United States Environmental Protection Agency

Office of Emergency and Remedial Response

EPA/ROD/R06-84/002
September 1984

EPA

Superfund Record of Decision:

Highlands Acid Pit Site, TX

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA/ROD/R06-84/002	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE SUPERFUND RECORD OF DECISION: Highlands Acid Pit Site, TX		5. REPORT DATE 09/25/84
		6. PERFORMING ORGANIZATION CODE
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15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Highlands Acid Pit site is located 16 miles east of Houston on a 6 acre peninsula. The site is bordered on the west and south by the San Jacinto River, on the north by a wooded area, and on the east by a sand pit. The site lies within the 10-year flood plain and has subsided 2.4 feet since 1964. An unknown quantity of industrial waste sludge was disposed of at the site in the 1950's. The sludge is believed to be spent sulfuric acid wastes from a refinery process. Waste materials at the site exhibit low pH and elevated concentrations of organics and heavy metals.

Extensive excavation with off-site disposal was selected as the cost-effective remedial action for this site. The selected remedy includes: excavating wastes to the ground water level (approximate depth of 8-feet), off-site disposal to a RCRA facility, backfilling the excavated area, constructing a temporary site perimeter fence and performing ground water monitoring and site maintenance for 30-years. Alternate Concentration Limits (ACLs) will be developed for this site. The capital cost for the selected alternative is estimated at $2,407,000 with annual monitoring and maintenance costs at $14,000.

Key Words: Environmental Impacts, Flood Plain, No Action Alternative, Subsidence, Contaminated Soil, Lined Landfill Cell(s), Off-Site Disposal, ACL, Groundwater Contamination, Ground Water Monitoring

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Highlands Acid Pit, TX Contaminated media: gw, soil, sludge, leachate Key Contaminants: sulfuric acid , industrial sludges, VOCs, metals, refinery wastes		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)* None	21. NO. OF PAGES 56
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ROD ISSUES ABSTRACT

Site: Highlands Acid Pit, Texas

Region: VI

AA, OSWER
Briefing Date: June 6, 1984

SITE DESCRIPTION

The Highlands Acid Pit site is located 16 miles east of Houston on a 6 acre peninsula. The site is bordered on the west and south by the San Jacinto River, on the north by a wooded area, and on the east by a sand pit. The site lies within the 10-year flood plain and has subsided 2.4 feet since 1964. An unknown quantity of industrial waste sludge was disposed of at the site in the 1950's. The sludge is believed to be spent sulfuric acid wastes from a refinery process. Waste materials at the site exhibit low pH and elevated concentrations of organics and heavy metals.

SELECTED ALTERNATIVE

Extensive excavation with off-site disposal was selected as the cost-effective remedial action for this site. The selected remedy includes: excavating wastes to the ground water level (approximate depth of 8-feet), off-site disposal to a RCRA facility, backfilling the excavated area, constructing a temporary site perimeter fence and performing ground water monitoring and site maintenance for 30-years. Alternate Concentration Limits (ACLs) will be developed for this site. The capital cost for the selected alternative is estimated at $2,407,000 with annual monitoring and maintenance costs at $14,100.

ISSUES AND RESOLUTIONS

1. The no action alternative was eliminated from consideration because of the threat of public exposure by direct contact, the potential impacts on aquatic life, the unstable nature of the site as a result of subsidence and the site's location in the 10-year flood plain.

KEY WORDS

- Environmental Impacts
- Flood Plain
- No Action Alternative
- Subsidence

ISSUES AND RESOLUTIONS	KEY WORDS
2. At the time the ROD was signed, the Region was to compare costs associated with disposal of excavated waste materials in lined and unlined cells. This information was used to assess the final disposal option.	. Contaminated Soil . Lined Landfill Cell(s) . Off-Site Disposal
3. No remedial action was proposed for the ground water at this time; data from the ground water monitoring program will be evaluated to determine if any future remedial measures are necessary to protect the environment and public health consistent with RCRA 264 requirements. Alternate Concentration Limits will be determined for the site.	. Alternate Concentration Limit (ACL) . Ground Water Contamination . Ground Water Monitoring

RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION

Site: Highlands Acid Pit Site, located south of the western end of Clear Lake Road in Highlands, Texas.

Documents Reviewed

I have reviewed the following documents describing the analysis of cost-effectiveness of remedial alternatives for the Highlands Acid Pit site:

- Highlands Acid Pit Site Investigation, Espey, Huston & Associates, Inc., and Roy F. Weston, Inc., December 1983.
- Highlands Acid Pit Site Remedial Action Feasibility Study, Espey, Huston & Associates, Inc., and Roy F. Weston, Inc., December 1983.
- Staff summaries and recommendations.
- Transcripts from the public meeting

Description of Selected Remedy

- Excavate the waste material (depth of excavation approximately eight feet).
- Transport the waste material to a permitted Class 1 disposal facility.
- Backfill the excavated area with clean fill. The fill will include six inches of topsoil that will be seeded, mulched, and fertilized.
- Construct a temporary site perimeter fence with warning signs.
- Install a groundwater monitoring system.
- Perform groundwater monitoring and site maintenance for a 30 year period.

Declarations

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan, I have determined that extensive excavation with off-site disposal for the Highlands Acid Pit 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 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, the off-site transport and secure disposition is more cost effective than other remedial action, and is necessary to protect public health, welfare and the environment.

I also will evaluate whether groundwater corrective measures are needed to protect the environment and public health. In the interim, I am approving a groundwater monitoring program.

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

JUN 25 1984

(DATE)

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

HIGHLANDS ACID PIT

Highlands, Texas

January 1984

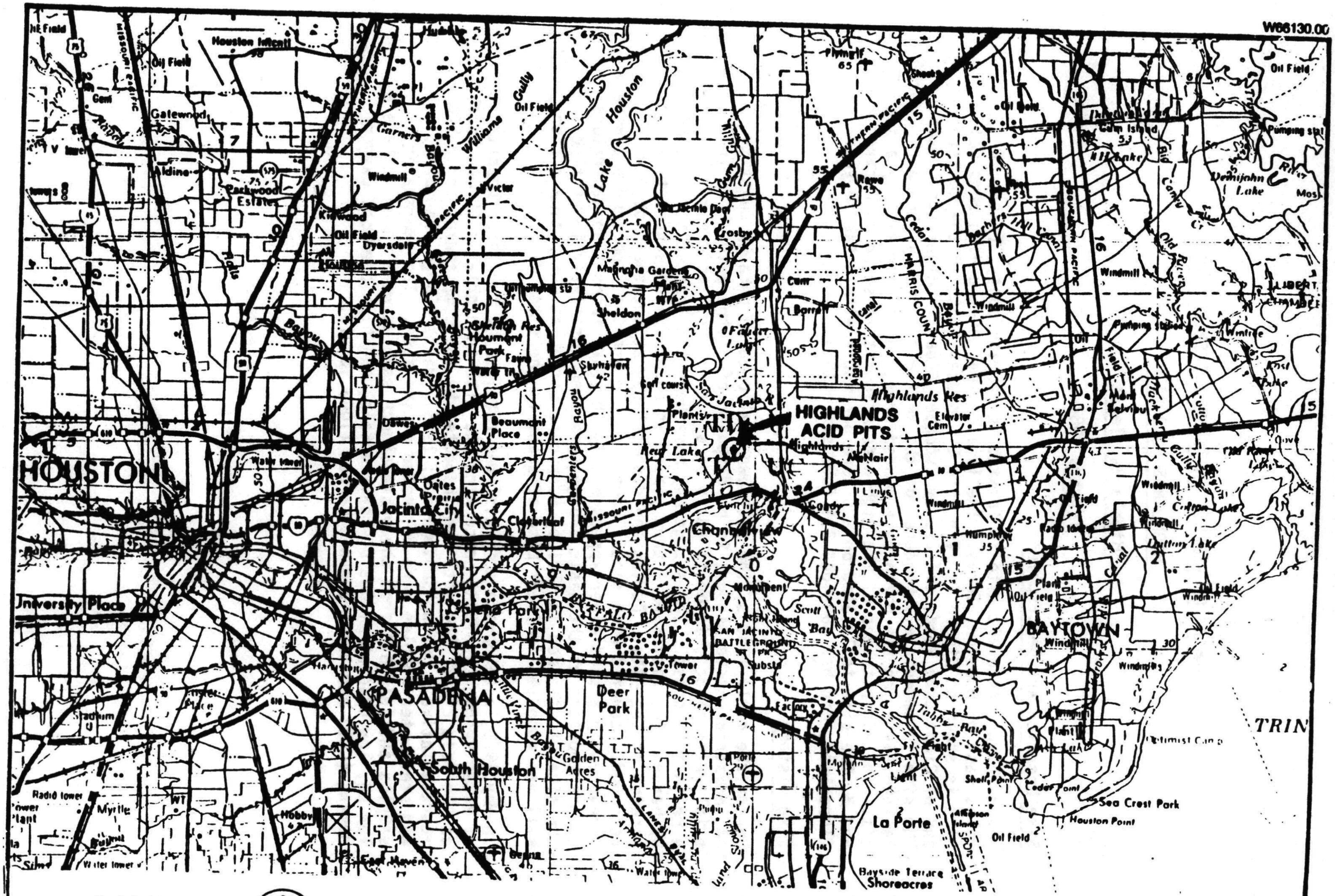
Site Location and Description

The Highlands Acid Pit site is located in Harris County, Texas, 16 miles east of Houston, Texas. The location map of the Highlands Acid Pits is shown on Figure 1. The site is located south of the western end of Clear Lake Road, off Crosby Lynchburg Road in Highlands, Texas. The site is immediately bordered on the west and south by the San Jacinto River, on the north by a wooded area, and on the east by a sand pit. The vicinity map of the Highlands Acid Pit is shown on Figures 2 and 3. The site is located on a 6 acre peninsula within the 10-year floodplain, and has subsided 2.4 feet since 1964.

Site History

During the early 1950's, the site owner allowed an unknown quantity of industrial waste sludge, to be disposed of at the site. The industrial waste sludge, is believed to be spent sulfuric acid sludge from a refinery process. The sludge may have been transported to the site by barge. The wastes were then placed in an excavated sand pit or pits located at the site. During the disposal operation, the sludge was reportedly covered with sand. However, some areas of the sand pit were uncovered by a sand miner approximately 10 years later. No generators or transporters of the waste sludge have been positively identified. The site was flooded in 1961 by Hurricane Carla, at which time a fish-kill was reported in Clear Lake adjacent to the site.

In May 1978, a telephone complaint was received by the Texas Department of Water Resources (TDWR) concerning the site in Highlands (known locally as the Acid Pit). The site was inspected by the complainant and a TDWR representative. During September of 1978, waste sludge, sediment, and stormwater samples were collected at the site. The stormwater samples and leachate from the waste sludge samples were found to have a low pH, low concentrations of heavy metals, and high chemical oxygen demand (COD) and total organic carbon (TOC) levels.



Scale in Miles
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FIGUR[illegible]
Location Map of Highlands Aci[illegible] Pits.

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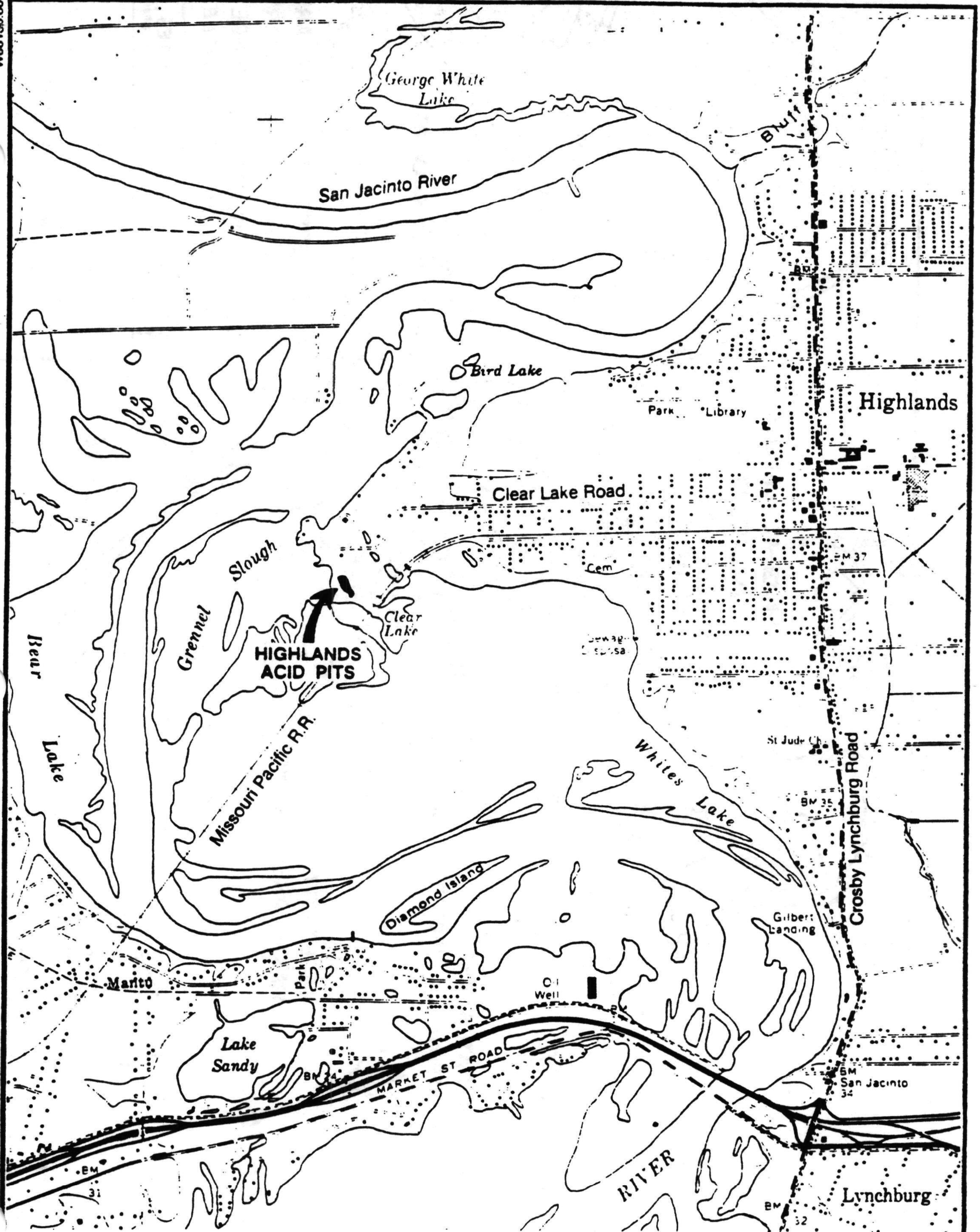

FIGURE 2
Vicinity Map of Highlands Acid Pits.

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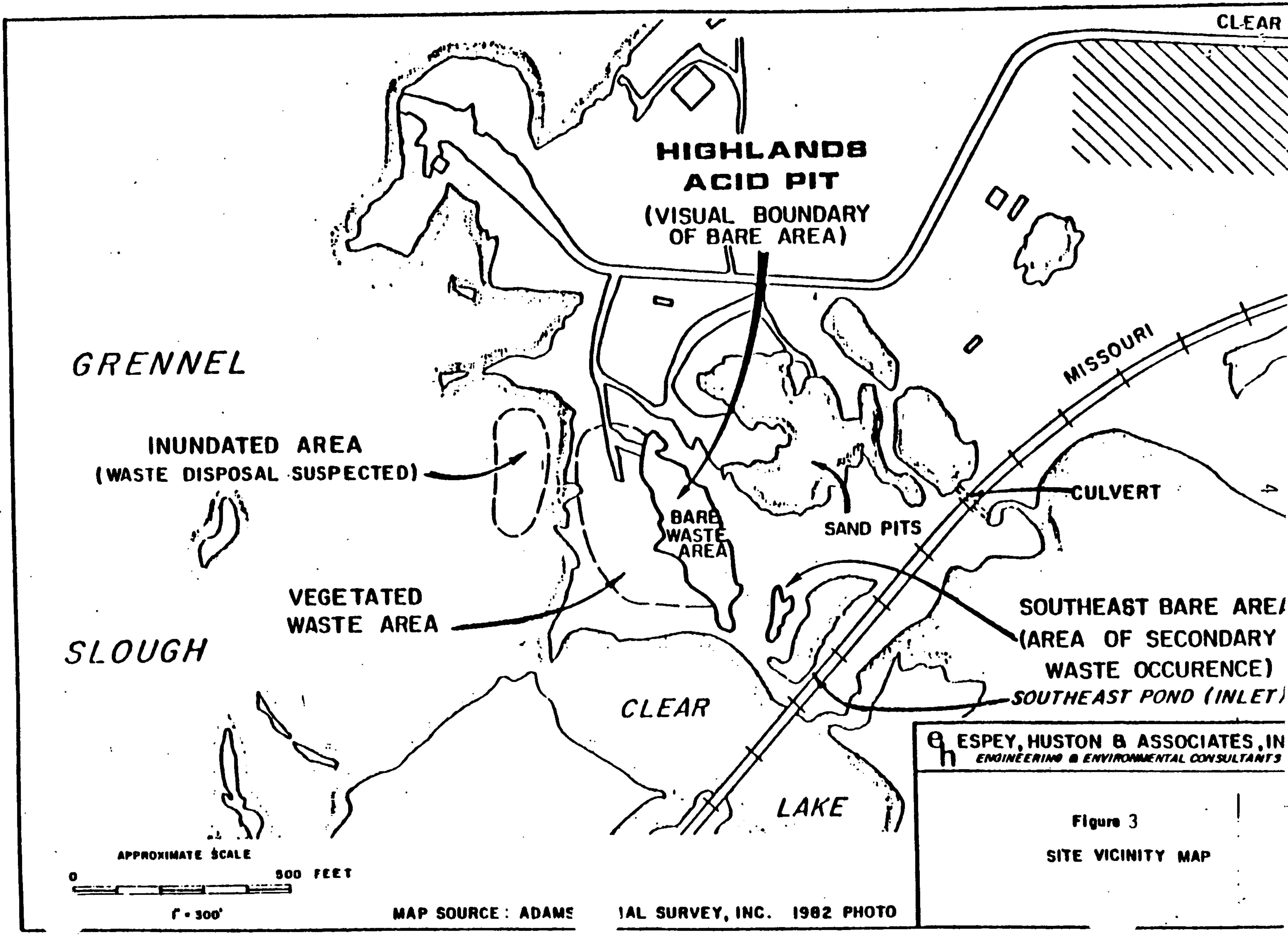

ESPEY, HUSTON & ASSOCIATES, IN

ENGINEERING & ENVIRONMENTAL CONSULTANTS

Figure 3

SITE VICINITY MAP

During June of 1981, six soil borings were conducted at the site and three of the soil borings were completed as monitoring wells. In October of 1981, groundwater samples were collected. Heavy metals and volatile organics were detected at concentrations in the parts per billion (ppb) range in these samples.

In August 1982, the application for a Cooperative Agreement for remedial investigation and feasibility studies (RI/FS) at the Highlands Acid Pit site was filed. The Cooperative Agreement for $402,864 between EPA and the State of Texas was awarded on September 30, 1982. In February 1983, Espey, Huston and Associates of Austin, Texas and Roy F. Weston of Houston, Texas were selected to conduct the RI/FS. The site work for the investigation was completed in July of 1983. The Feasibility Study was started in July 1983 and completed in December of 1983. The major findings of the Investigation and Feasibility Reports are discussed in the section titled "Current Site Status."

Current Site Status

The Highlands Acid Pit remedial investigation was a multi-disciplined approach consisting of site surveying, air monitoring, soil boring and monitoring well installation, test pit excavation, soil and groundwater sampling, geophysical surveys, water level data collection, surface water/sediment/benthos sampling, and land use and vegetation surveys. The following is a summary of the results of the investigation.

The site is surrounded by surface water bodies associated with the river system, Grennel Slough on the west, Clear Lake on the south, ponds in the southeast and sand pits to the northeast. Therefore, the site is essentially a peninsula extending into the San Jacinto River system. The total area of the peninsula is about 6.0 acres. The hydrographic system is very dynamic and is often subject to extreme water level fluctuations. Primary hydrological controls on the site are Lake Houston, Galveston Bay via the Houston Ship Channel, and hydrometeorological events within the local watershed. Lake Houston impounds the San Jacinto and is the primary controlling factor on the flow in the river. The effects of the Houston Ship Channel on the site are tidal oscillations and long term rise and fall of water levels. The highest surface water level measured in the field investigation was 3.5 feet mean sea level (MSL) in the Clear Lake (i.e., San Jacinto River). The tide range observed was on the order of 1.3 to 2.0 feet. Ground elevations on the site range from 5 to 9 MSL. Therefore, the higher ground elevations are on the order of 5.5 feet above the highest river elevations measured during the field study.

The site is flood-prone given the low relief between the site and the river. Data from the Harris County Flood Control District indicate the following approximate flood elevations at the site area:

Recurrence Period Years	Water Surface Elevation Feet (MSL)
10	9.6
50	14.4
100	16.9
500	22.1

Therefore, less than the 10-year flood will inundate the site, exposing the waste material to erosion. This elevation only considers the hydrology of the San Jacinto River drainage system, therefore, hurricane surges add an additional flooding potential to the site.

The Highlands Acid Pit site is located on the banks of the San Jacinto River and is geologically situated within recent meanderbelt alluvial sediments (upper sand). This alluvial material ranges in thickness from 18.5 feet to 26.0 feet with an average thickness of 22.5 feet.

The recent alluvium unconformably overlies the Beaumont Clay, and the sharp contact between the two formations is evident. This clay deposit is approximately 30 feet thick arcoss the entire site area. Samples of the upper 1 to 6 feet of the clay were typically stiff, very slightly silty. Below this clay interval lies a 23 foot to 26 foot thick sand interval (middle sand). Below this sand interval another clay deposit was encountered with a thickness of approximately 25 feet. Underlying this clay interval a sand deposit (lower sand) was encountered with an average thickness of 16 feet.

All of the groundwater for the region is furnished by two aquifers, the Chicot and the Evangeline. Both of these aquifers underlie the site. The Chicot Aquifer is made up of the four Pleistocene age formations and the overlying recent material. Therefore, at the site, the Chicot extends from the ground surface to a depth of about 700 feet. The Evangeline Aquifer is below the Chicot.

A water well inventory in the vicinity of the Highlands Acid Pit was conducted. Within a slightly over a one-mile radius of the site, 11 (possibly 12) water wells were identified. Table 1 is a compilation of these wells plus pertinent completion data and Figure 4 indicates the general locations. All water wells were completed in the Chicot Aquifer. Groundwater is not obtained from alluvial deposits in the site area and vicinity. Well depths in the Chicot are generally greater than 200 feet. However, one well was completed from 74 feet to 84 feet below ground surface. Existing groundwater wells in the Chicot are not being impacted by the site.

TABLE 1

WATER WELL INVENTORY AND WELL COMPLETION DATA

A	TDWR No.	Owner	Driller	Date Comp.	Depth of Well	Casing Dia.	Casing Depth	Water Bearing Unit	Altitude of Land Surface	Depth below Datum	Date of Measurement	Method of Lift	Use of Water	Remarks
	65-16-402	J. McDonald	J. W. Evans	1941	228	3 2	222 228	Chicot	30	72	Sep 1941	None	None	Screen from 222 to 228. Well destroyed.
	65-16-405	W. B. Williams	Lowry Water Wells	1967	421	4 2½	402 421	Chicot	36	210	Aug 1967	Sub, E	D	Screen from 405 to 420
	65-16-406	Conrad Ermel	A&L Pump & Well Service	1968	286	4 2½	263 286	Chicot	36	188	Mar 1968	Sub, E	D	Screen from 271 to 286
1	65-16-502	Harris Co. FWD No. 1 Well 1	Layne Texas Co.	1949	482	16 8	415 482	Chicot	38	--	—	T, E	P	Screen from 429 to 471. Original depth was 551. Well reworked in 1963. Reported yield 328 gpm in 1963.
5	65-16-503	Harris Co. FWD No. 1 Well 2	Layne Texas Co.	1949	476	12 6	417 476	Chicot	39	176.7	May 1962	T, E	P	Casing slotted from 421 to 476.
6	65-16-505	Harris Co. WD & ID No. 1	McMasters and Pomeroy	1940	606	8 7 6	403 -- 606	Chicot	39	80	Apr 1940	None	None	98 ft of screen from 417 to 589. Reported yield of 500 gpm with 92 ft drawdown in 1940. Well destroyed.
7	65-16-5E	J. M. Camfield	Marvin Gilbert	1972	84	2	74	Chicot	--	30	Jan 1972	—	I	Casing slotted from 74-84.
8	65-16-5H	H. W. Fondon	H. T. Chapman	1973	235	2	235	Chicot	--	158	Aug 1973	—	D	Casing slotted from 225-235.
9	65-16-5N	J. H. Summers	Millard Smith	1975	300	4 2½	290 300	Chicot	--	180	Sep 1975	Sub, E	D	Casing slotted from 290-300.
9	65-16-5N	Carl Hamil	Johnson's Water Well	1978	274	4 2½	259 274	Chicot	--	155	Jul 1978	Sub	D	Duplicate well at this location.
0	65-16-5P	Consumers Water Corp.	Shoppa Water Well	1978	343	6 4	276 342	Chicot	--	92	Apr 1978	—	P	Casing slotted from 272-342.
1	65-16-5W													Well plotted but no data on file at TDWR.

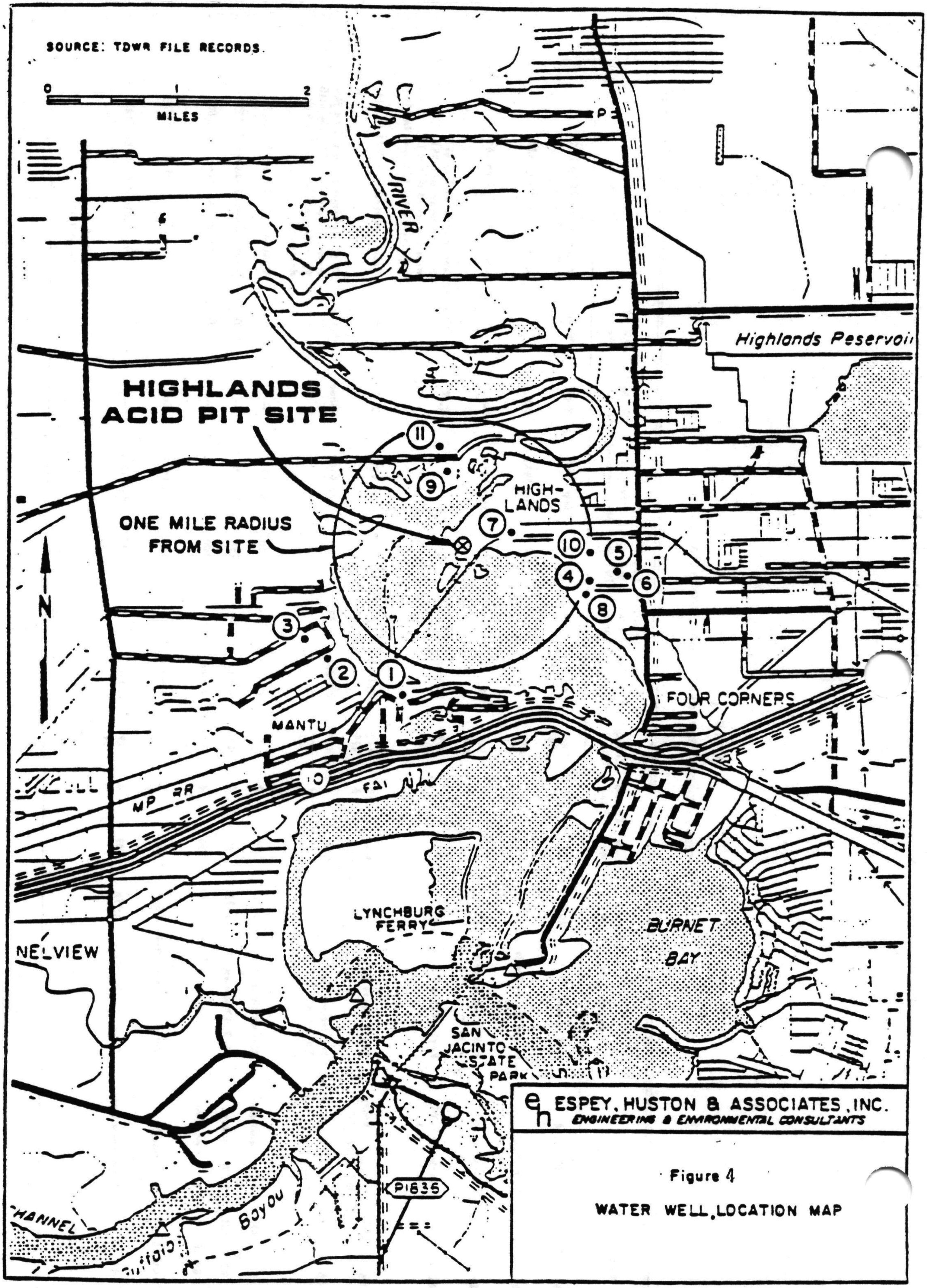

Figure 4

WATER WELL LOCATION MAP

Continuous water level data was collected during the site investigation. This data indicates that a hydraulic connection exists between the upper alluvial sand and the San Jacinto River. This was evidenced by the close correlation of fluctuations of ground and surface water. The average permeability of the upper sand is 5.08 feet per day, or 1.8 x 10^{-3} cm/second. This permeability is typical of fine sand and is sufficient to allow active interchange between the upper sand and the surface water bodies.

Groundwater, in the upper sand, flows radially from the site and discharges to Grennel Slough, Clear Lake, and the adjacent sand pits (See Figures 5 and 6). Approximately 45% of the groundwater leaving the site discharges into the sandpits. The remaining 55% discharges to Clear Lake and Grennel Slough with the majority flowing toward Clear Lake.

The groundwater velocities and discharges into San Jacinto River (Grennel Slough), Clear Lake, and the sand pits are summarized in the following table.

TABLE 2

	Discharge (cu.ft/day)	Velocity (ft/yr)
San Jacinto River	19.0	14.8
Clear Lake	20.9	8.2
Sand Pits	32.8	14.1

The distances from the waste areas to the surface water bodies are about 20 feet to San Jacinto River, 100 feet to Clear Lake, and 50 feet to the sand pits. Using these distances with the groundwater velocities for each respective direction of flow, the travel times for groundwater from the edge of the waste area to the surface water bodies are 1.4 years to San Jacinto River, 12.2 years to Clear Lake, and 3.5 years to the sand pits. Therefore, sufficient time has elapsed for waste material in the groundwater to be presently discharging into the surface water bodies.

Subsidence is a factor affecting the site. Due to extensive groundwater withdrawals in the Houston area, approximately 2.4 feet of subsidence has occurred in the area since 1964. However, subsidence has been ocurring in the region since the early part of the 1900's. Since 1976, the Harris-Galveston Coastal Subsidence District has been successful in curtailing pumpage in the area and has managed to reduce potential subsidence rates to virtually zero. If groundwater demand increases in the future, approximately 3 to 4 feet of additional subsidence is estimated by the year 2000. Several investigators postulated that faulting in the area has been aggravated by subsidence. During the field investigation no direct evidence of faulting was discovered at the site location. Figures 7 and 8 are aerial photographs of the site vicinity for 1955 and 1982 indicating the location of the waste area and the impact of subsidence.

Surface water runoff at the site conforms to the site togpography. The site is composed of three drainage basins which drain to Grennel Slough, Clear Lake, and the sandpits. Calculated runoff for the vegetated area of the site to Grennel Slough is 34.5% of the total precipitation, or approximately 16.3 inches per year. Surface runoff in the bare area is approximately 50% of the total precipitation or 26.6 inches per year. An estimated 15.7 tons of sediment per year are eroded from the bare portion of the waste area by this runoff. Runoff from the bare waste area on the site flows southeastward through a drainage course and collects in a swamp in close proximity to the north shore of Clear Lake. Soil and sediment samples collected in this area and immediately south in Clear Lake indicate the presence of slight contamination both in the swamp and the northern fringes of Clear Lake.

To evaluate the nature and distribution of waste at the site, soil and core samples, groundwater samples, surface water samples, sediment and benthos samples were collected for evaluation and laboratory analyses. It appears that the waste disposal pits were relatively shallow and, based upon the results of the field investigation and interviews were less than 10 feet in depth. The waste materials at the site are characterized by a low pH, and elevated levels of total organic carbon, sulfate heavy metals and organics consisting of benzene, toluene, xylene, and phenols. The wastes above the water table include the original waste materials, runoff waste, and highly contaminated black sand. This area covers about 1.45 acres. To calculate the volume in this area, the depth to the groundwater table was taken to be an average of 8 feet. The volume contained in the 1.45 acres is approximately 19,000 cubic yards (yd^3) with an estimated weight of 25,000 tons. Within the shallow alluvial sand (upper sand) there are about 77,428 yd^3 which includes the 19,000yd^3 of original waste and dissolved geologic materials encompassing about 2.51 acres. The geological materials bordering this discolored zone are also contaminated, as evidenced by soil water chemistry. This peripheral zone plus the 2.51 acre area contained about 103,165 yd^3 and encompass 4.41 acres.

The groundwater in the upper sand at the site is contaminated and is discharging into the Grennel Slough, Clear Lake, and the sandpits. However, given the dynamics of the surface water system, the presence of the waste constituents in the surface water system were not detected above what was determined to be background. The only exception to the above is the sandpits northeast of the site, where elevated concentrations of sulfate and total dissolved solids may be due to discharge of contaminated groundwater. These elevated readings may also be caused by surface runoff. However, hazardous constituents were not detected in the sandpits.

The major contaminants present in the soil/waste and the groundwater at Highlands Acid Pit are summarized in Table 3. Each contaminant is presented with the range of concentrations, as well as an average concentration, found during site investigative work. An estimated weight of each soil/waste contaminants is also presented.

TABLE 3

SUMMARY OF SELECTED SITE CONTAMINANTS

Contaminant	Groundwater		Soil/Waste		
	Range*	Average*	Range**	Average**	Tons***
Lead	<0.01 - 0.82	0.19	<0.5 - 185	49.2	1.2
Manganese	0.015 - 39.4	14.5	0.5 - 112	15.7	0.4
Chromium	0.005 - 0.772	0.354	0.5 - 1.2	0.7	0.02
Beryllium	-	-	6 - 24	11.0	0.3
Benzene	1 - 80.6	29.3	<2.5 - 822	454	11
Toluene	0.005 - 0.202	0.048	<2.5 - 21.2	13.5	0.3
Xylene	33.5 - 417	216	-	23.6	0.6

* Units - mg/l

** Units - mg/kg

*** Based on estimated 25,000 tons of contaminated soil/waste (19,000 yd^3 of soil/waste with estimated density of 100 pcf).

Groundwater elevations in the shallow alluvial sand range from +1.64 feet MSL to +2.25 feet MSL. The groundwater elevation in the middle sand was determined in one well and found to be -1.53 feet MSL. Groundwater elevations in the lower sand range from -57.02 feet MSL. to -64-25 feet MSL. Therefore, groundwater level elevations decrease with increasing well depth, and there is a vertical gradient creating a potential for vertical flow from the upper alluvial sand to the lower sand intervals. However, the low permeability of the intervening clays between the sand units, the lack of evidence of faulting at the site, and groundwater quality in the deeper sands suggest that the deeper sands have not been impacted by waste materials.

Two areas of secondary waste deposition were investigated as part of this study. These are the inundated area in Grennel Slough west of the site, and the southeast bare area. No significant amounts of waste were found in the inundated area. However, the results of the investigation indicate that the inundated area may have been an area of secondary or minor waste deposition. Waste materials are present in the southeast bare area as a result of runoff and erosion from the Clear Lake. The data indicate that waste materials are discharging into Clear Lake immediately south of the southeast bare area.

The results of benthos sampling and evaluation indicate no measureable impact to these organisms. This is probably due to the strong dynamics of the San Jacinto River system which dilutes ground and surface water as well as sediment runoff from the site.

One major impact associated with the site is exposure of the waste to the hydrologic system. The upper groundwater at the site is contaminated to a degree that the water is unfit for any practical use, and is discharging to highly utilized surface water (i.e. the sand pits and San Jacinto River system). However, no measureable impact was found to date. Floods are easibly capable of inudating the site and washing the waste materials directly into the San Jacinto River system. Continued subsidence could permit the water table to rise into the waste materials, increasing the discharge of contaminants to the shallow groundwater and adjoining surface water bodies. The potential exists for approximately 14 tons of additional contaminants to reach the hydroligic system, with the possibility for significant adverse impacts on aquatic life due to the toxic nature of the contaminants listed on Table 4.

A second major impact of the site is human contact with the waste. The San Jacinto River complex is an active area of recreational activity. The sand pits adjacent to the site are used for swimming by the local residents, as evidenced by a rope swing on the western shore of the sand pits which is adjacent to the waste disposal area. Fishing from the banks of Clear Lake is also apparent due to the presence of fishing equipment (lines, lures, etc.). This is consistent with the known facts that the San Jacinto River is an area of intensive sport and commercial fishing and recreation.
The following types of aquatic species are known to be present near the Highlands Acid Pit:

- Mullet
- Crabs
- Killy Fish
- Catfish
- Grennel
- Bass
- Shrimp
- Silverside
- Perch
- Shad
- Bream

The aquatic biota in the river system represent the most likely receptor of off-site contaminant migration. A large fishkill reportedly occurred in Clear Lake when the site was flooded as a result of Hurricane Carla. The fishkill may have been the result of contaminants released from the Highlands Acid Pits during the flooding. Due to the very dynamic hydrologic environment at the site pollutant transport modeling could not be done in a cost effective manner.

Several threatened or endangered species are known or suspected to occur in Harris County, Texas. Endangered species include the American alligator, Houston toad, brown pelican, southern bald eagle, peregrine falcon, Attwater's prairie chicken, least fern, red-cockaded woodpecker, and the paddlefish. Threatened species that occur in the county include the southeastern bat, reddish egret, white-tailed hawk, white-faced ibis, swallow-tailed kite, osprey, wood stork, Texas horned lizard, the Louisiana milk snake, and the Rio Grande frog. Based on habitat preference, several of these species may occasionally have direct contact with the Highlands Acid Pit site, however, no specific information is available.

Vegetation analyses at the site indicate reduced growth of species on the site. This situation may result in contaminants being passed through the food chain to higher organisms. While no specific analyses were performed to assess the degree to which this passage occurs, it is possible that the contaminants could reach humans. Mechanisms include hunting of browsing animals, and waste materials being blown onto any nearby vegetable crops. Some of the contaminants at the site are acutely toxic, while others are known or suspected carcinogens, mutagens, teratogens. Therefore, a potential threat exists to human health through inhalation, ingestion, and absorption of containmants. Potential human health risks of specific contaminants are discussed in Appendix A of the Feasibility Study. The Hazard Ranking System (HRS) determined that the greatest potential hazard to the local population is consumption of fish which bioaccumulate toxics. The HRS estimates that the equivalent population at risk is 3240.

Enforcement

Only one potentially responsible party, the landowner, has been identified. Attempts to identify the generator(s) of the waste have been unsuccessful. The identified party is on social security and does not have the financial assets to pay for the cleanup of the site. We recommend that the Fund be used for the cleanup of this site.

Alternatives Evaluation

The remedial action objectives for Highlands Acid Pit developed in the Feasibility Study have been slightly modified to more clearly address the nature of contamination at this site. The objectives are as follows:

- Control off-site migration of wastes by surface and subsurface pathways to mitigate future environmental impacts on surface waters and groundwaters;

- Minimize potential for human contact with waste materials.

The selected objectives are based upon (1) maintaining existing contact recreation, non-contact recreation, and fish and wildlife propagation uses of the nearby surface waters, (2) maintaining present use of lower aquifer as a water supply and (3) providing a soil and air quality on-site compatible with existing recreational and developed land uses in the area.

Development of specific criteria or standards to measure how the objectives are achieved, is difficult for Highlands Acid Pit, since the main concern is to protect the environment and public health from potential risk to future exposure to wastes. Since the surrounding surface waters have not been impacted to date, it is EPA's opinion if the surrounding surface waters are required to achieve specific EPA water quality criteria (WQC) based on surface water uses, all objectives should be met. Relevant WQC are shown on Table 4 along with average contaminant concentrations in the groundwater and soil/waste. Due to the carcinogenicity of several waste contaminants and/or high concentrations of specific contaminants, the potential for exceeding WQC exists if additional soil/waste contaminants are permitted to leach into the shallow groundwater or by direct migration of wastes into the surrounding surface waters.

TABLE 4

WASTE CONCENTRATIONS AND SPECIFIC WQC

Contaminant	Average Concentration		WQC (mg/l)
	Groundwater (mg/l)	Soil/Waste (mg/kg)	
Lead	0.19	49.2	0.170[1]
Chromium	0.354	0.7	0.021[1]
Beryllium	-	11.0	0.000117[2]/0.13[4]
Benzene	29.3	454	0.040[2]/5.3[4]
Manganese[3]	14.5	15.7	-
Xylene[3]	216	23.6	-

1. Aquatic life, freshwater acute.
2. Human health, carcinogenicity at 10^{-6} risk level, via aquatic organisms, only.
3. No established WQC, however, high concentrations are of concern.
4. Lowest species mean acute toxicity, freshwater.

The Feasibility Study developed several remedial action methods to achieve the above objectives. The applicable remedial action methods that were screened are shown in Table 5. In addition to the methods outlined in Table 5, the no-action alternative was also considered but was eliminated based on its inadequacy for meeting response objectives to mitigate the site specific problems and the fact that pathways exist for significant migration of the waste materials.

TABLE 5

POTENTIAL REMEDIAL ACTION METHODS

1. Site Management

   - Waste stabilization
   - Grading
   - Surface water diversion
   - Revegetation
   - Monitoring and maintenance

2. Infiltration Controls (Cap systems)

   - Synthetic membrane
   - Clay
   - Soil admixtures
   - Site management (see 1 above)

3. Waste Fixation

   - In situ
   - Removal/fix/replace
   - Site management (see 1 above)

4. Excavation with Off-Site Disposal

   - Disposal as hazardous waste
   - Fix and dispose as solid waste

5. Waste Encapsulation

   - Cap systems (see 2 above)

   - Liner systems

     - compacted clays
     - synthetic membranes
     - asphaltic liners
     - concrete mixtures
     - soil admixtures

   - Site management (see 1 above)

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TABLE 5 (Concluded)

6.	Incineration
7.	Land Treatment of Waste
8.	Treatment and Utilization for Energy Recovery
9.	RCRA Equivalent Landfill On-Site

The remedial action methods were screened using the following criteria:

- Technical Feasiblity
- Environmental Effectiveness
- Implementability (Time Frame)
- Cost-effectiveness

The technical feasibility was comprised of implementability, operability, and reliability.

- To be implementable, a technology must be able to be succesfully applied or accomplished.
- To be operable, it must be practical and feasible.
- To be reliable, it must be dependable and proven.

To assure the above conditions were met, only proven technologies (as opposed to state-of-the art) were considered.

The environmental effects of a remedial action strategy are an especially important evaluation criterion. Operations that created additional adverse impact or significant risk of impact were avoided. Therefore, applicable technologies were evaluated on the basis of their ability to accomplish the following set of environmental goals:

- Perform necessary environmental site restoration
- Create no additional negative impacts upon air, surface water, groundwater or soil quality.
- Create no impact upon neighboring properties.
- Make the site aesthetically more acceptable
- Prevent or minimize the potential for human contact with waste materials after site closure is complete.

Another criterion which was used was the time frame for implementation and maintenance. The time frame for any remedy will ultimately affect its cost and the potential for adverse environmental impact. Short-term managment can be implemented; and long-term remedial actions usually should be avoided based on economic and environmental considerations. Remedial action methods which maximized short-term accomplishment and minimized the long-term monitoring and maintenance work were favored.

A remedial cleanup program must be implemented and operated in a cost-effective manner in addition to successfully addressing the environmental concerns at the Highlands Acid Pit site. In considering cost-effectiveness of the various technologies, the following costs were considered:

- Capital Costs
- Operating Costs
- Maintenance Costs
- Monitoring Costs

Capital costs and occasionally operating costs are encountered during the implmentation phase of a remedial action program, but monitoring and maintenance costs continue during the post-closure period. Monitoring and maintenance operations can represent a substantial portion of a remedial action strategy. The added costs for these operations should be minimized.

The present worth method was utilized to evaluate the total cost of a remedial action strategy over the design period. The design period and discount rate used in the evaluation were 30 years and 10 percent, respectively.

An indepth discussion regarding the initial screening can be found on pages 7-10 to 7-22 of the feasibility report and is summarized on table 6.

The alternative methods which were selected as most viable, during the initial screening, to achieve the desired remedial action objectives were then evaluated in detail in order to develop a basis for their subsequent use in defining potential remedial action plans. The remedial action methods selected for evaluation were:

- Site Management
- Infiltration Control (Cap System)
- Excavation with Off-site Disposal
- Waste Encapsulation
- RCRA Equivalent Landfill On-site

TABLE 6

REMEDIAL ALTERNATIVE METHODS
INITIAL SCREENING RESULTS

Selected Methods	Objectives Achieved			
	Ground Water*	Soils	Surface Water*	Air**
Site Management	X		X	X
Infiltration Control	X	X	X	X
Excavation with Offsite Disposal	X	X	X	X
Waste Encapsulation	X	X	X	X
RCRA Equivalent Landfill On-Site	X	X	X	X

Rejected Methods	Reason for Rejection
Waste Fixation	Extent and depth of waste prohibit in situ fixation.
	Variation in waste material composition and organic compounds make acceptable fixation technically difficult.
	Waste removal with fixation and reburial results in excessive environmental risk.
Incineration	Low BTU values of waste and mixture with inert materials prevent efficient incineration.

TABLE 6 (Concluded)

Land Treatment	Type of waste contaminants unsuitable for bioreclamation. Extensive land area required.
Energy Recovery	Low BTU values and mixture with inert materials prevent energy recovery.

* Is being achieved at present.

** Will be achieved by implementing measures which focus on soils objective.

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Site specific applications for each of the measures were developed and evaluated to clarify important features and identify any elements which are inappropirate or unfavorable. Each alternative measure, was also evaluated and described in terms of the screening parameters outlined previously.

An indepth discussion regarding the detailed evaluation can be found on pages 7-22 to 7-84 of the feasibility report and is summarized on table 7.

The site management plan is the only method that does not achieve all of the planning objectives when considered alone. Therefore since the site management activities are required for any remedial measures of the Highlands Acid Pit, this method has been included as part of all remedial action plans as shown in table 8. Waste encapsulation was rejected in the final evaluation since it achieves the same objectives as infiltration control at a much greater cost.

Based on the results of the above evaluation it was determined that the Extensive Excavation Off-Site Disposal remedial method is the most cost-effective alternative. (See Recommended Alternative Section for details on selection).

Community Relations (See attachment 1)

Consistency With Other Environmental Requirements

Other environmental laws were reviewed to establish baseline technical requirements and determine if the recommended remedy met these requirements.

The RCRA technical regulations (40 CFR Part 264) were reviewed to establish baseline requirements and determine what components of the recommended remedy did or did not comply. In addition, an alternative was developed in the Feasibility Study that would fully comply with RCRA regulations for construction of a hazardous waste landfill. This alternative was described in the previous section. The RCRA equivalent landfill alternative on-site was about 397 percent more expensive than the recommended action and did not result in increased protection to public health, welfare, and the environment. The recommended off-site action, alternative EEOSD, will comply with RCRA generator & transporter requirements. The proposed remedy will include a groundwater monitoring program. The monitoring program will be used to determine if future conditions warrant additional remedial actions. This program will continue for at least 30 years.

TABLE 1

ALTERNATIVE REMEDIAL METHODS

DETAILED EVALUATION RESULTS

Remedial Methods	Status	Reasons for Rejection
Site Management		
• Site clearing/grading, revegetation, maintenance and monitoring	Preferred	—
• Flood protection	Rejected	Excessive costs, floodway encroachment, incompatible with desired land uses.
• Surface water diversion	Rejected	Limited run-off from adjacent areas.
Infiltration Control		
• Multilayer cap-clay and membrane seals	Preferred	—
• Soil admixtures, structural seals	Rejected	Technical uncertainties due to cracking and deterioration
Excavation with Off-Site Disposal		
• Extensive excavation off-site disposal	Preferred	—
• Limited excavation, off-site disposal	Preferred	—

TABLE 7 (Concluded)

Remedial Methods	Status	Reason for Rejection
Excavation with Off-Site Disposal (Cont'd)		
o Excavation to clay layer	Rejected	Costs are six times that of extensive excavation alternative.
Waste Encapsulation		
o Multilayer cap and clay liner	Preferred	—
o Soil admixtures, structural seals	Rejected	Technical uncertainties due to cracking and deterioration
o Synthetic membrane bottom and wall liners	Rejected	Unreliability under site hydrogeologic conditions and type of waste materials
RCRA Equivalent Landfill On-Site		
o Excavation of all on-site contaminated materials	Preferred	—
o Construction of landfill on-site above ground-water table		
o 100-year flood protection		

TABLE 8 SUMMARY OF REMEDIAL ALTERNATIVES

Alternative	Remedial Action Cost ($1000) Capital	Remedial Action Cost ($1000) Present Worth	Public Health Considerations	Environmental Considerations	Technical Considerations	Public Comment	Other
1. Infiltration Control Cap.	804	1,338*	Minimizes direct contact. Potential hazard through ingestion of contaminated fish if washout of waste occurs.	Potential washout of waste into surface water system during flood or subsidence with possible adverse impact on aquatic life.	Cap could be severely eroded during flooding.	Unacceptable.	Annual inspection/ repair of cap. High maintenance cost.
2. Extensive Excavation with Off-Site Disposal (8 feet depth).	2,407	2,540	Eliminates public health threat. Short term exposure of workers to waste during excavation.	Lowest risk of adverse environmental impacts.	Straightforward. Best reliable technology.	Highly Acceptable.	Minimal site maintenance.
3. Limited Excavation with Off-Site Disposal (4-6 feet depth).	1,637	1,770	Same as 1. Short term exposure of workers to waste during excavation.	Same as 1.	Long term reliability in unstable environment uncertain.	Unacceptable.	Minimal site maintenance.
4. RCRA Equivalent On-Site Landfill.	9,443	10,609	Same as 3.	Same as 1.	Same as 3. Difficult construction conditions. Poor location for RCRA landfill	Unacceptable.	Annual inspection/ repair of cap and retaining wall. High maintenance cost.
5. No action.	0	0	Direct contact to nearby residents and recreational users of river complex. Potential hazard through ingestion of contaminated fish.	Same as 1.	None.	Highly Unacceptable.	None.

* Infiltration control cost would increase by $700,000 to $800,000 if long term flood protection facilities are included to prevent erosion.

Since the site is located in the 100-year floodplain, the requirements of Executive Order No. 11988, covering Floodplain Management, were reviewed. It was concluded that the proposed remedy will not create a sustantial risk to public health, welfare and the environment due to the 100-year flood if certain measures are followed. The responsible government agencies will be contacted during the design stages to ensure that their requirements and recommendations are implemented.

Recommended Alternative

Section 300.68(j) of the National Contingency Plan (NCP) states that the appropriate extent of remedy shall be determined by the lead agency's selection of the remedial alternative which the agency determines is cost-effective (i.e. the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment). Based upon our evaluation of the investigation and feasibility reports, EPA has determined and the State has agreed, that the extensive excavation off-site disposal alternative meets the NCP criteria. In addition representatives from the Center for Disease Control have reviewed and concurred with the recommended remedy since it would adequately alleviate any public health threat which may result from the site (see attachment 2). The following discussion describes the recommended alternative and the reasons for its selection.

For the extensive excavation off-site disposal alternative wastes would be excavated to the groundwater level (about 8 ft) within the surficial waste area. Based on the site investigation, this is the maximum depth to which wastes were deposited. This excavation would remove approximately 19,000 cubic yards of materials. If material is visually in evidence anywhere beyond the defined outer lateral limit of excavation, it will be removed. Additionally, any soils excavated within the defined lateral limits that can be demonstrated as uncontaminated will be left on site to reduce transport/disposal costs. Wastes will be transported by truck to a secure hazardous waste disposal facility. The excavation then would be backfilled with common fill. In order to limit off-site migration of contaminants during construction temporary berms around stockpiled waste areas will be constructed. Figures 9 through 11 show the implementation of this alternative.

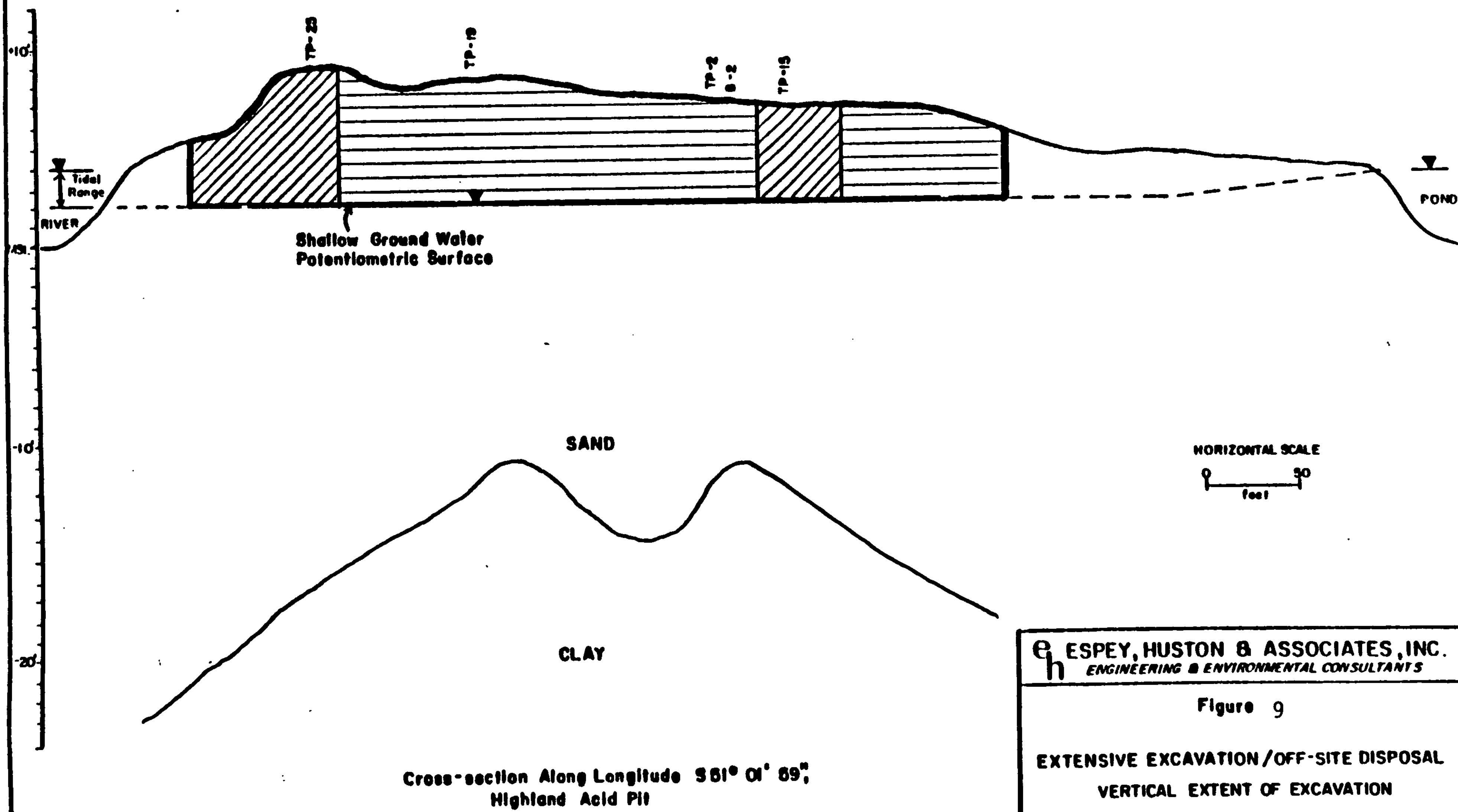

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Figure 9

EXTENSIVE EXCAVATION/OFF-SITE DISPOSAL
VERTICAL EXTENT OF EXCAVATION

31

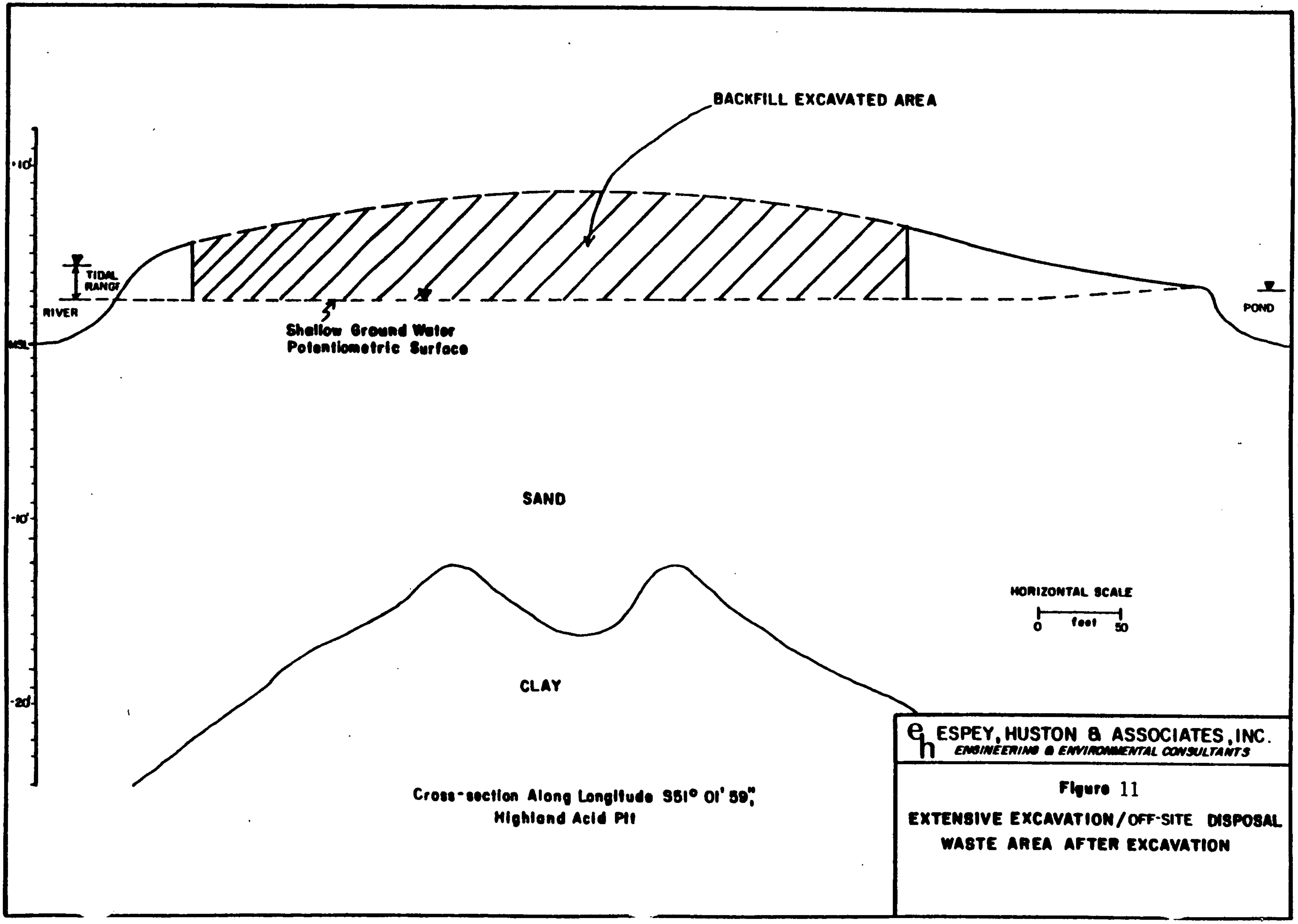

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Figure 11
EXTENSIVE EXCAVATION/OFF-SITE DISPOSAL
WASTE AREA AFTER EXCAVATION

For the purposes of estimating costs, it was assumed that the entire body of soils in the defined waste area, down to the water table, is to be excavated and removed. The site investigation work indicated that the soil/waste area is quite heterogenous and definition of extensive quanities of non-contaminated sands is unlikely. However, the actual construction activity will include such testing activities as required to identify significant deposits of such non-contaminated soils. Such soils would remain on site and will result in a lowering of overall costs. Tables 8 and 9 indicate the costs associated with the remedial action plans which were evaluated in detail (includes site management).

As mentioned earlier in this report certain site management measures would be implemented regardless of the alternative selected. In the case of the extensive excavation alternative the following site management measures will be employed.

The site management methods provide for clearing the rounded surficial waste area, shaping the area to fill depressions, and emplacing a contour layer of common fill to achieve a three percent gradient. Figures 12 and 13 show the recommended features. The fill will include

six inches of topsoil, that will be seeded, mulched, and fertilized. A temporary site perimeter fence will also be installed to minimize human intrusion during construction.

Maintenance for the site management method would consist of periodic inspections, revegetation and erosion control. Since the site is subject to flooding, it is projected that 10 percent of the site area would require regrading and revegetation annually. Additionally, the site will be mowed periodically.

As can be seen on Figure 12 groundwater monitoring wells will be installed to monitor the shallow and deeper groundwaters. The monitoring wells at the site will be checked and sampled quarterly for the first year and annually thereafter. Six monitoring wells are required, four of which will be new. To monitor the effectiveness of the proposed alternative on groundwater remediation, various laboratory analyses on key indicator parameters will be performed. Recommended analyses, based upon contaminants found at the site include pH, specific conductivity, TOC, TOX, phenols, benzene, toluene, methylene chloride, manganese, sodium, cadmium, chromium, lead and sulfate.

TABLE 9

ENGINEERING COSTS FOR DESIGN AND CONSTRUCTION SUPERVISION

Remedial Action Plan	Concept/Design	Construction	Total
Infiltration Control Cap.	$120,000-150,000	$60,000-80,000	$180,000-230,000
Extensive Excavation - Off-Site Disposal	170,000-220,000	110,000-140,000	280,000-360,000
Limited Excavation - Off-Site Disposal	150,000-180,000	80,000-100,000	230,000-280,000
RCRA Equivalent On-Site Landfill	470,000-660,000	150,000-230,000	620,000-890,000

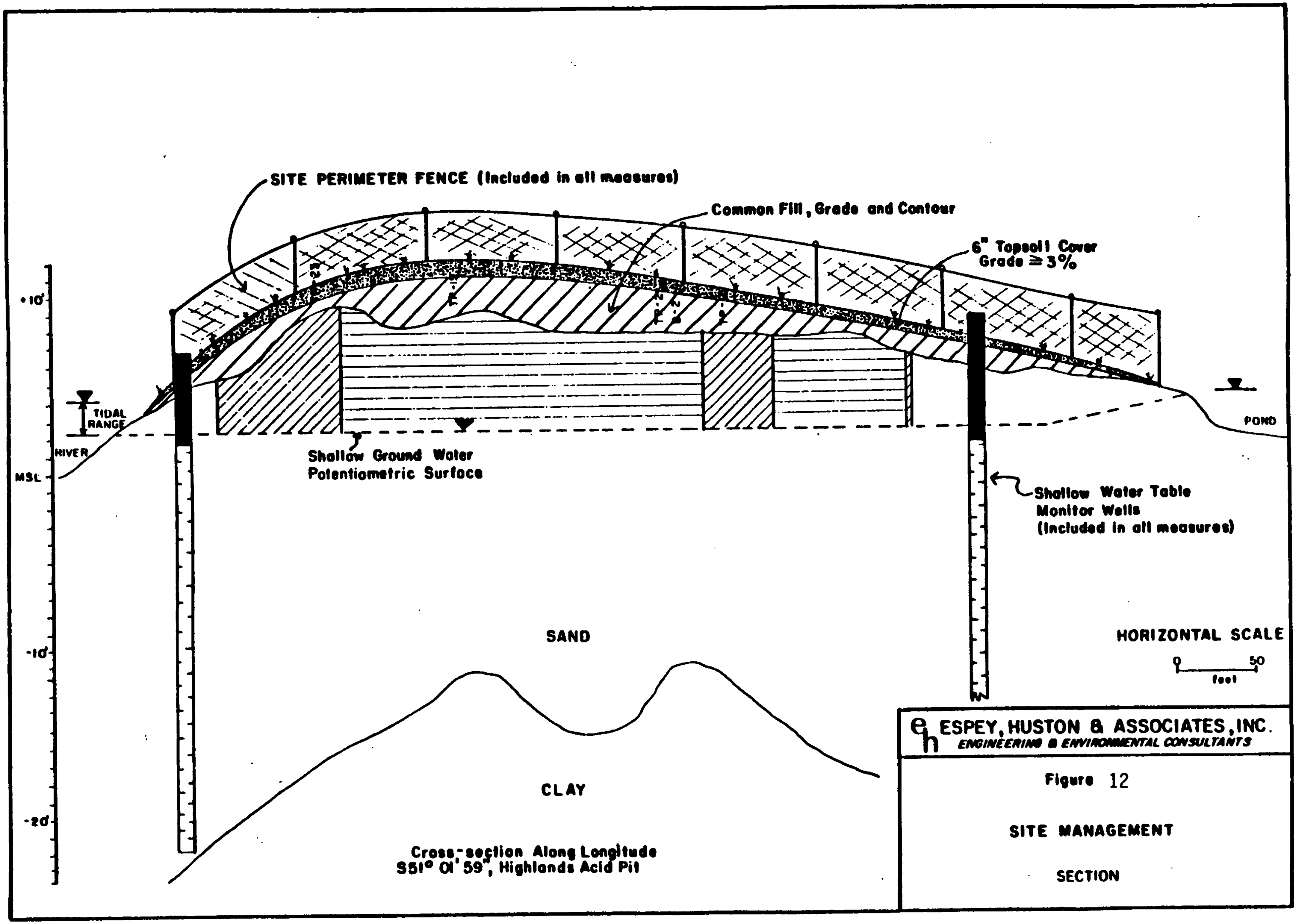
SITE PERIMETER FENCE (Included in all measures)
Common Fill, Grade and Contour
6" Topsoil Cover
Grade ≥ 3%
+10'
MSL
-10'
-20'
TIDAL RANGE
RIVER
POND
Shallow Ground Water
Potentiometric Surface
Shallow Water Table
Monitor Wells
(Included in all measures)
SAND
CLAY
HORIZONTAL SCALE
0
50
feet
Cross-section Along Longitude
S51° 01' 59", Highlands Acid Pit
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Figure 12
SITE MANAGEMENT
SECTION

Tables 10 and 11 show the detailed cost breakdown for the proposed alternative (extensive excavation off-site disposal and site management).

The extensive excavation with off-site disposal (EEOSD) alternative was selected as the recommended alternative from the list of plans on Table 8 of this document. EPA, has determined along with the State that the EEOSD alternative best complies with Section 300.68(j) of the NCP mentioned earlier.

The infiltration control cap alternative was not selected based on several reasons. The major negative environmental factor associated with this plan result from all the wastes remaining in place. This is a very significant point since the site is located in a very dynamic hydrologic environment. Due to the location of the site within the river floodplain, flooding is likely several times during the 30-year design period. A flood event could cause erosion of the cap and in turn result in a deposit of wastes in the San Jacinto River system. Flood protection facilities would reduce the risk of cap failure or damage during those storm events, however, a high potential would still exist for waste migration. In adition, should subsidence continue, the likelihood of failure for this system is increased. The costs associated with this alternative, when the flood protection facilities are included, equal $2,138,000, which is less than the proposed EEOSD plan. However, due the problems mentioned above, EPA and the State do not believe the cost savings are justified since there is less protection in the long-term to public health, welfare, and the environment.

The major problem with the limited excavation with offsite disposal (LEOSD) alternative is its lower reliability when compared to the EEOSD plan since some of the wastes will remain onsite. Long-term changes in the existing environmental setting could result in a higher potential for exposure of the waste materials to the environment. Continued subsidance, for instance, could permit the water table to rise into the remaining waste body, increasing the discharge of contaminants to the groundwater and adjoining surface water bodies. Excavation to a depth of only 4 to 6 feet is questionable, since only part of the original waste materials are removed. The costs of this alternative are also lower than the proposed EEOSD Plan (See Table 7). However, due to the problems mentioned above, EPA and the State again do not believe the cost savings are justified since there is less protection to public health, welfare, and the environment.

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TABLE 10

REMEDIAL METHODS: EXTENSIVE EXCAVATION WITH OFF-SITE DISPOSAL

Item		Total Cost
1.	Excavate Waste Material	$ 64,500
2.	Transport Waste Material Off-Site	247,500
3.	Dispose of Waste Material Off-Site	903,000
4.	Backfill Excavation Area	150,500
5.	Subtotal	$1,365,000
6.	Overhead/Profit, Indirect Field Labor Costs (25%)	341,500
7.	Subtotal for Capital Cost	$1,706,500
8.	Contingency for Capital Cost (25%)	426,500
	TOTAL PRESENT WORTH	$2,133,000

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TABLE 11

REMEDIAL METHODS: SITE MANAGEMENT

Item		Total Cost
1.	Mobilization/Demobilization and Site Services	$ 35,000
2.	Control Surveying	12,000
3.	Clear and Grub General Site Area	6,000
4.	Grade/Contour General Site Area	37,500
5.	Off-Site Disposal of Miscellaneous Solid Waste	10,000
6.	Topsoil Cover Installation	40,000
7.	Monitor Well Construction	8,000
8.	Site Perimeter Fence	26,500
9.	Subtotal	$175,000
10.	Overhead/Profit, Indirect Field Labor Costs (25%)	44,000
11.	Subtotal for Capital Cost	$219,000
12.	Contingency for Capital Cost (25%)	55,000
13.	TOTAL CAPITAL COST	$274,000
14.	Monitor Well Sampling/Analysis Program*	45,000
15.	Site Maintenance*	61,500
16.	Subtotal for Maintenance and Monitoring	$106,500
17.	Contingency for Maintenance and Monitoring (25%)	$ 26,500
18.	TOTAL MONITORING AND MAINTENANCE COST	$133,000
	TOTAL PRESENT WORTH	$407,000

*Present Worth Value based on Discount Rate of 10% over 30 years.

The last alternative evaluated against the proposed EEOSD Plan is the RCRA equivalent onsite landfill. There are several technical feasibility as well environmental effectiveness problems associated with this plan. Major difficulties are expected in excavating such a large volume of waste and constructing a landfill in a secure fashion. Due to the quanities of waste to be handled, adjacent properties will probably be needed as temporary storage areas. Storm events during construction will impact this alternative more than any of the others, since more waste will be exposed to the environment.

As part of the RCRA landfill alternative, a slurry wall will need to be constructed. Difficulties will probably be encountered during the installation of the slurry wall. Since the excavation area includes nearly all of the site, the slurry wall will be constructed on the edge of the site adjacent to the San Jacinto River, Clear Lake, and the sand pit. Minimal space will be left for equipment movement to install the barrier. Soil stability may also be a problem on the edges of the site.

The long-term stability of the RCRA landfill on the Highlands Acid Pit site is uncertain since rising and falling of groundwater poses potential problems for the integrity of the bottom landfill liner. Subsidence could also significantly impact the stability of the landfill due to groundwater intrusion and flood elevations. In addition, a flood event could cause a failure in the landfill cell resulting in a deposit of wastes in the San Jacinto River system. Flood protection facilities would reduce this impact. However, the potential still exists since the wastes will be left on-site.

The estimated costs of this plan are $10,609,000 plus $890,000.00 for design and construction management, which is $8,599,000 more than the proposed EEOSD alternative. This plan was rejected due to its many negative impacts and its substantially higher costs.

The no-action plan will not accomplish site objectives. Surficial soils are contaminated and exceed the criteria for health and toxicity limits. Human contact with the contamination is likely, as evidenced by past intrusions and garbage disposal activities and adjacent recreational uses. These contaminants will continue to migrate off-site through wind and surface water erosion. Infiltration through the site will also continue to leach contaminants into the ground water. Based on site investigation data, ground water, surface water, and air quality objectives are presently met. Continued erosion and subsidence of the site, however, could negatively impact ground waters, surface water and air quality. Extensive erosion of surface soils could expose additional wastes, thereby promoting volatilization of contaminants, decreasing air quality. Should the site continue to subside, ground water will rise into and will begin to migrate through the wastes, increasing the discharge of contaminants to the ground waters and adjoining surface water bodies. Contaminants will also be released more frequently to surface waters during flood events. The area of the site is located in a very productive estuary which is extensively fished and used for other recreational uses. The increased released of contaminants during flooding events and continued subsidence could adversely affect the water quality near the site. The concentration of benzene or other contaminants could increase above the WQC in adjacent water bodies near the site, thus adversely impacting their current uses.

The unstable environment at Highlands Acid Pit, due to its location in the 10-year floodplain and history of subsidence, precludes on-site remedies and the no-action alternative.

Of all the remedial action plans evaluated, the EEOSD has the lowest risk of additional adverse environmental impacts in the long-term. All contaminated materials demonstrated as currently or potentially affecting the environment are removed in this plan. Potential exposure of waste left onsite due to flooding, subsidence, or major storm events would be eliminated.

The total capital cost of the EEOSD Plan is estimated at $2,407,000 with annual monitoring and maintenance cost estimated at $14,100. The present worth of the annual monitoring and maintenance cost equals $133,000.

Operation and Maintenance

Projected operation and maintenance activities will include a monitoring well sampling/analysis program and site maintenance for a 30-year period. Six monitoring wells will be sampled/analyzed quarterly for the first year and annually thereafter for the following contaminants:

Manganese	Sulfate	TOC
Sodium	Phenol	TOH
Cadium	Benzene	pH
Chromium	Toluene	Specific Conductivity
Lead	Methylene Chloride	

Site maintenance will include mowing, replacement of 10% of topsoil per year, and reseeding of 10% of the site per year.

Present worth costs for operation and maintenance activities (O&M) are presented in and Table 11. Annual O&M costs are $14,100.

The recommend level of EPA findings for O&M activities is 90% of total O&M costs for a period of 1 year after the completion of construction. The state has agreed to accept all remaining O&M costs for a period of at least 29 years. The state can guarantee the funding on an ongoing 2 year period.

Schedule

-	Approve Remedial Action (sign ROD)	June 1984
-	Award Cooperative Agreement Amendment for Design of the Approved Remedy	June 1984
-	Start Design	August 1984
-	Complete Design	October 1984
-	Award Remedial Action Cooperative Agreement Amendment for Construction of Approved Remedy	November 1984
-	Start Cleanup	December 1984
-	Complete Cleanup	April 1985

ATTACHMENT I

Community Relations

The community relations objectives at the Highlands Acit Pit site focused on informing interested officials and citizens of progress at the site. The Remedial Investigation and Feasibility Study and the press release announcing the public comment period were placed in nine repositories in the Highlands/Houston area ten days before the beginning of the comment period. A press release was issued by the Region jointly with the Texas Department of Water Resources (TDWR) to notify officials and citizens of the public comment period and public meeting on the recommended alternative. Courtesy telephone calls were also made to elected officials and environmental groups prior to the initiation of the comment period. The public comment period ran from April 30 to May 21, 1984.

A public meeting was held by the Region on May 8, 1984, at the Highlands Junior High School in Highlands, Texas. William Hathaway, Deputy Director of Air and Waste Management Division, moderated the meeting. Also present were Stephen Romanow, Project Engineer for the Region, Charles Faulds, Project Engineer for TDWR, and George Buynoski, Superfund liaison from the Centers for Disease Control. Mr. Hathaway presented the background on the Superfund program, the Highlands site, and the recommended alternative. Mr. Faulds presented a summary of the technical aspects of the investigation and feasibility phases. Mr. Buynoski fielded comments and questions relating to potential health effects from the site. Approximately seventy people attended the meeting, including one elected official. Six people read statements, all of which were generally supportive of the Region's efforts at the site. The general topics of concern raised by the audience at the meeting included:

Technical details of the recommended alternative and the investigation and feasibility studies.

Health effects from the site

Possibility of conducting a health study in the area around the site

Impact of the site on groundwater and organisms (e.g., fish, shrimp) caught for consumption

Potential air pollution from the site during construction

Potential deposition of waste in neighborhoods while hauling the waste away from the site

Continued operation and maintenance at the site after the remedy has been implemented

These topics were covered in great detail by Mr. Hathaway, Mr. Faulds, and Mr. Buynoski during the meeting. A copy of the transcripts from the meeting is available for review. The meeting lasted approximately two and a half hours.

Two written statements have been received to date. One is a statement from an adjacent property owner expressing satisfaction with the remedy. The other is an anonymous postcard, also expressing satisfaction with the work being done by EPA. Neither statement required a written response.

ATTACHMENT 2

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Centers for Disease Control

Memorandum

Date · March 23, 1984

From George Buynoski
Public Health Advisor, CDC

Subject Highlands Acid Pit - Remedial Action

Steve Romanow
Superfund/Operations Section

As requested, staff at the Center for Environmental Health have reviewed the remedial measures proposed for closing out the Highlands Acid Pit site.

The plan, which basically involves the excavation and removal of the acid waste, should adequately alleviate any potential public health problems that might result from the site.

The sampling data evaluated indicates that waste migration off the site is not happening at an alarming rate. Elimination of the source should virtually curtail any future migration of hazardous substances. Once the obvious contamination is removed it is apparent that some residual concentrations will remain in the soil in/around the pit. Based on an analysis of past migration patterns, it would appear that these contaminated soils would not be considered a health concern. As an added precaution the addition of a neutralizing agent e.g. a Few inch layer of lime, prior to adding the final fill, would further minimize any possible impact from the residual acid waste.