
TABLES

Table 1-1. Listing of Soil and Groundwater UCL Exceedances

Sample Identifier	Sampling Date	COC	Environmental Medium	Measured Concentration	Units	UCL	
Upper Northern Area							
NSR01	7/31/00	Antimony	Soil	459	mg/Kg	300	
Central Commercial Area							
CL213 ¹	8/2/00	Lead	Soil	5960	mg/Kg	3,000	
Marsh Upland Area							
SDP11	10/16/00	Mercury	Soil	330	mg/Kg	300	
DPAL1412	7/22/97	Mercury	Soil	1170	mg/Kg	300	
DPWL4	7/22/97	Mercury	Soil	314	mg/Kg	300	
SDP0246	8/21/00	Mercury	Soil	3120	mg/Kg	300	
SDP0501	8/23/00	Mercury	Soil	319	mg/Kg	300	
DPMW1	12/7/01	Mercury	Groundwater	0.766	mg/L	0.2	
	8/25/00			0.359	mg/L	0.2	
	12/8/98			42.6	mg/L	0.2	
Southern Disposal Area							
SA-SS8 (1.5-2)	12/4/01	Lead	Soil	5030	mg/Kg	3,000	
SWBP11153	8/1/00	Lead	Soil	5970	mg/Kg	3,000	
SWBP11015	8/1/00	Lead	Soil	4690	mg/Kg	3,000	
SWBP05015	8/1/00	Lead	Soil	15200	mg/Kg	3,000	
PZ-24	12/11/01	Lead	Groundwater	1.09	mg/L	0.15	
	8/25/00			2.58	mg/L	0.15	
	12/8/98			5.95	mg/L	0.15	
	12/11/01			Nickel ²	2.31	mg/L	2
	8/25/00				16.1	mg/L	2
Cold Waste Area							
SCWD01015 ³	7/26/00	Antimony	Soil	1880	mg/Kg	300	
		Barium		28200	mg/Kg	10,000	
		Zinc		10900	mg/Kg	10,000	
SCWD01153	7/26/00	Barium	Soil	27700	mg/Kg	10,000	
		Lead		3070	mg/Kg	3,000	
		Antimony		1870	mg/Kg	300	

¹ The area around sample location CL213 has been redeveloped by others; therefore, the identified UCL exceedance will not be addressed in this RAP.

² The nickel groundwater UCL exceedances have been attributed to the stainless steel well casings and will not be addressed in this RAP.

³ Cold Waste Area samples SCWD01015 and SCWD01153 are co-located.

Notes:

mg/Kg – milligram per kilogram

mg/L – milligram per liter

Table 1-2. Summary of Phase II CSA Risk Characterization

Human Health				Environmental		
	Receptor Potentially at Risk	Exposure Medium	Constituents Posing Potential Risk	Receptor/Community Potentially at Risk	Exposure Medium	Constituents Posing Potential Risk
Terrestrial						
Upper North Area	No Significant Risks			Soil Invertebrates, Terrestrial Plants, and Microbial Communities	Surface Soils	Cu, Hg, Ni, Zn
Lower North Area	No Significant Risks			No Significant Risks		
100 Year Flood Area	No Significant Risks			Insectivorous Birds – American Woodcock	Surface Soils	Pb, Se
Potential Greenway Area	No Significant Risks			Insectivorous Birds – American Woodcock	Surface Soils	Hg
				Insectivorous Small Mammals – Short-tailed Shrew	Soil Invertebrates, Surface Soils	Th
Central Commercial Area	No Significant Risks			No Significant Risks		
Southern Conservation Commission Area	No Significant Risks			Insectivorous Birds – American Woodcock	Surface Soils	Ba, Hg, Pb, di-n-octylphthalate
				Soil Invertebrates, Terrestrial Plants and Microbial Communities	Surface Soils	Cu, Hg, Ni, Zn
Southern Disposal Area	Construction Worker, Utility Worker	Soil (0-6 ft bgs)	Cr, Pb, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, TCE	Insectivorous Birds – American Woodcock	Surface Soils	As, Ba, Cr, Cu, Hg, Pb, Se, Zn
	Adult Recreational User, Child Recreational User	Surface Soil (0-3 ft bgs)	1,1-DCE	Carnivorous Bird ¹ – Red-tailed Hawk	Surface Soils	Ba, Cr, Pb, Zn
				Insectivorous Small Mammals – Short-tailed Shrew	Soil Invertebrates, Surface Soils	Cu, Sb, Zn
				Soil Invertebrates, Terrestrial Plants and Microbial Communities	Surface Soils	Cu, Hg, Ni, Zn

Table 1-2. Summary of Phase II CSA Risk Characterization

Human Health				Environmental		
	Receptor Potentially at Risk	Exposure Medium	Constituents Posing Potential Risk	Receptor/Community Potentially at Risk	Exposure Medium	Constituents Posing Potential Risk
Cold Waste Area	Child Recreational User	Surface Soil (0-3 ft bgs)	Sb, Ba, Pb	Insectivorous Birds – American Woodcock	Surface Soils	As, Ba, Co, Cu, Hg, Pb, Se
				Insectivorous Small Mammals – Short-tailed Shrew	Soil Invertebrates, Surface Soils	As, Ba, Co, Cu, Sb, Zn, Th, hexachlorobenzene
Marsh Upland Area	Construction Worker	Soil (0-6 ft bgs)	Hg	Insectivorous Birds – American Woodcock	Surface Soils	Hg, Pb
				Carnivorous Bird ¹ – Red-tailed Hawk	Surface Soils	Ba, Cr, Pb, Zn
				Soil Invertebrates, Terrestrial Plants and Microbial Communities	Surface Soils	Cu, Hg, Ni, Zn
Aquatic						
Upper Drinkwater River Corridor	No Significant Risks			No Significant Risks		
Eastern Channel Corridor	Trespasser	Sediment	Hg, B(a)P	Freshwater Benthic Macroinvertebrates	Sediment	Hg, MeHg
	Fisherman	Sediment	Hg, B(a)P, D(a,h)A	Warm Water Freshwater Fish	Biota	MeHg
	Fisherman	Fish Tissue	Hg, MeHg	Piscivorous Birds – Belted Kingfisher	Biota	MeHg
				Omnivorous Waterfowl – Mallard	Sediment, Biota	Hg
				Herbivorous Waterfowl – Mute Swan	Sediment	MeHg
				Piscivorous Mammal – Mink	Biota	MeHg
				Omnivorous Mammal – Raccoon	Sediment, Aquatic Biota	Sb, Hg
			Herbivorous Mammal – Muskrat	Aquatic plants, sediment	Sb, Pb, MeHg	
Lower Drinkwater River Corridor	Fisherman	Sediment	B(a)P, Vinyl chloride	Freshwater Benthic Macroinvertebrates	Sediment	Hg, MeHg
	Fisherman	Fish Tissue	Hg, MeHg	Piscivorous Birds – Belted Kingfisher	Biota	MeHg
				Omnivorous Waterfowl – Mallard	Sediment, Biota	Hg

Table 1-2. Summary of Phase II CSA Risk Characterization

Human Health				Environmental		
	Receptor Potentially at Risk	Exposure Medium	Constituents Posing Potential Risk	Receptor/Community Potentially at Risk	Exposure Medium	Constituents Posing Potential Risk
				Piscivorous Mammal – Mink	Biota	MeHg
				Herbivorous Mammal – Muskrat	Aquatic plants, sediment	Sb, Pb, MeHg
				Herbivorous Waterfowl – Mute Swan	Sediment	MeHg
				Reptile Communities – Snapping Turtles	Sediment	Hg
Lily Pond/Upper Factory Pond Area	Fisherman	Sediment	B(a)P	Piscivorous Birds – Belted Kingfisher	Biota	MeHg
	Fisherman	Fish Tissue	Hg, MeHg	Herbivorous Waterfowl – Mute Swan	Sediment	MeHg
				Piscivorous Mammal – Mink	Biota	MeHg
				Herbivorous Mammal – Muskrat	Aquatic plants, sediment	Sb, Pb, MeHg
				Reptile Communities – Snapping Turtles	Sediment	Hg
Middle/Lower Factory Pond Area	Fisherman	Fish Tissue	Hg, MeHg	Piscivorous Birds – Belted Kingfisher	Biota	MeHg
				Herbivorous Waterfowl – Mute Swan	Sediment	MeHg
				Piscivorous Mammal – Mink	Biota	MeHg
				Herbivorous Mammal – Muskrat	Aquatic plants, sediment	Sb, Pb, MeHg
				Reptile Communities – Snapping Turtles	Sediment	Hg

Table 1-2. Summary of Phase II CSA Risk Characterization

Human Health				Environmental		
	Receptor Potentially at Risk	Exposure Medium	Constituents Posing Potential Risk	Receptor/Community Potentially at Risk	Exposure Medium	Constituents Posing Potential Risk
Marsh Upland Area	No Significant Risks			Freshwater Benthic Macroinvertebrates	Sediment	Hg, MeHg
				Omnivorous Waterfowl – Mallard	Sediment, Biota	Hg
				Herbivorous Mammal – Muskrat	Aquatic plants, sediment	Sb, Pb, MeHg
				Herbivorous Waterfowl – Mute Swan	Sediment	Hg, MeHg, Pb

- Notes:
- Based on the Site-wide evaluation this receptor will not be evaluated as part of this Phase III Report. No risk of significant harm to carnivorous birds was determined based upon the comparability of Site-wide exposures to background dosages.
- 1,1-DCE – 1,1-dichloroethene
 - As – arsenic
 - B(a)p – benzo(a)pyrene
 - Ba – barium
 - cis-1,2-DCE – cis-1,2-dichloroethene
 - Co – cobalt
 - Cr – chromium
 - Cu – copper
 - D(a,h)a – Dibenz(a,h)anthracene
 - Hg – mercury
 - MeHg – methyl mercury
 - Ni – nickel
 - Pb – lead
 - Sb – antimony
 - Se – selenium
 - TCE – trichloroethene
 - Th – thallium
 - trans-1,2-DCE – trans-1,2-dichloroethene
 - Zn – zinc

**TABLE 4-1
SITE-SPECIFIC SOIL PRGs AND BENCHMARK VALUES FOR COMPARISON
FIREWORKS SITE**

Chemicals of Potential Concern	Soil PRGs			MCP Method 1 Standard ³				MassDEP Published Background Concentration ⁴	
	Human Health		Environmental						
	Recreational Land Use PRG ^{1,2}	Commercial/Industrial Land Use PRG (Construction Worker and Utility Worker) ^{1,2}							
	0-3' BGS (mg/kg)	0-6' BGS (mg/kg)	Surface Soil (mg/kg)	S-2/GW-2 (mg/kg)	S-2/GW-3 (mg/kg)	S-3/GW-2 (mg/kg)	S-3/GW-3 (mg/kg)	Natural Soil (mg/kg)	Fill Material (mg/kg)
1,1-Dichloroethene	0.011 [No Value]	0.005 [No Value]	--	40	1,000	40	3,000	--	--
Benzene	--	0.18 [6,000]	--	200	200	700	900	--	--
Di-n-octylphthalate	--	--	0.5 LOAEL	--	--	--	--	--	--
Hexachlorobenzene	--	--	0.1 LOAEL	5	5	30	30	--	--
Trichloroethene	4.3 [650]	1.6 [5,000]	--	2	700	2	2,000	--	--
Vinyl Chloride	0.30 [3.6]	0.11 [30]	--	0.7	4	0.7	30	--	--
Antimony	--	--	2.2 LOAEL	30	30	30	30	1	7
Arsenic	20	20.0	5.2 LOAEL	20	20	20	20	20	20
Barium	--	--	717 LOAEL	3,000	3,000	5,000	5,000	50	50
Cadmium	--	15.8 [No Value]	--	30	30	30	30	2	3
Chromium (total)	30	30.0	0.4 NOEC	200	200	200	200	30	40
Copper	--	--	88 LOAEL	--	--	--	--	40	200
Lead	586 [590]	800	189 LOAEL	300	300	300	300	100	600
Mercury	--	10.5 [11.5]	0.1 NOEC	30	30	30	30	0.3	1
Selenium	--	--	5 LOAEL	800	800	800	800	0.5	1
Thallium	--	--	0.2 LOAEL	60	60	80	80	0.6	5
Zinc	--	--	130 LOAEL	3,000	3,000	5,000	5,000	100	300

Notes:

NA - Not Applicable

-- = No Value

BGS = Below Ground Surface

LOAEL = Lowest Observable Adverse Effect Level

NOEC = No Observable Effects Concentration

RBC = Risk Based Concentration

¹ Site-specific soil PRG is the maximum of the most stringent RBC, background, PQL, and policy criteria.

² Bracketed "[]" value indicates PRG based on RBC excluding the inhalation pathway

³ MassDEP, 2006. Massachusetts Contingency Plan, 310 CMR 40.0000. Effective April 3, 2006.

⁴ MassDEP, 2002. Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil. Technical Update. May.

**TABLE 4-2
SITE-SPECIFIC SEDIMENT PRGs AND BENCHMARK VALUES FOR COMPARISON
FIREWORKS SITE**

Chemicals of Potential Concern	Sediment PRGs		Site-Specific Background Concentration ⁸		MassDEP Freshwater Screening Benchmark ⁹
	Human Health ¹	Environmental ²	Mean (mg/kg)	Maximum (mg/kg)	
	(Accessible Surficial Sediment) (mg/kg)	(Dry Wt.) (mg/kg)			(mg/kg)
1,1-Dichloroethene	--	0.4 NOEC ³	NA	NA	--
Benzo(a)anthracene	0.67	--	0.54	1.7	110
Benzo(a)pyrene	0.65	--	0.65	1.8	150
Benzo(b)fluoranthene	0.73	--	0.73	2.1	--
Benzo(k)fluoranthene	6.7	--	0.71	1.8	--
Dibenzo(a,h)anthracene	0.34	--	0.18	0.58	33
Indeno(1,2,3-cd)pyrene	0.67	--	0.45	1.43	--
Trichloroethene	20.0	20.000	NA	NA	--
Vinyl Chloride	0.39	--	NA	NA	--
Antimony	48	9 LOAEL ⁴	0.79	1.7	--
Arsenic	30.0	30.000	4.0	9.2	33
Beryllium	0.68	--	0.68	1.8	--
Lead	77	740 LOAEL ⁵	66	204	130
Mercury	22.2	27 LOAEL ⁶	0.16	0.62	0.18
Methyl Mercury	--	0.0011 LOAEL ⁷	0.00064	0.0022	--
Selenium	--	3.5 LOAEL ⁴	0.9	2.2	--
Thallium	--	0.5 LOAEL ⁴	1.03	4.1	--
Zinc	--	337 NOEC ³	135	440	460

Notes:

NA = Not Applicable J = Estimated Value -- = No Value

¹ Site-specific sediment PRC is the maximum of the most stringent RBC, background, PQL, and policy criteria.

² Unless otherwise noted, the sediment PRG listed is the lowest corresponding PRG for all of the assessment endpoints.

³ The sediment PRG listed is the No Effect Concentration (NOEC) for benthic communities.

² Bracketed "[]" value indicates PRG based on RBC excluding the inhalation pathway

⁵ The sediment PRG listed is the LOAEL for Herbivorous Waterfowl/

⁶ The PRG listed for mercury (27mg/kg) is the LOAEL for Herbivorous Waterfowl and is the lowest corresponding PRG for all of the assessment endpoints above background [i.e., excluding the Piscivorous Birds and Piscivorous Mammals].

⁷ The PRG listed for methylmercury (0.0011mg/kg) is the LOAEL for Omnivorous Mammals and is the lowest corresponding PRG for all of the assessment endpoint above background [i.e., excluding the Piscivorous Birds and Piscivorous Mammals].

⁸ Data from surface sediment (0-0.5ft) collected from both the river and pond background locations were pooled to represent the site-specific background concentrations.

⁹ MassDEP, 2006. Revised Sediment Screening Benchmarks. Technical Update. January.

Table 5-1. Fireworks Site Soil – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained	Comments
No Action	None	Also known as natural attenuation, this action relies on the natural processes existing at most sites to retard the migration of the contaminants. Although metal concentrations will not decrease with time, the mobility and toxicity of metals can decrease as the site conditions mature. These processes may assist in reducing the risk at the Site, but would not eliminate the potential for direct contact with the metals in the soil at the Site.	No	NA	Yes	This GRA is retained as a baseline for comparative purposes.
Monitored Natural Attenuation	Natural Physical Recovery Processes and Periodic Monitoring	Contaminated soil would be left in place. Natural attenuation relies on the fact that physical, chemical, and biological processes may continue over time to isolate, weather, and degrade COCs in the soil. A comprehensive long term monitoring plan would be developed and implemented. Monitoring would include soil sampling to evaluate changes in COC concentrations with time.	Yes – temporary solution when used in conjunction with other GRAs such as Non-Engineering measures	Yes	Yes	This GRA has been retained to be combined with other GRAs to assemble alternative(s) that are likely to achieve a temporary solution.
Non-Engineering Measures	Activity and Use Limitations (AULs)	AULs specify activities and uses that are prohibited and allowed at the Site in the future. AULs are registered on property deeds and include a Grant of Environmental Restriction and a Notice of Activity and Use Limitation.	Yes – temporary solution	Yes	Yes	This GRA has been retained to be combined with other remedial technologies and/or GRAs to assemble alternative(s) that are likely to achieve a temporary solution.
	Fencing	Fencing would be installed and maintained to minimize access to portions of the Site where soil COC concentrations exceed the MCP UCLs for soil.	Yes – temporary solution	Yes	Yes	
	Warning Signs	Properties would have posted signs.	Yes – temporary solution	Yes	Yes	
	Educational Programs	Community information and education programs would be undertaken to enhance awareness of potential hazards.	Yes – temporary solution	Yes	Yes	
Capping	Capping with Long-Term Maintenance and Monitoring	Capping consists of placement of an above-grade engineered cap over targeted areas to limit the potential of human and ecological receptors contact with contaminated soil. Cap material may consist of asphalt, concrete, synthetics, clay, sand, gravel, or a combination of these materials. Capping can reduce the amount of water that infiltrates into the soil and thus reduces the amount of water that might potentially leach metals from the soil. The cap would be monitored regularly to ensure its integrity and maintenance would be performed as necessary.	Yes – permanent solution	Yes	Yes	This remedial technology has been retained to be combined with non-Engineering measures such as AULs, warning signs and possibly fencing to assemble a remedial alternative that is likely to achieve a permanent solution.
Removal	Excavation	This process is the physical removal of contaminated soil using traditional mechanical methods. This option would also involve removal and treatment of the groundwater (if present in the excavation) and backfill of excavation with clean material.	Yes – permanent solution	Yes	Yes	This GRA has been retained to be used in conjunction with transportation and disposal actions.
Ex Situ Physical/ Chemical Treatment	Solidification/ Stabilization	Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization). The target contaminant group for ex situ S/S is inorganics. On-site ex situ S/S could be employed if excavated soil does not pass the Paint-Filter Liquids Test (40 CFR 264.314). Off-Site ex situ S/S could be employed to treat excavated soil to meet the Land Disposal Restriction Standards (40 CFR Part 268).	Yes – could be part of a permanent solution	Yes	Yes	This GRA has been retained to be used in conjunction with removal, transportation and disposal actions.

Table 5-1. Fireworks Site Soil – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained	Comments
Pretreatment of Water from Dewatering of Excavation Area	Filtration	Filtration is the physical process of mechanical separation based on particle size whereby particles suspended in a fluid are separated by forcing the fluid through a porous medium. As fluid passes through the medium, the suspended particles are trapped on the surface of the medium and/or within the body of the medium. Assuming that the metals are bound up in soil and will be filtered out.	Yes	Yes	Yes	This technology has been retained to be used in conjunction with removal, transportation and disposal actions.
Transportation	Truck Transport (soil)	Transport excavated soil by truck to treatment/disposal facility in conjunction with removal and disposal actions.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and disposal actions
	Rail Transport	Transport excavated soil by rail to treatment/disposal facility in conjunction with removal and disposal actions.	Yes – could be part of a permanent solution	Yes	Yes ¹	This technology has been retained to be used in conjunction with removal and disposal actions
	Truck Transport (water)	Transport pretreated water from excavation area dewatering by truck to local POTW for final treatment in conjunction with removal, pretreatment and disposal actions.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal, pretreatment and disposal actions.
Disposal	On-Site Disposal at a Newly Constructed, Permitted Disposal Facility	Non-RCRA soil will be disposed of at an on-site, permitted disposal facility.	Yes – could be part of a permanent solution	Yes	Yes ²	This technology has been retained to be used in conjunction with removal and transportation actions
	Off-Site Disposal at a Permitted Disposal Facility	Non-RCRA soil will be disposed of at an off-site, permitted disposal facility.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and transportation actions
	Off-Site Disposal at a Hazardous Waste Landfill	RCRA soil (if any) will be disposed off at an off-site, permitted hazardous waste disposal facility	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and transportation actions
	Off-Site Disposal of Groundwater at a Permitted POTW	Pretreated (filtered) water from excavation area dewatering will be transferred to local POTW for final treatment	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and transportation actions.

¹ Though the rail transport technology/process option was retained, truck transport of excavated soil has been selected as the representative process option within the transportation category to be carried forward into the alternative development process.

² Though the on-site disposal at a permitted disposal facility technology/process option was retained, off-site disposal of excavated soil at a solid waste landfill or at a hazardous waste landfill has been selected as the representative process options within the disposal category to be carried forward into the alternative development process. Excavated soil is assumed to be non-TSCA waste. Some excavated soil may be RCRA waste based on COC concentrations.

Table 5-2. Assembled Soil Alternatives for Upper North Area

Alternative	Remedial Technologies/ Process Options	Affected Area	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Monitoring	Long-Term Maintenance	Excavation/ Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste Landfill
UNA-1	No Action	All Soils	-	2,017,749	-	•											
UNA-2	Limited Action - Monitored Natural Attenuation & Non-Engineering measures	Area with UCL Exceedance (Area Around Sample NSR- 01)	NSR 01	3827	-	•	•					•					
UNA-3A	Excavation/Backfill, Transport and Off- Site Disposal of Contaminated Soil in Area with Soil UCL Exceedance	Area with UCL Exceedance (Area Around Sample NSR- 01)	NSR 01	3827	142									•		•	•
UNA-3B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil in Area with Soil UCL Exceedance	Area with UCL Exceedance (Area Around Sample NSR- 01)	NSR 01	3827	142									•	•	•	•

Note:
No human health or ecological risks are identified in this Risk Characterization Area.

Table 5-3. Assembled Soil Alternatives for Potential Greenway Area

Alternative	Remedial Technologies/ Process Options	Affected Area	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Monitoring	Long-Term Maintenance	Excavation/ Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste Landfill
PGA-1	No Action	All Soils	-	378,362	-	•											
PGA-2	Limited Action - Monitored Natural Attenuation	Surface Soil Eco PRG Exceedances for Mercury and Thallium	A307AL6 NSR18 PGA01 PGA02 PGA03 PGA04 PGA05 PGA07 PGA08	286,215	-	•						•					
PGA-3A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil in Areas with Surface Soil PRG Exceedances for Eco Receptors	Surface Soil Eco PRG Exceedances for Mercury	NSR18 PGA01 PGA02 PGA03 PGA08	120,701	4,470									•		•	•
	Monitored Natural Attenuation	Surface Soil Eco PRG Exceedances for Thallium not Co- located with Surface Soil Eco PRG Exceedances for Mercury	A307AL6 PGA04 PGA05 PGA07	165,514	-	•						•					
PGA-3B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil in Areas with Surface Soil PRG Exceedances	See PGA-3A Above	See PGA- 3A Above	120,701	4,470									•	•	•	•
	Monitored Natural Attenuation		See PGA- 3A Above	165,514	-	•						•					
PGA-3C	Engineered Cap with Long-Term Monitoring and Maintenance in Areas with Surface Soil PRG Exceedances	See PGA-3A Above	See PGA- 3A Above	120,701	-						•	•	•				
	Monitored Natural Attenuation		See PGA- 3A Above	165,514	-	•						•					
PGA-4A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil in Areas with Surface Soil PRG Exceedances for Eco Receptors	Soil with Surface Soil Eco PRG Exceedances for Mercury and Thallium	A307AL6 NSR18 PGA01 PGA02 PGA03 PGA04 PGA05 PGA07 PGA08	286,215	10,601									•		•	•

Table 5-3. Assembled Soil Alternatives for Potential Greenway Area

Alternative	Remedial Technologies/ Process Options	Affected Area	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Monitoring	Long-Term Maintenance	Excavation/ Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste Landfill
PGA-4B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil in Areas with Surface Soil PRG Exceedances for Eco Receptors	See PGA-4A Above	See PGA-4A Above	286,215	10,601									•	•	•	•
PGA-4C	Engineered Cap with Long-Term Monitoring and Maintenance in Areas with Surface Soil PRG Exceedances for Eco Receptors	See PGA-4A Above	See PGA-4A Above	286,215	-						•	•	•				

Note:
No UCL exceedances or HH risks are identified in this Risk Characterization Area.

Table 5-4. Assembled Soil Alternatives for Southern Disposal Area

Alternative	Remedial Technologies/ Process Options	Affected Area or Volume	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Maintenance	Excavation/ Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste and/or RCRA Landfill
SDA-1	No Action	All Soils	-	97,647	-	•										
SDA-2	Limited Action - Monitored Natural Attenuation & Non-Engineering measures	All Soils with UCL Exceedances or HH or Eco PRG Exceedances	SA-SS8 SWBP11 SWBP05 SA-SS2 SA-SS3 SA-SS9 SA-SS10 SFPDA02 SWBP08 SWBP09 SWBP17 WBAL12 WBBL9	7,695	-	•	•	•	•	•						
SDA-3A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil in Areas with UCL exceedances	All Soils with UCL Exceedances	SA-SS8 SWBP11 SWBP05 WBAL12 WBBL9	7,695	855								•		•	•
	Monitored Natural Attenuation & Non-Engineering measures	All Soils with HH or Eco PRG Exceedances Outside Areas with UCL Exceedances	SA-SS2 SA-SS3 SA-SS9 SA-SS10 SFPDA02 SWBP08 SWBP09 SWBP17	50,954	-	•	•	•	•	•						
SDA-3B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil in areas with UCL exceedances	See SDA-3A Above	See SDA-3A Above	7,695	855								•	•	•	•
	Monitored Natural Attenuation & Non-Engineering measures		See SDA-3A Above	50,954	-	•	•	•	•	•						

Table 5-4. Assembled Soil Alternatives for Southern Disposal Area

Alternative	Remedial Technologies/ Process Options	Affected Area or Volume	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Maintenance	Excavation/ Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste and/or RCRA Landfill
SDA-4A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil to Address UCL Exceedances and Highest Human Health Risks	All Soils with UCL Exceedances and Areas with 1,1 DCE PRG exceedances	SA-SS2 SA-SS3 SA-SS8 SA-SS9 SA-SS10 SFPDA02 SWBP05 SWBP08 SWBP09 SWBP11 WBAL12 WBBL9	51,884	4,472								•		•	•
	Monitored Natural Attenuation	All Soils with HH or Eco PRG Exceedances Outside Areas with UCL Exceedances and Areas with 1,1-DCE PRG Exceedances	SWBP17	6,766	-	•										
SDA-4B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil to Address UCL Exceedances and Highest Human Health Risks	See SDA-4A Above	See SDA-4A Above	51,884	4,472								•	•	•	•
	Monitored Natural Attenuation		See SDA-4A Above	6,766	-	•										
SDA-4C	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil to Address UCL Exceedances	All Soils with UCL Exceedances	SA-SS8 SWBP11 SWBP05 WBAL12 WBBL9	7,695	855								•		•	•
	Engineered Cap with Long-Term Monitoring and Maintenance & Non-Engineering measures to Address UCL Exceedances and Highest Human Health Risks	Areas with 1,1 DCE PRG Exceedances Outside Areas with UCL Exceedances	SA-SS2 SA-SS3 SA-SS9 SA-SS10 SFPDA02 SWBP08 SWBP09	41,188	-		•	•	•	•	•	•				
	Monitored Natural Attenuation	All Soils with HH or Eco PRG Exceedances Outside Areas with UCL Exceedances and Areas with 1,1-DCE PRG Exceedances	SWBP17	6,766	-	•										

Table 5-4. Assembled Soil Alternatives for Southern Disposal Area

Alternative	Remedial Technologies/ Process Options	Affected Area or Volume	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Maintenance	Excavation/ Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste and/or RCRA Landfill
SDA-5A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil to Address UCL Exceedances and HH and Eco PRG Exceedances	All Soils with UCL Exceedances and HH and Eco PRG Exceedances	SA-SS8 SWBP11 SWBP05 SA-SS2 SA-SS3 SA-SS9 SA-SS10 SFPDA02 SWBP08 SWBP09 SWBP17 WBAL12 WBBL9	23,911	1,364								•		•	•
SDA-5B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil to Address UCL Exceedances and HH and Eco PRG Exceedances	See SDA-5A Above	See SDA-5A Above	23,911	1,364								•	•	•	•
SDA-5C	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil to Address UCL Exceedances	All Soils with UCL Exceedances	SA-SS8 SWBP11 SWBP05 WBAL12 WBBL9	7,695	855								•		•	•
	Engineered Cap with Long-Term Monitoring and Maintenance & Non-Engineering measures to Address HH and Eco PRG Exceedances Not Co-located with UCL Exceedances	All Soils with HH or Eco PRG Exceedances Outside Areas with UCL Exceedances	SA-SS2 SA-SS3 SA-SS9 SA-SS10 SFPDA02 SWBP08 SWBP09 SWBP17	50,954	-		•	•	•	•	•	•				

Table 5-5. Assembled Soil Alternatives for Southern Conservation Commission Area

Alternative	Remedial Technologies/ Process Options	Affected Area or Volume	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Monitoring	Long-Term Maintenance	Excavation/Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste Landfill
SCCA-1	No Action	All Soils	-	1,092,263	-	•											
SCCA-2	Limited Action - Monitored Natural Attenuation	All Soils with Identified Risks to Eco Receptors (All Soils with Surface Soil Eco PRG Exceedances for Mercury, Chromium, Zinc, Copper, Barium, and Antimony).	SCCA01 SCCA02 SCCA03 SCCA04 SCCA05 SCCA06 SCCA07 SCCA08 SCCA09 SCCA10 SCCA11 SCCA12 SCCA13 SCCA14 SCCA15 SFPDA13 SFPDA16 STRA006 STRA012 STRA013 STRA015 STS01	940,875	-	•						•					

Table 5-5. Assembled Soil Alternatives for Southern Conservation Commission Area

Alternative	Remedial Technologies/ Process Options	Affected Area or Volume	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Monitoring	Long-Term Maintenance	Excavation/Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste Landfill
SCCA-3A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil in Areas with Surface Soils with THg Concentrations > or = 1 mg/kg	All Soils with Surface Soil with THg Concentrations > or = 1 mg/kg	SCCA07 SCCA14 SFPDA16 STRA013	116,310	4,308									•		•	•
	Monitored Natural Attenuation	All Soils with Identified Risks to Eco Receptors (All Soils with Surface Soil Eco PRG Exceedances for Mercury, Chromium, Zinc, Copper, Barium, and Antimony) except Areas with Surface Soil with THg Concentrations > or = 1 mg/kg.	SCCA01 SCCA02 SCCA03 SCCA04 SCCA05 SCCA06 SCCA08 SCCA09 SCCA10 SCCA11 SCCA12 SCCA13 SCCA15 SFPDA13 STRA006 STRA012 STRA015 STS01	824,566	-	•						•					
SCCA-3B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil in Areas with Highest Risk to Eco Receptors	See SCCA-3A Above	See SCCA-3A Above	116,310	4,308									•	•	•	•
	Monitored Natural Attenuation		See SCCA-3A Above	824,566	-	•						•					
SCCA-3C	Engineered Cap with Long-Term Monitoring and Maintenance & Non-Engineering measures in Areas with Highest Risk to Eco Receptors	See SCCA-3A Above	See SCCA-3A Above	116,310	4,308		•	•	•	•	•	•	•				
	Monitored Natural Attenuation		See SCCA-3A Above	824,566	-	•						•					

Table 5-5. Assembled Soil Alternatives for Southern Conservation Commission Area

Alternative	Remedial Technologies/ Process Options	Affected Area or Volume	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Monitoring	Long-Term Maintenance	Excavation/Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste Landfill
SCCA-4A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil in Areas with Risks to Eco Receptors	All Soils with Surface Soil Eco PRG Exceedances for Mercury, Chromium, Zinc, Copper, Barium, and Antimony	SCCA01 SCCA02 SCCA03 SCCA04 SCCA05 SCCA06 SCCA07 SCCA08 SCCA09 SCCA10 SCCA11 SCCA12 SCCA13 SCCA14 SCCA15 SFPDA13 SFPDA16 STRA006 STRA012 STRA013 STRA015 STS01	940,875	34,847									•		•	•
SCCA-4B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil in Areas with Risks to Eco Receptors	See SCCA-4A Above	See SCCA-4A Above	940,875	34,847									•	•	•	•
SCCA-4C	Engineered Cap with Long-Term Monitoring and Maintenance & Non-Engineering measures in Areas with Risks to Eco Receptors	See SCCA-4A Above	See SCCA-4A Above	940,875	-		•	•	•	•	•	•	•				

Note:
No UCL exceedances or HH risks are identified in this Risk Characterization Area.

Table 5-6. Assembled Soil Alternatives for Marsh Upland Area

Alternative	Remedial Technologies/ Process Options	Affected Area or Volume	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Monitoring	Long-Term Maintenance	Excavation/Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste Landfill
MUA-1	No Action	All Soils	-	119,046	-	•											
MUA-2	Limited Action - Monitored Natural Attenuation & Non-Engineering measures	All Soils with UCL Exceedances or HH or Eco PRG Exceedances	DPAL14 DPWL4 SDP02 SDP05 SDP11 DPAL9 DPAL15 DPAL6A DPAL16 SDP10 DPAL6 SDP09 SDP06 SDP08 SDP03 DPBL12 DPBL6	22,927	-	•	•	•	•	•		•					
MUA-3A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil in areas with UCL exceedances	All Soils with UCL Exceedances	DPAL14 DPWL4 SDP02 SDP05 SDP11 SDP06	2,038	353									•		•	•
	Monitored Natural Attenuation & Non-Engineering measures	All Soils with HH or Eco PRG Exceedances Outside Areas with UCL Exceedances	DPAL9 DPAL15 DPAL6A DPAL16 SDP10 DPAL6 SDP09 SDP08 SDP03 DPBL12 DPBL6	21,437	-	•	•	•	•	•		•					
MUA-3B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil in areas with UCL exceedances	See MUA-3A Above	See MUA-3A Above	2,038	353									•	•	•	•
	Monitored Natural Attenuation & Non-Engineering measures		See MUA-3A Above	21,437	-	•	•	•	•	•		•					

Table 5-6. Assembled Soil Alternatives for Marsh Upland Area

Alternative	Remedial Technologies/ Process Options	Affected Area or Volume	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Monitoring	Long-Term Maintenance	Excavation/Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste Landfill
MUA-4A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil to Address UCL Exceedances and HH and Eco PRG Exceedances	All Soils with UCL Exceedances and Areas with Mercury Risks to CW and Surface Soil PRG Exceedances for Mercury, Chromium, Copper, and Lead	DPAL14 DPWL4 SDP02 SDP05 SDP11 DPAL9 DPAL15 DPAL6A DPAL16 SDP10 DPAL6 SDP09 SDP06 SDP08 SDP03 DPBL12 DPBL6	25,513	1,222									•		•	•
MUA-4B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil to Address UCL Exceedances and HH and Eco PRG Exceedances	See MUA-5A Above	See MUA-4A Above	25,513	1,222									•	•	•	•
MUA-4C	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil to Address UCL Exceedances	All Soils with UCL Exceedances	DPAL14 DPWL4 SDP02 SDP05 SDP06 SDP11	2,038	353									•		•	•
	Engineered Cap with Long-Term Monitoring and Maintenance & Non-Engineering measures to Address HH and Eco PRG Exceedances	All Soils with HH or Eco PRG Exceedances Outside Areas with UCL Exceedances	DPAL9 DPAL15 DPAL6A DPAL16 SDP10 DPAL6 SDP09 SDP08 SDP03 DPBL12 DPBL6	21,437	-		•	•	•	•	•	•	•				

Table 5-7. Assembled Soil Alternatives for Floodplain Area

Alternative	Remedial Technologies/ Process Options	Affected Area	Sample IDs	Area (sf)	Volume (cy)	Natural Attenuation	Activity and Use Limitations	Fencing	Warning Signs	Educational Programs	Capping	Long-Term Monitoring	Long-Term Maintenance	Excavation/Backfill	Solidification/ Stabilization	Truck Transport	Off-Site Disposal at Solid Waste Landfill
FPA-1	No Action	All Soils	-	-	-	•											
FPA-2	Limited Action - Monitored Natural Attenuation & Non-Engineering measures	All Soils with Identified Risks to Eco Receptors (Soil with Surface Soil Eco PRG Exceedance for Lead)	FEMA 02	11,410	-	•						•					
FPA-3A	Excavation/Backfill, Transport and Off-Site Disposal of Contaminated Soil in Areas with Eco PRG Exceedances	Soil with Surface Soil Eco PRG Exceedance for Lead (Area Around Sample FEMA 02)	FEMA 02	11,410	211									•		•	•
FPA-3B	Excavation/Backfill, S/S, Transport and Off-Site Disposal of Contaminated Soil in Areas with Eco PRG Exceedances	See FPA-3A Above	FEMA 02	11,410	211									•	•	•	•

Note:
No UCL exceedances or HH risks are identified in this Risk Characterization Area.

Table 5-8. Soil Alternatives Summary Table

Soil Alternative	MNA & Non-Engineering Measures or MNA Area (sf)	% of RCA Area	Removal Area (sf)	% of RCA Area	Removal Depth (ft)	Removal Volume (cy)	Capping Area/ LTM & ICs Area (sf)	% of RCA Area
Upper North Area								
UNA-1	0	0.00%	0	0.00%	NA	NA	0	0.00%
UNA-2	3827	0.19%	0	0.00%	NA	NA	0	0.00%
UNA-3A	0	0.00%	3,827	0.19%	1	142	0	0.00%
UNA-3B	0	0.00%	3,827	0.19%	1	142	0	0.00%
Potential Greenway Area								
PGA-1	0	0.00%	0	0.00%	NA	NA	0	0.00%
PGA-2	286,215	75.65%	0	0.00%	NA	NA	0	0.00%
PGA-3A	165,514	43.74%	120,701	31.90%	1	4,470	0	0.00%
PGA-3B	165,514	43.74%	120,701	31.90%	1	4,470	0	0.00%
PGA-3C	165,514	43.74%	0	0.00%	NA	NA	120,701	31.90%
PGA-4A	0	0.00%	286,215	75.65%	1	10,601	0	0.00%
PGA-4B	0	0.00%	286,215	75.65%	1	10,601	0	0.00%
PGA-4C	0	0.00%	0	0.00%	NA	NA	286,215	75.65%
Southern Disposal Area								
SDA-1	0	0.00%	0	0.00%	NA	NA	0	0.00%
SDA-2	58,649	60.06%	0	0.00%	NA	NA	0	0.00%
SDA-3A	50,954	52.18%	7,695	7.88%	3	855	0	0.00%
SDA-3B	50,954	52.18%	7,695	7.88%	3	855	0	0.00%
SDA-4A	6,766	6.93%	7,752	7.94%	0.5	144	0	0.00%
			5,652	5.79%	1	209		
			2,812	2.88%	1.5	156		
			35,668	36.53%	3	3,963		
SDA-4B	6,766	6.93%	7,752	7.94%	0.5	144	0	0.00%
			5,652	5.79%	1	209		
			2,812	2.88%	1.5	156		
			35,668	36.53%	3	3,963		
SDA-4C	6,766	6.93%	7,695	7.88%	3	855	44,188	45.25%
SDA-5A	0	0.00%	7,752	7.94%	0.5	144	0	0.00%
			5,652	5.79%	1	209		
			2,812	2.88%	1.5	156		
			7,695	7.88%	3	855		
SDA-5B	0	0.00%	7,752	7.94%	0.5	144	0	0.00%
			5,652	5.79%	1	209		
			2,812	2.88%	1.5	156		
			7,695	7.88%	3	855		
SDA-5C	0	0.00%	7,695	7.88%	3	855	50,954	52.18%

Table 5-8. Soil Alternatives Summary Table

Soil Alternative	MNA & Non-Engineering Measures or MNA Area (sf)	% of RCA Area	Removal Area (sf)	% of RCA Area	Removal Depth (ft)	Removal Volume (cy)	Capping Area/ LTM & ICs Area (sf)	% of RCA Area
Southern Conservation Commission Area								
SCCA01	0	0.00%	0	0.00%	NA	NA	0	0.00%
SCCA-2	940,875	85.98%	0	0.00%	NA	NA	0	0.00%
SCCA-3A	824,566	75.35%	116,310	10.63%	1	4,308	0	0.00%
SCCA-3B	824,566	75.35%	116,310	10.63%	1	4,308	0	0.00%
SCCA-3C	824,566	75.35%	0	0.00%	NA	NA	116,310	10.63%
SCCA-4A	0	0.00%	940,875	85.98%	1	34,847	0	0.00%
SCCA-4B	0	0.00%	940,875	85.98%	1	34,847	0	0.00%
SCCA-4C	0	0.00%	0	0.00%	NA	NA	940,875	85.98%
Marsh Upland Area								
MUA-1	0	0.00%	0	0.00%	NA	NA	0	0.00%
MUA-2	22,927	19.26%	0	0.00%	NA	NA	0	0.00%
MUA-3A	21,437	18.01%	900	0.76%	3	100	0	0.00%
			1,138	0.96%	6	253		
MUA-3B	21,437	18.01%	900	0.76%	3	100	0	0.00%
			1,138	0.96%	6	253		
MUA-4A	0	0.00%	23,475	19.72%	1	869	0	0.00%
			900	0.76%	3	100		
			1,138	0.96%	6	253		
MUA-4B	0	0.00%	23,475	19.72%	1	869	0	0.00%
			900	0.76%	3	100		
			1,138	0.96%	6	253		
MUA-4C	0	0.00%	900	0.76%	3	100	21,437	18.01%
			1,138	0.96%	6	253		
Floodplain Area								
FPA-1	0	0.00%	0	0.00%	NA	NA	0	0.00%
FPA-2	11,410	0.99%	0	0.00%	NA	NA	0	0.00%
FPA-3A	0	0.00%	11,410	0.99%	0.5	211	0	0.00%
FPA-3B	0	0.00%	11,410	0.99%	0.5	211	0	0.00%

Notes:
MNA – monitored natural attenuation
RCA – Risk Characterization Area
sf – square feet
ft – feet
cy – cubic yards
kg – kilogram
LTM – Long Term Maintenance and Monitoring

Table 6-1. Fireworks Site Groundwater – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained	Comments
No action	None	Also known as natural attenuation, this action relies on the natural subsurface processes—such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials—to attenuate the ground water contaminants over time. Although metal concentrations will not decrease with time unless the contamination source(s) is(are) removed, the mobility and toxicity of metals can decrease as the site conditions mature.	No	NA	Yes	This GRA is retained as a baseline for comparative purposes.
Monitored Natural Attenuation (MNA)	Natural Recovery Processes and Periodic Monitoring	As with natural attenuation, monitored natural attenuation relies on the natural subsurface processes—such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials—to attenuate the ground water contaminants over time. Although metal concentrations will not decrease with time unless the contamination source(s) is(are) removed, the mobility and toxicity of metals can decrease as the site conditions mature. Additionally, a comprehensive long term monitoring plan would be developed and implemented. Monitoring would include groundwater sampling to evaluate changes in COC concentrations with time.	Yes – permanent solution when used in conjunction with removal GRAs	Yes	Yes	This GRA has been retained to be combined with removal GRAs to assemble alternative(s) that are likely to achieve a permanent solution.
Non-Engineering Measures	Activity and Use Limitations (AULs)	AULs specify activities and uses that are prohibited and allowed at the Site in the future. AULs are registered on property deeds and include a Grant of Environmental Restriction and a Notice of Activity and Use Limitation. A groundwater use restriction could be implemented as an AUL.	Yes – Temporary Solution	Yes	Yes	The AULs portion of this GRA has been retained to be combined with other remedial technologies and/or GRAs to assemble alternative(s) that are likely to achieve a temporary solution. Fencing, warning signs, and hazard education programs are not necessary if AULs are in place.
	Fencing	Permanent fencing would be installed in around areas with groundwater UCL exceedances.	Yes – Temporary Solution	Yes	No	
	Warning Signs	Areas where groundwater UCL exceedances occur would be posted with warning signs.	Yes – Temporary Solution	Yes	No	
	Hazard Education Programs	Community information and education programs would be undertaken to enhance awareness of potential hazards.	Yes – Temporary Solution	Yes	No	
Removal	Source Removal - Excavation of Contaminated Soil	This process is the physical removal of contaminated soil using traditional mechanical methods. This option would also involve removal and treatment of the groundwater (if present in the excavation) and backfill of excavation with clean material.	Yes – permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with pretreatment (if water is present in excavation), transportation and disposal actions.
	Ground Water Pumping	Placement of groundwater wells into the areas with groundwater UCL exceedances to pump out contaminated groundwater. Groundwater removed (pumped out) requires treatment and disposal.	Yes – permanent solution	Yes	No	This technology has not been retained. There are only two groundwater UCL exceedances and these are located adjacent to and/or downgradient of soil UCL exceedances for the same COCs that must be addressed.
Pretreatment of Groundwater from Pumping or Dewatering of Excavation Areas	Filtration	Filtration is the physical process of mechanical separation based on particle size whereby particles suspended in a fluid are separated by forcing the fluid through a porous medium. As fluid passes through the medium, the suspended particles are trapped on the surface of the medium and/or within the body of the medium. Assuming that the metals are bound up in soil and will be filtered out.	Yes	Yes	No – for ground-water from pumping Yes – for ground-water from de-watering of excavation areas.	This technology was not retained for groundwater from pumping because pumping was not retained. This technology has been retained for groundwater from dewatering of excavation areas used in conjunction with removal, transportation and disposal actions.

Table 6-1. Fireworks Site Groundwater – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained	Comments
Transportation	Truck Transport (water)	Transport pretreated groundwater from excavation dewatering by truck to local POTW for final treatment in conjunction with removal, pretreatment and disposal actions.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal, pretreatment and disposal actions.
	Truck Transport (soil)	Transport excavated soil by truck to treatment/disposal facility in conjunction with removal, treatment and disposal options.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and disposal actions.
Disposal	Off-Site Disposal of Groundwater from Excavation Dewatering at a Permitted POTW	Pretreated (filtered) groundwater will be transferred to local POTW for final treatment	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and transportation actions.
	Off-site Disposal of Excavated Soil at a Permitted Disposal Facility	Non-RCRA soil will be disposed of at an off-site, permitted disposal facility.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and transportation actions.

Table 6-2. Assembled Alternatives for Groundwater in Southern Disposal Area

Alternative	Remedial Technologies/Process Options	Natural Attenuation	Activity and Use Limitations	Long-Term Monitoring	Source Removal	Pretreatment of Water	Truck Transport of Waste	Off-Site Disposal of Water at POTW	Off-Site Disposal of Soil at Solid Waste and/or RCRA Landfill
SDGW-1	No Action	•							
SDGW-2	Limited Action - Monitored Natural Attenuation & Non-Engineering Measures	•	•	•					
SDGW-3	Source Removal (Excavation of Soil with Lead UCL Exceedances), Transport and Off-Site Disposal of Contaminated Soil & MNA of Groundwater at PZ-24 Including Pretreatment, Transport, and Disposal of Incidental Water in Excavation Areas and AULs for Groundwater near PZ-24	•	•	•	•	•	•	•	•
SDGW-4	Extensive Source Removal (Excavation of Soil with Lead UCL Exceedances and Lead Human Health and Ecological PRG Exceedances for Soil), Transport and Off-Site Disposal of Contaminated Soil & MNA of Groundwater at PZ-24 Including Pretreatment, Transport, and Disposal of Incidental Water in Excavation Areas and AULs for Groundwater near PZ-24	•	•	•	•	•	•	•	•

Note:

Alternatives to address MassDEP UCL exceedances only. There are no identified human health or ecological risks due to groundwater.

Table 6-3. Assembled Alternatives for Groundwater in Marsh Upland Area

Alternative	Remedial Technologies/Process Options	Natural Attenuation	Activity and Use Limitations	Long-Term Monitoring	Source Removal/Backfill	Pretreatment of Water	Truck Transport of Waste	Off-Site Disposal of Water at POTW	Off-Site Disposal of Soil at Solid Waste and/or RCRA Landfill
MUGW-1	No Action	•							
MUGW-2	Limited Action - Monitored Natural Attenuation & Non-Engineering Measures	•	•	•					
MUGW-3	Source Removal (Excavation of Soil with Mercury UCL Exceedances), Transport and Off-Site Disposal of Contaminated Soil & MNA of Groundwater at DPMW1 Including Pretreatment, Transport, and Disposal of Incidental Water in Excavation Areas and AULs for Groundwater near DPMW1	•	•	•	•	•	•	•	•
MUGW-3	Extensive Source Removal (Excavation of Soil with Mercury UCL Exceedances and Mercury Human Health and Ecological PRG Exceedances for Soil) , Transport and Off-Site Disposal of Contaminated Soil & MNA of Groundwater at DPMW1 Including Pretreatment, Transport, and Disposal of Incidental Water in Excavation Areas and AULs for Groundwater near DPMW1	•	•	•	•	•	•	•	•

Note:

Alternatives to address MassDEP UCL exceedances only. There are no identified human health or ecological risks due to groundwater.

Table 7-1. Fireworks Site Sediment – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained	Comments
No Action	None	Also known as natural recovery, this action relies on the fact that physical, chemical, and biological processes may continue over time to isolate, weather, and degrade COCs in the sediment. These processes may assist in reducing the risks at the Site, but would not eliminate the potential for direct contact with the COCs in the sediment at the Site.	No	NA	Yes	This GRA is retained as a baseline for comparative purposes.
Monitored Natural Recovery	Natural Physical Recovery Processes and Periodic Monitoring	Contaminated sediment would be left in place. Natural recovery relies on the fact that physical, chemical, and biological processes may continue over time to isolate, weather, and degrade COCs in the sediment. A comprehensive long term monitoring plan for Site sediments and fish tissue would be developed and implemented. Monitoring would include sediment and fish tissue sampling to evaluate changes in COC concentrations with time and sediment deposition rate over time.	Yes – temporary solution when used in conjunction with other GRAs such as Institutional Controls	Yes	Yes	This GRA has been retained to be combined with other GRAs to assemble alternative(s) that are likely to achieve a temporary solution.
Non-Engineering Measures	Activity and Use Limitations (AULs)	AULs specify activities and uses that are prohibited and allowed at the Site in the future. AULs are registered on property deeds and include a Grant of Environmental Restriction and a Notice of Activity and Use Limitation. A fish consumption advisory and/or a fishing ban would be likely AULs associated with Site sediments.	Yes – temporary solution	Yes	Yes	This GRA has been retained to be combined with other remedial technologies and/or GRAs to assemble alternative(s) that are likely to achieve a temporary solution.
	Access Restriction - Fencing	Fencing would be installed and maintained to minimize access to portions of the Site where sediment COC concentrations pose risks to human health.	Yes – temporary solution	Yes	Yes	
	Warning Signs	Areas adjacent likely public access points would have posted signs.	Yes – temporary solution	Yes	Yes	
	Educational Programs	Community information and education programs would be undertaken to enhance awareness of potential hazards associated with site sediments and fish consumption.	Yes – temporary solution	Yes	Yes	
In Situ Containment	Isolation Capping with Long-Term Monitoring and Maintenance	<p>Capping consists of placement of clean materials over targeted areas of contaminated sediment to limit the potential of human and ecological receptors contact with contaminated sediment. Sediment caps can be constructed using a single material (such as clean sand) and can be multi-layer consisting of combinations of materials (such as clay, sand, and sorbent materials). Isolation caps used to physically and chemically isolate contaminated sediments and promote the recovery of the benthic community are typically 2 to 3 feet thick.</p> <p>Long term monitoring of capped areas would be performed to verify physical and chemical isolation of contaminated sediments and to assess the recovery of the benthic community. Maintenance would be performed as necessary.</p>	Yes – permanent solution	Yes	Yes	This GRA has been retained for use as a stand alone action or in combination with removal, transportation, and disposal actions to assemble a remedial alternative that is likely to achieve a permanent solution.

Table 7-1. Fireworks Site Sediment – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained	Comments
	Thin Capping with Long Term Monitoring and Maintenance	<p>Thin capping (also known as enhanced natural recovery) typically involves the placement of 6 to 12 inches of clean material over contaminated sediments to improve the sediment quality in the biologically active zone. Thin capping is appropriate in areas where the risks posed by contaminated sediments to human health and ecological receptors is low.</p> <p>Long term monitoring of capped areas would be performed to verify physical and chemical isolation of contaminated sediments and to assess the recovery of the benthic community. Maintenance would be performed as necessary.</p>	Yes – permanent solution	Yes	Yes	This GRA has been retained for use as a stand alone action or in combination with removal, transportation, and disposal actions to assemble a remedial alternative that is likely to achieve a permanent solution.
Removal	Excavation	This process is the physical removal of contaminated sediment using conventional earth moving equipment in areas adjacent to and accessible by land.	Yes – permanent solution	Yes	Yes	This GRA has been retained to be used in conjunction with S/S, transportation and disposal actions and could be combined with containment actions.
	Dredging	<p>This process is the physical removal of contaminated sediment using mechanical, hydraulic or specialty dredging equipment.</p> <p>Mechanical dredging equipment uses some type of bucket to excavate sediment. The bucket is lowered to the sediment surface, closed, then raised to the surface and sediment is off-loaded for treatment (if necessary) and disposal. Enclosed buckets (also known as environmental buckets) are generally used for mechanical dredging of contaminated sediments. Such buckets minimize the dispersion of dredge material through the water column as the bucket is raised to the water surface. Mechanical dredging is suitable for removal of cohesive or consolidated sediment as well as sands and gravels.</p> <p>Hydraulic dredging equipment uses suction, piping, and pumps to dislodge sediment and pump dredge material to an intermediate or final disposal location. Cutter head, auger and other specialty attachments are available to assist during hydraulic dredging of more cohesive sediments. Hydraulic dredging is most suitable for use in areas with minimal debris and soft sediments. Hydraulically dredged material must be dewatered prior to disposal. Decant water from dewatering operations may need to be treated prior to disposal.</p> <p>Specialty dredging equipment is equipment modified or built to meet specific project needs.</p>	Yes – permanent solution	Yes	Yes	

Table 7-1. Fireworks Site Sediment – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained	Comments
Ex Situ Physical/ Chemical Treatment	Solidification/ Stabilization (S/S)	Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization). The target contaminant group for ex-situ S/S is inorganics. On-site ex-situ S/S could be employed if excavated sediment does not pass the Paint-Filter Liquids Test (40 CFR 264.314). Off-Site ex-situ S/S could be employed to treat excavated sediment to meet the Land Disposal Restriction Standards (40 CFR Part 268).	Yes – could be part of a permanent solution	Yes	Yes	This GRA has been retained to be used in conjunction with removal, transportation and disposal actions.
	Pretreatment of Decant Water from Hydraulic Dredge Material Dewatering - Filtration	Filtration is the physical process of mechanical separation based on particle size whereby particles suspended in a fluid are separated by forcing the fluid through a porous medium. As fluid passes through the medium, the suspended particles are trapped on the surface of the medium and/or within the body of the medium. Assuming that the metals are bound up in sediment and will be filtered out.	Yes – could be part of a permanent solution	Yes	Yes	
Transportation	Truck Transport (water)	Transport pretreated groundwater from excavation dewatering by truck to local POTW for final treatment in conjunction with removal, pretreatment and disposal actions.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with dredging, ex-situ treatment, transportation, and disposal actions.
	Truck Transport (dredge material)	Transport dredge material by truck to treatment/disposal facility in conjunction with removal and disposal actions.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and disposal actions
	Rail Transport (dredge material)	Transport dredge material by rail to treatment/disposal facility in conjunction with removal and disposal actions.	Yes – could be part of a permanent solution	Yes	Yes ¹	This technology has been retained to be used in conjunction with removal and disposal actions
Disposal	On-Site Disposal at a Newly Constructed, Permitted Disposal Facility (dredge material)	Non-RCRA dredge material will be disposed of at an on-site, permitted disposal facility.	Yes – could be part of a permanent solution	Yes	Yes ²	This technology has been retained to be used in conjunction with removal and transportation actions
	Off-Site Disposal at a Permitted Disposal Facility (dredge material)	Non-RCRA dredge material will be disposed of at an off-site, permitted disposal facility.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and transportation actions
	Off-Site Disposal at a Hazardous Waste Landfill (dredge material)	RCRA dredge material (if any) will be disposed off at an off-site, permitted hazardous waste disposal facility	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and transportation actions
	Off-Site Disposal Decant Water at a Permitted POTW	Pretreated (filtered) decant water from hydraulic dredging operations will be transferred to local POTW for final treatment	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with hydraulic dredging, ex-situ treatment, transportation, and disposal actions.

Notes:
¹ Though the rail transport technology/process option was retained, truck transport of dredge material has been selected as the representative process option within the transportation category to be carried forward into the alternative development process.
² Though the on-site disposal remedial technology/process option was retained, off-site disposal of dredge material at a solid waste landfill or hazardous waste landfill have been selected as the representative process options within the disposal category to be carried forward into the alternative development process. Dredge material is assumed to be non-TSCA waste. Some dredge material may be RCRA waste based on mercury concentrations.

Table 7-2. Sediment Alternatives for Eastern Channel Corridor, Lower Drinkwater River Corridor, Lily/Upper Factory Pond, and Middle/Lower Factory Pond

SMU	Sample Identifier	Data Range (feet)	Measured Total Mercury Concentration (mg/kg)	Average Total Mercury Concentration (mg/kg)	Individual Area (ft²)	Total Area (ft²)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
							MNR + Non-Engineering Measures	Removal in ECC Only	Removals Such That SWA Meets HH and ECO PRGs for THg	Removals Such That Each RCA Meets HH and ECO PRGs for THg	Approach Background for THg (0.62 mg/Kg)
							MNR + Non-Engineering Measures	ECC Removal + MNR + Non-Engineering Measures	Removal in ECC + Removal/Capping in LDR, & LUFP with LTM + MNR + Non-Engineering Measures	Removal in ECC + Removal/Capping in LDR, LUFP & MLFP + LTM & Non-Engineering Measures	Removal in ECC + Removal/Capping in LDR, LUFP & MLFP + LTM & Non-Engineering Measures
Eastern Channel Corridor											
1	TR02IR	0 - 0.5	3.30	31.55	12,419	15,225	31.55	0.62	0.62	0.62	0.62
	TR02IL	0 - 0.5	90.00		106						
	TR02IC	0 - 0.5	1.35		2,700						
2	TR02HL	0 - 0.5	27.90	16.19	2,507	7,314	16.19	0.62	0.62	0.62	0.62
	TR02HR	0 - 0.5	4.47		4,807						
3	TR02GR	0 - 0.5	105.00	2841.67	4,940	7,967	2841.67	0.62	0.62	0.62	0.62
	TR02GL	0 - 0.5	7420.00		100						
	TR02GC	0 - 0.5	1000.00		2,927						
4	TR02FR	0 - 0.5	0.08	69.63	14,265	17,519	69.63	0.62	0.62	0.62	0.62
	TR02FL	0 - 0.5	68.80		1,115						
	TR02FC	0 - 0.5	140.00		2,139						
5	TR02EC	0 - 0.5	109.00	82.27	10,086	29,856	82.27	0.62	0.62	0.62	0.62
	TR02EL	0 - 0.5	136.00		168						
	TR02ER	0 - 0.5	1.81		19,602						
6	TR02DC	0 - 0.5	10.40	28.03	3,514	5,576	28.03	0.62	0.62	0.62	0.62
	TR02DL	0 - 0.5	0.20		1,355						
	TR02DR	0 - 0.5	73.50		707						
7	TR02CR	0 - 0.5	198.00	106.60	2,573	6,816	106.60	0.62	0.62	0.62	0.62
	TR02CL	0 - 0.5	15.20		4,243						
8	TR02BR	0 - 0.5	0.20	2.91	4,234	15,310	2.91	0.62	0.62	0.62	0.62
	TR02BC	0 - 0.5	5.62		11,076						
Total Area of the Eastern Channel Corridor						105,582					
Eastern Channel Corridor Total Mercury SWA							263.69	0.62	0.62	0.62	0.62
Upper Drinkwater River Corridor											
9	TR03CR	0 - 0.5	1.55	0.52	30,122	36,622	0.52	0.52	0.52	0.52	0.52
	TR03CL	0 - 0.5	0.00		313						
	TR03CC	0 - 0.5	0.01		6,187						
10	TR03BL	0 - 0.5	0.01	0.01	12,737	23,320	0.01	0.01	0.01	0.01	0.01
	TR03BR	0 - 0.5	0.01		10,583						
11	TR03AL	0 - 0.5	0.01	0.01	19,897	24,648	0.01	0.01	0.01	0.01	0.01
	TR03AR	0 - 0.5	0.01		4,750						
Total Area of the Upper Drinkwater River Corridor						84,589					
Upper Drinkwater River Corridor Total Mercury SWA							0.23	0.23	0.23	0.23	0.23
Lower Drinkwater River Corridor											
12	TR04DR	0 - 0.5	17.10	17.10	8,367	8,367	17.10	17.10	0.62	0.62	0.62

Table 7-2. Sediment Alternatives for Eastern Channel Corridor, Lower Drinkwater River Corridor, Lily/Upper Factory Pond, and Middle/Lower Factory Pond

SMU	Sample Identifier	Data Range (feet)	Measured Total Mercury Concentration (mg/kg)	Average Total Mercury Concentration (mg/kg)	Individual Area (ft²)	Total Area (ft²)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
							MNR + Non-Engineering Measures	Removal in ECC Only	Removals Such That SWA Meets HH and ECO PRGs for THg	Removals Such That Each RCA Meets HH and ECO PRGs for THg	Approach Background for THg (0.62 mg/Kg)
							MNR + Non-Engineering Measures	ECC Removal + MNR + Non-Engineering Measures	Removal in ECC + Removal/Capping in LDR, & LUFP with LTM + MNR + Non-Engineering Measures	Removal in ECC + Removal/Capping in LDR, LUFP & MLFP + LTM & Non-Engineering Measures	Removal in ECC + Removal/Capping in LDR, LUFP & MLFP + LTM & Non-Engineering Measures
13	TR04CR	0 - 0.5	7.64	7.64	7,034	7,034	7.64	7.64	0.62	0.62	0.62
14	TR04CL	0 - 0.5	2.40	2.40	10,474	10,474	2.40	2.40	0.62	0.62	0.62
15	TR04BR	0 - 0.5	47.70	47.70	14,094	14,094	47.70	47.70	0.62	0.62	0.62
16	TR04BL	0 - 0.5	0.31	0.31	20,198	20,198	0.31	0.31	0.31	0.31	0.31
17	TR04AR	0 - 0.5	12.80	12.80	18,342	18,342	12.80	12.80	0.62	0.62	0.62
18	TR04AL	0 - 0.5	5.59	5.59	3,593	3,593	5.59	5.59	0.62	0.62	0.62
19	TR09HR	0 - 1.0	277.00	277.00	19,779	19,779	277.00	277.00	0.62	0.62	0.62
20	TR08AC	0 - 1.0	0.10	0.10	17,093	17,093	0.10	0.10	0.10	0.10	0.10
Total Area of Lower Drinkwater River Corridor						118,974					
Lower Drinkwater River Corridor Total Mercury SWA							55.78	55.78	0.49	0.49	0.49
Lily Pond/Upper Factory Pond Area											
21	TR06DR	0 - 0.5	0.37	0.37	13,975	13,975	0.37	0.37	0.37	0.37	0.37
22	TR06DC	0 - 0.5	34.20	34.20	81,406	81,406	34.20	34.20	0.62	0.62	0.62
23	TR06DL	0 - 0.5	204.00	204.00	108,831	108,831	204.00	204.00	0.62	0.62	0.62
24	TR09GR	0 - 1.0	7.88	4.37		99,991	4.37	4.37	4.37	4.37	0.62
	TR06CR	0 - 0.5	0.86								
25	TR06CC	0 - 0.5	27.10	27.10	75,062	75,062	27.10	27.10	27.10	27.10	0.62
26	TR06CL	0 - 0.5	47.50	47.50	93,898	93,898	47.50	47.50	47.50	47.50	0.62
27	TR06BL	0 - 0.5	41.50	41.50	96,091	96,091	41.50	41.50	41.50	41.50	0.62
28	TR09FC	0 - 1.0	48.60	44.45		171,390	44.45	44.45	44.45	44.45	0.62
	TR06BC	0 - 0.5	40.30								
29	TR06BR	0 - 0.5	3.30	2.13		157,725	2.13	2.13	2.13	2.13	0.62
	TR09ER	0 - 1.0	0.95								
30	TR06AC	0 - 0.5	3.30	3.30	87,451	86,842	3.30	3.30	3.30	3.30	0.62
31	TR06AL	0 - 2.0*	33.20	33.20	76,675	87,451	33.20	33.20	33.20	33.20	0.62
32	TR06AR	0 - 0.5	0.69	0.69	27,077	27,077	0.69	0.69	0.69	0.69	0.69
Total Area of Lily Pond/Upper Factory Pond						1,099,739					
Lily Pond/Upper Factory Pond Area Total Mercury SWA							42.80	42.80	20.19	20.19	0.62
Middle/Lower Factory Pond Area											
33	TR06AC	0 - 0.5	3.30	3.30	75,383	75,383	3.30	3.30	3.30	3.30	0.62
34	TR09DL	0 - 1.0	19.20	19.20	80,369	80,369	19.20	19.20	19.20	19.20	0.62
35	TR07DL	0 - 0.5	62.80	62.80	34,200	34,200	62.80	62.80	62.80	62.80	0.62
36	TR07DC	0 - 0.5	1.43	1.43	45,560	45,560	1.43	1.43	1.43	1.43	0.62
37	TR07DR	0 - 0.5	81.40	95.20		52,407	95.20	95.20	95.20	95.20	0.62
	TR09CR	0 - 1.0	109.00								
38	TR07CL	0 - 0.5	14.20	14.20	21,506	21,506	14.20	14.20	14.20	14.20	0.62

Table 7-2. Sediment Alternatives for Eastern Channel Corridor, Lower Drinkwater River Corridor, Lily/Upper Factory Pond, and Middle/Lower Factory Pond

SMU	Sample Identifier	Data Range (feet)	Measured Total Mercury Concentration (mg/kg)	Average Total Mercury Concentration (mg/kg)	Individual Area (ft²)	Total Area (ft²)	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	
							MNR + Non-Engineering Measures	Removal in ECC Only	Removals Such That SWA Meets HH and ECO PRGs for THg	Removals Such That Each RCA Meets HH and ECO PRGs for THg	Approach Background for THg (0.62 mg/Kg)	
							MNR + Non-Engineering Measures	ECC Removal + MNR + Non-Engineering Measures	Removal in ECC + Removal/Capping in LDR, & LUFP with LTM + MNR + Non-Engineering Measures	Removal in ECC + Removal/Capping in LDR, LUFP & MLFP + LTM & Non-Engineering Measures	Removal in ECC + Removal/Capping in LDR, LUFP & MLFP + LTM & Non-Engineering Measures	
39	TR07CC	0 - 0.5	1.74	1.74	37,781	37,781	1.74	1.74	1.74	1.74	1.74	
40	TR07CR	0 - 0.5	1.20	1.20	29,993	29,993	1.20	1.20	1.20	1.20	1.20	
41	TR07BL	0 - 0.5	0.99	0.99	64,939	64,939	0.99	0.99	0.99	0.99	0.99	
42	TR07BC	0 - 0.5	7.58	7.58	54,037	54,037	7.58	7.58	7.58	7.58	0.62	
43	TR09BR	0 - 1.0	14.40	11.46		89,659	11.46	11.46	11.46	11.46	0.62	
	TR07BR	0 - 0.5	8.51									
44	TR07AR	0 - 0.5	16.30	16.30	71,234	71,234	16.30	16.30	16.30	16.30	0.62	
45	TR09AL	0 - 1.0	21.90	21.90	351,152	351,152	21.90	21.90	21.90	21.90	0.62	
46	TR07AC	0 - 0.5	119.00	119.00	105,238	105,238	119.00	119.00	119.00	0.62	0.62	
47	TR07AL	0 - 0.5	6.09	6.09	37,549	37,549	6.09	6.09	6.09	0.62	0.62	
Total Area of Middle/Lower Factory Pond						1,151,007						
Middle/Lower Factory Pond Area Total Mercury SWA								28.24	28.24	28.24	17.24	0.62
Total Sediment Area (SF)						2,559,890						
Total Sediment Area (AC)						58.77						
Site-wide Sediment Total Mercury SWA (excludes sediment in MUA)							44.56	33.71	21.43	16.48	0.63	
Total Affected Area (SF)							0	105,582	377,501	520,287	2,281,338	
Total Affected Area (AC)							0	2.42	8.67	11.94	52.37	
% of Total Area							0%	4%	15%	20%	89%	

Notes:

- Eco Ecological
- HH Human Health
- LTM Long Term Monitoring
- MNR Monitored Natural Recovery
- MUA Marsh Upland Area
- PRGs Preliminary Remediation Goals
- SMU Sediment Management Unit
- SWA Surface-Weighted Average
- SMU Sediment Management Unit
- THg Total Mercury

* No surface sample taken. Subsurface concentration (0.5 to 2.0 ft interval) was assigned surface concentration at this sampling location.

- Signifies SMU Total Hg concentration to be reduced to site background concentration (0.62 ppm) – Removal and Capping Area with LTM and Non-Engineering Measures
- Signifies SMU Total Hg concentration will be approximately 50% of original concentration – Thin capping area with LTM and Non-Engineering Measures.
- Signifies SMU Subject to MNR and Non-Engineering Measures

Table 7-3. Sediment Alternatives for Marsh Upland Sediment Area

MUA SMU	Sample Identifier	Data Range (feet)	Measured Total Mercury Concentration (mg/kg)	Total Area (ft ²)	MUA Sediment Alternative 1	MUA Sediment Alternative 2	MUA Sediment Alternative 3	MUA Sediment Alternative 4	MUA Sediment Alternative 5
					No Action	MNR + Non-Engineering Measures	Spot Removal	Limited Thin Capping	Widespread Removal
					No Action	MNR + Non-Engineering Measures	Removals Such That SWA Meets HH & Eco PRGs for THg + MNR & Non-Engineering Measures	Thin Capping Such That SWA Meets HH & Eco PRGs for THg + LTM + MNR & Non-Engineering Measures	Removals to Approach Site Background for THg (0.62 mg/Kg)
Marsh Upland Area Sediments									
MUA1	S12	0-3	0.46	2843.39	0.46	0.46	0.46	0.46	0.46
MUA2	S13	0-3	283.00	3686.14	283.00	283.00	0.62	141.50	0.62
MUA3	S14	0-2	45.60	4313.56	45.60	45.60	45.60	45.60	0.62
MUA4	S15	0-3	0.22	6031.94	0.22	0.22	0.22	0.22	0.22
MUA5	S16	0-2	0.37	5931.31	0.37	0.37	0.37	0.37	0.37
MUA6	S17	0-3	0.42	2321.43	0.42	0.42	0.42	0.42	0.42
MUA7	S18	0-3	2.24	4944.08	2.24	2.24	2.24	2.24	0.62
MUA8	S19	0-3	3.72	3301.81	3.72	3.72	3.72	3.72	0.62
MUA9	S20	0-2.75	0.83	3566.31	0.83	0.83	0.83	0.83	0.83
MUA10	S21	0-2.7	0.71	6543.01	0.71	0.71	0.71	0.71	0.71
MUA11	S22	0-1.0	62.20	4098.46	62.20	62.20	62.20	62.20	0.62
MUA12	S23	0-3	1.87	4101.77	1.87	1.87	1.87	1.87	0.62
MUA13	S24	0-2	103.00	5191.21	103.00	103.00	103.00	51.50	0.62
MUA14	S25	0-2.7	8.42	3987.15	8.42	8.42	8.42	8.42	0.62
MUA15	S26	0-2.5	1.89	4827.05	1.89	1.89	1.89	1.89	1.89
Total Sediment Area (SF)				65,689					
Total Sediment Area (AC)				1.51					
MUA Sediment Total Mercury SWA					32.22	32.22	16.38	20.21	0.66
Total Affected Area (SF)					0	0	3,686	8,877	33,624
Total Affected Area (AC)					0	0	0.08	0.20	0.77
% of Total MUA Sediment Area					0%	0%	6%	14%	51%

Notes:

- Eco – Ecological
- HH – Human Health
- LTM – Long Term Monitoring
- MNR – Monitored Natural Recovery
- MUA – Marsh Upland Area
- PRGs – Preliminary Remediation Goals
- SMU – Sediment Management Unit
- SWA – Surface-Weighted Average
- SMU – Sediment Management Unit
- THg – Total Mercury

Signifies SMU Total Hg concentration to be reduced to site background concentration (0.62 mg/Kg)

Signifies SMU Total Hg concentration will be approximately 50% of original concentration

Table 8-1. Retained Soil, Groundwater, and Sediment Alternatives – for Assembly into Site-wide Alternatives

Retained Soil Alternatives						Retained Groundwater Alternatives		Retained Sediment Alternatives	
UNA Soil	PGA Soil	SDA Soil	SCCA Soil	MUA Soil	FPA Soil	SDA Groundwater	MUA Groundwater	ECC, LDR, LUF, MLFP Sediments	MUA Sediment Area
<ul style="list-style-type: none"> ▪ UNA-2 ▪ UNA-3A 	<ul style="list-style-type: none"> ▪ PGA-2 ▪ PGA-3A ▪ PGA-4A 	<ul style="list-style-type: none"> ▪ SDA-2 ▪ SDA-3A ▪ SDA-4A ▪ SDA-5A 	<ul style="list-style-type: none"> ▪ SCCA-2 ▪ SCCA-3A ▪ SCCA-4A 	<ul style="list-style-type: none"> ▪ MUA-2 ▪ MUA-3A ▪ MUA-4A 	<ul style="list-style-type: none"> ▪ FPA-2 ▪ FPA-3A 	<ul style="list-style-type: none"> ▪ SDGW-2 ▪ SDGW-3 ▪ SDGW-4 	<ul style="list-style-type: none"> ▪ MUGW-2 ▪ MUGW-3 ▪ MUGW-4 	<ul style="list-style-type: none"> ▪ Sed. Alt. 2 ▪ Sed. Alt. 3 ▪ Sed. Alt. 4 ▪ Sed. Alt. 5 ▪ Sed. Alt. 6 	<ul style="list-style-type: none"> ▪ MUA Sed. Alt. 2 ▪ MUA Sed. Alt. 3 ▪ MUA Sed. Alt. 5

Table 8-2. Assembled Site-wide Alternatives

Site-wide Alternative No.	Site-wide Alternative Description	Soil Alternatives	Sediment Alternatives	GW Alternatives
1	MNA, MNR & Non-Engineering Measures	<ul style="list-style-type: none"> ▪ UNA-2 ▪ PGA-2 ▪ SDA-2 ▪ SCCA-2 ▪ MUA-2 ▪ FPA-2 	<ul style="list-style-type: none"> ▪ Sediment Alternative 2 ▪ MUA Sediment Alternative 2 	<ul style="list-style-type: none"> ▪ MUGW-2 ▪ SDGW-2
2	Sediment Removal in ECC + Soil Removal to address Soil and GW UCLs + MNA, MNR & Non-Engineering Measures	<ul style="list-style-type: none"> ▪ UNA-3A ▪ PGA-2 ▪ SDA-3A ▪ SCCA-2 ▪ MUA-3A ▪ FPA-2 	<ul style="list-style-type: none"> ▪ Sediment Alternative 3 ▪ MUA Sediment Alternative 2 	<ul style="list-style-type: none"> ▪ MUGW-3 ▪ SDGW-3
3	Sediment Removal Such That SWA Meets HH and Eco PRGs for THg (Sediment Removal in ECC & Sediment Removal/Capping in LDR and LUFP and Sediment Removal in MUA2) + Soil Removal to Address Soil and GW UCLs	<ul style="list-style-type: none"> ▪ UNA-3A ▪ PGA-2 ▪ SDA-3A ▪ SCCA-2 ▪ MUA-3A ▪ FPA-2 	<ul style="list-style-type: none"> ▪ Sediment Alternative 4 ▪ MUA Sediment Alternative 3 	<ul style="list-style-type: none"> ▪ MUGW-3 ▪ SDGW-3
4	Sediment Removal Such That SWA in Each Sediment RCA Meets HH and Eco PRGs for THg (Sediment Removal in ECC & Sediment Removal/Capping in LDR and LUFP and sediment removal in MUA1) + Soil Removal to Address Soil and GW UCLs + Intermediate Range Soil Removal Alternatives to address HH and Ecological Risks not Co-Located with UCL Exceedances	<ul style="list-style-type: none"> ▪ UNA-3A ▪ PGA-3A ▪ SDA-4A ▪ SCCA-3A ▪ MUA-3A ▪ FPA-3A 	<ul style="list-style-type: none"> ▪ Sediment Alternative 5 ▪ MUA Sediment Alternative 5 	<ul style="list-style-type: none"> ▪ MUGW-3 ▪ SDGW-3
5	Approach Background - Sediment Removal and Capping such that the SWA Approaches 0.62 mg/Kg THg + Soil Removal and Backfill to Address Soil & GW UCL Exceedances + Soil Removal to Address HH & Ecological PRG Exceedances + GW, Fish Tissue Sampling and Sediment Cap LTM	<ul style="list-style-type: none"> ▪ UNA-3A ▪ PGA-4A ▪ SDA-5A ▪ SCCA-4A ▪ MUA-4A ▪ FPA-3A 	<ul style="list-style-type: none"> ▪ Sediment Alternative 6 ▪ MUA Sediment Alternative 5 	<ul style="list-style-type: none"> ▪ MUGW-4 ▪ SDGW-4

Table 8-3. Regulatory Requirements Summary

Requirement	Citation	Status	Synopsis	Actions to be Taken to Attain ARAR
Clean Water Act - Section 404 and Rivers & Harbors Act Requirements	40 CFR 230.70-76; 33 USC 401-426(m)	Applicable	Controls discharges of dredged or fill material in order to restore and maintain the chemical, physical, and biological integrity of waters of the U.S.	The impact of dredging activities on the environment will be minimized and/or mitigated by the following practices: <ul style="list-style-type: none"> Use of dredging equipment and dredging rates that minimize sediment disturbance and migration,
National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Requirements for Construction Activities	40 CFR 122.26(a)(14)(x), 122.26(c)(1)(ii)(c) and (d); Federal Register, Vol. 63, No. 31, 9/17/98, Part IV, SWPP Requirements	Applicable	Regulation requires best management practices to control pollutants in stormwater discharges during and after construction including erosion and sediment control.	Erosion control will include implementation of best management practices for control of pollutants in stormwaters and erosion and sediment control during upland excavation and backfill work.
Fish and Wildlife Coordination Act	16 USC Part 661 et. seq.; 40 CFR 6.302(g)	Applicable	US Fish & Wildlife Service (USFWS) and appropriate State agencies must be consulted during project planning to determine ways to avoid or minimize potentially adverse effects to fish and wildlife.	TtEC will coordinate with the MA Dept. of Marine Fisheries and the USFWS to determine if dredging activities may occur throughout the year and if there are constraints due to fish migration.
Federal Endangered Species Act	16 USC Part 1531 et. seq.; 40 CFR 6.302(h)	Applicable	Appropriate federal & state agencies must be consulted if a threatened or endangered listed species or their habitat may be affected.	
National Historic Preservation Act of 1966; National Preservation of Historical and Archeological Data Act of 1974	16 USC 470 et. seq. & 40 CFR 800, as amended; 16 USC 469 et. seq.	Applicable	Requires an assessment be conducted to determine potential project impacts to cultural resources that are eligible for, nominated to, or listed in the National Register of Historic Places (NRHP). Specifically, cultural resources concerns will involve evaluation of project impacts to potentially significant (per 36 CFR 60.4 - NRHP Criteria for Evaluation) cultural resources.	
Massachusetts Surface Water Discharge Requirements	31 MGL 27; 314 CMR 3.000	Applicable	Outlines requirements for discharges to surface waters.	A Stormwater Management Plan will be prepared. The Plan will be prepared for the dewatering facility construction activities and will address best management practices to properly manage and control stormwater, in accordance with applicable federal and state regulatory requirements.
Surface Water Discharge	21 MGL 23(12) and 34; 314 CMR 3.10(3)(4-6); (9)(a); (19)(3-6), (10), (12)(a-b), (13)	Applicable	This section outlines the requirements for obtaining a NPDES permit in Massachusetts. The Drinkwater River system on the site are classified as Class B, which is designated as a habitat for fish, other aquatic life, and wildlife; for primary and secondary contact recreation and suitable for irrigation and other agricultural uses; compatible industrial cooling and process uses; and suitable as a source of public water supply with appropriate treatment.	No discharge to surface waters are planned.
Wetlands Protection Act	131 MGL 40; 310 CMR 10.00	Applicable	The Wetlands Protection Act regulates work conducted within coastal and inland wetland areas and associated buffer zones (collectively referred to as Resource Areas). Resource Areas within and adjacent to the site include Bordering Vegetated Wetlands, Banks, Land Under Water Bodies, and Land Subject to Flooding. For any work within these resource areas, a Notice of Intent is required to be filed with the local Conservation Commission. An Order of Conditions would then be placed on the work activities.	A Notice of Intent will be filed with the Conservation Commission in the towns of Hanover and Hanson and propose this project under the limited project status of the Wetlands Protection Act.

Table 8-3. Regulatory Requirements Summary

Requirement	Citation	Status	Synopsis	Actions to be Taken to Attain ARAR
Wetlands Protection Act (continued)			<p>310 CMR 10.24(7)(c)(6) and 10.53(3)(q) allow activities, such as Comprehensive Response Actions, to be performed as a “limited project” if they are conducted in accordance with the MCP. However, if the activity can meet normal Wetland regulatory performance standards, they will continue to be governed by those standards.</p> <p>Under limited project status, Conservation Commissions can condition the project activity without requiring the applicant to go through a variance process under the Wetland Protection Act. As a limited project, the applicant must demonstrate that there are no practical alternatives to the response action being proposed that would be less damaging to the Resource Areas. A Comprehensive Remedial Action Alternative that is selected in accordance with 310 CMR 40.0851 of the MCP is deemed to have met the above standard.</p>	<p>A Comprehensive Remedial Action Alternative will be selected in accordance with 310 CMR 40.0851 of the MCP For Firework, where avoidance is not possible, the Comprehensive Response Action will be designed to minimize impacts to the Resource Area and meet the following performance standards in 310 CMR 10.53(3)(q):</p> <ul style="list-style-type: none"> • hydrologic changes shall be minimized • BMPs shall be used during construction • Mitigation measures shall be implemented • Compensatory storage shall be provided for all flood storage lost • Temporary structures and access roads will be removed within 30 days of completion • Work in the Resource Areas will be performed when the ground is sufficiently frozen, dry, or otherwise stable to support the equipment
Surface Water Quality Standards	27 MGL 27; 314 CMR 4.03(1)(3)(c); 4.04(1)(2)(4)(6); 4.05(4)(a-b), (5)	Applicable	MassDEP surface water quality standards incorporate the federal ambient water quality criteria (AWQC) as standards for surface waters of the state. Standards establish acute and chronic effects on aquatic life for contaminants.	A project-specific water quality monitoring plan will be developed.
Certification for Dredging, Dredged Material Disposal, and Filling in Waters	21 MGL 26-53; 314 CMR 9.06(1-2)	Applicable	<p>Establishes procedures and criteria for administration of Section 401 of the federal Clean Water Act for the discharge of dredged or fill material in waters of the U.S. within the Commonwealth.</p> <p>9.04: Activities requiring an application include:</p> <ul style="list-style-type: none"> • An activity subject to 310 CMR 10.00 and will result in the loss of more than 5,000 square feet cumulatively of bordering vegetated wetlands and land under water • Any dredging or dredged material disposal of more than 100 cubic yards <p>9.06: Provides the criteria for evaluation of Applications for discharge of dredged or fill material, which includes:</p> <ul style="list-style-type: none"> • no discharge of dredged material shall be permitted if there is a practicable alternative that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences • no discharge of dredged material shall be permitted unless appropriate and practicable steps have been taken which will avoid or minimize potential adverse impacts to the bordering vegetated wetlands and land under water 	<p>The PRPs will submit the following as part of the application process:</p> <ul style="list-style-type: none"> • BRP WW10 Major Project Certification – 401 Water Quality Certification for Fill and Excavation Projects in Waters and Wetlands • BRP WW07, 08 Dredging – 401 Water Quality Certification for Projects Proposing more than 100 cubic Yards of Dredging or Dredged Material Disposal <p>The Comprehensive Response Action selected will not include discharge of dredged materials in the aquatic system. All contaminated dredged materials will be dewatered and transported off-site for disposal</p>

Table 8-3. Regulatory Requirements Summary

Requirement	Citation	Status	Synopsis	Actions to be Taken to Attain ARAR
Certification for Dredging, Dredged Material Disposal, and Filling in Waters (continued)			<p>9.07: Provides the criteria for evaluation of Applications for dredging and dredged material management, which includes:</p> <ul style="list-style-type: none"> • dredging and dredged material management shall be conducted in a manner that ensure protection of human health, public safety, public welfare, and the environment. • dredged material shall not be disposed if a feasible alternative exists that involves reuse, recycling, or contaminant destruction and/or detoxification • provides dredging performance standards <ul style="list-style-type: none"> ○ all dredged material when transported upon public roadways shall have no free liquid (as determined by the Paint Filter Test) and be covered to minimize fugitive dusts (unless transported in vehicles specifically designed to haul liquid materials) ○ provides standards for management of dredged material at Disposal Sites under 310 CMR 40.0000 ○ the dredging, management and placement of dredged material shall be performed pursuant to 310 CMR 40.0000 and 314 CMR 9.00 – a copy of the RAP shall be included in the application for the 401 Water Quality Certification ○ for dredged material going to out-of-state management facilities, the applicant shall demonstrate to the Department that this alternative is approved by the receiving state 	<p>The Comprehensive Response Action will include dredging as a component. Consistent with 310 CMR 40.0851 of the MCP, as part of the selection of the Comprehensive Remedial Action Alternative, feasible alternative to dredging will be considered and evaluated. During the performance of the Comprehensive Response Action, work will be conducted in a manner that ensure protection of human health, public safety, public welfare, and the environment. Dredged materials will be managed and transported in accordance with a Waste Management Plan that will be prepared as part of the design.</p>
Administration of Waterways Licenses Law	91 MGL 1.00 et seq.; 310 CMR 9.00	Applicable	<p>Criteria for work within Great Ponds, which are defined as any ponds which contain more than 10 acres in its natural state. Applicable provisions are listed below:</p> <p>9.05 (2): Any dredging activity requires submitting a permit application to the Department in accordance with 310 CMR 9.11.</p> <p>9.33: All projects must comply with the environmental regulatory programs listed in this section.</p>	<p>Temporary unavoidable impacts to public access rights to the water and to water dependent users will occur during remedial activities.</p>

Table 8-3. Regulatory Requirements Summary

Requirement	Citation	Status	Synopsis	Actions to be Taken to Attain ARAR
Administration of Waterways Licenses Law (continued)			9.40: Provides standards for dredging and dredge material management. Some of the requirements include: <ul style="list-style-type: none"> • no activity shall occur in areas with anadromous/ catadromous fish runs between March 15 and June 15 of any year, except upon a determination by the Division of Marine Fisheries • in general, no basin, canal, or channel shall be dredged deeper than the main channel to which it is connected • hydraulic dredging shall be favored over mechanical methods • the licensee shall inform the Department at least 3 days before commencing any authorized dredging or dredged material disposal • the licensee shall provide a dredging inspector approved by the Department who shall accompany the dredged material while in transit and during discharges for the following activities: <ul style="list-style-type: none"> ○ Any onshore disposal of dredged material greater than 10,000 cubic yards; or ○ The disposal of materials defined by the Department as potentially degrading or hazardous • the name, address, and qualifications of the dredging inspector shall be submitted to the Department as part of the license application • within 30 days after completion of the dredging, a report shall be submitted to the Department certified by the dredging inspector, including daily logs indicating the volume of dredged material, point of origin, point of destination and other appropriate information 	The dredging and dredge material management activities will require submission of Permit Application to the Department
Air Pollution Control	111 MGL 142A-J; 310 CMR 7.09(1-4); 7.10(1-2)	Applicable	Standards for, among other things, fugitive dust, excessive odor, and noise at construction sites. Pollution abatement controls may be required.	Engineering controls will be used as necessary to meet air action levels for dust, odor and noise. During dredging activities work will be performed by underwater excavation of sediments, which will be discharged as a slurry via pipeline and no dust is expected. During upland excavation, controls such as water spraying may be utilized to control dust.
Ambient Air Quality Standards	111 MGL 142D; 310 CMR 6.04(2)	Applicable	Establishes ambient air level for contaminants and particulates.	Emissions during construction will meet the particulate standard. Dust suppression will be used to reduce particulate emissions.
Noise Control	310 CMR 7.10(1) & (2)	Applicable	Activities must not cause or contribute to unnecessary emissions that may cause noise.	Engineering controls will be used during remedial construction such that the activities do not cause or contribute to unnecessary noise emissions.
Air Quality Guidelines	MADEP Memorandum dated 12/6/1995	To be considered	Provides short-term and long-term exposure point concentrations for air contaminants that were developed to be protective of public health.	Compliance with these guidelines will be ensured through an ambient air monitoring program that is designed to protect the public.
Allowable Sound Emissions	DAQC Policy 90-001; 2/1/90	To Be considered	Establishes guideline where source of new noise should not emit more than 10 decibels above the existing (background) level.	Site operations noise level will be minimized and will follow the suggested noise limit to the extent practicable.

Table 8-3. Regulatory Requirements Summary

Requirement	Citation	Status	Synopsis	Actions to be Taken to Attain ARAR
Massachusetts Stormwater Management Policy	131 MGL 40; 310 CMR 10	To Be considered	Regulates work conducted within coastal and inland wetlands and riverfront areas. For construction activities, the regulated area is 25 feet inland from the riverfront and the land subject to coastal storm flowage.	The project-specific Environmental Protection Plan will be reviewed for consistency with the policy requirements.

Notes:

- ARAR – applicable or relevant and appropriate requirement
- CFR – Code of Federal Regulations
- CMR – Code of Massachusetts Regulations
- MassDEP – Massachusetts Department of Environmental Protection
- MCP – Massachusetts Contingency Plan
- MGL – Massachusetts General Laws
- USC – United States Code

Table 8-4. Summary of Detailed Evaluation of Site-wide Alternatives

Alternative	Description	1. Effectiveness			2. Reliability		3. Implementing Difficulty						4. Cost			5. Risks			6. Benefits				7. Timeliness	8. Aesthetics
		a. Achieving a Temporary or Permanent Solution ^a	b. Reusing, recycling, destroying, detoxifying, or treating at disposal site	c. Reducing hazardous material to concentrations that achieve or approach background	a. Degree of certainty that alternative will be successful	b. Effectiveness of any measures required to manage residues or remaining wastes or control emissions or discharges to the environment.	a. Technical complexity	b. Integration with existing facilities.	c. Monitoring, maintenance, operations, and accessibility requirements or limitations	d. Availability of necessary services, materials, equipment, or specialists	e. The availability, capacity and location of necessary off-site treatment, storage, and disposal facilities.	f. Meets regulatory requirements for any likely approvals, permits or licenses required by the Department, or other state, federal, or local agencies	a. Cost of implementing including: design, construction, equipment, site preparation, labor, permits, disposal, operation, maintenance, and monitoring	b. Cost of environmental restoration, potential damages to natural resources	c. The relative consumption of energy resources in the operation of the alternatives, externalities associated with the use of those resources.	a. The short-term on-site and off-site risks posed during implementation of the alternative associated with any excavation, transport, disposal containment, construction, operations or maintenance activities, or discharges to the environment form remedial systems.	b. On-site and off-site risks posed over the period of time required for the alternative to attain applicable remedial standards, including the risks associated with ongoing transport, disposal, containment, operation or maintenance activities, or discharges from remedial systems.	c. Potential risk of harm to health, safety, public welfare or the environment posed to human or environmental receptors after completion of the alternative.	a. Benefit of restoring natural resources.	b. Providing for the productive reuse of the Site	c. The avoided costs of relocation of people, businesses, or providing alternative water supplies	d. The avoided lost value of the Site	a. The comparative timeliness to achieve a level of No Significant Risk ^b .	a. The relative effect of the alternatives upon non-pecuniary interests, such as aesthetic values.
1	Monitoring and Non-Engineering Measures	5	5	5	95	0	95	NA	95	90	100	90	95	100	95	95	95	5	5	5	NA	5	5	95
2	Targeted Removal to Address Soil and Groundwater UCLs and ECC Sediments	10	90	10	90	20	90	NA	85	80	95	60	90	95	90	85	85	10	10	10	NA	10	10	90
3	Targeted Removal to Address Soil and Groundwater UCLs and Limited Removal of Sediments to Meet Human Health and Ecological THg PRGs (Overall Sediment SWA < 22.2 mg/Kg THg)	40	50	40	80	75	80	NA	60	60	80	50	60	80	80	75	75	30	30	30	NA	30	30	80
4	Targeted Removal to Address Soil and Groundwater UCLs, Intermediate Range Soil Removal to Address Human Health and Ecological Risks not Co-located with UCL Exceedances and Limited Removal of Sediments to Meet Human Health and Ecological THg PRGs in Each Sediment RCA (Sediment SWA < 22.2 mg/Kg THg in Each Sediment RCA)	50	25	50	70	85	70	NA	50	40	45	40	30	50	50	50	50	60	60	60	NA	60	60	40
5	Approaching Background	95	10	95	50	95	50	NA	20	5	5	10	5	5	5	5	5	95	95	95	NA	95	95	5

Notes:

NA = Not applicable to the evaluation criteria

a. Permanent of Temporary Solution discussed in MCP 310 CMR 40.1000

b. No Significant Risk described in MCP CMR 40.0900

Table 8-5. Comparative Analysis of Site-wide Alternatives

		Evaluation Criteria								
		1. Effectiveness	2. Reliability	3. Implementing Difficulty	4. Cost	5. Risks	6. Benefits	7. Timeliness	8. Aesthetics	Totals
Alternative	Description	Values below are Weighted Results from Detailed Evaluation (Table 8.3)								
1	Monitoring and Non-Engineering Measures	5	48	94	97	65	5	5	95	413
2	Targeted Removal to Address Soil and Groundwater UCLs and ECC Sediments	37	55	82	92	60	10	10	90	435
3	Targeted Removal to Address Soil and Groundwater UCLs and Limited Removal of Sediments to Meet Human Health and Ecological THg PRGs (Overall Sediment SWA < 22.2 mg/Kg THg)	43	78	66	73	60	30	30	80	460
4	Targeted Removal to Address Soil and Groundwater UCLs, Intermediate Range Soil Removal to Address Human Health and Ecological Risks not Co-located with UCL Exceedances and Limited Removal of Sediments to Meet Human Health and Ecological THg PRGs in Each Sediment RCA (Sediment SWA < 22.2 mg/Kg THg in Each Sediment RCA)	42	78	49	43	53	60	60	40	425
5	Approaching Background	67	73	18	5	35	95	95	5	392

Table 8-6. No Risk Index of Human Health and Ecological Receptors Compared to Site-Wide Remedial Alternatives for Soil and Sediment

	Size (acres)	Site-Wide Alternative 0 - No Action				Site-Wide Alternative 1				Site-Wide Alternative 2				Site-Wide Alternative 3				Site-Wide Alternative 4				Site-Wide Alternative 5			
		Human Health		Ecological		Human Health		Ecological		Human Health		Ecological		Human Health		Ecological		Human Health		Ecological		Human Health		Ecological	
		# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area	# of Receptors Not at Risk	Total # of Receptors Assessed for Area
SOIL RISK ASSESSMENT AREA																									
Upper North Area	46.3	4	4	N/A	N/A	4	4	N/A	N/A	4	4	N/A	N/A	4	4	N/A	N/A	4	4	N/A	N/A	4	4	N/A	N/A
Lower North Area	7.7	4	4	N/A	N/A	4	4	N/A	N/A	4	4	N/A	N/A	4	4	N/A	N/A	4	4	N/A	N/A	4	4	N/A	N/A
Central Commercial Area	27.9	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4
Potential Greenway Area	8.7	3	3	3	4	3	3	3	4	3	3	3	4	3	3	3	4	3	3	4	4	3	3	4	4
Southern Conservation Commission Area	25.4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	3	4	4	4	4	4	4	4	4	4
Marsh Upland Area	2.5	3	4	0	4	3	4	0	4	3	4	0	4	3	4	0	4	3	4	0	4	4	4	4	4
Southern Disposal Area	2.2	0	4	0	4	0	4	0	4	0	4	1	4	0	4	1	4	4	4	4	4	4	4	4	4
Subtotal	120.7	22	27	9	20	22	27	9	20	22	27	10	20	22	27	10	20	26	27	15	20	27	27	19	20
No Risk Index - Not Area Weighted		81%		45%		81%		45%		81%		50%		81%		50%		96%		75%		100%		95%	
No Risk Index - Area Weighted		98%		39%		98%		39%		98%		39%		98%		39%		99%		47%		100%		49%	
SEDIMENT RISK ASSESSMENT AREA																									
Eastern Channel Corridor	2.4	0	2	0	9	0	2	0	9	2	2	7	9	2	2	7	9	2	2	7	9	2	2	7	9
Upper Drinkwater River Corridor	2.0	5	5	9	9	5	5	9	9	5	5	9	9	5	5	9	9	5	5	9	9	5	5	9	9
Lower Drinkwater River Corridor	2.7	4	5	3	9	4	5	3	9	4	5	3	9	5	5	7	9	5	5	7	9	5	5	7	9
Lilly Pond / Upper Factory Pond Area	26.5	2	3	3	9	2	3	3	9	2	3	3	9	3	3	6	9	3	3	6	9	3	3	7	9
Middle / Lower Factory Pond Area	26.4	3	3	4	9	3	3	4	9	3	3	4	9	3	3	4	9	3	3	6	9	3	3	7	9
Marsh Upland Area	2.5	2	2	3	5	2	2	3	5	2	2	4	5	2	2	4	5	2	2	5	5	2	2	0	0
Subtotal	62.5	16	20	22	50	16	20	22	50	18	20	30	50	20	20	37	50	20	20	40	50	20	20	37	45
No Risk Index - Not Area Weighted		80%		44%		80%		44%		90%		60%		100%		74%		100%		80%		100%		82%	
No Risk Index - Area Weighted		81%		40%		81%		40%		85%		44%		100%		60%		100%		70%		100%		75%	

Notes
N/A = Not Applicable