

Table S3. Cost of 130 bioremediation projects worldwide.

N#	Project	Country	State or Region	Contaminants	Contaminant type	Cost (US\$ per m ³)	Treatment	Observations	References
1	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	0.50	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
2	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	0.70	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
3	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	0.70	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
4	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	1.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
5	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	2.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
6	Sacramento Army Depot Superfund Site, Tank 2, OU 3	US	CA	cVOCs	Hydrocarbon-derived	2.73	Solvent Vapor Extraction	Granular activated carbon was utilized for bioremediation	[78]
7	Hastings Groundwater Contamination Superfund Site, Well Number 3 Subsite	US	NE	cVOCs	Hydrocarbon-derived	3.23	Solvent Vapor Extraction		[78,79]
8	K.I. Sawyer AFB	US	MI	TPH and light, nonaqueous-phase liquid (LNAPL)	Hydrocarbon-derived	3.27	Bioventing		[78, 80]
9	Hill AFB	US	UT	JP-4 jet fuel, TPH	Hydrocarbon-derived	3.53	Bioventing		[78, 81]

10	Intersil/Siemens Superfund Site	US	CA	cVOCs	Hydrocarbon-derived	3.74	Solvent Vapor Extraction	Granular activated carbon was utilized for bioremediation	[78,82]
11	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	4.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
12	Davis-Monthan AFB, Site ST-35	US	AZ	TPH, cVOCs	Hydrocarbon-derived	4.70	Solvent Vapor Extraction		[78,83]
13	Kelly AFB	US	TX	Reductive dehalogenation of Chlorinated Solvents	Organic solvent-derived	5.15	Bioventing		[78]
14	Plattsburgh AFB	US	NY	different hazardous waste, TPH	Hydrocarbon-derived	5.23	Bioventing		[78,84]
15	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	6.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
16	Beale AFB	US	CA	VOCs	Hydrocarbon-derived	7.20	Bioventing		[78,85]
17	Battle Creek ANGB	US	MI	BTEX y VOCs	Hydrocarbon-derived	8.05	Bioventing		[78,86]
18	Rocky Mountain Arsenal Superfund Site, Motor Pool Area, OU 18	US	CO	cVOCs	Hydrocarbon-derived	8.17	Solvent Vapor Extraction	Granular activated carbon was utilized.	[78,87]
19	Nellis AFB	US	NV	Hazardous materials, COCs, TPH	Hydrocarbon-derived	9.04	Bioventing		[78]
20	Inveresk Railyard, Launceston, Australia	Australia	Tasmania	TPH	Hydrocarbon-derived	10.32	Biostimulation	C:N and C:P ratios were adjusted to 28 : 1 and 200 : 1, respectively.	[88, 89]
21	Randolph AFB	US	TX	Chlorinated solvents	Halogenated volatile organic compounds	10.44	Bioventing		[78,90]

22	Eglin AFB	US	FL	JP-4 jet fuel spill	Hydrocarbon-derived	11.16	Bioventing		[78,91]
23	LA AFB	US	CA	organic compounds, including chlorinated volatile organic compounds (VOCs), PAHs, pesticides and herbicides, and explosives.	Hydrocarbon-derived	11.17	Bioventing		[78,92]
24	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	12.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
25	Cannon AFB	US	NM	VOCs	Hydrocarbon-derived	12.39	Bioventing		[78,93]
26	Bolling AFB	US	DC	BTEX	Hydrocarbon-derived	12.70	Bioventing		[78,94]
27	McClellan AFB	US	CA	Volatile Organic Compounds (VOCs), toxic and hazardous chemicals	Hydrocarbon-derived	15.30	Bioventing	Soil Vapor Extraction	[78]
28	Westover AFB	US	MA	hazardous materials, TPH	Hydrocarbon-derived	15.56	Bioventing		[78]
29	Bioventing (median among 12 sites)	US	-	hazardous materials, TPH	Hydrocarbon-derived	15.70	Bioventing		[95]
30	Glasgow Air Force Base UST Removal	US	MT	PHC	Hydrocarbon-derived	16.34	Biostimulation	Bioremediation primarily consisted in soil tilling.	[78]
31	Elmendorf AFB	US	AK	TPH y BTEX	Hydrocarbon-derived	16.34	Bioventing		[78,96]
32	Vandenberg AFB	US	CA	éter metil terbutílico (MTBE)	Organic solvent-derived	17.13	Bioventing		[78,97]
33	Hanscom AFB	US	MA	different hazardous waste, TPH and jet fuel	Hydrocarbon-derived	17.66	Bioventing		[78,98]

34	Grissom AFB	US	IN	TPH	Hydrocarbon-derived	19.09	Bioventing		[78,99]
35	Offutt AFB	US	NE	VOCs	Hydrocarbon-derived	19.36	Bioventing		[78]
36	Phytoremediation (2 sites)	US	-	hazardous materials, TPH	Hydrocarbon-derived	20.93	Phytoremediation		[19]
37	Ellsworth AFB	US	SD	TPH y BTEX	Hydrocarbon-derived	24.06	Bioventing		[78,100]
38	FE Warren AFB	US	WY	VOCs, TCE	Hydrocarbon-derived	24.72	Bioventing		[78,101]
39	Hickam AFB	US	HI	hazardous substances, pollutants or contaminants including oil	Hydrocarbon-derived	25.77	Bioventing		[78,102]
40	Pease AFB	US	NH	hazardous waste and petroleum releases, perfluorinated compounds (PFC's)	Hydrocarbon-derived	25.90	Bioventing		[78]
41	Shaw AFB	US	SC	hazardous materials, TPH, perchloroethylene and trichloroethylene	Hydrocarbon-derived	26.16	Bioventing		[78]
42	AFP PJKS	US	CO	fuel hydrocarbons (e.g., JP4 jet fuel, diesel fuel, gasoline, and heating oil)	Hydrocarbon-derived	29.69	Bioventing		[78,103]
43	Tinker AFB	US	OK	hazardous chemicals	various	30.21	Bioventing	Soil-vapor extraction (SVE)	[78]
44	Camp Pendleton	US	CA	not defined	various	31.26	Bioventing		[78,104]
45	Lowry AFB	US	CO	BTEX, PHC	Hydrocarbon-derived	31.52	Biostimulation	Conducted on plastic sheeting, nutrients added once and aerated.	[92]
46	USCG Supp. Cen. Kodiak	US	AK	hazardous waste and petroleum releases	Hydrocarbon-derived	31.91	Bioventing		[78]

47	Davis-Monthan	US	TX	TPH y BTEX	Hydrocarbon-derived	32.04	Bioventing	Soil-vapor extraction (SVE)	[78]
48	Kirtland AFB	US	NM	TPH, different hazardous waste	Hydrocarbon-derived	32.70	Bioventing		[78]
49	Cape Canaveral AFB	US	FL	different hazardous waste	Hydrocarbon-derived	34.92	Bioventing		[78,105]
50	Havre Air Force Station	US	MT	BTEX	Hydrocarbon-derived	35.71	Biostimulation	Application primarily consisted of soil plowing and tilling	[78]
51	McGuire AFB	US	NJ	cVOCs	Hydrocarbon-derived	38.85	Bioventing		[78,106]
52	Mt. Hope AFB	US	ID	different hazardous waste	various	40.42	Bioventing		[78,107]
53	Median between 2 sites (Bedford, IN)	US	IN	hazardous materials, TPH	Hydrocarbon-derived	41.85	Various		[95]
54	Amcor Precast	US	UT	TPH, BTEX	Hydrocarbon-derived	41.96	Solvent Vapor Extraction	Density-Driven Groundwater Sparging and Soil Vapor Extraction - System	[78,108]
55	Dane County Regional Airport, Truaz Field	US	WI	per- and polyfluoroalkyl substances (PFASs)	Halogenated volatile organic compounds	42.90	Thermal treatment		[78,109]
56	Shaw AFB, OU 1	US	SC	TPH	Hydrocarbon-derived	43.58	Solvent Vapor Extraction	catalytic oxidation	[78,7]
57	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	44.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
58	Ft. Drum	US	NY	VOCs, TCE	Hydrocarbon-derived	47.34	Bioventing		[78,110]
59	British Gas	UK	UK	Cu, Zn, Ni, PAH, phenols, cyanide, and BTEX	various	47.80	Others		[88, 111]

60	Camp LeJeune Military Reservation Superfund Site, Site 82, Area A	US	NC	cVOCs, BTEX	Hydrocarbon-derived	48.11	Solvent Vapor Extraction	The system required the use of granular activated carbon	[78]
61	Fort Campell POL Site	US	KY	hazardous materials, TPH	Hydrocarbon-derived	49.40	Thermal treatment		[92]
62	Fairchild AFB	US	WA	Trichloroethene (TCE)	Halogenated volatile organic compounds	50.74	Bioventing		[78,112]
63	Edwards AFB	US	CA	Chlorinated Solvents, Primary contaminant in groundwater-trichloroethene (TCE)	Halogenated volatile organic compounds	51.14	Bioventing		[78,113]
64	Fort Lewis Solvent Refined Coal Pilot Plant	US	WA	PAHs	Hydrocarbon-derived	51.22	Thermal treatment		[78,114]
65	Pope AFB	US	NC	TPH, JP-4 fuel	Hydrocarbon-derived	53.50	Bioventing		[78]
66	British Gas	UK	UK	Cu, Zn, Ni, PAH, phenols, cyanide, and BTEX	various	59.90	Various		[88, 35]
67	Malmstrom AFB	US	MT	benzene, toluene, ethylbenzene, and xylenes (BTEX)	Hydrocarbon-derived	67.23	Bioventing		[78,115]
68	British Gas	UK	UK	Cu, Zn, Ni, PAH, phenols, cyanide, and BTEX	Hydrocarbon-derived	71.40	Others		[44, 12]
69	Little Rock AFB	US	AR	Jet fuel and benzene vapor	Hydrocarbon-derived	72.59	Bioventing		[78,116]
70	Verona Well Field Superfund Site, Thomas Solvent Raymond Road OU 1	US	MI	cVOCs	Hydrocarbon-derived	83.11	Solvent Vapor Extraction	The system required the use of granular activated carbon and catalytic oxidation.	[78,117]
71	Alameda Naval Air Station,	US	CA	hazardous materials, TPH	Hydrocarbon-derived	88.92	Thermal treatment		[78]

	Interim Soil Removal								
72	Holloman AFB, Sites 2 and 5	US	NM	BTEX	Hydrocarbon-derived	89.03	Solvent Vapor Extraction	It required the use of a bioreactor.	[78, 83]
73	Sand Creek Industrial Superfund Site, OU 1	US	CO	cVOCs, TPH	Hydrocarbon-derived	95.06	Solvent Vapor Extraction	The process required a catalytic oxidation (CATOX) unit for vapor extraction.	[78, 118]
74	Median between 9 sites	US	-	hazardous materials, TPH	Hydrocarbon-derived	95.48	Bioventing		[95]
75	Charleston AFB	US	SC	TPH y BTEX	Hydrocarbon-derived	98.09	Bioventing		[78, 119]
76	Longhorn Army Ammunition Plant, Burning Ground No. 3	US	TX	Organic Compounds Volatiles (Halogenated), Methylene Chloride, Trichloroethylene (TCE)	Halogenated volatile organic compounds	98.41	Thermal treatment		[78, 120]
77	Fort Greely UST Soil Piles	US	AK	BTEX, PHC	Hydrocarbon-derived	99.92	Others		[78]
78	Median between 30 sites	US	-	hazardous materials, TPH	Hydrocarbon-derived	100.71	Various		[95]
79	Brown Wood Preserving Superfund Site	US	FL	PAHs	Hydrocarbon-derived	102.54	Various	The site has a moderate initial contaminant concentrations	[78]
80	FCX Washington Superfund Site	US	NC	Pesticides; Aldrin, chlordane, DDT, DDE, DDD, dieldrin, heptachlor, heptachlor epoxide, methoxychlor, benzene hexachlorides	Halogenated volatile organic compounds	102.70	Thermal treatment	The thermal desorption required a IRHV-200 vacuum-enhanced low temperature thermal desorption system.	[78, 121]

81	Kelly AFB, Area 1100	US	TX	TPH	Hydrocarbon-derived	108.38	Solvent Vapor Extraction		[78]
82	TH Agriculture & Nutrition Company Superfund Site	US	GA	organochlorine (OCL) pesticides	Halogenated volatile organic compounds	112.19	Thermal treatment		[78, 122]
83	French Limited Superfund Site	US	TX	cVOCs, PAHs, Other SVOCs, Other VOCs, PCBs	Hydrocarbon-derived	116.93	Others	Extremely large volume.	[78]
84	March AFB	US	CA	volatile organic compounds and heavy metals	Hydrocarbon-derived and metals	123.21	Bioventing		[78]
85	Arlington Blending & Packaging Superfund Site	US	TN	benzene; chlorodane; 1,1-dichloroethene (1,1-DCE); endrin; heptachlor epoxide; pentachlorophenol (PCP); toluene; xylenes, chlordane, heptachlor, endrin, arsenic, heptachlor epoxide, and PCP in the soils.	Halogenated volatile organic compounds and metals	128.31	Thermal treatment	The system required excavation, stockpiling, treatment, and backfilling.	[78]
86	Fort Wainwright, North Post Site Soil Remediation	US	AK	BTEX	Hydrocarbon-derived	133.41	Biostimulation		[78]
87	Defense Supply Center Richmond Superfund Site	US	VA	cVOCs	Hydrocarbon-derived	134.25	Solvent Vapor Extraction	The system required the use of granular activated carbon.	[78]
88	Fairchild Semiconductor Corporation Superfund Site	US	CA	cVOCs, BTEX	Hydrocarbon-derived	138.35	Solvent Vapor Extraction	The system required the use of granular activated carbon.	[78, 123]
89	Median between 17 sites	US		hazardous materials, TPH	Hydrocarbon-derived	138.64	Various		[95]
90	Commencement Bay, South	US	WA	cVOCs	Hydrocarbon-derived	140.38	Solvent Vapor Extraction		[78, 124]

	Tacoma Channel Well 12A Superfund Site								
91	Patrick AFB	US	FL	benzene, toluene, ethylbenzene, and xylene (BTEX)	Hydrocarbon-derived	141.26	Bioventing		[78, 125]
92	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	165.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
93	Matagora Island Air Force Base	US	TX	BTEX	Hydrocarbon-derived	202.73	Others		[78]
94	Sikes Disposal Pits	US	TX	Organic and phenolic compounds	Hydrocarbon-derived	208.00	Thermal treatment	The system required the use of rotary kiln, SCC, quench section, and two-stage scrubber.	[78]
95	Letterkenny Army Depot	US	PA	Volatile Organic Compounds and Metals	Hydrocarbon-derived and metals	210.60	Thermal treatment	Low Temperature Thermal Desorption was applied.	[78]
96	Naval Air Station Cecil Field	US	FL	Petroleum products (BTEX) and chlorinated solvents	Hydrocarbon-derived	217.10	Thermal treatment	The system included pump and treat and Soil Vapor Extraction system.	[78]
97	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	223.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
98	Hill AFB, Site 914	US	UT	BTEX, PHC	Hydrocarbon-derived	226.27	Others	Early bioventing application.	[78]
99	Sand Creek Industrial Superfund Site, OU 5	US	CO	Organochlorine pesticides	Halogenated volatile organic compounds	227.50	Thermal treatment	System consisted of a rotary kiln, two sulfur-impregnated vapor-phase carbon units, four liquid-phase	[78, 126]

								carbon units (1,000 lb each), cyclones, a baghouse, and a packed bed scrubber	
100	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	229.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
101	Travis AFB	US	CA	volatile organic compounds (VOCs), metals and polycyclic aromatic hydrocarbons (PAHs)	Hydrocarbon-derived	244.59	Bioventing		[78]
102	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	250.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
103	Metaltec	US	NJ	Chlorinated Volatile Organic Compounds (VOCs) and Heavy Metals	Halogenated volatile organic compounds and metals	256.10	Thermal treatment	A low temperature enhanced volatilization system was applied.	[78, 127]
104	Median between 7 sites	US	-	hazardous materials, TPH	Hydrocarbon-derived	261.59	Various		[19]
105	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	262.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
106	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	268.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
107	Sarney Farm Superfund Site	US	NY	Volatile Organic Compounds / Seven contaminants of concern (COCs) were identified including 1,2-dichloroethane, 2-butanone, 4-methyl-	Hydrocarbon-derived	304.20	Thermal treatment	A low temperature thermal desorption (LTTD) system was utilized.	[78, 128]

				2-pentanone, chloroform, toluene, trichloroethene, total xylenes					
108	Garden State Cleaners	US	NJ	cVOCs	Hydrocarbon-derived	311.75	Solvent Vapor Extraction	The process required granular activated carbon.	[78, 129]
109	Southeastern Wood Preserving Superfund Site, OU 1	US	MS	PAHs	Hydrocarbon-derived	317.83	Various	The process required bioreactor system. The siter has high initial concentrations of contaminants.	[78]
110	McKin Company Superfund Site	US	ME	VOCs, PAHs	Hydrocarbon-derived	327.60	Thermal treatment	The system required a pretreatment for solids and a post-treatment phase for water.	[78, 130]
111	Rocky Flats Environmental Technology Site	US	CO	VOCs, asbestos, hazardous waste, metals, uranium, plutonium, and americium contamination	various	338.00	Thermal treatment	The process required a seep-treatment system.	[78]
112	Reich Farm Superfund Site	US	NJ	Volatile Organic Compounds (VOCs) and Semivolatile Organic Compounds (SVOCs)	Hydrocarbon-derived	351.00	Thermal treatment	Low temperature volatilization system (LTVS)	[78]
113	Median between 10 sites	US	-	hazardous materials, TPH	Hydrocarbon-derived	367.53	Various		[95]
114	Bayou Bonfouca	US	LA	PAHs	Hydrocarbon-derived	390.00	Thermal treatment	It was performed in a Rotary kiln, SCC, quench system, gas conditioner,	[78, 131]

								scrubber, and mist eliminator.	
115	SMS Instruments Superfund Site	US	NY	cVOCs, VOCs, PHC	Hydrocarbon-derived	432.32	Solvent Vapor Extraction	The process required catalytic oxidation and scrubbing.	[78, 132]
116	Dover AFB, Area 6	US	DE	cVOCs, Heavy metals	Hydrocarbon-derived and metals	432.93	Bioventing	The process required direct injection of air and propane.	[78]
117	AFP 4	US	TX	chlorinated volatile organic compound (VOC) soil vapors, primarily trichloroethene (TCE)	Halogenated volatile organic compounds	435.55	Bioventing	The process required flameless thermal oxidation (FTO).	[78, 133]
118	Outboard Marine Corporation Superfund Site	US	IL	polychlorinated biphenyls (PCBs)	Halogenated volatile organic compounds	481.00	Thermal treatment	Treatment system included excavation, stockpiling, and treatment of PCB-contaminated soil and sediment.	[78, 134]
119	Dubose Oil Products Co. Superfund Site	US	FL	BTEX, cVOCs, Other, SVOCs, Other, VOCs	Hydrocarbon-derived	497.02	Various	Treatment system included leachate collection, inoculant generation, vacuum extractions, and wastewater treatment	[78]
120	Former Nebraska Ordnance Plant	US	NE	Explosives and propellants	various	559.00	Thermal treatment	It was performed in a rotary kiln, quench duct, baghouse, and packed-bed scrubber system.	[78, 135]

121	Celanese Corporation Shelby Fiber Operations	US	NC	Ethylene glycol, VOCs, PAHs, Phenol	Hydrocarbon and organic solvent-derived	572.00	Thermal treatment	It was performed in a rotary kiln, quench duct, baghouse, and packed-bed scrubber system.	[78, 136]
122	Wide Beach Development Superfund Site	US	NY	polychlorinated biphenyls (PCBs)	Halogenated volatile organic compounds	596.70	Thermal treatment	It was based on a dehalogenation treatment.	[78, 137]
123	Umatilla Army Depot Activity (FS)	US	OR	Other SVOCs	Hydrocarbon-derived	626.51	Biostimulation	Included addition of compost	[78]
124	Port Moller Radio Relay Station	US	AK	Oil spills, GRO, BTEX, DRO and TRPH	Hydrocarbon-derived	644.80	Thermal treatment	It required a post-treatment (off-gas), including oxidizer and baghouse.	[78, 138]
125	Re-Solve, Inc. Superfund Site	US	MA	hazardous materials, waste oil, VOCs, PCBs	Hydrocarbon-derived	712.40	Thermal treatment	It required two-tiered groundwater extraction and treatment system.	[78]
126	Niger Delta region	Nigeria	Niger-Delta	TPH, petroleum hydrocarbons	Hydrocarbon-derived	715.00	Biostimulation	Remediate soil to 50% of initial TPH.	[44]
127	Waldick Aerospace Devices Superfund Site	US	NJ	BTEX, PHC, VOC, metals	Hydrocarbon-derived and metals	725.40	Thermal treatment	It required thermal desorption, followed by off-site stabilization and solidification.	[78]
128	Scott Lumber Company Superfund Site	US	MO	PAHs	Hydrocarbon-derived	808.31	Bioaugmentation	It included irrigation and drainage system, and addition of nutrient and culture.	[78, 139]

129	Sacramento Army Depot Superfund Site, Burn Pits OU	US	CA	VOCs, cVOCs	Hydrocarbon- derived	1363.12	Solvent Vapor Extraction	The process required the use of granular activated carbon.	[78]
130	MOTCO	US	TX	benzene, vinyl chloride, 1,1,2- trichloroethane, lead, cadmium, mercury, and chromium	various	1820.00	Thermal treatment	It was performed in a rotary kiln.	[78, 140]