

## **APPENDIX B**

Table 1  
 Evaluation Table for Soil Alternatives  
**GRAND TRAVERSE OVERALL SUPPLY SITE**

Alternative	Overall Protection of Human Health and Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Contaminant Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost
<b>1. No Action</b>	<ul style="list-style-type: none"> <li>Not protective</li> </ul>	<ul style="list-style-type: none"> <li>Would not comply with ARARs</li> </ul>	<ul style="list-style-type: none"> <li>Not effective or permanent</li> </ul>	<ul style="list-style-type: none"> <li>No reduction other than natural attenuation</li> </ul>	<ul style="list-style-type: none"> <li>Would pose no short-term impacts</li> <li>Would require no time to implement</li> </ul>	<ul style="list-style-type: none"> <li>Nothing to implement</li> </ul>	None (\$0)
<b>2A. Limited Action With Excavation</b>	<ul style="list-style-type: none"> <li>High degree of protectiveness as a result of complete removal of residual contamination in soil</li> </ul>	<ul style="list-style-type: none"> <li>Would comply with ARARs (Part 201 Residential and Commercial Drinking Water Protection criteria)</li> </ul>	<ul style="list-style-type: none"> <li>Excavation would remove any residual soil contamination at or above the most stringent cleanup levels using verification sampling to confirm that all contaminated soils have been removed</li> <li>No O&amp;M is associated with this alternative</li> <li>Likely to restore soil to unrestricted uses</li> </ul>	<ul style="list-style-type: none"> <li>Alternative does not treat or reduce the total mass, mobility, or volume of contaminants in soil</li> <li>Contaminated soil would be disposed of off site at an appropriate facility</li> </ul>	<ul style="list-style-type: none"> <li>Would pose little short-term risk to community (other than increased construction traffic and activities)</li> <li>Air monitoring would be conducted during excavation</li> <li>Would require about 4 months to implement and no O&amp;M period</li> </ul>	<ul style="list-style-type: none"> <li>Would be technically and administratively easy to implement</li> <li>Assumes a borrow source for backfill material is readily available</li> </ul>	\$210,000
<b>2B. Limited Action With Soil Vapor Extraction</b>	<ul style="list-style-type: none"> <li>Moderate to high degree of protectiveness as a result of treatment of residual contamination in soil and institutional controls</li> </ul>	<ul style="list-style-type: none"> <li>Would comply with ARARs (Part 201 Residential and Commercial Drinking Water Protection criteria and air emission requirements for vapors)</li> </ul>	<ul style="list-style-type: none"> <li>Residual risks would be reduced and potentially eliminated using a reliable and proven technology</li> <li>Asphalt cap would prevent direct contact with and decrease infiltration into the soil</li> <li>Extracted vapors would be treated on site using the existing SVE system</li> <li>Requires implementation of engineering controls</li> <li>O&amp;M period would be shorter than for Alternative 4</li> </ul>	<ul style="list-style-type: none"> <li>Contaminants in soil would be transferred to the vapor phase and treated on GAC</li> <li>The mass, mobility, and total volume of VOCs in soil would be reduced through treatment</li> </ul>	<ul style="list-style-type: none"> <li>Would pose little short-term risk to community (other than increased construction traffic and activities)</li> <li>System malfunction could cause a short-term release of VOCs to the atmosphere until system is restored</li> <li>Would require about 4 months to implement and 5 years for soil treatment</li> </ul>	<ul style="list-style-type: none"> <li>Pilot tests would be needed to fully evaluate the technical ease of implementation</li> <li>Might be somewhat difficult to administratively implement because of the number of government and proprietary controls, air emission permits, and access agreements needed</li> </ul>	\$260,000
<b>3. Demolition and Excavation</b>	<ul style="list-style-type: none"> <li>High degree of protectiveness as a result of complete removal of contamination in soil</li> </ul>	<ul style="list-style-type: none"> <li>Would comply with ARARs (Part 201 Residential and Commercial Drinking Water Protection criteria)</li> </ul>	<ul style="list-style-type: none"> <li>Excavation would remove any contaminated soil at or above the most stringent cleanup levels using verification sampling to confirm that all contaminated soils have been removed</li> <li>No O&amp;M is associated with this alternative</li> <li>Likely to restore soil to unrestricted uses</li> </ul>	<ul style="list-style-type: none"> <li>Alternative would not treat or reduce the total mass, mobility, or total volume of contaminants in soil</li> <li>Contaminated soil would be disposed of off site at an appropriate facility</li> <li>Any soil classified as characteristic hazardous waste would be treated at the TSDF</li> </ul>	<ul style="list-style-type: none"> <li>Would pose little short-term risk to community (other than increased construction traffic and activities)</li> <li>Air monitoring would be conducted during building demolition and excavation</li> <li>Would require about 4 months to implement and no O&amp;M period</li> </ul>	<ul style="list-style-type: none"> <li>Would be technically easy to implement</li> <li>Might be somewhat difficult to implement administratively because of permits required from local agency and or property owner for building demolition</li> </ul>	\$1,200,000
<b>4. No Demolition and Soil Vapor Extraction</b>	<ul style="list-style-type: none"> <li>Moderate to high degree of protectiveness as a result of treatment of contamination in soil and institutional controls</li> </ul>	<ul style="list-style-type: none"> <li>Would comply with ARARs (Part 201 Residential and Commercial Drinking Water Protection criteria and air emission requirements for vapors)</li> </ul>	<ul style="list-style-type: none"> <li>Residual risks would be reduced and potentially eliminated</li> <li>Asphalt cap would prevent direct contact with and decrease infiltration into the soil</li> <li>Extracted vapors would be treated on site using the existing SVE system</li> <li>Requires implementation of engineering controls</li> <li>O&amp;M period would be longer than for Alternative 2B</li> </ul>	<ul style="list-style-type: none"> <li>Contaminants in soil would be transferred to the vapor phase and treated on GAC</li> <li>The mass, mobility, and total volume of VOCs in soil would be reduced through treatment</li> </ul>	<ul style="list-style-type: none"> <li>Would pose little short-term risk to community (other than increased construction traffic and activities)</li> <li>System malfunction could cause a short-term release of VOCs to the atmosphere until system is restored</li> <li>Would require about 5 months to implement and 15 years for soil treatment</li> </ul>	<ul style="list-style-type: none"> <li>Pilot tests would be needed to fully evaluate the technical ease of implementation</li> <li>Might be somewhat difficult to administratively implement because of the number of government and proprietary controls, air emission permits, and access agreements needed</li> </ul>	\$800,000

Notes:

- ARAR = Applicable or relevant and appropriate requirement
- GAC = Granular activated carbon
- O&M = Operation and maintenance
- SVE = Soil vapor extraction
- TSDF = Treatment, storage, disposal facility
- VOC = Volatile organic compound

Table 2  
Evaluation Table for Groundwater Alternatives  
**GRAND TRAVERSE OVERALL SUPPLY SITE**

Alternative	Overall Protection of Human Health and Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Contaminant Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost <sup>a</sup>
<b>1. No Action</b>	<ul style="list-style-type: none"> <li>Not protective</li> </ul>	<ul style="list-style-type: none"> <li>Would not comply with ARARs</li> </ul>	<ul style="list-style-type: none"> <li>Not effective or permanent</li> </ul>	<ul style="list-style-type: none"> <li>No reduction other than natural attenuation</li> </ul>	<ul style="list-style-type: none"> <li>Would pose no short-term impacts</li> <li>Would require no time to implement</li> </ul>	<ul style="list-style-type: none"> <li>Nothing to implement</li> </ul>	None (\$0)
<b>2. Limited Action With Contingency for Active Remediation</b>	<ul style="list-style-type: none"> <li>Moderate degree of protection as a result of institutional controls and monitoring</li> <li>Contingency allows for active remediation, if needed</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring might show that VOC concentrations are being naturally reduced over time</li> <li>Contingency for active remediation to comply with ARARs, if necessary</li> </ul>	<ul style="list-style-type: none"> <li>Institutional controls would minimize potential for exposure to groundwater</li> <li>Would not prevent migration of VOCs</li> <li>Contingency for active remediation, if necessary</li> <li>Groundwater monitoring period would be same as Alternative 3</li> </ul>	<ul style="list-style-type: none"> <li>Would achieve reduction of contaminant toxicity, volume of contaminated groundwater, mobility, and mass through natural attenuation or contingency for active remediation, if needed</li> </ul>	<ul style="list-style-type: none"> <li>Would pose little short-term risk to community</li> <li>Would require about 2 months to implement and 30 years for groundwater monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Would be technically easy to implement</li> <li>Might be somewhat difficult to implement administratively because of the number of institutional controls and access agreements needed</li> </ul>	\$470,000
<b>3. Groundwater Extraction, Treatment, and Discharge With Contingency for In Situ Treatment</b>	<ul style="list-style-type: none"> <li>Moderate to high degree of protectiveness</li> <li>Likely to restore aquifer to beneficial uses</li> </ul>	<ul style="list-style-type: none"> <li>Would comply with ARARs (MCLs, air emission requirements for vapors, and surface water or POTW discharge requirements for effluent)</li> </ul>	<ul style="list-style-type: none"> <li>Engineering and institutional controls would minimize potential for exposure to groundwater</li> <li>Likely to achieve moderate to high degree of effectiveness</li> <li>Contingency for in situ treatment would improve effectiveness if significant sources of VOCs exist</li> <li>Groundwater monitoring period would be same as Alternative 2</li> </ul>	<ul style="list-style-type: none"> <li>Would achieve reduction of contaminant toxicity, volume of contaminated groundwater, mobility, and mass through extraction and air stripping as well as in situ treatment, if needed</li> </ul>	<ul style="list-style-type: none"> <li>Would pose little short-term risk to community (other than increased construction activities)</li> <li>System malfunction could cause a release of VOCs to the atmosphere or spills or leaks to groundwater until system is restored</li> <li>Would require about 6 months to implement and 30 years for groundwater treatment and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Pumping tests and groundwater monitoring would be needed to fully evaluate the technical ease of implementation</li> <li>Might be somewhat difficult to implement administratively because of the number of institutional controls, access agreements, and discharge permits needed</li> <li>Discharge of treated groundwater may be somewhat difficult to implement, depending on actual volume of effluent</li> </ul>	\$1,800,000

Notes:

<sup>a</sup> The cost estimates presented in the FS do not include contingent actions.

ARAR = Applicable or relevant and appropriate requirement  
O&M = Operation and maintenance  
VOC = Volatile organic compound

Table 3  
Cost Estimate Summary for the Soil Remedy

**LIMITED ACTION WITH SOIL VAPOR EXTRACTION**

Item	Quantity	Units	Unit Cost	Extended Cost
<b>Item 1 – Site Preparation</b>				
Mobilization/demobilization @ 5 %	1	each	\$3,000	\$3,000
Evaluation of effectiveness of soil removal action	1	each	\$5,000	\$5,000
Identification of zones of residual contamination	1	each	\$20,000	\$20,000
Asphalt capping	1,000	sf	\$1	\$1,000
Security fencing install (temporary 6-ft chain link)	650	lf	\$30	\$19,500
SVE extraction wells	2	each	\$500	\$1,000
SVE collection piping/vaults	2	each	\$3,000	\$6,000
SVE extraction blower	1	each	\$2,000	\$2,000
			<b>Subtotal</b>	<b>\$57,500</b>
			Bonds/Insurance (@ 2%)	\$1,200
			Construction Subtotal	\$58,700
			Contingency (scope @ 15% and bid @ 15%)	\$17,600
			<b>SUBTOTAL</b>	<b>\$76,300</b>
			Project Management (@ 5%)	\$3,800
			Remedial Design (@ 8%)	\$6,100
			Construction Management (@ 6%)	\$4,600
			<b>TOTAL CAPITAL COST</b>	<b>\$90,800</b>
			<b>USE</b>	<b>\$90,000</b>

**OPERATION AND MAINTENANCE COSTS**

Item	Quantity	Units	Unit Cost	Extended Cost
<b>Annual Cost – Years 1 through 5</b>				
Operator-local part-time- SulTRAC 1/month	12	Month	\$2500	\$24,000
Maintenance	1	ls	\$1000	\$1,000
Water removal/disposal	1	Year	\$500	\$500
Granular-activated carbon removal/disposal/replacement	1	Year	\$1,500	\$1,500
Quarterly sampling and report	4	Each	\$1,500	\$6,000
Electric power	12	Month	\$100	\$1,200
			<b>Total Annual O&amp;M Cost</b>	<b>\$34,200</b>
			<b>PRESENT WORTH @ 7% over 5 years</b>	<b>\$140,300</b>

<b>Closeout Costs – Year 5</b>				
Site closeout – remove SVE, final sampling and report	1	each	\$20,000	\$20,000
Establish institutional controls	1	each	\$15,000	\$15,000
Remove temporary fencing	1	ls	\$500	\$500
			<b>Total Cost - Year 5</b>	<b>\$35,500</b>
			<b>PRESENT WORTH @ 7%</b>	<b>\$25,300</b>
			<b>TOTAL</b>	<b>\$165,600</b>
			<b>USE</b>	<b>\$170,000</b>

**SOIL ALTERNATIVE 2B – TOTAL COST      \$260,000**

Notes  
lf = Linear feet, ls = Lump Sum, sf = Square feet,  
SVE = Soil vapor extraction, O&M = Operation and maintenance

Table 4

## Cost Estimate Summary for the Groundwater Remedy

**GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE**

Item	Quantity	Units	Unit Cost	Extended Cost
<b>Item 1 – Site Preparation</b>				
Mobilization/Demobilization @ 5 %	1	ls	\$14,000	\$14,000
6-foot high chain-link fencing	200	lf	\$30	\$6,000
<b>Item 2 – Extraction System</b>				
Drilling three 6-inch dia. well 70 feet deep	210	ft	\$50	\$10,500
Extraction well – three 6-inch dia. s.s. 20 ft. deep	60	ft	\$295	\$17,700
Extraction well – three 6-inch dia. s.s. screen – 50 ft.	150	ft	\$395	\$59,300
6-inch s.s. well plug	3	each	\$400	\$1,200
Force main, 4-inch HDPE	940	lf	\$45	\$42,300
Extraction well manhole with cover	3	each	\$2,200	\$6,600
4-inch dia. well pump 50 gpm	3	each	\$3,000	\$9,000
Pitless adapter and miscellaneous	3	ls	\$2,100	\$6,300
Well development	3	each	\$300	\$900
<b>Item 3 – Well Vaults</b>				
Excavation for vaults	60	cy	\$85	\$5,100
Disposal of excavated material	60	cy	\$75	\$4,500
Flow meters and transmitters	3	each	\$3,700	\$11,100
Piping and valves in each vault	3	each	\$3,000	\$9,000
Electrical conduits, other work in vaults	3	each	\$2,000	\$6,000
<b>Item 4 – System Effluent</b>				
6-inch dia. HDPE effluent pipe to river	300	lf	\$50	\$15,000
Fiberoptic cable in PVC conduit	940	lf	\$5	\$4,700
Effluent sampler w/ piping, controls	1	each	\$5,000	\$5,000
<b>Item 5 – Treatment System</b>				
Granular foundation material	30	cy	\$30	\$900
Concrete foundation for air stripper	30	cy	\$370	\$11,100
150 gpm low profile air stripper, 600 gpm capacity	1	each	\$50,000	\$50,000
Air stripper piping and valves	1	ls	\$5,000	\$5,000
Electric service and electrical work	1	ls	\$2,000	\$2,000
Storage trailer	1	ls	\$10,000	\$10,000
			<b>Subtotal</b>	<b>\$313,200</b>
			Bonds/Insurance (@ 2%)	\$6,300
			Construction Subtotal	\$319,500
			Contingency (scope @ 15% and bid @ 15%)	\$95,900
			<b>SUBTOTAL</b>	<b>\$415,400</b>
			Project Management (@ 5%)	\$20,800
			Remedial Design (@ 8%)	\$33,200
			Construction Management (@ 6%)	\$25,000
			<b>TOTAL CAPITAL COST</b>	<b>\$494,400</b>
			<b>USE</b>	<b>\$500,000</b>

**GROUNDWATER ALTERNATIVE 3  
GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE**

**OPERATION AND MAINTENANCE COSTS**

Item	Quantity	Units	Unit Cost	Extended Cost
Operator, local part-time – SulTRAC 1/month	12	Month	\$3,500	\$42,000
Air stripper maintenance	1	Year	\$5,000	\$5,000
Air filter replacement for air stripper blower	1	Year	\$700	\$700
Permit sampling	12	Month	\$1,200	\$14,400
Electric power	12	Month	\$800	\$9,600
<b>Total Annual O&amp;M Cost</b>				<b>\$71,700</b>
<b>PRESENT WORTH @ 7% over 30 years</b>				<b>\$890,000</b>
<b>Monitoring Years 1 through 5</b>				
Quarterly sampling labor	4	Quarter	\$3,500	\$14,000
Sample analysis	4	Quarter	\$4,500	\$18,000
Shipping cost	4	Quarter	\$500	\$2,000
Consumables	4	Quarter	\$700	\$2,800
Sampling equipment	4	Quarter	\$500	\$2,000
Travel	4	Quarter	\$2,500	\$10,000
Quarterly report	4	Quarter	\$1,500	\$6,000
<b>Total Annual Monitoring Cost</b>				<b>\$54,800</b>
<b>PRESENT WORTH @ 7% over 5 years</b>				<b>\$225,000</b>
<b>Monitoring Years 6 through 30</b>				
Semi-annual sampling labor	2	Semi-annual	\$3,500	\$7,000
Sample analysis	2	Semi-annual	\$4,500	\$9,000
Shipping cost	2	Semi-annual	\$500	\$1,000
Consumables	2	Semi-annual	\$700	\$1,400
Sampling equipment	2	Semi-annual	\$500	\$1,000
Travel	2	Semi-annual	\$2,500	\$5,000
Semi-annual report	2	Semi-annual	\$1,500	\$3,000
<b>Total Annual Monitoring Cost</b>				<b>\$27,400</b>
<b>PRESENT WORTH @ 7% over 25 years (Years 6 through 30)</b>				<b>\$228,000</b>
<b>TOTAL</b>				<b>\$1,343,000</b>
<b>USE</b>				<b>\$1,300,000</b>

**GROUNDWATER ALTERNATIVE 3 – TOTAL COST \$1,800,000**

Notes:

cy	=	Cubic yard
dia	=	Diameter
ft	=	Feet
GAC	=	Granular activated carbon
gal	=	Gallon
gpm	=	Gallon per minute
HDPE	=	High density polyethylene
lf	=	Linear feet
ls	=	Lump sum
O&M	=	Operation and Maintenance
PVC	=	Polyvinyl chloride
sf	=	Square feet
s.s.	=	Stainless steel

Table 5  
 Cost Estimate Summary for Norris Elementary School  
 CONTINUATION OF EXISTING SVE SYSTEM

**OPERATION AND MAINTENANCE COSTS**

Item	Quantity	Units	Unit Cost	Ext Cost
<b>Annual Cost – Years 1 through 5</b>				
Operator –local part-time – 1/month	12	Month	\$3,500	\$42,000
Maintenance	1	LS	\$1,000	\$1,000
Travel	12	Year	\$1,000	\$12,000
Water removal/disposal	1	Year	\$1,000	\$1,000
Granular-activated carbon removal/disposal/replacement	1	Year	\$15,000	\$15,000
Quarterly sampling and report	4	Each	\$1,500	\$6,000
Electric power	12	Month	\$100	\$1,200
<b>Total Annual O&amp;M Cost</b>				<b>\$78,200</b>
<b>PRESENT WORTH @ 7% over 5 years</b>				<b>\$320,000</b>

<b>Closeout Costs – Year 5</b>				
Site Closeout – remove SVE, final confirmation sampling, final report	1	each	\$20,000	\$20,000
Establish institutional controls	1	each	\$15,000	\$15,000
<b>Total Cost - Year 5</b>				<b>\$35,000</b>
<b>PRESENT WORTH @ 7%</b>				<b>\$25,000</b>
<b>TOTAL</b>				<b>\$345,000</b>
<b>USE</b>				<b>\$350,000</b>

**NORRIS ELEMENTARY SCHOOL ALTERNATIVE 2 – TOTAL COST** **\$350,000**

Notes:

- LS = Lump sum
- O&M = Operation and maintenance
- SVE = Soil vapor extraction

Table 6  
Description of Potential ARARs

**SUMMARY OF POTENTIAL CHEMICAL-SPECIFIC ARARs FOR BUILDINGS  
GRAND TRAVERSE OVERALL SUPPLY SITE**

There are no federal or state chemical-specific ARARs for buildings. There are action-specific ARARs for building demolition

**SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs FOR BUILDINGS  
GRAND TRAVERSE OVERALL SUPPLY SITE**

<b>Description</b>	<b>Prerequisite for ARAR</b>	<b>Requirement</b>	<b>Citation</b>	<b>Comments</b>
<b>Federal Requirement</b>				
Demolition	Fugitive dust emissions from demolition	Control activity to minimize particulate matter emissions	40 CFR Part 51	May be applicable to alternatives that involve building demolition
Determination disposal criteria	Facility with hazardous debris or remediation wastes that require action	Treat and dispose of hazardous debris properly	40 CFR Part 268.45	May be applicable if building debris is determined to be a characteristic hazardous waste
Demolition of building with asbestos	Building with asbestos-containing material	Control activity to minimize emissions of asbestos and dispose of asbestos properly	40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants)	May be relevant and appropriate to demolition of building if asbestos containing material is found in the building
<b>State Requirement</b>				
Demolition	Maintenance or undertaking of a land use or earth change	Provide for control of soil erosion and prevent sedimentation of surface water	NREPA, Part 91 (1994 PA 451, as amended), Soil Erosion and Sedimentation Control	May be applicable to alternatives that involve demolition
	Demolition of contaminated building	Provide for control of fugitive dust or air emissions that would affect human health and the environment	NREPA, Part 55 (1994 PA 451, as amended), Air Pollution Control	May be applicable to alternatives that involve demolition
	Demolition of contaminated building	Requirements for characterization and handling of hazardous waste	NREPA, Part 111 (1994 PA 451, as amended), Hazardous Waste Management and R 299.9301 of the Michigan Administrative Code	May be applicable to alternatives that involve demolition
Off-site disposal of demolition debris	Disposal of building debris at a RCRA hazardous or nonhazardous waste landfill	Requirements for relocation of excavated soil	NREPA, Part 201, Section 20120(c) (1994 PA 451, as amended)	May be applicable to alternatives that involve off-site disposal of building debris
Transport of heavy materials or equipment	Transport of excavated soils and equipment	Requirements for maximum axle loads during frost periods	Michigan Vehicle Code (PA 300), Section 257.722	May be applicable to transport of building debris and heavy equipment
Sedimentation of surface waters	Earth changing activities more than 1 acre in area or within 500 feet of a lake or stream	Implement appropriate erosion and sedimentation control measures	NREPA, Part 91 (1994 PA 451, as amended), Soil Erosion and Sedimentation Control	May be applicable to demolition alternatives

**SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs FOR BUILDINGS  
GRAND TRAVERSE OVERALL SUPPLY SITE**

Notes:

40 CFR	=	Title 40 of the <i>Code of Federal Regulations</i>
ARAR	=	Applicable or relevant and appropriate requirement
NREPA	=	Natural Resources and Environmental Protection Act
PA	=	Public Act
RCRA	=	Resource Conservation and Recovery Act

**SUMMARY OF POTENTIAL CHEMICAL-SPECIFIC ARARs FOR SOIL  
GRAND TRAVERSE OVERALL SUPPLY SITE**

Description	Prerequisite for ARAR	Requirement	Citation	Comments
State Requirement				
Determination of cleanup criteria	Facility that requires remedial action	Cleanup category requirements and remedial action criteria	NREPA, Part 201 (1994 PA 451, as amended), Section 20120(a)	Soil cleanup levels may be applicable.
		Land-use requirements for facilities that do not meet residential cleanup goals	NREPA, Part 201 (1994 PA 451, as amended), Section 20120(b)	Requirement for land use restrictions may be applicable, depending on cleanup level achieved.

Notes:

ARAR = Applicable or relevant and appropriate requirement  
 NREPA = Natural Resources and Environmental Protection Act  
 PA = Public Act

**SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs FOR SOIL  
GRAND TRAVERSE OVERALL SUPPLY SITE**

<b>Description</b>	<b>Prerequisite for ARAR</b>	<b>Requirement</b>	<b>Citation</b>	<b>Comments</b>
<b>Federal Requirement</b>				
Excavation	Fugitive dust emissions from excavation	Control activity to minimize particulate matter emissions	40 CFR Part 50	May be relevant and appropriate to alternatives that involve excavation
Closure in place (capping)	Disposal of non-hazardous solid waste in land disposal unit	Minimum design and operation criteria for land disposal of solid wastes to minimize infiltration of precipitation, erosion, and odors, and to be aesthetically pleasing	40 CFR Part 240.208	May be relevant and appropriate to alternatives that involve capping
<b>State Requirement</b>				
Excavation	Maintenance or undertaking of a land use or earth change	Provide for control of soil erosion and prevent sedimentation of surface water	NREPA, Part 91 (1994 PA 451, as amended), Soil Erosion and Sedimentation Control	May be applicable to alternatives that involve excavation
	Excavation of contaminated soil	Provide for control of fugitive dust or air emissions that would affect human health and the environment	NREPA, Part 55 (1994 PA 451, as amended), Air Pollution Control; R336.1372	May be applicable to alternatives that involve excavation
	Excavation of contaminated soil	Requirements for characterization and handling of hazardous waste	NREPA, Part 111 (1994 PA 451, as amended), Hazardous Waste Management	May be applicable to alternatives that involve excavation
On-site waste piles storage	Storage of nonhazardous waste in on-site piles	Characterize nature of wastes to be accumulated in piles	NREPA, Part 115 (1994 PA 451, as amended), Solid Waste Management	May be applicable to alternatives that involve on-site storage of soil
On-site relocation of soil	Relocation of excavated soil	Requirements for relocation of excavated soil	NREPA, Part 201, Section 20120(c) (1994 PA 451, as amended)	May be applicable to alternatives that involve on-site relocation of soil
Off-site disposal of soil	Disposal of excavated soils at a RCRA hazardous or nonhazardous waste landfill	Requirements for relocation of excavated soil	NREPA, Part 201, Section 20120(c) (1994 PA 451, as amended)	May be applicable to alternatives that involve off-site disposal of excavated soil
Transport of heavy materials or equipment	Transport of excavated soil and equipment	Requirements for maximum axle loads during frost	Michigan Vehicle Code (PA 300), Section 257.722	May be applicable to transport of excavated soil or heavy equipment

**SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs FOR SOIL  
GRAND TRAVERSE OVERALL SUPPLY SITE**

<b>Description</b>	<b>Prerequisite for ARAR</b>	<b>Requirement</b>	<b>Citation</b>	<b>Comments</b>
Closure in place (capping)	Disposal of nonhazardous waste in land disposal units	Final covers minimum of 2 feet of compacted soil to specification	NREPA, Part 115, Section 11523a (1994 PA 451, as amended), Solid Waste Management	Capping requirements may be relevant and appropriate for containment alternatives
	Containment of wastes on site	Provide for control of fugitive dust or air emissions that would affect human health and the environment	NREPA, Part 55 (1994 PA 451, as amended), Air Pollution Control	May be applicable to alternatives that involve excavation
		Implement soil erosion and sediment control procedures	NREPA, Part 91 (1994 PA 451, as amended), Soil Erosion and Sedimentation Control	May be applicable to capping alternatives
Sedimentation of surface water	Earth-changing activities more than 1 acre in area or within 500 feet of a lake or stream	Implement appropriate erosion and sedimentation control measures	NREPA, Part 91 (1994 PA 451, as amended), Soil Erosion and Sedimentation Control	May be applicable to excavation alternatives

Notes:  
40 CFR = Title 40 of the *Code of Federal Regulations*  
ARAR = *Applicable or relevant and appropriate requirement*  
NREPA = Natural Resources and Environmental Protection Act  
PA = Public Act  
RCRA = Resource Conservation and Recovery Act

**SUMMARY OF POTENTIAL CHEMICAL-SPECIFIC ARARs FOR GROUNDWATER  
GRAND TRAVERSE OVERALL SUPPLY SITE**

<b>Description</b>	<b>Prerequisite for ARAR</b>	<b>Requirement</b>	<b>Citation</b>	<b>Comments</b>
<b>Federal Requirement</b>				
MCLs	Actual or potential drinking water source	Ensure that chemical constituents do not exceed water quality standards	Safe Drinking Water Act: 42 U.S.C.. 300, Subchapter XII: 40 CFR Part 141	MCLs may be relevant and appropriate if groundwater around the site is used or potentially used for drinking water or designed for public or private water use.
MCLGs	Actual or potential drinking water source and MCLG is not zero	Non-enforceable contaminant goals used to establish MCLs	Safe Drinking Water Act 42 U.S.C. 300, Subchapter XII: 40 CFR Part 141	Nonzero MCLGs may be relevant and appropriate when they are lower than corresponding MCL.
Water quality criteria	Discharge to surface water used by aquatic organisms and humans; human consumption of aquatic organisms	Surface water must not exceed numerical criteria for certain indicator chemicals and other water quality-related standards	Clean Water Act: 33 U.S.C. 1251	May be relevant and appropriate if contaminated groundwater discharges to surface water
<b>State Requirement</b>				
Drinking water source	Groundwater used or potentially used for drinking water	Acceptable concentrations of chemical constituents in groundwater must not exceed water quality standards	Michigan Safe Drinking Water Act (PA 399)	May be applicable if promulgated water quality standards are more stringent than federal MCLs or MCLGs
Groundwater discharge to surface water	Groundwater cleanup desired	Ensure that chemical constituents do not exceed water quality standards	Michigan Water Resources Commission (PA 451, Parts 1 and 4)	May be relevant and appropriate if groundwater discharges to surface water
Groundwater quality	Groundwater cleanup desired	Cleanup category requirements and remedial action criteria	NREPA, Part 201, Section 20120(b) (1994 PA 451, as amended)	Groundwater cleanup levels may be applicable
		Land-use requirements for facilities that do not meet residential cleanup goals	NREPA, Part 201, Section 20120(b) (1994 PA 451, as amended)	Requirement for land use restrictions may be relevant and appropriate during remedial action

**SUMMARY OF POTENTIAL CHEMICAL-SPECIFIC ARARs FOR GROUNDWATER  
GRAND TRAVERSE OVERALL SUPPLY SITE**

Description	Prerequisite for ARAR	Requirement	Citation	Comments
		Protection of public health and welfare and to maintain quality of groundwater in all usable aquifers used for individual, public, industrial, and agricultural water supply, and provide for the nondegradation of groundwater in usable aquifers	NREPA, Part 31 (1994 PA 451, as amended), Groundwater Quality	May be applicable if promulgated water quality standards are more stringent than federal MCLs or MCLGs

Notes:

- 40 CFR = Title 40 of the *Code of Federal Regulations*
- ARAR = Applicable or relevant and appropriate requirement
- MCL = Maximum contaminant level
- MCLG = Maximum contaminant level goal
- NREPA = Natural Resources and Environmental Protection Act
- PA = Public Act
- U.S.C. = *United States Code*

**SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs FOR GROUNDWATER  
GRAND TRAVERSE OVERALL SUPPLY SITE**

Description	Prerequisite for ARAR	Requirement	Citation	Comments
<b>Federal Requirement</b>				
Point-source discharge to surface water	Surface water discharge of treated effluent	Action must comply with applicable federal water quality criteria for the protection of aquatic life when environmental factors are being considered	CWA, 40 CFR Part 122.44	May be applicable to discharge of treated groundwater to surface water
		Action must comply with applicable federally approved state water quality standards; standards may be in addition to or more stringent than other federal standards under CWA		
		Discharge must be consistent with the requirements of the state's Water Quality Management Plan approved by EPA	CWA, Section 208(b)	May be applicable to discharge of treated groundwater to surface water
		Use of economically achievable BAT is required to control toxic and nonconventional pollutants; use of best conventional pollutant control technology is required to control conventional pollutants; technology-based limitations may be determined on case-by-case basis	40 CFR Part 122.44(a)	May be applicable to discharge of treated groundwater to surface water
		Discharge limitations must be established for all toxic pollutants that are or may be discharged at levels greater than those that can be achieved by technology-based standards	40 CFR Part 122.44(e)	May be applicable to discharge of treated groundwater to surface water
	Surface water discharge affecting waters outside of the state	Discharge must conform to applicable water quality requirements when discharge affects state other than the certifying state	40 CFR Part 122.44(e)	May be applicable to discharge of treated groundwater to surface water

**SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs FOR GROUNDWATER  
GRAND TRAVERSE OVERALL SUPPLY SITE**

Description	Prerequisite for ARAR	Requirement	Citation	Comments
		Comply with additional substantive requirements such as the following: <ul style="list-style-type: none"> <li>• Duty to mitigate any adverse effects on any discharge</li> <li>• Proper operation and maintenance of treatment systems</li> </ul>	40 CFR Part 122.41(d); 40 CFR Part 122.41(e)	May be applicable to the discharge of treated groundwater to surface water
	Surface water discharge	Develop and implement a BMP program and incorporate measures that prevent the release of toxic constituents to surface waters; BMP program must do the following: <ul style="list-style-type: none"> <li>• Establish specific procedures for the control of toxic and hazardous pollutant spills</li> <li>• Include a prediction of direction, rate of flow, and total quantity of toxic pollutants where experience indicates a reasonable potential for equipment failure</li> <li>• Ensure proper management of solid and hazardous waste in accordance with RCRA regulations</li> </ul>	40 CFR Parts 122.44(k)	May be applicable to discharge of treated groundwater to surface water
Discharge to POTW	Discharge of treated groundwater to local POTW	Meet federal pretreatment and reporting requirements	40 CFR 403.5	May be applicable to discharge of treated groundwater to POTW
On-site treatment	Waste treatment unit generating air emissions	Control of hazardous air pollutants	40 CFR Part 61	May be relevant and appropriate to vinyl chloride

**SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs FOR GROUNDWATER  
GRAND TRAVERSE OVERALL SUPPLY SITE**

<b>Description</b>	<b>Prerequisite for ARAR</b>	<b>Requirement</b>	<b>Citation</b>	<b>Comments</b>
<b>State Requirements</b>				
Point-source discharge to surface water	Discharge of treated effluent to surface water	Comply with Act 245 requirements to protect waters of the state and Great Lakes	NREPA, Part 31 (1994 PA 451, as amended)	May be applicable to discharge of treated groundwater to surface water
On-site treatment	Operation of an air stripper as part of the groundwater remedies	Comply with air emission standards and implement best available control technology	NREPA, Part 55 (1994 PA 451, as amended), Air Pollution Control; R336.1224 through R336.1232	May be applicable to alternatives that involve operation of an air stripper that emits regulated toxic air pollutants
Installation of monitoring and extraction wells	Installation of monitoring and extraction wells as part of the groundwater remedies	Requirements for permitting of drilling associated with monitoring and extraction well installation	NREPA, Part 624 (1994 PA 451, as amended); Mineral Well Act	May be applicable to installation of monitoring and extraction wells as part of the groundwater remedies
Transport of heavy materials	Transport of heavy materials and equipment	Requirements for maximum axle loads during frost	Michigan Vehicle Code, PA 300, Section 257.722	May be applicable to transport of heavy materials and equipment
On-site treatment	Construction of groundwater treatment system	Implement soil erosion and sediment control procedures	NREPA, Part 91 (1994 PA 451, as amended), Soil Erosion and Sedimentation Control	May be applicable to construction of an on-site groundwater treatment unit
	Construction and operation of groundwater treatment system	Requirements for characterization and handling of hazardous waste	NREPA, Part 111 (1994 PA 451, as amended), Hazardous Waste Management	May be applicable to construction and operation of an on-site treatment unit
Point source discharge to surface water	Discharge of treated effluent to surface water	Prohibits direct or indirect discharge to ground or surface waters of the state that are or may become injurious to the environment or public health	NREPA, Part 31, Section 3109 (1994 PA 451, as amended)	May be applicable to discharge of treated groundwater to surface water
Unpalatable flavor to food or fish; interference with surface water use	Taste and odor tainting of surface water	Prevent concentrations in surface water of taste- and odor-producing substances	NREPA, Part 31 (1994 PA 451, as amended), Water Resources Protection	May be applicable to discharge of treated groundwater to surface water
Acute toxicity of discharges	Acutely toxic surface water	Prevent acutely toxic substances from entering surface water	NREPA, Part 31 (1994 PA 451, as amended), Water Resources Protection	May be applicable to discharge of treated groundwater to surface water

**SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs FOR GROUNDWATER  
GRAND TRAVERSE OVERALL SUPPLY SITE**

<b>Description</b>	<b>Prerequisite for ARAR</b>	<b>Requirement</b>	<b>Citation</b>	<b>Comments</b>
Chronic toxicity of discharges	Chronically toxic surface water	Prevent chronically toxic substances from entering surface water	NREPA, Part 31 (1994 PA 451, as amended), Water Resources Protection	May be applicable to discharge of treated groundwater to surface water
General toxicity of discharges	Generally toxic surface water	Prevent generally toxic substances from entering surface water	NREPA, Part 31 (1994 PA 451, as amended), Water Resources Protection	May be applicable to discharge of treated groundwater to surface water
Human toxicity of discharges	Surface water toxic to humans	Prevent substances toxic to humans from entering surface water	NREPA, Part 31 (1994 PA 451, as amended), Water Resources Protection	May be applicable to discharge of treated groundwater to surface water
LC <sub>50</sub> toxicity criteria of discharges	Exposure of aquatic organisms to toxic concentrations at LC <sub>50</sub> doses	Prevent toxic concentrations of substances based on LC <sub>50</sub> doses	NREPA, Part 31 (1994 PA 451, as amended), Water Resources Protection	May be applicable to discharge of treated groundwater to surface water
Numeric criteria for toxics	Toxic materials and site indicator chemicals with numeric criteria	Discharges cannot exceed numeric criteria	NREPA, Part 31 (1994 PA 451, as amended), Water Resources Protection	May be applicable to discharge of treated groundwater to surface water
Antidegradation standard	Water quality of discharge must meet water quality standards of receiving water	Avoid degradation of waters with lower water quality standards	NREPA, Part 31 (1994 PA 451, as amended), Water Resources Protection	May be applicable to discharge of treated groundwater to surface water
Disposal of solid wastes from groundwater remedies	Groundwater remedies that generate solid waste	Characterization and handling of wastes generated from groundwater treatment	NREPA, Part 115 (1994 PA 451, as amended), Solid Waste Management	May be applicable to alternatives that involve groundwater treatment
Site-specific designated uses and criteria	Wastewater discharge to surface water	Designated uses of surface water must be provided	NREPA, Part 31 (1994 PA 451, as amended), Water Resources Protection	May be applicable to discharge of treated groundwater to surface water
Discharge to POTW	Discharge of treated groundwater to POTW	Meet pretreatment standards established by state and local authorities	NREPA, Part 23 (1994 PA 451, as amended)	Pretreatment standards and reporting requirements may be applicable to discharge of treated groundwater to POTW

**SUMMARY OF POTENTIAL ACTION-SPECIFIC ARARs FOR GROUNDWATER  
GRAND TRAVERSE OVERALL SUPPLY SITE**

Notes:

40 CFR	=	Title 40 of the <i>Code of Federal Regulations</i>
ARAR	=	Applicable or relevant and appropriate requirement
BAT	=	Best available technology
BMP	=	Best management practice
CWA	=	Clean Water Act
EPA	=	U.S. Environmental Protection Agency
LC <sub>50</sub>	=	Lethal concentration of 50 percent of exposed organisms
NAAQS	=	National Ambient Air Quality Standards (primary and secondary)
NREPA	=	Natural Resources and Environmental Protection Act
PA	=	Public Act
POTW	=	Publicly owned treatment works
U.S.C.	=	<i>United States Code</i>

**SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARARs  
GRAND TRAVERSE OVERALL SUPPLY SITE**

Description	Prerequisite for ARAR	Requirement	Citation	Comments
<b>Federal Requirement</b>				
Within flood plain	Action in lowlands, relatively flat areas adjoining inland and coastal waters, or other flood-prone areas	Avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values	Executive Order on Floodplain Management; Exec. Order No. 11,988; 40 CFR Part 6.302(b) and Appendix A	May be applicable if remedial action planned within flood plain
Critical habitat upon which endangered or threatened species depends	Determination of endangered or threatened species	Conserve endangered or threatened species in consultation with the U.S. Department of the Interior	Endangered Species Act (16 U.S.C. 1531 et. seq.); 50 CFR Part 17; 50 CFR Part 402	May be ARAR if endangered or threatened species exist on site
Within coastal zone	Conduct activities in manner consistent with approved state coastal zone management program	Activities affecting coastal zone, including lands thereunder and adjacent shorelands	Coastal Zone Management Act (16 U.S.C., Section 1451 et. seq.); 15 CFR Part 923.3	May be ARAR because site surface water has direct access to Grand Traverse Bay, which has direct access to the coastal management zone of Lake Michigan
<b>State Requirement</b>				
Within a 100-year flood plain	Occupation, filling, or grading of lands in a flood plain	Submit permit application to MDEQ containing, if requested, site development plan, river cross section, and hydraulic report	NREPA, Part 31 (1994 PA 451, as amended); Water Resources Protection	May be applicable if construction activities conducted in 100-year flood plain

Notes:

- 15 CFR = Title 15 of the *Code of Federal Regulations*
- 40 CFR = Title 40 of the *Code of Federal Regulations*
- 50 CFR = Title 50 of the *Code of Federal Regulations*
- ARAR = Applicable or relevant and appropriate requirement
- MDEQ = Michigan Department of Environmental Quality
- NREPA = Natural Resources and Environmental Protection Act
- PA = Public Act
- U.S.C. = *United States Code*

Table 7  
Human Health Risk Summary

for On-Site Receptors  
Human Health Risk Assessment, Grand Traverse Overall Supply Site, Greilickville, MI

Exposure Pathway	CANCER RISK			
	Future Industrial Worker, No Redevelopment	Future Industrial Worker, Redevelopment of GTOS Property	Future Construction Worker, Redevelopment of GTOS Property	Future Resident, Redevelopment of GTOS Property (Adult + Child)
Soil Ingestion	--	1.3E-05	1.8E-06	6.0E-05
Dermal Contact with Soil	--	5.7E-07	3.4E-08	1.3E-06
Inhalation of Particulates and Volatiles Released from Soil to Outdoor Air	2.3E-05	3.5E-05	2.0E-06	1.1E-04
Inhalation of Volatiles in Indoor Air (vapor intrusion)	1.0E-04	2.1E-04	--	2.3E-03
Groundwater Ingestion	--	2.6E-03	--	5.4E-03
Dermal Contact with Groundwater	--	--	1.3E-08	1.2E-03
Inhalation of Volatiles Released from Groundwater to Trench Air	--	--	7.5E-04	--
Inhalation of Volatiles Released from Household Use of Groundwater	--	--	--	7.3E-03
<b>Multipathway Total</b>	<b>1.3E-04</b>	<b>2.8E-03</b>	<b>7.5E-04</b>	<b>1.6E-02</b>
Exposure Pathway	NONCANCER HAZARD			
	Future Industrial Worker, No Redevelopment	Future Industrial Worker, Redevelopment of GTOS Property	Future Construction Worker, Redevelopment of GTOS Property	Future Resident, Redevelopment of GTOS Property (Child)
Soil Ingestion	--	1.1E-02	3.7E-02	1.4E-01
Dermal Contact with Soil	--	4.7E-04	7.0E-04	2.8E-03
Inhalation of Particulates and Volatiles Released from Soil to Outdoor Air	1.9E-01	3.8E-01	5.4E-01	1.8E+00
Inhalation of Volatiles in Indoor Air (vapor intrusion)	6.4E-01	1.3E+00	--	2.2E+01
Groundwater Ingestion	--	1.6E+01	--	5.1E+01
Dermal Contact with Groundwater	--	--	9.2E-04	6.0E+00
Inhalation of Volatiles Released from Groundwater to Trench Air	--	--	5.4E+01	--
Inhalation of Volatiles Released from Household Use of Groundwater	--	--	--	3.2E+01
<b>Multipathway Total</b>	<b>8.3E-01</b>	<b>1.7E+01</b>	<b>5.4E+01</b>	<b>1.14E+02</b>

Notes:

(a) Potential risks from vapor intrusion were estimated using EPA's advanced vapor intrusion model for soil gas contamination. COPC concentrations measured in soil gas were applied to the model to estimate indoor air concentrations

-- Not applicable; exposure pathway is not complete for this receptor

### Human Health Risk Summary for Off-Site Receptors

Human Health Risk Assessment, Grand Traverse Overall Supply Site, Greilickville, MI

Exposure Pathway	CANCER RISK				
	Current/Future Industrial Worker	Current/Future Construction Worker	Current/Future Resident (Adult + Child)	Current/Future Recreational User (Adult + Child)	Current/Future Fisherman
Inhalation of Volatiles in Indoor Air (vapor intrusion) (a)	2.1E-04	--	2.3E-03	--	--
Groundwater Ingestion	1.3E-03	--	2.7E-03	--	--
Dermal Contact with Groundwater	--	4.3E-09	3.9E-04	--	--
Inhalation of Volatiles Released from Groundwater to Trench Air	--	9.5E-04	--	--	--
Inhalation of Volatiles Released from Household Use of Groundwater	--	--	9.1E-03	--	--
Ingestion of Chemicals in Fish	--	--	--	--	6.3E-07
Dermal Contact with Surface Water	--	--	--	2.8E-07	--
Inhalation of Particulates and Volatiles Released from Surface Water to Outdoor Air	--	--	--	1.1E-07	--
<b>Multipathway Total</b>	<b>1.5E-03</b>	<b>9.5E-04</b>	<b>1.5E-02</b>	<b>3.9E-07</b>	<b>6.3E-07</b>
Exposure Pathway	NONCANCER HAZARD				
	Current/Future Industrial Worker	Current/Future Construction Worker	Current/Future Resident (Child)	Current/Future Recreational User (Child)	Current/Future Fisherman
Inhalation of Volatiles in Indoor Air (vapor intrusion) (a)	1.3E+00	--	2.2E+01	--	--
Groundwater Ingestion	2.1E+01	--	6.8E+01	--	--
Dermal Contact with Groundwater	--	1.1E-03	7.2E+00	--	--
Inhalation of Volatiles Released from Groundwater to Trench Air	--	5.5E+01	--	--	--
Inhalation of Volatiles Released from Household Use of Groundwater	--	--	3.0E+01	--	--
Ingestion of Chemicals in Fish	--	--	--	--	1.6E-03
Dermal Contact with Surface Water	--	--	--	7.9E-04	--
Inhalation of Particulates and Volatiles Released from Surface Water to Outdoor Air	--	--	--	4.0E-03	--
<b>Multipathway Total</b>	<b>2.2E+01</b>	<b>5.5E+01</b>	<b>1.28E+02</b>	<b>4.8E-03</b>	<b>1.6E-03</b>

**Notes:**

(a) Potential risks from vapor intrusion were estimated using EPA's advanced vapor intrusion model for groundwater contamination. COPC concentrations measured in groundwater were applied to the model to estimate indoor air concentrations.

-- Not applicable, exposure pathway is not complete for this receptor