4.3E-02	0%
Arsenic		1.4E-02	-	2.6E-03	2.6E-02	4.2E-02	0%
Fluoranthene		2.8E-03	-	6.8E-05	3.9E-02	4.2E-02	0%
Barium	2.1E-05	3.3E-02	-	1.9E-03	4.7E-03	4.0E-02	0%
Silver		9.5E-03	-	1.1E-04	2.7E-02	3.7E-02	0%
Beryllium		1.0E-02	-		9.6E-03	2.0E-02	0%
Naphthalene		1.0E-03	-	7.4E-05	1.4E-02	1.5E-02	0%
Aroclor-1254		6.3E-03	-	1.6E-04	4.5E-03	1.1E-02	0%
Total Cyanide		8.9E-03	-	-	-	8.9E-03	0%
Manganese	9.3E-06	4.1E-03	-	1.4E-05	1.5E-03	5.6E-03	0%
Acenaphthene		3.2E-04	-	2.6E-07	4.5E-03	4.8E-03	0%
Acetone		2.2E-04	-		-	2.2E-04	0%
Anthracene		1.3E-05	-	3.9E-08	1.9E-04	2.0E-04	0%
Carbon disulfide		2.3E-06	-		-	2.3E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.6E-03**	**8.9E+01**	**-**	**4.1E-01**	**4.8E+02**	**5.7E+02**	
PERCENTAGE OF TOTAL RISK	**0%**	**16%**		**0%**	**84%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: HERON
TOTAL RISK (HI): 5.7E+02

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: HERON
TOTAL RISK (HI): 1.2E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	2.7E-04	1.7E+01	-	5.1E-03	8.9E+01	***1.1E+02***	***90%***
Copper	2.0E-05	4.6E-01	-	1.6E-03	5.2E+00	***5.7E+00***	5%
Mercury		6.9E-03	-	5.6E-03	2.2E+00	***2.2E+00***	2%
Zinc	1.2E-05	2.9E-02	-	2.3E-03	1.2E+00	***1.2E+00***	1%
Antimony		2.9E-01	-	4.4E-03	2.7E-01	5.6E-01	0%
Nickel	4.5E-06	5.9E-02	-	5.4E-04	3.4E-01	4.0E-01	0%
Cadmium		7.0E-03	-	6.6E-05	2.8E-01	2.9E-01	0%
Aluminum	6.2E-06	6.2E-02	-	3.0E-05	8.9E-02	1.5E-01	0%
Selenium		8.9E-03	-	2.0E-03	1.3E-01	1.4E-01	0%
Methyl mercury		1.5E-04	-	2.8E-02	4.8E-02	7.6E-02	0%
Vanadium		2.1E-02	-	6.9E-04	4.9E-02	7.0E-02	0%
Lead	1.8E-06	5.1E-02	-	1.9E-04	1.5E-02	6.6E-02	0%
Benzo[a]anthracene		3.9E-03	-	3.5E-05	5.3E-02	5.7E-02	0%
Chrysene		3.8E-03	-	4.5E-05	5.3E-02	5.7E-02	0%
Benzo[b]fluoranthene		3.8E-03	-	4.3E-05	5.3E-02	5.7E-02	0%
Benzo[a]pyrene		3.3E-03	-	1.9E-05	4.6E-02	5.0E-02	0%
Benzo[k]fluoranthene		2.1E-03	-	1.6E-05	2.9E-02	3.1E-02	0%
Indeno[1,2,3-cd]pyrene		1.9E-03	-	1.4E-05	2.6E-02	2.8E-02	0%
Benzo[ghi]perylene		1.6E-03	-	2.0E-06	2.2E-02	2.4E-02	0%
Barium	1.1E-05	1.7E-02	-	9.7E-04	2.4E-03	2.0E-02	0%
Arsenic		5.5E-03	-	1.0E-03	1.0E-02	1.7E-02	0%
Aroclor-1260		8.6E-03	-	2.0E-04	6.2E-03	1.5E-02	0%
2-Methylnaphthalene		9.4E-04	-	2.3E-05	1.3E-02	1.4E-02	0%
Pyrene		6.1E-04	-	7.8E-06	8.5E-03	9.1E-03	0%
Fluorene		5.7E-04	-	1.5E-05	7.8E-03	8.4E-03	0%
Phenanthrene		3.6E-04	-	8.6E-06	4.9E-03	5.3E-03	0%
Dibenz[a,h]anthracene		2.9E-04	-	2.9E-06	4.0E-03	4.3E-03	0%
Fluoranthene		2.8E-04	-	6.8E-06	3.9E-03	4.2E-03	0%
Silver		9.5E-04	-	1.1E-05	2.7E-03	3.7E-03	0%
Acenaphthene		1.6E-04	-	1.3E-07	2.2E-03	2.4E-03	0%
Beryllium		1.0E-03	-		9.6E-04	2.0E-03	0%
Naphthalene		1.0E-04	-	7.4E-06	1.4E-03	1.5E-03	0%
Aroclor-1254		6.3E-04	-	1.6E-05	4.5E-04	1.1E-03	0%
Total Cyanide		8.9E-04	-	-	-	8.9E-04	0%
Manganese	9.3E-07	4.1E-04	-	1.4E-06	1.5E-04	5.6E-04	0%
Acetone		4.3E-05	-		-	4.3E-05	0%
Anthracene		1.3E-06	-	3.9E-09	1.9E-05	2.0E-05	0%
Carbon disulfide		2.3E-07	-		-	2.3E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.2E-04**	**1.8E+01**	**-**	**5.3E-02**	**9.9E+01**	**1.2E+02**	
PERCENTAGE OF TOTAL RISK	**0%**	**15%**		**0%**	**85%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: HERON
TOTAL RISK (HI): 1.2E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: HERON
TOTAL RISK (HI): 1.9E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	6.1E-04	2.7E+01	-	8.4E-03	1.5E+02	***1.7E+02***	***90%***
Zinc	5.2E-05	1.3E-01	-	1.0E-02	5.1E+00	***5.3E+00***	3%
Copper	1.5E-05	2.2E-01	-	7.5E-04	2.5E+00	***2.7E+00***	1%
Antimony		1.1E+00	-	1.7E-02	1.1E+00	***2.2E+00***	1%
Mercury		6.0E-03	-	4.9E-03	1.9E+00	***1.9E+00***	1%
Cadmium		4.1E-02	-	3.9E-04	1.7E+00	***1.7E+00***	1%
Aluminum	5.7E-05	5.0E-01	-	2.4E-04	7.1E-01	***1.2E+00***	1%
Methyl mercury		1.3E-03	-	2.3E-01	4.1E-01	6.4E-01	0%
Vanadium		1.7E-01	-	5.6E-03	3.9E-01	5.7E-01	0%
Selenium		2.2E-02	-	4.9E-03	3.2E-01	3.5E-01	0%
Lead	1.4E-05	2.4E-01	-	8.7E-04	6.9E-02	3.1E-01	0%
Nickel	3.5E-06	2.5E-02	-	2.3E-04	1.4E-01	1.7E-01	0%
Chrysene		1.1E-02	-	1.3E-04	1.5E-01	1.6E-01	0%
Benzo[a]anthracene		1.1E-02	-	9.5E-05	1.5E-01	1.6E-01	0%
Benzo[b]fluoranthene		1.0E-02	-	1.2E-04	1.4E-01	1.6E-01	0%
Benzo[a]pyrene		9.2E-03	-	5.2E-05	1.3E-01	1.4E-01	0%
Indeno[1,2,3-cd]pyrene		6.6E-03	-	5.0E-05	9.2E-02	9.9E-02	0%
Benzo[k]fluoranthene		5.8E-03	-	4.6E-05	8.1E-02	8.7E-02	0%
Benzo[ghi]perylene		5.8E-03	-	7.3E-06	8.0E-02	8.6E-02	0%
Aroclor-1260		3.4E-02	-	7.8E-04	2.4E-02	5.9E-02	0%
2-Methylnaphthalene		2.7E-03	-	6.5E-05	3.7E-02	4.0E-02	0%
Arsenic		9.8E-03	-	1.8E-03	1.9E-02	3.0E-02	0%
Fluorene		2.0E-03	-	5.1E-05	2.7E-02	2.9E-02	0%
Barium	1.5E-05	2.1E-02	-	1.2E-03	3.0E-03	2.5E-02	0%
Pyrene		1.6E-03	-	2.1E-05	2.3E-02	2.4E-02	0%
Silver		6.0E-03	-	6.7E-05	1.7E-02	2.3E-02	0%
Dibenz[a,h]anthracene		1.3E-03	-	1.3E-05	1.7E-02	1.9E-02	0%
Phenanthrene		1.2E-03	-	2.9E-05	1.7E-02	1.8E-02	0%
Fluoranthene		7.6E-04	-	1.8E-05	1.1E-02	1.1E-02	0%
Beryllium		5.8E-03	-		5.5E-03	1.1E-02	0%
Naphthalene		4.3E-04	-	3.1E-05	6.0E-03	6.4E-03	0%
Total Cyanide		4.9E-03	-	-	-	4.9E-03	0%
Aroclor-1254		1.6E-03	-	4.0E-05	1.2E-03	2.8E-03	0%
Manganese	7.1E-06	2.0E-03	-	7.0E-06	7.6E-04	2.8E-03	0%
Acenaphthene		1.2E-04	-	9.4E-08	1.6E-03	1.7E-03	0%
Acetone		1.2E-04	-		-	1.2E-04	0%
Anthracene		4.1E-06	-	1.2E-08	5.7E-05	6.1E-05	0%
Carbon disulfide		1.8E-06	-		-	1.8E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**7.7E-04**	**3.0E+01**	**-**	**2.9E-01**	**1.6E+02**	**1.9E+02**	
PERCENTAGE OF TOTAL RISK	**0%**	**16%**		**0%**	**84%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: HERON
TOTAL RISK (HI): 1.9E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: HERON
TOTAL RISK (HI): 3.9E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	1.2E-04	5.5E+00	-	1.7E-03	2.9E+01	***3.5E+01***	***88%***
Copper	1.1E-05	1.6E-01	-	5.7E-04	1.9E+00	***2.0E+00***	5%
Mercury		3.0E-03	-	2.4E-03	9.6E-01	9.7E-01	2%
Zinc	5.8E-06	1.4E-02	-	1.1E-03	5.7E-01	5.8E-01	1%
Antimony		1.1E-01	-	1.7E-03	1.1E-01	2.2E-01	1%
Cadmium		3.0E-03	-	2.8E-05	1.2E-01	1.2E-01	0%
Aluminum	5.7E-06	5.0E-02	-	2.4E-05	7.1E-02	1.2E-01	0%
Nickel	2.6E-06	1.8E-02	-	1.7E-04	1.0E-01	1.2E-01	0%
Selenium		6.5E-03	-	1.4E-03	9.3E-02	1.0E-01	0%
Methyl mercury		1.3E-04	-	2.3E-02	4.1E-02	6.4E-02	0%
Vanadium		1.7E-02	-	5.6E-04	3.9E-02	5.7E-02	0%
Lead	1.4E-06	2.4E-02	-	8.7E-05	6.9E-03	3.1E-02	0%
Chrysene		1.1E-03	-	1.3E-05	1.5E-02	1.6E-02	0%
Benzo[a]anthracene		1.1E-03	-	9.5E-06	1.5E-02	1.6E-02	0%
Benzo[b]fluoranthene		1.0E-03	-	1.2E-05	1.4E-02	1.6E-02	0%
Benzo[a]pyrene		9.2E-04	-	5.2E-06	1.3E-02	1.4E-02	0%
Barium	7.7E-06	1.1E-02	-	6.1E-04	1.5E-03	1.3E-02	0%
Arsenic		3.9E-03	-	7.4E-04	7.4E-03	1.2E-02	0%
Indeno[1,2,3-cd]pyrene		6.6E-04	-	5.0E-06	9.2E-03	9.9E-03	0%
Benzo[k]fluoranthene		5.8E-04	-	4.6E-06	8.1E-03	8.7E-03	0%
Benzo[ghi]perylene		5.8E-04	-	7.3E-07	8.0E-03	8.6E-03	0%
Aroclor-1260		3.4E-03	-	7.8E-05	2.4E-03	5.9E-03	0%
2-Methylnaphthalene		2.7E-04	-	6.5E-06	3.7E-03	4.0E-03	0%
Fluorene		2.0E-04	-	5.1E-06	2.7E-03	2.9E-03	0%
Pyrene		1.6E-04	-	2.1E-06	2.3E-03	2.4E-03	0%
Silver		6.0E-04	-	6.7E-06	1.7E-03	2.3E-03	0%
Dibenz[a,h]anthracene		1.3E-04	-	1.3E-06	1.7E-03	1.9E-03	0%
Phenanthrene		1.2E-04	-	2.9E-06	1.7E-03	1.8E-03	0%
Fluoranthene		7.6E-05	-	1.8E-06	1.1E-03	1.1E-03	0%
Beryllium		5.8E-04	-		5.5E-04	1.1E-03	0%
Acenaphthene		5.8E-05	-	4.7E-08	8.1E-04	8.6E-04	0%
Naphthalene		4.3E-05	-	3.1E-06	6.0E-04	6.4E-04	0%
Total Cyanide		4.9E-04	-	-	-	4.9E-04	0%
Aroclor-1254		1.6E-04	-	4.0E-06	1.2E-04	2.8E-04	0%
Manganese	7.1E-07	2.0E-04	-	7.0E-07	7.6E-05	2.8E-04	0%
Acetone		2.4E-05	-		-	2.4E-05	0%
Anthracene		4.1E-07	-	1.2E-09	5.7E-06	6.1E-06	0%
Carbon disulfide		1.8E-07	-		-	1.8E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.6E-04**	**5.9E+00**	**-**	**3.5E-02**	**3.3E+01**	**3.9E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**15%**		**0%**	**85%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: HERON
TOTAL RISK (HI): 3.9E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 3.7E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	4.8E-03	3.4E+02	-	5.7E-01	-	***3.4E+02***	***91%***
Methyl mercury		6.2E-03	-	6.2E+00	-	***6.2E+00***	2%
Antimony		1.2E+01	-	9.9E-01	-	***1.3E+01***	3%
Zinc	3.8E-04	1.1E+00	-	4.7E-01	-	***1.6E+00***	0%
Copper	9.1E-05	2.5E+00	-	4.7E-02	-	***2.5E+00***	1%
Aluminum	2.2E-04	2.6E+00	-	6.7E-03	-	***2.6E+00***	1%
Lead	6.4E-05	2.1E+00	-	4.2E-02	-	***2.2E+00***	1%
Vanadium		8.4E-01	-	1.6E-01	-	***1.0E+00***	0%
Mercury		5.6E-02	-	2.5E-01	-	3.1E-01	0%
Selenium		1.2E-01	-	1.5E-01	-	2.8E-01	0%
Aroclor-1260		3.5E-01	-	4.4E-02	-	4.0E-01	0%
Cadmium		4.0E-01	-	2.1E-02	-	4.2E-01	0%
Nickel	2.2E-05	3.4E-01	-	1.7E-02	-	3.5E-01	0%
Barium	7.6E-05	1.4E-01	-	4.4E-02	-	1.8E-01	0%
Arsenic		5.6E-02	-	5.8E-02	-	1.1E-01	0%
Chrysene		1.6E-01	-	1.0E-02	-	1.7E-01	0%
Benzo[b]fluoranthene		1.6E-01	-	9.7E-03	-	1.7E-01	0%
Benzo[a]anthracene		1.6E-01	-	7.8E-03	-	1.7E-01	0%
Benzo[a]pyrene		1.4E-01	-	4.2E-03	-	1.4E-01	0%
Benzo[k]fluoranthene		8.4E-02	-	3.7E-03	-	8.8E-02	0%
Indeno[1,2,3-cd]pyrene		7.8E-02	-	3.3E-03	-	8.1E-02	0%
Benzo[ghi]perylene		6.5E-02	-	4.6E-04	-	6.6E-02	0%
2-Methylnaphthalene		3.8E-02	-	5.1E-03	-	4.4E-02	0%
Silver		3.9E-02	-	2.4E-03	-	4.2E-02	0%
Beryllium		4.2E-02	-		-	4.2E-02	0%
Aroclor-1254		2.6E-02	-	3.6E-03	-	2.9E-02	0%
Total Cyanide		3.6E-02	-	-	-	3.6E-02	0%
Fluorene		2.3E-02	-	3.3E-03	-	2.7E-02	0%
Pyrene		2.5E-02	-	1.8E-03	-	2.7E-02	0%
Phenanthrene		1.5E-02	-	1.9E-03	-	1.7E-02	0%
Manganese	3.3E-05	1.7E-02	-	3.2E-04	-	1.7E-02	0%
Fluoranthene		1.2E-02	-	1.5E-03	-	1.3E-02	0%
Dibenz[a,h]anthracene		1.2E-02	-	6.6E-04	-	1.2E-02	0%
Naphthalene		4.3E-03	-	1.7E-03	-	5.9E-03	0%
Acenaphthene		1.3E-03	-	5.9E-06	-	1.3E-03	0%
Acetone		8.9E-04	-		-	8.9E-04	0%
Anthracene		5.5E-05	-	8.8E-07	-	5.6E-05	0%
Carbon disulfide		9.6E-06	-		-	9.6E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**5.6E-03**	**3.7E+02**	**-**	**9.2E+00**	**-**	**3.7E+02**	
PERCENTAGE OF TOTAL RISK	**0%**	**98%**		**2%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 3.7E+02

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 7.4E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	9.5E-04	6.8E+01	-	1.1E-01	-	***6.8E+01***	***93%***
Methyl mercury		6.2E-04	-	6.2E-01	-	6.2E-01	1%
Copper	6.9E-05	1.9E+00	-	3.6E-02	-	***1.9E+00***	3%
Antimony		1.2E+00	-	9.9E-02	-	***1.3E+00***	2%
Mercury		2.8E-02	-	1.3E-01	-	1.6E-01	0%
Zinc	4.2E-05	1.2E-01	-	5.3E-02	-	1.7E-01	0%
Nickel	1.6E-05	2.4E-01	-	1.2E-02	-	2.5E-01	0%
Aluminum	2.2E-05	2.6E-01	-	6.7E-04	-	2.6E-01	0%
Lead	6.4E-06	2.1E-01	-	4.2E-03	-	2.2E-01	0%
Selenium		3.7E-02	-	4.4E-02	-	8.1E-02	0%
Barium	3.8E-05	6.8E-02	-	2.2E-02	-	9.0E-02	0%
Vanadium		8.4E-02	-	1.6E-02	-	1.0E-01	0%
Arsenic		2.3E-02	-	2.3E-02	-	4.6E-02	0%
Aroclor-1260		3.5E-02	-	4.4E-03	-	4.0E-02	0%
Cadmium		2.9E-02	-	1.5E-03	-	3.0E-02	0%
Chrysene		1.6E-02	-	1.0E-03	-	1.7E-02	0%
Benzo[b]fluoranthene		1.6E-02	-	9.7E-04	-	1.7E-02	0%
Benzo[a]anthracene		1.6E-02	-	7.8E-04	-	1.7E-02	0%
Benzo[a]pyrene		1.4E-02	-	4.2E-04	-	1.4E-02	0%
Benzo[k]fluoranthene		8.4E-03	-	3.7E-04	-	8.8E-03	0%
Indeno[1,2,3-cd]pyrene		7.8E-03	-	3.3E-04	-	8.1E-03	0%
Benzo[ghi]perylene		6.5E-03	-	4.6E-05	-	6.6E-03	0%
2-Methylnaphthalene		3.8E-03	-	5.1E-04	-	4.4E-03	0%
Silver		3.9E-03	-	2.4E-04	-	4.2E-03	0%
Beryllium		4.2E-03	-		-	4.2E-03	0%
Aroclor-1254		2.6E-03	-	3.6E-04	-	2.9E-03	0%
Total Cyanide		3.6E-03	-	-	-	3.6E-03	0%
Fluorene		2.3E-03	-	3.3E-04	-	2.7E-03	0%
Pyrene		2.5E-03	-	1.8E-04	-	2.7E-03	0%
Phenanthrene		1.5E-03	-	1.9E-04	-	1.7E-03	0%
Manganese	3.3E-06	1.7E-03	-	3.2E-05	-	1.7E-03	0%
Fluoranthene		1.2E-03	-	1.5E-04	-	1.3E-03	0%
Dibenz[a,h]anthracene		1.2E-03	-	6.6E-05	-	1.2E-03	0%
Naphthalene		4.3E-04	-	1.7E-04	-	5.9E-04	0%
Acenaphthene		6.6E-04	-	3.0E-06	-	6.7E-04	0%
Acetone		1.8E-04	-		-	1.8E-04	0%
Anthracene		5.5E-06	-	8.8E-08	-	5.6E-06	0%
Carbon disulfide		9.6E-07	-		-	9.6E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.1E-03**	**7.3E+01**	**-**	**1.2E+00**	**-**	**7.4E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**98%**		**2%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 7.4E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 1.3E+02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	2.2E-03	1.1E+02	-	1.9E-01	-	***1.1E+02***	***87%***
Methyl mercury		5.2E-03	-	5.2E+00	-	***5.3E+00***	4%
Antimony		4.6E+00	-	3.9E-01	-	***5.0E+00***	4%
Aluminum	2.0E-04	2.0E+00	-	5.4E-03	-	***2.0E+00***	2%
Zinc	1.9E-04	5.3E-01	-	2.3E-01	-	7.6E-01	1%
Vanadium		6.8E-01	-	1.3E-01	-	8.1E-01	1%
Lead	5.1E-05	9.9E-01	-	2.0E-02	-	***1.0E+00***	1%
Copper	5.3E-05	8.9E-01	-	1.7E-02	-	9.0E-01	1%
Selenium		9.2E-02	-	1.1E-01	-	2.0E-01	0%
Mercury		2.4E-02	-	1.1E-01	-	1.3E-01	0%
Cadmium		1.7E-01	-	8.8E-03	-	1.8E-01	0%
Aroclor-1260		1.4E-01	-	1.8E-02	-	1.6E-01	0%
Arsenic		4.0E-02	-	4.2E-02	-	8.2E-02	0%
Barium	5.5E-05	8.6E-02	-	2.8E-02	-	1.1E-01	0%
Nickel	1.3E-05	1.0E-01	-	5.2E-03	-	1.1E-01	0%
Chrysene		4.4E-02	-	2.9E-03	-	4.7E-02	0%
Benzo[b]fluoranthene		4.3E-02	-	2.6E-03	-	4.5E-02	0%
Benzo[a]anthracene		4.3E-02	-	2.1E-03	-	4.5E-02	0%
Benzo[a]pyrene		3.8E-02	-	1.2E-03	-	3.9E-02	0%
Indeno[1,2,3-cd]pyrene		2.7E-02	-	1.1E-03	-	2.8E-02	0%
Silver		2.4E-02	-	1.5E-03	-	2.6E-02	0%
Benzo[k]fluoranthene		2.4E-02	-	1.0E-03	-	2.5E-02	0%
Benzo[ghi]perylene		2.4E-02	-	1.7E-04	-	2.4E-02	0%
Beryllium		2.4E-02	-		-	2.4E-02	0%
Total Cyanide		2.0E-02	-	-	-	2.0E-02	0%
2-Methylnaphthalene		1.1E-02	-	1.5E-03	-	1.2E-02	0%
Fluorene		8.1E-03	-	1.2E-03	-	9.3E-03	0%
Aroclor-1254		6.5E-03	-	9.0E-04	-	7.4E-03	0%
Manganese	2.5E-05	8.2E-03	-	1.6E-04	-	8.3E-03	0%
Pyrene		6.7E-03	-	4.7E-04	-	7.2E-03	0%
Phenanthrene		4.9E-03	-	6.6E-04	-	5.6E-03	0%
Dibenz[a,h]anthracene		5.1E-03	-	2.9E-04	-	5.4E-03	0%
Fluoranthene		3.1E-03	-	4.2E-04	-	3.6E-03	0%
Naphthalene		1.8E-03	-	6.9E-04	-	2.5E-03	0%
Acetone		5.0E-04	-		-	5.0E-04	0%
Acenaphthene		4.8E-04	-	2.1E-06	-	4.8E-04	0%
Anthracene		1.7E-05	-	2.7E-07	-	1.7E-05	0%
Carbon disulfide		7.4E-06	-		-	7.4E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**2.8E-03**	**1.2E+02**	**-**	**6.6E+00**	**-**	**1.3E+02**	
PERCENTAGE OF TOTAL RISK	**0%**	**95%**		**5%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 1.3E+02

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 2.5E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium	4.3E-04	2.2E+01	-	3.8E-02	-	***2.2E+01***	***90%***
Methyl mercury		5.2E-04	-	5.2E-01	-	5.3E-01	2%
Copper	4.0E-05	6.7E-01	-	1.3E-02	-	6.9E-01	3%
Antimony		4.6E-01	-	3.9E-02	-	5.0E-01	2%
Mercury		1.2E-02	-	5.5E-02	-	6.7E-02	0%
Aluminum	2.0E-05	2.0E-01	-	5.4E-04	-	2.0E-01	1%
Zinc	2.1E-05	5.8E-02	-	2.6E-02	-	8.4E-02	0%
Selenium		2.7E-02	-	3.2E-02	-	5.9E-02	0%
Vanadium		6.8E-02	-	1.3E-02	-	8.1E-02	0%
Lead	5.1E-06	9.9E-02	-	2.0E-03	-	1.0E-01	0%
Barium	2.7E-05	4.3E-02	-	1.4E-02	-	5.7E-02	0%
Nickel	9.1E-06	7.4E-02	-	3.7E-03	-	7.7E-02	0%
Arsenic		1.6E-02	-	1.7E-02	-	3.3E-02	0%
Aroclor-1260		1.4E-02	-	1.8E-03	-	1.6E-02	0%
Cadmium		1.2E-02	-	6.4E-04	-	1.3E-02	0%
Chrysene		4.4E-03	-	2.9E-04	-	4.7E-03	0%
Benzo[b]fluoranthene		4.3E-03	-	2.6E-04	-	4.5E-03	0%
Benzo[a]anthracene		4.3E-03	-	2.1E-04	-	4.5E-03	0%
Benzo[a]pyrene		3.8E-03	-	1.2E-04	-	3.9E-03	0%
Indeno[1,2,3-cd]pyrene		2.7E-03	-	1.1E-04	-	2.8E-03	0%
Silver		2.4E-03	-	1.5E-04	-	2.6E-03	0%
Benzo[k]fluoranthene		2.4E-03	-	1.0E-04	-	2.5E-03	0%
Benzo[ghi]perylene		2.4E-03	-	1.7E-05	-	2.4E-03	0%
Beryllium		2.4E-03	-		-	2.4E-03	0%
Total Cyanide		2.0E-03	-	-	-	2.0E-03	0%
2-Methylnaphthalene		1.1E-03	-	1.5E-04	-	1.2E-03	0%
Fluorene		8.1E-04	-	1.2E-04	-	9.3E-04	0%
Aroclor-1254		6.5E-04	-	9.0E-05	-	7.4E-04	0%
Manganese	2.5E-06	8.2E-04	-	1.6E-05	-	8.3E-04	0%
Pyrene		6.7E-04	-	4.7E-05	-	7.2E-04	0%
Phenanthrene		4.9E-04	-	6.6E-05	-	5.6E-04	0%
Dibenz[a,h]anthracene		5.1E-04	-	2.9E-05	-	5.4E-04	0%
Fluoranthene		3.1E-04	-	4.2E-05	-	3.6E-04	0%
Naphthalene		1.8E-04	-	6.9E-05	-	2.5E-04	0%
Acenaphthene		2.4E-04	-	1.1E-06	-	2.4E-04	0%
Acetone		1.0E-04	-		-	1.0E-04	0%
Anthracene		1.7E-06	-	2.7E-08	-	1.7E-06	0%
Carbon disulfide		7.4E-07	-		-	7.4E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**5.6E-04**	**2.4E+01**	**-**	**7.8E-01**	**-**	**2.5E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**97%**		**3%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 2.5E+01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 9.9E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	3.5E-04	4.9E+00	-	2.4E-02	1.8E+00	***6.8E+00***	***68%***
Lead	2.3E-05	9.2E-01	-	3.4E-02	3.4E-01	***1.3E+00***	***13%***
Antimony		4.0E-01	-	6.2E-02	1.5E-01	6.1E-01	6%
Copper	1.0E-05	3.4E-01	-	1.2E-02	1.3E-01	4.7E-01	5%
Vanadium		1.5E-01	-	5.1E-02	5.6E-02	2.6E-01	3%
Methyl mercury		8.9E-05	-	1.7E-01	3.3E-05	1.7E-01	2%
Arsenic		3.2E-02	-	6.1E-02	1.2E-02	1.0E-01	1%
Selenium		9.3E-03	-	2.1E-02	3.4E-03	3.3E-02	0%
Barium	8.6E-06	1.9E-02	-	1.1E-02	7.0E-03	3.7E-02	0%
Cadmium		2.6E-02	-	2.5E-03	9.7E-03	3.8E-02	0%
Nickel	1.2E-06	2.2E-02	-	2.1E-03	8.2E-03	3.2E-02	0%
Aroclor-1260		7.8E-03	-	1.8E-03	2.9E-03	1.3E-02	0%
Mercury		8.5E-04	-	7.1E-03	3.2E-04	8.3E-03	0%
Aroclor-1254		5.7E-03	-	1.5E-03	2.1E-03	9.3E-03	0%
Manganese	1.0E-05	6.3E-03	-	2.3E-04	2.3E-03	8.8E-03	0%
Chrysene		5.3E-03	-	6.4E-04	2.0E-03	7.9E-03	0%
Benzo[b]fluoranthene		5.3E-03	-	6.0E-04	2.0E-03	7.9E-03	0%
Benzo[a]anthracene		5.4E-03	-	4.9E-04	2.0E-03	7.8E-03	0%
Benzo[a]pyrene		4.6E-03	-	2.6E-04	1.7E-03	6.6E-03	0%
Chromium	4.8E-08	4.2E-03	-	1.3E-05	1.6E-03	5.8E-03	0%
Zinc	5.0E-07	1.8E-03	-	1.4E-03	6.6E-04	3.9E-03	0%
Benzo[k]fluoranthene		2.9E-03	-	2.3E-04	1.1E-03	4.1E-03	0%
Indeno[1,2,3-cd]pyrene		2.6E-03	-	2.0E-04	9.8E-04	3.8E-03	0%
Benzo[ghi]perylene		2.2E-03	-	2.9E-05	8.2E-04	3.1E-03	0%
2-Methylnaphthalene		1.3E-03	-	3.2E-04	4.8E-04	2.1E-03	0%
Silver		1.3E-03	-	1.5E-04	4.9E-04	2.0E-03	0%
Beryllium		1.4E-03	-		5.2E-04	1.9E-03	0%
Fluorene		7.9E-04	-	2.1E-04	2.9E-04	1.3E-03	0%
Pyrene		8.5E-04	-	1.1E-04	3.2E-04	1.3E-03	0%
Phenanthrene		5.0E-04	-	1.2E-04	1.8E-04	8.0E-04	0%
Fluoranthene		3.9E-04	-	9.7E-05	1.5E-04	6.4E-04	0%
Dibenz[a,h]anthracene		4.0E-04	-	4.1E-05	1.5E-04	5.9E-04	0%
Naphthalene		1.4E-04	-	1.0E-04	5.4E-05	3.0E-04	0%
Acenaphthene		4.5E-05	-	3.7E-07	1.7E-05	6.2E-05	0%
Acetone		3.0E-05	-		1.1E-05	4.1E-05	0%
Total Cyanide		2.0E-05	-	-	7.3E-06	2.7E-05	0%
Anthracene		1.9E-06	-	5.5E-08	6.9E-07	2.6E-06	0%
Carbon disulfide		3.2E-07	-		1.2E-07	4.5E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**4.0E-04**	**6.9E+00**	**-**	**4.6E-01**	**2.6E+00**	**9.9E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**70%**		**5%**	**26%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 9.9E+00

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 1.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	3.5E-05	4.9E-01	-	2.4E-03	1.8E-01	6.8E-01	***47%***
Copper	7.8E-06	2.6E-01	-	9.2E-03	9.7E-02	3.7E-01	***26%***
Methyl mercury		5.3E-05	-	1.0E-01	2.0E-05	1.0E-01	7%
Lead	2.3E-06	9.2E-02	-	3.4E-03	3.4E-02	1.3E-01	9%
Antimony		4.0E-02	-	6.2E-03	1.5E-02	6.1E-02	4%
Vanadium		1.5E-02	-	5.1E-03	5.6E-03	2.6E-02	2%
Selenium		5.6E-03	-	1.3E-02	2.1E-03	2.0E-02	1%
Nickel	5.9E-07	1.1E-02	-	1.0E-03	4.1E-03	1.6E-02	1%
Arsenic		3.2E-03	-	6.1E-03	1.2E-03	1.0E-02	1%
Barium	8.6E-07	1.9E-03	-	1.1E-03	7.0E-04	3.7E-03	0%
Cadmium		2.6E-03	-	2.5E-04	9.7E-04	3.8E-03	0%
Manganese	3.1E-06	1.9E-03	-	7.0E-05	7.2E-04	2.7E-03	0%
Aroclor-1260		1.6E-03	-	3.7E-04	5.8E-04	2.5E-03	0%
Aroclor-1254		1.1E-03	-	2.9E-04	4.3E-04	1.9E-03	0%
Mercury		8.5E-05	-	7.1E-04	3.2E-05	8.3E-04	0%
Chrysene		5.3E-04	-	6.4E-05	2.0E-04	7.9E-04	0%
Benzo[b]fluoranthene		5.3E-04	-	6.0E-05	2.0E-04	7.9E-04	0%
Benzo[a]anthracene		5.4E-04	-	4.9E-05	2.0E-04	7.8E-04	0%
Benzo[a]pyrene		4.6E-04	-	2.6E-05	1.7E-04	6.6E-04	0%
Chromium	4.8E-09	4.2E-04	-	1.3E-06	1.6E-04	5.8E-04	0%
Zinc	5.0E-08	1.8E-04	-	1.4E-04	6.6E-05	3.9E-04	0%
Benzo[k]fluoranthene		2.9E-04	-	2.3E-05	1.1E-04	4.1E-04	0%
Indeno[1,2,3-cd]pyrene		2.6E-04	-	2.0E-05	9.8E-05	3.8E-04	0%
Benzo[ghi]perylene		2.2E-04	-	2.9E-06	8.2E-05	3.1E-04	0%
2-Methylnaphthalene		1.3E-04	-	3.2E-05	4.8E-05	2.1E-04	0%
Silver		1.3E-04	-	1.5E-05	4.9E-05	2.0E-04	0%
Beryllium		1.4E-04	-		5.2E-05	1.9E-04	0%
Fluorene		7.9E-05	-	2.1E-05	2.9E-05	1.3E-04	0%
Pyrene		8.5E-05	-	1.1E-05	3.2E-05	1.3E-04	0%
Phenanthrene		5.0E-05	-	1.2E-05	1.8E-05	8.0E-05	0%
Fluoranthene		3.9E-05	-	9.7E-06	1.5E-05	6.4E-05	0%
Dibenz[a,h]anthracene		4.0E-05	-	4.1E-06	1.5E-05	5.9E-05	0%
Naphthalene		1.4E-05	-	1.0E-05	5.4E-06	3.0E-05	0%
Acenaphthene		2.2E-05	-	1.9E-07	8.3E-06	3.1E-05	0%
Acetone		6.0E-06	-		2.2E-06	8.2E-06	0%
Total Cyanide		2.0E-06	-	-	7.3E-07	2.7E-06	0%
Anthracene		1.9E-07	-	5.5E-09	6.9E-08	2.6E-07	0%
Carbon disulfide		3.2E-08	-		1.2E-08	4.5E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**4.9E-05**	**9.3E-01**	**-**	**1.5E-01**	**3.5E-01**	**1.4E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**65%**		**10%**	**24%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 1.4E+00

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 7.0E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	3.2E-04	3.9E+00	-	1.9E-02	1.5E+00	***5.4E+00***	***78%***
Lead	1.8E-05	4.3E-01	-	1.6E-02	1.6E-01	6.1E-01	9%
Antimony		1.6E-01	-	2.4E-02	5.8E-02	2.4E-01	3%
Vanadium		1.2E-01	-	4.1E-02	4.5E-02	2.1E-01	3%
Methyl mercury		7.5E-05	-	1.4E-01	2.8E-05	1.4E-01	2%
Copper	5.9E-06	1.2E-01	-	4.2E-03	4.5E-02	1.7E-01	2%
Arsenic		2.3E-02	-	4.3E-02	8.4E-03	7.4E-02	1%
Selenium		6.8E-03	-	1.5E-02	2.5E-03	2.5E-02	0%
Barium	6.1E-06	1.2E-02	-	7.0E-03	4.4E-03	2.3E-02	0%
Cadmium		1.1E-02	-	1.1E-03	4.1E-03	1.6E-02	0%
Nickel	6.7E-07	6.7E-03	-	6.2E-04	2.5E-03	9.8E-03	0%
Aroclor-1260		3.1E-03	-	7.2E-04	1.1E-03	5.0E-03	0%
Mercury		3.7E-04	-	3.1E-03	1.4E-04	3.6E-03	0%
Manganese	7.7E-06	3.1E-03	-	1.1E-04	1.1E-03	4.3E-03	0%
Aroclor-1254		1.5E-03	-	3.7E-04	5.4E-04	2.4E-03	0%
Chrysene		1.5E-03	-	1.8E-04	5.5E-04	2.2E-03	0%
Zinc	2.5E-07	8.6E-04	-	7.0E-04	3.2E-04	1.9E-03	0%
Benzo[b]fluoranthene		1.5E-03	-	1.7E-04	5.4E-04	2.2E-03	0%
Benzo[a]anthracene		1.5E-03	-	1.3E-04	5.4E-04	2.1E-03	0%
Chromium	2.2E-08	1.4E-03	-	4.3E-06	5.2E-04	1.9E-03	0%
Benzo[a]pyrene		1.3E-03	-	7.3E-05	4.8E-04	1.8E-03	0%
Indeno[1,2,3-cd]pyrene		9.2E-04	-	7.1E-05	3.4E-04	1.3E-03	0%
Silver		8.3E-04	-	9.5E-05	3.1E-04	1.2E-03	0%
Benzo[k]fluoranthene		8.1E-04	-	6.5E-05	3.0E-04	1.2E-03	0%
Benzo[ghi]perylene		8.0E-04	-	1.0E-05	3.0E-04	1.1E-03	0%
Beryllium		8.0E-04	-		3.0E-04	1.1E-03	0%
2-Methylnaphthalene		3.7E-04	-	9.1E-05	1.4E-04	6.0E-04	0%
Fluorene		2.7E-04	-	7.3E-05	1.0E-04	4.5E-04	0%
Pyrene		2.3E-04	-	3.0E-05	8.5E-05	3.4E-04	0%
Phenanthrene		1.7E-04	-	4.1E-05	6.2E-05	2.7E-04	0%
Dibenz[a,h]anthracene		1.7E-04	-	1.8E-05	6.5E-05	2.6E-04	0%
Fluoranthene		1.1E-04	-	2.6E-05	3.9E-05	1.7E-04	0%
Naphthalene		6.0E-05	-	4.3E-05	2.2E-05	1.3E-04	0%
Acetone		1.7E-05	-		6.3E-06	2.3E-05	0%
Acenaphthene		1.6E-05	-	1.3E-07	6.0E-06	2.2E-05	0%
Total Cyanide		1.1E-05	-	-	4.0E-06	1.5E-05	0%
Anthracene		5.7E-07	-	1.7E-08	2.1E-07	8.0E-07	0%
Carbon disulfide		2.5E-07	-		9.2E-08	3.4E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.6E-04**	**4.8E+00**	**-**	**3.2E-01**	**1.8E+00**	**7.0E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**70%**		**5%**	**26%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 7.0E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 9.0E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	3.2E-05	3.9E-01	-	1.9E-03	1.5E-01	5.4E-01	***60%***
Copper	4.5E-06	9.3E-02	-	3.3E-03	3.5E-02	1.3E-01	***15%***
Methyl mercury		4.5E-05	-	8.4E-02	1.7E-05	8.4E-02	9%
Lead	1.8E-06	4.3E-02	-	1.6E-03	1.6E-02	6.1E-02	7%
Antimony		1.6E-02	-	2.4E-03	5.8E-03	2.4E-02	3%
Vanadium		1.2E-02	-	4.1E-03	4.5E-03	2.1E-02	2%
Selenium		4.1E-03	-	9.2E-03	1.5E-03	1.5E-02	2%
Arsenic		2.3E-03	-	4.3E-03	8.4E-04	7.4E-03	1%
Nickel	3.3E-07	3.3E-03	-	3.1E-04	1.2E-03	4.9E-03	1%
Barium	6.1E-07	1.2E-03	-	7.0E-04	4.4E-04	2.3E-03	0%
Cadmium		1.1E-03	-	1.1E-04	4.1E-04	1.6E-03	0%
Manganese	2.4E-06	9.5E-04	-	3.4E-05	3.5E-04	1.3E-03	0%
Aroclor-1260		6.2E-04	-	1.4E-04	2.3E-04	9.9E-04	0%
Mercury		3.7E-05	-	3.1E-04	1.4E-05	3.6E-04	0%
Aroclor-1254		2.9E-04	-	7.4E-05	1.1E-04	4.7E-04	0%
Chrysene		1.5E-04	-	1.8E-05	5.5E-05	2.2E-04	0%
Zinc	2.5E-08	8.6E-05	-	7.0E-05	3.2E-05	1.9E-04	0%
Benzo[b]fluoranthene		1.5E-04	-	1.7E-05	5.4E-05	2.2E-04	0%
Benzo[a]anthracene		1.5E-04	-	1.3E-05	5.4E-05	2.1E-04	0%
Chromium	2.2E-09	1.4E-04	-	4.3E-07	5.2E-05	1.9E-04	0%
Benzo[a]pyrene		1.3E-04	-	7.3E-06	4.8E-05	1.8E-04	0%
Indeno[1,2,3-cd]pyrene		9.2E-05	-	7.1E-06	3.4E-05	1.3E-04	0%
Silver		8.3E-05	-	9.5E-06	3.1E-05	1.2E-04	0%
Benzo[k]fluoranthene		8.1E-05	-	6.5E-06	3.0E-05	1.2E-04	0%
Benzo[ghi]perylene		8.0E-05	-	1.0E-06	3.0E-05	1.1E-04	0%
Beryllium		8.0E-05	-		3.0E-05	1.1E-04	0%
2-Methylnaphthalene		3.7E-05	-	9.1E-06	1.4E-05	6.0E-05	0%
Fluorene		2.7E-05	-	7.3E-06	1.0E-05	4.5E-05	0%
Pyrene		2.3E-05	-	3.0E-06	8.5E-06	3.4E-05	0%
Phenanthrene		1.7E-05	-	4.1E-06	6.2E-06	2.7E-05	0%
Dibenz[a,h]anthracene		1.7E-05	-	1.8E-06	6.5E-06	2.6E-05	0%
Fluoranthene		1.1E-05	-	2.6E-06	3.9E-06	1.7E-05	0%
Naphthalene		6.0E-06	-	4.3E-06	2.2E-06	1.3E-05	0%
Acenaphthene		8.1E-06	-	6.7E-08	3.0E-06	1.1E-05	0%
Acetone		3.4E-06	-		1.3E-06	4.7E-06	0%
Total Cyanide		1.1E-06	-	-	4.0E-07	1.5E-06	0%
Anthracene		5.7E-08	-	1.7E-09	2.1E-08	8.0E-08	0%
Carbon disulfide		2.5E-08	-		9.2E-09	3.4E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**4.1E-05**	**5.7E-01**	**-**	**1.1E-01**	**2.1E-01**	**9.0E-01**	
PERCENTAGE OF TOTAL RISK	**0%**	**64%**		**13%**	**24%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.

TABLE T-3.10
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: OUTFALL 8 CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 9.0E-01

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]

c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 3.0E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		9.0E-05	1.2E-04	1.7E-01	-	1.7E-01	***57%***
Chromium		2.1E-02	7.0E-04	5.1E-03	-	2.7E-02	9%
Aluminum	1.9E-06	2.2E-02	7.0E-04	1.4E-03	-	2.5E-02	8%
Lead	1.5E-06	1.5E-02	4.5E-03	2.9E-03	-	2.3E-02	8%
Zinc		2.8E-03	1.4E-02	4.2E-03	-	2.1E-02	7%
2-Methylnaphthalene		2.4E-05	1.2E-02	3.0E-05	-	1.2E-02	4%
Selenium		6.6E-04	5.5E-04	4.4E-03	-	5.6E-03	2%
Mercury		1.8E-04	2.3E-04	2.7E-03	-	3.1E-03	1%
Vanadium		6.5E-04	3.7E-06	1.5E-03	-	2.2E-03	1%
Aroclor-1254		1.3E-04	2.7E-04	1.5E-03	-	1.9E-03	1%
Copper	2.1E-07	1.2E-03	3.6E-04	3.4E-04	-	1.9E-03	1%
Arsenic		2.4E-04	3.7E-04	1.2E-03	-	1.8E-03	1%
Aroclor-1260		3.5E-04	6.9E-04	4.4E-04	-	1.5E-03	0%
Barium	4.5E-07	4.8E-04	6.3E-05	9.3E-04	-	1.5E-03	0%
Cadmium		2.8E-04	5.8E-04	4.7E-04	-	1.3E-03	0%
Chrysene		2.6E-04	5.3E-06	1.6E-04	-	4.3E-04	0%
Benzo[a]anthracene		2.1E-04	4.3E-06	9.7E-05	-	3.1E-04	0%
Benzo[a]pyrene		1.6E-04	2.2E-06	4.6E-05	-	2.1E-04	0%
Benzo[b]fluoranthene		1.2E-04	1.5E-06	7.2E-05	-	2.0E-04	0%
Aroclor-1248		3.1E-05	6.1E-05	8.6E-05	-	1.8E-04	0%
Indeno[1,2,3-cd]pyrene		7.6E-05	4.7E-07	3.0E-05	-	1.1E-04	0%
Benzo[ghi]perylene		8.5E-05	5.3E-07	5.6E-06	-	9.1E-05	0%
Nickel		6.9E-05	5.0E-06	1.5E-05	-	8.8E-05	0%
Benzo[k]fluoranthene		5.6E-05	6.7E-07	2.3E-05	-	7.9E-05	0%
Phenanthrene		1.1E-05	1.1E-06	1.3E-05	-	2.5E-05	0%
Pyrene		1.3E-05	4.5E-07	8.6E-06	-	2.2E-05	0%
Fluorene		8.2E-06	1.2E-06	1.1E-05	-	2.0E-05	0%
Dibenz[a,h]anthracene		1.0E-05	7.2E-08	5.4E-06	-	1.6E-05	0%
Fluoranthene		4.0E-06	2.2E-07	5.0E-06	-	9.2E-06	0%
Acetone		4.2E-06	-	-	-	4.2E-06	0%
Acenaphthene		1.4E-06	3.1E-07	5.8E-08	-	1.8E-06	0%
Methylene chloride	3.1E-07					3.1E-07	0%
Silver	2.9E-07					2.9E-07	0%
Manganese	1.2E-07					1.2E-07	0%
Anthracene		3.8E-08	3.9E-09	5.8E-09	-	4.8E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**4.7E-06**	**6.7E-02**	**3.5E-02**	**2.0E-01**	**-**	**3.0E-01**	
PERCENTAGE OF TOTAL RISK	**0%**	**22%**	**12%**	**66%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - RME
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 3.9E-02

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		9.0E-06	1.2E-05	1.7E-02	-	1.7E-02	***44%***
Chromium		4.2E-03	1.4E-04	1.0E-03	-	5.4E-03	***14%***
Selenium		3.3E-04	2.8E-04	2.2E-03	-	2.8E-03	7%
Aluminum	1.9E-07	2.2E-03	7.0E-05	1.4E-04	-	2.5E-03	6%
Zinc		3.1E-04	1.5E-03	4.7E-04	-	2.3E-03	6%
Lead	1.5E-07	1.5E-03	4.5E-04	2.9E-04	-	2.3E-03	6%
Mercury		8.9E-05	1.1E-04	1.4E-03	-	1.6E-03	4%
Copper	1.6E-07	8.8E-04	2.8E-04	2.6E-04	-	1.4E-03	4%
2-Methylnaphthalene		2.4E-06	1.2E-03	3.0E-06	-	1.2E-03	3%
Barium	2.3E-07	2.4E-04	3.1E-05	4.6E-04	-	7.3E-04	2%
Arsenic		9.5E-05	1.5E-04	4.9E-04	-	7.3E-04	2%
Vanadium		6.5E-05	3.7E-07	1.5E-04	-	2.2E-04	1%
Aroclor-1254		1.3E-05	2.7E-05	1.5E-04	-	1.9E-04	1%
Aroclor-1260		3.5E-05	6.9E-05	4.4E-05	-	1.5E-04	0%
Cadmium		2.0E-05	4.2E-05	3.4E-05	-	9.6E-05	0%
Nickel		5.0E-05	3.6E-06	1.1E-05	-	6.4E-05	0%
Chrysene		2.6E-05	5.3E-07	1.6E-05	-	4.3E-05	0%
Benzo[a]anthracene		2.1E-05	4.3E-07	9.7E-06	-	3.1E-05	0%
Benzo[a]pyrene		1.6E-05	2.2E-07	4.6E-06	-	2.1E-05	0%
Benzo[b]fluoranthene		1.2E-05	1.5E-07	7.2E-06	-	2.0E-05	0%
Aroclor-1248		3.1E-06	6.1E-06	8.6E-06	-	1.8E-05	0%
Indeno[1,2,3-cd]pyrene		7.6E-06	4.7E-08	3.0E-06	-	1.1E-05	0%
Benzo[ghi]perylene		8.5E-06	5.3E-08	5.6E-07	-	9.1E-06	0%
Benzo[k]fluoranthene		5.6E-06	6.7E-08	2.3E-06	-	7.9E-06	0%
Phenanthrene		1.1E-06	1.1E-07	1.3E-06	-	2.5E-06	0%
Pyrene		1.3E-06	4.5E-08	8.6E-07	-	2.2E-06	0%
Fluorene		8.2E-07	1.2E-07	1.1E-06	-	2.0E-06	0%
Dibenz[a,h]anthracene		1.0E-06	7.2E-09	5.4E-07	-	1.6E-06	0%
Fluoranthene		4.0E-07	2.2E-08	5.0E-07	-	9.2E-07	0%
Acenaphthene		6.9E-07	1.6E-07	2.9E-08	-	8.8E-07	0%
Acetone		8.3E-07	-	-	-	8.3E-07	0%
Methylene chloride	3.7E-08					3.7E-08	0%
Silver	2.9E-08					2.9E-08	0%
Manganese	1.2E-08					1.2E-08	0%
Anthracene		3.8E-09	3.9E-10	5.8E-10	-	4.8E-09	0%
TOTAL MEDIUM-SPECIFIC RISK	**8.0E-07**	**1.0E-02**	**4.4E-03**	**2.4E-02**	**-**	**3.9E-02**	
PERCENTAGE OF TOTAL RISK	**0%**	**27%**	**11%**	**62%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - RME
RECEPTOR: HERON
TOTAL RISK (HI): 1.0E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		2.7E-03	-	3.4E-01	6.7E+00	***7.0E+00***	***67%***
Chromium		6.3E-01	-	1.0E-02	6.0E-02	7.0E-01	7%
Aluminum	5.5E-05	6.7E-01	-	2.9E-03	1.5E-02	6.8E-01	7%
Aroclor-1260		1.0E-02	-	8.9E-04	5.4E-01	5.5E-01	5%
Zinc		8.3E-02	-	8.5E-03	3.3E-01	4.2E-01	4%
Selenium		2.2E-02	-	1.0E-02	2.6E-01	2.9E-01	3%
Vanadium		2.0E-01	-	3.2E-02	3.8E-02	2.7E-01	3%
Lead	1.2E-05	1.3E-01	-	1.7E-03	2.2E-02	1.6E-01	1%
Mercury		5.3E-03	-	5.5E-03	1.1E-01	1.2E-01	1%
Aroclor-1254		8.0E-04	-	6.2E-04	9.8E-02	1.0E-01	1%
Copper	6.0E-06	3.4E-02	-	6.8E-04	8.8E-03	4.4E-02	0%
Barium	1.3E-05	1.4E-02	-	1.9E-03	7.1E-03	2.3E-02	0%
Arsenic		7.0E-03	-	2.5E-03	6.0E-03	1.6E-02	0%
Cadmium		8.2E-03	-	9.5E-04	3.6E-03	1.3E-02	0%
Chrysene		7.7E-03	-	3.3E-04	-	8.0E-03	0%
Benzo[a]anthracene		6.2E-03	-	2.0E-04	-	6.4E-03	0%
Benzo[a]pyrene		4.7E-03	-	9.4E-05	-	4.8E-03	0%
Benzo[b]fluoranthene		3.7E-03	-	1.5E-04	-	3.8E-03	0%
Aroclor-1248		4.0E-04	-	7.6E-05	2.6E-03	3.1E-03	0%
Benzo[ghi]perylene		2.5E-03	-	1.1E-05	-	2.5E-03	0%
Indeno[1,2,3-cd]pyrene		2.3E-03	-	6.1E-05	-	2.3E-03	0%
Nickel		2.0E-03	-	3.0E-05	2.6E-04	2.3E-03	0%
Benzo[k]fluoranthene		1.6E-03	-	4.6E-05	-	1.7E-03	0%
2-Methylnaphthalene		7.2E-04	-	6.2E-05	-	7.8E-04	0%
Pyrene		3.9E-04	-	1.8E-05	-	4.0E-04	0%
Phenanthrene		3.2E-04	-	2.7E-05	-	3.4E-04	0%
Dibenz[a,h]anthracene		3.0E-04	-	1.1E-05	-	3.1E-04	0%
Fluorene		2.4E-04	-	2.2E-05	-	2.6E-04	0%
Fluoranthene		1.2E-04	-	1.0E-05	-	1.3E-04	0%
Acetone		1.2E-04	-	-	-	1.2E-04	0%
Acenaphthene		4.1E-05	-	1.2E-07	-	4.1E-05	0%
Methylene chloride	9.1E-06					9.1E-06	0%
Silver	8.5E-06					8.5E-06	0%
Manganese	3.4E-06					3.4E-06	0%
Anthracene		1.1E-06	-	1.2E-08	-	1.1E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.1E-04**	**1.8E+00**	**-**	**4.2E-01**	**8.2E+00**	**1.0E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**18%**		**4%**	**78%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - RME
RECEPTOR: HERON
TOTAL RISK (HI): 1.3E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		2.7E-04	-	3.4E-02	6.7E-01	7.0E-01	***55%***
Chromium		1.3E-01	-	2.1E-03	1.2E-02	1.4E-01	***11%***
Selenium		6.5E-03	-	3.0E-03	7.6E-02	8.6E-02	7%
Aluminum	5.5E-06	6.7E-02	-	2.9E-04	1.5E-03	6.8E-02	5%
Mercury		2.6E-03	-	2.8E-03	5.4E-02	5.9E-02	5%
Aroclor-1260		1.0E-03	-	8.9E-05	5.4E-02	5.5E-02	4%
Zinc		9.2E-03	-	9.4E-04	3.6E-02	4.6E-02	4%
Copper	4.6E-06	2.6E-02	-	5.2E-04	6.7E-03	3.3E-02	3%
Vanadium		2.0E-02	-	3.2E-03	3.8E-03	2.7E-02	2%
Lead	1.2E-06	1.3E-02	-	1.7E-04	2.2E-03	1.6E-02	1%
Barium	6.6E-06	7.1E-03	-	9.4E-04	3.6E-03	1.2E-02	1%
Aroclor-1254		8.0E-05	-	6.2E-05	9.8E-03	1.0E-02	1%
Arsenic		2.8E-03	-	1.0E-03	2.4E-03	6.2E-03	0%
Nickel		1.5E-03	-	2.2E-05	1.8E-04	1.7E-03	0%
Cadmium		5.9E-04	-	6.9E-05	2.6E-04	9.2E-04	0%
Chrysene		7.7E-04	-	3.3E-05	-	8.0E-04	0%
Benzo[a]anthracene		6.2E-04	-	2.0E-05	-	6.4E-04	0%
Benzo[a]pyrene		4.7E-04	-	9.4E-06	-	4.8E-04	0%
Benzo[b]fluoranthene		3.7E-04	-	1.5E-05	-	3.8E-04	0%
Aroclor-1248		4.0E-05	-	7.6E-06	2.6E-04	3.1E-04	0%
Benzo[ghi]perylene		2.5E-04	-	1.1E-06	-	2.5E-04	0%
Indeno[1,2,3-cd]pyrene		2.3E-04	-	6.1E-06	-	2.3E-04	0%
Benzo[k]fluoranthene		1.6E-04	-	4.6E-06	-	1.7E-04	0%
2-Methylnaphthalene		7.2E-05	-	6.2E-06	-	7.8E-05	0%
Pyrene		3.9E-05	-	1.8E-06	-	4.0E-05	0%
Phenanthrene		3.2E-05	-	2.7E-06	-	3.4E-05	0%
Dibenz[a,h]anthracene		3.0E-05	-	1.1E-06	-	3.1E-05	0%
Fluorene		2.4E-05	-	2.2E-06	-	2.6E-05	0%
Acetone		2.5E-05	-	-	-	2.5E-05	0%
Acenaphthene		2.1E-05	-	5.9E-08	-	2.1E-05	0%
Fluoranthene		1.2E-05	-	1.0E-06	-	1.3E-05	0%
Methylene chloride	1.1E-06					1.1E-06	0%
Silver	8.5E-07					8.5E-07	0%
Manganese	3.4E-07					3.4E-07	0%
Anthracene		1.1E-07	-	1.2E-09	-	1.1E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**2.0E-05**	**2.9E-01**	**-**	**4.9E-02**	**9.3E-01**	**1.3E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**23%**		**4%**	**73%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - CT
RECEPTOR: HERON
TOTAL RISK (HI): 6.9E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.8E-03	-	2.4E-01	4.6E+00	***4.8E+00***	***70%***
Chromium		4.2E-01	-	7.0E-03	4.0E-02	4.7E-01	7%
Aluminum	4.9E-05	4.1E-01	-	1.8E-03	9.5E-03	4.2E-01	6%
Zinc		6.0E-02	-	6.2E-03	2.4E-01	3.0E-01	4%
Aroclor-1260		4.7E-03	-	4.1E-04	2.5E-01	2.5E-01	4%
Selenium		1.4E-02	-	6.6E-03	1.7E-01	1.9E-01	3%
Vanadium		1.2E-01	-	2.0E-02	2.4E-02	1.7E-01	2%
Lead	5.9E-06	8.7E-02	-	1.1E-03	1.4E-02	1.0E-01	1%
Mercury		3.2E-03	-	3.4E-03	6.5E-02	7.2E-02	1%
Aroclor-1254		3.1E-04	-	2.4E-04	3.8E-02	3.9E-02	1%
Copper	4.1E-06	2.1E-02	-	4.3E-04	5.5E-03	2.7E-02	0%
Barium	1.3E-05	9.4E-03	-	1.2E-03	4.7E-03	1.5E-02	0%
Arsenic		4.4E-03	-	1.6E-03	3.8E-03	9.9E-03	0%
Cadmium		4.5E-03	-	5.2E-04	2.0E-03	6.9E-03	0%
Chrysene		3.4E-03	-	1.5E-04	-	3.6E-03	0%
Benzo[a]pyrene		3.3E-03	-	6.7E-05	-	3.4E-03	0%
Aroclor-1248		4.2E-04	-	8.0E-05	2.8E-03	3.3E-03	0%
Benzo[a]anthracene		2.8E-03	-	8.8E-05	-	2.8E-03	0%
Benzo[b]fluoranthene		2.6E-03	-	1.0E-04	-	2.7E-03	0%
Benzo[ghi]perylene		2.0E-03	-	8.9E-06	-	2.0E-03	0%
Indeno[1,2,3-cd]pyrene		1.7E-03	-	4.6E-05	-	1.7E-03	0%
Nickel		1.4E-03	-	2.0E-05	1.7E-04	1.6E-03	0%
Benzo[k]fluoranthene		1.4E-03	-	4.0E-05	-	1.5E-03	0%
Fluorene		5.2E-04	-	4.8E-05	-	5.6E-04	0%
2-Methylnaphthalene		5.2E-04	-	4.4E-05	-	5.6E-04	0%
Pyrene		2.7E-04	-	1.2E-05	-	2.9E-04	0%
Dibenz[a,h]anthracene		2.4E-04	-	8.6E-06	-	2.5E-04	0%
Phenanthrene		1.9E-04	-	1.6E-05	-	2.1E-04	0%
Fluoranthene		1.0E-04	-	8.9E-06	-	1.1E-04	0%
Acetone		5.1E-05	-	-	-	5.1E-05	0%
Acenaphthene		2.6E-05	-	7.5E-08	-	2.6E-05	0%
Methylene chloride	4.2E-06					4.2E-06	0%
Silver	3.9E-06					3.9E-06	0%
Manganese	2.1E-06					2.1E-06	0%
Anthracene		6.9E-07	-	7.2E-09	-	7.0E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**8.2E-05**	**1.2E+00**	**-**	**2.9E-01**	**5.5E+00**	**6.9E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**17%**		**4%**	**79%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - CT
RECEPTOR: HERON
TOTAL RISK (HI): 8.4E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.8E-04	-	2.4E-02	4.6E-01	4.8E-01	***58%***
Chromium		8.4E-02	-	1.4E-03	8.1E-03	9.3E-02	***11%***
Selenium		4.2E-03	-	1.9E-03	4.9E-02	5.5E-02	7%
Aluminum	4.9E-06	4.1E-02	-	1.8E-04	9.5E-04	4.2E-02	5%
Mercury		1.6E-03	-	1.7E-03	3.3E-02	3.6E-02	4%
Zinc		6.7E-03	-	6.9E-04	2.6E-02	3.4E-02	4%
Aroclor-1260		4.7E-04	-	4.1E-05	2.5E-02	2.5E-02	3%
Copper	3.1E-06	1.6E-02	-	3.2E-04	4.2E-03	2.1E-02	2%
Vanadium		1.2E-02	-	2.0E-03	2.4E-03	1.7E-02	2%
Lead	5.9E-07	8.7E-03	-	1.1E-04	1.4E-03	1.0E-02	1%
Barium	6.4E-06	4.7E-03	-	6.2E-04	2.4E-03	7.7E-03	1%
Arsenic		1.8E-03	-	6.3E-04	1.5E-03	3.9E-03	0%
Aroclor-1254		3.1E-05	-	2.4E-05	3.8E-03	3.9E-03	0%
Nickel		1.0E-03	-	1.5E-05	1.3E-04	1.1E-03	0%
Cadmium		3.2E-04	-	3.8E-05	1.4E-04	5.0E-04	0%
Chrysene		3.4E-04	-	1.5E-05	-	3.6E-04	0%
Benzo[a]pyrene		3.3E-04	-	6.7E-06	-	3.4E-04	0%
Aroclor-1248		4.2E-05	-	8.0E-06	2.8E-04	3.3E-04	0%
Benzo[a]anthracene		2.8E-04	-	8.8E-06	-	2.8E-04	0%
Benzo[b]fluoranthene		2.6E-04	-	1.0E-05	-	2.7E-04	0%
Benzo[ghi]perylene		2.0E-04	-	8.9E-07	-	2.0E-04	0%
Indeno[1,2,3-cd]pyrene		1.7E-04	-	4.6E-06	-	1.7E-04	0%
Benzo[k]fluoranthene		1.4E-04	-	4.0E-06	-	1.5E-04	0%
Fluorene		5.2E-05	-	4.8E-06	-	5.6E-05	0%
2-Methylnaphthalene		5.2E-05	-	4.4E-06	-	5.6E-05	0%
Pyrene		2.7E-05	-	1.2E-06	-	2.9E-05	0%
Dibenz[a,h]anthracene		2.4E-05	-	8.6E-07	-	2.5E-05	0%
Phenanthrene		1.9E-05	-	1.6E-06	-	2.1E-05	0%
Acenaphthene		1.3E-05	-	3.8E-08	-	1.3E-05	0%
Fluoranthene		1.0E-05	-	8.9E-07	-	1.1E-05	0%
Acetone		1.0E-05	-	-	-	1.0E-05	0%
Methylene chloride	4.9E-07					4.9E-07	0%
Silver	3.9E-07					3.9E-07	0%
Manganese	2.1E-07					2.1E-07	0%
Anthracene		6.9E-08	-	7.2E-10	-	7.0E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.6E-05**	**1.9E-01**	**-**	**3.3E-02**	**6.2E-01**	**8.4E-01**	
PERCENTAGE OF TOTAL RISK	**0%**	**22%**		**4%**	**74%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 1.7E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.1E-02	-	7.7E+00	-	***7.7E+00***	***45%***
Chromium		2.6E+00	-	2.4E-01	-	***2.8E+00***	***16%***
Vanadium		8.1E-01	-	7.2E-01	-	***1.5E+00***	9%
Aluminum	2.0E-04	2.7E+00	-	6.4E-02	-	***2.8E+00***	***16%***
Zinc		3.4E-01	-	1.9E-01	-	5.3E-01	3%
Selenium		9.1E-02	-	2.3E-01	-	3.2E-01	2%
Lead	4.4E-05	5.4E-01	-	3.9E-02	-	5.8E-01	3%
Mercury		2.2E-02	-	1.3E-01	-	1.5E-01	1%
Arsenic		2.9E-02	-	5.6E-02	-	8.5E-02	0%
Barium	4.7E-05	5.8E-02	-	4.2E-02	-	1.0E-01	1%
Copper	2.1E-05	1.4E-01	-	1.5E-02	-	1.6E-01	1%
Aroclor-1260		4.2E-02	-	2.0E-02	-	6.2E-02	0%
Cadmium		3.3E-02	-	2.1E-02	-	5.5E-02	0%
Chrysene		3.2E-02	-	7.3E-03	-	3.9E-02	0%
Aroclor-1254		3.3E-03	-	1.4E-02	-	1.7E-02	0%
Benzo[a]anthracene		2.5E-02	-	4.4E-03	-	3.0E-02	0%
Benzo[a]pyrene		1.9E-02	-	2.1E-03	-	2.2E-02	0%
Benzo[b]fluoranthene		1.5E-02	-	3.3E-03	-	1.8E-02	0%
Indeno[1,2,3-cd]pyrene		9.3E-03	-	1.4E-03	-	1.1E-02	0%
Benzo[ghi]perylene		1.0E-02	-	2.6E-04	-	1.1E-02	0%
Nickel		8.3E-03	-	6.8E-04	-	9.0E-03	0%
Benzo[k]fluoranthene		6.8E-03	-	1.0E-03	-	7.8E-03	0%
2-Methylnaphthalene		3.0E-03	-	1.4E-03	-	4.4E-03	0%
Aroclor-1248		1.6E-03	-	1.7E-03	-	3.4E-03	0%
Phenanthrene		1.3E-03	-	6.1E-04	-	1.9E-03	0%
Pyrene		1.6E-03	-	4.0E-04	-	2.0E-03	0%
Fluorene		9.9E-04	-	5.1E-04	-	1.5E-03	0%
Dibenz[a,h]anthracene		1.2E-03	-	2.5E-04	-	1.5E-03	0%
Fluoranthene		4.9E-04	-	2.3E-04	-	7.1E-04	0%
Acetone		5.1E-04	-	-	-	5.1E-04	0%
Acenaphthene		1.7E-04	-	2.7E-06	-	1.7E-04	0%
Methylene chloride	3.2E-05					3.2E-05	0%
Silver	3.0E-05					3.0E-05	0%
Manganese	1.2E-05					1.2E-05	0%
Anthracene		4.6E-06	-	2.7E-07	-	4.9E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.8E-04**	**7.6E+00**	**-**	**9.5E+00**	**-**	**1.7E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**44%**		**56%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - RME
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 2.3E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		1.1E-03	-	7.7E-01	-	7.7E-01	***34%***
Chromium		5.1E-01	-	4.7E-02	-	5.6E-01	***25%***
Vanadium		8.1E-02	-	7.2E-02	-	1.5E-01	7%
Aluminum	2.0E-05	2.7E-01	-	6.4E-03	-	2.8E-01	***12%***
Selenium		2.7E-02	-	6.8E-02	-	9.5E-02	4%
Mercury		1.1E-02	-	6.3E-02	-	7.3E-02	3%
Copper	1.6E-05	1.1E-01	-	1.2E-02	-	1.2E-01	5%
Zinc		3.8E-02	-	2.1E-02	-	5.9E-02	3%
Barium	2.3E-05	2.9E-02	-	2.1E-02	-	5.0E-02	2%
Arsenic		1.2E-02	-	2.2E-02	-	3.4E-02	1%
Lead	4.4E-06	5.4E-02	-	3.9E-03	-	5.8E-02	3%
Aroclor-1260		4.2E-03	-	2.0E-03	-	6.2E-03	0%
Cadmium		2.4E-03	-	1.5E-03	-	4.0E-03	0%
Nickel		6.0E-03	-	4.9E-04	-	6.5E-03	0%
Chrysene		3.2E-03	-	7.3E-04	-	3.9E-03	0%
Aroclor-1254		3.3E-04	-	1.4E-03	-	1.7E-03	0%
Benzo[a]anthracene		2.5E-03	-	4.4E-04	-	3.0E-03	0%
Benzo[a]pyrene		1.9E-03	-	2.1E-04	-	2.2E-03	0%
Benzo[b]fluoranthene		1.5E-03	-	3.3E-04	-	1.8E-03	0%
Indeno[1,2,3-cd]pyrene		9.3E-04	-	1.4E-04	-	1.1E-03	0%
Benzo[ghi]perylene		1.0E-03	-	2.6E-05	-	1.1E-03	0%
Benzo[k]fluoranthene		6.8E-04	-	1.0E-04	-	7.8E-04	0%
2-Methylnaphthalene		3.0E-04	-	1.4E-04	-	4.4E-04	0%
Aroclor-1248		1.6E-04	-	1.7E-04	-	3.4E-04	0%
Phenanthrene		1.3E-04	-	6.1E-05	-	1.9E-04	0%
Pyrene		1.6E-04	-	4.0E-05	-	2.0E-04	0%
Fluorene		9.9E-05	-	5.1E-05	-	1.5E-04	0%
Dibenz[a,h]anthracene		1.2E-04	-	2.5E-05	-	1.5E-04	0%
Fluoranthene		4.9E-05	-	2.3E-05	-	7.1E-05	0%
Acetone		1.0E-04	-	-	-	1.0E-04	0%
Acenaphthene		8.4E-05	-	1.3E-06	-	8.6E-05	0%
Methylene chloride	3.8E-06					3.8E-06	0%
Silver	3.0E-06					3.0E-06	0%
Manganese	1.2E-06					1.2E-06	0%
Anthracene		4.6E-07	-	2.7E-08	-	4.9E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**7.2E-05**	**1.2E+00**	**-**	**1.1E+00**	**-**	**2.3E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**51%**		**49%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 1.1E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		7.6E-03	-	5.3E+00	-	***5.3E+00***	***47%***
Chromium		1.7E+00	-	1.6E-01	-	***1.9E+00***	***17%***
Aluminum	1.8E-04	1.7E+00	-	4.0E-02	-	***1.7E+00***	***15%***
Vanadium		5.1E-01	-	4.5E-01	-	9.6E-01	8%
Zinc		2.5E-01	-	1.4E-01	-	3.9E-01	3%
Lead	2.1E-05	3.6E-01	-	2.5E-02	-	3.8E-01	3%
Selenium		5.8E-02	-	1.5E-01	-	2.1E-01	2%
Copper	1.4E-05	8.8E-02	-	9.6E-03	-	9.8E-02	1%
Mercury		1.3E-02	-	7.6E-02	-	8.9E-02	1%
Barium	4.6E-05	3.9E-02	-	2.8E-02	-	6.7E-02	1%
Arsenic		1.8E-02	-	3.6E-02	-	5.4E-02	0%
Cadmium		1.8E-02	-	1.2E-02	-	3.0E-02	0%
Aroclor-1260		1.9E-02	-	9.2E-03	-	2.8E-02	0%
Chrysene		1.4E-02	-	3.3E-03	-	1.7E-02	0%
Benzo[a]pyrene		1.4E-02	-	1.5E-03	-	1.5E-02	0%
Benzo[a]anthracene		1.1E-02	-	2.0E-03	-	1.3E-02	0%
Benzo[b]fluoranthene		1.1E-02	-	2.4E-03	-	1.3E-02	0%
Benzo[ghi]perylene		8.0E-03	-	2.0E-04	-	8.2E-03	0%
Indeno[1,2,3-cd]pyrene		7.0E-03	-	1.0E-03	-	8.0E-03	0%
Benzo[k]fluoranthene		5.9E-03	-	9.1E-04	-	6.8E-03	0%
Aroclor-1254		1.3E-03	-	5.5E-03	-	6.8E-03	0%
Nickel		5.7E-03	-	4.6E-04	-	6.1E-03	0%
Aroclor-1248		1.7E-03	-	1.8E-03	-	3.5E-03	0%
Fluorene		2.1E-03	-	1.1E-03	-	3.2E-03	0%
2-Methylnaphthalene		2.1E-03	-	1.0E-03	-	3.1E-03	0%
Pyrene		1.1E-03	-	2.8E-04	-	1.4E-03	0%
Dibenz[a,h]anthracene		9.7E-04	-	1.9E-04	-	1.2E-03	0%
Phenanthrene		7.8E-04	-	3.7E-04	-	1.2E-03	0%
Fluoranthene		4.2E-04	-	2.0E-04	-	6.2E-04	0%
Acetone		2.1E-04	-	-	-	2.1E-04	0%
Acenaphthene		1.1E-04	-	1.7E-06	-	1.1E-04	0%
Methylene chloride	1.5E-05					1.5E-05	0%
Silver	1.4E-05					1.4E-05	0%
Manganese	7.4E-06					7.4E-06	0%
Anthracene		2.8E-06	-	1.6E-07	-	3.0E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**2.9E-04**	**4.9E+00**	**-**	**6.5E+00**	**-**	**1.1E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**43%**		**57%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - CT
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 1.5E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury		7.6E-04	-	5.3E-01	-	5.3E-01	***35%***
Chromium		3.4E-01	-	3.2E-02	-	3.8E-01	***25%***
Aluminum	1.8E-05	1.7E-01	-	4.0E-03	-	1.7E-01	***11%***
Vanadium		5.1E-02	-	4.5E-02	-	9.6E-02	6%
Copper	1.1E-05	6.7E-02	-	7.3E-03	-	7.4E-02	5%
Selenium		1.7E-02	-	4.3E-02	-	6.0E-02	4%
Mercury		6.5E-03	-	3.8E-02	-	4.5E-02	3%
Zinc		2.7E-02	-	1.5E-02	-	4.3E-02	3%
Lead	2.1E-06	3.6E-02	-	2.5E-03	-	3.8E-02	3%
Barium	2.3E-05	1.9E-02	-	1.4E-02	-	3.3E-02	2%
Arsenic		7.3E-03	-	1.4E-02	-	2.2E-02	1%
Nickel		4.1E-03	-	3.3E-04	-	4.4E-03	0%
Aroclor-1260		1.9E-03	-	9.2E-04	-	2.8E-03	0%
Cadmium		1.3E-03	-	8.5E-04	-	2.2E-03	0%
Chrysene		1.4E-03	-	3.3E-04	-	1.7E-03	0%
Benzo[a]pyrene		1.4E-03	-	1.5E-04	-	1.5E-03	0%
Benzo[a]anthracene		1.1E-03	-	2.0E-04	-	1.3E-03	0%
Benzo[b]fluoranthene		1.1E-03	-	2.4E-04	-	1.3E-03	0%
Benzo[ghi]perylene		8.0E-04	-	2.0E-05	-	8.2E-04	0%
Indeno[1,2,3-cd]pyrene		7.0E-04	-	1.0E-04	-	8.0E-04	0%
Benzo[k]fluoranthene		5.9E-04	-	9.1E-05	-	6.8E-04	0%
Aroclor-1254		1.3E-04	-	5.5E-04	-	6.8E-04	0%
Aroclor-1248		1.7E-04	-	1.8E-04	-	3.5E-04	0%
Fluorene		2.1E-04	-	1.1E-04	-	3.2E-04	0%
2-Methylnaphthalene		2.1E-04	-	1.0E-04	-	3.1E-04	0%
Pyrene		1.1E-04	-	2.8E-05	-	1.4E-04	0%
Dibenz[a,h]anthracene		9.7E-05	-	1.9E-05	-	1.2E-04	0%
Phenanthrene		7.8E-05	-	3.7E-05	-	1.2E-04	0%
Fluoranthene		4.2E-05	-	2.0E-05	-	6.2E-05	0%
Acenaphthene		5.3E-05	-	8.5E-07	-	5.4E-05	0%
Acetone		4.2E-05	-	-	-	4.2E-05	0%
Methylene chloride	1.7E-06					1.7E-06	0%
Silver	1.4E-06					1.4E-06	0%
Manganese	7.4E-07					7.4E-07	0%
Anthracene		2.8E-07	-	1.6E-08	-	3.0E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**5.7E-05**	**7.6E-01**	**-**	**7.5E-01**	**-**	**1.5E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**50%**		**50%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 1.6E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	7.6E-04	1.3E+01	-	5.7E-01	5.9E-03	***1.4E+01***	***84%***
Vanadium		3.6E-01	-	5.9E-01	1.4E-03	9.5E-01	6%
Methyl mercury		4.0E-04	-	5.2E-01	1.9E-02	5.4E-01	3%
Lead	3.9E-05	5.9E-01	-	7.8E-02	1.9E-03	6.7E-01	4%
Arsenic		4.0E-02	-	1.5E-01	6.8E-04	1.9E-01	1%
Selenium		1.7E-02	-	8.0E-02	3.9E-03	1.0E-01	1%
Barium	1.3E-05	2.0E-02	-	2.7E-02	2.0E-04	4.7E-02	0%
Copper	5.9E-06	4.8E-02	-	9.7E-03	2.4E-04	5.8E-02	0%
Aroclor-1254		1.8E-03	-	1.4E-02	4.4E-03	2.1E-02	0%
Mercury		8.1E-04	-	8.7E-03	3.3E-04	9.9E-03	0%
Cadmium		5.5E-03	-	6.5E-03	4.7E-05	1.2E-02	0%
Aroclor-1260		2.3E-03	-	2.1E-03	2.4E-03	6.8E-03	0%
Chrysene		2.7E-03	-	1.1E-03	-	3.8E-03	0%
Zinc		1.4E-03	-	1.5E-03	1.1E-04	3.0E-03	0%
Benzo[a]anthracene		2.1E-03	-	7.0E-04	-	2.8E-03	0%
Benzo[a]pyrene		1.6E-03	-	3.3E-04	-	2.0E-03	0%
Benzo[b]fluoranthene		1.3E-03	-	5.2E-04	-	1.8E-03	0%
Aroclor-1248		4.2E-04	-	8.1E-04	5.4E-05	1.3E-03	0%
Nickel		1.4E-03	-	2.1E-04	3.4E-06	1.6E-03	0%
Indeno[1,2,3-cd]pyrene		7.9E-04	-	2.2E-04	-	1.0E-03	0%
Benzo[ghi]perylene		8.8E-04	-	4.0E-05	-	9.2E-04	0%
Benzo[k]fluoranthene		5.7E-04	-	1.6E-04	-	7.3E-04	0%
2-Methylnaphthalene		2.5E-04	-	2.2E-04	-	4.7E-04	0%
Phenanthrene		1.1E-04	-	9.6E-05	-	2.1E-04	0%
Pyrene		1.3E-04	-	6.2E-05	-	2.0E-04	0%
Fluorene		8.4E-05	-	7.9E-05	-	1.6E-04	0%
Dibenz[a,h]anthracene		1.1E-04	-	3.9E-05	-	1.4E-04	0%
Fluoranthene		4.1E-05	-	3.6E-05	-	7.7E-05	0%
Chromium		8.0E-05	-	1.3E-05	1.5E-07	9.3E-05	0%
Acetone		4.3E-05	-	-	-	4.3E-05	0%
Manganese	9.1E-06					9.1E-06	0%
Acenaphthene		1.4E-05	-	4.2E-07	-	1.5E-05	0%
Methylene chloride	2.2E-06					2.2E-06	0%
Silver	2.1E-06					2.1E-06	0%
Anthracene		3.9E-07	-	4.2E-08	-	4.3E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**8.4E-04**	**1.4E+01**	**-**	**2.1E+00**	**4.1E-02**	**1.6E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**87%**		**13%**	**0%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - RME
RECEPTOR: RACCOON
TOTAL RISK (HI): 2.0E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	7.6E-05	1.3E+00	-	5.7E-02	5.9E-04	***1.4E+00***	***69%***
Methyl mercury		2.4E-04	-	3.1E-01	1.2E-02	3.2E-01	***16%***
Vanadium		3.6E-02	-	5.9E-02	1.4E-04	9.5E-02	5%
Selenium		1.0E-02	-	4.8E-02	2.3E-03	6.1E-02	3%
Lead	3.9E-06	5.9E-02	-	7.8E-03	1.9E-04	6.7E-02	3%
Copper	4.6E-06	3.7E-02	-	7.5E-03	1.9E-04	4.5E-02	2%
Arsenic		4.0E-03	-	1.5E-02	6.8E-05	1.9E-02	1%
Aroclor-1254		3.7E-04	-	2.9E-03	8.8E-04	4.1E-03	0%
Barium	1.3E-06	2.0E-03	-	2.7E-03	2.0E-05	4.7E-03	0%
Aroclor-1260		4.7E-04	-	4.1E-04	4.8E-04	1.4E-03	0%
Mercury		8.1E-05	-	8.7E-04	3.3E-05	9.9E-04	0%
Cadmium		5.5E-04	-	6.5E-04	4.7E-06	1.2E-03	0%
Nickel		6.8E-04	-	1.0E-04	1.7E-06	7.9E-04	0%
Chrysene		2.7E-04	-	1.1E-04	-	3.8E-04	0%
Zinc		1.4E-04	-	1.5E-04	1.1E-05	3.0E-04	0%
Aroclor-1248		8.3E-05	-	1.6E-04	1.1E-05	2.6E-04	0%
Benzo[a]anthracene		2.1E-04	-	7.0E-05	-	2.8E-04	0%
Benzo[a]pyrene		1.6E-04	-	3.3E-05	-	2.0E-04	0%
Benzo[b]fluoranthene		1.3E-04	-	5.2E-05	-	1.8E-04	0%
Indeno[1,2,3-cd]pyrene		7.9E-05	-	2.2E-05	-	1.0E-04	0%
Benzo[ghi]perylene		8.8E-05	-	4.0E-06	-	9.2E-05	0%
Benzo[k]fluoranthene		5.7E-05	-	1.6E-05	-	7.3E-05	0%
2-Methylnaphthalene		2.5E-05	-	2.2E-05	-	4.7E-05	0%
Phenanthrene		1.1E-05	-	9.6E-06	-	2.1E-05	0%
Pyrene		1.3E-05	-	6.2E-06	-	2.0E-05	0%
Fluorene		8.4E-06	-	7.9E-06	-	1.6E-05	0%
Dibenz[a,h]anthracene		1.1E-05	-	3.9E-06	-	1.4E-05	0%
Fluoranthene		4.1E-06	-	3.6E-06	-	7.7E-06	0%
Chromium		8.0E-06	-	1.3E-06	1.5E-08	9.3E-06	0%
Acetone		8.6E-06	-	-	-	8.6E-06	0%
Acenaphthene		7.1E-06	-	2.1E-07	-	7.4E-06	0%
Manganese	2.8E-06					2.8E-06	0%
Methylene chloride	2.6E-07					2.6E-07	0%
Silver	2.1E-07					2.1E-07	0%
Anthracene		3.9E-08	-	4.2E-09	-	4.3E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**8.9E-05**	**1.5E+00**	**-**	**5.1E-01**	**1.7E-02**	**2.0E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**74%**		**26%**	**1%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 1.0E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	6.9E-04	8.1E+00	-	3.5E-01	3.7E-03	***8.4E+00***	***83%***
Vanadium		2.3E-01	-	3.7E-01	8.6E-04	6.0E-01	6%
Methyl mercury		2.7E-04	-	3.6E-01	1.3E-02	3.7E-01	4%
Lead	1.9E-05	3.9E-01	-	5.1E-02	1.2E-03	4.4E-01	4%
Arsenic		2.6E-02	-	9.2E-02	4.3E-04	1.2E-01	1%
Selenium		1.1E-02	-	5.1E-02	2.5E-03	6.4E-02	1%
Barium	1.3E-05	1.3E-02	-	1.8E-02	1.3E-04	3.1E-02	0%
Copper	4.0E-06	3.0E-02	-	6.0E-03	1.5E-04	3.6E-02	0%
Aroclor-1254		7.1E-04	-	5.6E-03	1.7E-03	8.0E-03	0%
Mercury		4.9E-04	-	5.3E-03	2.0E-04	6.0E-03	0%
Cadmium		3.0E-03	-	3.5E-03	2.6E-05	6.6E-03	0%
Aroclor-1260		1.1E-03	-	9.4E-04	1.1E-03	3.1E-03	0%
Zinc		1.0E-03	-	1.1E-03	7.8E-05	2.2E-03	0%
Chrysene		1.2E-03	-	5.1E-04	-	1.7E-03	0%
Aroclor-1248		4.4E-04	-	8.5E-04	5.6E-05	1.3E-03	0%
Benzo[b]fluoranthene		9.1E-04	-	3.7E-04	-	1.3E-03	0%
Benzo[a]pyrene		1.2E-03	-	2.4E-04	-	1.4E-03	0%
Benzo[a]anthracene		9.6E-04	-	3.1E-04	-	1.3E-03	0%
Nickel		9.3E-04	-	1.4E-04	2.3E-06	1.1E-03	0%
Indeno[1,2,3-cd]pyrene		5.9E-04	-	1.6E-04	-	7.5E-04	0%
Benzo[k]fluoranthene		5.0E-04	-	1.4E-04	-	6.4E-04	0%
Benzo[ghi]perylene		6.8E-04	-	3.1E-05	-	7.1E-04	0%
Fluorene		1.8E-04	-	1.7E-04	-	3.5E-04	0%
2-Methylnaphthalene		1.8E-04	-	1.6E-04	-	3.4E-04	0%
Pyrene		9.5E-05	-	4.4E-05	-	1.4E-04	0%
Phenanthrene		6.6E-05	-	5.8E-05	-	1.2E-04	0%
Dibenz[a,h]anthracene		8.2E-05	-	3.0E-05	-	1.1E-04	0%
Fluoranthene		3.6E-05	-	3.1E-05	-	6.7E-05	0%
Chromium		5.3E-05	-	9.0E-06	1.0E-07	6.2E-05	0%
Acetone		1.8E-05	-	-	-	1.8E-05	0%
Manganese	5.7E-06					5.7E-06	0%
Acenaphthene		9.1E-06	-	2.7E-07	-	9.3E-06	0%
Methylene chloride	1.0E-06					1.0E-06	0%
Silver	9.5E-07					9.5E-07	0%
Anthracene		2.4E-07	-	2.5E-08	-	2.7E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**7.3E-04**	**8.8E+00**	**-**	**1.3E+00**	**2.5E-02**	**1.0E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**87%**		**13%**	**0%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: MARINE BASIN - CT
RECEPTOR: RACCOON
TOTAL RISK (HI): 1.3E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	6.9E-05	8.1E-01	-	3.5E-02	3.7E-04	8.4E-01	***67%***
Methyl mercury		1.6E-04	-	2.1E-01	8.0E-03	2.2E-01	***18%***
Vanadium		2.3E-02	-	3.7E-02	8.6E-05	6.0E-02	5%
Selenium		6.6E-03	-	3.1E-02	1.5E-03	3.9E-02	3%
Lead	1.9E-06	3.9E-02	-	5.1E-03	1.2E-04	4.4E-02	3%
Copper	3.1E-06	2.3E-02	-	4.7E-03	1.2E-04	2.8E-02	2%
Arsenic		2.6E-03	-	9.2E-03	4.3E-05	1.2E-02	1%
Barium	1.3E-06	1.3E-03	-	1.8E-03	1.3E-05	3.1E-03	0%
Aroclor-1254		1.4E-04	-	1.1E-03	3.4E-04	1.6E-03	0%
Mercury		4.9E-05	-	5.3E-04	2.0E-05	6.0E-04	0%
Aroclor-1260		2.1E-04	-	1.9E-04	2.2E-04	6.2E-04	0%
Cadmium		3.0E-04	-	3.5E-04	2.6E-06	6.6E-04	0%
Nickel		4.6E-04	-	7.0E-05	1.1E-06	5.3E-04	0%
Aroclor-1248		8.8E-05	-	1.7E-04	1.1E-05	2.7E-04	0%
Zinc		1.0E-04	-	1.1E-04	7.8E-06	2.2E-04	0%
Chrysene		1.2E-04	-	5.1E-05	-	1.7E-04	0%
Benzo[b]fluoranthene		9.1E-05	-	3.7E-05	-	1.3E-04	0%
Benzo[a]pyrene		1.2E-04	-	2.4E-05	-	1.4E-04	0%
Benzo[a]anthracene		9.6E-05	-	3.1E-05	-	1.3E-04	0%
Indeno[1,2,3-cd]pyrene		5.9E-05	-	1.6E-05	-	7.5E-05	0%
Benzo[k]fluoranthene		5.0E-05	-	1.4E-05	-	6.4E-05	0%
Benzo[ghi]perylene		6.8E-05	-	3.1E-06	-	7.1E-05	0%
Fluorene		1.8E-05	-	1.7E-05	-	3.5E-05	0%
2-Methylnaphthalene		1.8E-05	-	1.6E-05	-	3.4E-05	0%
Pyrene		9.5E-06	-	4.4E-06	-	1.4E-05	0%
Phenanthrene		6.6E-06	-	5.8E-06	-	1.2E-05	0%
Dibenz[a,h]anthracene		8.2E-06	-	3.0E-06	-	1.1E-05	0%
Fluoranthene		3.6E-06	-	3.1E-06	-	6.7E-06	0%
Chromium		5.3E-06	-	9.0E-07	1.0E-08	6.2E-06	0%
Acenaphthene		4.5E-06	-	1.3E-07	-	4.7E-06	0%
Acetone		3.5E-06	-	-	-	3.5E-06	0%
Manganese	1.8E-06					1.8E-06	0%
Methylene chloride	1.2E-07					1.2E-07	0%
Silver	9.5E-08					9.5E-08	0%
Anthracene		2.4E-08	-	2.5E-09	-	2.7E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**7.7E-05**	**9.1E-01**	**-**	**3.4E-01**	**1.1E-02**	**1.3E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**72%**		**27%**	**1%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: REFERENCE AREA
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.2E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury	6.0E-07	1.5E-03	1.9E-03	7.3E+00	-	***7.3E+00***	***62%***
Antimony	1.6E-02	6.1E-02	1.3E-02	5.4E-01	-	6.3E-01	5%
Lead	1.3E-04	1.5E-01	4.3E-02	4.3E-01	-	6.2E-01	5%
Cadmium		3.7E-03	7.8E-03	5.7E-01	-	5.9E-01	5%
Chromium		2.7E-01	9.0E-03	3.0E-01	-	5.8E-01	5%
Aluminum	1.4E-04	3.9E-01	1.2E-02	1.1E-01	-	5.1E-01	4%
Zinc	3.0E-05	4.6E-02	2.2E-01	2.3E-01	-	4.9E-01	4%
Selenium		1.5E-02	1.2E-02	1.9E-01	-	2.2E-01	2%
2-Methylnaphthalene		2.7E-04	1.4E-01	9.0E-03	-	1.5E-01	1%
Cobalt		2.3E-02	1.1E-03	1.0E-01	-	1.3E-01	1%
Mercury		2.7E-03	3.4E-03	1.0E-01	-	1.1E-01	1%
Arsenic	1.8E-05	3.5E-03	5.5E-03	6.1E-02	-	7.0E-02	1%
Barium		8.4E-03	1.1E-03	3.8E-02	-	4.8E-02	0%
Copper	8.3E-06	1.9E-02	6.1E-03	1.8E-02	-	4.4E-02	0%
Beryllium		2.7E-03	2.8E-05	3.9E-02	-	4.2E-02	0%
Nickel		1.1E-03	7.9E-05	3.3E-02	-	3.4E-02	0%
Vanadium	3.4E-05	9.9E-03	5.7E-05	1.7E-02	-	2.7E-02	0%
Aroclor-1260		4.7E-03	9.3E-03	1.3E-02	-	2.7E-02	0%
Aroclor-1248		4.8E-03	9.4E-03	5.4E-03	-	2.0E-02	0%
Benzo[b]fluoranthene	2.0E-06	1.1E-03	1.3E-05	1.6E-02	-	1.7E-02	0%
Chrysene		9.3E-04	1.9E-05	1.5E-02	-	1.6E-02	0%
Benzo[a]pyrene	2.6E-06	1.6E-03	2.2E-05	1.2E-02	-	1.4E-02	0%
Benzo[a]anthracene		7.7E-04	1.6E-05	9.4E-03	-	1.0E-02	0%
Indeno[1,2,3-cd]pyrene	4.0E-06	6.5E-04	4.0E-06	6.7E-03	-	7.4E-03	0%
Benzo[k]fluoranthene		6.1E-04	7.4E-06	6.6E-03	-	7.2E-03	0%
Naphthalene		6.2E-05	2.1E-05	6.1E-03	-	6.1E-03	0%
Fluorene		8.3E-05	1.3E-05	3.0E-03	-	3.1E-03	0%
Manganese	4.2E-06	1.2E-03	8.0E-04	1.1E-03	-	3.1E-03	0%
Pyrene		1.3E-04	4.5E-06	2.3E-03	-	2.4E-03	0%
Benzo[ghi]perylene	4.0E-06	8.4E-04	5.2E-06	1.5E-03	-	2.3E-03	0%
Phenanthrene		6.8E-05	6.9E-06	2.2E-03	-	2.3E-03	0%
Dibenz[a,h]anthracene		1.3E-04	9.0E-07	1.8E-03	-	1.9E-03	0%
Fluoranthene		4.7E-05	2.6E-06	1.6E-03	-	1.6E-03	0%
Acenaphthene		1.0E-05	2.3E-06	1.1E-05	-	2.4E-05	0%
Anthracene		5.0E-07	5.1E-08	2.0E-06	-	2.5E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.6E-02**	**1.0E+00**	**4.9E-01**	**1.0E+01**	**-**	**1.2E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**9%**	**4%**	**87%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : BLACK DUCK

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: REFERENCE AREA
RECEPTOR: BLACK DUCK
TOTAL RISK (HI): 1.4E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury	6.0E-08	1.5E-04	1.9E-04	7.3E-01	-	7.3E-01	***51%***
Chromium		5.5E-02	1.8E-03	6.0E-02	-	1.2E-01	8%
Selenium		7.3E-03	6.1E-03	9.6E-02	-	1.1E-01	8%
Antimony	1.6E-03	6.1E-03	1.3E-03	5.4E-02	-	6.3E-02	4%
Lead	1.3E-05	1.5E-02	4.3E-03	4.3E-02	-	6.2E-02	4%
Mercury		1.3E-03	1.7E-03	5.2E-02	-	5.5E-02	4%
Zinc	3.3E-06	5.0E-03	2.4E-02	2.5E-02	-	5.5E-02	4%
Aluminum	1.4E-05	3.9E-02	1.2E-03	1.1E-02	-	5.1E-02	4%
Cadmium		2.7E-04	5.7E-04	4.2E-02	-	4.2E-02	3%
Copper	6.3E-06	1.5E-02	4.6E-03	1.4E-02	-	3.3E-02	2%
Arsenic	7.0E-06	1.4E-03	2.2E-03	2.4E-02	-	2.8E-02	2%
Nickel		7.8E-04	5.7E-05	2.4E-02	-	2.5E-02	2%
Barium		4.2E-03	5.5E-04	1.9E-02	-	2.4E-02	2%
2-Methylnaphthalene		2.7E-05	1.4E-02	9.0E-04	-	1.5E-02	1%
Cobalt		2.3E-03	1.1E-04	1.0E-02	-	1.3E-02	1%
Beryllium		2.7E-04	2.8E-06	3.9E-03	-	4.2E-03	0%
Vanadium	3.4E-06	9.9E-04	5.7E-06	1.7E-03	-	2.7E-03	0%
Aroclor-1260		4.7E-04	9.3E-04	1.3E-03	-	2.7E-03	0%
Aroclor-1248		4.8E-04	9.4E-04	5.4E-04	-	2.0E-03	0%
Benzo[b]fluoranthene	2.0E-07	1.1E-04	1.3E-06	1.6E-03	-	1.7E-03	0%
Chrysene		9.3E-05	1.9E-06	1.5E-03	-	1.6E-03	0%
Benzo[a]pyrene	2.6E-07	1.6E-04	2.2E-06	1.2E-03	-	1.4E-03	0%
Benzo[a]anthracene		7.7E-05	1.6E-06	9.4E-04	-	1.0E-03	0%
Indeno[1,2,3-cd]pyrene	4.0E-07	6.5E-05	4.0E-07	6.7E-04	-	7.4E-04	0%
Benzo[k]fluoranthene		6.1E-05	7.4E-07	6.6E-04	-	7.2E-04	0%
Naphthalene		6.2E-06	2.1E-06	6.1E-04	-	6.1E-04	0%
Fluorene		8.3E-06	1.3E-06	3.0E-04	-	3.1E-04	0%
Manganese	4.2E-07	1.2E-04	8.0E-05	1.1E-04	-	3.1E-04	0%
Pyrene		1.3E-05	4.5E-07	2.3E-04	-	2.4E-04	0%
Benzo[ghi]perylene	4.0E-07	8.4E-05	5.2E-07	1.5E-04	-	2.3E-04	0%
Phenanthrene		6.8E-06	6.9E-07	2.2E-04	-	2.3E-04	0%
Dibenz[a,h]anthracene		1.3E-05	9.0E-08	1.8E-04	-	1.9E-04	0%
Fluoranthene		4.7E-06	2.6E-07	1.6E-04	-	1.6E-04	0%
Acenaphthene		5.1E-06	1.2E-06	5.7E-06	-	1.2E-05	0%
Anthracene		5.0E-08	5.1E-09	2.0E-07	-	2.5E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**1.6E-03**	**1.5E-01**	**6.5E-02**	**1.2E+00**	**-**	**1.4E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**11%**	**4%**	**85%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: REFERENCE AREA
RECEPTOR: HERON
TOTAL RISK (HI): 8.8E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury	2.7E-07	7.0E-04	-	2.3E-01	2.5E-04	2.3E-01	***27%***
Aluminum	6.4E-05	1.8E-01	-	3.4E-03	6.5E-04	1.9E-01	***21%***
Chromium		1.3E-01	-	9.6E-03	2.2E-02	1.6E-01	***18%***
Vanadium	1.6E-04	4.8E-02	-	5.6E-03	1.9E-02	7.3E-02	8%
Antimony	7.3E-03	2.8E-02	-	1.7E-02	7.3E-03	6.0E-02	7%
Zinc	1.3E-05	2.1E-02	-	7.3E-03	7.3E-05	2.9E-02	3%
Lead	1.7E-05	2.0E-02	-	4.0E-03	3.2E-03	2.8E-02	3%
Cadmium		1.7E-03	-	1.8E-02	6.2E-03	2.6E-02	3%
Cobalt		1.1E-02	-	3.4E-03	4.2E-03	1.8E-02	2%
Selenium		7.8E-03	-	7.0E-03	1.1E-03	1.6E-02	2%
Aroclor-1248		9.8E-04	-	7.5E-05	9.6E-03	1.1E-02	1%
Copper	3.8E-06	9.1E-03	-	5.8E-04	2.9E-04	9.9E-03	1%
Aroclor-1260		2.2E-03	-	4.0E-04	3.6E-03	6.2E-03	1%
Barium		3.9E-03	-	1.2E-03	4.2E-04	5.6E-03	1%
Mercury		1.3E-03	-	3.3E-03	4.5E-04	5.0E-03	1%
Arsenic	8.0E-06	1.6E-03	-	1.9E-03	8.8E-04	4.5E-03	1%
Beryllium		1.2E-03	-	1.3E-03	4.5E-04	2.9E-03	0%
Nickel		5.0E-04	-	1.1E-03	2.7E-04	1.8E-03	0%
Benzo[a]pyrene	1.2E-06	7.5E-04	-	3.9E-04	-	1.1E-03	0%
Benzo[b]fluoranthene	9.3E-07	5.0E-04	-	5.2E-04	-	1.0E-03	0%
Chrysene		4.4E-04	-	4.8E-04	-	9.2E-04	0%
Benzo[a]anthracene		3.6E-04	-	3.0E-04	-	6.6E-04	0%
Manganese	1.9E-06	5.5E-04	-	3.4E-05	1.7E-05	6.0E-04	0%
Indeno[1,2,3-cd]pyrene	1.8E-06	3.0E-04	-	2.2E-04	-	5.2E-04	0%
Benzo[k]fluoranthene		2.9E-04	-	2.1E-04	-	5.0E-04	0%
Benzo[ghi]perylene	1.8E-06	3.9E-04	-	4.7E-05	-	4.4E-04	0%
2-Methylnaphthalene		1.3E-04	-	2.9E-04	-	4.2E-04	0%
Naphthalene		2.9E-05	-	1.9E-04	-	2.2E-04	0%
Fluorene		3.9E-05	-	9.5E-05	-	1.3E-04	0%
Pyrene		6.1E-05	-	7.2E-05	-	1.3E-04	0%
Dibenz[a,h]anthracene		5.9E-05	-	5.6E-05	-	1.2E-04	0%
Phenanthrene		3.2E-05	-	7.1E-05	-	1.0E-04	0%
Fluoranthene		2.2E-05	-	5.0E-05	-	7.2E-05	0%
Acenaphthene		4.8E-06	-	3.6E-07	-	5.2E-06	0%
Anthracene		2.3E-07	-	6.4E-08	-	3.0E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**7.5E-03**	**4.7E-01**	**-**	**3.2E-01**	**8.1E-02**	**8.8E-01**	
PERCENTAGE OF TOTAL RISK	**1%**	**53%**		**37%**	**9%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : HERON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: REFERENCE AREA
RECEPTOR: HERON
TOTAL RISK (HI): 1.2E-01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Chromium		2.5E-02	-	1.9E-03	4.5E-03	3.2E-02	***27%***
Methyl mercury	2.7E-08	7.0E-05	-	2.3E-02	2.5E-05	2.3E-02	***20%***
Aluminum	6.4E-06	1.8E-02	-	3.4E-04	6.5E-05	1.9E-02	***15%***
Copper	2.9E-06	6.9E-03	-	4.4E-04	2.2E-04	7.6E-03	6%
Vanadium	1.6E-05	4.8E-03	-	5.6E-04	1.9E-03	7.3E-03	6%
Antimony	7.3E-04	2.8E-03	-	1.7E-03	7.3E-04	6.0E-03	5%
Selenium		2.3E-03	-	2.1E-03	3.2E-04	4.7E-03	4%
Zinc	1.5E-06	2.4E-03	-	8.1E-04	8.1E-06	3.2E-03	3%
Barium		2.0E-03	-	6.1E-04	2.1E-04	2.8E-03	2%
Lead	1.7E-06	2.0E-03	-	4.0E-04	3.2E-04	2.8E-03	2%
Mercury		6.3E-04	-	1.7E-03	2.3E-04	2.5E-03	2%
Cadmium		1.3E-04	-	1.3E-03	4.5E-04	1.9E-03	2%
Cobalt		1.1E-03	-	3.4E-04	4.2E-04	1.8E-03	2%
Arsenic	3.2E-06	6.6E-04	-	7.7E-04	3.5E-04	1.8E-03	1%
Nickel		3.6E-04	-	7.6E-04	2.0E-04	1.3E-03	1%
Aroclor-1248		9.8E-05	-	7.5E-06	9.6E-04	1.1E-03	1%
Aroclor-1260		2.2E-04	-	4.0E-05	3.6E-04	6.2E-04	1%
Beryllium		1.2E-04	-	1.3E-04	4.5E-05	2.9E-04	0%
Benzo[a]pyrene	1.2E-07	7.5E-05	-	3.9E-05	-	1.1E-04	0%
Benzo[b]fluoranthene	9.3E-08	5.0E-05	-	5.2E-05	-	1.0E-04	0%
Chrysene		4.4E-05	-	4.8E-05	-	9.2E-05	0%
Benzo[a]anthracene		3.6E-05	-	3.0E-05	-	6.6E-05	0%
Manganese	1.9E-07	5.5E-05	-	3.4E-06	1.7E-06	6.0E-05	0%
Indeno[1,2,3-cd]pyrene	1.8E-07	3.0E-05	-	2.2E-05	-	5.2E-05	0%
Benzo[k]fluoranthene		2.9E-05	-	2.1E-05	-	5.0E-05	0%
Benzo[ghi]perylene	1.8E-07	3.9E-05	-	4.7E-06	-	4.4E-05	0%
2-Methylnaphthalene		1.3E-05	-	2.9E-05	-	4.2E-05	0%
Naphthalene		2.9E-06	-	1.9E-05	-	2.2E-05	0%
Fluorene		3.9E-06	-	9.5E-06	-	1.3E-05	0%
Pyrene		6.1E-06	-	7.2E-06	-	1.3E-05	0%
Dibenz[a,h]anthracene		5.9E-06	-	5.6E-06	-	1.2E-05	0%
Phenanthrene		3.2E-06	-	7.1E-06	-	1.0E-05	0%
Fluoranthene		2.2E-06	-	5.0E-06	-	7.2E-06	0%
Acenaphthene		2.4E-06	-	1.8E-07	-	2.6E-06	0%
Anthracene		2.3E-08	-	6.4E-09	-	3.0E-08	0%
TOTAL MEDIUM-SPECIFIC RISK	**7.6E-04**	**7.0E-02**	**-**	**3.8E-02**	**1.1E-02**	**1.2E-01**	
PERCENTAGE OF TOTAL RISK	**1%**	**59%**		**31%**	**9%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: REFERENCE AREA
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 9.2E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury	9.7E-07	2.9E-03	-	5.3E+00	-	***5.3E+00***	***57%***
Antimony	2.6E-02	1.2E-01	-	3.9E-01	-	5.3E-01	6%
Cadmium		7.1E-03	-	4.1E-01	-	4.2E-01	5%
Chromium		5.2E-01	-	2.2E-01	-	7.4E-01	8%
Aluminum	2.3E-04	7.4E-01	-	7.6E-02	-	8.2E-01	9%
Zinc	4.8E-05	8.7E-02	-	1.6E-01	-	2.5E-01	3%
Vanadium	5.7E-04	2.0E-01	-	1.3E-01	-	3.2E-01	4%
Selenium		3.2E-02	-	1.6E-01	-	1.9E-01	2%
Lead	6.1E-05	8.3E-02	-	9.0E-02	-	1.7E-01	2%
Cobalt		4.4E-02	-	7.6E-02	-	1.2E-01	1%
Mercury		5.2E-03	-	7.5E-02	-	8.0E-02	1%
Arsenic	2.8E-05	6.7E-03	-	4.4E-02	-	5.0E-02	1%
Barium		1.6E-02	-	2.8E-02	-	4.4E-02	0%
Beryllium		5.1E-03	-	2.8E-02	-	3.3E-02	0%
Nickel		2.1E-03	-	2.4E-02	-	2.6E-02	0%
Copper	1.3E-05	3.7E-02	-	1.3E-02	-	5.0E-02	1%
Benzo[b]fluoranthene	3.3E-06	2.0E-03	-	1.2E-02	-	1.4E-02	0%
Aroclor-1260		9.0E-03	-	9.1E-03	-	1.8E-02	0%
Chrysene		1.8E-03	-	1.1E-02	-	1.3E-02	0%
Benzo[a]pyrene	4.2E-06	3.1E-03	-	8.9E-03	-	1.2E-02	0%
Benzo[a]anthracene		1.5E-03	-	6.8E-03	-	8.3E-03	0%
2-Methylnaphthalene		5.2E-04	-	6.5E-03	-	7.0E-03	0%
Indeno[1,2,3-cd]pyrene	6.4E-06	1.2E-03	-	4.9E-03	-	6.1E-03	0%
Benzo[k]fluoranthene		1.2E-03	-	4.7E-03	-	5.9E-03	0%
Naphthalene		1.2E-04	-	4.4E-03	-	4.5E-03	0%
Aroclor-1248		4.0E-03	-	1.7E-03	-	5.7E-03	0%
Fluorene		1.6E-04	-	2.1E-03	-	2.3E-03	0%
Pyrene		2.5E-04	-	1.6E-03	-	1.9E-03	0%
Phenanthrene		1.3E-04	-	1.6E-03	-	1.7E-03	0%
Benzo[ghi]perylene	6.5E-06	1.6E-03	-	1.1E-03	-	2.7E-03	0%
Manganese	6.8E-06	2.3E-03	-	7.7E-04	-	3.0E-03	0%
Dibenz[a,h]anthracene		2.4E-04	-	1.3E-03	-	1.5E-03	0%
Fluoranthene		9.1E-05	-	1.1E-03	-	1.2E-03	0%
Acenaphthene		2.0E-05	-	8.2E-06	-	2.8E-05	0%
Anthracene		9.6E-07	-	1.4E-06	-	2.4E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**2.7E-02**	**1.9E+00**	**-**	**7.3E+00**	**-**	**9.2E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**21%**		**79%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : SANDPIPER

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: REFERENCE AREA
RECEPTOR: SANDPIPER
TOTAL RISK (HI): 1.1E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Methyl mercury	9.7E-08	2.9E-04	-	5.3E-01	-	5.3E-01	***46%***
Chromium		1.0E-01	-	4.3E-02	-	1.5E-01	***13%***
Selenium		9.4E-03	-	4.6E-02	-	5.6E-02	5%
Antimony	2.6E-03	1.2E-02	-	3.9E-02	-	5.3E-02	5%
Mercury		2.6E-03	-	3.7E-02	-	4.0E-02	4%
Cadmium		5.1E-04	-	3.0E-02	-	3.1E-02	3%
Aluminum	2.3E-05	7.4E-02	-	7.6E-03	-	8.2E-02	7%
Zinc	5.3E-06	9.7E-03	-	1.8E-02	-	2.8E-02	2%
Vanadium	5.7E-05	2.0E-02	-	1.3E-02	-	3.2E-02	3%
Arsenic	1.1E-05	2.7E-03	-	1.7E-02	-	2.0E-02	2%
Copper	1.0E-05	2.8E-02	-	9.9E-03	-	3.8E-02	3%
Nickel		1.5E-03	-	1.7E-02	-	1.9E-02	2%
Barium		8.0E-03	-	1.4E-02	-	2.2E-02	2%
Lead	6.1E-06	8.3E-03	-	9.0E-03	-	1.7E-02	2%
Cobalt		4.4E-03	-	7.6E-03	-	1.2E-02	1%
Beryllium		5.1E-04	-	2.8E-03	-	3.3E-03	0%
Benzo[b]fluoranthene	3.3E-07	2.0E-04	-	1.2E-03	-	1.4E-03	0%
Aroclor-1260		9.0E-04	-	9.1E-04	-	1.8E-03	0%
Chrysene		1.8E-04	-	1.1E-03	-	1.3E-03	0%
Benzo[a]pyrene	4.2E-07	3.1E-04	-	8.9E-04	-	1.2E-03	0%
Benzo[a]anthracene		1.5E-04	-	6.8E-04	-	8.3E-04	0%
2-Methylnaphthalene		5.2E-05	-	6.5E-04	-	7.0E-04	0%
Indeno[1,2,3-cd]pyrene	6.4E-07	1.2E-04	-	4.9E-04	-	6.1E-04	0%
Benzo[k]fluoranthene		1.2E-04	-	4.7E-04	-	5.9E-04	0%
Naphthalene		1.2E-05	-	4.4E-04	-	4.5E-04	0%
Aroclor-1248		4.0E-04	-	1.7E-04	-	5.7E-04	0%
Fluorene		1.6E-05	-	2.1E-04	-	2.3E-04	0%
Pyrene		2.5E-05	-	1.6E-04	-	1.9E-04	0%
Phenanthrene		1.3E-05	-	1.6E-04	-	1.7E-04	0%
Benzo[ghi]perylene	6.5E-07	1.6E-04	-	1.1E-04	-	2.7E-04	0%
Manganese	6.8E-07	2.3E-04	-	7.7E-05	-	3.0E-04	0%
Dibenz[a,h]anthracene		2.4E-05	-	1.3E-04	-	1.5E-04	0%
Fluoranthene		9.1E-06	-	1.1E-04	-	1.2E-04	0%
Acenaphthene		9.8E-06	-	4.1E-06	-	1.4E-05	0%
Anthracene		9.6E-08	-	1.4E-07	-	2.4E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**2.7E-03**	**2.9E-01**	**-**	**8.5E-01**	**-**	**1.1E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**25%**		**74%**		**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: REFERENCE AREA
RECEPTOR: RACCOON
TOTAL RISK (HI): 7.1E+01

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	1.1E-02	4.6E+01	-	8.6E+00	3.2E-03	***5.4E+01***	***77%***
Methyl mercury	3.6E-07	1.3E-03	-	4.5E+00	9.3E-06	***4.5E+00***	6%
Lead	6.9E-04	1.2E+00	-	2.3E+00	3.5E-03	***3.5E+00***	5%
Vanadium	2.6E-03	1.1E+00	-	1.3E+00	8.7E-03	***2.4E+00***	3%
Cadmium		1.5E-02	-	1.6E+00	1.0E-03	***1.6E+00***	2%
Arsenic	4.1E-04	1.2E-01	-	1.4E+00	1.3E-03	***1.6E+00***	2%
Antimony	2.3E-02	1.3E-01	-	7.8E-01	6.3E-04	9.3E-01	1%
Selenium		7.6E-02	-	6.9E-01	2.0E-04	7.7E-01	1%
Barium		7.1E-02	-	2.2E-01	1.5E-04	3.0E-01	0%
Copper	4.7E-05	1.6E-01	-	1.0E-01	1.0E-04	2.6E-01	0%
Cobalt		4.7E-02	-	1.5E-01	3.7E-04	2.0E-01	0%
Nickel		4.3E-03	-	9.1E-02	4.5E-05	9.6E-02	0%
Mercury		2.5E-03	-	6.6E-02	1.7E-05	6.9E-02	0%
Beryllium		5.5E-03	-	5.6E-02	3.9E-05	6.2E-02	0%
Manganese	6.6E-05	2.7E-02	-	1.7E-02	1.6E-05	4.4E-02	0%
Benzo[b]fluoranthene	2.9E-06	2.2E-03	-	2.3E-02	-	2.6E-02	0%
Chrysene		1.9E-03	-	2.2E-02	-	2.4E-02	0%
Aroclor-1248		1.3E-02	-	1.0E-02	2.5E-03	2.5E-02	0%
Benzo[a]pyrene	3.7E-06	3.3E-03	-	1.8E-02	-	2.1E-02	0%
Zinc	2.0E-06	4.5E-03	-	1.6E-02	3.0E-07	2.0E-02	0%
Aroclor-1260		6.3E-03	-	1.2E-02	2.0E-04	1.8E-02	0%
Benzo[a]anthracene		1.6E-03	-	1.4E-02	-	1.5E-02	0%
2-Methylnaphthalene		5.6E-04	-	1.3E-02	-	1.4E-02	0%
Indeno[1,2,3-cd]pyrene	5.6E-06	1.3E-03	-	9.7E-03	-	1.1E-02	0%
Benzo[k]fluoranthene		1.3E-03	-	9.4E-03	-	1.1E-02	0%
Naphthalene		1.3E-04	-	8.7E-03	-	8.8E-03	0%
Fluorene		1.7E-04	-	4.3E-03	-	4.4E-03	0%
Pyrene		2.7E-04	-	3.2E-03	-	3.5E-03	0%
Phenanthrene		1.4E-04	-	3.2E-03	-	3.3E-03	0%
Benzo[ghi]perylene	5.7E-06	1.7E-03	-	2.1E-03	-	3.8E-03	0%
Dibenz[a,h]anthracene		2.6E-04	-	2.5E-03	-	2.8E-03	0%
Fluoranthene		9.8E-05	-	2.2E-03	-	2.3E-03	0%
Chromium		2.1E-04	-	1.6E-04	7.1E-07	3.6E-04	0%
Acenaphthene		2.1E-05	-	1.6E-05	-	3.8E-05	0%
Anthracene		1.0E-06	-	2.9E-06	-	3.9E-06	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.8E-02**	**4.8E+01**	**-**	**2.2E+01**	**2.2E-02**	**7.1E+01**	
PERCENTAGE OF TOTAL RISK	**0%**	**69%**		**31%**	**0%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

TABLE T-3.12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : RACCOON

REMEDIAL INVESTIGATION REPORT
STRATFORD ARMY ENGINE PLANT
STRATFORD, CT

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: REFERENCE AREA
RECEPTOR: RACCOON
TOTAL RISK (HI): 9.9E+00

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Aluminum	1.1E-03	4.6E+00	-	8.6E-01	3.2E-04	***5.4E+00***	***55%***
Methyl mercury	2.2E-07	7.9E-04	-	2.7E+00	5.6E-06	***2.7E+00***	***27%***
Selenium		4.6E-02	-	4.2E-01	1.2E-04	4.7E-01	5%
Lead	6.9E-05	1.2E-01	-	2.3E-01	3.5E-04	3.5E-01	3%
Vanadium	2.6E-04	1.1E-01	-	1.3E-01	8.7E-04	2.4E-01	2%
Cadmium		1.5E-03	-	1.6E-01	1.0E-04	1.6E-01	2%
Arsenic	4.1E-05	1.2E-02	-	1.4E-01	1.3E-04	1.6E-01	2%
Copper	3.6E-05	1.2E-01	-	8.0E-02	7.8E-05	2.0E-01	2%
Antimony	2.3E-03	1.3E-02	-	7.8E-02	6.3E-05	9.3E-02	1%
Nickel		2.2E-03	-	4.6E-02	2.3E-05	4.8E-02	0%
Barium		7.1E-03	-	2.2E-02	1.5E-05	3.0E-02	0%
Cobalt		4.7E-03	-	1.5E-02	3.7E-05	2.0E-02	0%
Manganese	2.0E-05	8.4E-03	-	5.3E-03	4.9E-06	1.4E-02	0%
Mercury		2.5E-04	-	6.6E-03	1.7E-06	6.9E-03	0%
Beryllium		5.5E-04	-	5.6E-03	3.9E-06	6.2E-03	0%
Aroclor-1248		2.6E-03	-	2.0E-03	4.9E-04	5.1E-03	0%
Aroclor-1260		1.3E-03	-	2.4E-03	4.1E-05	3.7E-03	0%
Benzo[b]fluoranthene	2.9E-07	2.2E-04	-	2.3E-03	-	2.6E-03	0%
Chrysene		1.9E-04	-	2.2E-03	-	2.4E-03	0%
Benzo[a]pyrene	3.7E-07	3.3E-04	-	1.8E-03	-	2.1E-03	0%
Zinc	2.0E-07	4.5E-04	-	1.6E-03	3.0E-08	2.0E-03	0%
Benzo[a]anthracene		1.6E-04	-	1.4E-03	-	1.5E-03	0%
2-Methylnaphthalene		5.6E-05	-	1.3E-03	-	1.4E-03	0%
Indeno[1,2,3-cd]pyrene	5.6E-07	1.3E-04	-	9.7E-04	-	1.1E-03	0%
Benzo[k]fluoranthene		1.3E-04	-	9.4E-04	-	1.1E-03	0%
Naphthalene		1.3E-05	-	8.7E-04	-	8.8E-04	0%
Fluorene		1.7E-05	-	4.3E-04	-	4.4E-04	0%
Pyrene		2.7E-05	-	3.2E-04	-	3.5E-04	0%
Phenanthrene		1.4E-05	-	3.2E-04	-	3.3E-04	0%
Benzo[ghi]perylene	5.7E-07	1.7E-04	-	2.1E-04	-	3.8E-04	0%
Dibenz[a,h]anthracene		2.6E-05	-	2.5E-04	-	2.8E-04	0%
Fluoranthene		9.8E-06	-	2.2E-04	-	2.3E-04	0%
Chromium		2.1E-05	-	1.6E-05	7.1E-08	3.6E-05	0%
Acenaphthene		1.1E-05	-	8.2E-06	-	1.9E-05	0%
Anthracene		1.0E-07	-	2.9E-07	-	3.9E-07	0%
TOTAL MEDIUM-SPECIFIC RISK	**3.8E-03**	**5.0E+00**	**-**	**4.9E+00**	**2.7E-03**	**9.9E+00**	
PERCENTAGE OF TOTAL RISK	**0%**	**50%**		**49%**	**0%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a CPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of CPC to total risk associated with the ingestion exposure pathway.

T-4

TISSUE EFFECT CONCENTRATIONS (CRITICAL BODY RESIDUES)

APPENDIX T-4 TISSUE EFFECT CONCENTRATIONS (CRITICAL BODY RESIDUES)

Methodology

Available data relating tissue residue levels in aquatic organisms to adverse ecological effects (e.g., survival, growth reproduction) were compiled from two main sources (Jarvinen and Ankley, 1999 and USACOE, 2002). Jarvinen and Ankley (1999) presents tissue residue data compiled from approximately 500 separate publications and includes over 3300 records. The USACOE electronic database currently contains over 3400 records compiled from 736 studies published between 1964 and 2001. The ERED database was downloaded and combined with an electronic version of the Jarvinen and Ankley dataset in a Microsoft Access database containing over 6700 records.

The database was modified in preparation for information retrieval, including the addition of auxiliary fields to facilitate sorting and the exclusion of records not considered relevant or applicable to the BERA. The additional fields included ecosystem classification (i.e., freshwater or saltwater), trophic level (i.e., predator, omnivore, bottom feeder (detritivore), or filter feeder), and taxonomic phylum. The modified database was then queried using several filtering criteria including: tissue type (whole body), ecosystem classification (freshwater, saltwater), and BERA COPCs. The query resulted in a dataset of approximately 700 records, which were then screened for duplicate records. Output was further limited to include only survival-, growth-, and reproduction-based endpoints. Data were summarized for the following contaminant groupings: Aroclors and inorganics (Tables T-4.1 and T-4.2, respectively in Appendix T-4).

For each contaminant class and general effect category (i.e., mortality, growth, and reproduction), LOAELs and NOAELs were selected for invertebrates and fish species (the selected NOAELs were the highest concentration in which no adverse effect was observed that does not exceed the LOAEL for a given taxon and effect category). Table 12-39 in the RI report summarizes the derived NOAELs and LOAELs obtained from this analysis, sorted into finfish, invertebrate (non-shellfish), and shellfish; concentrations are reported as ug/g wet weight.

TABLE T-4.1
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - AROCLORS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Aroclor 1248									
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	13	F	Mortality	NOEL	Survival - No effect. Radiotracer study
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	190		Mortality	NOEL	Survival - No effect. Female fish had the highest residues
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	2.8	F	Growth	NOEL	Growth - No effect. Female fish had the highest residue le
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	13		Growth	NOEL	Growth - No effect. Radiotracer study
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	11	F	Growth	LOEL	Growth - Reduced. Female fish had the highest residue le
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	190	F	Reproduction	NOEL	Reproduction - No effect. Female fish had the highest res
Gammarus pseudolimnaeus	Amphipod	Fresh	Invertebrate	detritivore	552	I	Mortality	NOEL	Survival - No effect.
Gammarus pseudolimnaeus	Amphipod	Fresh	Invertebrate	detritivore	127	I	Reproduction	NOEL	Reproduction - No effect.
Gammarus pseudolimnaeus	Amphipod	Fresh	Invertebrate	detritivore	552	I	Reproduction	LOEL	Reproduction - Reduced.
Aroclor 1254									
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	0.26	F	Mortality	NOEL	Survival - No effect. Embryos hatched and larvae raised i
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	0.26		Mortality	NOEL	Survival - No effect. Embryos hatched and larvae raised i
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.5		Mortality	NOEL	Survival - No effect.
Lagodon rhomboides	Pinfish	Salt	Finfish	omnivore	0.98		Mortality	NOED	No effect on survival in 48 hours
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	2		Mortality	NOEL	Survival - No effect.
Lagodon rhomboides	Pinfish	Salt	Finfish	omnivore	3.8		Mortality	NOED	No effect on survival in 48 hours
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.2		Mortality	NOED	No increase in mortality.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.5		Mortality	NOEL	Survival - No effect.
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	17		Mortality	NOEL	Survival - No effect. Salinity, 10 - 34 ppt
Lagodon rhomboides	Pinfish	Salt	Finfish	omnivore	17		Mortality	NOED	No effect on survival in 48 hours
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	21		Mortality	NOEL	Survival - No effect. Radiotracer study
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	27		Mortality	NOEL	Survival - No effect. Embryos hatched in clean water
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	27		Mortality	NOEL	Survival - No effect. Embryos hatched in clean water
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	47.2		Mortality	NOED	No effect on survival observed.
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	49		Mortality	NOEL	Survival - No effect.
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	49		Mortality	NOEL	Survival - No effect.
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	54		Mortality	NOEL	Survival - No effect. Radiotracer study
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	71		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	81		Mortality	NOEL	Survival - No effect.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	741		Mortality	NOEL	Survival - No effect.
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	1.53	F	Mortality	LOED	Significant increase in mortality. Exposure to 20.8 ng/L in
Lagodon rhomboides	Pinfish	Salt	Finfish	omnivore	14		Mortality	LOEL	Survival - Reduced 66%. Salinity, 20 - 32 ppt
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	46		Mortality	LOEL	Survival - Reduced 51-53%. Salinity, 16 - 32 ppt
Lagodon rhomboides	Pinfish	Salt	Finfish	omnivore	109		Mortality	LOEL	Survival - Reduced 41%. Salinity, 14 - 34 ppt
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	125		Mortality	LOED	18% Increase in mortality.
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	152		Mortality	LOEL	Survival - Reduced 62%. Salinity, 23 - 34 ppt
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	170		Mortality	LOEL	Survival - Reduced 27%. Embryos hatched in clean water
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	170		Mortality	LOEL	Survival - Reduced 27%. Embryos hatched in clean water

TABLE T-4.1
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - AROCLORS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	284		Mortality	LD50	50% Mortality.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	419		Mortality	LD100	100% Mortality in 127 days. Residue measured at 48 day
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	645		Mortality	LOEL	Survival - Reduced - Death. Radiotracer study; All fish die
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	648		Mortality	LOEL	Survival - Reduced - Death.
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	2	F	Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.2		Growth	NOED	No significant difference in total weight or in liver:body we
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.5		Growth	NOEL	Growth - No effect.
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	21		Growth	NOEL	Growth - No effect. Radiotracer study
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	26.3		Growth	NOED	No significant difference in weight gain. Exposure to 327
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	31		Growth	NOEL	Growth - No effect.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	47.2		Growth	NOED	No effect on weight observed.
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	54		Growth	NOEL	Growth - No effect. Radiotracer study
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	81		Growth	NOEL	Growth - No effect.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	741		Growth	NOEL	Growth - No effect.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	71	F	Growth	LOEL	Growth - Reduced.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	11.6	F	Reproduction	NOED	No effect on reproductive parameters; measurement endp
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	54		Reproduction	NOEL	Reproduction - No effect.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	13.7	F	Reproduction	LOED	Reproduction inhibited; frequency and fecundity 5-30% of
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	83		Reproduction	LOEL	Reproduction - Reduced.
Orconectes nais	Crayfish	Fresh	Invertebrate	omnivore	0.04	I	Mortality	NOED	Radiolabeled Compound
Orconectes nais	Crayfish	Fresh	Invertebrate	omnivore	0.14		Mortality	NOED	No effect on survival in 48 hours
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	0.42		Mortality	NOEL	Survival - No effect.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	0.42		Mortality	NOED	No significant increase in mortality in 90 days in field
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	0.42		Mortality	NOEL	Survival - No effect.
Macoma nasuta	Clam - Bent nose	Salt	Invertebrate	filter feeder	0.976		Mortality	NOED	99% survival; tissue burdens and toxicity were determine
Corydalus cornutus	Midge	Fresh	Invertebrate	omnivore	1.02		Mortality	NOED	Radiolabeled Compound
Chaoborus punctipennis	Midge	Fresh	Invertebrate	omnivore	1.2		Mortality	NOED	Radiolabeled Compound
Orconectes nais	Crayfish	Fresh	Invertebrate	omnivore	1.3		Mortality	NOED	No effect on survival in 48 hours
Pteronarcys dorsata	Giant Black Stonefly	Fresh	Invertebrate	omnivore	1.4		Mortality	NOED	Radiolabeled Compound
Palaemonetes kadiakensis	Shrimp - Grass	Estuarine	Invertebrate	omnivore	3.2		Mortality	NOED	Radiolabeled Compound
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	5.4		Mortality	NOEL	Survival - No effect.
Culex tarsalis	Mosquito	Fresh	Invertebrate	detritivore	5.4		Mortality	NOED	Radiolabeled Compound
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	5.4		Mortality	NOED	No significant increase in mortality in 7 days.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	5.4		Mortality	NOEL	Survival - No effect.
Gammarus pseudolimnaeus	Amphipod	Fresh	Invertebrate	detritivore	7.8		Mortality	NOED	Radiolabeled Compound
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	10.4		Mortality	NOED	Radiolabeled Compound
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	16.5		Mortality	NOEL	Survival - No effect.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	16.5		Mortality	NOED	No significant increase in mortality in 35 days.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	16.5		Mortality	NOEL	Survival - No effect.

TABLE T-4.1
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - AROCLORS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	18		Mortality	NOEL	Survival - No effect.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	18		Mortality	NOED	No significant increase in mortality in 16 days.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	18		Mortality	NOEL	Survival - No effect.
Callinectes sapidus	Crab - Blue	Salt	Invertebrate	predator	23		Mortality	NOED	No effect on survival in 20 days
Orconectes nais	Crayfish	Fresh	Invertebrate	omnivore	33		Mortality	NOED	No effect on survival in 48 hours
Orconectes nais	Crayfish	Fresh	Invertebrate	omnivore	16	I	Mortality	NA	Lethal to 18 of 25 fish in 20 days.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	27		Mortality	LOEL	Survival - Reduced 45%.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	27		Mortality	LOED	45% Increase in mortality in 16 days.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	27		Mortality	LOEL	Survival - Reduced 45%.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	65		Mortality	LD60	60% Mortality in 7 days.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	65		Mortality	LD60	60% Mortality in 7 days.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	65		Mortality	LOEL	Survival - Reduced 60%.
Acheta domesticus	Cricket - House	Terrestrial	Invertebrate	omnivore	143.9		Mortality	LOED	14-d soil bioassay; despite high mortality no significant dif
Macoma nasuta	Clam - Bent nose	Salt	Shellfish	filter feeder	0.02	S	Mortality	NOED	100% survival; tissue burdens and toxicity were determine
Macoma nasuta	Clam - Bent nose	Salt	Shellfish	filter feeder	0.0214		Mortality	NOED	100% survival; tissue burdens and toxicity were determine
Macoma nasuta	Clam - Bent nose	Salt	Shellfish	filter feeder	0.0278		Mortality	NOED	100% survival; tissue burdens and toxicity were determine
Macoma nasuta	Clam - Bent nose	Salt	Shellfish	filter feeder	0.0352		Mortality	NOED	100% survival; tissue burdens and toxicity were determine
Macoma nasuta	Clam - Bent nose	Salt	Shellfish	filter feeder	9.17		Mortality	NOED	99% survival; tissue burdens and toxicity were determined
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	101		Mortality	NOED	No effect on mortality
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	425		Mortality	NOED	No effect on mortality
Macoma nasuta	Clam - Bent nose	Salt	Shellfish	filter feeder	18.6	S	Mortality	ED26	26% survival; tissue burdens and toxicity were determined
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	8.1	S	Growth	NA	No effect on survival in 96 hours.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	33		Growth	NA	No effect on survival in 96 hours.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	101		Growth	NOED	No effect on growth
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	8.1	S	Growth	NA	19% reduction in rate of shell growth.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	33		Growth	NA	41% reduction in rate of shell growth.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	425		Growth	LOED	Reduced growth
Aroclor 1260									
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	32	F	Mortality	NOEL	Survival - No effect. Radiotracer study
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	350		Mortality	NOEL	Survival - No effect. Female fish had the highest residues
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.36	F	Mortality	LOEL	Survival - Reduced - Death. LBB affected by time of death
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	161		Mortality	LOEL	Survival - Reduced - Death. LBB affected by time of death
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	32	F	Growth	NOEL	Growth - No effect. Radiotracer study
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	350		Growth	NOEL	Growth - No effect. Female fish had the highest residues
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	350	F	Reproduction	NOEL	Reproduction - No effect. Female fish had the highest res
PCBs									
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	0.56	F	Mortality	NOED	Residues in surviving second generation fry ranged from
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	0.76		Mortality	NOED	PCB dosed with acetone carrier; no effect on mortality.

TABLE T-4.1
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - AROCLORS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	0.76		Mortality	NOED	PCB dosed with no acetone carrier; no effect on mortality
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	1.8		Mortality	NOED	PCB With No Acetone Carrier; No Effect On Mortality. Co
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	2.1		Mortality	NOED	PCB dosed with no acetone carrier; no effect on mortality
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	2.3		Mortality	NOED	PCB dosed with acetone carrier; no effect on mortality.
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	10.9		Mortality	NOED	No Effect On Mortality
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	14.3		Mortality	NOED	No Effect On Mortality
Lagodon rhomboides	Pinfish	Salt	Finfish	omnivore	17		Mortality	NOED	No Effect On Survival In 48 Hours
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	27		Mortality	NOED	Aroclor 1254 40mm animal length
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	30		Mortality	NOED	No Effect On Mortality
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	40.3		Mortality	NOEL	Survival - No effect.
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	49		Mortality	NOED	No effect on mortality.
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	57		Mortality	NOED	No Effect On Fry Mortality In 28 Days
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	110		Mortality	NOED	No Effect On Adult Mortality In 28 Days
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	230		Mortality	NOED	No Effect On Juvenile Mortality In 28 Days
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	0.15	F	Mortality	LOED	Significant increase (6%) in mortality of smolts during sea
Lagodon rhomboides	Pinfish	Salt	Finfish	omnivore	14		Mortality	LD65	Aroclor 1254 30mm animal length
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	17		Mortality	LD17	Aroclor 1254 25mm animal length
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	46		Mortality	LD50	Aroclor 1254 24mm animal length
Lagodon rhomboides	Pinfish	Salt	Finfish	omnivore	109		Mortality	LD40	Aroclor 1254 27mm animal length
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	120		Mortality	LD53	Aroclor 1254 24mm animal length
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	152		Mortality	LD64	Aroclor 1254 74mm animal length
Phoxinus phoxinus	Minnow	Estuarine	Finfish	omnivore	170		Mortality	LOED	Doubling of mortality rate compared to controls after 300
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	200		Mortality	LOED	Lethal To 86% Of Fry In 28 Days
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	250		Mortality	LD50	50% mortality in 22 days.
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	253		Mortality	LD50	50% mortality in 22 days.
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	256		Mortality	LD50	50% mortality in 22 days.
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	271		Mortality	LD50	50% mortality in 22 days.
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	293		Mortality	LD50	50% mortality in 22 days.
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	293		Mortality	LD50	50% mortality in 22 days.
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	324		Mortality	LD50	50% mortality in 22 days.
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	645		Mortality	ED100	Radiolabeled - Contam. Food Fed.
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	1100		Mortality	LOED	88% Juvenile Mortality In 28 Days
Brachydanio rerio	Zebra fish	Fresh	Finfish	omnivore	4300		Mortality	LOEL	Survival - Reduced 83%.
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	0.6	F	Growth	NOED	No Effect On Growth (weight gain)
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	0.76		Growth	NOED	Pcb Dosed With and Without Acetone Carrier; No Effect O
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	0.76		Growth	NOED	PCB with no acetone carrier; no effect on growth (weight
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	2.1		Growth	NOED	PCB with no acetone carrier; no effect on growth (weight
Oncorhynchus tschawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	3.5		Growth	NOED	No effect on weight gain.
Morone saxatilis	Bass - Striped	Estuarine	Finfish	piscivore	4.4		Growth	NOED	No significant difference in length and weight gain in larva

TABLE T-4.1
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - AROCLORS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	13.5		Growth	NOED	No difference in hepatosomatic index.
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	1.8	F	Growth	LOED	PCB With No Acetone Carrier; Enhanced Growth (weight
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	2.3		Growth	LOED	Significant increased rate of growth (weight gain).
Salvelinus namaycush	Trout - Lake	Fresh	Finfish	piscivore	2.4		Growth	LOED	PCB Dosed With Acetone Carrier; Enhanced Growth (wei
Pleuronectes americanus	Flounder - Winter	Estuarine	Finfish	bottom feeder	7.1		Growth	LOED	Residue measured in eggs from wild fish. Reduced lengt
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	9.8		Growth	LOED	Significant increase in hepatosomatic index. Concurrent
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	14.3		Growth	LOED	40% Reduction in body weight. Increased liver/body weig
Oncorhynchus kisutch	Salmon - Coho	Anadromous	Finfish	piscivore	43		Growth	LOED	Significant increase in hepatosomatic index.
Phoxinus phoxinus	Minnow	Estuarine	Finfish	omnivore	170		Growth	LOED	Increased growth.
Phoxinus phoxinus	Minnow	Estuarine	Finfish	omnivore	180		Growth	LOED	Significantly increased growth at 79 days. Residue meas
Phoxinus phoxinus	Minnow	Estuarine	Finfish	omnivore	1.6	F	Reproduction	NOED	No significant reduction in time to hatch. Residues measu
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	110		Reproduction	NOED	No effect on fertilization of eggs. Residue in eggs of 66 m
Cyprinodon variegatus	Minnow - Sheepshead	Estuarine	Finfish	omnivore	0.88	F	Reproduction	LOED	Increase in fecundity
Phoxinus phoxinus	Minnow	Estuarine	Finfish	omnivore	15		Reproduction	LOED	Reduction in time to hatch. Fry death within 1 week of ha
Phoxinus phoxinus	Minnow	Estuarine	Finfish	omnivore	170		Reproduction	ED85	85% reduction in hatchability of eggs.
Phoxinus phoxinus	Minnow	Estuarine	Finfish	omnivore	170		Reproduction	ED83	83% Reduction in hatchability of eggs. Residues measur
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	0.1	I	Mortality	NOEL	Survival - No effect.
Nereis virens	Polychaete	Salt	Invertebrate	detritivore	0.63		Mortality	NOEL	Survival - No effect.
Penaeus duorarum	Shrimp - Pink	Estuarine	Invertebrate	omnivore	1.3		Mortality	NOED	No Effect On Survival In 48 Hours
Ephemera danica	Mayfly	Fresh	Invertebrate	detritivore	1.5		Mortality	NOED	
Callinectes sapidus	Crab - Blue	Salt	Invertebrate	predator	23		Mortality	NOED	No Effect On Survival In 20 Days
Penaeus duorarum	Shrimp - Pink	Estuarine	Invertebrate	omnivore	3.9	I	Mortality	LD100	100% Mortality In 48 Hours
Penaeus duorarum	Shrimp - Pink	Estuarine	Invertebrate	omnivore	16		Mortality	LD72	72% Mortality in 20 days.
Ephemera danica	Mayfly	Fresh	Invertebrate	detritivore	1.5	I	Growth	NOED	
Crassostrea virginica	Oyster - Eastern	Salt	Invertebrate	filter feeder	101		Growth	NOED	No effect on growth rate.
Crassostrea virginica	Oyster - Eastern	Salt	Invertebrate	filter feeder	8.1	I	Growth	ED19	19% Reduction In Rate Of Shell Growth
Mercenaria mercenaria	Clam - Quahog	Salt	Shellfish	filter feeder	0.12	S	Mortality	NOEL	Survival - No effect.
Corbicula fluminea	Clam - Asiatic	Fresh	Shellfish	filter feeder	0.45		Mortality	NOEL	Survival - No effect.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	0.6		Mortality	NOED	No significant difference in ability to survive anoxic stress
Macoma nasuta	Clam - Bent nose	Salt	Shellfish	filter feeder	1.7		Mortality	NOED	No Effect On Mortality
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	33		Mortality	NOED	No Effect On Survival In 96 Hours
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	425		Mortality	NOED	No increase in mortality.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	1.4	S	Mortality	LOED	Significant decrease in ability to survive anoxic stress afte
Macoma nasuta	Clam - Bent nose	Salt	Shellfish	filter feeder	1.7	S	Growth	NOED	No difference in weight change.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	33	S	Growth	ED41	41% Reduction In Rate Of Shell Growth
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	425		Growth	LOED	Reduced growth rate (weight and height).

Notes:

TABLE T-4.1
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - AROCLORS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)	Effect	Endpoint	Comments

Concentration units in ug/g wet weight tissue unless otherwise specified.
Where available, NOAELs and LOAELs are identified separately for fish (F), invertebrates (I), and wildlife (W).
Information compiled from the following sources:
1. ACOE, 2002. Tissue Effects Database; Army Corps of Engineers, U.S. Waterways Experiment Station, Vicksburg, MS.
2. Jarvinen and Ankley, 1999.
3. USEPA, 2000. Bioaccumulation Summary; United States Environmental Protection Agency; EPA-823-R-00-002.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Aluminum									
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	1	F	Mortality	NOEL	Survival - No effect. Residues in surviving fish
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.53		Mortality	NOED	
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	8	F	Mortality	LOED	Mean Of Nominal Exposure Conc; Questionable Background Survival
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	8		Mortality	LOEL	Survival - Reduced <20%. Residues in surviving fish
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	20		Mortality	ED100	
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	20		Mortality	LOEL	Survival - Reduced - Death. Residues in dead fish
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	36.8		Mortality	LOEL	Survival - Reduced - Death. Residues in dead fish
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	8	F	Growth	NOEL	Growth - No effect.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	12.5		Growth	NOED	Significant Weight Relative to Other Exposures
Arsenic									
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	0.52	F	Mortality	NOED	No Effect On Mortality
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	1		Mortality	NOEL	Survival - No effect. 5°C
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	1.22		Mortality	NOED	Estimated Wet Weight□□ Arsanilic Acid
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.8		Mortality	NOED	No increase in mortality. Weekly application of sodium arsenite herbicide in artificial pond.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.8		Mortality	NOEL	Survival - No effect. *Total amount of arsenic applied; 16 treatments at 0.4 mg/L/wk
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2		Mortality	NOEL	Survival - No effect. 5°C; Residues in surviving fish
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2		Mortality	NOEL	Survival - No effect. 15°C
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.28		Mortality	NOED	Estimated Wet Weight□□ Dimethylarsenic
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.6		Mortality	NOEL	Survival - No effect.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	5.5		Mortality	NOED	No increase in mortality. Monthly applications of sodium arsenite herbicide in artificial pond.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	5.5		Mortality	NOEL	Survival - No effect. *Total amount of arsenic applied; 4 treatments 1.2 mg/L/mo
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	6.1		Mortality	NOEL	Survival - No effect. Organic form of arsenic was tested.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.8		Mortality	NOEL	Survival - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	9.1		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	11.4		Mortality	NOEL	Survival - No effect. Organic form of arsenic was tested.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.24	F	Mortality	LD16	Estimated Wet Weight□□ Disodium Arsenate
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	2.24		Mortality	LOED	Increase in mortality. One application of sodium arsenite herbicide in artificial pond.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	2.24		Mortality	LOEL	Survival - Reduced. *Total amount of arsenic applied; Treatments varied from 1 at 4 mg/L to 16 treatments at 1.2 mg/L/wk
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	3		Mortality	LD50	Survival - Reduced 50%. 5°C
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	3.58		Mortality	LD12	Estimated Wet Weight
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	4.7		Mortality	LOED	Pre-exposure to arsenic for 7 d produced significant increase in LC50 (reduced sensitivity to exposure) at shortest time interval tested.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.4		Mortality	LOEL	Survival - Reduced - Death. 5°C; Residues in dead fish
Lepomis cyanellus	Green sunfish	Fresh	Finfish	invertivore	6.7		Mortality	LOEL	Survival - Reduced - Death. LT50 = 46 h; Residues in dead fish
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	11.2		Mortality	LOEL	Survival - Reduced < 20%.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	11.6		Mortality	LOED	Increased mortality. Weekly appplications of sodium arsenite herbicide in artificial pond.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	11.6		Mortality	LOEL	Survival - Reduced. *Total amount of arsenic applied; 16 treatments 1.2 mg/L/wk
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	17.9		Mortality	LOEL	Survival - Reduced < 20%.
Lepomis cyanellus	Green sunfish	Fresh	Finfish	invertivore	108		Mortality	LOEL	Survival - Reduced - Death. LT50 = 17 h; Residues in dead fish
Lepomis cyanellus	Green sunfish	Fresh	Finfish	invertivore	116		Mortality	LOEL	Survival - Reduced - Death. LT50 = 12 h; Residues in dead fish
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.9		Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.9	F	Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	1		Growth	NOEL	Growth - No effect. 5°C
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	1.22		Growth	NOED	Estimated Wet Weight□□ Arsanilic Acid
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.8		Growth	NOED	No difference in weight gain. Weekly application of sodium arsenite herbicide in artificial pond.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.8		Growth	NOEL	Growth - No effect. *Total amount of arsenic applied; 16 treatments at 0.4 mg/L/wk
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2		Growth	NOEL	Growth - No effect. 15 ° C
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.28		Growth	NOED	Estimated Wet Weight□□ Dimethylarsenic
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.6		Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	3		Growth	NOED	Exposure to arsenic for 21 d did not affect growth at the longest time interval tested.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	5.5		Growth	NOED	No difference in weight. Monthly applications of sodium arsenite herbicide in artificial pond.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	5.5		Growth	NOEL	Growth - No effect. *Total amount of arsenic applied; 4 treatments 1.2 mg/L/mo
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	6.1		Growth	NOEL	Growth - No effect. Organic form of arsenic was tested.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	11.4		Growth	NOEL	Growth - No effect. Organic form of arsenic was tested.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.62	F	Growth	LOED	Estimated Wet Weight□□ Arsenic Trioxide
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	2.24		Growth	LOED	Decrease in weight gain. One application of sodium arsenite herbicide in artificial pond.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	2.24		Growth	LOEL	Growth - Reduced. *Total amount of arsenic applied; Treatments varied from 1 at 4 mg/L to 16 treatments at 1.2 mg/L/wk
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	3		Growth	LOEL	Growth - Reduced. 5°C
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	3.1		Growth	LOEL	Growth - Reduced.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	6.9		Growth	LOEL	Growth - Reduced.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	11.6		Growth	LOED	Decrease in weight. Weekly appplications of sodium arsenite herbicide in artificial pond.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	11.6		Growth	LOEL	Growth - Reduced. *Total amount of arsenic applied; 16 treatments 1.2 mg/L/wk
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	0.53	F	Reproduction	NOED	Normal ovary and oocyte development. Weekly applications of sodium arsenite herbicide in artificial pond.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.72	F	Reproduction	LOED	Abnormal ovary and oocyte development. Weekly applications of sodium arsenite herbicide in artificial pond.
Stagnicola emarginatus	Snail	Fresh	Invertebrate	herbivore	3.6	I	Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Stagnicola emarginatus	Snail	Fresh	Invertebrate	herbivore	3.6		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Stagnicola emarginatus	Snail	Fresh	Invertebrate	herbivore	3.6		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Stagnicola emarginatus	Snail	Fresh	Invertebrate	herbivore	3.6		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	3.8		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph, Tissues Exposed 21 D
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	4		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph, Tissues Exposed 21 D
Helisoma campanulata	Snail	Fresh	Invertebrate	herbivore	4		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	4.4		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph, Tissues Exposed 21 D
Helisoma campanulata	Snail	Fresh	Invertebrate	herbivore	5.8		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Pteronarcys dorsata	Giant Black Stonefly	Fresh	Invertebrate	omnivore	6		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Pteronarcys dorsata	Giant Black Stonefly	Fresh	Invertebrate	omnivore	7		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Pteronarcys dorsata	Giant Black Stonefly	Fresh	Invertebrate	omnivore	8.4		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Pteronarcys dorsata	Giant Black Stonefly	Fresh	Invertebrate	omnivore	8.4		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	9.8		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph, Tissues Exposed 21 D
Helisoma campanulata	Snail	Fresh	Invertebrate	herbivore	16		Mortality	NOED	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Helisoma campanulata	Snail	Fresh	Invertebrate	herbivore	4.2	I	Mortality	ED16	Mixture Of 4 Arsenic Cmpds, Est Body Burden From Graph
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	87		Mortality	ED50	Lethal body burden after 21 d exposure.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	1.03	I	Growth	NOED	No effect on growth rate.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	1.14		Growth	NOED	No effect on growth rate.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	1.15		Growth	NOED	No effect on growth rate.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	1.28		Growth	NOED	No effect on growth rate. Exposure to 10 ug/L arsenate in water and 14.6 ug/g in diet.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	87	I	Reproduction	ED10	10% reduction in number of offspring.
Cadmium									

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.026	F	Mortality	NOED	No effect on hatchability and survival of embryos. Parents exposed to 3.4 ug/L for up to 38 weeks.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	0.036		Mortality	NOEL	Survival - No effect.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.04		Mortality	NOEL	Survival - No effect. Third generation fish
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.042		Mortality	NOED	No effect on hatchability and survival of 3rd generation embryos. Parents exposed to 3.4 ug/L for up to 105 weeks.
Perca fluviatilis	Perch	Fresh	Finfish	piscivore	0.075		Mortality	NOEL	Survival - No effect. Radiotracer study; Residue calculated from BCF determined in the study
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	0.09		Mortality	NOED	Body Burden Est. From Graph, Fish Initially Exposed As Embryos
Gasterosteus aculeatus	Three-spined Sticklet	Fresh	Finfish	invertivore	0.11		Mortality	NOEL	Survival - No effect. Residue estimated by authors by summation of individual tissue burdens
Leucaspius delineatus	Fish	Fresh	Finfish	planktivore	0.15		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.25		Mortality	NOED	No Significant Effect On Mortality. Residue calculated at 6 hours exposure.
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	0.25		Mortality	NOEL	Survival - No effect. 9.6°C
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	0.4		Mortality	NOED	Body Burden Est. From Graph, Fish Not Exposed As Embryos
Anguilla anguilla	Eel - European	Anadromous	Finfish	predator	0.56		Mortality	NOEL	Survival - No effect.
Triborodon hakonensis	Dace	Fresh	Finfish	omnivore	0.69		Mortality	NOEL	Survival - No effect.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	0.8		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.96		Mortality	NOEL	Survival - No effect.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	1		Mortality	NOED	No increase in mortality.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	2		Mortality	NOEL	Survival - No effect. Residues were higher at 30 d than 100 d. Range shown is for 100 and 30 d
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	2		Mortality	NOEL	Survival - No effect. 5°C
Noemacheilus barbatulus	Stone loach	Fresh	Finfish	piscivore	2.3		Mortality	NOEL	Survival - No effect.
Lates calcarifer	Seabass	Salt	Finfish	piscivore	2.5		Mortality	NOEL	Survival - No effect.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	4.8		Mortality	NOEL	Survival - No effect.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	5		Mortality	NOED	No increase in mortality.
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	5.4		Mortality	NOEL	Survival - No effect.
Belone belone	Garpike	Salt	Finfish	piscivore	7		Mortality	NOEL	Survival - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Clupea harengus	Herring - Baltic	Salt	Finfish	piscivore	7		Mortality (viable hatch)	NOEL	Survival (viable hatch) - No effect. Salinity 5 ppt
Belone belone	Garpike	Salt	Finfish	piscivore	10		Mortality (hatchabi	NOEL	Survival (hatchability) No effect.
Clupea harengus	Herring - Baltic	Salt	Finfish	piscivore	11		Mortality (viable ha	NOEL	Survival (viable hatch) - No effect. Salinity 16 ppt
Clupea harengus	Herring - Baltic	Salt	Finfish	piscivore	19		Mortality	NOEL	Survival - No effect.
Clupea harengus	Herring - Baltic	Salt	Finfish	piscivore	29		Mortality (viable ha	NOEL	Survival (viable hatch) - No effect. Salinity 25 and 30 ppt
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	35		Mortality	NOED	
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.14	F	Mortality	LOEL	Survival - Reduced 20%.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.21		Mortality	LOED	Hatching Alevins Unable To Break Free From Egg Membrane, Died
Gasterosteus aculeatus	Three-spined Sticklet	Fresh	Finfish	invertivore	0.3		Mortality	LOEL	Survival - Reduced 5.6%. Residue estimated by authors by summation of individual tissue burdens
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	0.35		Mortality	LOEL	Survival - Reduced.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	0.4		Mortality	LOED	Body Burden Est. From Graph, Fish Initially Exposed As Embryos
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	0.4		Mortality	LOED	Body Burden Est. From Graph, Fish Not Exposed As Embryos
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.41		Mortality	LD50	Survival - Reduced 50%.
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	0.56		Mortality	LOEL	Survival - Reduced. 9.6°C
Gasterosteus aculeatus	Three-spined Sticklet	Fresh	Finfish	invertivore	0.75		Mortality	LOEL	Survival - Reduced 9.7%. Residue estimated by authors by summation of individual tissue burdens
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	0.8		Mortality	LOEL	Survival - Reduced 16%.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.84		Mortality	LD100	Complete Mortality Of Alevins Within 320 Hours
Gasterosteus aculeatus	Three-spined Sticklet	Fresh	Finfish	invertivore	0.9		Mortality	LOEL	Survival - Reduced 80%. Residues in control fish, 0.39 µg/g
Gasterosteus aculeatus	Three-spined Sticklet	Fresh	Finfish	invertivore	0.9		Mortality	LOED	At least 80% mortality.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	1.2		Mortality	LOED	14% Reduction In Survival
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.2		Mortality	ED50	Hardness: 70 Mg/l Caco3
Gasterosteus aculeatus	Three-spined Sticklet	Fresh	Finfish	invertivore	2.94		Mortality	LOEL	Survival - Reduced 27.4%. Residue estimated by authors by summation of individual tissue burdens
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	3.74		Mortality	ED50	Hardness: 279 Mg/l Caco3
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	4		Mortality	LOEL	Survival - Reduced. 5°C

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WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	4		Mortality	LOEL	Survival - Reduced. Residues were higher at 30 d than 100 d. Range shown is for 100 and 30 d.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	4		Mortality	ED50	Hardness: 70 Mg/l Caco3
Lates calcarifer	Seabass	Salt	Finfish	piscivore	4.2		Mortality	LOEL	Survival - Reduced 10%. Residues in surviving fish
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	6.4		Mortality	ED50	Hardness: 279 Mg/l Caco3
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	8		Mortality	LOEL	Survival - Reduced >50%.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	8		Mortality	LD50	50% Reduction In Survival
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	8		Mortality	LD50	Survival - Reduced 50%. Residues in surviving fish
Lates calcarifer	Seabass	Salt	Finfish	piscivore	8.3		Mortality	LOEL	Survival - Reduced <50%. Residues in surviving fish
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	8.6		Mortality	LD50	Survival - Reduced 50%. Residues in surviving fish
Belone belone	Garpike	Salt	Finfish	piscivore	10		Mortality (hatchabi	LOEL	Survival (hatchability) Reduced.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	16.4		Mortality	LD100	Complete Mortality Of Alevins Within 10 Hours
Belone belone	Garpike	Salt	Finfish	piscivore	18		Mortality	LOEL	Survival - Reduced.
Clupea harengus	Herring - Baltic	Salt	Finfish	piscivore	19		Mortality (viable ha	LOEL	Survival (viable hatch) - Reduced. Salinity 16 ppt
Lates calcarifer	Seabass	Salt	Finfish	piscivore	20.4		Mortality	LD50	Survival - Reduced 50%. Residues in surviving fish
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	24		Mortality	LD50	Survival - Reduced 50%. Residues in surviving fish
Clupea harengus	Herring - Baltic	Salt	Finfish	piscivore	24		Mortality (viable ha	LOEL	Survival (viable hatch) - Reduced. Salinity 5 ppt
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	34		Mortality	LD50	Survival - Reduced 50%. Residues in surviving fish
Clupea harengus	Herring - Baltic	Salt	Finfish	piscivore	36		Mortality	LOEL	Survival - Reduced.
Clupea harengus	Herring - Baltic	Salt	Finfish	piscivore	38		Mortality (viable ha	LOEL	Survival (viable hatch) - Reduced. Salinity 25 and 30 ppt
Leiostomus xanthurus	Spot	Salt	Finfish	omnivore	42		Mortality	LD50	Survival - Reduced 50%. Residues in surviving fish
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	144		Mortality	LOED	Significantly Reduced Survival At Lowest Test Concentration, Exp_conc = <3.6
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	0.06	F	Growth	NOEL	Growth - No effect. 9.6°C
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.13		Growth	NOEL	Growth - No effect. Third generation fish
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	0.3		Growth	NOEL	Growth - No effect. 5°C

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	0.35		Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.47		Growth	NOEL	Growth - No effect.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	0.5		Growth	NOED	No difference in body length.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.54		Growth	NOEL	Growth - No effect.
Triborodon hakonensis	Dace	Fresh	Finfish	omnivore	0.69		Growth	NOEL	Growth - No effect.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.75		Growth	NOEL	Growth - No effect.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	0.8		Growth	NOEL	Growth - No effect.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	2		Growth	NOEL	Growth - No effect. Residues were higher at 30 d than 100 d. Range shown is for 100 and 30 d
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	4.8		Growth	NOEL	Growth - No effect.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	5		Growth	NOED	No difference in body length..
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	6		Growth	NOED	Body Burden Est. From Graph
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	6		Growth	NOED	Body Burden Est. From Graph
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	10		Growth	NOED	Total Length Of Females
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	10		Growth	NOED	Total Length Of Females
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	0.12	F	Growth	LOEL	Growth - Reduced. 9.6°C
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.25		Growth	LOEL	Growth - Reduced. Third generation fish
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	0.25		Growth	LOED	Decreased weight gain at 12 weeks.
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	0.4		Growth	LOEL	Growth - Reduced. 5°C
Cyprinodon variegatus	Minnow - Sheepshea	Estuarine	Finfish	omnivore	0.5		Growth	LOED	Significant decrease in length.
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	0.8		Growth	LOED	Reduction In Body Length Within 10 Days
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.96		Growth	LOEL	Growth - Reduced.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	1.6		Growth	LOEL	Growth - Reduced.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	4		Growth	LOEL	Growth - Reduced. Residues were higher at 30 d than 100 d. Range shown is for 100 and 30 d.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	20		Growth	LOED	Total Length Of Females
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	20		Growth	LOED	Total Length Of Females
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	1.2	F	Reproduction	NOEL	Reproduction - No effect.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	2	F	Reproduction	LOEL	Reproduction - Reduced. Mean spawnings per female and total number of embryos produced were decreased.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	101		Reproduction	ED100	Complete Mortality Of Eggs Within 32 Hours
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	0.202	I	Mortality	NOED	No effect on mortality in one day.
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	0.284		Mortality	NOED	No effect on mortality in one day.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	0.61		Mortality	NOEL	Survival - No effect.
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	0.7		Mortality	NOEL	Survival - No effect.
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	0.9		Mortality	NOEL	Survival - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)	Effect	Endpoint	Comments
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	0.9	Mortality	NOED	Estimated Wet Weight
Mysidopsis bahia	Shrimp - Mysid	Salt	Invertebrate	invertivore	1.29	Mortality	NOED	No effect on mortality.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	1.6	Mortality	NOED	No increase in mortality. Salinity 30 ppt.
Monoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	2	Mortality	NOED	Body Burden Est. From Graph
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	2.1	Mortality	NOEL	Survival - No effect.
Pontoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	2.3	Mortality	NOEL	Survival - No effect.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	2.6	Mortality	NOEL	Survival - No effect. *8 HQ (8 - hydroxyquinoline) added
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	4.6	Mortality	NOEL	Survival - No effect.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	4.6	Mortality	NOEL	Survival - No effect. *EDTA added
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	5.6	Mortality	NOEL	Survival - No effect.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	5.6	Mortality	NOED	No increase in mortality.
Pontoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	6	Mortality	NOEL	Survival - No effect.
Monoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	6	Mortality	NOED	
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	6.4	Mortality	NOEL	Survival - No effect.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	6.4	Mortality	NOEL	Survival - No effect. *Humic acid added
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	7	Mortality	NOEL	Survival - No effect.
Nephtys caeca	Polychaete	Salt	Invertebrate	detritivore	7.8	Mortality	NOEL	Survival - No effect.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	8.4	Mortality	NOEL	Survival - No effect. *90% distilled water added
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	9.4	Mortality	NOEL	Survival - No effect. *Sediment A added
Physa integra	Snail	Fresh	Invertebrate	herbivore	10	Mortality	NOEL	Survival - No effect.
Monoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	10	Mortality	NOED	Body Burden Est. From Graph
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	10.6	Mortality	NOED	No Effect On Survival. Residue at 6 days.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	12.4	Mortality	NOEL	Survival - No effect. *Sediment B added
Cambarus latimanus	Crayfish	Fresh	Invertebrate	omnivore	14.9	Mortality	NOED	No significant increase in mortality. Feed contaminated with 0.17 ug Cd/g.
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	16	Mortality	NOED	No effect on mortality in one day.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	17.8	Mortality	NOEL	Survival - No effect. No effects on generations one to five
Glycera dibranchiata	Polychaete	Salt	Invertebrate	detritivore	24	Mortality	NOEL	Survival - No effect.
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	24.8	Mortality	NOED	No effect on mortality in one day.
Pteronarcys dorsata	Giant Black Stonefly	Fresh	Invertebrate	omnivore	29	Mortality	NOEL	Survival - No effect.
Hydropsyche betteni	Caddisfly	Fresh	Invertebrate	omnivore	40	Mortality	NOEL	Survival - No effect.
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	41.8	Mortality	NOED	No effect on mortality in one day.
Gammarus fossarum	Amphipod	Fresh	Invertebrate	detritivore	53.4	Mortality	NOED	No increase in mortality. Hard water 83-87 mg/L Ca ion, pH 8.3. Artificial stream system.
Lumbriculus variegatus	Oligochaete	Fresh	Invertebrate	detritivore	60	Mortality	NOEL	Survival - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Nereis arenaceodentata	Polychaete	Estuarine	Invertebrate	detritivore	62		Mortality	NOED	No Effect On Survival
Nereis virens	Polychaete	Salt	Invertebrate	detritivore	63.8		Mortality	NOEL	Survival - No effect.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	67.4		Mortality	NOEL	Survival - No effect.
Helisoma sp.	Snail	Fresh	Invertebrate	herbivore	78		Mortality	NOEL	Survival - No effect.
Helisoma sp.	Snail	Fresh	Invertebrate	herbivore	90		Mortality	NOEL	Survival - No effect.
Lumbriculus variegatus	Oligochaete	Fresh	Invertebrate	detritivore	138		Mortality	NOEL	Survival - No effect. Authors state that the high residue level may be caused by gut contents with biologically unavailable Cd bound to ingested particulates
Glyptotendipes pallens	Midge	Fresh	Invertebrate	omnivore	138		Mortality	NOED	No Effect On Mortality In 96 Hours
Artemia salina	Shrimp - Brine	Salt	Invertebrate	filter feeder	194.4		Mortality	NOEL	Survival - No effect. Radiotracer study
Helisoma sp.	Snail	Fresh	Invertebrate	herbivore	300		Mortality	NOED	No Effect On Mortality
Lumbriculus variegatus	Oligochaete	Fresh	Invertebrate	detritivore	310		Mortality	NOED	No Effect On Mortality
Helisoma sp.	Snail	Fresh	Invertebrate	herbivore	460		Mortality	NOED	No Effect On Mortality
Orconectes propinquus	Crayfish	Fresh	Invertebrate	omnivore	534		Mortality	NOED	No significant difference in mortality. Only 1 of 15 (7%) dead at end of exposure period (190.5 hours).
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	0.0934	I	Mortality	LOED	Mortality in two days.
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	0.118		Mortality	LOED	Mortality in one day.
Clioperla clio	Stonefly	Fresh	Invertebrate	omnivore	1.44		Mortality	ED10	
Clioperla clio	Stonefly	Fresh	Invertebrate	omnivore	1.67		Mortality	ED30	
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	1.8		Mortality	LOEL	Survival - Reduced 5% or less. Salinity 20 ppt
Clioperla clio	Stonefly	Fresh	Invertebrate	omnivore	1.84		Mortality	ED50	
Mysidopsis bahia	Shrimp - Mysid	Salt	Invertebrate	invertivore	2.38		Mortality	LD45	45% Increase in mortality.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	2.6		Mortality	LOED	20% Increase in mortality. Salinity 5 ppt.
Daphnia galeata mendotae	Cladoceran	Fresh	Invertebrate	filter feeder	3.5		Mortality	LOED	430% Increase in prenatal mortality (aborted eggs and embryos); reduced longevity.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	4		Mortality	LD25	25% mortality at day 21.
Mysidopsis bahia	Shrimp - Mysid	Salt	Invertebrate	invertivore	4.36		Mortality	LD94	94% Increase in mortality.
Gammarus pulex	Amphipod	Fresh	Invertebrate	detritivore	4.4		Mortality	LOEL	Survival - Reduced - Death.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	4.6		Mortality	LOEL	Survival - Reduced 10%. Salinity 10 ppt
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	4.6		Mortality	LOED	10% Increase in mortality. Salinity 10 ppt.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	5.6		Mortality	LOEL	Survival - Reduced. *8 HQ (8 - hydroxyquinoline) added
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	5.7		Mortality	LOEL	Survival - Reduced 25%.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	5.8		Mortality	LOED	22% Increase in mortality. Salinity 5 ppt.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	6		Mortality	LOEL	Survival - Reduced.
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	7		Mortality	LOED	25% Increase in mortality. Salinity 5 ppt.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)	Effect	Endpoint	Comments
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	7.6	Mortality	LD50	Survival - Reduced 50%.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	7.6	Mortality	LOEL	Survival - Reduced.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	7.6	Mortality	LOED	Increased mortality.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	7.8	Mortality	LOEL	Survival - Reduced. *Humic acid added
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	7.8	Mortality	LOEL	Survival - Reduced. *EDTA added
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	8	Mortality	LOEL	Survival - Reduced 20-25%. Salinity 5 ppt
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	8.8	Mortality	LOEL	Survival - Reduced.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	8.8	Mortality	LD50	Survival - Reduced 50%. *Humic acid added
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	8.8	Mortality	LD50	Survival - Reduced 50%. *EDTA added
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	9	Mortality	LOEL	Survival - Reduced.
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	9.8	Mortality	LOED	Mortality in one day.
Monoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	11	Mortality	LOED	
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	11.2	Mortality	LOEL	Survival - Reduced 74%.
Pontoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	11.4	Mortality	LOEL	Survival - Reduced. One adult female that survived 265d had a body burden of 30 µg/g
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	15.2	Mortality	LOEL	Survival - Reduced. *90% distilled water added
Pontoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	15.6	Mortality	LOEL	Survival - Reduced.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	15.8	Mortality	LD50	Survival - Reduced 50%. *90% distilled water added
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	16.4	Mortality	LOED	Reduced Survival. Residue at 6 days.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	17.2	Mortality	LD50	Survival - Reduced 50%. *Sediment A added
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	17.4	Mortality	LOEL	Survival - Reduced. *Sediment A added
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	17.4	Mortality	LOED	Mortality in two days.
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	17.8	Mortality	LOEL	Survival - Reduced - Death.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	19.6	Mortality	LD50	Survival - Reduced 50%. *Sediment B added
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	19.6	Mortality	LOEL	Survival - Reduced - Death.
Eohaustorius estuarius	Amphipod	Fresh	Invertebrate	detritivore	20	Mortality	LD50	Survival - Reduced 50%. Organisms held in the lab for 121 d before testing
Cambarus latimanus	Crayfish	Fresh	Invertebrate	omnivore	22	Mortality	LOED	Significant increase in mortality. Feed contaminated with 0.17 ug Cd/g.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	22.6	Mortality	LOEL	Survival - Reduced 55%.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	29.6	Mortality	LOEL	Survival - Reduced. *Sediment B added
Hydropsyche sp.	Caddisfly	Fresh	Invertebrate	detritivore	29.8	Mortality	LOED	Mortality in four days.
Physa integra	Snail	Fresh	Invertebrate	herbivore	30	Mortality	LOEL	Survival - Reduced = 80%.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	33	Mortality	LOEL	Survival - Reduced. Survival reduced by third generation, reproduction after the fourth generation
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	36	Mortality	LOEL	Survival - Reduced 57%.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	38		Mortality	ED50	Tap Water
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	43.4		Mortality	LOEL	Survival - Reduced 71%.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	44		Mortality	ED50	Tap Water With 20mg/l Humic Acid
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	44		Mortality	ED50	Tap Water With 0.5 um EDTA
Gammarus fossarum	Amphipod	Fresh	Invertebrate	detritivore	48.4		Mortality	LOED	Increase in mortality. Soft water 4.4 mg/L Ca ion, pH 7.2. Artificial stream system.
Gammarus fossarum	Amphipod	Fresh	Invertebrate	detritivore	52.8		Mortality	LOED	Increase in mortality. Hard water 83-87 mg/L Ca ion, pH 8.3. Artificial stream system.
Gammarus fossarum	Amphipod	Fresh	Invertebrate	detritivore	53.4		Mortality	LOED	Increase in mortality. Soft water 4.4 mg/L Ca ion, pH 7.2. Artificial stream system.
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	60		Mortality	LOEL	Survival - Reduced >70%.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	66		Mortality	LOEL	Survival - Reduced. First generation survival reduced, reproduction reduced by the third generation
Eohaustorius estuarius	Amphipod	Fresh	Invertebrate	detritivore	72		Mortality	LD50	Survival - Reduced 50%. Organisms held in the lab for 11-17 d before testing
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	79		Mortality	ED50	Med:90% Distilled Water
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	86		Mortality	ED50	Sediment A
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	98		Mortality	ED50	Sediment B
Gammarus fossarum	Amphipod	Fresh	Invertebrate	detritivore	101.6		Mortality	LOED	Increase in mortality. Hard water 83-87 mg/L Ca ion, pH 8.3. Artificial stream system.
Helisoma sp.	Snail	Fresh	Invertebrate	herbivore	125		Mortality	LD50	Survival - Reduced 50%. Residues in surviving organisms
Lumbriculus variegatus	Oligochaete	Fresh	Invertebrate	detritivore	134		Mortality	LOEL	Survival - Reduced 40%. Residues in surviving organisms
Gammarus fossarum	Amphipod	Fresh	Invertebrate	detritivore	216		Mortality	LD100	100% Mortality in 10 days. Soft water 4.4 mg/L Ca ion, pH 7.2. Artificial stream system.
Helisoma sp.	Snail	Fresh	Invertebrate	herbivore	625		Mortality	LD50	50% Mortality
Lumbriculus variegatus	Oligochaete	Fresh	Invertebrate	detritivore	670		Mortality	LD40	40% Mortality
Mysidopsis bahia	Shrimp - Mysid	Salt	Invertebrate	invertivore	0.08	I	Growth	NOEL	Growth - No effect.
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	0.7		Growth	NOEL	Growth - No effect.
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	1.12		Growth	NOED	No difference in weight. Residue value taken from graph and is approximate. Radiotracer study.
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	1.12		Growth	NOEL	Growth - No effect. *Cd activity; Radiotracer study
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	2.1		Growth	NOEL	Growth - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	4.6		Growth	NOEL	Growth - No effect*. *Molting stimulated; Salinity 10 ppt
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	7		Growth	NOEL	Growth - No effect.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	7.6		Growth	NOEL	Growth - No effect.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	7.6		Growth	NOED	No significant difference in weight gain measured in males as dry weight.
Daphnia galeata mendotae	Cladoceran	Fresh	Invertebrate	filter feeder	8.6		Growth	NOED	No effect on individual weight.
Cambarus latimanus	Crayfish	Fresh	Invertebrate	omnivore	14.9		Growth	NOED	No significant difference in length and weight. Feed contaminated with 0.17 ug Cd/g.
Pontoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	15.6		Growth	NOEL	Growth - No effect.
Glyptotendipes pallens	Midge	Fresh	Invertebrate	omnivore	18		Growth	NOED	No effect on biomass.
Glyptotendipes pallens	Midge	Fresh	Invertebrate	omnivore	20		Growth	NOED	No significant difference in larval weight or population biomass.
Cambarus latimanus	Crayfish	Fresh	Invertebrate	omnivore	22		Growth	NOED	No significant difference in length and weight. Feed contaminated with 0.17 ug Cd/g.
Mysidopsis bahia	Shrimp - Mysid	Salt	Invertebrate	invertivore	1.29	I	Growth	LOED	17% Significant Reduction In Growth, Mean Dry Weight Of Animals
Mysidopsis bahia	Shrimp - Mysid	Salt	Invertebrate	invertivore	2.38		Growth	ED15	15% Significant Reduction In Growth, Mean Dry Weight Of Animals
Mysidopsis bahia	Shrimp - Mysid	Salt	Invertebrate	invertivore	4.36		Growth	ED28	28% Significant Reduction In Growth, Mean Dry Weight Of Animals
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	8		Growth	LOEL	Growth - Reduced*. *Molting inhibited; Salinity 5 ppt
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	9		Growth	LOEL	Growth - Reduced.
Daphnia galeata mendotae	Cladoceran	Fresh	Invertebrate	filter feeder	10.3		Growth	LOED	Increased weight of individual animals.
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	16.4		Growth	LOED	Reduced length. Residue at 6 days.
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	16.8		Growth	LOED	Significant decrease in weight. Residue value taken from graph and is approximate. Radiotracer study.
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	16.86		Growth	LOEL	Growth - Reduced. *Cd activity; Radiotracer study
Glyptotendipes pallens	Midge	Fresh	Invertebrate	omnivore	26		Growth	LOED	Significant decrease in larval weight and population biomass.
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	60		Growth	LOEL	Growth - Reduced >70%.
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	0.27	I	Reproduction	NOEL	Reproduction - No effect.
Monoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	3		Reproduction	NOED	Percent Malformed Eggs

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Nereis arenaceodentata	Polychaete	Estuarine	Invertebrate	detritivore	3.8		Reproduction	NOED	No significant difference in number of eggs/pair or length of time from pairing to egg laying.
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	4.5		Reproduction	NOEL	Reproduction - No effect. *Cd activity; Radiotracer study
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	7		Reproduction	NOEL	Reproduction - No effect.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	7.6		Reproduction	NOEL	Reproduction - No effect.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	7.6		Reproduction	NOED	No significant difference in number of eggs per female.
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	8		Reproduction	NOED	No Effect On Brood Size. Residue at 6 days.
Pontoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	11.4		eproduction (no. eggs	NOEL	Reproduction (no. eggs/female)-No effect.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	17.8		Reproduction	NOEL	Reproduction - No effect. No effects on generations one to five
Monoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	6	I	Reproduction	LOED	Percent Malformed Eggs
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	6.4		Reproduction	LOEL	Reproduction - Reduced.
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	9		Reproduction	LOEL	Reproduction - Reduced.
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	10.6		Reproduction	LOED	Reduced Brood Size. Residue at 6 days.
Moina macrocopa	Cladoceran	Fresh	Invertebrate	herbivore	16.4		Reproduction	ED100	No Reproduction After 12 Days. Residue at 6 days.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	33		Reproduction	LOEL	Reproduction - Reduced. Survival reduced by third generation, reproduction after the fourth generation
Crassostrea virginica	Oyster - Eastern	Salt	Invertebrate	filter feeder	54		Reproduction	LOED	24% Increase in abnormal embryos from exposed parents.
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	61.82		Reproduction	LOEL	Reproduction - Reduced. *Cd activity; Radiotracer study
Nereis arenaceodentata	Polychaete	Estuarine	Invertebrate	detritivore	62		Reproduction	ED100	Reproductive failure. No eggs produced.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	66		Reproduction	LOEL	Reproduction - Reduced. First generation survival reduced, reproduction reduced by the third generation
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	3.7	S	Mortality	NOEL	Survival - No effect.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	3.74		Mortality	NA	Decreased anoxic survival time (Control 13 days).
Elliptio complanata	Mussel	Fresh	Shellfish	filter feeder	4		Mortality	NOEL	Survival - No effect. Radiotracer study
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	4		Mortality	NOED	No increase in mortality.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	4.2		Mortality	NOEL	Survival - No effect.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	6.45		Mortality	NOED	Estimated Wet Weight
Elliptio complanata	Mussel	Fresh	Shellfish	filter feeder	17.6		Mortality	NOEL	Survival - No effect.
Saccostrea commercialis	Oyster - Sydney Rocl	Salt	Shellfish	filter feeder	25		Mortality	NOEL	Survival - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	30		Mortality	NOED	Highest Body Burden Reported
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	32		Mortality	NOEL	Survival - No effect.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	32		Mortality	NOED	No increase in mortality.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	58.4		Mortality	NOEL	Survival - No effect.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	58.4		Mortality	NOED	No increase in mortality.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	100		Mortality	NOEL	Survival - No effect.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	100		Mortality	NOED	No increase in mortality. Residue was determined from graph and is approximate.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	114		Mortality	NOEL	Survival - No effect. Lower accumulation rate didn't result in mortality as observed at a similar body residue (108-120 µg/g) at 400 µg/L by 27d (see above)
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	114		Mortality	NOED	No increase in mortality.
Saccostrea commercialis	Oyster - Sydney Rocl	Salt	Shellfish	filter feeder	48	S	Mortality	LOEL	Survival-Reduced 100% in 60 d.
Saccostrea commercialis	Oyster - Sydney Rocl	Salt	Shellfish	filter feeder	85		Mortality	LOEL	Survival-Reduced 100% in 28 d.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	108		Mortality	LD50	Survival - Reduced 50%. *LT50
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	108		Mortality	LD50	50% Mortality in 27 days.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	160		Mortality	LOEL	Survival - Reduced 96%.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	160		Mortality	LD96	96% Mortality in 27 days.
Elliptio complanata	Mussel	Fresh	Shellfish	filter feeder	17.6	S	Growth	NOEL	Growth - No effect.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	30		Growth	NOED	
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	18.2	S	Reproduction	NOED	No increased abnormalities in embryos from exposed parents.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	54		Reproduction	NOED	No significant difference in fecundity.
Chromium VI									
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.3	F	Mortality	NOED	Ph 7.8; No mortality.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.3		Mortality	NOED	100% survival; pH = 6.5, exposure concentration 5.0 mg/L.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.5		Mortality	NOED	Ph 6.5; No mortality.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.5		Mortality	NOED	100% survival; pH = 7.8, exposure concentration 5.0 mg/L.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.7	F	Mortality	LD75	Ph 6.5; 75% Mortality
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.7		Mortality	LD75	25% survival; pH = 6.5, exposure concentration 16.5 mg/L.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.9		Mortality	LD37	63% survival; pH = 7.8, exposure concentration 16.5 mg/L.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	10.5		Mortality	LD50	Ph 7.8; 50% Mortality
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	10.5		Mortality	LD50	50% survival; pH = 7.8, exposure concentration 50 mg/L.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	9.2	I	Mortality	NOEL	Survival - No effect.
Portunus pelagicus	Crab - Sand	Salt	Invertebrate	predator	1	I	Growth	NOEL	Growth - No effect*. *2 instar stage
Portunus pelagicus	Crab - Sand	Salt	Invertebrate	predator	3.2		Growth	NOEL	Growth - Reduced*. *2 instar stage
Portunus pelagicus	Crab - Sand	Salt	Invertebrate	predator	3.2		Growth	NOEL	Growth - No effect*. *3 - 6 instar stage
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	9.2		Growth	NOEL	Growth - No effect.
Portunus pelagicus	Crab - Sand	Salt	Invertebrate	predator	6.3	I	Growth	LOEL	Growth - Reduced*. *3 - 6 instar stage
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	4.42	I	Reproduction	NOEL	Reproduction - No effect.
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	8.28		Reproduction	NOEL	Reproduction - No effect*. *Poor control reproduction and high variability may be the reason for lack of significant effect
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	6.03	I	Reproduction	LOEL	Reproduction - Reduced.
Copper									
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	7	F	Mortality	NA	Pre-exposure for 21 days produced increased tolerance to lethal concentration of copper -- 70% survival in 570 ug/L for 6 days after pre-exposure.
Cyprinus carpio	Carp - Common	Fresh	Finfish	bottom feeder	7.62		Mortality	NOED	Larval Mort, Ph 7.6, Body Burd From Graph
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	1.6	F	Mortality	LD100	100% Mortality
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.22		Mortality	LD50	50% Mortality In 7 Hours. Residue calculated at 6 hours exposure.
Cyprinus carpio	Carp - Common	Fresh	Finfish	bottom feeder	12.1		Mortality	LOED	Larval Mort, Ph 6.3, Body Burd From Graph
Cyprinus carpio	Carp - Common	Fresh	Finfish	bottom feeder	12.1		Mortality	LOED	Larval Mort, Ph 7.6, Body Burd From Graph
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	18.1	F	Growth	ED25	
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	18.1		Growth	ED45	
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	20.5		Growth	ED25	
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	20.6		Growth	ED10	
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	20.9		Growth	ED25	
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	25.9		Growth	ED50	
Cyprinus carpio	Carp - Common	Fresh	Finfish	bottom feeder	12.1	F	Reproduction	NOED	Egg Mortality, Ph 7.6, Body Burd From Graph
Cyprinus carpio	Carp - Common	Fresh	Finfish	bottom feeder	12.1		Reproduction	NOED	Egg Mortality, Ph 6.3, Body Burd From Graph
Cyprinus carpio	Carp - Common	Fresh	Finfish	bottom feeder	24.1	F	Reproduction	LOED	Egg Mortality, Ph 6.3, Body Burd From Graph
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	6.32	I	Mortality	NOEL	Survival - No effect.
Orconectes rusticus	Crayfish	Fresh	Invertebrate	omnivore	26		Mortality	NOED	No Effect On Survivorship
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	29.2		Mortality	NOEL	Survival - No effect.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	30.4		Mortality	NOED	calc wet from dry using default % moisture

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Phyllodoce maculata	Phyllodoce maculata	Salt	Invertebrate	detritivore	45.5		Mortality	NOEL	Survival - No effect. Rate of uptake more important than total body burden; *converted from dry wt. to wet wt. using factor determined by the authors
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	49.4		Mortality	NOED	calc wet from dry using default % moisture
Orconectes rusticus	Crayfish	Fresh	Invertebrate	omnivore	50		Mortality	NOEL	Survival - No effect.
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	85.4		Mortality	NOED	No Effect On Mortality
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	90		Mortality	NOED	No Effect On Mortality
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	116		Mortality	NOED	No Effect On Mortality in 20 hours.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	13.3	I	Mortality	LD25	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	16.5		Mortality	LD50	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	24.1		Mortality	LD25	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	32.8		Mortality	LOEL	Survival - Reduced 55%.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	41.7		Mortality	LD25	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	51.8		Mortality	LD50	calc wet from dry using default % moisture
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	54		Mortality	LOEL	Survival - Reduced - Death. No sediment; LT50 = 7.8d
Phyllodoce maculata	Phyllodoce maculata	Salt	Invertebrate	detritivore	67.7		Mortality	LD50	Survival - Reduced 50%. Rate of uptake more important than total body burden; *converted from dry wt to wet wt. using factor determined by the authors
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	68		Mortality	ED50	Lethal body burden after 21 day exposure.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	80		Mortality	LD94	6% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	81.2		Mortality	LOEL	Survival - Reduced - Death.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	81.2		Mortality	LD100	calc wet from dry using default % moisture
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	87.2		Mortality	LOED	10 to 15% Mortality in 48 hours.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	88		Mortality	LD71	29% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	91		Mortality	LD46	54% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	92		Mortality	LD50	50% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	95		Mortality	LD60	40% survival.
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	126		Mortality	LD25	25% Mortality in 72 hours.
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	142		Mortality	LD50	50% Mortality in 48 hours.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	148		Mortality	LD100	calc wet from dry using default % moisture
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	155		Mortality	LD50	50% Mortality in 72 hours.
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	190		Mortality	LD85	85% Mortality in 72 hours.
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	198.8		Mortality	LOEL	Survival - Reduced - Death. Sand sediment; LT50 = 36.5d
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	209.4		Mortality	LOEL	Survival - Reduced - Death. Sand and mud sediment; LT50 = 54.5d

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	292.8		Mortality	LOEL	Survival - Reduced - Death. Mud sediment; LT50 = 50d
Themisto abyssorum	Amphipod - Mesoplar	Salt	Invertebrate	detritivore	374		Mortality	LD50	
Themisto libellula	Amphipod - Mesoplar	Salt	Invertebrate	detritivore	374		Mortality	LD50	
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	1000		Mortality	LD100	100% Mortality
Calanus hyperboreus	Calanoid copepod	Salt	Invertebrate	herbivore	1320		Mortality	LD50	low concentration exposure
Calanus hyperboreus	Calanoid copepod	Salt	Invertebrate	herbivore	2440		Mortality	LD50	High concentration exposure
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	30.4	I	Growth	NOEL	Growth - No effect.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	13.3	I	Growth	ED25	Growth as weight□□ calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	29.2		Growth	LOEL	Growth - Reduced.
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	100		Growth	LOEL	Growth - Reduced. Survival data were not used because of inconsistency
Hydra littoralis	Hydra	Fresh	Invertebrate	predator	3.4	I	Reproduction	NOEL	Reproduction - No effect.
Hydra littoralis	Hydra	Fresh	Invertebrate	predator	4.4	I	Reproduction	LOEL	Reproduction - Reduced.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	5.8		Reproduction	ED10	10% reduction in number of offspring.
Protothaca staminea	Clam	Salt	Shellfish	filter feeder	9.3	S	Mortality	NOEL	Survival - No effect.
Macoma balthica	Clam - Burrowing	Salt	Shellfish	filter feeder	18		Mortality	NOEL	Survival - No effect. M. balthica is a deposit feeder
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	20		Mortality	NOEL	Survival - No effect.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	20		Mortality	NOED	No increase in mortality.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	30		Mortality	NOEL	Survival - No effect.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	32		Mortality	NOEL	Survival - No effect.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	32		Mortality	NOED	No increase in mortality. Residue was determined from graph and is approximate.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	40		Mortality	NOEL	Survival - No effect.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	80		Mortality	NOED	No increased mortality.
Cerastoderma edule	Clam	Salt	Shellfish	filter feeder	5	S	Mortality	LOEL	Survival - Reduced. C. edule is a suspension feeder
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	12		Mortality	LD50	Lethal body burden.
Macoma balthica	Clam - Burrowing	Salt	Shellfish	filter feeder	16		Mortality	LOEL	Survival - Reduced 45%. Animals not fed
Macoma balthica	Clam - Burrowing	Salt	Shellfish	filter feeder	22		Mortality	LOEL	Survival - Reduced.
Macoma balthica	Clam - Burrowing	Salt	Shellfish	filter feeder	22		Mortality	LOEL	Survival - Reduced 32%. *Animals fed Cu enriched algae that were held in 2 - 5 µg/L water
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	22.1		Mortality	LOEL	Survival - Reduced.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	34.2		Mortality	LD50	50% Mortality in 14 days.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	49.6		Mortality	LD50	50% Mortality in 7-8 days.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
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Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Meretrix casta	Clam - marine	Salt	Shellfish	filter feeder	201		Mortality	LOED	Average lethal body burden for all exposure concentrations up to 184 hours.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	34.2	S	Growth	NOED	No significant difference in shell length.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	49.6	S	Growth	LOED	Significant decrease in shell length.
Lead									
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	1.6	F	Growth	NOED	No effect on weight gain.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	2.5		Growth	NOEL	Growth - No effect. Third generation fish
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	2.55		Growth	NOED	No effect on weight gain in third generation. First and second generation exposed to 58 ug/L for up to 2 years.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	4.02	F	Growth	LOED	Reduced weight gain in third generation. First and second generations exposed to 119 ug/L for up to 2 years.
Monoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	4		Mortality	NOED	Body Burden Est. From Graph
Monoporeia affinis	Amphipod	Fresh	Invertebrate	detritivore	4	I	Mortality	NOED	Body Burden Est. From Graph
Physa integra	Snail	Fresh	Invertebrate	herbivore	200		Mortality	NOEL	Survival - No effect.
Brachycentrus sp.	Caddisfly	Fresh	Invertebrate	omnivore	260		Mortality	NOEL	Survival - No effect.
Pteronarcys dorsata	Giant Black Stonefly	Fresh	Invertebrate	omnivore	340		Mortality	NOEL	Survival - No effect.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	5.8	I	Mortality	LD40	60% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	7.1		Mortality	LD35	65% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	15.8		Mortality	LD52	48% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	19.2		Mortality	LD69	31% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	20.9		Mortality	LD96	4% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	30		Mortality	LD89	11% survival.
Calanus hyperboreus	Calanoid copepod	Salt	Invertebrate	herbivore	40.7		Mortality	LD50	Clearly written paper
Themisto abyssorum	Amphipod - Mesopla	Salt	Invertebrate	detritivore	63.3		Mortality	LD50	
Themisto libellula	Amphipod - Mesopla	Salt	Invertebrate	detritivore	63.3		Mortality	LD50	
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	70		Mortality	LD50	50% Mortality (estimate).
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	90		Mortality	LD50	50% Mortality (estimate).
Gammarus pseudolimnaeu	Amphipod	Fresh	Invertebrate	detritivore	98		Mortality	LOEL	Survival - Reduced >50%.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	115		Mortality	LD50	50% Mortality (estimate). Pre-exposed to 100 nM Pb for 4 weeks.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	160		Mortality	LD50	50% Mortality (estimate).
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	5040		Mortality	LD50	Lethal body burden after 21-day exposure.
Chironomus gr. thummi	Midge	Fresh	Invertebrate	omnivore	12.8	I	Growth	NOED	Normal 4rth instar larvae.
Chironomus gr. thummi	Midge	Fresh	Invertebrate	omnivore	16.22	I	Growth	LOED	Deformed 4rth instar larvae.
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	1880	I	Reproduction	ED10	10% reduction in number of offspring.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	2.28	S	Mortality	NOED	No increase in mortality.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	35		Mortality	NOED	No Effect On Mortality
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	200	S	Mortality	LOED	52% Mortality
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	2.28	S	Growth	NOED	No significant difference in weight gain.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	35		Growth	NOED	No effect on weight gain in surviving mussels.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	200	S	Growth	LOED	Decreased weight gain in surviving mussels.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	2.6	S	Reproduction	NOED	No effect on larva viability or development.
Manganese									
Macoma balthica	Clam - Burrowing	Salt	Shellfish	filter feeder	15.5	S	Mortality	NOEL	Survival - No effect.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	18.4		Mortality	NOEL	Survival - No effect.
Mercury									
Squalus acanthias	Spiny Dogfish	Salt	Finfish	piscivore	0.093	F	Mortality	NOED	No Effect On Mortality In 24 Hours
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.14		Mortality	NOED	No Effect On Mortality
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	0.2		Mortality	NOED	No increase in mortality.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.47		Mortality	NOED	No Effect On Mortality
Anguilla anguilla	Eel - European	Anadromous	Finfish	predator	0.56		Mortality	NOED	No increase in mortality. Freshwater eel adapted to seawater for test.
Stizostedion vitreum	Walleye	Fresh	Finfish	piscivore	2.37		Mortality	NOED	No Statistically Significant Increase In Mortality
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	2.75		Mortality	NOED	
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	4.8		Mortality	NOED	Increased in mortality.
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	6.2		Mortality	NOED	No significant increase in mortality.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	7.6		Mortality	NOED	
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.04	F	Mortality	LOEL	Survival - Reduced - 55%.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.27		Mortality	LOEL	Survival - Reduced - 77%.
Ictalurus punctatus	Catfish - Channel	Fresh	Finfish	bottom feeder	0.34		Mortality	LOEL	Survival - Reduced 49%.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.9		Mortality	LOEL	Survival - Reduced - Death.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2		Mortality	LOED	Increase in mortality.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	4.18		Mortality	LOED	
Pleuronectes americanus	Flounder - Winter	Estuarine	Finfish	bottom feeder	5		Mortality	LD50	50% Mortality in 16 hours.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.1		Mortality	LD50	15 Day LD50 For Single Intraperitoneal Injection
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	5.6		Mortality	LD80	Residues measured in surviving fish only.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	6.9		Mortality	LOED	Increase in mortality.
Carassius auratus	Goldfish	Fresh	Finfish	omnivore	7		Mortality	LD100	No fish with residues above 7 mg/kg survived.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	10		Mortality	LOED	Increase in mortality. Residue is injected dose (i.p.).
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	15		Mortality	LD100	100% Mortality In 15 Days

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Anguilla anguilla	Eel - European	Anadromous	Finfish	predator	15.3		Mortality	LD25	No increase in mortality. Freshwater eel adapted to seawater for test.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	96.8		Mortality	LOEL	Survival - Reduced - Death.
Stizostedion vitreum	Walleye	Fresh	Finfish	piscivore	0.25	F	Growth	NOED	No Effect On Length Or Weight
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.32		Growth	NOED	30-day Exposure: Progeny Of Exposed Fish
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.32		Growth	NOED	Weight Of Females
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.8		Growth	NOED	
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	2.64		Growth	NOED	
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	9.41		Growth	NOED	Weight Of Males
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	1.31	F	Growth	LOED	
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	1.36		Growth	LOED	30-day Exposure: Progeny Of Exposed Fish
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	1.36		Growth	LOED	Weight Of Females
Stizostedion vitreum	Walleye	Fresh	Finfish	piscivore	2.37		Growth	LOED	Significant Reduction In Length And Weight Of Males, But Not Females
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	4.76		Growth	LOED	
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	18.8		Growth	LOED	Weight Of Males
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	0.859	I	Mortality	NOED	No Effect On Mortality
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	1.1		Mortality	NOEL	Survival - No effect.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.53		Mortality	NOED	No Effect On Mortality
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	1.64		Mortality	NOED	No Statistically Significant Increase In Mortality
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.64		Mortality	NOED	No Effect On Mortality
Hexagenia rigida	Mayfly-Burrowing	Fresh	Invertebrate	detritivore	2		Mortality	NOED	Residues ranged from 2 to 2.4 mg/kg for the following test condition combinations: pH 5 or pH 7.5, temperatures of 10, 18, or 26C, and photoperiods of 6, 12, or 18 hours per day.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	2.33		Mortality	NOED	No Effect On Mortality
Hexagenia rigida	Mayfly-Burrowing	Fresh	Invertebrate	detritivore	2.7		Mortality	NOED	Residues ranged from 2.7 to 4.5 mg/kg for the following test condition combinations: pH 5 or pH 7.5, temperatures of 10, 18, or 26C, and photoperiods of 6, 12, or 18 hours per day.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	4.67		Mortality	NOED	No Effect On Mortality
Viviparus georgianus	Snail	Fresh	Invertebrate	herbivore	6		Mortality	NOEL	Survival - No effect.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	7.57		Mortality	NOED	No Effect On Mortality
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	40		Mortality	NOED	No mortality. No effect on emergence of adults.
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	107.6		Mortality	NOED	No mortality in 4th instar larvae.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	18.4	I	Mortality	ED25	25% Reduction In Survival Compared To Controls In 21 Days
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	0.04	I	Growth	NOEL	Growth - No effect. Radiotracer study
Hexagenia rigida	Mayfly-Burrowing	Fresh	Invertebrate	detritivore	2		Growth	NOED	No significant difference in weight gain. Residues ranged from 2 to 2.4 mg/kg for the following test condition combinations: pH 5 or pH 7.5, temperatures of 10, 18, or 26C, and photoperiods of 6, 12, or 18 hours per day.
Hexagenia rigida	Mayfly-Burrowing	Fresh	Invertebrate	detritivore	2.7		Growth	NOED	No significant difference in weight gain. Residues ranged from 2.7 to 4.5 mg/kg for the following test condition combinations: pH 5 or pH 7.5, temperatures of 10, 18, or 26C, and photoperiods of 6, 12, or 18 hours per day.
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	3.76		Growth	NOEL	Growth - No effect. Radiotracer study
Viviparus georgianus	Snail	Fresh	Invertebrate	herbivore	6		Growth	NOEL	Growth - No effect.
Crepidula fornicata	Slipper limpet	Salt	Invertebrate	herbivore	10		Growth	NOEL	Growth - No effect.
Crepidula fornicata	Slipper Limpet	Salt	Invertebrate	herbivore	8	I	Growth	ED25	25% Reduction in weight gain. Algal food source contaminated with mercury.
Crepidula fornicata	Slipper limpet	Salt	Invertebrate	herbivore	22		Growth	LOEL	Growth - Reduced.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	0.859	I	Reproduction	NOED	No significant difference in number of neonates produced in 21 days.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.53		Reproduction	NOED	No significant difference in number of neonates produced in 21 days.
Crepidula fornicata	Slipper limpet	Salt	Invertebrate	herbivore	4		Reproduction	NOEL	Reproduction - No effect.
Crepidula fornicata	Slipper Limpet	Salt	Invertebrate	herbivore	8		Reproduction	NOED	No significant effect on fecundity (number of larva released). Algal food source contaminated with mercury.
Crepidula fornicata	Slipper Limpet	Salt	Invertebrate	herbivore	22		Reproduction	NOED	No significant effect on time to maturity and spawning, spawning frequency, or egg incubation time. Algal food source contaminated with mercury.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.64	I	Reproduction	ED35	35% Reduction In Number Of Neonates Produced In 21 Days
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	2.33		Reproduction	LOED	32% Reduction In Number Of Neonates Produced In 21 Days
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	4.67		Reproduction	ED62	62% Reduction In Number Of Neonates Produced In 21 Days

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	7.57		Reproduction	ED63	63% Reduction In Number Of Neonates Produced In 21 Days
Crepidula fornicata	Slipper limpet	Salt	Invertebrate	herbivore	10		Reproduction (fecur	LOEL	Reproduction (fecundity) - Reduced.
Crepidula fornicata	Slipper Limpet	Salt	Invertebrate	herbivore	16		Reproduction	LOED	Significant effect on fecundity (number of larva released). Algal food source contaminated with mercury.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	18.4		Reproduction	ED99	99% Reduction In Number Of Neonates Produced In 21 Days
Elliptio complanata	Mussel	Fresh	Shellfish	filter feeder	3	S	Mortality	NOEL	Survival - No effect.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	28		Mortality	NOEL	Survival - No effect. *Flow-through for 12h (daylight), static with Hg added for 12h (nighttime)
Rangia cuneata	Clam - Marsh	Salt	Shellfish	filter feeder	20	S	Mortality	LD50	50% Mortality in clams that had been pre-exposed to 1 ppb Hg for 2 weeks prior to test.
Rangia cuneata	Clam - Marsh	Salt	Shellfish	filter feeder	20		Mortality	LD50	50% Mortality
Rangia cuneata	Clam - Marsh	Salt	Shellfish	filter feeder	73.1		Mortality	LOED	Lethal Body Burden. Initial water concentration of 10 mg Hg/L. At 96 hr, 0.176 mg Hg/L.
Crassostrea virginica	Oyster - Eastern	Salt	Shellfish	filter feeder	140.7		Mortality	LOEL	Survival - Reduced 65%. *Flow-through for 12h (daytime), static with Hg added for 12h (nighttime)
Elliptio complanata	Mussel	Fresh	Shellfish	filter feeder	3	S	Growth	NOEL	Growth - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Mercury (Methyl)									
Squalus acanthias	Spiny Dogfish	Salt	Finfish	piscivore	0.093	F	Mortality	NOED	No effect on mortality in 24 hours.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.14		Mortality	NOED	No effect on mortality.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.47		Mortality	NOED	No effect on mortality.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	1.91		Mortality	NOEL	Survival - No effect. 0% mortality
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2		Mortality	NOED	No mortality in 15 days.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	3.4		Mortality	NOEL	Survival - No effect. Second generation fish
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	7.6		Mortality	NOEL	Survival - No effect. *Compared to 0 mg/kg, 1%/d fixed ration control
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.6		Mortality	NOEL	Survival - No effect. *Compared to 0 mg/kg, 2%/d fixed ration control
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	10.4		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	11		Mortality	NOEL	Survival - No effect. *Compared to 0 mg/kg, ad libitum ration control
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	11		Mortality	NOEL	Survival - No effect. Radiotracer study; 2 d interval between doses
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	12		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	29		Mortality	NOEL	Survival - No effect. *Compared to 0 mg/kg, 1%/d fixed ration control
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	35		Mortality	NOEL	Survival - No effect. *Compared to 0 mg/kg, 2%/d fixed ration control
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2	F	Mortality	LOED	33% mortality in 15 days.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.03		Mortality	LD50	30 day ED50 for eye.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	2.2		Mortality	LOEL	Survival - Reduced - Death. Third generation fish, alevins died within 3 wks of hatch
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	3.7		Mortality	LOEL	Survival - Reduced 13%.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	3.91		Mortality	LD50	30 day ED50 for muscle.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	4		Mortality	LOED	13% mortality in 15 days.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	4.76		Mortality	LD50	30 day ED50 for brain.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5		Mortality	LOED	83% mortality in 15 days.
Pleuronectes americanus	Flounder - Winter	Estuarine	Finfish	bottom feeder	5		Mortality	LD50	50% Mortality in 16 hours.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.1		Mortality	LD50	Survival - Reduced 50%.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.7		Mortality	LD50	15 day ED50 for single intraperitoneal injection.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	6		Mortality	LD50	50% mortality in 15 days.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	6.5		Mortality	LOEL	Survival - Reduced - Death. Radiotracer study; 9° C
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8		Mortality	LOED	67% mortality in 15 days.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	9.4		Mortality	LOEL	Survival - Reduced. Second generation fish
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	10		Mortality	LOED	83% mortality in 15 days.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	10.7		Mortality	LOEL	Survival - Reduced - Death. Radiotracer study; 21° C
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	11.2		Mortality	LOEL	Survival - Reduced - Death. Mean d to death, 24.2
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	12.2		Mortality	LOEL	Survival - Reduced - Death. Radiotracer study; Authors state that the fish died from suffocation
Esox lucius	Pike	Fresh	Finfish	piscivore	12.5		Mortality	LOEL	Survival - Reduced - Death. Radiotracer study; *Ionic form of methylmercury
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	15		Mortality	LD100	100% mortality in 15 days.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	20		Mortality	LD100	100% mortality in 15 days.
Esox lucius	Pike	Fresh	Finfish	piscivore	23.2		Mortality	LOEL	Survival - Reduced - Death. Radiotracer study; *Cow liver
Esox lucius	Pike	Fresh	Finfish	piscivore	23.2		Mortality	LOEL	Survival - Reduced - Death. Radiotracer study; *Cow liver
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	37		Mortality	LOEL	Survival - Reduced - Death. Radiotracer study; 33° C
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.14	F	Growth	NOED	No effect on growth.
Stizostedion vitreum	Walleye	Fresh	Finfish	piscivore	0.25		Growth	NOED	No Effect On Length Or Weight
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.46		Growth	NOED	No effect on growth.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	2.28		Growth	NOEL	Growth - No effect.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	3.4		Growth	NOEL	Growth - No effect. Second generation fish
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5		Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.67		Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	7.6		Growth	NOEL	Growth - No effect. *Compared to 0 mg/kg, 1%/d fixed ration control
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.63		Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	10.4		Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	29		Growth	NOEL	Growth - No effect. *Compared to 0 mg/kg, 1%/d fixed ration control
Stizostedion vitreum	Walleye	Fresh	Finfish	piscivore	2.37	F	Growth	LOED	Significant Reduction In Length And Weight Of Males, But Not Females
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	8.6		Growth	LOEL	Growth - Reduced. *Compared to 0 mg/kg, 2%/d fixed ration control
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	9.4		Growth	LOEL	Growth - Reduced. Second generation fish
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	11		Growth	LOEL	Growth - Reduced. *Compared to 0 mg/kg, ad libitum ration control

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	35		Growth	LOEL	Growth - Reduced. *Compared to 0 mg/kg, 2%/d fixed ration control
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	3.4	F	Reproduction	NOEL	Reproduction - No effect. Second generation fish
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	9.4	F	Reproduction	LOEL	Reproduction - Reduced. Second generation fish
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	0.86	I	Mortality	NOED	No effect on mortality
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	1		Mortality	NOEL	Survival - No effect.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.52		Mortality	NOED	No effect on mortality
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.64		Mortality	NOED	No effect on mortality
Palaemonetes pugio	Shrimp - Grass	Estuarine	Invertebrate	omnivore	2.12		Mortality	NOED	No statistically significant increase in mortality.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	2.32		Mortality	NOED	No effect on mortality
Stizostedion vitreum	Walleye	Fresh	Invertebrate	piscivore	2.37		Mortality	NOED	No Statistically Significant Increase In Mortality
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	2.6		Mortality	NOEL	Survival - No effect. Tested at 10, 18, and 26°C
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	4.67		Mortality	NOED	No effect on mortality
Daphnia pulex	Cladoceran	Fresh	Invertebrate	filter feeder	5		Mortality	NOEL	Survival - No effect. *Residues were determined in separate water or diet 3 d studies that showed 4.6 µg/g uptake from the water and 0.8 µg/g from the food
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	7.57		Mortality	NOED	No effect on mortality
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	16		Mortality	NOEL	Survival - No effect.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	18.4	I	Mortality	ED25	25% reduction in survival compared to controls in 21 days.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	91.3		Mortality	LD50	Lethal body burden at 21 days exposure.
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	1	I	Growth	NOEL	Growth - No effect.
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	2.1		Growth	NOEL	Growth - No effect. Radiotracer study
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	2.6		Growth	NOEL	Growth - No effect. Tested at 10, 18, and 26°C
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	7.5		Growth	NOEL	Growth - No effect. Radiotracer study
Hexagenia rigida	Mayfly	Fresh	Invertebrate	detritivore	16		Growth	NOEL	Growth - No effect.
Crepidula fornicata	Slipper limpet	Marine	Invertebrate	filter feeder	9	I	Growth	ED25	Approximate 25% reduction in growth at lowest test concentration; algal food contained mercury at approximately 2.9 ug/L in addition to water concentration.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	0.86	I	Reproduction	NOED	No significant reproductive impairment.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.53		Reproduction	NOED	No significant reproductive impairment.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Daphnia pulex	Cladoceran	Fresh	Invertebrate	filter feeder	5		Reproduction	NOEL	Reproduction - No effect. *Residues were determined in separate water or diet 3 d studies that showed 4.6 µg/g uptake from the water and 0.8 µg/g from the food
Crepidula fornicata	Slipper limpet	Marine	Invertebrate	filter feeder	9		Reproduction	NOED	No significant effect on fecundity (number of gametes); exposure includes mercury in food at approximately 2.9 ug/L.
Crepidula fornicata	Slipper limpet	Marine	Invertebrate	filter feeder	30		Reproduction	NOED	No significant effect on ability to produced gametes; exposure includes mercury in food at approximately 31 ug/L.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	0.79	I	Reproduction	ED10	10% reduction in number of offspring.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.64		Reproduction	ED35	35% reduction in number of neonates produced in 21 days.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	2.32		Reproduction	ED32	32% reduction in number of neonates produced in 21 days.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	4.67		Reproduction	ED62	62% reduction in number of neonates produced in 21 days.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	7.57		Reproduction	ED63	63% reduction in number of neonates produced in 21 days.
Crepidula fornicata	Slipper limpet	Marine	Invertebrate	filter feeder	15		Reproduction	LOED	Significant effect on fecundity (number of gametes); exposure includes mercury in food at approximately 9.5 ug/L.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	18.39		Reproduction	ED99	99% reduction in number of neonates produced in 21 days.
Pyganodon grandis	Mussel - Floater	Fresh	Shellfish	filter feeder	0.045	S	Mortality	NOEL	Survival - No effect.
Rangia cuneata	Clam - Marsh	Estuarine	Shellfish	filter feeder	6		Mortality	NOED	No effect on mortality
Rangia cuneata	Clam - Marsh	Estuarine	Shellfish	filter feeder	12	S	Mortality	LD50	Lethal to 50% of clams in 7 days.
Rangia cuneata	Clam - Marsh	Estuarine	Shellfish	filter feeder	28		Mortality	LD50	Lethal to 50% of clams in 7 days.
Rangia cuneata	Clam - Marsh	Estuarine	Shellfish	filter feeder	73.14		Mortality	LOED	Lethal body burden.
Pyganodon grandis	Mussel - Floater	Fresh	Shellfish	filter feeder	0.045	S	Growth	NOEL	Growth - No effect.
Elliptio complanata	Mussel - Freshwater	Fresh	Shellfish	filter feeder	0.043	S	Growth	ED97	Relative to least contaminated station (17.9 ug/g, dry total Hg in sediment vs 0.07 ug/g, dry), whole animal ww was reduced by 97 percent.
Pyganodon grandis	Mussel - Floater	Fresh	Shellfish	filter feeder	0.045	S	Reproduction	NOEL	Reproduction - No effect.
Nickel									
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	0.586934	I	Mortality	NOED	No mortality; converted from molar concentration (0.01 umol/g)

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Neanthes arenaceodentata	Polychaete	Salt	Invertebrate	detritivore	0.586934	I	Mortality	LOED	13% mortality; converted from molar concentration (0.01 umol/g).
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	223		Mortality	LD50	Lethal body burden after 21-day exposure.
Cerastoderma edule	Clam	Salt	Shellfish	filter feeder	79	S	Mortality	NOED	No significant increase in mortality. Residue measured at 16 days.
Cerastoderma edule	Clam	Salt	Shellfish	filter feeder	56.6	S	Mortality	LD50	Estimated body residue by regression from other data values, number of replicates is 2 to 5.
Cerastoderma edule	Clam	Salt	Shellfish	filter feeder	575		Mortality	LOED	Significant increase in mortality. Mortality started after 8 days. Residue measured at 8 days.
Cerastoderma edule	Clam	Salt	Shellfish	filter feeder	575	S	Growth	NOED	No significant difference in body condition measured as ratios of tissue weight and shell weight or volume. Residue measured at 8 days.
Selenium									
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.28	F	Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.32		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.32		Mortality	NOED	Significant increase in mortality. Residue measured at 24 weeks.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.44		Mortality	NOEL	Survival - No effect. *Estimated by authors from individual tissues and weights (see below)
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	0.52		Mortality	NOED	No Effect On Survival In 90 Days
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.8		Mortality	NOEL	Survival - No effect. High carbohydrate diet
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	0.8		Mortality	NOED	No Effect On Survival In 90 Days
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	0.8		Mortality	NOEL	Survival - No effect.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	0.8		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.9		Mortality	NOEL	Survival - No effect. Low carbohydrate diet
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.16		Mortality	NOEL	Survival - No effect. 20°C
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.6		Mortality	NOED	No increase in mortality. Exposure at 20 degrees C. Concurrent epxosure to 5 ug inorganic Se/L in water and 5.1 ug Seleno-L-Methionine/g in food.
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	2.08		Mortality	NOED	No Effect On Survival In 60 Days
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	2.4		Mortality	NOED	No Effect On Mortality
Micropterus salmoides	Bass - Largemouth	Fresh	Finfish	piscivore	2.7		Mortality	NOEL	Survival - No effect.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	2.7		Mortality	NOEL	Survival - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Micropterus salmoides	Bass - Largemouth	Fresh	Finfish	piscivore	3.1		Mortality	NOED	No mortality at 20 or 30 degrees C in soft or hard water.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	4.4		Mortality	NOEL	Survival - No effect.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	4.54		Mortality	NOEL	Survival - No effect. Slightly lower survival than controls, but not significant. Control survival was only 50%.
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	4.64		Mortality	NOED	No Effect On Survival In 120 Days
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	4.7		Mortality	NOED	No mortality at 20 or 30 degrees C in soft or hard water.
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	5.76		Mortality	NOED	No Effect On Survival In 120 Days
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	12.2		Mortality	NOED	No Effect On Mortality□□ Larva uptake was 1.46 ng Se per day.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	16.9		Mortality	NOEL	Survival - No effect. *Female and male, respectively
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	19		Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.92	F	Mortality	LOEL	Survival - Reduced.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.92		Mortality	LOED	Significant increase in mortality. Residue measured at 12 weeks.
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	1.08		Mortality	LOED	Reduced Survival In 90 Days
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.08		Mortality	LD50	Survival - Reduced 50%.
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	1.3		Mortality	LOED	Reduced Survival In 90 Days
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.54		Mortality	LOEL	Survival - Reduced. 4°C (Simulated winter stress)
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.6		Mortality	LOED	35% Increase in mortality. Exposure at 4 degrees C. Concurrent epxosure to 5 ug inorganic Se/L in water and 5.1 ug Seleno-L-Methionine/g in food.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	4.6		Mortality	LOED	
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	4.68		Mortality	LOED	37% Reduced Survival In 60 Days
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	15.1		Mortality	LOEL	Survival - Reduced.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	17.8		Mortality	LOED	Mortality
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.08	F	Growth	NOEL	Growth - No effect.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.12		Growth	NOED	No difference in weight gain.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.12		Growth	NOEL	Growth - No effect. Radiotracer study
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.14		Growth	NOEL	Growth - No effect. Low carbohydrate diet
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.24		Growth	NOED	No significant difference in weight gain.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.24		Growth	NOEL	Growth - No effect. Radiotracer study
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.28		Growth	NOEL	Growth - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.32		Growth	NOED	No difference in weight gain. Residue measured at 24 weeks.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.44		Growth	NOEL	Growth - No effect. *Estimated by authors from individual tissues and weights (see below)
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.44		Growth	NOED	No significant difference in weight gain. Exposure to 43.5 ug/L in water and 7.32 ug/g in diet.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.44		Growth	NOEL	Growth - No effect. Radiotracer study
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	0.54		Growth	NOED	No Effect On Weight Or Length Gain In 90 Days
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	0.72		Growth	NOED	No Effect On Weight Gain After 120 Days
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	1		Growth	NOEL	Growth - No effect.
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	1.02		Growth	NOED	No Effect On Weight Or Length Gain In 30 Days
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	1.06		Growth	NOED	No Effect On Weight Or Length Gain In 60 Days
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	1.08		Growth	NOED	No Effect On Weight Or Length Gain In 90 Days
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	1.14		Growth	NOED	No significant difference in body weight.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.2		Growth	NOED	No difference in body weight to length ratio. Exposure at 20 degrees C. Concurrent epxosure to 5 ug inorganic Se/L in water and 5.1 ug Seleno L-Methionine/g in food.
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	1.6		Growth	NOED	No Effect On Length After 120 Days
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	2.52		Growth	NOED	No Effect On Lenght And Weight Gain
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	4.54		Growth	NOEL	Growth - No effect. Slightly lower survival than controls, but not significant. Control survival was only 50%.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	4.6		Growth	NA	
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	16.9		Growth	NOEL	Growth - No effect. *Female and male, respectively
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	19		Growth	NOEL	Growth - No effect.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	0.18	F	Growth	LOED	Decrease weight gain.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.32		Growth	LOEL	Growth - Reduced.
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	0.66		Growth	LOED	Reduced Weight And Length Gain In 60 Days
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	0.68		Growth	LOED	Reduced Weight And Length Gain In 30 Days
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.8		Growth	LOEL	Growth - Reduced. High carbohydrate diet
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	0.8		Growth	LOED	Reduced Weight And Length Gain In 60 Days

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.9		Growth	LOEL	Growth - Reduced. Low carbohydrate diet
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.92		Growth	LOEL	Growth - Reduced.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.92		Growth	LOED	Significant decrease in weight gain. Residue measured at 12 weeks.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	1.2		Growth	LOED	Reduced weight to length ratio. Exposure at 4 degrees C. Concurrent epxosure to 5 ug inorganic Se/L in water and 5.1 ug Seleno-L-Methionine/g in food.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	1.22		Growth	LOEL	Growth - Reduced.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	1.4		Growth	LOED	Significant decrease in body weight gain.
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	1.6		Growth	LOED	Reduced Weight Gain After 120 Days
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	1.7		Growth	LOED	Reduced Weight And Length Gain In 30 Days
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	2.01		Growth	LOED	Reduced Weight And Length Gain In 60 Days
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	2.16		Growth	LOED	Reduced Weight And Length Gain
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	2.88		Growth	LOED	Reduced Length After 120 Days
Oncorhynchus tshawytscha	Salmon - Chinook	Anadromous	Finfish	piscivore	4.64		Growth	LOED	Reduced Weight And Length Gain In 120 Days
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	8.6		Growth	LOED	46% Reduction in weight gain.□□ Larval uptake was 1.46 ng selenium per day.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	9.5		Growth	LOEL	Growth - Reduced.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	10.3		Growth	ED28	28% Reduction in weight gain.□□ Larval uptake of 1.46 ng selenium per day.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	12		Growth	LOED	Significant reduction in weight.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	1.5	F	Reproduction	NOED	No significant difference in # spawns per pair and eggs per spawn.
Pimephales promelas	Minnow - Fathead	Fresh	Finfish	omnivore	1.5		Reproduction	NOEL	Reproduction - No effect.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	4.54		Reproduction	NOEL	Reproduction - No effect. Slightly lower survival than controls, but not significant. Control survival was only 50%.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	4.6		Reproduction	NA	Measurable But Not Statistically Significant Reduced Survival Of Embryos And Larvae
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	4.6		Reproduction	NA	Measurable But Not Statistically Significant Reduced Survival Of Embryos And Larvae
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	16.9		Reproduction	NOEL	Reproduction - No effect. *Female and male, respectively
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	19		Reproduction	NOEL	Reproduction - No effect.
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	1.37	I	Mortality	NOEL	Survival - No effect. 9.63 mg/L sulfate added (sulfate hinders bioaccumulation of Se)
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.8		Mortality	NOEL	Survival - No effect. Radiotracer study

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	2.42		Mortality	NOEL	Survival - No effect. Radiotracer study
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	4.36		Mortality	NOEL	Survival - No effect. Radiotracer study
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	5.08		Mortality	NOEL	Survival - No effect. Selenium: sulfur ratios 1:1 to 1:25
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	6.62		Mortality	NOEL	Survival, No effect. Selenium: sulfur ratio 1:15
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	10.2		Mortality	NOED	No Effect On Mortality
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	10.22		Mortality	NOEL	Survival - No effect.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	13		Mortality	NOEL	Survival - No effect. Radiotracer study
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	20.4		Mortality	NOEL	Survival - No effect. Radiotracer study
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	0.22	I	Mortality	LOEL	Survival - Reduced. Radiotracer study
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	3.42		Mortality	LOEL	Survival - Reduced 95%. No sulfate added
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	12.6		Mortality	LD50	Lethal To 50% Of Animals In 48 Hours
Brachionus calyciflorus	Rotifer	Fresh	Invertebrate	zooplanktivore	15		Mortality	LD100	100% Mortality in 10 days.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	15.42		Mortality	LOEL	Survival - Reduced >50%*. *Immobilized; selenium: sulfur ratio 1:3
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	17		Mortality	LD50	Lethal To 50% Of Animals In 48 Hours
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	25		Mortality	LOED	Mortality measured as decreased biomass.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	29.6		Mortality	LOED	Mortality measured as decreased biomass.
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	0.26	I	Growth	NOEL	Growth - No effect. *A conservative residue value (see footnote°)
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1.8		Growth	NOEL	Growth - No effect. Radiotracer study
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	2.42		Growth	NOEL	Growth - No effect. Radiotracer study
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	4.22		Growth	NOED	No Effect On Growth (weight)
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	4.36		Growth	NOEL	Growth - No effect. Radiotracer study
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	13		Growth	NOEL	Growth - No effect. Radiotracer study
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	20.4		Growth	NOEL	Growth - No effect. Radiotracer study
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	20.4		Growth	NOED	No difference in biomass compared to controls.
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	0.2	I	Growth	ED40	40% Decreased body weight
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	0.22		Growth	LOEL	Growth - Reduced. Radiotracer study
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	0.51		Growth	LOED	Reduction In Growth (weight)
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	2		Growth	ED54	54% Decreased body weight
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	2.94		Growth	LOED	24% Decrease in weight gain.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	3		Growth	LOED	Significant increase in biomass over controls - a hormetic effect at lowest dose.
Chironomus decorus	Midge	Fresh	Invertebrate	omnivore	4.4		Growth	ED68	68% Decreased body weight
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	6.34		Growth	ED36	36% Decrease in weight gain.
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	6.34		Growth	LOEL	Growth - Reduced.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Brachionus calyciflorus	Rotifer	Fresh	Invertebrate	zooplanktivore	6.5		Growth	LOED	Significant Reduction In Population Biomass
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	10.2		Growth	ED42	42% Decrease in weight gain.
Brachionus calyciflorus	Rotifer	Fresh	Invertebrate	zooplanktivore	12		Growth	LOED	Significant Reduction In Population Biomass
Brachionus calyciflorus	Rotifer	Fresh	Invertebrate	zooplanktivore	12		Growth	LOEL	Growth - Reduced.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	29.6		Growth	LOEL	Growth - Reduced. Radiotracer study
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	0.26	I	Reproduction	NOEL	Reproduction - No effect. *A conservative residue value (see footnote°)
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	2.94		Reproduction	NOED	No effect on number of total young and time to first brood.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	6.34	I	Reproduction	LOED	Decrease in total young and young per female. Delayed time to first brood.
Daphnia magna	Cladoceran	Fresh	Invertebrate	filter feeder	6.34		Reproduction	LOEL	Reproduction - Reduced.
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	10.2		Reproduction	ED70	Over 70% decrease in total young and young per female. Delayed time to first brood.
Silver									
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	0.06	F	Mortality	NOEL	Survival - No effect.
Lepomis macrochirus	Bluegill	Fresh	Finfish	invertivore	0.06	F	Growth	NOEL	Growth - No effect.
Crepidula fornicata	Slipper limpet	Salt	Invertebrate	herbivore	4.47	I	Reproduction	NOEL	Reproduction - No effect. Only 24 mo residues were determined
Crepidula fornicata	Slipper limpet	Salt	Invertebrate	herbivore	5.36		Reproduction	NOEL	Reproduction - No effect. Body residues were 54.1 and 44.9 µg/g at 6 and 12 mo, respectively. Residue shown is at 24 mo
Corbicula fluminea	Clam - Asiatic	Fresh	Shellfish	filter feeder	1650	S	Mortality	NOED	No Effect On Survival
Corbicula fluminea	Clam - Asiatic	Fresh	Shellfish	filter feeder	2510	S	Mortality	LOED	Reduced Survival
Corbicula fluminea	Clam - Asiatic	Fresh	Shellfish	filter feeder	800	S	Growth	NOED	No Effect On Growth measured as weight.
Corbicula fluminea	Clam - Asiatic	Fresh	Shellfish	filter feeder	1650	S	Growth	LOED	Reduction In Growth measured as weight
Vanadium									
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	2.4	F	Mortality	NOEL	Survival - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.3		Mortality	NOED	No Effect On Mortality
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.33		Mortality	NOEL	Survival - No effect.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	5.74		Mortality	NOEL	Survival - No effect.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	3.12	F	Mortality	LOEL	Survival - Reduced 73%.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	3.12		Mortality	LOEL	Survival - Reduced 60%.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.02	F	Growth	NOEL	Growth - No effect.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	0.57		Growth	NOEL	Growth - No effect.

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	0.68		Growth	NOED	No Effect On Growth in second generation. Parents exposed to 0.041 mg/L for up to 86 days.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	5.74		Growth	NOEL	Growth - No effect.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.41	F	Growth	LOED	Reduced Feeding And Body Weight, Digestive Tract Distress
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	0.41		Growth	LOEL	Growth - Reduced.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	2.22		Growth	LOEL	Growth - Reduced.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	2.7		Growth	LOED	Reduced growth in second generation. Parents exposed to 0.17 mg/L for up to 86 days.
Oncorhynchus mykiss	Trout - Rainbow	Fresh	Finfish	piscivore	5.3		Growth	ED70	70% Reduction in Body Weight, Digestive Tract Distress
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	5.74	F	Reproduction	NOEL	Reproduction - No effect.
Marthasterias glacialis	Starfish	Salt	Invertebrate	predator	0.3	I	Mortality	NOED	No Effect On Mortality Or Feeding
Lysmata seticaudata	Shrimp	Estuarine	Invertebrate	filter feeder	0.58		Mortality	NOED	No Effect On Mortality After 3 Weeks
Carcinus maenas	Crab - Green	Salt	Invertebrate	predator	0.6		Mortality	NOED	No Effect On Mortality After 3 Weeks
Paracentrotus lividus	Sea Urchin	Salt	Invertebrate	predator	0.74		Mortality	NOED	No Effect On Mortality Or Feeding
Holothuria forskali	Sea Cucumber	Salt	Invertebrate	herbivore	0.8		Mortality	NOED	No Effect On Mortality Or Feeding
Zinc									
Poecilia reticulata	Guppy	Fresh	Finfish	omnivore	0.284	F	Mortality	NOED	
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	3.9		Mortality	NOED	No reduction in percentage of eggs hatching in second generation. Residue in newly hatched larva.
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	37		Mortality	NOED	No Effect On Survivorship
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	40		Mortality	NOEL	Survival - No effect. Larvae not previously exposed as embryos
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	42		Mortality	NOED	No Effect On Survivorship
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	50		Mortality	NOED	Body Burden Est. From Graph
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	60		Mortality	NOED	No Effect On Survivorship
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	60		Mortality	NOEL	Survival - No effect. Increased mortality (25%) but was not significant
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	220		Mortality	NOED	Body Burd. Est. From Graph
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	300		Mortality	NOED	Body Burd. Est. From Graph
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	4.5	F	Mortality	LOED	Reduction in percentage of hatchability in second generation eggs. Residue in newly hatched larva.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	44		Mortality	LOEL	Survival - Reduced 80%. Larvae not previously exposed as embryos

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	50		Mortality	LOED	Body Burden Est. From Graph
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	59.6		Mortality (30 day	LOEL	Survival (30 day)- Reduced.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	220		Mortality	LOED	Body Burd. Est. From Graph
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	34	F	Growth	NOEL	Growth - No effect. Larvae not previously exposed as embryos
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	37		Growth	NOED	No Effect On Weight Gain
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	42		Growth	NOED	No Effect On Weight Gain
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	44		Growth	NOEL	Growth - No effect.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	58		Growth	NOED	Body Burden Est. From Graph
Salmo salar	Salmon - Atlantic	Anadromous	Finfish	piscivore	60		Growth	NOED	No Effect On Weight Gain
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	190		Growth	NOED	Body Burd. Est. From Graph, Total Length Of Females
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	230		Growth	NOED	Body Burd. Est. From Graph, Total Length Of Males
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	40	F	owth (female fis	LOEL	Growth (female fish) - Reduced. Larvae not previously exposed as embryos
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	60		Growth	LOEL	Growth - Reduced.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	220		Growth	LOED	Body Burd. Est. From Graph, Total Length Of Females
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	220		Growth	LOED	Body Burden Est. From Graph; total length of females.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	300		Growth	LOED	Body Burd. Est. From Graph, Total Length Of Males
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	6.7	F	Reproduction	NOED	No reduction in percentage of eggs hatching in second generation. Residue in newly hatched larva.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	15.3		Reproduction	NOED	No reduction in percentage of eggs hatching in second generation. Residue in newly hatched larva.
Salvelinus fontinalis	Trout - Brook	Fresh	Finfish	piscivore	19.3		Reproduction	NOED	No reduction in percentage of eggs hatching in second generation. Residue in newly hatched larva.
Jordanella floridae	American flagfish	Fresh	Finfish	bottom feeder	58		Reproduction	NOED	Body Burden Est. From Graph
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	12.7		Mortality	NOED	No significant increase in mortality.
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	12.7	I	Mortality	NOEL	Survival - No effect. Authors state that the crayfish may have been adapted to low concentrations of zinc prior to testing
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	26		Mortality	NOEL	Survival - No effect.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	53.6		Mortality	NOED	calc wet from dry using default % moisture

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	53.6		Mortality	NOEL	Survival - No effect.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	60.8		Mortality	NOED	calc wet from dry using default % moisture
Chironomus riparius	Midge	Fresh	Invertebrate	omnivore	524		Mortality	NOEL	Survival - No effect. Development was significantly retarded
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	19.5	I	Mortality	LD25	calc wet from dry using default % moisture
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	24		Mortality	LOEL	Survival - Reduced 90%. Residues in surviving organisms
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	30		Mortality	LOEL	Survival - Reduced 30%. Residues in surviving organisms
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	35.2		Mortality	LD23	23% Significant increase in mortality.
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	35.2		Mortality	LOEL	Survival - Reduced 22%. Authors state that the crayfish may have been adapted to low concentrations of zinc prior to testing
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	37.8		Mortality	LD43	43% Increase in mortality.
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	37.8		Mortality	LOEL	Survival - Reduced 42%. Authors state that the crayfish may have been adapted to low concentrations of zinc prior to testing
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	40.3		Mortality	LD25	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	50.2		Mortality	LD50	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	60.8		Mortality	LD67	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	60.8		Mortality	LOEL	Survival - Reduced.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	66		Mortality	LD50	50% survival.
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	69.2		Mortality	LD61	61% Increase in mortality.
Orconectes virilis	Crayfish	Fresh	Invertebrate	omnivore	69.2		Mortality	LOEL	Survival - Reduced 61%. Authors state that the crayfish may have been adapted to low concentrations of zinc prior to testing
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	72.7		Mortality	LD25	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	85		Mortality	LD44	56% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	90.6		Mortality	LD50	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	105.8		Mortality	LD100	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	117.8		Mortality	LD100	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	117.8		Mortality	LD40	calc wet from dry using default % moisture
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	117.8		Mortality	LOEL	Survival - Reduced - Death.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	126		Mortality	LD49	51% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	136		Mortality	LD65	35% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	167		Mortality	LD94	6% survival.
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	167		Mortality	LD97	3% survival.
Themisto abyssorum	Amphipod - Mesoplar	Salt	Invertebrate	detritivore	951		Mortality	LD50	
Themisto libellula	Amphipod - Mesoplar	Salt	Invertebrate	detritivore	951		Mortality	LD50	

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)		Effect	Endpoint	Comments
Calanus hyperboreus	Calanoid copepod	Salt	Invertebrate	herbivore	1750		Mortality	LD50	low concentration exposure
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	2690		Mortality	LD50	Lethal body burden at 21 days exposure.
Calanus hyperboreus	Calanoid copepod	Salt	Invertebrate	herbivore	2980		Mortality	LD50	High concentration exposure
Hyalella azteca	Amphipod	Fresh	Invertebrate	detritivore	60.8	I	Growth	NOEL	Growth - No effect.
Allorchestes compressa	Amphipod	Fresh	Invertebrate	detritivore	24	I	Growth	LOEL	Growth - Reduced. Residues in surviving organisms
Daphnia magna	Water flea	Fresh	Invertebrate	filter feeder	1340	I	Reproduction	ED10	10% reduction in number of offspring.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	40	S	Mortality	NOED	No effect on mortality.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	46		Mortality	NOED	No effect on mortality.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	71.4		Mortality	NA	7.5% Mortality In 14 Days
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	78		Mortality	NOEL	Survival - No effect.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	120		Mortality	NOED	No increase in mortality. Residue was determined from graph and is approximate.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	122		Mortality	NOEL	Survival - No effect.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	130		Mortality	NOED	No effect on mortality.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	140		Mortality	NOED	No Effect On Mortality
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	150		Mortality	NOEL	Survival - No effect.
Mytilus edulis	Mussel - Blue	Salt	Shellfish	filter feeder	130	S	Mortality	LD100	100% Mortality In 14 Days
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	600		Mortality	LOEL	Survival - Reduced >50%.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	621		Mortality	LOED	56% Mortality
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	22	S	Growth	NOED	No effect on weight gain of suviving mussels.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	40		Growth	NOED	No effect on weight gain of suviving mussels.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	46		Growth	NOED	No effect on weight gain of suviving mussels.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	130		Growth	NOED	No effect on weight gain of suviving mussels.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	600		Growth	NOEL	Growth - No effect.
Dreissena polymorpha	Mussel - Zebra	Fresh	Shellfish	filter feeder	621		Growth	NOED	No Effect On Weight Gain Of Surviving Mussels

TABLE T-4.2
WHOLE BODY TISSUE RESIDUE EFFECT DATA SUMMARY - METALS

REMEDIAL INVESTIGATION REPORT - STRATFORD ARMY ENGINE PLANT
STRATFORD, CONNECTICUT

Species	Common Name	Water Type	Category	Trophic Level	Conc (mg/Kg)	Effect	Endpoint	Comments

Notes:
Information compiled from the following sources:
Where available, NOAELs and LOAELs are identified separately for fish (F), invertebrates (I), and wildlife (W).
1. ACOE, 2002. Tissue Effects Database; Army Corps of Engineers, U.S. Waterways Experiment Station, Vicksburg, MS.
2. Jarvinen and Ankley, 1999.
3. USEPA, 2000. Bioaccumulation Summary; United States Environmental Protection Agency; EPA-823-R-00-002.

T-5

TOXICITY PROFILES

APPENDIX T-5

TOXICITY PROFILES

The following toxicity profiles for the potential COPCs have been grouped into metals, PAHs, and PCBs. The information presented focuses on estuarine and marine aquatic environments, where such information is available. Profiles were gathered for constituents which were known to be Site related, especially toxic and bioaccumualtive, and present in high concentration.

Chemical transfer via sediments and behavior in sediments are pathways of primary concern. Data are presented for primary avian receptors, where available. Information on toxicity to fish and invertebrates are also of interest. The two COPCs which display known bioaccumulative and biomagnifying potential, mercury and PCBs, are given special attention.

1 Cadmium

Chemistry and Environmental Fate. Cadmium is a relatively rare element that is concentrated in zinc-bearing sulfide ores. It occurs in the earth's crust at a concentration around 0.15 mg/kg. Compared to other metals cadmium is relatively mobile in the aquatic environment. Sorption processes are important in determining transport, partitioning and potential for remobilization. In polluted waters, complexing with organic materials is the determining factor in environmental fate (USEPA 1979).

In aquatic systems, cadmium is present in the free, readily bioavailable, divalent form (2+) up to pH 8. Cadmium begins to hydrolyze at pH 9, forming $Cd(OH)_2$. Cadmium 2+ is available for sorption onto suspended solids and complexation with organic matter and is transported in these forms. Under oxygen-rich conditions, sediment suspensions release significantly greater amounts of cadmium as salinity increases (Moore and Ramamoorthy 1984a). Adsorption and desorption are the most important factors in controlling the concentration of cadmium in water. Adsorption and desorption rates are rapid on mud solids, and particles of clay, silica, and humic material (Eisler 1985). The decomposition of aquatic plants which have accumulated cadmium from sediments may release the metal into water.

Residues in Water. Background levels of cadmium in uncontaminated media are variable. Concentrations in freshwater range from 0.05 to 0.2 µg/L (Eisler 1985). Oceanic waters show significant enrichment at mid-depth (up to 0.15 µg/L at 5000m), but only about 0.01 to 0.07 at the surface. Pollution by industrial outfalls can lead to levels as high as 17.3 µg/L (Moore and Ramamoorthy 1984a).

Residues in Sediment. In freshwater sediments, cadmium residues are also highly variable and can range from less than 0.1 mg/kg to 3000 mg/kg dry weight. In highly contaminated areas, concentrations can range up to 50,000 mg/kg. Unpolluted marine sediments may contain as little as 0.01 mg/kg, whereas industrial areas may exceed 50 mg/kg (Moore and Ramamoorthy 1984a).

Sediment samples collected in 1990 at the Mussel Watch sampling area located at the mouth of the Housatonic River in Long Island Sound showed a cadmium level of 0.6 mg/kg (not corrected for percent fines) (NOAA 1992).

Residues in Plants. Plants accumulate cadmium from water and sediments, although the magnitude of accumulation varies with species and conditions. There does not appear to be a strong correlation between residues in seawater and plant tissue. Scandinavian species from fjords contaminated by smelting plant effluent reported plant levels up to 16 mg/kg DW, but the highest plant cadmium concentrations were found in areas showing lower water cadmium concentrations than other areas. The presence of manganese and iron, as well as other heavy metals, may inhibit uptake of cadmium in aquatic plants (Moore and Ramamoorthy 1984a).

Residues in Invertebrates. Cadmium is transferred to invertebrates from both food and water. High cadmium levels (up to 1120 mg/kg DW in estuarine gastropods) have been reported for invertebrates inhabiting heavily polluted waters. Benthic organisms can accumulate cadmium from sediments. The presence of chelators decreases uptake. Depuration is slow in almost all species. Residues in a shrimp (*Pandalus montagui*), showed no significant decline during a 75-day post-exposure period (Moore and Ramamoorthy 1984a). Concentrations up to 3.6 mg/kg DW were reported for *Nereis* species, and up to 89 mg/kg WW for *Nephtys* species from sediments with high concentrations of cadmium (Eisler 1985).

Residues in Fish. Moore and Ramamoorthy (1984a) summarized cadmium accumulation in fish as follows: cadmium tends to accumulate in major organ tissues of fish, particularly liver and kidneys, rather than muscle. In general, residues in fish cannot be correlated to concentrations in water or feeding habits. Cadmium uptake in fish is highly variable and inconsistent. Water hardness does not appear to affect uptake, although it does seem to protect against toxicity. Cadmium availability is increased in salt water, although the presence of chelators decreases uptake.

Cadmium is found even in the livers of arctic char from pristine Arctic lakes, although no cadmium was found in the muscle tissue. Sculpin from a pristine arctic estuary averaged 1.4 and 4.1 mg/kg DW in muscle and liver. In industrially impacted areas, such as estuaries and coastal waters in the United Kingdom, fish have been found to contain up to 2.5 mg/kg in muscle tissue, and 5.2 mg/kg, DW in whole body analyses (Moore and Ramamoorthy 1984a; and Eisler 1985).

Ecotoxicity. In general, mortality due to exposure to cadmium increases with increased exposure time and decreased organism age. Cadmium toxicity to aquatic plants is less than copper, and similar to lead, nickel and chromium. Increasing pH resulted in increased mortality in a wide variety of aquatic plant species. Inhibitions to growth can occur in some species at 0.02 - 1.0 mg/L, although chronic effects have been reported at levels as low as 1 µg/L (Moore and Ramamoorthy 1984a). Eisler (1985) reported that concentrations greater than 10 µg/L are associated with high mortality, reduced growth and inhibited reproduction in certain aquatic plants.

Toxicity of cadmium to estuarine invertebrates varies by a factor of at least 5000. Crustaceans appear to be the most sensitive, followed by mollusks and polychaetes. Increasing salinity decreases toxicity to many estuarine species, as does low

temperatures. Several species have the ability to adapt to mildly contaminated media, other species can detect and avoid low cadmium concentrations in water (Moore and Ramamoorthy 1984a).

Acute LC_{50} values for estuarine fish species range from 8 to 85 mg/L. Juvenile stages are usually more sensitive than adult fish. Cadmium appears to have adverse effects upon a fish's ability to osmoregulate. High salinity, hardness, and the presence of chelators all reduce toxicity (Moore and Ramamoorthy 1984a).

Most studies of cadmium have been designed to define the effects of high intakes, generally in a short period of time, rather than to establish no-effect levels. With an adequate diet, 5 mg/kg dietary cadmium is the level at which gross adverse effects are most apt to begin in domestic animals (NAS 1980). The presence of zinc, iron, vitamin C, calcium, or selenium in the diet reduces cadmium toxicity (Eisler 1985). Higher levels of cadmium produce a wide range of changes in metabolic measurements that have been observed in one or more species. High intakes of cadmium in the diet can cause reduced growth rates, anemia, enteropathy, kidney damage, infertility, deformed fetuses, abortions, and hypertension (NAS 1980). Most information about cadmium's biological behavior shows it to be toxic and an antagonist of several essential minerals, such as zinc, iron, copper, and calcium (NAS 1980).

2 Chromium

Chemistry and Environmental Fate. Trivalent chromium, Cr(III), is the most stable and most common form of chromium in natural waters and sediments, although Cr(III) and Cr(VI) are interconvertible under natural conditions. Cr(VI) can be reduced by Fe(II), dissolved sulfides, and certain organic compounds with sulfhydral groups to Cr(III). Cr(III) in natural waters (pH less than 9) may be oxidized by O_2 at a slow rate to form Cr(VI) in the presence of a catalyst (Losi et al. 1994). Hydrolysis and precipitation are the most important processes that determine the fate and effects of chromium. When Cr(III) is present in waters at a pH greater than 5, it quickly precipitates due to the formation of the insoluble hydroxide or oxide, and accumulates in the sediment (USEPA 1979). Suspended particulates are a major source of environmental transport of chromium in aquatic systems (Eisler 1986a). While Cr(III) is virtually insoluble in environmental waters, Cr(VI) is soluble over a wide pH range, and generally mobile in soil/water systems (Losi et al. 1994).

Residues in Water. Dissolved concentrations of chromium in unpolluted freshwaters range from approximately 1 to 2 µg/L, and marine waters range from 0.05 to 0.5 µg/L. Clean coastal waters contained predominately Cr(VI), with the median concentrations of Cr(III) and Cr(VI) as 0.045 and 0.14 µg/L, respectively (Moore and Ramamoorthy 1984a).

Residues in Sediment. Sediment chromium concentrations from industrial zone waters can be as high as 1337 mg/kg dry weight, but generally fall below 1000 mg/kg. Less impacted sediments may be less than 100 mg/kg DW. Much of this chromium is not bioavailable, being bound to humic materials, and iron oxides (Moore and Ramamoorthy 1984a).

Sediment samples collected in 1990 at the Mussel Watch sampling area located at the mouth of the Housatonic River in Long Island Sound showed a level of 67 mg/kg (not corrected for percent fines) (NOAA 1992).

Residues in Plants. Residues of chromium in marine plants are usually higher than those from freshwater. Twenty filamentous plant species from unpolluted Malayan waters had chromium levels which ranged up to 58 mg/kg. Levels up to 140 mg/kg were reported for 19 species from Japanese coastal waters (Moore and Ramamoorthy 1984a). In one study, marine marsh grass (*Spartina* spp.) from control areas contained chromium levels up to 3.1 mg/kg, while that grown in areas treated with chromium-tainted sludge contained up to 44 mg/kg (Eisler 1986a).

Residues in Invertebrates. Resides in invertebrates from industrial marine environments generally range up to 25 mg/kg dry weight as compared with $\leq$ 5 mg/kg reported for unpolluted sediments. Eisler (1986a) reports whole annelid chromium concentrations of 23.8-38.0 mg/kg DW in marine sediments impacted by heavy metals.

Residues in Fish. Chromium does not normally accumulate in fish, and levels are not reliably related to feeding habits. Marine specimens collected from industrial areas may have slightly higher tissue levels than those found in freshwater, but those residues usually range from 0.5 to 1 mg/kg WW (Moore and Ramamoorthy 1984a). Muscle tissue of fish from contaminated areas may reach concentrations as high as 7.3 mg/kg DW. Internal organs may reach similar concentrations. Highest levels are seen in scales, with a reported level as high as 97 mg/kg DW (Eisler 1986a).

Ecotoxicity. The trivalent form of chromium [Cr(III)] is an essential element to mammals (Eisler, 1986a). Chromium, under most natural conditions which favor the Cr(III) form, has lower toxicity to aquatic organisms than many other metals. Hexavalent chromium [Cr(VI)], on the other hand, forms chromate and dichromate anions, which can be toxic and mutagenic. These effects seem to be related to the strong oxidizing nature of Cr(VI) (Eisler 1986a; Losi et al. 1994).

Chromium is less toxic in saltwater than in freshwater, due to competitive inhibition with cations present in saltwater. As with many metals, changing water hardness and salinity significantly influence toxic effects (Moore and Ramamoorthy 1984a). Chronic effects include decreased growth and body size. Toxicity may be influenced by the presence of other metals. Fish are generally less susceptible to the toxic effects of chromium than invertebrates.

The 96-hour LC_{50} for dissolved chromium is 5 to 35 mg/L for several species of mollusks and polychaetes (Moore and Ramamoorthy 1984a). Eisler (1986a) reports the 96-hour LC_{50} for Cr(VI) as 14 to 105 mg/L for three unspecified species of mollusk, and the 28-day LC_{50} for nereids species (a polychaete present in the SAEP Site areas) as 0.28 to 0.55 mg/L. The Cr(VI) 96-hour LC_{50} for Atlantic silverside (*Menidia menidia*) juveniles (which may be present in the Intertidal Mudflats and Marine Basin areas during tidal coverage) is 20.1 mg/L. The 96-hour LC_{50} for larval *M. menidia* is 12.4 to 14.3 mg/L.

3 Copper

Chemistry and Environmental Fate. Copper is widely distributed in nature in its free state and in sulfides, arsenides, chlorides and carbonates. The physical/chemical properties of copper depend on its speciation. Oxidation state 2+ [Cu(II)] is the most common. Copper is insoluble in water but soluble in some acids. Formation of ion complexes, sorption (to hydrous metal oxides, clays and organic materials) and bioconcentration can be important processes in the environmental fate of copper. Redox potential, pH, concentrations of organic materials and adsorbents, availability of iron and manganese oxides, biological activity and competition with other metals are all determinants of the aquatic fate of copper. In organic rich environments, the control of dissolved copper concentrations is generally competition between organic complexing in solution and sorption onto clay and particulate organic material.

Of the copper transported by rivers, only 1% is in a soluble form, 85% is in particulate crystalline phases, about 6% is bound to metal hydroxides, 4.5% is bound to organics, and about 3.5% is adsorbed onto suspended solids. Desorption from sediments into the water phase depends on pH, salinity, and the presence of natural and/or synthetic chelating agents (Moore and Ramamoorthy 1984a).

Residues in Water. Copper is rapidly sorbed to sediments. Soluble copper levels in marine and estuarine waters may range from less than 2 µg/L in the open ocean to greater than 15 µg/L in areas subject to anthropogenic loading (Moore and Ramamoorthy 1984a).

Residues in Sediment. Uncontaminated marine sediments generally contain copper levels less than 20 mg/kg. Concentrations on the order of 1000 mg/kg are typical of aquatic sediments in areas contaminated with mine wastes. Mixed industrial discharges may be associated with local marine sediment copper concentrations in the range of 3 to 200 mg/kg (Moore and Ramamoorthy 1984a).

Residues in Invertebrates. Residues in marine invertebrates can reach high levels, with copper concentrations of 6480 mg/kg reported for oyster tissue collected from the United Kingdom. However, mollusks taken from most parts of Europe and North America have copper levels less than 60 mg/kg. Uptake by benthic species is directly related to levels in sediment (Moore and Ramamoorthy 1984a).

Residues in Fish. Contaminated food is probably a more important source of copper to fish burdens than uptake directly from water, although several field studies have shown that there is no biomagnification of copper through the food chain (Moore and Ramamoorthy 1984a). Marine fish generally have higher copper residues than freshwater species due to the increased bioavailability of $CuCl_2$ in seawater. Fish tissue from polluted marine waters generally contain 0.5 to 2 mg/kg in muscle tissue, although liver concentrations may be up to 5-60 times greater than that. Extreme contamination may show fish muscle levels of 3-6 mg/kg (Moore and Ramamoorthy 1984a).

A study of copper in sediments and 12 species of fish in the Mediterranean coast of Israel found a concentration factor (CF) of 2.4 for transfer from sediment (at 1.6 mg/kg DW) to fish (3.8 mg/kg DW) (Moore and Ramamoorthy 1984a). Bioconcentration factor values are highly dependent on the chemical concentrations in media. Another study of a pond

treated with copper sulfate found sediment concentrations of 28 mg/kg DW, compared to a mean of 0.6 mg/kg DW in green sunfish (a CF of 0.02) (Moore and Ramamoorthy 1984a).

Ecotoxicity. Soluble copper is highly toxic to most aquatic plants. Inhibition of growth generally occurs at concentrations as low as 0.1 mg/L. Only mercury is more toxic to aquatic plants. Its toxicity is thought to be attributable to Cu^{2+} ion. The presence of complexing substances in water (e.g., from decaying organic matter) greatly reduces toxicity. Many species of algae develop a tolerance to copper thereby increasing copper in the food chain (Moore and Ramamoorthy, 1984).

Copper is highly toxic to most marine invertebrates, with the LC_{50} generally less than 0.5 mg/L. Toxicity is usually greater in freshwater than marine waters, and is much less in the presence of increased water hardness, and organic matter. Some invertebrate species can adapt to high levels (Moore and Ramamoorthy 1984a).

Species vary widely in susceptibility to copper toxicity, in part due to differences in sulfur metabolism as well as differences in concurrent levels of sulfur, molybdenum, zinc, iron, and selenium. The effects of copper toxicosis when it does occur are not always obvious and include growth inhibition, anemia, muscular dystrophy, impaired reproduction, and decreased longevity (NAS 1980). The maximum tolerable levels of dietary copper during growth of various species approximate the following under normal levels of molybdenum, sulfate, zinc, and iron: chickens, 300 mg/kg; turkeys, 300 mg/kg; rabbits, 200 mg/kg; and rats, 1000 mg/kg (NAS 1980). The minimal lethal dose of copper for bird and fowl species varies from 300-1550 on a mg/kg-BW basis depending on the form of copper fed (NAS 1977). Mallards have been shown to tolerate 29 mg/kg-BW (NAS 1977).

4 Lead

Chemistry and Environmental Fate. Lead from the atmosphere, carried via precipitation and runoff, is a primary source to aquatic systems. Partitioning of lead between aqueous and solid phases depends on sediment geochemistry, temperature, pH, redox potential, and ionic competition. Most lead discharged into surface waters is rapidly adsorbed onto sediments, and sorption is correlated to organic content and grain size. In the absence of soluble complexing species, lead in sediments is almost totally sorbed as precipitated species at pH > 6.0 (Moore and Ramamoorthy 1984a). Solubility of lead is low in water because it requires low pH, low organic content, and low concentrations of suspended sediments. The portion of the lead that is not water soluble is adsorbed to sediment and suspended colloids. In sediments, lead is bound to clay and organic matter fractions (Baudo et al. 1990).

Residues in Water. Concentrations of soluble lead in uncontaminated freshwaters are generally less than 3 µg/L. In industrial-zone rivers and waters receiving liquid mine wastes, concentrations of lead can reach more than 500 µg/L. Comparable levels may occur in estuaries adjacent to mining areas but, in off-shore areas, decline to less than 0.05 µg/L (Moore and Ramamoorthy 1984a).

Residues in Sediment. In uncontaminated areas, sediment concentrations can range from 2 to 50 mg/kg depending on the composition of the underlying bedrock.

Municipal/industrial zone rivers can produce sediment concentrations on the order of 50 to 500 mg/kg (Moore and Ramamoorthy 1984a).

Sediment samples collected in 1990 at a Mussel Watch sampling area located at the mouth of the Housatonic River in Long Island Sound showed a lead level of about 31 mg/kg (not corrected for percent fines) (NOAA 1992).

Residues in Plants. High levels of lead residues are reported in attached plants inhabiting polluted waters. There is a correlation between lead levels in water and plant tissues. Several species have been used to monitor contamination levels. Few studies have been done on the interaction of sediments and plant residues (Moore and Ramamoorthy 1984a).

Residues in Invertebrates. Benthic invertebrates do not concentrate lead from algal food or water. Little accumulation is found at higher trophic levels. Variability in sorption is species dependent, and likely affected by feeding style. It is possible however, for deposit-feeders, such as oligochaetes, to contain relatively high levels. Oligochaetes sampled in a freshwater river (Illinois River) had a mean lead level of 17 mg/kg (wet weight). This corresponds to a dry weight lead concentration of 131 mg/kg. [The oligochaete dry weight to wet weight (DW:WW) ratio is 13% (Markwell et al. 1989)]. The corresponding sediment lead concentration was 28 mg/kg DW, resulting in a biota-sediment concentration factor of 4.7 for the oligochaetes in the Illinois River study. Mollusks at the same location had wet weight tissue concentrations of 3.7 mg/kg (18.5 mg/kg DW if a DW:WW ratio of 20% is assumed), for a concentration factor of 0.66.

Residues are usually greater in the exoskeleton of crustaceans than in muscle tissue. In blue mussels (*Mytilis edulis*) collected from Australia, lead accumulated primarily in the gills, stomach and shell. Other mollusks are reported to show a similar pattern of lead deposition (Moore and Ramamoorthy 1984a).

Residues in Fish. In general, little accumulation of lead is found in marine or freshwater fish, and there is no tissue that appears to preferentially accumulate lead in most fish, although liver levels tend to be higher (Moore and Ramamoorthy 1984a; Eisler 1988). Methylation of lead is rare under natural conditions, and organolead is seldom found in fish tissues, although industrially produced organolead compounds released into the environment may be rapidly accumulated from water (Moore and Ramamoorthy 1984a). Fish sampled downstream from lead mining operations have shown lead concentrations of 0.4 to 18 mg/kg WW. Bluegill taken from a mine tailings pond had lead levels measured at 128 mg/kg DW. In contrast, bluegill from the Mississippi River carried maximal lead burdens of only 1.1 mg/kg DW; while carp from the same sampling event carried whole body burdens of 1 to 12 mg/kg DW (Eisler 1988).

Ten species of omnivorous and carnivorous fish from the Illinois River area discussed above had mean lead levels of 0.64 mg/kg WW, which corresponds to 2.24 mg/kg DW [using a DW:WW ratio of 29% for fish (USEPA 1993a)]. The concentration factor for lead in fish from (freshwater) sediment is thus about 0.08 (Moore and Ramamoorthy 1984a).

Ecotoxicity. Lead adversely affects survival, growth, reproduction, development, and metabolism of most species under controlled conditions, but its effects are substantially modified by numerous physical, chemical, and biological variables (Eisler 1988). Although it is ubiquitous and is a trace constituent in soils, water, plants, animals, and air, lead is neither biologically essential nor beneficial to living organisms.

Lead is less toxic to aquatic plants than mercurials and copper. Acute and chronic plant effects appear at surface water concentrations of 0.1-5 mg/kg. Manganese and copper may affect lead induced inhibitions. Some plant species are relatively tolerant of lead (Moore and Ramamoorthy 1984a).

Lead is less toxic to invertebrates than copper, cadmium, and zinc. Toxicity appears similar in both marine and freshwater environments. Acute effects are reported at 0.1-10 mg/kg. However, significant mortality may occur within the range of 0.002-670 mg/kg. The presence of chelators in water which bind Pb(II) reduces toxicity, as does increasing levels of salinity. Some isopods and polychaetes are particularly resistant. Mussel embryos exposed to 0.25 mg/L total lead had 87% survivorship at 32.5 ppt salinity and 15°C; but at 25 ppt salinity and 17.5°C, none survived (Moore and Ramamoorthy 1984a). Acute lead toxicity is inversely proportional to water hardness. Fish of earlier life stages are more sensitive to lead than are fish of later life stages. Acute toxicity of water-borne lead to fish range from 0.1 to 10 mg/L (Sorensen 1991).

Dietary lead at 1000 mg/kg can be tolerated by poultry for several months with no visible signs of toxicosis (NAS 1980). The maximum tolerable dietary level for lead is considered to be 30 mg/kg for most domestic animal species, although detectable increases in lead concentration may occur in certain tissues (NAS 1980).

5 Mercury

Chemistry and Environmental Fate. Mercury is a ubiquitous, widespread metal. In natural waters, mercury tends to associate strongly with suspended solids depending on pH, redox potential, salinity and presence of organic liquids. Dissolved mercury fractionates among organic ligands of molecular weight ranging from 500-100,000. In unpolluted water, the low molecular weight fraction predominates, and typically binds 75% of the mercury present in the water. In waters contaminated with industrial effluents, 66.4% of the mercury was found in the high molecular weight organic fraction (≥100,000). The strongest complexes are formed with S-containing ligands (such as cysteine), the next strongest with amino acids and hydroxycarboxylic acids (Moore and Ramamoorthy 1984a).

Most of the mercury in sediment-water systems is associated with the sediment phase in insoluble and relatively unavailable forms due to strong and stable bonds formed with carbonate, sulfide, hydroxide, and organic matter. The presence of sulfide, in particular, in sediments is related to decreased mercury bioavailability and toxicity (van Straalen 1993). Desorption of mercury in sediments is a slow process and depends largely on sediment features such as grain size, organic content, and cation exchange capacity. Significant desorption can occur in the presence of strong surfactant/chelating agents and NaCl (salt), because mercury (II) forms its strongest covalent bonds with chloride ions.

Biological and chemical cycling of mercury in the aquatic environment is complex. Most is discharged as of elemental mercury, divalent mercuric ion and phenyl mercuric acetate. Of particular ecological importance is the potential for conversion of inorganic mercury compounds to methylmercury by chemical and biological processes (Jernelov 1969). Mercury loadings, microbial activity, nutrient availability, pH and redox condition, suspended solids load, and sedimentation rates are among the parameters important in determining the degree of methylation (Eisler 1987a). Abiological methylation of mercury is considered to be limited (Callister and Winfrey 1986). The synthesis of methylmercury from inorganic forms by bacteria is considered the major source of the compound in aquatic systems (Eisler 1987a). In the environment, two general types of organic mercurials are formed: amphiphilic mercurials are soluble in water and lipids and are persistent in the aquatic environment; lipophilic mercurials are almost insoluble in water and extremely volatile.

Residues in Water. Total mercury concentrations in unpolluted estuarine seawater average less than 0.05 µg/L (Eisler 1987a). Non-polluted aquatic systems show less than 0.2 to 1 ng/L of methylmercury. Rainfall can be a source of mercury: levels in precipitation may range up to 1 µg/L, especially near industrial sources such as chlor-alkali plants. The atmosphere may be a significant reservoir for mercury (Moore and Ramamoorthy 1984a).

Residues in Sediment. Mercury residues in marine and freshwater sediments contaminated from natural sources are generally less than 1 mg/kg. Freshwater sediment mean concentrations measured in industrialized areas in the Great Lakes range from about 0.15 mg/kg to 0.66 mg/kg dry weight. Marine sediments impacted by industrial activities have means that range from 0.1 to 2.1 mg/kg. "Hotspots" of severe contamination show levels up to 630 mg/kg in Minamata Bay (Japan, in 1969) and as high as 9,000 mg/kg in the Jintsu River (Japan, in 1970) (Moore and Ramamoorthy 1984a).

Evans and Engel's (1994) review of the literature found that marine and estuarine sediments typically have methylmercury concentrations which are in the range of 0.01% to 1% of the total mercury. Sorenson (1991) described a study that found methylmercury concentrations (in experimentally spiked intertidal bay sediment) to be between non-detect and 0.14% of the total mercury content.

Sediment samples collected in 1990 at a Mussel Watch sampling area located at the mouth of the Housatonic River in Long Island Sound near the SAEP Site showed a mercury level of about 0.10 mg/kg (not corrected for percent fines) (NOAA 1992).

Residues in Plants. Total mercury residues in aquatic vascular plants collected in industrial areas have ranged from 0.07 to 0.43 mg/KG dry weight (Moore and Ramamoorthy 1984a). Only about 2% of the mercury in marine marsh plants is in the methylmercury form (Evans and Engel 1994).

Residues in Invertebrates. In organisms, methylmercury becomes an important, and often dominant fraction, of the total mercury present. The amount of methylmercury, expressed as a percentage of the total mercury, in marine invertebrates ranges from 20% in bivalves, to 32% in worms, to 50-60% in shrimp, gastropods and blue crabs, to 85% in other species of crabs (Evans and Engel 1994). Total mercury in three species of annelid

from a Georgia, USA, estuary contaminated with mercury were compared to their counterparts from a control estuary. The total mercury levels (whole body, dry weight) ranged from 0.7-4.5 mg/KG in the polluted estuary, compared to 0.1-0.6 mg/KG in the control estuary. The maximum methylmercury concentrations in these annelids reached 0.80 mg/KG, versus 0.13 mg/KG in the control estuary (Eisler 1987a).

Deposit-feeding bivalves in a Danish estuary polluted by mercury had total mercury levels of 1.4-4.4 mg/KG (wet weight). Filter-feeding bivalves in the same area had lower mercury concentrations (0.9-1.9 mg/KG WW). Clams taken downstream from chlor-alkali plants may attain total mercury levels up to 6.4 mg/KG DW (*Donax venustus*, Israel, 1980-1982) and 3.6 mg/KG WW (*Mya arenaria*, New Brunswick, 1970's) (Eisler 1987a).

An experimentally derived parameter, the Biota Sediment Factor (BSF) for mercury, relates the ratio of total mercury concentrations (dry weight) in benthic organisms to total mercury concentrations in habitat sediments. Median values were drawn from literature sources and reported by Evans and Engel (1994). The median BSF for worms (overwhelmingly the predominant benthic macroinvertebrate in the mud flat area) is given as 2.7. The value for gastropods (present in low numbers in mud flat area) is 2.68. No value was provided for amphipods (occasionally found in the mud flat area); however, the values for gastropods and worms were higher than any other median BSFs listed (clams, mussels, oysters, shrimp, and crabs), and higher than the value of 2 used by Evans and Engel as a generic "benthic organism" BSF.

The mercury detection limits attained by the laboratory analyzing SAEP oyster tissue appears to have been at least 10 times higher than the detection limit achieved in the Mussel Watch data set [reported to be 0.01 mg/kg DW or less (NOAA 1992)]. Whereas mercury levels are reported in the Mussel Watch Project to be around 0.07-0.08 mg/kg DW in *Mytilis edulis*, with no non-detects listed in the raw data set, the 1994 SAEP tissue (*Crassostrea virginica*) data set had mercury detections which ranged from 0.13 to 0.26 mg/kg DW, with reporting limits of 0.13 to 0.93 mg/kg. In the SAEP data, lower reporting limits (in the vicinity of 0.15-0.2 mg/kg) were always associated with reported non-detects, whereas higher reporting limits (0.61-0.93 mg/kg) were always associated with detections. Reported values are consistently about 1/4th of the reporting limit for that sample. This pattern, seeing detections only in association with elevated detection limits, raises the possibility of sample or matrix-related interferences, and introduces further uncertainty in interpretation of the data. Mercury was undetected in 1999 ribbed mussel tissue at reporting limits ranging from 0.5-0.69 mg/kg.

Residues in Fish. Mercury detected in fish tissues is generally in the methylmercury form, reported to range from 70 to 98% of the total mercury burden (Moore and Ramamoorthy 1984a). The concentration of mercury measured in muscle tissues from various fish species from unpolluted areas is on the order of 0.04 - 0.15 mg/kg fresh weight. Concentrations are generally greater than 1.0 mg/kg in moderately polluted systems, and may range from 10 to 24 mg/kg fresh weight in highly polluted areas (Eisler 1987a).

Uptake of methylmercury into fish directly from water is an insignificant accumulation mechanism when compared to uptake through food (Evans and Engel, 1994). Small fish

(such as the Atlantic silverside), which primarily consume small crustaceans, worms, insects, and algae (Thomson et al. 1978), are assumed to accumulate methylmercury indirectly from the sediments via the benthic organisms which comprise their food (Evans and Engel, 1994).

Ecotoxicity. Mercury is one of the most toxic contaminants to aquatic plants and organisms. Toxicity is higher at elevated temperatures, in reduced salinities, and in the presence of metals such as zinc and lead (Eisler 1987a). In general, the pre-hatch (egg) stage is most susceptible to intoxication. Organic mercurials are generally more toxic in all biota (Moore and Ramamoorthy 1984a).

The 96-hour LC_{50} for inorganic mercury for several invertebrate species as given in Elder (1990) are as follows: *Nais communius*, 160 µg/L; *Limnodrilus hoffmeisteri*, 180 µg/L; and *Asellus aquaticus*, 200 µg/L. The mean acute toxicity values for several marine invertebrates are as follows: *Nereis virens*, 70 µg/L; *Capitella capitata*, 14 µg/L; blue mussel (*Mytilis edulis*), 6 µg/L; Eastern oyster (*Crassostrea virginica*), 8 µg/L; and the soft-shelled clam (*Mya arenaria*), 400 µg/L (USEPA 1985). In general, toxic concentrations of mercury salts range from less than 0.1 µg/L to more than 200 µg/L for marine and freshwater organisms. The USEPA marine acute and chronic ambient water quality criteria for the protection of aquatic organisms are 2.1 and 0.025 µg/L, respectively (USEPA 1985).

Mercury is not essential in animal nutrition, and its level of concentration in living organisms depends on the type of organism and the form of mercury to which the organism is exposed. While mercury in the environment is typically in the inorganic form, biomethylation of inorganic mercury to the more toxic methylmercury form can occur in the environment or in the animal. Methylmercury significantly biomagnifies throughout the food web, and mercury is considered to be a bioaccumulative chemical of concern (USEPA 1995).

Mercury is a general protoplasmic poison. Mercury binds strongly with sulfhydryl, carboxyl, amide, amine, and phosphoryl groups. The general mode of toxicological action involves the covalent binding of mercury to sulfhydryl groups of enzymes important to cellular function and metabolism of carbohydrates. Biological membranes tend to discriminate against the absorption of ionic and inorganic mercury, but allow relatively free passage of methyl mercury and dissolved mercury vapor (Eisler 1987a). This, in part, explains the significantly higher toxicity of organic mercury versus inorganic mercury. In addition, the membrane permeability of organomercurial compounds allows these compounds to more readily pass the blood-brain and placental barriers (Campbell et al. 1992). In fish, methylmercury is roughly ten to twenty times more potent than Hg^{2+} in collapsing the structural integrity of gill epithelial membranes and destroying the concentration gradient at the brachial surface (Sorensen 1991).

The suggested maximum tolerable dietary level for domestic animals is 2 mg/kg mercury for both the organic and inorganic forms (NAS 1980). Chickens, turkeys, ducks, and pheasants have been shown to tolerate up to 3.3 mg/kg supplemental dietary mercury without evidence of adverse effects. The recommended dietary limit for birds is <0.64 mg/kg-BW daily dose or a dietary limit of 0.05-0.1 mg/kg FW (Eisler 1987a). Inorganic

mercury has been demonstrated to be toxic to earthworms at soil levels of 0.79 mg/kg (LD50) to 5.0 mg/kg (LD100) (Eisler, 1987a).

Mercury may cause reproductive and behavioral changes in bird species. Behavioral changes were noted in pigeons given 3 mg/kg-BW/day for 17 days. Japanese quail (*Coturnix japonica*) fed diets containing 8 mg/kg of inorganic mercury for 3 weeks had depressed gonad weight. Those fed 3 mg/kg inorganic mercury or 1 mg/kg methylmercury for 9 weeks showed alterations in brain and plasma enzyme activities (Eisler 1987a).

6 Nickel

Chemistry and Environmental Fate. Nickel is a silvery white metal with many uses in metal-working. It is an essential element for avian and mammalian species, although in excess, it can produce acute and chronic toxicity (Moore and Ramamoorthy 1984a). It appears to be a relatively mobile heavy metal in the environment. Sorption to particulate matter can scavenge nickel from solution, but adsorption and precipitation do not appear to be as effective as they are with many other heavy metals. Complexation with humic acids in natural waters helps to keep nickel in the water column, and increase its mobility (USEPA 1979).

Most common aqueous ligands form moderately soluble compounds with nickel, the exception being nickel sulfide, which is highly insoluble. Under aerobic conditions and below pH 9, the hydroxide, carbonate, sulfate, and halide compounds are sufficiently soluble to maintain aqueous Ni^{2+} concentrations above 60 µg/L. Sorption of nickel by hydrous iron and manganese oxides and organic matter probably exerts the major control on the mobility of nickel in natural waters. Nickel concentrations in sediments show a strong correlation with iron and manganese concentrations. Much of the nickel in the water column is associated with suspended particulates, organic material or colloids (USEPA 1979).

Residues in Water. Dissolved nickel concentrations in unpolluted coastal waters are about 1.8 µg/L. Anthropogenic input may increase levels to 2.5 to 15 µg/L. Rainwater over urban areas may carry 3 to 100 µg/L nickel (Moore and Ramamoorthy 1984a).

Residues in Sediment. In many industrialized parts of the world, sediment concentrations differ little from unpolluted areas, with levels between up 100 mg/kg. High nickel levels in sediments may occur near smelters, with reported concentrations greater than 500 mg/kg DW (Moore and Ramamoorthy 1984a).

The Mussel Watch Project sampling area located near the SAEP Site had mean sediment nickel levels of about 12 mg/kg (uncorrected for percent fines) in 1990 (NOAA 1992).

Residues in Plants. Marine plants and algae generally have low nickel residues (Moore and Ramamoorthy 1984a).

Residues in Invertebrates. Total concentrations of nickel in invertebrates vary seasonally in response to reproductive condition and changing water temperature, with lower values occurring in the fall. Nickel concentrations in bivalves from industrially impacted aquatic systems range up to 46 mg/kg DW. Nickel concentrations in gastropods and bivalves from unpolluted areas may be as high as 9.5 mg/kg (Moore and

Ramamoorthy 1984a). No information specific to aquatic annelid concentrations was available.

Residues in Fish. Moore and Ramamoorthy (1984a) summarized data on nickel residues in fish. From industrial areas the levels are usually less than 1 mg/kg. Several species of marine fish collected from an unpolluted area showed levels from 0.5 to 7.2 mg/kg, apparently derived from natural sources. Significant nickel contamination from smelter activities was associated with freshwater fish levels of 9.5 to 13.8 mg/kg WW. Nickel does not accumulate through the food chain.

In the Illinois River, average concentrations of 27 mg/kg DW in sediments were associated with concentrations in omnivorous fish of 0.18 mg/kg WW (approximately 0.7 mg/kg DW), for a fish-sediment concentration factor of 0.03 (Moore and Ramamoorthy 1984a).

Ecotoxicity. Under test conditions, nickel is less toxic to aquatic plants and algae than mercury, copper, cadmium, silver, and thallium, but more toxic than lead and zinc. Toxicity is mitigated by high water hardness and the presence of chelators. Combinations of nickel/ mercury and nickel/copper act synergistically towards many species. Antagonism often occurs between mixtures of nickel/cadmium, nickel/zinc, and nickel/cadmium/mercury. Some algal species can adapt to high nickel levels (Moore and Ramamoorthy 1984a).

Nickel is one of the least toxic heavy metals for invertebrates, and toxicity is less in the presence of hard water ions (calcium, magnesium) and other cations. When water hardness increased from 0.1 to 261 mg/L, the toxicity of nickel to an oligochaete (*Tubifex tubifex*) decreased 750 times. It is believed that a comparable response occurs in marine systems. Toxicity in oysters and other invertebrates is apparent as a reduction in growth and fertility (Moore and Ramamoorthy 1984a).

Nickel is less toxic to fish than other heavy metals as well. Increasing hardness and/or cation concentrations are protective. Immature stages are more sensitive than adult fish. Although treatment of fathead minnows with 1.6 mg/L had no immediate effect on survival or growth, there was a 50% reduction in fecundity and egg survival 5 months after exposure. Acute aquatic nickel toxicity in fish is apparent as a reduction of the diffusion capacity of gills, leading to asphyxiation unless the exposure is very brief (Moore and Ramamoorthy 1984a).

Acute toxicity in higher animals results from competitive interaction with five major essential elements: calcium, cobalt, copper, iron and zinc. Teratogenic effects can occur in mammalian and avian embryos exposed to nickel compounds.

7 Silver

Chemistry and Environmental Fate. Sorption by manganese and iron oxides and clays, and precipitation as sulfide (Ag_2S) and chloride (AgCl) are effective processes in reducing the concentration of dissolved silver and result in higher levels in sediments than in overlying water. For these reasons, silver is not very mobile. Organic materials also adsorb silver (USEPA 1979).

Residues in Water. Silver is usually found in extremely low concentrations in the aquatic environment due to the effectiveness of precipitation as a means of removal from water. In a study of ten U.S. rivers, silver concentrations ranged from 0.092 to 0.55 µg/L (USEPA 1979).

Residues in Sediment. No sediment silver levels were reported in the available literature. The nearby Mussel Watch Project sampling area had mean silver levels of about 0.43 mg/kg (uncorrected for percent fines) in 1990 (NOAA 1992). 1999 data showed levels ranging from undetected in the Marine Basin, 7.3 mg/kg in the Intertidal Mudflats, to 32.7 mg/kg in surficial sediments in the Outfall 008 Drainage.

Residues in Invertebrates. Algae, daphnids, freshwater mussels, and fish are all capable of accumulating silver from water, but silver does not biomagnify through the food web. Planktonic species of an alpine lake ecosystem had silver levels that correlated with water concentrations, while benthic species' levels correlated with sediment levels (USEPA 1979). Red abalone from the California coast had silver levels of 13 to 129 mg/kg DW in gill, mantle, or digestive tissues, but only 1.1 to 44 mg/kg in foot tissue (USEPA 1978).

Since BCFs for silver were not available , the concentration factor for zinc (1.8) (Beyer and Stafford 1993) was adopted for use with silver based on a consideration of data presented by Thomann et al. (1995) which evaluated 3 years of Mussel Watch (NOAA) data to model biota sediment accumulation factors (BSAFs) for two bivalves (*Mytilus edulis* and *Crassostrea virginica*). The median and mean values for silver were more similar to those for zinc than they were to other metals, yet generally lower than the zinc values, so that adoption of a zinc value for use with silver accumulation in annelids remains conservative. The mean and median BSAFs for zinc for *C. virginica* are 59.2 and 28.2, respectively. The mean and median BSAFs for silver for *C. virginica* are 38.3 and 16.4, respectively. The mean and median BSAFs for zinc for *M. edulis* are 5 and 2.1, respectively. The mean and median BSAFs for silver for *M. edulis* are 6.6 and 0.63, respectively.

Residues in Fish. Silver levels in marine and freshwater fish are reported to be usually less than 0.1 mg/kg. Internal organs typically contain more silver than muscle tissue. Silver measured in trout (sampled from an alpine lake contaminated with silver as a result of extensive cloud seeding) showed concentrations that ranged from non-detect in skin to 4.4 mg/kg DW in bone. Liver had the second highest silver concentration at 1.08-2.21 mg/kg, and muscle contained 0.09-1 mg/kg. No water or sediment silver concentrations were provided for the lake (USEPA 1978).

Ecotoxicity. Silver is one of the most toxic metals to aquatic life when it occurs in a freely dissolved form, ranking ahead of mercury on a relative acute toxicity basis, however, most silver salts are insoluble in water, especially in the presence of sulfide, silver concentrations in natural waters are very low (USEPA 1978). The Federal acute criterion for the protection of marine aquatic life for total recoverable silver is 2.3 µg/L. The proposed Federal chronic criterion is 0.92 µg/L (USEPA 1990).

Silver is very toxic to aquatic life. In the saltwater environment, invertebrate species are generally more sensitive than fish. The LC_{50} for the Atlantic silverside (*Menidia menidia*) is 210 µg/L, that for the hard clam (*Mercenaria mercenaria*) is 21 µg/L (USEPA 1980).

Dissolved silver in minute amounts is toxic to fish. The primary mechanism in fish is probably interference with gas exchange by the gills (Gough et al. 1979). Toxicity of silver decreases with increasing hardness and chloride concentration.

Hill et al. (1964) demonstrated that 10 to 100 mg/kg of dietary silver had no adverse effects on chickens grown to 3 weeks of age in a dose-response relationship. Using 0.0126 kg/day and 0.121 kg for a mean food intake and body weight, respectively, for a 1-day to 3-week old chick (Opresko et al. 1994), 100 mg/kg as the subchronic NOAEL, and a subchronic-chronic uncertainty factor of 0.1 results in a final oral dose NOAEL of 1.0 mg/kg/day.

8 Zinc

Chemistry and Environmental Fate. Zinc is a naturally occurring element found in the earth's crust at an average concentration of about 123 mg/kg. It is similar in chemical properties to cadmium. In aqueous solution, zinc always has a valence of +2. Zinc-ligand complexes are soluble in neutral and acidic solutions, so that zinc is readily transported in most surface waters. Zinc is one of the most mobile of the heavy metals (USEPA 1979).

Most zinc introduced into aquatic systems is partitioned into the sediments by sorption onto hydrous iron and manganese oxides, clay minerals and organics. Precipitation of the sulfide is an important control on the mobility of zinc in reducing environments. Precipitation of the hydroxide, carbonate or basic sulfate can occur where zinc is present in high concentrations (USEPA 1979).

Residues in Water. Dissolved levels of zinc range from about 0.5 to 15 µg/L in unpolluted freshwaters. Metal mining and flooding of industrial zone rivers can result in surface water concentrations as high as 3000 µg/L. Dissolved zinc concentrations in offshore marine areas range from 0.4 to 5 µg/L. Anthropogenic inputs may enrich levels to greater than 20 µg/L (Moore and Ramamoorthy 1984a).

Residues in Sediment. Freshwater sediment levels of zinc can range from less than 50 mg/kg dry weight in unpolluted systems, to more than 1000 mg/kg in contaminated areas. A similar range occurs for marine and estuarine systems (Moore and Ramamoorthy 1984a).

The Housatonic River Mussel Watch Project sampling area near the SAEP Site had mean zinc levels of about 91 mg/kg (uncorrected for percent fines) in 1990 (NOAA 1992).

Residues in Plants. Zinc residues in plants in polluted water range from 100 - 500 mg/kg dry weight (Moore and Ramamoorthy 1984a).

Residues in Invertebrates. Some marine species appear to concentrate zinc. In Tasmania, maximum residues in Pacific oysters (*Crassostrea gigas*) and bottom sediment were 14,000 and 500 mg/kg, respectively. Gastropods from another estuary were found to have tissue levels of 3,100 mg/kg in the presence of sediment concentrations of 540 mg/kg. Concentrations up to 1,500 mg/kg DW are reported for marine annelids, but no corresponding sediment concentrations were included (Eisler 1993). In unpolluted coastal waters, residues in benthic invertebrates range from 20 to 200 mg/kg (Moore and Ramamoorthy 1984a).

Residues in Fish. Residues in fish are generally much lower than those found in algae and invertebrates. There is little evidence for biomagnification. Internal organs, such as liver and gonads, generally have the highest zinc levels. In most cases, zinc concentrations in fish can be related to feeding habits. Fish obtain zinc from food, not water (Moore and Ramamoorthy 1984a). Marine fish showed levels of 80 mg/kg DW (Eisler 1993), and 0.5-33 mg/kg DW (Moore and Ramamoorthy 1984a) in areas not considered to be heavily impacted by anthropogenic activities. Zinc in muscle tissue from 15 species of freshwater omnivorous and carnivorous fish collected from industrial and agricultural areas of the lower Great Lakes were 16-82 and 3-9 mg/kg WW, respectively (Moore and Ramamoorthy 1984a).

Ecotoxicity. Zinc toxicity to aquatic plants ranges from 0.0075 to more than 50 mg/kg depending upon physiochemical characteristics of the organism and physio-chemical factors which influence bioavailability. An increase in calcium or magnesium content tends to reduce toxicity to flora, as does an increase in pH or organic chelators (Moore and Ramamoorthy 1984a).

Zinc is an essential element and is taken up by organisms. For example, Anderson (1977) found higher concentrations of zinc in clam bodies than zinc sediment concentrations, while copper, cadmium and lead concentrations were at or below those found in sediments. Hemelraad et al (1987) documented the protective action of zinc against cadmium absorption in freshwater clams.

Acute toxicity of zinc to freshwater invertebrates is generally low. The 96-hour LC_{50} for *Asellus aquaticus* is 18.2 mg/L (Elder, 1990), although certain species may show more sensitivity. The 48-hour LC_{50} for zinc for fish usually falls within the 0.5 to 5.0 mg/L range, but differences in physio-chemical and biological factors can extend this range orders of magnitude. The acute toxicity of zinc decreases as hardness increases (Moore and Ramamoorthy 1984a). Ninety-six hour LC_{50}s for bluegills exposed to zinc in soft water ranged from 2860 to 3780 µg/L (at 18°C). Whereas bluegill exposed to zinc in hard water (at 18°C) exhibited 96-hour LC_{50}s which ranged from 10,130 to 12,500 µg/L. Zinc toxicity is manifested as gill damage, and temperature significantly influences susceptibility to zinc toxicosis.

Zinc compounds are relatively nontoxic to mammals and domestic animals. For most species of domestic animals, overt toxicosis of zinc first appears when levels of 1000 mg/kg are incorporated into a natural-ingredient diet with many nutrients above required levels (NAS 1980). Swine, turkeys, and chickens performed normally with 1000 mg/kg zinc in nonpurified diets (NAS 1980). Signs of zinc toxicosis may include gastrointestinal distress, emesis, decreased food consumption, decreased growth, anemia, poor bone mineralization, damage to the pancreas, arthritis, white muscle disease, internal hemorrhaging, and nonviable newborn (NAS 1980). Maximum tolerable levels of 300 to 1000 mg/kg zinc in the diet appear to be safe, depending on the species (NAS 1980).

9 Polychlorinated Biphenyls (PCBs)

Toxicological properties of individual PCBs are primarily influenced by their individual Kow values and chlorine substitution. In general, the higher the Kow value and the

greater the number of substituted chlorines in adjacent positions, the greater the environmental concern. The following discussion will focus on Aroclors-1248, -1254, and -1260, since they are the PCBs which were detected in the Intertidal Mudflats, Outfall 008 Drainage, and the Marine Basin. Some information will also be provided on total PCBs since most standards are given for total PCBs, and since chemical information on individual Aroclors are more limited.

Chemistry and Environmental Fate. PCBs are organic compounds commercially produced by the chlorination of biphenyl. They are extremely stable compounds, and degrade very slowly under environmental conditions. The more highly chlorinated PCBs are the most resistant to degradation (Eisler 1986b).

PCBs bind tightly to particulate matter, especially soils and sediments. Levels are usually highest in sediments containing microparticulates, high organic carbon content and/or clays. Aqueous transport of PCBs is in association with suspended particles (Eisler 1986b). Sediments are the primary environmental sink for PCBs (Moore and Ramamoorthy 1984b), and represent a major contamination source.

Volatilization may be a significant fate process for lower chlorinated biphenyls. Evaporation of higher chlorinated PCBs from water is a slower, but still substantial transfer. Because of their hydrophobic nature, PCBs dissolved in water tend to accumulate at the air-water interface, leading to evaporation. Photodegradation may be possible for lower chlorinated biphenyls in the atmosphere (Moore and Ramamoorthy 1984b).

Lower chlorinated biphenyls, such as Aroclor-1221, -1232, and to a lesser degree, -1016 and -1242, show evidence of microbial degradation under certain environmental conditions. Aroclors-1248, -1254, and -1260 appear highly resistant to biodegradation, and thus are much more persistent in environmental media (Moore and Ramamoorthy 1984b).

Residues in Water. PCBs are sparingly soluble in water, with solubility decreasing with higher numbers of chlorine substitution on the biphenyl rings. The aqueous solubility of Aroclor-1248 is 100 µg/L, and that of Aroclor-1260 is 25 µg/L (Moore and Ramamoorthy 1984b). Commonly accepted log P values (= log K_{ow}) for the two Aroclors are 6.11 for Aroclor-1248, and 6.91 for Aroclor-1260 (Knox et al. 1993 and Stephan 1993).

Residues in Sediment. Sediments concentrations in some major lakes and harbors have declined in recent years, although the PCB burden is still high in sediments adjacent to industrial zones. Lake Michigan sediments near Chicago, Milwaukee, and Green Bay have reported sediment residues of 10-20 µg/kg, DW. In the vicinity of waste outfalls, residues may range from 2000 to >500,000 µg/kg. Marine sediments is the Southern California Bight (Los Angeles) generally exceed 1000 µg/kg, and in some areas reach 10,000 µg/kg. Less impacted sediments bear residues usually less than 5 µg/kg (Moore and Ramamoorthy 1984b).

The Housatonic River Mussel Watch Project sampling area had mean total PCB levels of about 104 µg/kg, DW (uncorrected for percent fines) in 1990 (NOAA 1992). 1994 and 1999 surficial sediment samples recorded high levels.

Residues in Plants. PCBs are rapidly sorbed from water by aquatic plants. Concentration factors, though variable, generally fall within a range of 1×10^4 to 5×10^4 (Moore and Ramamoorthy 1984b). Since water concentrations are so low, algae residues seldom exceed 1 mg/kg WW.

Residues in Invertebrates. Uptake of PCBs from marine sediments by benthic invertebrates is governed by processes that include ingestion of contaminated sediment particles, and exchange of PCBs directly from sediment particles. As a result, PCB-laden sediments containing high silt and clay content has more impact on benthic populations than sediments with low silt and clay amounts (Eisler 1986b). The organic carbon content of the sediment and the lipid content of the organism are the two most important factors affecting the partitioning of lipophilic compounds (including PCBs) into biota (Markwell et al. 1989).

PCBs are a significant and widespread contaminant of both marine and freshwater invertebrates. Residues in several species of polychaetes and crabs from an Australian estuary reached 520 µg/kg WW. Benthic species usually carry higher burdens than pelagic species (Moore and Ramamoorthy 1984b). PCB levels of freshwater oligochaetes from the Niagara River (NY) were positively correlated with sediment PCB levels. Uptake of PCBs from sediment by chironomid larvae was also directly related to sediment PCB concentrations. When the larvae metamorphosed to adults, PCB compounds were concentrated into the adult and transferred to the terrestrial environment (Eisler 1986b). Macroinvertebrates in the lower Hudson River (NY) carried PCB body burdens of 1,000-13,000 µg/kg, WW, when the sediments contained 1,000 to 15,000 µg/kg, DW. Fish in the same area had PCB levels of 500 to 15,000 µg/kg, WW. In Lake Ontario, surficial sediments had PCB concentrations of 300-800 µg/kg, DW, while associated oligochaetes and trout had body burdens of 1500-5300 µg/kg and 6300 µg/kg, DW, respectively (Eisler 1986b).

PCB residues in mussel were found to be as high as 3500 µg/kg, DW, at a Mussel Watch locations in California in 1970 (NOAA 1989).

The Housatonic River Mussel Watch Project has sampled blue mussels in the SAEP Site vicinity each year between 1986 and 1992. Total PCBs vary year to year, with no apparent trend. The levels fluctuated between a high of 1100 µg/kg, DW (in 1987) and a low of 440 µg/kg, DW (in 1988), with a mean for all 7 years of about 700 µg/kg (NOAA 1995).

Residues in Fish. Seasonal variation in fish burdens of PCBs can be quite marked: a 3- to 7-fold decrease in fall concentrations compared to spring levels in marine whiting, perch and roach have been observed. The variability stems from an interplay of nutritional, reproductive, and activity cycles. Maximum concentrations in fish are usually associated with fat deposits and liver tissue (Moore and Ramamoorthy 1984b). Food is the most important route of uptake in fish, with marked biomagnification possible. PCB body burden in top predators is due almost entirely to consumption of contaminated prey (Thomann and Connolly 1984).

In addition to the fish burdens mentioned as part of the integrated studies above, other fish tissue levels have been reported to be 10,000 to 130,000 µg/kg, WW in the presence of sediment concentrations from 20,000 to 150,000 µg/kg, DW in the upper Hudson

River. Flounder from Long Island Sound, NY, 1980-1982, had liver concentrations between 900 and 1900 µg/kg, WW (Eisler 1986b).

Ecotoxicity. For total PCBs, the chronic criterion to protect saltwater aquatic life is 0.03 µg/l as a 24-hour average. Eisler (1986b) recommends that the saltwater aquatic life protection criterion should not differ from the freshwater criterion of 0.014 µg/l. The available data indicate that acute toxicity to saltwater aquatic life probably will only occur at concentrations above 10 µg/l and that the 24-hour average chronic criterion should provide adequate protection against acute toxicity (USEPA 1986).

PCBs generally inhibit the growth of aquatic plants at concentrations of 10 to 100 µg/l, but reductions in photosynthesis and carbon uptake in sensitive species may occur at 0.1 to 1.0 µg/l (Moore and Ramamoorthy 1984b). Effects to fauna include mortality, decreased reproductive success, and behavioral modifications (USEPA 1993d).

Based on data summarized by the US Fish and Wildlife Service (USFWS), LC_{50} values for sensitive species of marine invertebrates and fish subjected to various Aroclor mixtures ranged from 0.32 to 12.5 µg/l during exposure periods of 4 to 38 days (Eisler 1986b).

Based on data summarized in Eisler (1986b) LD_{50}s for various species of birds varied from 604 to more than 6000 mg Aroclor/kg diet, and for mallards more than 2000 mg/kg body weight administered orally. The 5-day LD_{50}s for *Colinus virginianus* (northern bobwhite), *Anas platyrhynchos* (mallard) ring-necked pheasant *(Phasianus colchicus* and *Coturnix coturnis japonica* (Japanese quail) were 604, 2699, 1091 and 2898 mg/kg diet, respectively (Eisler 1986b).

PCB accumulations from the diet and from other sources are high, and retention is lengthy in fatty tissues. Interspecies differences in sensitivity to PCBs are large, even between species that are closely related taxonomically (Eisler 1986b). The BCF for the American oyster (*Crassostrea virginica*) where the concentration in the water was 5.0 µg/l was 85,000 (Eisler 1986b).

Residues in brains of starlings, red-winged blackbirds (*Agelaius phoeniceus*), common grackles (*Quiscalus quiscula*), and brown-headed cowbirds (*Molothrus ater*), that died after eating diets containing 1500 mg Aroclor 1254/kg, varied from 349 to 763 mg/kg. Surviving birds, at the 50% mortality point, contained 54 to 301 mg/kg (Eisler 1986b).

10 Polynuclear Aromatic Hydrocarbons (PAHs)

This section will review literature information that is applicable to PAHs as a general class of compounds. Following this section, information specified to each PAH COPC will be discussed.

Chemistry and Environmental Fate. There are thousands of PAH compounds that differ in the number and arrangement of aromatic rings and substituents. The molecular weight of PAHs of environmental concern (those that show mobility in the environment) range from 128 (naphthalene) to 300 (coronene). Higher molecular weight PAHs are generally immobile due to their large molecular volumes and extremely low volatility and solubility (Neff 1985) and hence pose little environmental threat.

PAHs are components of crude and refined petroleum and coal. As much as 75% of the carbon present in bituminous coal may be in aromatic form. Oil spills and combustion of organic materials produce and release PAHs into the environment in exhaust particles and ash which are deposited by the settling of larger particles, and the atmospheric scrubbing of smaller particulates and water-soluble volatiles by precipitation. Long-range transport of airborne particulate PAHs has been demonstrated. Industrial and domestic sewage and storm runoff from asphalt surfaces contribute the PAHs input to the aquatic environment. Many PAHs are very persistent in the environment, and some are known to be potent animal carcinogens (Neff 1985).

PAHs entering water from various sources quickly become adsorbed on organic and inorganic particulate matter and large amounts are deposited in bottom sediments. When incorporated into anoxic sediments, PAHs may persist virtually indefinitely. Leaching or biological activity in the sediments returns a small fraction to the water column, from which PAHs are easily accumulated by aquatic biota. Routes of removal of PAHs from the aquatic environment include volatilization from surface water [mainly low molecular weight (LMW) PAHs], photooxidation by aqueous oxidants (singlet oxygen, ozone, OH radicals, and others) and direct photolysis, microbial metabolism, and metabolism by higher animals (Neff 1985). Abiotic oxidation and oxidative metabolism may yield derivatives, such as quinones and arene oxides, which are carcinogenic and mutagenic (Moore and Ramamoorthy 1984b).

Residues in Water. PAHs are commonly found in natural waters, particularly in industrialized parts of the world. Pristine bodies of water usually have total PAHs concentrations less than 1 µg/L, whereas water impacted by oil wells and other hydrocarbon sources may have levels greater than 50 µg/L. Benzo(a)pyrene (B[a]P) is one of the most common PAHs; and because of its carcinogenicity, it has been assayed in monitoring programs. Levels of B[a]P may range from less than 0.01 µg/L to as high as 3.5 µg/L downstream from an oil field. Concentrations of other PAH in waters, especially the smaller, more water soluble compounds, may exceed those reported for B[a]P (Moore and Ramamoorthy 1984b).

Residues in Sediment. PAH residues in remote lakes demonstrated that PAH levels are much higher in recent deposits than in older, deeper cores, implying atmospheric transport of anthropogenic releases. Remote sediments usually have PAH concentrations in the low ppb (µg/kg) range, whereas industrially impacted sediments may carry burdens over 100 mg/kg (Neff 1985).

Sediment samples collected in 1990 at the Mussel Watch sampling area located at the mouth of the Housatonic River in Long Island Sound near the SAEP Site showed a total PAH level of 5000 µg/kg, DW (not corrected for percent fines) (NOAA 1992).

Residues in Invertebrates. The available evidence is that sediment-adsorbed PAHs have limited bioavailability to marine biota. Studies have shown the uptake from water to be more important than from sediments, and accumulation from sediments may be attributed in large part to uptake of PAHs desorbed from sediment particles into interstitial water (Neff 1985). Sediment residues have been shown to correlate with the presence of PAHs in oligochaetes and insect larvae (Moore and Ramamoorthy 1984b).

Bivalve molluscs tend to accumulate high PAH levels in general due to their inability to metabolize and excrete them. The BCF for the oyster *Crassostrea virginica* was 242 after 14 days (Eisler 1987b).

Total PAHs in softshell clam (*Mya arenaria*), a species known to occur in the SAEP Site vicinity, from contaminated areas in an Oregon bay showed levels of total PAHs of 555 µg/kg, WW, in contrast to clams from an uncontaminated control, which had levels of 76 µg/kg WW. Blue mussels sampled near industrialized areas in Oregon had levels up to 1000 µg/kg, WW, in contrast to the same bivalve from remote locations, which contained up to 275 µg/kg, WW (Eisler 1987b). An integrated study of 9 PAH compounds in sediment and oyster collected from a Japanese harbor showed that the sum of the totaled means [∑(9 PAH mean values)] was 51.5 µg/kg, WW in the oysters. The sediments associated with those oysters had a sum [∑(9 PAH mean values)] of 1867 µg/kg, WW (Moore and Ramamoorthy 1984b).

Mussel tissues from the Housatonic River Mussel Watch Project sampling area near the SAEP Site have been analyzed for PAH compounds each year between 1986 and 1992. Total PAHs vary year to year, with no apparent overall trend. The levels fluctuated between a high of 1210 µg/kg, DW (in 1988) and a low of 283 µg/kg, DW (in 1986), with a mean for all 7 years of about 717 µg/kg. The 1992 mean for total PAHs was 789 µg/kg (NOAA 1995).

Residues in Fish. Although many PAHs have been found in both marine and freshwater fish, residues are generally low except at localized-specific discharge points. Based on experimental data, half-lives of parent PAH compounds may be short, only 1-2 days, but metabolites may have longer half-lives (Moore and Ramamoorthy 1984b). Brown bullhead from a contaminated area of the Ohio River had body burdens of total PAH of 660 µg/kg, WW in the presence of sediment concentrations of 6700 µg/kg, DW (Eisler 1987b). PAHs are not considered to be bioaccumulative chemicals of concern by EPA (USEPA 1995).

Ecotoxicity. Toxicity to aquatic plants is highly variable, and depends on species, compound, and environmental conditions. Fluoranthene is one of the least toxic PAHs to plants, whereas 1-chloro-naphthalene is one of the more toxic. Exposure of algae to toxic PAH concentrations causes effects that include a rapid loss of chlorophyll and decreased cellular manganese and potassium (Moore and Ramamoorthy 1984b).

Several PAHs appear virtually nontoxic to invertebrates. Others are more toxic. Symptoms of sublethal/chronic intoxication include reduced growth and molting rate, impaired osmoregulation, decreased fertility, locomotion impairment and disordered behavior (Moore and Ramamoorthy 1984b).

Most PAHs probably do not represent an acute threat to fish, except at very high concentrations which approach water solubility limits. However, exposure to chronic levels has been implicated in a reduction in growth and fecundity and behavioral abnormalities. Since many PAHs or their metabolites are mutagens or teratogens, developmental abnormalities have been reported for fish. These include liver tumors, gill hyperplasia, kidney lesions, scoliosis, and twinning. Immature stages are more sensitive than adult fish. Osmotic stress may cause fish to be more sensitive in seawater than in freshwater (Moore and Ramamoorthy 1984b). The prevalence of liver lesions and

neoplasms in benthic species are positively correlated with the levels of PAHs in sediment (Varanasi 1989).

The following paragraphs present existing information on specific PAH compounds. Note that for certain PAH compounds, existing toxicity information is limited at best.

Acenaphthylene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for acenaphthylene. No toxicity values for acenaphthylene are reported in Eisler (1987b).

Anthracene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for anthracene. The half-life of anthracene in the tissues of the oyster *Crassostrea virginica* is approximately 3 days (Connell & Miller 1984).

Benz(a)anthracene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for B[a]A. The 6 month LC_{87} for bluegill (*Lepomis macrochirus*) is 1,000 µg/L.

Benzo(a)pyrene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for B[a]P. Both *Mercenaria mercenaria* (hard clam) and *Crassostrea virginica* (oyster) possess a mixed function oxygenase system (MFO) which metabolizes B[a]P. In the process, B[a]P is converted to various mutagenic epoxides and carcinogenic diols (Anderson and Angel 1986). The time of exposure played a significant role in the uptake and excretion of B[a]P, and the appearance of B[a]P monooxygenase activity was related to developmental stage in laboratory experiments conducted on freshwater fish embryos (Stahl and Kocan 1986).

Callinectes sapidus (blue crab) has been shown to possess a MFO system which effectively metabolizes B[a]P in the stomach and hepatopancreas. In these experiments, B[a]P was taken up from both food and water (Lee 1986).

The 96-hour LC_{50} for *Neanthes arenceodentata*, a marine sandworm, was greater than 1000 µg/l (Eisler 1987b).

NOAEL. This is based on mouse studies which found a NOAEL of 1,000 µg/kg/day. Toxicological benchmarks for wildlife based on this NOAEL range from dietary levels of 1,499 µg/kg for the cottontail rabbit, to 7,755 µg/kg for the meadow vole.

Chrysene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for chrysene. The 96-hour LC_{50} for *Neanthes arenceodentata*, a marine sandworm was greater than 1000 µg/l (Eisler 1987b).

Dibenz(a.h)anthracene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for dibenz(a,h)anthracene. No toxicity values for dibenz(a,h)anthracene are reported in Eisler (1987b).

Fluorene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for fluorene. The 96-hour LC_{50} for *Neanthes arenceodentata*, a marine sandworm was greater than 1000 µg/l). The 96-hour LC_{50} for *Cyprinodon variegatus*, the sheepshead minnow was 1680 µg/L. The 30-day LC_{12} for bluegill (*Lepomis macrochirus*) was 500 µg/L (Eisler 1987b).

2-Methylnaphthalene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for 2-methylnaphthalene. No toxicity values for 2-methylnaphthalene are reported in Eisler (1987b).

Naphthalene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for naphthalene. No toxicity values for naphthalene are reported in Eisler (1987b).

Pyrene

Ecotoxicity. There are no acute or chronic water quality criteria (USEPA 1992b) for pyrene. No toxicity values for pyrene are reported in Eisler (1987b).

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