United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R06-86/013
Sept. 1986

EPA

Superfund Record of Decision:

Sikes Disposal Pits, TX

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA/ROD/R06-86/013	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE SUPERFUND RECORD OF DECISION Sikes Disposal Pits		5. REPORT DATE September 18, 1986 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460		13. TYPE OF REPORT AND PERIOD COVERED Final ROD Report 14. SPONSORING AGENCY CODE 800/00

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Sikes Disposal Pits site is located on a 185-acre site, approximately 2 miles southwest of Crosby, TX. It is bordered by the San Jacinto River on the west, Jackson Bayou on the north, and U.S. Highway 90 on the south. The site lies in the 100-year floodplain of the river while portions lie within the 10-year and 50-year floodplain. The site has been flooded four times since 1969. The area immediately surrounding the site is largely underdeveloped with numerous active and abandoned sandpits and low lying swamp areas. The area plays host to sport fishermen as well as water sport enthusiasts on the nearby river and bayou. One family lives onsite. The only residential development in close proximity is 500 feet southwest. Between the early 1960s and 1967, Sikes Disposal Pits operated as a waste depository. Chemical wastes from area petrochemical industries and numerous drums were deposited onsite in several old sand pits. A preliminary sampling at the site in 1982 indicated the presence of phenolic compounds and other organics. In June 1983 a removal action performed at the site by the EPA removed approximately 440 cubic yards of phenolic tars from a partially buried pit. Subsequent studies at the site indicated the need for a total remedial site plan. Onsite soils and surface water from the sludge areas as well as Tank Lake were found to be contaminated. Ground water in the shallow aquifer below the site has been heavily contaminated; no residential wells are currently affected. Neither surface

(See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Sikes Disposal Pits Contaminated Media: gw, sw, soils, sediments Key contaminants: phenols, sludges, toluene, organics		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)* None	21. NO. OF PAGES 56
	20. SECURITY CLASS *(This page)* None	22. PRICE

16. ABSTRACT (continued)

water or groundwater contamination has migrated beyond the site boundaries. The primary contaminants of concern include: organics, toluence, creosote, benzene, xylene, phenolic compounds, halides, dichloroethane, vinyl chloride.

The selected remedial action includes: onsite incineration of sludges and contaminated soils; onsite disposal of residue ash - use as backfill; ban use of upper aquifer onsite, while naturally attenuating to 10^{-5} Human Health Criteria (less than 30 years); discharge contaminated surface water to river, treat as necessary to meet discharge criteria; monitor lower aquifer and ban its use onsite if site degradation occurs. The estimated capital cost for this action is $102,217,000 with annual O&M of $41,000.

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Sikes Disposal Pits, U.S. HWY 90, Crosby, Texas.

DOCUMENTS REVIEWED

I have reviewed the following documents describing the analysis of cost-effectiveness of remedial alternatives for the Sikes Disposal Pits site:

- Sikes Disposal Pits Site Remedial Investigation Lockwood, Andrews, and Newnam July 1986.
- Sikes Disposal Pits Site, Remedial Investigation Addendum Report, Lockwood, Andrews and Newnam, June 1986.
- Sikes Disposal Pits Site Feasibility Study. Lockwood, Andrews, and Newnam, July 1986.
- Responsiveness Summary
- Staff Summaries and Recommendations.

DESCRIPTION OF SELECTED REMEDY

- Onsite incineration of sludges and contaminated soils;
- Onsite disposal of residue ash - use as backfill;
- Ban use of upper aquifer onsite, while naturally attenuating to 10^{-5} Human Health Criteria (less than 30 years);
- Discharge contaminated surface water to river, treat as necessary to meet discharge criteria;
- Monitor lower aquifer and ban its use onsite if site degradation occurs.

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 for the Sikes Disposal Pits site is a cost-effective remedy and provides adequate protection of public health, welfare and the environment. The State of Texas has been consulted and agrees with the approved remedy. In addition, the action will require future operation and maintenance activities to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies for a period of one (1) year.

I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites. In addition, onsite incineration of sludges and contaminated soils is the most cost-effective remedial action, since it provides the best protection to human health, welfare, and the environment.

Sept. 18, 1986
DATE

Dick Whittington
Dick Whittington, P.E.
Regional Administrator
Region VI

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

SIKES DISPOSAL PITS
CROSBY, TEXAS

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Record of Decision Remedial Alternative Selection

Sikes Disposal Pits
Crosby, Texas

Site Location and Description

The Sikes Disposal Pits site is located on a 185-acre site, approximately 2 miles southwest of Crosby, Texas. It is bordered by the San Jacinto River on the west, Jackson Bayou on the north, and U.S. Highway 90 on the south (Figure 1 and 2). The area immediately surrounding the site is largely undeveloped with numerous active and abandoned sand pits and low-lying swampy areas. Some commercial timber operations and mineral exploration have been conducted in the past. The area plays host to sport fishermen as well as water sport enthusiasts on nearby San Jacinto River and Jackson Bayou. One family lives onsite. The Riverdale Subdivision, 500 feet southwest of the site, is the only residential development in close proximity of the site.

The site completely lies in the 100-year flood plain of the San Jacinto River, while portions lie within the 10-year and 50-year flood plains. The site has been flooded four times since 1969.

The site locations where significant waste deposits have been identified, and thus, are considered source areas include (Figure 2):

- o The main waste pit
- o The main waste pit overflow area
- o Tank Lake and slough
- o Small waste pits (3)
- o Drum waste areas
- o Suspect waste areas

The approximate volumes of waste at these source areas are listed in Table 2.

Alluvial sand deposits, ranging from 17 to 34 feet thick, underlie the site and form a shallow aquifer. Many of the local inhabitants rely on this aquifer for drinking water (Figure 3).

Site History

The Sikes Disposal Pits site began operation as a waste depository in the early 1960's and closed in 1967. During this period, a variety of chemical wastes from area petrochemical industries were deposited onsite in several old sand pits. Numerous drums of wastes were also left on the property.

The dike around the unlined main waste pit was not adequate to withstand the periodic flooding of the site. Floodwaters have breached the dike and transported wastes across a large, low-lying area east of the main waste pit.

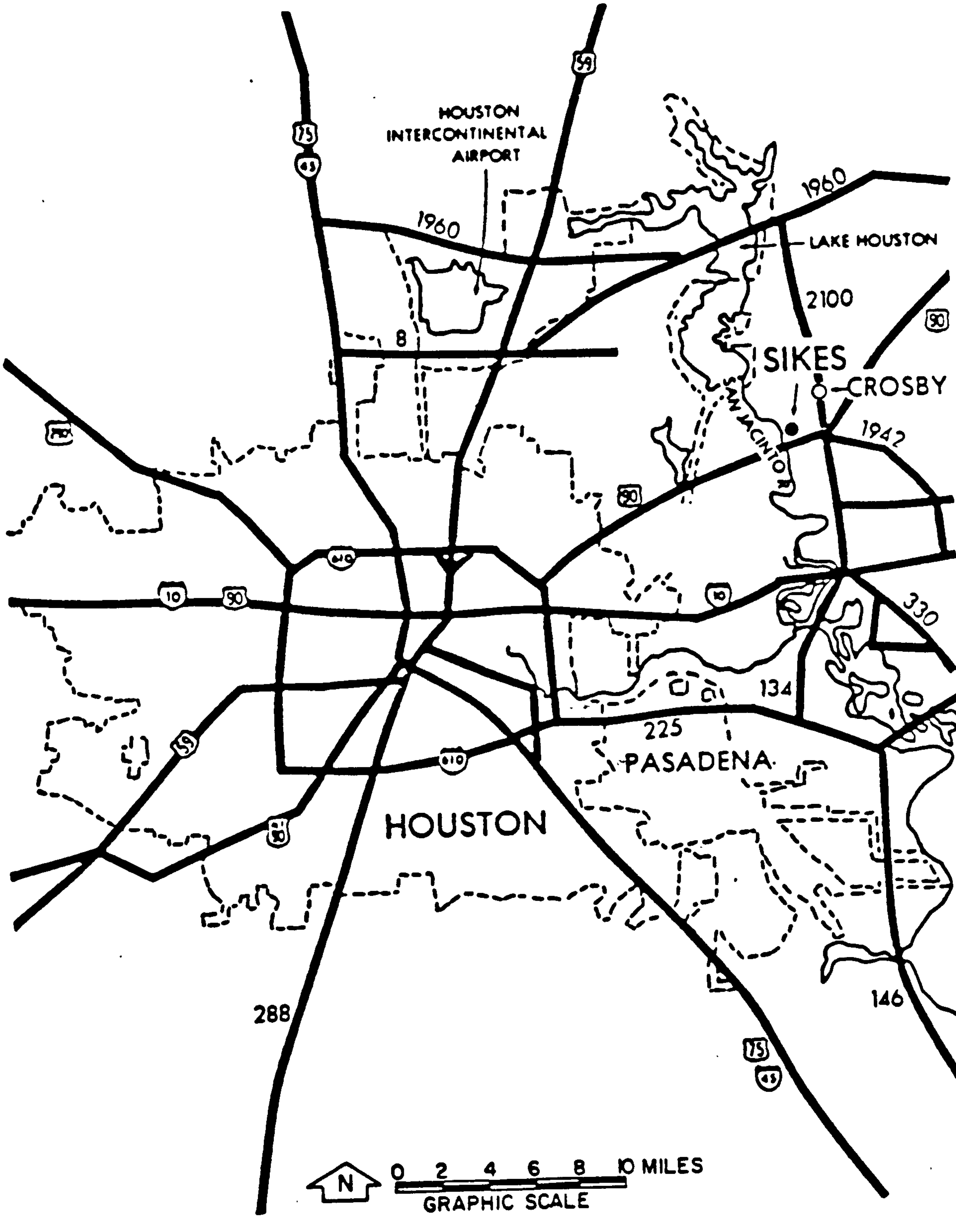

FIGURE 1 SIKES DISPOSAL PITS SITE LOCATION	SIKES DISPOSAL PITS CROSBY, TEXAS	Prepared for: TEXAS WATER COMMISSION LAN HLA DATE: JUNE 1986 PROJECT NO.1633-20-003-000

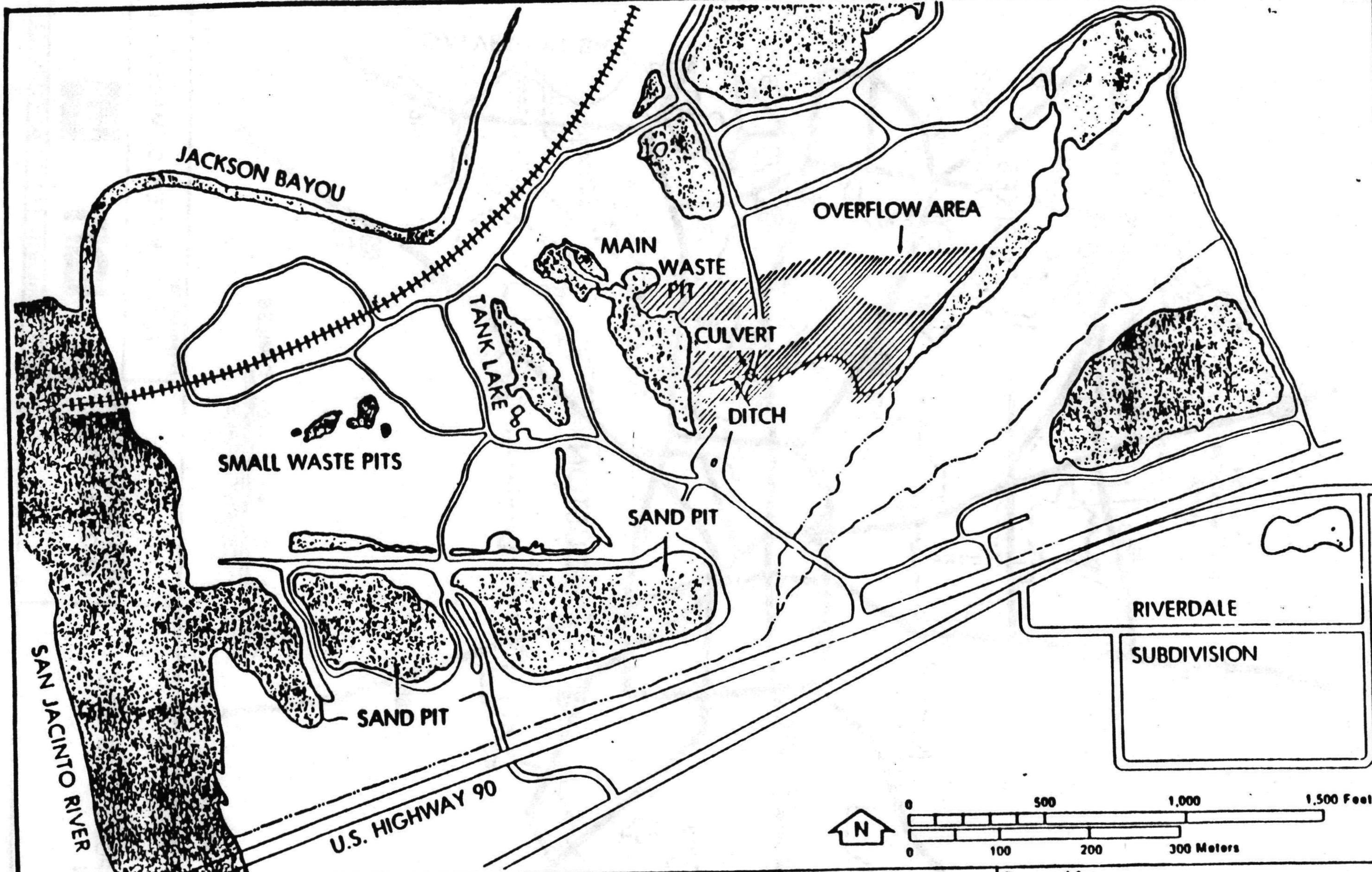

Figure 2
OVERFLOW AREA

SIKES DISPOSAL PITS
CROSBY, TEXAS

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

LAN / ESE / HLA

DATE: JAN. 1985 PROJECT NO. 1633-20.002

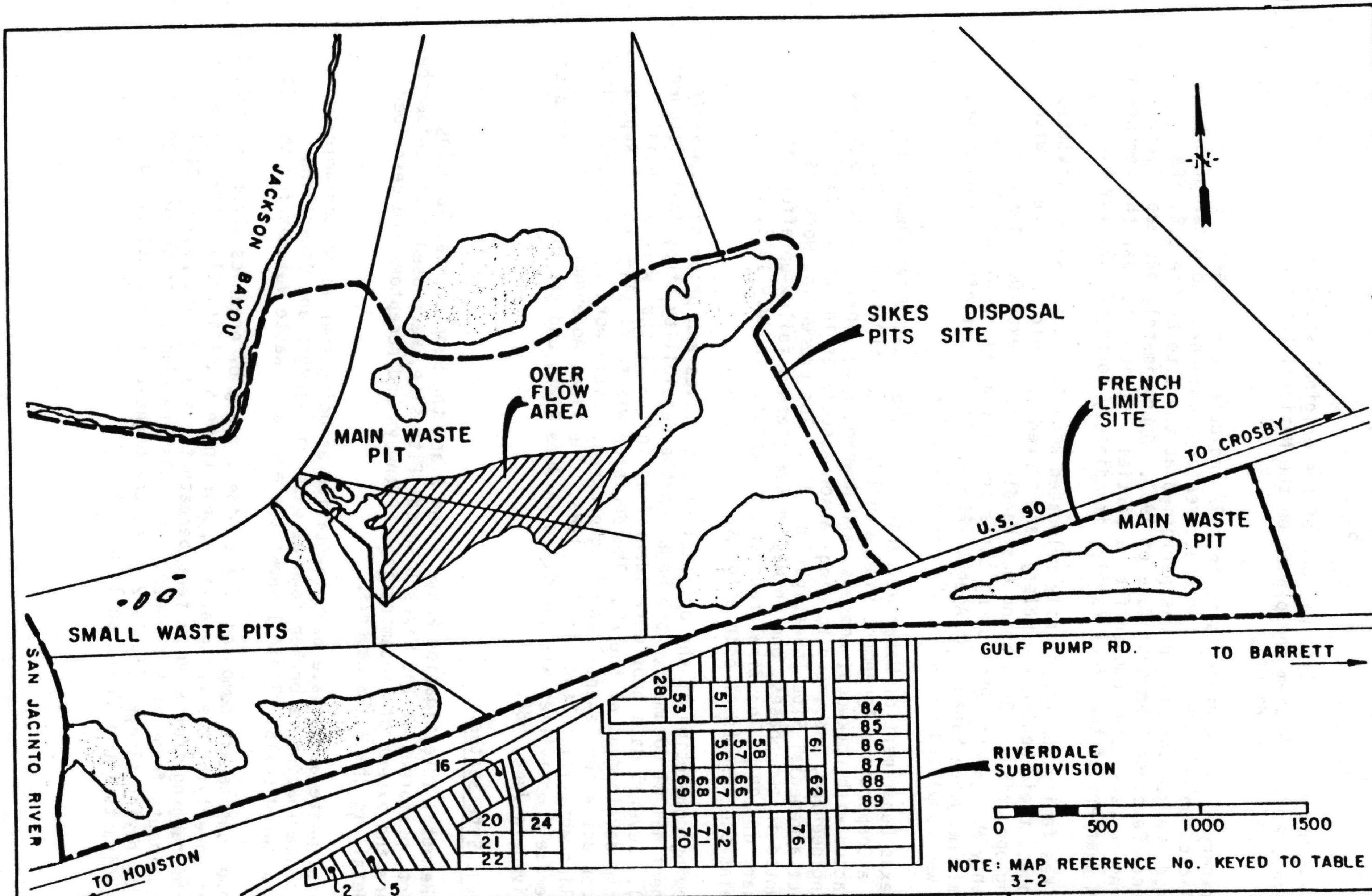

Figure 3
SHALLOW WATER SUPPLY WELLS
RIVERDALE SUBDIVISION

SIKES DISPOSAL PITS
CROSBY, TEXAS

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

ESE

DATE: JAN. 1985 PROJECT NO. 163120002

The Sikes Disposal Pits site was one of the original sites ranked under the Hazard Ranking System and placed on the National Priorities List in 1983 (score: 61.62).

Preliminary sampling at the site in 1982 indicated the presence of phenolic compounds, xylene, benzene, creosote, toluene, and other organics. An Immediate Removal Action was performed at the site by the U.S. EPA Emergency Response Branch in June of 1983. Approximately 440 cubic yards of phenolic tars were removed from a partially buried pit near the temporary living quarters of the Sikes family, immediately north of U.S. Hwy 90.

The Sikes family was temporarily relocated away from the onsite activities to protect their health and safety, and to reduce their interference with ongoing operations. Relocation was handled by the Texas Department of Emergency Management (DEM) using three travel trailers provided by the Federal Emergency Management Agency (FEMA). Total cost of the relocation, which was completed on May 6, 1983, was $30,000.

The Texas Department of Water Resources (now the Texas Water Commission) under a Cooperative Agreement signed with the U.S. EPA in June 1982, contracted with Lockwood, Andrews, and Newnam, Inc., Environmental Science and Engineering, Inc., and Harding Lawson Associates in January 1983, to conduct a Remedial Site Investigation (RI). The preceeding work was conducted in two phases, one in May of 1983, and a follow-up effort in February of 1984. The final report was submitted in July 1985, and contains the results of both efforts.

Following completion of the original RI activities and prior to submission of the final RI document, work began on the Feasibility Study (FS) (October 1984). Several data gaps were identified in the RI that were essential for the development of the FS. The decision was to finalize the RI Report and conduct a supplemental sampling program. Field work for the supplemental sampling activities began in July 1985. The final Addendum RI Report for these field activities was submitted in June 1986, and the draft FS was also received in June 1986.

Current Site Status

The Remedial Investigation Phase 1 and 2 and the Supplemental Sampling effort, performed at the Sikes Disposal Pits site, were used to describe the nature and extent of contamination. Pathways and receptors are described in detail in the RI/FS Reports.

Several waste areas have been identified as being sources of contamination. The contamination is broken down as waste or sludges and underlying contaminated soils. Table 1 shows the estimated waste volumes for the site.

Sludges onsite are composed of the wide variety of organics shown on Table 2. Soils underlying the waste areas appear to be significantly contaminated to depths ranging from 3 to 18 feet beneath the sludge/water/soil interface. Contaminants found in the underlying soils are similar to those found in the overlying sludges (Table 2 gives the highest concentrations for contaminants found in the soils onsite).

Table 1 Approximate Waste Volumes at the Sikes Disposal Pits Site, July 1985

Medium/Area	Volume
I. Wastes	
Pits	5,900
Barrels	2,600
Spills	43,300
Suspected	16,700
Total	68,500 C.Y.
II. Contaminated Soils	
Main Waste Pit	21,000
Sludge Overflow Area	58,300
Total	79,300 C.Y.
III. Contaminated Sediment	
Tank Lake	2,000
Slough	300
Total	2,300 C.Y.
IV. Contaminated Surface Water	
Main Waste Pit	4,700,000
Small Waste Pits	417,000
Tank Lake	7,071,000
Slough	412,200
Total	12,600,000 Gal.

Note: Volume totals have been rounded to the nearest 100 cubic yards and the nearest 1000 gallons. For complete volume calculations see Appendices M, N, O, and P.

TABLE 2

MAXIMUM CONTAMINANT CONCENTRATIONS IN SOILS AND SLUDGES AT THE SIKES DISPOSAL PITS SITE

PARAMETER	SOILS	SLUDGES
	Concentration, PPB	Concentration, PPB
Benzene	320,000	400,000
1,2-Dichloro-ethane	1,000,000	1,400,000
1,2,-Trichloro-ethane	500,000	290,000
Toluene	93,000	48,000
Ethylbenzene	100,000	52,000
Napthalene	1,200,000	78,300,000
Fluorene	290,000	1,600,000
Pyrene	590,000	3,300,000
Lead	370,000	4,150,000

Surface water from the sludge areas as well as a natural surface water body, called Tank Lake, and natural drainage ways were found to be contaminated. The contaminants were similar to those found in the underlying sludge/sediments except at lower concentrations. Table 3 shows the highest concentrations of contaminants found in the surface water onsite.

Dewatering operations in the local sand pits have altered the groundwater gradients and subsequently spread contaminants. Groundwater contamination appears to be moving from the main waste pit to the south, southeast, and northwest. Groundwater contaminants are shown in Table 3.

Groundwater in the shallow aquifer has been heavily contaminated by the leaching action of organic wastes deposited in pits and spread on the surface. At this time, only the shallow aquifer below the site is significantly contaminated, no residential wells are currently affected. Neither surface water or groundwater contamination has migrated beyond the site boundaries.

A second aquifer lies below the first, separated from it by approximately 65 feet of highly plastic clay strata. This lower aquifer appears to contain trace concentrations of one or more volatile organic compounds which seem to be originating from an upgradient source.

Underlying the two aquifers previously discussed and separated by several hundred feet of clay are the Chicot and Evangeline Aquifers, the primary drinking water source for metropolitan Houston. These aquifers do not appear to be in any danger of future contamination.

Air quality at the site has not been measurably degraded, however, if the wastes were to be disturbed in an uncontrolled situation the air releases could be substantial.

Migration Pathways

Groundwater in the upper aquifer enters the site area from the east and northeast. Ultimate discharge of the shallow groundwater flow is to the San Jacinto River. Onsite there are localized areas of groundwater recharge from surface water ponds which include abandoned sand pits, the main waste pit, Tank Lake, and possibly the small waste pits. The overflow area also receives recharge from the north, the east, and the southeast. The flow of shallow groundwater across the site is intercepted by the surface drainages in the overflow area, by dewatered sand pits to the south, by Jackson Bayou to the north, and the San Jacinto River to the west.

Table 3 Summary of Maximum Contaminant Concentrations at Sikes Disposal Pits and Human Health Criteria (All Units in ug/l or ppb)

Parameters	Human Health Criterion*	Highest Observed Levels Ground Water	Highest Observed Levels Surface Water
Conventional Analysis			
Phenols, Total	3,500	15,000	23
Metals			
Beryllium	0.037	15	--
Cadmium	10	770	--
Chromium	50	44	13
Mercury	0.144	0.4	--
Nickel	13.4	18	--
Lead	50	46	--
Thallium	13	93	--
GC/MS Volatiles			
Benzene	6.6	10,000	9
Chlorobenzene	488	390	3
Chloroform	1.9	290	2
1,2-Dichloroethane	9.4	2,200	91
T-1, 3-Dichloropropene	87	9	--
Ethylbenzene	1,400	1,700	--
1,12,2-Tetrachloroethane	1.7	5	--
1,1,2-Trichloroethane	6.0	390	4
Trichloroethene	23	44	--
Toluene	14,300	4,300	2
Vinyl Chloride	20	400	6
GC/MS Base/Neutral			
Acenaphthene	20.0[1]	68.0	5
Acenaphthylene	0.028	--	2
Anthracene	0.028	--	2
Benzo(A)anthracene	0.028	--	3
Benzo(B)fluoranthene	0.028	--	3
Benzo(A)pyrene	0.028	--	2
Bis(2-ethylhexyl)phthalate	15,000	190	37
Chrysene	0.028	--	2
1,4-Dichlorobenzene	400	6	--
1,2-Dichlorobenzene	400	6	--
Di-N-butylphthalate	34,000	--	2
Fluoranthene	42	6	2
Naphthalene	--	5900	--
Phenanthrene	0.028	--	290
Pyrene	0.028	--	190
PCBs	0.00079	--	153

Contaminated wastes within the main waste pit and the overflow area are the primary sources of shallow groundwater contamination. The groundwater within this immediate vicinity is heavily contaminated. In addition, because numerous smaller sources of contamination (i.e., small waste pits, scattered drum stockpiles, and possibly undiscovered buried wastes) exist, and because groundwater flow patterns were previously altered by sand pit dewatering, groundwater contamination is widespread onsite (Figure 4). North of Jackson Bayou the shallow groundwater flow is suspected to be toward the south. Thus, the contaminated groundwater plume has advanced north of the railroad tracks, based on contaminated groundwater seeps observed under the railroad trestle, and in some areas has advanced to Jackson Bayou, based on surface water sampling.

The most rapid advance of shallow groundwater contamination is presently located around Love Sand Pit south of the main waste pit. Groundwater in this area has become heavily contaminated due to extensive pumping of water from the sand pit. A groundwater seep visible in the pit indicates that movement of contaminants through the upper aquifer toward the Love Sand Pit is occurring. Pumping in the pit has resulted in the formation of a large cone of depression that effectively isolates groundwater in the western portion of the Riverdale community from the more heavily contaminated groundwater to the north. If pumping were discontinued, the groundwater gradient would decrease and the contaminated groundwater would disperse covering a larger area. This would increase the risk of the Riverdale community's groundwater becoming contaminated. The groundwater flow would maintain a southwesterly direction but would proceed at a reduced rate.

Data from the borings and wells indicate that the upper and lower aquifers are separated by an aquitard consisting of 64 to 69 feet of low permeability (less than 10^{-7} cm/sec) clay which appears to be continuous and relatively uniform across the site. The estimated vertical groundwater velocity in the aquitard between the upper and lower aquifer is approximately 0.2 feet/year.

Groundwater in the lower aquifer has at times exhibited elevated concentrations of total organic carbon (TOC), total organic halides (TOX), and total phenols, as well as traces of benzene, chlorobenzene, 1,1-dichloroethane, and vinyl chloride.

Soil core samples collected in the aquitard at depths between 31 and 88 feet below the ground surface (elevations -11 feet and -68 feet MSL, respectively) revealed no apparent vertical migration of the contaminants mentioned.

Similar contamination in the background monitoring well as in the onsite monitoring wells indicates that contamination in the lower aquifer is not from the Sikes site. This assumption is reinforced by the lack of evidence indicating a mechanism through which contamination of the lower aquifer could occur.

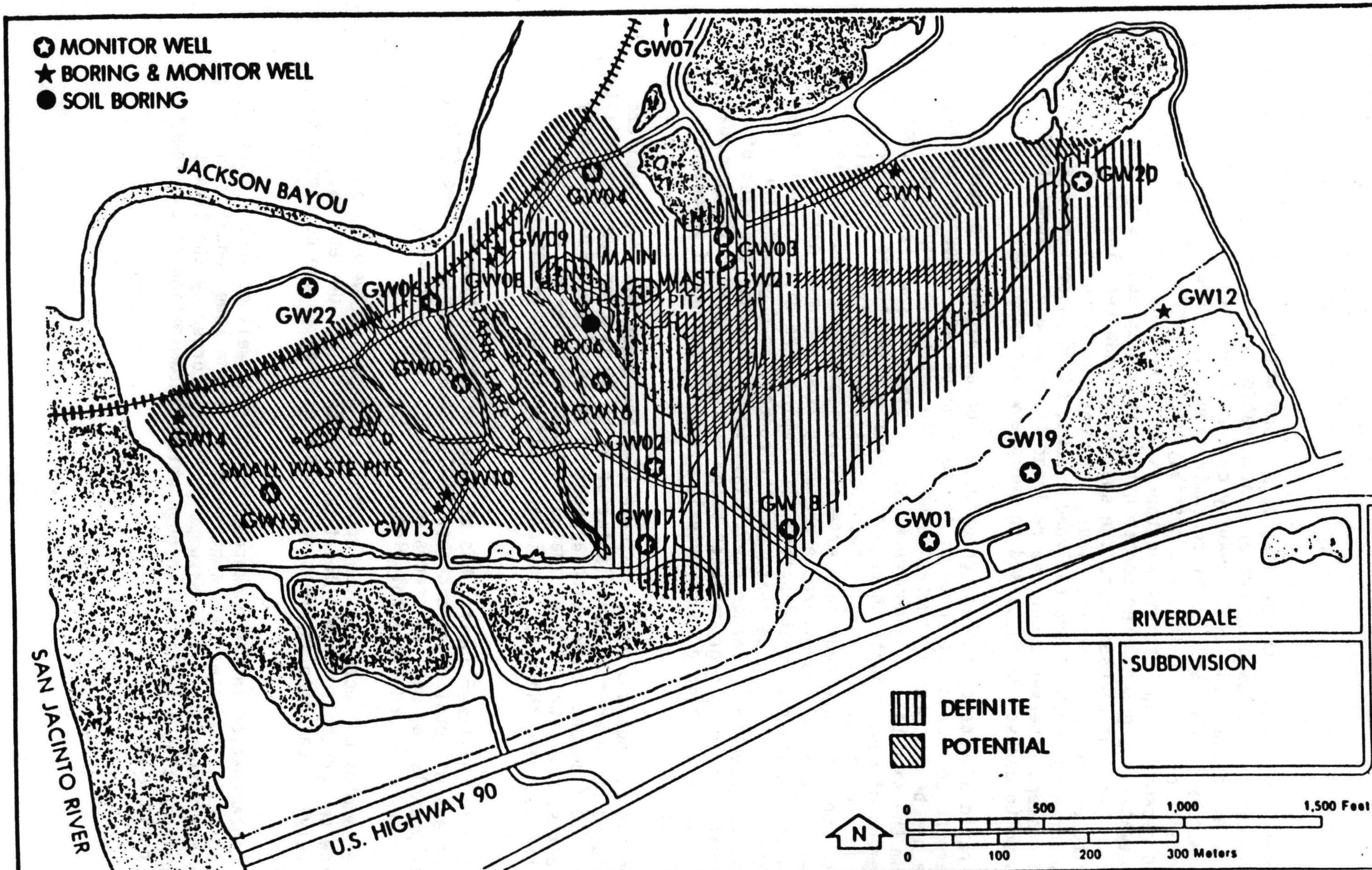

Figure 4
SHALLOW GROUNDWATER CONTAMINATION

SIKES DISPOSAL PITS
CROSBY, TEXAS

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

LAN / ESE / HLA

DATE: JAN., 1985 PROJECT NO. 1633 20 002

The general surface water flow pattern at the site is southwest towards the San Jacinto River. The drainage of the site is poor and generally dominated by man-made features such as roads, sand pits, berms, ditches and culverts.

The main waste pit drains to the east into the overflow area via a ditch and a 24 inch culvert. The overflow area acts as a runoff detention area, releasing stormwater to the two drainageways located to the south.

These drainageways join and ultimately discharge to the San Jacinto River just north of U.S. Highway 90. Contamination is carried along this surface drainage path to the San Jacinto River. Surface water and sediments along this drainage pattern exhibit decreasing concentrations of TOX, TOC, and total extractable organics (TOE) with distance from the main waste pit and sludge overflow area.

The northern portion of the site, including the area around the small waste pits, drains northwest toward Jackson Bayou. The small waste pits are bermed with no outlet. Tank Lake has no defined outlet but drains south across the road to the slough during periods of heavy rainfall. TOE concentrations in sediments from Jackson Bayou indicate that some transport and deposition of contaminants is occurring along the drainage pattern in the northern portions of the site.

Because the site is in the floodplain of the San Jacinto River, it is frequently inundated by floodwaters. In the past 20 years there has been flooding, including major ones in 1969, 1979 and 1983. The effects of flooding on contaminant migration include surficial transport and deposition of contaminants. In the past, floodwaters have deposited large quantities of waste in various areas of the site. Most notable of these areas is the 8 acre sludge overflow area.

Floodwaters move across the site in the patterns shown on Figure 5. Several residences in the western portion of the Riverdale Community are located in the path of the floodwaters. However, soil samples collected in the Riverdale area exposed to floodwaters indicate that no significant deposition of contaminated soils and sediments has occurred.

Two possible pathways exist for airborne contamination at the Sikes site. Truck traffic travelling along the A and B Sand Company Road across the overflow area approximately 150 to 300 feet east of the main waste pit raises dust particles possibly contaminated by wastes. Wind may potentially transport dust particles offsite. However, because the dust appears to settle quickly, the quantity of contaminated dust particles leaving the site is minimal.

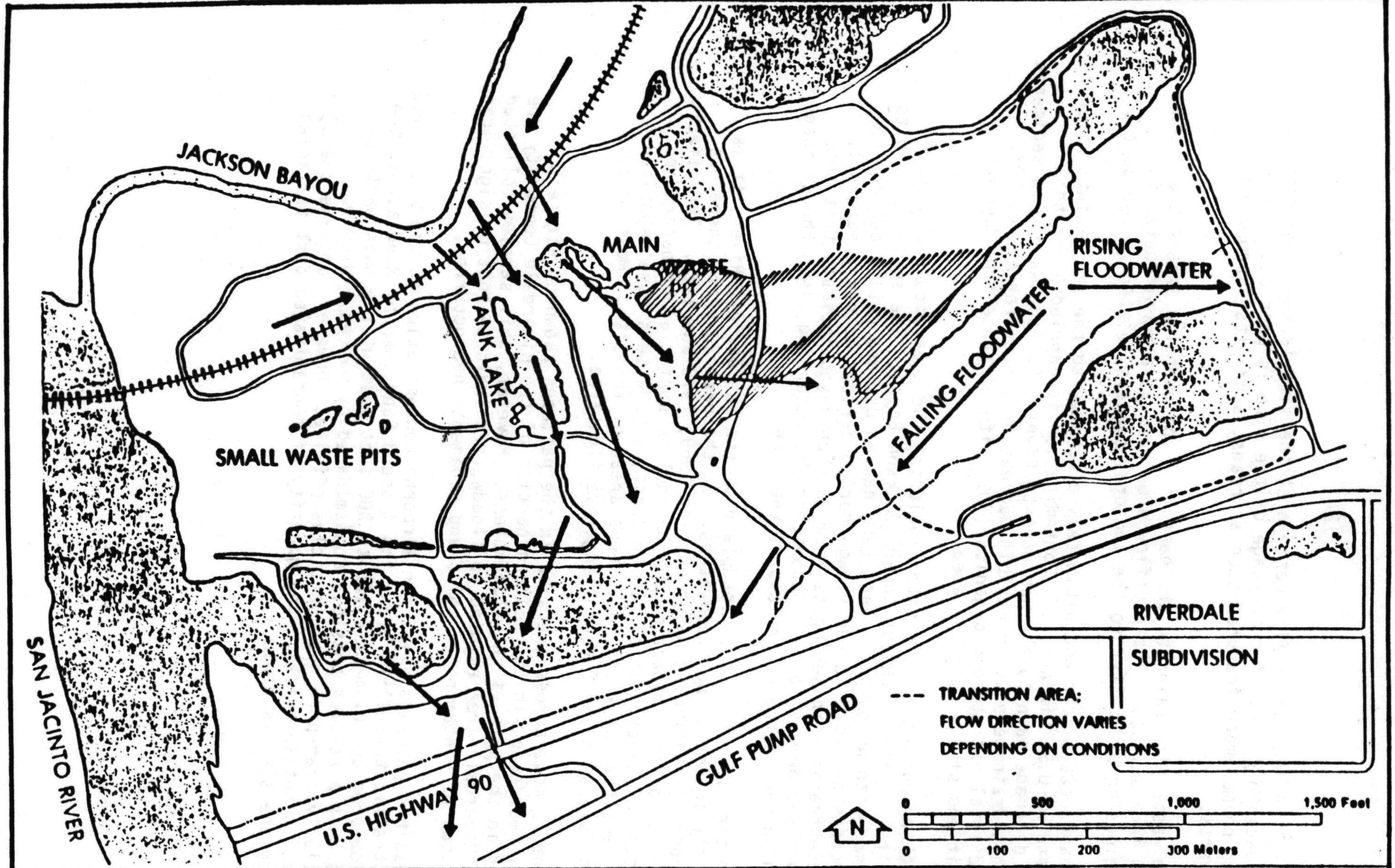

Figure 5
FLOOD FLOW PATTERNS
MAY 24, 1983

SIKES DISPOSAL PITS
CROSBY, TEXAS

Prepared for:
TEXAS DEPARTMENT OF WATER RESOURCES

LAN / ESE / HLA

DATE: JAN. 1985 PROJECT NO. 33 20.002

The second airborne contamination pathway is by volatilization of organic compounds in the wastes. Preliminary screening of air quality around the site indicated that if left undisturbed volatilization of organics is minimal. However, volatilization may be catalyzed by rainwater in the hot summer months. Short term rains that evaporate quickly appear to produce higher than normal readings.

Target Receptors

The following target receptors were identified in the remedial investigation:

- Members of the Sikes family, who live on the site;
- residents in the western portions of the Riverdale community;
- employees of the nearby sand mining operations;
- people who use potentially contaminated sands from the Love Sand Pit;
- sport fishermen that frequent Jackson Bayou and the San Jacinto River;
- persons who make unauthorized or inadvertent entrance to the site;
- Southern Pacific Railroad maintenance personnel; and
- boaters and skiers on the San Jancinto River.

Results of the RI study indicate that remedial action is required to reduce the potential for public health exposure through:

- Direct contact with sludges and contaminated soils;
- consumption of contaminated groundwater;
- direct contact with contaminated surface waters; and
- inhalation of toxic organic compounds through uncontrolled disturbance of the waste.

Enforcement Analysis

Approximately 10 potentially responsible parties (PRPs) have been identified for the site. PRPs for the Sikes Disposal Pits site consist of the owners, the Sikes family, in addition to several corporations, designated as either generators or transporters. At the present time, the Sikes family is the only PRP to indicate inability to fund any portion of the cleanup strategy.

At the termination of the investigative proceedings, all identified PRPs will be offered the opportunity to voluntarily implement the preferred remedy. If anticipated negotiations are unsuccessful, the Fund will be utilized for cleanup of the site. However, no negotiations have been initiated to date. If the PRPs decline to implement the remedy, EPA will seek appropriate enforcement action.

One of the generators identified has acknowledged partial responsibility. Two of the generators identified have requested additional information from EPA on their status as a PRP. No task force has been formed yet.

Alternatives Evaluation

The Feasibility Study for the Sikes Disposal Pits site was performed to determine what actions, if any, would be appropriate as part of a permanent remedy for the site. Several alternative remedial methods were developed to mitigate damage to, and provide adequate protection of public health, welfare, and the environment from past and future releases of contaminants onsite.

The National Contingency Plan (NCP), 40 CFR Part 300.68(e)(2) states that "Source control remedial actions may be appropriate if a substantial concentration of hazardous substances remains at or near the area where they were originally located and inadequate barriers exist to retard migration of substances into the environment." In accordance with the NCP, and based on the conclusions of the Remedial Investigation, a source control remedial action is necessary at the Sikes Disposal Pits site.

The major threats to public health and the environment attributed to contaminants at the site are:

1. Direct contact with sludges and contaminated soils;
2. continued direct contamination of the upper aquifer;
3. potential contamination of the lower aquifer;
4. direct contact with contaminated surface waters; and
5. releases of toxic volatile organic compounds into the air, through uncontrolled disturbances of the waste.

Remedial Objectives

The Feasibility Study performed by Lockwood, Andrews and Newnam, Inc., in July 1986, developed the following objectives and criteria based on the results of the Remedial Investigation:

1. Prevent human contact with contaminated soils and wastes.

   Criteria: No direct contact with waste containing greater than 100 ppm polynuclear aromatics.

2. Minimize impact of contaminated runnoff.

   Criteria: Surface Water Quality Criteria: a maximum of 0.1 mg/l benzene, 0.3 mg/l vinyl chloride, 0.3 mg/l of total phenols, and metals as per Section 156.19.15.002 of the Texas Water Code.

3. Prevent human contact with contaminated surface water.

   Criteria: Surface Water Quality Criteria.

4. Minimize site related degradation of the San Jacinto River and Jackson Bayou.

   Criteria: Surface Water Quality Criteria.

5. Prevent use of contaminated groundwater (upper aquifer).

   Criteria: Drinking Water Standards and Human Health Criteria (10^{-4} to 10^{-7} risk range).

6. Protect against contamination of the lower aquifer.

   Criteria: Existing background water quality in lower aquifer.

7. Prevent migration of waste offsite during flood events.

   Criteria: Surface Water Quality Criteria.

8. Prevent use of groundwater (lower aquifer) contaminated above background.

   Criteria: Existing background water quality in lower aquifer.

9. Minimize the potential of any adverse air discharge.

   Criteria: OSHA standards at site boundary, Federal Ambient Air Standards.

Initial Screening of Alternatives and Identification of Potential Remedial Technologies

Section 300.68(h) of the National Contingency Plan states that the following broad criteria should be used in the initial screening of alternatives and technologies:

1. Cost. For each alternative, the cost of installing or implementing the remedial action must be considered, including operation and maintenance costs. An alternative that far exceeds the costs of other alternatives and does not provide substantially greater public health or environmental benefit should usually be excluded from further consideration.

2. Effects of the Alternative. The effects of each alternative should be evaluated in two ways: (i) whether the alternative itself or its implementation has any adverse environmental effects; and (ii) for source control remedial actions, whether the alternative is likely to achieve adequate control of source material, or for offsite remedial actions, whether the alternative is likely to effectively mitigate and minimize the threat of harm to public health, welfare, or the environment. If an alternative has significant adverse effects, it should be excluded from further consideration. Only those alternatives that effectively contribute to protection of public health, welfare, or the environment should be considered.

3. Acceptable Engineering Practices. Alternatives must be feasible for the location and conditions of the release, applicable to the problem, and represent a reliable means of addressing the problem.

Identification of Response Actions and Applicable Technologies

In the screening process, only technologies applicable to the following objective response actions were considered:

1. Removing and disposing of sludges and contaminated soils;

2. removing and treating (if necessary) surface waters; and

3. groundwater restoration.

Table 4 lists the technologies initially screened and their applicability to the site.

No air emission control/abatement technologies are presented since air pollution is not a significant problem at this time. Air emission control/monitoring technologies will be considered as part of the health and safety plan for remedial action, since excavation could cause air releases.

Development of Site Remedial Alternatives

The alternative technologies which were retained after the initial screening process were combined into remedial alternatives for a permanent remedy at the site. Twelve remedial alternatives plus the no-action alternative were formulated for mitigating the problems at the Sikes Disposal Pits site. The prescreened alternatives are described in Table 4.

All alternatives listed in Table 5 are composed of the following common elements except the No Action alternative (FS Alternative 13).

1) Discharge surface waters to river or treat as necessary to meet discharge criteria.
2) Ban use of upper aquifer onsite while restoring upper aquifer to Drinking Water Standards or (10^{-4} to 10^{-7} range) Human Health Criteria.
3) Monitor lower aquifer.

TABLE 4

SUMMARY REVIEW OF TECHNOLOGIES
SIKES DISPOSAL PITS

Technology	Applicability (1)	Comments
Removal/Disposal Treatment of Sludges and Contaminated Soils		
Waste Removal Technologies		
Dragline/Dozer/Backhoe	A	Applicable in combination with other technologies that treat or dispose of waste.
Hydraulic Dredging	NA	Would produce large volumes of contaminated, possibly emulsified water.
Waste Disposal Technologies		
RCRA Landfill	A	Applicable for onsite and offsite disposal in combination with excavation.
Non-RCRA Landfill (slurry walls and caps)	A	Applicable for onsite disposal only.
Waste Treatment Technologies		
Biodegradation	A	Biological land application has a high potential for surface water contamination. It is also not feasible due to the large volume and type of waste and limited surface area. Other biodegradation methods are not considered proven technologies.
Incineration (Rotary kiln, fluidized bed, multiple health)	A	Applicable to offsite and onsite treatment in combination with excavation technology. Rotary kiln is the most appropriate for treating solid wastes.
Fixation	A	Applicable with excavation and landfill technologies.
Stabilization	A	Applicable to sludges with onsite landfilling.

(1) A = applicable major technology
a = applicable minor technology, used in conjunction with major technologies.
NA = Not Applicable technology

TABLE 4 (CONT.)

SUMMARY REVIEW OF TECHNOLOGIES

Technology	Applicability (1)	Comments
Surface Water and Groundwater Treatment		
Physical Treatment Technologies		
Air Stripping	A	Applicable to volatile contaminants.
Activated Carbon	A	Applicable to non-polar contaminants.
Filtration	a	Applicable with other treatment technologies.
Membrane Filtration	NA	Not applicable due to quantities involved and cost.
Biological Treatment		
Activated Sludge	NA	High cost with poor removal of trace organics.
Aerated Lagoons	NA	High cost with poor removal of trace organics.
Chemical Treatment		
Oxidation	NA	High cost with bench scale testing required.
Neutralization	a	Applicable to some groundwater contamination with other treatment technologies. Not suitable for removal of organic contaminants.
Ultraviolet/Ozonation	NA	High cost with bench scale testing required.
Hydrolysis	NA	Produces only a partial treatment and requires bench scale testing.
Natural Flushing	A	Applicable to the upper aquifer only.

(1) A = applicable major technology
a = applicable minor technology, used in conjunction with major technologies.
NA = Not applicable technology.

These twelve alternatives were then screened according to the guidelines given in the NCP, especially 40 CFR 300.68 (g). The objective of the screening process was to narrow down the twelve remedial alternatives to a smaller list of potential remedial alternatives for further detailed analysis.

Each remedial alternative was evaluated for the following specific criteria which includes technical feasibility, environmental and public health factors:

- o Performance
- o Reliability
- o Engineering Implementability/Constructability
- o Public Health and Welfare
- o Environmental Impacts
- o Institutional Factors
- o Costs

Cost estimates and brief descriptions of the engineering feasibility, and effectiveness, as well as screening results are also summarized on Table 5. The rating system that was used for the non-cost screening of alternatives is described below:

Rating Symbol	Definition
--	Extremely negative effects, even with mitigating measures. Alternative not worth further consideration in this category.
-	Negative effects, but not strong enough to be sole justification for eliminating an alternative; or only of moderate negative effects.
o	Of very little apparent positive or negative effects, but inclusion can be justified for some special reason; or no change from existing conditions.
+	A positive or moderately positive benefit.
++	An extremely positive benefit.

Detailed Evaluation of Alternatives

Based upon the screening process, six alternatives were retained for detailed evaluation in accordance with the NCP, 40 CFR 300.68(h). These alternatives were selected to demonstrate a reasonable range of remedial actions which are applicable to the Sikes Disposal Pits site.

TABLE 5
INITIAL ALTERNATIVES SCREENING SUMMARY
SIKES DISPOSAL PITS SITE

Alternative	Sludges & Contaminated Soils: Effectiveness	Sludges & Contaminated Soils: Engineering Feasibility	Shallow Groundwater: Effectiveness	Shallow Groundwater: Engineering Feasibility	Rel. Cost ($M)	Retained for further Eval.	Rationale
1. Sludges: Offsite RCRA Landfill Soils: Offsite RCRA Landfill	+	+	+	+	93-143	No	Costly; Risks during transport. Disposal capacity may not be available.
2. Sludges: Offsite incineration Soils: Fix & backfill Ash: Offsite RCRA Landfill	+	+	+	+	73-103	No	Incinerator capacity may not be available. More costly than other equitable alternatives. Risks during transport.
3. Sludges: Offsite RCRA Landfill Soils: Fix & backfill	+	+	+	+	53-83	Yes	Provides protection equal to Alternative 2 at less cost. Risk during long transport.
4. Sludges: On-site incineration Soils: On-site RCRA Landfill Ash: Fix & backfill	+	-	+	-	53-72	No	More costly than Alternative 10 with no additional protection; Site remains closed. w/landfill on-site major tech-problems; e.g. size, location, settlement, subject to flooding erosion.
5. Sludge: On-site incineration Soils: Fix & backfill Ash: Fix & backfill	+	+	+	+	33-53	Yes	Destroys worst contaminants. Immobilizes rest. Might provide equal cleanup effect as total incineration. No transport risks.
6. Sludges: On-site incineration Soils: Off-site RCRA Landfill Ash: Fix & backfill	+	+	+	+	73-113	Yes	Destroys worst contaminants. Risk during transport, but less than for Alternative 1, 2, 3.
7. Sludge: On-site RCRA Landfill Soils: On-site RCRA Landfill	+	-	+	-	53-63	No	Major technical problems; size, location, settlement subject to flooding erosion. May require long term monitoring. Risk of liner failure.
8. Sludges: On-site RCRA Landfill Soils: Fix & backfill	+	-	+	-	38-43	No	Greater risks than Alternative 4. Similar technical problems as Alt. 4,7. Less risks than Alt. 7. No transport risks.
9. Sludge: On-site incineration Soils: Off-site RCRA Landfill Ash: Off-site RCRA Landfill	++	+	++	+	108-163	No	Costly; Disposal capacity may not be available. Lengthly transport time with attendant exposure risks.
10. Sludge: On-site incineration Soils: On-site incineration Ash: backfill	+	+	+	+	43-68	Yes	Destroys or renders wastes effectively non-hazardous. Only total destruction alternative. No long term monitoring due to disposal option chosen. Longer cleanup time. No transport risks.
11. Sludge: On-site Non-RCRA Landfill Soils: Fix & backfill	0	-	0	-	33-43	No	Major technical problems; e.g. size location, settlement, subject to floods. Waste remain in less than RCRA facility. Long term monitoring required.
12. Sludge: Slurry walls & Cap S & S: Fix and backfill	0	+	0	+	23-28	Yes	Contains or immobilizes wastes. Requires long term monitoring inspection and maintenance.
13. No Action	--		--		0-.4	Yes	Retained for comparison.

All the alternatives retained for detailed analysis, except the No Action Alternative, include natural flushing of the upper aquifer as the restoration technique. Contamination of groundwater in the upper aquifer attenuates due to the effects of advection, dispersion, and biotransformation as the distance from the contaminant source increases. Also, approximately 572,000 gallons per day of uncontaminated groundwater flows into the aquifer under the site (which itself contains about 271 million gallons) towards the San Jacinto River or Jackson Bayou. The aquifer water entering the river or bayou meets the Surface Water Quality Criteria because of significant dilution by the clean groundwater.

To meet the objective of Human Health Standards (10^{-4} to 10^{-7} range) or Drinking Water Quality in the aquifer under the site, removal or isolation of the source of contamination has to be accomplished. With the limited sources of contamination remaining infiltration and flushing would effectively attenuate this aquifer to a 10^{-5} Human Health Risk in less than 30 years.

Alternative 1 (FS Alternative 13) No Action

Section 300.68(f) of the National Contingency Plan (NCP) specifies that the "No Action" alternative be evaluated. Under this alternative no construction activities are implemented. This means the site remains in its present state and continues to pose a risk to public health and the environment.

Periodic monitoring of the upper and lower aquifers is ongoing to detect changes in upper aquifer contamination and areal extent, and in lower aquifer water quality.

Alternative 2 (FS Alternative 3) Offsite RCRA Landfilling of Sludges, Onsite Fixation of Soils.

Alternatives 2 through 7 contain several supporting work tasks (referred to as common components) that will not be repeated under each alternative description. These include:

- o Perimeter fence;
- o protecting the site against flooding;
- o stormwater run-on and run-off collection/disposal system; and
- o pit surface water/infiltration water collection and treatment system.

It should be noted that for costing purposes the most conservative approach to flood protection (i.e., perimeter diking) was used, however the exact nature of flood protection to be used will be determined during the design phase. Also, for alternatives which involve incineration, fixation of residue ash was assumed for costing purposes, though this may be eliminated if the ash is determined to be non-hazardous.

This alternative includes the excavation of sludges to the 100 ppm polynuclear aromatic hydrocarbon (PNA) criteria level and contaminated soils to the 10 ppm volatile organic aromatic (VOA) criteria level. The sludges are then trucked offsite to an EPA approved RCRA landfill. The contaminated soils are chemically fixed with a cement based agent and utilized as backfill onsite. Use of the contaminated upper aquifer is banned onsite until restored to drinking water quality through natural flushing. Both the upper and lower aquifers are monitored following completion of remedial action and continued for up to 30 years, if needed.

Alternative 3 (FS Alternative 5) Onsite Incineration of Sludges, Fixation of Soils and Ash

For this alternative, sludges are excavated to the 100 ppm PNA criteria level and contaminated soils to the 10 ppm VOA criteria level. The sludge organics are then destroyed by onsite incineration while the ash and contaminated soils are chemically fixed with a cement based agent and utilized as backfill onsite. Use of the contaminated upper aquifer is banned onsite until restored to drinking water quality through natural flushing. Both the upper and lower aquifers are monitored following completion of the remedial action and continued for up to 30 years, if needed.

Alternative 4 (FS Alternative 6) Onsite Incineration of Sludges, Offsite RCRA Landfilling of Soils

This alternative includes excavation of sludges to the 100 ppm PNA criteria level and soils to the 10 ppm VOA criteria level. Sludges are then incinerated onsite and contaminated soils trucked offsite for disposal at an EPA approved RCRA landfill. Incinerator ash is chemically fixed onsite using a cement based agent. The resulting solid is used as backfill. Use of the contaminated upper aquifer is banned onsite until restored to drinking water quality through natural flushing. Both the upper and lower aquifers are monitored for up to 30 years following completion of the remedial action.

Alternative 5 (FS Alternative 10) Incineration of Sludges and Soils

For this alternative sludges and soils are excavated to the 10 ppm VOA criteria level, combined and incinerated onsite. The ash is tested, and if appropriate used as backfill. Use of contaminated upper aquifer water is banned onsite until restored to drinking water quality through natural flushing. Both the upper and lower aquifers are monitored for up to 30 years following the completion of the remedial action.

Alternative 6 (FS Alternative 12) Cap and Slurry Wall

This alternative involves dewatering of the main waste pit and Tank Lake. Sludges are excavated to the 100 ppm PNA criteria level and placed in these two pits. Prior to dewatering and excavation, a slurry wall is placed around both pits and tied into the upper aquitard. Following transfer of sludges into these pits, a geomembrane and clay cap are placed over each pit and tied into the slurry walls. Contaminated soils are then excavated, chemically fixed and the solids utilized for onsite backfill. Use of the contaminated upper aquifer water is banned onsite until restored to drinking water quality through natural flushing. Both the upper and lower aquifers are monitored for up to 30 years following completion of the remedial action. Information, including cost estimates on all these alternatives, are summarized in Table 6.

Community Relations

Public interest in the Sikes Disposal Pits site initial project phases has been minimal, except during periodical flooding of the site.

In May 1983, when the flooded San Jacinto River inundated the site, local residents voiced their concerns over possible contamination of their neighborhoods from the flood waters.

Public interest increased upon completion of the Feasibility Study. The two week public notice period began on July 14, 1986. This was followed by a 21-day public comment period from July 30, 1986, to August 20, 1986. A briefing of local officials, primarily Chamber of Commerce members from Crosby, Texas, was held August 7, 1986. A public meeting was held later in the same day, with approximately 120 people attending.

With a few exceptions, incineration (EPAs preferred alternative) appeared to be acceptable as long as wastes only from Sikes were incinerated at the site, and adequate controls were used to prevent upsets and pollution. Responses to the comments received during the comment period are presented in the "Community Relations Responsiveness Summary" attached to this Record of Decision.

Consistency with other Environmental Laws

It is EPA policy to give primary consideration to remedial actions that attain or exceed applicable and relevant standards of other Federal public health and environmental laws. Environmental laws which will have an impact on the proposed remedies for the Sikes Disposal Pits site are summarized on Table 7. Provisions of the applicable and relevant or appropriate requirements of these laws are summarized in Table 8.

Recommended Alternative

Section 300.68(i) of the National Contingency Plan states that "the appropriate extent of remedy shall be determined by the lead agency's selection of a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment."

TABLE 6

SUMMARY OF DETAILED EVALUATION OF REMEDIAL ALTERNATIVES
SIKES DISPOSAL PITS SITE

Remedial Alternative	Present Worth Cost ($M) Implementation	O&M	Public Health Considerations	Environmental Considerations	Technical Considerations	Institutional Considerations
3 - Off-Site RCRA Landfilling of Sludges, On-Site Fixation of Contaminated Soils.	56.0	0.4	Removes direct contact or ingestion hazard. Low cancer risk. Use of upper aquifer banned until restored. Transportation risks.	Removes or isolates waste. Promotes aquifer restoration. Potential for leaching from fixed soils. Least time to implement.	Demonstrated technology effectiveness if fixation is effective.	Banning use of Upper Aquifer continued. Longterm groundwater monitoring required. Longterm monitoring may affect site use.
5 - On-Site Incineration of Sludges, Fixation of Contaminated Soils and Ash.	53.8	0.4	Removes direct contact or ingestion hazard. Low cancer risk. Use of upper aquifer banned until restored.	Removes or isolates waste. Promotes aquifer restoration. Potential for leaching from fixed soils. Longer implementation time than Alt. 3 & 12.	Demonstrated technology effectiveness if fixation is effective.	Use of Upper Aquifer banned. Longterm groundwater monitoring required. Longterm monitoring may affect site use.
6 - On-Site Incineration of Sludges, Off-Site RCRA Landfilling of Contaminated Soils, On-Site Fixation of Ash.	111.3	0.4	Removes direct contact or ingestion hazard. Very low cancer risk. Use of upper aquifer banned until restored. Reduced transportation risks than Alt. 3.	Destroys or removes waste. Promotes aquifer restoration. Longer implementation time than Alt. 3 and 12.	Demonstrated technologies. More reliable.	Use of Upper Aquifer banned. Longterm groundwater monitoring required. Longterm monitoring may affect site use.
10 - On-Site Incineration of Sludges and Contaminated Soils.	92.9	0.4	Achieves maximum protection against direct contact or ingestion hazard. Very low cancer risk. Use of upper aquifer banned until restored.	Destroys organic waste on-site. Provides greater protection against potential aquifer contamination than Alt. 3, 5 and 12. Longer implementation time than other alternatives.	Demonstrated technologies used. Maximum reliability.	Use of Upper Aquifer banned. Longterm groundwater monitoring required. Longterm monitoring may affect site use.
12 - On-Site Burial of Sludges in Pits with Slurry Walls and Caps. Fixation of Contaminated Soils.	23.4	1.3	Removes direct contact or ingestion hazard. Low cancer risk. Use of upper aquifer banned until restored.	Wastes isolated or immobilized but not destroyed. Leaching potential greatly reduced, although sludges left on-site.	Not totally demonstrated technology. System failure possible. Continued maintenance required. Collection and disposal of leachate required.	Use of Upper Aquifer banned. Longterm monitoring required. Use of land area prohibited.
13 - No Action	---	0.4	Continued potential for direct contact on-site and off-site. Potential ingestion hazard on-site.	Wastes remains in place. Continued potential for contaminating lower aquifer. Upper aquifer remains unsuitable for use.	Not applicable.	Direct contact and ingestion hazards continued.

TABLE 7

REMEDIAL ALTERNATIVE COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Law or Regulation	Analysis	Remedial Alternative No. 3	5	6	10	12
Federal Water Quality Criteria (FWQC)	Implementation of this alternative should result in compliance with FWQC in groundwater.	X	X	X	X	X
Floodplain Management Executive Order No. 11988 May 24, 1977	Implementation of this alternative will be consistent with Floodplain Management requirements as prescribed in Executive Order 11988.	X	X	X	X	X
State						
Texas Water Commission (TWC) Surface Water Quality Criteria (SWQC)	Implementation of this alternative will produce a point source discharge. The discharge will be treated on-site as necessary to satisfy State SWQC.	X	X	X	X	X
Texas Air Control Board Regulations	Implementation of this alternative may produce a point source emission from on-site equipment. Emissions will be in compliance with State regulations.	X	X	X	X	X
Texas Solid Waste Act	Implementation of this alternative would require the transport and disposal of waste off-site. Transport and disposal will be in compliance with State requirements.	X		X		
Local						
Local Approvals	Local agency approval for implementing this alternative may be required.	X	X	X	X	X

TABLE 7

REMEDIAL ALTERNATIVE COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Law or Regulation	Analysis	Remedial Alternative No. 3	5	6	10	12
Federal						
Resource Conservation and Recovery Act (RCRA)	Implementation of the source controls for this alternative will be consistent with current RCRA regulations, including standards for owners and operators of hazardous waste treatment, storage and disposal facilities and closure performance standards for facilities located within a 100-year floodplain.	X	X	X	X	
Department of Transportation (DOT) Hazardous Materials Transport Rules	Implementation of this alternative does not specifically require the off-site transport of hazardous materials.		X		X	X
	Implementation of this alternative requires the off-site transport of hazardous materials. Transport will be in compliance with these rules, including use of properly constructed and marked transport vehicles, use of licensed transporter, and use of hazardous waste manifests.	X		X		
Clean Air Act (CAA) and National Ambient Air Quality Standards (NAAQS)	Implementation of this alternative may result in the emission of pollutants into the air. On-site personnel will be adequately protected.	X	X	X	X	X
	Implementation of this alternative will require point source emissions to the air. Pollution control equipment will be placed on the on-site treatment facility to comply with standards.	X	X	X	X	X

TABLE 8

PROVISIONS OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

RCRA Part 264

Subpart B - General Facilities Standards

Requires that facilities located in the 100-year floodplain be designed, constructed, operated and maintained to prevent washout of any hazardous waste by a 100-year flood.

- o Could be applied to any on-site landfill which would be constructed in the future to dispose of wastes.

Subpart E - Manifest system, recordkeeping, and reporting

- o Hazardous waste manifesting procedures would be required if any waste is transported to an off-site TSD facility.

Subpart F - Groundwater Protection

- o Requires that levels of hazardous constituents (40 CFR, Part 261 Appendix VIII) in the uppermost aquifer at the point of compliance (generally site boundary) meet limits set by U.S. EPA as:

  1) Background, or
  2) Maximum Contaminant Levels (MCLs), or
  3) An alternate concentration limit (ACL) posing no present or future hazard to human health or the environment.

- o Will be more fully addressed in Upper Aquifer restoration.

Subpart G - Closure and Post-Closure

Requires closure in a manner that minimizes the need for further maintenance and prevents future release of contaminants.

- o Could be applied to in-place capping of wastes or closure of any on-site landfills constructed as part of the remedial action.

Subpart N - Landfills

Requires that RCRA compliant landfills be double-lined and contain leachate collection and leak detection systems; does not allow placement of liquid, ignitable, or reactive wastes in landfill; also provides specific closure requirements.

- Could be applied to any on-site landfill which would be constructed in the future to dispose of wastes.

Subpart O - Incinerators

Requires detailed waste analysis and trial burns on incinerator before operations commence and on-line monitoring during operation.

- Would apply to any on-site incineration.

Maximum Contaminant Level for Drinking Water (MCLs): 40 CFR Section 141.11 - 141.16

Sets water quality standards for several metals and compounds based on health protection.

- MCL values must be met for Upper Aquifer restoration.

Clean Water Act: 40 CFR Section 301 and 403

Requires NPDES permit for discharge of treated water to natural surface water systems

Occupational Safety and Health Standards: 29 CFR 1910

OSHA sets standards for protection of workers.

- Would be applied to site workers during any remedial action; some standards may be considered in developing safe exposure levels (in air for example) for near site residents.

TABLE 8

PROVISIONS OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Clean Air Act: 42 U.S.C. 7401

Regulates primary air pollutants; does not address volatile organics or most toxics in air.

- o Application to site limited, possibly applies during remedial actions involving waste excavation.

D.O.T. Rules for the Transportation of Hazardous Materials: 49 CFR Parts 107, 171.11 - 171.500

Regulates the transport of hazardous wastes through licensing of qualified transporters.

Regulates hazardous waste manifesting system.

Regulates transport placarding.

EPA Groundwater Protection Strategy

Ranks aquifers in the order to be protected:

Class I - sole source aquifer
Class II - usable aquifer, other supplies available
Class III - water unfit for consumption (due to high salt content for example), or aquifer has low yield.

Alternative 5 (FS Alternative 10) is the recommended alternative for the Sikes Disposal Pits site. Costs for this alternative are summarized on Table 9. This alternative consists of:

- Flood protection during remedial action;
- Storm water run-on and run-off collection system;
- Excavation of 150,000 cubic yards soils and sludges with greater than 10 ppm VOA's;
- Onsite incineration of excavated sludges and soils;
- Onsite disposal of residue ash;
- Backfilling of pits and excavated areas;
- Collection and treatment, if necessary of contaminated surface water;
- Natural restoration of upper aquifer; and
- Post closure monitoring of upper and lower aquifer.

The rationale for selection of Alternative 5 (FS Alternative 10) is as follows:

Alternative 1 (FS Alternative 13 - No Action) was eliminated because the site would remain as it is, continuing to pose a risk to public health and the environment.

Alternative 2 and 3 (FS Alternatives 3 and 5 - Fixation of soils on-site) were eliminated because adequate protection of public health and the environment would not be provided.

Soil fixation at this site poses several problems. For one, the effectiveness of soil fixing in preventing contaminant leaching is questionable when organics relatively high in solvents, such as those present at Sikes, are involved. In addition certain site factors increase the risk of leaching from any fixated soils. These factors are a high water table which lies only 10 feet below the surface, and inundation from frequent flooding.

Taking this into consideration, while direct contact with contaminants would be eliminated, there is the substantial potential for leaching from the fixed soils. This reduces the long-term integrity of these remedies. Because of the high levels of contaminants remaining onsite, this would not provide adequate protection of the upper aquifer, which needs 30 years to restore itself. This reasoning precludes the use of this technology.

Alternative 4 (FS Alternative 6) was eliminated because transport and off-site disposal of soils increases the cost of this alternative $18,000,000 over the next less expensive alternative (Alternative 5, EPAs preferred alternative). The increased cost is not justified by a commensurate increase in protection because the waste is not being permanently treated. Furthermore, there is the risk of a transportation incident since the material would be removed offsite.

TABLE 9
COST SUMMARY
REMEDIAL ALTERNATIVE 10
ONSITE INCINERATION OF SLUDGES AND
CONTAMINATED SOILS, FIXATION OF ASH
SIKES DISPOSAL PITS SITE

ITEM	IMPLEMENTATION CAPITAL	IMPLEMENTATION O & M	POST IMPLEMENTATION O & M	PRESENT WORTH 10%
GENERAL				
Mobilization and Demobilization	$113,000			$113,000
Office Area *	$224,000	$15,000		$210,000
Security *	$500,000	$100,000		$408,000
Environmental Permitting	$300,000			$300,000
Health and Safety Program *** -Air Monitoring -Report Generating	$360,000	$40,000		$363,000
Onsite Laboratory *** -Operation and Maintenance, Including Technicians	$400,000	$60,000		$350,000
Parking Facility *	$24,000	$2,000		$22,000
SITE PREPARATION				
Road Construction *	$83,000	$5,500		$78,000
Decontamination Facility *** -Concrete Pad -Water Storage Tank -Steam Sprayer -Sump	$77,000	$13,000		$66,000
Storm Water Collection Runoff and Disposal ***	$450,000	$20,000		$433,000
Surface Water/Infiltration Water Collection and Treatment ***	$455,000	$70,000		$397,000
Dike Construction	$1,526,000			$1,526,000
Dike Removal	$718,000			$718,000
Fencing and Lighting	$126,000			$126,000
Clearing and Grubbing	$86,000			$86,000
Equipment Area	$198,000			$198,000

TABLE 9 CONT.

EXCAVATION,INCINERATION AND DISPOSAL				
Excavate Wastes	$1,127,000			$1,127,000
Sheet Piling	$379,000			$379,000
Incinerator: -Mobilization and Demobilization of Onsite Incineration Unit	$1,825,000			$1,825,000
-Construct Drying/Holding Pad ***	$66,000	$4,000		$63,000
-Load Incinerator ***	$1,112,000	$278,000		$881,000
-Annual Operation and Maint. Costs ***	$38,880,000	$9,720,000		$30,811,000
Dewatering and Storage	$25,000			$25,000
Fixation of Incinerator Ash ***	$3,596,000	$899,000		$2,850,000
Backfill and Revegetate	$585,000			$585,000
GROUNDWATER MONITORING **	$58,000		$41,000	$445,000
CONSTRUCTION SUBTOTALS	$53,293,000		$41,000	$44,385,000
BID CONTINGENCIES (15%)	$7,994,000			$7,994,000
SCOPE CONTINGENCIES (25%)	$13,323,000			$13,323,000
CONSTRUCTION TOTALS	$74,610,000			$65,702,000
PERMITTING AND LEGAL SERVICES DURING CONSTRUCTION (5%)	$3,731,000			$3,731,000
BONDING AND INSURANCE (10%)	$7,461,000			$7,461,000
SERVICES DURING CONSTRUCTION (7%)	$5,223,000			$5,223,000
ADDITIONAL ITEMS (5%)	$3,731,000			$3,731,000
TOTAL IMPLEMENTATION COST	$94,756,000			$85,848,000
ENGINEERING DESIGN COST (10%)	$7,461,000			$7,461,000
TOTAL CAPITAL COST	$102,217,000		$41,000	$93,309,000

* Annual O & M for 5.0 Years
** Annual O & M for 30 Years
*** Annual O & M for 4 Years

Alternative 6 (FS Alternative 12 - Cap and slurry wall for sludges, soil fixation) was eliminated because adequate protection of public health and the environment could not be assured.

The same reasoning as outlined for alternatives 2 and 3 applies here for soil fixation. In addition to this is the nearly impossible requirement of maintaining the integrity of a cap in an extremely flood prone area. This alternative was eliminated for these reasons.

Consequently, Alternative 5 (FS Alternative 10 - Incineration on-site of sludges and soils) complies with all applicable and relevant Federal environmental laws and regulations.

Furthermore, it is the lowest cost permanent remedy that mitigates short and long term threats to public health and the environment. The greater protection afforded by this remedy justifies the additional cost.

Operation and Maintenance

Operation and maintenance will consist of post closure monitoring of the upper and lower aquifers as well as surficial maintenance of the site once closure is complete. Surficial maintenance includes such items as:

- o Fence repair
- o Fill replacement and regrading.

Besides the aforementioned, costs also include purchased services such as sampling and laboratory analysis for groundwater monitoring, administrative costs, taxes, insurance, labor, and materials.

The State of Texas will assume responsibility for operation and maintenance of the site for a period of 29 years, commencing one year after the post closure period begins.

Annual operation and maintenance costs for the recommended alternative is estimated to be $41,000 and the present worth is estimated to be $445,000.

Schedule

The schedule for the remedial design and construction of the remedy at the Sikes Disposal Pits site is currently dependent upon re-authorization of Superfund. The design phase of the project will begin as soon as funding becomes available, either through re-authorization or a continuing resolution. When funding is available, the design of the remedy will take an estimated 18 to 24 months to complete. Remedial construction will begin as soon as possible after completion of the design, and take approximately five years to complete.

TEXAS WATER COMMISSION

September 15, 1986

Mr. Dick Whittington
U. S. Environmental Protection Agency
Region VI
1201 Elm Street
Dallas, Texas 75270

Re: Draft Record of Decision
Sikes Disposal Pits Superfund Site

Dear Mr. Whittington:

We have reviewed the proposed Draft Record of Decision (ROD) and responsiveness summary for the Sikes Disposal Pits Superfund Site.

We have no objection to the issuance of a ROD by the Environmental Protection Agency (EPA). Before the State of Texas can concur by providing its 10% share of the cost for the selected remedial alternative, the fiscal impact of this action must be evaluated and subsequently coordinated with state's budgetary process.

On a related matter, we would like to comment on the obligation of State monies for a period of 30 years after the remedial construction activities are complete. Such a commitment by the State of Texas may be a violation of Article VIII, Section 6 of the Texas Constitution which addresses the appropriation of money beyond a two year period.

Sincerely yours,

Larry R. Soward

Larry R. Soward
Executive Director

P. O. Box 13087 Capitol Station • Austin, Texas 78711 • Area Code 512/463-7898

COMMUNITY RELATIONS RESPONSIVENESS SUMMARY
ON PREFERRED REMEDIAL ALTERNATIVE
SIKES DISPOSAL PITS, CROSBY, TEXAS

This community relations responsiveness summary is divided into the following sections:

I. Overview - This section discusses EPA's preferred alternative for remedial action, and likely public reaction to this alternative.

II. Background on Community Involvement and Concerns - This section provides a brief history of site background and community interest and concerns raised during remedial planning activities at the Sikes Disposal Pits site.

III. Summary of Major Comments Received During the Public Comment Period and the EPA Responses to Comments

I. OVERVIEW

In the presentation for the public meeting on August 7, 1986, EPA discussed the remedial alternatives which were examined in the Feasibility Study, for addressing the contamination at the Sikes Disposal Pits site.

After the initial screening of the alternatives a detailed evaluation was performed on the six remaining. Except for the no action alternative, all met basic criteria for protecting public health and the environment and all had common components, including; natural flushing of the upper aquifer as a restoration technique, a perimeter fence, protection of the site against flooding, stormwater and surface water treatment (if necessary), and discharge. The alternatives are:

1.	No Action with Monitoring	Est. Cost: $ .4 Million
2.	Offsite Landfill; Onsite Stabilization of Soils	Est. Cost: $ 56 Million
3.	Onsite Incineration of Sludges; Onsite Stabilization of Soils	Est. Cost: $ 54 Million
4.	Onsite Incineration; Offsite Landfill	Est. Cost: $111 Million
5.	Onsite Incineration of Sludges and Soils; Onsite Disposal of Ash	Est. Cost: $ 93 Million
6.	Cap and Slurry Walls	Est. Cost: $ 24 Million

The corrective action proposed by the EPA was Alternative No. 5, Onsite Incineration. The estimated cost of $93 Million includes annual operation and maintenance costs of $41,000 ($445,000 over a ten-year time period). Comments from the Crosby, Texas, Chamber of Commerce favored this option, provided that the incinerated wastes were only those generated at the Sikes site and not hazardous wastes brought from other sites. The comments on the options, along with EPA's response to each, are presented later in this document.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Site Background

The Sikes Disposal Pits site is located on 185 acres, approximately two miles southwest of Crosby, Texas in northeast Harris County. The area surrounding the site is largely undeveloped with numerous active and abandoned sand pits and low-lying swampy areas. The entire site lies within the 100-year floodplain of the San Jacinto River, and portions of the site lie within the 10-and 50-year floodplains. The dike around the unlined main waste pit was not adequate to withstand this flooding.

The Sikes Disposal Pits site began operation as a waste depository in the early 1960s and closed in 1967. During this period, a variety of chemical wastes from area petrochemical industries were deposited onsite in the sand pits. Numerous drums of wastes were also left on the property. The site was placed on the original National Priorities List in September 1983.

Major Concerns and Issues

Community involvement relating to the Sikes Disposal Pits site has been relatively low from the time of active operation in the early 1960s to the present. When the French Limited site located across Highway 90 from Sikes began operation in 1966, local attention to the Sikes Disposal Pits and French Limited sites increased. Shortly thereafter, residents in the nearby Riverdale subdivision sent a telegram to then President Lyndon Johnson concerning the waste dumping and their fruitless attempts to halt it. There were fewer community complaints once indiscriminate dumping ceased. In May 1983, the San Jacinto River flooded and inundated the site, and the news media focused attention on the potential environmental hazards caused by the flooding. Local residents telephoned the Texas Department of Water Resources (TDWR) now Texas Water Commission (TWC), District 7 office with their concerns over the possibility of contaminated flood waters flowing through the neighborhood. Other than concerns during flooding, community involvement in the Sikes project has been very low.

Activities to Elicit Input and Address Concerns

The TDWR (TWC) conducted site investigations through a cooperative agreement with the EPA pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

In order to accomplish site investigation activities and to provide safety for the Sikes family who resided on the site, the Texas Department of Emergency Management moved the family in March 1983, to travel trailers provided by the Federal Emergency Management Agency (FEMA), which were placed at a location on the property removed from EPA activity.

III. SUMMARY OF PUBLIC COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

The public comment period on the preferred remedial action alternative for the Sikes Disposal Pits site extended from July 30 to August 20, 1986. A public meeting took place on August 7, 1986, in the Crosby High School, Crosby, Texas. Approximately one-hundred thirty (130) people were in attendance with twenty-two (22) people making oral statements or asking questions. Eight written statements were received during the comment period. A summary of the comments and EPAs response is provided herein.

In addition to the public meeting, a briefing was held for local officials, primarily composed of the Crosby Chamber of Commerce, on August 7, 1986. The preferred remedial alternative was presented, and appeared to be acceptable, provided no wastes, other than those generated at Sikes, be incinerated at the site.

Comment 1

Will wastes from other Houston area hazardous waste sites be incinerated at Sikes?

EPA Response

No. This alternative was not a part of the Remedial Investigation and Feasibility Study (RI/FS), and therefore, no waste from any other site was considered for incineration or disposal at Sikes.

Comment 2

Opposition to incineration onsite was stated. Citizens were concerned about adequate protection of their health and safety, and whether the incinerator would be a permanent fixture. Questions were also asked about the type of incinerator and operating parameters.

EPA Response

The design of the incinerator and operating parameters will be established during the remedial design phase, which is the next step after remedy selection. The incinerator will be designed to meet all applicable Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA) requirements. The contract for construction and operation will require the incinerator to meet technical requirements for permitting, although the incinerator will not have to be permitted. The requirements include, at a minimum, that a trial burn be conducted to confirm that the wastes, including PCBs, can be destroyed to required levels. While in operation the incinerator will be continuously monitored to ensure compliance with these criteria.

The incinerator will also be designed with built-in controls, which will shut down the facility automatically should any burn parameter, such as feed rate, temperature, or emissions, move out of the optimal operation range. By designing the incinerator in this way the chances of an uncontrolled hazardous emission will be minimized. The incinerator will be a temporary facility and will be removed at the completion of the Sikes remedial action.

Comment 3

Fumes from an incinerator would be held down by heavy fogs causing local residents to breath the incinerator emissions.

EPA Response

The operation contract for the incinerator will be written such that during any atmospheric event that would prevent dispersion, feed to the incinerator will be stopped.

Comment 4

The property values around Sikes will be depressed by incineration at the site.

EPA Response

Property values around Sikes are already depressed due the presence of an uncontrolled hazardous waste site. By cleaning up the site permanently this will no longer be the case. It is hoped that once remedial action is completed at Sikes the surrounding property values will return to normal.

Comment 5

Several local residents and three Potentially Responsible Parties (PRP's) questioned why Alternative 12 (cap and slurry wall for sludges, fixation of soil) was not preferred by EPA since it appears to cost much less than the preferred alternative ($23.4 million versus $92.9 million).

EPA Response

Alternative 12 does not meet the criteria of Section 300.68(i) of the National Contingency Plan which states that "the appropriate extent of remedy shall be determined by the lead agency's selection of a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment."

A cap is not a viable long term remedy because the area is extremely flood prone.

The application of soil fixation at this site also poses several problems. For one, the effectiveness of soil fixing in preventing contaminant leaching is questionable when organics relatively high in solvents, such as those present at Sikes, are involved. In addition, the water table (only 2 to 10 feet below the surface) and inundation from frequent flooding increases the risk of leaching contaminants.

The above considerations reduce the long term integrity of this remedy. Also, because of the high levels of contaminants remaining onsite, this remedy would not provide adequate protection of the upper aquifer.

On the other hand, Alternative 10 complies with all applicable and relevant Federal environmental laws and regulations. It is also the lowest cost permanent remedy that mitigates short and long term threats to public health and the environment. The greater protection afforded by this remedy over Alternative 12 justifies the additional cost, and is therefore, the most cost-effective alternative.

Comment 6

There have been 12 cases of meningitis in the area within a month when the river flooded. Are these cases linked to pollutants from the Sikes site?

EPA Response

No. Carl Hickam of the Centers for Disease Control (CDC) contacted Mark Canfield of the Harris County Health Department on meningitis cases in the county. Although meningitis cases are elevated in Harris County, data do not suggest an excessive number of cases for Crosby. Those cases that have been reported (there have been three in Crosby this year) appear to be linked to virus/vector borne routes, not flooding of the Sikes site.

Comment 7

Local residents wanted to know if any contaminated sand from the Love Sand Pit (adjacent to the site) had been sold.

EPA Response

To the Agency's knowledge no contaminated sand has been sold. The owners of the Love Sand Pit have been requested not to sell any sand from an area in the pit that showed evidence of leaching of contaminants. Mr. Love agreed verbally with the request and there is no evidence to show that he has not been complying with this. The Texas Water Commission sampled sand thought to be bought from this company and found no evidence of contamination.

Comment 8

Why doesn't EPA require the county to condemn the land, making access difficult, and making it unnecessary to remove or treat the waste?

EPA Response

This essentially implies a no action response, which does not adequately protect human health and the environment. Although direct contact with contaminants may be minimized for a short while, the long term security of the site is still questionable. Furthermore, by not removing the waste you risk further contamination of the groundwater as well as migration of surface contamination via flooding.

Comment 9

Several commentors stated a strong preference for biodegradation and wanted to know why it was not considered as an alternative.

EPA Response

Biodegradation techniques were eliminated as a remedial technology for active consideration in the Feasibility Study's initial screening of technologies. Biodegradation poses several problems at this site. Heavy metals present in the waste could prove toxic to the microorganisms. It is also likely that the desired final soil concentration of 10 ppm of benzene or 1,2-dichloroethane may be well below the minimum concentration required to sustain a specialized microbal population. If this were the case, the soil would not be decontaminated to the necessary level.

Landfarming or in situ treatment may not be applicable because of the siting requirements for treatment units set forth in RCRA (40 CFR 264.271(c)). According to the regulations the maximum depth of the treatment zone must be more than three feet above the seasonal high water table, as required by RCRA regulations. Data indicates that the groundwater levels for the upper aquifer ranges from 2 to 10 feet below the ground surface.

Comment 10

Where does Sikes stand on the priority list to get funds?

EPA Response

The inclusion of Sikes on the National Priorities List allows for funding of all remedial activities. Once Superfund is reauthorized EPA will proceed with the design and construction phases.

Comment 11

Have the synergistic effects of the different pollutants in East Harris County or Sikes been studied by EPA? Have the cummulative health effects of these pollutants on East Harris County residents been studied?

EPA Response

No. Because of the variety of different pollutants present at Sikes and in East Harris County it would be very difficult to assess the synergistic effects. Studies of a similar nature to the ones proposed in the comment have proven to be inconclusive. Instead, what EPA attempts to do is to assess the health impacts of individual sites on the nearby populace. Also, EPA's Office of Research and Development and CDC/ATSDR have begun studies on the health effects of many individual compounds present at hazardous waste sites.

Comment 12

The remedial objectives proposed in the Feasibility Study appear to be appropriate for the site, but several criteria to achieve those objectives require clarification and/or modification:

A. The definition of waste is proposed as 100 ppm of polynuclear aromatic hydrocarbons (PAH), based upon clean-up criteria for a residential area. A site-specific objective for nonresidential areas (e.g. 1000 ppm PAH) would be more appropriate for the Sikes site.

B. The surface water quality criteria are "average quality" requirements, and should apply to ambient water quality in the receiving streams (San Jacinto River and Jackson Bayou).

C. The alluvial aquifer is not an appropriate drinking water supply even in the absence of the Sikes Pits, and the criterion for Objective 5 (prevent use of contaminated groundwater, upper aquifer) should be to eliminate the use of that zone as a potable water supply.

D. The criteria to satisfy Objective 9 (minimize the potential of any adverse air discharge) should extend to an assessment of odorous emissions during remedial action.

EPA Response

The proposed criteria are appropriate for the following reasons (letters of responses match the comment letter):

A. The 100 ppm PAH criteria is based on the direct contact hazard at the Sikes site. This level reflects the need to protect the many workers near and around the site and the sports fisherman that frequent the area.

B. The surface water quality criteria is a maximum limit that applies to all surface water, not just major receiving streams.

C. Whether the alluvial aquifer is an appropriate drinking water supply is irrelevant and immaterial, since it is currently being used as a drinking water supply.

D. Design of the remedy will be such that air emissions are minimized. After remediation the air at the site's border must meet OSHA standards at site boundary, and Federal Ambient Air Standards.

Comment 13

The volume and characteristics of the wastes at the site have not been sufficiently defined.

A. The current waste volume estimates could be low by a factor of three. "Miscellaneous" sludge volume estimates could be significantly in error, since the aerial extent and depth have not been fully determined, and no data are available regarding PAH concentrations in underlying soils. Also, further investigation may identify other significant sources of sludge. No current estimates are available for the volume of additional sludge that might be found, leaving additional contingency in the total amount of sludge to be managed under the FS alternatives.

B. The Tank Lake and Slough sediments should not have been included in the FS sludge volume because they do not meet the FS definition of either sludges or contaminated soils.

EPA Response

EPA disagrees. The Remedial Investigation report provides a fully sufficient evaluation of the waste volume and characteristics needed to decide upon a remedy.

A. The FS states, in detail, how waste volumes were calculated. Sludges were identified as waste containing greater than 100 ppm PNAs. The depth of contaminated soils is equal to the depth where a single volatile organic is present at a concentration equal to or greater than 10 ppm and where total PNA's are less than 100 ppm. The concern over the determination of aerial extent and depth could have arisen from an inaccurate chemical analysis found in Table 1-2 of the FS. The analysis presented does fit the definition of sludges given in the FS and has led to the impresssion that underlying soils of the main waste pit are really sludges, and that there are additional contaminated soils beneath the sludges that have not been accounted for. However, none of the chemical analyses given in Tables 1-1 and 1-2 representing sludges and contaminated soils were used to estimate waste quantities, therefore this would not have changed the numbers.

   Sampling and waste quantification were executed on a priority basis related to known or most probable areas of waste deposits. Further sampling was not performed because the size of the site (185 acres) rules out the feasibility of fully determining the compositions and quantities of all site wastes. This would not be a cost effective objective for the RI. However, enough contingency was added into the waste volume estimates that it should fall into the acceptable range for feasibility cost estimates.

B. The chemical composition of Tank Lake sediments shown in Table 1-1 of the FS indicates as claimed that Tank Lake sediments do not classify as sludges or as contaminated soils. However, this is due to an error made in the FS. The concentration shown for benzene of 1400 ppb was misread as 14 ppm, and not 1.4 ppm as it really is. For this reason, this analysis was originally shown in Table 1-2, as representing contaminated soils in Tank Lake. None of the chemical analysis for Tank Lake sediments show it satisfies the FS definition of sludge, but based on the analysis for a composite sample, Tank Lake sediments do classify as contaminated soils.

Comment 14

The RI and FS documents characterizing the Sikes Disposal Pits do not provide sufficient data to conclude that incineration is technically feasible or cost effective as a remedial action.

EPA Response

EPA disagrees. Sufficient data was developed in the RI to establish the technical feasibility of utilizing incineration, either onsite or offsite, as a remedial technology. Incinerator construction costs, operating parameters and efficiency are well documented and the type of waste materials identified have been disposed of by commercial incineration for years. Sufficient data is presented in the FS to determine the feasibility of incineration as part of an overall remedial plan. Additional physical data will be developed during the design phase to provide the specific needs of a detailed assessment of incineration. Whether incineration is cost effective or not doesn't depend only on collecting more waste samples for physical characterization, but is determined by blending many factors into a comparative analysis of alternate technologies.

Comment 15

The soil decontamination criterion for Objective 1 (prevent human contact with contaminated soils and wastes) based upon 100 ppm Polynuclear Aromatic Hydrocarbons will provide more than adequate protection to human health and the environment for the area. Additional criteria for soil decontamination based upon the simplified model in Appendix D of the FS are unnecessary.

EPA Response

The goal of the 10 ppm benzene or 1,2-dichloroethane decontamination criteria is necessary to restore the upper aquifer to drinking water quality within 30 years following the completion of remedial action. Using the site characteristics to develop the model, it was determined that the 10 ppm criteria was the level of cleanup required to attain the 30 year objective. If the site were not cleaned-up to this level, then it is highly feasible that a groundwater remediation would be necessary.

Comment 16

A 100-year flood protection dike surrounding the entire site, as suggested in the FS, is unnecessary and would cost $5 million. The flood protection dike need only protect the areas of the site in which a remedial program could be significantly impacted due to flooding which results in equipment damage or contaminant dispersal.

EPA Response

Total protection of the area used during remediation is necessary due to frequent flooding of the site. However, the dike cost estimated in the FS is approximately $1.5 million, not $5 million.

The costs used to calculate this amount were taken from Average Low Bid Unit Costs published monthly by the State Department of Highways and Public Transportation. Costs for District 12, Houston and surrounding area, in the January 1986 issue were used.

Comment 17

The wastewater treatment system is under-sized for those alternatives which require excavation of the pits without groundwater migration controls. The basis for this argument is a calculated flow rate of 350 gpm for groundwater. The flow rate in the FS is 80 gpm.

If alternative 12 (cap and slurry wall) were performed less groundwater would need to be treated, making this method even more economical.

EPA Response

EPA disagrees. The expected flow rate of groundwater into Tank Lake during excavation of sediments was the basis for sizing the water treatment system. This flow was estimated by two methods. First, the flow rate was calculated from permeability, differential head, and side wall area. This method produced a flow rate of 80 gpm. The second method was to use the flow of groundwater infiltrating Love's large sand pit south of the slough (the wall area and depth of this pit was estimated as being equal to or greater than that of Tank Lake). The discharge of water from this pit was estimated to be less than 50 gpm. The 80 gpm flow rate was used so that the worst case cost estimate would be produced.

The difference between the 350 gpm flow rate mentioned in the comment and the 80 gpm flow rate calculated in the FS is due to the permeability values used. The permeability used for the 350 gpm calculation ($2.5X10^{-3}$ cm/sec) represents a single point value from a well located upgradient and in a clean area. An average of well permeabilities located close to Tank Lake would have yielded a more realistic flow rate.

The same volume of contaminated groundwater was used for costing all alternatives. Although the volume of water to be treated would probably be less for Alternative 12 than for the preferred alternative, this would not make Alternative 12 more cost effective.

Comment 18

The time allocated to environmental permitting, design, procurement, and construction of incineration facilities in the FS (i.e. one year) is insufficient.

EPA Response

If the above comment were accurate it would be true. However, implementation time referred to accounts for only the construction period, as defined in the FS. It is anticipated that mobilization of the incinerator would be completed during the one year time period required for dike construction. The design of the incinerator will have occurred previous to this. Also, according to CERCLA, 40 CFR Part 300.68 (a) (3), Federal, State, and local permits are not required for fund financed remedial action or remedial actions taken pursuant to Federal action under Section 106 of CERCLA.

Comment 19

In the event substantial volumes of additional sludge are found, the onsite incineration option could include two subcategories. These subcategories include: increasing the incinerator size (or number of incineration trains) to incinerate all sludges within the designated 3 years; or, extending the implementation schedule to accomodate larger waste volumes.

EPA Response

EPA does not feel there will be a substantial volume change from that estimated in the FS, for the reasons stated in the response to Comment 11. However, if greater amounts of waste are found, it would be the Agency's choice to bring in more incineration trains to accomplish the cleanup in the given amount of time.

Comment 20

The implementation schedules for all alternatives considered (except the no action alternative) should be adjusted to reflect realistic time requirements. These adjustments to schedule will have a significant impact upon present value costs of implementing the various alternatives.

EPA Response

The assumption that the time requirements are unrealistic is based on the statements in Comments 13 and 18 regarding volume of wastes and time allocated for permitting, design, procurement, and construction of the incinerator. Because EPA does not believe the volumes of waste are drastically underestimated, and the comment regarding construction time was invalid, no adjustment to the schedule is required.

Comment 21

The Feasibility Study states that there appear to be trace quantities of one or more VOC's, including benzene, chlorobenzene, 1,1-dichloroethane, 1,2-dichloroethane, and vinyl chloride in the lower aquifer; however, Table I-9 of the FS indicates that none of these substances were detectable in the lower aquifer. There is also a statement that polynuclear aromatics (PNA's) are at two times the concentration in the main waste pit as in the small pit. Analytical results in table 1-1 do not support this statement.

EPA Response

The data in Table 1-1 of the FS does show that for most individual PNA's, the ratio is about two times the concentration in the main waste pit as in the small waste pit. The analysis listed in Table 1-9 of the FS represents an upgradient water sample, taken in July 1985, for setting background water quality criteria. The contamination mentioned in the comment has been detected intermittently in the lower aquifer in concentrations below the Human Health Standards (10^{-5} risk level) in wells both upgradient and downgradient of the site. This data indicated the trace contamination was not from the site, and therefore, was not be considered in the remedy.

Comment 22

There has not been a consistent approach in assessing feasible remedies throughout the FS. For example, among the objectives for remediation established by EPA are: to <u>minimize</u> site-related degradation of the San Jacinto River and the Jackson Bayou. Another objective is to <u>prevent</u> use of contaminated groundwater from the upper aquifer. The Feasibility Study states in numerous places that there is no evidence of any degradation of the San Jacinto River and Jackson Bayou from the site and there is also no evidence of any contaminated groundwater offsite in the upper aquifer.

EPA Response

EPA disagrees. There is currently no evidence of migration of contaminants offsite that would lead to the stated degradation. However, this migration will occur if appropriate actions are not taken to meet the objectives.

Comment 23

An alternate water supply can be provided for the Riverdale subdivision; this would eliminate human exposure to potentially contaminated groundwater in the vicinity of the Sikes site. This means the lower aquifer would not have to be cleaned up and a less stringent soil removal criteria could be used.

EPA Response

Even if an alternate water supply were provided, there would be no way to prevent continued use of the upper aquifer. With some of the wastes still in place the upper aquifer would continue to be contaminated, possibly leading to contamination of the lower aquifer. Also, the State of Texas may not have institutional controls that could prevent the use of the upper aquifer.

Comment 24

Natural and enhanced soil degassing are proven remediation techniques, but these alternatives were not thoroughly tested and evaluated for the Sikes site.

EPA Response

Natural and enhanced soil degassing were not considered because they are not viable technologies for remediation of the Sikes site. Soil degassing is usually effective when used on sandy soils that have been contaminated with volatile organics, such as the case with the Sikes Disposal Pits site. However, this technology is not effective when water saturated soils are involved, which is also the case at this site. This method cannot be used on sludges, and does nothing to remedy heavy metal contamination. If this technology were used on the contaminated soils in spite of the high water table, a separate remedy would still have to be designed for disposing of the sludges and soils contaminated with inorganics and non-volatiles. This makes it a very impractical remediation technique for the Sikes Disposal Pits site.