

Groundwater Containment at Site SS-07, Pope AFB

Site Background

This section focuses on the groundwater containment system located at the Blue Ramp Spill Site, SS-07, Pope AFB. A site map for SS-07 is included as Figure 42.

Contaminants in Soil

- Soil vapor investigations indicate concentrations of greater than 1,000 ppm of VOCs exist in the vadose zone.
- The soil vapor plume is estimated at 25 acres in areal extent.

Contaminants in Groundwater

- As much as 75,000 gallons of JP-4 free product are floating on top of the groundwater.
- Dissolved VOCs have also been detected within the groundwater.

Lithology

- Subsurface soils are silty to clayey fine-grained sands.
- Clay lenses ranging from 1 to 5 feet in thickness.
- Groundwater is encountered between 22.5 and 27 feet bgs.

Groundwater Containment System Details

- Dual pump recovery system with one free product cut-off trench (Radian Corporation, 1996).
- In 1993 and 1995, the free product cut-off trench was extended.
- The system operates at an average groundwater flow rate of 1 gpm.
- JP-4 is recovered by pneumatic skimmer pumps and is stored in a product recovery tank.

Operation Period

- The system began operation in November 1993 and may operate approximately 40 years.

Total Capital Costs

- \$394,000 for initial capital investment.

Total O&M Costs

- Total cumulative O&M costs from November 1993 through November 1996 were \$96,200.

Cost and Performance of Groundwater Containment at Site SS-07

Groundwater Containment with Free Product Source Removal Operational Objectives

The objective of free product source removal is typically to remove liquid-phase contamination as quickly and cost-effectively as possible to prevent continued contamination of surrounding soil and groundwater. The emphasis for free product removal is that the mass of contaminants is cost effectively removed.

Cost for Operation

Figure 43 illustrates curves of the O&M costs for the groundwater containment system at Site SS-07. Accurate month to month data were not available. The monthly O&M costs average \$2,600. Total O&M costs after three years of operation were \$96,200.

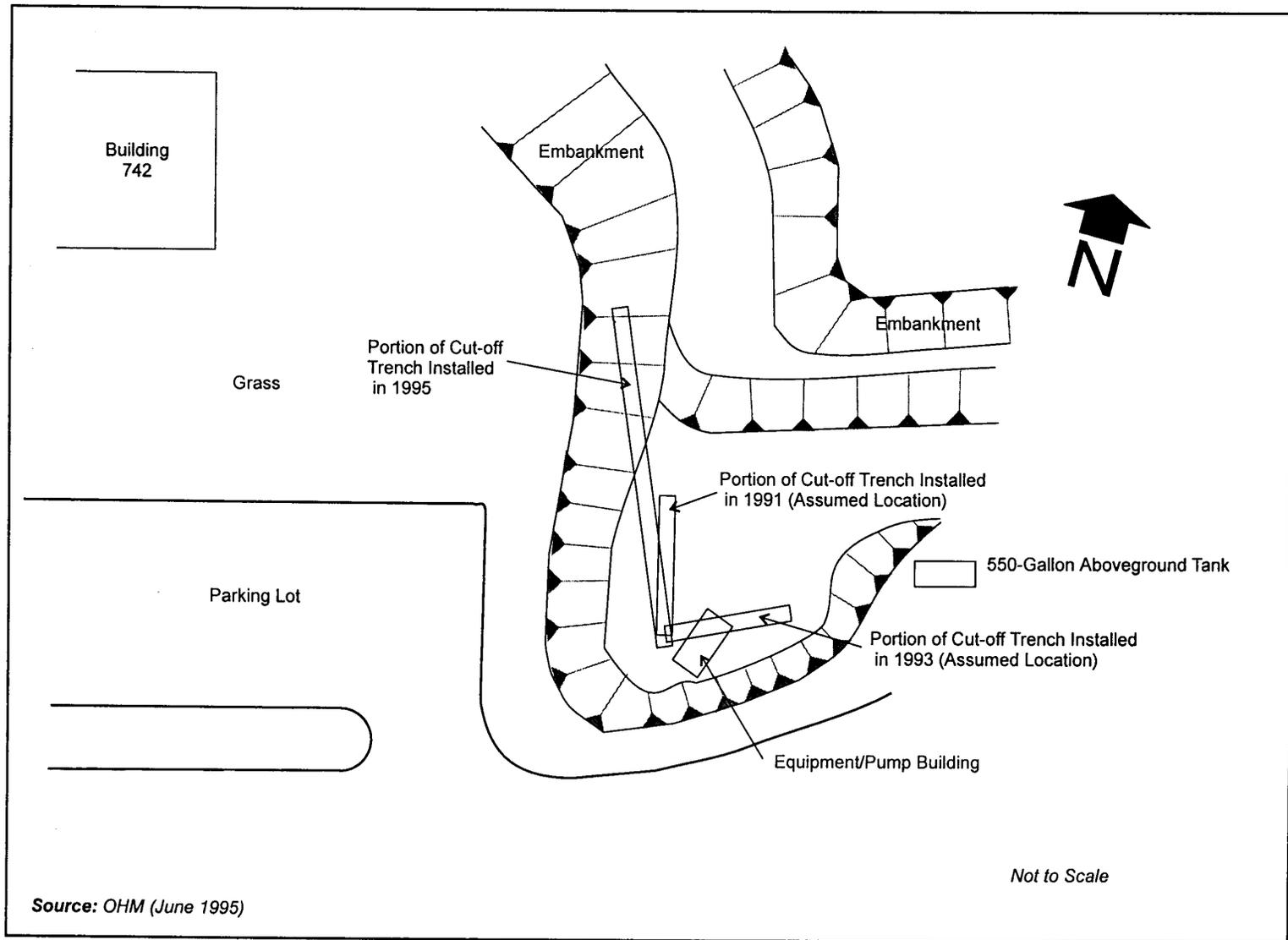
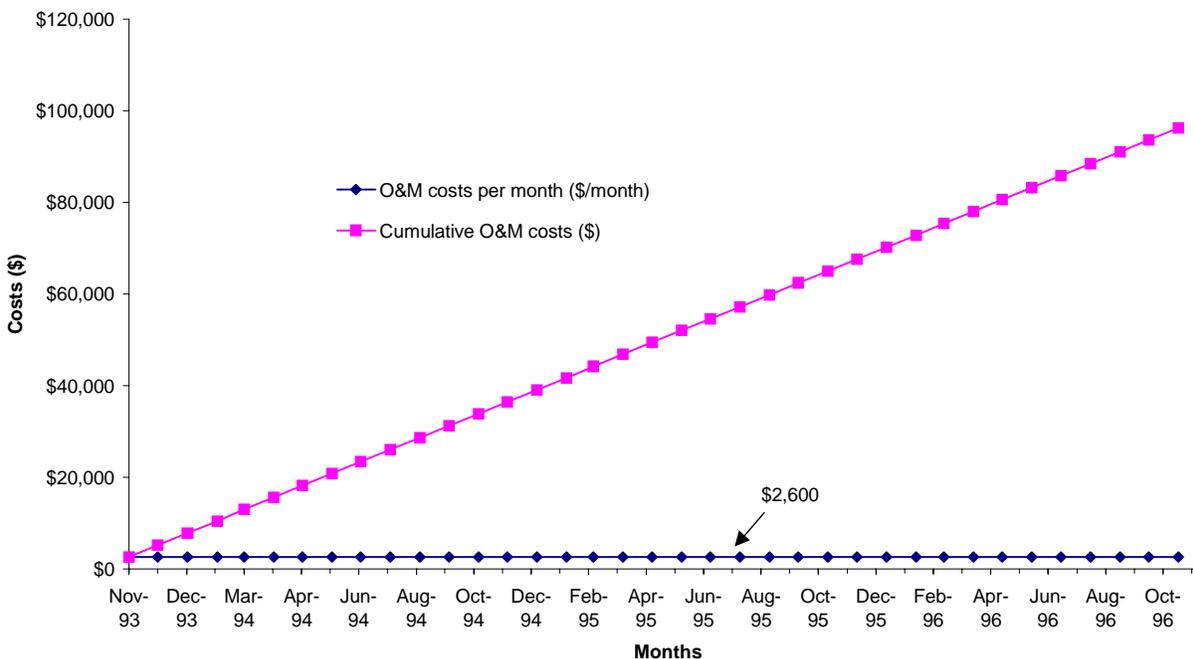


Figure 42. Free Product Recovery System at Site SS-07, Pope AFB

Figure 43
Monthly and Cumulative O&M Costs vs. Time
JP-4 Free Product Recovery
Site SS-07, Pope AFB



Raws07.xls; O&M costs

Contaminant Removal

Figure 44 illustrates curves of the removal rates of JP-4 product at the groundwater containment system at Site SS-07. Monthly removal rates of JP-4 product ranged from 1 to 340 gallons. Total contaminant removal after three years of operation was 3,516 gallons of JP-4 product. After April 1995 the curve representing the cumulative removal rate had begun to flatten, indicating that the removal rate for this system is slowing. It is recommended that the system be evaluated for increasing product removal.

Correlation of Costs and Contaminant Removal

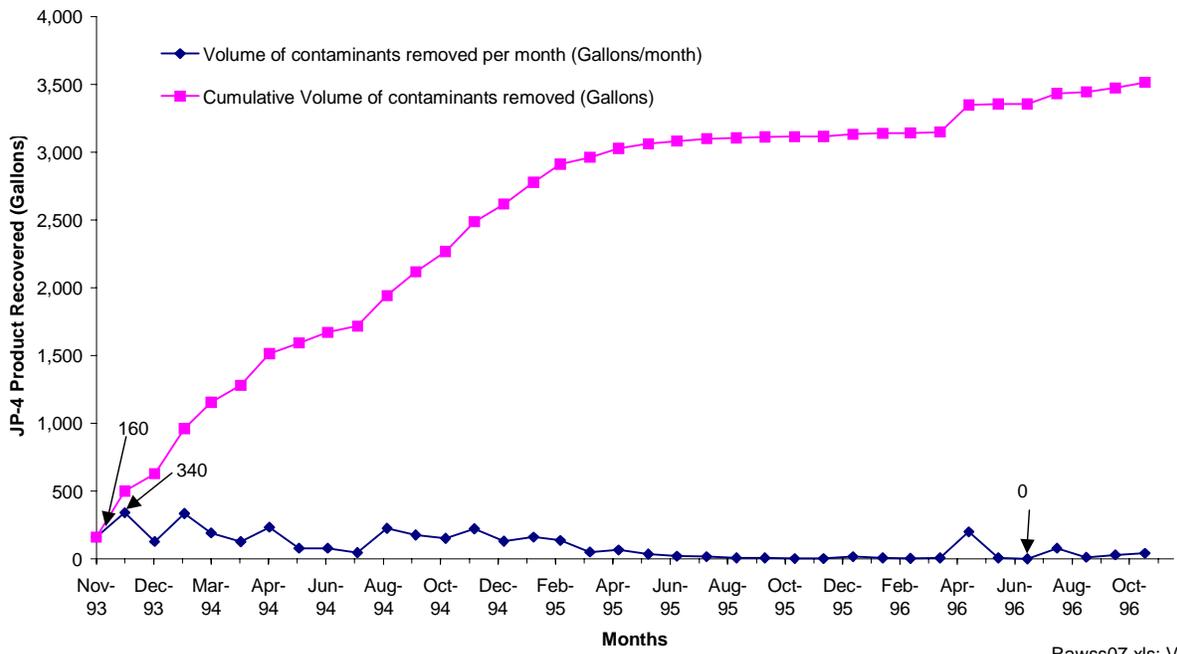
Figures 45 and 46 illustrate the relationship between the O&M costs and the removal rates for the groundwater containment system at Site SS-07.

Figure 45 illustrates the cumulative O&M cost relative to the cumulative contaminant removal.

In November 1996, this curve was no longer vertical. In November 1996, this groundwater containment system was operating adequately for this system's performance and meeting its operational objectives of cost-effectively removing contaminants.

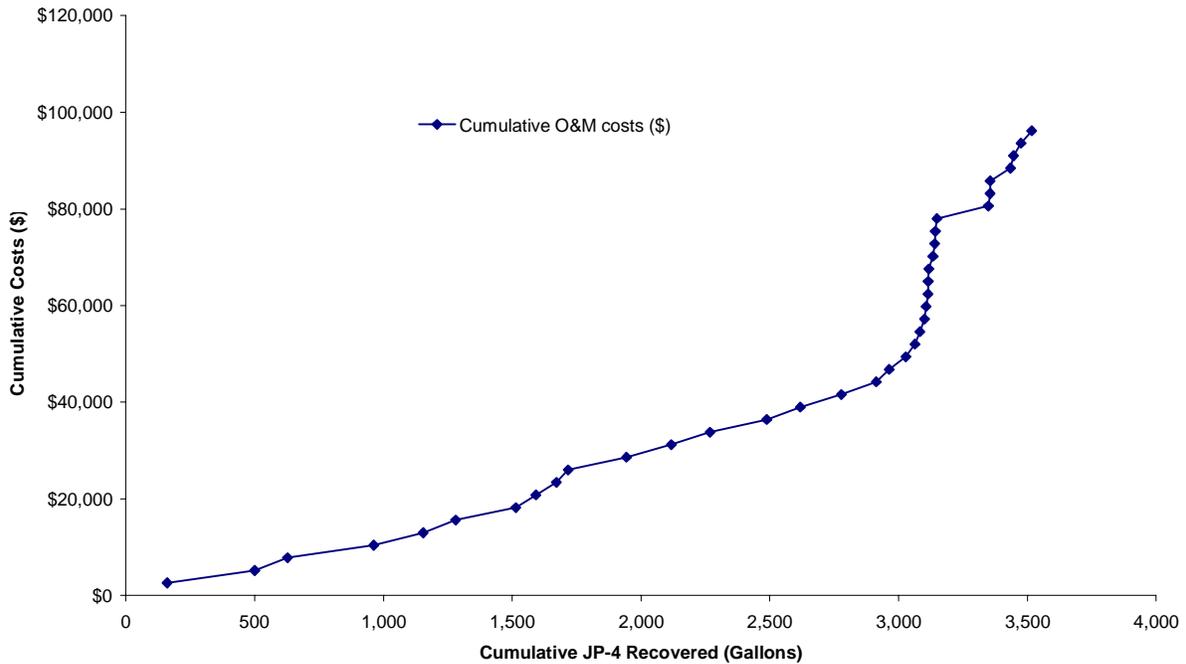
Figure 46 illustrates curves of the monthly as well as the cumulative cost per unit of contaminant removal over the operation time of the technology. The first curve illustrates the cost per gallon of JP-4 product removal in each month. The cumulative curve illustrates that the average cost per unit of contaminant removal was \$27.36/gallon of JP-4 product after three years of operation time.

Figure 44
Monthly & Cumulative JP-4 Product Recovery vs. Time
Site SS-07, Pope AFB



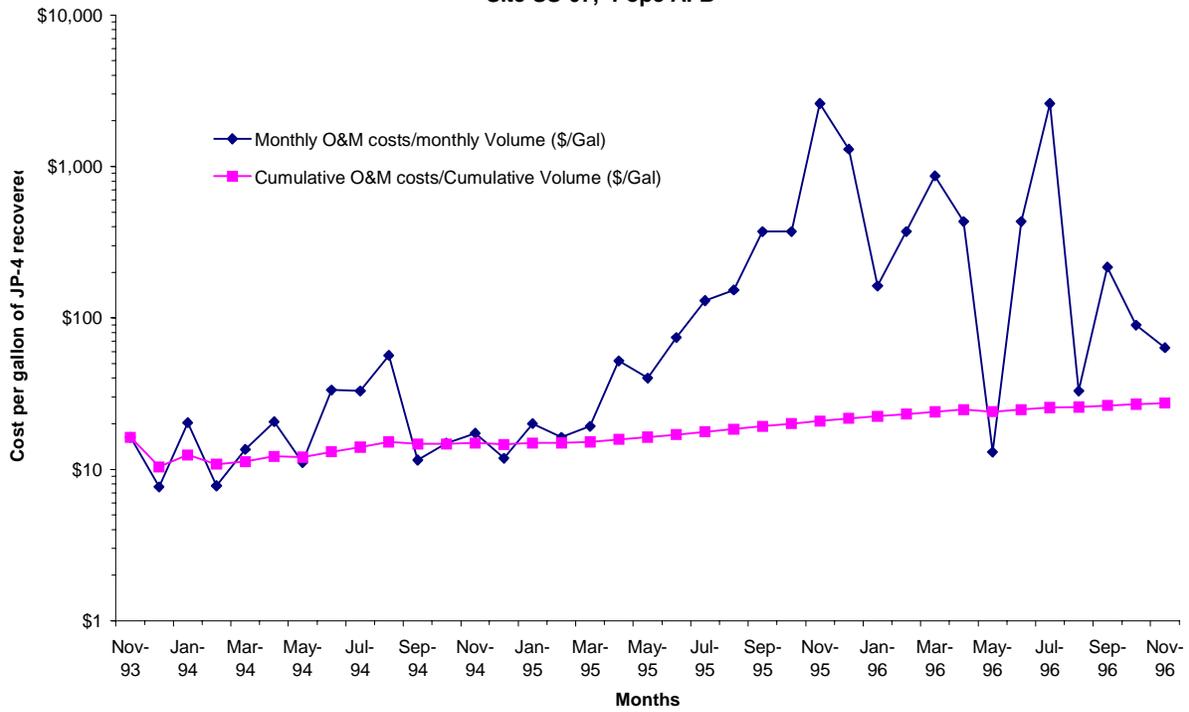
Rawss07.xls; Volume

Figure 45
Cumulative O&M Costs vs. JP-4 Product Volume Recovered
Site SS-07, Pope AFB



Rawss07.xls; O&M vs. vol

Figure 46
Monthly and Cumulative Costs per Gallon of JP-4 Recovered vs. Time
Site SS-07, Pope AFB



Rawss07.xls; mon\$pergalovrt

APPENDIX A

Detailed Cost and Performance Data Table

**JP-4 Free Product Recovery Pumping
Blue Ramp Spill Site (SS-07)
Pope AFB**

Date of contamination removal	Volume of contaminants removed per month (Gallons/month)	Cumulative Volume of contaminants removed (Gallons)	O&M costs per month (\$/month)	Cumulative O&M costs (\$)	Monthly O&M costs/monthly Volume (\$/Gal)	Cumulative O&M costs/Cumulative Volume (\$/Gal)
Nov-93	160	160	\$2,600	\$2,600	\$16.25	\$16.25
Dec-93	340	500	\$2,600	\$5,200	\$7.65	\$10.40
Jan-94	128	628	\$2,600	\$7,800	\$20.31	\$12.42
Feb-94	334	962	\$2,600	\$10,400	\$7.78	\$10.81
Mar-94	192	1,154	\$2,600	\$13,000	\$13.54	\$11.27
Apr-94	126	1,280	\$2,600	\$15,600	\$20.63	\$12.19
May-94	234	1,514	\$2,600	\$18,200	\$11.11	\$12.02
Jun-94	78	1,592	\$2,600	\$20,800	\$33.33	\$13.07
Jul-94	79	1,671	\$2,600	\$23,400	\$32.91	\$14.00
Aug-94	46	1,717	\$2,600	\$26,000	\$56.52	\$15.14
Sep-94	226	1,943	\$2,600	\$28,600	\$11.50	\$14.72
Oct-94	175	2,118	\$2,600	\$31,200	\$14.86	\$14.73
Nov-94	150	2,268	\$2,600	\$33,800	\$17.33	\$14.90
Dec-94	220	2,488	\$2,600	\$36,400	\$11.82	\$14.63
Jan-95	130	2,618	\$2,600	\$39,000	\$20.00	\$14.90
Feb-95	160	2,778	\$2,600	\$41,600	\$16.25	\$14.97
Mar-95	135	2,913	\$2,600	\$44,200	\$19.26	\$15.17
Apr-95	50	2,963	\$2,600	\$46,800	\$52.00	\$15.79
May-95	65	3,028	\$2,600	\$49,400	\$40.00	\$16.31
Jun-95	35	3,063	\$2,600	\$52,000	\$74.29	\$16.98
Jul-95	20	3,083	\$2,600	\$54,600	\$130.00	\$17.71
Aug-95	17	3,100	\$2,600	\$57,200	\$152.94	\$18.45
Sep-95	7	3,107	\$2,600	\$59,800	\$371.43	\$19.25
Oct-95	7	3,114	\$2,600	\$62,400	\$371.43	\$20.04
Nov-95	1	3,115	\$2,600	\$65,000	\$2,600.00	\$20.87
Dec-95	2	3,117	\$2,600	\$67,600	\$1,300.00	\$21.69
Jan-96	16	3,133	\$2,600	\$70,200	\$162.50	\$22.41
Feb-96	7	3,140	\$2,600	\$72,800	\$371.43	\$23.18
Mar-96	3	3,143	\$2,600	\$75,400	\$866.67	\$23.99
Apr-96	6	3,149	\$2,600	\$78,000	\$433.33	\$24.77
May-96	200	3,349	\$2,600	\$80,600	\$13.00	\$24.07
Jun-96	6	3,355	\$2,600	\$83,200	\$433.33	\$24.80
Jul-96	0	3,355	\$2,600	\$85,800	\$2,600.00	\$25.57
Aug-96	79	3,434	\$2,600	\$88,400	\$32.91	\$25.74
Sep-96	12	3,446	\$2,600	\$91,000	\$216.67	\$26.41
Oct-96	29	3,475	\$2,600	\$93,600	\$89.66	\$26.94
Nov-96	41	3,516	\$2,600	\$96,200	\$63.41	\$27.36