Table 4 - Alternative 2 - Monitored Natural Attenuation and Institutional Controls

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Hydrogeological Investigations (to determine fate of plume)					
Monitoring Wells	per well	$30,000	10	$300,000	
Modeling and other Consulting Fees	lump sum	$200,000	1	$200,000	
Sub-Total				***$500,000***	
Infrastructure					
Monitoring Wells	per well	$30,000	10	$300,000	
Contingencies	lump sum	30%	1	$90,000	
Sub-Total				***$390,000***	
Consulting/Engineering Fees for Monitoring Wells					
Monitoring Wells	lump sum	12%	1	$36,000	Additional to wells installed for investigations
Modeling/Other Analysis	lump sum	$20,000	1	$20,000	
Contingencies	lump sum	30%	1	$16,800	
Sub-Total				***$72,800***	
Access (including land owner fees, legal fees, insurance)					
Access/Legal Fees	lump sum	$100,000	1	$100,000	
Monitoring Wells	per well	$10,000	20	$200,000	
Contingencies	lump sum	50%	1	$100,000	
Sub-Total				*$400,000*	
Total Capital Costs				**$1,362,800**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Reporting	per year	$20,000	1	40	$800,000	Assume Quarterly Reports
Well Maintenance	per year	$2,000	1	40	$80,000	
Groundwater Sampling	per well	$150	90	40	$540,000	See Supporting Calculations - A
Analytical (Nat. Atten. Parameters)	per sample	$175	40	1	$7,000	Year 1, See Supporting Calculations - A
Analytical (Nat. Atten. Parameters)	per sample	$175	20	39	$136,500	Year 2-40, See Supporting Calculations - A
Analytical (1,4-dioxane)	per sample	$250	90	40	$900,000	
Pall Staff	per year	$56,000	1	40	$2,240,000	
Contingencies	lump sum	10%		40	$470,350	
Total Operation and Maintenance Cost					**$5,173,850**	

Post Closure Costs		Cost/Unit	Number of Units	Cost	Comments
Plugging of Monitoring Wells	well	$1,000	20	$20,000	
Technical/Professional Services	lump sum	30%	1	$6,000	
Contingencies	lump sum	30%	1	$6,000	
Reporting	per report	$10,000	1	$10,000	
Total Post Closure Cost				***$32,000***	

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 4 - Alternative 2 - Monitored Natural Attenuation and Institutional Controls

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Hydrogeological Investigations (to determine fate of plume)					
Monitoring Wells	per well	$30,000	10	$300,000	
Modeling and other Consulting Fees	lump sum	$200,000	1	$200,000	
Sub-Total				***$500,000***	
Infrastructure					
Monitoring Wells	per well	$30,000	10	$300,000	
Contingencies	lump sum	30%	1	$90,000	
Sub-Total				***$390,000***	
Consulting/Engineering Fees for Monitoring Wells					
Monitoring Wells	lump sum	12%	1	$36,000	Additional to wells installed for investigations
Modeling/Other Analysis	lump sum	$20,000	1	$20,000	
Contingencies	lump sum	30%	1	$16,800	
Sub-Total				***$72,800***	
Access (including land owner fees, legal fees, insurance)					
Access/Legal Fees	lump sum	$100,000	1	$100,000	
Monitoring Wells	per well	$10,000	20	$200,000	
Contingencies	lump sum	50%	1	$100,000	
Sub-Total				*$400,000*	
Total Capital Costs				**$1,362,800**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Reporting	per year	$20,000	1	40	$800,000	Assume Quarterly Reports
Well Maintenance	per year	$2,000	1	40	$80,000	
Groundwater Sampling	per well	$150	90	40	$540,000	See Supporting Calculations - A
Analytical (Nat. Atten. Parameters)	per sample	$175	40	1	$7,000	Year 1, See Supporting Calculations - A
Analytical (Nat. Atten. Parameters)	per sample	$175	20	39	$136,500	Year 2-40, See Supporting Calculations - A
Analytical (1,4-dioxane)	per sample	$250	90	40	$900,000	
Pall Staff	per year	$56,000	1	40	$2,240,000	
Contingencies	lump sum	10%		40	$470,350	
Total Operation and Maintenance Cost					**$5,173,850**	

Post Closure Costs		Cost/Unit	Number of Units	Cost	Comments
Plugging of Monitoring Wells	well	$1,000	20	$20,000	
Technical/Professional Services	lump sum	30%	1	$6,000	
Contingencies	lump sum	30%	1	$6,000	
Reporting	per report	$10,000	1	$10,000	
Total Post Closure Cost				***$32,000***	

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 5 - Alternative 3a-1 - Groundwater Pumping, Pipeline to Wagner Road Facility, Treatment at Wagner Road with Ozone/Hydrogen Peroxide Followed by Transmission Through a New Pipeline to the Huron River for Disposal Under an NPDES Permit

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Infrastructure					
Extraction Wells	per well	$50,000	3	$150,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Pipeline to Pall Wagner Road	lump sum	$3,586,740	1	$3,586,740	See Supporting Calculations - B
Pipeline to Huron River	lump sum	$1,704,912	1	$1,704,912	See Supporting Calculations - B
Electrical Service	per well	$50,000	3	$150,000	
Pumping Systems	per well	$3,000	3	$9,000	
Process Controls	per well	$25,000	3	$75,000	
Monitoring Wells	per well	$30,000	4	$120,000	
Treatment System	lump sum	$688,110	1	$688,110	See Supporting Calculations - D
Contingencies	lump sum	30%		$1,967,628	
Sub-Total				***$8,526,390***	
Consulting/Engineering Fees					
Extraction Well Installation	lump sum	12%	1	$18,000	
Connection Piping	lump sum	12%	1	$9,000	
Pumping System/Process Controls	lump sum	12%	1	$10,080	
Monitoring Wells	lump sum	12%	4	$14,400	
NPDES Permit (uncontested)	lump sum	$20,000	1	$20,000	
Contingencies	lump sum	30%		$21,444	
Sub-Total				***$92,924***	
Access (including land owner fees, legal fees, insurance)					
Extraction Wells	per well	$10,000	3	$30,000	
Monitoring Wells	per well	$10,000	0	$0	
Pipeline to Pall Wagner Road	lump sum	$75,000	1	$75,000	
Pipeline to Huron River	lump sum	$75,000	1	$75,000	
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies	lump sum	50%		$190,000	
Sub-Total				***$395,000***	
Total Capital Costs				**$9,014,314**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Treatment System Operation	1000 gallons	$0.91	262,800	20	$4,782,960	See Supporting Calculations - E
NPDES Discharge Monitoring	per year	$50,500	1	20	$1,010,000	
NPDES Fees	per year	unknown			unknown	
Pipeline Maintenance	per year	$100,000	1	20	$2,000,000	
Well Maintenance	per year	$6,000	3	20	$360,000	3 TWs, rehab once each year
Groundwater Sampling	per well	$125	144	25	$450,000	Sample 36 wells quarterly sampling 5 years past remediation
Analytical - Monitoring Wells	per sample	$250	144	25	$900,000	Sample 36 wells quarterly sampling 5 years past remediation
Analytical - Extraction Wells	per sample	$250	36	20	$180,000	Sample 3 wells monthly during purging
Electrical for Pumping	per year	$49,448	1	20	$988,969	See Supporting Calculations - C
Access Fees	lump sum	$0	0	20	$0	
Pall Staff	per person	$56,000	5	20	$5,600,000	
Contingencies	lump sum	30%			$3,147,579	
Total Operation and Maintenance Cost					**$19,419,508**	

Post Closure Costs		Cost/Unit	Number of Units	Cost	Comments
Plugging of Pipelines	foot	$3	30,000	$90,000	Based on verbal from Cementrite, Mt. Pleasant, MI
Plugging of Extraction Wells	well	$1,500	3	$4,500	
Plugging of Monitoring Wells	well	$1,000	0	$0	
Technical/Professional Services	lump sum	20%	1	$18,900	
Contingencies	lump sum	30%		$34,020	
Total Post Closure Cost				**$147,420**	

NPDES = National Pollutant Discharge Elimination System

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 6 - Alternative 3a-2 - Groundwater Pumping, Pipeline to Wagner Road Facility, Treatment at Wagner Road with Hydrogen Peroxide/UV Followed by Transmission Through a New Pipeline to the Huron River for Disposal Under an NPDES Permit

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Infrastructure					
Extraction Wells	per well	$50,000	3	$150,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Pipeline to Pall Wagner Road	lump sum	$3,586,740	1	$3,586,740	See Supporting Calculations - B
Pipeline to Huron River	lump sum	$1,704,912	1	$1,704,912	See Supporting Calculations - B
Electrical Service	per well	$50,000	3	$150,000	
Pumping Systems	per well	$3,000	3	$9,000	
Process Controls	per well	$25,000	3	$75,000	
Monitoring Wells	per well	$30,000	4	$120,000	
Treatment System	lump sum	$594,830	1	$594,830	See Supporting Calculations - F
Contingencies	lump sum	30%		$1,939,645	
Sub-Total				***$8,405,126***	
Consulting/Engineering Fees					
Extraction Well Installation	lump sum	12%	1	$18,000	
Connection Piping	lump sum	12%	1	$9,000	
Pumping System/Process Controls	lump sum	12%	1	$10,080	
Monitoring Wells	lump sum	12%	1	$14,400	
NPDES Permit (uncontested)	lump sum	$20,000	1	$20,000	
Contingencies	lump sum	30%		$21,444	
Sub-Total				***$92,924***	
Access (including land owner fees, legal fees, insurance)					
Extraction Wells	per well	$10,000	3	$30,000	
Monitoring Wells	per well	$10,000	4	$40,000	
Pipeline to Pall Wagner Road	lump sum	$75,000	1	$75,000	
Pipeline to Huron River	lump sum	$75,000	1	$75,000	
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies	lump sum	50%		$230,000	
Sub-Total				***$475,000***	
Total Capital Costs				**$8,973,050**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Treatment System Operation	1000 gallons	$3.07	262,800	20	$16,135,920	See Supporting Calculations - G
NPDES Discharge Monitoring	per year	$50,500	1	20	$1,010,000	
NPDES Fees	per year	unknown			unknown	
Pipeline Maintenance	per year	$100,000	1	20	$2,000,000	
Well Maintenance	per year	$6,000	3	20	$360,000	
Groundwater Sampling	per well	$125	144	25	$450,000	Sample 36 wells quarterly sampling 5 years past remediation
Analytical - Monitoring Wells	per sample	$250	144	25	$900,000	Sample 36 wells quarterly sampling 5 years past remediation
Analytical - Extraction Wells	per sample	$250	36	20	$180,000	Sample 3 wells monthly during purging
Electrical for Pumping	per year	$49,448	1	20	$988,969	See Supporting Calculations - C
Access Fees	lump sum	$0	0	20	$0	
Pall Staff	per person	$56,000	5	20	$5,600,000	
Contingencies	lump sum	30%			$6,553,467	
Total Operation and Maintenance Cost					**$34,178,356**	

Post Closure Costs		Cost/Unit	Number of Units	Cost	Comments
Plugging of Pipelines	foot	$3	30,000	$90,000	Based on verbal from Cementrite, Mt. Pleasant, MI
Plugging of Extraction Wells	well	$1,500	3	$4,500	
Plugging of Monitoring Wells	well	$1,000	0	$0	
Technical/Professional Services	lump sum	20%	1	$18,900	
Contingencies	lump sum	30%		$34,020	
Total Post Closure Cost				**$147,420**	

NPDES = National Pollutant Discharge Elimination System

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 7 - Alternative 3c-1 - Groundwater Pumping, Pipeline to Wagner Road Facility, Treatment at Wagner Road with Ozone/Hydrogen Peroxide Followed by Injection into Unit E Through Multiple New Wells at Locations Where 1,4-Dioxane Levels are less than 85 ppb, but exceed 1 ppb under a Part 22 Permit

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Infrastructure					
Extraction Wells	per well	$50,000	3	$150,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Pipeline to Pall Wagner Road	lump sum	$3,586,740	1	$3,586,740	See Supporting Calculations - B
Injection Wells	per well	$55,000	5	$275,000	
Pipelines to Injection Wells	per well	$100	3,500	$350,000	
Electrical Service	per well	$50,000	3	$150,000	
Pumping Systems	per well	$3,000	8	$24,000	Includes 3 TWs, 5 IWs
Process Controls	per well	$25,000	8	$200,000	Includes 3 TWs, 5 IWs
Monitoring Wells	per well	$30,000	6	$180,000	
Treatment System	lump sum	$688,110	1	$688,110	See Supporting Calculations - D
Contingencies	lump sum	30%		$1,703,655	
Sub-Total				***$7,382,504***	
Consulting/Engineering Fees					
Extraction Well Installation	lump sum	12%	1	$18,000	
Connection Piping	lump sum	12%	1	$9,000	
Pumping System/Process Controls	lump sum	12%	1	$26,880	
Monitoring Wells	lump sum	12%	1	$21,600	
Injection Wells	lump sum	15%	1	$41,250	
Contingencies	lump sum	30%	1	$35,019	
Sub-Total				***$151,749***	
Access (including land owner fees, legal fees, insurance)					
Extraction Wells	per well	$10,000	3	$30,000	
Monitoring Wells	per well	$30,000	0	$0	Assume PLS property
Pipeline to Pall Wagner Road	lump sum	$75,000	0	$0	
Injection Wells	lump sum	$0	0	$0	Assume PLS property
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies	lump sum	50%	1	$27,500	
Sub-Total				***$82,500***	
Total Capital Costs				**$7,616,753**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Treatment System Operation	1000 gallons	$0.91	262,800	20	$4,782,960	See Supporting Calculations - E
Pipeline Maintenance	per year	$75,000	1	20	$1,500,000	
Extraction Well Maintenance	per well	$6,000	3	20	$360,000	
Injection Well Maintenance	per well	$10,000	10	20	$2,000,000	
Groundwater Sampling	per well	$125	144	25	$450,000	Sample 36 wells quarterly sampling 5 years past remediation
Analytical - Monitoring Wells	per sample	$250	144	25	$900,000	Sample 36 wells quarterly sampling 5 years past remediation
Analytical - Extraction Wells	per sample	$250	36	20	$180,000	Sample 3 wells monthly during purging
Electrical for Pumping	per year	$45,085	1	20	$901,700	See Supporting Calculations - C
Electrical for Injection	per year	$3,532	1	20	$70,640	Assumes no additional pressure to inject water into Unit E
Access Fees	per year	$0	0	20	$0	
Pall Staff	per year	$56,000	5	20	$5,600,000	
Contingencies	lump sum	30%			$3,343,590	
Total Operation and Maintenance Cost					**$20,088,890**	

Post Closure Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Plugging of Injection Wells	lump sum	$3,000	5	$15,000	
Plugging of Extraction Wells	per well	$3,000	3	$9,000	
Plugging of Monitoring Wells	per well	$1,000	4	$4,000	
Plugging of Pipelines	per foot	$3	20,500	$61,500	Based on verbal from Cementrite, Mt. Pleasant, MI
Technical/Professional Services	lump sum	12%	1	$10,740	
Contingencies	lump sum	30%	1	$30,072	
Total Post Closure Cost				**$130,312**	

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 8 - Alternative Jc-2 - Groundwater Pumping, Pipeline to Wagner Road Facility, Treatment at Wagner Road with Hydrogen Peroxide/UV Followed by Injection into Unit E Through Multiple New Wells at Locations Where 1,4-Dioxane Levels are less than 85 ppb, but exceed 1 ppb under a Part 22 Permit

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Infrastructure					
Extraction Wells	per well	$50,000	3	$150,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Pipeline to Pall Wagner Road	lump sum	$3,586,740	1	$3,586,740	See Supporting Calculations - B
Injection Wells	per well	$55,000	5	$275,000	
Pipelines to Injection Wells	per well	$100	3,500	$350,000	
Electrical Service	per well	$50,000	3	$150,000	
Pumping Systems	per well	$3,000	8	$24,000	Includes 3 TWs, 5 IWs
Process Controls	per well	$25,000	8	$200,000	Includes 3 TWs, 5 IWs
Monitoring Wells	per well	$30,000	4	$120,000	
Treatment System	lump sum	$594,830	1	$594,830	See Supporting Calculations - F
Contingencies	lump sum	30%		$1,657,671	
Sub-Total				***$7,183,240***	
Consulting/Engineering Fees					
Extraction Well Installation	lump sum	12%	1	$18,000	
Connection Piping	lump sum	12%	1	$9,000	
Pumping System/Process Controls	lump sum	12%	1	$26,880	
Monitoring Wells	lump sum	12%	1	$14,400	
Injection Wells	lump sum	15%	1	$41,250	
Contingencies	lump sum	30%	1	$32,859	
Sub-Total				***$142,389***	
Access (including land owner fees, legal fees, insurance)					
Extraction Wells	per well	$10,000	3	$30,000	
Monitoring Wells	per well	$30,000	4	$120,000	
Pipeline to Pall Wagner Road	lump sum	$75,000	0	$0	
Injection Wells	lump sum	$0	0	$0	Assume PLS property
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies	lump sum	50%	1	$87,500	
Sub-Total				***$262,500***	
Total Capital Costs				**$7,588,129**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Treatment System Operation	1000 gallons	$3.07	262,800	20	$16,135,920	See Supporting Calculations - G
Pipeline Maintenance	per year	$75,000	1	20	$1,500,000	
Well Maintenance	per well	$6,000	3	20	$360,000	
Injection Well Maintenance	per well	$10,000	10	20	$2,000,000	
Groundwater Sampling	per well	$125	144	25	$450,000	Sample 36 wells quarterly sampling 5 years past remediation
Analytical - Monitoring Wells	per sample	$250	144	25	$900,000	Sample 36 wells quarterly sampling 5 years past remediation
Analytical - Extraction Wells	per sample	$250	36	20	$180,000	Sample 3 wells monthly during purging
Electrical for Pumping	per year	$45,085	1	20	$901,700	See Supporting Calculations - C
Electrical for Injection	per year	$3,532	1	20	$70,640	Assumes no additional pressure to inject water into Unit E
Access Fees	per year	$0	0	20	$0	
Pall Staff	per year	$56,000	5	20	$5,600,000	
Contingencies	lump sum	30%			$6,749,478	
Total Operation and Maintenance Cost					**$34,847,738**	

Post Closure Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Plugging of Injection Wells	lump sum	$3,000	5	$15,000	
Plugging of Extraction Wells	per well	$3,000	3	$9,000	
Plugging of Monitoring Wells	per well	$1,000	4	$4,000	
Plugging of Pipelines	per foot	$3	20,500	$61,500	Based on verbal from Cementrite, Mt. Pleasant, MI
Technical/Professional Services	lump sum	12%	1	$10,740	
Contingencies	lump sum	30%	1	$30,072	
Total Post Closure Cost				**$130,312**	

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 9 - Alternative 3e-1 - Groundwater Pumping, Pipeline to Wagner Road Facility, Treatment at Wagner Road with Hydrogen Peroxide/Ozone, Discharge into Honey Creek (Tributary)

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Infrastructure					
Extraction Wells	per well	$50,000	3	$150,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Pipeline to Pall Wagner Road	lump sum	$3,586,740	1	$3,586,740	See Supporting Calculations - B
Pipelines to Honey Creek	per well	$100	2,350	$235,000	
Electrical Service	per well	$50,000	3	$150,000	
Pumping Systems	per well	$3,000	3	$9,000	
Process Controls	per well	$25,000	3	$75,000	
Monitoring Wells	per well	$30,000	4	$120,000	
Treatment System	lump sum	$594,830	1	$594,830	See Supporting Calculations - F
Contingencies	lump sum	30%		$1,498,671	
Sub-Total				***$6,494,240***	
Consulting/Engineering Fees/Legal Fees					
Extraction Well Installation	lump sum	12%	1	$18,000	
Connection Piping	lump sum	12%	1	$9,000	
Pumping System/Process Controls	lump sum	12%	1	$10,080	
Monitoring Wells	lump sum	12%	1	$14,400	
NPDES Permit (uncontested)	lump sum	$250,000	1	$250,000	
Contingencies	lump sum	30%		$90,444	
Sub-Total				***$391,924***	
Access (including land owner fees, legal fees, insurance)					
Extraction Wells	per well	$10,000	3	$30,000	
Monitoring Wells	lump sum	$10,000	4	$40,000	
Pipeline to Pall Wagner Road	lump sum	$75,000	0	$0	
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies	lump sum	50%		$47,500	
Sub-Total				***$142,500***	
Total Capital Costs				**$7,028,664**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Treatment System Operation	1000 gallons	$0.91	262,800	20	$4,782,960	See Supporting Calculations - E
Pipeline Maintenance	per year	$75,000	1	20	$1,500,000	
Well Maintenance	per year	$6,000	3	20	$360,000	3 TWs, rehab once each year
Groundwater Sampling	per well	$125	144	25	$450,000	quarterly sampling 5 years past remediation
Analytical - Monitoring Wells	per sample	$250	144	25	$900,000	Sample 36 wells quarterly, 5 years past remediation
Analytical - Extraction Wells	per sample	$250	36	20	$180,000	Sample 3 wells monthly during purging
Electrical for Pumping	per year	$45,085	1	20	$901,700	See Supporting Calculations - C
Electrical for Injection	per year	$3,012	1	20	$60,240	Assumes no additional pressure to discharge water
Access Fees	per year	$0	0	20	$0	
Pall Staff	per year	$56,000	5	20	$5,600,000	
Contingencies	lump sum	30%			$2,740,470	
Total Operation and Maintenance Cost					**$17,475,370**	

Post Closure Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Plugging of Injection Wells	per well	$3,000	0	$0	
Plugging of Extraction Wells	per well	$3,000	3	$9,000	
Plugging of Monitoring Wells	per well	$1,000	4	$4,000	
Plugging of Pipelines	per foot	$3	19,500	$58,500	Based on verbal from Cementrite, Mt. Pleasant, MI
Technical/Professional Services	lump sum	20%		$14,300	
Contingencies	lump sum	30%		$25,740	
Total Post Closure Cost				**$111,540**	

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 10 - Alternative 3e-2 - Groundwater Pumping, Pipeline to Wagner Road Facility, Treatment at Wagner Road with Hydrogen Peroxide/UV, Discharge into Honey Creek (Tributary)

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Infrastructure					
Extraction Wells	per well	$50,000	3	$150,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Pipeline to Pall Wagner Road	lump sum	$3,586,740	1	$3,586,740	See Supporting Calculations - B
Pipelines to Honey Creek	per well	$100	2,350	$235,000	
Electrical Service	per well	$50,000	3	$150,000	
Pumping Systems	per well	$3,000	3	$9,000	
Process Controls	per well	$25,000	3	$75,000	
Monitoring Wells	per well	$30,000	4	$120,000	
Treatment System	lump sum	$594,830	1	$594,830	See Supporting Calculations - F
Contingencies	lump sum	30%		$1,498,671	
Sub-Total				***$6,494,240***	
Consulting/Engineering Fees/Legal Fees					
Extraction Well Installation	lump sum	12%	1	$18,000	
Connection Piping	lump sum	12%	1	$9,000	
Pumping System/Process Controls	lump sum	12%	1	$10,080	
Monitoring Wells	lump sum	12%	1	$14,400	
NPDES Permit (uncontested)	lump sum	$250,000	1	$250,000	
Contingencies	lump sum	30%		$90,444	
Sub-Total				***$391,924***	
Access (including land owner fees, legal fees, insurance)					
Extraction Wells	per well	$10,000	3	$30,000	
Monitoring Wells	lump sum	$10,000	4	$40,000	
Pipeline to Pall Wagner Road	lump sum	$75,000	0	$0	
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies	lump sum	50%		$47,500	
Sub-Total				***$142,500***	
Total Capital Costs				**$7,028,664**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Treatment System Operation	1000 gallons	$3.07	262,800	20	$16,135,920	See Supporting Calculations - G
Pipeline Maintenance	per year	$75,000	1	20	$1,500,000	
Well Maintenance	per year	$6,000	3	20	$360,000	3 TWs, rehab once each year
Groundwater Sampling	per well	$125	144	25	$450,000	quarterly sampling 5 years past remediation
Analytical - Monitoring Wells	per sample	$250	144	25	$900,000	Sample 36 wells quarterly, 5 years past remediation
Analytical - Extraction Wells	per sample	$250	36	20	$180,000	Sample 3 wells monthly during purging
Electrical for Pumping	per year	$45,085	1	20	$901,700	See Supporting Calculations - C
Electrical for Injection	per year	$3,012	1	20	$60,240	Assumes no additional pressure to discharge water
Access Fees	per year	$0	0	20	$0	
Pall Staff	per year	$56,000	5	20	$5,600,000	
Contingencies	lump sum	30%			$6,146,358	
Total Operation and Maintenance Cost					**$32,234,218**	

Post Closure Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Plugging of Injection Wells	per well	$3,000	0	$0	
Plugging of Extraction Wells	per well	$3,000	3	$9,000	
Plugging of Monitoring Wells	per well	$1,000	4	$4,000	
Plugging of Pipelines	per foot	$3	19,500	$58,500	Based on verbal from Cementrite, Mt. Pleasant, MI
Technical/Professional Services	lump sum	20%		$14,300	
Contingencies	lump sum	30%		$25,740	
Total Post Closure Cost				**$111,540**	

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 11 - Alternative 4a - Groundwater Pumping, Treatment Near Maple Road with Ozone/Hydrogen Peroxide Treatment Followed by Transmission through a New Pipeline to the Huron River for Disposal Under an NPDES Permit

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Infrastructure					
Extraction Wells	per well	$50,000	3	$150,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Pipeline to Maple Road	lump sum	$1,812,065	1	$1,812,065	See Supporting Calculations - B
Pipeline to Huron River	lump sum	$1,650,660	1	$1,650,660	See Supporting Calculations - B
Electrical Service	per well	$50,000	3	$150,000	
Pumping Systems	per well	$3,000	3	$9,000	
Process Controls	per well	$15,000	3	$45,000	
Monitoring Wells	per well	$30,000	4	$120,000	
Treatment System	lump sum	$688,110	1	$688,110	See Supporting Calculations - D
Contingencies		30%		$1,409,950	
Sub-Total				***$6,109,785***	
Consulting/Engineering Fees					
Extraction Well Installation	lump sum	12%	1	$18,000	
Connection Piping	lump sum	12%	1	$9,000	
Pumping System/Process Controls	lump sum	12%	1	$6,480	
Monitoring Wells	lump sum	12%	1	$14,400	
Contingencies	lump sum	30%	1	$14,364	
Sub-Total				***$62,244***	
Access Fees (including land owner fees, legal fees, insurance)					
Extraction Wells	per well	$10,000	3	$30,000	
Monitoring Wells	per well	$10,000	4	$40,000	
Pipeline to Maple Road	lump sum	$50,000	1	$50,000	
Treatment System	per year	$20,000	20	$400,000	
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies (50 percent)	lump sum	50%	1	$272,500	
Sub-Total				***$817,500***	
Total Capital Costs				**$6,989,529**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Treatment System Operation	1000 gallons	$0.91	262,800	20	$4,782,960	See Supporting Calculations - E
Pipeline Maintenance	per year	$75,000	1	20	$1,500,000	
Well Maintenance	per well	$6,000	8	20	$960,000	3 TWs, rehab once each year
Groundwater Sampling	per well	$125	144	25	$450,000	Quarterly sampling 5 years past remediation
Analytical	per sample	$250	144	25	$900,000	Quarterly sampling 5 years past remediation
Electrical for Pumping	per year	$38,956	1	20	$779,125	See Supporting Calculations - C
Electrical for Discharge	lump sum	$3,740	1	20	$74,800	Assumes no additional pressure to discharge water
Pall Staff	per year	$56,000	5	20	$5,600,000	
Contingencies	lump sum	30%			$2,834,065	
Total Operation and Maintenance Cost					**$17,880,950**	

Post Closure Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Plugging of Injection Wells	per well	$3,000	5	$15,000	
Plugging of Extraction Wells	per well	$3,000	3	$9,000	
Plugging of Monitoring Wells	per well	$1,000	0	$0	
Plugging of Pipelines	per foot	$3	22,000	$66,000	Based on verbal from Cementrite, Mt. Pleasant, MI
Technical/Professional Services		20%		$18,000	
Contingencies (30 percent)		30%		$32,400	
Total Post Closure Cost				**$140,400**	

NPDES = National Pollutant Discharge Elimination System

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 12 - Alternative 4c - Groundwater Pumping, Treatment at Site Near Maple Road with Ozone/Hydrogen Peroxide Treatment Followed by Injection into Unit E Through Multiple New Wells at Locations Where 1,4-Dioxane Levels are Less than 85 ppb, but Exceed 1 ppb Under a Part 22 Permit

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Infrastructure					
Extraction Wells	per well	$50,000	3	$150,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Extraction Well Pipeline to Maple Road	lump sum	$1,812,065	1	$1,812,065	See Supporting Calculations - B
Injection Well Pipeline to Maple Road	lump sum	$2,773,149	1	$2,773,149	See Supporting Calculations - B
Injection Wells	per well	$55,000	5	$275,000	
Connection Pipeline to Injection Wells	per foot	$150	3,000	$450,000	
Electrical Service	per well	$50,000	3	$150,000	
Pumping Systems	per well	$3,000	8	$24,000	Includes 3 TWs, 5 IWs
Process Controls	per well	$25,000	8	$200,000	Includes 3 TWs, 5 IWs
Monitoring Wells	per well	$30,000	8	$240,000	
Treatment System	lump sum	$688,110	1	$688,110	See Supporting Calculations - D
Contingencies	lump sum	30%		$2,051,197	
Sub-Total				***$8,888,520***	
Consulting/Engineering Fees					
Extraction Wells	lump sum	12%	1	$18,000	
Connection Piping	lump sum	12%	1	$63,000	
Pumping System/Process Controls	lump sum	12%	1	$26,880	
Monitoring Wells	lump sum	12%	1	$28,800	
Injection Well Installation	lump sum	15%	1	$41,250	
Contingencies	lump sum	30%	1	$53,379	
Sub-Total				***$231,309***	
Access (including land owner fees, legal fees, insurance)					
Extraction Wells	per well	$10,000	2	$20,000	
Monitoring Wells	per well	$10,000	8	$80,000	
Injection Wells	per well	$10,000	5	$50,000	
Treatment System	per year	$20,000	20	$400,000	
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies	lump sum	50%	1	$287,500	
Sub-Total				***$862,500***	
Total Capital Costs				**$9,982,329**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Treatment System Operation	1000 gallons	$0.91	262,800	20	$4,782,960	See Supporting Calculations - E
Pipeline Maintenance	per year	$100,000	1	20	$2,000,000	See supporting calculations
Extraction Well Maintenance	per well	$6,000	3	20	$360,000	
Injection Well Maintenance	per well	$10,000	10	20	$2,000,000	
Groundwater Sampling	per year	$125	144	25	$450,000	Quarterly sampling 5 years past remediation
Analytical	per well	$250	144	25	$900,000	Quarterly sampling 5 years past remediation
Electrical for Pumping	per year	$38,956	1	20	$779,125	See Supporting Calculations - C
Electrical for Injection	lump sum	$6,337	1	20	$126,738	Assumes no additional pressure to inject water into Unit E
Access Fees	lump sum	0	0	20	$0	
Pall Staff	per year	$56,000	5	20	$5,600,000	
Contingencies	lump sum	30%			$3,419,647	
Total Operation and Maintenance Cost					**$20,418,469**	

Post Closure Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Plugging of Injection Wells	per well	$3,000	5	$15,000	
Plugging of Extraction Wells	per well	$3,000	3	$9,000	
Plugging of Monitoring Wells	per well	$1,000	4	$4,000	
Plugging of Pipelines	per foot	$3	11,000	$33,000	Based on verbal from Cementrite, Mt. Pleasant, MI
Technical/Professional Services	lump sum	20%		$12,200	
Contingencies	lump sum	30%		$21,960	
Total Post Closure Cost				**$95,160**	

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies. Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 13 - Alternative 5 - Groundwater Pumping, Pipeline to Wagner Road Facility, No Treatment, Injection into Deep Geological Unit

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Infrastructure					
Extraction Wells	per well	$50,000	3	$150,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Pipeline to Pall Wagner Road	lump sum	$3,586,740	1	$3,586,740	See Supporting Calculations - B
Deep Injection Well (including permitting)	lump sum	$2,000,000	1	$2,000,000	
Electrical Service	per well	$50,000	3	$150,000	
Pumping Systems	per well	$3,000	3	$9,000	Includes 3 TWs
Process Controls	per well	$25,000	3	$75,000	Includes 3 TWs
Monitoring Wells	per well	$30,000	0	$0	
Contingencies	lump sum	30%	1	$1,813,722	
Sub-Total				***$7,859,461***	
Consulting/Engineering Fees					
Deep Injection Well	lump sum	15%	1	$300,000	
Extraction Well Installation	lump sum	12%	2	$18,000	
Connection Piping	lump sum	12%	1	$9,000	
Pumping System/Process Controls	lump sum	12%	1	$10,080	
Monitoring Wells	lump sum	12%	0	$0	
Contingencies	lump sum	30%		$101,124	
Sub-Total				***$438,204***	
Access (including land owner fees, legal fees, insurance)					
Extraction Wells	lump sum	$10,000	3	$30,000	
Monitoring Wells	lump sum	$10,000	0	$0	
Pipeline to Pall Wagner Road	lump sum	$75,000	0	$0	
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies	lump sum	50%	1	$27,500	
Sub-Total				***$82,500***	
Total Capital Costs				**$8,380,165**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Injection Well Tests/Maintenance	per year	$50,000	1	20	$1,000,000	
Pipeline Maintenance	per year	$75,000	1	20	$1,500,000	
Well Maintenance	per year	$6,000	3	20	$360,000	
Groundwater Sampling	per well	$125	144	25	$450,000	Quarterly sampling 5 years past remediation
Analytical	per sample	$250	144	25	$900,000	Quarterly sampling 5 years past remediation
Injection Water Treatment (filtering)	per year	$20,000	1	20	$400,000	
Electrical for Injection	per year	$10,000	1	20	$200,000	
Electrical for Pumping	per year	$45,085	1	20	$901,707	See Supporting Calculations - C
Access Fees	per year	$0	1	0	$0	
Pall Staff	per year	$56,000	3	20	$3,360,000	
Contingencies	lump sum	30%	1		$1,713,512	
Total Operation and Maintenance Cost					**$10,785,219**	

Post Closure Costs		Cost/Unit	Number of Units	Cost	Comments
Plugging of Pipelines	per foot	$3	30,000	$90,000	Based on verbal from Cementrite, Mt. Pleasant, MI
Plugging of Injection Wells	lump sum	$21,000	1	$21,000	~1,000 bags of cement, 10,000 labor/equipment
Plugging of Extraction Wells	per well	$1,500	3	$4,500	
Plugging of Monitoring Wells	per well	$1,000	0	$0	
Technical/Professional Services	lump sum	12%	1	$13,860	
Contingencies	lump sum	30%	1	$38,808	
Total Post Closure Cost				**$168,168**	

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of source including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.

Table 14 - Alternative 6 - Groundwater Pumping with Active Remediation Proximate to the Huron River, if necessary

Capital Costs	Units	Cost/Unit	Number of Units	Cost	Comments
Hydrogeological Investigations (to determine fate of plume)					
Monitoring Wells	per well	$30,000	10	$300,000	
Modeling and other Consulting Fees	lump sum	$200,000	1	$200,000	
Access/Legal Fees	lump sum	$100,000	1	$100,000	
Sub-Total				***$600,000***	
Infrastructure					
Extraction Wells	per well	$50,000	5	$250,000	
Connection Piping to Extraction Wells	per foot	$150	500	$75,000	Estimate 100 foot of connection per well
Pipeline to Huron River	lump sum	$1,298,024	1	$1,298,024	See Supporting Calculations - B
Electrical Service	per well	$50,000	5	$250,000	
Pumping Systems	per well	$3,000	5	$15,000	
Process Controls	per well	$25,000	5	$125,000	
Monitoring Wells	per well	$30,000	10	$300,000	
Treatment System	lump sum	$688,110	1	$688,110	
Contingencies	lump sum	30%		$900,340	
Sub-Total				***$3,901,474***	
Consulting/Engineering Fees					
Extraction Well Installation	lump sum	12%	1	$30,000	
Connection Piping	lump sum	12%	1	$9,000	
Pumping System/Process Controls	lump sum	12%	1	$16,800	
Monitoring Wells	lump sum	12%	0	$36,000	
NPDES Permit (uncontested)	lump sum	$20,000	1	$20,000	
Contingencies	lump sum	30%		$33,540	
Sub-Total				***$145,340***	
Access (including land owner legal fees, insurance)					
Access/Legal Fees	lump sum	$100,000	1	$100,000	
Treatment System	per year	$20,000	30	$600,000	
Extraction Wells	per well	$10,000	5	$50,000	
Monitoring Wells	per well	$10,000	0	$0	
Pipeline to Pall Wagner Road	lump sum	$75,000	0	$0	
Pipeline to Huron River	lump sum	$75,000	1	$75,000	
Well Pipelines	lump sum	$25,000	1	$25,000	
Contingencies	lump sum	50%		$125,000	
Sub-Total				***$275,000***	
Total Capital Costs				**$4,321,814**	

Operation and Maintenance Costs	Units	Unit Cost	Units/Year	Number of Years	Cost	Comments
Treatment System Operation	1000 gallons	$0.91	262,800	30	$7,174,440	See Supporting Calculations - E
NPDES Discharge Monitoring	per year	$50,000	1	30	$1,500,000	
NPDES Fees	per year	unknown			unknown	
Pipeline Maintenance	per year	$100,000	1	30	$3,000,000	
Well Maintenance	per year	$6,000	5	30	$900,000	
Groundwater Sampling (Pre Contingency Implementation)	per well	$150	90	20	$270,000	
Groundwater Sampling (Post Contingency Implementation)	per well	$150	30	30	$135,000	
Analytical (Nat. Atten. Parameters)	per sample	$175	40	1	$7,000	Year 1, See Supporting Calculations - A
Analytical (Nat. Atten. Parameters)	per sample	$175	20	19	$66,500	Year 2-20, See Supporting Calculations - A
Analytical (1,4-dioxane) - Monitoring Wells (Pre Contingency Implementatior	per sample	$250	90	20	$450,000	See Supporting Calculations - A
Analytical (1,4-dioxane) - Monitoring Wells (Post Contingency Implementatio	per sample	$250	30	30	$225,000	
Analytical (1,4-dioxane) - Extraction Wells	per sample	$250	60	30	$450,000	Assume 5 samples per month
Electrical for Pumping	per year	$30,126	1	30	$903,785	See Supporting Calculations - C
Pall Staff	per person	$56,000	5	30	$8,400,000	
Pall Staff	per person	$56,000	1	20	$1,120,000	
Contingencies	lump sum	30%			$4,065,517	
Total Operation and Maintenance Cost					**$28,687,242**	

Post Closure Costs		Cost/Unit	Number of Units	Cost	Comments
Plugging of Pipelines	foot	$3	5,100	$15,300	Verbal estimate from Cementrite
Plugging of Extraction Wells	well	$1,500	5	$7,500	
Plugging of Monitoring Wells	well	$1,000	20	$20,000	
Technical/Professional Services	lump sum	30%	1	$12,840	
Contingencies	lump sum	30%		$16,692	
Total Post Closure Cost				**$72,332**	

NPDES = National Pollutant Discharge Elimination System

General Comments Regarding Costs
The alternative cost estimates were developed from a variety of sources including technology unit costs developed by Pall and/or its consultants, vendor information, published cost-estimating guides, and prior experience with similar technologies.
Costs are based on current (2004) U.S. Dollars. No adjustments have been made to account for inflation.