United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R02-84/001
December 1984

EPA

Superfund Record of Decision:

Bridgeport Site, NJ

BRIDGEPORT, NJ

Record of Decision
Abstract

This 30-acre site is located approximately one mile east of the Town of Bridgeport and about two miles south of the Delaware River. The site is an abandoned waste oil storage and recovery facility which operated from 1950 through the early 1970's. The site includes a tank farm consisting of 90 tanks and process vessels, drums, tank trucks and a 12.7 acre waste oil and wastewater lagoon. The lagoon is divided into three layers: an oily upper layer, an aqueous middle layer, and bottom sludge/sediment deposits. Sampling of these lagoon layers and the ground water reveal average PCB concentrations in excess of 500 ppm; organics, such as benzene, methylene chloride and toluene, at concentrations up to 1,000 ppb; and acetone at levels up to 70 ppm.

The cost-effective remedial alternative selected for the first operable unit includes disposal of oily waste and sediment/sludge via on-site incineration; removal and disposal of contaminated water via an on-site treatment system; drum excavation and removal; maintenance pumping to prevent further migration of the contaminated plume; complete removal of tanks and waste; installation of a water supply pipeline from an existing pump station; and a second phase RI/FS to determine appropriate ground water cleanup and lagoon closure remedies. The estimated total project capital cost for this remedy is $57,672,000 and the estimated 10-year operation and maintenance costs for the water supply pipeline is $20,000.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 2046

Record of Decision
Remedial Alternative Selection

Site

Bridgeport Rental and Oil services (BROS), Inc., Logan Township, New Jersey.

Documents Review

I am basing my decision on the following documents describing the analysis of cost effectiveness of remedial alternatives for the BROS site:

- BROS Remedial Investigation Report and Feasibility Study (RI/FS, July 1984)
- Summary of Remedial Alternative Selection
- The documents attached to this Record of Decision

Description of Selected Remedy

Lagoon:

- Removal and disposal of oily waste via on-site incineration*
- Removal and disposal of sediment/sludge via on-site incineration*
- Removal and disposal of contaminated water via an on-site treatment system
- Drum excavation and on-site disposal
- Maintenance pumping to prevent further spreading of contaminated plume and ensure capture of any contaminants that may escape during lagoon excavation

*Off-site incinerators may be permitted to bid on this project

Tank Farm:

- Complete removal of tanks and waste.

Residental Wells:

- Water supply pipline from an existing pump station in the Village of Bridgeport to contaminated wells.

Additional Studies:

- 2nd phase RI/FS to determine appropriate ground water cleanup and lagoon closure remedies.

Declaration

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR part 300), I have determined that the selected remedy as described above is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment. The State of New Jersey has been consulted and agrees with the approved remedy.

I have also determined that the action being taken is appropriate when balanced against the availabilty of Trust Fund monies for use at other sites. In addition, the off-site transportation, storage, destruction, treatment, or secure disposition of wastes stored in tanks currently on-site is more cost-effective than other remedial action, and is necessary to protect public health, welfare, or the environment.

12/31/84
Date

Lee M. Thomas, Assistant Administrator
Office of Solid Waste and
Emergency Response

Summary of Remedial Alternative Selection

Bridgeport Rental and Oil Services
Bridgeport, New Jersey

Site Location and Description

The Bridgeport Rental and Oil Services BROS site is located on Cedar Swamp Road at the divergence of Route 130 and I-295 in southwest New Jersey, approximately one mile east of the Town of Bridgeport and about 2 miles south of the Delaware River (see Figure 1). More specifically, the BROS site is located on a parcel of land delineated as Block 59, Lots 18, 22A, 22B and 22F on Tax Map 14A, Township of Logan, Gloucester County, New Jersey. The total area of the site is about 30 acres. The site includes a tank farm containing about 90 tanks and process vessels, drums, tank trucks and a 12.7 acre waste oil and wastewater lagoon. The general arrangement of the site is shown on Figure 2.

The area surrounding the BROS facility is predominately rural and agricultural in nature. An active peach orchard borders the western edge of the BROS site. A truck repair garage is located approximately 300 feet northwest of the site and 3 homes are located about 800 feet north. East of the site is a swampy area (Little Timber Creek Swamp) which leads into Little Timber Creek. South and southwest of the site, adjacent to the lagoon, are three large ponds. These ponds are man-made and were excavated by a sand and gravel mining operation which started in the late 1940's and was completed by the early 1970's.

Topography surrounding the site is nearly flat. The Bridgeport area is bounded on the north by the Delaware River, and the local land is characterized by swamps and streams flowing north-northwest to the river. However, the site is not located within the 100 year floodplain.

A thick clay layer exists beneath the BROS site. The top of this clay layer is located at a depth of 100 feet below ground surface in the northwest corner of the site and dips southeast to a depth of about 140 feet below the ground surface in the southeast corner. Above the clay layer is the Cape May/Magothy-Raritan Formation, which is a surficial aquifer beneath the site and an outcrop of the Raritan Magothy aquifer, one of New Jersey's major sources of potable water. Regional flow of this aquifer is estimated to be north toward the Delaware River with a velocity of about .056 ft/day; however, local flow is radial around the BROS lagoon due to mounding effects from the hydrostatic head of the lagoon. This aquifer is also used as a potable water supply for about 800 people in the Bridgeport area. Domestic water wells are located north, northwest and west of the site, with ten wells located from 50 to 1000 feet of the site.

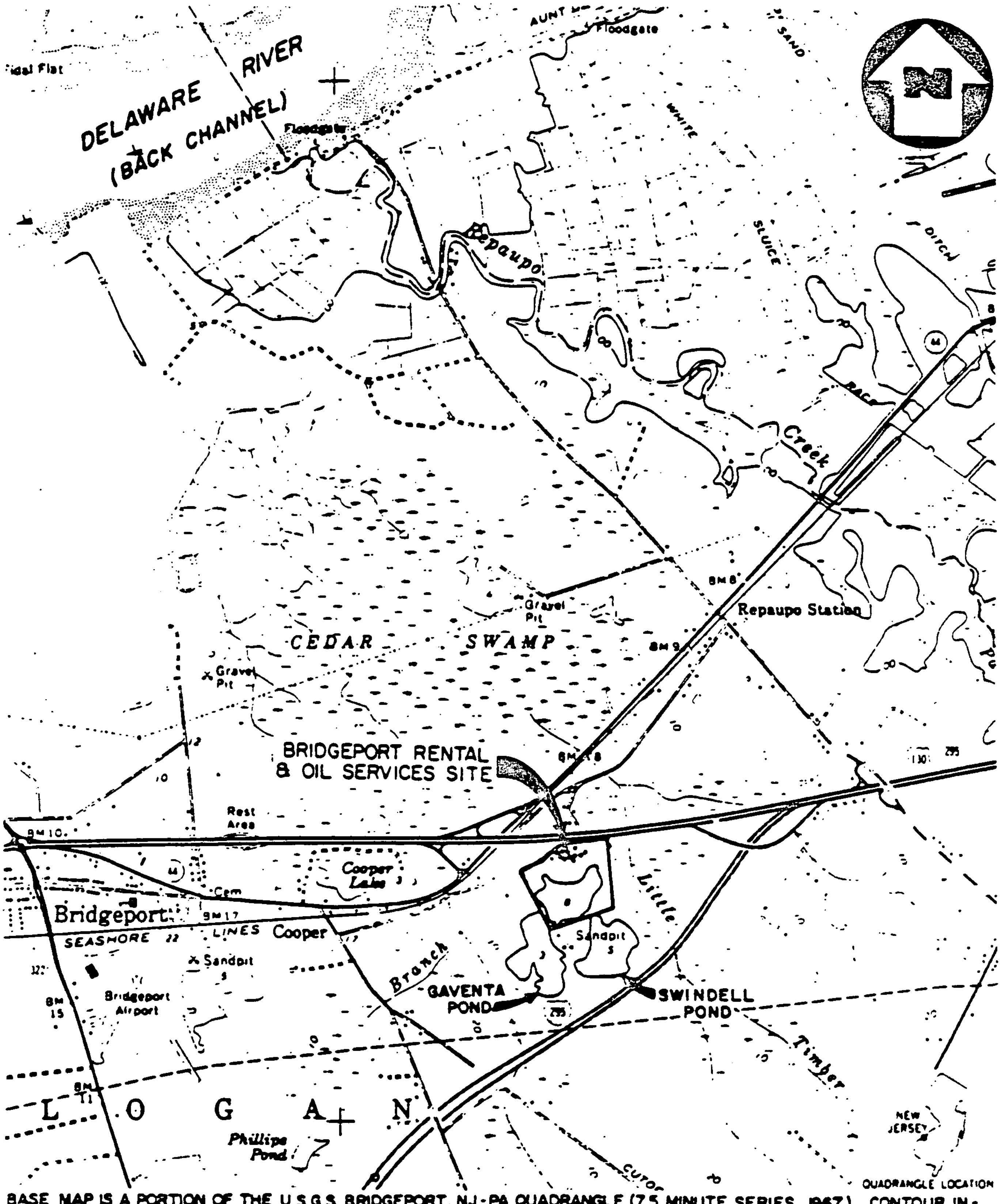
Site History

The BROS lagoon reportedly began to form in the 1940's as a result of sand and gravel dredging operations. An examination of aerial photos reveals that light dumping in the lagoon was occuring at about the same time. From the 1940's to present, the lagoon increased in size from .54 acres to 12.7 acres. Presently the lagoon is 21 feet deep in certain locations and the bottom 13 feet of the lagoon is in contact with groundwater. Also, during that time frame, various liquids and oils were deposited into the lagoon. In the late 1950's and 1960's, storage tanks began to be constructed on the site. The wastes in the lagoon and in some of the tanks still remain.

When the present owners of the site took over in the late 1960's, the site was used for waste oil storage and recovery, and for storage tank leasing operations. In the early 1970's, the eastern dike of the lagoon was breached and caused a large area (3 acres) of vegetative damage. The damage included an area of obviously stressed vegetation including shubbery and trees. In addition, the 3 acre area is covered with a surficial layer of PCB contaminated oil. From 1975 to 1980, various remedial cleanup efforts were proposed by the owners of BROS to clean up the lagoon. Those that were attempted proved to be unsuccessful. These unsuccessful attempts included booming and collecting the oil, unsuccessfully treating the aqueous phase of the lagoon, as well as attempting to volatilize the volatile organics from the lagoon by using a giant fan. In the Spring of 1981, the lagoon began to rise and threatened to overflow its dike. In response to this threat, the U.S. Coast Guard utilizing funds provided by Section 311(K) of the Clean Water Act increased the height of the existing dike by about 5 feet. This addition was designed to contain the liquid in the lagoon for approximately 4 to 5 years. However, in the Spring of 1982 and 1983, the lagoon again rose and threatened to flow over the new dike. During those two periods, EPA initiated emergency action at the site. This action consisted of lowering the level of the lagoon by pumping the aqueous phase through a mobile activated carbon system. The lagoon level was lowered approximately 2 feet each time. Presently, under an initial remedial action at the site, EPA has lowered the level of the lagoon by approximately 8 feet. This was accomplished by pumping the aqueous phase of the lagoon through an oil/water separator, flocculation/sedimentation tanks, sand and granular activated carbon filters and discharging the effluent to Little Timber Creek. This action was designed to stabilize the situation until a long-term cleanup could be implemented.

Current Site Status

The BROS site, as previously described, consists basically of a tank farm and a 12.7 acre waste oil and wastewater lagoon. Table I describes the quantity and quality of the material in the tanks with the most significant volumes. Most of the tanks are in relatively poor condition and not suitable for long-term storage of material.



BASE MAP IS A PORTION OF THE U.S.G.S. BRIDGEPORT, NJ-PA QUADRANGLE (7.5 MINUTE SERIES, 1967). CONTOUR INTERVAL 10'.

FIGURE 1

LOCATION MAP
BRIDGEPORT RENTAL & OIL SERVICES, LOGAN TWP., NJ
SCALE: 1" = 2000'

NUS CORPORATION
A Halliburton Company

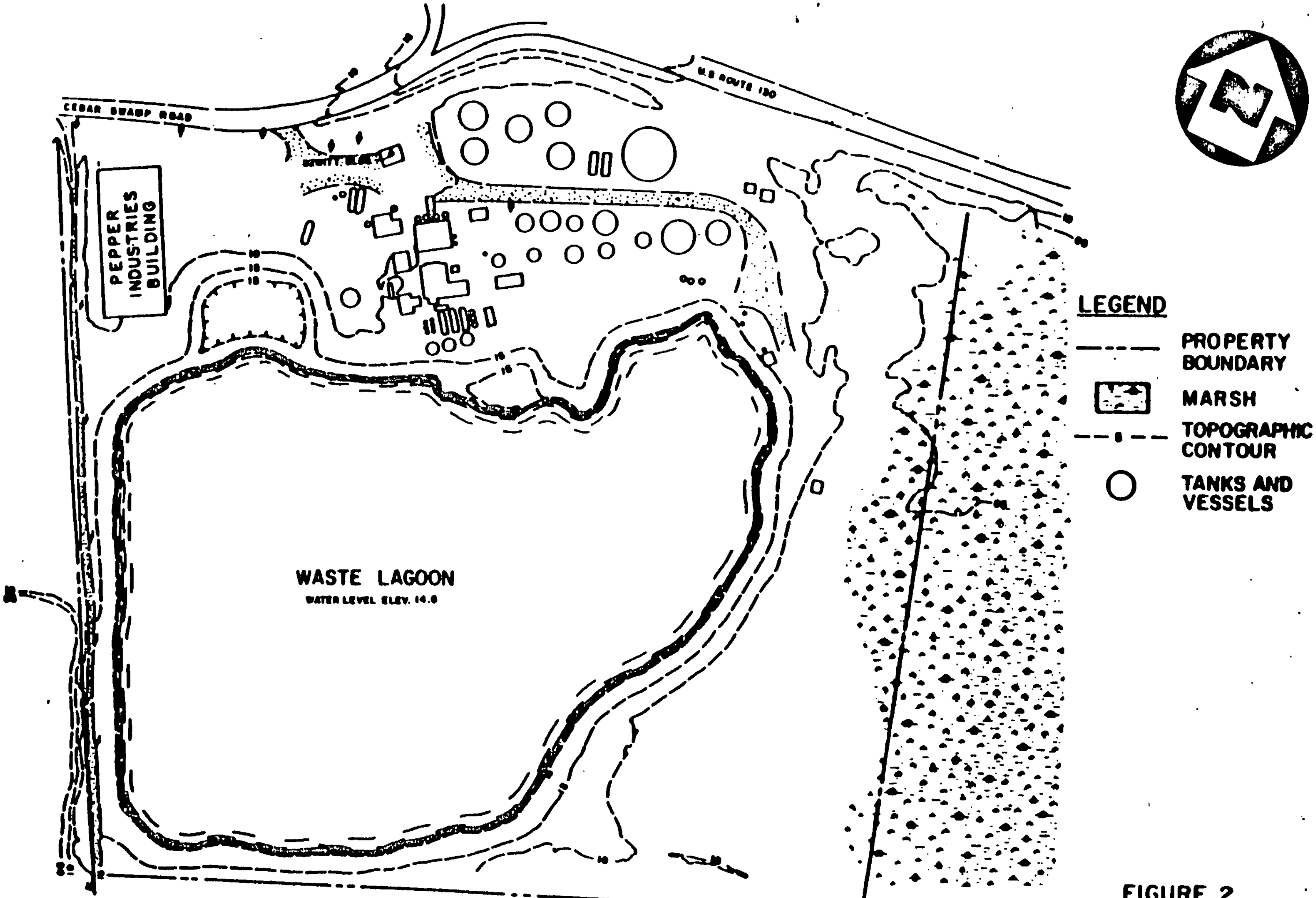


FIGURE 2

GENERAL SITE ARRANGEMENT
BRIDGEPORT RENTAL & OIL SERVICES, LOGAN TWP., NJ
SCALE: 1"=200'

NUS CORPORATION

TABLE 1

GENERAL PHYSICAL AND CHEMICAL CHARACTERIZATION OF TANK CONTENTS
BROS SITE, LOGAN TOWNSHIP, NEW JERSEY

NUS Tank Number[1]	Sampled Phase	Estimate Volume of Sampled Phase (Gallons)	Total HSL[2] Organics (µg/g)	Chlorinated Hydrocarbon Solvents (µg/g)	PCB (µg/kg)
1	Sludge	2,600	ND	ND	ND
6	Sludge	1,100	72	ND	ND
15	Aq. Liq.	1,500	ND	ND	ND
18	Aq. Liq.	2,500	2,502	180	11
18	Sludge	2,500	4,615	430	4.7
21	Aq. Liq.	22,800	ND	ND	ND
30	Oil	4,200	88	ND	300
31	Oil	3,400	2.5	ND	87
36	Oil	11,200	40	ND	940
37	Oil	4,800	9,087	687	66
38	Oil	2,600	537	29	28
39	Oil	3,900	385	ND	ND
50	Aq. Liq.	18,900	ND	ND	ND
51	Oil	2,300	307	65	113
52	Oil	3,200	1,544	ND	217
53	Oil	1,300	225	60	150
54	Solid	1,500	ND	ND	ND
55	Oil	9,500	1,739	105	3,900
56	Oil	1,700	33	ND	1,200
60	Oil	11,400	2,250	115	ND
63	Oil	216,500	3,782	30	1,240
66	Oil	1,700	255	ND	ND
68	Aq. Liq.	1,800	11,600	ND	ND
69 Top[3]	Oil	310,000	258	50	128,000
69 mid[3]	Aq. Liq.	90,000	15	ND	ND
69 Bot[3]	Sludge	13,000	955	290	330,000
70	Aq. Liq.	6,000	ND	ND	ND
82	Oil	3,300	142	30	ND
87	Aq. Liq.	1,800	ND	ND	ND
88	Aq. Liq.	1,800	2,500	ND	ND
88	Oil	7,100	ND	ND	ND

1 Tank locations are shown on Figure 3-24.
2 HSL = Hazardous Substance List.
3 Tank Number 69 was not sampled in the NUS RI; reported volumes and results are from previous sampling performed by CDM in July 1982.

Source: NUS Remedial Investigation, 1983.

TABLE 2

LAGOON SAMPLING RESULTS
BRIDGEPORT RENTAL AND OIL SERVICES SITE

Sample Identification[1] Parameter	Units	BPR-LS-01 Oil	BPR-LS-01 Water	BPR-LS-01 Sediment	BPR-LS-02 Oil	BPR-LS-02 Dup	BPR-LS-02 Water	BPR-LS-02 Dup	BPR-LS-02 Sediment	BPR-LS-02 Dup
EP Toxicity - Metals										
Arsenic	mg/l			<0.001					0.013	0.012
Barium	mg/l			<0.1					0.1	0.2
Cadmium	mg/l			<0.005					<0.005	<0.005
Chromium	mg/l			<0.01					0.15	0.04
Lead	mg/l			<0.01					0.62	0.12
Mercury	mg/l			0.007					0.0026	0.0003
Selenium	mg/l			<0.002					<0.002	<0.02
Silver	mg/l			<0.01					<0.01	<0.01
EP Toxicity - Pesticides										
Lindane	µg/l			<0.05					0.80	0.40
Endrin	µg/l			<0.1					<0.1	<0.1
Methoxychlor	µg/l			<0.5					<0.5	<0.5
Toxaphene	µg/l			<2.5					<2.5	<2.5
EP Toxicity - Herbicides										
2,4- Dichlorophenoxyacetic acid	µg/l			<5					<5	<5
2,4,5- Trichlorophenoxypropionic acid	µg/l			<0.5					<0.5	<0.5
Total PCB	µg/g			1,400[2]					450[3]	600[3]
Oil/Grease	%			61					32	14
Moisture	%			40.6					49.3	78.0
Organic Carbon	mg/l		189				182	192		
Total Organic Halogen	µg/l		622				850	580		
Dissolved Solids, 180°C	mg/l		472				485	426		
Suspended Solids, 103°C	mg/l		6				2	6		
Oils, Extracted	mg/l		200				42	35		
Hazardous Substance List (HSL)										
Acid Compounds	µg/l µg/kg	ND			ND	ND				
2,4-Dimethyl Phenol			11				64			
Phenol			160				110	270		
4-Methyl Phenol			30				120	190		
2-Methyl Phenol								112		

TABLE 2
LAGOON SAMPLING RESULTS
BRIDGEPORT RENTAL AND OIL SERVICES SITE
PAGE 10

Sample Identification[1] Parameter	Units	BPR LS 03 Oil	BPR LS 03 Water	BPR LS 03 Sediment	BPR LS 04 Oil	BPR LS 04 Water	BPR LS 04 Sediment
EP Toxicity - Metals							
Arsenic	mg/l			0.028			0.008
Barium	mg/l			<0.1			0.2
Cadmium	mg/l			0.019			<0.005
Chromium	mg/l			1.00			0.11
Lead	mg/l			0.48			0.11
Mercury	mg/l			0.0007			0.0009
Selenium	mg/l			<0.002			<0.002
Silver	mg/l			<0.01			<0.01
EP Toxicity - Pesticides							
Lindane	µg/l			<0.05			<0.05
Endrin	µg/l			<0.1			<0.1
Methoxychlor	µg/l			<0.5			<0.5
Toxaphene	µg/l			<2.5			<2.5
EP Toxicity - Herbicides							
2,4- Dichlorophenoxyacetic acid	µg/l			5.6			<5
2,4,5- Trichlorophenoxypropionic acid	µg/l			<0.5			<0.5
Total PCB	µg/g			210[3]			190[3]
Oil/Grease	%			50			43
Moisture	%						41.7
Organic Carbon	mg/l		150			191	
Total Organic Halogen	µg/l		520			470	
Dissolved Solids, 180°C	mg/l		242			472	
Suspended Solids, 103°C	mg/l		53			<2	
Oils, Extracted	mg/l		52			42	
Hazardous Substance List (HSL)							
Acid Compounds	µg/l-µg/kg	ND			ND	ND	
2,4-Dimethyl Phenol			56				
Phenol			170				
4- Methyl Phenol			150				
2- Methyl Phenol			62				

TABLE 2
LAGOON SAMPLING RESULTS
BRIDGEPORT RENTAL AND OIL SERVICES SITE
PAGE 2A

Sample Identification[1] Parameter	Units	BPR-LS-01 Oil	BPR-LS-01 Water	BPR-LS-01 Sediment	BPR-LS-02 Oil	BPR-LS-02 Dup	BPR-LS-02 Water	BPR-LS-02 Dup	BPR-LS-02 Sediment	BPR-LS-02 Dup
Hazardous Substance List (HSL) (Continued)										
Base/Neutral Compounds	μg/l-μg/kg	ND			ND	ND				
Naphthalene			64					28		
bis (2-ethylhexyl)phthalate			LT				LT	24		
Butyl Benzyl Phthalate			LT				22	50		
Fluorene			LT					LT		
Phenanthrene			LT				LT	24		
2-Methylnaphthalene			28					44		
bis(2-chloroethyl)ether							LT			
Di-n-octyl Phthalate							LT	20		
Benzyl Alcohol							92	LT		
Isophorone								LT		
Diethyl Phthalate								LT		
Acenaphthylene								LT		
Pyrene								LT		
Volatiles	μg/l-μg/kg									
Benzene			56				57	65		
1,1,1-Trichloroethane			LT				LT	LT		
1,2-Trans-dichloroethene			230				240	260		
Ethylbenzene		19,000	LT		17,700	25,400	53	59		
Toluene		65,700	78		56,500	74,000	400	450		
Trichloroethene			LT							
Acetone			1,200				1,100	1,020		
O-xylene			120				120	130		
1,2-Dichloropropane							LT	LT		
Chlorobenzene										
1,2-Dichloroethane										
1,1-Dichloroethane										
Chloroform										
Tetrachloroethene										
2-Butanone										

TABLE 2
LAGOON SAMPLING RESULTS
BRIDGEPORT RENTAL AND OIL SERVICES SITE
PAGE 20

Sample Identification[1] Parameter	Units	BPR-LS-03 Oil	BPR-LS-03 Water	BPR-LS-03 Sediment	BPR-LS-04 Oil	BPR-LS-04 Water	BPR-LS-04 Sediment
Hazardous Substance List (HSL) (Continued)							
Base/Neutral Compounds	μg/l μg/kg	ND			ND		
Naphthalene			32			70	
Bis (2-ethylhexyl)phthalate			22				
Butyl Benzyl Phthalate			28			12	
Fluorene							
Phenanthrene			LT			24	
2-Methylnaphthalene			30			42	
Bis(2-Chloroethyl)ether						LT	
Di-n-octyl Phthalate							
Benzyl Alcohol			78				
Isophorone							
Diethyl Phthalate							
Acenaphthylene						22	
Pyrene						LT	
Volatiles	μg/l μg/kg						
Benzene			86			34	
1,1,1-Trichloroethane			LT			19	
1,2-Trans-dichloroethene			280			140	
Ethylbenzene		11,500	100		50,800	30	
Toluene		35,000	510		70,800	330	
Trichloroethene			LT			LT	
Acetone			1,200			510	
O-xylene						41	
1,2-Dichloropropane			LT			16	
Chlorobenzene						LT	
1,2-Dichloroethane						LT	
1,1-Dichloroethane						LT	
Chloroform						LT	
Tetrachloroethene						LT	
2-Butanone						LT	

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TABLE 2
LAGOON SAMPLING RESULTS
BRIDGEPORT RENTAL AND OIL SERVICES SITE
PAGE 3A

Sample Identification(1)		BPR LS 01			BPR LS 02					
Parameter	Units	Oil	Water	Sediment	Oil	Dup	Water	Dup	Sediment	Dup
Pesticides/Dioxins	µg/l- µg/kg		ND				ND	ND		
PCB 1254		850.000			400 000	735 000				
PCB 1260		530.000			200 000	320 000				
Solvent Insolubles	%	11 1			1 61	11 0				
Specific Gravity	g/cc	0 951			0 940	0 951				
Dioxin Screen Solids	mg/kg	< 100			< 100	< 100				
British Thermal Units	BTU/lb	WNC			WNC	14000				

TABLE 2
LAGOON SAMPLING RESULTS
BRIDGEPORT RENTAL AND OIL SERVICES SITE
PAGE 3D

Sample Identification[1] Parameter	Units	BPR LS-03 Oil	BPR LS-03 Water	BPR LS-03 Sediment	BPR LS-04 Oil	BPR LS-04 Water	BPR LS-04 Sediment
Pesticides/Dioxins	pg/l · pg/kg	ND	ND			ND	
PCB 1254					200,000		
PCB 1260							
Solvent Insolubles	%	30.7			19.7		
Specific Gravity	g/cc	0.962			0.971		
Dioxin Screen Solids	mg/kg	<100			<100		
British Thermal Units	BTU/lb	WNC			WNC		

(1) Sample description found in text in Section 3.0
(2) Contains PCB 1248, 1254, 1260
(3) Contains PCB 1248 and 1260
mg/l - milligram per liter
µg/l - microgram per liter
% - percent
µg/kg - microgram per kilogram
LT - Present, but below the detection limit of the procedure
ND - All Priority Pollutants analyzed, but none detected above the detection limit of the procedure
g/cc - grams per cubic centimeter
mg/kg - milligram per kilogram
BTU/lb - British Thermal Units per pound
WNC - Will not combust
< - Less than
Dup - Duplicate

Source: NUS Remedial Investigation, 1983

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TABLE 3

SEDIMENT SAMPLING RESULTS
BRIDGEPORT RENTAL AND OIL SERVICES SITE

Sample Identification(1)		BPR-SD-01	BPR-SD-02	BPR-SD-04	BPR-SD-05	BPR-SD-15	BPR-SD-16	BPR-SD-17	BPR-SD-18	BPR-SD-21
Parameter	**Units**									
Oil/Grease, Soxhlet	%	<0.1	27	<0.1	0.2	0.2	<0.1	<0.1	<0.1	<0.1
EP Toxicity										
Arsenic	mg/l	0.014	0.006	0.032	0.022	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/l	0.2	0.3	0.2	0.3	0.2	0.1	0.1	0.1	<0.1
Cadmium	mg/l	<0.005	<0.005	0.016	<0.005	0.005	<0.005	<0.005	<0.005	<0.005
Chromium	mg/l	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	mg/l	<0.03	<0.03	0.12	0.06	<0.03	<0.03	<0.03	<0.03	<0.03
Mercury	mg/l	0.0005	0.0005	0.0004	0.0004	0.0009	0.0004	0.0005	0.0003	0.0005
Selenium	mg/l	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EP Toxicity Pesticides										
Lindane	µg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toxaphene	µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
EP Toxicity Herbicides										
2,4-Dichlorophenoxy-acetic acid	µg/l	<5	<5	<5	<5	<5	<5	<5	<5	<5
2,4,5-Trichlorophenoxy-propionic acid	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Moisture	%	17.2	35.7	16.3	29.6	25.2	20.8	19.3	13.6	13.6
Hazardous Substance List (HSL) (Wet basis)	µg/kg									
Acid Compounds	µg/kg	ND	ND		ND	ND	ND	ND	ND	ND
Benzoic acid				LT						
Base/Neutral Compounds	µg/kg	ND			ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate			2,200	LT						

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TABLE 3
SEDIMENT SAMPLING RESULTS
BRIDGEPORT RENTAL AND OIL SERVICES SITE
PAGE TWO

Sample Identification[1]		BPR-SD-01	BPR-SD-02	BPR-SD-04	BPR-SD-05	BPR-SD-15	BPR-SD-16	BPR-SD-17	BPR-SD-18	BPR-SD-21
Parameter	Units									
Volatiles										
Methylene Chloride	μg/kg	13.2	6.2	2.9	NDB	7.2	5.5	7.2	NDB	NDB
Toluene	μg/kg				LT					
Pesticides		ND				ND	ND	ND	ND	ND
PCB-TOTAL	μg/kg		PN-2500	PN-96	PN190*					
Dioxins	μg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND

1) *Sample description found in the text of Section 3.0*
ND - All HSL compound analyzed, but not detected above the detection limit of the procedure.
LT - *Present but below detection limits*
NDB - Concentration in the blank is greater than 1/2 the detection limit and is greater than 1/2 the concentration in the sample.
PN - PCB cannot be confirmed by GC/MS, but is identified by electron capture. Value is the combined total of all PCB.
* - Combination of PCB 1254 and 1260.

Source: NUS Remedial Investigation, 1983.

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TABLE 3

SURFACE WATER SAMPLING RESULTS
BRIDGEPORT RENTAL AND OIL SERVICES SITE

Sample Identification[1]		BPR-SW-01	BPR-SW-02	BPR-SW-04	BPR-SW-05	BPR-SW-15	BPR-SW-16	BPR-SW-17	BPR-SW-18	BPR-SW-21
Parameter	**Units**									
Organic Carbon	mg/l	12.9	42.9	25.5	41.7	10.5	9.5	8.6	8.5	9.4
Total Organic Halogen	µg/l	300	300	720	103	25	20	73	40	66
Dissolved Solids, 180C	mg/l	106	186	114	140	86	89	84	81	68
Suspended Solids, 103C	mg/l	3	8800	94	128	9	2	2	1	<1
Oils, Extracted	mg/l	2.7	4400	4.5	8.9	4.1	<1	1.4	6.2	<1
Hazardous Substance List (HSL)										
Acid/Base/Neutral Compounds	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND
Volatiles	µg/l									
Methylene Chloride		28	330	41	11	ND	ND	30	24	41
Acetone										
Pesticides	µg/l	ND		ND		ND	ND	ND		ND
4,4'-DDT									0.1	
PCB-TOTAL			PN-34		PN-36					
Dioxins	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND

LT - Present but below the detection limit
ND. - All HSL compounds analyzed but none detected above the detection limit of the pounds.
PN - PCB cannot be confirmed by GC/MS but is identified by electron capture. Value is the combined total of all PCB.
(1) - Sample descriptions found in the text of Section 3.

Source: NUS Remedial Investigation, 1983.

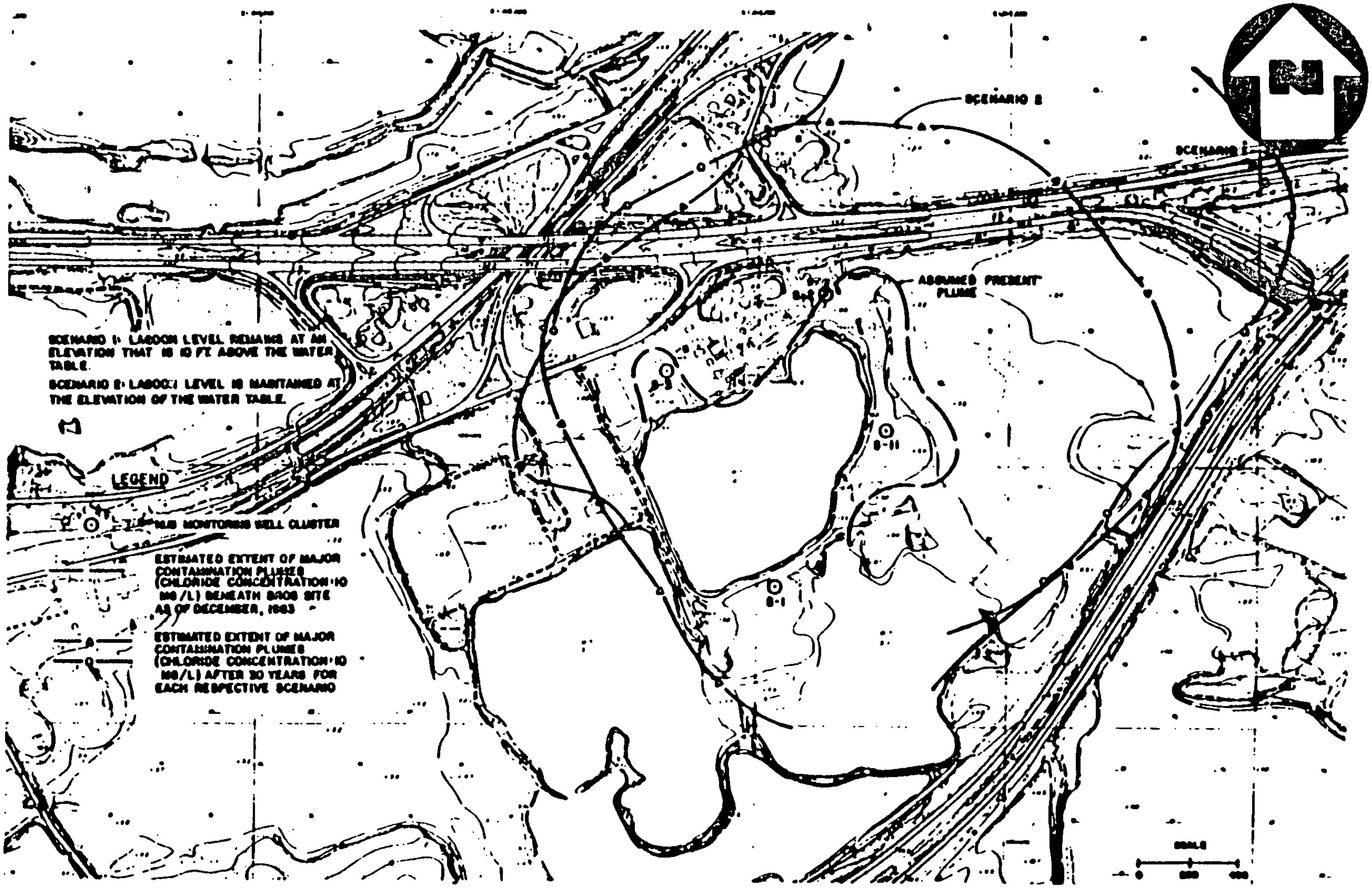
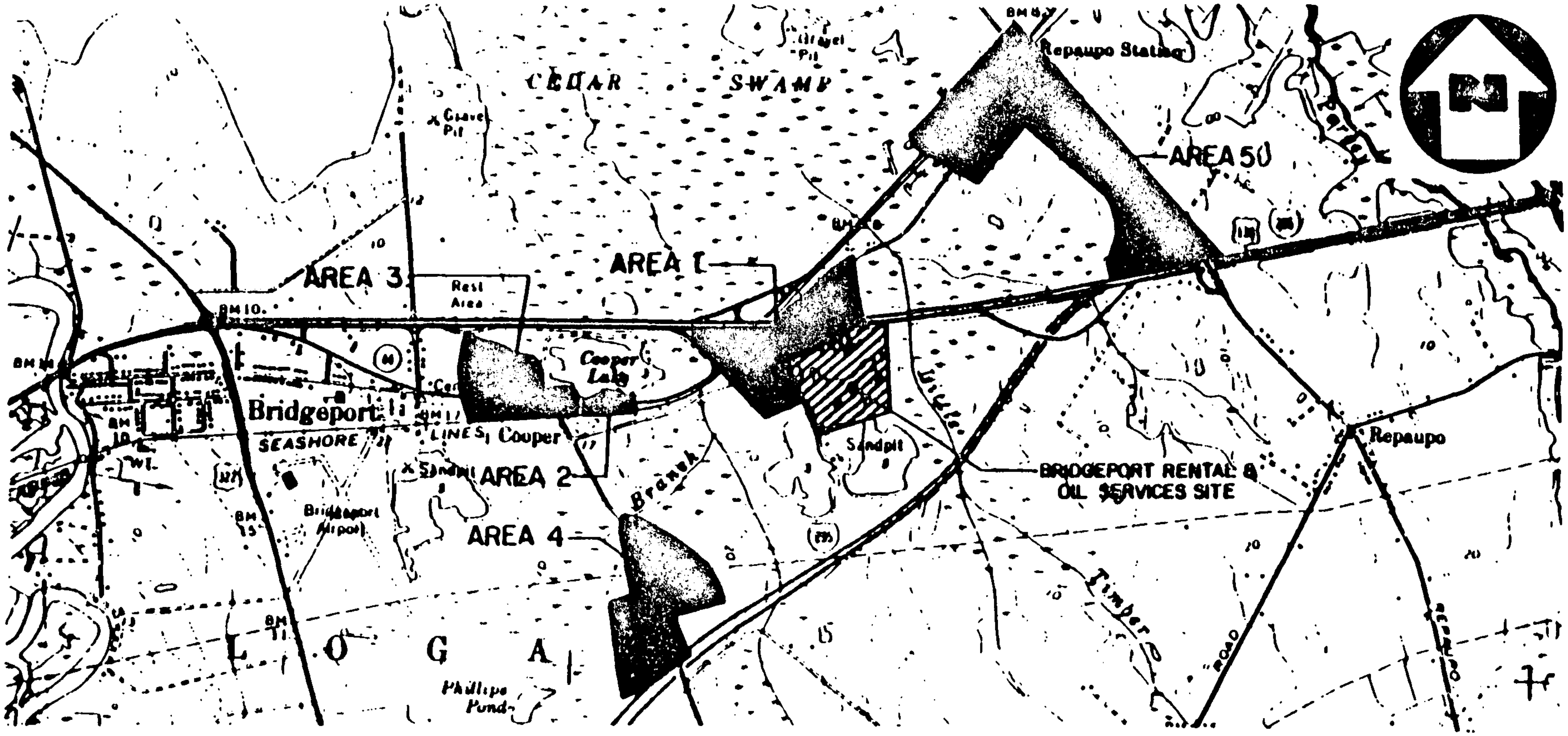


FIGURE 3

GROUNDWATER MODELING OF CONTAMINANT MIGRATION
BRIDGEPORT RENTAL & OIL SERVICES, LOGAN TWP., NJ

NUS CORPORATION
A Halliburton Company



RESIDENTIAL WELL OWNERS IDENTIFIED BY AREA	AREA 1		AREA 2	AREA 3	AREA 4	AREA 5
	BELL	HILLMAN	AUGUST	LLOYD	BECKETT	GAVENTA
	BYRNES	KELLER	MIKULETSKY	LONG	COCO	NUNES
	CAHILL	LINDLE		MUNTZ	PANSERRA	
	FISH DIESEL REPAIR	NEWTON	TREW	QUATTROCHI	PARISI	WACHTER
				RETKOVIS		
	FRYBERGER	PEPPER IND.	WILSON	SEIVERD	STULL	WEITZ

FIGURE 4

GENERAL LOCATION OF RESIDENTIAL WELLS SAMPLED BY THE E.P.A.
BRIDGEPORT RENTAL & OIL SERVICES, LOGAN TWP., NJ

SCALE 1" = 2000'

NUS CORPORATION
A Halliburton Co[illegible]y

Also, in general, many of the tanks are empty or contain only a residual amount of sludge and liquid. However, some tanks contain large quantities of PCB-laden oil.

Also on the site is a 12.7 acre lagoon. As previously mentioned, the lagoon is 21 feet deep in certain locations. The bottom 13 feet of the lagoon is in contact with the groundwater. The lagoon is basically divided into three phases including an oily layer with drums, trash, and other debris floating upon it; an aqueous layer; and sludge/sediment deposits on the bottom. The oil layer is contaminated with PCB's above 500 ppm as well as other priority pollutant chemicals. It is estimated that there are approximately 2.5 million gallons of oil. The depth of the oil layer varies from a few inches to 2 feet. The depth of the oil at any given location is dependent upon meteorological conditions at the time. Below the oily layer is the aqueous phase of the lagoon. Presently, the aqueous layer has been lowered to an elevation 7.2 feet above mean sea level (MSL) and contains approximately 44 million gallons of water. Underlying the water phase is a sludge layer. The depth of this layer varies from 2 to 4 feet with an estimated volume of 60,000 yd^3. Sampling of the sludge layer reveals average PCB concentrations in excess of 500 ppm. Beneath the sludge layer is contaminated groundwater and soils. Contaminants found in the various phases of the lagoon are shown in Table 2. The major problems associated with the site and its contaminants are as follows;

1) The sludge layer on the bottom and sides of the lagoon has partially sealed the lagoon, thus preventing any significant discharge of liquids through it. In addition, the oil layer on top of the lagoon inhibits any significant evaporation. Therefore, the level of the lagoon rises with each rainfall. Left unattended, the lagoon level would continue to rise, eventually overtop the dikes and spread contaminated material over the surrounding area.

2) The lagoon surface is about 10 feet above the water table. This 10 feet of hydrostatic head acts as a driving force, since the lagoon is only partially sealed, "pushing" the contaminated lagoon water and its contaminants into the groundwater. Further, the sludge layer at the bottom of the lagoon is in contact with the groundwater and is contributing to groundwater contamination.

3) Some of the tanks on the site contain a substantial amount of waste and could pose a serious hazard to public health and the environment if a tank would rupture and leak its contents over the surrounding area.

4) Other concerns related to the BROS site include surface soil in the marsh, and sediment in Little Timber Creek which are contaminated (via PCB oil) due to previous lagoon seeps, overflows, and from spillage of wastes in and around the tank area. Table 3 indicates the extent of contamination found in these areas (See July, 1984 RI/FS, Drawing No. 0707-15-01 for exact sampling locations). Also, according to magnetometer surveys, drums have been reportedly buried around the site.

In addition, the contamination from the site has spread into the surrounding groundwater about 600 feet away from the lagoon. Figure 3 identifies the edge of the contaminated plume where concentrations are estimated to exceed background. Results of the Remedial Investigation reveal that organics such as benzene, methylene chloride and toluene, have been detected in the groundwater at concentrations up to 1000 ppb. Furthermore, acetone has been detected up to 70 ppm. Also, oily waste has been detected in some wells. See Table 4 for further definition of the contaminants found in the groundwater. For more detailed information regarding groundwater contamination please refer to the BROS RI/FS report dated July 1984. Due to the radial movement of the groundwater near the lagoon, the contamination has spread to varying degrees in all directions. Ten private wells are potentially affected by the contamination in the relatively near future. Their general locations in relation to the site are shown on Figure 4 (Area 1). However, at this time, only the Keller well has been closed by the State of New Jersey due to this contamination. Trichloroethene was detected in this well at levels exceeding 200 ppb.

Enforcement Activities

The State of New Jersey, Department of Environmental Protection, filed suit against the Defendant, Bridgeport Rental and Oil Services, Inc., charging that the Defendant had polluted the waters of the State by allowing waste oil to leach from the waste oil lagoon. (State of New Jersey Department of Environmental Protection v. Bridgeport Rental and Oil Service, Inc., Case No. C-1523-73, Superior Court of New Jersey, Chancery Division, Gloucester County). A Consent Order was filed April 26, 1976 in that action. In that Order, which was signed by counsel for both parties, the Defendant, in part, agreed to collect and analyze samples from the waste oil lagoon, formulate a treatability study for the waste, and plan, construct and operate a waste oil recovery and treatment facility, all by January 7, 1977. BROS did not comply with that Order.

A Second Order, State of New Jersey Department of Environmental Protection v. Bridgeport Rental and Oil Service, Inc., supra, was filed March 10, 1977. This Order required Defendant, in part, to prepare a preliminary engineering report on the feasibility of its new treatment proposal for the material in the waste oil lagoon by April 11, 1977. Again, BROS did not comply with the Order. The United States filed suit pursuant to Section 7003 of RCRA on October 2, 1980, against Bridgeport Rental and Oil Services, Inc., Dominick and Elia Borrelli, the president and secretary of BROS. Settlement negotiations resulted in a Consent Decree that was signed by the Court on June 25, 1982. The Decree required BROS to make the following payments: $25,000.00; ten percent of all gross revenues from BROS from whatever source received; entire proceeds of liquidation or sale of the BROS facility. As a result of the agreement, EPA also obtained access to the site. The Defendants were released from: civil claims that could have been raised in the action; other environmental and health claims under existing federal laws resulting from or related to the migration, discharge or storage of chemicals and/or oil from the BROS site; and civil claims under CERCLA arising after entry into the Decree. Releases were based on the Defendants' factual representation made to the plaintiff and the Court in view of their entry into the Decree. These representations include assertions that BROS and the Borelli's were not involved in the introduction of any additional waste into the lagoon.

A burglary took place at the BROS site on January 23, 1981. The firm's business records were among the stolen items. These documents would have been subject to pretrial discovery, and most likely would have been made available to the government.

In April, 1983, Information Request letters were sent to Potentially Responsible Parties (PRPs). Records indicating lessees of tanks at the BROS facility near the waste oil lagoon, provided the basis for identifying the PRPs. For the most part the companies responded that they used the tanks only for storage and that none of their wastes were disposed of at the BROS site. One company admitted making a shipment of acetone wastes to the BROS site for disposal.

EPA will follow up on any leads concerning additional PRP's. We do not believe that the remedial action should be delayed in anticipation of any further investigation since it is not likely to be fruitful in a timely manner.

ALTERNATIVES EVALUATION

The major objective of the feasibility study was to evaluate remedial alternatives using a cost-effective approach consistent with the goals and objectives of CERCLA. A cost-effective remedial alternative is defined in the National Contingency Plan (NCP) (40 CFR 300.68(J)) as "the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment." The NCP outlines procedures and criteria to be used in selecting the most cost-effective alternative.

The next step is to develop a limited list of possible remedial actions which could be used. The no action alternative is included on the list.

The third step in the process is to provide an initial screening of those alternatives. The costs, possible adverse effects, relative effectiveness in minimizing threats, and reliability of the methods are reviewed here.

The no action alternative was evaluated for BROS in the following assessment:

The results of the RI/FS indicate that there is significant contamination at BROS. Specifically, three distinct sources of potential contamination are defined, the tank farm area, the 12.7 acre lagoon and the groundwater. Analyses of the three indicate that the BROS lagoon poses the most serious threat to the health and welfare of the general public and the environment. The lagoon oil and sediment are laden with PCBs at concentrations above 500 ppm, as well as other organics, and the lagoon water and oil contain significant concentrations of a variety of priority pollutants (See Table 2) Without any action, the lagoon will pose a health threat from direct contact, and the level will continue to rise from rainwater input, and eventually overflow the existing dike and thereby cause substantial contamination of the local environment. Overflow of the dike can cause severe damage to the surrounding ponds that are stocked with fish, Cedar Swamp where a variety of wildlife habitate as well as providing a larger area where contaminants can percolate into the groundwater. The lagoon did overflow in the mid 1970's resulting in the contamination of approximately 3 acres of marshland. This area has severely stressed vegetation and represents a potential source for the introduction of PCB's into the surrounding wetland ecosystem due to the lipophilic nature of PCB's. Also, an adjacent active peach orchard can become contaminated. Furthermore, the lagoon wastes are in contact with the underlying aquifer, which as previously described, is used for potable water, and according to the results of the RI/FS is contaminated.

In addition, many of the tanks are in relatively poor condition and not suitable for storage of materials. Many of the tanks are rusted, with paint peeling off the sides. Inspections of the tanks indicates that leakage has occurred in the past from many of these tanks. Refer to Table 3-1 in the July 1984 RI/FS for more specific information relative to each tank. Some of these tanks contain liquids and sludges contaminated with significant concentrations of PCBs and chlorinated hydrocarbons. These tanks pose a potential threat to the general public and local environment should they eventually leak and begin to discharge their hazardous contents.

Analysis of the potable groundwater aquifer, see Table 4, describes the nature of the contamination caused by the BROS lagoon. The contaminated groundwater poses a concern to public health. Contaminant levels found in the monitoring wells exceed the New Jersey Department of Environmental Protection drinking water quality guidelines for volatile organics (100 ppb for total volatile organics). In fact, one residential well has been closed due to contamination and nine others are threatened.

TABLE 4

Summary of Groundwater Sampling Results at BROS

Contaminant	Concentration Range PPB
Methylene Chloride	9 - 10,000
Trichloroethene	10 - 9,000
Aldrin	.19 - .23
Dieldrin	.39 - 1.15
Endrin	ND - .52
Benzene	ND - 800
Toluene	ND - 1000
2-butanone	ND - 4900
Endosulfanl	ND - .47
Heptachlor	ND - .60
1, 2-Trans dichloroethene	ND - 520
Bis (2-ethylhexyl) phthalate	ND - 110
Chlorobenzene	ND - 130
Ethylbenzene	4 - 490
1, 1, 1 trichloroethane	ND - 840
Acetone	ND - 73,000

Based on these problems, the no action alternative was eliminated from further consideration.

To address the potential above referenced problems caused by the BROS site, the remedial options were divided into 4 broad categories; remediation of the lagoon, tank farm, residential wells and groundwater.

The list of alternatives considered under each of these broad categories are contained in Table 5.

However, before discussing remedial action options for the 12.7 acre lagoon, a principal consideration was whether contaminated materials would remain in contact with and continue to contaminate the groundwater after completion of a particular activity. Therefore, those alternatives that permitted the hazardous wastes in the lagoon (including the oil, aqueous, and contaminated sediment phases) to remain in contact with the groundwater were eliminated from further consideration. This was because the hazard posed by the lagoon in terms of continued groundwater contamination would still exist. Also, the technical requirements of TSCA and RCRA would be violated.

The alternatives presented in Table 5 were initially screened using technical feasibility, costs, and environmental/ public health impacts as criteria for evaluation (RI/FS, July, 1984). The following presents a summary of the reasons why various alternatives were eliminated from further consideration.

<u>Lagoon</u>:

<u>No action</u> - The alternative was eliminated due to the reasons specified above.

<u>Site Management</u> (lagoon-level control) - this alternative involved just maintaining the level of the lagoon such that the contents won't overflow the existing dikes. However, this alternative was screened out because the contents of the lagoon would remain in contact with the groundwater.

<u>Cap System</u> - this alternative involved constructing a cap with impervious material such that the potential for leachate generation and migration is reduced. Obviously, as the lagoon exists today, a capping system is not feasible given the liquid state of the lagoon. However, a capping system can be utilized as part of other lagoon remedial actions, such as waste excavation.

TABLE 5

POTENTIAL REMEDIAL ACTION STRATEGIES
AT THE BROS SITE

Lagoon

° No Action
° Site Management (lagoon-level control)
° Cap System
° Lagoon Waste Excavation, Stabilization and Replacement
° Lagoon waste Excavation and Onsite Encapsulation
° Lagoon waste Excavation and Onsite Incineration
° Wastewater Treatment
° In-site Biodegradation of Waste
° Waste Removal with offsite disposal in a Annex I Incinerator
° Waste Removal, waste stabilization with offsite disposal in an Annex II Chemical Landfill
° Cut off wall
° Partial Lagoon Removal

Tank Farm

° No Action
° Tank Cleaning and Waste Removal
° Tank Demolition and Removal

Residential Wells

° No Action/Monitoring
° Carbon Filtration of Individual Residential Water Supplies
° Alternate Water Supply (pipeline from the terminus of the existing municipal water system)
° Alternate Water Supply (pipeline from the existing pump station)

Groundwater

° No Action/Monitoring
° Passive Groundwater Controls (Flow Diversion)
° Active Groundwater Controls (Flow Manipulation)

Insitu Waste Stabilization with Onsite Storage - this alternative involves removing the liquid contents of the lagoon to the depth of the water table. Chemicals and inert materials would be mixed with the contaminated lagoon sediment to form an admixture. This alternative was screened out because the hazardous materials in the lagoon would not be removed from contact with the groundwater and could continue to contaminate the groundwater. In addition, leaving the materials in-place would be inconsistent with several technical siting requirements for PCB landfills given in 40 CFR Section 761.75(b). Also, it would be extremely difficult if not impossible to successfully blend chemicals to produce a uniformly inert admixture.

Lagoon Waste Excavation, Stabilization and Replacement - this alternative requires that the waste be removed from the lagoon, be stabilized by a chemical fixation process in a stabilization facility and then returned to the lagoon. This alternative was screened out for the following reasons: 1) The available space at the BROS site is not sufficient (even if the tanks are removed) to store the lagoon waste while the lagoon in being backfilled. 2) Leachability studies that were performed showed that the stabilized sediment appeared to leach more organic contaminants than the unstabilized sediments. 3) Additionally, this alternative would place hazardous waste into an area with an unfavorable site geological framework (e.g. sandy soils and high water table). This would be inconsistent the with siting requirements of PCB landfills, 40 CFR Section 761.75(6).

Lagoon Waste Excavation and Onsite Encapsulation - this alternative would require the excavation of the bottom sediments, encapsulating (lining) the lagoon replace the sediment and place a cap on the replaced sediment. This alternative was rejected for many of the same reasons as the one described above. In particular, the BROS site is not situated in a favorable location for a hazardous waste containment facility.

In-situ Biodegradation of Waste - this alternative involves the employment of a mutant strain of bacteria to metabolize and thereby destroy or detoxify the organic contaminants. This alternative was screened out because current research indicates that no specific microorganism has been discovered that will effectively oxidize or degrade highly chlorinated biphenyls, which are the contaminant of primary concern in the BROS lagoon.

<u>Cut-off Wall</u> - this alternative involves the installation of a subsurface cut-off wall designed to divert groundwater flow from coming in contact with the lagoon bottom sediments. However, this alternative was screened out because the depth to the confining layer beneath the site (100 to 140 feet) approaches the limits of the feasible depth of cut-off walls. This is particularly true in the BROS situation because of the irregular site topography (dikes), and the confined work space which would require that considerable site preparations be done and innovative construction methods be used in order to install cut-off walls. In addition, the presence of dikes around much of the BROS lagoon would preclude constructing cut-off walls directly around the perimeter of the lagoon since the cut-off wall trench would seriously jeopardize the integrity and stability of these dikes. In addition, due to the extremely swampy conditions around the entire area, it would be technically difficult to install a wall and there would be serious questions as to the technical reliability of the alternative.

<u>Partial Lagoon Removal</u> - this alternative involved cleaning out the entire lagoon except that the lagoon sludge would be left in place. However, this was rejected for the following reasons: a) the lagoon sludge/sediment creates a partial seal about the lagoon bottom. If the seal is maintained, the lagoon would always fill up with water and eventually would overflow its dikes. This water would likely be contaminated due to leaching from the sediments. b) The contaminated sediments would still be in contact with groundwater. c) Treatability studies performed on the sediments in the lagoon indicate that various organics such as 2,4-dimethylphenol, phenol were found in the leachate. Therefore, the sediment would be a continuous source of contamination into the groundwater. Based on these reasons, this alternative was rejected.

<u>Tank Farm:</u>

In reference to Table 5, the only alternative to be screened out was the no action alternative. This was eliminated because the tanks on the site are in very poor condition and it is likely that they will eventually leak their contents. Some of the tanks contain PCB contaminated oil and sludges as well as other contaminated liquids (see Table I), and leakage or rupture of these tanks would further contaminate the existing soils in the tank farm area. In addition, the contamination could easily spread into Cedar Swamp and Cedar Swamp Road. This could destroy a wetland (Cedar Swamp) that is habitated by many species of wildlife as well as contaminate an entrance road to an Interstate highway (Cedar Swamp Road).

<u>Residential Wells:</u>

In reference to Table 5, none of the alternatives were screened out.

Groundwater:

In reference to Table 5, only the passive groundwater control alternative was eliminated. This is essentially the cut-off wall alternative which was eliminated for the same reason as discussed under the lagoon alternatives. Also, the groundwater would still remain contaminated.

After completion of the initial screening of technologies, a detailed evaluation of technologies was conducted in order to recommend a cost-effective alternative.

Table 6 presents the technologies that passed the initial screening phase. The technologies are categorized into groups according to which site problems the technology addresses (i.e. lagoon, tank farm, residential wells, groundwater). Furthermore, the lagoon technologies are particularly categorized into subgroups depending upon which phase of the lagoon cleanup technology is involved (i.e., waste disposal, waste removal, site closure). The technologies that are determined to be the most cost-effective in each group will then be combined into one cleanup alternative for the site.

Table 6

ALTERNATIVES EVALUATED IN DETAIL

Group #1: LAGOON:

Subgroup A) Waste Disposal - Oil

Alternative 1- Onsite incineration

Alternative 2- Offsite incineration

Subgroup B) Waste Disposal - Sediment

Alternative 1- Onsite incineration

Alternative 2- Offsite incineration

Alternative 3- Stabilize and landfill offsite (if less than 500 ppm PCB)

Subgroup C) Waste Disposal - Aqueous Phase

Alternative 1- Onsite treatment

Alternative 2- Offsite treatment

Subgroup D) Lagoon Waste Removal

Alternative 1- Remove oil (via pumping), remove aqueous phase (via pumping), dredge sediments, (ONLY AVAILABLE OPTIONS) and maintenance pumping

Subgroup E) Closure

Alternative 1- Backfill lagoon to above the water table and revegetate

Alternative 2- Regrade and revegetate lagoon sides, allow lagoon to remain as a pond

Group #2: TANK FARM

Alternative 1- Tank cleaning and waste removal

Alternative 2- Tank demolition and removal

Group #3: RESIDENTIAL WELLS

Alternative 1- No action/monitoring

Alternative 2- Carbon filtration of individual wells

Alternative 3- Alternate water supply (pipeline from the terminus of the Pennsgrove Water Supply Company).

Alternative 4- Alternate water supply (pipeline from existing pump station.

Group #4: GROUNDWATER

Alternative 1- No action

Alternative 2- Active groundwater control

The cost-effective alternative is the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates or minimizes damage to and provides adequate protection of public health, welfare, and the environment. The candidate technologies were rated according to several measures of effectiveness and cost.

The critical components of effectiveness measures were determined to be:

- o Technology Status
- o Risk and Effect of Failure
- o Level of Cleaning/Isolation Achievable
- o Ability to Minimize Community Impacts
- o Ability to Meet Relevant Public Health and Environmental Criteria
- o Ability to Meet Legal and Institutional/Regulatory Requirements.
- o Time required to Achieve Cleanup/Isolation
- o Acceptability of Land Use After Action

The following evaluation of the remedial action alternatives will consider the effectiveness of each alternative to meet these critical components.

Also, according to the NCP, a total cost estimate for remedial action must include both construction and annual operation and maintenance costs. Construction costs and operation and maintenance costs were estimated for the alternatives under consideration. For operation and maintenance costs, a "present value" analysis was used to convert the annual costs to an equivalent single value. Operation and maintenance costs were considered over a 30 year period (except for active gorundwater control which has a projected life of 5 years); a 10 percent discount rate and 0 percent inflation rate were assumed.

Group 1:

LAGOON:

As previously mentioned, each of the technologies that passed the initial screening for the remediation of the BROS lagoon was grouped into a category based on which aspect of the lagoon cleanup the technology addressed. Each of these categories (waste disposal-oil; waste disposal--sludge; waste disposal--water; waste removal; and site closure) will be evaluated separately, with the exception of waste removal, in order to determine the most cost-effective alternative in each category. The chosen technologies from each category will then be combined to form the overall cost-effective action with respect to the lagoon.

After initial screening of alternatives, the removal of waste (oil, aqueous and sludge) from the lagoon was a common denominator among all alternatives. Therefore, the cost-effectiveness of waste removal need not be performed. The only issue that remains is the method of removal of the various phases within the lagoon. The method of removal will be discussed in general terms, since the design engineer and cleanup contractor may modify the removal method.

Subgroup A

Waste Oil Disposal:

As previously stated, the average concentration of PCBs in the oil is greater than 500 ppm. Therefore, the only appropriate disposal method available is incineration (See 40 CFR Section 761.60). Onsite or offsite incineration are available methods of disposal.

Onsite incineration of the lagoon oil would involve the setting up of a mobile incinerator at BROS to incinerate the lagoon oil. Included with this technology would be the need to have laboratory facilities present at the site to determine whether the established emission guidelines are being satisfied. Also included is the proper disposal of the residual ash produced by the incineration of the oil.

Offsite incineration of the lagoon oil would involve hauling the oil to an approved incinerator that is licensed to handle PCB wastes. In terms of the effectiveness criteria, both options are fairly similar. However, the local community impact may be unfavorable to onsite incineration. The local community has strongly opposed any incineration of hazardous waste in the area and will likely oppose the installation of any onsite incineration facility. In fact, the Township has an ordinance which prohibits PCB incineration. The onsite incinerator will meet the technical requirements of TSCA and RCRA. The State has informed EPA of its intention to conduct an analysis of incinerator emissions on the airshed and establish criteria for design and operational requirements. EPA will consider the results of the State analysis in developing an operation plan for the incinerator.

Offsite incinerators have an extensive backlog of materials to burn and therefore delays may occur in disposing of the lagoon oil. In addition, the possibility of accidents during transportation of the oil to an offsite facility increases the risk of failure of an offsite alternative.

The average costs for onsite and offsite incineration are presented below. The costs include the actual incineration costs, hauling costs, and ash disposal costs. Mobilization and permitting costs are also included. The cost estimates assume that an average of 2.5 million gallons (with a range of 2 to 3 million gallons) of oil would be disposed onsite via the Pyrotech mobile incinerator. For offsite disposal the oil would be transported to PCB permitted incinerators in either Chicago, Ill. or El Dorado, Arkansas.

Method	Cost (millions of dollars)
Alternative 1- Onsite incineration-oil --------	2.65
Alternative 2- Offsite incineration-oil -------	8.66

Subgroup B) Waste Disposal--Sludge

The methods which passed the initial screening process include:

Alternative 1 - onsite incineration
Alternative 2 - offsite incineration
Alternative 3 - stabilization and landfilling

The onsite and offsite incinerator options are similar to those described for oil disposal except that a greater amount of ash will be generated for each option.

The stabilization and landfilling option involves removing the sludge from the lagoon, stabilizing it onsite in a stabilization facility, and hauling it to an approved chemical waste landfill. However, the alternative can only be used if the sludge (classified as a non-solid) is categorized as containing less than 500 ppm PCB. While the average PCB concentration in the sludge was greater than 500 ppm PCB, the level of PCBs found in the sludge ranged from 7.5 ppm to 2010 ppm. Therefore this alternative is being considered in more detail.

In terms of the effectiveness criteria, onsite incineration and offsite incineration compare similarly for disposal of the sludge as for disposal of the oil.

˜ th the stabilization and landfilling alternative and the incineration alternatives will meet public health and environmental criteria if operated and maintained properly, however, the risk of failure of the stabilization and offsite incineration alternatives may be somewhat greater than onsite incineration because of the possibility of accidents during the transportation of the sludge. Also, once the sludge is landfilled, there is always the risk that leachate from the landfill may escape and contaminate the environment around the landfill.

Stabilization and landfilling and offsite incineration would be more favorable to the local community than the onsite incineration alternative for the same reasons described under oil disposal.

Also, stabilization and landfilling would be slightly favored over onsite incineration because the time to complete the stabilization and landfilling alternative is on the order of 1 year whereas it may take 3 year to complete the onsite incineration effort due to the capacity of mobile or transportable units.

The costs for these alternatives are presented below. The costs for the incineration alternatives include the same costs as that described for the incinerators in the oil disposal alternatives. The sludge stablilization and landfilling cost estimate includes the cost for equipment, materials and labor to stabilize the sludge and the cost to haul the sludge to CECOS in Niagara Falls, New York. Also, assumed in this cost estimate is that an estimated 60,000 yd^3 (with a range of 40,000yd^3 to 80,000yd^3) of sludge will be landfilled or incinerated.

Method	Cost (Millions of Dollars)
Alternative 1- Onsite incineration	32.4
Alternative 2- Offsite incineration	129
Alternative 3- Stabilization and landfilling	25.8*

* This cost assumes that all of the sludge will be allowed to be stabilized and landfilled. However, if some of the sludge contains greater than 500 ppm PCB, then that portion would require incineration. Because of space limitations at the site, an onsite incinerator and a stabilization facility could not both be located at the same time. Therefore, any sludge that is removed and contains a PCB concentration of greater than 500 ppm must be hauled and incinerated at any offsite location. With this in mind, a sensitivity analyses was performed which indicated that, if as little as 5 percent of the sludge contains in excess of 500 ppm PCB, the cost for stabilization and landfilling will increase to about the same cost as onsite incineration. Based on previous sampling and analysis, it is likely that 5% of the sludge does contain greater than 500 ppm PCB.

Subgroup C) <u>Waste Disposal -- Water</u>

The methods which passed the initial screening of alternatives were:

Alternative 1- Onsite Treatment
Alternative 2- Offsite Treatment

Onsite treatment for the disposal for the BROS lagoon water involves the construction of a treatment facility on the site, similar to the facility that was utilized in the initial remedial action (see Site History section). The waste water would be pumped through this facility and treated and discharged to Little Timber Creek.

As in the initial remedial action, the discharge requirements would entail meeting a TOC limit of 50 ppm on a 30 day average as well as other various limitations specified by NJDEP in order to adequately protect the water quality of the receiving stream.

The treatment system will include oil/water separation, flocculation and sedimentation, granular activated carbon filtration, and sludge handling facilities. The separated oil would be handled in the same manner as the oil collected from the lagoon. The sludge generated by the system would be taken to an approved landfill.

The offsite treatment option involves pumping the lagoon water into tank trucks and hauling the water to a nearby industrial wastewater treatment facility that has previously been contacted and is willing to accept the waste.

In terms of the effectiveness criteria, both options compare equally, however, there may be a greater risk in the offsite treatment option in that there is a potential for a spill during hauling of the waste water to the offsite treatment facility.

The average costs for onsite and offsite treatment are presented below. The onsite treatment cost estimate includes the capital cost for the treatment plant and the operation cost for the system (labor, chemicals, energy, sludge disposal). The offsite treatment cost estimates include labor (to load the hauling vehicle). transportation costs and the disposal fees.

Assumed in the cost figures is that an average of 70 million gallons (within a range of 44 to 95 million gallons) will be treated by the system. The actual volume of water to be treated is highly dependent upon the amount of rainfall accumulated over the next 2 to 3 years and the amount of sediment excavated from the lagoon.

	Method	Cost (Millions of dollars)
Alternative 1-	Onsite Treatment	5.92
Alternative 2-	Offsite Treatment	11.3

Subgroup D) Lagoon Waste Removal

As previously mentioned, all options that left the lagoon waste in place were screened from further consideration and thus it became evident early in the site evaluation process that the waste needed to be removed. Therefore, the only analysis necessary is a discussion of possible removal techniques, the order of removal of the various contaminants and buried drums in and around the lagoon and a safety system design to ensure that no additional contaminants enter the groundwater during the removal operation.

The removal of the lagoon water would occur via pumping (a straight forward and well established technology). The oil will be removed first as a layer floating on top of the water.

The oil removal method involves using a floating oil skimmer pump to pump the oil from the surface of the lagoon to an oil/water separator. The oil effluent from the separator would then be sent to a holding tank until it is ready to be fed to an incinerator. The aqueous phase would be fed to the onsite treatment system.

The cost of this removal operation is estimated to be 400,000 dollars.

Removal of the contaminated sludge on the sides and bottom of the lagoon, including an area that has been surficially contaminated on the east side of the lagoon, the debris in the lagoon as well as the oil layer in the Gaventa Pond and Little Timber Creek, will likely be performed either via a dragline dredge or sauerman (The PCB laden surficially contaminated soil must be removed because it is located in a wetland area where various birds and other wildlife habitate). Once the material has been dredged, it would be placed in sedimentation bins for dewatering and incineration. The water collected from the sediment will be treated via the treatment system established for disposal of the lagoon's aqueous phase.

It is estimated that the cost for dredging and dewatering will be approximately 8.22 million dollars. This is based on removing an estimated sludge volume of 60,000yd^3 (within a range of 40,000yd^3 to 80,000yd^3). The sludge will be dredged until soils appear which are not visibly contaminated. Visible contamination is defined as the oily characteristics of the sludge. Once non-oily sludge or soil is observed the initial excavation will stop. At that point, additional sampling will be conducted and a decision will be be made as to the need for additional excavation. Also, sampling of the lagoon bottom will be performed during design in order to better estimate the volume and concentration of the sediment.

Another action included in the lagoon waste removal alternative is the exploration for buried drums around the site and their disposal, should any be found. During sludge removal, the dikes will eventually be removed thus exposing drums which have been buried around the site. In addition, an access road will likely be constructed around the lagoon for the excavation equipment. Buried drums are again likely to be exposed. If the drums were not excavated, they are likely to be crushed by heavy equipment on the site. Although the contents and condition of these drums is unknown they were assumed to contain material similar to what has been found at the site (including PCB's) and they must be assumed to pose a future threat to groundwater due to rupture and leakage. Therefore, these drums will be excavated and disposed during the initial site preparation. Areas to be dug include those sections around the lagoon where the magnetometer survey suggests that buried ferromagnetic materials exist. (See Drawing 0707.15-04 in RI/FS, July, 1984). Since little is known about what may be found, it is roughly estimated that the cost of the operation is 1.46 million dollars. This assumes that 100 drums buried to a depth of 5 feet will be found, examined and disposed of onsite by incineration or by water treatment if appropriate.

Also included under this alternative is a maintenance pumping system. The purpose of this system is to ensure that any contaminant that may be released into the groundwater during lagoon excavation is captured and treated, as well as preventing the groundwater plume from advancing any further. This alternative will remain in place until a final groundwater cleanup alternative is determined as a result of the second phase RI/FS. In addition, this alternative will consist of monitoring the groundwater to ensure that it is working effectively. This alternative will basically just consist of maintaining the level of liquid in the lagoon, by pumping the aqueous phase through the waste treatment system, below the level of the groundwater table. In that way, the groundwater gradient would be towards the lagoon and therefore, additional contamination of the groundwater, which may occur during the excavation operation, will be prevented. Also, with the groundwater flowing into the lagoon, it is likely that the contaminated soils under the lagoon will be cleansed thus reducing the need for additional soil excavation. This option will be further developed during design. Other systems, such as a well pumping system will also be examined during design. It is anticipated that a flow rate of between 500 and 700 gpm would have to be maintained in order to keep the liquid level of the lagoon below the level of groundwater table. The cost of this system includes an increase in size of the aqueous phase onsite treatment facility, and a groundwater monitoring system. The cost is estimated to be about $1,500,000. This also includes the incremental cost in operation and maintenance of the aqueous phase on site treatment system. It is assumed that the system would run for about 180 days during the first phase excavation.

Subgroup E) Lagoon Closure

Two options are feasible for the final closure of the BROS lagoon. These are:

Alternative 1- Backfilling and revegetation
Alternative 2- Revegetation and leaving the lagoon as a pond

Under the backfilling option, the lagoon would be backfilled to above the high water table elevation and then revegetated. The lagoon would be contoured such that rainwater runoff would discharge into Little Timber Creek Swamp. A security fence would also be provided.

Under the pond option, the lagoon would not be backfilled. The lagoon sides would be contoured and revegetated, and the cleared lagoon would remain as a pond. A security fence would also be provided. Since the lagoon would have already been dredged and the sludge layer removed, the lagoon water level would fluctuate with the water table and the lagoon level would not rise as it does now.

In terms of effectiveness criteria, both options are fairly comparable except that the backfilling option would likely achieve a higher level of isolation in that it would more effectively reduce human contact to the former lagoon area. The pond option might encourage human contact in that a pond would remain and people could trespass and go swimming. If contaminated materials were left in the pond, a problem could arise.

The costs for the two closure options are presented below:

Option	Cost (millions of dollars)	
	Capital Cost	30-year O&M
Alternative 1 - Backfilling and revegetation	1.7	.141
Alternative 2 - Revegetation and leaving the lagoon as a pond	.211	.203

The cost of backfilling and revegetation is based on an average of 60,000yd^3 (within a range of 40,000yd^3 to 80,000yd^3) of backfill material being placed in the lagoon. Also included is backfilling with rock to the water table for stability, followed by gravel sand, and common borrow to achieve the desired contours. The O&M costs include sampling and analysis of offsite surface water twice year. The costs for revegetation include hauling and spreading top soil as well as some grading. The O&M costs include sampling and analysis of the pond water twice a year.

Group 2) Tank Farm

The only two alternatives that passed initial screening for the tank farm are:

Alternative 1- Removal of tank wastes and cleaning of tanks
Alternative 2- Complete removal of tanks and contained waste materials

In terms of effectiveness criteria, comlete removal of the tanks and waste is superior to the option of just removing the waste. The removal of the tanks will provide the needed work area when lagoon cleanup activities commence. An examination of Figure 2 shows limited area for the amount of equipment that would be brought onto the site. This includes an onsite incinerator unit typically consisting of 7 trailers plus support facilities, mobile water treatment units, sedimentation bins (as previously described) as well as heavy earth moving equipment. In order to work safely and effeciently during the clean up operation, the tanks must be removed to provide adequate work space. This is also true if an offsite incineration option is selected. Room would be needed for earth moving equipment as well as sedimentation bins. In addition, an area would have to be provided to load the many hundreds of trucks that would be necessary to haul the contaminated material to the offsite facility.

The costs for both options are presented below. They include removal, transportation disposal of the waste at an off site facility, cleaning of the tanks and demolition as appropriate. Offsite disposal is necessary because the on site treatment facility will not be available until the tanks and their contents are removed and there are no other viable means for onsite disposal.

	Method	Cost (millions of dollars)
Alternative	1- Removal of tank waste and cleaning of tanks	3.53
Alternative	2- Complete removal of tanks and waste	4.14

Group 3) Residential Wells

After the initial screening of alternatives, all three options were retained for further consideration. These options are:

Alternative 1- No action except for monitoring
Alternative 2- Carbon filtration of each well
Alternative 3- Pipeline extension from the terminus of the Penns-grove Water System
Alternative 4- Pipeline extension from the existing pump station

As previously mentioned, only ten residential wells are threatened by the BROS plume in the next ten to twenty years (see Area 1 on Figure 4). The above options, therefore, address remediation of those wells only.

Alternative 1) No Action/Monitoring

This alternative involves quarterly sampling of all ten wells for volatile organics and annually for priority pollutants. Also included would be the sampling of six monitoring wells to determine if a plume "wave front" was approaching the wells.

Alternative 2) Carbon Filtration of Each Residential Well

This option involves installing a granular activated carbon filter on each residential well. Monitoring as described under the no action alternative would be required except that both carbon filter influent and effluent sampling would be necessary.

Alternative 3) Alternate Water Supply - Pipeline from the terminus of the Pennsgrove Water Supply Company

This option involves the installation of a potable water pipeline from the Pennsgrove water system, at its terminus on Steelman Avenue, to the affected residents, including hookups.

Alternative 4) Alternate Water Supply - Pipline from existing pump station

This option involves the installation of a potable water pipeline from the terminus of the Pennsgrove water system (at Steelman Avenue) to the affected residents, including hookups. Also included is a new water main from the terminus of the system to an existing pumping station near the municipal water supply well at Station Avenue.

In terms of effectiveness criteria for each of the alternatives, the 2 pipeline options are superior. They have an extremely low risk of failure and will isolate the residents from the groundwater contamination as compared with the other non-pipeline alternatives. Also, the pipelines will be more favorably recieved by the local community because it will provide a safer supply of water than the other options.

The cost for the 4 options are presented below. Alternative 3 costs include a 6 inch diameter pipeline for a length of 8000 feet from the terminus of the system to the 10 affected homes, including ten home connectors. Alternative 4 costs include, for estimation purposes, installation of 3,300 feet of 8 inch pipe from the existing pumping station to the terminus of the system and then 8000 feet of 8 inch pipe from the terminus of the system to the 10 affected homes, including ten home connectors. The O&M costs for these two alternatives includes the cost for water service and the base annual service charge. The carbon filters capital costs include material and installation costs. O&M costs include carbon replacement, monitoring and analytical requirements. The no action option has no capital costs. The O&M costs for the no action alternative include labor and analytical costs for monitoring.

Option	Cost (millions of dollors)		
	Capital	Annual O&M	Total Present Worth
No Action/Monitoring	0	.048	.30
Carbon Filtration	.020	.051	.50
*Water Pipeline (From Terminus)	.29	.002	.31
*Water Pipeline (From Pump Station)	.48	.002	.50

*Actual length and pipe size will be determined during the detailed design phase

Group 4) Groundwater

The only two alternatives that passed initial screening for the groundwater control alternative were:

- o No action
- o Groundwater extraction and treatment

Alternative 1) No action:

This alternative involves taking no action to prevent the migration of contaminated groundwater or to clean up the contaminated groundwater. However, this alternative does include a long-term groundwater monitoring program to track the plume.

Alternative 2) Groundwater Extraction and Treatment:

This alternative involves placing 32 extraction wells in and around the BROS lagoon, and pumping these wells at a rate of 20 gpm in order to remove the contaminated groundwater from the underlying aquifer thus cleaning the groundwater. The extracted groundwater would be treated via activated carbon to remove the contaminants, and the treated water would be discharged to Little Timber Creek. This alternative would operate until the groundwater achieves either drinking water guidelines or background levels are achieved. A five year operating period is expected. In addition, groundwater monitoring programs as proposed in the no action alternative would also be required.

In terms of effectiveness criteria, the groundwater extraction and treatment alternative is far superior than the no action alternative. In particular, the groundwater extaction alternative would clean up the groundwater to drinking water levels whereas the no action alternative would let the contaminated plume enter Little Timber Creek and Cedar Swamp. Also, the groundwater extraction alternative would meet appropriate environmental standards, and the groundwater extraction alternative could make this groundwater resource usable once again as a potential water supply aquifer.

The costs for the two options, including monitoring, are presented below. The cost for the no action alternative inludes just monitoring costs. The costs for the extraction alternative include installation of 32 wells, pump, piping, etc. The O&M cost include rental of activated carbon units, monitoring, labor costs, etc. This alternative is anticipated to operate for 5 years.

Cost (Millions of Dollars)

Option	Capital	Annual O&M	30 year Present Worth
No Action Monitoring	0	.03	.281
Groundwater Extraction and Treatment	.83	1.46	6.24*

* 5 year Present Worth

Table 7 represents a summary of all the alternatives and their estimated costs.

TABLE 7

Cost Summary

Alternative		Capital Cost	30 Year O&M	Total Present Worth
I.	Lagoon			
A.	Waste Disposal-Oil			
	- Onsite incineration	2.65	-	2.65
	- Offsite incineration	8.66	-	8.66
B.	Waste Disposal-Sediment			
	- Onsite incineration	32.4	-	32.4
	- Offsite incineration	129.0	-	129.0
	- Stabilize and landfill offsite (PCB < 500 ppm)	25.8	-	25.8
C.	Waste Disposal - Aqueous		-	5.92
	- Onsite treatment	5.92	-	11.3
	- Offsite treatment	11.3		
D.	Lagoon Waste Removal (only alternative available)			
	-Remove Oil	.4	-	.4
	- Remove Sludge	8.22	-	8.22
	- Buried Drum Excavation	1.46	-	1.46
	- Maintenance pumping	1.50		1.50
E.	Closure			
	- Backfill Lagoon	1.7	.141	1.84
	- Leave as Pond	.211	.203	.414
II.	Tank Farm			
	- Tank Cleaning and Waste Removal	3.53	-	3.53
	- Tank Demolition and Removal	4.14	-	4.14
III.	Residential Wells			
	- No Action	-	.30	.30
	- Carbon Filtration	.02	.48	.50
	- Alternate Water Supply (from terminus)	.29	.02	.31
	- Alternate Water Supply (from pump station)	.48	.02	.50

	Alternative	Capital Cost	30 Year O&M	Total Present Worth
IV.	Groundwater			
	- No Action	-	.281	.281
	- Active Groundwater Controls	.83	5.41*	6.24
	- Groundwater Monitoring (Required for any groundwater alternative)		.281	.281

Note: All costs in millions of dollars
*5 year present worth

Community Relations

In March 1983, EPA held a meeting regarding implementation of the initial remedial measure at the BROS site. In addition, EPA made a public presentation of the remedial investigation and feasibility study work plan for the BROS site. Notification of the meeting was accomplished through newsreleases and Township mailings. Attachment 1 is a list of attendees from the meeting. In general, the public seemed pleased that we were implementing an initial remedial measure at the lagoon. They also understood why we had to do additional studies to determine the most cost effective long term remedial plan. However, they were upset that the study would take so long. Also, they claimed that we have sufficient information to make a decision.

In particular, they were concerned about their drinking water supplies that have been contaminated by the BROS site. They were concerned that it would take nearly a year before a decision would be made as to whether or not a water line could be constructed. The public felt that action should be taken now.

On July 9, 1984, EPA made the draft Remedial Investigation/ Feasibility Study (RI/FS) available for public comment at select locations in Gloucester County. In addition, the Agency met with the Logan Township Council on July 17, 1984 to explain the findings of the report. After that meeting a public meeting was set up for August 22, 1984. The public comment period was opened until August 31, 1984. Notification of the meeting was handled by EPA. An attendance sheet is attached as Attachment 2. EPA and NUS Corporation made a presentation on the RI/FS findings and recommendations. The responsiveness summary that was prepared is based on public comments received at the meeting and is attached as Attachment 3. In general, however, the public was opposed to onsite incineration. This was due to the negative experience that they have had with a nearby hazardous waste incinerator, as well as their perception of the efficiency of the technology. In addition, EPA received 3 comment letters regarding the RI/FS. Copies of those letters and EPA responses are attached as Attachment 4.

Consistency With Other Environmental Laws

The final recommended remedial alternatives for BROS will require the removal and disposal of oil, wastewater and sludge from the lagoon; removal and disposal of the contents of the tanks as well as the dismantling of the tanks; surficial cleanup of contaminated soil; and provision for an alternate water supply. The treatment and disposal of oil, and PCB contaminated sediments from the lagoon will be performed via incineration in accordance with applicable substantive RCRA and TSCA requirements. The waste materials in the tanks and the tanks themselves will be disposed of in an offsite treatment facility or landfill that complies with RCRA and TSCA. The contaminated soil that contains levels of PCBs over 500 ppm will also be treated and disposed of via incineration in accordance with the substantive requirements of TSCA and RCRA. Compliance with the Safe Drinking Water Act will be the responsibility of the water purveyor.

Recommended Alternatives

According to 40CFR Part 300.68(j), cost-effectiveness is described as the lowest cost alternative that is technically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare and the environment. Evaluation of the suggested remedial alternatives leads to the conclusion that alternatives shown in Table 8 are the cost-effective options for the BROS site.

Table 8

Recommended Alternatives

Group #1 — Lagoon:

Subgroup A) Waste Disposal-Oil

Alternative 1 - Onsite incineration*

Subgroup B) Waste Disposal-Sediment

Alternative 1- Onsite incineration*

Subgroup C) Waste Disposal-Aqueous Phase

Alternative 1- Onsite treatment

Subgroup D) Lagoon Waste Removal

Alternative 1- Remove oil phase, aqueous phase, sediments, buried drums and maintenance pumping

Group #2 — Tank Farm

Alternative 2- Tank demolition and removal

Group #3 — Residential Wells

Alternative 4- Alternate Water Supply (From existing pump station)

Additional Studies

- 2nd phase RI/FS to determine appropriate groundwater cleanup and lagoon closure remedies.

*Onsite incineration was found to be cost effective, however, final design criteria and implementation costs will be considered before determining whether the wastes will be disposed of either on or off site.

The above referenced alternatives are technically feasible and reliable and, when combined, provide adequate protection for public health, welfare and the environment. Preceding the detailed alternative evaluation, it was determined that the only solution to the problems and potential problems posed by the BROS site, as well as to meet the requirements of other environmental laws, was to remove and dispose of the contents of the lagoon, therefore, Group #1 (lagoon) evaluated the most cost effective methods of performing that task. In most cases, the cost was the decisive criteria or determining factor. The disposal of the lagoon oil via onsite incineration was significantly less costly than shipping the oil to an offsite facility (by approximately 6 million dollars). The local community, however, does object to onsite incineration. Nevertheless, the cost difference between on and offsite incineration significantly favors onsite incineration, therefore, onsite incineration is recommended.

In terms of sediment disposal, it was least costly to stabilize the sludge/sediments and dispose of them at a landfill. However, this would only be the case if less than 5% of the sediments contain PCBs greater than 500 ppm. If more than 5% of the sediment contain in excess of 500 ppm PCB, then onsite incineration is more cost-effective. (Offsite incineration is likely to be subtantially more costly than onsite incineration). Based on sampling results, it is likely that more than 5% of the sediments contain greater than 500 ppm PCBs. In addition, sampling to determine PCB concentration of the sludge in every truck load exiting the site would not be practical and the burden of proof would be on the generator (EPA) to demonstrate that all sludge removed from the site had a concentration of less than 500 ppm. Therefore, as with the oil disposal option, onsite incineration is recommended as the disposal option for the lagoon sediments.

It should be noted, that incineration of the lagoon waste can be performed either onsite or at an offsite location. Final design criteria and implementation costs will be considered in selecting the most appropriate incineration location. However, the cost estimates contained in the RI/FS suggest that onsite incineration at BROS is the most economical method for disposal of both the lagoon oil and sediments.

In terms of aqueous disposal, it was least costly to dispose of the lagoon water via an onsite treatment system. All other criteria involving on and offsite treatment alternatives were essentially the same. The onsite treatment system would consist of an oil/water separator, floculation/sedimentation and granular activated carbon units and sludge treatment units.

As discussed in the Alternatives Evaluation section, removal of the waste is the only alternative available which allows compliance with other relevant laws. The method of removal is discussed in that section. Included in this alternative is a maintenance pumping system and monitoring to ensure that any contaminants that are released into the groundwater during the excavation of the lagoon are captured and treated and the identified contaminated plume does not advance any further. Other removal methods may be evaluated during the final design and value engineering phases of this project.

It should also be noted that since the lagoon cleanout may not begin for two years, that it is recommended that a dike inspection should be performed during design and that necessary corrective action be taken, if deemed appropriate, to ensure that the dike does not fail in the interim. Also, as mentioned in the Current Site Status section of this document, additional characterization, of the lagoon sediments, in terms of concentration and volume, will be performed during design.

The closure of the lagoon involved either leaving it as a pond and revegetating it, or backfilling the lagoon and revegetating the new ground surface. In evaluating the alternatives, it appeared as though the backfilling alternative was more effective than the pond alternative to achieve a higher level of isolation in terms of human contact. However, the cost of backfilling the lagoon was about 1 million dollars more than leaving it as a pond. During the dredging of the lagoon sampling will occur within the pond to determine the efficiency of the dredging process and how effectively the contaminants were removed. At that point, a study will be initiated to determine the exact closure option.

Group #2 evaluated whether to remove the contents from and clean the tanks, or whether to remove the contents from the tanks and clean and remove the tanks themselves from the site. In the effectiveness criteria evaluation, complete removal of the tanks was found to be superior compared to just cleaning them out. Although the cost for removing the tanks is $600,000 more than leaving them, the removal of the tanks was determined necessary to accommodate the equipment (described in the Alternative Evaluation Section) that is required to remove and dispose of the contaminated materials in the BROS lagoon. Therefore, it is recommended to clean and remove the tanks from the BROS site.

Group #3 evaluated the actions to be taken to remediate the problems with the residential wells. These actions include, no action/ monitoring, individual carbon filtration units, and 2 pipeline extension alternatives for the Pennsgrove Water System. In terms of effectiveness criteria, the pipeline extension alternatives are clearly superior to the other alternatives. They will provide a safer and more reliable source of water to the homes, and allay any concerns that private wells may become contaminated at some future time. As previously mentioned, the contaminated groundwater plume is moving in the direction of those residences and may eventually contaminate the wells. A cost evaluation for these alternatives indicate that the no action/monitoring alternative and the pipeline extension from the terminus of the system are equal in cost, with the pipeline extension from the pump station being the next least cost alternative. However, since it has been demonstrated that contamination has been detected in the area of the private wells and that the groundwater plume is heading in the direction of the wells, the no action/monitoring alternative was deleted.

Moreover, the condition of the existing municipal water system is extremely poor. The system was constructed in 1904 with the majority of pipelines being constructed of cast iron. Many of these pipes are deteriorated and in conversations with the Township Engineer it has been indicated that many people barely get a "trickle" out of their taps. Therefore, extension of the system from its terminus would result in insufficient pressure (<20psi) at the new connections and seriously jeopardize pressure for existing customers. Based on these technical consideration this alternative is eliminated. The next least costly alternative, the carbon filtration system, was eliminated from further consideration because of its lack of reliability over a long period of time. Breakthrough of the system may occur and not be detected for weeks or months, and therefore can cause a public health concern. The extension of the pipeline from the existing pump station would provide a water line, with adequate pressure, to the new connections. Therefore, it is recommended that the pipeline extension from the existing pump station be implemented.

Group #4 evaluated groundwater control options which included no action/monitoring, and groundwater extraction, treatment and monitoring. However, the soils beneath the sludge layer in the lagoon have not been sampled, but are likely to be contaminated with solvents because of their presence in the groundwater. Therefore, additional sampling of this soil will be performed during the sludge excavation and disposal phase of the project. This information will enable an assessment of future conditions and the need for additional remedial action. For instance, if the contaminated soil continues to serve as a groundwater contamination source which causes concentration above safe drinking water levels, then available alternatives include establishing alternate concentration limits, pumping and treating, soil excavation, or a combination of the above. While it is recognized that the groundwater must be remediated, a decision on the exact method of groundwater cleanups is therefore deferred until this assessment is completed. However, as previously discussed, maintenance pumping will be performed during the cleanup of the lagoon in order to ensure that the contaminated plume doesn't spread any further. This pumping will be maintained until a long term cleanup stategy is determined and implemented.

In summary, the following activities are recommended for approval:
- Installation of a potable-water pipeline from the Pennsgrove Water Supply Company, from the existing pump station, to the affected residents
- Complete removal of the tank wastes and tanks
- Removal and onsite incineration of the lagoon oil
- Removal and onsite incineration of the lagoon sediment
- Removal and onsite treatment of the lagoon water
- Excavation and incineration of buried drums
- Maintenance pumping

The determination as to whether incineration will take place onsite or at an offsite location will be detemined during final design and the competitive bidding process.

The following represents the cost estimates for the proposed action. Cost sharing for project implementation is 90% Federal and 10% State on capital costs. Water usage costs will be borne by the individual residential consumers. Post closure monitoring costs will be borne by the State of New Jersey.

Action	Capital Cost	30 Year O&M Present Worth
LAGOON		
°Oil removal	$400,000	-
°Sediment removal	$8,220,000	-
°Onsite incineration of oil	$2,650,000	-
°Onsite incineration of sediment	$32,400,000	-
°Onsite treatment of water	$5,920,000	-
°Drum excavation and incineration	$1,460,000	-
°Maintenance pumping and monitoring	$1,500,000	-
TANK FARM		
°Complete removal of tanks and wastes	$4,140,000	-

RESIDENTIAL WELLS

°Water supply pipeline (From existing pump station)	$482,000	$20,000

ADDITIONAL STUDIES

°2nd Phase RI/FS (determine closure option and final groundwater cleanup option)	$500,000	
Total Capital Cost	$57,672,000	

WETLANDS AND FLOODPLAINS

Executive Order 11990 provides for the protection of wetlands when Federal agencies conduct construction activities. The marshy area adjoining the BROS site is a wetland. There is no practicable alternative to the selected alternative, and the selected alternativ includes all practicable measures to minimize harm to wetlands.

Executive Order 11988 contains requirements for Federal agencies to avoid adverse effects in floodplains. The BROS lagoon site is located in a 500-year floodplain, it is not located in a 100-year floodplain. The selected alternative is consistent with the requirements of the Executive Order and implementing guidance for 500-year floodplains.

OPERATION AND MAINTENANCE (O&M)

The operation and maintenance activities involved in this phase of the project only include the water user charges to the residential homes. The water user charges will be borne by the residents.

The annual O&M cost for the 10 residential homes is estimated to be 2000 dollars a year.

SCHEDULE	DATE
- Enforcement action has essentially ceased with a signed consent decree. However, some additional investigation to identify PRPs may begin shortly.	
- Final Record of Decision	December 31, 1984
- Amend State Superfund Contract	December 31, 1984
- Award IAG for Design	December 31, 1984
- Start Design	January 15, 1985
- Complete Design	January 15, 1986
- Start Phase Construction	October 1, 1985
- Start 2nd Phase RI/FS	October 1, 1987
- Complete Construction	September 1, 1990

It is anticipated that this project will be phased. The first activity will be the construction of the water pipeline and the removal of the tanks. Removal of the tanks is a necessary first step in order to provide sufficient work area for the lagoon removal and disposal activities. Once the lagoon removal and cleanup activities are initiated, a 2nd phase RI/FS will begin for the purpose of determining the cost effective groundwater cleanup approach and determining the final lagoon closure alternative.

FUTURE ACTIONS

Upon approval of the recommended remedial action, as outlined in the Recommended Alternative section, the design of those actions will commence. The design will include the preparation of plans and specifications for the recommended remedial alternatives.

During design, additional sampling will take place to further define the extent of PCB contamination in the sludges and the underlying soils leading to a confirmation of the volume of material requiring excavation. After completion of design, the recommended remedial actions will be implemented. As previously mentioned, the data indicates that PCB's are closely associated with the presence of oily wastes and therefore the sludge/sediments in the lagoon will be excavated until nonoily soils which are beneath the sludge layer are observed. This sludge excavation represents the first phase of the lagoon cleanup. The need for a second excavation phase will be assessed in a study which will determine the cost-effectiveness of additional excavation. The study will specifically address groundwater solvent contamination, residual PCB contamination of the lagoon, and the procedure for final closure of the lagoon. The second phase analysis will be conducted during the sludge excavation and disposal phase so any additional remedial measures can be implemented immediately following the first phase excavation.

The second phase study will address groundwater contamination. Sampling results indicate that PCB's have not been carried away from the site by the solvents which are found in the groundwater. However, the soils beneath the sludge layer are likely to be contaminated with these solvents because of their high concentration in the groundwater. Since the solvents are in equilibrium with the soil matrix, they may continue to be released into the groundwater after the sludge layer is removed and the existing contaminated groundwater is pumped and treated. Additional sampling of the soil beneath the sludge layer will identify the distribution of the contaminants and their potential for leaching into the groundwater and the lagoon. This information will enable an assessment of future conditions and the need for additional remedial action.

If the contaminated soil will continue to serve as a source which causes concentrations above safe drinking water levels then available alternatives consist of establishing Alternate Concentration Limits, pumping and treating, soil excavation, or a combination of the above. The groundwater model which has been developed for the site can be used to determine the well placement and pumping duration which will be required to capture different quantities of contaminants released from the soil. This will enable an analysis of different soil excavation and groundwater pumping scenarios leading to the determination of a cost-effective strategy for complete restoration of the groundwater and the site.