

APPENDIX A

ASSUMPTIONS FOR REMEDIAL ALTERNATIVE COST ESTIMATES

1. Costs for no action with monitored natural attenuation are estimated in Table A-1 for all three aquifers combined (A-, Upper 180-Foot, and Lower 180-Foot Aquifers). These costs include installation of additional monitoring wells in the A-Aquifer only. Costs for additional monitoring well installation for the Upper 180-Foot and Lower 180-Foot Aquifers are assumed to be addressed under separate programs, as applicable. Costs for well destruction are assumed to be addressed under the Basewide Groundwater Monitoring program.
2. Costs for remediation (active treatment) of the A-Aquifer only are estimated in Tables A-2, A-3, and A-4. These costs include additional monitoring and treatment well installation, and associated treatment system and plume monitoring for the A-Aquifer. Costs for well destruction are assumed to be addressed under the Basewide Groundwater Monitoring program.
3. Costs for remediation (active treatment) of the Upper 180-Foot Aquifer are assumed to be addressed under the existing OU2 GWTS program. Associated plume monitoring, installation of additional monitoring wells, and well destruction costs are assumed to be addressed under the existing OU2 GWTS program and/or the Basewide Groundwater Monitoring program, as applicable.
4. Costs for remediation (contingent wellhead treatment) of the Lower 180-Foot Aquifer are assumed to be addressed under a separate program. Associated plume monitoring, installation of additional monitoring wells, and well destruction costs are assumed to be addressed under a separate program and/or the Basewide Groundwater Monitoring program, as applicable.
5. The following administrative costs are assumed to be addressed under separate programs: (a) Administrative Record management (after submission of documents); (b) Community Relations; (c) 5 Year Review and Reporting; and (d) Habitat Monitoring.

**Table A1. No Action with Monitored Natural Attenuation Cost Estimate
Feasibility Study, OUCTP RI/FS, Former Fort Ord, California**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS				
<i>Planning and Design Documents</i>				
Monitored Natural Attenuation Planning & Sampling Program Design	1	lump sum	\$18,000	\$18,000
Total Planning Costs				\$18,000
<i>Additional Monitoring Well Installation</i>				
Construct 5-inch monitoring wells	30	well	\$7,500	\$225,000
Log, develop well, sample/dispose drill cuttings, water	30	well	\$5,000	\$150,000
Baseline sampling/analysis (VOCs, biodeg parameters)	30	well	\$1,500	\$45,000
Baseline sampling labor	30	well	\$900	\$27,000
Total Construction Costs				\$447,000
Subtotal Capital Costs				\$465,000
Capital Cost Contingency (Engineering, Construction)	20%	of Capital Costs		\$93,000
TOTAL CAPITAL COSTS				\$558,000
ANNUAL O&M COSTS				
YEARS 1-5				
Quarterly Monitoring of 120 MWs (VOCs, Natural Attenuation Parameters)	4	quarters	\$50,000	\$200,000
Reporting, Data Management & Evaluation	4	quarters	\$20,000	\$80,000
Subtotal Annual Costs				\$280,000
Annual Cost Contingency	7%	of Annual Costs		\$20,000
Annual O&M Costs				\$300,000
YEARS 1-5 TOTAL O&M COSTS (*2% Interest; OMB Jan. 2005)				\$1,415,000
YEARS 6-10				
Semi-Annual Monitoring of 60 MWs (VOCs, Natural Attenuation Parameter:	2	quarters	\$25,000	\$50,000
Reporting, Data Management & Evaluation	2	quarters	\$10,000	\$20,000
Subtotal Annual Costs				\$70,000
Annual Cost Contingency	7%	of Annual Costs		\$5,000
Annual O&M Costs				\$75,000
YEARS 6-10 TOTAL O&M COSTS (*2% Interest; OMB Jan. 2005)				\$354,000
YEARS 11-30				
Annual Monitoring of 30 MWs (VOCs, Natural Attenuation Parameters)	1	quarter	\$14,000	\$14,000
Reporting, Data Management & Evaluation	1	yearly	\$10,000	\$10,000
Subtotal Annual Costs				\$24,000
Annual Cost Contingency	7%	of Annual Costs		\$2,000
Annual O&M Costs				\$26,000
YEARS 11-30 TOTAL O&M COSTS (*2% Real Interest Rate, OMB; Jan. 2005)				\$426,000
TOTAL 30 YEAR O&M COST				\$2,195,000
TOTAL 30 YEAR NPV COST				\$2,753,000

DEFINITIONS

MWs = Monitoring Wells / NPV = Net Present Value / O&M = Operation and Maintenance / OMB = President's Office of Management and Budget

ASSUMPTIONS

*These costs are for comparison purposes only, and have an accuracy of +50/-30%. Cost estimates will be refined after the field preparation/design is completed. Many design variables and necessary prefield activities have not been established. O&M costs are calculated using a 2.0% Real Interest Rate for Federal Projects, President's Office of Management and Budget (OMB), Circular A-94, Appendix C, Updated January, 2005

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**Table A2. In Situ Enhanced Biodegradation Cost Estimate
Feasibility Study, OUCTP RI/FS, Former Fort Ord, California**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS				
<i>Planning and Design</i>				
Planning, System Design Documents	1	lump sum	\$100,000	\$100,000
Total Planning Costs				\$100,000
<i>Construct Lactate Injection/Recirculation System</i>				
Construct 4-inch double screened wells	180	well	\$10,000	\$1,800,000
Log, develop well, sample/dispose drill cuttings, water	180	well	\$1,500	\$270,000
Baseline sampling/analysis (VOCs, biodeg parameters)	30	well	\$1,500	\$45,000
Baseline sampling labor	30	each	\$900	\$27,000
Construct injection system (tank, pump, packer, piping, mixer)	10	each	\$4,000	\$40,000
Total Construction Costs				\$2,182,000
<i>Lactate Injection (Year 1)</i>				
Lactate Solution	180	well	\$3,000	\$540,000
Generator	20	each	\$1,250	\$25,000
Inject lactate	180	well	\$1,200	\$216,000
Temporary Fencing	4	each	\$6,500	\$26,000
Total Injection/Recirculation Cost				\$807,000
<i>Injection/Recirculation Well Monitoring (Year 1)</i>				
Well Monitoring (field measurements)	24	biweekly	\$3,000	\$72,000
Well Sampling (VOCs, natural attenuation parameters)	12	monthly	\$10,000	\$120,000
Reporting	4	quarterly	\$20,000	\$80,000
Total Injection/Recirculation Monitoring Costs				\$272,000
<i>Conduct Direct-Push Injection Toe of Plume (Year 1)</i>				
Direct Push Injection Points	80	points	\$3,000	\$240,000
Labor	4	weeks	\$7,500	\$30,000
Lactate Solution	80	points	\$1,500	\$120,000
Observation Well Sampling	10	wells	\$2,400	\$24,000
Total Direct-Push and Monitoring Costs				\$414,000
<i>Additional Monitoring Well Installation</i>				
Construct 5-inch monitoring wells	30	well	\$7,500	\$225,000
Log, develop well, sample/dispose drill cuttings, water	30	well	\$5,000	\$150,000
Baseline sampling/analysis (VOCs)	30	well	\$1,200	\$36,000
Baseline sampling labor	30	well	\$900	\$27,000
Total Construction Costs				\$438,000
Subtotal Capital Costs (Year 1)				\$4,213,000
Capital Cost Contingency (Engineering, Construction)	10%	of Capital Costs		\$422,000
TOTAL CAPITAL COSTS				\$4,635,000
ANNUAL O&M COSTS				
REINJECTION ANNUAL O&M COSTS (5 OF 15 YEARS)				
Reinject Lactate	1	lump sum	\$1,493,000	\$1,119,750
Subtotal Annual Costs				\$1,119,750
Annual Cost Contingency	10%	of Annual Costs		\$112,000
Total ReInjection Annual O&M Costs (YEAR 3) Assumes 220 Injection Points				\$1,231,000
			60%	
Total ReInjection Annual O&M Costs (YEAR 6) Assumes 130 Injection Points				\$739,200
			60%	
Total ReInjection Annual O&M Costs (YEAR 9) Assumes 80 Injection Points				\$443,520
			60%	
Total ReInjection Annual O&M Costs (YEAR 12) Assumes 50 Injection Points				\$266,112
			60%	
Total ReInjection Annual O&M Costs (YEAR 15) Assumes 30 Injection Points				\$159,667
TOTAL REINJECTION O&M COSTS (5 OF 15 YEARS)				\$2,841,000
SYSTEM MONITORING ANNUAL O&M COSTS (9 OF 15 YEARS)				
System Monitoring/Observation Well Sampling	4	quarters	\$16,000	\$64,000
Reporting	4	quarterly	\$20,000	\$80,000
Subtotal Annual Costs				\$144,000
Annual Cost Contingency	10%	of Annual Costs		\$15,000
Total System Monitoring Annual O&M Costs				\$159,000
TOTAL SYSTEM MONITORING O&M COSTS (9 OF 15 YEARS) (*2.0% Real Interest Rate, OMB; Jan. 2005)				\$1,298,000
PLUME MONITORING (YEARS 1-20)				
Semi-Annual Monitoring of 20 MWs (VOCs, Natural Attenuation Paramet	2	quarters	\$14,000	\$28,000
Reporting, Data Management & Evaluation	1	yearly	\$15,000	\$15,000
Subtotal Annual Costs				\$43,000
Annual Cost Contingency	7%	of Annual Costs		\$4,000
Plume Monitoring Annual O&M Costs				\$47,000
TOTAL PLUME MONITORING O&M COSTS (YEARS 1-20) (*2% Real Interest Rate, OMB; Jan. 2005)				\$769,000
TOTAL 20-YEAR O&M COSTS				\$4,908,000
TOTAL 20 YEAR NPV COST				\$9,543,000

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ASSUMPTIONS

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**Table A3. In Situ Permeable Reactive Barrier Cost Estimate
Feasibility Study, OUCTP RI/FS, Former Fort Ord, California**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS				
<i>Planning and Design</i>				
Planning, System Design Documents	1	lump sum	\$120,000	\$120,000
Conduct Pilot Study	1	lump sum	\$200,000	\$200,000
Total Planning Costs				\$320,000
<i>Construct Permeable Reactive Barrier</i>				
Set Up, Clearance, Utilities, Fencing, Dust Monitoring	1	lump sum	\$180,000	\$180,000
Hydrofracture Injection	120	points	\$5,500	\$660,000
Iron Material/Slurry	10	tons	\$350,000	\$3,500,000
Labor	12	weeks	\$7,500	\$90,000
Observation Well Installation	10	each	\$12,000	\$120,000
Observation Well Sampling	10	each	\$3,000	\$30,000
Total Construction Costs				\$4,580,000
<i>System Monitoring (Year 1)</i>				
Observation Well Sampling	26	biweekly	\$90,000	\$2,340,000
Compliance Monitoring Well Network Sampling	12	monthly	\$10,000	\$120,000
Reporting, Data Management & Evaluation	4	quarterly	\$35,000	\$140,000
Total System Monitoring Costs				\$2,600,000
<i>Additional Monitoring Well Installation</i>				
Construct 5-inch monitoring wells	30	well	\$7,500	\$225,000
Log, develop well, sample/dispose drill cuttings, water	30	well	\$5,000	\$150,000
Baseline sampling/analysis (VOCs)	30	well	\$1,200	\$36,000
Baseline sampling labor	30	well	\$900	\$27,000
Total Construction Costs				\$438,000
Subtotal Capital Costs (Year 1)				\$7,938,000
Capital Cost Contingency (Engineering, Construction)	10%	of Capital Costs		\$794,000
TOTAL CAPITAL COSTS				\$8,732,000
ANNUAL O&M COSTS				
YEARS 1-5				
Quarterly Monitoring of 120 MWs (VOCs)	4	quarters	\$40,000	\$160,000
Reporting, Data Management & Evaluation	4	quarters	\$20,000	\$80,000
Subtotal Annual Costs				\$240,000
Annual Cost Contingency	7%	of Annual Costs		\$556,000
Annual O&M Costs				\$796,000
YEARS 1-5 TOTAL O&M COSTS (*2% Interest; OMB Jan. 2005)				\$3,752,000
YEARS 6-10				
Semi-Annual Monitoring of 60 MWs (VOCs)	2	quarters	\$20,000	\$40,000
Reporting, Data Management & Evaluation	2	quarters	\$10,000	\$20,000
Subtotal Annual Costs				\$60,000
Annual Cost Contingency	7%	of Annual Costs		\$6,000
Annual O&M Costs				\$66,000
YEARS 6-10 TOTAL O&M COSTS (*2% Interest; OMB Jan. 2005)				\$312,000
YEARS 11-30				
Annual Monitoring of 30 MWs (VOCs)	1	quarter	\$10,000	\$10,000
Reporting, Data Management & Evaluation	1	yearly	\$10,000	\$10,000
Subtotal Annual Costs				\$20,000
Annual Cost Contingency	7%	of Annual Costs		\$2,000
Annual O&M Costs				\$22,000
YEARS 11-30 TOTAL O&M COSTS (*2% Real Interest Rate, OMB; Jan. 2005)				\$360,000
TOTAL 30 YEAR O&M COST				\$4,424,000
TOTAL 30 YEAR NPV COST				\$13,156,000

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 Approved *EJP*

**Table A4. Groundwater Extraction and Treatment Via Activated Carbon Cost Estimate
Feasibility Study, OUCTP RI/FS, Former Fort Ord, California**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS				
<i>Planning and Design</i>				
Planning, System Design Documents	1	lump sum	\$120,000	\$120,000
Total Planning Costs				\$120,000
<i>Construct Extraction & Treatment System</i>				
Mobe/Demobe	1	lump sum	\$50,000	\$50,000
Construct Vertical 4-inch double screened wells	3	well	\$20,000	\$60,000
Construct Horizontal 4-inch double screened wells	2	well	\$50,000	\$100,000
Pumps and Well Completion	5	well	\$8,500	\$42,500
Log, develop well, sample/dispose drill cuttings, water	5	well	\$7,000	\$35,000
Baseline sampling/analysis (VOCs, biodeg parameters)	5	well	\$1,500	\$7,500
Conveyance Piping to Central Treatment Processing Unit	1	lump sum	\$80,000	\$80,000
Labor	6	weeks	\$6,000	\$36,000
Carbon Vessels (2-4,000 lb)	2	each	\$16,000	\$32,000
Tank, pumps, compressor, meters, controls	1	lump sum	\$76,000	\$76,000
Construct Extraction System (tank, pumps, piping)	10	each	\$15,000	\$150,000
Total Construction Costs				\$669,000
<i>GAC System Monitoring (Year 1)</i>				
System Monitoring	52	weekly	\$5,500	\$286,000
System Sampling	52	weekly	\$10,000	\$520,000
Reporting (System Operation)	4	quarterly	\$50,000	\$200,000
Total Monitoring Costs				\$1,006,000
<i>Additional Monitoring Well Installation</i>				
Construct 5-inch monitoring wells	30	well	\$7,500	\$225,000
Log, develop well, sample/dispose drill cuttings, water	30	well	\$5,000	\$150,000
Baseline sampling/analysis (VOCs)	30	well	\$1,200	\$36,000
Baseline sampling labor	30	well	\$900	\$27,000
Total Construction Costs				\$438,000
Subtotal Capital Costs				\$2,233,000
Capital Cost Contingency (Engineering, Construction)	10%	of Capital Costs		\$224,000
TOTAL CAPITAL COSTS				\$2,457,000
ANNUAL O&M COSTS				
<i>Treatment System O&M</i>				
Carbon Changeout, Regeneration, Labor (every 6 weeks)	9	lump sum	\$10,800	\$97,200
Utilities, fuel	1	lump sum	\$26,000	\$26,000
System Monitoring	52	weekly	\$3,500	\$182,000
System Sampling	52	weekly	\$7,500	\$390,000
Reporting	4	quarterly	\$35,000	\$140,000
Subtotal Annual Costs				\$835,200
Annual Cost Contingency	10%	of Annual Costs		\$84,000
Total Treatment System Annual O&M Costs (YEARS 1-10)			60%	\$920,000
Total Treatment System Annual O&M Costs (YEARS 10-20)			40%	\$552,000
Total Treatment System Annual O&M Costs (YEARS 20-30)				\$368,000
PLUME MONITORING (YEARS 1-30)				
Semi-Annual Monitoring of 20 MWs (VOCs)	2	quarters	\$12,000	\$24,000
Reporting, Data Management & Evaluation	1	yearly	\$15,000	\$15,000
Subtotal Annual Costs				\$39,000
Annual Cost Contingency	7%	of Annual Costs		\$3,000
Plume Monitoring Annual O&M Costs				\$42,000
TOTAL PLUME MONITORING O&M COSTS (YEARS 1-30) (*2% Real Interest Rate, OMB; Jan. 2005)				\$941,000
TOTAL ANNUAL O&M COSTS (30 YEARS) (*2.0% Real Interest Rate, OMB; Jan. 2005)				\$17,469,000
TOTAL 30 YEAR NPV COST				\$19,926,000

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Checked *MS*
 Approved *CJ*

**Table A5. Groundwater Extraction and Treatment Via Air Stripping Cost Estimate
Feasibility Study, OUCTP RI/FS, Former Fort Ord, California**

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS				
<i>Planning and Design</i>				
Planning, System Design Documents	1	lump sum	\$120,000	\$120,000
Total Planning Costs				\$120,000
<i>Construct Extraction & Treatment System</i>				
Mobe/Demobe	1	lump sum	\$50,000	\$50,000
Construct Vertical 4-inch double screened wells	3	well	\$20,000	\$60,000
Construct Horizontal 4-inch double screened wells	2	well	\$50,000	\$100,000
Pumps and Well Completion	5	well	\$8,500	\$42,500
Log, develop well, sample/dispose drill cuttings, water	5	well	\$7,000	\$35,000
Baseline sampling/analysis (VOCs, biodeg parameters)	5	well	\$1,500	\$7,500
Conveyance Piping to Central Treatment Processing Unit	3,000	lineal feet	\$30	\$90,000
Labor	6	weeks	\$6,000	\$36,000
Air Stripper	1	tray tower	\$32,000	\$32,000
Vapor Phase Secondary Carbon Treatment	1	vessel	\$8,000	\$8,000
Tank, pumps, compressor, meters, controls	1	lump sum	\$36,000	\$36,000
Total Construction Costs				\$497,000
<i>Air Stripper System Monitoring (Year 1)</i>				
System Monitoring	52	weekly	\$7,500	\$390,000
System Sampling	52	weekly	\$10,000	\$520,000
Reporting (System Operation)	4	quarterly	\$50,000	\$200,000
Total Monitoring Costs				\$1,110,000
<i>Additional Monitoring Well Installation</i>				
Construct 5-inch monitoring wells	30	well	\$7,500	\$225,000
Log, develop well, sample/dispose drill cuttings, water	30	well	\$5,000	\$150,000
Baseline sampling/analysis (VOCs)	30	well	\$1,200	\$36,000
Baseline sampling labor	30	well	\$900	\$27,000
Total Construction Costs				\$438,000
Subtotal Capital Costs				\$2,165,000
Capital Cost Contingency (Engineering, Construction)	10%	of Capital Costs		\$217,000
TOTAL CAPITAL COSTS				\$2,382,000
ANNUAL O&M COSTS				
<i>Treatment System O&M</i>				
Air Stripper Cleanout	1	lump sum	\$45,000	\$45,000
Vapor Phase Carbon Changeout, regeneration, labor (every 8 weeks)	7	lump sum	\$8,500	\$59,500
Utilities, fuel	1	lump sum	\$18,000	\$18,000
System Monitoring	52	weekly	\$7,500	\$176,000
System Sampling	52	weekly	\$10,000	\$12,000
Reporting	4	quarterly	\$50,000	\$200,000
Subtotal Annual Costs				\$510,500
Annual Cost Contingency	10%	of Annual Costs		\$52,000
Total Annual O&M Costs (YEARS 1-10)				\$563,000
Total Annual O&M Costs (YEARS 10-20)			60%	\$338,000
Total Annual O&M Costs (YEARS 20-30)			40%	\$226,000
PLUME MONITORING (YEARS 1-30)				
Semi-Annual Monitoring of 20 MWs (VOCs)	2	quarters	\$12,000	\$24,000
Reporting, Data Management & Evaluation	1	yearly	\$15,000	\$15,000
Subtotal Annual Costs				\$39,000
Annual Cost Contingency	7%	of Annual Costs		\$3,000
Plume Monitoring Annual O&M Costs				\$42,000
TOTAL PLUME MONITORING O&M COSTS (YEARS 1-30) (*2% Real Interest Rate, OMB; Jan. 2005)				\$941,000
TOTAL ANNUAL O&M COSTS (30 YEARS) (*2.0% Real Interest Rate, OMB; Jan. 2005)				\$11,065,000
TOTAL 30 YEAR NPV COST				\$13,447,000

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ASSUMPTIONS

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