

**Table 1-3:** This chemical-specific ARARs table presents a comparison of the ROD-specified standards (1988) to current (1993) standards for surface water chemicals of concern.

**Table 1-4:** This table compares groundwater, leachate, and residential well monitoring results with current (1993) standards. The standards and criteria are derived from Table 1-2.

**Table 1-5:** In this table, Massachusetts Method 1 soil standards (MCP, July 1993) are presented. These soil standards have been selected as being applicable to the site. The standards apply to areas underlain by usable groundwater where the soil exposure route is low, i.e., subsurface soils, low intensity land use, or mixed frequency and intensity land use by adults only.

**Table 1-6:** This table compares sediment sampling results with available sediment guidelines or criteria.

**Table 1-7:** Potential location-specific ARARs and guidance identified in the ROD are presented.

**Table 1-8:** Potential action-specific ARARs and guidance identified in the ROD are re-evaluated. The re-evaluation includes a determination of whether the rule is currently ARAR or TBC.

For future use, a summary of 1993 ARARs as determined by this review is provided as Appendix B.

Overall, many of the ARARs have changed since ROD completion in 1988. What follows is a summary of newly promulgated or modified state and federal requirements.

**1.3.3.1 Chemical-Specific ARARs.** Standards specified by the various chemical-specific ARARs have undergone significant revision since ROD completion in 1988. These revisions are reflected in the tables accompanying this text. For future use, a summary of 1993 ARARs as determined by this review is provided as Appendix B.

Newly promulgated chemical-specific requirements include the Massachusetts Contingency Plan (MCP). The MCP, as revised (July, 1993), lists numerical standards for both soil and

**TABLE 1-3. COMPARISON OF ROD-SPECIFIED NUMERICAL, CHEMICAL-SPECIFIC ARARS AND CRITERIA<sup>A</sup> FOR SURFACE WATER AND SEDIMENT CHEMICALS OF CONCERN<sup>B</sup>, CHARLES GEORGE LANDFILL, MASSACHUSETTS**  
(All criteria in mg/L)

COC <sup>B</sup>	AMBIENT WATER QUALITY CRITERIA <sup>C</sup>			
	Aquatic Life <sup>D</sup>			
	Acute		Chronic	
	1988	1993	1988	1993
2-butanone (MEK)	--	--	--	--
toluene	17.5 <sup>F</sup>	17.5 <sup>F</sup>	--	--
acetone	--	--	--	--
benzene	5.3 <sup>F</sup>	5.3 <sup>F</sup>	--	--
4-methyl,2-pentanone	--	--	--	--
ethylbenzene	32 <sup>F</sup>	32 <sup>F</sup>	--	--
1,1-dichloroethene	--	--	--	--
trichloroethene	--	45 <sup>F</sup>	--	21.9 <sup>F</sup>
benzoic acid	--	--	--	--
4-methylphenol	--	--	--	--
2-methylphenol	--	--	--	--
phenol	--	10.2 <sup>F</sup>	--	2.56 <sup>F</sup>
PAHs	--	--	--	--
bis(2-ethylhexyl) phthalate	0.94 <sup>F</sup>	0.94 <sup>F</sup>	0.003 <sup>F</sup>	0.003 <sup>F</sup>
arsenic (trivalent)	0.36	0.36	0.19	0.19
arsenic (pentavalent)	0.85	0.85	0.048	--
chromium (III)	--	1.7 <sup>H</sup>	--	0.21 <sup>H</sup>
chromium (VI)	--	0.016	--	0.011
copper	--	0.018 <sup>H</sup>	--	0.012 <sup>H</sup>
mercury	--	2.4E-3	--	1.2E-5
cadmium	3.9E-3 <sup>H</sup>	3.9E-3 <sup>H</sup>	1.1E-3 <sup>H</sup>	1.1E-3 <sup>H</sup>

**TABLE 1-3 (Continued). COMPARISON OF ROD-SPECIFIED NUMERICAL, CHEMICAL-SPECIFIC ARARS AND CRITERIA<sup>A</sup> FOR SURFACE WATER AND SEDIMENT CHEMICALS OF CONCERN<sup>B</sup>, CHARLES GEORGE LANDFILL, MASSACHUSETTS (All criteria in mg/L)**

COC <sup>B</sup>	AMBIENT WATER QUALITY CRITERIA <sup>C</sup>			
	Water Only 1988	Public Health <sup>E</sup>		Water & Fish Ing. 1993
		1988	Fish Consumption 1988	
2-butanone (MEK)	--	--	--	--
toluene	15	424	<b>300</b>	10
acetone	--	--	--	--
benzene	6.7E-4	0.040	<b>7.1E-2</b>	1.2E-3
4-methyl,2-pentanone	--	--	--	--
ethylbenzene	2.4	3.28	<b>29</b>	3.1
1,1-dichloroethene	--	--	<b>3.2E-3</b>	5.7E-5
trichloroethene	--	--	<b>8.1E-2</b>	2.7E-3
benzoic acid	--	--	--	--
4-methylphenol	--	--	--	--
2-methylphenol	--	--	--	--
phenol	--	--	<b>4600</b>	21
PAHs	--	--	<b>3.11E-5</b>	2.8E-6
bis(2-ethylhexyl) phthalate	15	50	<b>5.9E-3</b>	1.8E-3
arsenic (trivalent)	2.5E-6	--	<b>0 (1.8x10<sup>-6</sup>)</b>	0 (1.4x10 <sup>-4</sup> )
arsenic (pentavalent)	2.5E-6	--	--	--
chromium (III)	--	--	<b>670</b>	33
chromium (VI)	--	--	<b>0.17</b>	3.4
copper	--	--	--	1.3
mercury	--	--	<b>1.5E-4</b>	1.4E-4
cadmium	1.1E-2	--	<b>0.17</b>	1.0E-2

<sup>A</sup> This table provides an update of the surface water regulatory criteria identified in Table 2-1 of the feasibility study (EBASCO, 1988) regulations and criteria.

<sup>B</sup> Chemicals of Concern (COCs) drawn from 1988 Record of Decision, Table 6, entitled *CGL Contaminants of Concern - Phase III*. ROD-specified criteria are from Table 2-1 of the Draft Final Feasibility Study Report, Charles George Landfill (EBASCO, 1988).

<sup>C</sup> Ambient Water Quality Criteria (AWQC). From Code of Massachusetts Regulation, Title 314, Section 4.05(5)(e) and/or U.S. Environmental Protection Agency, 57 FR 60848, December 22, 1992.

<sup>D</sup> Acute criteria are one-hour average concentrations not to be exceeded more than once every three years. Chronic criteria are four-day average concentrations not to be exceeded more than once every three years. Freshwater criteria are shown.

<sup>E</sup> The criterion value of zero for potential carcinogens is listed in the table. Concentrations in the parenthesis for potential carcinogens correspond to a risk of 10<sup>-6</sup>. The U.S. EPA no longer calculates for a water only criterion - the Safe Drinking Water Act MCL would be the ARAR for drinking water.

<sup>F</sup> Value represented is the Lowest Observed Effect Level.

<sup>H</sup> Hardness-dependent criteria (100 mg/L as CaCO<sub>3</sub> used).

Shading indicates the value has been updated since 1988.

TABLE 1-4. 1993 COMPARISON OF NUMERICAL, CHEMICAL-SPECIFIC ARARS AND CRITERIA FOR GROUNDWATER AND LEACHATE CHEMICALS OF CONCERN WITH ANALYTICAL RESULTS<sup>1</sup>, CHARLES GEORGE LANDFILL, MASSACHUSETTS (All criteria in µg/L)

CHEMICAL	Most Stringent GW		Groundwater Results			Leachate Results			Residential Wells		
	ARAR	TBC	Max.	Min.	# Hits	Max.	Min.	# Hits	Max.	Min.	# Hits > ARAR
<b>COC<sup>B</sup></b>											
acetone	300 <sup>H</sup>	300 <sup>F</sup>	140	2	27/48	96	ND	1/6	4	3	0
benzene	5 <sup>C, G, H</sup>	0 <sup>I</sup>	1,300	1	24/48	3	ND	1/9			
benzoic acid	--	--	See note 2.								
2-butanone (MEK)	350 <sup>H</sup>	350 <sup>F</sup>	300	2	8/43						
1,1-dichloroethene	7 <sup>C, G, H</sup>	7 <sup>D(Lifetime), I</sup>	ND	ND	0/48						
ethylbenzene	700 <sup>C, G, H</sup>	700 <sup>I, D(Lifetime)</sup>	1,800	1	16/48	1.4	ND	1/9			
4-methyl,2-pentanone	--	--	31	ND	2/48						
4-methylphenol	--	--	See note 2.								
2-methylphenol	--	--	See note 2.								
phenol	400 <sup>H</sup>	400 <sup>D(Lifetime)</sup>	See note 2.								
toluene	1,000 <sup>C, G, H</sup>	340 <sup>D(Lifetime)</sup>	21	2	11/48	2	ND	1/9			
trichloroethene	5 <sup>C, G, H</sup>	0 <sup>I</sup>	8	1	6/48						
arsenic	50 <sup>C, E, G, H, J</sup>	50 <sup>I</sup>	348	3.2	35/43	14	ND	8/11	13	1.9	0
cadmium	5 <sup>C, G, H</sup>	5 <sup>I, D(Lifetime)</sup>	5.6	1	7/43	ND	ND	0/11			
chromium (total)	50 <sup>E, J</sup>	100 <sup>I</sup>	54	7.4	18/43	28	ND	3/11			
copper	1,000 <sup>E</sup>	1,300 <sup>I</sup>	78.8	3.8	18/39	31	ND	2/11	910	4	0
mercury	2 <sup>C, G, H, J</sup>	2 <sup>D(Lifetime), I</sup>	0.36	0.12	6/43	ND	ND	0/10			
<b>Other Chemicals<sup>K</sup></b>											
1,2-dichloroethane	5 <sup>C, G, H</sup>	0 <sup>C</sup>	13	1	10/48						
methylene chloride	5 <sup>C, H</sup>	0 <sup>C</sup>	93	1	13/48 <sup>See note 3.</sup>	526	ND	1/9	2	2	0
antimony	6 <sup>C, H</sup>	3 <sup>D(Lifetime)</sup>	94.1	60	1/43 <sup>See note 3.</sup>	380	ND	2/11	42	27	3
lead	15 <sup>G, H</sup>	0 <sup>C</sup>	49.3	1	24/43	18	ND	6/11	1600	1	14
nickel	100 <sup>H</sup>	100 <sup>F, D(Lifetime)</sup>	128	12.5	25/43	53	ND	9/11	85	7	0
thallium <sup>See note 4</sup>	2 <sup>C, G</sup>	0.4 <sup>D (Lifetime)</sup>	NA	NA	NA	ND	ND	0/2			
1,4-dioxane <sup>See note 4</sup>	--	50 <sup>F</sup>	11,000	ND	4/70	ND	ND	0/2			
tetrahydrofuran <sup>See note 4</sup>	--	1,300 <sup>F</sup>	94	ND	49/85	ND	ND	0/2			

Notes:

1. This table compares the most stringent ARARs and TBC, from Table 1-2, to analytical results from sampling conducted between August 1990 and November 1992, except where noted.
2. Although this constituent was identified in the ROD as a chemical of concern, the monitoring program did not include analysis for this compound.
3. Detection limits in most cases were equal to or higher than the SDWA MCL. Specifically: for antimony, 32/33 samples had detection limits greater than the MCL; for methylene chloride, only 5/40 samples had detection limits lower than the MCL.
4. Not all of the historical data was available at the time of printing. Thallium, 1,4-dioxane and tetrahydrofuran results shown are from November 1989 - August 1990 analytical data. NA = not analyzed.

**TABLE 1-4 (Continued). 1993 COMPARISON OF NUMERICAL, CHEMICAL-SPECIFIC ARARS AND CRITERIA FOR GROUNDWATER AND LEACHATE CHEMICALS OF CONCERN WITH ANALYTICAL RESULTS<sup>1</sup>, CHARLES GEORGE LANDFILL, MASSACHUSETTS (All criteria in  $\mu\text{g/L}$ )**

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**Sources:**

- <sup>B</sup> Chemicals of Concern (COCs) are drawn from 1988 Record of Decision, Table 6, entitled *CGL Contaminants of Concern - Phase III*. 1988).
- <sup>C</sup> Federal Safe Drinking Water Act, Maximum Contaminant Levels (MCLs). 40 CFR 141, National Primary Drinking Water Standards.
- <sup>D</sup> U.S. Environmental Protection Agency, Drinking Water Regulations and Health Advisories, December 1992. One-day, ten-day, longer-term advisories are for 10 kg child; lifetime advisory is for 70 kg adult.
- <sup>E</sup> The standards listed are under both sets of Massachusetts Department of Environmental Protection Division of Water Pollution Control regulations and are based on Class I and II groundwaters. 314 CMR 5.10, Groundwater Discharge Program, water quality based effluent limitations (primary and secondary). Toxic pollutants without listed limits are subject to Health Advisory criteria. 314 CMR 6.06, Groundwater Quality Standards, minimum groundwater quality criteria for Class I and II.
- <sup>F</sup> Massachusetts Department of Environmental Protection, Office of Research and Standards Guidelines, drinking water guidelines. Autumn 1994.
- <sup>G</sup> Massachusetts Department of Environmental Protection, 310 CMR 22.00, Drinking Water Regulations, maximum contaminant levels.
- <sup>H</sup> Massachusetts Contingency Plan, 310 CMR 40.0974(2) Table 1, Method 1 Groundwater Standards per 310 CMR 40.0932.
- <sup>I</sup> Federal Safe Drinking Water Act, Maximum Contaminant Goals (MCLGs). 40 CFR 141, National Primary Drinking Water Standards.
- <sup>J</sup> Federal Resource Conservation and Recovery Act (RCRA) groundwater protection standards specified at 40 CFR 264.94.
- <sup>K</sup> Other chemicals listed, although not identified in the 1988 ROD as chemicals of concern, were analyzed as being present at levels greater than MCLs during sampling between 8/90 and 11/92.
- \* An action level of 1.3 mg/L for copper and 0.0015 mg/L for lead is provided for in the SDWA regulations. These levels are not MCLs.

**TABLE 1-5. NUMERICAL, CHEMICAL-SPECIFIC ARARS FOR SOIL,  
CHARLES GEORGE LANDFILL, MASSACHUSETTS (All criteria in  $\mu\text{g}/\text{kg}$ )**

CHEMICAL	MCP METHOD 1 SOIL STANDARDS <sup>A</sup>
acetone	3,000
benzene	10,000
benzoic acid	--
bis(2-ethylhexyl)phthalate	100,000
2-butanone (MEK)	300
di-n-butylphthalate	--
1,1-dichloroethene	700
ethylbenzene	80,000
fluoranthene	600,000
4-methyl,2-pentanone	--
4-methylphenol	--
2-methylphenol	--
phenanthrene	700,000
phenol	60,000
pyrene	500,000
toluene	90,000
trichloroethene	400
arsenic	30,000
cadmium	80,000
chromium (total)	5,000,000
copper	--
mercury	60,000

**Notes:**

<sup>A</sup> Massachusetts Contingency Plan, 310 CMR 40.0975(6)(c), Table 4, applicable to soil where the combination of soil and groundwater categories are S-3 soil and GW-1 groundwater.

**TABLE 1-6. 1993 COMPARISON OF NUMERICAL, CHEMICAL-SPECIFIC CRITERIA FOR  
SEDIMENT CHEMICALS OF CONCERN WITH ANALYTICAL RESULTS<sup>1</sup>,  
CHARLES GEORGE LANDFILL, MASSACHUSETTS (All criteria in  $\mu\text{g}/\text{Kg}$ )**

CHEMICAL	Ecological Sediment Criteria <sup>2</sup>	Sediment Results		
		Max.	Min. #Hits/#Samples	
acetone	--	7.78	7.78	1/7
benzene	--	0.32	0.28	2/7
benzoic acid	--	ND	ND	0/7
bis(2-ethylhexyl) phthalate	3,600 <sup>4</sup>	1.2	0.61	4/7
2-butanone (MEK)	--	ND	ND	0/7
1,1-dichloroethene	--	see note 3		
di-n-butylphthalate	--	0.43	0.43	1/7
ethylbenzene	--	ND	ND	0/7
fluoranthene	600	0.68	0.43	3/7
4-methyl,2-pentanone	--	ND	ND	0/7
4-methylphenol	--	ND	ND	0/7
2-methylphenol	--	ND	ND	0/7
phenanthrene	225	0.58	0.40	3/7
phenol (total)	18 <sup>4</sup>	ND	ND	0/7
pyrene	350	0.60	0.40	4/7
toluene	--	0.28	0.18	2/7
trichloroethene	--	see note 3		
arsenic	3,000	7,500	3.1	4/7
cadmium	800	5,400	1.4	7/7
chromium (total)	25,000	22,000	8.9	7/7
copper	19,000	14,000	1.9	7/7
mercury	110	180	0.13	4/7
lead	27,000	34,000	5.4	5/7
nickel	20,000	22,000	6.6	7/7

**Notes:**

1. This table compares the most stringent ARARs, (see Section 1.4.2) to analytical results from sampling conducted between 1988 and 1992. Chemicals of Concern (COCs) are drawn from 1988 Record of Decision, Table 6, entitled *CGL Contaminants of Concern - Phase III, 1988*.
2. See Section 1.4.2 for references and criteria description. None of these criteria are considered ARARs.
3. Although this constituent was identified in the ROD as a chemical of concern, the monitoring program did not include analysis for this compound.
4. Based on total organic carbon content of 3%.

**TABLE 1-7  
POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE  
CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

SITE FEATURE and AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS and CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
<u>Wetlands</u>				
Federal Regulatory Requirements	Clean Water Act (CWA) - (40 CFR Part 230)	Applicable	Under this requirements, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available.  During identification, screening, and evaluation of alternatives, the effects on wetlands are evaluated.	This ARAR has not been met. Adversely impacted wetlands have not been restored or mitigated.
	Fish and Wildlife Coordination Act (16 U.S.C. 661)	Applicable	This regulation requires that any federal agency proposing to modify a body of water must consult with the U.S. Fish and Wildlife Service. This requirement is addressed under CWA Section 404 requirements.	This ARAR was met; consultation occurred as part of the RI/FS process.
State Regulatory Requirements	Massachusetts Wetlands Protection (310 CMR 10.00)	Applicable	These requirements are promulgated under Wetlands Protection Laws, which regulate dredging, filling, altering, or polluting inland wetlands. Work within 100 feet of a wetland is regulated under this requirement. The requirement also defines wetlands based on vegetation type and requires that effects on wetlands be mitigated.  If alternatives require that work be completed within 100 feet of a defined wetland, these regulations will be considered. Mitigation of impacts on wetlands will be addressed under CWA 404.	This ARAR has not been met. Adversely impacted wetlands have not been restored/mitigated.
	Hazardous Waste Facility Siting Regulations (990 CMR 1.00)	Relevant and Appropriate	These regulations outline the criteria for the construction, operation, and maintenance of a new facility or increase in an existing facility for the storage, treatment, or disposal of hazardous waste. Specifically, no portion of the site may be located within a wetland or bordering a vegetated wetland. These regulations will be addressed during the design phase of the treatment facility construction.	This ARAR was not met. Facility impacted approximately 1.5 acres of wetlands without apparent mitigation.

**TABLE 1-7 (continued)**  
**POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

SITE FEATURE and AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS and CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
Federal Requirements to be Considered	Wetlands Executive Order (EO 11990)	To Be Considered	<p>Under this regulation, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands.</p> <p>Many of the requirements of this EO will be addressed under CWA Section 404. Any remaining requirements will also be considered during the identification, screening, and evaluation of alternatives.</p>	This ARAR has not been met. Adversely impacted wetlands have not been restored/mitigated.
<u>Floodplains</u>				
Federal Regulatory Requirements	RCRA Location Standards 40 CFR 264.18(b)	Relevant and Appropriate	None	RCRA-defined listed or characteristic hazardous waste (40 CFR 261) facility must be designed, constructed, operated, and maintained to prevent washout by 100-year flood.
	Executive Order 11988; Clean Water Act (40 CFR 6.302(b), Appendix A)	Applicable	None	Federal agencies shall take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values of floodplains. Federal agencies shall also evaluate potential effects of actions in floodplains and ensure consideration of flood hazards and floodplain management. If action is taken in floodplains, alternatives to avoid adverse effects, incompatible development, and minimize potential harm must be taken.

**TABLE 1-7 (continued)**  
**POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

SITE FEATURE and AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS and CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
State Regulatory Requirements	Massachusetts Wetlands Protection (310 CMR 10.57 (2), 10.04)	Applicable	None	Actions in "bordering land subject to flooding" shall provide compensatory storage for flood storage volume lost as a result of the project, shall not restrict flows so as to cause an increase in flood stage or velocity, and shall not impair its capacity to provide important wildlife habitat functions or alter vernal pool habitat. Actions in "isolated land subject to flooding" shall not result in flood damage because of lateral displacement of water that would otherwise be confined within the area, adverse effects on water supply, adverse effects on the capacity of the area to prevent groundwater pollution, or adverse effects on vernal pool habitat.
	Massachusetts Hazardous Waste Facility Location Standards (310 CMR 30.701)	Relevant and Appropriate	None	Active portions of new treatment or storage facilities are prohibited within the boundary of land subject to flooding from the statistical 100-year frequency storm. Active portion of surface impoundments are prohibited within the boundary of land subject to flooding from the statistical 500-year frequency storm.

**TABLE 1-7 (continued)  
 POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE  
 CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

SITE FEATURE and AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS and CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
<u>Landfill and Leachate Ponds</u>				
Federal Regulatory Requirements	RCRA - Standards for Owners and Operators of Permitted Hazardous Waste Facilities (40 CFR 264.10-264.18)	Relevant and Appropriate	General facility requirements outline waste analysis, security measures, and training requirements.  Treatment residuals from the wastewater treatment facility will be disposed according to RCRA Subtitle C.	This action-specific ARAR is discussed in Table 1-8.
	RCRA - Preparedness and Prevention (40 CFR 264.30-264.37)	Relevant and Appropriate	This regulation outlines safety equipment and spill control requirements for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated so that the possibility of an unplanned release which could threaten public health or the environment is minimized.  RCRA requirements must be considered when evaluating extensions to the present landfill.	This action-specific ARAR is discussed in Table 1-8.
	RCRA - Contingency Plan and Emergency Procedures (40 CFR 264.50-264.56)	Relevant and Appropriate	This regulation outlines requirements for emergency procedures to be used following explosions and fires. This regulation also requires that threats to public health and the environment be minimized.  RCRA requirements must be considered when evaluating extensions to the present landfill.	This action-specific ARAR is discussed in Table 1-8.

**TABLE 1-7 (continued)**  
**POTENTIAL LOCATION-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

SITE FEATURE and AUTHORITY	REQUIREMENT	ROD STATUS	ROD REQUIREMENT SYNOPSIS and CONSIDERATION IN RI/FS	FIVE-YEAR REVIEW
<u>Landfill and Leachate Ponds (contd.)</u>	RCRA - Groundwater Protection (40 CFR 264.90-264.109)	Relevant and Appropriate	<p>Under this regulation, groundwater monitoring program requirements are outlined.</p> <p>A groundwater monitoring system must be installed as part of any alternative. During site characterization, the location and depth of monitoring wells will be evaluated for use in this monitoring program.</p>	This action-specific ARAR is discussed in Table 1-8.
	RCRA - Closure and Post-Closure (40 CFR 264.110-264.120)	Relevant and Appropriate	<p>This requirement details the specific requirements for closure and post-closure of hazardous waste facilities.</p> <p>A post-closure plan is currently being developed for the site by EPA.</p>	This action-specific ARAR is discussed in Table 1-8.
State Regulatory Requirements	DEQE - Hazardous Waste Regulations, Phase I and II	Relevant and Appropriate	<p>These regulations provide a comprehensive program for the handling, storage, and recordkeeping at hazardous waste facilities. They supplement RCRA regulations.</p> <p>Because these requirements supplement RCRA hazardous waste regulations, they must also be considered at the site.</p>	This action-specific ARAR is discussed in Table 1-8.

**TABLE 1-8  
POTENTIAL ACTION-SPECIFIC ARARS  
CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
<b>Federal Regulatory Requirements</b>			
RCRA - Standards for Owners and Operators of Permitted Hazardous Waste Facilities (40 CFR 264.10 - 264.18)	General facility requirements outline general waste analysis, security measures, inspections, and training requirements - <b>Relevant and Appropriate</b>	All facilities on-site will be constructed, fenced, posted, and operated in accordance with this requirement. All workers will be properly trained. Process wastes will be evaluated for the characteristics of hazardous wastes to assess further requirements. Treatment residuals from wastewater treatment will be disposed of according to RCRA Subtitle C.	These requirements remain relevant and appropriate, and are being complied with.
RCRA - Preparedness and Prevention (40 CFR 264.30-264.37)	This regulation outlines safety equipment and spill control requirements for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated so that the possibility of an unplanned release which could threaten public health or the environment is minimized - <b>Relevant and Appropriate.</b>	Safety and communication equipment will be installed at the site; local authorities will be familiarized with site operations. RCRA requirements must be considered when evaluating extensions to the present landfill.	These requirements remain relevant and appropriate, and are being complied with.
RCRA - Contingency Plan and Emergency Procedures (40 CFR 264.50-264.56)	This regulation outlines the requirements for emergency procedures to be used following explosions, fires, etc. This regulation also requires that threats to public health and the environment be minimized - <b>Relevant and Appropriate.</b>	Plans will be developed and implemented during site work including installation of monitoring wells, and implementation of site remedies. Copies of the plans will be kept on-site. RCRA requirements must be considered when evaluating extensions to the present landfill.	These requirements remain relevant and appropriate, and are being complied with.
RCRA - Manifesting, Recordkeeping, and Reporting (40 CFR 264.70-264.77)	This regulation specifies the recordkeeping and reporting requirements for RCRA facilities - <b>Relevant and Appropriate.</b>	Records of facility activities will be developed and maintained during remedial actions.	These requirements remain relevant and appropriate, and are being complied with.

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
RCRA - Groundwater Protection (40 CFR 264.90-264.109)	This regulation details requirements for a groundwater monitoring program to be installed at the site - <b>Relevant and Appropriate.</b>	A groundwater monitoring system must be installed as part of any alternative. During site characterization, the location and depth of monitoring wells will be evaluated for use in this monitoring program.	A groundwater monitoring program has been implemented at the site.
RCRA - Closure and Post-Closure (40 CFR 264.110-264.120)	This regulation details specific requirements for closure and post-closure of hazardous waste facilities - <b>Relevant and Appropriate.</b>	Those parts of the regulations concerned with long-term monitoring and maintenance of the site will be considered during remedial design. A post-closure plan will be developed.	A post closure plan is currently being managed by the EPA and USACE.
OSHA - General Industry Standards (29 CFR Part 1910)	This regulation specifies the 8-hour time-weighted average concentration for various organic compounds - <b>Not ARAR.</b>	Proper respiratory equipment will be worn if it is impossible to maintain the work atmosphere below the concentrations.	OSHA has promulgated standards for protection of workers at hazardous waste operations at RCRA or CERCLA sites. These regulations are designed to protect workers who would not be exposed to hazardous waste.
OSHA - Safety and Health Standards (29 CFR Part 1926)	This regulation specifies the type of safety equipment and procedures to be followed during site remediation - <b>Not ARAR.</b>	All appropriate safety equipment will be on-site. In addition, safety procedures will be followed during on-site activities.	OSHA requirements are no longer considered ARAR by the EPA as OSHA is viewed as an employee protection law rather than an "environmental" law, and as OSHA standards apply directly to all CERCLA response actions. (see Federal Register volume 55, page 8679, March 8, 1990). EPA requires compliance with the OSHA standards in the NCP (40 CFR 300.150), not through the ARAR process. OSHA standards are discussed in the Site Health and Safety Plan.
OSHA - Recordkeeping, Reporting, and Related Regulations (29 CFR 1904)	This regulation outlines the recordkeeping and reporting requirements for an employer under OSHA - <b>Not ARAR.</b>	These requirements apply to all site contractors and subcontractors and must be followed during all site work.	

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
RCRA - EPA Regulations on Land Disposal Restrictions (40 CFR 268)	This regulation outlines land disposal requirements and restrictions for hazardous wastes - <b>Relevant and Appropriate.</b>	Regulations to be phased in over the next few years require contaminated soils to be treated to the Best Demonstrated Available Technology levels before being placed or replaced on the land. Hazardous waste cannot be stored except when accumulated for recovery, treatment, or disposal. Land disposal restrictions for PAH's have not yet been developed.	Land disposal restrictions (LDR) apply (or are relevant and appropriate) only to wastes being placed on the land and not to wastes already in place. These rules may be applied only to new wastes generated on-site as a result of treatment or to wastes excavated or dredged that meet RCRA characteristics for hazardous wastes. LDR criteria have been developed for most site contaminants.
Clean Water Act - 40 CFR Parts 122, 125	Any point source discharges must meet NPDES permitting requirements, which include compliance with applicable water quality standards; establishment of a discharge monitoring system; and routine completion of discharge monitoring records. <b>Applicable.</b>	If groundwater that has been treated by on-site treatment processes is discharged to surface waters on-site, treated groundwater must be in compliance with applicable water quality standards. In addition, a discharge monitoring program must be implemented. Routine discharge monitoring records must be completed.	Leachate collection was implemented in 1991. Collected leachate is periodically treated and discharged to Bridge Meadow Brook. Discharges are monitored, although no specific monitoring program is documented. A groundwater collection and treatment program is under construction. Upon its completion, leachate treatment will be combined with groundwater treatment. A discharge monitoring program for the combined flows must then be implemented. Toxicity on surface water runoff is being conducted biannually. Any leachate breakouts that impact surface water bodies are thus being monitored. Discharges from the sedimentation basins are being monitored. Documentation of these activities is desirable.

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
CWA - 40 CFR Part 403	This regulation specifies pretreatment standards for discharges to a POTW - <b>Not ARAR.</b>	If a leachate collection system is installed and the discharge is sent to a POTW, the POTW must have an approved pretreatment program. The collected leachate runoff must be in compliance with the approved program. Prior to discharging, a report must be submitted containing identifying information, list of approved permits, description of operations, flow measurements, measurement of pollutants, certification by a qualified professional, and a compliance schedule.	No on-site wastes are currently discharging, or planned for discharge, to the POTW.
CWA - 40 CFR Part 230	This regulation outlines requirements for discharges of dredged or fill material. Under this requirement, no activity that impacts a wetland will be permitted if a practicable alternative that has less impact on the wetland is available. If there is no other practicable alternative, impacts must be mitigated - <b>Applicable</b>	During the identification, screening, and evaluation of alternatives, the effects on wetlands must be evaluated.	An evaluation of the effects of remedial actions on wetlands is on-going. Wetlands mitigation efforts will continue throughout remediation.
CAA - NAAQS for Total Suspended Particulates (40 CFR 129.105,750)	This regulation specifies maximum primary and secondary 24-hour concentrations for particulate matter - <b>Applicable.</b>	Fugitive dust emissions from site excavation activities will be maintained below 260 $\mu\text{g}/\text{m}^3$ (primary standard) by dust suppressants, if necessary.	These requirements remain applicable.
Protection of Archeological Resources (32 CFR Part 229, 229.4; 43 CFR Parts 107, 171.1-171.5)	This regulation develops procedures for the protection of archeological resources - <b>Not ARAR</b>	If archeological resources are encountered during soil excavation, work will stop until the area has been reviewed by federal and state archaeologists.	No archeological resources have been, or are expected to be encountered at the site.

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
<p>DOT Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171.1-171.5)</p> <p><b>State Regulatory Requirements</b></p>	<p>This regulation outlines procedures for the packaging, labeling, manifesting, and transportation of hazardous materials - <b>Applicable</b></p>	<p>Contaminated materials shipped off-site will be packaged, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.</p>	<p>Shipping of hazardous materials has been in compliance. A higher frequency of shipment is expected upon startup of the groundwater treatment plant.</p>
<p>Massachusetts Hazardous Waste Regulations, Phase I and II (310 CMR 30.000, MGL Ch. 21C)</p>	<p>These regulations provide a comprehensive program for the handling, storage, and recordkeeping at hazardous waste facilities. They supplement RCRA regulations - <b>Relevant and Appropriate</b></p>	<p>Because these requirements supplement RCRA hazardous waste regulations, they must also be considered at the site.</p>	<p>These requirements remain relevant and appropriate, and are being complied with.</p>
<p>Massachusetts General Laws, Ch. III, Sec. 150B</p>	<p>Under this regulation, the local board of health may require a local site assignment for hazardous waste treatment, storage, and/or disposal facilities - <b>Relevant and Appropriate</b></p>	<p>The local board of health should be made aware of any hazardous waste activities.</p>	<p>The local board of health is aware of all site activities and has been a participant in remediation efforts.</p>
<p>Acts of 1982, Ch. 232, Sec. 150A and 150B. (Now Codified in Massachusetts Solid Waste Management regulations at 310 CMR 19.141)</p>	<p>This regulation requires that notice be recorded in the Registry of Deeds whenever certain types of solid or hazardous waste activity occur on property - <b>Applicable</b>.</p>	<p>Notification of remedial actions will be given to the County Registry of Deeds.</p>	
<p>Massachusetts - Air Quality, Air Pollution (310 CMR 6.00 - 8.00)</p>	<p>This regulation outlines the standards and requirements for air pollution control in Massachusetts; all provisions, procedures, and definitions are described - <b>Applicable</b>.</p>	<p>Particulate matter emissions from site excavation activities must be maintained at an annual geometric mean of 75 <math>\mu\text{g}/\text{m}^3</math>, and a maximum 24-hour concentration of 40 <math>\text{mg}/\text{m}^3</math> (primary standards).</p>	<p>Application of water, seed, cover, or other treatment is required over the landfill to prevent excessive emissions of particulate matter (310 CMR 7.09). Final seeding activities are ongoing and anticipated to be completed during 1994.</p>

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Massachusetts Air Pollution Control (Continued)			<p>All air emissions facilities as defined in 310 CMR 7.02 must meet Best Available Control Technology (BACT) requirements (310 CMR 7.02(2)(a)(2)(g) and (b)(2)(g)). The Charles George site remediation does not include any facilities as defined by 310 CMR 7.02 that emit greater than 1 ton/year VOCs. The definition of a "Contaminated Groundwater Treatment System (CGTS)" is restricted to the "stripping of VOC from the water. . ." The groundwater treatment system includes biological treatment, metal precipitation, carbon adsorption, and, if necessary, ion exchange. Air stripping of VOCs is not known to be included in the design, however, if the design does include a VOC stripper, this rule would become applicable and BACT would be required.</p> <p>The definition of a "Contaminated Soil Venting System" specifically excludes the venting of landfills and is, therefore, not applicable. However, MA DAQC has stated that the preferred treatment option for best available control technology for treatment of landfill gas is construction of an enclosed gas flare.</p>

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Off-Gas Treatment of Point-Source Remedial Air Emissions (Policy #WSC-94-150)	This policy concerns air emissions from remedial activities - <b>To be considered</b>	None.	Preliminary calculations show that, without any treatment, total VOCs emitted would be less than .368 tons per year, far less than the one ton per year level that triggers additional MA DAQC facility requirements.  This policy articulates when off-gas treatment of point-source remedial air emissions may be necessary to eliminate risks.
Massachusetts Wetlands Protection (310 CMR 10.00)	This regulation outlines the requirements necessary to work within 100 feet of a coastal or inland wetland. The act sets forth a public review and decision-making process by which activities affecting waters of the state are to be regulated to contribute to their protection - <b>Applicable.</b>	Wetland remediation will comply with the substantive but not the administrative requirements for wetland protection.	Based on field inspection, wetland remediation has not been conducted.
Massachusetts Surface Water Discharge Permit Program (314 CMR 2.00 - 4.00)	This section outlines the requirements for obtaining an NPDES permit in Massachusetts - <b>Applicable.</b>	Pollutant discharges to surface water must comply with NPDES permit requirements. Permit conditions and standards for different classes of water are specified.	314 CMR 3.00 establishes the program whereby discharges of pollutants to surface waters are regulated. Outlets for such discharges and any associated treatment works are also regulated. Surface water at the site is classified "B - warm water, treated water supply" under 314 CMR 4.06. Since the planned wastewater treatment facility will address, and possibly discharge, toxic pollutants listed under 314 CMR 3.16, these rules apply. Although a permit is not required, its substantive equivalent is.

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Massachusetts Groundwater Permit Program and Groundwater Quality Standards (314 CMR 2.00, 5.00, 6.00)	These rules specify the requirements for obtaining a groundwater discharge permit in Massachusetts - <b>Not ARAR</b>	Pollutant discharges to groundwater must comply with permit requirements. Permit conditions and standards for different classes of water are specified.	314 CMR 5.00 establishes the program whereby discharges of pollutants to groundwater are regulated, as are outlets for such discharges and any associated treatment works. 314 CMR 6.00 establishes groundwater quality standards and the designation and assignment of groundwater classifications. Groundwater underlying the site is designated Class I. ReInjection of treated groundwater is not planned at this time, so discharge permit-equivalent documentation is not required. (Groundwater does require remediation under chemical-specific requirements).
Supplemental Requirements for Hazardous Waste Management Facilities (314 CMR 8.00)	This regulation outlines the additional requirements that must be satisfied in order for a RCRA facility to comply with the NPDES regulations. These regulations apply to a water treatment unit; a surface impoundment that treats influent wastewater; and a POTW that generates, accumulates, and treats hazardous waste - <b>Not ARAR</b> .	All owners and operators of RCRA facilities shall comply with the management standard of 310 CMR 30.500, the technical standards of 310 CMR 30.600, the location standards of 310 CMR 30.700, the financial responsibility requirements of 310 CMR 30.900 and, in the case of POTWs, the standards for generators in 310 CMR 30.300.	314 CMR 8.00 establishes the program whereby wastewater treatment works exempted from RCRA rules would be regulated here. Since the wastewater treatment facility is being managed as a RCRA/MGL 21C facility, these rules are redundant. In the event that the facility is reclassified, these rules may become applicable.

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Certification for Dredging, Dredged Material Disposal, and Filling in Waters (314 CMR 9.00, MGL Ch. 21, ss. 26-53)	This regulation is promulgated to establish procedures, criteria, and standards for the water quality certification of dredging and dredged material disposal - <b>Not ARAR.</b>	Applications for proposed dredging/fill work need to be submitted and approved before work commences. Three categories have been established for dredge or fill material based on the chemical constituents. Approved methods for dredging, handling, and disposal options for the three categories must be met.	No dredging, discharge of dredge material, or filling in of navigable waters is occurring or planned to occur. However, during remedial actions the discharge of pollutants into surface water bodies will occur; this situation triggers Wetlands Protection Act (MGL Ch. 131) and waterways (MGL ch. 91) requirements.
Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works, and Indirect Discharges (314 CMR 12.00)	The regulations establish requirements that ensure the proper operation and maintenance of wastewater facilities within the Commonwealth - <b>Applicable.</b>	A wastewater treatment facility would be operated and maintained in compliance with this regulation.	No indirect discharges to a POTW have occurred or are planned. A wastewater treatment facility is currently under construction for the treatment of collected groundwater and leachate. The wastewater treatment facility would discharge directly on-site. These rules require any wastewater treatment facility to adopt and keep current an operation and maintenance manual in accordance with 314 CMR 12.04(1). An O&M manual is planned for the future facility.
Implementation of M.G.L. C.111F, Employee and Community "Right to Know" (310 CMR 33.00)	The regulations establish rules and requirements for the dissemination of information related to toxic and hazardous substances to the public - <b>Applicable</b>	Information applicable to site activities and characteristics will be made available to the public.	The EPA has implemented an active community relations program to disseminate information about the site to the local community.
Worker "Right to Know" (441 CMR 21.00)	These regulations establish requirements for worker "Right to Know."	These requirements apply to all site workers and must be followed during all site work.	Each contractor performing site work is responsible for compliance with this requirement.

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Massachusetts Solid Waste Management Regulations under MGL Ch. 21D (310 CMR 19.130)	Not identified in ROD - <b>Applicable.</b>	None.	<p>Maintenance requirements of a solid waste landfill identified here include: prevention of unauthorized access by fences and other barriers; locked gates at all points of entry; and posting of warning signs.</p> <p>Maintenance requirements are being met.</p>
Massachusetts Solid Waste Management Regulations under MGL Ch. 21D (310 CMR 19.110)	Not identified in ROD - <b>Applicable.</b>	None.	<p>Groundwater protection systems are specified to control migration of leachate out of the landfill and into the groundwater.</p> <p>A leachate collection system has been installed at the site.</p>
Massachusetts Solid Waste Management Regulations under MGL Ch. 21D (310 CMR 19.117, 19.118, 19.132, 19.133)	Not identified in ROD - <b>Applicable.</b>	None.	<p>All solid waste landfills must include groundwater, surface water and gas monitoring systems designed, operated, and maintained in accordance with applicable rules. Explosive gases must be controlled to no greater than 25% LEL within on-site structures or at the property boundary.</p> <p>Long-term groundwater and surface water monitoring requirements are being met. Gas monitoring needs to be conducted at the property boundary.</p>

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

ARAR	ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS	ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS	FIVE-YEAR REVIEW
Massachusetts Solid Waste Management Regulations under MGL Ch. 21D (310 CMR 19.112, 19.140, 19.142)	Not included in ROD - <b>Applicable.</b>	None.	<p>Limitations on post-closure construction and use are outlined in the regulations. Alternative end uses need to be proposed. Use restrictions, such as deed restrictions, must be provided for after completion of remedial activities.</p> <p>Final cover system standards and landfill closure/post-closure care requirements are applicable to the site. Applicable post-closure care requirements include: monitor the site during the post-closure period in order to ensure the integrity of the closure measures and to detect and prevent any adverse impacts of the site on public health, safety or the environment; take corrective actions in response to any conditions which would compromise the integrity and purpose of the final cover; maintain the integrity of the liner system and final cover system; collect leachate from and monitor and maintain leachate collection systems; monitor and maintain the surface water, groundwater, and air quality monitoring systems; maintain landfill gas control systems; maintain access roads; protect and maintain surveyed benchmarks.</p>

**TABLE 1-8 (Continued)**  
**POTENTIAL ACTION-SPECIFIC ARARS**  
**CHARLES GEORGE LANDFILL, TYNGSBORO, MASSACHUSETTS**

<b>ARAR</b>	<b>ROD REQUIREMENT SYNOPSIS AND REQUIREMENT STATUS</b>	<b>ROD-SPECIFIED ACTION TO BE TAKEN TO ATTAIN ARARS</b>	<b>FIVE-YEAR REVIEW</b>
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The site cap is designed to meet the more stringent requirements for a hazardous waste landfill and, thus, achieves compliance with solid waste rules. Not all components of these requirements have been installed as yet.

groundwater, providing several methods for determining which standards would apply. For the site, it has been determined that category GW-1 groundwater applies since site groundwater is within 500 feet of a private water supply well that was in use at the time of site discovery (310 CMR 40.0932(4)(f)). Also, category S-3 soil applies due to the low accessibility of site soils. In addition, it has been determined that Method 1 Risk Assessment Soil Standards apply, as this method considers both the potential risk of harm resulting from direct exposure to the contaminated soil and potential impacts on groundwater.

Another requirement to be added to the chemical-specific ARAR list for the site is the Massachusetts Surface Water Discharge Permit Program. Even though this program existed in 1988, the ROD did not identify its requirements as ARAR. These regulations apply to any current or planned discharges to surface water bodies, such as Dunstable Brook, Bridge Meadow Brook, Flint Marsh, or Flint Pond. Although a Massachusetts surface water discharge permit is not required, equivalent documentation must be attained, and identified toxic pollutants are to be controlled to within equivalent effluent limitations. Discharge standards have been established for the leachate and groundwater treated effluent. These standards were developed by the MA DEP and have given EPA a window of 5 years to discharge, starting in 1992 and ending in 1996. Determination as to the feasibility of groundwater reinjection (ROD III remedy) must be made, with state approval, prior to extending this discharge allowance. The state conducts periodic sampling of surface water runoff from the site and sediments in the sedimentation ponds as part of its O&M responsibilities under OU #2 (ROD II).

Although federal ambient water quality criteria are non-enforceable guidance developed under the Clean Water Act, and therefore cannot be applicable by definition, Section 121(d) of CERCLA specifies that these criteria be attained when relevant and appropriate. Environmental factors being considered at the site render these requirements relevant and appropriate.

Criteria to-be-considered are also modified from the 1988 presentation. Massachusetts Drinking Water Health Advisories have been replaced by Massachusetts Office of Research and Standards Guidelines (ORSGs). Federal acceptable intake chronic and subchronic values are no longer

used, having been replaced by Risk Reference Doses (RfDs). In addition, RfDs and Carcinogen Assessment Group (CAG) slope factors are two of several factors that may be used to calculate risk at a site. These criteria do not need to be identified in the ARAR section as they are usually covered under the risk assessment discussion. For the purposes of this re-evaluation, however, RfDs and CAG slope factors are updated on the numerical tables.

Revisions to the chemical-specific requirements affect treatment plant design, construction, operation, and maintenance as well as waste disposal practices. Environmental monitoring programs may also need to be modified to address the chemical-specific ARARs, particularly the groundwater protection programs under RCRA and the Commonwealth of Massachusetts.

**1.3.3.2 Location-Specific ARARs.** The wetlands ARARs identified in the 1988 ROD still apply today. The Resource Conservation and Recovery Act (RCRA) contains a number of explicit limitations on where on-site storage, treatment, or disposal of hazardous waste may occur. RCRA location requirements and land disposal restrictions are considered to be location-specific ARARs. Other siting requirements are also considered ARAR.

Because there are no wilderness areas in the vicinity of the site, the site is not located near any wild or scenic rivers, and the site is not located near a coastal area, the requirements associated with the Wilderness Act, the Coastal Zone Management Act, and the Marine Protection, Research, and Sanctuaries Act are not considered. Also, because there are no identified historic, scientific, or archaeological sites in the vicinity of the site, the requirements associated with the Archaeological and Historic Preservation Act of 1974, Historic Sites Building and Antiquities Act, and the National Historic Preservation Act of 1966 are not considered. As no endangered or threatened species or critical habitat have been identified, the requirements of the federal Endangered Species Act are also not considered ARARs. Should any federal endangered or threatened species, or critical habitat, be identified in the vicinity of the site, this act would become applicable.

Based upon the 1993 wetlands assessment, areas impacted by remedial actions were assessed. The *Wetland Damage Assessment Report* (HMM, 1990) stated that approximately 1.5 acres of wetlands were filled during capping activities and an additional 5 acres of wetlands were altered or otherwise damaged. This report also outlined general mitigation requirements and procedures. Based on the 1993 wetlands inspection, it appears that the wetland mitigation proposed in the Wetland Damage Assessment Report has not been addressed since no replicated wetlands were observed and damage to other wetland areas persists. In ROD II, the Consistency With Other Environmental Laws and Regulations Section includes a provision for wetlands restoration and replication.

Several requirements listed as location-specific in the 1988 ROD have been deleted as being redundant with identified action-specific requirements.

**1.3.3.3 Action-Specific ARARs.** Action-specific requirements identified in the 1988 ROD were presented for all alternatives evaluated; action-specific requirements for the selected remedy were not clearly distinguished. An attempt has been made to clarify the requirements. The requirement status identified in Table 1-8 is accurate for on-going remedial actions.

## **1.4 RISK ASSESSMENT REVIEW**

### **1.4.1 Human Health Risk Assessment**

Site-related human health and environmental risks were estimated in the Remedial Investigation Report prepared by E.C. Jordan and Ebasco (Ebasco, 1988). Human health risks were estimated to exceed the EPA target cancer risk range of  $10^{-7}$  to  $10^{-4}$  and/or a hazard index of 1.0 from the following exposures:

1. Dermal exposure to sediment in one location in Dunstable Brook (carcinogenic risk at E.C. Jordan sample location No. 8 estimated as  $2.2 \times 10^{-4}$  from a worst-case scenario, mostly from PAHs).

2. Exposure to groundwater from a hypothetical future deep bedrock water supply well to the east (estimated carcinogenic risks from groundwater 500 feet from the landfill sum to  $7.2 \times 10^{-4}$ , mostly from arsenic present below the MCL).
3. Exposure to groundwater from existing domestic shallow groundwater wells to the southwest (carcinogenic risk for most-probable and realistic worst-case exposures estimated as  $1.8 \times 10^{-2}$ , and  $2.2 \times 10^{-2}$  respectively; and estimated hazard indices 0.90 and 1.09 from the same scenarios).
4. Exposure to groundwater from hypothetical bedrock groundwater wells, southwest of the landfill (hazard indices estimated as maximum of 1.2).
5. Inhalation of venting system emissions on-site (risks estimated as maximum of  $1.2 \times 10^{-3}$ , for a realistic worst case scenario, with a hazard index up to 8.0).
6. Inhalation of venting system emissions in off-site area (risk from inhalation of air, based on monitoring results at the Cannongate residential complex was estimated as at least  $1.5 \times 10^{-4}$ ).
7. Inhalation of venting system emissions in off-site area (risk from inhalation of air, based on monitoring results at Flint Pond was estimated as at least  $4.2 \times 10^{-4}$ ).

In this five-year review, risks from contaminants in groundwater and landfill gas are not reassessed, because remediation of these media is planned and/or under way, under ROD III. Human health risks from exposure to sediment are qualitatively re-assessed, using data from samples collected in 1993. Several factors differ in the risk from sediment, compared to the 1988 assessment.

The 1988 assessment evaluated human health risk separately for each sampling point. Metcalf & Eddy evaluated all Dunstable Brook sediment samples together as one exposure route. Measured sediment concentrations are expected to be different after five years. Table 1-9 presents sediment data from 1987 and 1988. The list of chemicals detected also differs; however, for comparability, only those compounds listed in ROD III as sediment contaminants of concern are compared to 1993 sediment data. Reference doses and slope factors have changed from 1988, as shown in Table 1-10, for analytes assessed in 1988. One assumption which does not need to be changed is that inhalation and ingestion of sediment would be negligible, so only dermal

**TABLE 1-9. SEDIMENT CONCENTRATIONS, 1987-1988**

CHEMICAL	1987 Concentrations from Alliance (mg/kg)		1988 Concentrations from ECJordan, by area (mg/kg)	
	Most-probable	Worst-case	Most-probable	Worst-case
Bis(2-ethylhexyl)phthalate	0.16	0.91		
Di-n-butyl phthalate	0.0334	0.2		
PAHs	0.393	6.32	-- (1)	11,000 (1)
			-- (2)	-- (2)
			-- (3)	5.3 (3)
2-Butanone	0.0036	0.073		
Toluene	0.0011	0.011		
Arsenic	20	86	29.4 (1)	110 (1)
			30.4 (2)	300 (2)
			-- (3)	17.0 (3)
Cadmium	0.4	6.5	0.14 (1)	0.2 (1)
			2.1 (2)	6.5 (2)
			-- (3)	4.8 (3)
Copper	13	75		

- (a) RME, reasonable maximum exposure, is defined by U.S. EPA Region I as representing maximum contaminant concentrations.
- (1) Concentration in Flint Pond
- (2) Concentration in Flint Pond Marsh
- (3) Concentration in Dunstable Brook
- No value provided

TABLE 1-10. CHANGES IN REFERENCE DOSES AND SLOPE FACTORS 1988-1994

CHEMICAL NAME	Reference Doses (mg/kg/day)			Slope Factors (/ (mg/kg/day))			
	1988 Value	April 1994		1988 Value	April 1994		
		Value	Source		Group	Value	Source
Bis(2-ethylhexyl)phthalate	0.02	0.02	IRIS 2/93	$6.8 \times 10^{-4}$	B2	$1.4 \times 10^{-2}$	IRIS 2/93
Di-n-butyl phthalate	0.1	0.1	IRIS 2/93	--	D	--	IRIS 2/93
PAHs: fluoranthene	--	0.04	IRIS 7/93	--	D	--	IRIS 7/93
phenanthrene	--	--	IRIS 7/93	--	D	--	IRIS 7/93
pyrene	--	0.03	IRIS 7/93	--	D	--	IRIS 7/93
carcinogenic PAHs	--	--		11.5	B2	7.3	IRIS 3/94 Slope factor for B(a)P applies to all cPAHs, per EPA Region I
2-Butanone	0.05	0.6	IRIS 6/93	--	D	--	IRIS 6/93
Toluene	0.29	0.2	IRIS 2/94	--	D	--	IRIS 2/94
Arsenic	--	0.0003	IRIS 3/94	1.5	A	1.75	IRIS 3/94 Slope factor extrapolated from unit risk
Cadmium	0.00029 <sup>(a)</sup>	0.001 <sup>(b)</sup>	IRIS 2/94	--	(c)	--	IRIS 2/94
Copper	0.037 <sup>(a)</sup>	0.037 <sup>(a)</sup>	HEAST 93	--	D	--	IRIS 1/92

NOTES

Shaded values are changed since 1988

-- No value provided

a. Value shown is based on the drinking water action level and is not a reference dose

b. Cadmium RfD is 0.001 mg/kg/day in food, 0.0005 mg/kg/day in water

c. Cadmium is a Group B1 carcinogen by inhalation, but is not considered carcinogenic by ingestion

contact requires evaluation. Current/recent EPA Region I risk assessment policy would be to evaluate dermal exposures to sediments only "qualitatively." This review evaluates dermal exposures qualitatively by comparing to the past quantitative assessment. Possible updates to dermal exposure assumptions are presented in Table 1-11. This includes reduction to one set of exposure parameters (except that exposures will be evaluated at two different concentrations - average and RME), in accordance with EPA Region I protocols. Also, M&E has recalculated the average weight of people in the age group which was selected for assessment in the 1988 assessment.

A limited percentage of contaminants present in sediments absorbed to skin will diffuse through the skin so as to be absorbed by the body. This amount is generally less than the absorption of chemicals following ingestion. The amount of chemical absorbed through the skin can be described as a roughly equivalent oral dose if the ratio between skin and gastrointestinal absorption can be estimated. This would be useful because most oral reference doses and slope factors are based on absorption following ingestion; in these cases the absorption ratio is the relative absorption factor (RAF). Relative absorption factors have been estimated for various chemicals from a soil matrix.

Metcalf & Eddy recommends using RAFs tabulated by the Massachusetts Department of Environmental Protection (MADEP, 1992). Chemical-specific RAFs are available from MADEP for most of the 1988 chemicals of concern in sediment, MADEP presents documentation of each selected RAF, and the values are in general use within the Commonwealth of Massachusetts. Alternatives would be to use discontinued EPA Region I absorption factors (EPA, 1989) or the values used by E.C. Jordan (1988).

#### **1.4.2 Ecological Risk Assessment**

Alliance Technologies Corporation (ATC) reviewed environmental risks in the vicinity of the Charles George Landfill in the 1987 Endangerment Assessment report (ATC, 1987). The report was largely qualitative and did not contain a quantitative characterization of risks to flora and

TABLE 1-11. POSSIBLE CHANGES IN EXPOSURE PARAMETERS, 1988-1994

Parameter	Alliance Selections, 1987	ECJordan Selections, 1988	Proposed, 1994	Source of 1994 parameter
Ages exposed	6-15 years	8-17 years	8-17 years	ECJordan
Average weight over period of exposure	35 kg	35 kg	47 kg	Calculated from EPA 1991 (EFH)
Frequency of contact:				ECJordan
Most-probable	16 times/year	16 times/year	32 times/yr	(reasonable worst-case)
Reasonable worst-case	32 times/year	32 times/year	32 times/yr	
Years of exposure:				ECJordan
Most-probable	1 year	5 years	10 years	(reasonable worst-case)
Reasonable worst-case	5 years	10 years	10 years	
Quantity of sediment contacted:				ECJordan
Most-probable	0.01 kg	0.005 kg	0.01 kg/day	(reasonable worst-case)
Reasonable worst-case	0.02 kg	0.01 kg	0.01 kg/day	
Relative absorption factor	-- [100%]	PAHs: 10% Others: 1% (most-probable); 10% (reasonable worst-case)	Alternative 1: phthalates: 2% (DEHP) PAHs: 2% to 29% MEK: 10% toluene: 12% As: 3%    Cd: 14% Cu: 35% (from Ni) (MADEP, 1992)	Alternative 2: PAHs and, by extension, phthalates, 5%, MEK & toluene, 50%; metals, negligible (EPA, 1989)
Fraction of arsenic available for absorption	-- [100%]	5% 10%	-- [100%]	term assumed to be included in RAF term

Note: Shaded values would be changed from the parameters used in 1988.

fauna. The report defined the contaminants of most concern (with respect to human health) and discussed routes of exposure, mechanisms of contamination, and the potential direct and ecosystem-level indirect effects of contamination.

The ATC (1987) report stated that the greatest concern for the biota in the vicinity of the landfill were the chronic effects associated with bioaccumulation and biomagnification of inorganic and organic compounds within the food chain. Another subject of concern was the high potential for the loss of species diversity through competitive dominance of less sensitive plants and animals. ATC (1987) cited data from the NUS (1986) Remedial Investigation which suggested that sediment toxicity had caused a decrease in macroinvertebrate species diversity from the location of landfill leachate discharge downstream to Dunstable Brook.

Because previous studies only identified a risk to ecological receptors based on sediment exposures, only this medium will be directly re-evaluated in this five-year review for ecological risks. This reassessment will utilize data from sediment toxicity tests conducted on sediments collected in 1993. If these tests show that the sediments are toxic, results of sediment chemical analyses for volatile organic compounds, semivolatile organic compounds, and metals will be compared with available sediment standards, guidelines, or criteria, or to effect levels obtained from the literature. These include low effect range level (ER-L) and medium effect range level (ER-M) guideline values developed as part of the National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Program (Long and Morgan, 1990), U.S. Environmental Protection Agency (USEPA) Region 5 unpublished guidelines (presented in Fitchko [1989] and Beyer [1990]) for the pollution classification of Great Lakes harbor sediments, New York State Department of Environmental Conservation (NYSDEC, 1989) sediment criteria, and USEPA interim sediment quality criteria (USEPA, 1988). Although none of these values are considered enforceable criteria and thus would not be considered ARARs, they provide a reasonable estimate of the potential ecological risk posed by contaminants in sediments.

Data from fish tissue sampling, conducted in the fall of 1993, will also be evaluated to estimate the risk to aquatic receptors. These 1993 fish tissue data, for metals only, will be compared to similar data collected previously at the site to determine temporal trends in contaminant concentrations.