

Appendix I

Detailed Cost Estimates for Remedial Alternatives for the Lower Vadose Soil and Exposition Groundwater Remediation Zone (35 to 110 Feet bgs)

TABLE 11 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG2
IN-SITU CHEMICAL OXIDATION/IN-SITU CHEMICAL REDUCTION/GROUNDWATER PUMP AND TREAT/
MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Treatment System Equipment and Installation						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
<u>ISCO/ISCR Equipment, Materials, and Subcontractors</u>						
1	Bench Test	1	lump sum	\$5,200.00	\$5,200	ISOTEC
2	Mobilization/Demobilization	2	each	\$5,200.00	\$10,400	ISOTEC and Gregg Drilling
3	ISCO-ISCR Pilot Study	1	lump sum	\$116,250.00	\$116,250	ISOTEC and ARS Technologies
4	Injection wells, 2" PVC	98	lump sum	\$2,100.00	\$205,800	Gregg Drilling
5	Median ISCO/ISCR Reagent Cost, for 65-ft. thickness	6,370	per vertical foot	\$196.00	\$1,248,520	ISOTEC
7	Site Restoration	98	per well	\$250.00	\$24,500	Miller Brooks Env.
8	Confirmation GW Sampling (Baseline plus monitoring)	94	per sample	\$463.45	\$43,379	Gregg Drilling and Calscience
<u>Pump and Treat Equipment, Materials, and Subcontractors</u>						
9	Treatment Compound - Concrete Pad, Fencing, Lights	1	lump sum	\$10,864.00	\$10,864	RS Means
10	Utility Connections	1	lump sum	\$12,906.00	\$12,906	RS Means
11	Mobilization/Demobilization	4	each	\$2,400.00	\$9,600	Gregg Drilling
12	Well Installation, 6" dia.	15	each	\$15,785.00	\$236,775	Gregg Drilling
13	Piping Network, Manifold, Valves	1	lump sum	\$37,425.00	\$37,425	Harrington Industrial Plastics
14	Trenching and Backfill, 8" wide trench, 24" deep	3,324	linear feet	\$2.18	\$7,246	RS Means
15	Grundfos Rediflo 3, 1/3 Hp, 120 ft. Lead, Controllers	15	each	\$2,235.00	\$33,525	Grundfos
16	Site Restoration/Well Destruction	15	lump sum	\$950.00	\$14,250	Gregg Drilling
<u>UV Ox. Equipment, Materials, & Subcontractors</u>						
17	Mobilization/Installation/Start-Up/Demob.	1	lump sum	\$16,650.00	\$16,650	Calgon Carbon
18	Rayox Reactor System w/PreTrmt. Flow rated to 50 gpm.	1	lump sum	\$111,000.00	\$111,000	Calgon Carbon
19	Discharge Conveyance System	1	lump sum	\$12,675.00	\$9,810	McMaster-Carr and RS Means
<u>Monitored Natural Attenuation Equipment, Materials, and Subcontractors</u>						
20	Monitoring Well Installation	30	per well	\$15,785.00	\$473,550	Gregg Drilling
21	Handling Fees (3%)	1	lump sum	\$78,829.51	\$78,830	T N & Associates
22	Contingency (10%)	1	lump sum	\$262,765.02	\$262,765	RS Means
	Subtotal (Equipment, Materials, and Subs)				\$2,969,245	
<u>Equipment Installation Labor</u>						
23	Construction Management	1,050	hour	\$85.00	\$89,250	T N & Associates
24	Mechanical Assembly and Installation	240	hour	\$85.00	\$20,400	T N & Associates
24	Engineering, Design, and Inspection	480	hour	\$100.00	\$48,000	T N & Associates
25	Project Management	300	hour	\$110.00	\$33,000	T N & Associates
	Subtotal (Installation Labor)				\$190,650	
TOTAL TREATMENT SYSTEM EQUIPMENT AND INSTALLATION:					\$3,159,895	

Assumptions:

1. Refer to the conceptual design for Alternative SG2 (Section 3.4.3.2) for additional design information and assumptions.
2. Estimated duration for the pilot study and treatment is approximately 1 year plus a minimum of 5 years additional monitoring.
3. The ROI for injection well placement is assumed to be 15 feet.
4. Assumes a median priced ISCO/ISCR reagent, converted to \$/foot of well depth, is used to inject into the 98 wells.
5. Confirmation sampling for ISCO/ISCR is based on two groundwater monitoring events at 39 wells, plus QC.
6. Assume injection wells can be converted to monitoring wells if necessary.

TABLE 11 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG2
IN-SITU CHEMICAL OXIDATION/IN-SITU CHEMICAL REDUCTION/GROUNDWATER PUMP AND TREAT/
MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Annual Operation and Maintenance (Monitoring)						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
<u>Pump and Treat System</u>						
1	Electrical Consumption	117,178	kWH	\$0.18	\$21,092	S.C. Edison
2	Maintenance and Service (Average)	1	lump sum	\$2,200.00	\$2,200	T N & Associates
3	Mechanical, Pipe, Valves, Parts (Average)	1	lump sum	\$2,420.18	\$2,420	T N & Associates
<u>UV Oxidation System</u>						
4	Electrical Consumption	479,952	kWH	\$0.18	\$86,391	Calgon and S.C. Edison
5	Peroxide, Delivered as 50% Solution (in lbs)	27,375	lbs	\$0.65	\$17,794	Calgon Carbon
6	Maintenance, Parts, Lamp Replacement (Avg. 6 years)	1	lump sum	\$9,007.00	\$9,007	Calgon Carbon
7	Laboratory Analysis of Water Discharge	12	month	\$500.00	\$6,000	Calscience Environmental Labs.
<u>Groundwater Monitoring</u>						
8	(2) Semiannual GW Sampling Events, Incl. QC	90	each	\$546.40	\$49,176	Calscience Labs
9	Handling Fees (3%)	1	lump sum	\$5,822.41	\$5,822	TN& Associates
10	Contingency (10%)	1	lump sum	\$19,408.02	\$19,408	RS Means
Subtotal (Annual Operation and Maintenance)					\$219,311	
<u>O&M Labor</u>						
11	Weekly Inspection and Monitoring	1,040	hours	85.00	\$88,400	T N & Associates
12	Data Processing and Reporting	770	hours	100.00	\$77,000	T N & Associates
13	Management of O&M	440	hours	110.00	\$48,400	T N & Associates
Subtotal (O&M Labor)					\$213,800	
TOTAL ANNUAL OPERATION AND MAINTENANCE					\$433,111	

Present Worth of Annual Operation and Maintenance (Monitoring)				
	Cost	Interest Rate	Years	Present Worth
Total Present Worth of Annual O&M	\$433,111	4.25%	6	\$2,252,176

Calculated using uniform series present worth factor.

Assumptions:

1. Costs associated with treatment of water and vapor discharge are included with the treatment scenarios.
2. Semiannual groundwater sampling at 39 well locations includes analysis for VOCs via EPA Methods 8260B and oxidation specific analyses.
3. The interest rate used in the present worth calculation (4.25%) is the reported Prime Rate (Nov. 2002).

TABLE I2 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG3
ENHANCED *IN-SITU* BIOREMEDIATION/GROUNDWATER PUMP AND TREAT/
MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION
LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Treatment System Equipment and Installation						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
<u>EISB Equipment, Materials, and Subcontractors</u>						
2	Mobilization/Demobilization	2	each	\$5,200.00	\$10,400	ISOTEC and Gregg Drilling
2	Pilot Study (Includes Baseline Monitoring)	1	lump sum	\$73,600.00	\$73,600	Regenesis, Gregg Drilling, TN&A
4	Injection wells, 2" PVC	98	lump sum	\$2,100.00	\$205,800	Gregg Drilling
4	Regenesis HRC, 910 lbs/well	89,180	lbs	\$9.20	\$820,456	Regenesis
7	Site Restoration	98	per well	\$250.00	\$24,500	Miller Brooks Env.
8	Confirmation GW Sampling (Baseline plus monitoring)	94	per sample	\$463.45	\$43,379	Gregg Drilling and Calscience
<u>Pump and Treat Equipment, Materials, and Subcontractors</u>						
9	Treatment Compound - Concrete Pad, Fencing, Lights	1	lump sum	\$10,864.00	\$10,864	RS Means
10	Utility Connections	1	lump sum	\$12,906.00	\$12,906	RS Means
11	Mobilization/Demobilization	4	each	\$2,400.00	\$9,600	Gregg Drilling
12	Well Installation, 6" dia.	15	each	\$15,785.00	\$236,775	Gregg Drilling
13	Piping Network, Manifold, Valves	1	lump sum	\$37,425.00	\$37,425	Harrington Industrial Plastics
14	Trenching and Backfill, 8" wide trench, 24" deep	3,324	linear feet	\$2.18	\$7,246	RS Means
15	Grundfos Rediflo 3, 1/3 Hp, 120 ft. Lead, Controllers	15	each	\$2,235.00	\$33,525	Grundfos
16	Site Restoration/Well Destruction	15	lump sum	\$950.00	\$14,250	Gregg Drilling
<u>UV Ox. Equipment, Materials, & Subcontractors</u>						
17	Mobilization/Installation/Start-Up/Demob.	1	lump sum	\$16,650.00	\$16,650	Calgon Carbon
18	Rayox Reactor System w/PreTrmt. Flow rated to 50 gpm.	1	lump sum	\$111,000.00	\$111,000	Calgon Carbon
19	Discharge Conveyance System	1	lump sum	\$12,675.00	\$9,810	McMaster-Carr and RS Means
<u>Monitored Natural Attenuation Equipment, Materials, and Subcontractors</u>						
20	Monitoring Well Installation	30	per well	\$15,785.00	\$473,550	Gregg Drilling
21	Handling Fees (3%)	1	lump sum	\$64,552.09	\$64,552	T N & Associates
22	Contingency (10%)	1	lump sum	\$215,173.62	\$215,174	RS Means
	Subtotal (Equipment, Materials, and Subs)				\$2,431,462	
<u>Equipment Installation Labor</u>						
23	Construction Management	1,050	hour	\$85.00	\$89,250	T N & Associates
24	Mechanical Assembly and Installation	240	hour	\$85.00	\$20,400	T N & Associates
24	Engineering, Design, and Inspection	480	hour	\$100.00	\$48,000	T N & Associates
25	Project Management	300	hour	\$110.00	\$33,000	T N & Associates
	Subtotal (Installation Labor)				\$190,650	
TOTAL TREATMENT SYSTEM EQUIPMENT AND INSTALLATION:					\$2,622,112	

Assumptions:

1. Refer to the conceptual design for Alternative SG3 (Section 3.4.3.3) for additional design information and assumptions.
2. Estimated duration for the pilot study and treatment is approximately 1 year plus a minimum of 5 years additional monitoring.
3. The ROI for injection well placement is assumed to be 15 feet.
4. Due to the uncertainty with achieving dispersion in unsaturated soils, the hydrogen release compound (HRC) is not recommended for unsaturated zones.
5. Baseline and confirmation sampling is based 39 sampling wells plus quality control samples.
6. Assume injection wells can be converted to monitoring wells if necessary.

**TABLE I2 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG3
 ENHANCED *IN-SITU* BIOREMEDIATION/GROUNDWATER PUMP AND TREAT/
 MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE**

Annual Operation and Maintenance (Monitoring)						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
<u>Pump and Treat System</u>						
1	Electrical Consumption	117,178	kWH	\$0.18	\$21,092	S.C. Edison
2	Maintenance and Service (Average)	1	lump sum	\$2,200.00	\$2,200	T N & Associates
3	Mechanical, Pipe, Valves, Parts (Average)	1	lump sum	\$2,420.18	\$2,420	T N & Associates
<u>UV Oxidation System</u>						
4	Electrical Consumption	479,952	kWH	\$0.18	\$86,391	Calgon and S.C. Edison
5	Peroxide, Delivered as 50% Solution (in lbs)	27,375	lbs	\$0.65	\$17,794	Calgon Carbon
6	Maintenance, Parts, Lamp Replacement (Avg. 6 years)	1	lump sum	\$9,007.00	\$9,007	Calgon Carbon
7	Laboratory Analysis of Water Discharge	12	month	\$500.00	\$6,000	Calscience Environmental Labs.
<u>Groundwater Monitoring</u>						
8	(2) Semiannual GW Sampling Events, Incl. QC	90	each	\$546.40	\$49,176	Calscience Labs
9	Handling Fees (3%)	1	lump sum	\$5,822.41	\$5,822	TN& Associates
10	Contingency (10%)	1	lump sum	\$19,408.02	\$19,408	RS Means
Subtotal (Annual Operation and Maintenance)					\$219,311	
<u>O&M Labor</u>						
11	Weekly Inspection and Monitoring	1,040	hours	85.00	\$88,400	T N & Associates
12	Data Processing and Reporting	770	hours	100.00	\$77,000	T N & Associates
13	Management of O&M	440	hours	110.00	\$48,400	T N & Associates
Subtotal (O&M Labor)					\$213,800	
TOTAL ANNUAL OPERATION AND MAINTENANCE					\$433,111	

Present Worth of Annual Operation and Maintenance (Monitoring)				
	Cost	Interest Rate	Years	Present Worth
Total Present Worth of Annual O&M	\$433,111	4.25%	6	\$2,252,176

Calculated using uniform series present worth factor.

Assumptions:

1. Costs associated with treatment of water and vapor discharge are included with the treatment scenarios.
2. Semiannual groundwater sampling at 39 well locations includes analysis for VOCs via EPA Methods 8260B and bioremediation specific analyses.
3. The interest rate used in the present worth calculation (4.25%) is the reported Prime Rate (Nov. 2002).

TABLE I3 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG4a
VACUUM-ENHANCED GROUNDWATER EXTRACTION/GROUNDWATER PUMP AND TREAT/
MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION/FLAMELESS THERMAL OXIDATION/GRANULAR ACTIVATED CARBON
LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Treatment System Equipment and Installation						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
<u>Vacuum Enhanced GW Extract Equip., Materials, and Subs</u>						
1	Treatment Compound - Concrete Pad, Fencing, Lights	1	lump sum	\$10,864.00	\$10,864	RS Means
2	Utility Connections (all systems - gas, elec., sewer)	1	lump sum	\$29,220.00	\$29,220	RS Means
3	Mobilization/Demobilization	4	each	\$5,200.00	\$20,800	EnviroSupply and Gregg Drilling
4	1000 SCFM Duel Phase Extraction System	2	lump sum	\$122,869.44	\$245,739	EnviroSupply Purchase
5	Well Installation, 4" dia.	20	each	\$15,785.00	\$315,700	Gregg Drilling
6	Piping Network, Manifold, Valves	1	lump sum	\$33,600.40	\$33,600	Harrington Industrial Plastics
7	Trenching and Backfill, 8" wide trench, 24" deep	3,324	linear feet	\$2.18	\$7,246	RS Means
8	Installation and Start-Up	100	hour	\$65.00	\$6,500	EnviroSupply
9	Site Restoration	1	lump sum	\$10,500.00	\$10,500	TN& Associates
10	Confirmation Soil Sampling after Treatment	1	lump sum	\$34,574	\$34,574	Gregg Drilling and Calscience
<u>Pump and Treat Equipment, Materials, and Subcontractors</u>						
11	Well Installation, 6" dia.	15	each	\$15,785	\$236,775	Gregg Drilling
12	Piping Network, Manifold, Valves	1	lump sum	\$10,207	\$10,207	Harrington Industrial Plastics
13	Grundfos Rediflo 3, 1/3 Hp, 120 ft. Lead, Controllers	15	each	\$2,235	\$33,525	Grundfos
14	Site Restoration/Well Destruction	15	lump sum	\$950	\$14,250	Gregg Drilling
<u>UV Ox. Equipment, Materials, & Subcontractors</u>						
15	Mobilization/Installation/Start-Up/Demob.	1	lump sum	\$16,650.00	\$16,650	Calgon Carbon
16	Rayox Reactor System w/PreTrmt. Flow rated to 50 gpm.	1	lump sum	\$111,000.00	\$111,000	Calgon Carbon
17	Discharge Conveyance System	1	lump sum	\$12,675.00	\$9,810	McMaster-Carr and RS Means
<u>Flameless Thermal Oxidizer (1st Year Costs) Equip., Materials, and Subs</u>						
18	Electrical Consumption	346,896	kWH	\$0.18	\$62,441	Alzeta and S.C. Edison
19	Water Consumption	24,312	100 c.f.	\$1.67	\$40,601	Alzeta and Maywood Mutual Water Co.
20	Gas Consumption	304,848	therm	\$0.69	\$210,345	Alzeta and S. Cal Gas Company
21	Sodium Hydroxide Additive	144,540	gal	\$1.10	\$158,994	Alzeta
22	Alzeta 2000 scfm FTO - Lease	12	month	\$18,750.00	\$225,000	Alzeta
23	Alzeta Service Contract Plan	1	lump sum	\$10,356.00	\$10,356	Alzeta
24	Laboratory Analysis of Vapor Discharge	12	month	\$6,587.00	\$79,044	Air Toxics
25	Laboratory Analysis of Water Discharge	12	month	\$500	\$6,000	Calscience Env. Labs.
<u>Vapor Phase GAC (Installed Yr 2) Equipment, Materials, & Subcontractors</u>						
26	Mobilization/Installation/Start-Up/Demob.	1	each	\$13,320.00	\$13,320	TN& Associates
27	2000 lb Vapor Phase GAC Vessels (full)	2	lump sum	\$10,400.00	\$20,800	EnviroSupply Service, Inc.
<u>Monitored Natural Attenuation Equipment, Materials, and Subcontractors</u>						
28	Monitoring Well Installation	30	per well	\$15,785.00	\$473,550	Gregg Drilling
29	Handling Fees (3%)	1	lump sum	\$73,422.36	\$73,422	TN& Associates
30	Contingency (10%)	1	lump sum	\$244,741.19	\$244,741	RS Means
Subtotal (Equipment, Materials, and Subs)					\$2,765,575	
<u>Equipment Installation Labor</u>						
31	Construction Management	1,560	hour	\$85.00	\$132,600	TN& Associates
32	Mechanical Assembly and Installation	250	hour	\$85.00	\$21,250	T N & Associates
33	Engineering, Design, and Inspection	600	hour	\$100.00	\$60,000	TN& Associates
34	Project Management	360	hour	\$110.00	\$39,600	TN& Associates
Subtotal (Installation Labor)					\$ 253,450	
TOTAL TREATMENT SYSTEM EQUIPMENT AND INSTALLATION:					\$3,019,025	

Assumptions:

- Refer to the conceptual design for Alternative SG4 (Section 3.4.3.4) for additional design information and assumptions.
- The estimated treatment duration is 15 years based on estimated contaminant extraction rates plus 5 additional years of monitoring.
- Confirmation soil sampling is included above, confirmation groundwater sampling is included under O&M.
- Approximately 16 confirmation soil borings would be installed and seven samples would be collected per boring.
- This alternative assumes that that initial high mass loading of VOCs extracted in vapor during the first year of operation would be more effectively and efficiently treated using FTO. After one year of remediation, the vapor treatment system would be switched to GAC - a more cost effective option for lower contaminant loading.

TABLE 13 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG4a
VACUUM-ENHANCED GROUNDWATER EXTRACTION/GROUNDWATER PUMP AND TREAT/
MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION/FLAMELESS THERMAL OXIDATION/GRANULAR ACTIVATED CARBON
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Annual Operation and Maintenance						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
<u>Vacuum Enhanced Extract and P&T System</u>						
1	Electrical Consumption	536,550	kWH	\$0.18	\$96,579	S.C. Edison
2	Blower Maintenance and Service (Average for 15 yrs.)	1	lump sum	\$2,200.00	\$2,200	T N & Associates
3	Mechanical, Pipe, Valves, Parts (Average for 15 yrs.)	1	lump sum	\$1,680.02	\$1,680	Assume 5% of Network Cost
4	Annualized Blower Replacement/Overhaul	1	lump sum	\$6,143.47	\$6,143	EnviroSupply Service Inc.
<u>UV Oxidation System</u>						
5	Electrical Consumption	525,600	kWH	\$0.18	\$94,608	Calgon and S.C. Edison
6	Peroxide, Delivered as 50% Solution (in lbs)	31,755	lbs	\$0.65	\$20,641	Calgon Carbon
7	Maintenance, Parts, Lamp Replacement (Avg. 15 year)	1	lump sum	\$9,007.00	\$9,007	Calgon Carbon
8	Laboratory Analysis of Water Discharge	12	month	\$500.00	\$6,000	Calscience Environmental Labs.
<u>Vapor Phase GAC System</u>						
9	Replacement Carbon (average over 14 years)	36,000	lbs	\$1.15	\$41,400	EnviroSupply and S.C. Gas Company
10	Carbon Analytical Profiling	18	per vessel	\$350.00	\$6,300	EnviroSupply Service Inc.
11	Carbon Disposal	36,000	lbs	\$0.60	\$21,600	EnviroSupply Service Inc.
12	Laboratory Analysis of Vapor Discharge	12	month	1,867.14	\$22,406	Air Toxics
<u>Groundwater Monitoring</u>						
13	(2) Semiannual GW Sampling Events, Incl. QC	94	each	\$546.40	\$51,220	Calscience Labs
14	Handling Fees (3%)	1	lump sum	\$11,393.52	\$11,394	TN& Associates
15	Contingency (10%)	1	lump sum	\$37,978.39	\$37,978	RS Means
Subtotal (Annual Operation and Maintenance)					\$429,156	
<u>O&M Labor</u>						
16	Weekly Inspection and Monitoring	1,300	hours	85.00	\$110,500	T N & Associates
17	Data Processing and Reporting	840	hours	100.00	\$84,000	T N & Associates
18	Management of O&M	480	hours	110.00	\$52,800	T N & Associates
Subtotal (O&M Labor)					\$247,300	

TOTAL ANNUAL OPERATION AND MAINTENANCE	\$676,456
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Present Worth of Annual Operation and Maintenance					
	Cost	Interest Rate	Years	Present Worth	
Present Worth of Annual O&M	\$676,456	4.25%	5	\$2,990,611	Calculated using uniform series present worth factor.
Present Worth of 5 Years of Additional GW Monitoring (years 15 to 20)	\$249,088	5.00%	15	\$119,816	Calculated from present worth of single payment in 15 years time. The single payment in 15 years time was calculated from a uniform series present worth factor for 5 years of monitoring (5% is a reasonable future interest rate).
Total Present Worth of Annual O&M				\$3,110,427	

Assumptions:

- Costs associated with treatment of water and vapor discharge are included with the treatment scenarios.
- Electrical rate for small business were provided by Southern California Edison (Los Angeles) and range from \$.14 - \$.21/kWH.
- Semiannual groundwater sampling would be performed on 39 wells and the analysis would be for VOCs via EPA Methods 8260B and natural attenuation parameters.
- Weekly inspections will be performed and reported in conjunction with the remediation system monitoring and compliance sampling.
- The interest rate used in the present worth calculation (4.25%) is the reported Prime Rate (Nov. 2002).
- Lab analysis of vapor is based on bi-weekly VOC analysis via EPA Method TO-15.
- A major blower overhaul or replacement cost is assumed to occur at year 10. This cost has been annualized and included above.
- It is also assumed the blower will have no resale/salvage value after 20 years.

TABLE I4 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG4b
VACUUM-ENHANCED GROUNDWATER EXTRACTION/GROUNDWATER PUMP AND TREAT/
MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION/GRANULAR ACTIVATED CARBON
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Treatment System Equipment and Installation						
<u>Item No.</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Rate</u>	<u>Total Cost</u>	<u>Source</u>
<u>Vacuum Enhanced GW Extract Equip., Materials, and Subs</u>						
1	Treatment Compound - Concrete Pad, Fencing, Lights	1	lump sum	\$10,864.00	\$10,864	RS Means
2	Utility Connections (all systems - gas, elec., sewer)	1	lump sum	\$29,220.00	\$29,220	RS Means
3	Mobilization/Demobilization	4	each	\$5,200.00	\$20,800	EnviroSupply and Gregg Drilling
4	1000 SCFM Dual Phase Extraction System	2	lump sum	\$122,869.44	\$245,739	EnviroSupply Purchase
5	Well Installation, 4" dia.	20	each	\$15,785.00	\$315,700	Gregg Drilling
6	Piping Network, Manifold, Valves	1	lump sum	\$33,600.40	\$33,600	Harrington Industrial Plastics
7	Trenching and Backfill, 8" wide trench, 24" deep	3,324	linear feet	\$2.18	\$7,246	RS Means
8	Installation and Start-Up	100	hour	\$65.00	\$6,500	EnviroSupply
9	Site Restoration	1	lump sum	\$10,500.00	\$10,500	TN& Associates
10	Confirmation Soil Sampling after Treatment	1	lump sum	\$34,574	\$34,574	Gregg Drilling and Calscience
<u>Pump and Treat Equipment, Materials, and Subcontractors</u>						
11	Well Installation, 6" dia.	15	each	\$15,785	\$236,775	Gregg Drilling
12	Piping Network, Manifold, Valves	1	lump sum	\$10,207	\$10,207	Harrington Industrial Plastics
13	Grundfos Rediflo 3, 1/3 Hp, 120 ft. Lead, Controllers	15	each	\$2,235	\$33,525	Grundfos
14	Site Restoration/Well Destruction	15	lump sum	\$950	\$14,250	Gregg Drilling
<u>UV Ox. Equipment, Materials, & Subcontractors</u>						
15	Mobilization/Installation/Start-Up/Demob.	1	lump sum	\$16,650.00	\$16,650	Calgon Carbon
16	Rayox Reactor System w/PreTrmt. Flow rated to 50 gpm.	1	lump sum	\$111,000.00	\$111,000	Calgon Carbon
17	Discharge Conveyance System	1	lump sum	\$12,675.00	\$9,810	McMaster-Carr and RS Means
<u>Vapor Phase GAC Equipment, Materials, & Subcontractors</u>						
26	Mobilization/Installation/Start-Up/Demob.	1	each	\$14,744.33	\$14,744	TN& Associates
27	2000 lb Vapor Phase GAC Vessels (full)	2	each	\$10,400.00	\$20,800	EnviroSupply Service, Inc.
<u>Monitored Natural Attenuation Equipment, Materials, and Subcontractors</u>						
28	Monitoring Well Installation	30	per well	\$15,785.00	\$473,550	Gregg Drilling
29	Handling Fees (3%)	1	lump sum	\$49,681.64	\$49,682	TN& Associates
30	Contingency (10%)	1	lump sum	\$165,605.47	\$165,605	RS Means
	Subtotal (Equipment, Materials, and Subs)				\$1,871,342	
<u>Equipment Installation Labor</u>						
31	Construction Management	1,085	hour	\$85.00	\$92,225	TN& Associates
32	Mechanical Assembly and Installation	240	hour	\$85.00	\$20,400	T N & Associates
33	Engineering, Design, and Inspection	480	hour	\$100.00	\$48,000	TN& Associates
34	Project Management	310	hour	\$110.00	\$34,100	TN& Associates
	Subtotal (Installation Labor)				\$ 194,725	
TOTAL TREATMENT SYSTEM EQUIPMENT AND INSTALLATION:					\$2,066,067	

Assumptions:

1. Refer to the conceptual design for Alternative SG4b (Section 3.4.3.5) for additional design information and assumptions.
2. The estimated treatment duration is 15 years based on estimated contaminant extraction rates plus 5 additional years of monitoring.
3. Concentrations of 1,4 dioxane in perched groundwater would not adsorb efficiently to carbon and is therefore best treated using UV oxidation.
4. This alternative assumes that additional volume and higher quality GAC (vapor phase) will adequately control emissions of vinyl chloride and 1,4 dioxane (if they are found to be at low enough concentrations). Therefore, some uncertainty exists with the ability of vapor phase GAC treatment to meet discharge requirements.
5. Confirmation soil sampling is included above, confirmation groundwater sampling is included under O&M.
6. Approximately 16 confirmation soil borings would be installed and seven samples would be collected per boring.

TABLE I4 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG4b
VACUUM-ENHANCED GROUNDWATER EXTRACTION/GROUNDWATER PUMP AND TREAT/
MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION/GRANULAR ACTIVATED CARBON
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Annual Operation and Maintenance						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
<u>Vacuum Enhanced Extract and P&T System</u>						
1	Electrical Consumption	536,550	kWH	\$0.18	\$96,579	S.C. Edison
2	Blower Maintenance and Service (Average for 15 yrs.)	1	lump sum	\$2,200.00	\$2,200	T N & Associates
3	Mechanical, Pipe, Valves, Parts (Average for 15 yrs.)	1	lump sum	\$1,680.02	\$1,680	Assume 5% of Network Cost
4	Annualized Blower Replacement/Overhaul	1	lump sum	\$6,143.47	\$6,143	EnviroSupply Service Inc.
<u>UV Oxidation System</u>						
5	Electrical Consumption	525,600	kWH	\$0.18	\$94,608	Calgon and S.C. Edison
6	Peroxide, Delivered as 50% Solution (in lbs)	31,755	lbs	\$0.65	\$20,641	Calgon Carbon
7	Maintenance, Parts, Lamp Replacement (Avg. 15 year)	1	lump sum	\$9,007.00	\$9,007	Calgon Carbon
8	Laboratory Analysis of Water Discharge	12	month	\$500.00	\$6,000	Calscience Environmental Labs.
<u>Vapor Phase GAC System</u>						
9	Replacement Carbon (average over 15 years)	58,000	lbs	\$1.15	\$66,700	EnviroSupply and S.C. Gas Company
10	Carbon Analytical Profiling	29	per vessel	\$350.00	\$10,150	EnviroSupply Service Inc.
11	Carbon Disposal	58,000	lbs	\$0.60	\$34,800	EnviroSupply Service Inc.
12	Laboratory Analysis of Vapor Discharge	18	month	1,867.14	\$33,609	Air Toxics
<u>Groundwater Monitoring</u>						
13	(2) Semiannual GW Sampling Events, Incl. QC	94	each	\$546.40	\$51,220	Calscience Labs
14	Handling Fees (3%)	1	lump sum	\$13,000.10	\$13,000	TN& Associates
15	Contingency (10%)	1	lump sum	\$43,333.68	\$43,334	RS Means
Subtotal (Annual Operation and Maintenance)					\$489,671	
<u>O&M Labor</u>						
17	Weekly Inspection and Monitoring	1,144	hours	85.00	\$97,240	T N & Associates
18	Data Processing and Reporting	784	hours	100.00	\$78,400	T N & Associates
19	Management of O&M	480	hours	110.00	\$52,800	T N & Associates
Subtotal (O&M Labor)					\$228,440	
TOTAL ANNUAL OPERATION AND MAINTENANCE					\$718,111	
Present Worth of Annual Operation and Maintenance						
		Cost	Interest Rate	Years	Present Worth	
Present Worth of Annual O&M		\$718,111	4.25%	5	\$3,174,767	Calculated using uniform series present worth factor.
Present Worth of 5 Years of Additional GW Monitoring (years 15 to 20)		\$249,088	5.00%	15	\$119,816	Calculated from present worth of single payment in 15 years time. The single payment in 15 years time was calculated from a uniform series present worth factor for 5 years of monitoring (5% is a reasonable future interest rate).
Total Present Worth of Annual O&M					\$3,294,582	

Assumptions:

- Costs associated with treatment of water and vapor discharge are included with the treatment scenarios.
- Electrical rate for small business were provided by Southern California Edison (Los Angeles) and range from \$.14 - \$.21/kWH.
- Semiannual groundwater sampling would be performed on 39 wells and the analysis would be for VOCs via EPA Methods 8260B and natural attenuation parameters.
- Weekly inspections will be performed and reported in conjunction with the remediation system monitoring and compliance sampling.
- The interest rate used in the present worth calculation (4.25%) is the reported Prime Rate (Nov. 2002).
- Lab analysis of vapor is based on bi-weekly VOC analysis via EPA Method TO-15.
- A major blower overhaul or replacement cost is assumed to occur at year 8. This cost has been annualized and included above.
- It is also assumed the blower will have no resale/salvage value after 15 years.

TABLE I5 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG5a
ELECTRICAL RESISTANCE HEATING WITH VAPOR EXTRACTION/VACUUM-ENHANCED GROUNDWATER EXTRACTION/GROUNDWATER PUMP AND
TREAT/MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION/FLAMELESS THERMAL OXIDATION/GRANULAR ACTIVATED CARBON
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Treatment System Equipment and Installation						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
ERH Equip., Materials, Subs + 1 year O&M						
1	Treatment Compound - for Power Deliver Systems	1	lump sum	\$24,474	\$24,474	RS Means
2	Mobilization/Demob.	2	each	\$20,000.00	\$40,000	McMillan-McGee
3	Preliminary Resistivity Testing & Design	1	lump sum	\$16,573.00	\$16,573	McMillan-McGee
4	Pilot Study - 12 electrode, install, monitor, report, trmt.	1	lump sum	\$318,953.00	\$318,953	McMillan-McGee
5	Full Scale Ops. - 96 elec., 33 borings, utils., controls	1	lump sum	\$1,111,517.12	\$1,111,517	McMillan-McGee and Gregg Drilling
6	SVE Extraction System - 16 wells, 4 in., piping, trench.	1	lump sum	\$255,940.32	\$255,940	Harrington Plastics & Gregg Drilling
7	Confirmation Soil and GW Sampling after Treatment	1	lump sum	\$22,314.36	\$22,314	T N & Associates
1	Electrical Consumption	756,864	kWH	\$0.18	\$136,236	McMillan-McGee & S.C. Edison
Vacuum Enhanced GW Extract Equip., Materials, and Subs						
1	Treatment Compound - Concrete Pad, Fencing, Lights	1	lump sum	\$10,864.00	\$10,864	RS Means
2	Utility Connections (all systems - gas, elec., sewer)	1	lump sum	\$29,220.00	\$29,220	RS Means
3	Mobilization/Demobilization	4	each	\$5,200.00	\$20,800	EnviroSupply and Gregg Drilling
4	1000 SCFM Duel Phase Extraction System	2	lump sum	\$122,869.44	\$245,739	EnviroSupply Purchase
5	Well Installation, 4" dia.	12	each	\$15,785.00	\$189,420	Gregg Drilling
6	Piping Network, Manifold, Valves	1	lump sum	\$33,600.40	\$33,600	Harrington Industrial Plastics
7	Trenching and Backfill, 8" wide trench, 24" deep	3,324	linear feet	\$2.18	\$7,246	RS Means
8	Installation and Start-Up	100	hour	\$65.00	\$6,500	EnviroSupply
9	Site Restoration	1	lump sum	\$10,500.00	\$10,500	TN& Associates
10	Confirmation Soil Sampling after Treatment	1	lump sum	\$34,574	\$34,574	Gregg Drilling and Calscience
Pump and Treat Equipment, Materials, and Subcontractors						
11	Well Installation, 6" dia.	15	each	\$15,785	\$236,775	Gregg Drilling
12	Piping Network, Manifold, Valves	1	lump sum	\$10,207	\$10,207	Harrington Industrial Plastics
13	Grundfos Rediflo 3, 1/3 Hp, 120 ft. Lead, Controllers	15	each	\$2,235	\$33,525	Grundfos
14	Site Restoration/Well Destruction	15	lump sum	\$950	\$14,250	Gregg Drilling
UV Ox. Equipment, Materials, & Subcontractors						
15	Mobilization/Installation/Start-Up/Demob.	1	lump sum	\$16,650.00	\$16,650	Calgon Carbon
16	Rayox Reactor System w/PreTrmt. Flow rated to 50 gpm.	1	lump sum	\$111,000.00	\$111,000	Calgon Carbon
17	Discharge Conveyance System	1	lump sum	\$12,675.00	\$12,675	McMaster-Carr and RS Means
Flameless Thermal Oxidizer (1st Year Costs) Equip., Materials, and Subs						
18	Electrical Consumption	346,896	kWH	\$0.18	\$62,441	Alzeta and S.C. Edison
19	Water Consumption	24,312	100 c.f.	\$1.67	\$40,601	Alzeta and Maywood Mutual Water Co.
20	Gas Consumption	304,848	therm	\$0.69	\$210,345	Alzeta and S. Cal Gas Company
21	Sodium Hydroxide Additive	144,540	gal	\$1.10	\$158,994	Alzeta
22	Alzeta 2000 scfm FTO - Lease	12	month	\$18,750.00	\$225,000	Alzeta
23	Alzeta Service Contract Plan	1	lump sum	\$10,356.00	\$10,356	Alzeta
24	Laboratory Analysis of Vapor Discharge	12	month	\$6,587.00	\$79,044	Air Toxics
25	Laboratory Analysis of Water Discharge	12	month	\$500	\$6,000	Calscience Env. Labs.
Vapor Phase GAC (Installed Yr 2) Equipment, Materials, & Subcontractors						
26	Mobilization/Installation/Start-Up/Demob.	1	each	\$13,320.00	\$13,320	TN& Associates
27	2000 lb Vapor Phase GAC Vessels (full)	2	lump sum	\$10,400.00	\$20,800	EnviroSupply Service, Inc.
Monitored Natural Attenuation Equipment, Materials, and Subcontractors						
28	Monitoring Well Installation	30	per well	\$15,785.00	\$473,550	Gregg Drilling
29	Handling Fees (3%)	1	lump sum	\$127,500.13	\$127,500	TN& Associates
30	Contingency (10%)	1	lump sum	\$425,000.42	\$425,000	RS Means
Subtotal (Equipment, Materials, and Subs)					\$4,802,505	
Equipment Installation Labor						
31	Construction Management	1,820	hour	\$85.00	\$154,700	TN& Associates
32	Mechanical Assembly and Installation	300	hour	\$85.00	\$25,500	T N & Associates
33	Engineering, Design, and Inspection	720	hour	\$100.00	\$72,000	TN& Associates
34	Project Management	360	hour	\$110.00	\$39,600	TN& Associates
Subtotal (Installation Labor)					\$ 291,800	
TOTAL TREATMENT SYSTEM EQUIPMENT AND INSTALLATION:					\$5,094,305	

Assumptions:

1. Refer to the conceptual design for Alternative SP5a (Section 3.4.3.6) for additional design information and assumptions.
2. The pilot scale and full scale operations include all drilling, power modules, utility costs, O&M, data collection, and reporting.
3. Costs associated with treatment of groundwater and vapor are included with the treatment scenarios. Since 1,4 Dioxane was detected in the perched zone and does not adsorb to carbon and is not amenable to air stripping, oxidation technologies were selected for treatment of groundwater and vapor.
4. Costs associated with treatment of groundwater and vapor are included with the treatment scenarios. Since 1,4 Dioxane was detected in the perched zone and does not adsorb to carbon and is not amenable to air stripping, oxidation technologies were selected for treatment of groundwater and vapor.
5. Estimated duration for the pilot scale plus full scale in perched zone is approximately 1 year plus a minimum of 5 years additional monitoring.

TABLE I5 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG5a
ELECTRICAL RESISTANCE HEATING WITH VAPOR EXTRACTION/VACUUM-ENHANCED GROUNDWATER EXTRACTION/GROUNDWATER PUMP AND
TREAT/MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION/FLAMELESS THERMAL OXIDATION/GRANULAR ACTIVATED CARBON
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Annual Operation and Maintenance						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
<u>Vacuum Enhanced Extract and P&T System</u>						
1	Electrical Consumption	536,550	kWH	\$0.18	\$96,579	S.C. Edison
2	Blower Maintenance and Service (Average for 5 yrs.)	1	lump sum	\$1,800.00	\$1,800	T N & Associates
3	Mechanical, Pipe, Valves, Parts (Average for 5 yrs.)	1	lump sum	\$1,680.02	\$1,680	T N & Associates
<u>UV Oxidation System</u>						
5	Electrical Consumption	479,952	kWH	\$0.18	\$86,391	Calgon and S.C. Edison
6	Peroxide, Delivered as 50% Solution (in lbs)	31,755	lbs	\$0.65	\$20,641	Calgon Carbon
7	Maintenance, Parts, Lamp Replacement (Avg. 5 year)	1	lump sum	\$9,007.00	\$9,007	Calgon Carbon
8	Laboratory Analysis of Water Discharge	12	month	\$500.00	\$6,000	Calscience Environmental Labs.
<u>Vapor Phase GAC System</u>						
9	Replacement Carbon (average over 5 years)	98,000	lbs	\$1.15	\$112,700	EnviroSupply and S.C. Gas Company
10	Carbon Analytical Profiling	51	per vessel	\$350.00	\$17,850	EnviroSupply Service Inc.
11	Carbon Disposal	98,000	lbs	\$0.60	\$58,800	EnviroSupply Service Inc.
12	Laboratory Analysis of Vapor Discharge	12	month	1,867.14	\$22,406	Air Toxics
<u>Groundwater Monitoring</u>						
13	(2) Semiannual GW Sampling Events, Incl. QC	94	each	\$546.40	\$51,220	Calscience Labs
14	Handling Fees (3%)	1	lump sum	\$14,552.21	\$14,552	TN& Associates
15	Contingency (10%)	1	lump sum	\$48,507.38	\$48,507	RS Means
Subtotal (Annual Operation and Maintenance)					\$548,133	
<u>O&M Labor</u>						
16	Weekly Inspection and Monitoring	1,560	hours	85.00	\$132,600	T N & Associates
17	Data Processing and Reporting	840	hours	100.00	\$84,000	T N & Associates
18	Management of O&M	480	hours	110.00	\$52,800	T N & Associates
Subtotal (O&M Labor)					\$269,400	
TOTAL ANNUAL OPERATION AND MAINTENANCE					\$817,533	
Present Worth of Annual Operation and Maintenance						
		Cost	Interest Rate	Years	Present Worth	
	Present Worth of Annual O&M	\$817,533	4.25%	5	\$3,614,315	Calculated using uniform series present worth factor.
	Present Worth of 5 Years of Additional GW Monitoring (years 5 to 10)	\$237,766	5.00%	5	\$186,296	Calculated from present worth of single payment in 5 years.
Total Present Worth of Annual O&M					\$3,800,611	

Assumptions:

- Semiannual groundwater sampling would be performed at 12 wells and the analysis would be for VOCs via EPA Methods 8260B.
- The interest rate used in the present worth calculation (4.25%) is the reported Prime Rate (Nov. 2002).

TOTAL: \$ 8,894,916

TABLE I6 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG5b
ELECTRICAL RESISTANCE HEATING WITH VAPOR EXTRACTION/VACUUM-ENHANCED GROUNDWATER EXTRACTION/GROUNDWATER PUMP AND
TREAT/MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION/GRANULAR ACTIVATED CARBON
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Treatment System Equipment and Installation						
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source
<u>ERH Equip., Materials, Subs + 1 year O&M</u>						
1	Treatment Compound - for Power Deliver Systems	1	lump sum	\$24,474	\$24,474	RS Means
2	Mobilization/Demob.	2	each	\$20,000.00	\$40,000	McMillan-McGee
3	Preliminary Resistivity Testing & Design	1	lump sum	\$16,573.00	\$16,573	McMillan-McGee
4	Pilot Study - 12 electrode, install, monitor, report, trmt.	1	lump sum	\$318,953.00	\$318,953	McMillan-McGee
5	Full Scale Ops. - 96 elec., 33 borings, utils., controls	1	lump sum	\$1,111,517.12	\$1,111,517	McMillan-McGee and Gregg Drilling
6	SVE Extraction System - 16 wells, 4 in., piping, trench.	1	lump sum	\$255,940.32	\$255,940	Harrington Plastics & Gregg Drilling
7	Confirmation Soil and GW Sampling after Treatment	1	lump sum	\$22,314.36	\$22,314	T N & Associates
1	Electrical Consumption	756,864	kWH	\$0.18	\$136,236	McMillan-McGee & S.C. Edison
<u>Vacuum Enhanced GW Extract Equip., Materials, and Subs</u>						
1	Treatment Compound - Concrete Pad, Fencing, Lights	1	lump sum	\$10,864.00	\$10,864	RS Means
2	Utility Connections (all systems - gas, elec., sewer)	1	lump sum	\$29,220.00	\$29,220	RS Means
3	Mobilization/Demobilization	4	each	\$5,200.00	\$20,800	EnviroSupply and Gregg Drilling
4	1000 SCFM Duel Phase Extraction System	2	lump sum	\$122,869.44	\$245,739	EnviroSupply Purchase
5	Well Installation, 4" dia.	12	each	\$15,785.00	\$189,420	Gregg Drilling
6	Piping Network, Manifold, Valves	1	lump sum	\$33,600.40	\$33,600	Harrington Industrial Plastics
7	Trenching and Backfill, 8" wide trench, 24" deep	3,324	linear feet	\$2.18	\$7,246	RS Means
8	Installation and Start-Up	100	hour	\$65.00	\$6,500	EnviroSupply
9	Site Restoration	1	lump sum	\$10,500.00	\$10,500	TN& Associates
10	Confirmation Soil Sampling after Treatment	1	lump sum	\$34,574	\$34,574	Gregg Drilling and Calscience
<u>Pump and Treat Equipment, Materials, and Subcontractors</u>						
11	Well Installation, 6" dia.	15	each	\$15,785	\$236,775	Gregg Drilling
12	Piping Network, Manifold, Valves	1	lump sum	\$10,207	\$10,207	Harrington Industrial Plastics
13	Grundfos Rediflo 3, 1/3 Hp, 120 ft. Lead, Controllers	15	each	\$2,235	\$33,525	Grundfos
14	Site Restoration/Well Destruction	15	lump sum	\$950	\$14,250	Gregg Drilling
<u>UV Ox. Equipment, Materials, & Subcontractors</u>						
15	Mobilization/Installation/Start-Up/Demob.	1	lump sum	\$16,650.00	\$16,650	Calgon Carbon
16	Rayox Reactor System w/PreTrmt. Flow rated to 50 gpm.	1	lump sum	\$111,000.00	\$111,000	Calgon Carbon
17	Discharge Conveyance System	1	lump sum	\$12,675.00	\$12,675	McMaster-Carr and RS Means
<u>Vapor Phase GAC (Installed Yr 2) Equipment, Materials, & Subcontractors</u>						
26	Mobilization/Installation/Start-Up/Demob.	1	each	\$13,320.00	\$13,320	TN& Associates
27	2000 lb Vapor Phase GAC Vessels (full)	4	lump sum	\$10,400.00	\$41,600	EnviroSupply Service, Inc.
<u>Monitored Natural Attenuation Equipment, Materials, and Subcontractors</u>						
28	Monitoring Well Installation	30	per well	\$15,785.00	\$473,550	Gregg Drilling
29	Handling Fees (3%)	1	lump sum	\$104,340.68	\$104,341	TN& Associates
30	Contingency (10%)	1	lump sum	\$347,802.27	\$347,802	RS Means
	Subtotal (Equipment, Materials, and Subs)				\$3,930,166	
<u>Equipment Installation Labor</u>						
31	Construction Management	1,664	hour	\$85.00	\$141,440	TN& Associates
32	Mechanical Assembly and Installation	300	hour	\$85.00	\$25,500	T N & Associates
33	Engineering, Design, and Inspection	672	hour	\$100.00	\$67,200	TN& Associates
34	Project Management	360	hour	\$110.00	\$39,600	TN& Associates
	Subtotal (Installation Labor)				\$ 273,740	
TOTAL TREATMENT SYSTEM EQUIPMENT AND INSTALLATION:					\$4,203,906	

Assumptions:

1. Refer to the conceptual design for Alternative SP5a (Section 3.4.3.7) for additional design information and assumptions.
2. The pilot scale and full scale operations include all drilling, power modules, utility costs, O&M, data collection, and reporting.
3. Costs associated with treatment of groundwater and vapor are included with the treatment scenarios. Since 1,4 Dioxane was detected in the perched zone and does not adsorb to carbon and is not amenable to air stripping, oxidation technologies were selected for treatment of groundwater and vapor.
4. Estimated duration for the pilot scale plus full scale in perched zone is approximately 1 year plus a minimum of 5 years additional monitoring.

TABLE I6 - DETAILED COST SUMMARY FOR REMEDIAL ALTERNATIVE SG5b
ELECTRICAL RESISTANCE HEATING WITH VAPOR EXTRACTION/VACUUM-ENHANCED GROUNDWATER EXTRACTION/GROUNDWATER PUMP AND
TREAT/MONITORED NATURAL ATTENUATION/ULTRAVIOLET OXIDATION/GRANULAR ACTIVATED CARBON
 LOWER VADOSE SOIL AND EXPOSITION GROUNDWATER REMEDIATION ZONE

Annual Operation and Maintenance																																									
Item No.	Description	Quantity	Unit	Unit Rate	Total Cost	Source																																			
<u>Vacuum Enhanced Extract and P&T System</u>																																									
1	Electrical Consumption	536,550	kWH	\$0.18	\$96,579	S.C. Edison																																			
2	Blower Maintenance and Service (Average for 5 yrs.)	1	lump sum	\$1,800.00	\$1,800	T N & Associates																																			
3	Mechanical, Pipe, Valves, Parts (Average for 5 yrs.)	1	lump sum	\$1,680.02	\$1,680	T N & Associates																																			
<u>UV Oxidation System</u>																																									
5	Electrical Consumption	525,600	kWH	\$0.18	\$94,608	Calgon and S.C. Edison																																			
6	Peroxide, Delivered as 50% Solution (in lbs)	31,755	lbs	\$0.65	\$20,641	Calgon Carbon																																			
7	Maintenance, Parts, Lamp Replacement (Avg. 5 year)	1	lump sum	\$9,007.00	\$9,007	Calgon Carbon																																			
8	Laboratory Analysis of Water Discharge	12	month	\$500.00	\$6,000	Calscience Environmental Labs.																																			
<u>Vapor Phase GAC System</u>																																									
9	Replacement Carbon (average over 5 years)	174,000	lbs	\$1.15	\$200,100	EnviroSupply and S.C. Gas Company																																			
10	Carbon Analytical Profiling	80	per vessel	\$350.00	\$28,000	EnviroSupply Service Inc.																																			
11	Carbon Disposal	174,000	lbs	\$0.60	\$104,400	EnviroSupply Service Inc.																																			
12	Laboratory Analysis of Vapor Discharge	18	month	1,867.14	\$33,609	Air Toxics																																			
<u>Groundwater Monitoring</u>																																									
13	(2) Semiannual GW Sampling Events, Incl. QC	94	each	\$546.40	\$51,220	Calscience Labs																																			
14	Handling Fees (3%)	1	lump sum	\$19,429.30	\$19,429	TN& Associates																																			
15	Contingency (10%)	1	lump sum	\$64,764.33	\$64,764	RS Means																																			
Subtotal (Annual Operation and Maintenance)					\$731,837																																				
<u>O&M Labor</u>																																									
16	Weekly Inspection and Monitoring	1,430	hours	85.00	\$121,550	T N & Associates																																			
17	Data Processing and Reporting	840	hours	100.00	\$84,000	T N & Associates																																			
18	Management of O&M	480	hours	110.00	\$52,800	T N & Associates																																			
Subtotal (O&M Labor)					\$258,350																																				
TOTAL ANNUAL OPERATION AND MAINTENANCE					\$990,187																																				
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Assumptions:

1. Semiannual groundwater sampling would be performed at 12 wells and the analysis would be for VOCs via EPA Methods 8260B.
2. The interest rate used in the present worth calculation (4.25%) is the reported Prime Rate (Nov. 2002).