United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R06-88/031
March 1988

EPA

Superfund Record of Decision:

Brio Refining, TX

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R06-88/031	2.	3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
[redacted] Refining, TX
First Remedial Action - Final

5. Report Date 03/31/88

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered
800/000

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 58-acre Brio Refining site is located in Harris County, Texas, approximately 20 miles southeast of Houston. The site is broken into two parcels, 49-acre Brio North and 9-acre Brio South, separated by Drive Farm Road. The site is bordered by Mud Gully, a flood control ditch that drains into Clear Creek, Dixie Oil Processors NPL site, Friendswood oil field and the Southbend residential subdivision. Between 1957 and [redacted]2 the site refined crude oil and styrene tars to produce toluene, ethylbenzene, aromatic solvents, naphthalene, diesel fuel and kerosene. Various owners of the site stored styrene tars in 24 open pits. Other waste products and sludges were stored in aboveground tanks. Site investigation indicate that between 500,000-700,000 yd^3 of onsite soil have measurable contamination, and that high levels of VOCs exist in ground water underlying the site. Primary contaminants of concern affecting the soil and ground water are VOCs including 1,1-dichloroethane, 1,1,2-trichloroethane, and methylene cnloride; and base/neutral organic compounds including phenanthrene and fluoranthene.

The selected remedial action for the Brio Refining site includes: excavation and incineration or biological treatment of all onsite soils, sludges, and liquids found to be above action levels defined in the Endangerment Assessment, with backfilling of all
(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
Brio Refining, TX
First Remedial Action - Final
Contaminated Media: gw, sludge, soil
Key Contaminants: organics, VOCs (DCA, TCE)
b. Identifiers/Open-Ended Terms

[redacted] OSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 88
	20. Security Class (This Page) None	22. Price

F[redacted]ROD/R06-88/031
E[redacted] Refining, TX
First Remedial Action - Final

16. ABSTRACT (continued)

treated material passing the Toxicity Characteristic Leaching Procedure (TCLP). If the Brio Site Task Force (PRPs) can successfully demonstrate the effectiveness of aqueous-phase biological treatment it will be considered, otherwise, incineration will be selected; excavation and treatment of all visual onsite seeps; excavation and removal of all offsite soils contaminated above background levels; further investigation of Pit G to locate sludge or contaminated soil underlying the existing onsite wastewater treatment impoundment; consolidation and disposal of all inert debris and rubble with ultimate disposition to be determined during remedial design; disposition of Mud Gully, the flood control ditch, to be determined during remedial design; inplace stabilization of wastes existing in the wastewater treatment impoundments, backfilling with dike materials, capping, regrading and vegetating to improve runoff, and installation of a package wastewater treatment system or route wastewater to a POTW; removal and offsite disposal of tank contents, and decontamination, dismantling and selling or offsite disposal of tanks; dismantling of all onsite process equipment; monitoring ambient air; control of air emission from the treatment processes; venting waste enclosures to an emission control device; treatment of ground water in the Numerous Sand Channel Zone to a level to be determined in design; natural attenuation of the Fifty-Foot Sand Aquifer with monitoring to ensure effectiveness; regrading and vegetating areas outside [redacted]evation boundaries; construction of a stormwater transmission system draining to Mud [redacted]ly; and imposition of deed restrictions as necessary. The estimated present worth cost of this remedial action is $23,308,000-$23,333,000 for biological treatment or $22,458,000-$26,598,000 for incineration based on 62,900 yd^3 of treatable material.

BRIO REFINING
RECORD OF DECISION
MARCH 31, 1988

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
ALLIED BANK TOWER AT FOUNTAIN PLACE
1445 ROSS AVENUE
DALLAS, TEXAS 75202

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Brio Refining site, Harris County, Texas

STATEMENT OF PURPOSE

This decision document outlines the selected remedial action for the Brio Refining site in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, November 20, 1985.

The State of Texas (through the Texas Water Commission) has been provided an opportunity to comment on the technology and degree of treatment proposed by the Record of Decision and has no objection to the selected remedy (See Appendix G).

STATEMENT OF BASIS

This decision is based on the administrative record for the Brio Refining site (See Appendix F). The attached index identifies the items which comprise the administrative record.

DESCRIPTION OF THE REMEDY

Upon review of the information contained in the administrative record, it is EPA's judgment that on-site incineration of wastes appears to best serve both statutory and selection criteria in relation to the other solutions evaluated. A detailed description of this remedy and an explanation of how it meets statutory requirements is contained in the attached "Summary of Remedial Alternative Selection."

The Brio Site Task Force (a group of potentially responsible parties) proposes the use of on-site aqueous-phase biological treatment. The lack of the demonstrated performance of this technique on the wastes of concern at the Brio Refining site, while of concern to EPA, may not prevent favorable consideration if the Brio Site Task Force can demonstrate that aqueous-phase

biological treatment can provide the same level of treatment deemed necessary to protect human health and the environment.

This action would include:

Affected materials and soils - Shall be treated using either incineration or biological treatment. This media shall be defined as all contaminated sludges and liquids and waste material found to exist above the action levels defined in the Endangerment Assessment (EA). This will include those affected materials and soils existing in pits B, J, H/V, E, Q, and R (as defined in the EA). Additionally, the Remedial Investigation identified sludges and liquids in pits F, G, I, K, L, and M; therefore, these sludges and liquids (and any others found during remedial action) must also be excavated and treated. The definition of the boundary between the sludge/soil interface will be determined prior to remedial action.

Excavations shall be conducted in enclosures, material transported to the treatment unit(s), and the treated material backfilled in the pits if it successfully passes the Toxicity Characteristic Leaching Procedure.

Surface contamination - Attachments 8 and 9 of the Remedial Investigation Report shall be examined and the site re-evaluated prior to remedial action, to identify those areas where surface seeps are visually apparent. These areas will be scraped or excavated to remove the source of contamination and to prevent future migration of this material. This source of contamination will then be consolidated and treated with the affected materials and soils.

Off-site soil contamination - Any off-site soil contamination found during the remedial investigation, or during the remedial action, shall be removed to background levels. This may require that special detection limits be used for sampling efforts at the site boundaries during the remedial action. This activity will have to be further defined in the remedial design.

Pit G - Further investigation into this pit area to locate sludges or liquids may have to be done at the completion of the remedial action due to the location of this pit beneath the wastewater treatment surface impoundment. This activity will be further defined in the remedial design.

Debris and rubble - There is much inert debris and rubble remaining on the site from past operations. This material may be consolidated and the ultimate disposition of the material determined during the remedial design.

Mud Gully - Contaminants observed in this flood control ditch and the "bottle neck" that exists as it passes the Brio site h been a noted concern of the EPA as well as local residents and

the Harris County Flood Control District. It is apparent that these problems will have to be corrected as part of any remedy that is instituted at the site. Initial thoughts would suggest a low-maintenance approach to resolving this problem where some type of performance standard would be set in cooperation with the Harris County Flood Control District. Such actions shall be further defined in the remedial design.

Wastewater treatment system - In-place stabilization of wastes existing in the impoundments, backfill impoundments with dike materials and other uncontaminated materials (if necessary), cap and cover, grade to promote runoff and minimize infiltration, install a package wastewater treatment plant or route wastewater to a POTW. Portions of the existing wastewater treatment system may be used during remedial action, but will be decommissioned once the remedial action is completed.

Storage tanks and drums - Remove tank contents, decontaminate tanks, dismantle tanks; sell dismantled tanks or transport the tanks to an EPA approved off-site disposal facility; transport the tank contents and drums to an EPA approved off-site disposal facility. If any tanks are used during remedial activities, they will be dismantled upon completion.

Process equipment - The entire process facility will be dismantled. If any portion of the existing facility is used during remedial activities, the structure will be dismantled upon completion of remedial action.

Monitoring and control of migration pathways - Ambient air sampling on a semi-annual basis; control air emissions from treatment processes; excavate in enclosures and vent the enclosure to an emission control device; eliminate or control rainfall on construction areas; sample and monitor Mud Gully sediments; treat the groundwater in the Numerous Sand Channel Zone to a level to be determined in the remedial design (but to achieve treatment of the Dense Non-Aqueous Phase Liquids (DNAPLs) to the satisfaction of EPA) monitor the groundwater for a timeframe to be determined in the remedial design; allow natural attenuation (no treatment) of the Fifty-Foot Sand aquifer and monitor the groundwater in the aquifer to ensure that it is naturally cleaning itself. Monitoring activities will be utilized to determine the effectiveness of the actions to be implemented and shall be detailed in the operation and maintenance plan of the remedial design. This same data will be evaluated during the Agency's 5-year review, in accordance with SARA Section 121(c), to determine if any corrective action is necessary.

Site management plan - Areas outside the boundaries of excavation will be regraded and vegetated to promote drainage and minimize infiltration. A stormwater transmission system draining to Mud Gully will be constructed in an east/west direction across

the north and south parcels. All regrading will be covered with 6 inches of topsoil, if necessary, to promote vegetative growth. To the maximum extent practicable, the aesthetics of the site (upon completion of the remedy) shall be enhanced by utilizing creative design and landscaping techniques with input from local residents.

Site control - This remedial action is based on permanent site control, imposition of necessary deed notices and restrictions (if possible), and restriction of access to the site by use of a fence or similar barrier.

USE OF BIOLOGICAL TREATMENT IN LIEU OF INCINERATION

All factors considered, EPA has determined that the Brio Site Task Force's proposal utilizing biotreatment has the potential to provide for the protection of human health and the environment comparable to the on-site incineration remedy. The Task Force (or settling party) must agree to undertake any corrective action deemed appropriate by EPA in the event of remedy failure, if biotreatment is used. Pass/fail criteria for use of biotreatment, rather than incineration, will be developed prior to the start of remedial action. If biotreatment cannot meet the pass/fail criteria, then on-site incineration will be implemented.

DECLARATION

The remedy described above is protective of human health and the environment, attains Federal and State requirements applicable or relevant and appropriate and is cost-effective compared to equally protective alternatives. This remedy satisfies the preference for treatment that reduces toxicity, mobility or volume as a principal element. Finally, it is determined that this solution utilizes permanent solutions and alternative technologies to the maximum extent practicable.

3/31/88
Date

Robert E. Layton Jr., P.E.,
Regional Administrator

BRIO REFINING
Record of Decision Concurrences

The Brio Refining Record of Decision has been reviewed and I concur:

Allyn M. Davis, Director
Hazardous Waste Management (6H)

For Robert E. Hannesschlager, P.E., Chief
Superfund Enforcement Branch (6H-E)

for 3/28/88
Larry D. Wright, Chief
Superfund Enforcement Section (6H-EE)

Bennett Stokes, Chief
Office of Regional Counsel (6OC)

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

BRIO REFINING SITE

SOUTHEAST HARRIS COUNTY, TEXAS

MARCH 31, 1988

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 SITE LOCATION AND DESCRIPTION

The Brio Refining site is located approximately 20 miles southeast of Houston, Texas, in Harris County (Figure 1). The site occupies approximately 58.1 acres. Portions of the site occur both north and south of Dixie Farm Road and are designated as Brio North and Brio South. Brio North occupies 48.8 acres and Brio South covers 9.3 acres.

Mud Gully, a flood control ditch and local tributary of Clear Creek, runs along the western boundary of the Brio site. The Dixie Oil Processors site borders Brio South to the southwest. The Southbend Subdivision borders the Brio property to the northwest and Beamer Road borders to the northeast. The Friendswood Oil Field borders the remaining areas (Figure 2).

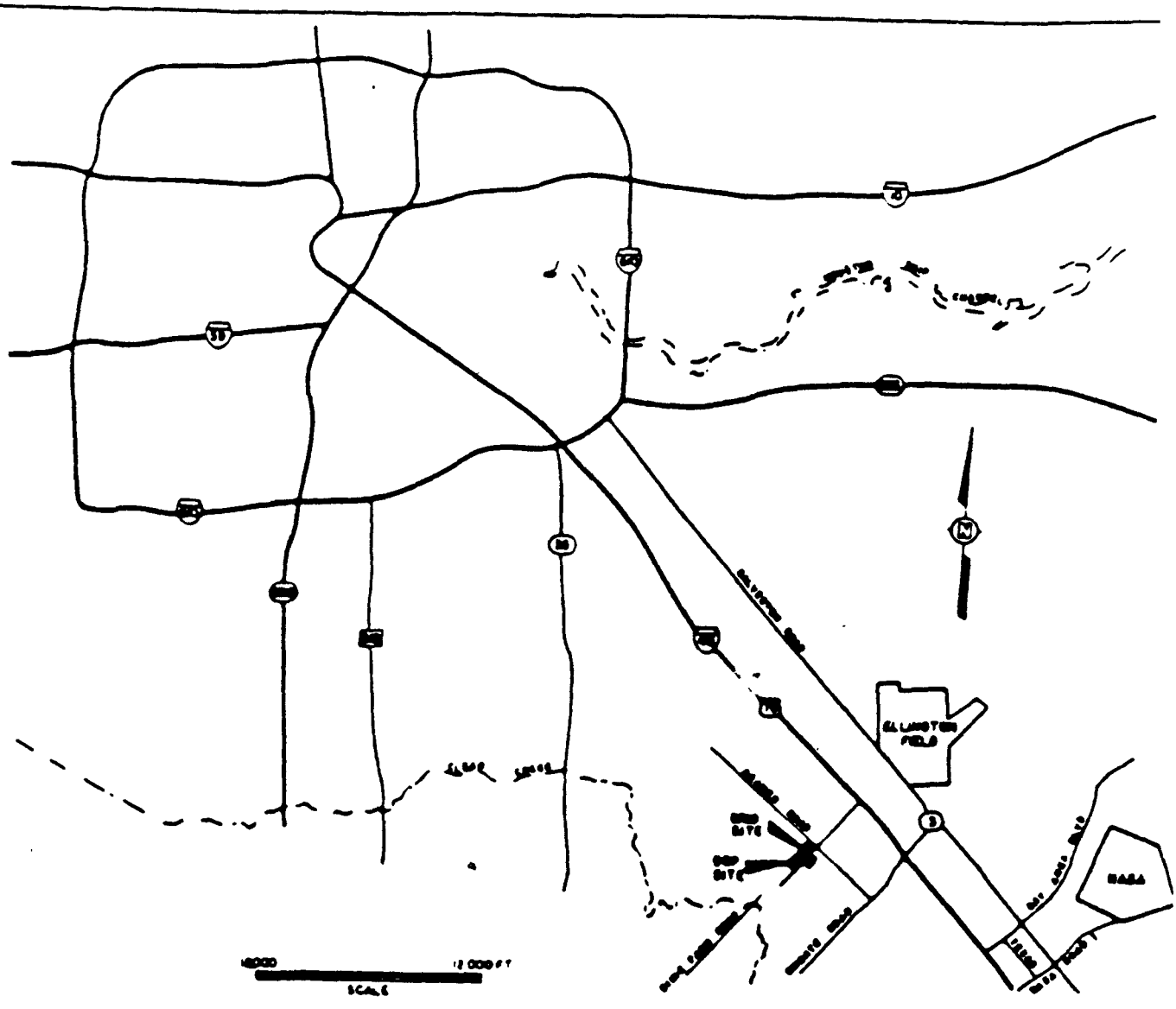
1.1 SITE HISTORY

Past ownership and operations as obtained from the Brio Refining/Dixie Oil Processors Feasibility Report and Summary Report prepared for the Brio Site Task Force by IT Corporation are summarized below:

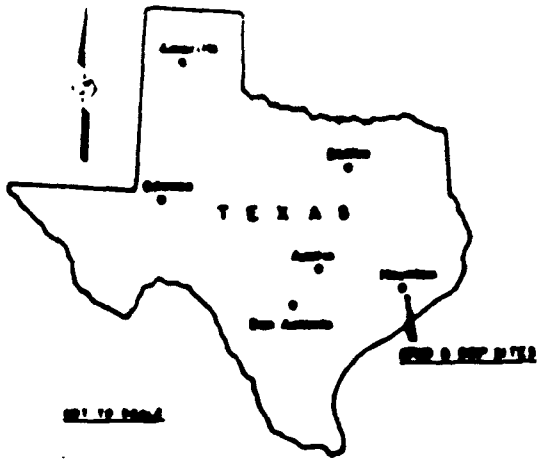
- o 1957-1969 Hard Lowe Co. operations included regeneration of copper catalysts, recovery of ethylbenzene from styrene tars and recovery of chemicals from vinyl chloride bottoms. The company changed names in 1959 to Hard Lowe Chemical Company and again in 1963 to Lowe Chemical Co. In 1963 operations included reclamation of chemicals/petrochemicals from phenol heavy ends, chlorinated hydrocarbons, cresylic acid and ethylene glycol.

- o 1969 -1972 Chemical Pollution Control Corp. took over operations and the name of the facility was changed to Phoenix Chemical Company. Production of ethylbenzene, toluene, aromatic solvents and styrene pitch occurred. Archem Corporation leased Brio North from Phoenix to produce cresylic acid, sodium sulfide and sodium cresyllite. They also stored spent caustic on site. Phoenix assumed operations of Archem in 1971.

- o 1972-1975 Phoenix Chemical Corporation lost control of the site and its operations in 1972. The facility was purchased and operated by the Lowe Chemical Company.



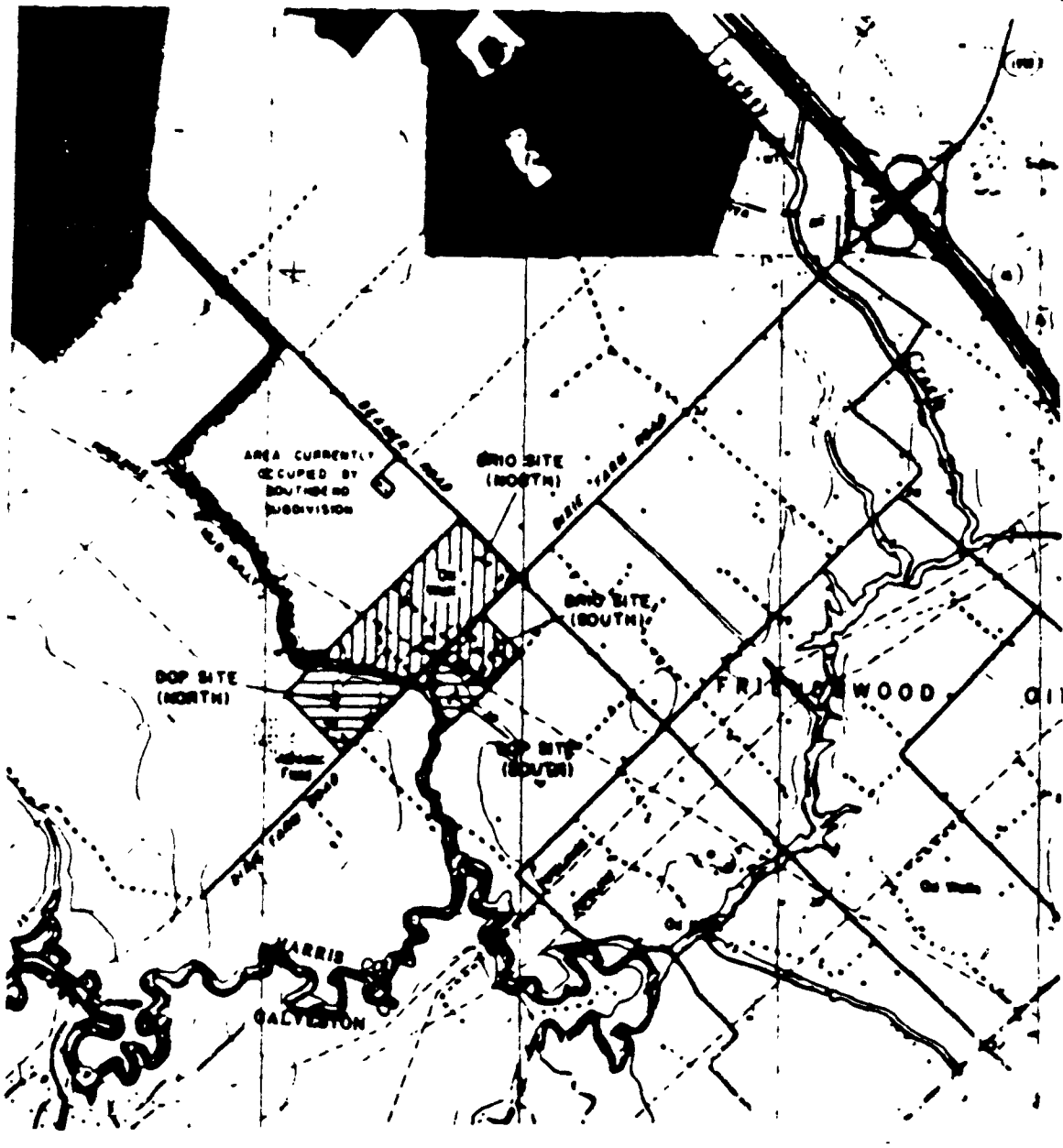
VICINITY MAP



LOCATION MAP

NOTE INFORMATION OBTAINED FROM THE IT CORPORATION FEASIBILITY STUDY

BRIO REFINERY RECORD OF DECISION		
SITE LOCATION MAP		
PROJECT NO. TC3621-23	DATE 2-18-88	FIGURE NO. 1



NOTE. INFORMATION OBTAINED FROM THE IT CORPORATION FEASIBILITY STUDY

BRIO REFINERY RECORD OF DECISION		
SITE LOCATION MAP		
PROJECT NO.	DATE	FIGURE NO.
TC3621-23	2-18-88	2

- o 1975-1978 In 1975, JOC Oil Aromatics, Inc. controlled the site and production included toluene, ethylbenzene, cumene, aromatic oil and fuel oil.

- o 1978 Friendswood Processing Inc., a wholly owned subsidiary of the Brio Petroleum Corporation, purchased the facility and converted it to a crude oil topping unit for jet fuel production.

- o 1978-1981 Facility changed names to Friendswood Refining Inc. and onsite production of diesel fuel, residual oil, naphtha, kerosene and fuel gas occurred.

- o 1981-1982 The facility changed names to Brio Refining, Inc. and operations changed to the production of jet fuel. Operations closed in 1982 after Brio Refining filed for bankruptcy.

Between 1957 and 1960, Hard Lowe Chemical Co. constructed several pits to support the styrene tar processing operations. The majority of the pits were built from 1964 through 1970. Due to the lack of processing capacity, styrene tars were stored in four large impoundments on Brio North.

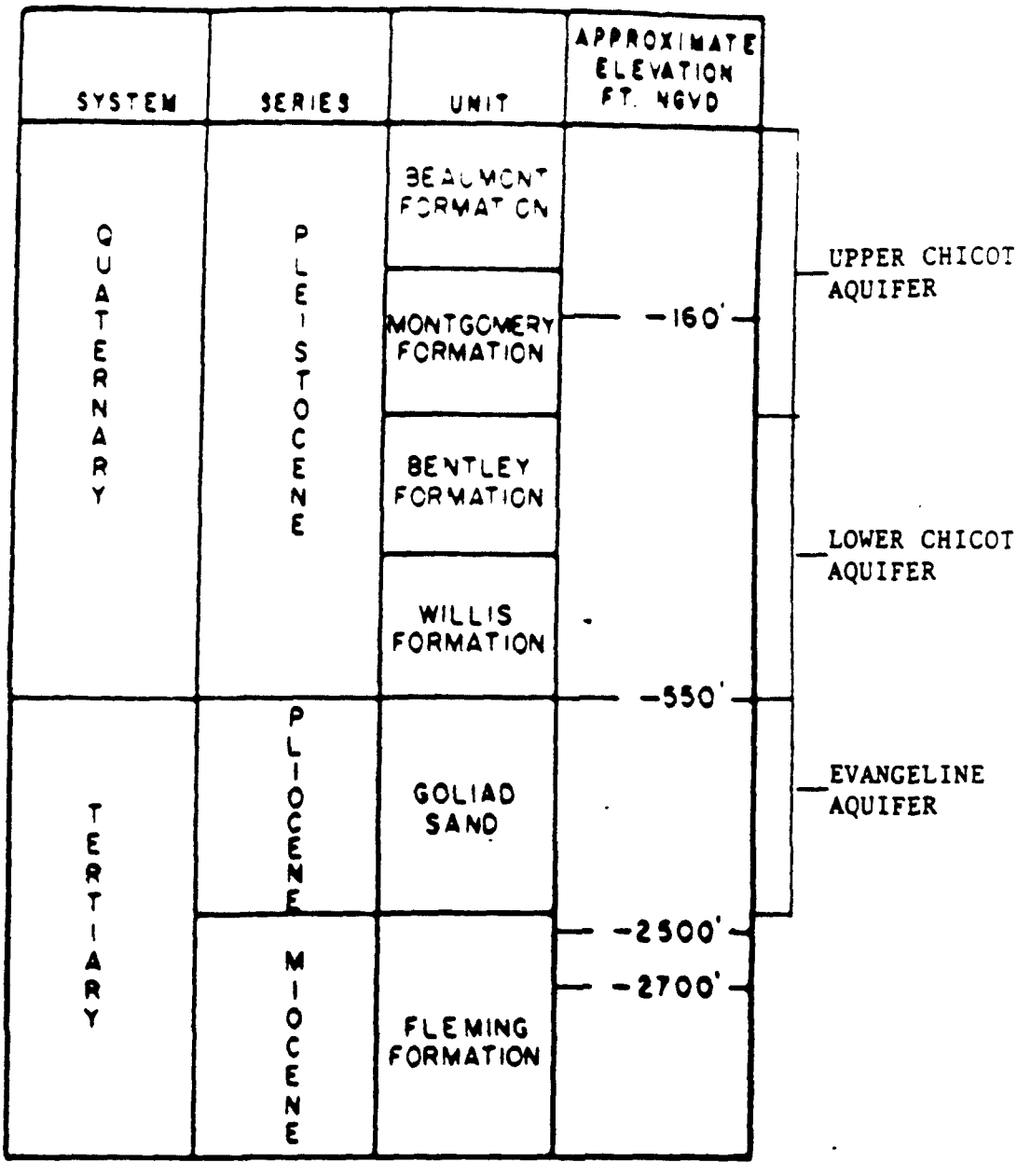
The first pit closure activities were conducted in 1969 and 1970 with some pit materials left in place. Closures were reportedly accomplished by removing the stored material from the pit and backfilling with a mixture of soil, calcined clay and pit residue. Soil cover was then placed over the stabilized pit material. Approximately seven additional pits were closed from 1972 through 1975 while under the ownership of the Lowe Chemical Company.

JOC Oil Aromatics, Inc. (JOC) stored styrene tars in open pits on the site from 1975 to 1978. Four of the open pits were closed in 1976 and 1977. One new pit was constructed by JOC.

The final pit closure occurred in 1979-80 by Friendswood Refining Inc. Operations closed down in December 1982 (with the declaration of bankruptcy by Brio Refining, Inc.) and the Brio site has remained inactive.

1.2 SITE GEOLOGY

The Brio site is located within the Pleistocene Deltaic Plain of the Brazos River, known as the Alameda Delta. The site is underlain with Pleistocene and Pliocene deposits to a depth of approximately 2400.0 feet as shown on Figure 3. The aquifers used to supply water for domestic, industrial and agricultural purposes are the Lower Chicot and Evangeline, which are confined



NOTES:

1. DRAWING NOT TO SCALE.
2. MODIFIED FROM GABRYSCH, 1980
3. NGVD REFERS TO NATIONAL GEODETIC VERTICAL DATUM.

NOTE. INFORMATION OBTAINED FROM THE IT CORPORATION SUMMARY REPORT

BRIO REFINERY RECORD OF DECISION		
GENERALIZED STRATIGRAPHIC COLUMN		
PROJECT NO. TC3621-23	DATE 2-18-88	FIGURE NO. 3

aquifers isolated from surface recharge. The groundwater flow in the Lower Chicot and the Evangeline is to the southeast.

The Friendswood Oil Field borders the site and is an extensively explored oil and gas field. The Oligocene Age Brio Formation of the Texas Gulf Coast Region is the oil producing zone with wells from 4000.0 to 7000.0 feet deep.

The site specific geology that was under investigation during the Remedial Investigation/Feasibility Study (RI/FS) was the Beaumont Formation as shown in Figure 4. The results from the Feasibility Study and Summary Report are given in the following paragraphs.

The Beaumont Formation is separated into five major units (Figure 4). The Upper Clay Unit is composed of clay and silty clay. The unit is continuous across the site and ranges in depth from 14.0 to 32.0 feet. The Numerous Sand Channels Zone (NSCZ) is the next unit and is comprised of interbedded sands, sandy silts, silty sands, clayey silts and silty clays. The thickness of the NSCZ varies across the site from less than 10 feet to over 20 feet. The NSCZ is the upper water bearing unit with well yields less than 10 gpm. The Middle Clay Unit is next and is composed of silty clay/clayey silt. The thickness ranges from 8.0 to 20.0 feet. The Middle Clay separates the NSCZ from the lower aquifer and forms a confining layer over the lower unit. The Fifty-Foot Sand is the fourth unit and occurs between 52.0 and 61.5 feet below ground surface. The thickness varies from 35.0 to 45.0 feet. The Fifty-Foot Sand Unit has a reasonably high well yield. The fifth and last unit is the Lower Clay Unit, a silty clay approximately 100.0 to 120.0 feet thick. The unit extends to at least 200.0 feet below ground surface.

A salt dome fault is located in the western part of the Brio site. According to Dr. Carl Norman of the University of Houston, the ground movement north of the fault has been downward in relation to the ground south of the fault. The fault could cause a slight reduction in lateral groundwater flow for various units across the fault. At this time, there is no evidence to support a vertical hydraulic connection between the units along the fault.

1.3 SITE HYDROGEOLOGY

The NSCZ and the Fifty-Foot Sand are the two water bearing units investigated at the Brio site. The NSCZ potentiometric surface indicates that the groundwater flow is towards Mud Gully and will either run parallel to the gully or discharge into the gully. The groundwater flow volumes range from 6.6 to 102.0 gallons per year per square foot of cross-sectional area. The velocity of the groundwater ranged from 2.9 to 68.0 feet per year.

The potentiometric surface of the Fifty-Foot Sand showed a hydraulic gradient of 0.0001 in the south-southeast direction.

LITHOSTRATIGRAPHIC UNITS			SITE LITHOLOGIC UNITS	SITE HYDROLOGIC UNITS
BEAUMONT FORMATION	UPPER	EUNICE MEMBER	UPPER CLAY UNIT	SEMI-CONFINING LAYER
			NUMEROUS SAND CHANNELS ZONE (NSCZ	UPPER WATER-BEARING ZONE
	LOWER	OBERLIN MEMBER	MIDDLE CLAY UNIT	AQUITARD
			FIFTY-FOOT SAND ZONE	LOWER WATER-BEARING ZONE
LISSIE FORMATION			LOWER CLAY UNIT	AQUITARD

NOTE. INFORMATION OBTAINED FROM THE IT CORPORATION FEASIBILITY STUDY

BRIO REFINERY
RECORD OF DECISION

SITE LITHOLOGIC UNITS

PROJECT NO.	DATE	FIGURE NO.
TC3621-23	2-18-88	4

Flow would be towards the Gulf Coast. Lateral groundwater flow volumes range from 1.2 to 12.0 gallons per year per sq. ft. of cross sectional area. The average groundwater velocities were 3.9 to 58.0 feet per year.

The Middle Clay Unit has an upward hydraulic gradient thereby minimizing the potential for groundwater movement between the NSCZ and the Fifty-Foot Sand over most of the site.

1.4 REMEDIAL AND SUPPLEMENTAL REMEDIAL INVESTIGATION RESULTS

Five different types of wastes were sampled at the Brio Superfund Site. Those included sewage sludge, wastewater treatment system sludge and liquid, above ground storage tank sludge and liquid, closed impoundment (pit) soils, and groundwater as described in the following paragraphs.

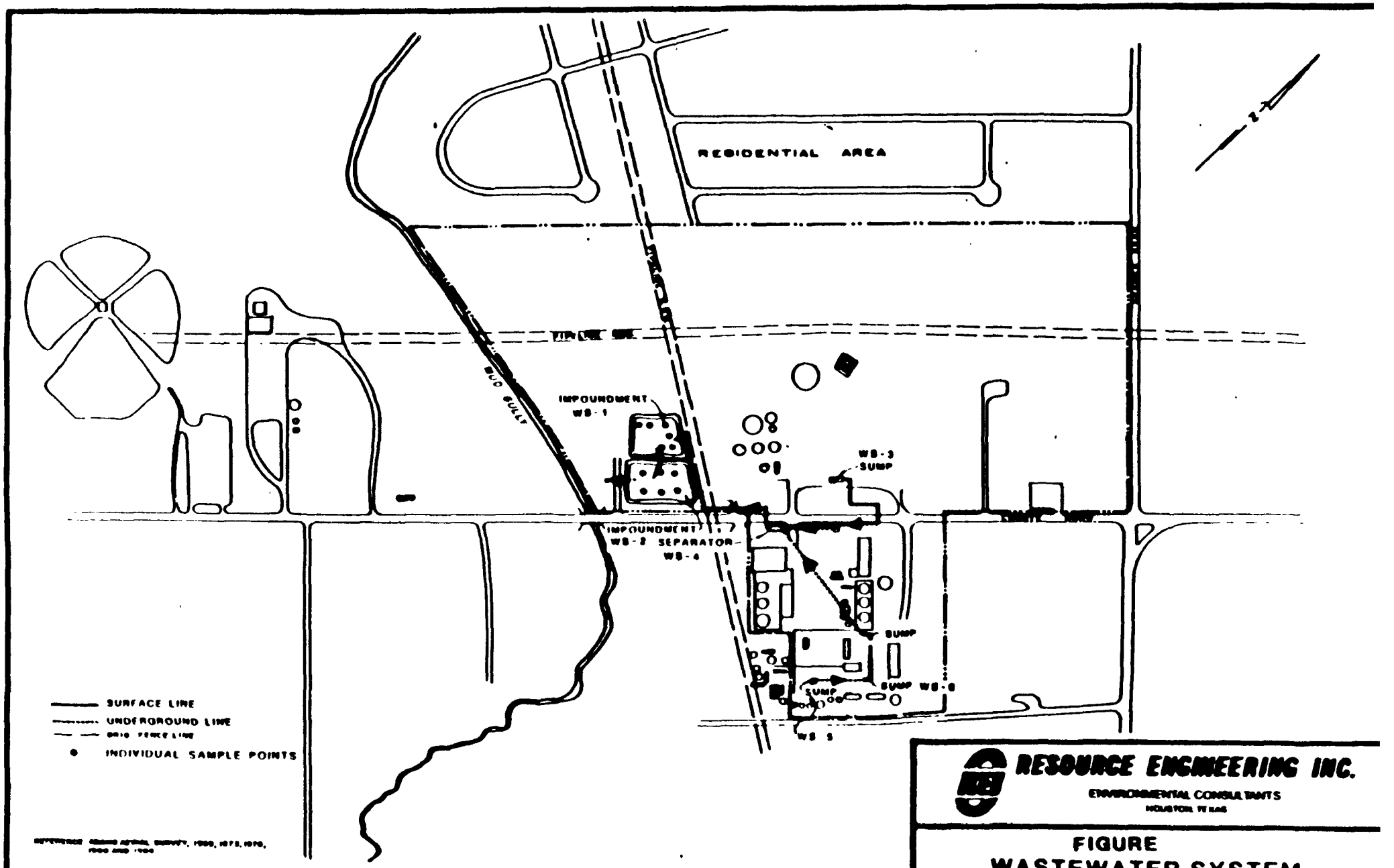
At some time when the Brio refinery was active, processed sewage sludge was brought in for odor control. There are numerous piles of sludge on the northwest section of the site. After testing, this material was found not to be RCRA hazardous by characteristic, but could be intermingled with hazardous substances, pollutants or contaminants inherent to the site.

The wastewater treatment plant for the Brio site has been tested and the discharge was found to be within the limits of its old NPDES permit. Testing was also done on the sludge and water in the impoundments and sumps, and the results indicated that these wastes are also not RCRA hazardous by characteristic, but are considered hazardous substances, pollutants or contaminants.

Various sludges and liquids are stored in vessels and tanks on the site (reference Appendix B). All but six tanks are within earthen or concrete berms. The six uncontained tanks would drain into the wastewater treatment plants impoundments (Figures 5 and 6). There are 1,757 drums on the site, most of which were generated during the Remedial and Supplemental Remedial Investigations.

The major sources of possible contamination are the closed impoundments (pits) on the site and the contamination these pits have caused to the shallowest aquifer.

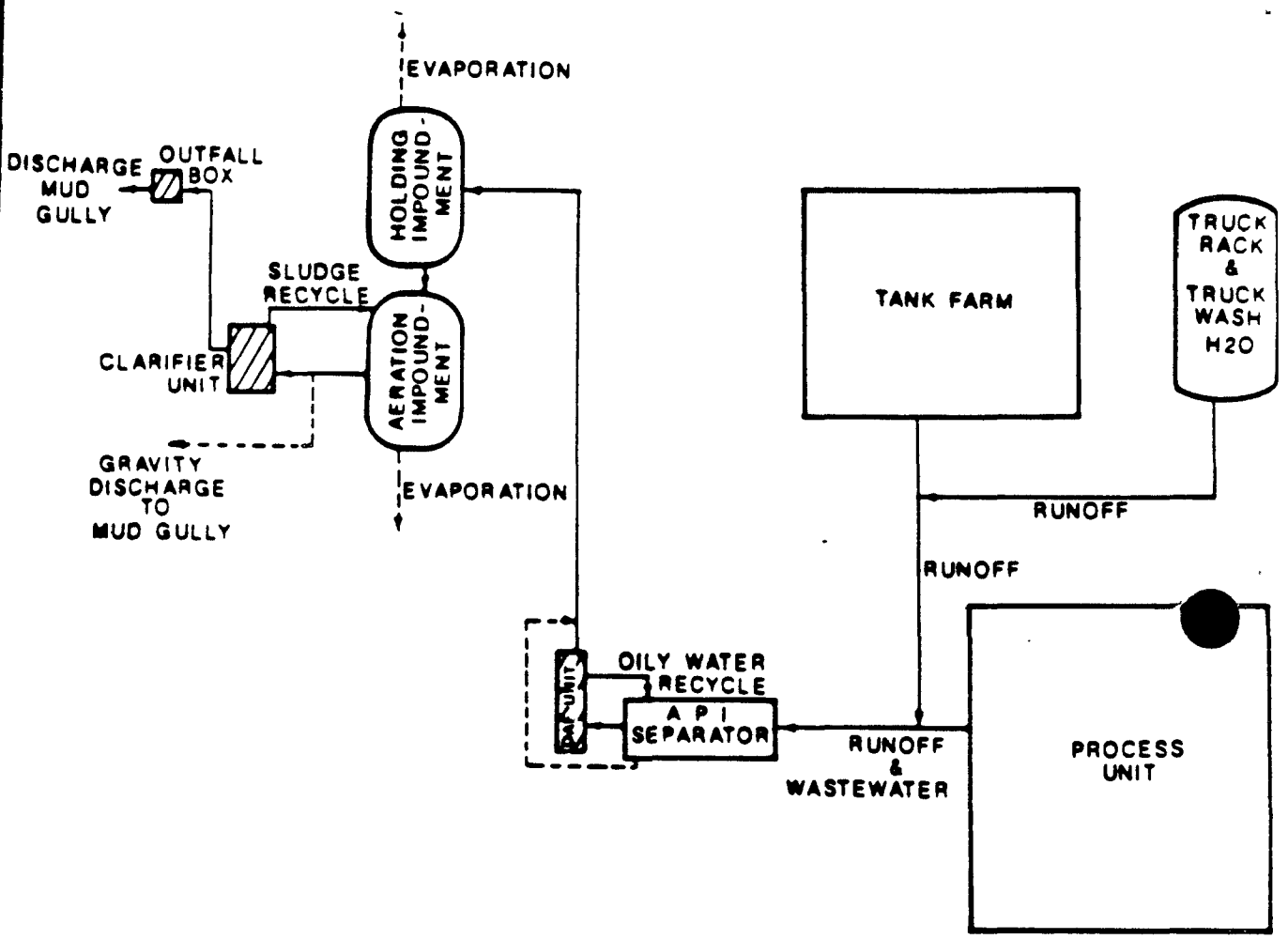
There are approximately 200,000 cubic yards of contaminated pit and subsurface soils on the site, associated with 24 different pits. But, the site investigations indicated that there is between 500,000 and 700,000 cubic yards of soils with measureable amounts of contamination. The pits are identified as A through X. Numerous discrete interval and composite samples were collected from each pit and the subsoil around each pit. Table 1 shows the compounds with the highest concentrations detected in the pit and subsurface soil samples. 1,2-dichloroethane had the highest concentration (245,000 mg/kg) of any of the volatile



RESOURCE ENGINEERING INC.
ENVIRONMENTAL CONSULTANTS
HOUSTON, TEXAS

FIGURE
WASTEWATER SYSTEM
SAMPLING LOCATION
BRIO REFINING

DRAWN BY	DATE	PROJECT NO
BH	11-10-86	351 03



RESOURCE ENGINEERING
ENVIRONMENTAL CONSULTANTS
HOUSTON, TEXAS

FIGURE
SCHEMATIC OF WATER FLOW
BRIO REFINING SITE
FRIENDSWOOD, TEXAS

DRAWN BY BH	DATE 11-10-86	PROJECT NO. 351-

organics detected in the pit soils, while phenanthrene had the highest concentration (6,670 mg/kg) of any of the base neutral organics found in the pit soils. In the subsoils around the pits 1,1,2-trichloroethane had the highest concentration (918 mg/kg) of any of the volatile organics found and fluoranthene had the highest concentration (29.5 mg/kg) of the base neutral organics detected.

Over twenty wells were installed in the shallowest aquifer (known as the NSCZ) to test it for contamination, and five more were drilled into the next aquifer (known as the Fifty-Foot Sand aquifer). Table 2 shows the highest concentrations of contaminants detected in the groundwater samples from the site. The analyses of these samples indicates that the pits are sources or potential sources of groundwater contamination.

In ground water samples from the NSCZ bis-(2-chloroethyl) ether had the highest concentration (38 mg/l) of the base neutral organic compounds detected while 1,2-dichloroethane had the highest concentration (3,580 mg/l) of volatile organics found. The highest concentration of contaminants in the Fifty-Foot Sand were limited to volatile organics including 1,1,2-trichloroethane (0.02 mg/l), 1,2-dichloroethane (0.055 mg/l) and methylene chloride (0.018 mg/l).

The most frequently detected volatile organic compounds in the pit and subsoil samples were methylene chloride and 1,1,2-trichloroethane. Fluoranthene and phenanthrene were the most frequently detected base neutral organic compounds found in pit and subsoil compounds. The most frequently detected compound in the groundwater samples was methylene chloride.

1.5 PILOT STUDIES

While generally available information will give an indication as to the potential applicability of a given remedial technology, performance of actual field tests using site-specific materials under site-specific conditions is often the best method for determining the appropriateness of a remedial technology. For this reason, treatability studies were performed at the Brio site. The studies were undertaken to obtain an in-depth analysis of the applicability of two remedial technologies (1) infrared incineration; and (2) solid and aqueous phase biological treatment.

The incineration testing was performed by Shirco Infrared Systems. In this treatability study, a pilot-scale size portable unit was mobilized on the Brio site. Soil and material samples from pits B, I, J and M were incinerated utilizing the infrared process. The objectives of the test program were:

- To determine the incinerator ash chemical composition;

- o to demonstrate that the incinerator feed system could provide a continuous, blended feed which could be fed to the furnace in a uniform manner;

- o to demonstrate that the incineration system can meet the RCRA requirement of 99.99% destruction efficiency removal; and

- o to provide design information and economic data required to evaluate the feasibility of incinerating certain Brio site pit wastes.

The results of the studies indicated that these objectives were accomplished and the results are summarized below:

Incinerator Ash

All compounds detected in the feed were reduced substantially in concentration.

Incinerator Feed System

The material processed from each pit required preparation prior to being place in the feed conveyer hopper. Some materials required delumping and screening. These results indicated that some type of materials handling techniques would have to be utilized during remedial action to improve the manageability of the waste.

Destruction Efficiency

Emissions sampling found that the destruction and removal efficiency of the system was greater than 99.9997% for each of the test conditions (differing residence times).

Design Data and Economics

The analysis concluded that using the currently available size mobile system 45,000 tons per year could be processed at an estimated cost of $143 per ton. Using the largest mobile system that may be built, at the time of the study, a total of 67,000 tons per year could be processed at a cost of $119 per ton. The accuracy of the cost estimate is ± 25 percent. This estimate did not include feed excavation, preparation, interest and taxes.

A preliminary assessment of remedial technologies indicated that biodegradation might be a suitable technology for destroying a portion of the organic constituents present in the soil at the Brio site. In early 1987, a solid-phase biodegradation pilot study was initiated at the Brio site. Pit O was selected as the pit which could best test this hypothesis.

Ecova Corporation conducted an evaluation of the amenability of

the organic constituents in Pit O to solid-phase biodegradation. As part of this evaluation, Ecova defined the types of organic constituents present in Pit O soil; defined the level of microbial activity; demonstrated destruction of organics at a bench-scale level; demonstrated destruction of organics using an on-site pilot-scale application; and evaluated potential full-scale systems capable of removing or destroying organic compounds in contaminated material.

The results of these studies are summarized as follows:

- o A solid-phase treatment process can be used for removing or destroying the contaminants detected in Pit O;
- o the process removes organic compounds by air stripping and destroys semi-volatile organic compounds by biodegradation;
- o although such a facility would be effective in reducing concentrations of volatile and semi-volatile organic compounds, the time required to treat affected materials and soils by a solid-phase treatment process might be unacceptably long; and
- o an aqueous-phase biodegradation process would increase the rate of removal of organic compounds.

This last point is in the process of being verified by the Brio Site Task Force. This group of PRPs have been conducting their own aqueous-phase biodegradation studies during late 1987/early 1988, not only to confirm the above referenced findings, but to support their own recommendation for remedial action (as discussed in Section V, under "Selected Remedy").

1.6 POTENTIAL IMPACTS OF THE SITE ON HUMAN HEALTH AND ENVIRONMENT

The assessment of risk posed by the Brio Refining site was evaluated in the Brio Refining/Dixie Oil Processors Endangerment Assessment. This assessment examined the amount, concentration, properties, and environmental fate and transport of chemical found at the site; the populations and environments potentially at risk; exposure pathways; and potential exposure events.

EPA has concluded that the site potentially poses four major risks to human health and the environment. These risks would result from:

- o Ingestion of contaminated soils on the site;
- o direct contact with contaminated soils on site;
- o inhalation of contaminated dust from the site;

- o ingestion of contaminated shallow groundwater from the site; and

- o air emissions of organic fumes from the site (resulting from soil disturbance activities).

Many of the chemicals found on the site are carcinogens (1,1,2 trichloroethane and methylene chloride) or toxic to the central nervous system, liver, or respiratory system (toluene and chlorobenzene).

The populations identified as being potentially at risk are several subdivisions, including Southbend, a junior college, an elementary school, and a hospital. Each is located within one-half mile of the site. The 1985 population residing within one mile is estimated at 5,751. Approximately 71,000 people reside within a four-mile radius.

Using a trespass exposure scenario, which assumed that the site would remain a secured industrial facility, target removal and treatment levels for selected chemicals were developed. These target levels were based on a 10^{-6} increased cancer risk for carcinogens and on an acceptable chronic daily intake for non-carcinogens. The endangerment assessment also examined an unrestricted access exposure scenario which indicated that greater volumes of affected materials and soil would have to be treated should exposure to the site increase.

II. ENFORCEMENT

Approximately 100 potential responsible parties (PRPs) have been identified. To this group, 74, 104(e) information requests were sent, with 28 follow-up letters. EPA received 49 responses (many of the companies identified are no longer in business). The Agency also sent 28 Notice Letters to these parties.

EPA will continue its enforcement activities and send Special Notice Letters to PRPs prior to the initiation of the remedial design. Should the PRPs decline to conduct future remedial activities, EPA will provide funding for such activities, but will retain its right to seek cost recovery for all EPA-funded response actions from the above referenced PRPs.

III. COMMUNITY RELATIONS

The Brio Refining site was proposed for the National Priorities List in October 1984. Funds were approved in the Spring of 1985 for EPA to conduct a Remedial Investigation and Feasibility Study at the Brio site. Prior to the initiation of the studies a group of companies, identified through the Agency's enforcement efforts as PRPs, formed the Brio Site Task Force in an effort to work with EPA in assessing the nature and extent of the contamination

at the site.

On May 16, 1985, EPA announced that the terms of an Administrative Order (signed in June 1985) had been agreed upon with the Task Force enabling them to undertake the investigations and studies necessary to determine the solution to the contamination problems at the Brio site. Included in the Administrative Order was the stipulation that, with EPA oversight, the Task Force would initiate and implement a comprehensive community relations program for interested citizens. EPA representatives would also participate in the community relations effort.

The Task Force held its first community leaders meeting on May 16, 1985, in order to discuss the Administrative Order and present a timeframe for the site investigation. A community meeting was held by the Task Force on July 2, 1985, to announce the initiation of water-quality sampling and odor abatement programs. The results of the water tests were announced at a community meeting on September 26, 1985.

Field activities were completed in November 1985. Upon completion of the first phase of the site investigation (and review of the information by EPA), the Task Force held a community meeting on April 30, 1986, to share the results of their initial efforts. On September 4, 1986, a community meeting was held to discuss any issues or concerns the local residents may have regarding the site studies. Status reports were also provided through newsletters.

On February 2, 1987, the Task Force held a community meeting on various treatment techniques that may be employed during remedial actions at a typical Superfund site. A community leaders meeting was held on April 2, 1987, to provide an update on site activities. A meeting to discuss the preliminary results of the Endangerment Assessment was held with the community leaders on June 18, 1987.

On January 21, 1988, EPA announced through a press release that studies were completed on the Brio site. The announcement also advised the public that EPA would be accepting comments on the proposed remedy for the site from February 1 to March 1, 1988, and that the Agency would hold a public meeting on February 9, 1988. An EPA prepared fact sheet describing various alternatives evaluated was mailed to interested citizens. EPA held a community leaders meeting on January 25, 1988, to brief the members of the group on the solutions proposed for the site. On the following night, January 26, 1988, the Brio Site Task Force held a community meeting to discuss the overall results of the site investigations, the findings of the Endangerment Assessment. An EPA representative announced the scheduled public meeting to discuss remedial alternatives. EPA's public meeting was held on February 9, 1988, at the Weber Elementary School. Approximately

350 people attended the meeting. The community expressed great concern that remedial action would address only partial remediation of the site. A summary of the public response to the solutions proposed by EPA at this meeting, can be found in the Responsiveness Summary (See Appendix E). On February 22, EPA met with the Friendswood City Council to discuss the proposed alternative solutions that the Agency had outlined in its public meeting on February 9.

Again, it should be noted that EPA was an active participant in all of the community or community leaders meetings discussed above. These activities were carried-out in cooperation with the Brio Site Task Force in accordance with the terms outlined in the above mentioned Brio Refining/Dixie Oil Processors Administrative Order on Consent.

IV. ALTERNATIVE EVALUATION

4.1 EVALUATION CRITERIA

Section 121(a), (b), and (d) of the Superfund Amendments and Reauthorization Act (SARA) contains nine factors which EPA must consider in selecting a remedy for a Superfund site. These items are summarized below:

1. Consistency with Other Environmental Laws

   In determining appropriate remedial actions at Superfund sites, consideration must be given to the requirements of other Federal and State environmental laws, in addition to CERCLA as amended by SARA. Primary consideration is given to attaining applicable or relevant and appropriate Federal and State public health and environmental laws and regulations and standards. Not all Federal and State environmental laws and regulations are applicable to each Superfund response action. The compliance of each remedial alternative with all applicable or relevant and appropriate environmental laws is discussed in Appendix C.

2. Reduction of Toxicity, Mobility or Volume

   The degree to which alternatives employ treatment that reduces toxicity, mobility or volume must be assessed. Relevant factors include:

   - The treatment processes the proposed solutions employed and materials they treat;
   - the amount of contaminated materials that will be destroyed or treated;
   - the degree of expected reduction in toxicity,

mobility, or volume;

- o the degree to which the treatment is irreversible; and
- o the residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity for bio-accumulation of such hazardous substances and their constituents.

3. Short-term Effectiveness

The short-term effectiveness of an alternative must be assessed considering the following:

- o Magnitude of reduction of existing risks; and
- o short-term risks that might be posed to the community, workers, or the environment during the implementation of an alternative including potential threats to human health or the environment associated with excavation, transportation, and redisposal or containment.

4. Long-term Effectiveness and Permanence

Alternatives are assessed for the long-term effectiveness and permanence they afford along with the degree of certainty that the remedy will prove successful. Factors considered are:

- o Magnitude of residual risks in terms of amounts and concentrations of wastes remaining following implementation of a remedial action, considering the persistence, toxicity, mobility, and propensity for bio-accumulation of such hazardous substances and their constituents;
- o type and degree of long-term management required, including monitoring and operation and maintenance;
- o potential for exposure of human and environmental receptors to remaining waste considering the potential threat to human health and the environment associated with excavation, transportation, redisposal, or containment;
- o long-term reliability of the engineering and institutional controls, including uncertainties associated with the land disposal of untreated wastes and residuals; and
- o potential need for replacement of the remedy.

5. Implementability

The ease or difficulty of implementing the alternatives are assessed by considering the following factors:

- o Degree of difficulty associated with constructing the solution;
- o expected operational reliability of the treatment technology;
- o need to coordinate with and obtain necessary approvals and permits (or meet the intent of any permit in the case of Superfund actions);
- o availability of necessary equipment and specialists; and
- o available capacity and location of needed treatment, storage, and disposal services.

6. Costs

The types of costs that should be assessed include the following:

- o Capital costs;
- o operation and maintenance costs;
- o net present value of capital and operation and maintenance cost; and
- o potential future remedial action costs.

7. Community Acceptance

This assessment should evaluate:

- o Components of remedial alternatives that the community supports;
- o features of the alternatives about which the community has reservations; and
- o elements of the alternatives which the community strongly opposes.

8. State Acceptance (through the Texas Water Commission)

Evaluation includes assessment of:

- o Components of remedial alternatives that the State supports;

- o features of the alternatives about which the State has reservations; and

- o elements of the alternatives which the State strongly opposes.

9. Overall Protection of Human Health and the Environment

Following the analysis of the remedial options against individual evaluation criteria, the alternatives are assessed from the standpoint of whether they provide adequate protection of human health and the environment.

EPA is also directed by Superfund law (SARA) to give preference to solutions that utilize treatment to remove contaminants from the environment. Offsite transport and disposal without treatment is the least preferred option where practicable treatment technologies are available.

4.2 DESCRIPTION OF ALTERNATIVES

In conformance with the National Contingency Plan (NCP), initial remedial approaches were screened to determine which might be appropriate for this site (see the Brio Refining/Dixie Oil Processors Feasibility Study for details of this evaluation). From these possible remedies, four were chosen for more detailed evaluation and comparison with the remedy selection criteria outlined above. Two other alternatives, No Action and Offsite Disposal were also evaluated to comply with the requirements of the NCP. Each remedy is summarized below. Common elements of all the plans include:

- o Implementing the Site Management Plan. Areas of the site which are not treated by one of the four remedies would be regraded and revegetated to promote rainwater drainage into Mud Gully and to minimize infiltration.

- o Monitoring the 15 existing wells on the site. There are ten in the shallowest aquifer (the NSCZ) and five in the next deeper aquifer (the Fifty-Foot Sand).

- o Monitoring Mud Gully in three locations for any increased contaminated runoff.

- o All the sludge in the wastewater treatment plant will be stabilized in place and the impoundments will then be backfilled.

- o All tank contents will be removed and properly disposed.

- o There will be semi-annual air monitoring of the sit
- o There are two lenses of DNALP (Denser than Water Non-Aqueous Phase Liquid) trapped on the top of the Middle Clay Unit. The lenses are beneath pits J and Q. This liquid would be collected by two well nests and disposed.
- o Site control through the use of the existing site security fence and the imposition of deed notices and restrictions (if necessary).

The cost estimates provided below for each alternative do not include the cost of dismantling the existing process facility. The cost of this effort has been estimated to be $500,000 as illustrated in Appendix H.

Alternative 1: No Action All of the items summarized above as common elements to all alternatives would be included in this remedy. The approximate cost of this action is $3,266,000.

Alternative 2: Cap and Cover This remedy consists of three main phases. First all on-site liquids and flowable organics will be stabilized in place. Any work which might release VOC fumes will be done inside portable buildings connected to a fume incinerator/scrubber. Next the pits would be closed by constructing compacted clay caps over them. These caps would have a venting system to trap any volatile organic compound (VOC) fumes released later by the unstabilized materials (such as untreated contaminated soils) in the pits. The vents will be connected to carbon canisters to control any VOC emissions, if necessary. The estimated cost of this alternative is $13,333,000 (plus $500,000 for dismantling the process facility).

Alternative 3: Vault This remedy would place all affected materials in an on-site vault. Affected materials would be drum contents, surface and subsurface soil contaminated at or above action levels, and any liquids and flowable solids. Any liquids or flowable solids will be stabilized first, and then put in the vault. Any work which might release VOC fumes would be done in portable building, and the fumes collected and incinerated. After the vault was filled it would be capped and covered. As in the Cap and Cover alternative, a venting system for VOC fumes would be installed. Tank liquids and drums with liquids would be disposed of off site. All tanks but one would be dismantled and buried in the vault along with all drums of solids. One tank would be used to equalize the flow to a package wastewater treatment plant. This plant would treat the vault's leachate. The estimated cost of this alternative is $20,723,000 (plus $500,000 for dismantling the process facility).

Alternative 4: Biological Treatment This remedy would use either a solid phase or aqueous phase biological system to treat

all affected materials and soils. After treatment, the solid residues from either process would be sufficiently decontaminated for use as direct backfill of the areas from which they were removed (cover soil and vegetative growth also placed in these areas). All excavation would be enclosed in a portable structure which would vent to a fume incinerator/scrubber system. The estimated cost of this alternative is $22,808,000 (aqueous phase) and $22,833,000 (solid phase - plus $500,000 for dismantling the process facility).

Alternative 5: On-Site Incineration The only difference between this remedy and Alternative 3 is that the affected- materials would be incinerated. The decontaminated ash would be used to backfill the excavations. These areas would then be covered with top soil and vegetation. The estimated cost of this alternative is $21,958,000 to $26,098,000 (depending on the type of incinerator used - plus $500,000 for dismantling the process facility).

Alternative 6: Off-site Disposal This solution would include excavation inside portable buildings connected to a fume incinerator/scrubber. The pits would then be backfilled with clean soil. The excavated material would be placed in trucks, specially equipped for hauling hazardous substances, and transported to an off-site disposal facility. The estimated cost of this alternative is $84,283,000 (plus $500,000 for dismantling the process facility).

4.3 EVALUATION OF ALTERNATIVES

The degree to which the remedial alternatives meet the nine selection criteria is contained in Table 3. The following values were assigned to compare remedy selection criteria:

- ++ Alternative would greatly exceed a selection criterion when compared to other alternatives.
- + Alternative would exceed a criterion in comparison to other alternatives.
- 0 Alternative can be designed to meet the selection criterion.
- - Special efforts will be necessary in the design of the remedy to meet the selection criterion.
- -- In comparison to the other remedies, these alternatives would present most difficulty in achieving a selection criterion.

The rationale for the ratings assigned in this table is as follows:

1. Complies with ARARS (i.e. meets or exceeds

Applicable, or Relevant and Appropriate Federal and State Requirements).

No Action is assigned a "--" because it violates the intent of SARA Section 121 regarding the selection of a remedy that is protective of human health and the environment.

All other alternatives are rated "0" since they all can be designed to meet any ARARs as discussed in Appendix C.

2. Reduces: Toxicity, Mobility, and Volume

No Action and Off-site Disposal are rated "--" because they do not reduce any of these parameters.

Cap and Cover was rated differently for each of these parameters.

- Toxicity was rated "-" since none of the organic contamination would be removed from the site except for possible air emissions.
- Mobility was rated "0" since the plan could be designed to meet the selection criteri
- Volume was rated "-" since the addition of stabilizing agents would increase the amount of material.

Vault was rated differently for each of these parameters

- Toxicity was rated "-" since none of the organic contamination would be removed from the site.
- Mobility was rated "+" since the leachate from the vault would be contained and treated before discharge.
- Volume was rated "-" since the addition of stabilizing agents would increase the amount of material.

Biological Treatment and Incineration were both rated "++" since both remedies would remove organic components in the waste materials thus reducing all parameters.

3. Short-Term Effectiveness

Off-site Disposal is rated "-" because the

transportation of waste poses additional environmental risks.

No Action is rated "0", but only in the short-term (less than one year) as long as site access is restricted and direct contact with site contaminants is prevented.

All other alternatives were rated "0" since any excavation or stabilization would be done in portable buildings. These buildings would vent to a fume incinerator, thus minimizing any VOC fume releases during the clean up.

4. Long-Term Effectiveness and Permanence

No Action was rated "--" because of the potential human health and environmental risks involved in leaving untreated wastes at a site where long-term site control can not be insured.

The rating of "+" were given to Biological Treatment and Incineration since these remedies would entail the destruction of most of the organic contamination on the site. The Vault remedy was rated "0" and Cap and Cover was rated "-" since they would involve more long term monitoring and maintenance.

Off-site Disposal rated "-" due to the potential threat involved in the long-term transport of wastes from the site and the problems associated with redisposal of the wastes.

5. Implementability

The Cap and Cover and Vault remedies were rated "+" since these remedies could be easily implemented. Biological Treatment was rated "0" since it is more complex but is still easy to construct and implement. Incineration was rated "-" since it is the most complex alternative which requires a significant amount of testing prior to start-up. Off-site Disposal received a rating of "-" due to potential transportation problems.

6. Cost

Estimated costs for each remedial action alternative are summarized in Table 5. Included in this table are total capital and present worth costs. Operation and maintenance costs were factored into each line item. Replacement costs have been evaluated as the cost involved in remediation should the alternative

fail. With the exception of No Action, the potential for failure was determined to be greatest with the Cap and Cover solution, since there would remain a potential for contaminants to leach from stabilized wastes without some direct means of capturing the leachate (as used in the Vault).

The Vault alternative would rank second to Cap and Cover with regard for the probability of failure because these structures have been known to leak (over the long-term) even with the leachate collection devices they provide. Biological Treatment and Incineration would have the lowest probability of failure because they would be treating certain amounts of contaminated materials to levels that should not cause future problems if used as backfill for the site. However, to differing degrees, all solutions will leave contaminated soils on site property, therefore, all solutions will include a cost for an estimated cost for corrective action should the remedy fail. In this case, we will assume that incineration will be the replacement treatment and that $21 million will be the cost of replacement.

The No Action alternative has the lowest present worth cost of the various alternatives followed by Cap and Cover, Vault, Biological Treatment, Incineration and Off-site Disposal (in increasing order of cost). The line items accounting for the greatest cost were treatment of affected materials and soils, air emission controls and monitoring, groundwater treatment and monitoring, and the site management plan. Transportation costs are the primary reason for the vast difference in cost between any of the on-site remedies and Off-site Disposal.

7. Community Acceptance

Comments from local residents received at the public meeting on February 9, 1988, and during the public comment period have one central theme, there is general agreement among local residents that all measurable amounts of affected soils found on the site should be treated. EPA has proposed to treat only affected materials and soils that would pose a health threat. Thus, some measurable amounts of contaminants will remain on site, however, deed restrictions will be imposed and site access will be controlled. Another major concern of the public is the potential adverse impact that this Superfund si will have on their property values and on the

economic development of the area.

Community members have also expressed concern over the need to widen Mud Gully (a flood control ditch located on the western boundary of the site) to prevent a "bottle neck" in the ditch. Additionally, they would like to see the tanks and process equipment dismantled as part of any remedy.

Off-site Disposal was the only solution which the public appeared to favor, but they wanted all measurable amounts of contaminants excavated and disposed offsite. Therefore, all alternatives in this Record of Decision were rated "-" due to the lack of support from the community.

To address the concerns mentioned above, EPA will request that any settling party (as part of the selected remedy) investigate creative design and landscaping ideas, in cooperation with the local residents, that might reduce any adverse economic impact the site might have on the area and enhance the aesthetics of the site. Additionally, any remedy will have to address the problem associated with Mud Gully to the satisfaction of the local Flood Control District and include dismantling the above ground storage tanks and process equipment. For further detail refer to Section V, entitled "Selected Remedy." Further discussion concerning EPA's response to public comments can be found in Appendix E, "Community Relations Responsiveness Summary."

8. State Acceptance

The State (through the Texas Water Commission) has been provided an opportunity to comment on the Record of Decision. They have indicated that they have no objection to the proposed remedy (See Appendix G).

Therefore, on-site incineration and on-site biological treatment have been rated "+" while all other alternatives were rated "0".

9. Overall Protection of Human Health and the Environment

No Action receives a rating of "--" because it does not provide adequate protection from the potential risks involved with leaving untreated wastes onsite. Off-site Disposal is rated "-" because the solution does not utilize treatment and the problem is merely transferred from one location to another. Furthermore, there is potential for exposure or release during transportation, and most importantly

it is the least preferred alternative where practicable treatment technologies are available.

The Vault and Cap and Cover rated "+" because they utilize treatment (stabilization) and do provide overall protection of human health and the environment. Biological Treatment and Incineration both rated "++" because they provide the best means of treatment (i.e., destruction of organics) and they do provide overall protection of human health and the environment.

4.4 OPERATION AND MAINTENANCE

The need for future operation and maintenance will be minimized since the primary sources of contamination will be removed through treatment. Site operation and maintenance will include a monitoring program for sampling groundwater wells, ambient air, and Mud Gully sediments. This sampling program will monitor the effectiveness of the selected remedy and provide the data necessary to trigger future corrective action, if necessary. Additional site maintenance would include, but not necessarily be limited to, inspections of surface vegetation, ensuring proper drainage, proper operation of any actions such as groundwater treatment which may extend beyond the time required for the source control remedy, and periodic fence (or barrier) repair. The details of this activity will be defined in the Operation & Maintenance Plan of the remedial design.

V. SELECTED REMEDY

Based on the information provided in the administrative record and the results of the evaluation of alternatives (Section 4.3), the final remedy has been selected.

It is EPA's judgment that on-site incineration of affected materials and soils best serves both statutory and selection criteria in relation to the other solutions evaluated in this document. However, the Brio Site Task Force proposes the use of aqueous-phase biological treatment. The lack of the demonstrated performance of this technique on the affected materials and soils at the Brio Refining site, while of concern to EPA, may not prevent favorable consideration if the Brio Task Force can demonstrate that aqueous-phase biological treatment can provide the same level of treatment deemed necessary to protect public health and the environment.

EPA has determined that if adequate demonstration is provided prior to remedial action, the Brio Site Task Force's proposal has the potential to provide protection of human health and the environment comparable to the on-site incineration remedy. But this determination has been made with the understanding that if the remedy (aqueous-phase biological treatment) should fail the

Task Force (or settling party) would have to undertake any corrective action deemed appropriate by EPA. Pass/fail criteria for use of biotreatment rather than incineration will be developed prior to the start of remedial action. If biotreatment cannot meet the pass/fail criteria, then on-site incineration will be implemented.

The final remedy is summarized as follows:

Affected materials and soils - Shall be treated using either incineration or biological treatment. This media shall be defined as all contaminated sludges and liquids and waste material found to exist above the action levels defined in the Endangerment Assessment (EA). This will include those affected materials and soils existing in pits B, J, H/V, E, Q, and R (as defined in the EA). Additionally, the Remedial Investigation identified sludges and liquids in pits F, G, I, K, L, and M; therefore, these sludges and liquids (and any others found during remedial action) must also be excavated and treated. The definition of the boundary between the sludge/soil interface will be determined prior to remedial action.

Excavations shall be conducted in enclosures, material transported to the treatment unit(s), and the treated material backfilled in the pits if it successfully passes the Toxicity Characteristic Leaching Procedure.

Surface contamination - Attachments 8 and 9 of the Remedial Investigation Report shall be examined and the site re-evaluated prior to remedial action, to identify those areas where surface seeps are visually apparent. These areas will be scraped or excavated to remove the source of contamination and to prevent future migration of this material. This source of contamination will then be consolidated and treated with the affected materials and soils.

Off-site soil contamination - Any off-site soil contamination found during the remedial investigation, or during the remedial action, shall be removed to background levels. This may require that special detection limits be used for sampling efforts at the site boundaries during the remedial action. This activity will have to be further defined in the remedial design.

Pit G - Further investigation into this pit area to locate sludges or liquids may have to be done at the completion of the remedial action due to the location of this pit beneath the wastewater treatment surface impoundment. This activity will be further defined in the remedial design.

Debris and rubble - There is much inert debris and rubble remaining on the site from past operations. This material may be consolidated and the ultimate disposition of the material determined during the remedial design.

Mud Gully - Contaminants observed in this flood control ditch and the "bottle neck" that exists as it passes the Brio site has been a noted concern of the EPA as well as local residents and the Harris County Flood Control District. It is apparent that these problems will have to be corrected as part of any remedy that is instituted at the site. Initial thoughts would suggest a low-maintenance approach to resolving this problem where some type of performance standard would be set in cooperation with the Harris County Flood Control District. Such actions shall be further defined in the remedial design.

Wastewater treatment system - In-place stabilization of wastes existing in the impoundments, backfill impoundments with dike materials and other uncontaminated materials (if necessary), cap and cover, grade to promote runoff and minimize infiltration, install a package wastewater treatment plant or route wastewater to a POTW. Portions of the existing wastewater treatment system may be used during remedial action, but will be decommissioned once the remedial action is completed.

Storage tanks and drums - Remove tank contents, decontaminate tanks, dismantle tanks; sell dismantled tanks or transport the tanks to an EPA approved off-site disposal facility; transport the tank contents and drums to an EPA approved off-site disposal facility. If any tanks are used during remedial activities, they will be dismantled upon completion.

Process equipment - The entire process facility will be dismantled. If any portion of the existing facility is used during remedial activities, the structure will be dismantled upon completion of remedial action.

Monitoring and control of migration pathways - Ambient air sampling on a semi-annual basis; control air emissions from treatment processes; excavate in enclosures and vent the enclosure to an emission control device; eliminate or control rainfall on construction areas; sample and monitor Mud Gully sediments; treat the groundwater in the Numerous Sand Channel Zone to a level to be determined in the remedial design (but to achieve treatment of the Dense Non-Aqueous Phase Liquids (DNAPLs) to the satisfaction of EPA) monitor the groundwater for a timeframe to be determined in the remedial design; allow natural attenuation (no treatment) of the Fifty-Foot Sand aquifer and monitor the groundwater in the aquifer to ensure that it is naturally cleaning itself. Monitoring activities will be utilized to determine the effectiveness of the actions to be implemented and shall be detailed in the operation and maintenance plan of the remedial design. This same data will be evaluated during the Agency's 5-year review, in accordance with SARA Section 121(c), to determine if any corrective action is necessary.

Site management plan - Areas outside the boundaries of excavation will be regraded and vegetated to promote drainage and minimize infiltration. A stormwater transmission system draining to Mud Gully will be constructed in an east/west direction across the north and south parcels. All regrading will be covered with 6 inches of topsoil, if necessary, to promote vegetative growth. To the maximum extent practicable, the aesthetics of the site (upon completion of the remedy) shall be enhanced by utilizing creative design and landscaping techniques with input from local residents.

Site control - This remedial action is based on permanent site control, imposition of necessary deed notices and restrictions (if possible), and restriction of access to the site by use of a fence or similar barrier.

APPENDIX A

TABLE 1

HIGHEST COMPOUND CONCENTRATIONS FOR PIT SOIL AND SUBSOIL SAMPLES

Highest Concentration of
Volatile Organic Compounds
(mg/kg)

Pit	Compound	Pit Soil	Subsoil
A	Vinyl Chloride	0.074	ND
B	1,2 Dichloroethane	245,000	515
C	Methylene Chloride	0.037	0.050
D	1,2 Dichloroethane	0.0245	ND
E	1,1,2 Trichloroethane	12,500	36.1
F	1,1,2 Trichloroethane	728	0.50
G	Methylene Chloride	0.50	0.01
H	1,2 Dichloroethane	32,000	ND
I	1,1,2 Trichloroethane	3,980	ND
J	1,2 Dichloroethane	179,000	159
K	Ethylbenzene	328	ND
L	Methylene Chloride	392	ND
M	1,2 Dichloroethane	121	9.97
N	1,1,2 Trichloroethane	23	1.19
O	Ethylbenzene	340	ND
P	1,1,2 Trichloroethane	0.934	91.0
Q	1,1,2 Trichloroethane	65,700	472
R	Ethylbenzene	588	21.1
S	None Detected		
T	Methylene Chloride	0.19	ND
U	Methylene Chloride	0.054	ND
V	Methylene Chloride	1000	ND
X	None Detected		

TABLE 1 (Cont.)

HIGHEST COMPOUND CONCENTRATIONS FOR PIT SOIL AND SUBSOIL SAMPLES

Highest Concentrations of
Base Neutral Organic Compounds
(mg/kg)

Pit	Compound	Pit Soil	Subsoil
A	Fluoranthene	0.074	16.1
B	Bis (2 chloroethyl) ether	3,040	ND
C	None Detected		
D	None Detected		
E	Phenanthrene	838	ND
F	Phenanthrene	411	ND
G	Phenanthrene	91.5	ND
H	Pyrene	762	ND
I	Phenanthrene	6,670	ND
J	Phenanthrene	2,910	ND
K	Phenanthrene	740	ND
L	Phenanthrene	120	ND
M	Phenanthrene	62.6	ND
N	Phenanthrene	111	ND
O	Phenanthrene	29	ND
P	Anthracene	86.5	ND
Q	Bis (2 chloroethyl) ether	1,810	ND
R	Phenanthrene	758	ND
S	None Detected		
T	None Detected		
U	Phenanthrene	2.18	ND
V	None Detected		
X	None Detected		

TABLE 2

ORGANIC COMPOUND CONCENTRATIONS IN THE NSCZ

Well	Concentration (mg/l)
BMW 1A	ND
BMW 2A	ND
BMW 3A	2.41
BMW 4A	3.21
BMW 6A	664
BMW 7A	4165
BMW 8A	4.89
BMW 9A	13.2
BMW 10A	.51
BMW 11A	1.25
BMW 12A	.02
BMW 13A	829
BMW 14A	ND
BMW 15A	5.99
BMW 16A	.02*
BMW 17A	73
BMW 18A	1756
BMW 26A	.02*
BMW 27A	.04
BMW 28A	38.4
BMW 30A	1.83
BMW 31A	37.2

BMW = Brio Monitoring Well

A = Well monitors the NSCZ aquifer.

* = Only Methylene Chloride detected.

Concentration is the sum of the concentrations of:

Vinyl Chloride
Dichloroethane
Trichloroethane
Methylene Chloride
Bis (2 chloroethyl) ether

TABLE 3

COMPARISON OF REMEDIAL ALTERNATIVES
BRIO REFINING SITE

ALTERNATIVES	COMPLIES WITH ARARS	REDUCES			SHORT-TERM EFFECT	LONG-TERM EFFECT	IMPLE-MENT-ABILITY	COST MILLION ($)	COMMUN-ITY ACCEPT	STATE ACCEPT	OVERALL PROTECT OF H&E
		TOX	MOB	VOL							
NO ACTION	--	--	--	--	0	--	+	3	-	0	--
CAP AND COVER	0	-	0	-	0	0	+	13	-	0	+
VAULT	0	-	+	-	0	0	+	21	-	0	+
ON-SITE BIOLOGICAL TREATMENT	0	++	++	++	0	+	0	23	-	+	++
ON-SITE INCINERATION	0	++	++	++	0	+	-	22-26	-	+	++
OFF-SITE DISPOSAL	0	--	--	--	-	-	-	84	+	0	-

++ = Alternative greatly exceeds criteria when compared to other alternatives.
+ = Alternative exceeds criteria when compared to other alternatives.
0 = Alternative can be designed to meet the criteria.
- = Special efforts will be necessary for this criteria to meet the criteria.
-- = Compared to other alternatives, this alternative would have the most difficulty in meeting the criteria.

TABLE 4

ESTIMATED AMOUNT OF AFFECTED MATERIALS AND SOILS
REQUIRING TREATMENT
AT THE BRIO REFINING SITE

Pit Location	Volume (cu.yd.)	Pit Location	Volume (cu.yd.)
B	6,319	F	3,918
E	7,870	G	3,759
H/V	15,020	I	10,415
J	11,636	K	4,478
Q	16,889	L	3,176
R	5,022	M	2,333
Total	62,756		24,320

Surface Contamination - 0 - 50,000 cu. yd.

Contaminated Liquids

Liquids in Tanks	104,225 gals.
Denser than water non-aqueous phase liquid	66,000 gals.
Total	170,225 gals.

Drums

Generated during Remedial Investigation	1,674
Generated by Past Operators	34
Generated by Pilot Studies	49
Total	1,757

TABLE 5

RIO REFINING
REMEDIAL ACTION PLANS
LINE ITEM COSTS
($ THOUSANDS)

ITEM	NO ACTION	CAP & COVER	VAULT	BIOLOGICAL	INCINERATION	OFF-SITE
Affected Soils and Materials	0	6770	12870	14335 14360	15120 19260	76710
Wastewater Treatment System	310	510	800	1350	775	800
Storage Tanks and Drums	6[illegible]	620	700	770	700	700
Air Migration	120	1775	2695	2695	1705	2415
Mud Gully Sediments	0	270	270	270	270	270
Ground water (NSCZ)	600	1832	1832	1832	1832	1832
Ground water (50-Foot Sand)	86	86	86	86	86	86
Site Management Plan	1470	1470	1470	1470	1470	1470
Total Cost	3266	13333	20723	22808* 22833**	21958*** 26098****	84283
Net Present Worth Cost	1350	11570	17180	19790* 19800**	17430*** 21640****	66060

Volume : 62,000 cu. yd.
Duration: 30 years
Cost Basis: -30% to + 50%

* Aqueous-Phase Biological Treatment
** Solid-hase Biological Treatment
*** Infrared Incineration
**** Rotary Kiln Incineration

APPENDIX B

TABLE 3-1

VESSEL SUMMARY BRIO REFINING

Vessel Number*	Brio	Pre-Brio	Service	Capacity (bbls)	Contents Volume (bbls)	Contents (gallons)	Contents Description	Date last Inspected
100/N6		X	Unknown	Unknown	~190	~7,980	Rainwater with hydrocarbon	9/9/85
104		X	Slop	2,100	0	0	9/9/85	
155	X		Crude Storage	58,000	1,595	66,990	Water with crude	9/9/85
**201	X		JP-4 Treater Surge Drum	315	103	4,326	Water with JP-4 (Toluene 15.1ppm, benzene 5.5 ppm)	7/12/85
**202	X		JP-4 Phase Separator	144	0	0	9/9/85	
**206	X		Waste Caustic	210	93	3,906	JP-4 + 10% Caustic (TOC 12,700 ppm, pH 12.0, phenol 25 ppm)	7/8/85
**207	X		Caustic Storage	210	8	336	10° Be' Caustic	7/8/85
**208	X		Caustic Storage	210	4	168	50° Be' Caustic	7/8/85
231	X		Residual Fuel Oil	4850	0	0	9/9/85	
232	X		Residual Fuel Oil	4830	0	0	9/9/85	
303		X	Fuel Oil	Unknown	0	0	9/9/85	
**332	X		Atm. Gas Oil + Residual Fuel	1000	13	546	AGO + Resid Fuel (Fl. pt. 215°F; 19,358 BTU/lb; Toluene 12 ppm)	7/24/85
**333	X		Atm. Gas Oil + Residual Fuel	1000	15	630	AGO + Resid Fuel (Fl. pt. 207°F; 19,200 BTU/lb; Toluene 100 ppm)	7/24/85
401/501	X		Diesel	5000	0	0	9/9/85	
402/502	X		Diesel	5000	0	0	9/9/85	
451		X	Diesel	10200	0	0	9/9/85	

*See the Figure in Attachment 15 for vessel location.
** Tanks inspected by EPA.
A second vessel inventory confirmed the findings of the initial inventory.

TABLE 3-1 (Continued)
VESSEL SUMMARY BRIO REFINING

Vessel Number*	Brio	Pre-Brio	Service	Capacity (bbls)	Contents Volume (bbls)	Contents (gallons)	Contents Description	Date Last Inspected
501	X		JP-4	5050	0	0	9/9/85	
502	X		JP-4	5050	0	0	9/9/85	
551		X	Diesel	4834	0	0	9/9/85	
552		X	Naphtha	5162	0	0	9/9/85	
601	X		Raffinate	1300	0	0	9/9/85	
602	X		Raffinate	2100	0	0	9/9/85	
651		X	Naphtha	25300	0	0	9/9/85	
40042		X	Unknown	Unknown	0	0	9/9/85	
**BT-15		X	Jet-A	~1000	589	24,738	Viscous oil (Fl. pt. 155°F; 18,358 BTU/lb; Styrene 828 ppm; ethylbenzene 742 ppm)	7/25/85
BT-21		X	Propane	2000	0	0	8/12/85	
**N1	X		LPG	714	<1	<42	LPG	Not inspected
**N2	X		LPG	714	<1	<42	LPG	Not inspected
**N3	X		LPG	714	<1	<42	LPG	Not inspected
**N4	X		LPG	714	<1	<42	LPG	Not inspected
**N5	X		LPG	714	<1	<42	LPG	Not inspected
N7		X	Plant Water (in use)	Unknown	Unknown	Unknown	Well water	9/9/85
**N8		X	Unknown	Unknown	65	2,730	Hydrocarbon (Fl. pt. 227°F; 19,234 BTU/lb; 0.003 wt% ash)	7/25/85
**S1		X	Styrene centrifuge bottoms	~715	673	28,266	Sludge (Fl. pt. 30°F; 6900 BTU/lb; 1.1% Sulfur; 7% toluene; 1.6% Benzene; 1.6% Ethylbenzene; 1.6% styrene) Oil (Fl. pt. 116°F; 1.1% Sulfur; 18,800 BTU/lb; 3.3% toluene; 1.5% ethylbenzene; 1.8% styrene)	7/8/85

** Tanks inspected by EPA.
A second vessel inventory confirmed the findings of the initial inventory.

TABLE 3-1 (Continued)

VESSEL SUMMARY BRIO REFINING

Vessel Number*	Brio	Pre-Brio	Service	Capacity (bbls)	Volume (bbls)	Volume (gallons)	Contents Description	Date last Inspected
**S2		X	Styrene centrifuge bottoms	Unknown	757	31,794	Sludge (Fl. pt. 87°F; 8000 BTU/16; 1.07% Sulfur; 1.3% toluene; 0.5% ethylbenzene	7/8/85
**S3		X	Styrene centrifuge bottoms	Unknown	85	3,570	Water (pH 6.45; TSS 835 ppm; TOC 2762 ppm) Sludge (Fl. pt. 82°F; 7500 BTU/lb; 0.93% Sulfur; 2% toluene; 0.9% ethylbenzene)	7/8/85
**S4	X		Firewater	5000	3160	132,720	Well water	Not inspected
**S5		X	Unknown	Unknown	0	0	Styrene tar (?)	9/9/85
**S6	X		Loading rack spills	Unknown	170	7,140	Oil (Fl. pt. 78°F; 19,550 BTU/lb; 0.163% Sulfur) Water (pH 6.5; TOC 197 ppm; TSS 8600 ppm)	8/12/85
S7		X	Unknown	Unknown	0	0	9/9/85	
**S8	X		Fuel Tank	Unknown	0	0		Not inspected
**S9	X		Fuel Tank	Unknown	0	0		Not inspected
S10	X		Diesel Fuel Additive	Unknown	~0	~0	9/9/85	
S11		X	Unknown	Unknown	0	0	9/9/85	
S12		X	Unknown	Unknown	0	0	9/9/85	
**S13	X		Unknown	Unknown	~0	~0	9/9/85	

** Tanks inspected by EPA.
A second vessel inventory confirmed the findings of the initial inventory.

APPENDIX C

4.7 REGULATORY COMPLIANCE

4.7.1 General Background

Section 121(d) of CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), describes the types of standards that a remedial action is required to meet. Those standards must be met by any remedial action proposed by this Feasibility Study for the Brio site. Section 121(d) mandates that the remedial action selected must be protective of public health and the environment and the types of control in place and the levels of the hazardous substances, pollutants, or contaminants at the site must meet those standards, requirements, criteria, or limitations under any Federal environmental law, or any more stringent state standard, that are "legally applicable" or "relevant and appropriate". To obtain compliance with this general standard, and in recognition of the USEPA's July 9, 1987 memorandum "Interim Guidance on Compliance with Applicable and Relevant and Appropriate Requirements", all remedial action plans were evaluated to determine what standard and appropriate technologies would be adequately protective of public health and the environment.

The universe of environmental standards and controls was reviewed to determine which of them had a bearing on remedial action at the site, Table 4-8. The results of that evaluation are summarized in Table 4-9 which specifies controls and standards deemed appropriate during remediation on the basis of a best engineering judgement evaluation.

At the completion of remediation the only standards that must be complied with are those that describe the level at which a hazardous substance, pollutant or contaminant should be found in the environment or those standards that specify a means of controlling releases of hazardous substances, pollutants or contaminants.

For those standards that describe a level or type of control, these requirements need only be met if they are "legally applicable" or "relevant and appropriate". These terms are not defined in the amended CERCLA. The EPA's Interim Guidance defines "applicable requirements" as "those cleanup standards, standards of control, and other substantive environmental

TABLE 4-8

STANDARDS, REQUIREMENTS, CRITERIA, OR LIMITATIONS EVALUATED FOR ARARs DETERMINATION

- Safe Drinking Water Act
- Clean Water Act
- Solid Waste Disposal Act
- Occupational Safety and Health Act
- Hazardous Materials Transportation Act
- National Historic Preservation Act
- Archeological and Historical Preservation Act
- Historic Sites, Buildings and Antiquities Act
- Fish and Wildlife Coordination Act
- Endangered Species Act
- Rivers and Harbors Act of 1899
- Wilderness Act
- Scenic River Act
- Coastal Zone Management Act
- Texas Clean Air Act
- Texas Solid Waste Disposal Act
- Texas Water Code

BRO/FS-FN-S4Tr(16)

TABLE 4-9

STANDARDS AND CONTROL TECHNOLOGY
UTILIZED DURING REMEDIATION AS
SPECIFIED BY BEST ENGINEERING
JUDGEMENT TO PROTECT PUBLIC HEALTH
AND THE ENVIRONMENT

A. AIR EMISSIONS

1. Excavation/stabilization performed in enclosure and air emissions collected and routed to fume incinerator with scrubber (all remedial options).

2. Any stockpiles of feedstock for treatment (biological or incineration) maintained in enclosure with air emissions collected and routed to scrubber equipped fume incinerator.

3. Biological treatment (solid or aqueous) performed in an enclosure with air emissions collected and routed to a scrubber equipped fume incinerator.

4. Incinerator equipped with high-temperature secondary combustion chamber and wet scrubber designed to meet particulate, HCl and destruction removal efficiency limitations specified in 40 CFR Part 264, Subpart O.

B. SURFACE AND GROUNDWATER

1. Process water and potentially contaminated stormwater[1] collected and routed to a package activated sludge treatment system equipped with carbon polishing and discharged to Mud Gully or routed to a POTW for treatment (all remedial options).

2. Discharge from package treatment system consistent with NPDES permit limitations, and 40 CFR Part 125.

3. Any groundwater subject to treatment would be treated in the package treatment system prior to discharge.

BRO/FS-FN-S4Tr(12)

1 Since excavation/stabilization, stockpiling and any treatment will take place in enclosures such that potentially contaminated stormwater would not be generated, the only areas subject to stormwater collection would be the transfer areas between pit excavation and stockpile and stockpile and treatment.

TABLE 4-9
(Continued)

C. AFFECTED SOIL AND MATERIAL

1. Compliance with substantive portions of 40 CFR Part 264, Subpart J, relating to tanks (aqueous biological treatment), including:

   a. 40 CFR § 264.191 (shell strength)
   b. 40 CFR § 264.192 (prevent overfilling)

2. Compliance with substantive portions of 40 CFR Part 264, Subpart L, relating to covered storage piles (all remedial options), including:

   a. 40 CFR § 264.250(c) (covered waste pile)

3. Compliance with substantive portions of 40 CFR Part 264, Subpart M, relating to land treatment (solid phase biodegradation), including:

   a. 40 CFR § 264.273 (maximize degradation)
   b. 40 CFR § 264.278 (unsaturated zone monitoring)

D. GENERAL

1. OSHA Health and Safety Regulations as provided for in 20 CFR Part 1910, Subpart H.

protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site." The guidance also notes that to be "applicable" implies that the remedial action or circumstance satisfy all the jurisdictional prerequisites of a requirement.

The Interim Guidance defines "relevant and appropriate" requirements as "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal and State law that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site."

Section 121 also provides that on-site remedies are not required to obtain Federal, State, or local permits. This permit exemption covers Federal, State or potentially responsible party response actions being taken on site under the authority of CERCLA Sections 104, 106 or 122. Therefore, these remedies must comply with the substantive requirements which specify a level or means of control, but do not need to comply with administrative and procedural requirements associated with the permitting process. "On-site" includes the areal extent of contamination and all suitable areas in reasonable proximity to the contamination necessary for implementation of the response action.

ARARs must be determined on a site specific basis. Therefore, with this general understanding of the requirements of § 121(d), the following is an assessment by environmental media of compliance of the proposed remedial actions with the standards found to be either "legally applicable" or "relevant and appropriate".

4.7.2 Air Emissions

Based on a review of all potentially applicable air emission-related regulations and standards, the only "legally applicable or relevant and appropriate requirement" for air emissions at the completion of remediation is

specified in Section 4.01 of the Texas Clean Air Act, which provides that "no person may cause, suffer, allow or permit the emission of air contaminants or the performance of any activity which causes or contributes to, or which will cause or contribute to, a condition of air pollution". "Air pollution" is defined "as the presence in the atmosphere of one or more air contaminants or a combination thereof, in such concentration and of such duration as are of may tend to be injurious to or to adversely affect human health or the environment, animal life, vegetation or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property."

To assure compliance with this standard, each of the proposed remedial action plans contains provisions for semiannual ambient monitoring to verify that site conditions existing at the completion of remediation are not causing or contributing to a condition of air pollution. All of the remedial actions are designed to insure that emissions are in compliance this ARAR. Specific measures to control air emissions during remediation have been incorporated into each remedial action plan and are outlined in Table 4-9.

4.7.3 Surface and Ground Water

4.7.3.1 Discharges to Surface Water

Mud Gully runs through the site and will be impacted from both point and non-point sources of water discharges from the site. The point sources will consist of water generated by remedial activities as well as storm water flows. At the completion of remediation, there will be no point source discharge.

However, at the completion of remediation Mud Gully may be impacted by a non-point source discharge, namely ground water flow from the NSCZ. The only standards that could be "legally applicable or relevant and appropriate" to discharges from the NSCZ would be state water quality standards or federal water quality criteria.

State water quality standards are the legally enforceable counterpart to federal water quality criteria. In Texas, the state water quality standards are set forth in Chapters 319 and 333, of the rules and regulations of the

Texas Water Commission. Those standards establish certain numerical criteria which are legally applicable to Mud Gully. All remedial action plans satisfy the requirements of 31 TAC §§319.21 - 29, 333.17 - .19 for the discharge of water from the NSC2 to Mud Gully.

While these requirements are ARARs, those portions of the state's standards and the federal water quality criteria that relate to use of surface waters as a source of drinking water (because the surface water directly supplies water to a public drinking water supply system or recharges an aquifer used for that purpose) are not applicable or relevant and appropriate, because Mud Gully does not supply water to a potable water supply system nor does it recharge an aquifer used for that purpose.

4.7.3.2 Ground Water

The EPA's ground water protection strategy is based on the "differential protection" of ground water (i.e., ground water protection as it relates to a specific classification of an aquifer). Under the strategy ground waters are classified as follows:

- Class I - ground waters that are highly vulnerable and either an irreplaceable source of drinking water or ecologically vital;
- Class II - ground water currently used or potentially available for drinking water or other beneficial use; and
- Class III - ground waters are not a potential source of drinking water and of limited beneficial use.

For Class I and Class II ground waters MCLs established under The Safe Drinking Water Act would be applicable for ground water which qualifies as a public water system or a community water system. MCLs may also be relevant and appropriate to ground water that would not currently qualify as such systems but could potential so qualify in the future. Similarly, where the State has established drinking water standards are more stringent than the Federal MCL, these may be applicable or relevant and appropriate.

There are two water-bearing zones underlying the site which appear to have been impacted by on-site activities. The uppermost zone is the NSCZ. The next zone, which is separated from the NSCZ by an aquitard referred to as the Middle Clay Unit, is the Fifty-Foot Sand. As discussed in this FS, the NSCZ is neither an existing nor potential drinking water supply because of the poor yield of that zone and therefore is a Class III aquifer under the EPA Groundwater Protection Strategy. As such MCLs are neither applicable nor are they relevant and appropriate to the NSCZ. As outlined above, however, NSCZ ground water quality will be maintained such that its discharge does not represent a threat to aquatic life in Mud Gully.

While the Fifty-Foot Sand might be a "potential" drinking water source, demographic data, land use, and projected water supply plans for the area clearly indicate that this aquifer is not likely to be used for drinking water supply purposes.

Even if it is used as a drinking water supply it is not likely to serve as a public water system or even a community water system. Therefore, MCLs would not be legally applicable to the Fifty-Foot sand. However, because of its status as a potential drinking water source these standards may be considered relevant. Given that any potential use is unlikely in the near future, and indeed may never occur, immediate application of MCL is not appropriate. Instead, it is more appropriate to monitor this zone and let natural attenuation, which will eventually allow any affected ground water in the Fifty-Foot Sand to achieve MCL levels, take its course since there is not current or projected threat of exposure. Furthermore, any subsequent application of MCLs would apply to concentrations at the point of use and not at the source.

4.7.4 Affected Material and Soils

The primary standards of criteria that could be legally applicable to the storage, treatment or disposal of affected material and soils are those developed under the authority of RCRA. RCRA requirements would be "legally applicable" to "hazardous waste" which includes: (1) wastes which exhibit one of four characteristics (ignitability, reactivity, corrosivity, or toxicity) or (2) are listed in the RCRA regulations as hazardous waste or (3) are

TABLE 4-10

BRIO/DOP APPLICABLE OR
RELEVANT AND APPROPRIATE REQUIREMENTS

1. Section 4.01 of Texas Clean Air Act (applicable).

2. Sections 329.41-.49, 333.17-.19 of Chapter 31 of Texas Administrative Code Relating to State Water Quality Standards as applied to Mud Gully (applicable).

3. Federal Water Quality Criteria for Fresh Water Aquatic Life Protection as applied to Mud Gully (relevant and appropriate).

4. Safe Drinking Water Act Primary and Secondary Maximum Contaminant Levels (MCLs) as applied to Fifty-Foot Sand (relevant and appropriate).

5. RCRA requirements contained in 40 CFR, Part 264, consisting of the following (by remedial action plan) (relevant and appropriate).

   a. Cap and Cover (40 CFR Part 264, Subpart N)

      (1) Eliminate Free Liquids.

      (2) Stabilize to a bearing capacity sufficient to support final cover.

      (3) Cover designed to:

         (a) provide long term minimization of migration of liquids through closed area;

         (b) function with minimum maintenance;

         (c) promote drainage and minimize erosion;

         (d) accommodate settling and subsidence so that cover integrity maintained; and

         (e) have a permeability less than or equal to permeability of any bottom liner system or natural subsoil.

      (4) Post-Closure Designed to:

         (a) maintain integrity and effectiveness of cover;

         (b) maintain groundwater monitoring system;

TABLE 4-10
(Continued)

(c) prevent run-on and run-off from eroding or otherwise damaging final cover; and

(d) prevent disturbance of cover.

b. Vault (40 CFR Part 264, Subpart N)

(1) Constructed with two liners and a leachate collection system.

(2) Lower liner at least 3 feet thick constructed of recompacted clay with a permeability of no more than 1×10^{-7} cm/s.

(3) Maintain a run-on control system to prevent flow into active portion of landfill.

(4) Maintain a run-off control system to collect and control water volume from active portions resulting from a 24-hour, 100 year storm.

(5) Manage wind dispersal of particulates.

(6) Stabilize materials sufficiently such that no free liquids are placed into vault.

(7) Cap construction consistent with 5a, above.

(8) Post-closure consistent with 5a, above.

6. RCRA requirements contained in 40 CFR Parts 262 and 263 to the extent that a remedial alternative involves off-site transportation of materials (applicable). Additionally, 49 CFR Parts 107, 174-177 relating to Hazardous Materials Transportation would be applicable.

7. RCRA requirements contained in 40 CFR Part 264, Subpart B, related to general facility standards (applicable), consisting of:

a. 40 CFR § 264.14 (site security).

b. 40 CFR § 264.17 (incompatible waste).

8. RCRA requirements contained in 40 CFR Part 265, Subpart G (relevant and appropriate), consisting of:

a. 40 CFR § 264.114 (equipment decontamination).

b. 40 CFR § 264.117 (monitoring).

9. Executive Order 11988 - Flood Plain Management

Additionally, all remedial action plans that involve the off site transport for disposal would be managed in a manner consistent with 40 CFR Part 262, including disposal at a RCRA approved facility.

4.7.5 Land Ban Requirements

Waste banned pursuant to the Hazardous and Solid Waste Amendments of 1984 (HSWA) cannot be placed in or on the land unless they have been first treated to levels achieving by best demonstrated available technology (BDAT) for each hazardous constituent in the waste. "Placement" triggers the land disposal requirements and this only occurs when disposal occurs. Therefore, for placement to occur, hazardous waste must be picked-up and moved across the boundary of RCRA "unit area of contamination". Applying this definition to the Brio/DOP sites, it is clear that "placement" does not occur when waste is consolidated within an area of contamination, capped in place (including grading prior to capping) or treated in-situ.

Therefore, since the Brio/DOP sites are each considered an "area of contamination", for the reasons discussed above, "placement" does not occur during any of the proposed remedial actions. Therefore, the land disposal requirement is not "applicable" nor is it considered "relevant and appropriate".

4.8 SUMMARY OF DETAILED ANALYSIS

4.8.1 Introduction

At this stage, remedial investigations and endangerment assessment of the Brio/DOP site have been completed. Utilizing data developed in the RI and SRI, the EA concluded that existing conditions at the Brio/DOP site do not in and of themselves represent unacceptable risks to public health and the environment. The EA further concluded that exposure scenarios reflecting reasonably anticipated future changes to site conditions can be developed which, were they to occur, would result in unacceptable risks to human health and the environment. The identified areas containing materials that exceed the cleanup levels developed in the EA include materials and soils in Pits B, E, J, Q and H/V. The exposures of concern include long term inhalation of volatilized compound from these areas or direct ingestion of these affected soils and materials.

To remediate these affected areas, four surviving remedial action plans were refined in the beginning of this chapter (Section 4.3). Each plan was then evaluated in relation to its technical feasibility (Section 4.4), effectiveness in achieving health and environmental goals (Section 4.5), cost (Section 4.6) and regulatory compliance (Section 4.7). The purpose of this section is to summarize the results of these earlier analyses.

4.8.2 Cap and Cover

- Technical Evaluation - Stabilization followed by cap and cover is a feasible and commonly practiced remedial approach. It is applicable, practical and proven. Some long term monitoring and maintenance of cap conditions would be required.

- Public Health/Environmental Evaluation - Stabilization, cap and cover and venting will isolate affected soils from human contact. Cap and cover in combination with the site management plan will minimize the potential for migration via infiltration or runoff. Cap and cover in combination with long term venting system will eliminate potential air emissions.

- Regulatory Compliance - Cap and cover complies with all legally applicable or relevant and appropriate federal and state standards, requirements, criteria or limitations.

- Cost - Total cost of cap and cover is $13,481,000. Net present cost of cap and cover is $11,700,000. Cap and cover is the most cost effective remedial action plan.

4.8.3 Vault

- Technical Evaluation - The vault is a feasible and readily constructable remedial approach. Equipment manpower and materials for vault construction are readily available. Some uncertainty regarding the effectiveness of stabilization remains. Some long-term maintenance would be required.

- Public Health/Environmental Evaluation -Stabilization and vaulting of affected soils and materials will isolate the materials from direct human contact. Vault construction in combination with the site management plan will minimize the potential for migration via infiltration or runoff. The secure cap and cover installed on the vault will eliminate potential air emissions.

- Regulatory Compliance - Stabilization and vaulting of affected soils and materials complies with all legally applicable or relevant and appropriate federal and state standards, requirements, criteria or limitations.

- Cost - Total vault costs are $20,871,000. Net present costs of the vault are $17,300,000.

4.8.4 Biological Treatment

- Technical Evaluation - Biological destruction of organic compounds is applicable, practical, and proven. Field testing on site specific materials has yielded further positive results for degradation of PNAs and removal of volatiles. Basic process configurations (solid or aqueous phase) are easily constructable and implementable.

- Public Health/Environmental Evaluation - Biological treatment of affected soils and materials will significantly reduce constituent concentrations for both PNAs and volatiles. This destructive technology will result in the production of soils that can be backfilled to the pit areas with no need for further treatment effectively eliminating the ingestion and runoff issues. Cap and cover on other site areas will further isolate materials from potential contact or transport.

- Regulatory Compliance - Biological treatment complies with all legally applicable or relevant and appropriate federal and state standards, requirements, criteria or limitations. Further substantial reductions in

mobility, toxicity and volume of affected soils and materials are achieved.

- Cost - Total costs for biological treatment are $22,956,000 (aqueous phase) and $22,981,000 (solid phase). Net present costs are $19,920,000 (aqueous phase) and $19,930,000 (solid phase).

4.8.5 Incineration

- Technical Evaluation - Destruction of organic compounds through incineration is applicable and a proven technology for remediation of affected soils and materials. Field testing of high temperature incineration on site specific soils indicated successful destruction of organic constituents. Mobile/transportable incinerators are available from various vendors. Application of incineration, however, will be more complex than other alternatives.

- Public Health/Environmental Evaluation - Incineration will eliminate potential public health/environmental impacts by elimination of organic compounds in affected soils and materials. Air emissions would be controlled with conventional scrubber technology. Constituent destruction eliminates future concerns regarding ingestion, inhalation and off site transport. Cap and cover on other site areas will further isolate materials on site from potential contact or transport.

- Regulatory Compliance - Incineration complies with all legally applicable or relevant and appropriate federal and state standards, requirements, criteria or limitations. Further, substantial reductions in mobility, toxicity and volume of affected soils and materials are achieved.

- Cost - Total costs for incineration are $22,271,000 (Rotary Kiln) and $22,131,000 (Infrared). Net present costs are $21,780,000 (Rotary Kiln) and $17,540,000 (Infrared).

4.8.6 Comparative Evaluation

All remedial action plans are technically implementable and constructable. Both aqueous phase and solid phase biological treatment systems will be more complex to implement than the containment options (cap and cover and vault) because of the fact that complete modular units are not available. However

the process itself is not complex. All technologies are field-proven although certainty concerning performance is variable.

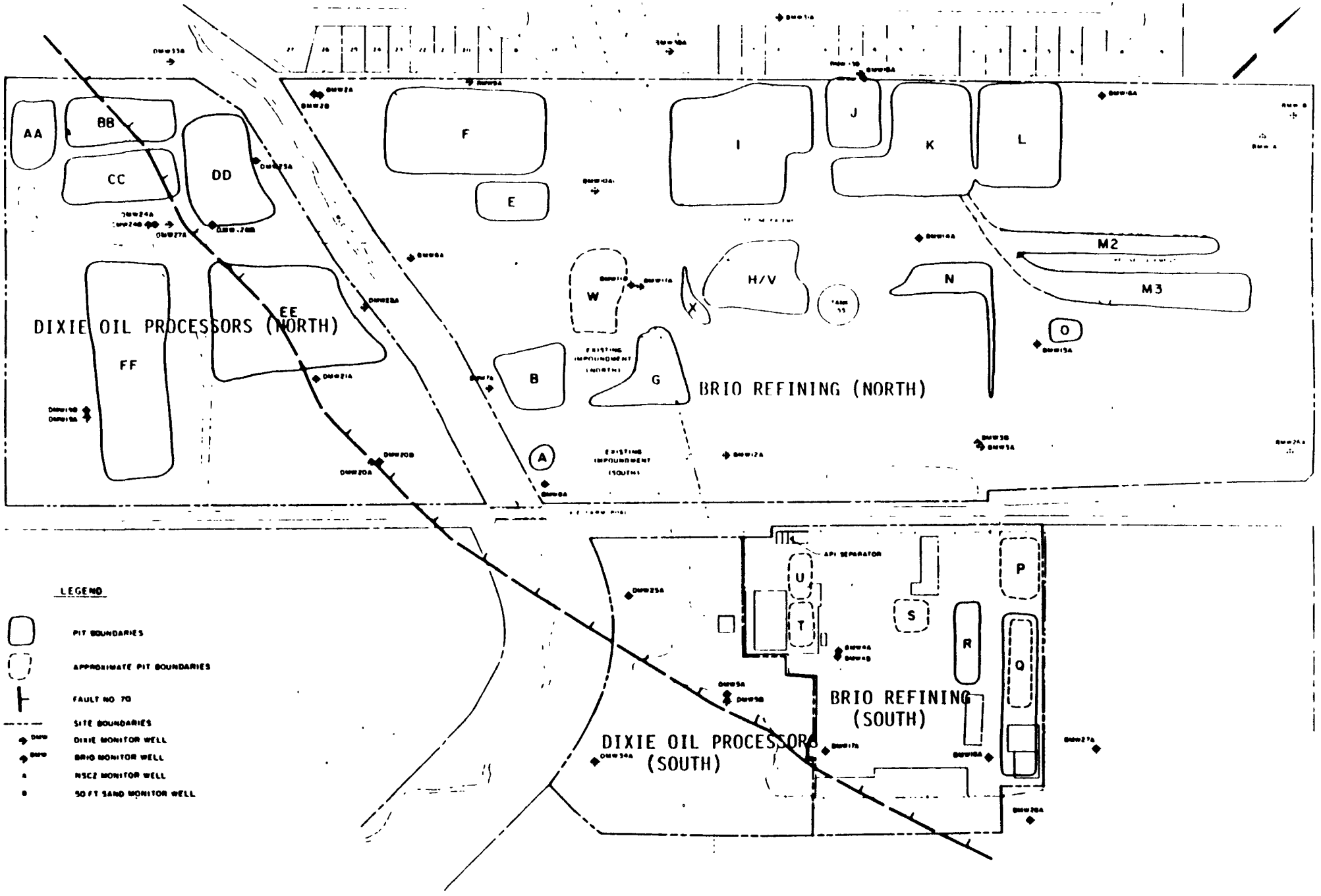
All remedial action plans achieve compliance with the specified remedial objectives. The containment options isolate affected materials and soils from human contact. While subject to prior stabilization, affected soils and materials remain on site in the cap and cover and vault alternatives. The treatment alternatives (biological and incineration) reduce or destroy organic constituents down to trace levels to the extent that future concerns regarding inhalation, ingestion or off site transport are eliminated.

All remedial action plans achieve compliance will all legally applicable or relevant and appropriate federal and state standards, requirements, criteria or limitations. Both treatment options achieve an additional reduction in mobility, toxicity and volume of affected soils and materials.

Cap and cover is the most cost effective containment options. The treatment option costs are essentially equivalent given the accuracy of the cost estimation.

Table 4-11 summarizes this comparison of alternatives.

APPENDIX D


AA
BB
CC
DD
EE
FF
F
E
I
J
K
L
M2
M3
N
O
H/V
W
X
B
G
A
DIXIE OIL PROCESSORS (NORTH)
BRIO REFINING (NORTH)
EXISTING IMPOUNDMENT (NORTH)
EXISTING IMPOUNDMENT (SOUTH)
API SEPARATOR
U
T
S
R
P
Q
BRIO REFINING (SOUTH)
DIXIE OIL PROCESSORS (SOUTH)
LEGEND
PIT BOUNDARIES
APPROXIMATE PIT BOUNDARIES
FAULT NO 70
SITE BOUNDARIES
DIXIE MONITOR WELL
BRIO MONITOR WELL
NSCZ MONITOR WELL
50 FT SAND MONITOR WELL

APPENDIX E

BRIO REFINING SITE
SOUTHEAST HARRIS COUNTY, TEXAS
RESPONSIVENESS SUMMARY

This community relations responsiveness summary is divided into two sections:

SECTION I: BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERN

This section provides a brief history of community interest and concern raised during the planning activities at the Brio Refining Superfund site.

Section II: SUMMARY OF MAJOR COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND THE EPA'S RESPONSE TO THE COMMENTS

Both written and oral comments are presented. EPA's responses to these relevant topics are also presented.

I. BACKGROUND ON COMMUNITY INVOLVEMENT

The Brio Refining site was proposed for the National Priorities List in October 1984. Funds were approved in the Spring of 1985 for EPA to conduct a Remedial Investigation and Feasibility Study at the Brio site. Prior to the initiation of the studies a group of companies, identified through the Agency's enforcement efforts as potentially responsible parties (PRPs), formed the Brio Site Task Force in an effort to work with EPA in assessing the nature and extent of the contamination at the site.

On May 16, 1985, EPA announced that the terms of an Administrative Order (signed in June 1985) had been agreed upon with the Task Force enabling them to undertake the investigations and studies necessary to determine the solution to the contamination problems at the Brio site. Included in the Administrative Order was the stipulation that, with EPA oversight, the Task Force would initiate and implement a comprehensive community relations program for interested citizens. EPA representatives would also participate in and conduct oversight on the community relations effort.

The Task Force held its first community leaders meeting on May 16, 1985, in order to discuss the Administrative Order and present a timeframe for the site investigation. A community meeting was held by the Task Force on July 2, 1985, to announce the initiation of water-quality sampling and odor abatement programs. The results of the water tests were announced at a community meeting on September 26, 1985.

Field activities were completed in November 1985. Upon completion of the first phase of the site investigation (and review of the information by EPA), the Task Force held a

community meeting on April 30, 1986, to share the results of their initial efforts. On September 4, 1986, a community meeting was held to discuss any issues or concerns the local residents may have regarding the site studies. Status reports were also provided through newsletters.

On February 2, 1987, the Task Force held a community meeting on various treatment techniques that may be employed during remedial actions at a typical Superfund site. A community leaders meeting was held on April 2, 1987, to provide an update on site activities. A meeting to discuss the preliminary results of the Endangerment Assessment was held with the community leaders on June 18, 1987.

On January 21, 1988, EPA announced through a press release that studies were completed on the Brio site. The announcement also advised the public that EPA would be accepting comments on the proposed remedy for the site from February 1 to March 1, 1988, and that the Agency would hold a public meeting on February 9, 1988. An EPA prepared fact sheet describing various alternatives evaluated was mailed to interested citizens. EPA held a community leaders meeting on January 25, 1988, to brief the members of the group on the solutions proposed for the site. On the following night, January 26, 1988, the Brio Site Task Force held a community meeting to discuss the overall results of the site investigations, the findings of the Endangerment Assessment. An EPA representative attended and announced the scheduled public meeting to discuss remedial alternatives. EPA's public meeting was held on February 9, 1988, at the Weber Elementary School. Approximately 350 people attended the meeting. The community voiced great concern that the remedial action would not be complete. A summary of the public response to the solutions proposed by EPA at this meeting, can be found in the Responsiveness Summary (Appendix E). On February 22, EPA met with the Friendswood City Council to discuss the proposed alternative solutions that the Agency had outlined in its public meeting on February 9.

Again, It should be noted that EPA was an active participant in all of the community or community leaders meetings discussed above and provided oversight on a comprehensive program. These activities were carried-out in cooperation with the Brio Site Task Force in accordance with the terms outlined in the above mentioned Brio Refining/Dixie Oil Processors Administrative Order on Consent.

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

The public comment period on the Feasibility Study for the Brio Refining Superfund site opened on February 1, 1988 and closed on March 1, 1988. A public meeting was held February 9, 1988, at the Weber Elementary School with approximately 350 people in

attendance. The EPA received many comments regarding all aspects of the Superfund actions taken at this site. This Responsiveness Summary is written to summarize the publics response to EPA's proposal for remediation at the Brio Refining and Dixie Oil Processors sites. Therefore, the Agency has focused its attention on summarizing and responding only comments concerning the Brio Refining and Dixie Oil Processors Feasibility Study and the remedial alternatives being evaluated. This summary is provided below:

Comment 1

EPA misrepresented what was meant by "cleanup" of the site (i.e., partial versus complete treatment).

EPA Response to Comment 1

The EPA agrees that, in general, the term "cleanup" is misused in certain situations. However, the Agency's representatives for this particular site have been very careful as to not mislead the local residents during the many public meetings that have been held throughout the past few years. Experience has shown us that very few sites are ever returned to a naturally "clean" state; therefore, we are very careful about the message that we communicate to the public. It is our opinion that this misconception is a result of the publics own belief that an eventual remedial action would mean treating all measurable amounts of contaminated materials and soils enabling the site to be used for commercial or recreational purposes.

Comment 2

The proposed remedy does not provide maximum health protection to nearby residences, schools, and hospitals.

EPA Response to Comment 2

It is EPA's opinion that the proposed remedy provides what EPA considers to be adequate protection of human health and the environment. This message is discussed in great detail in the Brio Refining and Dixie Oil Processors Endangerment Assessment. This document provided EPA with the information necessary to make this determination. Additionally, the calculations made in the assessment are very conservative thus providing the Agency with added certainty for protection of public health.

EPA has proposed to excavate and treat all affected materials and soils that have a potential for creating an unacceptable risk to human health or the environment. Once this activity is completed, site controls will be enforced to restrict access to the site thus reducing the probability of exposure to any low level contaminants that may remain upon completion of remediation.

Comment 3

The deed restrictions and restricted access associated with the proposed remedy will promote a negative perception of the community and will adversely affect property values.

EPA Response to Comment 3

EPA in conducting its environmental mandate, must balance a large number of factors before determining the best approach to addressing problems at Superfund sites. The Superfund Amendments and Reauthorization Act (SARA) specifies that EPA shall "... select a remedial action that is protective of human health and the environment ..." The statute also states that EPA shall "... select appropriate remedial actions determined to be necessary to be carried out ... which provide for cost-effective response." These laws are developed by our governmental leaders and EPA must use them as a guide in conducting its business.

EPA believes that the proposed plan of action at the Brio and Dixie Oil Processors (DOP) sites comply to the maximum extent practicable, with the provisions of SARA. The first priority of the Agency is the protection of human health and the environment and the proposed solutions serve this purpose very well. An increased degree of treatment at either site would result in very little added protection relative to the incremental increase in cost that would result. Furthermore, the appearance of the sites upon completion of the remedial action is a consideration of the final Record of Decision. Appearance will also be a factor in all discussions on conducting and funding of remedial actions by potentially responsible parties. It is believed that the parties will be interested in investigating, in concert with local homeowners, various creative landscaping ideas that will result in an acceptable solution.

Implementing solutions which account for local property values and economic development is outside the jurisdiction of EPA. Local residents have the State courts available to them to resolve these issues or they can request that their State government intervene on their behalf. State governments have the opportunity to request for and pay the additional costs attributed to meeting any such standard they may deem necessary. This would include a request for treating all measurable quantities of waste at a Superfund site. Additionally, the State would then become a signatory to the Consent Decree and actively participate in negotiations, the remedial design, and remedial action.

Comment 4

Bioremediation should be evaluated further as a potential remedy at the site.

EPA Response to Comment 4

It is EPA's judgment that on-site incineration of wastes would best serve both statutory and selection criteria in relation to the other solutions evaluated. On the other hand, the Brio Site Task Force has proposed the use of on-site aqueous-phase biological treatment. The EPA had some concerns over the lack of demonstrated performance of this technique on the wastes at the site. However, this will not prevent EPA from favorably considering the proposal of the Task Force if they can demonstrate that biological treatment can provide the same level of treatment deemed necessary by the Agency. Pass/fail criteria for use of biological treatment rather than incineration will be developed prior to the start of remedial action. If biological treatment cannot meet the pass/fail criteria, then on-site incineration will be implemented.

Comment 5

On-site incineration is not a practical alternative given the lengthiness of its treatment.

EPA Response to Comment 5

The six alternatives evaluated in the Brio Refining and Dixie Oil Processors Feasibility Study and there associated remedial action (actual construction) time requirements are as follows:

No Action	-	+30 years
Cap & Cover	-	2 years
Vault	-	3 years
Incineration	-	3-4 years
Biotreatment	-	3.3 years
Offsite Disposal	-	4 years

All of these plans assume that 62,000 cubic yards of contaminated soils will be treated and site controls are implemented. As you can see there is not a great deal of difference in the length of actual construction time involved in any of the alternatives with the exception of No Action which would involve sampling and monitoring for an indefinite time.

Comment 6

Complete incineration of waste would allow productive use of the land -- athletic fields or other similar use after it is completed.

EPA Response to Comment 6

See EPA's response to comments #1 and #3.

Comment 7

Given the current restricted access of the site, the Mud Gully must be widened to allow the flood control system in the South Belt area to work properly.

EPA Response to Comment

The EPA shares the same concern as the commenters with regard to Mud Gully. This problem is addressed in the Record of Decision for both the Brio Refining and Dixie Oil Processors sites. As part of any solution, some type of low maintenance approach to resolving the problem, in cooperation with the Harris County Flood Control District, will be implemented.

Comment 8

There is great concern about the lack of plans to dismantle and remove all storage facilities.

EPA Response to Comment

Based on the public response to this situation, as part of any remedy, all storage tanks, surface vessels, drums, and process equipment will be dismantled and either sold (after proper decontamination) or disposed according to EPA regulations.

Comment 9

The ash from the incinerator is going to be harmful to our health.

EPA Response to Comment 9

If incineration is used for treatment of affected materials and soils all of the ash resulting from the thermal treatment operations will have to pass specific tests before it would be allowed to be placed back into the ground. These tests will provide EPA with the confidence that this material will not result in a future problem. Additionally, this material will remain onsite and site access will be restricted.

Additionally, our incineration tests showed us that we could achieve a 99.997% reduction in contaminants. These results suggest that minimal amounts of contamination, if any, will remain after treatment.

Comment 10

Identify the methods of control for odors in the incineration process.

EPA Response to Comment 10

The most likely cause of odors during the remedial action would result from volatile contaminants being released during excavation activities. As outlined in the Brio Refining and Dixie Oil Processors Feasibility Study, all excavations (during the construction of the solution) will be performed in portable enclosures. The enclosures will trap the volatile compounds. The air in the enclosures will then be treated to remove these compounds. This practice should reduce, to the maximum extent practicable, any odors resulting from soil disturbance activities.

Comment 11

Describe the regulations and standards that will be in place after the cleanup is completed that will ensure the protection of the publics health and safety.

EPA Response to Comment 11

This remedial action is based on permanent site controls. This will include the imposition of deed notices and restrictions to ensure that the site is never used in such a way as to increase exposure to contaminants that will remain on site and a security fence or similar barrier will be maintained to prevent trespass and potential exposure to contaminants left onsite.

In addition to these activities, the ambient air, groundwater and Mud Gully sediments will be sampled and monitored to provide information for evaluation of the effectiveness of the solution. This program will be conducted indefinitely or until such time that EPA feels that such efforts are no longer necessary. Also any remedial action where EPA leaves contaminants at the site (upon completion of the remedy), the Agency must review such actions no less than five years after the initiation of such remedial action to assure that human health and the environment are being protected.

Comment 12

In screening the remedial alternatives, the offsite disposal option was quickly dismissed in the Feasibility Study. This conclusion is not reached in a logical and well documented manner.

EPA Response to Comment 12

The Superfund law, specifically SARA Section 121 (b) state that "... offsite transport and disposal of hazardous substances or contaminated materials without such treatment should be the least favored alternative remedial action where practicable treatment technologies are available ... shall conduct an assessment of

permanent solutions and alternative technologies ... that, in whole or in part, will result in a permanent and significant decrease in toxicity, mobility, or volume of hazardous substances dismissal of Offsite Disposal as a viable alternative.

Comment 13

It was suggested that the estimates in the Feasibility Study for waste volumes of the on-site pits were ball-park figures; heavily contaminated areas could have been missed by soil borings; the shallow groundwater contamination was not well defined; and the cost analysis lacked sufficient support.

EPA Response to Comment 13

The EPA feels that the field work conducted as part of the Remedial Investigation and Supplemental Investigation was more than sufficient to characterize the magnitude and extent of contamination. This effort will be further refined during the actual remedial action where all contaminated sludges and liquids will be excavated and treated. The Feasibility Study identified pits B, J, Q, R, H/V, and E as needing remediation based on the findings of the Endangerment Assessment. As part of the Record of Decision pits F, G, I, K, L, and M will require examination during remedial action for removal of all sludges and liquids. Additionally, all surface contamination (in the form of tars) will be scraped and consolidated for treatment. Regarding the comment on cost estimates, the Feasibility Study contained sufficient information to evaluate each conceptual design.

Comment 14

Some comments were received concerning the question of off-site contamination which originated from the Brio Refining site.

EPA Response to Comment 14

This information has been turned over to EPA's Site Assessment section for further investigation. Those individuals who have commented in this fashion will be contacted by this group following their evaluation of the matter.

Comment 15

Explain what pits will be excavated.

EPA Response to Comment 15

See EPA's response to Comment #13.

APPENDIX F

"administrative Record Index" not included.

APPENDIX G

TEXAS WATER COMMISSION

March 25, 1988

Allyn M. Davis, Ph.D., Director
Hazardous Waste Management Division
U.S. Environmental Protection Agency
Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

Re: Brio Refining, Inc.
Draft Record of Decision

Dear Dr. Davis:

We have reviewed the proposed Record of Decision (ROD) for the Brio Superfund Site. We have no objection to the selected remedy as described in the draft ROD of March 17, 1988. The selected remedy requires excavation and treatment of all contaminated sludges and liquids and waste material found to exist above the action levels defined in the Endangerment Assessment Report. The treatment method will be either a mobile incinerator or aqueous phase biological treatment.

Sincerely,

Allen P. Beinke
Executive Director

APPENDIX H

RIMCO DISMANTLING

1331 Lamar, Suite 1459
Houston, Texas 77010
713/739-0388

August 2, 1985

Brio Task Force
D. E. Ganschinietz
c/o Monsanto Company
P. O. Box 711
Alvin, Texas 77511

Gentlemen:

The following costs are for the cleaning and dismantling of the Brio Refinery Inc. site as requested by Mr. Donald E. Ganschinietz:

1A.	$90,000.00	Flushing and Steam Cleaning Refinery Area.
1B.	$220,000.00	Dismantle Refinery Area.
2A.	$40,000.00	Flushing and Steam Cleaning Dixie Chemical Area.
2B.	$60,000.00	Dismantle Dixie Chemical Area.
3.	$50,000.00	Dismantle Site Building.
4.	$38,000.00	All Other Equipment On Site.
5.	$150,000.00	Remove All Concrete.
6.	Revenue Sharing Plan	70% for Contractor 30% for Brio Task Force
7.	Decontamination Work:	Cost Plus 10% Overhead 20% Profit

Thank you for the opportunity to estimate this work.

Very truly yours,

J. R. Brown

JRB:ah