UNITED STATES DEPARTMENT OF ENERGY

STRATEGIC PETROLEUM RESERVE

Boeing Petroleum Services, Inc.

STRATEGIC PETROLEUM RESERVE
ANNUAL SITE
ENVIRONMENTAL REPORT
FOR
CALENDAR YEAR 1990

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ENVIRONMENTAL REPORT

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Document No. D506-02799-09

Prepared for the Department of Energy
Strategic Petroleum Reserve Project Management Office
under Contract No. DE-AC96-85PO21431

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June, 1991

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ABBREVIATIONS AND ACRONYMS

ac	acre
adj	adjacent
AFFF	aqueous film forming foam
ARCO	Atlantic Richfield Company
AST	above ground storage tanks
avg	average
bbl	barrel(s) (1bbl = 42 gallons)
BC	Bayou Choctaw
BH	Big Hill
BM	Bryan Mound
bldg	building
BOD_5	five day biochemical oxygen demand
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Ci	Curies
COD	Chemical Oxygen Demand
cm	centimeter
COE	United States Army Corps of Engineers
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	dissolved oxygen
DOE	United States Department of Energy
EPA	United States Environmental Protection Agency
ERT	Emergency Response Team
ESA	Endangered Species Act
F&WS	United States Fish and Wildlife Service
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
ft	feet
gpd	gallons per day
in	inch
ha	hectacre
kg	kilogram
km	kilometers

LA	Louisiana
lab	laboratory
lbs	pounds
LDEQ	Louisiana Department of Environmental Quality
LDHHR	Louisiana Department of Health and Human Resources
LDNR	Louisiana Department of Natural Resources
LDOTD	Louisiana Department of Transportation and Development
LDWF	Louisiana Department of Wildlife and Fisheries
m/sec	meters per second
m	meters
m^3	cubic meters
MACT	Maximum Available Control Technology
maint	maintenance
max	maximum
mCi	millicuries
mg/l	milligrams per liter
mi	miles
min	minute
MMB	million barrels
NE	northeast
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NORM	naturally occurring radioactive material
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NW	northwest
O&G	oil and grease
OPS	operations
P&A	plug and abandon
PCB	polychlorinated biphenyls
pCi	prcocuries

pH	negative logarithm of the hydrogen ion concentration (acidic to basic on a scale of 0 to 14, 7 is neutral)
ppm	parts per million
ppt	parts per thousand
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
RCT	Railroad Commission of Texas
RQ	reportable quantity
RWIS	raw water intake structure
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SE	southeast
SJ	St. James
SM	Sulphur Mines
SPR	Strategic Petroleum Reserve
STN	station
STP	sewage treatment plant
S.U.	standard units
SW	southwest
TACB	Texas Air Control Board
TDH	Texas Department of Health
TDH&PT	Texas Department of Highways and Public Transportation
TDS	total dissolved solids
TOC	total organic carbon
TPY	tons per year
TSCA	Toxic Substance Control Act
TSD	treatment, storage, and disposal
TSS	total suspended solids
TWC	Texas Water Commission
TX	Texas
UIC	Underground Injection Control
UST	underground storage tank
USCG	United States Coast Guard
VOC	volatile organic compound
WH	West Hackberry
WI	Weeks Island

EXECUTIVE SUMMARY

This report, provided annually in accordance with DOE Order 5400.1, summarizes monitoring data collected to assess Strategic Petroleum Reserve (SPR) impacts on the environment. The report serves as a management tool for mitigating such impacts, thus serving the public interest by ensuring environmentally sound operation of the SPR.

Included in this report is a description of each site's environment, an overview of the SPR environmental program, and a recapitulation of special environmental activities and events associated with each SPR site during 1990. The active permits and the results of the environmental monitoring program (i.e., air, surface water, groundwater, and water discharges) are discussed within each section by site. The quality assurance program is presented which includes results from laboratory and field audits and studies performed internally and by regulatory agencies.

In general, no significant adverse environmental impact resulted from any SPR activities during 1990. Environmental areas of concern, such as potential groundwater contamination, are fully addressed in the applicable section by site. The SPR continues to maintain an overall excellent environmental record.

1. INTRODUCTION

The creation of the Strategic Petroleum Reserve (SPR) was mandated by Congress in Title I Part B of the Energy Policy and Conservation Act (P.L. 94-163), of December 22, 1975. The SPR provides the United States with sufficient petroleum reserves to minimize the effects of an oil supply interruption.

The SPR consists of six Gulf Coast underground salt dome oil storage facilities (four in Louisiana and two in Texas), a marine terminal facility (in Louisiana), and an administrative facility (in Louisiana). Figure 1-1 is a regional map showing the relative location of SPR facilities. Four of the sites were acquired with existing solution mined caverns, three of which have had additional solution mining. A fifth site, room and pillar salt mine, was acquired with storage previously created by mechanical underground mining techniques. The sixth storage site was created by new solution mining. Two sites (Bayou Choctaw and Big Hill) are being expanded by solution mining to create the mandated storage capacity.

The pipeline terminals currently used by the SPR are the ARCO Terminal (Texas City, Texas), the Sunoco Pipeline Terminal (Nederland, Texas), and the Capline Pipeline Terminal (St. James, Louisiana). The sites are also capable of distributing crude oil via tankships. The ARCO pipeline connecting the Bryan Mound site with the Texas City, Texas, docks and area refineries was completed in 1987. A second pipeline connecting the West Hackberry site to refineries in Lake Charles, Louisiana, and Beaumont - Port Arthur, Texas areas via the Texas 22 pipeline was completed in 1989. Access to adjacent commercial dockage was completed in 1988 for the St. James Terminal with the installation of a short segment of pipeline connecting the nearby Shell Capline facility. An additional tie-in to the Koch pipeline has also been completed.

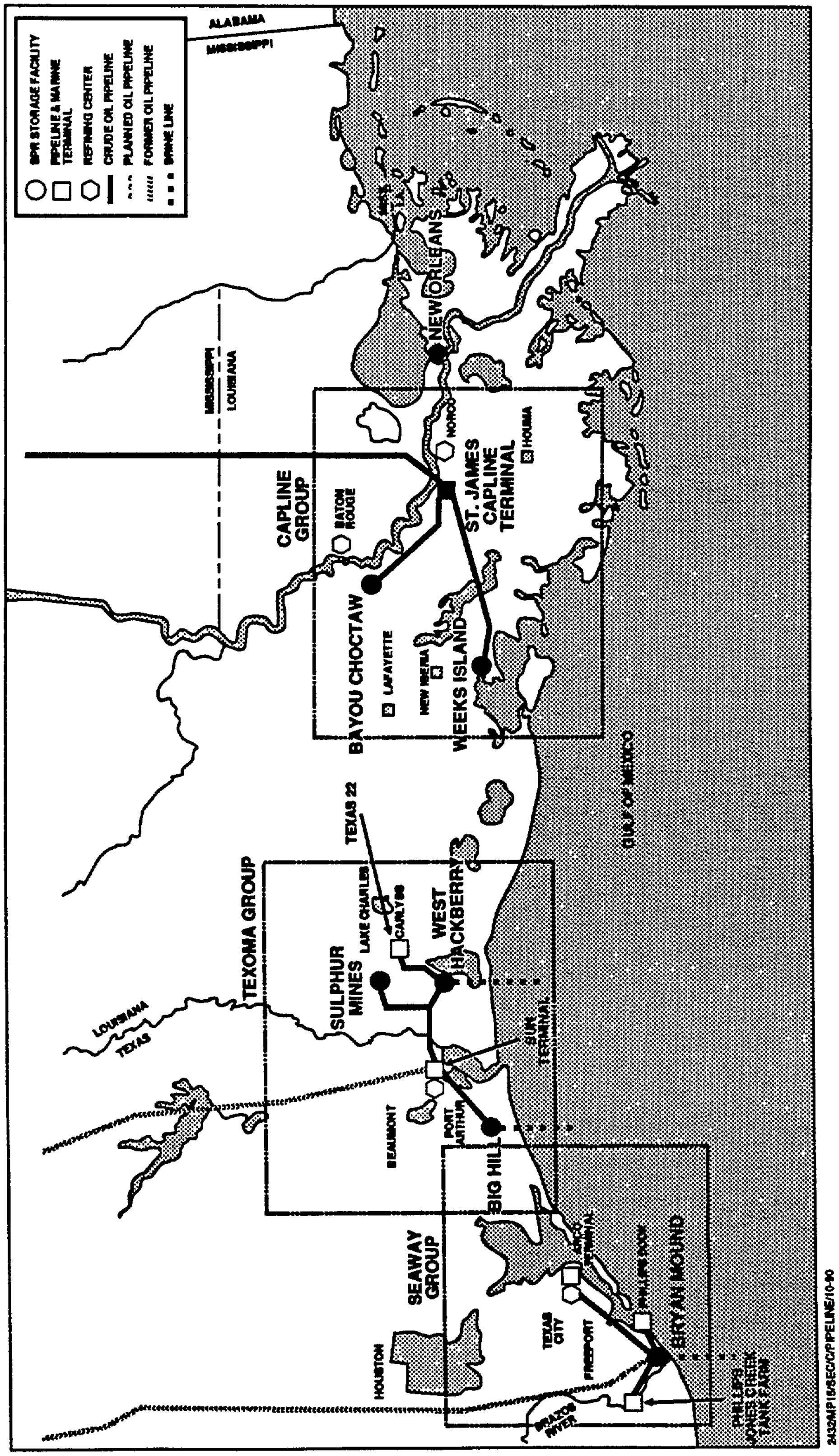


Figure 1-1. SPR Site Locations

Descriptions of the individual sites with photographs (Figures 1-2 through 1-8), follow. Figures 5-1 through 5-7 provide the site specific layouts.

1.1 BAYOU CHOCTAW

The Bayou Choctaw (BC) site is located on the west side of the Mississippi River 19.3 km (12 mi) southwest of Baton Rouge in Iberville Parish, Louisiana (Figure 1-2). The site consists of a primary operational area and a brine disposal area occupying approximately 69 and 81 ha (168 and 200 ac) respectively. The area surrounding the site is rural, with a number of people living in small settlements along the nearby highways. The nearest communities are Addis to the northeast and Plaquemine to the southeast. Baton Rouge, the Louisiana State Capitol and the major source of housing and services for the site, is within easy commuting distance.

The habitat surrounding the site is a freshwater swamp. Elevation ranges from approximately 1.5 to 3.0 m (5 to 10 ft) above sea level. Although there are no clear topographic expressions in the area, major surface subsidence has occurred creating substantial areas of bottomland hardwoods and swamp with interconnecting waterways. The site proper is normally dry and protected from spring flooding by the site's flood control levees and pumps. The collapse of a solution-mined cavern in 1954 resulted in the formation of a 4.9 hectare (12 acre) lake (Cavern Lake) on the north side of the site.

Bottomland hardwood forest and deciduous swamps are predominant at the Bayou Choctaw site. The vegetation at the site includes baldcypress, sweetgum, tupelo (characteristic of lowland areas), bulltongue, and spikerushes. Water oak is also present but not abundant. The deciduous swamp is the most widespread

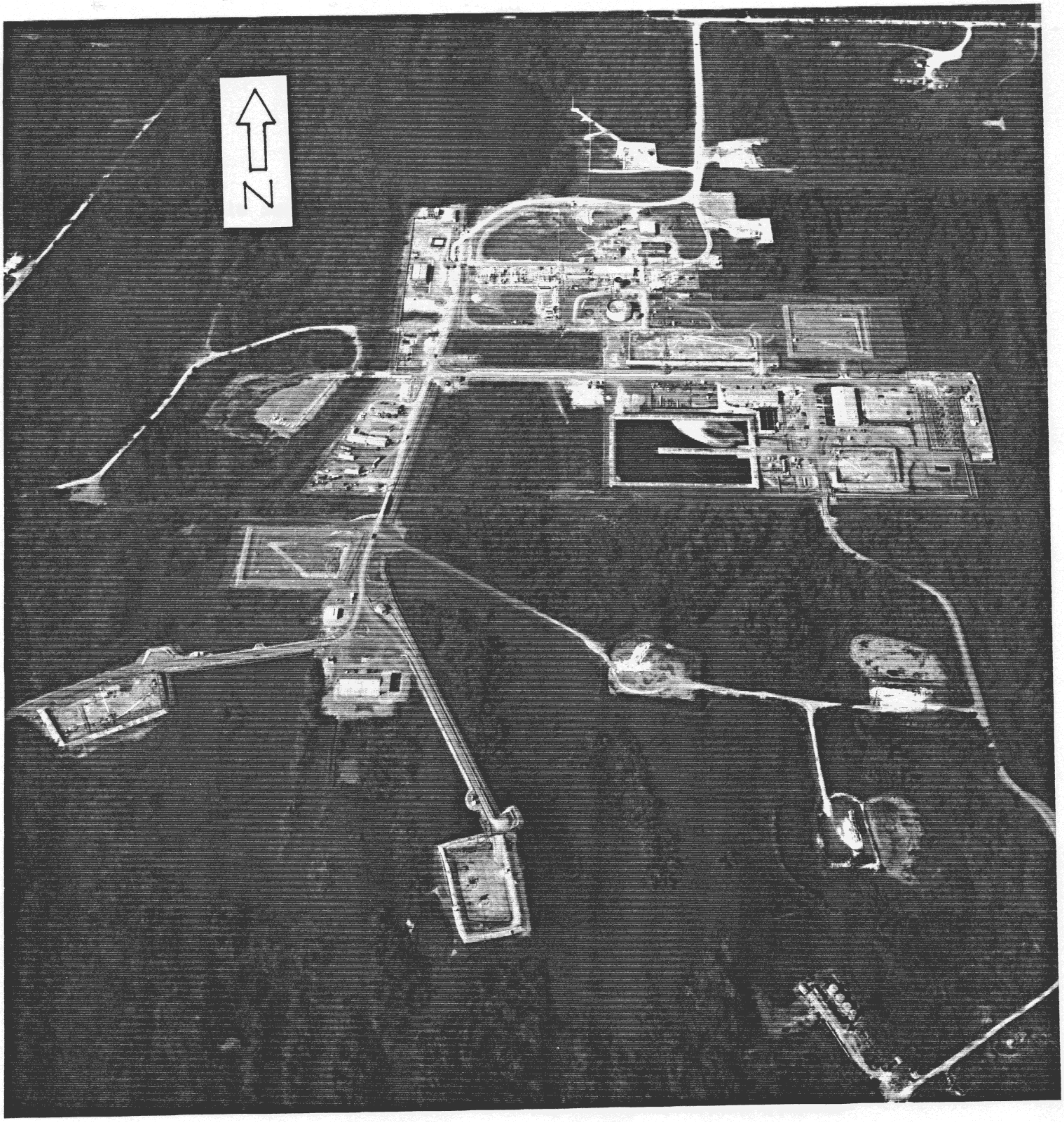


Figure 1-2. Bayou Choctaw SPR Site

habitat type found at the site. It provides resources for a large number of wildlife. Bird species common at Bayou Choctaw are herons, ibis, egrets, woodpeckers, wood duck, thrushes, American anhinga, and American woodcock. Inhabitants of the bottomland forest and swamp include opossum, squirrels, nutria, mink, river otter, raccoon, swamp rabbit, white-tailed deer, American alligator, and snakes.

The site is located near the intersection of several major bayous and waterways. The Intracoastal Waterway (Port Allen Canal) passes in a north-south direction 1 km (0.6 mi) west of the site. The Intracoastal Waterway extends to the north and then turns eastward through the Port Allen Canal to enter the Mississippi River at Baton Rouge. In the area of the site, the Intracoastal Waterway is part of Choctaw Bayou, a natural waterway. Smaller canals and bayous, such as the North-South Canal and the East-West Canal, enter the site area and continue to Bull Bay and the Intracoastal Waterway.

The Bayou Choctaw site will be used to store 11.4 million m^3 (72 MMB) of crude oil. Currently, there are six solution-mined caverns at this storage site. An existing cavern, Number 18, is being expanded to enhance the overall storage capacity of the Bayou Choctaw SPR site. Raw water is provided from Cavern Lake. Brine is transported via pipeline to 12 brine disposal wells located approximately two miles south of the site. There is a 58 km (36 mi), 91 cm (36 in) crude oil pipeline connecting the site to the St. James Terminal.

1.2 BIG HILL

The Big Hill (BH) site is located in Jefferson County, Texas, approximately 109 km (68 mi) east of Houston, 37 km (23 mi) southwest of Port Arthur, and 14 km (9 mi) north of the Gulf of Mexico. Only small unincorporated communities are located near the site. The rural area around the site (Figure 1-3) is used

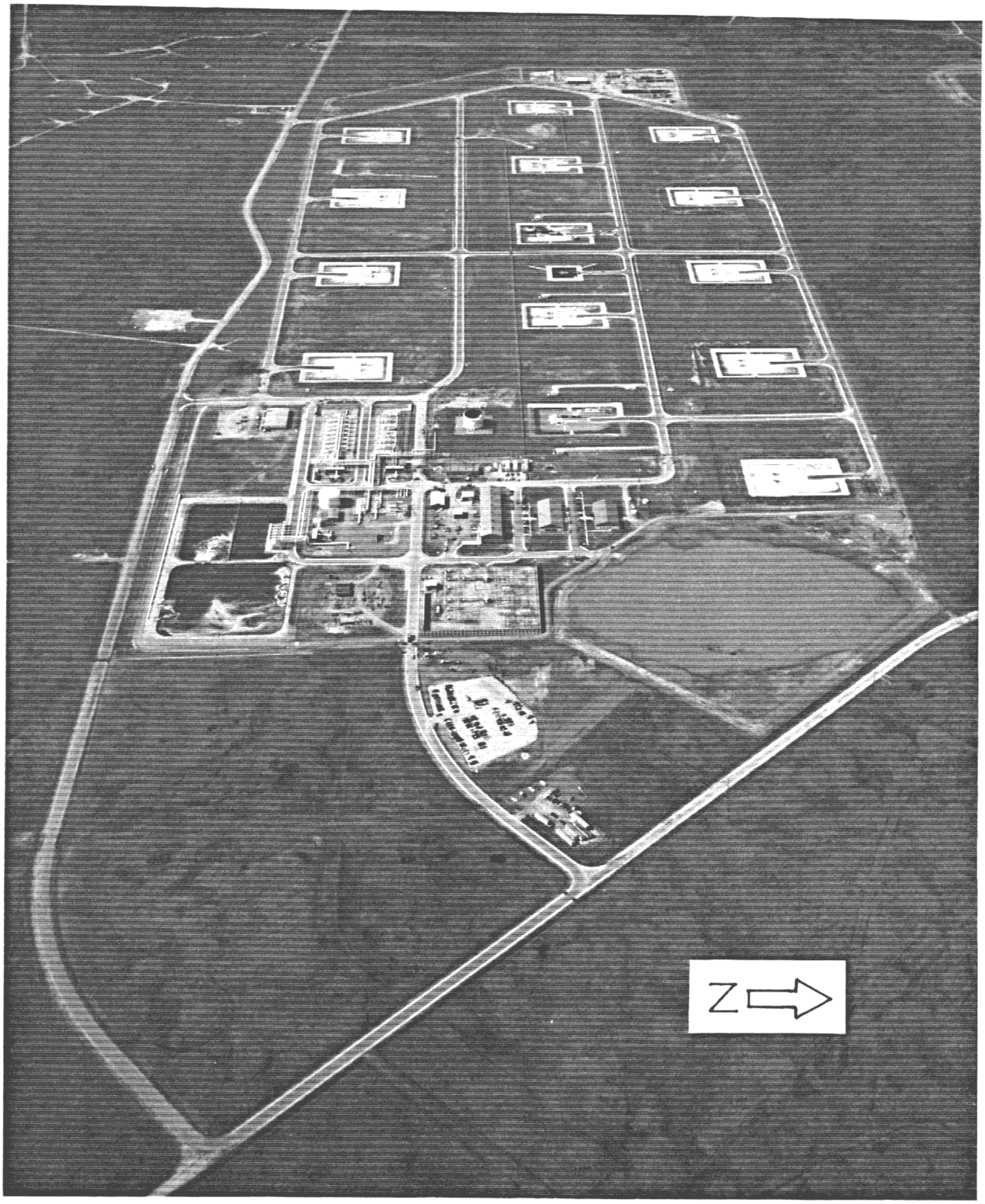


Figure 1-3. Big Hill SPR Site

primarily for rice farming, cattle grazing, and oil and gas production. The permanent work force is supplied in small part from the local area, with the remainder moving into the area or commuting from Beaumont or Port Arthur. During the construction phase, much of the transient skilled labor was brought in from Houston, Galveston, or Lake Charles. The site is situated on approximately 111 ha (275 ac) of land on the Big Hill salt dome. Surface elevations reach 10 m (35 ft) above sea level, the highest elevations in the region. The agricultural and pasture land uses around Big Hill are typical of the region.

Approximately one km (.6 mi) south of the dome is the northern boundary of fresh to intermediate marsh which grades into brackish and saline marsh towards the Gulf of Mexico. The nearby waterways include Spindletop Ditch approximately five km (3 mi) south of the site, which connects to the Intracoastal Waterway located three km (2 mi) further south and oriented in a northeast to southwest direction. Freshwater impoundments are located south of the site. Numerous sloughs, bayous, and lakes, including Willow Slough Marsh, Salt Bayou, Star Lake, and Clam Lake, connect with the Intracoastal Waterway. Natural ridges (cheniers) paralleling the coastline isolate the marsh from the Gulf of Mexico.

Existing habitats in the vicinity of the site are related to agricultural use. There are petroleum-related industrial operations on and off the salt dome which have altered land use. There are two natural ponds present on the eastern edge of the dome, one of which is located on the northeast corner of the site and the other just northeast of the site.

The upland habitat, which comprises the majority of the site, consists of many tall grasses such as bluestem, indiangrass, switchgrass, and prairie wildgrass. A few 150 year old live oak trees are present on site. Fauna typical in the area include coyote, rabbits, raccoon, rodents, snakes, turtles, and numerous upland game birds and passerines. The nearby ponds and marsh south of the site provide excellent alligator habitat. The McFaddin National Wildlife Refuge located south of the site provides important habitat for over wintering waterfowl.

The Big Hill site is planned for the storage of 25.6 million m^3 (160 MMB) of crude oil in 14 caverns. Appurtenant facilities include a raw water intake structure on the Intracoastal Waterway with a 107 cm (48 in) pipeline extending to the site, a 107 cm (48 in) brine disposal pipeline extending 8 km (5 mi) offshore in the Gulf of Mexico, and a 91 cm (36 in) pipeline for transporting crude oil between the site and the Sunoco Terminal in Nederland, Texas. The brine pipeline has a series of brine diffuser nozzles which operate to promote brine dispersion.

Drilling and construction commenced in 1983 at the site. Actual leaching (solution mining) of the oil storage caverns began in October 1987 and is scheduled to be completed in 1991.

1.3 BRYAN MOUND

The Bryan Mound (BM) site is located in Brazoria County, about 105 km (65 mi) due south of Houston, Texas, and five km (3 mi) south of Freeport, Texas, on the east bank of the Brazos River Diversion Channel, near the Gulf of Mexico. The area is highly industrialized, and includes several petrochemical related facilities. Approximately 50 percent of the area's population are between 20 and 55 years of age and work in the local area, although many commute to work from outside the immediate vicinity.

The site occupies 237 ha (586 ac) in the southwest apex of a triangle formed by the Brazos River Diversion Channel, the old Brazos River, and the Intracoastal Waterway. A U.S. Army Corps of Engineers silt gate controls the flow of water between the Intracoastal Waterway and the Diversion Channel. Levees, protecting the town of Freeport, form a second 5.5 square km (3.5 sq mi) triangular pattern within the triangle formed by the rivers. A levee parallels the Diversion Channel in a southern direction from Freeport until due west of the site. The levee then turns east essentially bisecting the site.

Figure 1-4 shows the major water bodies near the site, Blue Lake to the north, and Mud Lake to the southeast. These water bodies generally define the mounded aspect of the Bryan Mound dome, which creates a surface expression in the terrain by rising approximately 5 m (15 ft) above the surrounding wetlands. Although Blue Lake is within the protective triangle formed by the levee system (with excess rain water drained off by two large pump stations operated by the city of Freeport) there is some drainage through culverts southward into the Intracoastal Waterway. Mud Lake, on the other hand, is directly connected with the Intracoastal Waterway.

The marsh and prairie areas surrounding Bryan Mound are typical of those found throughout this region of the Texas Gulf Coast. Brackish marshland dominates the low-lying portions of the site in all but the northern area, where the coastal prairie ecosystem extends along the levee paralleling the Brazos River Diversion Channel. The coastal prairie is covered with medium to very tall grasses which form a moderate to dense cover for wildlife. These grasses also occur in unmowed "natural" site areas. Those areas periodically inundated by seawater are dominated by cordgrasses.

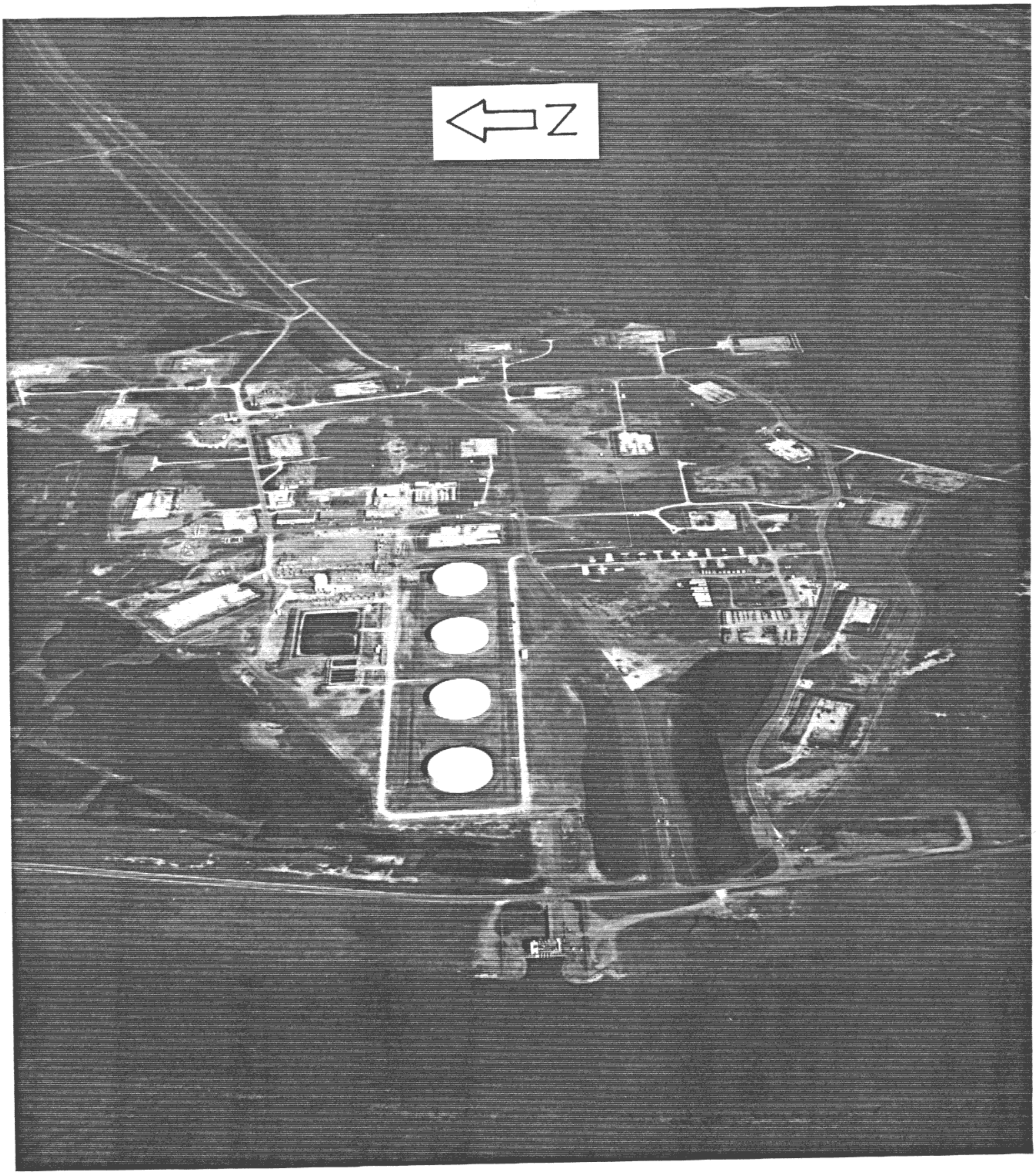


Figure 1-4. Bryan Mound SPR Site

A diverse range of habitats is created by water bodies surrounding Bryan Mound. Marshes and tidal pools, such as Mud Lake and Bryan Lake, which connect with the Gulf of Mexico by way of the Intracoastal Waterway or the Brazos River, are ideal habitats for a variety of birds, aquatic life, and mammals. Migratory waterfowl, common egret, snowy egret, great blue heron, killdeer, least tern, and black-necked stilt (the latter two are state-protected species), as well as nutria, raccoon, skunk, rattlesnakes, turtles, and frogs can be found on and in the area surrounding Bryan Mound.

Shrimp, crabs, trout, flounder, and redfish are abundant in Mud Lake during various seasons of the year. Black drum, mullet, gar, and blue crab are found in Blue Lake.

A total storage capacity of 35.9 million m^3 (226 MMB) of crude oil in 20 solution-mined caverns is planned for Bryan Mound. Appurtenant facilities include a 91 cm (36 in) brine disposal pipeline extending 20.1 km (12.5 mi) into the Gulf of Mexico; a raw water intake structure adjacent to the site on the Brazos River Diversion Channel, two 76 cm (30 in) crude oil pipelines connecting the site to the Jones Creek Tank Farm 4.8 km (3 mi) northwest of the site, the Phillips docks 6.4 km (4 mi) northeast of the site, and the 102 cm (40 in), 73.6 km (46 mi) crude oil pipeline from the site to the ARCO Refinery in Texas City. A series of brine diffuser nozzles, located at the end of the brine pipeline are operated to promote brine dispersion.

1.4 ST. JAMES TERMINAL

The St. James Terminal (SJ) consists of six aboveground storage tanks (total capacity 0.3 million m^3 or two MMB) and two tanker docks, as seen in Figure 1-5. The tank farm area occupies 42.5 ha (105 ac) and the docks occupy 19.4 ha (48 ac). The terminal has separate crude oil pipelines connecting it with Weeks Island and Bayou Choctaw. The site is located on the west bank

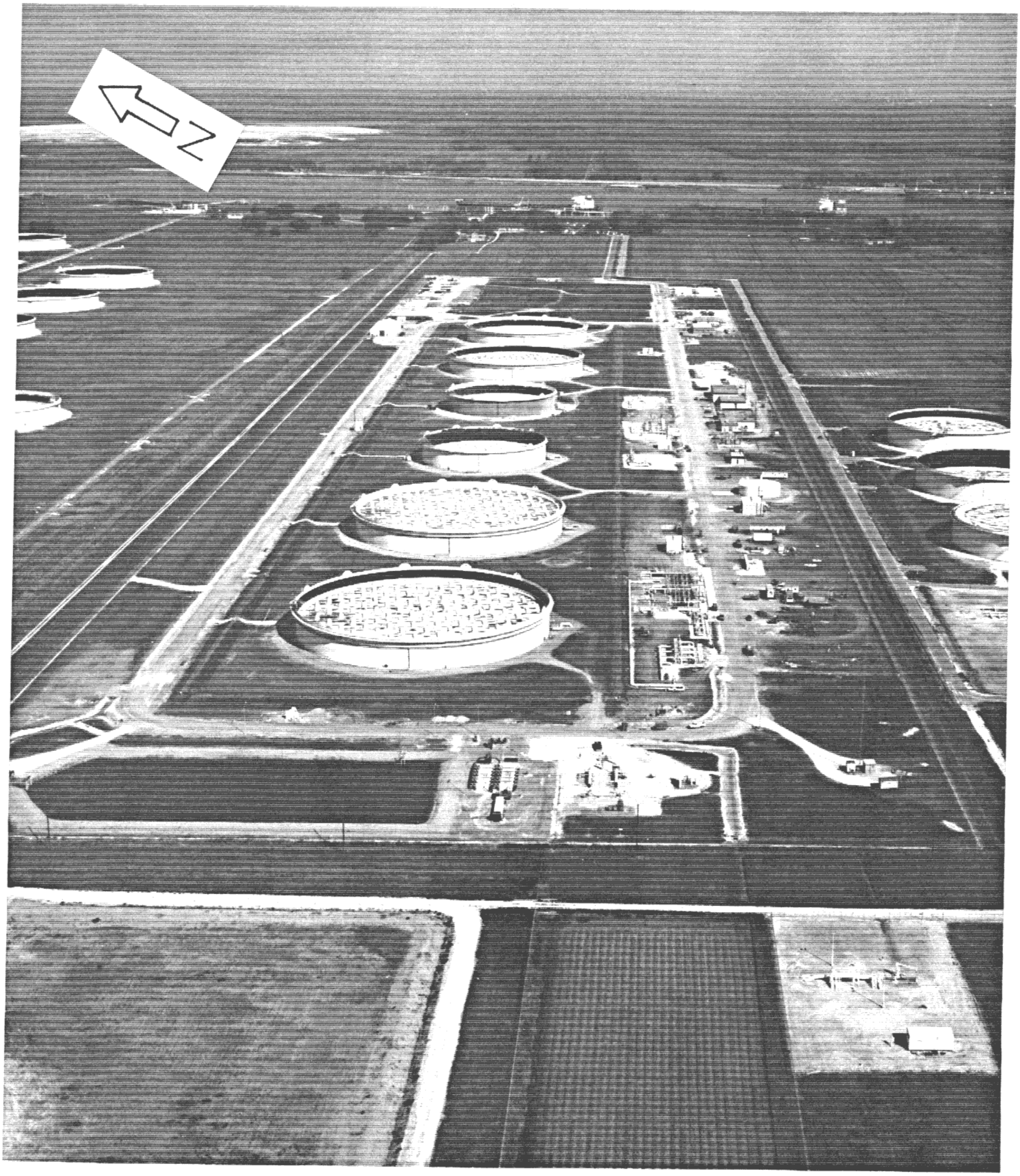


Figure 1-5. St. James SPR Terminal

of the Mississippi River, approximately halfway between New Orleans and Baton Rouge, Louisiana, and 3.1 km (1.9 mi) north of the town of St. James, on Louisiana Highway 18. The area around the site is rural with a number of people living in small settlements along Highway 18, the major thoroughfare in the area. Although some of the work force may commute from New Orleans or Baton Rouge, the majority of the workers are from local labor pools.

The terminal is bounded by the Texas and Pacific Railroad to the west, commercial facilities to the north and south, and the Mississippi River levee on the east between Louisiana Highway 18 and the river. The area adjacent to the Mississippi River at the St. James docks (the batture) is a freshwater wetland that is inundated during high water periods. Much of the land area surrounding the terminal is used for pasture and sugar cane cultivation. Frogs, snakes, turtles, rabbits, raccoon, armadillo, muskrat, opossum, nutria, squirrels, egrets, ibis, and herons can be found on the site and in the surrounding areas.

1.5 SULPHUR MINES

The Sulphur Mines (SM) site, approximately 71 ha (175 ac), is located in Calcasieu Parish, 2.4 km (1.5 mi) west of the town of Sulphur, Louisiana (Figure 1-6). There has been considerable industrial activity on and near the site since the late 1800's. The greater part of the work force comes from the town of Sulphur, with the remainder from outlying communities and the major urban area of Lake Charles. Four brine disposal wells are located on property owned by the Pittsburgh Plate Glass Company approximately 3.5 km (2.2 mi) southwest of the main site.

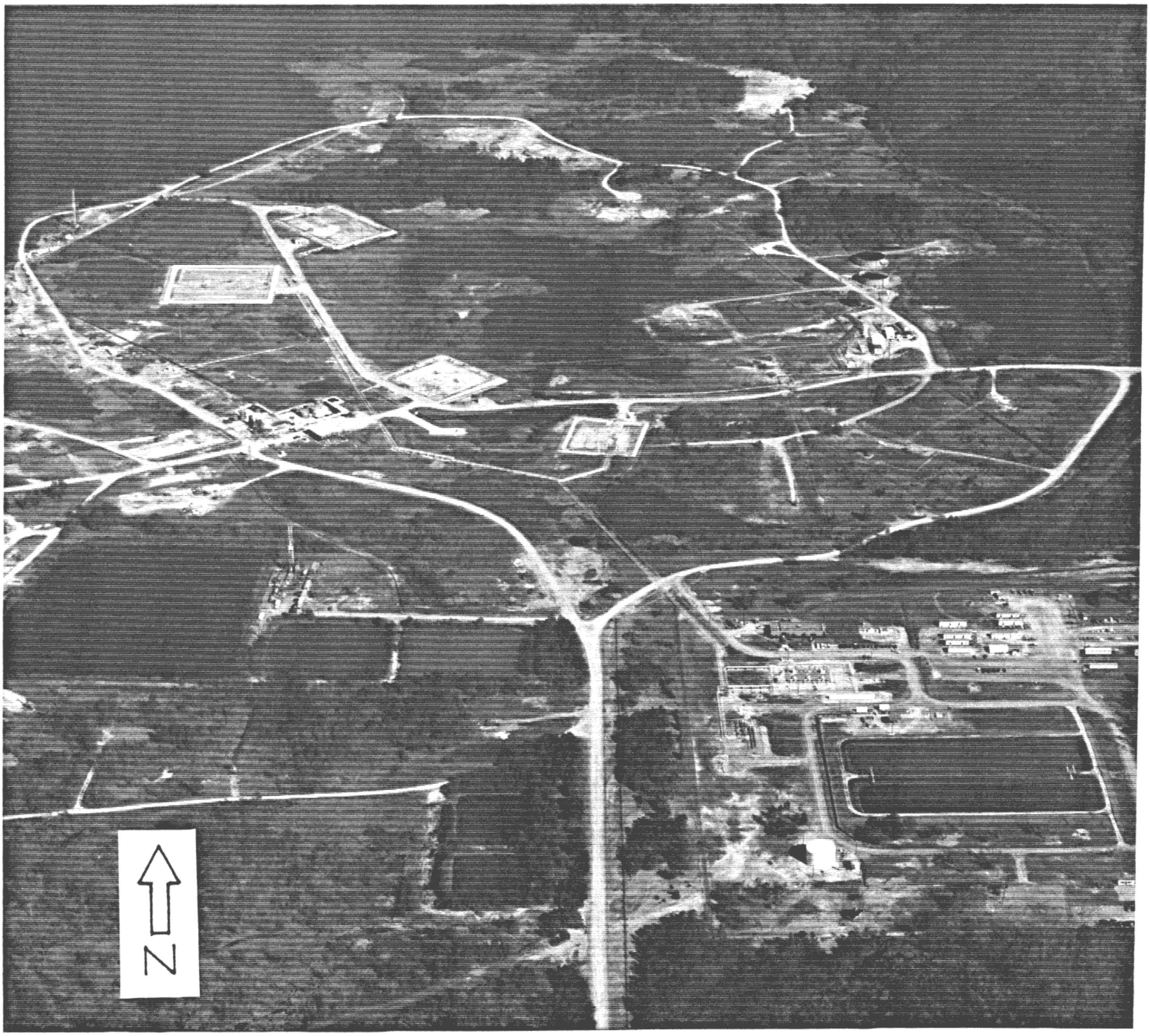


Figure 1-6. Sulphur Mines SPR Site

Due to the area land contours and differing terrain types, the site is divided into two operational areas, primary (administrative) and secondary (caverns). The secondary site area is bordered on the west, northwest, and north by water bodies. Most of these bodies of water are interconnected and drained by one creek flowing eastward from the site to Bayou D'Inde. A floodwater canal is located 0.4 km (1/4 mi) east of the site. Changes in elevation throughout the site are minor, with most of the site four to six m (15 to 20 ft) above sea level. The site proper is normally dry except in the spring season or during heavy rains when high waters sometimes flood portions of it. The lowest elevations are over the center of the dome, where subsidence has occurred as a result of prior sulfur mining activity. Much of the surrounding area is covered with a mixed pine/hardwood forest.

Mammals on site and in the surrounding area include white-tailed deer, raccoon, fox squirrel, cottontail rabbit, opossum, striped skunk, armadillo, nutria, southern flying squirrel, white-footed mouse, and bobcat. Snakes, turtles, alligator, frogs, and toads can also be found. Crappie, largemouth bass, sunfish, gar, carp, bowfin, and catfish inhabit shallow ponds on the site. Many bird species including egrets, killdeer, herons, and migratory waterfowl are present.

Sulphur Mines currently stores 4.1 million m^3 (26 MMB) of crude oil in five existing solution-mined caverns three of which form a single gallery. The site is connected to the Sunoco Terminal in Nederland by a 41 cm (16 in), 25.6 km (16 mi) crude oil pipeline which connects to the West Hackberry 107 cm (42 in) line at the Gulf Intracoastal Waterway. Brine disposal is via injection into four brine disposal wells located approximately two miles (3.2 km) southwest of the site. For efficiency and cost effectiveness this site will not be used for crude oil storage in the future. Transfer of the oil in storage began December 1990 and is scheduled for completion in 1991.

1.6 WEEKS ISLAND

The aboveground facility, shown in Figure 1-7, occupies approximately 4.5 ha (11 ac) and is located in Iberia Parish, Louisiana, about 22 km (14 mi) south of New Iberia. The surrounding area is sparsely populated. New Iberia, the closest major urban center, supplies the greater part of the labor force. The major employment sectors within the parish are mineral production, manufacturing, construction, and agriculture.

The Weeks Island (WI) salt dome borders Vermilion Bay, which opens to the Gulf of Mexico. The Weeks Island salt mine, developed in the early 1900's by room-and-pillar mining, operated continuously until 1981, at which time operations were moved to another part of the same dome. The land surface over the salt dome forms an "island" caused by domal upthrusting and includes the highest elevation, 52 m (171 ft) above sea level, in southern Louisiana. The area surrounding the island is a combination of marsh, bayous, manmade canals (including the Intracoastal Waterway), and bays contiguous with the Gulf of Mexico.

The vegetation communities on Weeks Island are diverse. Lowland hardwood species proliferate in the very fertile loam soil common at the higher elevations. The predominant tree species are oak, magnolia, and hickory, which extend down to the surrounding marsh. Pecan trees are also present. Gulls, terns, herons, and egrets are common in the marsh area. Mink, nutria, river otter, raccoon, and alligator are the most common inhabitants of the intermediate marshes. Other mammals found at Weeks Island are opossum, bats, squirrels, swamp rabbit, bobcat, white-tailed deer, black bear, and coyote. The water

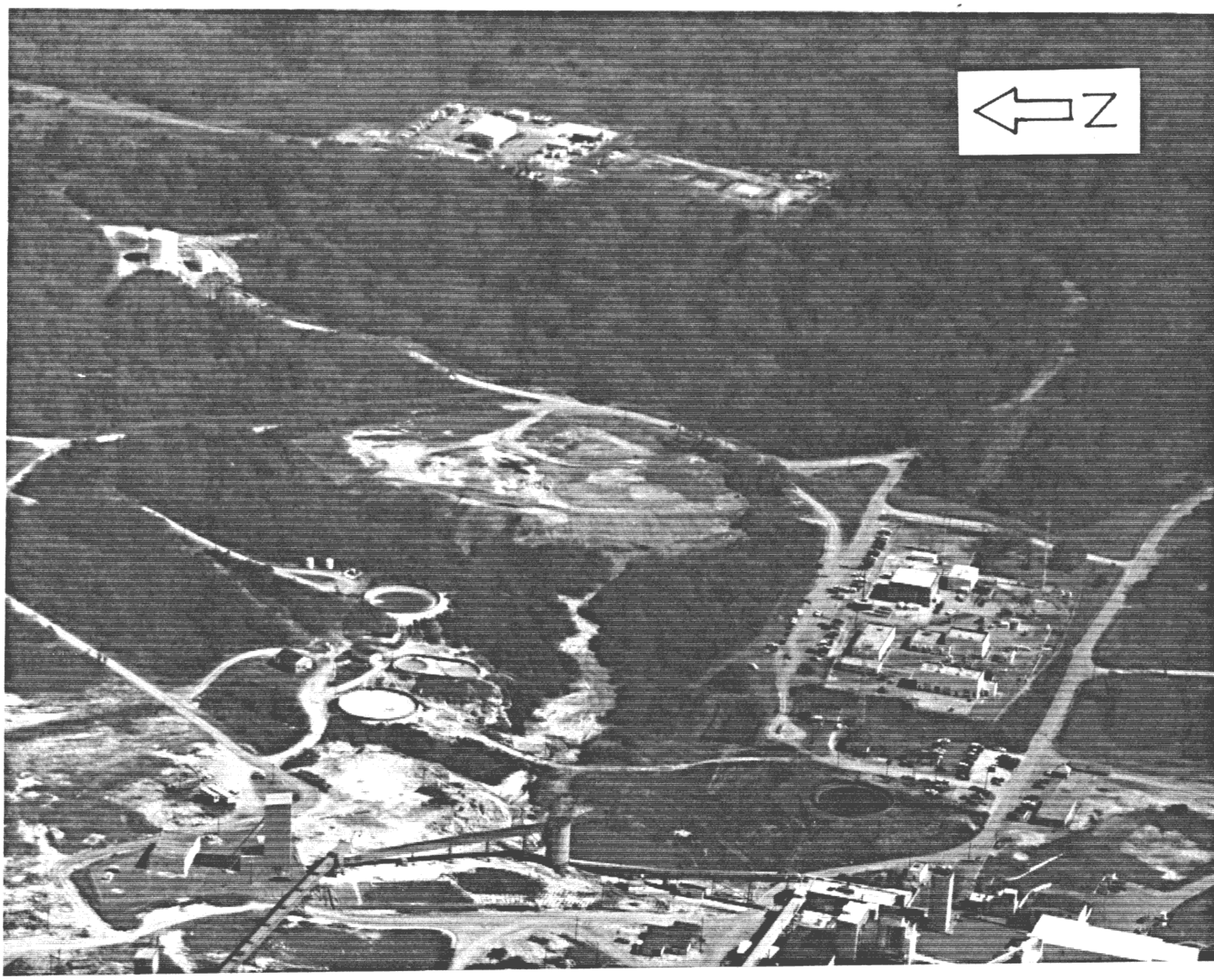


Figure 1-7. Weeks Island SPR Site

bodies surrounding Weeks Island provide a vast estuarine nursery ground for an array of commercially and recreationally important finfish and shellfish.

The Weeks Island site consists of a large mechanically excavated (room and pillar type) salt mine with 11.6 million m^3 (73 MMB) of crude oil storage capacity. In addition to normal site facilities, there is a 91 cm (36 in) 108 km (67 mi) long crude oil pipeline connecting the site to the St. James Terminal.

1.7 WEST HACKBERRY

The West Hackberry (WH) site is located in Cameron Parish 29 km (18 mi) southwest of Lake Charles, Louisiana and 26 km (16 mi) north of the Gulf of Mexico. Cameron Parish is the largest and least populous parish in Louisiana. The population derives its economy from fishing, shrimping, rice farming, and petroleum production. The work force at the site is derived from local residents of the Hackberry community, the towns of Sulphur and Lake Charles, in Calcasieu Parish, and from recent arrivals to the area.

The site is situated on 229 ha (565 ac) of land on top of the West Hackberry salt dome (Figure 1-8). The dome is covered by a distinct mounded overburden on its western portion, with elevations up to nearly 6.5 m (21 ft), the highest point in Cameron Parish. The majority of the dome is approximately 1.5 m (5 ft) above sea level. Two brine disposal well pads occupying approximately 2.5 ha (6 ac) are located 3 km (1.9 mi) south of the site.

Waterways near the site include Calcasieu Lake and the Calcasieu Ship Channel approximately 5 km (3 mi) to the east, and the Intracoastal Waterway approximately 6 km (4 mi) north of the site. Black Lake, a brackish water lake, borders the

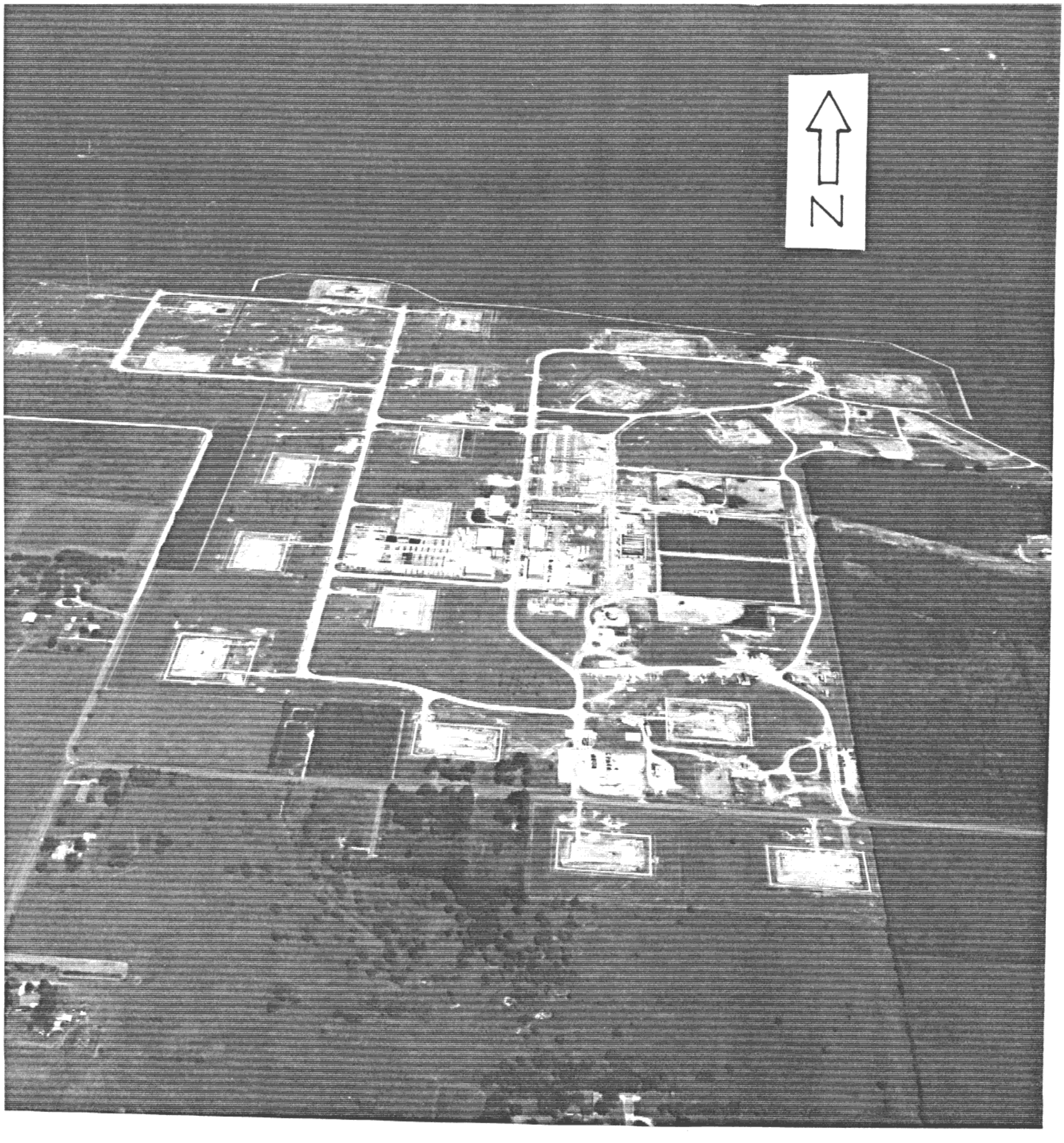


Figure 1-8. West Hackberry SPR Site

dome on the northern and western sides. Numerous canals and natural waterways, including Black Lake Bayou, connect Black Lake to Alkali Ditch and then to the Intracoastal Waterway on the eastern side of the site. Black Lake Bayou, referred to locally as Kelso Bayou, continues wandering in a generally easterly direction from Black Lake, eventually connecting with the Calcasieu Ship Channel northeast of the town of Hackberry.

The western part of Cameron Parish consists of marshland with natural ridges extending in a generally east-west direction. These ridges, or cheniers, are stranded former beach lines which affect water flow through the marshes. The cheniers typically support grasses and trees. In many areas, lakes, bayous, and canals are concentrated so that the marsh may not seem to be a land mass, but rather a large region of small islands. Marshland closest to the coast generally has the highest salinity levels and lowest species diversity. Vegetation found on site and in the surrounding area of the West Hackberry facility is dominated by Chinese tallow, willow, various oak species, and numerous species of marsh and upland grasses. American alligator, snakes, egrets, herons, roseate spoonbill, migratory waterfowl, red-tailed hawk, red fox, raccoon, nutria, opossum, rabbits, and white-tailed deer inhabit the area surrounding the West Hackberry site. Aquatic inhabitants of Black Lake include crabs, shrimp, drum, croaker, spot, sheepshead, mullet, gar, redfish, and catfish.

The West Hackberry site will store 34.8 million m^3 (219 MMB) of crude oil in 22 solution-mined caverns. Brine is transported and disposed either by injection into eight active brine disposal wells, or the Gulf of Mexico through a 91 cm (36 in), 42 km (26 mi) pipeline at an area 11 km (7 mi) south of Holly Beach, LA. A series of brine diffuser nozzles are operated to promote brine dispersion. Raw water is brought to the site via pipeline from the Intracoastal Waterway and crude oil is transported between the site and the Sunoco Terminal in Nederland via a 107 cm (42 in), 66 km (42 mi) crude oil pipeline.

1992. Visual monitoring is being conducted on a small (65 bbl), 1990 brine pipeline spill area at West Hackberry.

Clean Air Act (CAA). Subsequent to a Texas Air Control Board (TACB), inspection, a Notice of Violation was received which cited incomplete monitoring as described in the Bryan Mound site air permit. A meeting was held with the TACB to resolve the interpretational differences of the permit. Additional quarterly sampling of all valves and pump seals, whether "active" or not, ensued as a result of negotiations. Reporting of all secondary seal gap measurements of floating roof storage tanks and other emission sources continues to be accomplished at all sites as required by individual permit.

In August, 1990, the Louisiana Department of Environmental Quality (LDEQ) issued a Form Order to the SPR and 73 industrial sites around Baton Rouge, Louisiana, permitted to emit 100 tons per year or more of nitrous oxide or reactive hydrocarbons. The Order requires industry to develop Maximum Achievable Control Technology (MACT) to reduce emissions of volatile organic compounds (VOCs). St. James Terminal, in so far as the current air permit indicates, is the only SPR site that would require MACT due to potential emissions during drawdown, because it is a terminal facility located within the Baton Rouge, LA industrial corridor. Negotiations will be undertaken with regulatory agencies in 1991.

Radon, which is regulated under the National Emission Standards for Hazardous Air Pollutants (NESHAPS), was measured at all SPR sites. All measurements were <2 picocuries per liter, well under the 20 picocurie limit.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The SPR has no removal or remedial activities pursuant to this Act. Reporting requirements under the Superfund Amendments and Reauthorization Act (SARA) (Title III, Tier II) do apply and are complete. The 1989 report was distributed, as required, by March 1, 1990.

Safe Drinking Water Act (SDWA). The SPR oil storage caverns and brine disposal wells are regulated by the SDWA. The SPR operates 25 salt water disposal wells in Louisiana. The Louisiana Department of Natural Resources (LDNR) issued eight Notices of Violation (NOV) in regard to recordkeeping, pursuant to work performed under various well permits. All recordkeeping violations have been resolved. The Railroad Commission of Texas (RCT) sent an order to provide missing Annual Disposal/Injection Well Monitoring Report (H-10) for two wells at Bryan Mound. The data were provided.

Bryan Mound, St. James, and West Hackberry are on local municipal water supply. West Hackberry completed site piping modifications to prevent the potential for backflow of water into the local water system. Bayou Choctaw, Sulphur Mines, and Weeks Island have water wells for nonpotable use and bottled water for sanitary purposes. Big Hill has its own non-community, non-transient water supply and in March 1990 received Texas Department of Health (TDH) approval to operate. The SPR and TDH are currently reviewing new sampling and reporting requirements.

The SPR has a groundwater monitoring program to determine the source and extent of brine contamination and its source at Bryan Mound and West Hackberry. Monitoring wells or sumps have been installed at five sites. The final assessment report will be completed in early 1991 in accordance with DOE Order 5400.1.

Resource Conservation and Recovery Act (RCRA). The SPR sites are generators under either Small Quantity Generator (LA) or Conditionally Exempt Small Quantity Generator (TX) status and therefore have no RCRA permits. In 1990 however, accumulated solvent waste volume exceeded the generator threshold at some SPR sites. In 1990, the SPR manifested hazardous waste from two TX sites and three LA sites for offsite disposal. The wastes consisted primarily of paint solvent wastes, paint still bottoms, solvent contaminated oils, and lab wastes (out-of-date chemicals).

The underground storage tanks (UST) at the SPR sites contain diesel or gasoline fuels. They are all registered under the UST program as required. Because of their age (less than 10 years), monitoring and testing requirements are not required until 1992.

Toxic Substances Control Act (TSCA). PCB's and friable asbestos are not stored or used at SPR sites. All nonfriable asbestos (gaskets, insulation) is disposed in accordance with applicable regulations as solid waste. The asbestos in the cooling tower at Weeks Island (excess property) was tested and determined to be non-friable. The asbestos was then removed and disposed as solid waste.

National Environmental Policy Act (NEPA). The SPR did not prepare any Environmental Impact Statements or Assessments in 1990. Twelve Memoranda to File were processed for qualifying projects.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). All use of insecticides or herbicides were in accordance with manufacturers recommendations. If the substance was controlled, application was performed by a licensed commercial applicator.

Endangered Species Act (ESA). There were no determinations made or sought for the SPR this year.

National Historic Preservation Act (NHPA). No activity was undertaken by the SPR applicable to this Act this year.

Executive Order 11988, "Floodplain Management" and Executive Order 11990, "Protection of Wetlands." No SPR activities adversely impacted floodplains or wetlands in 1990.

Louisiana Administrative Code, Title 33 (LAC:33). The State of Louisiana enacted a requirement to survey oil and gas facilities for the presence of naturally occurring radioactive material (NORM). Procurement action to conduct the survey was initiated in 1990. The actual survey was conducted February 1991.

2.3 CURRENT ISSUES AND ACTIONS (1990)

During 1990, the SPR has maintained a status of low risk to the environment.

CAA. DOE considers the requirement to monitor all valves and pump seals to be a change in TACB policy. DOE procedures were previously reviewed by both TACB and the EPA without objections. Further action remains for TACB to provide DOE a clear interpretation of the term "active service" in the permitting requirements.

CWA. Inspections in 1990 by both TWC and LDEQ revealed some administrative oversights and deficiencies. No NOVs were issued and all the agency's recommendations have been completed or are in the process of being resolved.

SDWA. To preclude recordkeeping violations (see section 2.2) of work performed on SPR wells, a quarterly "look ahead" schedule has been implemented.

Initial findings from the brine pond oriented groundwater study at West Hackberry and Bryan Mound indicate that both sites have brine leaks most likely from the brine ponds or nearby underground piping. However, affected groundwaters are naturally brackish and not suitable for domestic or agricultural use. Final report recommendations are expected in early 1991. Meetings are being held with state regulators to resolve issues.

Environmental Awareness Training courses were provided to DOE and contractor management and staff. The course emphasized the laws and regulations that specifically pertain to SPR operations such as the CWA, CAA, SDWA, and SARA.

Environmental reports and notifications have been submitted routinely as required by applicable codes and permits. Seven applications to renew NPDES permits are currently being processed by the EPA. All operating permits are current, and the SPR is under no regulatory compliance orders. All NOVs have been closed. There are no outstanding lawsuits involving environmental issues at the SPR.

The issue between EPA and DOE regarding the signator as operator or co-operator on the NPDES permits has been resolved. Effective with the award of a new management and operations contract, currently scheduled for April 1, 1993, NPDES permits will be signed by DOE as owner and the contractor as operator.

In response to the Louisiana Form Order to permit holders of potential emissions greater than 100 tons per year (tpy), has caused the SPR to relook at its emissions, and update the permit in 1991.

2.4 SUMMARY OF PERMITS (1990)

Permits currently in effect include seven NPDES permits, seven air quality permits, 45 Corps of Engineers (COE) wetlands permits, and over 100 pit, underground injection, and mining permits. In addition, a number of corresponding state discharge and other local permits are in effect.

2.5 COMPLIANCE STATUS FOR JANUARY 1 THROUGH APRIL 1, 1991

CWA. For this period no oil spills, one brine spill, and nine NPDES noncompliances have occurred. No adverse environmental impacts were observed from the spills or noncompliances. Monitoring of the 65-barrel brine spill at the 17-mile marker of the West Hackberry brine line is complete with observed spring growth of the impacted grasses. No further action is planned.

CAA. All monitoring and reporting has been in strict accordance with the permits and as agreed by the TACB. No agency inspections have been conducted.

The SPR has directed an evaluation of all emissions at the St. James facility in order to determine a course of action in response to the State Form Order requiring MACT. Activities are underway to request modification of the air permit to reflect standby operations as "actual emissions" and to acquire an exemption to the periodic occurrences when VOCs exceed authorized permit levels. Use of a vapor recovery unit during drawdown and refill is being considered.

SDWA. The draft final report on the groundwater monitoring study was completed. Meetings are being held with state regulatory agencies to resolve issues.

SARA. All 1990 Title III, Tier II reports were distributed March 1, 1991, as required, to the various state and local agencies and local fire departments.

NEPA. The SPR has prepared two Action Description Memoranda involving replacement of the Bryan Mound and West Hackberry brine pipelines. No environmental assessments have been written.

As a first step in the environmental review of the proposed expansion to one billion barrels, the SPR conducted a aupplemental analysis to reevaluate the adequacy of it's programmatic environmental impact statement(PEIS). On March 14, 1991, DOE determined that preparation of a new supplement to the PEIS is not required.

In the first three months of 1991 there has been no change to, or activity in regards to, CERCLA, TSCA, FIFRA, ESA, NHPA or the Executive Orders 11988 and 11990.

2.6 CURRENT ISSUES AND ACTIONS (JANUARY 1 THROUGH APRIL 1, 1991)

One NOV was received from LDNR regarding a missing 1988 well report which was resubmitted.

The SPR has conducted a major emergency preparedness exercise involving both Texas sites and numerous state and local agencies as well as hospitals, fire departments, etc. All environmental portions of the exercise were coordinated through the agencies for their ideas and approvals.

Meetings with both LDNR and RCT will be held with DOE presenting the corrective action plan to stop the brine contamination source(s) at West Hackberry and Bryan Mound, in addition to groundwater pumping activity at West Hackberry to limit further brine contamination.

The NORM survey was completed this quarter with report submitted to LA. No SPR site exhibited the presence of NORM.

2.7 SUMMARY OF PERMITS (JANUARY 1 THROUGH APRIL 1, 1991)

There has been no change in the permit status during this quarter.

3. ENVIRONMENTAL PROGRAM OVERVIEW

The environmental program is implemented by a prime contractor for the SPR on behalf of the United States Department of Energy (DOE) (who holds the environmental permits). The environmental program is designed to support the SPR through tasks aimed at avoiding or minimizing adverse environmental effects from the SPR on surrounding lands and water bodies.

The monitoring and inspection program was originally developed under guidance of the SPR Programmatic Environmental Action Report, Site Environmental Action Reports, and DOE Orders. This program includes monitoring permitted National Pollutant Discharge Elimination System (NPDES) outfalls and air emissions, conducting other required Federal and state inspections, and regular sampling and analysis of site-associated surface and groundwater quality. This makes possible the assessment of environmental impacts and early detection of water quality degradation that may occur from SPR operations.

The results of the individual program areas such as air quality monitoring and reporting, NPDES compliance, water quality monitoring, and groundwater monitoring, for 1990 are discussed in sections 5 and 6.

3.1 ASSOCIATED PLANS AND PROCEDURES

Associated plans and procedures developed to support the SPR environmental program include group-specific Spill Contingency Plans with spill reporting procedures, site-specific Spill Prevention, Control, and Countermeasures Plans, the Environmental Programs and Procedures Manual that includes a Solid Waste Management Plan, an Underground Injection Control Plan, and a Fugitive Emissions Monitoring Plan. Plans and procedures for groundwater protection (draft), pollution prevention awareness, and waste minimization were prepared in 1990 (issued in early 1991). Compliance with Federal, state, and local laws, regulations, and permits has been accomplished in part by implementation of these plans and procedures.

3.2 TRAINING

Site Environmental and Emergency Response Team (ERT) personnel have received training in environmental plans and procedures. Site management personnel are knowledgeable of environmental procedures, spill reporting procedures, the group-specific Spill Contingency Plans, the site-specific Spill Prevention, Control, and Countermeasures Plans, and compliance awareness. Compliance awareness training is conducted by the individual site environmental specialists at each of the SPR sites. During this training, site personnel learn about applicable regulatory requirements. Several sessions of an environmental awareness course were provided to DOE and contractor management and staff.

ERT personnel from all sites participate in annual spill response training at the Texas A & M University, Engineering Extension Service. Onsite training is also provided in spill cleanup and control. Site response personnel are trained to rapidly and effectively contain and cleanup oil, brine, and hazardous substance spills under the special circumstances unique to each SPR site.

3.3 REPORTING

Proper operation of the SPR with respect to the environment involves several types of reports and reporting procedures. The basic reports are summarized briefly in this section.

3.3.1 <u>Spill Reports</u>

The spill contingency plans include procedures for reporting spills to the SPR contractor, DOE, and appropriate regulatory agencies. Specific reporting procedures are dependent upon several key factors including the quantity and type of material spilled, immediate and potential impacts of the spill, and spill location (e.g., wetland or waterbody). Any spill considered significant at the site is first verbally reported to site management and then to the SPR contractor management in New Orleans and the onsite DOE representative. These procedures contained in contractor operating procedure 220P-21 "Reporting of Spills," have been simplified and condensed to a credit card-like document for attachment to identification badges and to a laminated placard for handy desk reference. Verbal notification to the appropriate regulatory agencies follows when necessary. Final written reports from the site are submitted after cleanup, unless otherwise directed by the DOE or appropriate regulatory agency.

3.3.2 Discharge Monitoring Reports

Wastewater discharges from SPR sites are authorized by the Environmental Protection Agency (EPA) through the NPDES Program. Depending on site specific permit requirements, discharge sample analyses are reported to the state and EPA monthly (Big Hill, Bryan Mound, and West Hackberry), and quarterly (Bayou Choctaw, Saint James, Sulphur Mines, and Weeks Island). Included in the report is an explanation of the cause and actions taken to correct any noncompliance or bypass.

3.3.3 Other Reports

The SPR contractor provides several other reports to or on behalf of DOE. These reports include:

a. Fugitive Air Emissions for Bryan Mound (quarterly);
b. Emission Inventory Questionnaire Status update for St. James Terminal, Sulphur Mines, and Weeks Island (annually);
c. Air Quality Construction Status Report for West Hackberry (semi-annually);
d. Permit Tracking System review and update (annually and quarterly);
e. Monthly Noncompliance and Spill Report with an annual summary for all sites;
f. Environmental Audit Reports for each site (annually);
g. Water Usage for Bryan Mound and Big Hill (annually);
h. Raw Water Usage and Brine Discharge Data for Big Hill, Bryan Mound and West Hackberry (monthly)
i. Quarterly Environmental Compliance Report (SEN-7a)

j. Performance Indicator Program (monthly)

k. OMB Circular A-106 Environmental Project Plan (semi-annually)

l. Environmental Compliance Issue Coordination DOE Order 5400.2A (annual)

m. Environmental Protection and Implementation Plan DOE Order 5400.1 (annual revision)

n. Annual Monitoring Report, H-10

o. Plug and Abandon Report (as needed)

p. Work Resume Report (as needed)

3.4 OIL SPILLS: RECAPITULATION

In 1990, the total amount of oil moved (received and transferred internally or sold) was approximately 2.2 million m^3 (13.7 MMB). The total number of crude oil spills (which is one less than total of oil spills), total volume spilled, and the percent volume spilled of total volume moved are shown below (Table 3-1) for each year from 1982 through 1990.

The oil spills involving quantities in excess of 0.16 m^3 (one barrel (bbl)) that occurred during 1990, both contained and uncontained, are presented in Table 3-2. The table also contains data from three spills that were off DOE property but less than 1 bbl. Six crude oil spills were caused by equipment failures, four by operator error, two by design deficiencies, one by corrosion/erosion of pipeline, and two not classified.

The total number of spills has increased in the past two years, although the percent spilled during 1987-1989 is similar to 1990 based on throughput. Approximately 80% of the oil spilled in 1990 was associated with two spills involving the failure of piping because of internal corrosion/erosion, the other from operator error. Thirteen other spills resulted in spillage of only 80 barrels of oil. No environmental damage resulted.

Table 3-1. Number of Crude Oil Spills

Year	Total Spills	Volume Spilled m^3 (barrels)	Percent Spilled of Total Throughput
1982	24	847.0 (5,328)	0.00704
1983	21	380.9 (2,396)	0.00281
1984	13	134.8 (848)	0.00119
1985	7	85.4 (537)	0.00122
1986	5	1232.5 (7,753)	0.01041
1987	5	2.5 (16)	0.00002
1988	6	8.8 (55)	0.00001
1989	11	136.4 (858)	0.00004
1990	14	74.8 (467)	0.00003

Table 3-2. 1990 Oil Spills

DATE	LOCATION	AMOUNT	CAUSE/CORRECTIVE ACTION
01/22/90	BH	0.64 m^3 (4 bbls)	Vent valve leaked by on meter prover near sump 10. Oil spread to stone pad by meter prover and the foam retention pond. Work request generated to install a level alarm.
02/22/90	WH	0.16 m^3 (1 bbl)	Overpressurization of pressure relief valve inside cavern 8 manifold. Valve was isolated and reset.
02/23/90	BH	0.64 m^3 (4 bbls)	Dome cover gasket on vacuum truck failed under pressure spilling oil onto wellpad 113. Gasket replaced.
03/10/90	SJ	1.6 m^3 (10 bbls)	During heavy rains the weight of water on the tank 6 roof caused submersion of center hatch allowing oil to escape, some into diked area. Spill stopped as water drained from roof. Hatch design will be reviewed.

Table 3-2. 1990 Oil Spills (continued)

DATE	LOCATION	AMOUNT	CAUSE/CORRECTIVE ACTION
03/18/90	WH	36.8 m^3 (230 bbls)	36" crude oil bypass to the suction header on high pressure pump pad ruptured due to erosion. Pipe was isolated and oil diverted into north retention pond. Section of piping replaced.
03/21/90	WH	25.1 m^3 (157 bbls)	During cold cut of 36" pipe, remaining oil overflowed catchment tubs in pipe trench as there had been more than anticipated. Pipe cutting was stopped to control spill.
03/22/90	WH	1.3 m^3 (8 bbls)	Pressure relief valve (PRV) failed on cavern 117. Block valve under PRV closed.
03/22/90	BH	3.2 m^3 (20 bbls)	Valves on cavern 103 brine line leaked by by allowing oil to flow to anhydrite pond.
04/28/90	BH	0.32 m^3 (2 bbls)	Found oil in anhydrite pond (south sparger). Presumed to have come from a leaking brine valve at cavern 103 which had oil when sampled.
06/17/90	BH	3.2 m^3 (20 bbls)	Valves near Cavern 104 leaked.
06/21/90	SJ	0.06 m^3 (15 gals)	Sample line (1/2") at Dock 1 was leaking near elbow into Mississippi. Valve was shut to stop leak and line was repaired.
07/13/90	BM	0.96 m^3 (6 bbls)	Frac tank overflowed when cleaning out wellhead cellar.
07/16/90	BH	0.8 m^3 (5 bbls)	Valve leaked oil into the anhydrite pond when moving oil from Sun terminal. Repaired valve.
07/18/90	BH	0.004 m^3 (1 gal)	Oil from anhydrite pond blew into drainage ditch on site which connects with pasture offsite. Project to add more freeboard is being developed.
07/23/90	BH	0.009 m^3 (2.5 gal)	Overturned vacuum truck leaked 2 gal of crank case oil and 1/2 gal diesel spilled into Pipkin Ranch reservoir.

3.5 BRINE SPILLS: RECAPITULATION

The SPR disposed of 70.2 million m^3 (438.8 MMB) of brine (mostly saturated sodium chloride solution, some discharges were of lower salinities than normally attributed to brine) during 1990. Approximately 94.3% of the brine was disposed in the Gulf of Mexico via the Big Hill (87.4%), Bryan Mound (3.1%), and West Hackberry (3.8%) brine disposal pipelines. The remainder was disposed in saline aquifers via injection wells at the Bayou Choctaw (5.6%) and Sulphur Mines (less than 0.1%) sites, and at offsite disposal wells (less than 0.1%).

The total number of spills, total volume spilled, and percent volume spilled of total volume disposed are shown in Table 3-3 for each year from 1982.

The brine spills involving quantities in excess of 0.16 m^3 (one bbl), both contained and uncontained, during 1990 are discussed in Table 3-4. Seven spills were caused by corrosion/erosion of piping either at a weld (1) or non-weld area (6), two by gasket/flange failures, two by operator error, and one by design problem.

Table 3-3. Number of Brine Spills

Year	Total Spills	Volume Spilled m^3 (barrels)	Percent Spilled of Total Disposed
1982	43	443.8 (2,792)	0.0005
1983	44	259.4 (1,632)	0.0002
1984	17	314.0 (1,975)	0.0003
1985	16	96,494.8 (607,000)	0.1308
1986	7	275.6 (1,734)	0.0017
1987	22	96.5 (608)	0.0003
1988	12	93.8 (586)	0.0001
1989	17	131,231.6 (825,512)	0.1395
1990	12	11,944.3 (74,650)	0.0170

One spill (due to corrosion/erosion of a brine pipeline) accounted for 99% of the brine spilled. The spill location was in the Gulf of Mexico and there was no adverse environmental impact. This year the number of spills decreased slightly, while, with the exception of the above-mentioned spill, the volume (650 barrels) remained substantially the same for the past four years. No significant long term adverse environmental impact was observed from any SPR brine spills as evidenced by subsequent surveys and water quality monitoring.

Table 3-4. 1990 Brine Spills

DATE	LOCATION	AMOUNT	CAUSE/CORRECTIVE ACTION
02/22/90	WH	0.8 m^3 (5bbls)	Insufficient torque on valve flange allowed brine to drain into large pool of storm water under valve in cavern 112 perimeter dike. Valve isolated and reset.
04/28/90	BH	1.6 m^3 (10 bbls)	Brineline ruptured at a weld on cavern pad 112. Line was repaired.
05/13/90	BH	2.6 m^3 (16 bbls)	Brineline ruptured near the corrosion monitor pit due to corrosion. Pipe section was replaced.
05/26/90	WH	26 m^3 (161 bbls)	Brineline ruptured on the High Pressure Pump Pad due to corrosion. Section of pipe was replaced.
5/31/90	BH	14.4 m^3 (90 bbls)	Brineline ruptured near Cavern 111 due to corrosion. Section of pipe was replaced.
07/05/90	WH	0.96 m^3 (6 bbls)	1/2" to 3/4" hole on bottom of 6" brine manifold piping. Piping was repaired.
07/30/90	BH	0.48 m^3 (3 bbls)	Buried 48" brine line leaked brine. Section was replaced and is in service.
09/29/90	BM	11,840 m^3 (74,000 bbls)	Brine line leak was discovered during quarterly flow test. Leak occurred approximately 6.5 miles offshore. Line was sleeved in place.

Table 3-4. 1990 Brine Spills (continued)

DATE	LOCATION	AMOUNT	CAUSE/CORRECTIVE ACTION
11/20/90	WH	10.4 m^3 (65 bbls)	Brine leaked from a flange at the valve station near the beach (mile marker 17) after the spool was replaced by a valve. Gasket in flange was replaced.
12/5/90	WH	8.2 m^3 (51 bbls)	Raw water suction header at high pressure pump pad drained for freeze protection. Water in pipe was saline.
12/6/90	WH	37.6 m^3 (235 bbls)	An operational brine bleed down was started while a valve still removed from line.
12/10/90	WH	1.3 m^3 (8 bbls)	Gasket on on downstream side of valve failed while disposing brine to Gulf. Gasket replaced.

3.6 WASTEWATER DISCHARGE COMPLIANCE

In 1990, a total of 11,131 analyses were performed to monitor wastewater discharge quality from the SPR in accordance with NPDES and corresponding state permits. Although 19 noncompliances were reported (Tables 5-2 through 5-8), the SPR was in compliance with permit requirements for approximately 99.8% of the analyses performed. Five of the noncompliances involved site sewage treatment plants, seven operator errors in failing to collect, analyze, or record samples, four problems with brineline operation, two from design deficiencies, and one due to natural phenomena.

Corrective actions implemented to mitigate noncompliance recurrence included developing or modifying applicable procedures, retraining and certifying personnel, initiating special studies, and repairing faulty equipment.

3.7 PIPELINES

The SPR owns 325 miles of pipelines for transporting either crude oil, raw water, or brine. The crude oil lines tie each site into a terminal for distribution during a drawdown to refineries by pipeline, tanker, or barges. They also serve to fill the SPR with crude oil.

The raw water lines bring water to the sites for solution mining to create the caverns in the salt domes and during drawdown to displace the crude oil. The brine disposal pipelines either dispose of brine in saline underground aquifers or offshore in the Gulf of Mexico as allowed by permit. Brine discharges occur during solution mining, fill-refill, and to relieve pressures from cavern creep.

The pipelines are routinely inspected by designated pipeline crews, periodic overflights, coupon monitoring, pigging, and various testing including integrity flow tests and ultrasonic testing.

During 1990, a failure in the Bryan Mound brine line occurred approximately eight miles south of the site in the Gulf of Mexico. At West Hackberry, replacement of a faulty valve at a valve station located near mile marker 17 allowed brine to leak from the brine line onto the ground and into an adjacent marsh. There was no longterm adverse impact as a result of the spills. These were the only offsite pipeline spills in 1990.

3.8 WASTE MINIMIZATION PROGRAM

A waste minimization program was created, documented, and implemented to reduce the generation of all wastes including hazardous waste. The SPR has introduced a shop rag service, is eliminating the use of styrofoam cups, and is substituting less hazardous materials in the workplace as some of its methods to minimize waste.

3.9 SPECIAL ENVIRONMENTAL ACTIVITIES

Brief examples of SPR environmental activities are presented here.

During 1989, there was a major brine pipeline spill at Bryan Mound that prompted additional studies to assess and monitor impact. Weekly, monthly, and quarterly water quality monitoring, quarterly vegetation assessment, and interstitial soil water sampling were conducted, along with aerial photographic interpretation. The final report recommended revegetation of the impacted area and the addition of culverts to promote tidal nutrient exchange. These actions will be undertaken at the completion of planned pipeline work.

The Environmental Survey of the SPR conducted by DOE Headquarters was completed in early 1988. The 29 findings were categorized as either lower level III or IV and not of an immediate threat to health or the environment. Two of the findings were closed in 1990, but a previously closed finding was reopened due to the ineffectiveness of the corrective action, bringing the total number closed to 20. Of the remaining 9, four are awaiting guidance from the Survey and Analysis team, one is scheduled for completion in FY'91, three in FY'92, and one in FY'93. Permanent repair of the BM cavern pad 113 is underway and should be completed shortly. The groundwater study undertaken by Geraghty and Miller has been completed with the final report to be delivered the first part of 1991. Corrective action is scheduled for 1991. The ponds will be monitored throughout the life of the project to determine what, if any, repairs are needed. The two findings that were closed include obtaining a permanent source of fresh water for the BH fire water tank and making the necessary piping changes to the WH potable water system.

The Environmental Advisory Committee, whose purpose is to supplement existing BPS environmental and safety efforts by providing impartial assessments and advice to the operating management, public, and media relative to SPR management, programs, and policies, held its quarterly meetings in 1990. Several recommendations were made by the committee. An example of these include a recommendation to perform an engineering study to determine ways to prevent debris accumulating around valve station 7 on the SJ-WI crude oil pipeline and creating hazardous horizontal stresses on the piping.

Project Directive 116, Storage and Maintenance of Drummed Materials at SPR facilities, continued being implemented in 1990 with participation of several BPS directorates. Procedures implemented for managing central storage and satellite areas; contracted for all site hazardous waste pickup (two sites will be done in 1991); preparing call out contracts for waste pickup; and obtained launderable rag (shop rag) services.

4. ENVIRONMENTAL RADIOLOGICAL PROGRAM INFORMATION

There are no radioactive process effluents from any SPR facility. The only radioactive materials at any SPR facility are sealed sources in certain field instruments.

4.1 SEALED SOURCES

A total of 132 nuclear density gauges (SGH Model Nos. 5190, 5191, and 5202) are located on pipelines within the Bayou Choctaw, West Hackberry, Sulphur Mines, and Bryan Mound sites. The gauges are used for monitoring fluid density changes (oil versus brine) in pipelines. Each gauge unit contains between 100 and 400 millicuries (mCi) of cesium 137. Gauge wipe tests are performed every three years as recommended by the manufacturer. No radiation leakage has been detected to date. The DOE is a general licensee under the manufacturer, Texas Nuclear.

A Princeton Gamma Tech Model 100 sulfur analyzer is used in the St. James laboratory for analyzing sulfur concentrations in oil samples. A similar instrument was excessed at Bryan Mound in 1990. The radioisotope source for each analyzer was 50 mCi of iron-55. No radiation leakage from either analyzer has been detected from semiannual wipe tests.

4.2 NATURALLY OCCURRING RADIOACTIVE MATERIALS (NORM)

In 1989, LA amended its Radiation Regulations to require a survey to determine the locations and contamination levels of NORM in the oil and gas industry. DOE has contracted for each of its sites to be surveyed, especially in the laydown yards where pipe is stored. It is believed that radioactive material becomes bound with the pipescale and pipewall coatings that result from oilfield drilling activity. A cursory inspection using a geiger counter was conducted. This preliminary inspection revealed no NORM present. The survey completed in early 1991, and results submitted to the state as required.

5. ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

A primary goal of DOE and the SPR contractor is to ensure that all SPR activities are conducted in accordance with sound environmental practices and the environmental integrity of the SPR sites, and their respective surroundings, is maintained.

Effective environmental monitoring (separate from discharge permit compliance monitoring) provides a mechanism for assessing the impact of SPR activity on air, surface water, and groundwater (Section 6). Site monitoring programs were developed as management tools to provide the information necessary for limiting unwarranted environmental impacts, thus serving the public interest by ensuring environmentally sound operation of the SPR.

5.1 AIR QUALITY

During 1990, air emissions were monitored primarily through measurements and calculations from operating data. Volatile hydrocarbons from valves, pumps, tanks, tankers, and brine ponds are the predominant air emissions from SPR facilities. They are monitored for permit compliance at Big Hill and Bryan Mound using an organic vapor analyzer. The quantity of hydrocarbon emissions is generally dependent on the volume of oil throughput, with minimal emissions occurring during periods of static storage. Small amounts of hydrogen sulfide are released from some crude oils handled and stored by the SPR. Estimated emissions associated with the SPR were generally lower during 1989 and 1990 as compared to 1982 through 1988 due to the reduction in fill activity. Actual throughput was monitored at Bryan Mound only and is discussed in the Bryan Mound subsection. Dust emissions from most site roads have been mitigated through paving or application of dust control agents.

5.1.1 Bayou Choctaw

During 1990, Bayou Choctaw, located in a nonattainment area for ozone, operated in accordance with air quality regulatory requirements. Total emissions from the facility were calculated using method AP-42 (EPA, 1985) to be less than nine metric tons/(10 tons)/year (a "nonsignificant facility" as noted in the air quality regulations for Louisiana). Nonsignificant facilities are exempt from vapor monitoring requirements. There were no configurational changes which would have resulted in additional air emissions during 1990. No air quality monitoring using actual monitoring equipment was required or conducted during 1990.

5.1.2 Big Hill

The Big Hill facility, located in a nonattainment area for ozone, operated in accordance with applicable air quality regulatory requirements and all conditions of the air quality permit. This included wetting plant roads with water and dust abatement chemicals to control fugitive dust emissions. Annual hydrocarbon emission monitoring as required by the permit began in 1990 when crude oil fill was initiated. This monitoring involves testing for fugitive VOC emissions from valves and pump seals on a quarterly basis. No repairs were needed based on this monitoring.

5.1.3 Bryan Mound

The Bryan Mound facility, located in a nonattainment area for ozone, operated in accordance with all air quality regulatory requirements throughout 1990 with the single exception. The ongoing fugitive emissions monitoring program, as required by the TACB, includes monitoring for fugitive VOC emissions from valves and seals on a quarterly basis using a VOC detector. A TACB inspection conducted during 1990 found a discrepancy in SPR air quality compliance having to do with interpretation of valving in "active" service and a Notice of Violation was issued. Previous inspections did not identify this apparent change in regulatory requirement. Subsequent to the inspection, agreement was made between DOE and the TACB to monitor all valves and pump seals on a quarterly basis. The program also includes monthly calculations of emissions based on crude oil throughput for each storage tank. No leaks (greater than 10,000 ppm) of hydrocarbon vapors from valves or pump seals were detected during 1990. Hydrocarbon emissions from surge tanks were calculated at 2.1 metric tons (2.3 tons) during 1990, or 38% of the permitted limit (5.5 metric tons (6.1 tons) per year).

5.1.4 St. James

St. James Terminal, located in a nonattainment area for ozone, operated in accordance with all air quality permit and regulatory requirements during 1990. Hydrocarbon emissions were well below the levels projected in the Emission Inventory Questionnaire (866 metric tons/year for loading operations and 541 metric tons/year for unloading operations). Primary Seals on five of the six external floating roofs were visually inspected during 1990 and were in compliance with state air quality regulations. The sixth tank was out of service for the year. Secondary seal gap measurements were also taken and were within required limits. No air quality monitoring using actual monitoring equipment was required or conducted during 1990.

5.1.5 Sulphur Mines

Sulphur Mines operated in accordance with all air quality permit and regulatory requirements during 1990. No configurational or operational changes affecting emission rates occurred at Sulphur Mines. Hydrocarbon emissions, based on crude oil throughput, were well below levels cited in the Emissions Inventory Questionnaire (0.2 metric tons (440 pounds)/year for standby (static) mode of operation). No air quality monitoring using actual monitoring equipment was required or conducted during 1990. This SPR site is located in a nonattainment area for ozone.

5.1.6 Weeks Island

Weeks Island operated in accordance with all air quality permit and regulatory requirements during 1990. No significant configurational or operational changes affecting emission rates occurred at the facility. Hydrocarbon emissions, based on throughput, were well below levels shown in the Emissions Inventory Questionnaire (i.e., 0.2, 0.6, and 0.8 metric tons (440, 1320 and 1760 pounds) per year for filling, withdrawal and recirculation operations respectively). Air quality monitoring using actual monitoring equipment was neither required nor conducted during 1990.

5.1.7 West Hackberry

West Hackberry operated in accordance with all air quality permit and regulatory requirements during 1989. According to throughput and AP-42 computations, hydrocarbon emissions were well below the 50.4 metric tons (55.4 tons) permitted for filling operations. Air quality monitoring using actual monitoring equipment was neither required nor conducted during 1990. There were no construction or configurational changes which would have resulted in additional emissions during 1990. The facility is located in a nonattainment area for ozone.

5.2 SURFACE WATER QUALITY MONITORING

During 1990, the surface waters of the Bayou Choctaw, Bryan Mound, Sulphur Mines, and West Hackberry SPR sites were sampled and monitored for general water quality. This monitoring is separate from, and in addition to, the water discharge permit monitoring program and is not required by any Federal or state regulatory agency. Surface water quality monitoring was not conducted at St. James Terminal or Weeks Island because of the low potential to impact surface waters on these two sites. Table 5-1 identifies frequency of specific parameters measured at each SPR site. Variations in the data are discussed by site following the water quality monitoring discussions.

5.2.1 Bayou Choctaw

Samples collected once monthly at each monitoring station were used to monitor surface water quality. Specific monitoring stations are identified by letter in Figure 5-1. Parameters monitored in the Bayou Choctaw surface waters included pH, salinity, temperature, dissolved oxygen (DO), and oil and grease. A discussion of each parameter follows. Years without data are shown as blank in the following graphs.

Table 5-1. Physiochemical Parameters

PHYSICO-CHEMICAL PARAMETERS	SAMPLE IDENTIFICATION AND FREQUENCY BY SITE																
	DAILY						WEEKLY			MONTHLY							QTR
	BC	BH	BM	SJ	SM	WH	BH	BM	SM	BC	BH	·BM	SJ	SM	WI	WH	SJ
pH	15, 17- 20 101 HPP SWD1 SWD2 SWD3	003	101- 116 1,2 4,5 TX- 001 002	001		001 6-9, 11 101- 117 HPP SOT			001, 002 2,4, 6,7, HPP	001 002 A-F	001 002 004 A-G	001 A-J		A,B D-G	01A 01B 002	002 A-F 001 004	002 003
SALINITY		001	001			001 HPP			002	A-F	A-G	A-J		A,B D-G		A-F	
TEMP.		001	001			001				A-F	A-G	A-J		A,B D-G		A-F	
TOTAL DISSOLVED SOLIDS						001	001	001								A-F	
TOTAL SUSPENDED SOLIDS						001	001 002	001	004	001 002	004	002*			01B 002 003	002 A-F	002 003
DISSOLVED OXYGEN		001	001			001				A-F	A-G	A-J		A,B D-G	A-F		
BOD_5								001	004	001 002	004	002*			01B 002	002	002 003
COD			TX- 001 1,2 4,5 101- 116									A-J					
OIL & GREASE	15, 17- 20 101 HPP SWD1 SWD2 SWD3	001 003	001 101- 116 1,2 4,5 TX- 001	001		001 6-9 11 101- 117 HPP			2,4, 6,7, HPP						01A	004	
TOC		003		001		6-9 11 101- 117 HPP SOT		001		A-F	A-G	A-J		A,B D-G	E	A-C E-F 004	
FECAL COLIFORM															01B 002	002	
RESIDUAL CHLORINE		004	TX- 002														
FLOW	001 002 15, 17- 20 101 HPP SWD1 SWD2 SWD3	001	TX- 001, 001	001		001 HPP**	002 004**	TX- 002*	001, 002, 2,4, 6,7, HPP			002*	002 003		01A 01B 002 003	002 004	

Sampling performed twice per indicated period.
** Sampling performed 5 days/week.

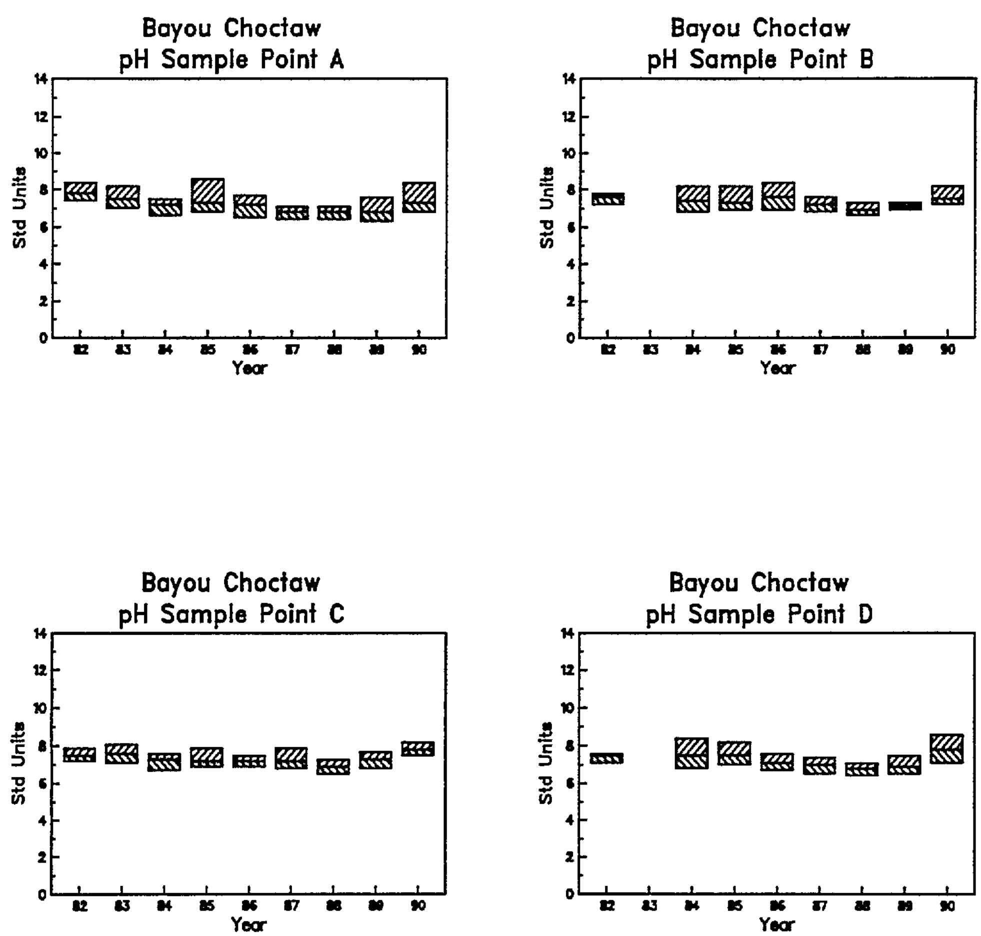
HPP: High Pressure Pump Pad
SWD: Salt Water Disposal (Injection Well)
SOP: Slop Oil Tank

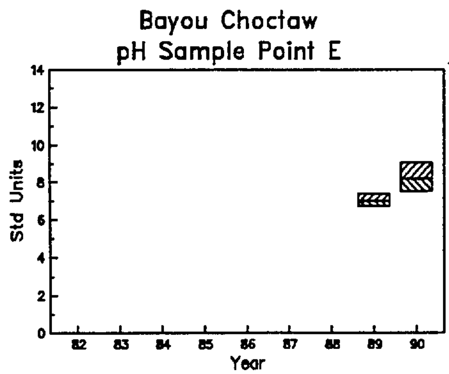
NOTE: Water quality stations (lettered stations) are sampled for possible detection of any adverse environmental condition on and in the waters surrounding the SPR sites.

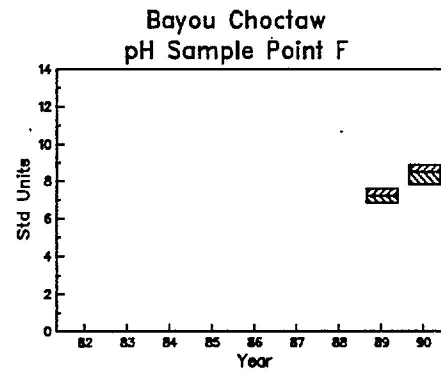
5.2.1.1 Hydrogen Ion Activity (pH)

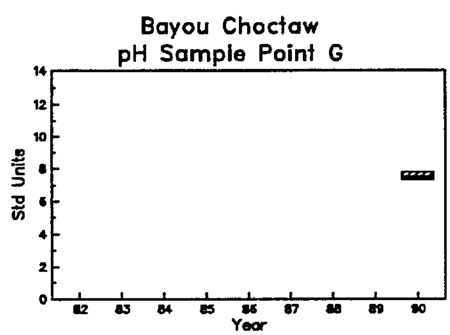
The hydrogen ion activity, or pH, remained essentially neutral (7.0) in most cases.

The 1982 through 1990 data have remained relatively constant in terms of median pH and range. The slight fluctuations observed are attributed to a variety of environmental and seasonal factors such as variations in rainfall or aquatic system flushing.

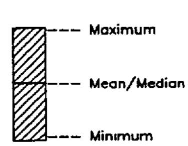








NOTE: Scale between stations changes to show long term variation with greater amplitude.



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BAYOU CHOCTAW

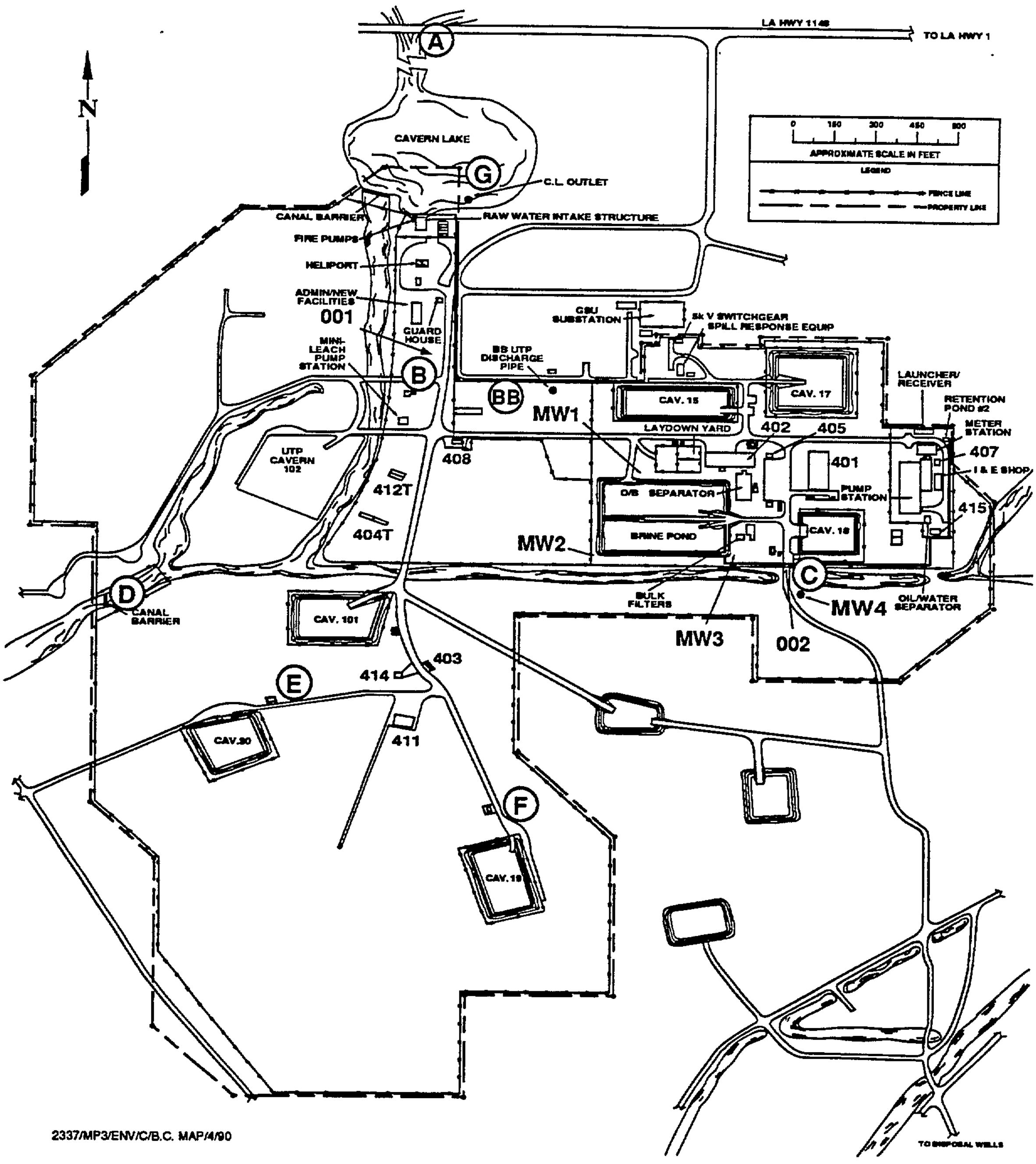


Figure 5-1 (Sheet 1 of 2). Bayou Choctaw Environmental Monitoring Stations

Discharge Monitoring Stations

001	Discharge from sewage treatment plant (administration building)
002	Discharge from sewage treatment plant (control building) stormwater discharges
	Stormwater and pump flush from pump pads
	Stormwater runoff from well pads 15, 17-20, and 101

Water Quality Monitoring Stations

A	Canal north of Cavern Lake at perimeter road bridge
B	North-South Canal at bridge to caverns 10, 11, and 13
C	East-West Canal at Intersection of road to brine disposal wells
D	East-West Canal at cavern 10
E	Wetland Area near well pad 19
F	Wetland Area near well pad 20
G	Near Raw Water Intake (new station established 10/31)
BB	Union Texas Petroleum

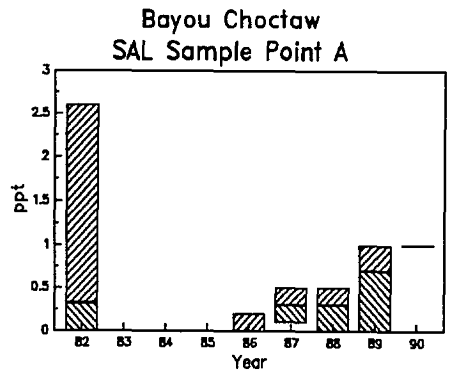
Groundwater Monitoring Stations

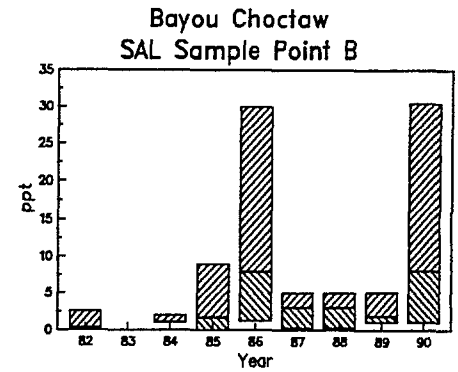
MW1	North of brine pond
MW2	Southwest corner of brine pond
MW3	Southeast corner of brine pond
MW4	Monitor Well established away from brine pond for background data

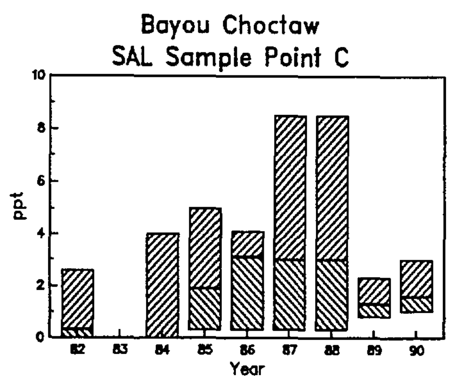
Figure 5-1 (Sheet 2 of 2). Bayou Choctaw Environmental Monitoring Stations

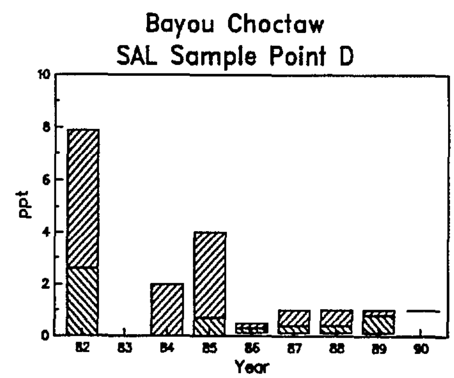
5.2.1.2 Salinity (SAL)

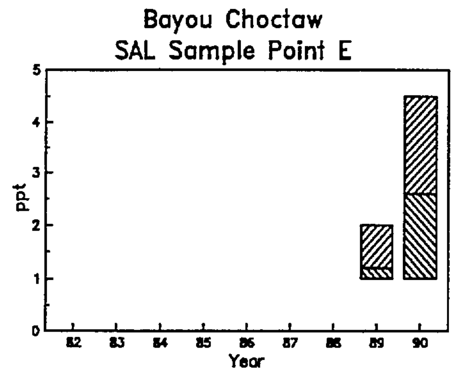
Salinities remained low, less than 3 mg/l, at all monitor stations except B which could possibly be receiving offsite contamination from a drain outlet at location BB. A new sample station, BB, has been established to monitor brine flow from UTP.

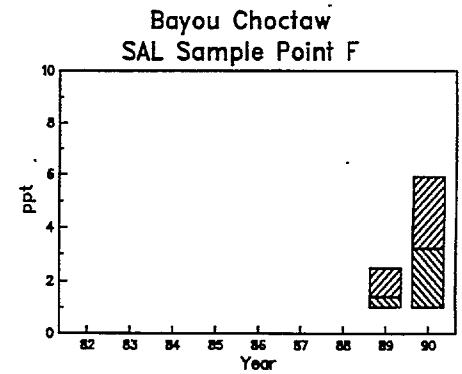






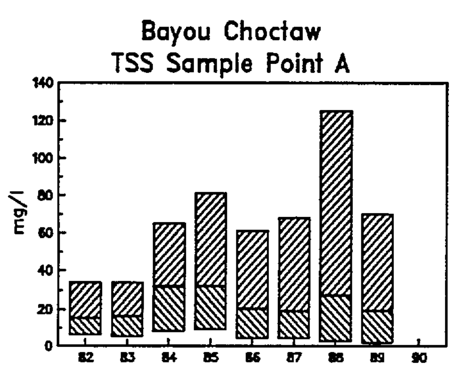


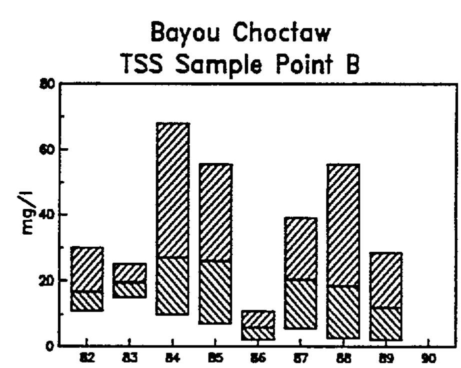


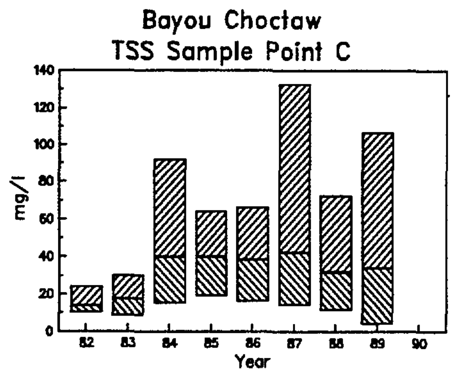


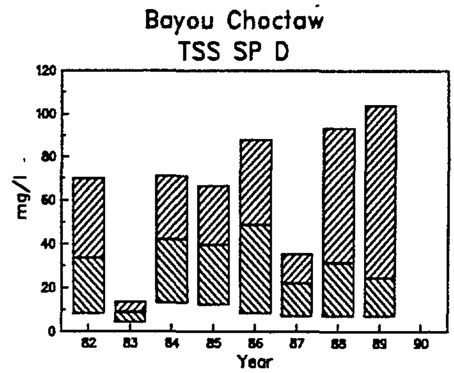
5.2.1.3 Total Suspended Solids (TSS)

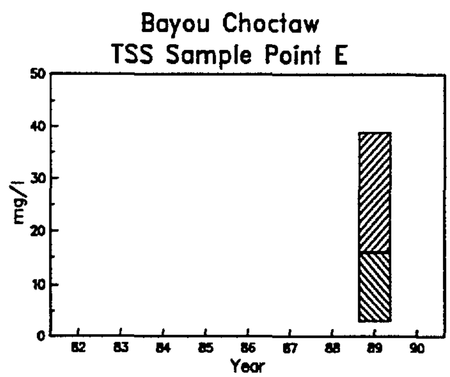
No outfall at the site exceeded the permit limitation for TSS during 1990. TSS levels for 1990 were relatively consistent with those observed during previous years. Since the site is located in an essentially wetland/marshy area, TSS fluctuations are a natural occurrence and do not reflect site operations or influences. Therefore, to limit marginally related analyses and to standardize where possible across the SPR, the TSS data will no longer be generated.

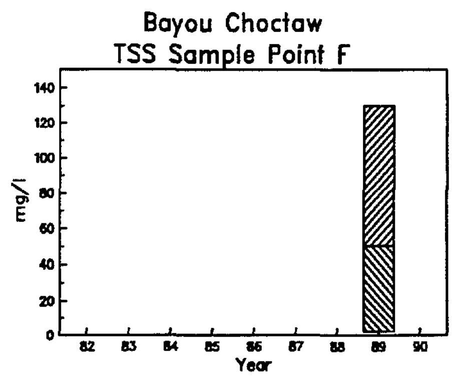






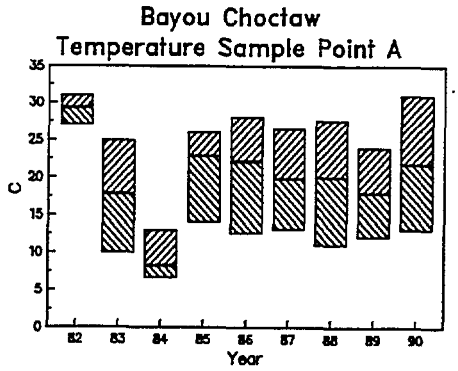






5.2.1.4 Temperature

There was a slight decline in temperature observed at all monitoring stations. Temperature fluctuations are attributed solely to meteorological conditions since Bayou Choctaw produces no thermal discharges.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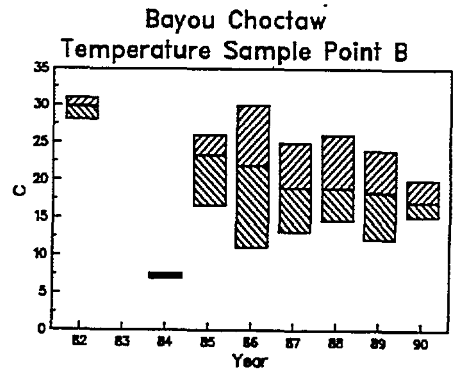
Temperature Sample Point A
C
Year
82 83 84 85 86 87 88 89 90
0 5 10 15 20 25 30 35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Temperature Sample Point B
C
Year
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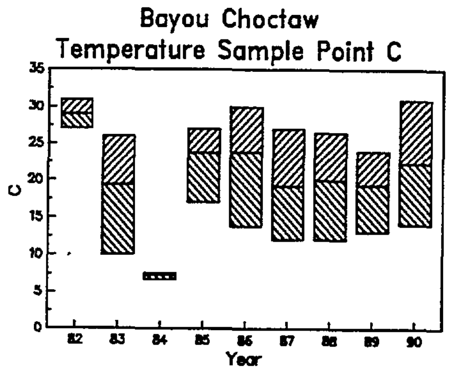
0 5 10 15 20 25 30 35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Temperature Sample Point C
C
Year
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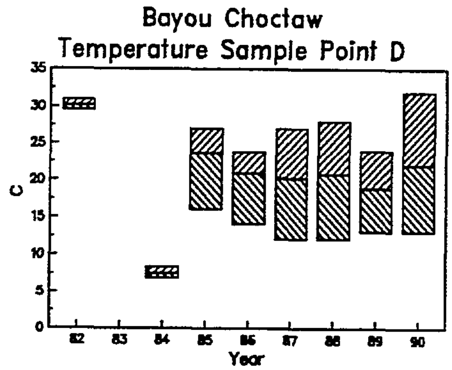
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Year
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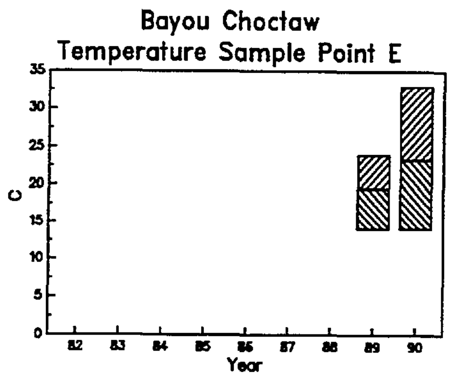
Bayou Choctaw
Temperature Sample Point E
C
Year
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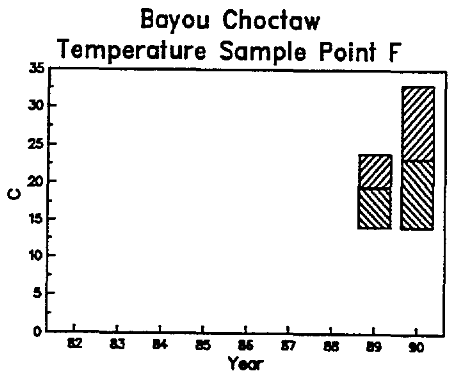
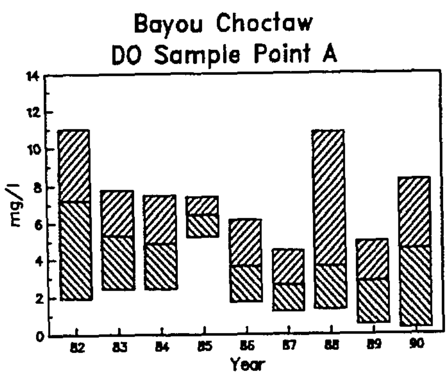
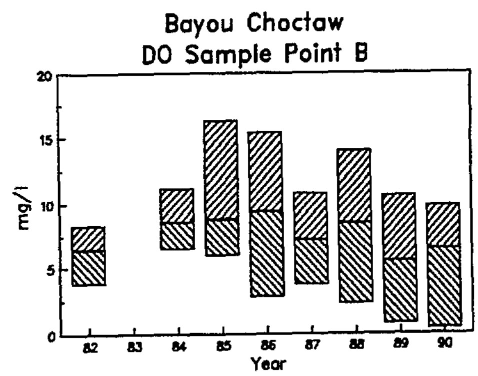
0 5 10 15 20 25 30 35

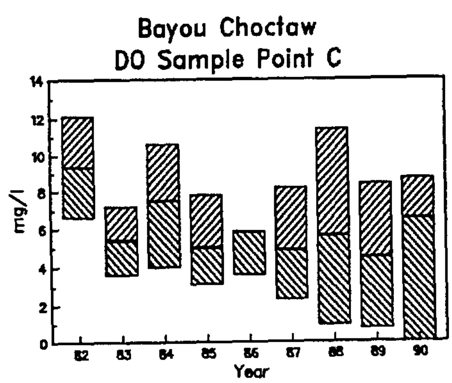

Bayou Choctaw
Temperature Sample Point F
C
Year
82 83 84 85 86 87 88 89 90
0 5 10 15 20 25 30 35

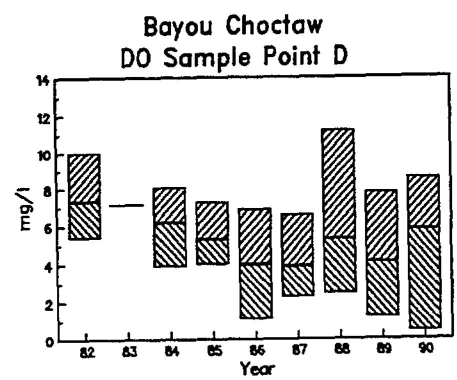
5.2.1.5 Dissolved Oxygen (DO)

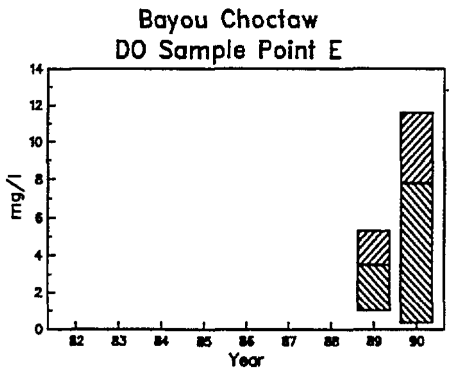
The consistency in DO observation suggests that SPR runoff and discharges do not significantly reduce the DO of receiving waters. Low levels observed at various times of the year are attributed to low flow and minimal flushing typically observed at times in a wetland environment.

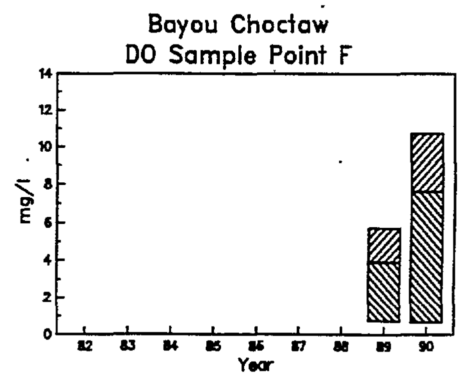






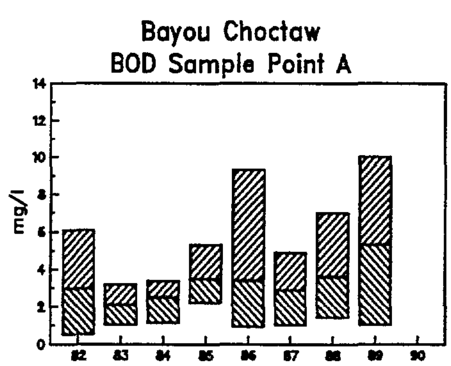


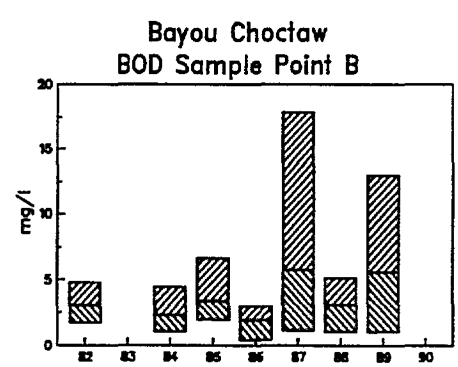


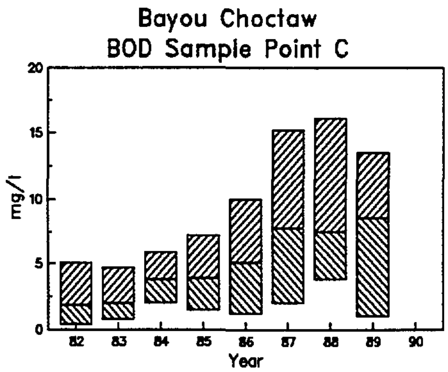


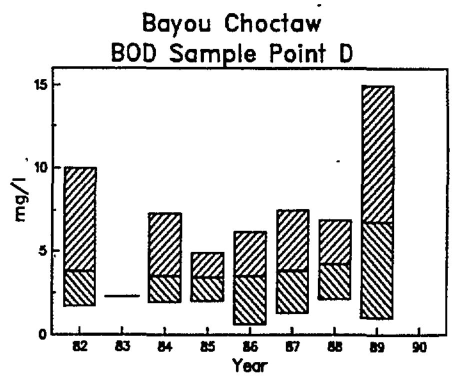
5.2.1.6 Biochemical Oxygen Demand (BOD_5)

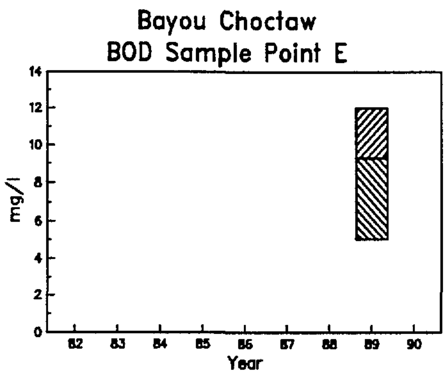
Ranges observed during previous years were similar to the 1990 data. Mean BOD_5 has shown a slight upward trend since 1982, but is still considered typical for the area. These data indicate general low organic loading in the Bayou Choctaw surface waters supporting the contention that the observed DO levels are not due to organic decomposition originating from an inefficient sewage treatment plant. Since Bayou Choctaw is the only site determining and reporting BOD (a 5 day analysis and computation) and this parameter, like TSS, is monitored for permit compliance, with little or no effect on site surroundings, this parameter will be eliminated in the future.

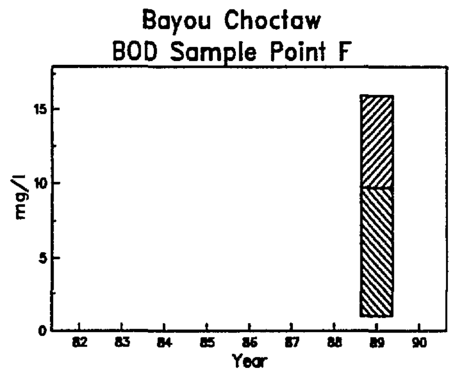






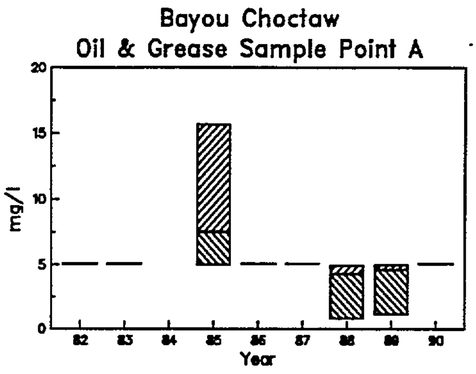


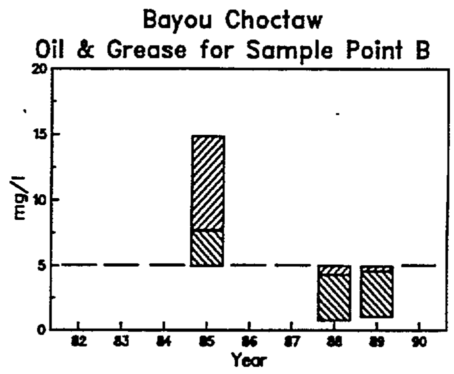


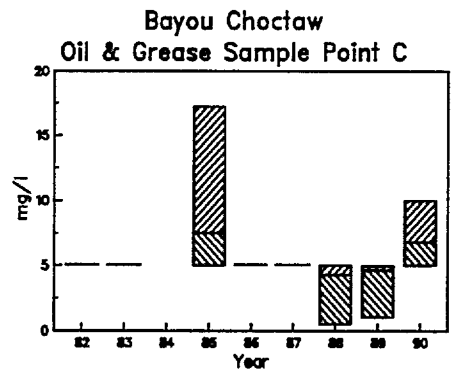


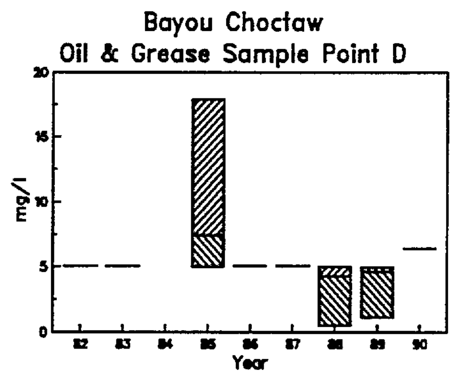
5.2.1.7 Oil and Grease

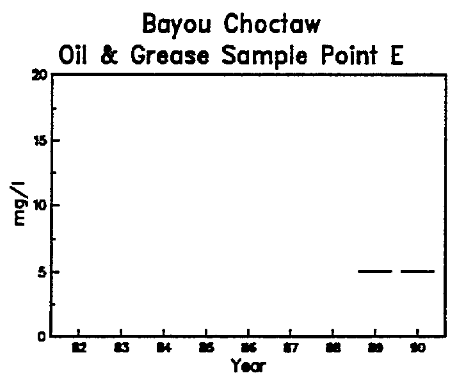
Oil and grease levels were below previously detectable levels (<5 mg/l) at all monitoring stations throughout 1990 except for C and F, which were just above detectable but below permit limits. However, these data are consistent with data collected since 1982 with the exception of 1985. Data prior to 1988 were obtained using "wet chemistry" methods which had a lower detection limit of 5.0 mg/l. Data for 1988 through 1990 were obtained using instrumentation with lower detection levels of 1.0 mg/l. The data favorably reflects continued good site housekeeping and effective site spill prevention, control, and response efforts.

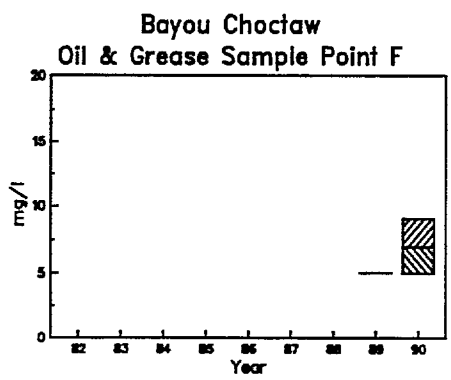

Bayou Choctaw
Oil & Grease Sample Point A
mg/l
Year


Bayou Choctaw
Oil & Grease for Sample Point B
mg/l
Year


Bayou Choctaw
Oil & Grease Sample Point C
mg/l
Year


Bayou Choctaw
Oil & Grease Sample Point D
mg/l
Year


Bayou Choctaw
Oil & Grease Sample Point E
mg/l
Year


Bayou Choctaw
Oil & Grease Sample Point F
mg/l
Year

5.2.1.8 General Observations

Based on the above discussion, the following general observations are made regarding the quality of Bayou Choctaw surface waters.

a. The surrounding surface waters continue to have a relatively neutral pH.

b. The observed salinities were generally low. Those slightly elevated salinities observed were not attributed to SPR activity.

c. The moderately high TSS levels observed reflect ambient surface water conditions at the site. Such conditions reduce the depth of the photic zone and may smother invertebrates. These conditions are not attributed to SPR operations, but rather appear indigenous to the area as demonstrated by consistently high TSS observations over an eight year period at both site and control stations. This parameter will therefore be eliminated.

d. The lower DO levels observed are attributed to low flow and minimal flushing. Typically observed in backwater swamp areas.

e. The consistently low BOD_5 and oil and grease levels observed since 1982 indicate that site oil spills and wastewater treatment plants are effectively managed, minimizing the impact on the Bayou Choctaw environs.

5.2.2 Big Hill

Beginning July 1989, selected locations were established as monitoring stations (Figure 5-2) to assess site-associated surface water quality and to provide early detection of any surface water quality degradation that may result from SPR operations. Parameters such as pH, salinity, temperature, total organic carbon (TOC) or oil and grease, and DO, were monitored. Initial data collected in 1989 will be incorporated with data collected in 1990 to establish trend information. Insufficient data has been collected to formulate any conclusions. However, observation of surrounding areas indicates that there has been no observed adverse impact from SPR operations.

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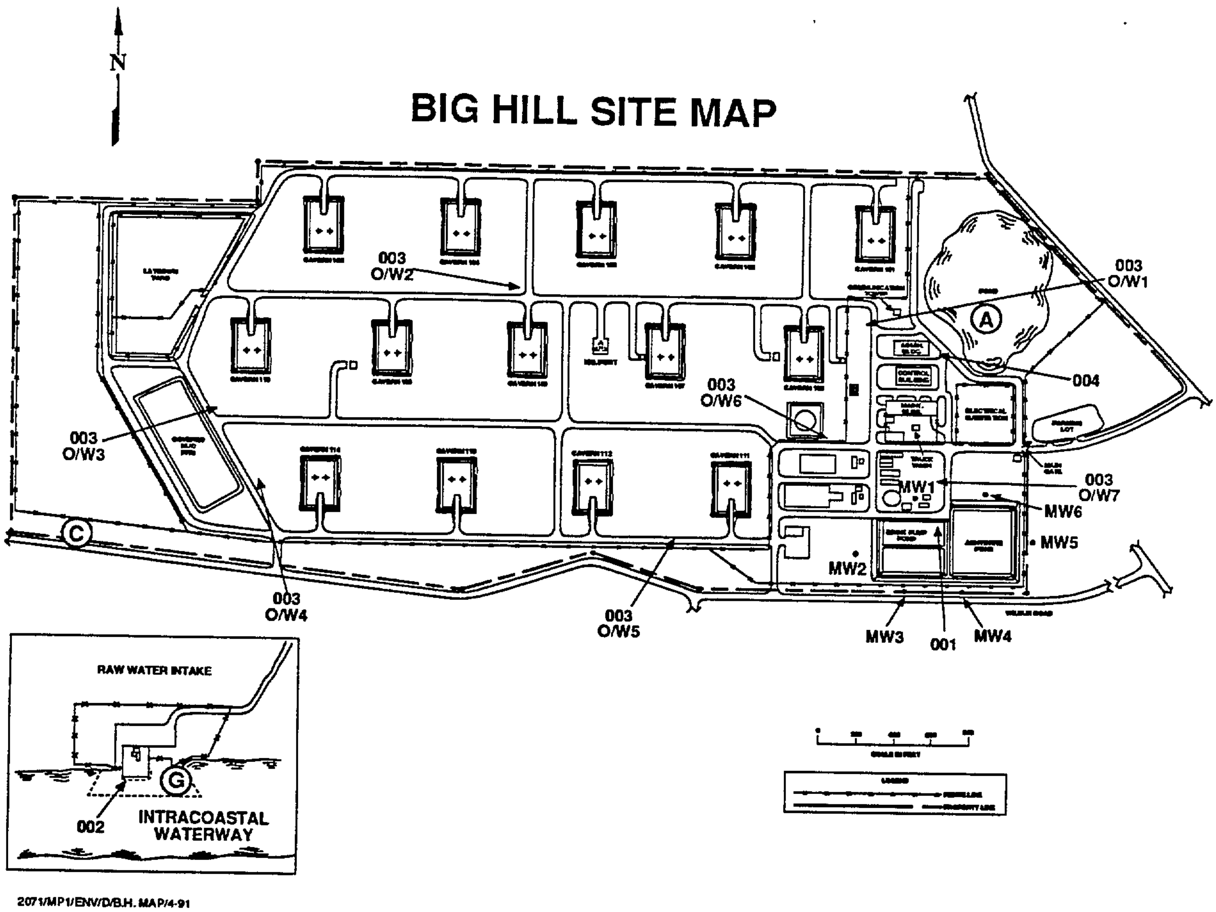
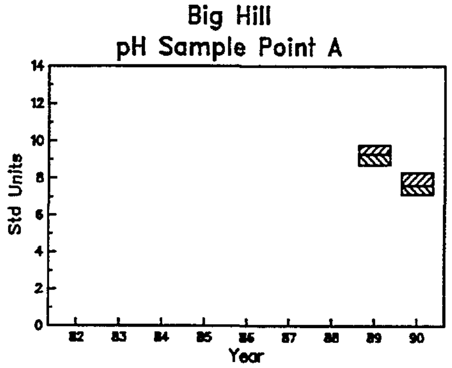
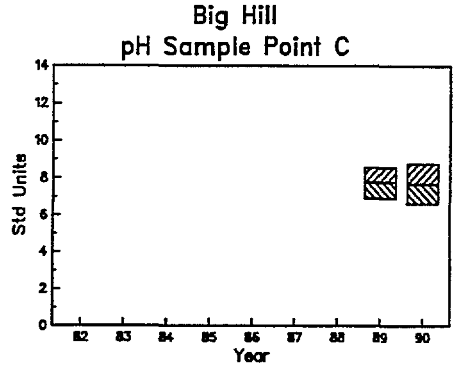


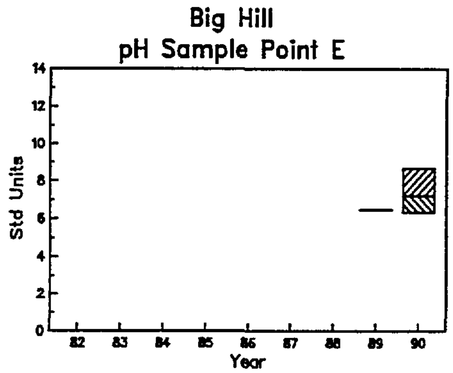
Figure 5-2 (Sheet 1 of 2). Big Hill Environmental Monitoring Stations

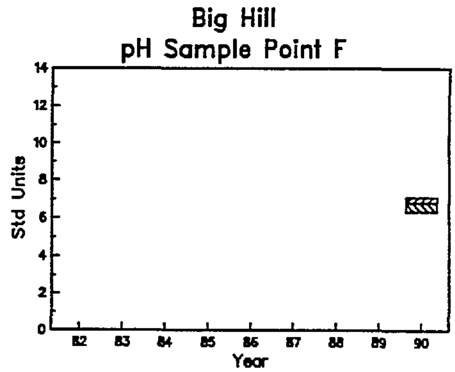
5.2.2.1 Hydrogen Ion Activity (pH)

Initial data show the pH of the site and surrounding surface waters to be neutral. Sample Point B was combined with Sample Point A, which were both located in the site pond, due to a difficulty in gaining access to Point B. Sample Point D was also combined with Sample Point E since dense vegetation and low water level prevented access to Point D at all times. Sample Point F was not sampled during 1989.









Discharge Monitoring Stations

001 Brine disposal to Gulf of Mexico
002 Hydroclone and blowdown at raw water intake structure
003 Stormwater discharges
- O/W1 Stormwater from well pads 101, 102, 106, 107
- O/W2 Stormwater from well pads 103, 104, 105
- O/W3 Stormwater from well pads 108, 109, 110
- O/W4 Stormwater from well pads 113, 114
- O/W5 Stormwater from well pads 111, 112
- O/W6 Stormwater from BHT-7 (crude oil surge tank) diked area
- O/W7 Stormwater from pump and meter pads

004 Discharge from sewage treatment plant (TWC only)

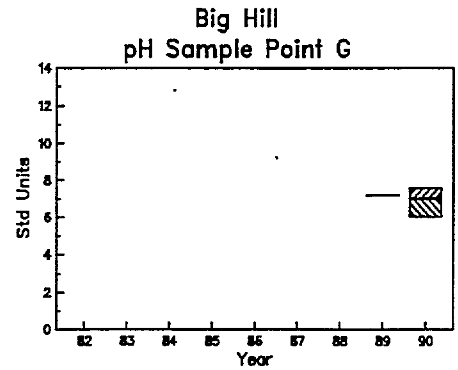
Proposed Water Quality Stations

A Ten Acre Pond (STP Pond) (A was combined with B due to access difficulty)
C Wilber Road Ditch - southwest of site
E Pier at Pipkin Pond (D was combined with E due to dense vegetation and low water level)
F Culvert crossover (Gator Hole) on RWIS road
G RWIS at Intracoastal Waterway

Groundwater Monitoring Stations

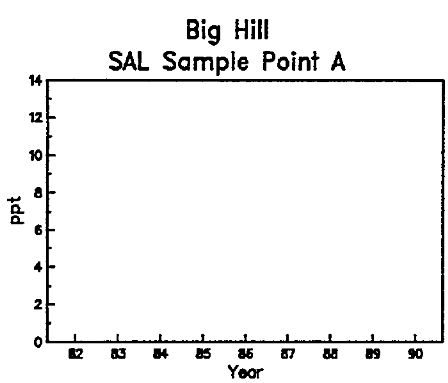
MW1 North of brine pond
MW2 West of brine pond
MW3 South of brine pond
MW4 South of anhydrite pond
MW5 East of anhydrite pond
MW6 North of anhydrite pond

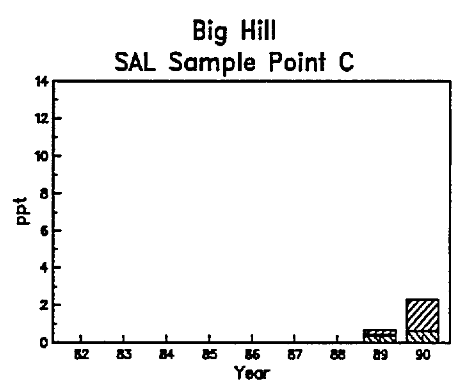
Figure 5-2 (Sheet 2 of 2). Big Hill Environmental Monitoring Stations

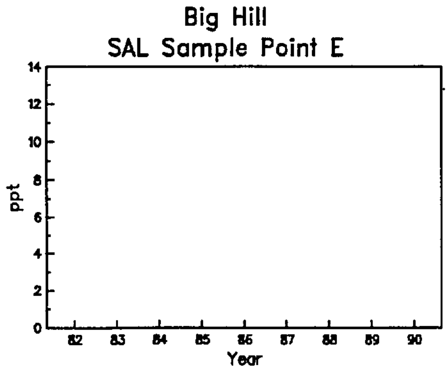


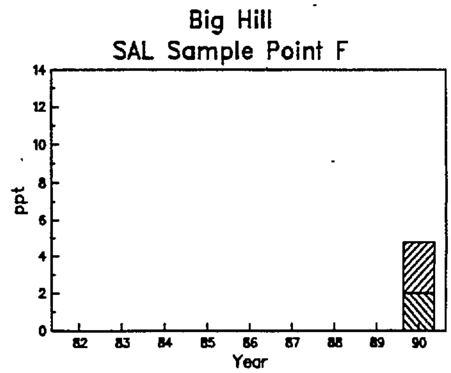
5.2.2.2 Salinity (SAL)

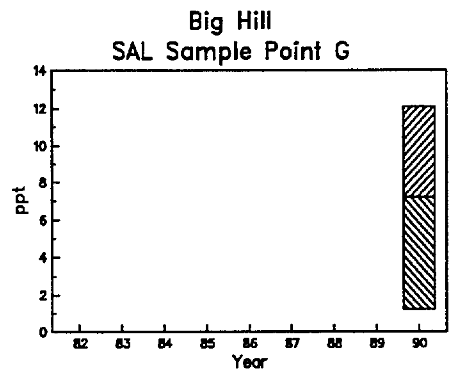
Sample parameter levels at Points A and E were zero for 1989 and 1990. Again Points A and B were combined as well as D and E, which is explained under Hydrogen Ion Activity (pH), and F was not sampled in 1989. Salinities were generally low based on the limited data available at this time.





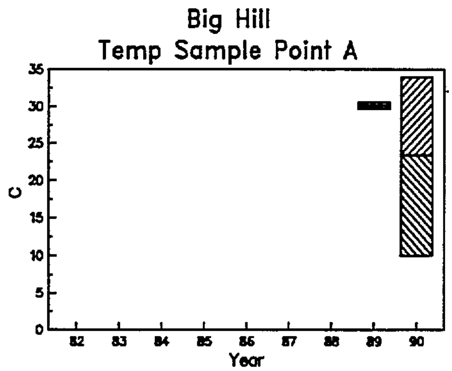


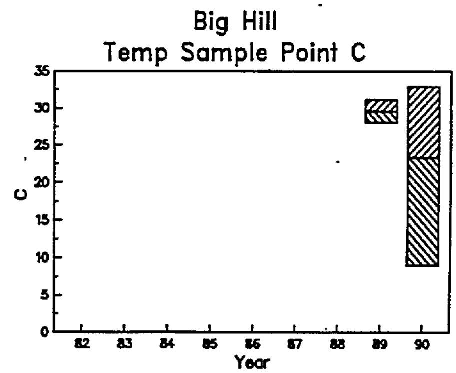


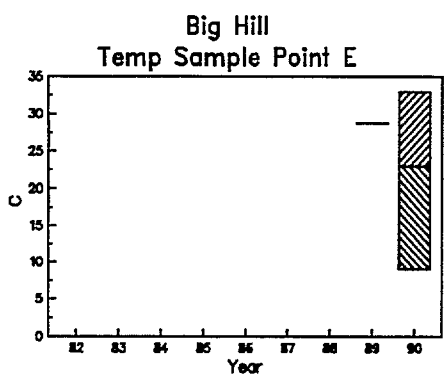


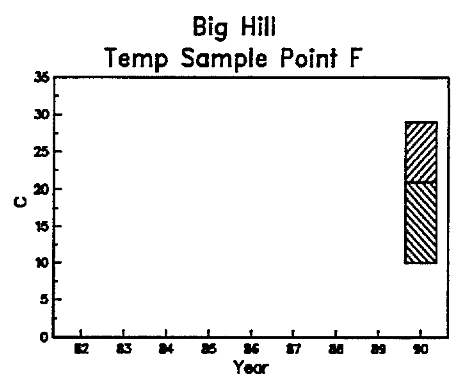
5.2.2.3 Temperature

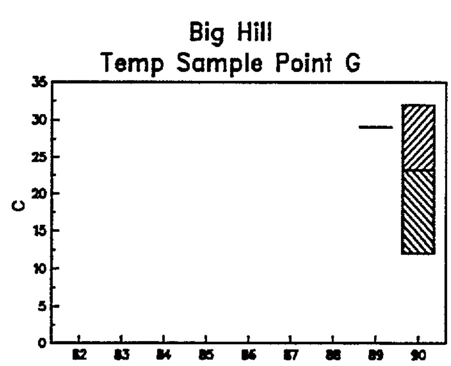
Temperature data for 1990, which is the first full year of water quality trending, exhibited the characteristics expected from seasonal meteorological changes.


Big Hill
Temp Sample Point A
C
Year


Big Hill
Temp Sample Point C
C
Year

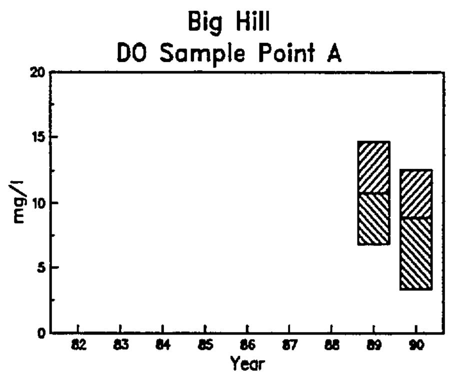

Big Hill
Temp Sample Point E
C
Year

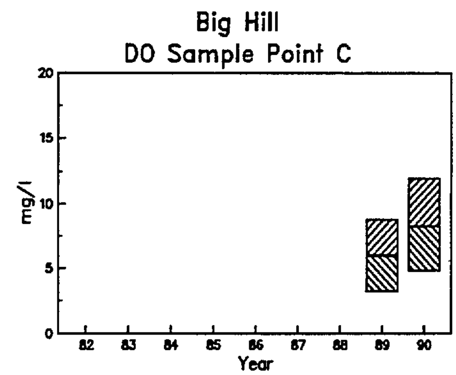

Big Hill
Temp Sample Point F
C
Year

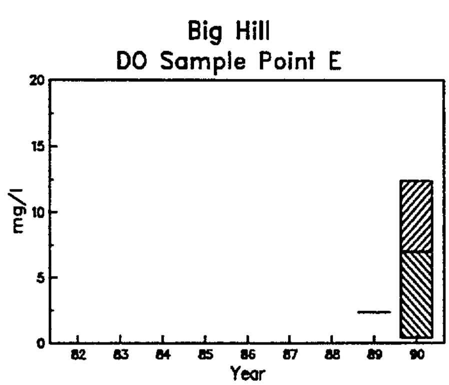

Big Hill
Temp Sample Point G
C
Year

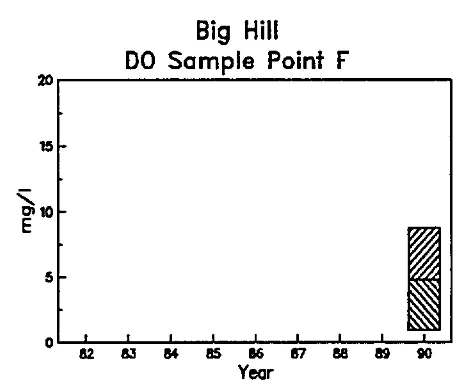
5.2.2.4 Dissolved Oxygen (DO)

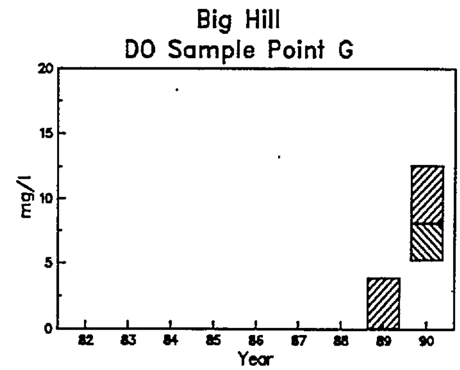
Dissolved oxygen fluctuated with the seasonal temperature changes as expected. Sample Point F was not sampled in 1989 and Sample Point G, at the Intracoastal Canal was sampled only once in 1989.





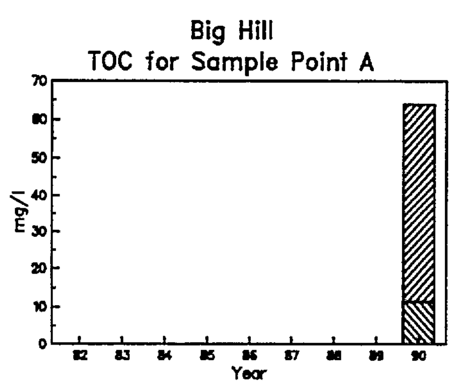


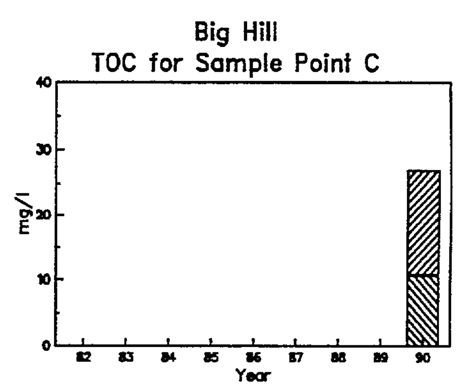


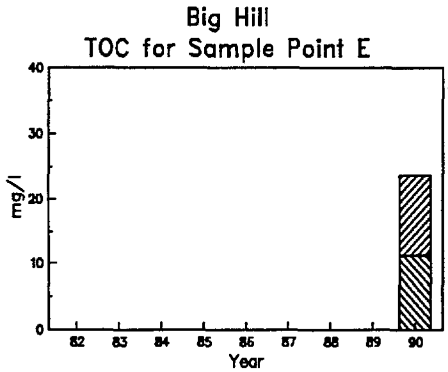


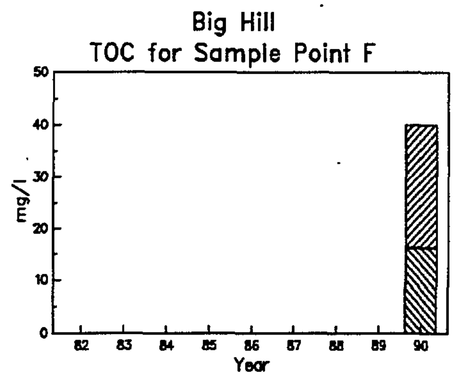
5.2.2.5 Total Organic Carbon (TOC)

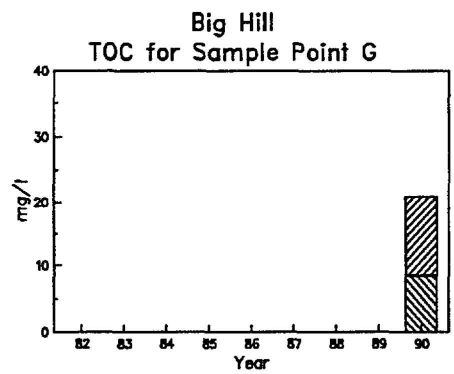
Total Organic Carbon was a new parameter for 1990 and there was insufficient data existing to establish a trend.











5.2.3 Bryan Mound

The surface waters surrounding the Bryan Mound site were monitored throughout 1990. Blue Lake was sampled once monthly at each station. Mud Lake was sampled once monthly except during August and September when low tides restricted access to the lake.

Specific surface water monitoring stations are identified in Figure 5-3. Stations A through C and E through G are located along the Blue Lake shoreline to monitor effects of site runoff. Station D, located farther away from the site in Blue Lake, serves as a control. Stations H and I are located along the Mud Lake shoreline to monitor effects of site runoff.

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BRYAN MOUND SITE MAP

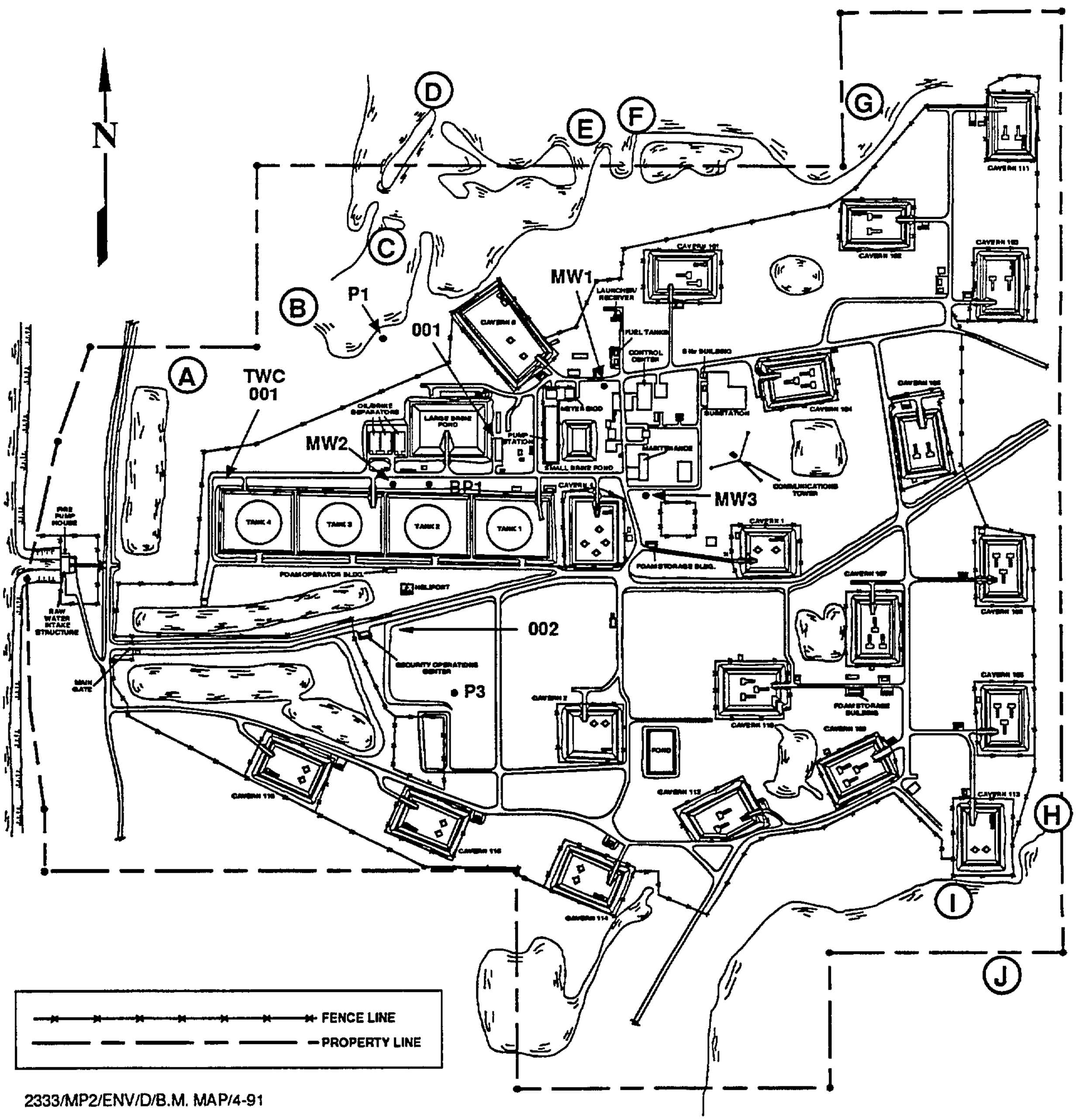


Figure 5-3 (Sheet 1 of 2). Bryan Mound Environmental Monitoring Stations

Discharge Monitoring Stations

001 Brine disposal
002 Discharge from the sewage treatment plant
Stormwater runoff from surge tank area (corresponds to TWC permit no. 02271 discharge 001)

Stormwater discharges
Stormwater runoff from well pads 1, 2, 4, 5, and 101-116
Stormwater runoff from the high-pressure pump pad

Water Quality Monitoring Stations

A	Blue Lake
B	Blue Lake
C	Blue Lake
D	Blue Lake - Control Point 1
E	Blue Lake
F	Blue Lake
G	Blue Lake
H	Mud Lake
I	Mud Lake
J	Mud Lake - Control Point 2

Groundwater Monitoring Stations

BP-1	South of brine pond
P1	Northwest of brine pond, between brine pond and Blue lake
P3	South of crude oil surge tanks
MW1	West of the control building
MW2	Southwest of the brine pond
MW3	South of the maintenance shop

Figure 5-3 (Sheet 2 of 2). Bryan Mound Environmental Monitoring

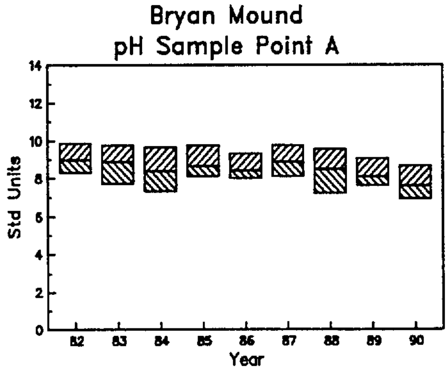
Station J, located away from the shoreline in Mud Lake, serves as a control.

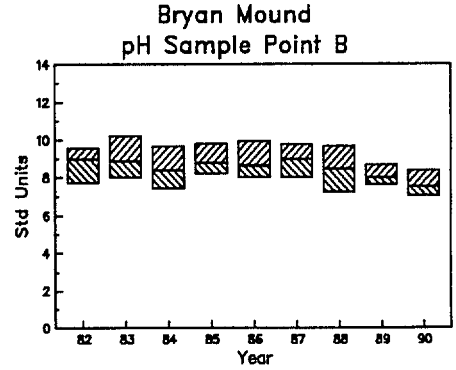
Specific parameters monitored in the Bryan Mound surface waters include pH, salinity, temperature, DO, and total organic carbon (TOC). The parameters are discussed below and compared to 1982 through 1989 monitoring data.

5.2.3.1 Hydrogen Ion Activity (pH)

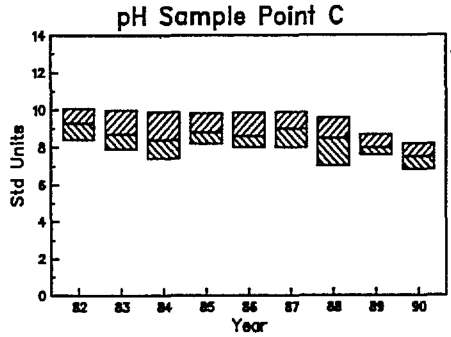
pH data is relatively consistent with data from previous years. The consistently basic conditions indicate natural waters devoid of carbon dioxide and generally hard in regard to mineral content. Marine and estuarine waters, such as those in Blue Lake and Mud Lake, typically have somewhat elevated pH levels and high mineral contents. The pH is believed to fluctuate directly with the rate of carbon dioxide uptake as related to low primary productivity (lower pH) during cool periods and high primary productivity (higher pH) during warm periods.

There were no known pH inducing impacts resulting in any pH changes to Mud Lake during 1990 or previous years as indicated by these comparisons. Thus, minor pH fluctuations in the Bryan Mound surface waters appear to be the result of seasonal weather and tidal variations rather than site activity.

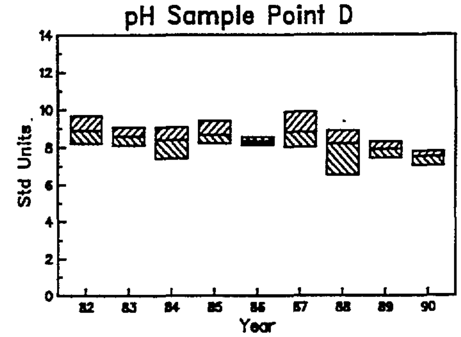




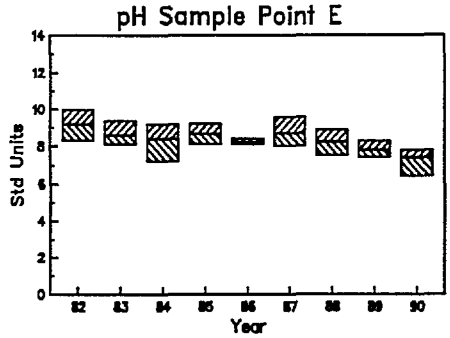
Bryan Mound
pH Sample Point C



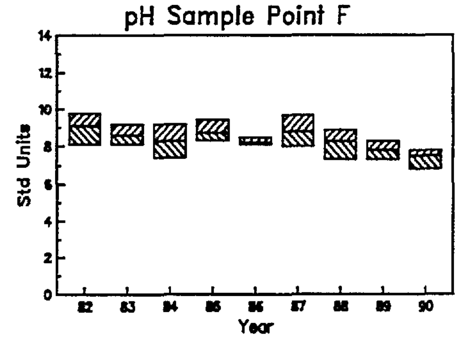
Bryan Mound
pH Sample Point D



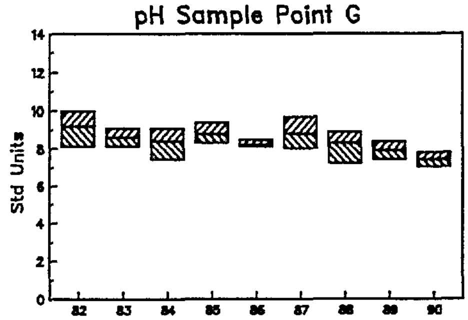
Bryan Mound
pH Sample Point E



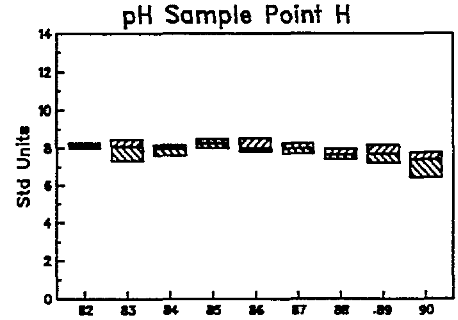
Bryan Mound
pH Sample Point F

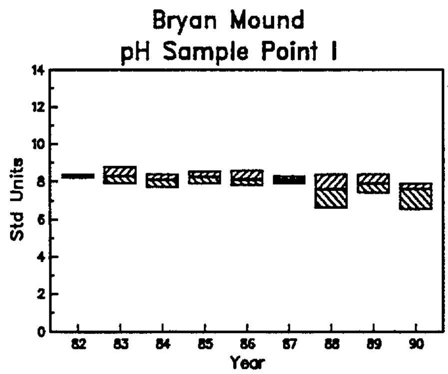


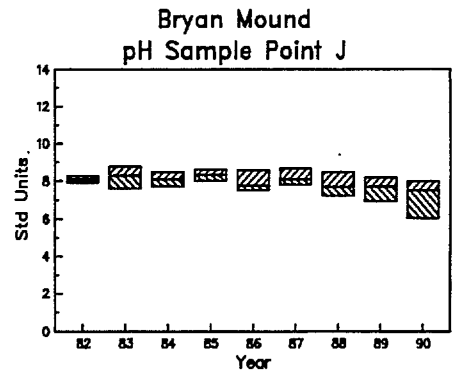
Bryan Mound
pH Sample Point G



Bryan Mound
pH Sample Point H



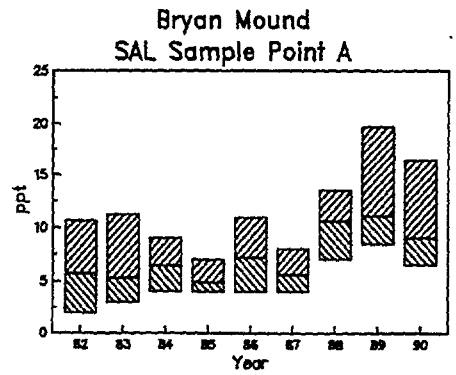


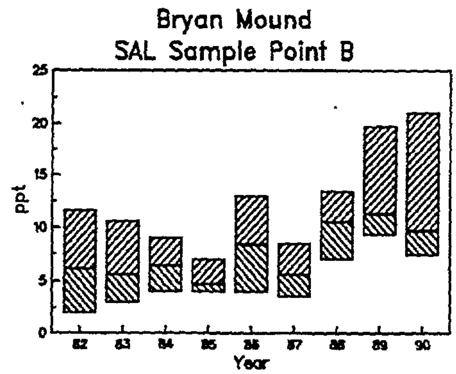


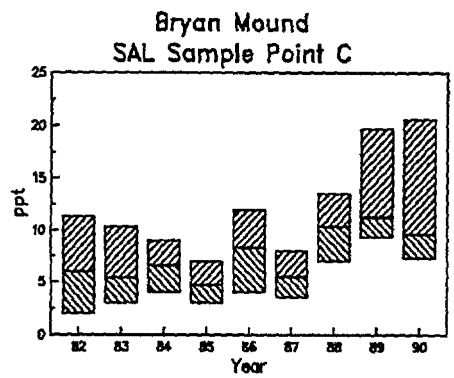
5.2.3.2 Salinity (SAL)

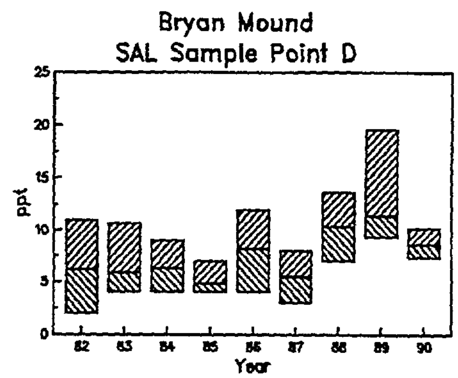
Salinity fluctuations in Blue Lake have been attributed to meteorologically induced conditions rather than site operations, since salinities observed at control sample points were consistent with those found along the site shoreline, between 1982 and 1987. 1988 through 1990 has shown a 4 to 5 ppt average increase in salinities. This can be attributed to lower rainfall and reduced tidal circulation from recent dredge and fill activities undertaken by the community.

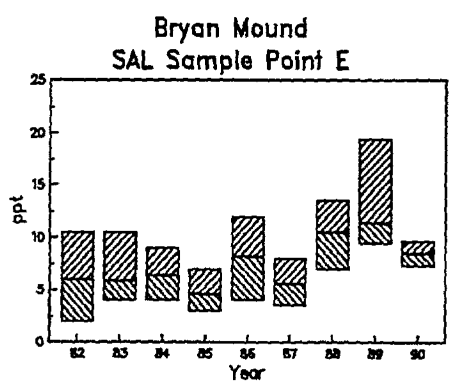
Mean salinities were at or below the midpoint since 1982. The larger salinity variations in Mud Lake relative to Blue Lake are primarily attributed to the strong tidal and wind influence on the Lake and its more direct link with the Gulf of Mexico.

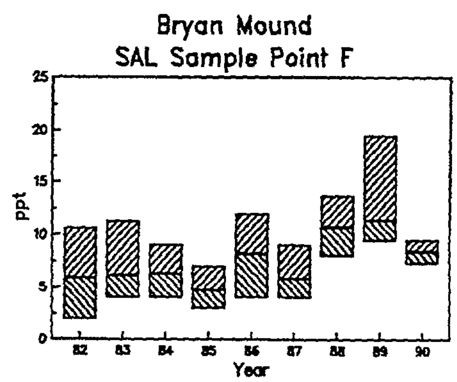

Bryan Mound
SAL Sample Point A
25
20
15
10
5
0
ppt
82 83 84 85 86 87 88 89 90
Year

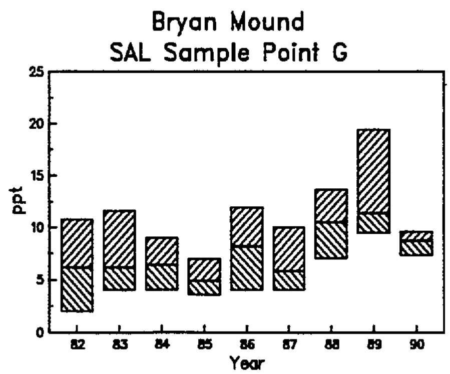

Bryan Mound
SAL Sample Point B
25
20
15
10
5
0
ppt
82 83 84 85 86 87 88 89 90
Year

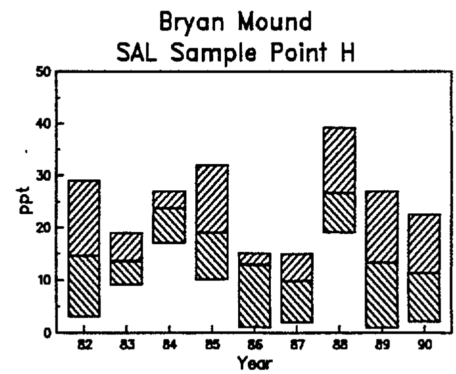

Bryan Mound
SAL Sample Point C
25
20
15
10
5
0
ppt
82 83 84 85 86 87 88 89 90
Year

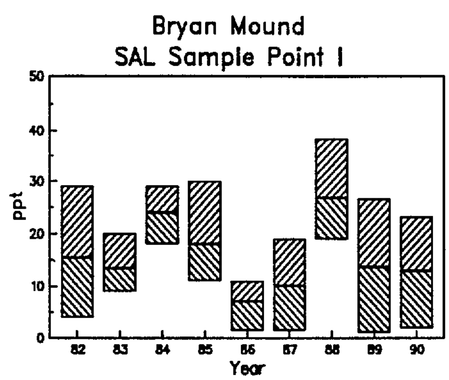

Bryan Mound
SAL Sample Point D
25
20
15
10
5
0
ppt
82 83 84 85 86 87 88 89 90
Year

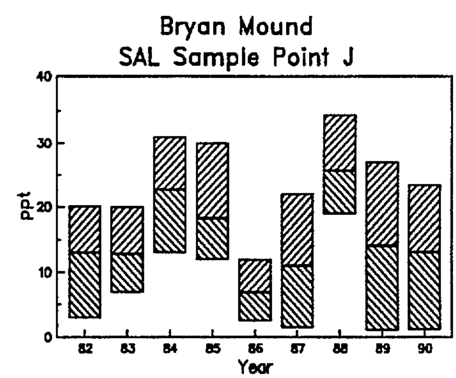

Bryan Mound
SAL Sample Point E
25
20
15
10
5
0
ppt
82 83 84 85 86 87 88 89 90
Year


Bryan Mound
SAL Sample Point F
25
20
15
10
5
0
ppt
82 83 84 85 86 87 88 89 90
Year





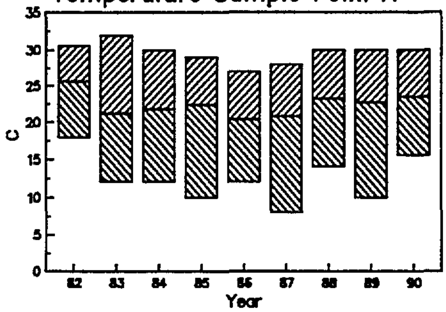




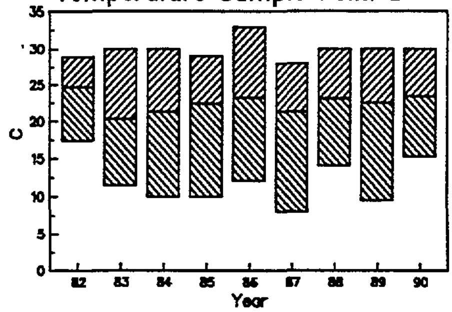
5.2.3.3 Temperature

Temperature data for 1990 was relatively consistent with data from previous years, which indicate fairly consistent temperatures with no influence from site operation.

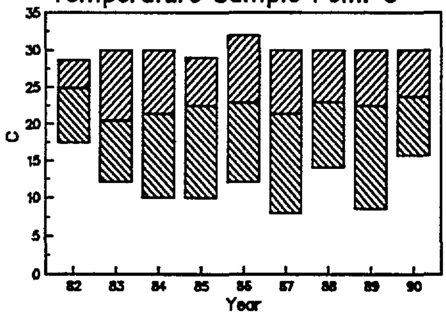
Bryan Mound
Temperature Sample Point A



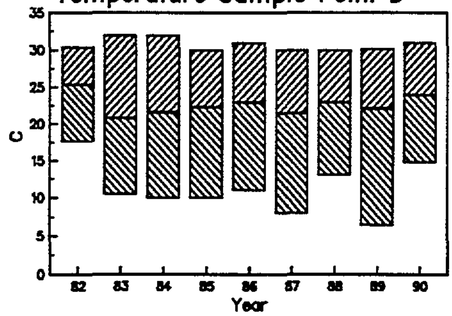
Bryan Mound
Temperature Sample Point B



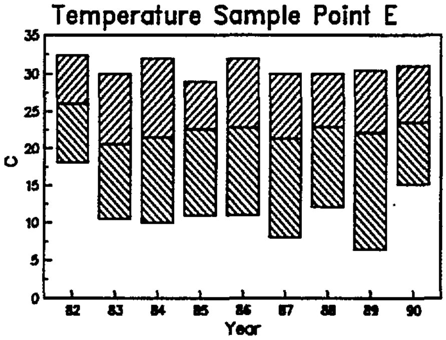
Bryan Mound
Temperature Sample Point C



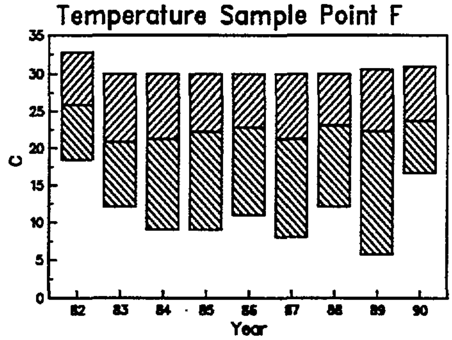
Bryan Mound
Temperature Sample Point D

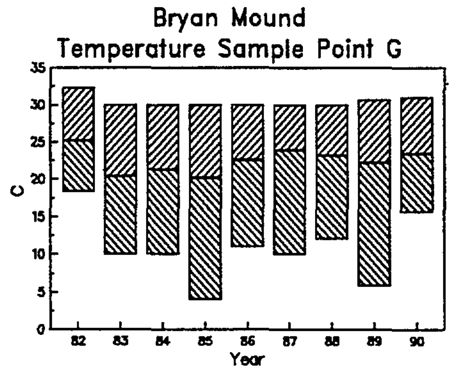


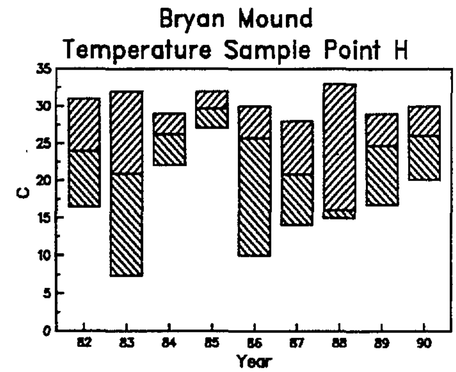
Bryan Mound
Temperature Sample Point E

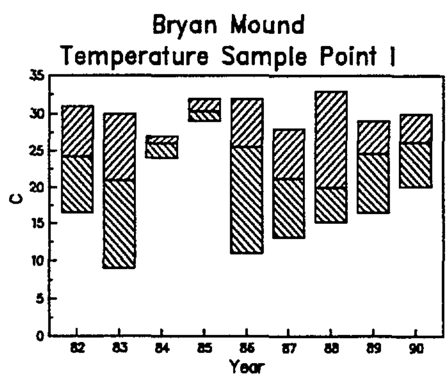


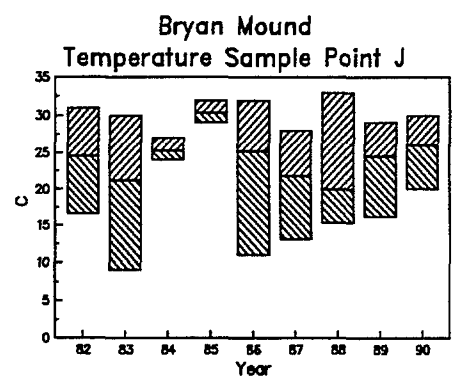
Bryan Mound
Temperature Sample Point F







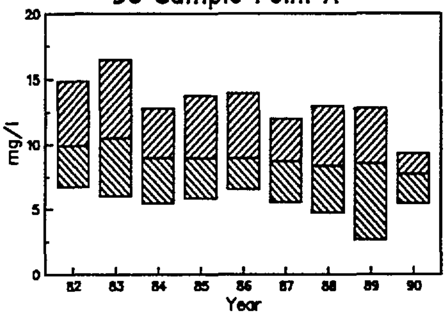




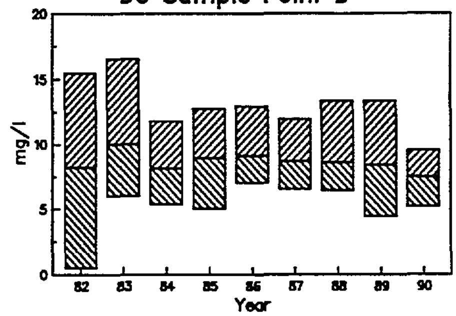
5.2.3.4 Dissolved Oxygen (DO)

The DO levels in 1990 were consistent with that observed since 1982. The DO ranges observed are considered beneficial to the aquatic organisms inhabiting these lakes. Fluctuations in DO levels were attributed to the inverse relationship between temperature and DO as well as seasonal fluctuations in primary organic productivity, and meteorological factors such as wind driven mixing.

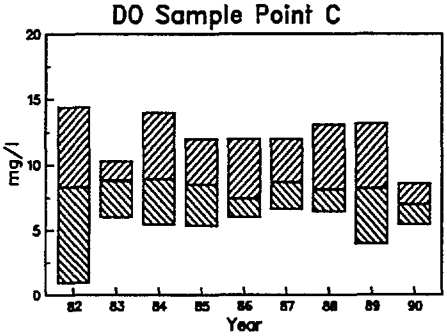
Bryan Mound
DO Sample Point A



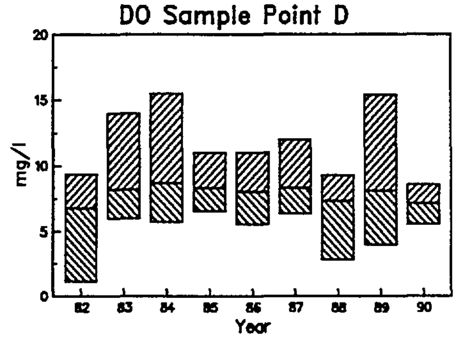
Bryan Mound
DO Sample Point B



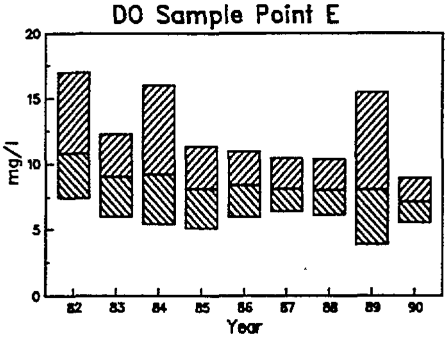
Bryan Mound
DO Sample Point C



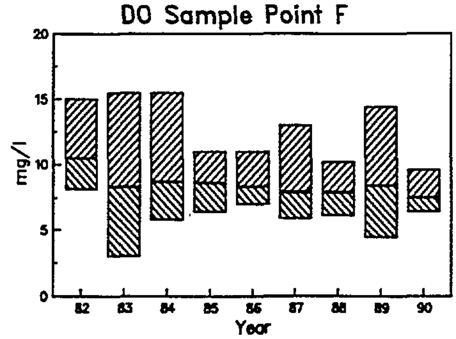
Bryan Mound
DO Sample Point D

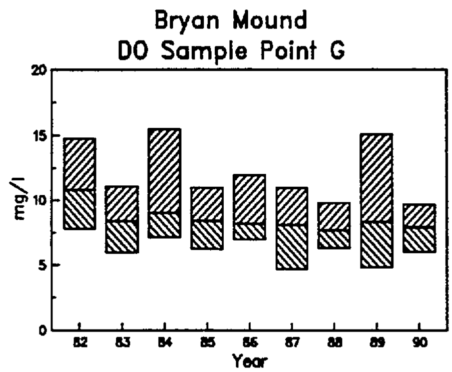


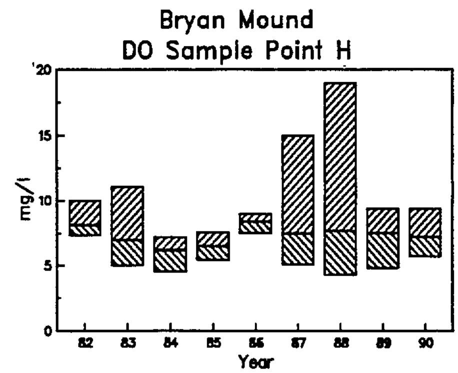
Bryan Mound
DO Sample Point E

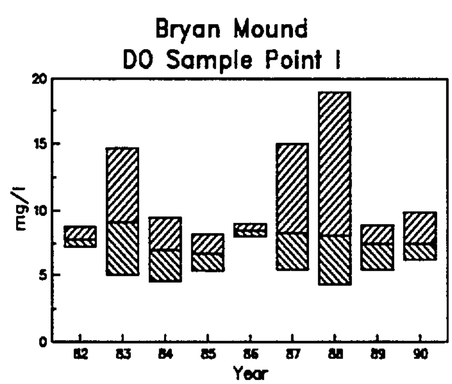


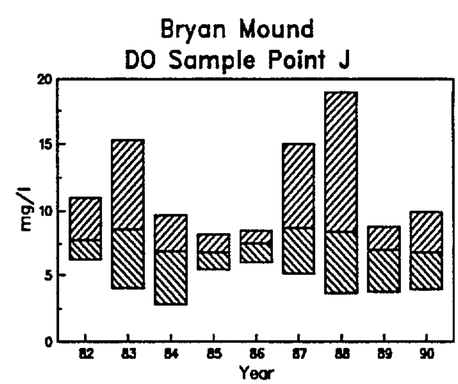
Bryan Mound
DO Sample Point F





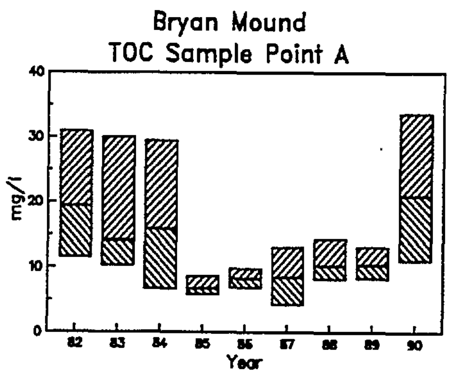


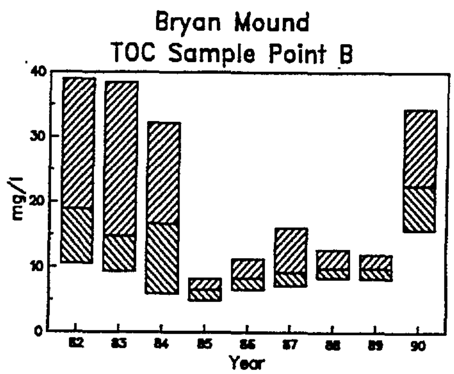


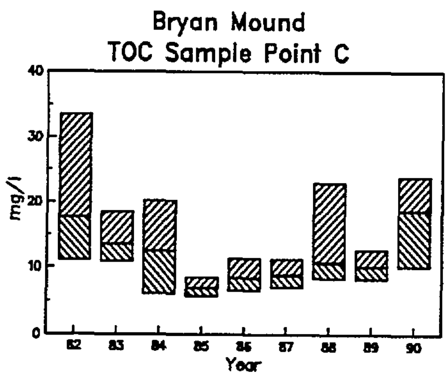


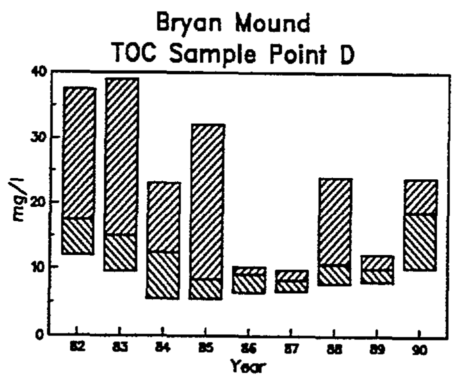
5.2.3.5 Total Organic Carbon (TOC)

TOC data for 1990 is slightly higher than data collected from previous years. The elevated concentrations attributed to natural phytoplankton blooms from 1982 through 1984, not observed in subsequent years, were observed in 1990. The TOC concentration in Mud Lake was elevated also. The TOC levels observed in both lakes are consistent with healthy conditions and a stable oxygen demand.


Bryan Mound
TOC Sample Point A
mg/l
Year
0
10
20
30
40
82
83
84
85
86
87
88
89
90


Bryan Mound
TOC Sample Point B
mg/l
Year
0
10
20
30
40
82
83
84
85
86
87
88
89
90


Bryan Mound
TOC Sample Point C
mg/l
Year
0
10
20
30
40
82
83
84
85
86
87
88
89
90


Bryan Mound
TOC Sample Point D
mg/l
Year
0
10
20
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40
82
83
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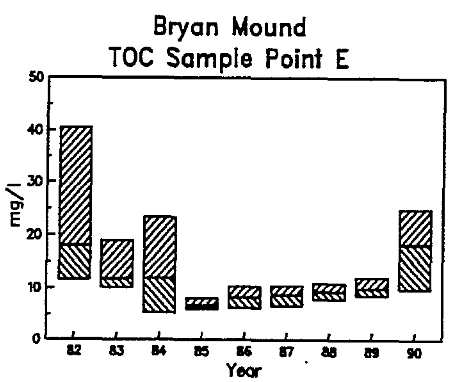
90


Bryan Mound
TOC Sample Point E
mg/l
Year
0
10
20
30
40
50
82
83
84
85
86
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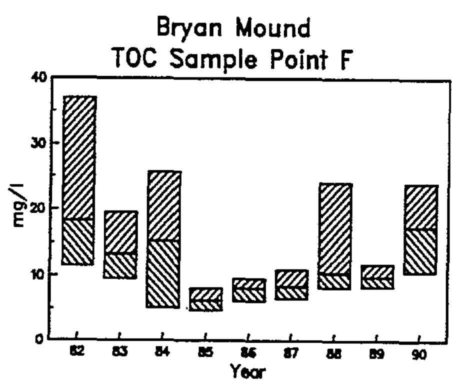
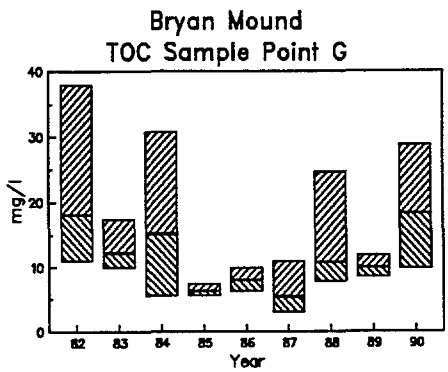
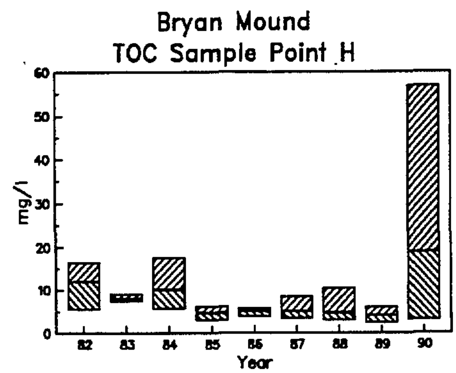
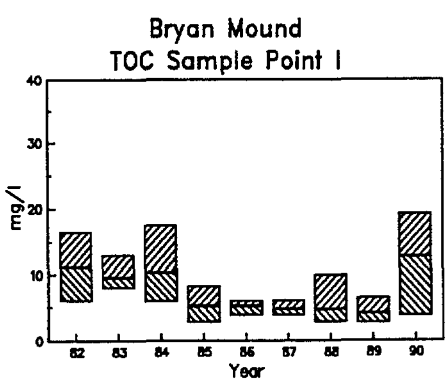
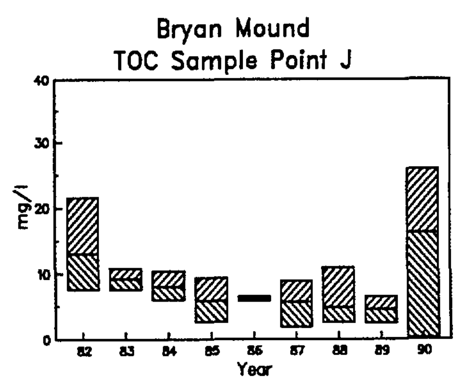
90


Bryan Mound
TOC Sample Point F
mg/l
Year
0
10
20
30
40
82
83
84
85
86
87
88
89
90









5.2.3.6 Additional Water Quality Monitoring

Visual surveys of adjacent water bodies were performed periodically to monitor those climatic events and environmental perturbations that may affect the SPR either directly or by association. Survey findings for 1990 were negative.

5.2.3.7 General Observations

Based on the above discussions, the following general observations are made regarding the quality of Bryan Mound surface waters.

a. The observed pH was stable and predominantly neutral in Blue Lake and Mud Lake. This is consistent with the observed characteristic alkalinity and relative water hardness data from previous years.
b. Salinity levels in Mud Lake were generally consistent , though a little higher, with that observed during previous years. Salinity fluctuations during and among years are attributed to meteorologically induced conditions and previous industrial activity rather than site operations.
c. Levels of DO remained moderate and fairly constant throughout the year. These data indicate stable continued primary production, however the elevated TOC data suggest a return to periods of higher primary productivity.
d. Mud Lake experiences more pronounced changes in water quality than Blue Lake. The more direct link of Mud Lake with the Gulf of Mexico and the frequent wind and tidal induced flushing are responsible for dramatic seasonal changes in water quality.

5.2.4 St. James

St. James Terminal is located in a low-lying agricultural area beyond the west levee of the Mississippi River. All precipitation is effectively drained from the terminal and surrounding sugar cane fields by a series of ditches.

The two St. James docks are located on the west bank of the Mississippi River. They are curbed with all runoff pumped to the stormwater treatment system and retention pond. The site retention pond, which also collects stormwater runoff from the six crude oil storage tank containment areas, is discharged

ST. JAMES SITE MAP

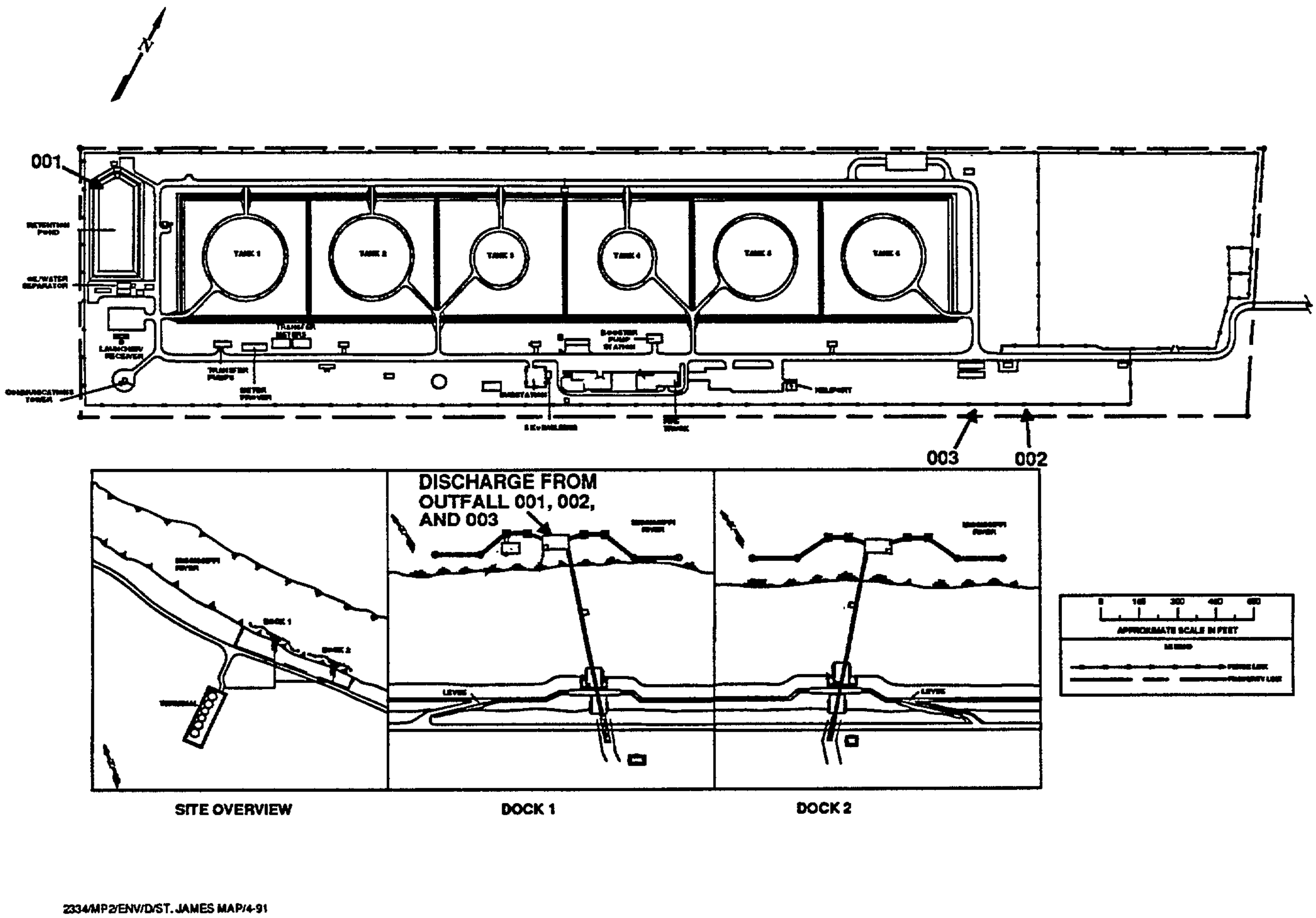


Figure 5-4 (Sheet 1 of 2). St. James Terminal Environmental Monitoring Stations

<u>Discharge Monitoring Stations</u>

001	Discharge from retention pond
002	Discharge from package sewage treatment plant
003	Discharge from package sewage treatment plant

There are no water quality monitoring stations at St. James

Figure 5-4 (Sheet 2 of 2). St. James Terminal
Environmental Monitoring Stations

intermittently through outfall 001 (Figure 5-4) into the Mississippi River. Two wastewater treatment plants, which serve the site control and maintenance buildings, discharge as state outfalls 002 and 003 through outfall 001 into the Mississippi River.

At St. James, the Mississippi River has a large flow volume and rapid currents providing a strong assimilative capacity. The intermittent nature of discharges from site outfalls, the characteristic hydrographic features of the Mississippi River, and a state-conducted water quality monitoring program limit the value of a site-directed water quality monitoring program in the Mississippi River. There are no other surface waters located near the site.

5.2.5 Sulphur Mines

Samples collected once monthly at each monitoring station were used to monitor surface water quality. Specific monitoring stations are identified in Figure 5-5. Station C was not monitored during 1990 due to access problems associated with construction activities by an adjacent land owner. Specific parameters monitored in the Sulphur Mines surface waters were pH, salinity, TSS, temperature, oil and grease, and DO. These data are summarized and compared to data collected since 1982.

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SULPHUR MINES SITE MAP

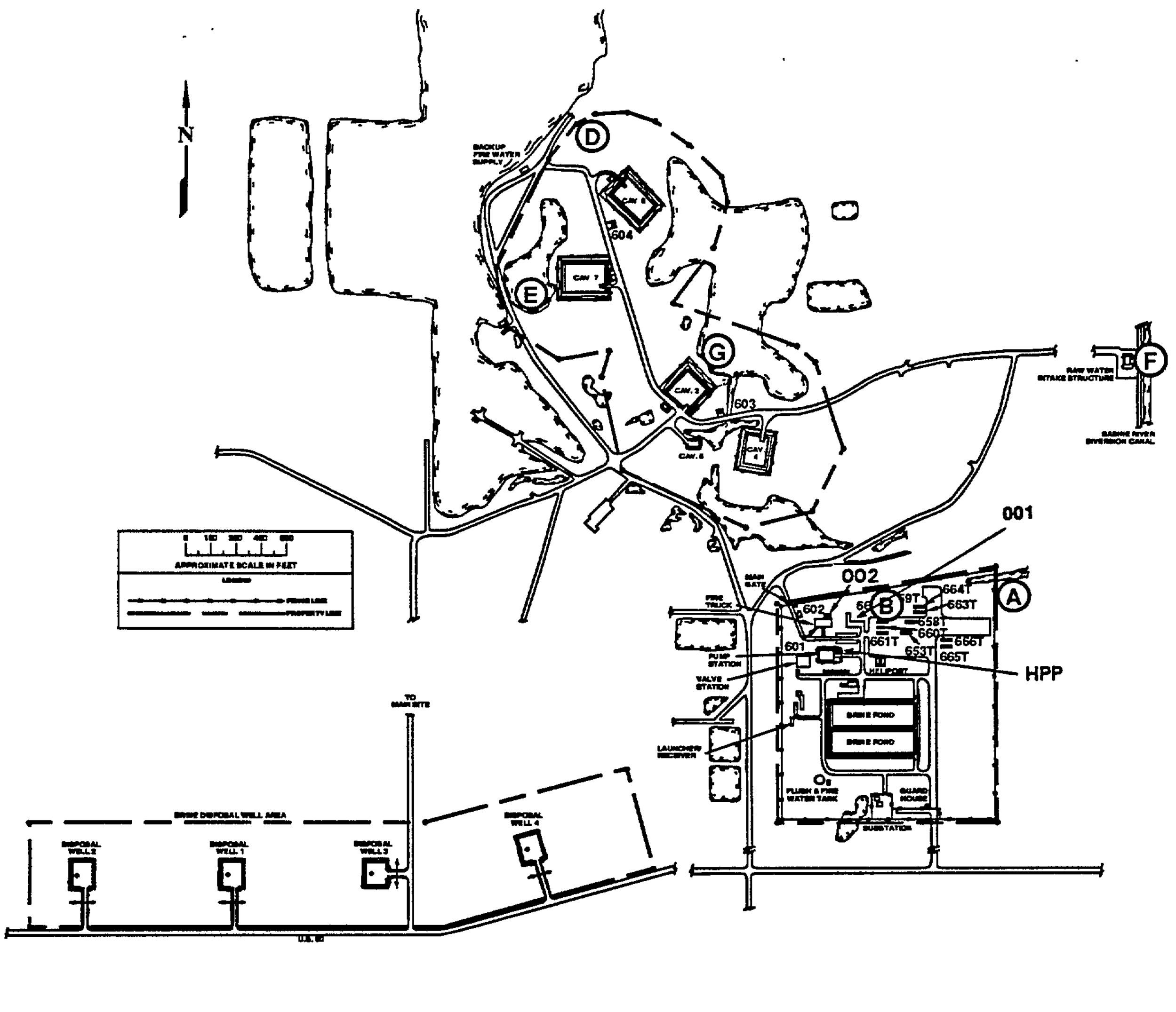


Figure 5-5 (Sheet 1 of 2). Sulphur Mines Environmental Monitoring Stations

Discharge Monitoring Stations*

001	Discharge from sewage treatment plant
002	Stormwater discharge from high pressure pump pad
	Stormwater discharge from well pads 2, 4, 6, and 7

Water Quality Monitoring Stations

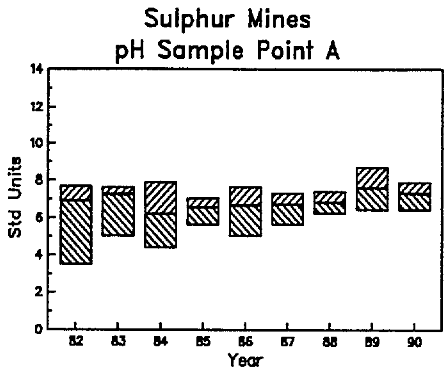
A	Drainage ditch at northeast corner of primary site
B	Creek north of primary site
C	Subsidence area (pump) replaced with G
D	Impoundment north of Cavern 6
E	Impoundment west of Cavern 7
F	Intake structure
G	Subsidence area

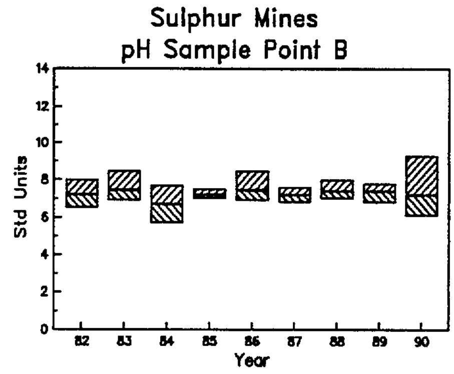
* The permit renewal submitted in 1990 regrouped discharges to simplify the reporting process

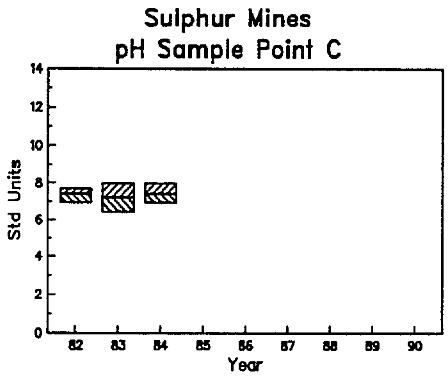
Figure 5-5 (Sheet 2 of 2). Sulphur Mines Environmental Monitoring Stations

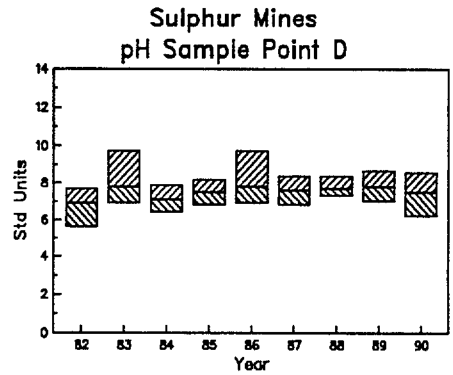
5.2.5.1 Hydrogen Ion Activity (pH)

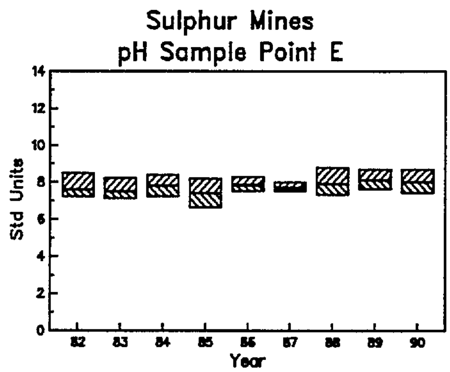
1990 pH data was consistent with corresponding data from previous years.

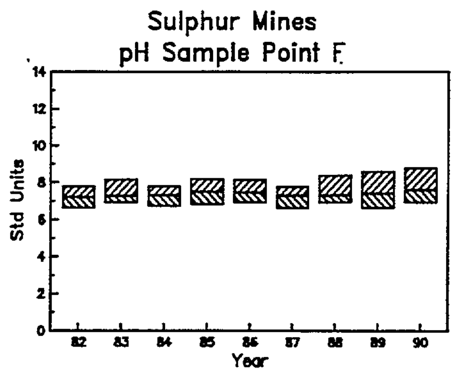


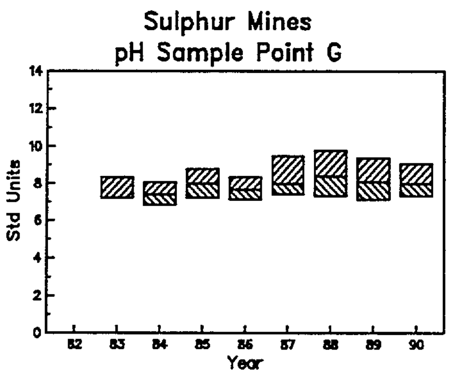








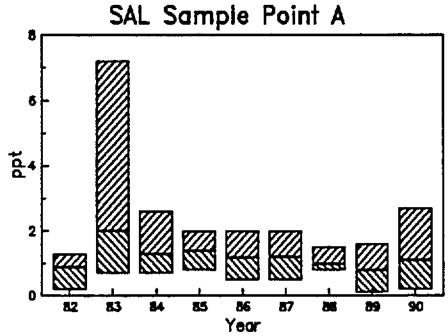




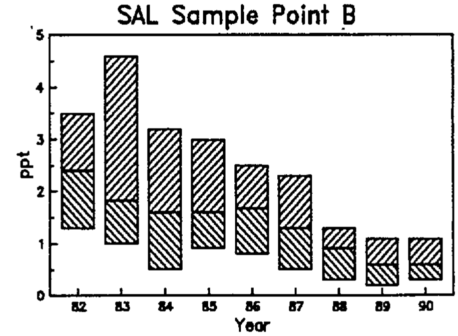
5.2.5.2 Salinity (SAL)

1990 salinity was consistent with overall salinities from previous years. Sample points B and G show low values although they have not continued their decline as in previous years, suggesting an ambient plateau.

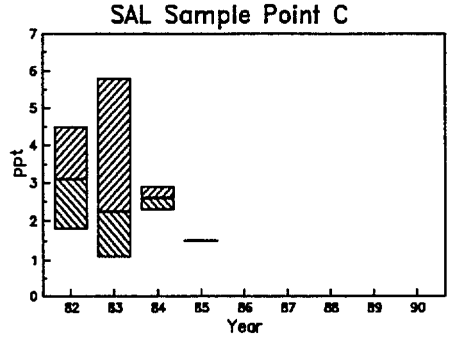
Sulphur Mines
SAL Sample Point A



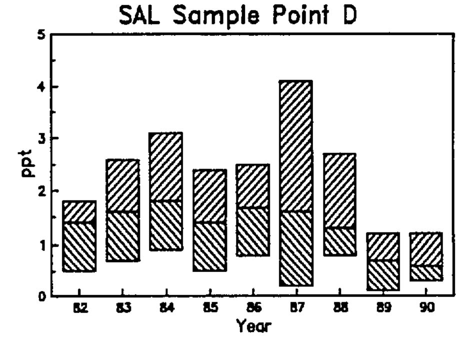
Sulphur Mines
SAL Sample Point B



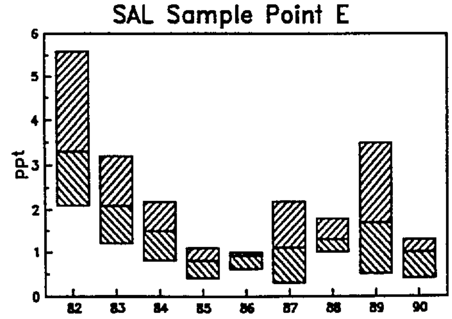
Sulphur Mines
SAL Sample Point C



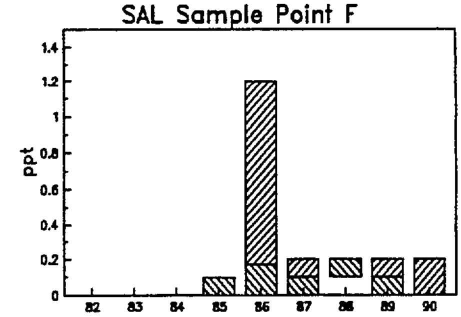
Sulphur Mines
SAL Sample Point D

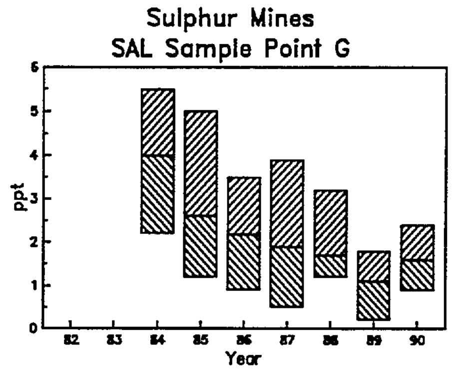


Sulphur Mines
SAL Sample Point E



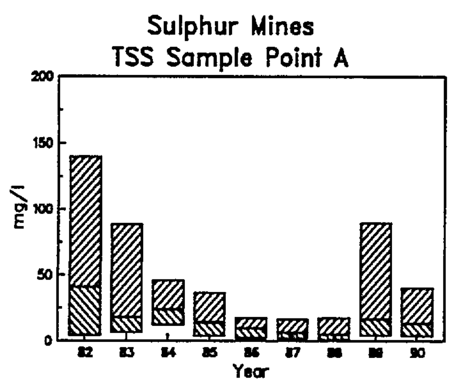
Sulphur Mines
SAL Sample Point F

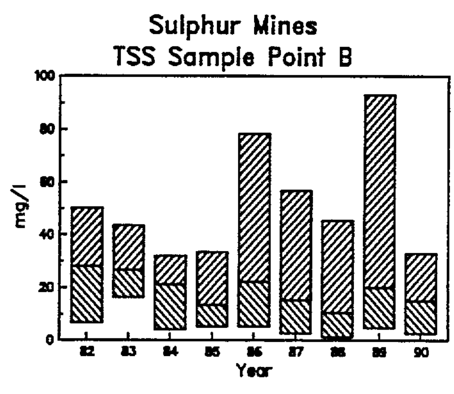


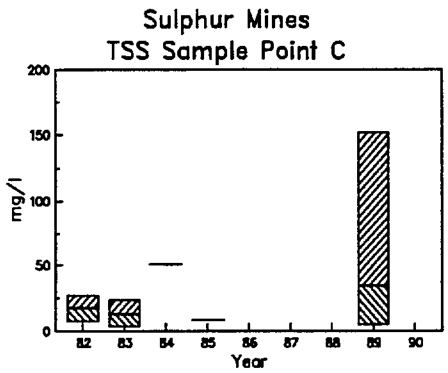


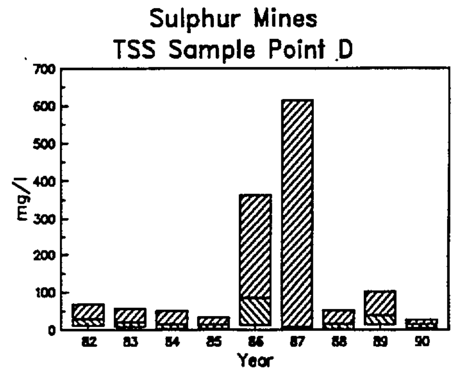
5.2.5.3 Total Suspended Solids (TSS)

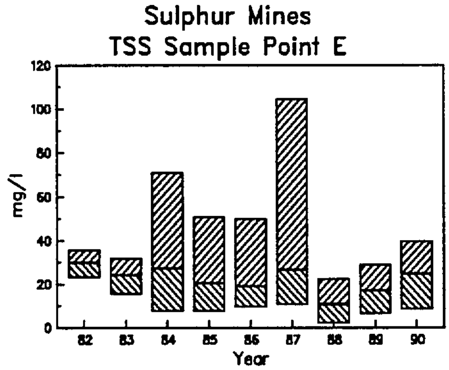
1990 TSS data was consistent with data from previous years. All site point source discharges were within permit limitations for TSS throughout 1990. The generally high and variable TSS levels observed in the surrounding waters are not attributed to any point source discharge from the site.

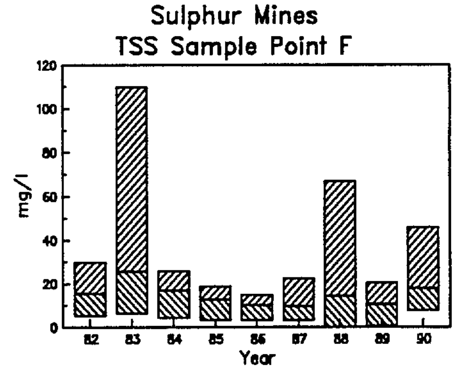






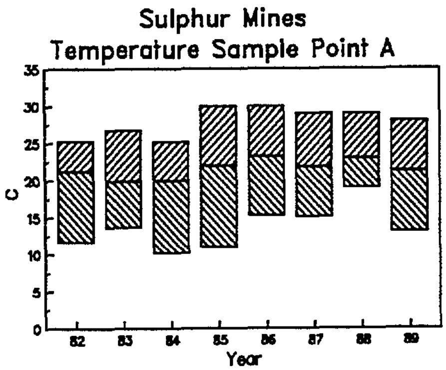


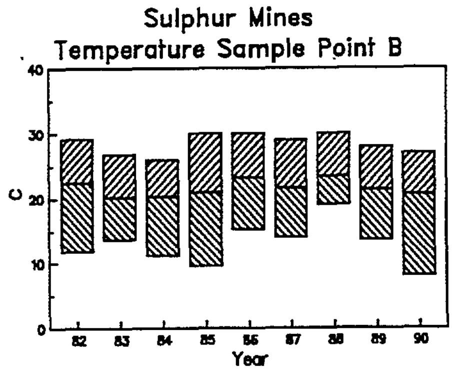


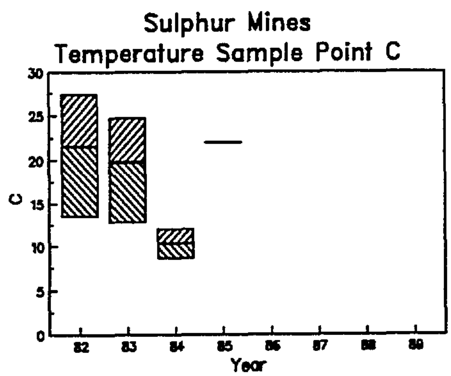


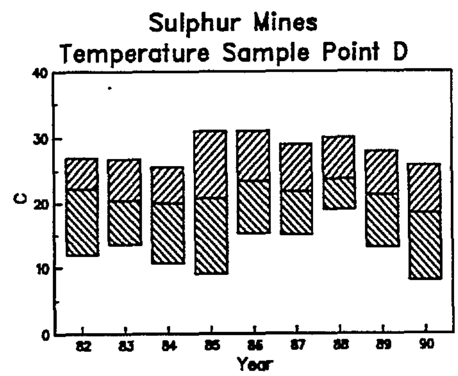
5.2.5.4 Temperature

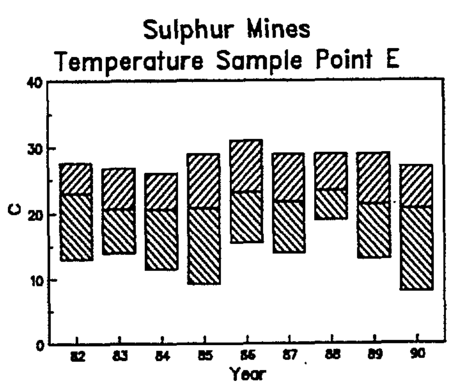
The sample temperatures of the Sulphur Mines surface waters were generally conducive to supporting aquatic life throughout 1990. 1990 temperature data was comparable to data from previous years.

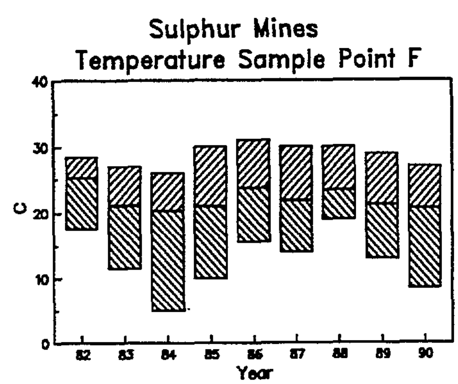

Sulphur Mines
Temperature Sample Point A
C
Year


Sulphur Mines
Temperature Sample Point B
C
Year


Sulphur Mines
Temperature Sample Point C
C
Year

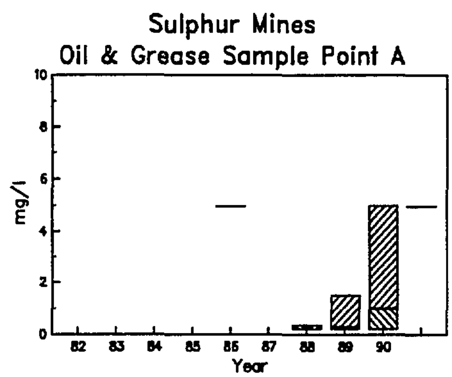

Sulphur Mines
Temperature Sample Point D
C
Year

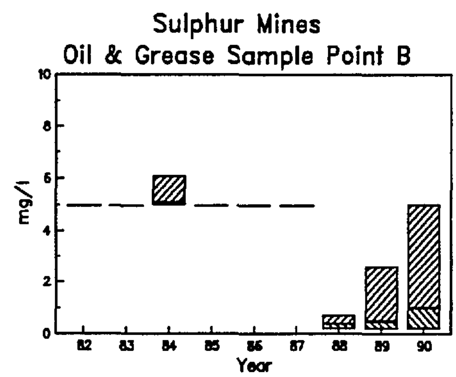

Sulphur Mines
Temperature Sample Point E
C
Year

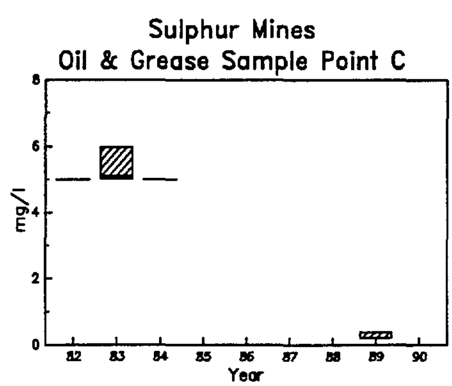

Sulphur Mines
Temperature Sample Point F
C
Year

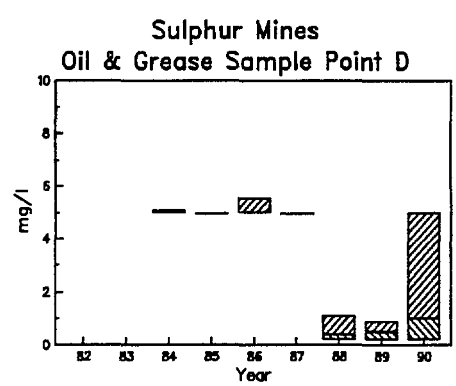
5.2.5.5 Oil and Grease

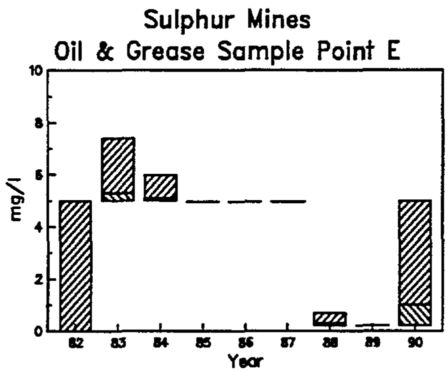
Oil and Grease levels were less than 5 mg/l at all monitoring stations throughout 1990. These data reflect favorably on the site spill prevention, control, and overall good housekeeping during 1990. These results are consistent with that collected during previous years. In 1988 through 1990 a more discrete analytical method was used enabling the SPR to have lower detection limits instead of the normal <5 mg/l.

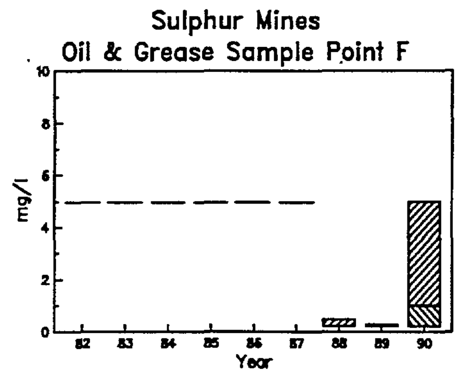


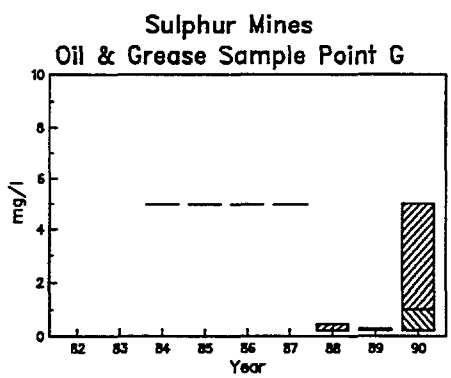






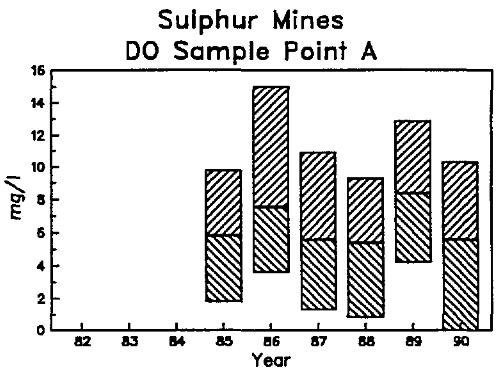






5.2.5.6 Dissolved Oxygen (DO)

Dissolved oxygen monitoring was performed only at station A throughout 1990. This station is located in a relatively stagnant drainage ditch that receives effluent from the site package sewage treatment plant. The sewage plant operated in compliance throughout 1990. High DO levels are attributed to increased flushing caused by high rainfall.



5.2.5.7 General Observations

Based on the above discussion, the following general observations are made regarding the quality of Sulphur Mines surface waters.

a. Overall, pH continues to be relatively neutral.

b. Changes in water temperature observed during years since 1982 are attributed to seasonal meteorological variation since the SPR has no thermal discharges.

c. The DO levels observed since 1985 have been relatively consistent, with only a sight deviation in 1986, and are attributed to natural factors as well as low BOD_5 levels in effluent from the site sewage treatment plant.

d. Stations B and G have leveled off after years of a steady decline in salinity suggesting a general reduction of salinity when compared to previous levels and the years of industrial activity in the area.

5.2.6 Weeks Island

The Weeks Island site is located on the Weeks Island salt dome approximately 30 m (100 ft) above sea level. The surrounding topography is of rather sharp relief with several small ponds. None of the SPR outfalls discharge directly into these ponds. Other surface waters at this site are intermittent in nature, draining rapidly and thoroughly after any precipitation. The site outfalls (Figure 5-6) discharge small volumes into surface runoff at a substantial distance from receiving waters. The lack of potentially impacted surface waters precludes the need for surface water quality monitoring at the Weeks Island site. Outfalls 004 and 01B are combined with 01A into a single surface drain, similar to the St. James arrangement.

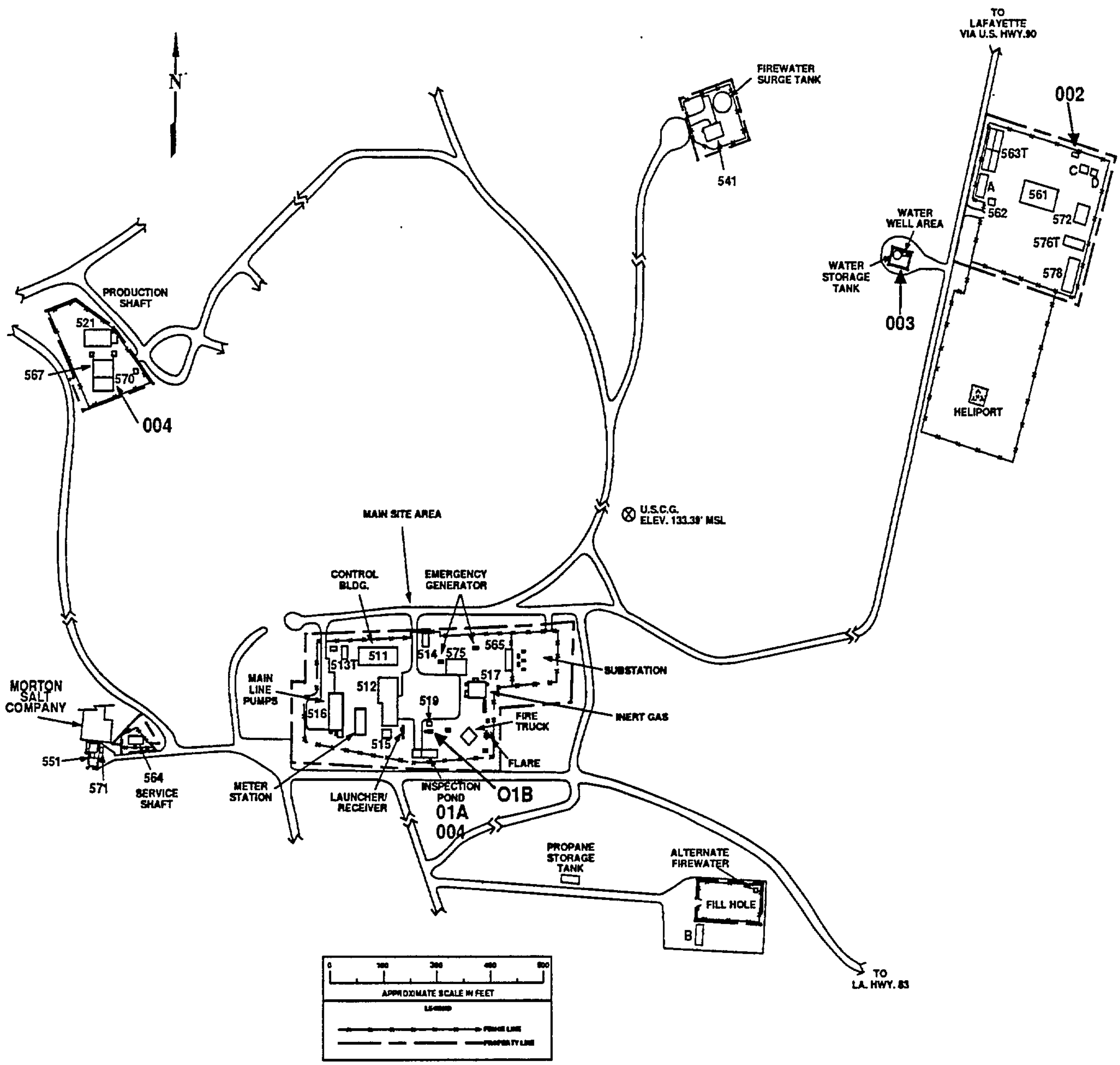
5.2.7 West Hackberry

West Hackberry surface water quality was monitored by sampling once monthly at each station throughout 1990. Specific monitoring stations are identified in Figure 5-7. Specific parameters monitored in the West Hackberry surface waters include pH, salinity, TSS, temperature, TOC, and oil and grease. TOC was monitored only at station E corresponding to the NPDES permit requirement regarding stormwater discharges. Each parameter is discussed in the following sections.

5.2.7.1 Hydrogen Ion Activity (pH)

1990 data is generally consistent with data from previous years. Natural waters low in, or devoid of, carbon dioxide are medium hard to hard, with regard to mineral content, and characteristically have a slightly high pH. Some compounds, such as hydrogen cyanide and hydrogen sulfide, increase in toxicity with the degree of dissociation, resulting in increasing aquatic toxicity with reduced pH. A mildly high pH is beneficial to aquatic life and consistent with an environmentally sound ecosystem.

WEEKS ISLAND SITE MAP



2073/MP1/ENV/C/W I. MAP/4-91

Figure 5-6 (Sheet 1 of 2). Weeks Island Environmental Monitoring Stations

Discharge Monitoring Stations

01A Stormwater runoff
01B Discharge from sewage treatment plant
002 Discharge from sewage treatment plant
003 Discharge from iron removal system
004 Discharge from mine air dryer condensate

There are no water quality monitoring stations at Weeks Island

Figure 5-6 (Sheet 2 of 2). Weeks Island Environmental Monitoring Stations

WEST HACKBERRY SITE MAP

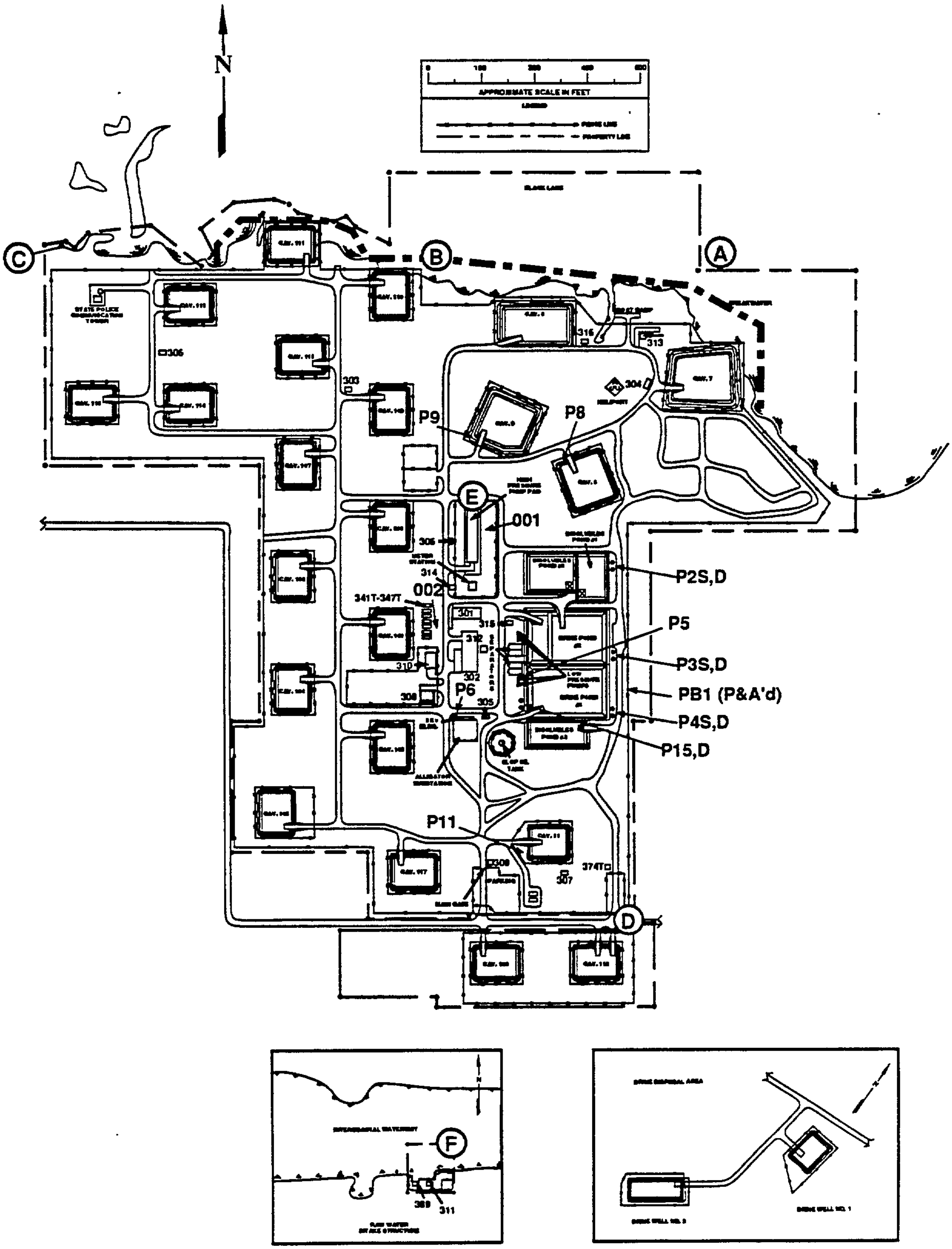


Figure 5-7 (Sheet 1 of 2). West Hackberry Environmental Monitoring Stations

Discharge Monitoring Stations

001	Brine disposal
002	Discharge from sewage treatment plant
003 (State)	Stormwater and pump flush from high-pressure pump pad Stormwater runoff from well pads 6-9, 11, and 101-117
004	Stormwater from the Texoma/Lake Charles meter station

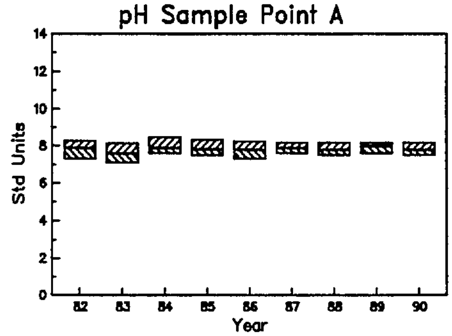
Water Quality Monitoring Stations

A	Black Lake
B	Black Lake
C	Black Lake
D	Southeast drainage ditch
E	High-pressure pump pad
F	Raw water intake structure

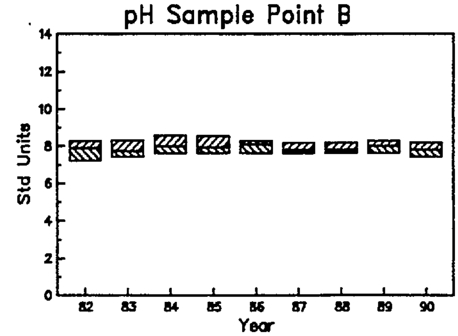
Groundwater Monitoring Stations

PB1	East of brine pond #1 - plugged and abandoned
P8	North of cavern 8
P9	South of cavern 9
P11	West of cavern 11
P1S, D	Southwest of brine pond
P2S, D	Northeast of anhydrite pond
P3S, D	Northeast of brine pond
P4S, D	Southeast of brine pond
P5	Northwest of brine pond
P6	Northwest of site electrical substation

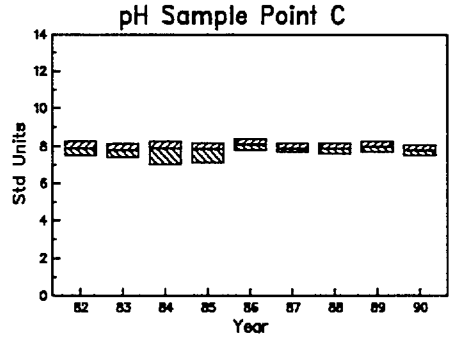
Figure 5-7 (Sheet 2 of 2). West Hackberry Environmental Monitoring Stations



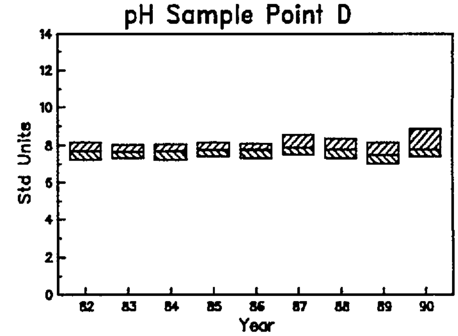
West Hackberry
pH Sample Point A



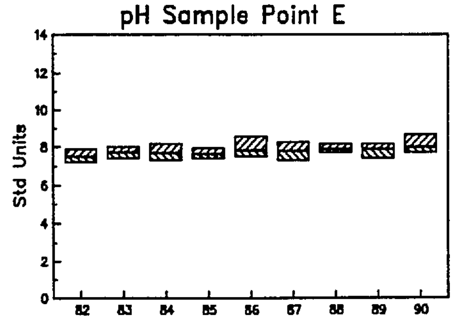
West Hackberry
pH Sample Point B



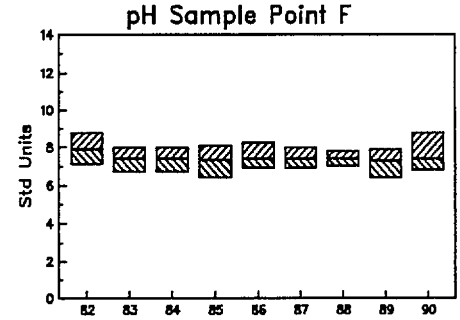
West Hackberry
pH Sample Point C



West Hackberry
pH Sample Point D



West Hackberry
pH Sample Point E

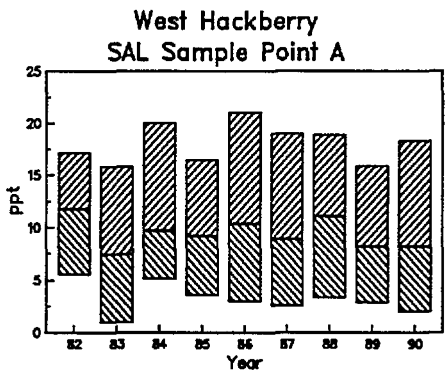


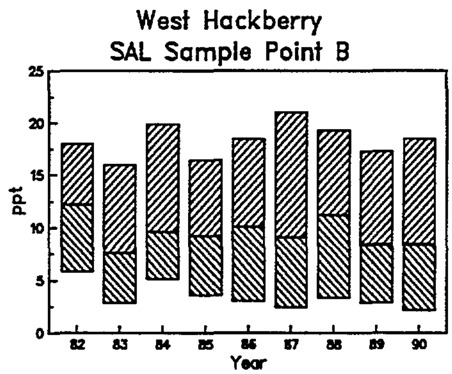
West Hackberry
pH Sample Point F

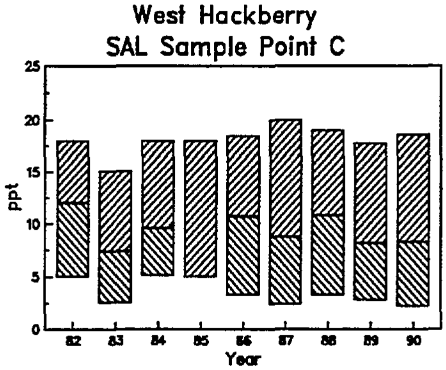
5.2.7.2 Salinity (SAL)

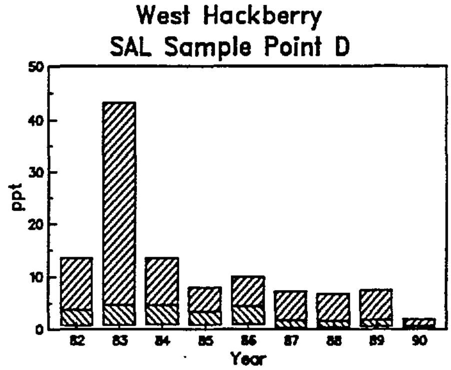
The salinity of Black Lake exhibited a slight decline possibly attributed to tropical storms during the year, with all other data being consistent with previous years.

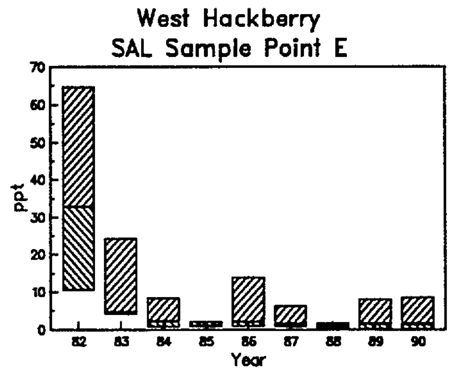
Wind, tide, and rainfall contributed to the salinity variation in Black Lake. The broad salinity range observed in Black Lake is more conducive to supporting euryhaline organisms or those with sufficient mobility to avoid salinity stresses with such seasonal changes.

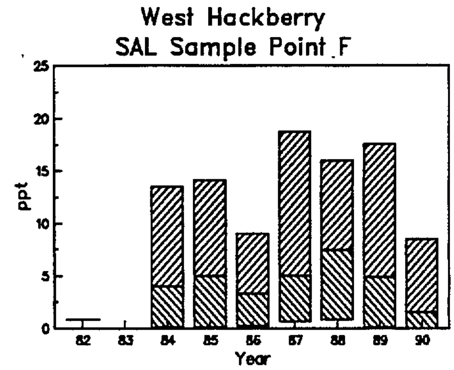






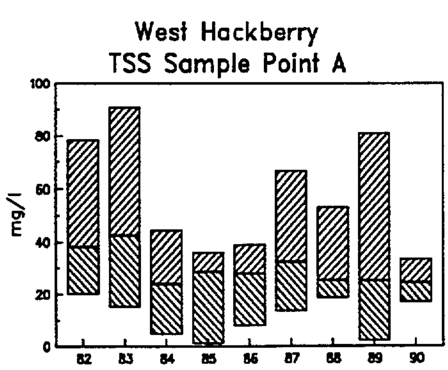


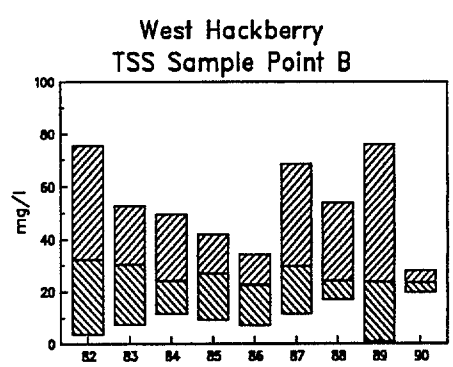


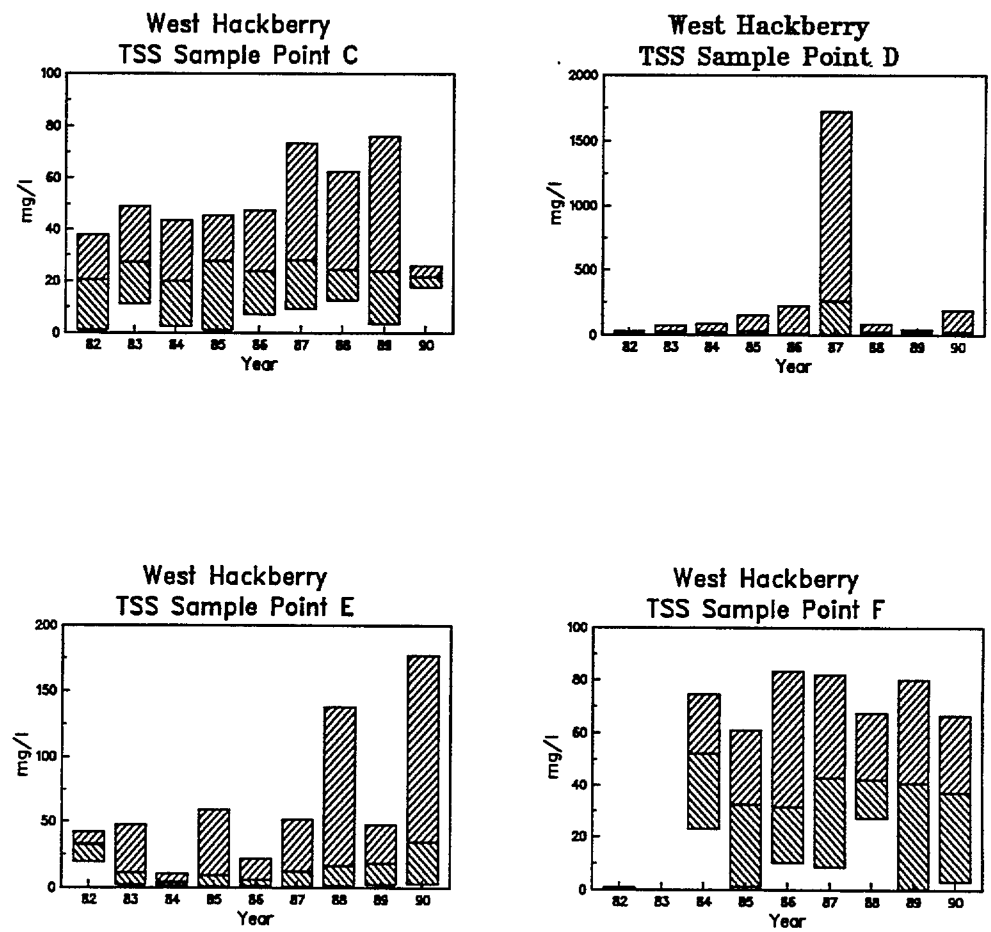


5.2.7.3 Total Suspended Solids (TSS)

It appears that the high pressure pump pad does not significantly contribute to the levels of suspended solids in the lake. TSS fluctuations at Station F (on the Intracoastal Waterway) is expected for a high traffic, shallow waterway. The relatively high excursion at Sample Point E was the result of construction excavation near the high pressure pump pad. The 1990 TSS observations were generally similar to previous year's data suggesting that occurrence of relatively high TSS levels are typical for this water body.

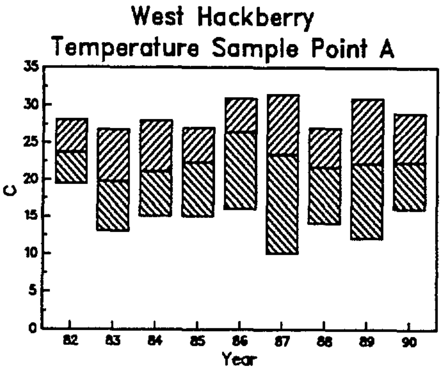






5.2.7.4 Temperature

1990 data was consistent with observations at other sites indicative of regional climatic effects.


West Hackberry
Temperature Sample Point A
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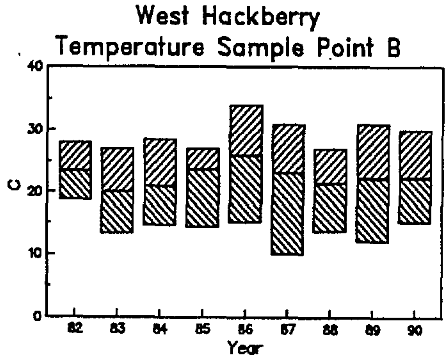
West Hackberry
Temperature Sample Point B
C
Year
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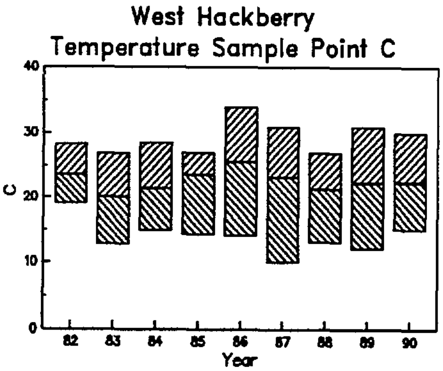
West Hackberry
Temperature Sample Point C
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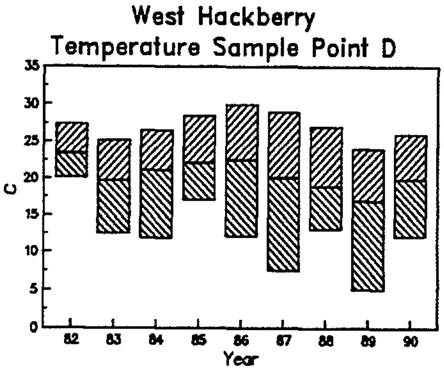
West Hackberry
Temperature Sample Point D
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Year
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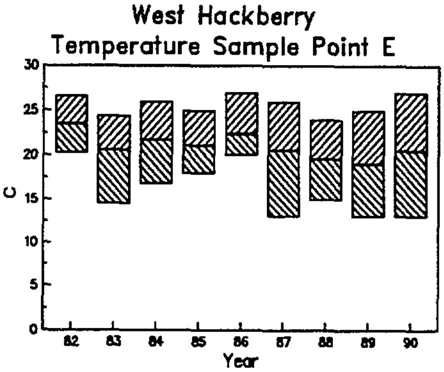
West Hackberry
Temperature Sample Point E
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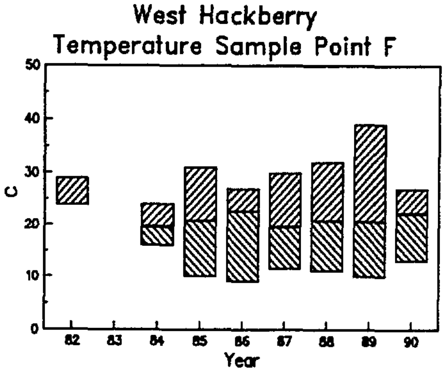
West Hackberry
Temperature Sample Point F
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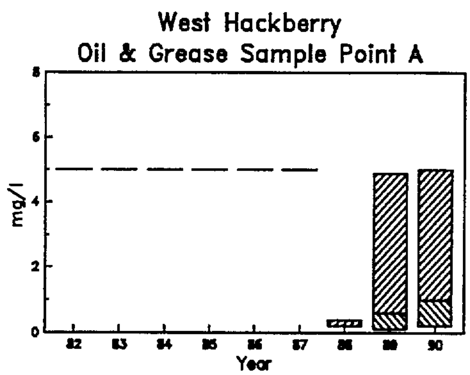
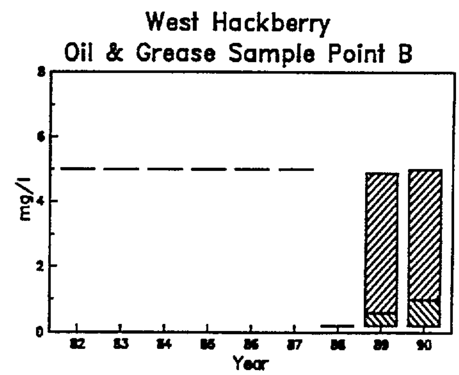
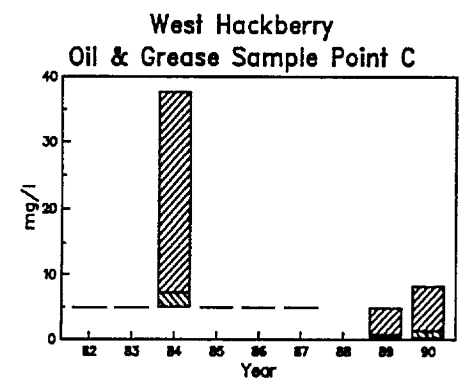
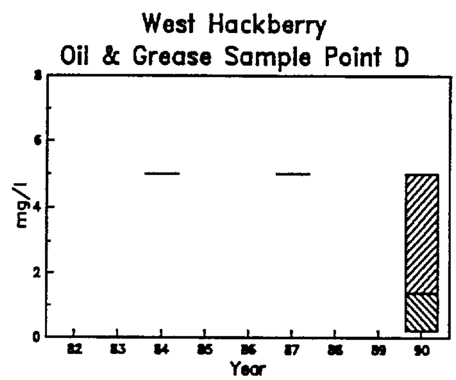
5.2.7.5 Oil and Grease

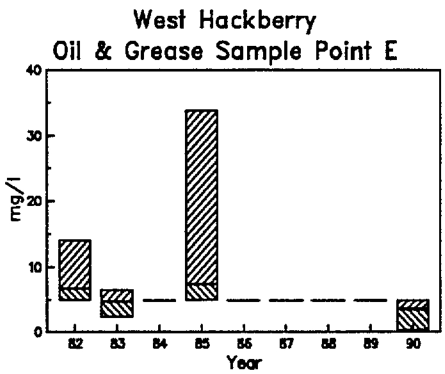
Oil and grease levels were below the previously detectable levels (<5 mg/l) at all stations throughout 1990. New instrumentation has allowed lower detection limits. These data are generally consistent with oil and grease data collected since 1982. Data from 1988 through 1990 were analyzed using an infrared method which gives detection limits below 5 mg/l.

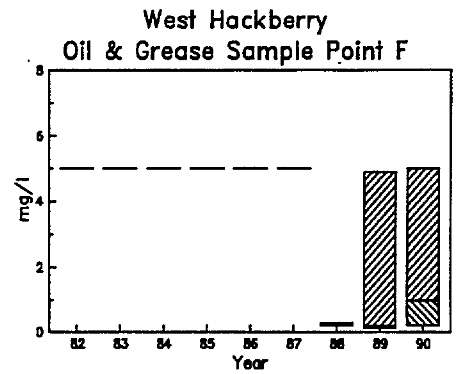






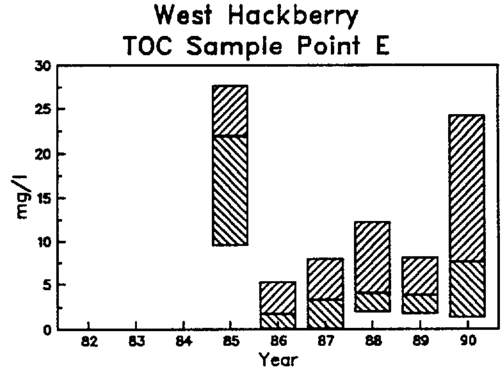






5.2.7.6 Total Organic Carbon (TOC)

TOC is an NPDES permit required parameter for discharges from the high-pressure pump pads and adjacent stormwater discharges. The low levels indicate that effluent from the pad did not contribute to TOC loading in the lake. These TOC levels are only slightly higher than the three previous years, still indicating a relatively low and insignificant level.



5.2.7.7 General Observations

The following observations are made, based on the above discussion, concerning operational impacts on the West Hackberry aquatic environs.

a. pH remained fairly stable and consistent with previous years.
b. Runoff from the high pressure pump pad was of lower salinity than the Black Lake receiving waters. This demonstrates continuing good control of brine leaks and spills observed since 1982.
c. TSS levels have fluctuated widely at all stations since 1982. High levels of TSS in Black Lake did not appear to be related to site discharges or runoff, but to natural phenomena.
d. Oil and grease levels were <5 mg/l in Black Lake throughout 1990.
e. TOC remained well below permit limits.

5.3 WATER DISCHARGE PERMIT MONITORING

The water discharge permit monitoring program fulfills the requirements of the EPA NPDES, and corresponding state programs. All SPR point source discharges are conducted in compliance with these Federal and state programs.

SPR personnel regularly conducted point source discharges from all sites during 1990. These discharges are grouped as:

a. brine discharge to the Gulf of Mexico,
b. stormwater runoff from tank, well, and pump pads
c. effluent from package sewage treatment plants.

Parameters monitored varied by site and discharge. Table 5-1 identifies frequency of specific parameters measured at each SPR site. The variations in data are discussed by site.

5.3.1 Bayou Choctaw

Most monitoring is related to water discharges regulated under the EPA (NPDES) permit and a corresponding permit issued by the Louisiana Department of Environmental Quality (LDEQ) Office of Water Resources. Discharges are from two package sewage treatment plants (STP) and stormwater runoff from well pads and pump pads (containment areas). The outfalls are shown in Figure 5-1.

Parameters for these discharge permits are described below.

Location/Discharge	Parameter	Compliance Range
sewage treatment plants	flow	(report only)
	BOD_5	$\leq$45 mg/l
	TSS	$\leq$45 mg/l
	pH	6.0 - 9.0
stormwater	flow	(report only)
	oil and grease	$\leq$15 mg/l
	pH	6.0 - 9.0

A total of 388 analyses were conducted on permitted outfalls to monitor NPDES and state permit compliance during 1990. There were three noncompliances (Table 5-2) in 1990 resulting in a 99.2% compliance level for 1990.

Table 5-2. 1990 Noncompliances/Bypasses at Bayou Choctaw

Outfall Location	Permit Parameter	Value / Limit	Cause
003	O & G	------	Well pad stormwater samples taken but data lost.
002	TSS	59 mg/l / 45/mg/l	Unknown. Presumed cleaning agent entered sewage treatment plant system causing microbial upset.
SOT*	ALL	------	Stormwater was discharged from slop oil tank dike without having a sample taken.

* SOT - Slop Oil Tank

5.3.2 Big Hill

Water discharges at Big Hill are regulated and enforced through the EPA NPDES permit program and the similar TWC discharge permit program. An NPDES renewal application was submitted in 1988 as required every five years. No significant changes were requested in the application. The discharges at the facility involve brine to the Gulf of Mexico, hydroclone blowdown into the Intracoastal Waterway, effluent from the sewage treatment plant, and stormwater from well pads and pump pads. Figure 5-2 shows the existing outfalls.

There were no discharges during 1990 from the hydroclone blowdown system. The sewage treatment plant was retrofitted and brought on line in 1990. A vacuum truck service hauls the sewage to the local community sewage treatment plant on occasion. Parameters for all the discharges are described below.

Location/Discharge	Parameter	Compliance Range
brine to Gulf	flow	0.27 million m^3/day
	velocity	$\geq$ 6.1 m/sec)
	oil and grease	$\leq$ 15 mg/l
	TDS	(report only)
	TSS	< 40 mg/l (TWC only)
	pH	6.0-9.0
	DO	detectable (when using O_2 scavenger)
stormwater	oil and grease	$\leq$ 15 mg/l
	TOC	$\leq$75mg/l (EPAonly)
	pH	6.0-9.0
sewage treatment plant (TWC only)	flow	< 37.8 m^3/day
	BOD5	$\leq$ 45 mg/l and $\leq$ 0.38 kg/day
	TSS	$\leq$ 45 mg/l and $\leq$ 0.38 kg/day only)
	chlorine	$\geq$ 1.0 - 4.0 mg/l
	pH	6.0-9.0
hydroclone blowdown (not used)	flow	report
	TSS	report
	pH	6.0-9.0

A total of 2721 analyses were performed to monitor NPDES and state discharge permit compliance during 1990. There were 6 noncompliances during 1990 (Table 5-3) resulting in a 99.8% site compliance performance level.

5.3.3 Bryan Mound

Water discharges at Bryan Mound are regulated and enforced through the EPA NPDES permit program and the similar TWC discharge permit program for state waters. An NPDES renewal application was submitted during 1988 as required every five years. No significant changes were requested in the application. The three categories of discharges are brine to the Gulf of Mexico; stormwater from the tank farm, well pads, and pump pads; and package sewage treatment plant effluent.

Parameters for the three discharges are described below.

Location/Discharge	Parameter	Compliance Range
brine to Gulf (EPA only)	flow	0.17 million m^3/day
	velocity	$\geq$ 6.1 m/sec
	oil and grease	$\leq$15 mg/l
	TDS	(report only)
	TSS	(report only)
	pH	6.0 - 9.0
stormwater	flow	(report only)
	oil and grease	$\leq$15 mg/l
	TOC	$\leq$75 mg/l (EPA only)
	pH	6.0 - 9.0
	COD	$\leq$200 mg/l (TWC only)
sewage treatment plant	flow	$\leq$22.7 m^3/day (TWC only)
	BOD_5	$\leq$45 mg/l and $\leq$0.68 kg/day
	TSS	$\leq$45 mg/l and $\leq$0.68 kg/day
	chlorine	$\geq$ 1.0 - 4.0 mg/l
	pH	6.0 - 9.0

A total of 4,008 analyses were performed on permitted outfalls for the purpose of monitoring NPDES and state discharge permit compliance during 1990.

Table 5-3. 1990 Noncompliances/Bypasses at Big Hill

Outfall Location	Permit Parameter	Value / Limit	Cause
001	DO	0 mg/l / detectable*	Too much ammonium bisulfite was added to brine being disposed for a 45 min period.
003	pH	9.2 & 9.7 / 9.0	Stormwater leaked by butterfly valves on drain lines.
003	O&G, pH	------	Stormwater released from wellpads before all samples were taken.
Car wash	TOC	203 mg/l / 75 mg/l	Accumulated water discharged prior to obtaining sample results
001	DO	0.1 & 0.2 mg/l / detectable*	Ammonium bisulfite adjustment too high, reducing oxygen levels below calculated limit.
003	Visible	------	Oil discharged with stormwater through an oil/water separator.

* Detectable oxygen levels at discharge point (4 mi. into Gulf of Mexico) back calculated to site sample port. Minimum allowed is 0.3 mg/l to compensate for oxygen loss in the pipeline.

Table 5-4. 1990 Noncompliances/Bypasses at Bryan Mound

Outfall Location	Permit Parameter	Value / Limit	Cause
002	TSS	20.6 & 29.1 mg/l / 20.0 mg/l	Hydraulic overload attributable to malfunctioning toilet valve.
002	Flow (TX only)	10,080 gpd / 6,000 gpd	Maximum flow rate exceeded due to malfunctioning toilet valve.
002	TSS	61 mg/l / 45 mg/l	Unknown. The only variation from normal sewage treatment plant operation was low flow.

There were three noncompliances during 1990 (Table 5-4) resulting in a 99.9% site compliance performance level.

5.3.4 St. James

Outfall 001 consists of stormwater from the site retention pond. Outfalls 002 and 003 are for the two site package sewage treatment plants. All three outfalls discharge are through a common pipe to the Mississippi River.

A total of 118 analyses were performed on permitted outfalls to monitor NPDES and state discharge permit compliance. There was one noncompliance in 1990 (Table 5-5) giving the site a 99.2% compliance level.

Parameters for the outfalls are described below.

Location/Discharge	Parameter	Compliance Range
retention pond	flow	(report only)
	oil and grease	≤15 mg/l
	pH	6.0 - 9.0
	TOC	≤50 mg/l
sewage treatment plants	flow	(report only)
	BOD_5	≤45 mg/l
	TSS	≤45 mg/l
	pH	6.0 - 9.0

Table 5-5. 1990 Noncompliances/Bypasses at St. James Terminal

Outfall Location	Permit Parameter	Value / Limit	Cause
002	BOD_5	49 mg/l / 45 mg/l	Elevated BOD_5 in sewage treatment plant attributed to losing the bacterial culture, creating a weak mixed liquor.

5.3.5 Sulphur Mines

The water discharge points at Sulphur Mines are regulated through the EPA NPDES program. The permit renewal regrouped the discharges. Five of the discharges are stormwater runoff from the well and pump pads. The sixth (outfall 001) is the effluent from the sewage treatment plant. See Figure 5-6 for locations and the seventh (outfall 002) is from the water treatment system back flush.

Parameters for stormwater and wastewater discharges are described below.

Location/Discharge	Parameter	Compliance Range
stormwater	flow	(report only)
	oil and grease	≤15 mg/l
	pH	6.0 - 9.0
sewage treatment plant	flow	≤5.6 m^3/day
	BOD_5	≤45 mg/l
	TSS	≤45 mg/l
	pHQ	6.0 - 9.0
water treatment system back flush	flow	(report only)
	pH	6.0 - 9.0
	salinity	(report only)

A total of 512 analyses were conducted on permitted outfalls to monitor NPDES compliance during 1990. The water system back flush was not used in 1990. There was one noncompliance during 1990 (Table 5-6) resulting in a compliance performance level of 99.8%.

Table 5-6. 1990 Noncompliances/Bypasses at Sulphur Mines

Outfall Location	Permit Parameter	Value Limit	Cause
stormwater	All	-----	Stormwater samples were taken in non-approved containers, thus invalidating any results.

5.3.6 Weeks Island

The water discharges at Weeks Island are regulated and enforced in accordance with the EPA NPDES permit program. There are separate outfalls (01B and 002) for each package sewage treatment plant. Outfall 01A handles of stormwater runoff collected in an onsite retention pond (Figure 5-6). There was no discharge from the iron removal unit (outfall 003) in 1990. A new discharge for water condensate (outfall 004) was permitted in 1990, but had no discharge.

The various parameters for the monthly samples of all discharge points are listed below with their maximum limits.

Location/Discharge	Parameter	Compliance Range
stormwater	flow	(report only)
	oil and grease	≤15 mg/l
	pH	6.0 - 9.0
sewage treatment plant	flow	(report only)
	BOD_5	≤45 mg/l
	TSS	≤45 mg/l
	fecal coliforms	≤400 colonies/100 ml
	pH	6.0 - 9.0
iron removal unit	flow	(report)
	TSS	≤45 mg/l
mine air dryer condensate water	flow	(report)
	pH	6.0 - 9.0
	TOC	(report)

A total of 192 analyses were conducted on permitted outfalls to monitor NPDES compliance during 1990. There was one noncompliance in 1990 (Table 5-7). The site experienced a compliance performance level of 99.5%.

Table 5-7. 1990 Noncompliances/Bypasses at Weeks Island

Outfall Location	Permit Parameter	Value Limit	Cause
01A	pH	9.2 9.0	Stormwater from the retention pond may have had high algae levels causing elevated pH value.

5.3.7 West Hackberry

The water discharges at the West Hackberry site are regulated and enforced in accordance with the EPA NPDES permit program. The Louisiana Stream Control Commission (currently the Office of Water Resources in LDEQ) authorized discharge of stormwater and sanitary wastewater effluents.

The three categories of discharges (Figure 5-7) at West Hackberry are brine disposal to the Gulf of Mexico, sewage treatment plant effluent, and stormwater runoff from well and pump pads. The various parameters for these discharges are listed below with their maximum limits.

Location/Discharge	Parameter	Compliance Range
brine to Gulf	flow	$\leq$0.17 million m^3/day
	velocity	>7.6 m/sec (25 ft /sec)
	oil and grease	$\leq$15 mg/l
	TSS	(report only)
	TDS	(report only)
	pH	6.0 - 9.0
	DO	detectable (when using O_2 scavenger)
sewage treatment plant	flow	(report only)
	BOD_5	$\leq$15 mg/l
	TSS	$\leq$45 mg/l
	fecal coliform	(report only)
	pH	6.0 - 9.0
stormwater	flow	(report only)
	oil and grease	$\leq$15 mg/l
	TOC	$\leq$75 mg/l
	pH	6.0 - 9.0

A total of 3,192 analyses were conducted on permitted outfalls to monitor NPDES compliance during 1990. Permit noncompliances were identified on four occasions (Table 5-8). These 1990 noncompliances, on a per analysis basis, resulted in a site compliance performance level of 99.9%.

Table 5-8. 1990 Noncompliances/Bypasses at West Hackberry

Outfall Location	Permit Parameter	Value Limit	Cause
001	All	------	Brine sample was not taken during a brief batching operating. Batching occurred during offshift hours.
001	All	------	Brine sample was not taken during a brief batching operation. Batching occurred during offshift hours.
001	DO	0.1 mg/l detectable*	Ammonium bisulfite adjustment too high, reducing oxygen levels below calculated limit.
001	DO	0 mg/l detectable*	Ammonium bisulfite adjustment too high, reducing oxygen levels below calculated limit.

* Dectable oxygen levels at discharge point (7.2 mi into the Gulf of Mexico) back calculated to site sample port. Minimum allowed is 0.3 mg/l to compensate for oxygen loss in the pipeline.

5.4 ENVIRONMENTAL PERMITS

The active environmental permits, required by regulatory agencies to construct, operate and maintain the SPR, are discussed by site.

5.4.1 Bayou Choctaw

Table 5-9 lists the active permits at Bayou Choctaw. Individual work permits are received from the Louisiana Underground Injection Control Division for each well workover performed. State inspectors regularly visit the site to observe SPR operations.

5.4.2 Big Hill

Table 5-10 lists the active permits at Big Hill. The Big Hill site has submitted an amendment to its TWC permit for appropriating additional state waters for the leaching, site utility, and fire protection systems. The permit requires a yearly report of water quantities used. In 1990, the site appropriated 76.7 million m^3 (62,188 acre-feet) of water from the Intracoastal Waterway. This represents 20% of the total volume permitted.

5.4.3 Bryan Mound

Table 5-11 lists the active permits for the Bryan Mound site. The Bryan Mound site has a second TWC permit for the appropriation of state waters for the leaching program, site utility, and fire protection systems. The permit requires a yearly report of the quantity of water used. In 1990, the site appropriated 1.07 million m^3 (865.1 acre-feet) of water from the Brazos River Diversion Channel. A total of 146.96 million m^3 (119,142 acre-feet) of water has been appropriated to date for site activities which represents 32.4% of the total volume permitted.

Table 5-9. Active Permits at Bayou Choctaw

PERMIT NUMBER	ISSUING* AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
LA0053040	EPA	NPDES	3/13/88	3/12/93	(1)
WP0179	LDEQ	Water (Disch.)	7/22/83	7/21/88	(1) (5)
1280-00015-000	LDEQ	Air	10/01/87	Open	
None	LDNR	Injection	1/11/83	Open	(2)
SDS-1	LDNR	Injection	9/09/77	Open	(8)
LMNOD-SP (Bayou Plaquemine)17	COE	Maint.	09/26/77	9/26/87	(3) (7)
LMNOD-SP (Bull Bay)3	COE	Constr. Maint.	01/30/79 1/30/79	01/29/82 09/26/87	(4), (6) (7)

(1) Renewal submitted (2/2/83 and 11/9/87).
(2) Letter of financial responsibility to plug and abandon injection wells.
(3) Maintain 36-inch crude oil pipeline.
(4) Maintain Bull Bay 24" Brine Disposal Pipeline.
(5) No response from LDEQ. Application resubmitted.
(6) Recorded with applicable Registrar of Deeds.
(7) Maintenance clause of permit is being renewed.
(8) Permit approved use of salt dome cavities for storage of liquid Hydrocarbons

* COE - U.S. Army Corps of Engineers
EPA - Environmental Protection Agency
LDEQ - Louisiana Department of Environmental Quality
LDNR - Louisiana Department of Natural Resources

Table 5-10. Active Permits at Big Hill

PERMIT NUMBER	ISSUING* AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
TX0092827	EPA	NYDES	01/18/88	01/17/94	(1)
SWGCO-RP 16536 (01,02,03)	COE	Constr. Maint.	01/11/84 01/11/84	01/11/94 Open	(2)
P-7	F&WS	Constr. Operate	07/31/86 07/31/86	07/31/88 06/30/2036	(3)
C-9256	TACB	Air	05/17/83	Open	(4)
02937-02939	RCT	Operate	11/28/83	Open	(5)
P000226A-P000226B	RCT	Operate/ Maintain	09/19/84	Open	(9)
0048295-0048320	RCT	Operate	05/09/83 06/23/83	Open Open	(6)
02638	TWC	Water (Disch.)	03/27/89	03/26/94	(7)
4045	TWC	Water (Use)	11/14/83	Open	(8)

(1) Renewal submitted 9-23-88.
(2) Completion of raw water, brine disposal, and crude oil pipeline extended. Amended to install offshore pipeline by trenching.
(3) Completion of pipeline construction extended. (48" Brine Pipeline)
(4) While under construction.
(5) Valid until ownership changes, system changes, or other physical changes are made in the system.
(6) Permits to create, operate, and maintain an underground hydrocarbon storage facility consisting of 14 caverns.
(7) Corresponds to TX0092827. (EPA-NPDES)
(8) Permit expires after consumption of 239,080 acre-feet of water or end of project.
(9) Permits to operate and maintain anhydrite and brine/oil pits.

* F&WS - U.S. Fish and Wildlife Service
RCT - Railroad Commission of Texas
TACB - Texas Air Control Board
TWC - Texas Water Commission

Table 5-11. Active Permits at Bryan Mound

PERMIT NUMBER	ISSUING* AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
TX0074012	EPA	NPDES	02/02/89	02/01/94	(1)
SWGCO-RP-12347(1)	COE	Dredging	02/29/84	12/31/94	(2)
3-67-782 (Docket#)	RCT	Injection	08/21/78	Open	(3)
P001447	RCT	Operate	10/30/84	Open	(5)
P001448	RCT	Operate	10/30/84	Closed	(4)
3-70-377 (Docket#)	RCT	Injection	12/18/78	Open	(3)
3681A	TWC	Water	07/20/81	Open	(6)
02271	TWC	Water	02/05/90	02/04/95	(7)
R-6176B	TACB	Air	02/23/87	Open	
82-8475	TDH&PT	Constr.	01/01/83	Open	(8)

(1) Renewal submitted 9/7/88.
(2) Maintenance dredging of raw water intake extended.
(3) Approval of oil storage and salt disposal program.
(4) Small brine pond closed August, 1989.
(5) Authority to operate brine pond.
(6) Permit expires after consumption of 367,088 acre-feet of water or project ends.
(7) Corresponds with TX0074012. (EPA-NPDES)
(8) Corresponds with SWGCO-RP-16177.

* TDH&PT - Texas Department of Highways and Public Transportation

5.4.4 St. James

Table 5-12 lists the active permits at St. James Terminal.

5.4.5 Sulphur Mines

Table 5-13 lists the active permits at Sulphur Mines. The brine disposal wells are routinely exercised, and all state underground injection control certifications are current. State inspectors regularly visit the site to observe underground injection operations.

5.4.6 Weeks Island

The active permits for Weeks Island are listed in Table 5-14.

5.4.7 West Hackberry

Active permits for West Hackberry are listed in Table 5-15.

5.5 SARA TITLE III REPORTING REQUIREMENTS

The SPR submitted the SARA Title III, Tier II forms for 1990, for each site. This fulfills requirements set forth in The Emergency Planning and Community Right-to-Know Act of 1986. Following the format for reporting quantities, substances are reported in reportable ranges. Tables 5-16 through 5-24, list the groups of hazardous substances, and chemicals on the SPR above planning quantities. Nine are above the reportable quantity (RQ). There are six extremely hazardous substances found on the SPR but none are above the RQ or threshold planning quantity. No hazardous substance release occurred on the SPR in 1990.

Table 5-12. Active Permits at St. James Terminal

PERMIT NUMBER	ISSUING AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
LA0054674	EPA	NPDES	07/11/90	07/10/95	
LMNOD-SP (Mississippi River) 998	COE	Maint.	03/20/78	03/20/88	(1)
WP 0929	LDEQ	Water (Disch.)	05/04/90	05/03/95	(3)
983	LDEQ	Air	07/25/78	Open	(2)

(1) Permit and all amendments recorded with Registrar of Deeds in St. James Parish.
(2) Requires annual operating report.
(3) LDEQ Water Permit renewal submitted.
(4) Permit renewal submitted May 25, 1990.

Table 5-13. Active Permits at Sulphur Mines

PERMIT NUMBER	ISSUING* AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
LMNOD-SP (LTCS)20	COE	Maint.	07/24/78	Open	(1)
LA0055786	EPA	NPDES	04/12/90	04/11/95	(2)
NONE	LDEQ	Water (Disch.)	12/07/84	Open	(7)
1042	LDEQ	Air	09/26/78	Open	(3)
None	LDOTD	Water (Use)	01/01/90	12/31/90	(4)
None	LDNR	Brine Injection	01/11/83	Open	(5)
SDS-6	LDNR	Brine Injection	07/20/78	Open	(6)

(1) Renewal submitted 8/13/85 for erosion control work on the Intracoastal Waterway. Recorded permit and amendments with applicable Parish Registrars of Deeds.
(2) Third round renewal submitted April 12, 1990.
(3) Requires annual operating report.
(4) Water purchase agreement (renewed annually).
(5) Letter of financial responsibility to close, plug, and abandon any and all injection wells.
(6) Approval for use of salt dome cavities for storage of liquid hydrocarbons.
(7) Permit submitted to LDEQ. State never responded. EPA NPDES renewal notification sent to LDEQ. Still no response from state.

* LDOTD - Louisiana Department of Transportation and Development

Table 5-14. Active Permits at Weeks Island

PERMIT NUMBER	ISSUING AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
LA0056243	EPA	NPDES	10/14/87	10/13/92	(1)
LMNOD-SP (Atchafalaya Floodway) 251	COE	Maint.	07/12/78	07/11/88	(2)
1105	LDEQ	Air	01/30/79	Open	(3)
SDS-8	LDNR	Injection	02/16/79	Open	(4)
None	LDEQ	Water (Disch.)	01/17/87	1/16/92	

(1) Renewal submitted 9/25/87.
(2) Recorded permit and amendments with applicable Parish Registrar of Deeds. Maintenance clause being renewed.
(3) Requires annual operating report.
(4) Approval for use of salt dome cavities for storage of liquid hydrocarbons.

Table 5-15. Active Permits at West Hackberry

PERMIT NUMBER	ISSUING AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
LA0053031	EPA	NPDES	08/22/89	08/21/94	(8)
LMNOD-SP (LTCS)26	COE	Dredging	02/08/79	02/08/99	(1)
LMNOD-SP (Black Lk)31	COE	Dredging	10/26/82	05/15/97	(2)
LMNOD-SP (Black Lk)43	COE	Constr. Maint.	07/26/84 07/26/94	07/25/87 Open	(3)
LMNOD-SP (Gulf of Mexico)2574	COE	Constr. Maint.	08/11/80 08/11/80	08/11/90 Open	(4)
LMNOD-SE (LTCS)40	COE	Constr. Maint.	05/25/88 05/25/88	06/30/91 Open	(10)
LMNOD-SP (Cameron Parish Wetlands)162	COE	Maint.	03/09/78	03/09/88	(11)
None	LDNR	Injection	08/07/79	Open	(5)
971198-9	LDNR	Injection	10/06/83	Open	(6)
WP1892	LDEQ	Water (Use)	12/08/88	12/09/93	(8) (9)
1048	LDEQ	Air	10/26/78	Open	(7)

(1) Maintenance dredging for raw water intake.
(2) Maintenance dredging for fire water canal.
(3) Maintenance of erosion control dike completed in 1986.
(4) Amended to install parallel pipeline. (05/29/86)
(5) Approval to create 16 additional salt dome cavities.
(6) Approval to construct and operate wells 117A and B.
(7) Requires semi-annual status-of-construction report.
(8) Renewal submitted 4/6/89. Dates based on previous permit.
(9) Includes Texoma/Lake Charles Meter Station-Outfall 004.
(10) Permit to construct and maintain 36" crude oil pipeline from site to Texoma/LC Meter Station.
(11) Permit to maintain 42" crude oil pipeline being renewed.

Table 5-16. QUANTITIES/LOCATIONS OF HAZARDOUS SUBSTANCES/CHEMICALS AT BAYOU CHOCTAW

Chemical Name/Category	Amount lbs* Max Daily	Avg. Daily	Location
AFFF, (butylcarbitol)	10,000-99,999	10,000-99,999	Foam deluge bldg & fire systems foam stg. bldg
Ammonium Bisulfite	10,000-99,999	10,000-99,999	Adj to brine pond
Ammonium Chloride	100,000-999,999	1,000-9,999	Disposal wells
Bromotrifluoromethane (Halon 1301)	1,000-9,999	1,000-9,999	Control room in ops bldg
Crude Oil, Petroleum flammable and combustible liquid	100,000,000-499,999,999	100,000,000-49,999,999	Offsite pipeline in Iberville Parish, LA
Crude Oil, Petroleum flammable and combustible liquid	1 billion > 1 billion	1 billion> 1 billion	Six underground storage caverns in salt dome & site piping
Diesel Fuel	10,000-99,999	10,000-99,999	Fuel stn, flood pump & generators near SW exit water pumps near NW entrance
Gasoline	10,000-99,999	1,000-9,999	Fuel stn near SW exit emergency generator at disposal wells
Hazardous Waste, liquid or solid, N.O.S.	1,000-9,999	100-999	Laydown yard and satellite areas
Hydrochloric Acid, Mixture (HCl,HF)	100,000-999,999	10,000-99,999	Disposal wells
Oil, Flammable and Combustible	1,000-9,999	100-999	Maint bldg, flammable stg bldg, laydown area
Paint, Flammable or Combustible	1,000-9,999	1,000-9,999	Flammable stg bldg & maint bldg
Thinners, Flammable or Combustible	100-999	100-999	Flammable stg bldg
Visco 1152 Biocide	10,000-99,999	1,000-9,999	Pig trap at NE

* Adj - Adjacent
AFFF - Aqueous Film Forming Foam
avg - average
bldg - building
lbs - pounds
maint - maintenance
max - maximum
NE - northeast
NW - northwest
ops - operations
stn - station
SW - southwest

Table 5-17. QUANTITIES/LOCATIONS OF HAZARDOUS SUBSTANCES/CHEMICALS AT BIG HILL

Chemical Name/Category	Amount lbs* Max Daily	Amount lbs* Avg. Daily	Location
1,1,2 Trichloro - Trifluoroethane	100-999	100-999	Lab
Ammonium Bisulfite	10,000-99,999	10,000-99,999	Near brine pond
AFFF, (butylcarbitol)	10,000,000-49,999,999	10,000,000 49,999,999	Drum stg in laydown yard, Fire systems at/near pump pads
Bromotrifluoromethane (Halon 1301)	1,000-9,999	1,000-9,999	Control bldg, control room, RWIS
Crude oil, petroleum, flammable and combustible liquid	10,000,000-49,000,000	10,000,000-49,000,000	Offsite pipelines in Jefferson County, TX
Crude oil, petroleum, flammable and combustible liquid	100,000,000-499,999,999	100,000,000-499,999,999	Tanks, piping & underground stg caverns across the salt dome
Diesel Fuel	10,000-99,999	10,000-99,999	Fuel stn & RWIS
Gasoline, including casing-head and natural (a volatile blend)	10,000-99,999	1,000-9,999	Fuel stn
Hazardous Waste, liquid or solid, N.O.S.	1,000-9,999	100-999	Laydown Yard & satellite stg
Oil, Flammable and Combustible	100-999	100-999	Warehouse, lab & RWIS
Paint, Flammable or Combustible	1,000-9,999	1,000-9,999	Laydown yard, RWIS, lab & warehouse
Small Arms Ammunition	100-999	100-999	Security trailer
Thinners, Flammable	100-999	100-999	Flammable stg in laydown area, warehouse, RWIS, & lab

* lab - laboratory
RWIS - raw water intake structure

Table 5-18. QUANTITIES/LOCATIONS OF HAZARDOUS SUBSTANCES/CHEMICALS AT BRYAN MOUND

Chemical Name/Category	Amount lbs Max Daily	Amount lbs Avg. Daily	Location
1,1,1-Trichloroethane	1,000-99,999	1,000-9,999	Laydown yard, flammable stg bldg, warehouse bldg & tool room
AFFF (butylcarbitol)	100,000-999,999	100,000-999,999	Fire systems throughout site, foam bldg, laydown yard, & excess yard
Antifreeze Compound, liquid	1,000-9,999	1,000-9,999	Laydown yard
Bromotrifluoromethane (Halon 1301)	1,000-9,999	1,000-9,999	Control room, motor control center
Calgon, cat-floc and polymer	1,000-9,999	1,000-9,999	Laydown yard & pump pad
Carbethoxy malathion insecticide	1,000-9,999	100-999	Laydown yard, flammable stg bldg & tool room
Compound, tree or weed killing liquid poison B	1,000-9,999	1,000-9,999	Laydown area, warehouse, & flammable bldg
Crude oil, petroleum, flammable and combustible liquid	50,000,000-99,999,999	50,000,000-99,999,999	Offsite pipelines in Brazoria County, TX
Crude Oil, petroleum, flammable and combustible liquid	1 billion < 1 billion	1 billion < 1 billion	Tanks, piping, & underground stg caverns across the salt dome
Diesel Fuel	10,000-99,999	10,000-99,999	Fuel stn and RWIS
Gasoline - including casing-head and natural (a volatile blend)	10,000-99,999	10,000-99,999	Fuel stn
Hazardous Waste liquid or solid, N.O.S.	1,000-9,999	100-999	Laydown yard & satellite stg

Chemical Name/Category	Amount lbs Max Daily	Avg. Daily	Location
Oil, flammable and combustible	10,000-99,999	1,000-9,999	Laydown yard, flammable stg bldg, & warehouse
Paints, flammable or Combustible	1,000-9,999	1,000-9,999	Flammable stg bldg
Propane or liquefied petroleum gas (supplied as pressurized)	10,000-99,999	10,000-99,999	Site motor control center
Thinners, flammable and combustible	1,000-9,999	1,000-9,999	Flammable storage & paint bldg, maintenance trailer

Table 5-19. QUANTITIES/LOCATIONS OF HAZARDOUS SUBSTANCES/CHEMICALS AT NEW ORLEANS

Chemical Name/Category	Amount lbs Max Daily	Amount lbs Avg. Daily	Location
Compound, Cleaning Liquid, Flammable Liquid	100-999	100-999	GSA* warehouse (Edwards Avenue), Elmwood complex bldgs, & graphic arts in 850 bldg
Ink, Flammable or Combustible	1,000-9,999	1,000-9,999	Elmwood complex bldgs near copy machines, stg rooms, & graphic arts in 850 bldg, GSA warehouse
Paint, Flammable or Combustible	100-999	100-999	GSA warehouse, graphic arts in Elmwood complex bldgs
Thinners, Flammable and Combustible	1,000-9,999	100-999	GSA warehouse, Elmwood complex bldgs, & graphic arts

* GSA - Government Services Administration

Table 5-20. QUANTITIES/LOCATIONS OF HAZARDOUS SUBSTANCES/CHEMICALS AT ST. JAMES TERMINAL

Chemical Name/Category	Amount lbs Max Daily	Amount lbs Avg. Daily	Location
Acid, Liquid, N.O.S.	100-999	100-999	Lab, Flammable stg, laydown area
AFFF (butylcarbitol)	10,000-99,999	10,000-99,999	Containers in fire truck bay, Fire systems on main site and dock
Antifreeze Compound, liquid	100-999	100-999	Flammable stg, laydown area, & lab
Bromotrifluoromethane (Halon 1301)	100-999	100-999	Control room in OPS bldg
Compound, cleaning, liquid, combustible liquid	1,000-9,999	100-999	Lab, OPS, warehouse, maint bldg
Compound, tree or weed killing, liquid poison B	100-999	100-999	Laydown area
Compressed gas (except helium, neon, argon, krypton, xenon)	1,000-9,999	1,000-9,999	Lab, meter stn, inside & outside of OPS bldg
Crude oil, petroleum flammable and combustible liquid	10,000,000-49,999,999	10,000,000-49,999,999	Offsite pipelines in St. James Parish, LA
Crude oil, petroleum flammable and combustible liquid	500,000,000-999,999,999	100,000,000 499,999,999	Six large tanks, onsite piping & sumps
Diesel Fuel	10,000-99,999	10,000-99,999	Fuel stn in laydown area, dock fire pumps, emergency generators along south site fence, & fire pump near fuel stn

Chemical Name/Category	Amount lbs Max Daily	Avg. Daily	Location
Gasoline	10,000-99,999	1,000-9,999	Fuel stn in laydown area
Hazardous Waste, liquid or solid N.O.S.	100-999	0-99	Laydown yard & satellite areas
Oil, Flammable and Combustible	1,000-9,999	1,000-9,999	Flammable stg bldg, lab, flammable cabinet OPS bldg
Paint, Flammable or Combustible	1,000-9,999	1,000-9,999	Flammable stg bldg, & paint shed near laydown area
Propane or Liquified petroleum gas supplied as pressurized	10,000-99,999	1,000-9,999	Lab, fire pumps, flammable stg near laydown area
Silica, Crystalline-quartz	100-999	100-999	Laydown area
Thinners, Flammable and Combustible	1,000-9,999	1,000-9,999	Flammable stg bldg, near laydown area, laydown area & lab
Visco 1152 Biocide	10,000-99,999	10,000-99,999	West end main site

Table 5-21. QUANTITIES/LOCATIONS OF HAZARDOUS SUBSTANCES/CHEMICALS AT SULPHUR MINES

Chemical Name/Category	Amount lbs Max Daily	Avg. Daily	Location
AFFF (butylcarbitol)	10,000,000	10,000-99,999	Laydown yard drum stg
Bromotrifluoromethane (Halon 1301)	100-999	100-999	Primary site area control room
Crude oil, petroleum flammable and combustible liquid	50,000,000-99,999,999	50,000,000-99,999,999	Offsite pipelines in Calcasieu Parish, LA
Crude oil, petroleum flammable and combustible liquid	1 billion > 1 billion	1 billion > 1 billion	Underground stg caverns in salt dome & site piping
Diesel Fuel	10,000-99,999	10,000-99,999	Primary site flammable stg area & fuel stn, secondary site firewater pumps, RWIS
Gasoline	10,000-99,999	1,000-9,999	Primary site are fuel stn
Hazardous Waste liquid or solid N.O.S.	1,000-9,999	100-999	Laydown yard & satellite areas
Oil, flammable and combustible	1,000-9,999	1,000-9,999	Primary site drum stg area & paint shed
Paint, flammable or combustible	1,000-9,999	1,000-9,999	Primary site area paint shed
Propane or liquified petroleum gas supplied as pressurized	10,000-99,999	1,000-9,999	Primary site motor control center secondary site subsidence area
Small Arms Ammunition	1,000-9,999	1,000-9,999	Primary site area
Visco 1152 Biocide	1,000-9,999	1,000-9,999	Primary site area meter skid

Table 5-22. QUANTITIES/LOCATIONS OF HAZARDOUS SUBSTANCES/CHEMICALS AT WEEKS ISLAND

Chemical Name/Category	Amount lbs Max Daily	Avg. Daily	Location
Acrylate	10,000-99,999	10,000-99,999	Laydown area drum storage
AFFF (butylcarbitol)	10,000-99,999	10,000-99,999	Fire equipment & maint bldg & foam stg bldg
Ammonium Nitrate Fertilizer	100-999	100-999	Laydown area
Ammonium Persulfate	1,000-9,999	100-999	Laydown area
Antifreeze Compound, Liquid	1,000-9,999	1,000-9,999	Laydown area
Bromotrifluoromethane (Halon 1301)	10,000-99,999	10,000-99,999	Control room in OPS bldg, mine service shaft
Compound, cleaning, liquid, combustible liquid	1,000-9,999	100-999	Laydown area flammable storage, warehouse, main site area control bldg
Compressed gases, N.O.S., flammable and nonflammable (excluding propane)	1,000-9,999	100-999	Laydown area flammable stg bldg
Crude Oil, petroleum flammable and combustible liquid	1,000,000-9,999,999	1,000,000-9,999,999	Offsite pipeline in Iberia Parish, LA
Crude Oil, petroleum and combustible liquid	1 billion > 1 billion	1 billion > 1 billion	Underground storage cavern in salt dome & site piping
Diesel Fuel	10,000-99,999	1,000-9,999	Fuel stn in laydown area, fire water stg area, production shaft area, & main site near emergency generator

Chemical Name/Category	Amount lbs Max Daily	Avg. Daily	Location
Gasoline	1,000-9,999	1,000-9,999	Fuel station in laydown area
Hazardous Waste, liquid or solid, N.O.S.	1,000-9,999	100-999	Laydown yard & satellite areas
Insecticide, Liquid, N.O.S.	1,000-9,999	100-999	Laydown area, flammable storage bldg.
Oil, Flammable and Combustible	1,000-9,999	1,000-9,999	Laydown area, flammable storage, bldg
Paint, Flammable and Combustible	1,000-9,999	1,000-9,999	Laydown area paint shed & flammable stg bldg
Phosphoric Acid	100-999	100-999	Laydown area drum rack & shed
Propane or Liquified Petroleum Gas supplied as pressurized	10,000-99,999	10,000-99,999	At approach to fill area & laydown area flammable stg bldg
Thinners, flammable and combustible	1,000-9,999	100-999	Laydown area paint shed

Table 5-23. QUANTITIES/LOCATIONS OF HAZARDOUS SUBSTANCES/CHEMICALS AT WEST HACKBERRY

Chemical Name/Category	Amount lbs Max Daily	Avg. Daily	Location
1,1,1-Trichloroethane	1,000-9,999	100-999	Warehouse & flammable stg bldg
Acetylenic alcohols	100,000-999,999	100-999	Disposal wells
AFFF (butylcarbitol)	100,000-999,999	100,000-999,999	Foam stg bldg, (site fire systems)
Ammonium bisulfite, solution	100,000-999,999	100,000-999,999	West of brine pond
Antifreeze compound, liquid	1,000-9,999	100-999	Property yard
Bromotrifluoromethane (Halon 1301)	1,000-9,999	1,000-9,999	Control room & lab
Compound, cleaning, liquids flammable liquid	100-999	0-99	Warehouse, OPS & main bldg
Compound, Rust Preventing or Rust Removing	100-999	100-999	Site warehouse & and flammable stg bldg.
Crude oil, petroleum, Flammable and Combustible liquid	10,000,000-49,999,999	10,000,000 49,999,999	Offsite pipeline in Cameron Parish, LA
Crude oil, petroleum, flammable and combustible liquid	1 billion > 1 billion	1 billion > 1 billion	Underground storage caverns in salt dome & site piping
Diesel Fuel	10,000-99,999	1,000-9,999	Site fuel stn, & workover yard
Epoxy Grout	1,000-9,999	1,000-9,999	Site warehouse
Gasoline	1,000-9,999	1,000-9,999	Site fuel stn
Hazardous Waste, liquid or solid, N.O.S.	1,000-9,999	100-999	Laydown yard & satellite areas

Chemical Name/Category	Amount lbs Max Daily	Avg. Daily	Location
Hydrochloric Acid, Mixture (HCl, HF)	10,000-99,999	100-999	Disposal wells
Oil, Flammable and Combustible	1,000-9,999	1,000-9,999	Warehouse, property yard, & flammable stg bldg
Paint, Flammable or Combustible	1,000-9,999	1,000-9,999	Flammable storage & warehouse bldgs
Propane or Liquefied Petroleum Gas supplied as pressurized	10,000-99,999	10,000-99,999	Maint bldg, motor control center, & site fire training area

Table 5-24. QUANTITIES/LOCATIONS OF HAZARDOUS SUBSTANCES/CHEMICALS IN OFFSITE PIPELINES

Chemical Name/Category	Amount lbs Max Daily	Avg. Daily	Location
Crude Oil, Petroleum, flammable and combustible liquid	10,000,000-49,999,999	10,000,000 49,999,999	Offsite pipelines in St. Martin Parish, LA
Crude Oil, Petroleum, flammable and combustible liquid	50,000,000-99,999,999	10,000,000-49,999,999	Offsite pipelines in Assumption Parish, LA
Crude Oil, Petroleum, flammable and combustible liquid	1,000,000-9,999,999	1,000,000-9,999,999	Offsite pipelines in Ascension Parish, LA
Crude Oil, Petroleum, flammable and combustible liquid	10,000,000-49,999,999	10,000,000-49,999,999	Offsite pipelines in St. Mary Parish, LA
Crude Oil, Petroleum, flammable and combustible liquid	10,000,000-49,999,999	10,000,000-49,999,999	Offsite pipelines in Galveston County, TX
Crude Oil, Petroleum, flammable and combustible liquid	10,000,000-49,999,999	10,000,000 49,999,999	Offsite pipelines in Orange County, TX

6. HYDROLOGY AND GROUNDWATER MONITORING

Groundwater monitoring is performed at Bayou Choctaw, Big Hill, Bryan Mound, and West Hackberry. Salinities are monitored although well monitoring is not required by any Federal or state regulations or permits.

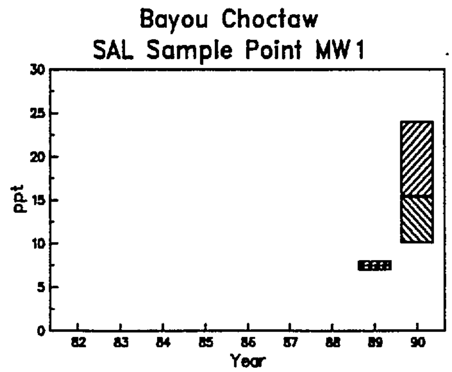
Groundwater monitoring will be expanded in 1991 and 1992 at all sites through resistivity/conductance and soil hydrocarbon vapor testing for brine and crude oil soil contamination, respectively. Confirmation of contamination will be made through groundwater sampling. Wells will be installed in number and location in response to soil testing results.

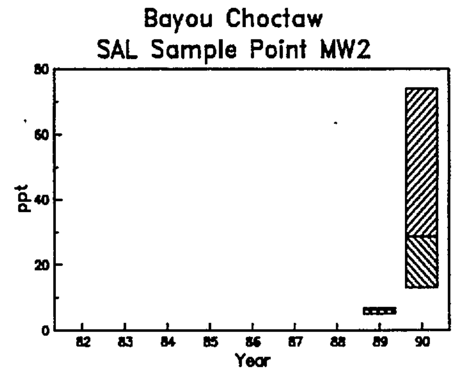
Background information is not available on the construction and installation of some of the existing monitoring wells which presents problems when interpreting data. The groundwater characteristics of each site are discussed within each site section.

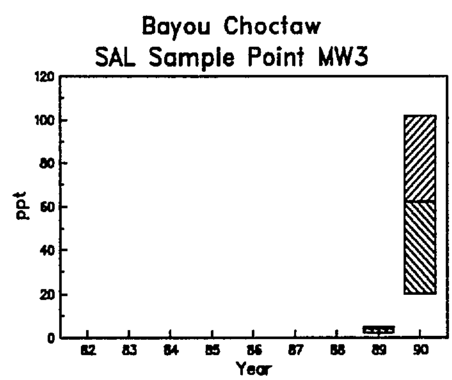
6.1 BAYOU CHOCTAW

The Plaquemine Aquifer is the main source of fresh water for the site and several surrounding municipalities. It is located approximately 18 m (60 ft) below the surface and extends to a depth of 150 to 182 m (500-600 ft). The upper 18 m (60 ft) of sediments in the aquifer consist of Atchafalaya clay. The interface of freshwater and saline water occurs at a depth of 122 to 150 m (400-500 ft) below the surface. Groundwater in the Plaquemine Aquifer communicates with the Mississippi River flowing away from it during the high river stage and towards the river in the low stage.

Three monitoring wells were installed at the Bayou Choctaw facility in September 1989. Initial sampling has indicated low salinity levels both upgradient and downgradient. Sampling will continue throughout 1991. Salinities increased with monitor well production during 1990. The cause of this salinity fluctuation has not yet been ascertained.





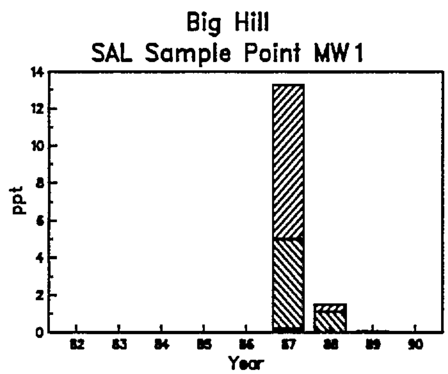


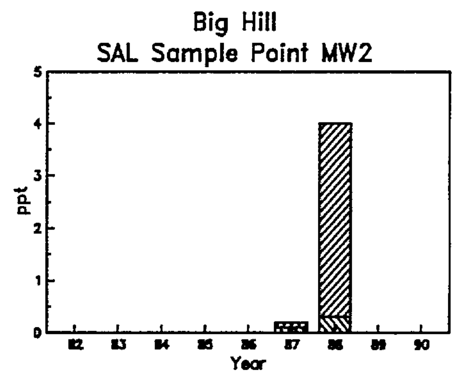
6.2 BIG HILL

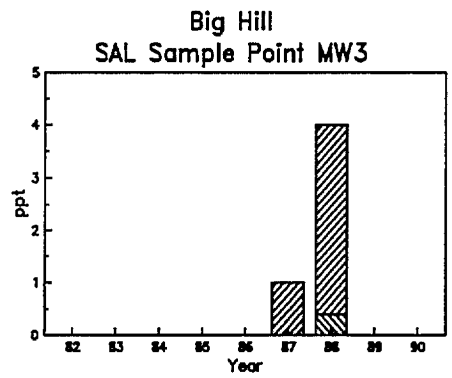
The three major subsurface hydrological formations in the Big Hill area are the Chicot and Evangeline aquifers and the Burkville aquiclude. The major source of fresh water is the Chicot Aquifer which is compressed over the Big Hill salt dome. Fresh water in the upper Chicot Aquifer at Big Hill is limited from near the surface to a depth of -30 m (-98 ft) mean sea level.

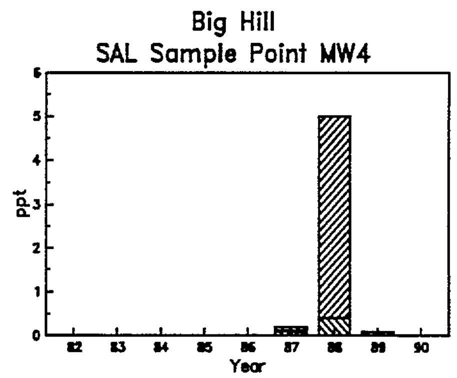
The town of Winnie uses fresh water from the upper Chicot Aquifer. Beaumont and Port Arthur draw fresh water from the lower Chicot Aquifer.

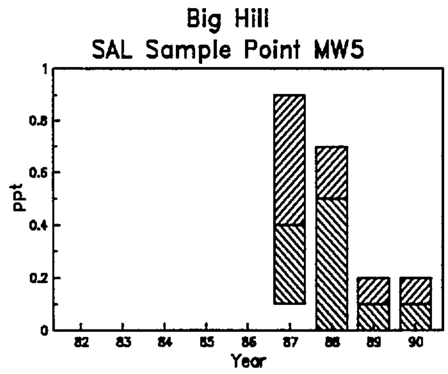
Six monitoring wells were installed around the brine disposal pond system and were sampled for the first time in September 1987. Data collected for the past three years indicate a consistency between monitor wells. The wells are also consistent within each parameter indicating acceptable conditions between upgradient MW 1, 2, and 3 and downgradient MW 4, 5, and 6 wells with no apparent leakage at the brine pond. Monitoring of these wells will continue so that a trend can be established.

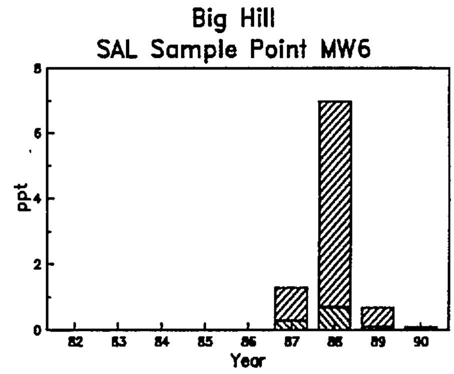












6.3 BRYAN MOUND

The Chicot and Evangeline Aquifers are fresh and slightly saline in the Bryan Mound area. Fresh water for Brazoria County is obtained from the upper portions of the Chicot Aquifer.

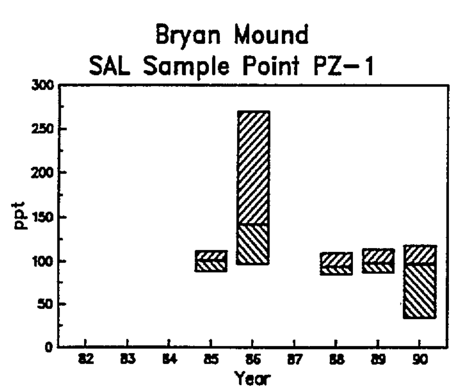
Over the salt dome, fresh water is thought to occur in the upper 24 m (79 ft) with slightly saline water from a depth of 24 to approximately 69 m (79 to 226 ft). However, the wells drilled on site for rig water are all brackish.

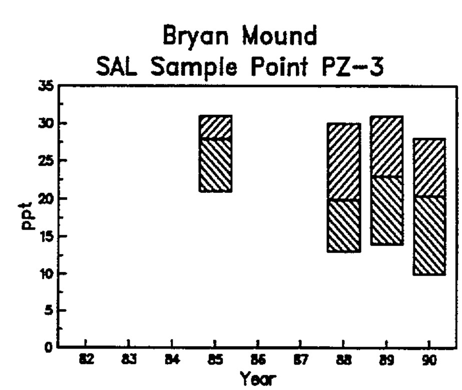
The sampling of two existing monitoring wells, PZ1 and PZ3 began again in April of 1988. Installation and sampling of two additional monitoring wells, BP1 and BP2 began in December of 1988. Three monitoring wells (MW1, MW2, and MW3) were installed in August of 1989 and seven more (M1-D, MW2-D, P21-D, MW3-D, MW4-S, MW4-D, and MW5-S) were installed in 1990. BP2, crushed by a bulldozer, is out of service.

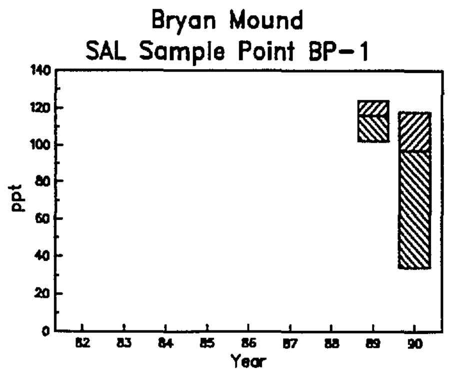
Monitor Wells PZ-1 and BP-1 istalled in April and December of 1988, respectively, exhibited high salinities which have remained high since their installation. This leads to the conclusion that the wells are receiving a continuous instrusion of chloride compounds (salts), probably originating from the large brine pond. Monitor well MW1 exhibited a high salinity due either to a pre-existing condition resulting from DOW Chemical Co. activities or to chloride loss from the small brine pond which is now closed and covered. Monitor Wells MW3, near the southwest corner of the large brine pond and MW2, near the maintenance shop laydown area, both exhibit low salinity which may indicate that they may fall outside of the brine plume formation. The MW series wells are the most recently drilled and have not provided a sufficient amount of reliable data. The large brine pond was built over a pre-existing unlined DOW Chemical Co. brine pond.

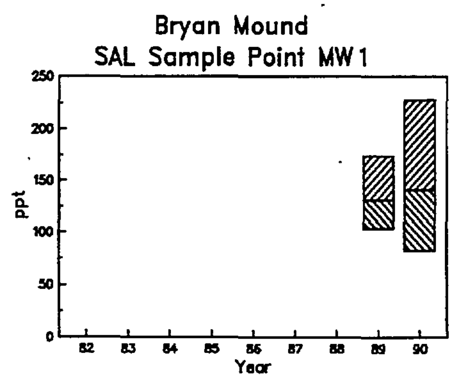
Results of a recent groundwater study performed by an outside contractor indicate that brine loss to the first aquifer is occurring around the existing pond. Brine sources could be the pond or adjacent buried piping. There are no indications that the second (deeper) aquifer has been affected by DOE activities.

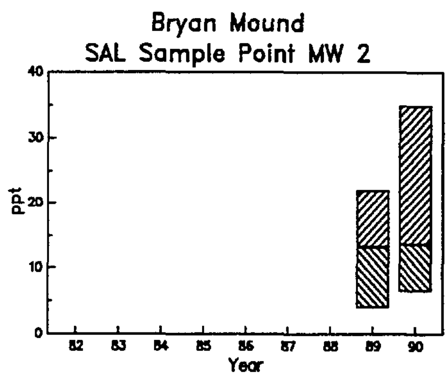
Buried piping will be leak tested and repaired if defective. If subsequent groundwater data continues to indicate leakage, horizontal wells will be installed underneath the pond to check for leakage. If leakage is evident, the pond liner will be repaired. Due to the tight characteristics of the surface clay, a substantial drop in groundwater salinity at the monitoring wells may not become evident for several years.

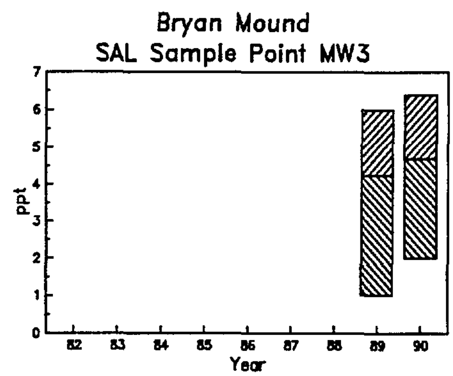












6.4 ST. JAMES

The Chicot Aquifer is the principal regional aquifer at St. James. The upper strata of the Chicot Aquifer is in direct hydrologic contact with the Mississippi River. Most of the groundwater contained in this aquifer is slightly brackish. In the St. James area only the uppermost units contain fresh water. There are no groundwater monitoring wells at the St. James site.

6.5 SULPHUR MINES

The main aquifers in the vicinity of Sulphur Mines are the Chicot, Evangeline, and Jasper. The Chicot Aquifer provides a fresh water source for public and industrial use to the towns of Hackberry, Lake Charles, and Sulphur. The Evangeline and Jasper Aquifers are saline. The Evangeline Aquifer is used for salt water disposal in the Lake Charles area. There are no groundwater monitoring wells on the Sulphur Mines site.

6.6 WEEKS ISLAND

The Chicot formation is the principal aquifer in the Weeks Island area. The aquifer surface is at approximately sea level near Weeks Island and slopes slightly northwest towards a cone of depression attributed to heavy withdrawals in the Lake Charles area. The fresh water sand layers provide water for the local area. There are no groundwater monitoring wells at Weeks Island.

6.7 WEST HACKBERRY

There are three shallow aquifers found in the vicinity of the West Hackberry site. The Chicot Aquifer, which flows closest to the surface in the Hackberry area, contains predominantly fresh water with salinity increasing with proximity to the coast. The Evangeline Aquifer flows under the Chicot and the Jasper Aquifer.

The majority of the groundwater pumping from the Chicot Aquifer takes place in the Lake Charles area. The pumping is so great that a cone of depression has been created which has reversed the flow direction to the north. The fresh/saline water interface is approximately 200 m (700 ft) below the surface.

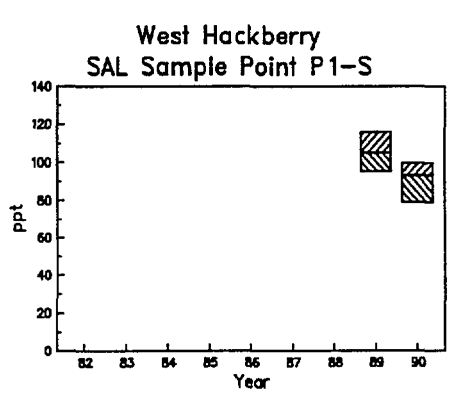
There are 18 monitoring wells (Figure 5-7) on the West Hackberry site. Four of these monitoring wells have been sampled monthly since 1982. Eight monitoring wells were installed in 1988, two were installed in 1989, and five were installed in 1990. One of the original four monitoring wells (PB1) was plugged and abandoned in 1989 due to a casing failure. Well logs and background information on construction and installation are lacking for the other three wells installed prior to 1982.

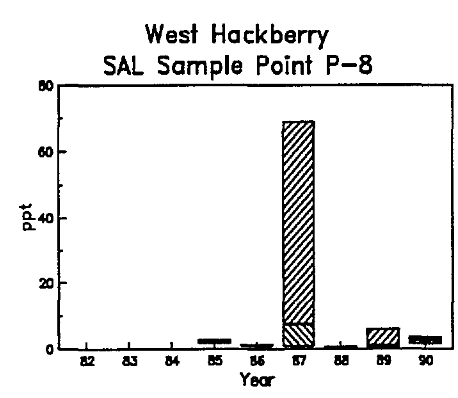
Continuous pump downs (evacuation) of wells P1-S and P3-S (wells were relatively consistent) exhibited a slight decrease in salinity. P5 exhibited an increase in salinity toward the end of 1989. Groundwater studies performed this year by an outside contractor indicate that continuous sources of brine contamination exist around the pond system. These sources include the ponds, adjacent buried piping, and possibly the brine pump sumps. Groundwater recovery pumping at wells P1-S, P3-S, and P-5 is not sufficient to contain the brine plume. Additional recovery wells will be installed in the vicinity of the ponds, and several monitoring wells presently in place will be fitted for pumping duty.

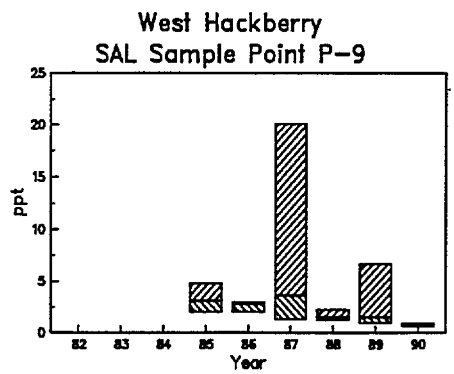
During groundwater recovery, buried piping around the pond system will be leak tested and repaired if defective. A brine and anhydrite pond repair will also be designed and implemented when budgeted.

Continued pump down should eventually result in a reduction of groundwater salinity. Additional wells planned for 1990 should provide additional information on the source of the salinity and provide recovery alternatives.

pH and salinity remained fairly low and consistent in wells P8 and P9, a drop in salinity along with an approach to neutral pH was found in P11.






West Hackberry
SAL Sample Point P-9
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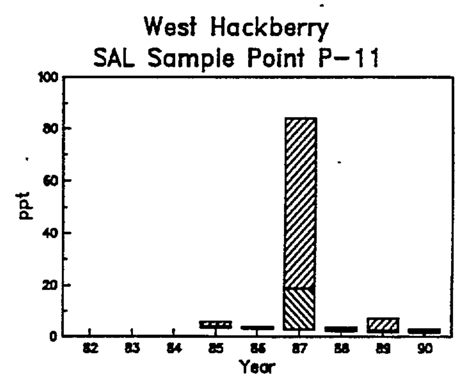
West Hackberry
SAL Sample Point P-11
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Year
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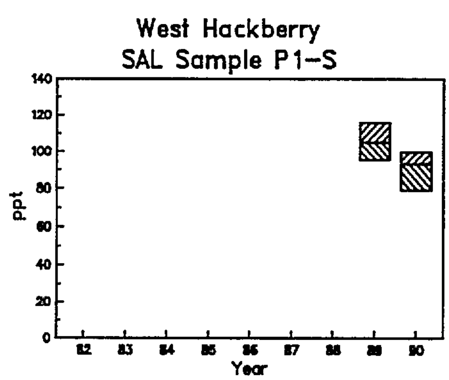
West Hackberry
SAL Sample P1-S
ppt
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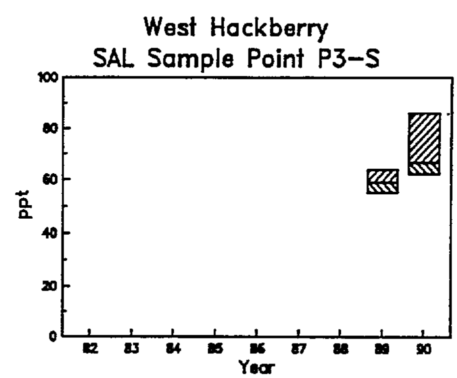
West Hackberry
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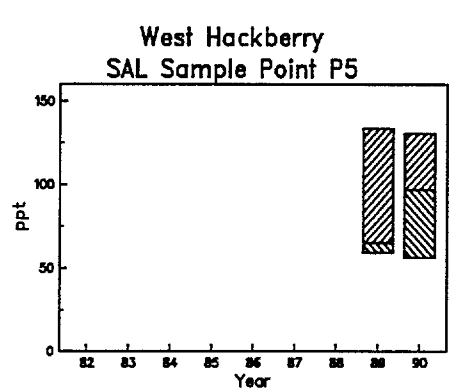
West Hackberry
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7. QUALITY ASSURANCE

The SPR sites undergo periodic evaluation throughout the year in the form of internal audits as well as audits by outside federal and state agencies. The structured laboratory quality assurance program has continued through the systematic application of acceptable accuracy and precision criteria at SPR laboratories. Compliance with this and other environmental program requirements was reviewed and evaluated at each site by means of the Management and Operating (M&O) contractor's annual audits and audits at select sites by state and federal environmental agencies.

7.1 FIELD QUALITY CONTROL

All field environmental monitoring and surveillance activities are performed in accordance with standard procedures contained in the BPS Environmental Programs and Procedures Manual. These procedures include maintenance of chain-of-custody, collection of quality control (QC) samples, and field documentation. BPS site operations personnel are routinely trained in the implementation of these procedures.

7.2 EPA DISCHARGE MONITORING REPORT QUALITY ASSURANCE STUDY

The EPA entered the tenth year of its Discharge Monitoring Report Quality Assurance (DMR-QA) program. Through this program EPA provides analytical laboratories of major NPDES dischargers blind samples of permit parameters for analysis. Due to budgetary constraints EPA narrowed its 1989 list of participants in the DMR-QA program. The SPR was removed from the list apparently due to erroneous classification of Big Hill, Bryan Mound, and West Hackberry as minor dischargers. These facilities will be reinstated as participants by 1991.

7.3 SPR LABORATORY ACCURACY AND PRECISION PROGRAM

The SPR laboratory quality assurance program is based on the U.S. EPA Handbook for Analytical Quality Control in Water and Waste Water Laboratories. This program focuses on the use of analyses of field and laboratory spikes, standard recoveries, split samples, and blanks at regular intervals to determine the accuracy and precision of analyses. Duplicate analyses and matrix spikes are performed on every tenth sample, of each analysis type, using the methods listed in Table 7-1. Several hundred of these quality assurance analyses were performed in addition to the 1990 discharge compliance analyses to verify the continuing high quality of SPR laboratory data.

The EPA quality control document advocates use of quality control charts to maintain and evaluate accuracy and precision data. The SPR has developed software for the Hewlett-Packard 41CX handheld computer to allow rapid and exact determinations of accuracy and precision without the necessity of quality control chart preparation. The listing below summarizes the QA data by site. Accuracy and precision data was generated for the West Hackberry lab only.

TEST TYPE	SITE	N	STD.DEV.(avg)
Accuracy	WH	1779	7.760
Precision	WH	510	25.377

N = Number of determinations through 1990
STD.DEV. (avg)= Cumulative Average Standard Deviations

Due to staffing limitations and SPR QA Program familiarity the remaining sites performed the QA/QC analyses indicated in table below.

	DUPS/REPS	SPIKE RECOVERIES
BC	181	31
BH	802	288

DUPS/REPS = Duplicate or replicate analyses

Table 7-1. SPR WASTEWATER LABORATORY ANALYTICAL METHODOLOGY

Analysis Determination	Method	Source*	Description
Biochemical Oxygen Demand	507 405.1	SM-16 EPA	5 Day, 20°C 5 Day, 20°C
Chemical Oxygen Demand	410.4	EPA	Colorimetric Instrument
Fecal Coliform	909C	SM-16	Membrane Filter
Residual Chlorine	330.4	EPA	Titrimetric
Oil & Grease	413.1 503A	EPA SM-16	Separatory Funnel Extraction Separatory Funnel Extraction
Total Organic Carbon	415.1 505B	EPA SM-16	Combustion/Oxidation Combustion/Oxidation
Dissolved Oxygen	360.1 360.2 421B	EPA EPA SM-16	Membrane Electrode (Field) Winkler Method (Lab) Electrometric
Hydrogen Ion Conc.	150.1 423	EPA SM-16	Electrometric Electrometric
Total Dissolved Solids	160.1 209A	EPA SM-16	Gravimetric, 180°C Gravimetric, 180°C
Total Suspended Solids	160.2 209B	EPA SM-16	Gravimetric, 103-105°C Gravimetric, 103-105°C

*EPA = U.S. Environmental Protection Agency, Methods for Chemical Analysis of Water and Waste, Document No EPA - 600/4-79-020, March 1983.

SM-16 = American Public Health Association, et al., Standard Methods for the Examination of Water and Wastewater, 16th Ed., 1985.

Standard Deviation is used to monitor changes in the accuracy and precision of specific analyses at specific sites. A trend 7 analysis is applied to this Standard Deviation Data (per the EPA Handbook for Analytical Quality Control) to identify degradation of accuracy and precision. Identification of a trend 7 error, or a tendency towards this error, causes the chemist to examine procedures, instrumentation, and reagents for the source of error.

7.4 ENVIRONMENTAL AUDITS AND INSPECTIONS

In addition to federal and state regulatory agency audits, the M&O contractor conducts an annual environmental audit at each site. Internal audits are conducted in accordance with a detailed audit check list which addresses the pertinent aspects of all environmental programs and activities. Each audit is performed over a two to three-day period followed by an outbriefing with site management and preparation of a formal audit report with specific recommendations as appropriate. Audit areas include environmental records, laboratory procedures and records, site housekeeping, operating procedures, training, environmental response equipment, and permit regulatory compliance. A general field inspection of the site environs is also conducted to assess the general site conditions, changes attributable to site impacts, and the effects of planned and proposed site construction modifications.

The 1990 environmental audit at each SPR site showed the overall implementation and execution of the SPR Environmental Program to be excellent.

Those areas noted needing improvement have generally been in missing reports and recordkeeping. Specific corrective actions are tracked through completion.

Audits and inspections were conducted in 1990 by the EPA, COE, TACB, RCT, LDEQ, LDNR, TDH, USCG, and DOE. Findings reported during 1990 by those state and federal regulatory agencies that performed compliance inspections were generally consistent with SPR findings. The areas identified by regulatory agencies have all been resolved and are discussed in detail below. Such positive findings are attributed to the high level of environmental awareness exhibited among all site personnel and the emphasis SPR management has placed on fulfilling the intent and conditions of the SPR Environmental Program.

The TACB performed a compliance inspection had had one finding resulting in NOV. The finding consisted of an interpretive change in monitoring requirements for valves, pumps, and pump seals in active service. Until a definitive interpretation is received, the SPR has agreed to monitor all valves, pumps, and pump seals.

The RCT cited the SPR for failure to submit a year end (H-10) report for one well. This was an apparent oversight as all other H-10 reports had been submitted. The missing report was submitted closing the action.

On two occasions the LDNR identified missing well status reports. Those reports have since been submitted, closing the action. The SPR has initiated a tracking system specifically for these routine reporting requirements to preclude their recurrence.

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