

Table Q-1 Summary of Estimated Cost of Remedial Alternatives
Area 20 Sites 7D, 10D, 11D, FCS, and C41 and Area 49 Sites 32D, 33D, 34D, 35D, 38D, and C4
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Feasibility Study Group	Sites	Planned Future Land Use	Remedial Alternative	Potential Land Use Under Remedy	No Action	Institutional Controls ^{1,2,3}	Vapor Barriers	Excavation and Disposal	Enhanced Bioremediation	Capp
A20-1	10D and 11D	Commercial	A20-1A	Not Applicable	\$0					
			A20-1B	Commercial		\$17,500		\$82,000		
			A20-1C	Residential				\$178,000		
A20-2	7D and FCS	Residential	A20-2A	Not Applicable	\$0					
			A20-2B	Residential		\$17,500	\$44,000			
			A20-2C	Commercial		\$17,500	\$7,400			
A20-3	C41	Residential	A20-3A	Not Applicable	\$0					
			A20-3B	Residential				\$590,000		
			A20-3C	Residential					\$192,000	
A49-1	32D, 34D, 35D, and 38D	Roadway	A49-1A	Not Applicable	\$0					
			A49-1B	Roadway/Parking Lot		\$17,500				\$348,000
			A49-1C	Commercial		\$17,500				
A49-2	33D	Commercial	A49-2A	Not Applicable	\$0					
			A49-2B	Residential		\$17,500	\$1,300			
			A49-2C	Commercial		\$17,500				
A49-3	C4	Residential	A49-3A	Not Applicable	\$0					
			A49-3B	Residential				\$41,000		

Notes and Key:

1 = Costs associated with institutional controls (ICs) for the entire Aerojet site are presented in Tables Q-2a through Q-2d.

2 = Costs associated with ICs for PGOU's portion of the sitewide cost are presented in Tables Q-3a through Q-3d.

3 = Costs (\$70,000) associated with ICs for the PGOU are divided between the alternatives.

SVE = Soil vapor extraction

**Table Q-2a Estimated Cost of Sitewide Institutional Controls
Aerojet Superfund Site
Sacramento County, California**

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
SITEWIDE¹ INITIAL INSTITUTIONAL CONTROLS ACTIVITIES² COST ESTIMATE				
<u>Preliminary</u>				
Preparing/negotiating documents that establish ICs (Attorney)	20	hours	300	6,000
Enacting and modifying State and local laws/regulations	20	hours	300	6,000
Amending local by-laws, rules, regs, ordinances (e.g., zoning overlays)	8	hours	300	2,400
Obtain local regulatory approval of proposed legal documents	20	hours	300	6,000
Perform title searches, research land plans, records of prior interests/encumbrances, deeds, cure title defects that may impair establishment of ICs (Aerojet assigned IC Coordinator)	80	hours	85	6,800
Initial training of registry, property records office about ICs for initial recordation purposes	16	hours	85	1,400
Filing and recording property law-based ICs w/ property records office	6	hours	85	500
Providing financial assurances to regulators or parties	0	hours	300	0
Filing fees	1	lump sum	1,000	1,000
<u>Planning</u>				
Prepare comprehensive Institutional Controls Plan (Attorney)	60	hours	300	18,000
Prepare comprehensive Institutional Controls Plan (Project Manager)	80	hours	120	9,600
<u>Public Information</u>				
Plan the "who, what, where, when, and how" to inform Public	6	hours	150	900
Determine optimal media and frequency for informing Public	4	hours	150	600
Develop content for communications about ICs	4	hours	150	600
<u>Record-Keeping Systems</u>				
Planning for record-keeping systems	2	hours	85	200
Determine if existing record-keeping systems can accommodate land use restriction and contamination information	2	hours	85	200
Contact State registry of sites	4	hours	85	300
Determine need/ability to maintain all info in one system	2	hours	85	200
Acquire/develop/modify manual or automatic record- keeping system	8	hours	85	700
Purchase hardware or find unused hardware capacity	1	lump sum	1,000	1,000
Acquire new or allocate existing space for storing records	2	hours	85	200
<u>Administration/Funding</u>				
Plan for long-term funding; specify who will be responsible for financing various IC-related activities	4	hours	120	500
Develop estimate of annual cost of IC activities	4	hours	120	500
<u>Monitoring</u>				
Create schedule/assign responsibility for monitoring activities	4	hours	120	500
Determine what monitoring data will be collected/how recorded	2	hours	300	600
<u>Inspection</u>				
Train inspectors	6	hours	85	500
<u>Enforcement</u>				
Determine which Agency/Dept has authority/responsibility to enforce each IC	2	hours	300	600
Assign enforcement responsibilities; training in IC enforcement	2	hours	120	200
Establish contact with entities implementing ICs	16	hours	85	1,400
Determine how to communicate enforcement information among Agencies	4	hours	120	500
Indirect costs (copying, materials/supplies, travel costs)	1	lump sum	1,000	1,000
Capital Costs Subtotal - Initial Institutional Controls Activities				\$69,000
Capital Cost Contingency (scope and cost) 20%				\$14,000
TOTAL - ESTIMATED CAPITAL COST (SITEWIDE)				\$83,000

Specific Institutional Controls include State and local government land use controls; proprietary or property-law based controls; governmental controls; enforcement tools; and informational devices.

¹ The total Institutional Controls costs included in this table will be divided equally among the following Operable Units (OUs): Perimeter (OU-5), Boundary (OU-6), Island (OU-7), Eastern (OU-8), Central (OU-9), and Area 41.

² As defined in "Estimating the Cost of Institutional Controls", Environmental Law Institute and Resources for the Future (2005).

**Table Q-2b Estimated Cost of Sitewide Institutional Controls
Aerojet Superfund Site
Sacramento County, California**

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
SITEWIDE¹ ANNUAL INSTITUTIONAL CONTROLS ACTIVITIES² COST ESTIMATE				
Planning				
Verifying that Institutional Controls Plan is still accurate	2	hours	85	200
Public Information				
Deliver tailored ongoing information programs to help lower risk of exposure for each segment of public	8	hours	85	700
Ensure that public health organizations, hospitals, fire/emergency response are informed about the site	8	hours	85	700
Coordinate Agency communications concerning ICs	4	hours	85	300
Record-Keeping Systems				
Managing and maintaining record-keeping systems	16	hours	85	1,400
Coordinate sharing of data among federal, State, local govts, landowners and non-governmental organizations who may maintain records about the site	8	hours	85	700
Convert/reformat State/local govt data into format required by EPA for exporting data to its system(s)	4	hours	85	300
Maintain QA/QC for data	2	hours	85	200
Administration/Funding				
Including cost of IC activities in annual budget requests	2	hours	85	200
Obtaining funds as needed for annual activities	2	hours	85	200
Reporting on status and funding of sites and IC programs for an entity	2	hours	85	200
Monitoring				
Coordinate monitoring of sites covered by multiple jurisdictions	8	hours	85	700
Collect monitoring data and input into record-keeping system	40	hours	85	3,400
Report results	16	hours	85	1,400
Inspection				
Visit sites regularly to confirm acceptable land uses	24	hours	85	2,000
Visit sites to inspect monitoring equipment, signs, and other ICs (may be conducted simultaneously w/ inspections of engineered controls)	16	hours	85	1,400
Enforcement				
Obtain/interpret inspection and monitoring data	8	hours	85	700
Evaluate data to ensure site compliance	4	hours	85	300
Communicate enforcement info and planned actions w/ other Agencies	6	hours	85	500
Indirect costs (copying, materials/supplies, travel costs)	1	lump sum	1,000	1,000
			Subtotal - Annual Institutional Controls Activities	\$16,500
			Annual Cost Contingency (scope and cost) 20%	\$3,300
			TOTAL - ESTIMATED ANNUAL COST (SITEWIDE)	\$20,000

¹ The total Institutional Controls costs included in this table will be divided equally among the following Operable Units (OUs): Perimeter (OU-5), Boundary (OU-6), Island (OU-7), Eastern (OU-8), Central (OU-9), and Area 41.

² As defined in "Estimating the Cost of Institutional Controls", Environmental Law Institute and Resources for the Future (2005).

**Table Q-2c Estimated Cost of Sitewide Institutional Controls
Aerojet Superfund Site
Sacramento County, California**

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
SITEWIDE¹ PERIODIC INSTITUTIONAL CONTROLS ACTIVITIES² COST ESTIMATE				
<u>Planning</u>				
Adding to/revising Institutional Controls Plan in response to change in circumstances (e.g., change in land use or site ownership)	16	hours	85	1,400
<u>Public Information</u>				
Revise/deliver public info about ICs; refresh/update public info	8	hours	85	700
Assess effectiveness of programs and improving them	8	hours	120	1,000
Provide updated education for federal, State, and local govt staff and the public about ICs and related laws and programs	8	hours	85	700
<u>Record-Keeping Systems</u>				
Respond to requests for info from govt agencies, potential lenders, insurers, purchasers, general public	16	hours	85	1,400
Enter/update data in systems as needed (when ICs are implemented at a site or when a site changes hands)	8	hours	85	700
Upgrading hardware and software	4	hours	85	300
Training new staff; training when system changes	8	hours	85	700
Tracking property transactions and parcel divisions	8	hours	85	700
Re-parceling property if/when a landowner wants to change land uses. Survey related properties.	16	hours	85	1,400
Propagating new and updated IC information through all land-use related offices.	8	hours	85	700
<u>Administration/Funding</u>				
Obtaining funds as needed for periodic activities	2	hours	85	200
<u>Monitoring</u>				
Provide monitoring-related ongoing training, specialized training, and outreach to affected regulatory bodies such as EPA, RWQCB, DTSC, and local governments	8	hours	85	700
<u>Inspection</u>				
Visiting sites in response to information about possible changes in land use or other issues	8	hours	85	700
Prepare 5 - year Review Report per CD/UAO (Project Manager)	24	hours	120	2,900
Prepare 5 - year Review Report per CD/UAO (Aerojet Coordinator)	80	hours	85	6,800
<u>Enforcement</u>				
Issue orders, negotiate, litigate with landowner/user who is out of compliance	24	hours	85	2,000
Update property records, hazardous site registry	16	hours	85	1,400
Communicate updated information to other Agencies	8	hours	85	700
Repair damage resulting from a failed IC, including damage to the site itself, abutting land, or other land	8	hours	85	700
Determine cause of IC failure and whether new/revised ICs needed	8	hours	120	1,000
Take steps to design/implement/effectuate new ICs, if appropriate, including obtaining funding to pay the costs of such steps	16	hours	120	1,900
Indirect costs (copying, materials/supplies, travel costs)	1	lump sum	1,500	1,500
Subtotal - Periodic Institutional Controls Activities				\$30,200
Cost Contingency (scope and cost) 20%				\$6,000
TOTAL - ESTIMATED PERIODIC COST (SITEWIDE)				\$36,000

¹ The total Institutional Controls costs included in this table will be divided equally among the following Operable Units (OUs): Perimeter (OU-5), Boundary (OU-6), Island (OU-7), Eastern (OU-8), Central (OU-9), and Area 41.

² As defined in "Estimating the Cost of Institutional Controls", Environmental Law Institute and Resources for the Future (2005).

**Table Q-2d Estimated Cost of Sitewide Institutional Controls
Aerojet Superfund Site
Sacramento County, California**

YEAR	<i>n</i>	P/F(<i>i</i> = 7%)	INITIAL IC ACTIVITIES COSTS (\$)	ANNUAL IC ACTIVITIES COSTS (\$/yr)	PERIODIC IC ACTIVITIES COSTS (\$)	SUBTOTAL COSTS (\$)	PRESENT WORTH OF COSTS (\$)	CUMULATIVE PRESENT WORTH (\$)
SITEWIDE¹ PRESENT WORTH COST ESTIMATE								
2011	0	1.00000	83,000			83,000	83,000	83,000
2012	1	0.93458		20,000		20,000	18,700	102,000
2013	2	0.87344		20,000		20,000	17,500	120,000
2014	3	0.81630		20,000		20,000	16,300	136,000
2015	4	0.76290		20,000	36,000	56,000	42,700	179,000
2016	5	0.71299		20,000		20,000	14,300	193,000
2017	6	0.66634		20,000		20,000	13,300	206,000
2018	7	0.62275		20,000		20,000	12,500	219,000
2019	8	0.58201		20,000		20,000	11,600	231,000
2020	9	0.54393		20,000	36,000	56,000	30,500	262,000
2021	10	0.50835		20,000		20,000	10,200	272,000
2022	11	0.47509		20,000		20,000	9,500	282,000
2023	12	0.44401		20,000		20,000	8,900	291,000
2024	13	0.41496		20,000		20,000	8,300	299,000
2025	14	0.38782		20,000	36,000	56,000	21,700	321,000
2026	15	0.36245		20,000		20,000	7,200	328,000
2027	16	0.33873		20,000		20,000	6,800	335,000
2028	17	0.31657		20,000		20,000	6,300	341,000
2029	18	0.29586		20,000		20,000	5,900	347,000
2030	19	0.27651		20,000	36,000	56,000	15,500	363,000
2031	20	0.25842		20,000		20,000	5,200	368,000
2032	21	0.24151		20,000		20,000	4,800	373,000
2033	22	0.22571		20,000		20,000	4,500	378,000
2034	23	0.21095		20,000		20,000	4,200	382,000
2035	24	0.19715		20,000	36,000	56,000	11,000	393,000
2036	25	0.18425		20,000		20,000	3,700	397,000
2037	26	0.17220		20,000		20,000	3,400	400,000
2038	27	0.16093		20,000		20,000	3,200	403,000
2039	28	0.15040		20,000		20,000	3,000	406,000
2040	29	0.14056		20,000	36,000	56,000	7,900	414,000
TOTAL - ESTIMATED COSTS (SITEWIDE):			\$83,000					\$410,000

¹ The total Institutional Controls costs included in this table will be divided equally among the following Operable Units (OUs): Perimeter (OU-5), Boundary (OU-6), Island (OU-7), Eastern (OU-8), Central (OU-9), and Area 41.

Table Q-3a Estimated Cost of Institutional Controls (Perimeter OU Share of Total)
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
SITEWIDE¹ INITIAL INSTITUTIONAL CONTROLS ACTIVITIES² COST ESTIMATE				
Preliminary				
Preparing/negotiating documents that establish ICs (Attorney)	20	hours	300	6,000
Enacting and modifying State and local laws/regulations	20	hours	300	6,000
Amending local by-laws, rules, regulations, ordinances (e.g., zoning overlays)	8	hours	300	2,400
Obtain local regulatory approval of proposed legal documents	20	hours	300	6,000
Perform title searches, research land plans, records of prior interests/encumbrances, deeds, cure title defects that may impair establishment of ICs (Aerojet assigned IC Coordinator)	80	hours	85	6,800
Initial training of registry, property records office about ICs for initial recordation purposes	16	hours	85	1,400
Filing and recording property law-based ICs w/ property records office	6	hours	85	500
Providing financial assurances to regulators or parties	0	hours	300	0
Filing fees	1	lump sum	1,000	1,000
Planning				
Prepare comprehensive Institutional Controls Plan (Attorney)	60	hours	300	18,000
Prepare comprehensive Institutional Controls Plan (Project Manager)	80	hours	120	9,600
Public Information				
Plan the "who, what, where, when, and how" to inform Public	6	hours	150	900
Determine optimal media and frequency for informing Public	4	hours	150	600
Develop content for communications about ICs	4	hours	150	600
Record-Keeping Systems				
Planning for record-keeping systems	2	hours	85	200
Determine if existing record-keeping systems can accommodate land use restriction and contamination information	2	hours	85	200
Contact State registry of sites	4	hours	85	300
Determine need/ability to maintain all info in one system	2	hours	85	200
Acquire/develop/modify manual or automatic record-keeping system	8	hours	85	700
Purchase hardware or find unused hardware capacity	1	lump sum	1,000	1,000
Acquire new or allocate existing space for storing records	2	hours	85	200
Administration/Funding				
Plan for long-term funding; specify who will be responsible for financing various IC-related activities	4	hours	120	500
Develop estimate of annual cost of IC activities	4	hours	120	500
Monitoring				
Create schedule/assign responsibility for monitoring activities	4	hours	120	500
Determine what monitoring data will be collected/how recorded	2	hours	300	600
Inspection				
Train inspectors	6	hours	85	500
Enforcement				
Determine which Agency/Dept has authority/responsibility to enforce each IC	2	hours	300	600
Assign enforcement responsibilities; training in IC enforcement	2	hours	120	200
Establish contact with entities implementing ICs	16	hours	85	1,400
Determine how to communicate enforcement information among Agencies	4	hours	120	500
Indirect costs (copying, materials/supplies, travel costs)	1	lump sum	1,000	1,000
Capital Costs Subtotal - Initial Institutional Controls Activities				\$69,000
Capital Cost Contingency (scope and cost) 20%				\$14,000
TOTAL - ESTIMATED CAPITAL COST (SITEWIDE)				\$83,000
TOTAL - ESTIMATED CAPITAL COST FOR PERIMETER OU (1/6th of Sitewide Capital Cost)				\$14,000

¹ The total Institutional Controls costs included in this table will be divided equally among the following Operable Units (OUs): Perimeter (OU-5), Boundary (OU-6), Island (OU-7), Eastern (OU-8), Central (OU-9), and Area 41.

² As defined in "Estimating the Cost of Institutional Controls", Environmental Law Institute and Resources for the Future (2005).

Specific Institutional Controls include State and local government land use controls; proprietary or property-law based controls; governmental controls; enforcement tools; and informational devices.

**Table Q-3b Estimated Cost of Institutional Controls (Perimeter OU Share of Total)
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California**

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
SITEWIDE¹ ANNUAL INSTITUTIONAL CONTROLS ACTIVITIES² COST ESTIMATE				
<u>Planning</u>				
Verifying that Institutional Controls Plan is still accurate	2	hours	85	200
<u>Public Information</u>				
Deliver tailored ongoing information programs to help lower risk of exposure for each segment of public	8	hours	85	700
Ensure that public health organizations, hospitals, fire/emergency response are informed about the site	8	hours	85	700
Coordinate Agency communications concerning ICs	4	hours	85	300
<u>Record-Keeping Systems</u>				
Managing and maintaining record-keeping systems	16	hours	85	1,400
Coordinate sharing of data among federal, State, local govts, landowners and non-governmental organizations who may maintain records about the site	8	hours	85	700
Convert/reformat State/local govt data into format required by EPA for exporting data to its system(s)	4	hours	85	300
Maintain QA/QC for data	2	hours	85	200
<u>Administration/Funding</u>				
Including cost of IC activities in annual budget requests	2	hours	85	200
Obtaining funds as needed for annual activities	2	hours	85	200
Reporting on status and funding of sites and IC programs for an entity	2	hours	85	200
<u>Monitoring</u>				
Coordinate monitoring of sites covered by multiple jurisdictions	8	hours	85	700
Collect monitoring data and input into record-keeping system	40	hours	85	3,400
Report results	16	hours	85	1,400
<u>Inspection</u>				
Visit sites regularly to confirm acceptable land uses	24	hours	85	2,000
Visit sites to inspect monitoring equipment, signs, and other ICs (may be conducted simultaneously w/ inspections of engineered controls)	16	hours	85	1,400
<u>Enforcement</u>				
Obtain/interpret inspection and monitoring data	8	hours	85	700
Evaluate data to ensure site compliance	4	hours	85	300
Communicate enforcement info and planned actions w/ other Agencies	6	hours	85	500
Indirect costs (copying, materials/supplies, travel costs)	1	lump sum	1,000	1,000
			Subtotal - Annual Institutional Controls Activities	<u>\$16,500</u>
			Annual Cost Contingency (scope and cost) 20%	<u>\$3,300</u>
			TOTAL - ESTIMATED ANNUAL COST (SITEWIDE)	<u>\$20,000</u>
TOTAL - ESTIMATED ANNUAL COST FOR PERIMETER OU (1/6th of Sitewide Annual Cost)				\$3,000

¹ The total Institutional Controls costs included in this table will be divided equally among the following Operable Units (OUs): Perimeter (OU-5), Boundary (OU-6), Island (OU-7), Eastern (OU-8), Central (OU-9), and Area 41.

² As defined in "Estimating the Cost of Institutional Controls", Environmental Law Institute and Resources for the Future (2005).

**Table Q-3c Estimated Cost of Institutional Controls (Perimeter OU Share of Total)
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California**

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
SITEWIDE¹ PERIODIC INSTITUTIONAL CONTROLS ACTIVITIES² COST ESTIMATE				
Planning				
Adding to/revising Institutional Controls Plan in response to change in circumstances (e.g., change in land use or site ownership)	16	hours	85	1,400
Public Information				
Revise/deliver public info about ICs; refresh/update public info	8	hours	85	700
Assess effectiveness of programs and improving them	8	hours	120	1,000
Provide updated education for federal, State, and local govt staff and the public about ICs and related laws and programs	8	hours	85	700
Record-Keeping Systems				
Respond to requests for info from govt agencies, potential lenders, insurers, purchasers, general public	16	hours	85	1,400
Enter/update data in systems as needed (when ICs are implemented at a site or when a site changes hands)	8	hours	85	700
Upgrading hardware and software	4	hours	85	300
Training new staff; training when system changes	8	hours	85	700
Tracking property transactions and parcel divisions	8	hours	85	700
Re-parceling property if/when a landowner wants to change land uses. Survey related properties.	16	hours	85	1,400
Propagating new and updated IC information through all land-use related offices.	8	hours	85	700
Administration/Funding				
Obtaining funds as needed for periodic activities	2	hours	85	200
Monitoring				
Provide monitoring-related ongoing training, specialized training, and outreach to affected regulatory bodies such as EPA, RWQCB, DTSC, and local governments	8	hours	85	700
Inspection				
Visiting sites in response to information about possible changes in land use or other issues	8	hours	85	700
Prepare 5 - year Review Report per CD/UAO (Project Manager)	24	hours	120	2,900
Prepare 5 - year Review Report per CD/UAO (Aerojet Coordinator)	80	hours	85	6,800
Enforcement				
Issue orders, negotiate, litigate with landowner/user who is out of compliance	24	hours	85	2,000
Update property records, hazardous site registry	16	hours	85	1,400
Communicate updated information to other Agencies	8	hours	85	700
Repair damage resulting from a failed IC, including damage to the site itself, abutting land, or other land	8	hours	85	700
Determine cause of IC failure and whether new/ revised ICs needed	8	hours	120	1,000
Take steps to design/implement/effectuate new ICs, if appropriate, including obtaining funding to pay the costs of such steps	16	hours	120	1,900
Indirect costs (copying, materials/supplies, travel costs)	1	lump sum	1,500	1,500
Subtotal - Periodic Institutional Controls Activities				\$30,200
Cost Contingency (scope and cost) 20%				\$6,000
TOTAL - ESTIMATED PERIODIC COST (SITEWIDE)				\$36,000
TOTAL - ESTIMATED PERIODIC COST FOR PERIMETER OU (1/6th of Sitewide Periodic Cost)				\$6,000

¹ The total Institutional Controls costs included in this table will be divided equally among the following Operable Units (OUs): Perimeter (OU-5), Boundary (OU-6), Island (OU-7), Eastern (OU-8), Central (OU-9), and Area 41.

² As defined in "Estimating the Cost of Institutional Controls", Environmental Law Institute and Resources for the Future (2005).

**Table Q-3d Estimated Cost of Institutional Controls (Perimeter OU Share of Total)
 Perimeter Groundwater Operable Unit RI/FS
 Aerojet Superfund Site
 Sacramento County, California**

YEAR	<i>n</i>	P/F(<i>i</i> = 7%)	INITIAL IC ACTIVITIES COSTS (\$)	ANNUAL IC ACTIVITIES COSTS (\$/yr)	PERIODIC IC ACTIVITIES COSTS (\$)	SUBTOTAL COSTS (\$)	PRESENT WORTH OF COSTS (\$)	CUMULATIVE PRESENT WORTH (\$)
<i>PRESENT WORTH COST ESTIMATE (Perimeter OU Share of Total)</i>								
2011	0	1.00000	14,000			14,000	14,000	14,000
2012	1	0.93458		3,000		3,000	2,800	17,000
2013	2	0.87344		3,000		3,000	2,600	20,000
2014	3	0.81630		3,000		3,000	2,400	22,000
2015	4	0.76290		3,000	6,000	9,000	6,900	29,000
2016	5	0.71299		3,000		3,000	2,100	31,000
2017	6	0.66634		3,000		3,000	2,000	33,000
2018	7	0.62275		3,000		3,000	1,900	35,000
2019	8	0.58201		3,000		3,000	1,700	37,000
2020	9	0.54393		3,000	6,000	9,000	4,900	42,000
2021	10	0.50835		3,000		3,000	1,500	44,000
2022	11	0.47509		3,000		3,000	1,400	45,000
2023	12	0.44401		3,000		3,000	1,300	46,000
2024	13	0.41496		3,000		3,000	1,200	47,000
2025	14	0.38782		3,000	6,000	9,000	3,500	51,000
2026	15	0.36245		3,000		3,000	1,100	52,000
2027	16	0.33873		3,000		3,000	1,000	53,000
2028	17	0.31657		3,000		3,000	900	54,000
2029	18	0.29586		3,000		3,000	900	55,000
2030	19	0.27651		3,000	6,000	9,000	2,500	58,000
2031	20	0.25842		3,000		3,000	800	59,000
2032	21	0.24151		3,000		3,000	700	60,000
2033	22	0.22571		3,000		3,000	700	61,000
2034	23	0.21095		3,000		3,000	600	62,000
2035	24	0.19715		3,000	6,000	9,000	1,800	64,000
2036	25	0.18425		3,000		3,000	600	65,000
2037	26	0.17220		3,000		3,000	500	66,000
2038	27	0.16093		3,000		3,000	500	67,000
2039	28	0.15040		3,000		3,000	500	68,000
2040	29	0.14056		3,000	6,000	9,000	1,300	69,000
TOTAL - ESTIMATED COSTS (Perimeter OU):			\$14,000					\$70,000

Table A20-1a Summary of Estimated Cost of Remedial Alternatives
FS Group A20-1
Sites 10D and 11D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative	Potential Land Use Under Remedy	No Action	Institutional Controls ^{1,2,3}	Excavation and Disposal	Total Cost of Alternative
A20-1A No Action	Not Applicable	\$0	\$0	\$0	\$0
A20-1B Land Use Restriction and Excavation and Disposal	Commercial	\$0	\$17,500	\$82,000	\$99,500
A20-1C Excavation and Disposal	Residential	\$0	\$0	\$178,000	\$178,000

Notes and Key:

- 1 = Costs associated with institutional controls (ICs) for the entire Aerojet site are presented in Tables Q-2a through Q-2d.
- 2 = Costs associated with ICs for PGOU's portion of the sitewide cost are presented in Tables Q-3a through Q-3d.
- 3 = Costs (\$70,000) associated with ICs for the PGOU are divided between all the alternatives.

Table A20-1b *Estimated Cost of Institutional Controls and Hot Spot Soil Excavation and Disposal
FS Group A20-1 - Remedial Alternative A20-1B (Commercial Use)
Sites 10D and 11D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California*

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
DIRECT CAPITAL COST				
Reporting				
Remedial Design/Remedial Action(RD/RA) Workplan	1	LS	\$15,000	\$15,000
Remedial Action Summary (Construction Completion Report)	1	LS	\$15,000	\$15,000
		SUBTOTAL - REPORTING		\$30,000
Excavation and Disposal				
Surveying (pre- and post-excavation)	2	DAY	\$1,500	\$3,000
Equipment mobilization/demobilization	1	LS	\$6,000	\$6,000
Excavate and stockpile soil for Class II Landfill - Site 10D	135	TON	\$6	\$800
Soil transportation and disposal (Class II Landfill) - Site 10D	135	TON	\$40	\$5,400
Excavate and stockpile soil for Class I Landfill	0	TON	\$36	\$0
Soil transportation and disposal (Class I Landfill)	0	TON	\$91	\$0
Backfill excavations with clean fill and compact fill	0	TON	\$10	\$0
Water truck	3	DAY	\$500	\$1,500
Regulatory Oversight	1	LS	\$10,000	\$5,000
		SUBTOTAL - EXCAVATION AND DISPOSAL		\$21,700
Confirmation and Stockpile Sample Analyses				
Stockpile sampling - Title 22 metals (1 sample/100 CY)	2	EA	\$130	\$300
Excavation floor confirmatory sampling ²	6	EA	\$130	\$800
Excavation sidewall sampling ³	6	EA	\$130	\$800
		SUBTOTAL - SAMPLING		\$1,900
		SUBTOTAL - DIRECT CAPITAL COST		\$53,600
INDIRECT CAPITAL COST				
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	%	10	\$5,400
Construction Management (% of Direct Capital Costs)	1	%	10	\$5,400
Project Management (% of Direct Capital Costs)	1	%	6	\$3,200
Contractor's General Requirements (assume monthly rental of job trailer, storage box, and portable toilet; and administration support)	0.5	Week	\$1,000	\$500
		SUBTOTAL - INDIRECT CAPITAL COST		\$14,500
		SUBTOTAL - CAPITAL COST (DIRECT AND INDIRECT)		\$68,000
		General Contingency (20% of total direct and indirect)		\$14,000
		TOTAL ESTIMATED CAPITAL COST		\$82,000
INSTITUTIONAL CONTROLS COST (From Table Q-3d):				\$17,500
		TOTAL ESTIMATED COST FOR ICs AND EXCAVATION AND DISPOSAL		\$99,500

Notes and Key:

1 = Costs associated with the excavation and disposal of soil containing PCBs at Source Area 11D are included Volume III (Feasibility Study) of the Boundary Operable Unit RI/FS (ERM, November 2008).

2 = Excavation Floor Confirmation Samples assumes 1 sample per 1,000 square feet or 1 sample from excavation less than 1,000 square feet.

3 = Excavation Sidewall Samples - Assumes 1 sample every 25 liner foot or 1 sample from each sidewall for excavation.

% = Percent

EA = Each

LS = Lump Sum

Ton = 2,000 pounds

Table A20-1c *Estimated Cost of Soil Excavation and Disposal*
FS Group A20-1 - Remedial Alternative A20-1C (Residential Use)
Sites 10D and 11D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
DIRECT CAPITAL COST				
Reporting				
Remedial Design/Remedial Action(RD/RA) Workplan	1	LS	\$20,000	\$20,000
Remedial Action Summary (Construction Completion Report)	1	LS	\$20,000	\$20,000
		SUBTOTAL - REPORTING		\$40,000
Excavation and Disposal				
Surveying (pre- and post-excavation)	2	DAY	\$1,500	\$3,000
Equipment mobilization/demobilization	1	LS	\$6,000	\$6,000
Excavate and stockpile soil for Class II Landfill - Site 10D	1,170	TON	\$6	\$7,000
Excavate and stockpile soil for Class II Landfill - Site 11D ¹	45	TON	\$6	\$300
Soil transportation and disposal (Class II Landfill) - Site 10D	1,170	TON	\$40	\$46,800
Soil transportation and disposal (Class II Landfill) - Site 11D ¹	45	TON	\$40	\$1,800
Excavate and stockpile soil for Class I Landfill	0	TON	\$36	\$0
Soil transportation and disposal (Class I Landfill)	0	TON	\$91	\$0
Backfill excavations with clean fill and compact fill	0	TON	\$10	\$0
Water truck	4	DAY	\$500	\$2,000
Regulatory Oversight	1	LS	\$10,000	\$5,000
		SUBTOTAL - EXCAVATION AND DISPOSAL		\$71,900
Confirmation and Stockpile Sample Analyses				
Stockpile sampling - Title 22 metals (1 sample/100 CY)	10	EA	\$130	\$1,300
Excavation floor confirmatory sampling ²	6	EA	\$130	\$800
Excavation sidewall sampling ³	18	EA	\$130	\$2,300
		SUBTOTAL - SAMPLING		\$4,400
		SUBTOTAL - DIRECT CAPITAL COST		\$116,300
INDIRECT CAPITAL COST				
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	%	10	\$11,600
Construction Management (% of Direct Capital Costs)	1	%	10	\$11,600
Project Management (% of Direct Capital Costs)	1	%	6	\$7,000
Contractor's General Requirements (assume monthly rental of job trailer, storage box, and portable toilet; and administration support)	1	Week	\$1,000	\$1,000
		SUBTOTAL - INDIRECT CAPITAL COST		\$31,200
		SUBTOTAL - CAPITAL COST (DIRECT AND INDIRECT)		\$148,000
		General Contingency (20% of total direct and indirect)		\$30,000
		TOTAL ESTIMATED CAPITAL COST		\$178,000

Notes and Key:

1 = Costs associated with the excavation and disposal of soil containing PCBs at Source Area 11D are included Volume III (Feasibility Study) of the Boundary Operable Unit RI/FS (ERM, November 2008).

2 = Excavation Floor Confirmation Samples assumes 1 sample per 1,000 square feet or 1 sample from excavation less than 1,000 square feet.

3 = Excavation Sidewall Samples - Assumes 1 sample every 25 liner foot or 1 sample from each sidewall for excavation.

% = Percent

EA = Each

LS = Lump Sum

Ton = 2,000 pounds

Table A20-2a Summary of Estimated Cost of Remedial Alternatives
FS Group A20-2
Sites 7D and FCS
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		Potential Land Use Under Remedy	No Action	Institutional Controls ^{1,2}	Vapor Mitigation	Total Cost of Alternative
			Both Sites	Both Sites	Both Sites	
A20-2A	No Action	Not Applicable	\$0	\$0	\$0	\$0
A20-2B	Institutional and Engineering Controls	Residential	\$0	\$17,500	\$44,000	\$62,000
A20-2C	Land Use Restrictions and Engineering Controls	Commercial	\$0	\$17,500	\$7,400	\$25,000

Notes and Key:

1 = Costs associated with institutional controls (ICs) for the entire Aerojet site are presented in Tables Q-2a through Q-2d.

2 = Costs associated with ICs for PGOU's portion of the sitewide cost are presented in Tables Q-3a through Q-3d.

3 = Costs (\$70,000) associated with ICs for the PGOU are divided between all the alternatives.

Table A20-2b *Estimated Cost for Vapor Mitigation
FS Group A20-2 (Residential Use)
Sites 7D and FCS
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California*

DESCRIPTION	QUANTITY		COST	
	NUMBER	UNIT	UNIT COST	TOTAL COST
DIRECT CAPITAL COST				
<u>Vapor Barriers^{1,2}</u>				
<u>Site 7D & FCS</u>				
Site 7D: Vapor Barrier - Residential Development	1,620	sq. ft.	\$0.50	\$810
Site 7D: Subslab Venting System	1,620	sq. ft.	\$0.15	\$243
FCS: Vapor Barrier - Residential Development	59,400	sq. ft.	\$0.50	\$29,700
FCS: Subslab Venting System	59,400	sq. ft.	\$0.15	\$8,910
			General Contingency (10% of Capital Costs)	\$4,000
			TOTAL ESTIMATED CAPITAL COST FOR VAPOR BARRIERS	\$44,000

Notes and Key:

FCS = Former company store

LS = Lump sum

sq. ft. = Square feet

¹Assumptions for areas requiring suitable vapor mitigation measures:

Residential Development - Assumes 40% building and 60% green belt/streets/parking

7D Area of Impact (square feet): 4,050

FCS Area of Impact (square feet): 148,500

Total square feet: 152,550

²Assumptions for cost of soil vapor barriers

Estimated cost of vapor barrier: It is assumed that for any future residential or commercial development that would require vapor intrusion controls, the developer would install a moisture barrier with taped seams as part of any new construction as specified in requirements made on current development plans undergoing California Environmental Quality Act (CEQA) review. The costs of the materials and installation for the moisture barrier would be borne by the developer.

It is further assumed that the only difference between a moisture barrier and a vapor barrier is that seals/taping be provided around any utility penetrations (e.g., plumbing piping) of the moisture barrier. Based on a verbal quotation from Regenesys, estimated costs to install moisture barriers under residential and commercial scenarios are \$3.00 and \$2.50 per square foot, respectively. For purposes of estimating costs for this FS, it is assumed that the incremental materials and labor costs for sealing/taping utility penetrations are \$0.50 and \$0.30 per square foot, respectively, for residential and commercial risk scenarios.

**Table A20-2c Estimated Cost for Vapor Mitigation
 FS Group A20-2 (Commercial Use)
 Sites 7D and FCS
 Perimeter Groundwater Operable Unit RI/FS
 Aerojet Superfund Site
 Sacramento County, California**

DESCRIPTION	QUANTITY		COST	
	NUMBER	UNIT	UNIT COST	TOTAL COST
DIRECT CAPITAL COST				
<u>Vapor Barriers^{1,2}</u>				
<u>Site 7D & FCS</u>				
Site 7D: Vapor Barrier - Commercial Development	0	sq. ft.	\$0.30	\$0
Site 7D: Subslab Venting System	0	sq. ft.	\$0.15	\$0
FCS: Vapor Barrier - Commercial Development	15,000	sq. ft.	\$0.30	\$4,500
FCS: Subslab Venting System	15,000	sq. ft.	\$0.15	\$2,250
		General Contingency (10% of Capital Costs)		\$675
		TOTAL ESTIMATED CAPITAL COST FOR VAPOR BARRIERS		\$7,400

Notes and Key:

FCS = Former company store

LS = Lump sum

sq. ft. = Square feet

¹Assumptions for areas requiring suitable vapor mitigation measures:

Commercial Development - Since it is a relatively small area, assumes 100% building

7D Area of Impact (square feet): 0

FCS Area of Impact (square feet): 15,000

Total square feet: **15,000**

²Assumptions for cost of soil vapor barriers

Estimated cost of vapor barrier: It is assumed that for any future residential or commercial development that would require vapor intrusion controls, the developer would install a moisture barrier with taped seams as part of any new construction as specified in requirements made on current development plans undergoing California Environmental Quality Act (CEQA) review. The costs of the materials and installation for the moisture barrier would be borne by the developer.

It is further assumed that the only difference between a moisture barrier and a vapor barrier is that seals/taping be provided around any utility penetrations (e.g., plumbing piping) of the moisture barrier. Based on a verbal quotation from Regenesys, estimated costs to install moisture barriers under residential and commercial scenarios are \$3.00 and \$2.50 per square foot, respectively. For purposes of estimating costs for this FS, it is assumed that the incremental materials and labor costs for sealing/taping utility penetrations are \$0.50 and \$0.30 per square foot, respectively, for residential and commercial risk scenarios.

*Table A20-3a Summary of Estimated Cost of Remedial Alternatives
 FS Group A20-3
 Site C41
 Perimeter Groundwater Operable Unit RI/FS
 Aerojet Superfund Site
 Sacramento County, California*

Alternative		Potential Land Use Under Remedy	No Action	Excavation and Disposal	Enhanced Bioremediation	Total Cost of Alternative
A20-3A	No Action	Not Applicable	\$0	\$0	\$0	\$0
A20-3B	Excavation and Disposal	Residential	\$0	\$590,000	\$0	\$590,000
A20-3C	Enhanced Bioremediation	Residential	\$0	\$0	\$192,000	\$192,000

Table A20-3b *Estimated Cost of Soil Excavation and Disposal*
FS Group A20-3 - Remedial Alternative A20-3B (Residential and Commercial Use)
Site C41
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
DIRECT CAPITAL COST				
Reporting				
RD/RA Workplan	1	LS	\$10,000	\$10,000
Remedial Action Summary (Construction Completion Report)	1	LS	\$10,000	\$10,000
			SUBTOTAL - REPORTING	\$20,000
Excavation and Disposal				
Surveying (pre- and post-excavation)	2	DAY	\$1,500	\$3,000
Equipment mobilization/demobilization	1	LS	\$6,000	\$6,000
Excavate and stockpile soil for Class II Landfill	6,765	TON	\$6	\$40,600
Soil transportation and disposal (Class II Landfill)	6,765	TON	\$40	\$270,600
Excavate and stockpile soil for Class I Landfill	0	TON	\$36	\$0
Soil transportation and disposal (Class I Landfill)	0	TON	\$91	\$0
Backfill excavations with clean fill and compact fill	6,765	TON	\$10	\$67,700
Water truck	10	DAY	\$500	\$5,000
Regulatory Oversight	1	LS	\$6,500	\$6,500
			SUBTOTAL - EXCAVATION AND DISPOSAL	\$399,400
Confirmation and Stockpile Sample Analyses				
Stockpile sampling - Title 22 metals (1 sample/100 CY)	2	EA	\$130	\$300
Excavation floor confirmatory sampling	2	EA	\$130	\$300
Excavation sidewall sampling	8	EA	\$130	\$1,000
			SUBTOTAL - SAMPLING	\$1,600
			SUBTOTAL - DIRECT CAPITAL COST	\$421,000
INDIRECT CAPITAL COST				
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	%	6	\$25,300
Construction Management (% of Direct Capital Costs)	1	%	5	\$21,100
Project Management (% of Direct Capital Costs)	1	%	5	\$21,100
Contractor's General Requirements (assume monthly rental of job trailer, storage box, and portable toilet; and administration support)	3	Week	\$1,000	\$3,000
			SUBTOTAL - INDIRECT CAPITAL COST	\$70,500
			SUBTOTAL - CAPITAL COST (DIRECT AND INDIRECT)	\$492,000
			Capital Cost Contingency (scope and cost) 20%	\$98,000
			TOTAL ESTIMATED CAPITAL COST	\$590,000

Notes and Key:

Excavation Floor Confirmation Samples assumes 1 sample per 1,000 square feet or 1 sample from excavation less than 1,000 square feet.

Excavation Sidewall Samples - Assumes 1 sample every 25 liner foot or 1 sample from each sidewall for excavation.

LS = Lump Sum

% = Percent

EA = Each

Ton = 2,000 pounds

Table A20-3c **Estimated Cost of Enhanced Bioremediation**
FS Group A20-3 - Remedial Alternative A20-3C (Residential and Commercial Use)
Site C41
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
DIRECT CAPITAL COST				
Baseline and Clearance Sampling				
Workplan	1	LS	\$10,000	\$10,000
Surveying	1	DAY	\$1,500	\$1,500
Site Drilling	2	DAY	\$1,875	\$3,800
Sample Analysis (Perchlorate)	35	EA	\$75	\$2,600
Supervision and Sample Prep	5	DAY	\$1,000	\$5,000
		SUBTOTAL - REPORTING		\$22,900
Intensified In Situ Treatment				
Mobilization and Demobilization	1	LS	\$2,000	\$2,000
Soil Excavation and Replacement	6,765	TON	\$10	\$67,700
Electron Donor - Soybean oil methyl ester (55 gallon drum)	5	EA	\$800	\$4,000
Soil Preparation (cross ripping and discing)	1	LS	\$3,000	\$3,000
Water Delivery Pipe (install and removal)	2,000	FT	\$1.75	\$3,500
Drip System Materials	1	LS	\$1,500	\$1,500
Drip System Installation and Startup	1	LS	\$5,000	\$5,000
Citric Acid (55 gallon drum)	5	EA	\$600	\$3,000
Regulatory Oversight	1	LS	\$10,000	\$10,000
		SUBTOTAL - EXCAVATION AND DISPOSAL		\$99,700
Confirmation and Stockpile Sample Analyses				
Sample Analysis (Perchlorate)	35	EA	\$75	\$2,600
Site Drilling	2	DAY	\$1,875	\$3,800
Supervision and Sample Prep	5	DAY	\$1,000	\$5,000
		SUBTOTAL - SAMPLING		\$11,400
		SUBTOTAL - DIRECT CAPITAL COST		\$134,000
INDIRECT CAPITAL COST				
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	%	6	\$8,000
Construction Management (% of Direct Capital Costs)	1	%	5	\$6,700
Project Management (% of Direct Capital Costs)	1	%	5	\$6,700
Contractor's General Requirements (assume monthly rental of job trailer, storage box, and portable toilet; and administration support)	5	Week	\$1,000	\$5,000
		SUBTOTAL - INDIRECT CAPITAL COST		\$26,400
		SUBTOTAL - CAPITAL COST (DIRECT AND INDIRECT)		\$160,000
		Capital Cost Contingency (scope and cost) 20%		\$32,000
		TOTAL ESTIMATED CAPITAL COST		\$192,000

Notes and Key:

LS = Lump Sum

% = Percent

EA = Each

Table A49-1a Summary of Estimated Cost of Remedial Alternatives
FS Group A49-1
Sites 32D, 34D, 35D, and 38D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative	Potential Land Use Under Remedy	No Action	Institutional Controls^{1,2}	Capping	Soil Vapor Extraction and Cap
A49-1A No Action	Not Applicable	\$0	\$0	\$0	\$0
A49-1B Capping with Institutional Controls	Roadway or Parking Lot	\$0	\$17,500	\$348,000	\$0
A49-1C SVE with Capping and Institutional Controls	Commercial	\$0	\$17,500	\$0	\$1,172,000

Notes and Key:

1 = Costs associated with institutional controls (ICs) for the entire Aerojet site are presented in Tables Q-2a through Q-2d.

2 = Costs associated with ICs for PGOU's portion of the sitewide cost are presented in Tables Q-3a through Q-3d.

3 = Costs (\$70,000) associated with ICs for the PGOU are divided between all the alternatives.

SVE = Soil vapor extraction

Area 49 - Includes Sites 32D, 34D, 35D, and 38D

Table A49-1b *Estimated Cost of Capping*
FS Group A49-1 - Remedial Alternative A49-1B (Roadway or Parking Lot Reuse)
Sites 32D, 34D, 35D, and 38D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		COST		SOURCE
	NUMBER	UNIT	UNIT COST	TOTAL COST	
DIRECT CAPITAL COST					
- Surveying/Site Layout	1	DAY	\$1,500	\$1,500	
- Purchase and Placement of Baserock for Asphalt Surface (2 inches over approximately 8.1 acres)	2,175	CY	\$15.50	\$33,713	
- Placement of Asphalt-Concrete Surface over Baserock (2 inches)	35,000	SY	\$6.83	\$239,085	
	TOTAL DIRECT CAPITAL COSTS			\$274,300	
INDIRECT CAPITAL COST					
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	ls	10%	\$27,430	ERM, 2006
Construction Management (% of Direct Capital Costs)	1	ls	15%	\$41,145	ERM, 2006
Health and Safety Contingency (2% of Direct Capital Costs)	1	ls	2%	\$5,486	ERM, 2006
	INDIRECT CAPITAL COST			\$74,100	
	TOTAL CAPITAL COST (DIRECT AND INDIRECT)			\$348,000	

Notes and Key:

All total costs rounded to the nearest \$1,000.
CY = Cubic yard
ls = Lump sum
SY = Square yard

References:

ERM, 2006: ERM-West Incorporated, Internal Quote, 2006.
Means 2002: RS Means Site Work and Landscape Cost Data, 18th Annual Edition, 2004.
Means 2004: RS Means Heavy Construction Cost Data, 18th Annual Edition, 2004.
Means ECHOS 2004: RS Means Environmental Cost Data, 10th Annual Edition, 2004.

Table A49-1c Estimated Cost of Capping and Soil Vapor Extraction
FS Group A49-1 - Remedial Alternative A49-1C (Residential and Commercial Use)
Sites 32D, 34D, 35D, and 38D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		COST	
	NUMBER	UNIT	UNIT COST	TOTAL COST
DIRECT CAPITAL COST				
System Construction				
- Pre-Pilot Test Soil Vapor Evaluation	1	LS	\$15,000	\$15,000
- Pilot Testing	1	LS	\$25,000	\$25,000
- Surveying/Site Layout	1	DAY	\$1,500	\$1,500
- SVE Well Installation (34 wells to 35 ft bgs)	1,190	FT	\$42	\$49,980
- Purchase and Placement of Baserock for Asphalt Surface	2,175	CY	\$15.50	\$33,713
- Placement of Asphalt-Concrete Surface over Baserock (2 inches)	26,267	SY	\$6.83	\$179,430
- Install Aboveground Conveyance Piping from Well Field to Treatment Pad	4,300	FT	\$12.00	\$51,600
- Purchase and Install Vacuum Blower (15 hp) and Moisture Knockout Vessel	1	LS	\$17,000	\$17,000
- Purchase and Install Thermal Oxidizer (500 cfm, all electric capacity unit)	1	LS	\$60,000	\$60,000
- Electrical and Controls Connection	1	LS	\$15,000	\$15,000
- Fencing Around Remediation Equipment	2,500	FT	\$15.00	\$37,500
			SUBTOTAL	\$486,000
Miscellaneous Costs				
- AQMD Permit-to-Construct	1	LS	\$3,200	\$3,200
- Baseline Soil Vapor Sample Analysis from each SVE Well	39	EA	\$240	\$9,360
- Regulatory Oversight	1	LS	\$10,000	\$10,000
			SUBTOTAL	\$23,000
			ESTIMATED TOTAL DIRECT CAPITAL COST	\$509,000
INDIRECT CAPITAL COST				
- Engineering Design, Procurement, Administrative, and Legal Costs (10% of Direct Capital Costs)	1	LS	\$50,900	\$50,900
- Construction Management (7% of Direct Capital Costs)	1	LS	\$35,630	\$35,630
- Health and Safety Contingency (2% of Direct Capital Costs)	1	LS	\$10,180	\$10,180
			INDIRECT CAPITAL COST	\$97,000
			TOTAL CAPITAL COST (DIRECT AND INDIRECT)	\$606,000
ANNUAL COST (5-YEAR O&M PROGRAM)				
- Engineering and Technician Labor (12.5% FTE for Engineer-level and 20% FTE for Technician-level) - Includes Progress Reporting to Agencies	1	LS	\$58,500	\$58,500
- Annual AQMD Permit-to-Operate	1	LS	\$1,750	\$1,750
- Monthly System Sampling (for compliance with AQMD permit - system influent and effluent samples each month)	24	EA	\$240	\$5,760
- Annual Soil Vapor Sample Analysis from each SVE Well	39	EA	\$240	\$9,360
- Repair and Replacement of Miscellaneous Equipment and Materials	1	LS	\$5,000	\$5,000
- Electrical Power (assumes 1350 kW-hr/day at 90% operation time)	443,475	kW-hr	\$0.13	\$57,652
- Natural Gas (assumes 1,000,000 BTU/hr at 90% operation time)	78,840	Therm	\$0.00	\$0
			TOTAL ANNUAL COST	\$138,000
			TOTAL O&M PROGRAM COST (5 years)	\$690,000
			TOTAL CAPITAL AND ANNUAL COSTS	\$1,296,000
General Contingency (10% of Capital and Annual Costs)				\$130,000
			TOTAL COST OF ALTERNATIVE	\$1,426,000

Notes and Key:

AQMD = Air Quality Management District
CF = Cubic feet
CFM = Cubic feet per minute
CY = Cubic Yard
EA = Each
EA = Each
FT = Foot

FTE = Full Time Employee
kW-hr = Kilowatt hour
LS = Lump sum
MO = Month
O&M = Operations and Maintenance
SVE = Soil Vapor Extraction
SY = Square Yard

**Table A49-1d Net Present Worth of Capping and Soil Vapor Extraction
 FS Group A49-1A
 Sites 32D, 34D, 35D, and 38D
 Perimeter Groundwater Operable Unit RI/FS
 Aerojet Superfund Site
 Sacramento County, California**

YEAR	<i>n</i>	P/F(<i>i</i> = 7%)	CAPITAL COSTS (\$)	O&M AND MONITORING COSTS (\$/yr)	SUBTOTAL COSTS (\$)	PRESENT WORTH OF COSTS (\$)	CUMULATIVE PRESENT WORTH (\$)
PRESENT WORTH COST ESTIMATE							
2010	0	1.00000	\$606,000		\$606,000	\$606,000	\$606,000
2011	1	0.93458		\$138,000	\$138,000	\$129,000	\$735,000
2012	2	0.87344		\$138,000	\$138,000	\$121,000	\$856,000
2013	3	0.81630		\$138,000	\$138,000	\$113,000	\$969,000
2014	4	0.76290		\$138,000	\$138,000	\$105,000	\$1,074,000
2015	5	0.71299		\$138,000	\$138,000	\$98,000	\$1,172,000
TOTAL - ESTIMATED COSTS:			\$610,000	\$690,000			\$1,172,000

Notes and Key:

n = number
 \$ = United States dollars
 \$/yr = Dollars per year
 % = Percent

Table A49-2a Summary of Estimated Cost of Remedial Alternatives
FS Group A49-2
Site 33D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		Potential Land Use Under Remedy	No Action	Institutional Controls ^{1,2}	Vapor Barriers	Total Cost of Alternative
A49-2A	No Action	Not Applicable	\$0	\$0	\$0	\$0
A49-2B	Institutional and Engineering Controls	Residential	\$0	\$17,500	\$1,300	\$18,800
A49-2C	Land Use Restrictions	Commercial	\$0	\$17,500	\$0	\$17,500

Notes and Key:

1 = Costs associated with institutional controls (ICs) for the entire Aerojet site are presented in Tables Q-2a through Q-2d.

2 = Costs associated with ICs for PGOU's portion of the sitewide cost are presented in Tables Q-3a through Q-3d.

3 = Costs (\$70,000) associated with ICs for the PGOU are divided between all the alternatives.

Table A49-2b *Estimated Cost for Vapor Barriers*
FS Group A49-2 (Residential Use)
Site 33D
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		COST	
	NUMBER	UNIT	UNIT COST	TOTAL COST
DIRECT CAPITAL COST				
Vapor Barriers^{1,2}				
Vapor Barrier - Residential Development	1,920	sq. ft.	\$0.50	\$960
Subslab Venting System	1,920	sq. ft.	\$0.15	\$288
		General Contingency (10% of Capital Costs)		\$96
	TOTAL ESTIMATED CAPITAL COST FOR VAPOR BARRIERS			\$1,300

Notes and Key:

sq. ft. = Square feet

¹Assumptions for areas requiring suitable vapor mitigation measures:

Residential Development - Assumes 40% building and 60% green belt/streets/parking
Area of Impact (square feet): 4,800

²Assumptions for cost of soil vapor barriers

Estimated cost of vapor barrier: It is assumed that for any future residential or commercial development that would require vapor intrusion controls, the developer would install a moisture barrier with taped seams as part of any new construction as specified in requirements made on current development plans undergoing California Environmental Quality Act (CEQA) review. The costs of the materials and installation for the moisture barrier would be borne by the developer.

It is further assumed that the only difference between a moisture barrier and a vapor barrier is that seals/taping be provided around any utility penetrations (e.g., plumbing piping) of the moisture barrier. Based on a verbal quotation from Regenesys, estimated costs to install moisture barriers under residential and commercial scenarios are \$3.00 and \$2.50 per square foot, respectively. For purposes of estimating costs for this FS, it is assumed that the incremental materials and labor costs for sealing/taping utility penetrations are \$0.50 and \$0.30 per square foot, respectively, for residential and commercial risk scenarios.

Table A49-3a Summary of Estimated Cost of Remedial Alternatives
FS Group A49-3
Site C4
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

Alternative		Potential Land Use Under Remedy	No Action	Excavation and Disposal	Total Cost of Alternative
A20-3A	No Action	Not Applicable	\$0	\$0	\$0
A20-3B	Excavation and Landfill Disposal	Residential	\$0	\$41,000	\$41,000

Notes and Key:

- 1 = Costs associated with institutional controls (ICs) for the entire Aerojet site are presented in Tables Q-2a through Q-2d.
- 2 = Costs associated with ICs for PGOU's portion of the sitewide cost are presented in Tables Q-3a through Q-3d.
- 3 = Costs (\$70,000) associated with ICs for the PGOU are divided between all the alternatives.

Table A49-3b *Estimated Cost of Soil Excavation and Landfill Disposal*
FS Group A49-3
Site C4
Perimeter Groundwater Operable Unit RI/FS
Aerojet Superfund Site
Sacramento County, California

DESCRIPTION	QUANTITY		ESTIMATED COST	
	NUMBER	UNIT	UNIT COST (\$)	TOTAL COST (\$)
DIRECT CAPITAL COST				
Reporting				
RD/RA Workplan	1	LS	\$2,000	\$2,000
Remedial Action Summary (Construction Completion Report)	1	LS	\$2,000	\$2,000
			SUBTOTAL - REPORTING	\$4,000
Excavation and Disposal				
Surveying (pre- and post-excavation)	2	DAY	\$1,500	\$3,000
Equipment mobilization/demobilization	1	LS	\$6,000	\$3,000
Excavate and stockpile soil for Class II Landfill	270	TON	\$6	\$1,600
Soil transportation and disposal (Class II Landfill)	270	TON	\$40	\$10,800
Excavate and stockpile soil for Class I Landfill	0	TON	\$36	\$0
Soil transportation and disposal (Class I Landfill)	0	TON	\$91	\$0
Backfill excavations with clean fill and compact fill	0	TON	\$10	\$0
Water truck	1	DAY	\$500	\$500
Regulatory Oversight	0.25	LS	\$10,000	\$2,500
			SUBTOTAL - EXCAVATION AND DISPOSAL	\$21,400
Confirmation and Stockpile Sample Analyses				
Stockpile sampling - Title 22 metals (1 sample/100 CY)	1	EA	\$130	\$100
Excavation floor confirmatory sampling	4	EA	\$130	\$500
Excavation sidewall sampling	8	EA	\$130	\$1,000
			SUBTOTAL - SAMPLING	\$1,600
			SUBTOTAL - DIRECT CAPITAL COST	\$27,000
INDIRECT CAPITAL COST				
Engineering Design, Procurement, Administrative, and Legal Costs (% of Direct Capital Costs)	1	%	10	\$2,700
Construction Management (% of Direct Capital Costs)	1	%	10	\$2,700
Project Management (% of Direct Capital Costs)	1	%	6	\$1,600
Contractor's General Requirements (assume monthly rental of job trailer, storage box, and portable toilet; and administration support)	0.2	Week	\$1,000	\$200
			SUBTOTAL - INDIRECT CAPITAL COST	\$7,200
			SUBTOTAL - CAPITAL COST (DIRECT AND INDIRECT)	\$34,000
			Capital Cost Contingency (scope and cost) 20%	\$7,000
			TOTAL ESTIMATED CAPITAL COST	\$41,000

Notes and Key:

Excavation Floor Confirmation Samples assumes 1 sample per 1,000 square feet or 1 sample from excavation less than 1,000 square feet.

Excavation Sidewall Samples - Assumes 1 sample every 25 liner foot or 1 sample from each sidewall for excavation.

LS = Lump Sum

% = Percent

EA = Each

Ton = 2,000 pounds