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ENGINEER DISTRICT NEW ORLEANS LA APR 82

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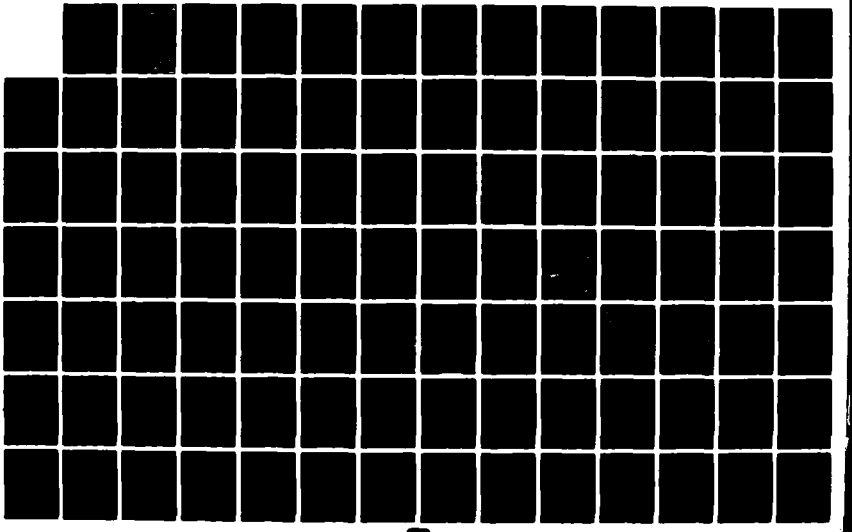

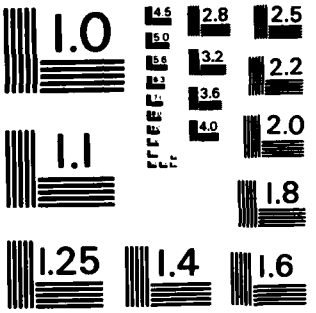

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FINAL

ENVIRONMENTAL IMPACT STATEMENT

AD-A135266

PUBLIC WATER SUPPLY

Red River Parish, Louisiana

U.S. Army Engineer District, New Orleans
Corps of Engineers
New Orleans, Louisiana

DTIC FILE COPY

April 1982

FINAL
ENVIRONMENTAL IMPACT STATEMENT

Public Water Supply
Red River Parish, Louisiana

The responsible lead agency is the U.S. Army Engineer District, New Orleans.
The responsible cooperating agencies are:

U.S. Fish and Wildlife Service;
Environmental Protection Agency;
Louisiana Department of Wildlife and Fisheries
Office of Public Works, Louisiana Department of Transportation and Development

Abstract: Red River Parish, located in northwest Louisiana, is without an adequate supply of good quality potable water. This Environmental Impact Statement addresses alternatives which would produce a new source of water and a resulting increase in economy through new industry and residential growth. From a total of 11 alternatives considered, two alternatives were considered by the U.S. Corps of Engineers to be reasonable alternatives. The two reasonable alternatives discussed in this Environmental Impact Statement are: (1) withdrawal of water and the construction of a transmission pipeline from the Red River and (2) a reservoir built on the Grand Bayou near Coushatta, Red River Parish, and the construction of a transmission pipeline from the reservoir. The permit application is for a Section 404 permit. This Final Environmental Impact Statement covers the proposed work advertised by public notice LMNOD-SP (Grand Bayou)132, dated 27 December 1977. The Draft Environmental Impact Statement was officially filed with the Environmental Protection Agency on 19 March 1981 and the Notice of Availability appeared in the Federal Register dated 27 March 1981 on page 19074.

SEND YOUR COMMENTS TO THE DISTRICT ENGINEER BY

District Engineer
U.S. Army Engineer District,
New Orleans
P.O. Box 60267
New Orleans, Louisiana 70160
ATTN: LMNOD-SA

If you would like further information on this statement, please contact:
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SUMMARY

INTRODUCTION

Permit Application. In December, 1977, the Black Lake Bayou Recreation and Water Conservation District of Red River Parish(also referred to as the Grand Bayou Reservoir Commission) submitted an application to the Department of the Army, Corps of Engineers, New Orleans District, to install and maintain a dam, spillway, and appurtenances to form a reservoir for municipal and industrial water supply with attendant incidental recreational value. The proposed location of the project is across Grand Bayou at a point 4.1 miles above the mouth of the waterway approximately 7.5 miles east of Coushatta, Red River Parish, Louisiana. The District Engineer determined that an environmental impact statement was required for the proposed project pursuant to the National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321, et seq., in compliance with the regulations of the Council on Environmental Quality, 40 CFR, Parts 1500-1508, November 29, 1978.

The U.S. Corps of Engineers has required this report to insure a thorough evaluation of both the beneficial and adverse impacts of the proposed project, the impacts of no action, and the impacts of reasonable alternatives. Funds for construction of the proposed Grand Bayou Reservoir will be provided by the State of Louisiana.

Project Purpose and Needs. The primary purpose of this project is to supply municipal, industrial, and agricultural water. Water for domestic users will be furnished to the entire portion of the parish located on the east side of Red River, while the non-domestic users are located in general in the area surrounding the reservoir and in particular in the vicinity of Coushatta. It is upon this premise that alternatives were developed, evaluated, and resultant plan selection made.

If the Grand Bayou Reservoir alternative is selected, in addition to a municipal water supply, a recreation potential will be created. It is the intention of the Black Lake Bayou Recreation and Water Conservation District of Red River Parish to realize this potential in a manner which would benefit the general public's use and enjoyment. Recreation, however, is incidental to the water supply purpose. As such any recreational development as well as any other potential land and/or water uses will be regulated by the Black Lake Bayou Recreation and Water Conservation District so as to insure that the primary purpose of this project, the provision of a water supply source, is not impaired. Because the Red River navigation project may provide recreation facilities for the Coushatta area, the Grand Bayou Reservoir will be constructed for the primary reason of water supply.

The need for water within the project area is expected to increase dramatically in future years. The 1970 water usage for the Grand Bayou

service area was 0.918 million gallons/day (mgd), according to the Feasibility Study for the Grand Bayou Reservoir, Ozarks Regional Commission, Vol. II-A, Schedule WM3, 1976. Gulf South Research Institute in a study published in 1979 entitled Present and Projected Water Requirements for Parishes and Major Drainage Basins, 1975-2000, projected the water demand for Red River Parish. Those projections are presented in Table 1.

TABLE 1

PROJECT WATER REQUIREMENTS FOR RED RIVER PARISH: 1975-2000

SOURCE	1975	1980	1990	2000
Ground Water (mgd)	7.020	18.990	22.732	26.478
Surface Water (mgd)	0.340	3.375	4.357	5.339
Total Water (mgd)	7.360	22.365	27.089	31.817

SOURCE: Present and Projected Water Requirements for Parishes, 1975-2000, GSRI, 1979.

The above table shows that the demand in Red River Parish for water will increase from 7.360 mgd in 1975 to 31.817 mgd in the year 2000, according to the Gulf South Research Institute (GSRI). When the report was written, GSRI stated that ground water sources could ideally supply approximately 26.48 mgd by the year 2000. GSRI correctly stated that most of the ground water would be used for agriculture because of its poor quality, i.e. high iron content. As of 1980, a capacity of about .542 mgd of ground water was available for portable use in the service area, according to Major Truman Crawford of Coushatta and records of Central Louisiana Electric Corporation (CLECO). Major Crawford stated further that the did not know "how long the wells would produce....and that the past history of drilling for water was discouraging, based on previous unsuccessful wells."

The limited availability of good quality water has inhibited economic development in this economically depressed rural area. The proposed project will provide water in sufficient quantity and quality to allow future municipal and industrial development. The area is presently undergoing rapid change due to the mining and processing of lignite coal in the vicinity. New industrial, commercial and residential growth is expected to occur in the next two decades. To support the growth and attendant demand for water, new water sources such as the Grand Bayou Reservoir project and existing water supplies will be used. Existing water sources will be used to supplement new water supplies.

The estimated water usage from the proposed Grand Bayou Reservoir is summarized in Table 2. The data is taken primarily from the Feasibility Study for the Grand Bayou Reservoir, Ozarks Regional Commission, Vol. II-A, 1976. This study is referred to as the "FDP" in Table 2. The preparers of the FDP used 1979 as a base year and considered in the 15th and 30th year for purposes of projection and calculation, hence the years 1993 and 2008 appear in the table.

Project Area.

(1) Location. Red River Parish is located in northwest Louisiana, an area that was defined as a major "energy impact area" in 1979 by the U.S. Department of Energy. Red River Parish is bordered by Caddo,

TABLE 2
ESTIMATED WATER DEMAND OF RED RIVER
PARISH FROM GRAND BAYOU RESERVOIR

NO.	ITEM	YEAR 1993	YEAR 2008	REMARKS
1.	Population	9455[1]	9990[2]	Yr. 1970 - Pop. 9461 1,2: From FDP, Vol. IIA, Pg. 1 Schedule WM-3 and Pg. SE-1
2.	Domestic/Commercial Usage	963,560 gpd	1,016,440 gpd	Derived from FDP, Vol. IIA, Pg. 1, Schedule No. SM-1, Without Peak Factor
3.	Farm Usage	-0-	479,450 gpd	"
4.	Industrial Usage	1,720,000 gpd	3,424,660 gpd	"
5.	Total	2,683,560 gpd	4,920,550 gpd	"
6.	Add 10(+) percent for growth	268,356 gpd	649,450 gpd	"
7.	Total say	2,951,916 2.95 mgd	5,570,000 5.57 mgd	
8.	Add 2.4 mgd for downstream req'd *	2.40 mgd	2.40 mgd	*Dept. of Wildlife and Fisheries requirement
GRAND TOTAL OF PROJECT DEMAND		5.35 mgd	7.97 mgd say 8.00 mgd	

SOURCE: "Feasibility for the Grand Bayou Reservoir," Vol. II-A, Ozarks Regional Commission, 1976.

Bossier, Bienville, Natchitoches, and DeSoto Parishes, the latter two having also been included in the "energy impact area" in the 1979 designation.

(2) Economic Conditions. Data from the 1970 U.S. Census of Population indicate a relatively depressed economy in Red River Parish. Red River Parish has:

--the lowest family income ($4,563) compared with the state average of $7,530;

--the highest percentage of families with incomes below the poverty level (40.0%), compared with the state average of 21.5%;

--the highest percentage of total population receiving public assistance (20.2%), compared with the state average of 11.3%;

--the highest percentage of total population receiving food stamps (31.1%), compared with the state average of 12.0%;

--the highest percentage of households lacking adequate plumbing (37.2%), compared with the state average of 10.6%, and

--the highest percentage of unemployment in 1970 (7.8%), compared with the state average of 5.4%.

The availability of an adequate public water supply for municipal and industrial use is critical to economic development in the parish. A secondary benefit created as a result of the fresh water reservoir will be the addition of recreational opportunities. However, recreation will be an indirect benefit because no extensive plans for new recreational facilities are anticipated due to the fact that recreational opportunities will result from the improvements on the Red River Waterway project.

ALTERNATIVES

Alternative Selection Process. The alternatives for study were identified in several scoping meetings with the U.S. Corps of Engineers. Representatives from the U.S. Corps of Engineers, the cooperating agencies and the applicant attended the scoping meetings.

Reasonable Alternatives. Two reasonable alternatives were selected for detailed study and analysis. Both of these alternatives appear to meet the applicant's needs in terms of water availability. This study will evaluate the quality of the water of both alternatives as it relates to the public's safety. The alternatives are:

1. Withdrawal of water from the Red River upstream of the International Paper Company's discharge point in Red River Parish, Louisiana;

2. Installation of a dam, spillway, and appurtenances to form a reservoir on Grand Bayou, Red River Parish.

Several other alternatives were analyzed in this report, but they were judged to be disqualified for purposes stated below in the report. A No Action alternative was also considered.

Alternatives Deemed Not Feasible. The following alternatives were presented in the scoping process. The research in this report show them not feasible.

-Groundwater. The existing groundwater sources for a public water supply are of doubtful quality or quantity. However, ground water supplies may play an important role in meeting the future requirements of the agricultural sector and isolated commercial and industrial demands. Groundwater from the Red River alluvium is available in substantial quantities, but is primarily limited to non-potable uses such as irrigation. Over the past twenty years, the U.S. Geological Survey and the Office of Public Works, State of Louisiana, Department of Transportation and Development, have conducted an extensive search for new groundwater supplies in Red River Parish. No new adequate supplies of water suited for potable usage were located. Therefore, this alternative was not included as a reasonable alternative even though existing sub-surface water will continue to be used in the future as is shown later in this report under the analysis of alternatives. Future use of sub-surface water will be essentially limited in terms of its systems application.

-Pipeline from Toledo Bend Reservoir. Toledo Bend Reservoir is located approximately 32 miles west of Coushatta on the Louisiana-Texas border. This alternative was not determined to be reasonable due to the long distance and difficult terrain encountered along possible pipeline corridors. The cost of building and operating a long distance pipeline for a relatively limited number of customers with limited water demand would be prohibitive.

-Black Lake. A written request to derive water (if found feasible and cost effective) from Black Lake was refused by the Northwest Louisiana Fish and Game Preserve Commission. Hence, this alternative was dropped from further consideration. A copy of the cited letter appears in Appendix J to this report.

-Lake Bisteneau. As in the case of Black Lake, permission was refused (by the Louisiana Department of Wildlife and Fisheries) for

usage of water from the lake as a public water supply for Coushatta and Red River Parish. Therefore, this possible alternative was dropped from further consideration. A copy of the cited letter appears in Appendix J to this report.

-Grand Bayou Reservoir plus water via a pipeline from Lake Bistineau. This alternative which could have allowed a reduction in the size of the Grand Bayou Reservoir could not be further evaluated when permission to withdraw water from Lake Bistineau was denied by the controlling authority.

-Grand Bayou Reservoir plus water via a pipeline from Black Lake. This alternative was dropped from consideration for the same reason stated above with respect to the potential combination of Grand Bayou Reservoir and Lake Bistineau.

-Grand Bayou plus existing wells. The existing wells have a present capacity which is less than seven percent of the proposed Grand Bayou Reservoir's design capacity of nearly 8 mgd (year 2000). Hence, the effect of combining existing wells with Grand Bayou in meeting the future water requirements for the Town of Coushatta and Red River Parish would result in a relatively small reduction in the designed size of the proposed reservoir. Further, any formal combination would result in the necessity for under-sizing the proposed reservoir by approximately 7 percent of required water volume. Further, the combination would prove to be more expensive than the design, construction, and operation of the proposed reservoir as the primary water supply source. Extensive drilling has resulted in the production of very little increased water supplies, according to reports from the U.S. Geological Survey and the State of Louisiana, Office of Public Works, Department of Transportation and Development. However, as discussed in Section 2 of the Draft Environmental Impact Statement, the existing wells will be retained as a backup service for other users. This report does not suggest the closing of the existing wells.

-Grand Bayou plus the Red River. The combination of both of these sources as a public water supply has been determined economically not feasible. This is true because in order to combine the Red River with the Grand Bayou Reservoir for a public water supply, two separate water systems would have to be designed, constructed, and maintained. Operational expenses would be appreciably more than if one single alternative were chosen. Use of Red River water in combination with water from Grand Bayou would require the development and operation of additional treatment facilities, pipelines and support systems. The case against using Red River water in combination with Grand Bayou water is similar to the case against using Red River water singly with respect to the basic quality of Red River water. If it were deemed feasible in terms of water quality to use Red River water in combination with water from Grand Bayou, it would be obvious that the

quantity of water, coupled with a holding facility, would be adequate for all the system's needs. The quality of Red River water is discussed in detail later in this report. Therefore, the alternatives of using these two sources in combination has been determined unfeasible.

- Grand Bayou Reservoir plus Red River plus existing wells. This potential combination was not considered any further because of the expense of simultaneously developing and operating three systems as opposed to one system.

BENEFICIAL/ADVERSE IMPACTS

Red River. The beneficial impacts of the Red River as a source of public water are its location near the Town of Coushatta and its ability to supply water to an expanding population; its abundant quantity of water for most periods of the year; and the relative economy of securing its water. Further, use of water from the Red River would be environmentally less harmful than alternative possibilities. Habitat modification in Red River Parish, if the Red River alternative were selected, would be less than if the Grand Bayou Reservoir alternative were selected. A settling pond would be necessary to remove material in suspension prior to treatment. The location of a pipeline from the Red River to Coushatta would cause the necessity of removing vegetative cover, but the route could be designed to minimize such environmental harm.

The adverse impacts of using Red River water for a public water supply are presented as follows. Water from the Red River is high in dissolved solids and chlorides derived from natural sources plus high counts of fecal coliform. Municipal effluent from Shreveport, Bossier City, and other locations immediately upstream from Coushatta account for the coliform deposits. Additionally, large quantities of putrescribles and attendant leachates are deposited in the Red River upstream from Coushatta by the City of Shreveport and Bossier City, both of which operate river-side garbage dumps. A new International Paper Company containerboard complex will begin discharging effluent treated by an overland flow scheme of land application in the Red River in 1981. The point of discharge is approximately thirteen river miles upstream of Coushatta. It is the opinion of International Paper Company, Southwest Electric Power Company, Pineville Kraft Paper Company, and Sunbeam Industries that water from the Red River can not be used for their operations because of its high content of solids and other pollutants and for that reason those industries have used alternative water supplies.

Further, proposed navigation and commercial traffic on the Red River could adversely impact the availability or water for domestic use. In an April 20, 1979, report by the U.S. Corps of Engineers, New Orleans, (LMNED-DL) it was stated that the following volumes of commercial traffic are anticipated:

Year	Projected Tonnage	Estimated minimum flow required (cubic ft per second) (cfs)
1988 *	2,476,000	411
1998	3,616,000	467
2008	5,008,000	544
2018	6,803,000	670
2028	9,346,000	852
2038	12,316,000	1,056

*Estimated first year of full operation.

The report states that the required minimum flow to support navigation of 1,056 c.f.s. (projected for year 2038) did not occur in the Red River for 46 days in 1956, 18 days in 1963, 4 days in 1964, 1 day in 1972 and 12 days in 1977. The average flow at Shreveport is 24,020 c.f.s., and the minimum flow for a one-month period averaged 1,020 c.f.s. "There is no dependable inflow to the Red River between the proposed pumping site (near Fulton, Arkansas) and Shreveport during low flows .... Therefore, after navigation begins, we intend to prohibit use of the pumping station (proposed for a capability of 40,000 gallons per minute or 89 c.f.s.) during low flows when the river flow is barely enough for navigation, "the report states." The report further states that, "A river flow of about 1,060 c.f.s. is needed to provide sufficient water for operating the Red River waterway when barge traffic develops. The flow is needed for lockage, infiltration, evaporation, and leakage. Therefore, we recommend that withdrawals not be permitted when the river flow is 1,060 c.f.s. or less, and that withdrawals not be permitted that would cause the river flow to be less than 1,060 c.f.s."

Because the water requirements for the study area are projected to be 31.817 mgd by year 2000 (See Table I, page iii), of which from 7.97 mgd (12.33 c.f.s.) to 8.00 mgd (12.38 c.f.s.) be provided from one of the proposed alternatives, the policy of the Corps of Engineers to limit water withdrawal from the Red River during certain times of the year could adversely affect the area's future ability to secure water from the Red River.

Grand Bayou Reservoir. The beneficial impacts of the Grand Bayou Reservoir as a source of public water are its location near the Town of Coushatta; its abundant quantity and high quality water; and the relative economy of securing its water. The reservoir will be created by the impoundment of Grand Bayou at a point 4.1 miles above its mouth. Of the 2,900 acre area affected by this proposal, approximately 2,700 acres will be inundated and an additional 200 acres will be cleared. Some 630 acres of wet bottomland hardwoods and 1,350 acres of dry bottomland hardwoods will be lost. The project will create 2,700 acres of fishery habitat.

The new public water supply from Grand Bayou Reservoir will benefit

an expanding population in the region. Because Red River Parish is located in an officially designated "Energy Impact Area" (U.S. Department of Energy, 1979), significant increases in industrial activities are anticipated. This industrial expansion is expected to directly create 5,445 new jobs in the four parish area of Red River, Natchitoches, DeSoto, and Sabine. (See, Designation Report, Public Law 95-620: Powerplant and Industrial Fuel Use Act of 1978, State of Louisiana, Office of the Governor, June 30, 1979, page 18.) Because Red River Parish is in the center of the lignite coal area, many of the new workers will locate in Red River Parish.

Eventual plans for recreation on the proposed lake are not finalized by the Black Lake Recreation and Water Conservation District because the Commission has stated that its plans must be developed so as not to conflict with plans for recreation on the Red River waterway.

The adverse impacts resulting from selection of the Grand Bayou alternative are presented as follows in summary and described throughout this report in detail. The foremost adverse impact will be the loss of 630 acres of wet bottomland hardwoods and the clearance of an additional 2,270 acres of land which will result in the elimination of wildlife habitat. In Section 2, Subsection "Comparative Impacts Among Alternatives", descriptions of modifications to transportation and transmissions systems and displacements of households, churches, and cemeteries are addressed.

A 17.3 percent survey of the proposed impoundment area was performed to assess the cultural resources subject to potential impact. An additional 25.9 percent of the pool perimeter was surveyed for the same purpose. The search took place during the period between 24 September 1979 and 19 October 1979, a time of dry conditions which allowed for optimal survey results. Eighteen archeological sites were located which will be subject to direct impacts resulting from either complete inundation or erosion along the pool margin. Another five sites, located previously, are also believed to be subject to the same impacts. Detailed results of the cultural resources survey are presented in the report, A Sample-Based Cultural Resources Survey of the Proposed Grand Bayou Reservoir. None of the sites represent unique deposits of cultural resources, however, National Register eligibility has not been assessed on any of the archeological sites reported to date.

MAJOR CONCLUSIONS

Provide Municipal and Industrial Water Supply. The quantity of water from both alternatives is satisfactory for a water supply source although the availability of water from Red River for Bossier City was lacking in the extremely dry season of 1980, particularly in the month of September when Bossier City's system was threatened. At Bossier City the lowest pump intake is at elevation 3.0 on the Shreveport gage. Stages in September 1980 reached a low of 2.6 feet. Water quality at low stages is questionable. In January, 1981, the stage reached 2.9 feet on the Shreveport gage. At this time, Bossier City again experienced problems with its water supply system because its low level

pump (intake elevation 3.0) was out of commission and the water in the Red River had developed a color that was difficult and costly to remove. Comparing the two alternatives, the water from Red River has the most variable quality and would require a greater extent of treatment to achieve a water safe for human consumption. Between the two alternatives, there would be a greater adverse impact on the environment if the Grand Bayou Reservoir alternative is chosen. The alternative which has the better quality for a public water supply is the Grand Bayou Reservoir.

Recreation. Although recreation is not the reason for the development, the Grand Bayou Reservoir alternative would create opportunities for recreation and would likely generate some amount of associated business and tourism. Regardless of the water supply alternative selected, the completion of the Red River Waterway project will provide recreational facilities in the area.

Habitat Modification. Selection of the Red River alternative would involve minimum habitat modification. Selection of the Grand Bayou Reservoir alternative would require modification of 2,900 acres of habitat. Please refer to Section 2 for additional details.

AREAS OF CONTROVERSY

The most significant area of controversy is the loss of 630 acres of wet bottomland hardwoods associated with the Grand Bayou alternative.

ISSUE TO BE RESOLVED

The Commission will take all procedures necessary to insure compliance with the National Historic Preservation Act by assessing National Register eligibility on all cultural resources, documenting coordination with the State Historic Preservation Office and Heritage Conservation and Recreation Service. The Commission will develop and coordinate a mitigation plan with the State Historic Preservation Officer and the Advisory Council on Historic Preservation.

TABLE 3

RELATIONSHIP OF THE PROPOSED GRAND BAYOU RESERVOIR TO ENVIRONMENTAL AND STATUTORY REQUIREMENTS

Requirements	Alternatives
Section 9 of River and Harbor Act (R&HA) of 3 March 1899	Not Applicable
Section 10, R&HA	Not Applicable
Section 11, R&HA	Not Applicable
Section 13 of R&HA	Not Applicable
Section 14 of R&HA	Not Applicable
Section 1 of the River and Harbor Act of 1902	Not Applicable
Section 404 of the Clean Water Act (CWA)	Full Compliance
The Marine Protection, Research and Sanctuaries Act	Not Applicable
Section 401 of CWA	Full Compliance
National Environmental Policy Act	Full Compliance
Fish and Wildlife Coordination Act	Full Compliance
Migratory Marine Game Fish Act	Not Applicable
Fish and Wildlife Act of 1956	Partial Compliance
Federal Power Act of 1929	Not Applicable
National Historic Preservation Act of 1966	Full Compliance
Interstate Land Sales Full Disclosure Act	Not Applicable
Endangered Species Act of 1973	Full Compliance
Deepwater Ports Act of 1974	Not Applicable
Marine Mammal Protection Act of 1972	Not Applicable
Wild and Scenic Rivers Act	Not Applicable
Land and Water Conservation Fund Act of 1965	Not Applicable

TABLE 3 CONTINUED

Clean Air Act	Full Compliance
Floodplain Management (E.O. 11988)	Partial Compliance
Louisiana Air Control Act	Full Compliance
Louisiana Archeological Treasure Act	Full Compliance
Louisiana Historic District Preservation Act	Not Applicable
Louisiana Scenic Streams Act	Full Compliance
Louisiana Coastal Zone Management Act	Not Applicable
Louisiana Coastal Zone Management Plan	Not Applicable
Area-wide Comprehensive Plan	Not Applicable

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SECTION I

PURPOSE AND NEED FOR THE PROPOSAL

1.01 The applicant is the Black Lake Bayou Recreation and Water Conservation District of Red River Parish. The applicant's primary purpose and need is to provide public multi-purpose water supply in Red River Parish. A secondary benefit will be the creation of a water-related recreation facility.

If the Grand Bayou Reservoir alternative is selected, in addition to a water supply source, a potential for recreation will be created. The applicant recognizes the fact that recreation is incidental to the main purpose of this project, which is water supply. The recreation potential will be realized in a manner which would benefit the general public's use and enjoyment.

The applicant has submitted an application to the Department of the Army, Corps of Engineers, New Orleans District, for a Section 404 permit for the installation and maintenance of a dam, spillway, and appurtenances to form a reservoir on Grand Bayou, Red River Parish, Louisiana, toward the end of fulfilling the purpose and need set forth in the preceding paragraph.

On 20 February 1979, the applicant held a public meeting at the parish courthouse in Coushatta. The purpose of this meeting was to give all interested persons a chance to express their opinions of the water situation in the area. Several citizens complained about having to constantly replace plumbing fixtures due to the corrosive elements in the water. The manager of Coushatta's water system described the water situation as "ridiculous" because of the inadequate quantity of good quality water. He also stated that because of the inadequate quantity, especially during the summer, that Coushatta's fire rating was very poor, only one class above the worst rating. Many elected and appointed officials expressed their concern over industries refusing to locate in the area because of the inadequate water supply. It was reported in this meeting that Coushatta had lost 14 industrial prospects because of the limited water supply.

Two of the major industrial corporations, Sunbeam and Pineville Kraft, expressed their concerns over both quantity and quality of the water supply. Sunbeam is on the Coushatta water system but has to treat the water before it enters their plant. Also, in order to be assured of an adequate quantity, Sunbeam had to construct two storage tanks of 250,000 and 100,000 gallons capacity. Sunbeam has to rely on these tanks at least once a week because of pressure reductions in the town's system. Pineville Kraft Corporation is located in Coushatta but was denied permission to utilize the city's water system because of the quantity of water the plant would require. Consequently, Pineville Kraft drilled and maintains three onsite wells.

The annual water usage is not known since the wells are not metered. However, Pineville Kraft must analyze and treat (when necessary) their water an average of six times per day because of the fluctuations in the water quality. The hardness of the water at Pineville Kraft creates a "major expense" since the water must be treated to prevent excessive damage to the plant's boiler. (Please see Pineville Kraft letter in Appendix J.)

Mayor Truman Crawford, Coushatta, said on 20 February 1979, "The Town of Coushatta will experience a major growth impact due to the imminent mining of lignite coal in this region. The state of Louisiana through the Governor's office has predicted that as many as 17,000 new residents will come into this general area by the year 1990. Many of these people will come to Coushatta to live near the mine-mouth power plants. But, we do not have enough water to meet our current needs. There is a major water shortage here that we must solve immediately. Dr. Jackie Huckabay (owner of the hospital in Coushatta) has told me repeatedly that our water is not safe for human consumption."

Truman's concern is supported by the following data provided by the State of Louisiana.

(1) The American-Canadian Coal Company (AMCA) and the Phillips Coal Company have purchased major coal leases and will begin mining in the area in the early 1980s. Phillips will directly employ 280 people, while AMCA will employ a minimum of 75 workers.

(2) Cajun Electric Cooperative plans to build five power generators and to employ 1,792 workers for construction and operation by the year 1986.

(3) Central Louisiana Electric Company and Southwest Electrical Power Company will build two power generators and employ 680 workers.

(4) Dow Chemical and International Paper Company will employ a total of 675 workers by the year 1986.

(5) Other major industries are expected to develop plants in the general region.

None of the industries cited above are expected to use water from the proposed Grand Bayou Reservoir. However, the additional population generated by these new industries will benefit from the implementation of this project.

Approximately one billion tons of lignite coal within a 50-mile radius of Coushatta will be mined and processed between 1982 and 2012, thus Coushatta is expected to be the center of rapid population growth. A public water supply is required to support the growth.

SECTION 2

ALTERNATIVES

2.01 ALTERNATIVES CONSIDERED IN THE SCOPING PROCESS

During the early scoping process, three general alternative sources of water to meet the applicant's purpose and need were identified. These include: groundwater, existing surface water, and surface water created by impoundment. The existing surface water category contains two sub-categories: (1) rivers and streams and (2) lakes and reservoirs. From this outline, source specific alternatives were identified (Table II-1).

The primary purpose of the proposed project is to provide a public multi-purpose water supply for the residents of Red River Parish. It is not uncommon, however, for per capita water demand to increase somewhat when an adequate supply and distribution system is available. In light of the ever-increasing demand on existing water supplies from such diverse sources as industry, energy production, agriculture, recreation and fish and wildlife purposes, it is imperative that regardless of the alternative selected every effort should be made to conserve water, reduce demand and improve efficiency.

These goals can be achieved by a combination of methods including:

- Installation of individual water meters and a periodic testing program to insure accuracy.

- Installation of a leak-free distribution system constructed with a pipe with a high "C" factor. The "C" factor determines to a large extent how easily the water flows through the pipe and consequently how much pump energy is required.

- Proper maintenance program to insure that leaks are detected and repaired quickly.

- Public awareness and education program. Informative brochures describing water conservation methods could be mailed to users in monthly billing statements.

Responsibility for these programs will be shared between the Black Lake Bayou Recreation and Water Conservation District and the individual water districts which purchase the water.

TABLE II-1

DERIVATION OF ALTERNATIVES CONSIDERED
IN THE SCOPING PROCESS *

General Alternative Source	Source Specific Alternatives
A. Groundwater	1. Additional Wells
B. Existing Surface Water	
1. Rivers/Streams	2. Red River
2. Lakes/Reservoirs	3. Toledo Bend Reservoir
	4. Black Lake
	5. Lake Bistineau
C. New Surface Water	6. Grand Bayou Reservoir
D. Combinations	7. Grand Bayou Reservoir plus pipeline from Lake Bistineau
	8. Grand Bayou Reservoir plus pipeline from Black Lake
	9. Grand Bayou Reservoir plus existing wells
	10. Grand Bayou Reservoir plus Red River
	11. Grand Bayou Reservoir plus existing wells plus Red River
E. No Action	12. No Action

*(Scoping sessions were held with the U.S. Corps of Engineers, New Orleans, in 1979. The above listed specific and general alternatives were discussed in detail. Alternatives eliminated from further analysis are given on the following pages.)

The following alternatives have been eliminated from detailed evaluation for the reasons stated under each alternative.

a. Alternatives Eliminated From Detailed Study

(1) Additional Wells. All existing public water supply sources in Red River Parish come from wells. The largest system in the parish is the Coushatta water system which is owned by the Town of Coushatta and operated by the Central Louisiana Electric Company (CLECO). The Office of Public Works, Louisiana Department of Transportation and Development (DOTD), in cooperation with the U.S. Geological Survey, Water Resources Division, has drilled twenty-six test wells in eastern Red River Parish near Coushatta since 1967 (Plate II-1). The purpose of this extensive drilling was to locate additional groundwater for municipal and industrial supply. Of the twenty-six test wells, eight (8) or 30% could not produce water. Six (6) or 23% produced less than 12 gallons per minute (gpm). Four (4) of these six (6) produced 4 gpm or less (Table II-2).

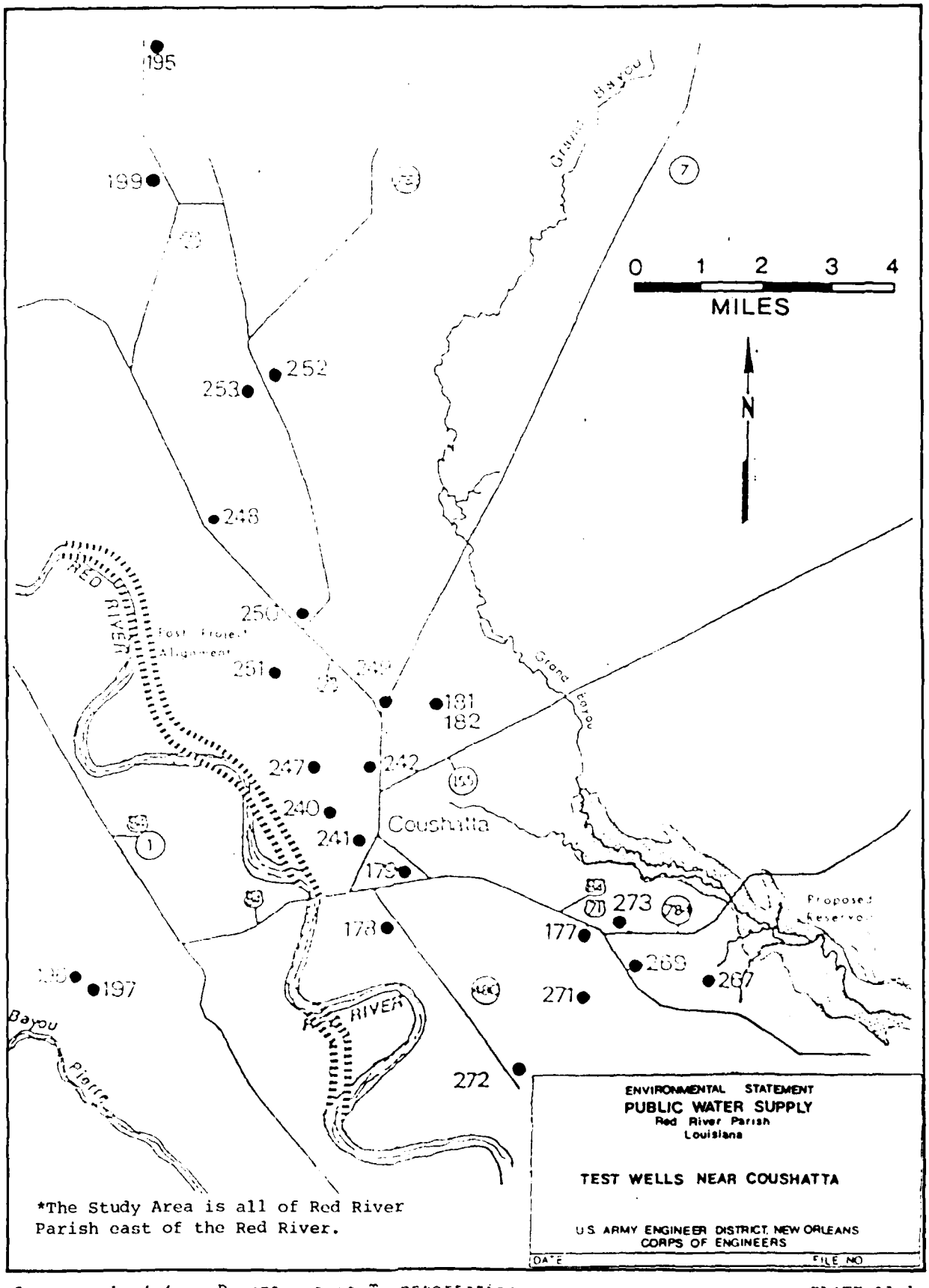
The remaining 12 wells tested produced within a range of 17 to 50 gpm with an average flow of approximately 30 gpm. At this rate of flow, it would require about 130 wells to meet the estimated demand of 5.57 mgd. The water-bearing sands in this area (Wilcox Formation) are lenticular in nature and are thus sporadically spaced. The strategic difficulties of operating and maintaining up to 130 motors, pumps, and controls in remote locations, plus the extensive collection system which would be required to bring the water to a central treatment plant render this alternative not feasible. (See **, page II-8.)

The Louisiana DOTD, Office Public Works, classified only seven of the twelve wells mentioned above as having a "good reliability.

If the water produced from these wells was unusually pure and clean, the reduced cost of the required treatment would help in reducing the costs of such a system; however, the twelve wells with significant water production exhibited a range of treatment problems such as high chlorides and pH values. Thus, extensive treatment would be required of the water from these wells.

Groundwater from the Red River alluvium is available in substantial quantities, but is primarily limited to non-potable uses such as irrigation. Following is a quotation from the 1962 USGS and Office of Public Works (DOTD) report entitled, "Water Resources in Red River Parish, Louisiana."

> "The extremely hard iron-bearing water from the alluvium of the Red River Valley has a distinctive chemical composition. It contains an unusually high percentage of bicarbonate for a water of the calcium-magnesium type. The dissolved-solids content is also high, and the water generally is not considered potable. As indicated by the analysis in Table 11, the hardness averages



*The Study Area is all of Red River Parish east of the Red River.

Source: Louisiana Department of Transportation and Development, Office of Public Works, 1979.

PLATE II-1

TABLE II-2

TEST HOLES AND WELLS - RED RIVER PARISH

	177	178	179	181	182	195	196	197
Drilling								
Depth				250	250	306		
Well Depth				184	156	120		
Strat. Unit				Wilcox	Wilcox	Wilcox		
Test Date				1/18/67	2/7/67	5/15/69		
Sand Thickness(Ft.)				31	34	14		
Screened Interval				174-184	146-156	108-120		
Yield (gpm)				20	33	1-1.5		
Trans (gpd/ft)	NO WATER	NO WATER	NO WATER	1450	9200	-	NO WATER	NO WATER
Perm (gpd/ft^2)				47	270	-		
Reliability				Good	Good	-		
Water Sample								
Temp. (^oF)				78.5	-	70.0		
Color				-0-	-0-	-0-		
Odor				-0-	-0-	-0-		
Taste				Good	-0-	-0-		
pH				7.9	7.2	8.0		
Chloride (ppm)				9.2	23.0	5.0		
Hardness ($CaCO_3$)				4	20	28		
Fe (ppm)				-	-	0.22		
CO_3 (ppm)				-0-	-0-	-0-		
HCO_3 (ppm)				217	155	194		
SO_4 (ppm)				0.2	0.6	0.4		
Flouride (ppm)				0.2	0.2	0.1		
NO_3 (ppm)				0.1	-0-	0.2		
Na (ppm)				85	63	63		
K (ppm)				0.7	1.0	1.6		

TABLE II-2

TEST HOLES AND WELLS - RED RIVER PARISH
(Continued)

	199	240	241	242	247	248	249	250	251
Drilling									
Depth	234	300	280	300	306		315		279
Well Depth	90	227	160	285	196		120		180
Strat. Unit	Pleis Terrace	Wilcox	Wilcox	Wilcox	Wilcox		Wilcox		Wilcox
Test Date	11/6/69	4/17/75	4/17/75	4/17/75	6/19/75		6/25/75		7/03/75
Sand Thickness(Ft.)	71	47	11	91	40		18		15
Screened Interval	80-90	217-227	150-160	275-285	186-196		110-120		170-180
Yield(gpm)	43	39.5	20	24	43		50		37.5
Trans(gpd/ft)	-	3600	730	-			10600		2400
Perm(gpd/ft^2)	-	76	66	-	80		600		160
Reliability	-	Good	Good	UNR	Good	NO WATER	Fair	NO WATER	Fair
Water Sample									
Temp (^oF)	-	70	70	73.5	67		65		6.8
Color	-0-	-0-	-0-	-0-	-0-		-0-		-0-
Odor	-0-	-0-	-0-	-0-	-0-		-0-		-0-
Taste	-0-	-0-	-0-	OK	-0-		-0-		-0-
pH	7.3	7.9	7.7	8.5	7.9		7.1		7.3
Chloride(ppm)	16	110	8.2	260	88		13		98
Hardness(ppm)	24	55	150	8	130		34		74
Fe (ppm)	*0.68	0.08	0.31	0.06	0.13		1.5		0.1
CO_3 (ppm)	-0-	-0-	-0-	11	-		-		-
HCO_3 (ppm)	44	285	340	482	-		-		-
SO_4 (ppm)	9.4	-0-	16	-0-	-		-		-
Flouride(ppm)	0.1	0.5	0.5	0.9	0.1		0.2		0.2
NO_3 (ppm)	-0-	0.68	0.1	0.24	-		-		-
Na (ppm)	20	160	120	350	-		-		-
K (ppm)	1.6	4.2	1.3	1.6	-		-		-

TABLE II-2

TEST HOLES AND WELLS - RED RIVER PARISH
(Continued)

	252	253	267A	267B	269	271	272	273A	273B
Drilling									
Depth	256	279	293	293	305	317	306	292	292
Well Depth	123	165	120	201	210	160		65	248
Strat. Unit	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox		Upland	Wilcox
Test Date	7/17/75	7/25/75	7/26/75	7/11/78	8/7/78	8/18/78		9/22/78	9/18/78
Sand Thickness(Ft.)	20	20	25	55	131	38		41	21 + 15
Screened Interval	110-130	155-165	110-120	161-181	155-210	122-160		55-65	200-248
Yield(gpm)	2	4	1	17.3	25	25.5		11	9.6
Trans(gpd/ft)	-	-	-	300	1000	725		-	-
Perm(gpd/ft^2)	-	-	-	5.5	18	20		-	-
Reliability	-	-	UNR	Good	Good	Fair		UNR	Questionable
Water Sample									
Temp (^oF)	-	-	-	*69	*70	*69		-	-
Color	-0-	-0-	-0-	-0-	Slightly Cloudy	Cloudy		-0-	-0-
Odor	Slight H_2S	-0-	Some	-0-	Sulfur	Slight Sulfur		-0-	-0-
Taste	-0-	Good	Bad	Good	Sulfur	Good		-0-	OK
pH	*7.2	-	8.0	8.3	8.2	8.3		5.5	8.5
Chloride(ppm)	*52	*52	6.2	14	14	12		14	85
Hardness ($CaCO_3$)	*28	*6	110	12	5	10		18	20
Fe (ppm)	*0.45	0.1	2.1	0.04	0.08	0.6		0.19	0.05
CO_3 (ppm)	-	-	-0-	-0-	-0-	-0-		-0-	10
HCO_3 (ppm)	-	-	174	210	256	254		22	438
SO_4 (ppm)	-	-	3.4	0.4	0.2	0.2		2	-0-
Flouride (ppm)	-	-	0.1	0.2	0.3	0.4		0.1	1.2
NO_3 (ppm)	-	-	0.54	0.6	0.3	0.2		2.3	0.3
Na (ppm)	-	-	21	81	100	100		11	220
K (ppm)	-	-	2.5	2.2	1.2	1.5		1.5	2.4

NO WATER

TABLE II-2

TEST HOLES AND WELLS -- RED RIVER PARISH

LEGEND

Source: Louisiana Department of Transportation and Development
UNR* -- Unreliable
- No Test
* Field Result
No Data ----------

** The data contained in Table II-2 was the complete official available data on ground water in Red River Parish at the time this report was written. An update, as of March 5, 1982, reveals that only one additional water well has been successfully drilled for public consumption. This additional well was drilled June 26, 1980, at the end of Riddle Street in Coushatta. The depth was 173 feet. Tests conducted show the following characteristics: pH value, 6.7; Ca, 98; Mg, 20; Hardness, 100; Cl, 94; Fl, 2.5; Fe, 2.5; color, 10; and Dissolved Solids, 441. (Refer to Table II-2 for measurements.) This well is characteristic of the hard, iron-bearing water from the Red River alluvium. No successful wells were drilled in 1981, according to sources at the Town of Coushatta.

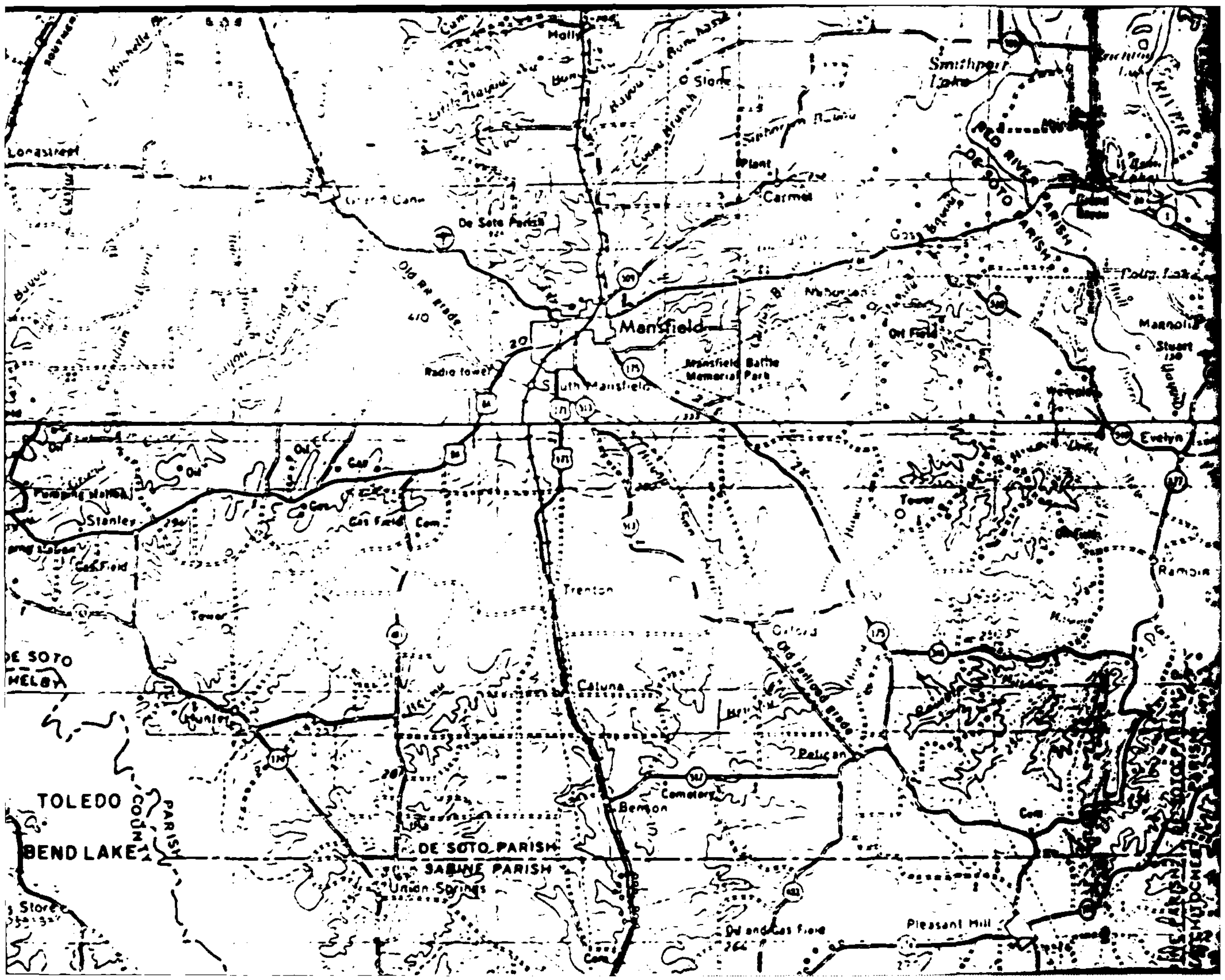
about 500 parts per million (ppm) and the iron content about 6 ppm. The water tends to be alkaline because the pH is above 7.0. The hardness and high iron content may be attributed to passage of the water through the iron-bearing calcareous sediments of red materials overlying the aquifer."

(2) Toledo Bend Reservoir. A pipeline from Toledo Bend Reservoir to Red River Parish east of the Red River was discussed as a possible alternative. This alternative was deleted from detailed study by the U.S. Corps of Engineers in the scoping process due to problems relative to the distance involved (approximately 32 miles) and because of physical obstacles. To support a transmission system from Toledo Bend Reservoir would require placement of pumping stations to carry water from the east to the west side of the Dolet Hills, and then across two navigable streams, Bayou Pierre and the Red River (Plate II-2).

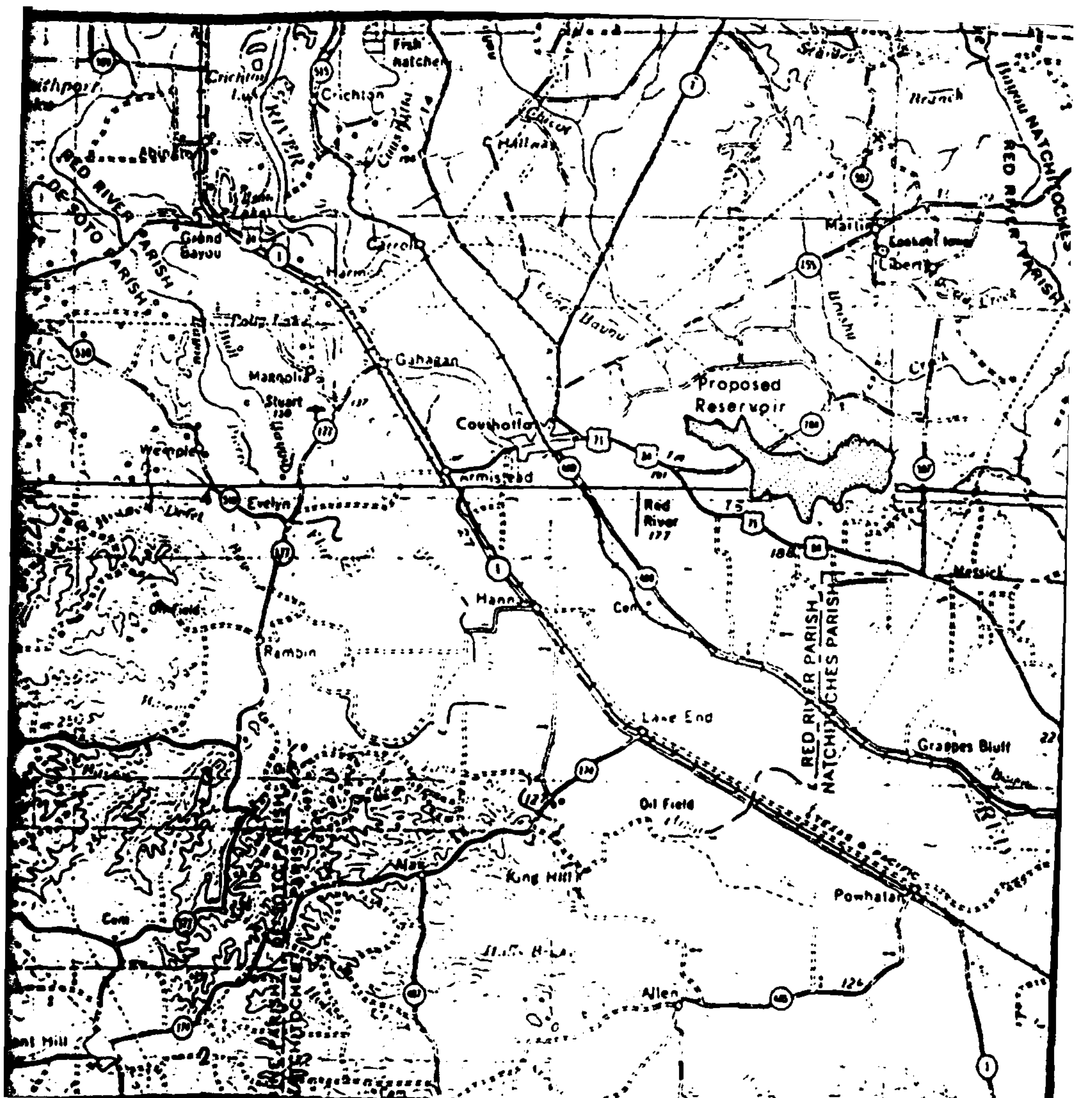
(3) Lake Bistineau. Lake Bistineau is located approximately 22 miles north of Coushatta along the boundaries of Webster, Bossier, and Bienville Parishes. The reservoir was constructed for recreation and conservation purposes. The applicant requested permission from the controlling agency, the Louisiana Department of Wildlife and Fisheries, to withdraw water from Lake Bistineau for a municipal and industrial water supply for Red River Parish. A letter dated 27 March 1980 from Mr. J. Burton Angelle, Secretary of the Louisiana Department of Wildlife and Fisheries, states that Lake Bistineau, "Provides very high quality recreation and the Louisiana Department of Wildlife and Fisheries can not allow the use of the lake in any manner which might jeopardize this activity." A copy of the referenced letter is contained in Appendix J.

(4) Black Lake. Black Lake is located in Natchitoches Parish, approximately 15 miles east-southeast of Coushatta. Black Lake is a 13,500 acre lake constructed for conservation and recreational purposes. The Black Lake Bayou Recreation and Water Conservation District of Red River Parish submitted a written request to the controlling agency, the Northwest Louisiana Fish and Game Preserve Commission, for permission to buy and withdraw water from Black Lake. The Commission members refused to commit any water from Black Lake for the Red River Parish public water supply due to the "current water demands within Natchitoches Parish by users and prospective need for the water in the future." A copy of the letter from the Commission is included in Appendix J.

(5) Grand Bayou Reservoir Plus a Pipeline from Lake Bistineau. This alternative, if it were feasible, would allow reduction in the size of the Grand Bayou Reservoir. Such a system would require the design, construction, and maintenance of two systems with the attendant costs. However, this alternative could not be pursued because



Mansfield
South Mansfield
Mansfield Battle Memorial Park
Radio tower
Smithport Lake
Longstreet
Grand Cane
De Soto Parish
Carmel
Stanley
Trenton
Oxford
Pelican
Cemetery
Pleasant Hill
Union Springs
Evelyn
Magnolia
Tower
Gas Field
RED RIVER PARISH
DE SOTO PARISH
SABINE PARISH
TOLEDO
BEND LAKE


Crichton
Grand Bayou
Gahagan
Proposed
Reservoir
Coushatta
Armistead
Evelyn
Red River
177
Rambin
Oil Field
Lake End
King Hill
Powhatan
Allen
Grappes Bluff
Messick
Martin
RED RIVER PARISH
NATCHITOCHES PARISH
DE SOTO PARISH

permission was refused by the Louisiana Department of Wildlife and Fisheries allowing any water to be drawn from the Lake.

(6) Grand Bayou Reservoir Plus a Pipeline from Black Lake. This alternative was determined not to be feasible because the Northwest Louisiana Fish and Game Preserve Commission will not allow the applicant to draw any water from the Lake. The same problems exist with respect to this alternative as with the alternative discussed in the previous paragraph concerning Lake Bistineau.

(7) Grand Bayou Reservoir Plus Existing Wells. The five existing water supply systems in Red River Parish derive a quantity of potable water from wells equal to approximately seven percent of the design capacity of the proposed Grand Bayou Reservoir. Hence, consideration of the existing wells as an alternative source along with Grand Bayou Reservoir does not appear feasible. Rather than combining the two sources and reducing the size of the Grand Bayou Reservoir, the applicant prefers to develop as much capacity as is practical within the current design parameters for Grand Bayou Reservoir and the capacities of the existing wells. The duration of water production from the wells is uncertain, but because they are in place, they could remain connected to the system with little or no modification. Existing wells in the parish have often experienced overpumpage with resultant salt infiltration. Health officials in the parish have complained about the poor quality of well water. (See letter from Dr. Jackie Huckabay of Coushatta in Appendix J.) The reliable quantity and quality of water from Grand Bayou Reservoir would reduce the withdrawal required from the wells making it possible to use smaller pumps and motors or to install timers so that the existing system would work only periodically in the future. These wells would have extended life when used periodically and would provide a source of "standby" water for possible emergency conditions such as malfunctions at the Grand Bayou Reservoir, extreme drought periods, pipeline breakages, or other interruptions of the supply from Grand Bayou Reservoir.

The chemical analysis of the well water (Table II-2, typical) and Grand Bayou water (Table III-2) show the chemical properties of both potential water supplies.

(8) Grand Bayou Reservoir Plus Red River. A combination of the Red River and Grand Bayou would cost more than either alternative would cost separately. This is due to the fact that construction of a reservoir includes appreciable costs which are not significantly reduced by size reduction. Further, the construction of a smaller reservoir would not result in the saving of many acres of bottomland hardwoods. Additionally, the development of two systems would necessitate two major pipelines, extra pumping stations, extra rights-of-way, storage facilities, and increased maintenance and operational expenses. The relative percentages of water to be taken from each source, and thus the size of the reservoir required, is difficult to ascertain in the absence of a detailed engineering feasibility study.

In view of the complexities involved and the potentially excessive costs, this alternative is considered to be not reasonable. Subsequently, however, each is analyzed in detail in this report.

(9) Grand Bayou Reservoir Plus Existing Wells Plus Red River. This alternative would pair the two combinations of alternatives listed and discussed previously. It would be more complex and potentially more expensive than other alternatives considered, therefore, it is also deemed unfeasible.

b. Reasonable Alternatives. The U.S. Corps of Engineers identified two reasonable alternatives:

(1) Withdrawal of water from the Red River (See Appendix I)
(2) Construction of a reservoir on Grand Bayou

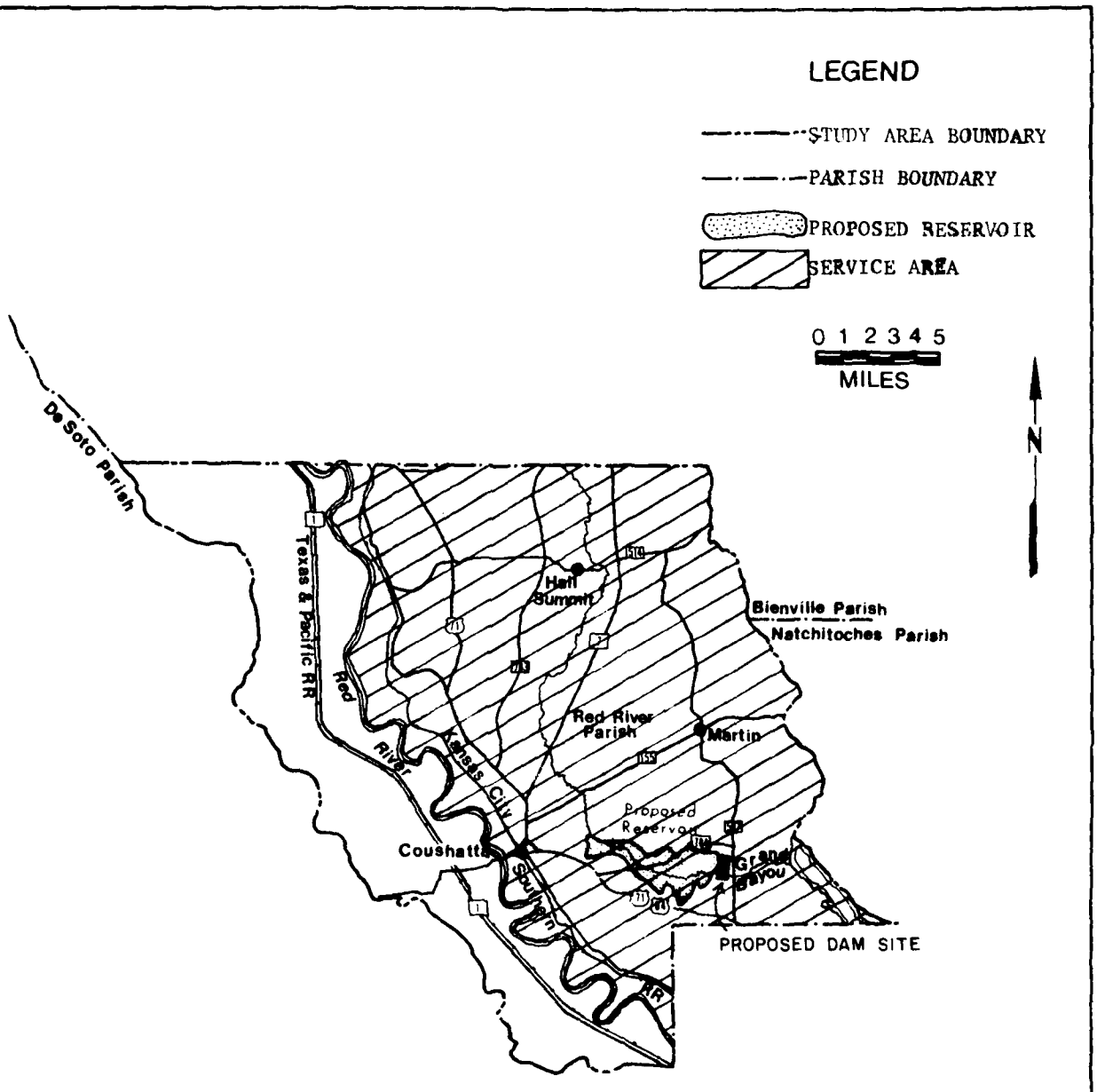
These alternatives were deemed reasonable from the standpoint that each appears to have the potential water supply to meet the applicant's purpose and need, and each is within a reasonable distance of the project area (Red River Parish). Refer to Plate II-3.

c. No Action Alternative. The No Action alternative will leave Red River Parish without an adequate public water supply in the face of rapid economic, industrial, and attendant population growth during the decade of the 1980's and 1990's, resulting from planned extensive lignite coal mining and processing in the area. But, even if the area did not expect substantial growth in the immediate future, without a reliable, sanitary, safe water supply, the area would be adversely impacted.

2.02 RELATION OF THE REASONABLE ALTERNATIVES TO THE APPLICANT'S PURPOSE AND NEED

The applicant's purpose and need is to obtain a source of multipurpose water supply. Both the Grand Bayou Reservoir and Red River alternatives have the potential to meet this purpose and need. Recreational opportunities, although incidental to this project, will also be available from the reservoir.

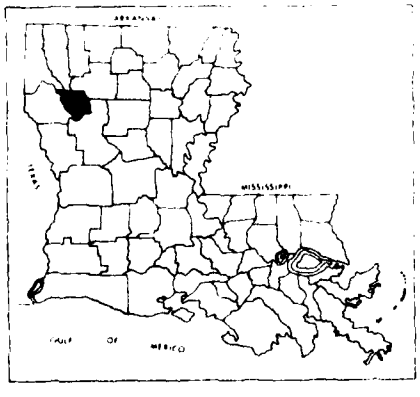
a. Potential of Alternatives to Provide for Municipal and Industrial Water Supply. Both of the reasonable alternatives have the potential to supply the quantity of water needed. See Table II-3.



NOTE: The Study Area includes virtually all of Red River Parish; thus, parish-wide data are used for analysis because of a lack of data at the Study Area level.

Source: Louisiana Department of Public Works

REGIONAL LOCATION



ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana

LOCATION OF STUDY AREA

US ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS

DATE FILE NO

Plate **II-3**

TABLE II-3

RANKING OF ALTERNATIVES IN RELATION TO PROJECT REQUIREMENTS

ALTERNATIVE NAME	SUITABILITY FOR PUBLIC WATER SUPPLY		RECREATIONAL BENEFITS INCIDENTAL TO PROJECT
	QUANTITY	QUALITY	
Red River	Good	Poor	No
Grand Bayou	Good	Good	Yes, Fishing & Hunting
No Action	Poor	Poor	Red River Waterway Project will provide significant recreational facilities on the river near Coushatta

b. Potential of Alternatives to Provide for Recreation. The Grand Bayou Reservoir alternative will provide some recreational value by the fact of its existence, though the purpose of the reservoir is not a recreational one.

The Red River and Grand Bayou alternatives include facilities such as intake structures, pumping stations, and force mains which will convey water into water distribution systems. Neither one of the conveyance facilities will provide recreational opportunities. However, the Red River waterway project, expected to be completed in 1984, will provide recreational facilities near Coushatta.

2.03 COMPARATIVE IMPACTS AMONG ALTERNATIVES

Each of the two reasonable alternatives and the No Action alternative are compared in terms of:

1. Water quality
2. Habitat modification
3. Short-term and long-term pollution
4. Transportation system modifications
5. Displacement of households, churches, and cemeteries
6. Indirect economic benefits.

a. Water Quality Among Alternatives. Water from the Red River is least desirable as a public water supply (Table II-4). The Grand Bayou alternative contains a good water quality. The No Action alternative offers no solution to the need for public water supply.

b. Habitat Modifications Among Alternatives. The Grand Bayou Reservoir would be the most detrimental to bottomland hardwoods (Table II-5). On the other hand, the proposed reservoir would create more habitat for waterfowl and fish than the other alternatives. The pipeline right-of-way could be directed in a route that would be least detrimental to the vegetational communities. A pipeline from Red River would produce forest-edge habitats. With proper restrictions, the Grand Bayou Reservoir could produce a forest-edge habitat also.

TABLE II-4

WATER QUALITY AMONG ALTERNATIVES

ALTERNATIVE	GENERAL QUALITY	PROBLEMATIC PARAMETERS
Red River	Poor	Coliform, iron, dissolved solids, hardness, phosphates, sulfates, turbidity
Grand Bayou	Good	Coliform, iron, dissolved oxygen during low flow periods in late summer
No Action	Poor	Iron, chloride

TABLE II-5

HABITAT MODIFICATIONS AMONG ALTERNATIVES

ALTERNATIVE	DETRIMENTAL	BENEFICIAL
Red River	Requires 85 Acres of land for a settling pond plus 10+miles of clearing for pipeline location.	None
Grand Bayou	Inundation of 2,700 acres: 630 acres of wet bottomland hardwoods; 1,350 acres of dry bottomland hardwoods; 690 acres of pine hardwoods; 230 acres of pines, pasture, and agricultural lands; 200 acres clearance up to the 140' N.G.V.D. TOTAL: 2,900 acres, plus possible deterioration of wetlands below the dam site, eutrophication, and clearing of 5 miles for pipelines.	400-500 acres of waterfowl habitat; 2,700 acres fisheries habitat; 62 acres forest edge habitat.
No Action	None	None

c. Short-Term and Long-Term Pollution Impacts Among Alternatives. With the exception of the No Action alternative, both of the alternatives will create short-term noise and air pollution during construction (Table II-6). Erosion and sedimentation will also be a short-term impact of construction with both of the alternatives except No Action. Sludge from the water treatment plant will be the major long-term impact that would result from the Red River alternative. An estimated five tons of processed sludge per day must be disposed of in an acceptable lagoon on sanitary landfill. (Based on a treatment plant capable of treating 5.57 mgd an estimated 60,000 gpd at approximately two percent concentration will be produced.) These projections are based on data received from Bossier City, Louisiana, where Red River is treated and used. Pipeline right-of-way maintenance (cutting and spraying) will be required for both the Red River and the Grand Bayou alternatives. Red River alternative involves 10+ miles of force main while Grand Bayou Reservoir involves 5+ miles of force main. Noise, air, solid waste, and water pollution, as well as erosion and sedimentation, are long-term effects of the proposed reservoir. The No Action alternative will have no long-term pollution impact upon the environment.

TABLE II-6

SHORT-TERM AND LONG-TERM
POLLUTION IMPACTS AMONG ALTERNATIVES

ALTERNATIVE	SHORT-TERM	LONG-TERM
Red River	Noise, air, sedimentation and erosion from construction	Water treatment process sludge disposal, pipeline right-of-way maintenance
Grand Bayou	Noise, air, sedimentation and erosion from construction	Noise, air, sedimentation and erosion, solid waste, and water pollution from induced recreation development, pipeline right-of-way maintenance.
No Action	None	None

d. Transporation and Transmission System Modifications Among Alternatives. The Grand Bayou Reservoir alternative will require the most extensive modifications. During construction of the reservoir, two roads and seven bridges would require new structures; one-20" products and one-14" products pipelines would require weighting or realignment; and one electrical transmission powerline would require relocation. The Red River alternative should not require modification to any existing transportation or transmission system; however, because a final site selection for this alternative has not been made, modifications could be necessary. Table II-7 is a summary of the modifications that would be required if any of the alternatives were implemented.

e. Displacements of Households, Churches, and Cemeteries Among Alternatives. The only alternative which will cause a displacement is Grand Bayou. Five households will be displaced as a result of the proposed reservoir, if it is constructed (Table II-8). No cemeteries or churches will be displaced by the reservoir. No displacements are expected for the Red River alternative since a pipeline can be routed to minimize or delete these impacts.

TABLE II-7

TRANSPORTATION AND TRANSMISSION SYSTEM
MODIFICATIONS AMONG ALTERNATIVES

Alternative	Highways	Bridges	Pipelines	Railroads	Powerlines
Red River	None	None	None	None	None
Grand Bayou	1 State Hwy. (#784) raised, 1 parish road raised (Esperenza Road)	Total of seven bridges to be replaced with 3 bridges	1-20" Products, 1-14" Products to be weighted or rerouted	None	1 to be re-located (CLECO)
No Action	None	None	None	None	None

f. Indirect Economic Benefits Among Alternatives. Construction of a new reservoir on Grand Bayou would precipitate an increase in the land value of immediately surrounding areas. Land which is only marginally attractive could become a prime site for homes and campsites after construction of the reservoir.

TABLE II-8
DISPLACEMENT OF HOUSEHOLDS,
CHURCHES AND CEMETERIES AMONG ALTERNATIVES

Alternative	Households	Churches	Cemeteries
Red River	None	None	None
Grand Bayou	Five	None	None
No Action	None	None	None

Documentation showing the increase in surrounding land value caused by reservoir construction in several areas is provided in Section 4.02-a.(5).

g. Archeological/Cultural Impacts Among Alternatives. Direct and indirect impacts among the three alternatives are shown in Table II-9. No direct impacts are listed for the pipeline route because the route has not been specifically located yet. Once the corridor is chosen, a full archeological analysis will be made and appropriate action taken or the applicant will conduct appropriate archeological analyses.

TABLE II-9
NUMBER OF KNOWN ARCHEOLOGICAL SITES
AMONG ALTERNATIVES THAT WILL BE DIRECTLY OR INDIRECTLY
IMPACTED

Alternative	Direct	Indirect
Red River	None	Some possible
Grand Bayou	23	9
No Action	None	None

2.04 COMBINATION OF ALTERNATIVES

The two alternatives under consideration, withdrawal of water from Red River and construction of a reservoir on Grand Bayou, are each capable of supplying the total projected water demand. Thus the combination of these alternatives is not necessary to meet the water supply requirements.

The combination of alternatives is sometimes desirable for other reasons. In this particular situation, however, each of the alternatives is essentially a project in itself. Although a combination of the two projects may reduce the required size of the proposed reservoir, the cost and environmental impact of a combined project would be greatly increased. Refer to Section 2.01-a.(5-9) for additional discussion of the combination of alternatives.

2.05 MANAGEMENT OF ENVIRONMENT

The Soil Conservation Service, USDA, will be asked to design a master plan for preventing soil erosion during construction of either alternative in order to minimize short term adverse effects resulting from the disturbance of ground cover. The Soil Conservation Service will also assist in the long term proposition of sludge management which will be a major concern if the Red River alternative is selected.

Acceptable water standards will be met in the Grand Bayou alternative by the treatment for problem minerals and other influences, especially excessive iron (range from 870 ug/l to 920 ug/l with 300.0 ug/l being the standard). For Red River with a range of 30,000 ug/l to 370 ug/l, more extensive treatment for iron to accomodate the peak level of 30,000 ug/l in the Red River would be required in order for acceptable standards to be achieved and maintained.

Water quality at Grand Bayou must be protected by treatment for fecal coliform which is higher than the standard at its peak occurence. However, the peak for coliform in the Red River was measured at 38,000 no/100 ml, compared to a peak of 200 at Grand Bayou. Strict watershed and water frontage controls can reduce the presence of fecal coliform in the proposed reservoir. Sanitary sewer systems are planned for the shoreline.

Color is a major problem for Red River water (peak of 500 units) and a lesser problem at Grand Bayou where the peak is 100 units, however, color could be readily removed from the Grand Bayou water with treatment.

There are no other known or predictable long-term potential problems regarding the quality of water from Grand Bayou. Shoreline conservation and regulation and water treatment would insure that the Grand Bayou water would meet all applicable standards.

The lake's hypolimnion (lower most water) will not be depleted of oxygen because the water will have a minimum stratification effect due to its shallowness and movement (withdrawal and downstream discharge).

The proposed Grand Bayou reservoir will not be a marsh lake. Its epilimnion is projected to be normal in terms of oxygen supply. As stated

elsewhere (See IV-12) in this report, aquatic weeds will flourish, however, unless an aquatic vegetation control program is developed. In this light, the Grand Bayou Commission anticipates frequent drawdowns during the months of September through January as a part of the proposed lake's management curve and operational plan. Further, the lake, as proposed, will be small and the hypolimnion could be, if necessary, enhanced by either weed harvesting and/or mechanical oxidation.

The State of Louisiana has provided a 401 certification that deposits of fill, in connection with the proposed project, will not violate water quality standards.

SECTION III

AFFECTED ENVIRONMENT

3.01 GENERAL DESCRIPTION

a. Geographic Location (Refer to Plate II-3). Red River Parish is located in northwest Louisiana. The parish seat and largest populated municipality is the Town of Coushatta (1970 population, 1,429). The parish's population (1970 population, 9,226) is classified as rural by the U.S. Census. The parish is bound by DeSoto Parish to the west; Caddo, Bossier, and Bienville Parishes to the north and northeast; and Natchitoches Parish to the south and southeast. Two bayous, Bayou Pierre and Black Lake Bayou, form the respective western and eastern boundaries. The Red River crosses the parish from northwest to southeast. The service area, as far as domestic use of water is concerned, represents the portion of Red River Parish located on the east side of Red River.

3.02 GEOLOGICAL ELEMENTS

a. Regional Geology. Red River Parish lies in the northwestern portion of Louisiana and is part of the Gulf Coastal Plain Province. Red River Parish is bordered on the west by Bayou Pierre which runs the entire length of the parish in a north-south direction. Black Lake Bayou forms the eastern border of Red River Parish with Natchitoches Parish. A line approximately 32° 15' N. latitude forms the northern border with Caddo, Bossier and Bienville Parishes. The southern boundary is formed by Bayous Pierre and Lumbro. The Red River flows the entire length of the parish. The alluvial plain of the Red River is a major geological entity of the parish. Grand Bayou drains approximately 111 square miles (about 27 percent) of the total area of Red River Parish. Black Lake Bayou drains approximately 75 square miles in Red River Parish (about 18 percent of the total area of the parish). The Red River is the drainage outlet for the remaining area of the parish. The southeasterly flow of these major streams is effected by the Sabine Uplift, a domed structural feature centered in the southern part of Caddo Parish. The dome is approximately 80 miles long and 65 miles wide (Murray, 1948).

b. Local Geology.

(1) Physiography. Three distinct topographic provinces are found in Red River Parish. The first is the alluvial valley or floodplain areas adjoining the Red River, Grand Bayou, and Black Lake Bayou drainage network. The Prairie Terrace surface is a second topographic province which is primarily situated adjacent to the floodplains of the

major streams. The "hills area" is a third province which consists of terrace uplands and tertiary uplands (Murray, 1948).

(2) Soils. Eleven (11) soil associations exist within the study area. These eleven associations are divided into two major categories based on location and topography: (1) the soils of the Red River alluvial plain and (2) the soils of the upland drainages. Two subdivisions are further derived from the upland soils. These are (1) the nearly level to gently sloping soils and (2) the gently sloping to moderately sloping soils. Table III-1 lists the eleven soil associations and a description of their respective surface and subsurface soils. The surface soils within the study area vary in color from red to yellowish brown and in texture from loams to clays. The thickness of the surface soils vary from three to eleven inches. The subsurface soils of the area are very similar to the surface soils in color and texture; however, the thickness of the subsurface soils vary from eight inches to thirty inches. The soil associations of Red River Parish are shown in Plate III-1. Plate III-2 represents the soil associations of the Grand Bayou area.

3.03 HYDROLOGIC ELEMENTS

a. General Hydrology. The study area encompasses a portion of the Red River drainage basin. Black Lake Bayou and Grand Bayou, both of which flow into Black Lake, are tributaries of the Red River. The drainage areas for Black Lake Bayou and Grand Bayou are 908.34 and 135.84 square miles respectively. The drainage area of the Red River at the mouth of Saline Bayou (drainage from Black Lake) is 65,933.86 square miles. This area includes Grand Bayou and Black Lake Bayou (Sloss, 1971).

b. Hydrology of Project Area.

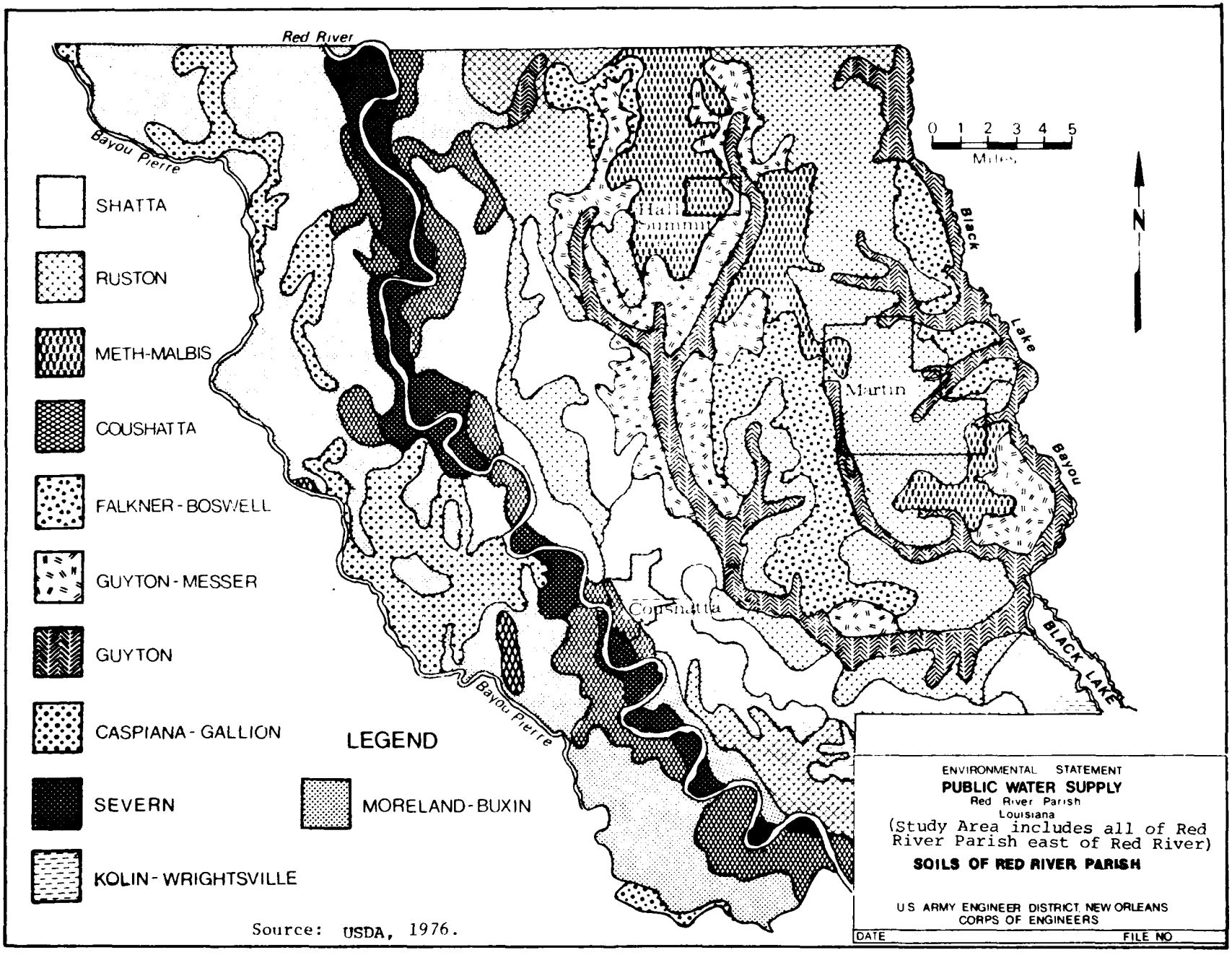
(1) Climatic Characteristics. Climate of Red River Parish is humid subtropical. Maritime tropical air masses from the Gulf of Mexico dominate the lengthy summer season. Arctic or interior air masses are frequent during the winter. The average annual termperature is 65°F, with a low average daily temperature of 47°F in January and a high average daily temperature of 82°F in August. The average length of a freeze-free season is 240 days. Average annual precipitation is 45 inches per year. Most precipitation occurs as rain; however, light snow occurs. Peak precipitation, generally associated with cold front activity, occurs in the winter months and low precipitation occurs in June and August (U.S. Army, 1975).

TABLE III-1

SOILS

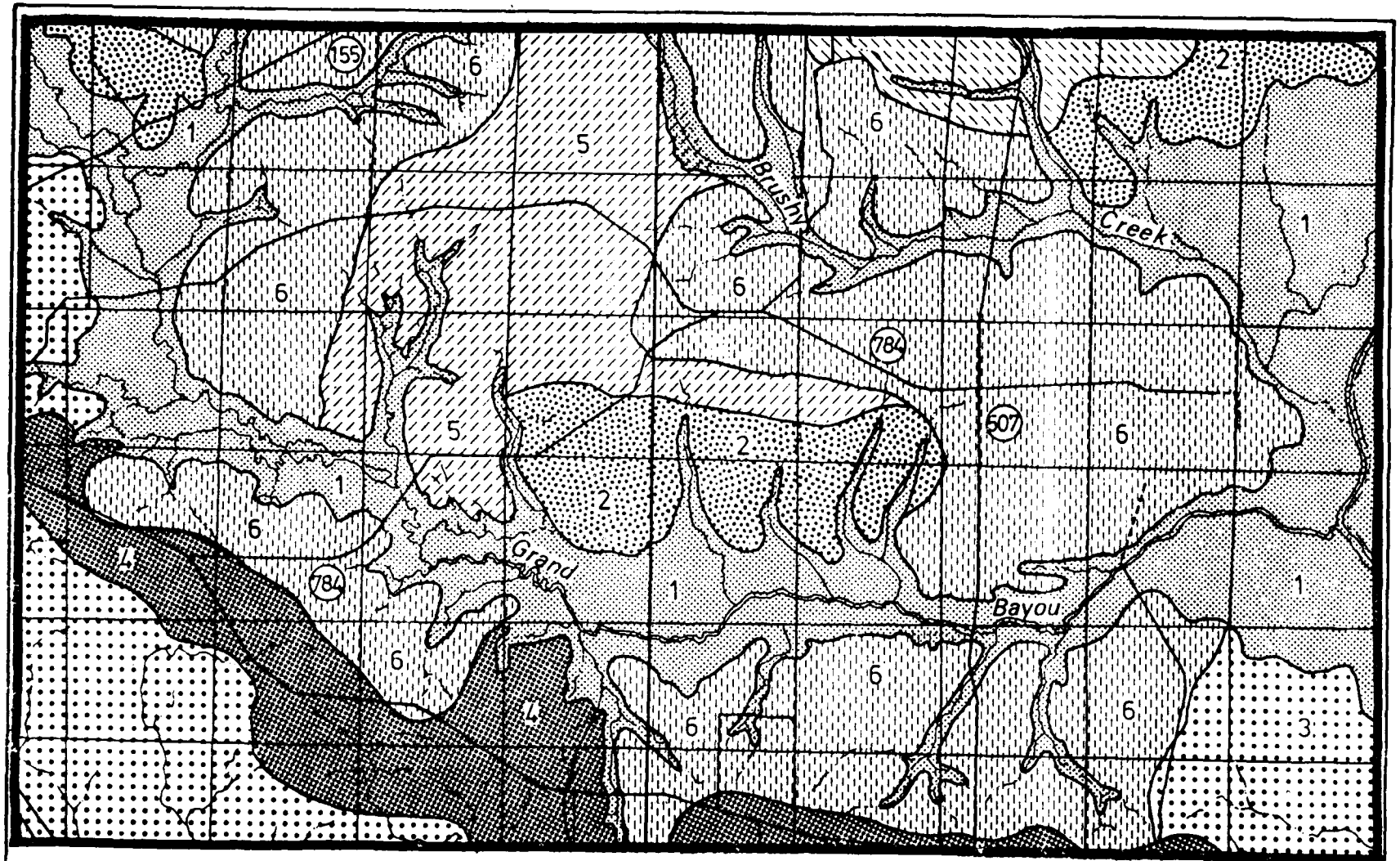
ASSOCIATION	PARISH	SURFACE LAYER	SUBSURFACE LAYER
Red River Alluvial Plain			
1) Coushatta	Red River	Reddish Brown Silt Loam	Reddish Brown Silt Loam, Silty Clay Loam, and Very Fine Sandy Loam
2) Moreland-Buxin	Red River	Dark Reddish Brown Clay	Lighter Reddish Brown Clay
3) Severn	Red River	Reddish Brown Very Fine Sand Loam	Reddish Brown Very Fine Sandy Loam, Silt Loam, Loam and Loamy Very Fine Sand
4) Caspiana-Gillion	Red River	Dark Brown Silt Loam	Reddish Brown Silt Loam
5) Miller-Roebuck-Buxin	Bossier	Dark Reddish Brown Clayey	Reddish Brown Clayey
Upland Drainage; Level to Gently Sloping			
1) Guyton	Red River	Dark Grayish Brown Silt Loam	Light Brownish Gray Silt Loam
2) Guyton-Messer	Red River	Dark Grayish Brown Silt Loam	Light Brownish Gray Silt Loam
3) Kolin-Wrightsville	Red River, Natchitoches	Brown Silt Loam	Brown Silt Loam
4) Shatta	Red River, Natchitoches	Dark Grayish Brown Silt Loam	Strong Brown or Yellowish Brown Clay Loam
5) Buxin	Bienville	Reddish Brown Clay	Gray Clay
6) Roebuck-Cahaba	Bienville	Gray Silt Loam	Gray Silty Clay Loam
7) Wrightsville-Acadia	Webster, Bossier	Gray Silt Loam	Gray Mottled with Brown Silty Loam
8) Perry-Buxin	Bossier	Dark Gray Clay	Dark Gray and Reddish Brown Clay
9) Guyton-Cahaba	Natchitoches	Grayish-Brown Silt Loam	Light Brownish Gray to Gray Silty Clay Loam
Upland Drainage; Gently to Moderately Sloping			
1) Falkner-Boswell	Red River	Brown Silt Loam	Yellowish Brown Silt Loam
2) Ruston	Red River, Natchitoches	Yellowish Brown Fine Sandy Loam	Yellowish Red Loam
3) Meth-Malbis	Red River	Grayish Brown Fine Sandy Loam	Yellowish Brown Fine Sandy Loam
4) Shubuta-Boswell-Susquehanna	Bienville	Grayish Brown Fine Sandy Loam	Red Sandy Clay
5) Gore-Malbis	Bienville, Bossier, Webster	Grayish Brown Fine Sandy Loam	Mottled Red and Gray Plastic Clay
6) Ora-Savannah-Shubuta	Webster	Dark Brown Very Fine Sandy Loam	Yellowish Red Loam

Source: General Soil Map, Red River Parish (1976), Webster Parish (1971), Bossier Parish (1971), Bienville Parish (1971), Soil Conservation Service in Cooperation with Louisiana Agricultural Experiment Station.



Source: USDA, 1976.

PLATE III-1



ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana

GRAND BAYOU SOILS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: FILE NO

Source: USDA, 1976.

PLATE III-2

(2) Drainage Basin.

(a) Red River. The drainage basin of the Red River is approximately 65,934 square miles at the mouth of Saline Bayou (Plate III-3). Some of the major tributaries include Black Lake Bayou, Grand Bayou, and Bayou Dorcheat. (Refer to Red River Waterway Louisiana, Texas, Arkansas and Oklahoma, Design Memorandum No. 15, Vol. 3, U.S. Army Corps of Engineers, 1975, for further details of the drainage area of the Red River).

(b) Grand Bayou. Grand Bayou drains an area of 135.84 square miles of which 111 square miles lie in Red River Parish (Plate III-4). The channel length of Grand Bayou is approximately 40 miles from its mouth, at Black Lake, to its headwaters in Bienville Parish. Bayou Chicot, which drains 27.96 square miles, is the major tributary of Grand Bayou. All other tributaries of Grand Bayou, most of which are intermittent streams, drain an area of less than ten square miles.

(3) Water Quality.

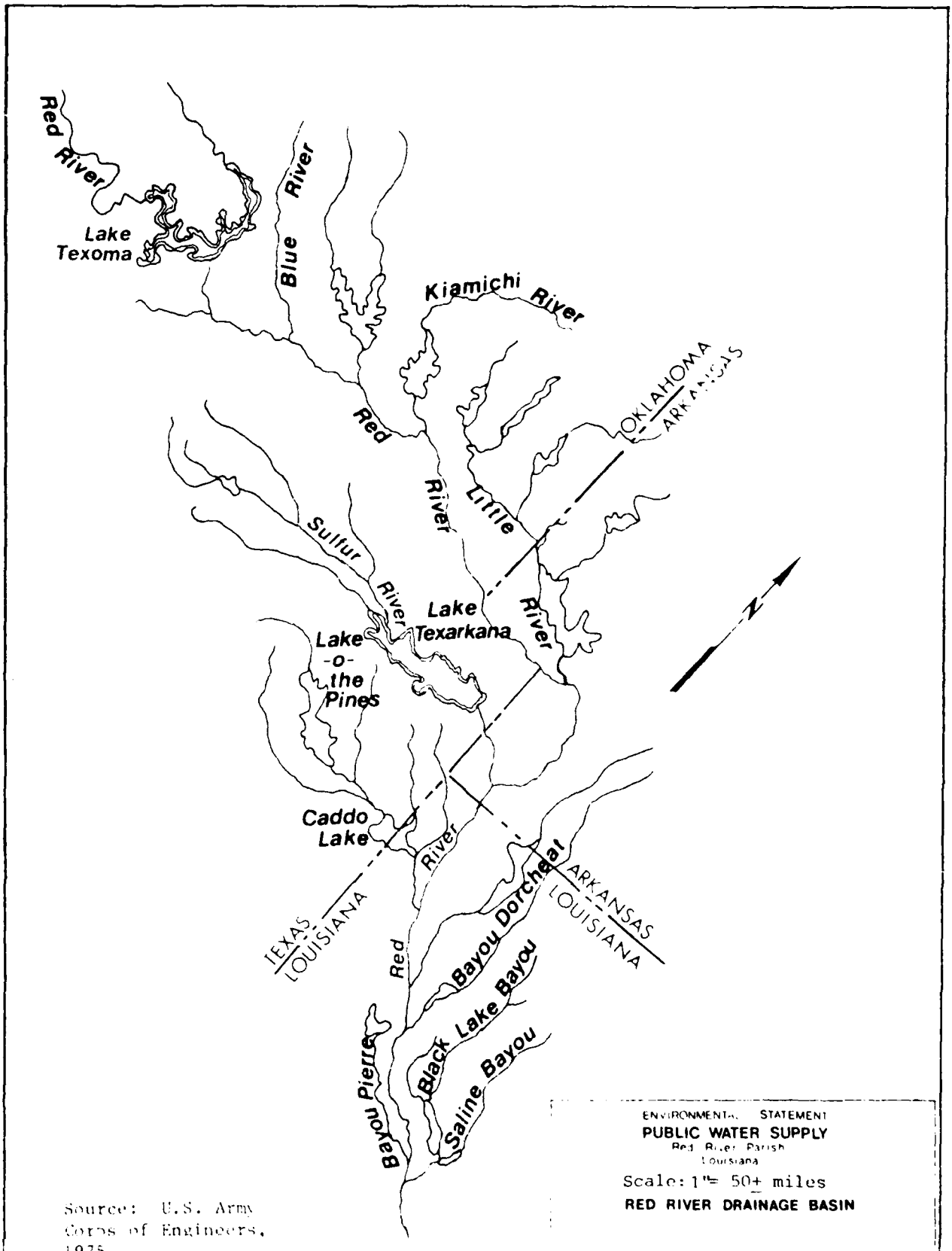
(a) Red River. Table II-2 is a listing of the important water quality parameters tested by the Environmental Protection Agency.

> "The quality of water on the Red River main stem below Denison Dam has been described by various sources as highly variable but generally poor, primarily because of high concentrations of dissolved solids, chloride, total hardness, and fecal coliform....Extensive treatment is required in Louisiana to make the river water acceptable for use by public water supply systems and industrial use. Because of salinity hazards in this reach, the river is also a poor source of irrigation water."

(Refer to Red River Waterway Louisiana, Texas, Arkansas and Oklahoma Design Memorandum No. 15, Vol. III, p. 196, U.S. Army Corps of Engineers, 1975, for further details on water quality of the Red River.)

(b) Grand Bayou. Grand Bayou generally has a good quality water. The amount of pesticides found in the stream are all less than the criteria as set forth by the EPA for safe drinking water. During the low flows in summer months, total coliform counts increase, and dissolved oxygen decreases. The low dissolved oxygen levels in Grand Bayou shown in Table III-2 are due to the low flow at the time of sampling. The total coliform probably is partially attributable to the numerous warm blooded animals that come to drink water from the stream. No municipal effluent is discharged into Grand Bayou. Iron is a problem in Grand Bayou also, as it is in most by leaching from a poor grade iron ore that is abundant in the area (Germany, 1979). Table III-2 compares the water quality of Grand Bayou with that of the Red River alternative.

The proposed Grand Bayou Reservoir will have an average depth of less than 10 feet. In a shallow lake such as the proposed Grand Bayou Reservoir, oxygen depletion is not a likely prospect. Organic enrich-

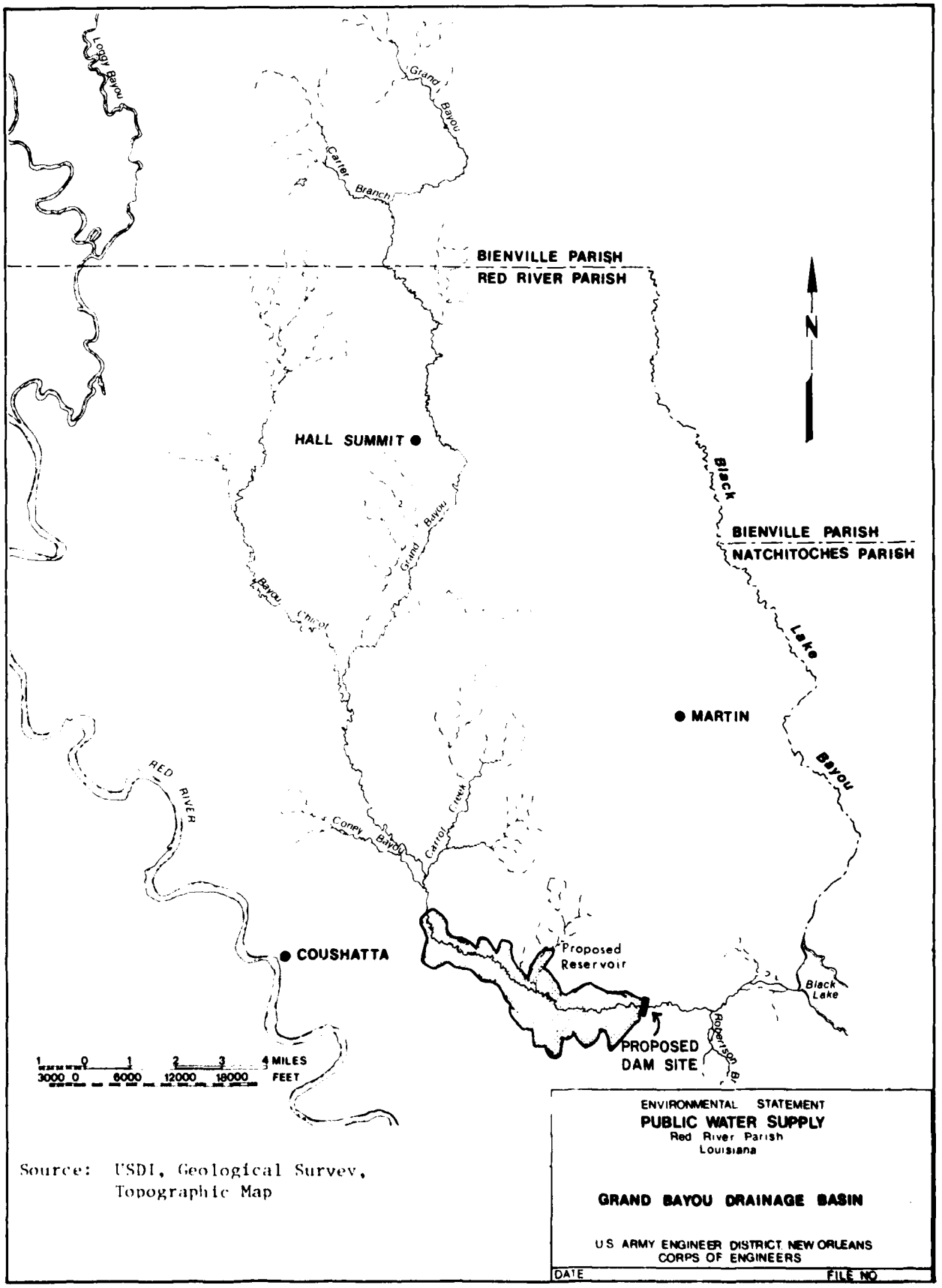


Source: U.S. Army Corps of Engineers, 1975.

ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana
Scale: 1" = 50± miles
RED RIVER DRAINAGE BASIN

ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS
FILE NO.

PLATE III-3



Source: USDI, Geological Survey, Topographic Map

ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana

GRAND BAYOU DRAINAGE BASIN

U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS

DATE FILE NO.

PLATE III-4

TABLE III-2

WATER QUALITY, RED RIVER AND GRAND BAYOU

PARAMETER	RED RIVER @ COUSHATTA		GRAND BAYOU @ COUSHATTA		STANDARD/ UNITS
	Maximum	Minimum	Maximum	Minimum	
Biological Oxygen Demand	8.8	0.3	6.7	0.0	mg/l
Chemical Oxygen Demand	116.0	0.0	63.0	39.0	mg/l
Dissolved Oxygen	13.0	5.4	8.4	3.3	mg/l
Fecal Coliform	38,000.0	62.0	200.0	80.0	No/100ml
Total Dissolved Solids	696.0	96.0	88.0	61.0	500.0 mg/l
Turbidity	260.0	10.0	20.0	4.0	5 JTU
Color	500.0	5.0	100.0	15.0	15 Units
Temperature	31.0	3.5	27.0	11.1	^{o}C
Conductivity @ 25^{o}C	1260.0	153.0	182.0	84.0	umhos
pH	8.4	6.6	7.1	6.0	units
Total Hardness as $CaCO_3$	300.0	60.0	38.0	16.0	mg/l
Total Nitrogen	1.6	0.54	2.3	0.88	mg/l
Total Kjeldahl	1.5	0.44	2.2	0.75	mg/l
Total Phosphates	44.0	0.04	0.13	0.06	mg/l
Total Calcium	68.0	28.0	10.0*	4.4*	mg/l
Total Magnesium	19.0	7.4	4.5*	1.2*	mg/l
Total Sodium	88.0	22.0	25.0*	8.2*	mg/l
Total Potassium	6.0	3.4	6.0*	1.9*	mg/l
Chloride	230.0	11.0	40.0	5.0	250.0 mg/l
Total Sulfate	120.0	9.8	15.0	0.8	250.0 mg/l
Fluoride	0.4	0.0	0.2	0.1	0.7 mg/l

TABLE III-2

WATER QUALITY, RED RIVER AND GRAND BAYOU
(Continued)

PARAMETER	RED RIVER @ CO...ITA		GRAND BAYOU @ COUSHATTA		STANDARD/ UNITS
	Maximum	Minimum	Maximum	Minimum	
Total Nitrate	1.8	0.3	0.5	0.2	45.0 mg/1
Total Arsenic	22.0	0.0	+.0*	+.0*	50.0 ug/1
Total Cadmium	5.0	0.0	1.0*	1.0*	10.0 ug/1
Total Chromium	30.0	0.0	0*	0*	50.0 ug/1
Diss. Copper	0.0	0.0	5.0	4.0	1000.0 ug/1
Total Iron	30,000.0	370.0	920.0*	870.0*	300.0 ug/1
Total Lead	61.0	0.0	-	-	50.0 ug/1
Total Strontium	190.0	160.0	300.0*	230.0*	ug/1
Total Zinc	150.0	5.0	30.0*	10.0*	5000.0 ug/1
Total Mercury	0.7	0.0	0.1*	0.0*	2.0 ug/1

* Indicates Dissolved not Total, Limits.

Source: EPA STORET information.

ment is likely to occur in the first four to five years of the proposed Lake's existence after impoundment, but the organic enrichment will not adversely affect the water's quality due to proposed treatment processes. No known or anticipated harmful organic compounds have been identified in the environmental analyses. Iron influences may exist at levels requiring specialized treatment, therefore, such a possibility has been considered in the design of a treatment process. The prospect of inevitable algal growth is addressed in page IV-17.

Water samples of Grand Bayou have been systematically taken and recorded in state files; a specific sample was taken on August 9, 1979, for use in this analysis (See p. B-12).

(4) Stages and Flows.

(a) Red River. The Red River is one of the major streams in Louisiana. It has a drainage area of 65,934 square miles at the mouth of Saline Bayou. Even though the Red River drains a large area, it still becomes quite shallow during the later summer months. (Refer to the Red River Waterway Louisiana, Texas, Arkansas and Oklahoma, Design Memorandum No. 15, U.S. Army Corps of Engineers, 1975, for further details.)

(b) Grand Bayou. The flow of Grand Bayou is highly variable. The basin is normally inundated for extended periods of time during the late winter or early spring months. On the other hand during the mid and late summer months the flow on Grand Bayou drops to near zero. The average discharge for a 21 year period is 66,901 acre feet per year (USDI, 1977). Table III-3 is a listing of the flow on Grand Bayou for the twenty-one year period.

(5) Pool and Flow Level Regulations.

(a) Red River. The Red River Waterway project will require stabilization of the stream. A lock and dam system will be constructed as part of the navigational project. In order to maintain the Red River in a navigable state, the pool elevation will be maintained at a elevation of 115'-120' N.G.V.D.*. A final elevation will be determined at a later date. (For further details refer to Final Supplement No. 1 to the Final Environmental Statement, Red River Projects; Mississippi River to Shreveport, Louisiana, Reach; U.S. Army Engineer District, New Orleans, Louisiana, February, 1977.) The 120 feet above N.G.V.D. which will provide a 20-30 foot depth. (For further detail refer to sheet 113 of the 1967-69 hydrographic survey of the Red River.)

(b) Grand Bayou. There are no pool or flow level regulations for Grand Bayou.

(6) Natural and Scenic Streams. Several parameters such as wilderness, recreation, archeological, and botanical qualities are used by the Louisiana Department of Wildlife and Fisheries to evaluate a stream to be included in the natural and scenic streams system. Channelization, clearing and

*N.G.V.D. - National Geodetic Vertical Datum = Mean Sea Level (MSL).

TABLE III-3

FLOW RECORD, GRAND BAYOU, 1956-1977
(Acre-Feet by Month and Year)

Calendar Year	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
56	-	-	-	-	-	-	-	-	-	0.4	5.6	4.6	-
57	1,630	13,590	8,460	20,330	12,400	10,910	419	91	27	1,470	30,510	7,150	107,000
58	13,500	4,630	11,070	4,010	9,910	2,510	4,280	457	28,840	878	1,290	682	81,860
59	1,220	7,220	9,560	11,180	3,720	4,700	250	30	3.4	135	1,950	8,240	48,210
60	10,680	19,960	12,050	525	156	1,190	105	98	6.9	5.6	169	4,300	49,240
61	21,010	12,160	37,280	8,590	685	2,370	337	4,110	8,870	115	3,800	50,390	144,700
62	13,020	5,580	8,930	18,800	11,360	972	729	6.7	30	0	29	135	59,590
63	196	563	559	1,280	24	3.6	11	0.2	65	.6	23	394	3,119
64	1,740	806	5,510	7,430	744	601	.8	1.4	2.4	12	9.9	86	16,940
65	100	2,140	2,790	6,340	399	100	13	24	2,460	101	51	3,610	18,130
66	7,960	27,290	3,450	7,640	10,070	23	0	1.2	1.2	4.8	26	22	56,490
67	73	915	204	302	313	8,870	2,170	3.4	2.8	.7	.6	679	13,540
68	21,790	3,630	13,680	37,760	19,240	1,600	747	551	7,090	157	6,950	19,210	132,400
69	2,310	8,100	17,160	16,940	5,490	124	30	.06	2.5	5.2	354	579	51,090
70	2,420	4,260	8,350	1,870	10,690	1,660	208	3.3	22	931	881	846	32,140
71	1,300	6,130	2,440	414	6,970	14	161	1,850	1,180	56	1,240	12,830	34,590
72	17,860	8,040	4,420	683	456	1.5	3.2	1.0	55	118	2,330	7,790	41,750
73	25,410	7,150	17,910	16,500	3,690	333	301	87	202	396	4,400	14,190	90,570
74	51,290	16,640	9,660	7,270	1,660	7,130	52	64	1,800	2,260	11,050	22,170	131,100
75	23,940	20,820	25,520	3,100	33,960	23,120	26,590	3,860	303	167	303	1,190	162,900
76	5,330	6,310	23,130	2,010	4,880	13,230	3,430	30	11	6.3	7.6	2,320	62,680
77	6,390	12,470	13,200	6,440	1,390	6.6	45	8.0	53	-	-	-	-
Mean	10,912.8	8,971.6	11,206.3	8,543.5	6,581.3	3,784.2	1,994.4	537.0	2,429.9	324.7	3,113.3	7,467.5	66,901

- No Data

Source: "Water Resources Data for Louisiana," 1956-1977. U.S. Department of the Interior, Geological Survey.

snagging, channel realignment, and reservoir construction are absolutely prohibited on any stream classified as a natural and scenic stream (Louisiana Department of Wildlife and Fisheries, 1973). Grand Bayou and Red River are not listed as natural and scenic streams.

3.04 BIOLOGICAL ENVIRONMENT

a. Botanical.

(1) Red River. The terrestrial and aquatic vegetation of the Red River Valley has been described in a report entitled Red River Waterway, Louisiana, Texas, Arkansas and Oklahoma, Design Memorandum No. 15, (U.S. Army Corps of Engineers, 1975, Vol. 6). This is an extensive study which describes the different habitat communities that occur along the Red River and their importance to wildlife.

(2) Grand Bayou. The study area, which includes all of Red River Parish east of the Red River, is located in the northwestern portion of the state which Brown (1945) describes as having two major tree regions: (1) the "Bottomland Hardwoods and Cypress Region" and (2) the "Shortleaf Pine-Oak-Hickory Region" (See Plate III-5). These regions are classified as such due to the general distribution of vegetation, which is determined by several environmental factors such as topography, rainfall, and soils. (See Plate III-6 for habitat areas and Appendix C for Vegetational Species of Grand Bayou.)

Pursuant to Executive Order (E.O.) 11990, the proposed Grand Bayou Lake will not be enlarged to include adjacent prime farmlands. Less than two percent of the total impoundment is classified as prime farmland.

None of the affected wetlands has been set aside as a study area, sanctuary or refuge area. Because of the proposed dam design, natural drainage patterns will not be adversely affected, though sedimentation patterns, salinity distributions and flushing characteristics will be altered. No detrimental affects regarding shielding of other areas from wave action, erosion or flooding are anticipated. Storage of storm or flood waters will not be adversely affected.

(a) Bottomland Hardwoods. In September, 1981, the U.S. Corps of Engineers made a final wetlands determination of the proposed 2900-acre Grand Bayou Reservoir and shoreline. In the 2900-acre area, three types of hardwood areas were documented, of which two types were classified as wet bottomland hardwoods and dry bottomland hardwoods. The third classification was pine-hardwoods.

In this Corps of Engineers report, 630 acres were classified as wet bottomland hardwoods, all of which would be inundated.

A total of 1,350 acres of dry bottomland hardwoods were found and classified in this Corps of Engineers study.

Pine hardwoods comprised 690 acres of the area to be inundated, according to the 1981 study.

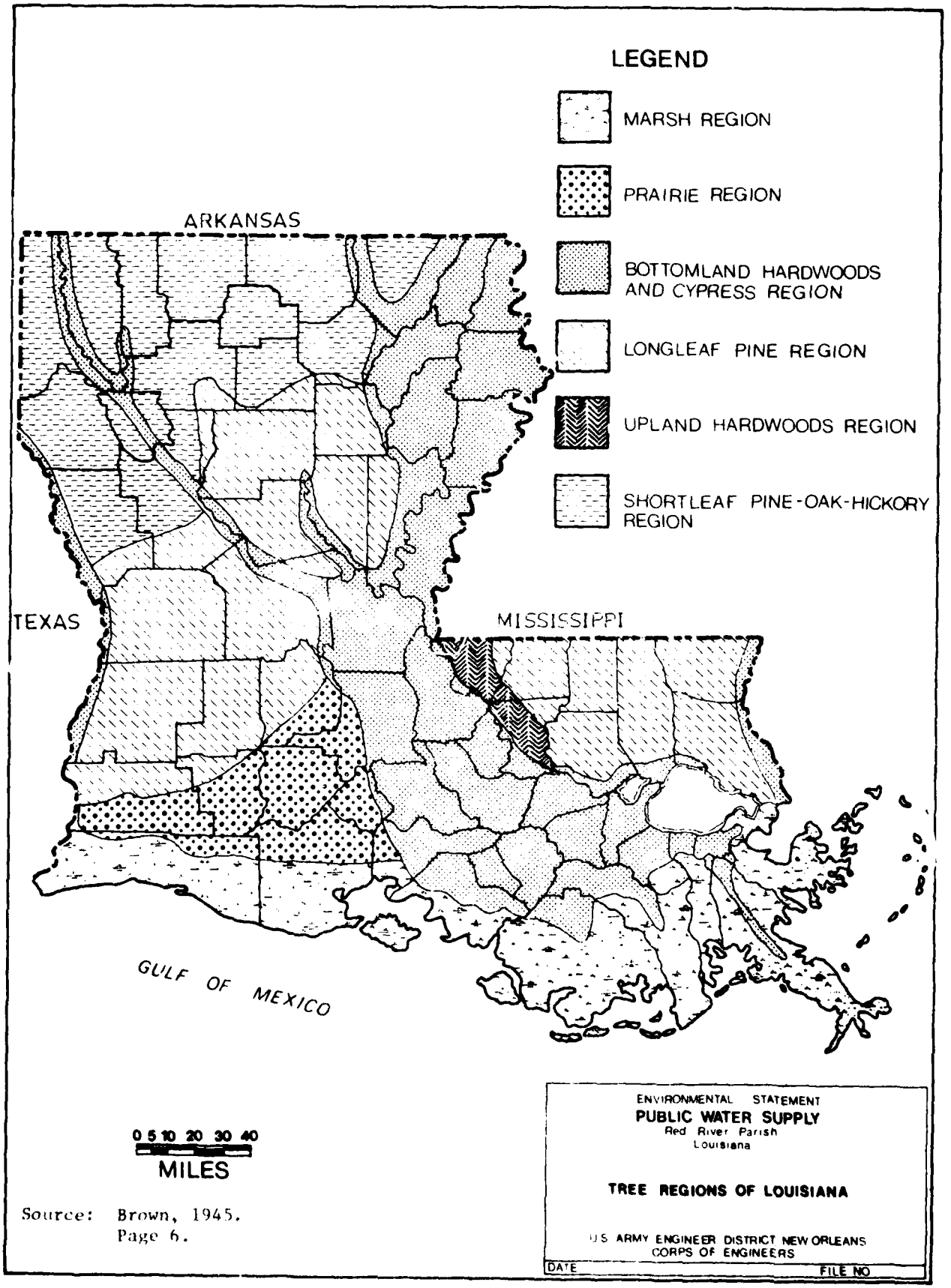
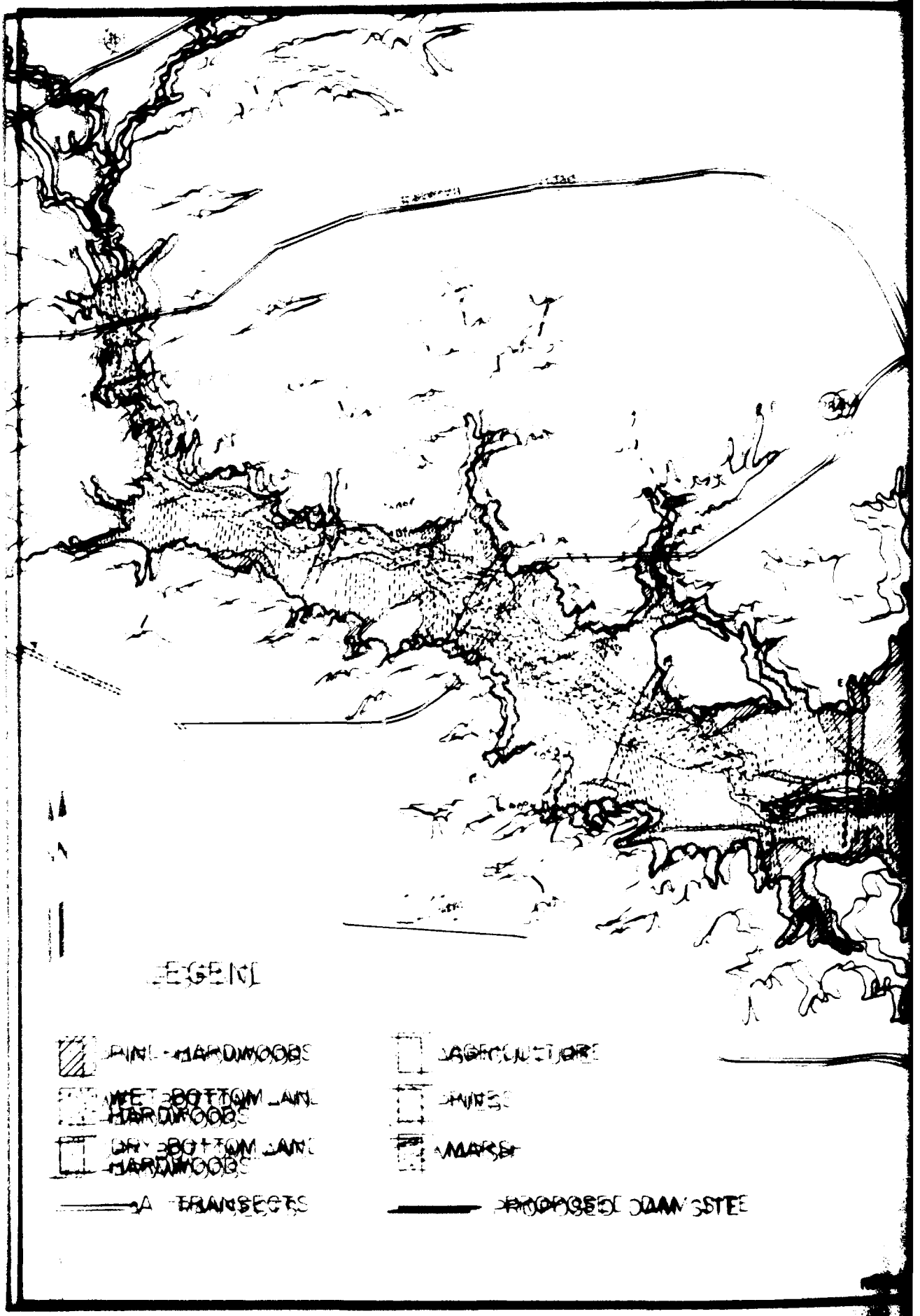

LEGEND
MARSH REGION
PRAIRIE REGION
BOTTOMLAND HARDWOODS AND CYPRESS REGION
LONGLEAF PINE REGION
UPLAND HARDWOODS REGION
SHORTLEAF PINE-OAK-HICKORY REGION
ARKANSAS
TEXAS
MISSISSIPPI
GULF OF MEXICO
0 5 10 20 30 40
MILES
Source: Brown, 1945. Page 6.
ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana
TREE REGIONS OF LOUISIANA
U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS
DATE
FILE NO

PLATE III-5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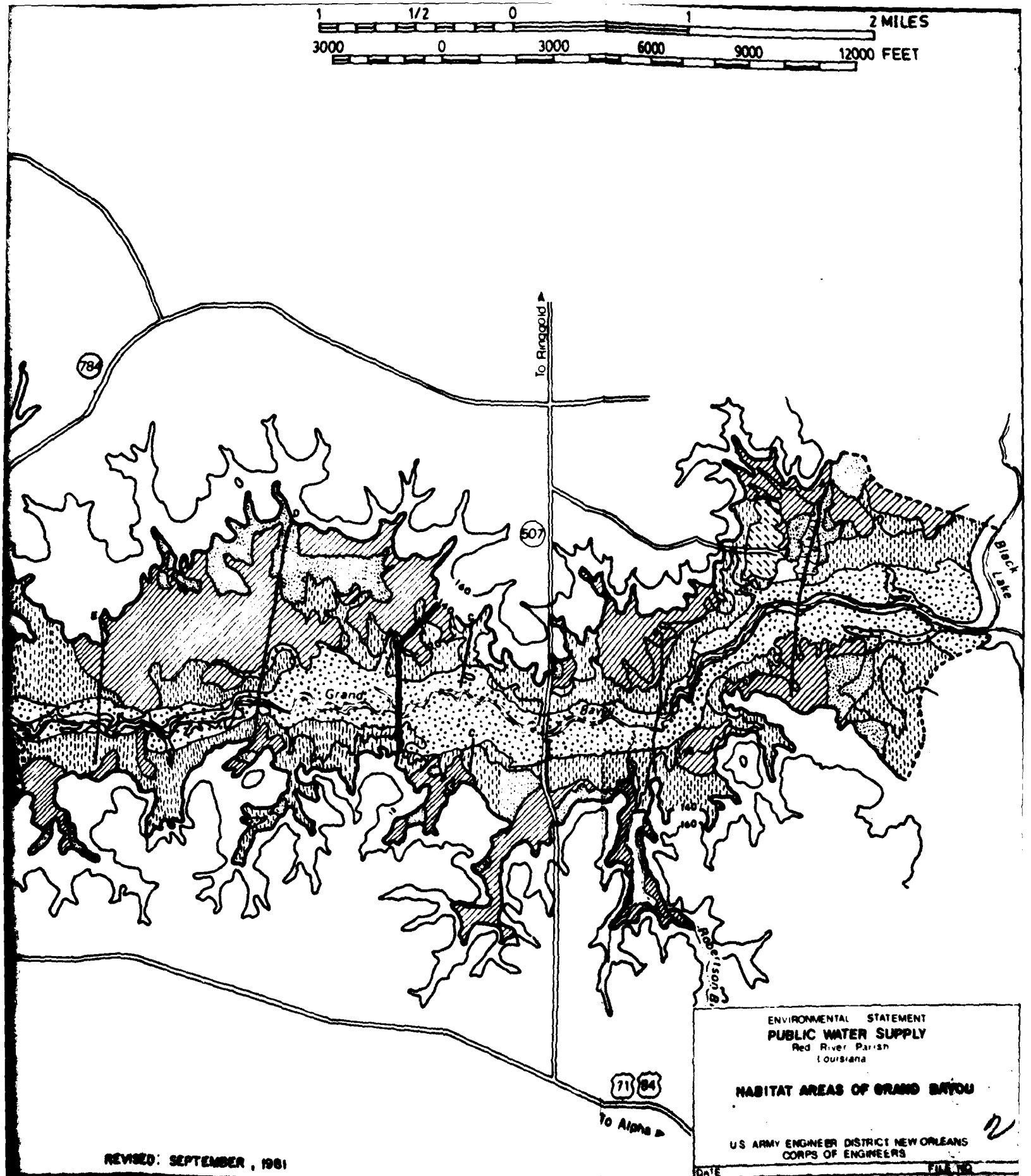
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3000 0 3000 6000 9000 12000 FEET
To Arnaudville
784
507
Black Lake
Grand
Bayou
Roberson Bayou
71
84
To Alpha
REVISED: SEPTEMBER, 1981
ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana
HABITAT AREAS OF GRAND BAYOU
US ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS
DATE
FILE NO

The balance of land (230 acres) within the proposed Grand Bayou Reservoir impact area consists of pines, pasture land and farm land, according to the 1981 Corps of Engineers report. A summary of the 1981 Corps of Engineers report is shown in tabular form on page II-16, Table II-5.

1. Wet Bottomland Hardwoods. The 630 acres defined as wet bottomland hardwoods are nearly level, poorly drained, and frequently flooded. The surface layer is dark, grayish-brown silt loam about three inches thick (USDA, 1976). *Common overstory species* are overcup oak *(Quercus lyrata)*, Drummond red maple *(Acer drummondii)*, and tupelogum *(Nyssa aquatica)*. These species produce a medium to sparse canopy. Along the swamps and natural levees bald cypress *(Taxodium distichium)*, green ash *(Fraxinus pennsylvanica)*, and hornbeam *(Carpinus caroliniana)* are also abundant. The understory consist of a diversity of shrubs, vines, and herbs. The common understory and ground cover species are green hawthorn *(Crataegus viridus)*, wild azalea *(Rhododendron canescens)*, lizards tail *(Saururus cernuus)*, spiderwort *(Tradescantia spp.)*, and green briar *(Smilax spp.)*. The natural biological functions associated with these wetlands will be altered due to impoundment; however a new aquatic environment will result.

2. Dry Bottomland Hardwoods. These 1,350 acres are found in the upper regions of the basin on soils which are more readily drained due to the slightly higher elevation and better soil composition. The common species forming the overstory canopy include water oak *(Quercus nigra)* willow oak *(Quercus phellos)*, sweet gum *(Liquidambar styraciflua)*, and elms *(Ulmus spp.)*. Flowering dogwood *(Cornus florida)*, silverbell *(Halesia diptera)*, parsley hawthorn *(Crataegus marshallii)*, and huckleberry *(Vaccinium spp.)* are common species of the woody understory. Herbaceous species and vines common to the community are violets *(Viola rosacea)*, partridge berry *(Mitchella repens)*, bulb bittercress *(Cardamine bulbosa)*, poison ivy *(Rhus radicans)*, and muscadine *(Vitis rotundifolia)*.

(b) Uplands. The uplands within the study area are in the region described by Brown (1945) as the "shortleaf pine-oak-hickory region." The soils of the uplands within the study area vary from a very fine sandy loam with a clayey subsoil, to a fine yellowish-red sandy loam which is loamy throughout (USDA, 1976). The shortleaf pines within the study area have been cut out and replaced with slash pine (Pinus elliottii) and loblolly pine (Pinus taeda) or with agricultural lands. The uplands are the best timber producing community that is found within the study area.

1. Pine-Hardwoods. These regions are located mostly above the normal floodplain. The topography of these communities varies from a gentle rolling slope to an abrupt escarpment, especially along the southern or western edge of the study area. The overstory canopy is medium to dense and consists of loblolly pine (Pinus taeda), slash pine (Pinus elliottii), water oak (Quercus nigra), post oak (Quercus stellata), mockernut hickory (Carya tomentosa), and cow oak (Quercus micauxii).

Herbaceous plants found in this habitat type include wake robin (Trillium sessile), dewberry (Rubus spp.), huckleberry (Vaccinium spp.), Mexican plum (Prunus mexicana), green briar (Smilax spp.), arrowwood (Viburnum spp.), yellow jessamine (Gelsemium sempervirens), and horsesugar (Symplocos tinctoria) are common.

2. Agricultural. Few agricultural crops are cultivated within the study area. The majority of croplands are located west of the Red River. Most of the agricultural land in the immediate project area is used for pasture, much of which is unimproved pastureland. Species common to this community type include spiny thistle *(Cirsium horridulum)*, broomsedge *(Andropogon virginiana)*, dichondra *(Dichondra carolinesis)*, rabbit tobacco *(Gnaphalium obtusifolium)*, dogfennel *(Eupatorium capillifolium)*, Dewberry *(Rubus spp.)*, goldenrod *(Solidago spp.)*, and St. Augustine grass *(Stenotaphrum secundatum)*. The agricultural areas to be inundated are shown on Plate III-6. The prime agricultural areas represent about 2% of the total area.

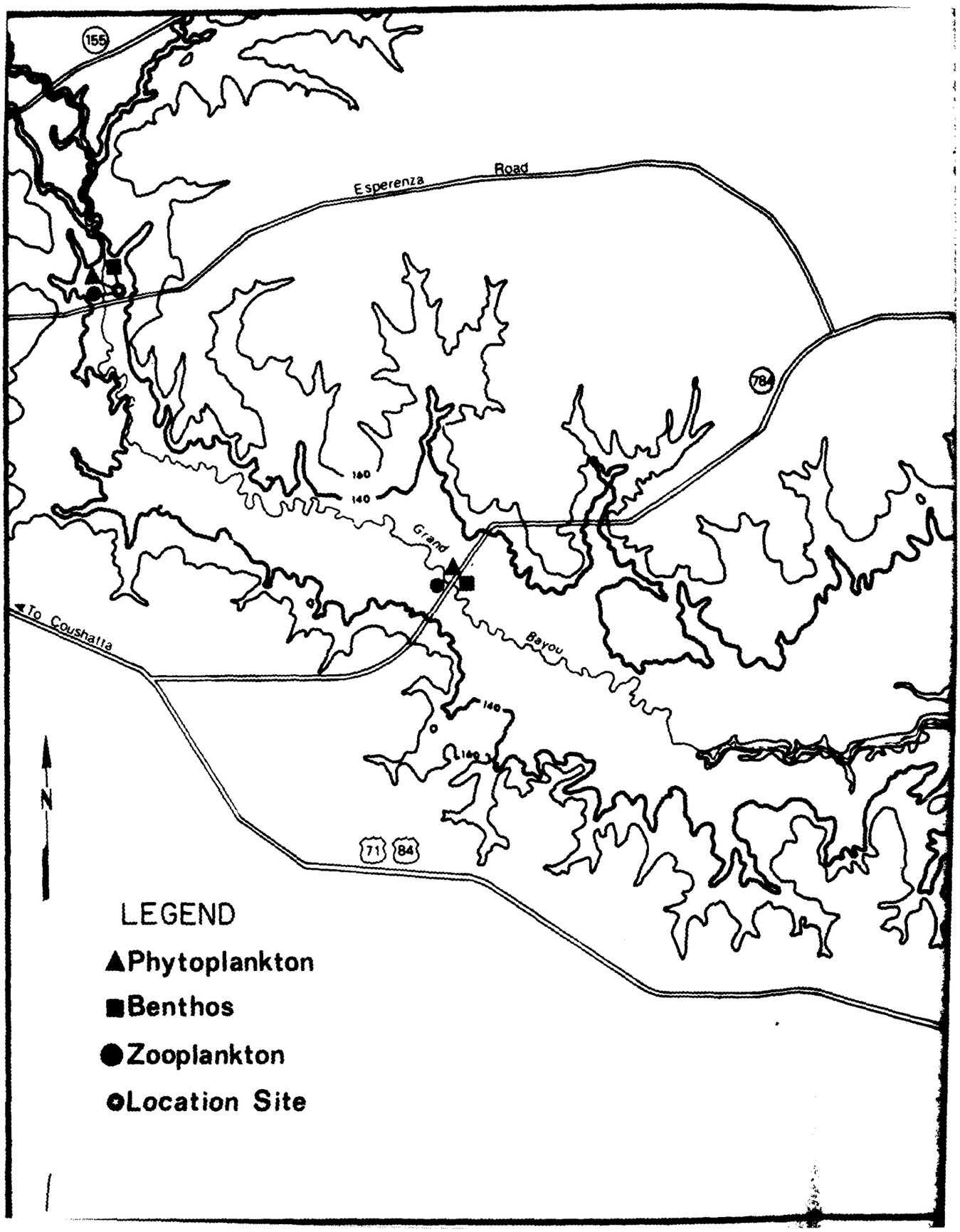
(c) Marshes. One small fresh water marsh (10 acres) is found within the study area. It is located approximately two miles downstream from the proposed dam site. The marsh is nourished year round with periodic inundation of Grand Bayou and with the several springs located within the marsh. The plant species common to the community include marsh elder *(Baccharis halimifolia)*, spike rush *(Eleocharis spp.)*, soft rush *(Jancus effusus)*, smartweed *(Polygonum spp.)*, and cattails *(Typha latifolia)*.

(d) Phytoplankton. Whole water samples were taken at four sample sites to determine the phytoplankton communities (Plate III-7). Temperature, pH, total dissolved solids, and dissolved oxygen were taken at each site before the plankton samples were collected (Table III-4). The group of plankters more commonly represented was the green algae. Six genera of green algae were found in the samples. The most common green algae were *Spirogyra*, *Ulothrix*, and *Microspora*. Common diatoms which were identified included *Melosira*, *Navicula*, and *Synedra*. *Oscillatoria* and *Anabaena* were the two most common blue-green algae. The only two desmids found were *Closterium* and *Penium*, *Closterium* being the more abundant of the two. With the exception of two species of diatoms, all of the plankters were recorded from at least 50 percent of the sample sites (Table III-5). Due to the abundance and diversity of the different taxa, it seems that the primary productivity of Grand Bayou relies heavily on the contribution of the phytoplankters.

b. Zoological.

(1) Red River. The zoological elements (terrestrial and aquatic) of Red River have been identified in extensive surveys. Narrative descriptions as well as tables of collection data of the zoological elements appear in the Red River Waterway, Louisiana, Texas, Arkansas, and Oklahoma, Design Memorandum No. 15, U.S. Army, 1975.

(2) Grand Bayou. Several environmental factors such as climate, precipitation, topography, and soil composition affect the vegetative cover types so that a numerous amount of ecosystems is formed. These various ecosystems, in turn, affect the wildlife populations. In conjunction with the natural phenomena is man's practice in land use, which also aids in producing variations in the ecosystems. The terrestrial wildlife populations


155
Esperenza
Road
784
160
140
Grand
To Coushatta
Bayou
140
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84
LEGEND
▲Phytoplankton
■Benthos
●Zooplankton
⊙Location Site

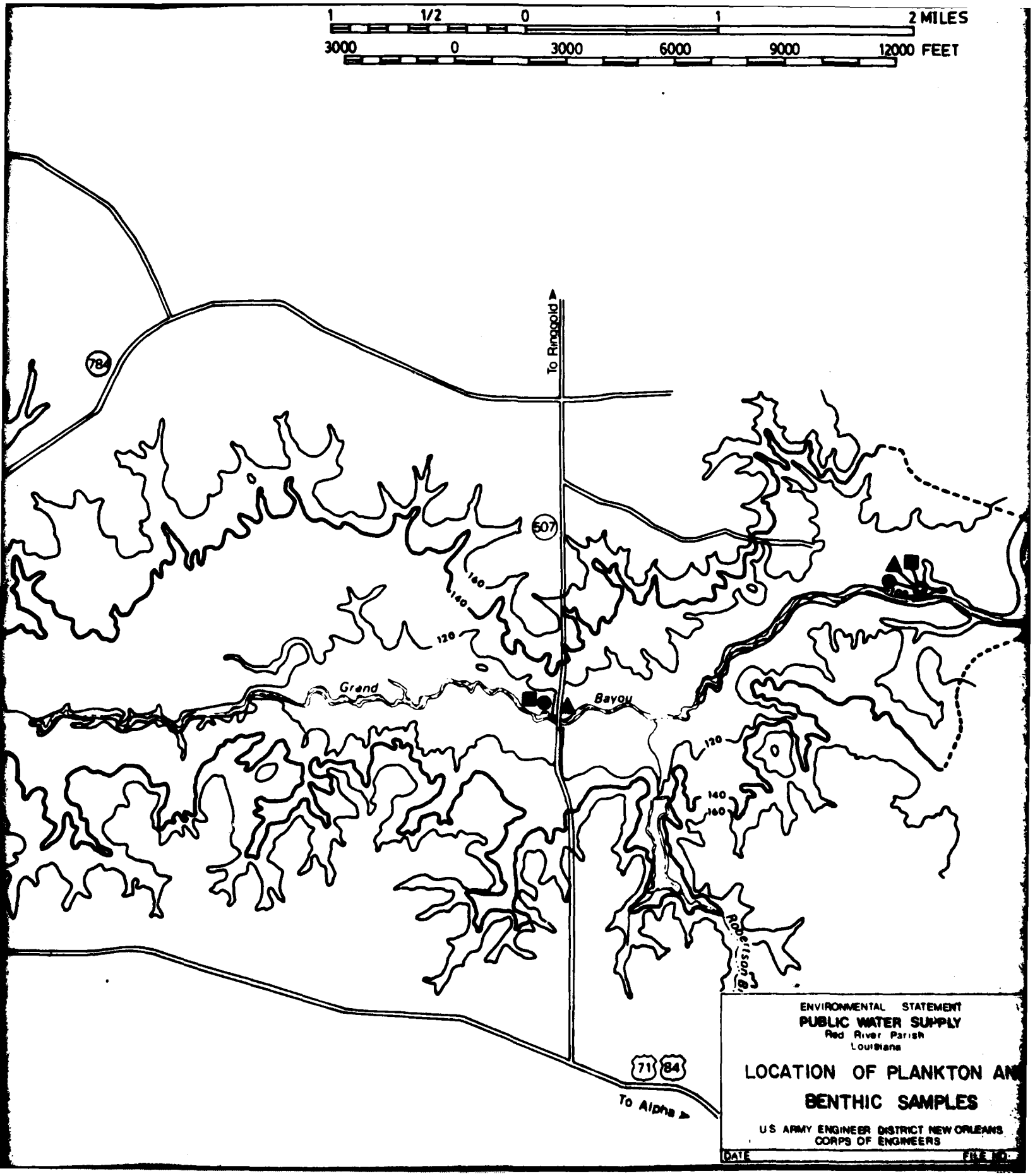

1 1/2 0 1 2 MILES
3000 0 3000 6000 9000 12000 FEET
To Ringgold
784
507
160
140
120
Grand
Bayou
120
140
160
Robertson
71
84
To Alpha
ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana
LOCATION OF PLANKTON AN
BENTHIC SAMPLES
U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS
DATE
FILE NO.

TABLE III-4

WATER ANALYSIS DURING PLANKTON AND BENTHIC SAMPLES
GRAND BAYOU, MAY 1979

TEST	Pt. 1 Esperenza Rd	Pt. 2 LA Hwy 784	Pt. 3 LA Hwy 507	Pt. 4 Black Lake	$\bar{x}$ Results
Temperature, °C	22.00	23.00	24.00	29.00	24.500
pH	6.60	6.70	6.60	7.40	6.825
Total dissolved solids, ppm	115.20	115.20	96.00	102.40	107.2
Dissolved oxygen, ppm	0.24	0.24	1.28	4.00	1.440

TABLE III-5
PHYTOPLANKTON COUNTS[1]
GRAND BAYOU, MAY 1979

	Pt. 1 Esperenza Rd.	Pt. 2 LA Hwy 784	Pt. 3 LA Hwy 507	Pt. 4 Black Lake	Totals
Desmids:					
Closterium	2	1	3	2	8
Penium		2	2		4
Diatoms:					
Melosira	4	1		1	6
Navicula		3	3	1	7
Asterionella		1			1
Synedra				2	2
Stauroneis			1		1
Blue-Green Algae:					
Anabaena	1		2	1	4
Oscillatoria	1	1	3	2	7
Merismopedia				1	1
Green Algae:					
Spirogyra	1	1	4	1	7
Ulothrix	1	3	4	4	12
Ankistrodesmus	1	1			2
Microspora		3	3	1	7
Oedogonium			2	1	3
Euglena		1	1		2

[1]These are actual numbers of organisms counted as described in Appendix A. Methodology.

within the study area consist of five groups of invertebrates and vertebrates: insects, mammals, birds, amphibians, and reptiles. On site observations and museum research records 44 mammals (10 furbearers, 5 game species, 29 non-game species), 56 reptiles (15 turtles, 9 lizards, 32 snakes), 23 amphibians (14 frogs and toads, 9 salamanders), 152 birds (4 waterfowl, 5 upland game species, and 143 non-game species).

(a) Terrestrial.

1. Game and Fur Animals. Since the mid 1900's Louisiana has been the nation's leading fur producing state, with most seasons averaging near 40 percent of the total United States wild fur production (O'Neil, 1977). In the six year period of 1971-1977, trapping, buying, and licenses have created a steady income for trappers and the state in recent years. A total of ten furbearers are known or presumed to be located within the study area. The nutria, primary fur source since 1961 (Lowery, 1974b), is presumed to live within the basin; however, no reliable record or sighting has been found of the nutria within the study area. The secondary fur producer, the common muskrat, does not occur within the project area. Other furbearers which have been recorded or sighted within the study area include the Virginia opossum, American beaver, red fox, northern raccoon, striped skunk, and bobcat. The North American mink and Nearctic river otter are both presumed to occur within the project area but were not recorded in the field and museum surveys. Depending upon the vegetative cover types and densities of cover, five game species of mammals are known to occur within the study area in varying population densities. The gray squirrel, swamp rabbit, and white-tailed deer prefer the bottomland hardwoods. The uplands are generally preferred by the fox squirrel and eastern cottontail. The cottontail is specially fond of the dense forest edges along the agricultural pasturelands of the uplands. The fox squirrel requires the pine-hardwood ridges which offer a more open understory than does the bottomland hardwoods. By far the primary big game animal is the white-tailed deer. The most popular small game mammal is the gray squirrel. Due to the abundance of rabbits, they represent a hunting quotient of similar magnitude as that of the gray squirrel. The sale of sporting goods and hunting licenses represents an enormous monetary input for the state's economy. Aside from the income these animals create from hunting expenditure, they provide certain aesthetic value for nonconsumptive recreation such as nature walks, painting, and nature photography.

2. Non-Game Mammals. Non-game mammals do not represent any direct monetary input into the state's economy. They do provide nonconsumptive recreational activities such as photography, so that aesthetic value is associated with many of the non-game species. More importantly, many of the non-game species are a direct link within the food chain of other species and could affect the economy of the state. The most common group of non-game species found within the area comprise Order Rodentia. These include the cricetid rats and mice, the Old World rats and mice, and the Plains-pocket Gopher. The house mouse *(Mus musculus)*, roof rat *(Rattus rattus)*, Eastern wood rat *(Neotoma floridana)*, Fulvous harvest mouse *(Reithrodontomys fulvescens)*, and Plains-pocket gopher *(Geomys bursarius)* are the only rodents which have

been sighted or recorded within the area and adjacent lands within Red River Parish. The red bat *(Lasiurus borealis)*, nine-banded armadillo *(Dasypus novemcinctus)*, and short-tailed shrew *(Blarina brevicauda)* are the only other non-game mammals which have been recorded as occurring within Red River Parish. Other common non-game mammals presumed to occur within the area include the Eastern mole, Eastern pipistrelle, evening bat, Rafinesque's big-eared bat, Eastern harvest mouse, white-footed mouse, Hispid cotton rat, and coyote (Lowery, 1974b).

3. Game Birds.

a. Resident. The only resident game birds found within the study area are the bobwhite and wild turkey. The project is located within the region of the state in which turkey hunting is allowed. (Louisiana Department of Wildlife & Fisheries, 1979) However, the bobwhite is considered the primary resident game bird. The bobwhite is very common along undisturbed fence rows, unimproved pastures, and in the pine-hardwood ridges which provide oak mast for food. Some wood ducks and mourning doves set up resident populations but are still considered migratory under the federal classification.

b. Migratory. Two basic groups of migratory game birds occur within the study area. These groups include the upland game birds and the waterfowl. Depending upon the habitat, either group can be found in abundance.

i. Upland Species. American woodcock, common snipe, and mourning doves are the game species associated with the uplands. The bottomland hardwoods are preferred by the woodcock and snipe due to the moist soils found in this region. These two species are not actively hunted, and thus represent only a small portion of consumptive recreation. However, woodcock and snipe are occasionally taken incidental to quail hunting. The mourning dove is the most popular upland migratory game bird. They are quite common in open agricultural fields which are surrounded by trees and provide an adequate water supply.

ii. Waterfowl Species. Wood ducks are the most common waterfowl species located within the study area. The wood duck prefers the flooded hardwood bottomland which offers a medium canopy, and plenty of acorns and nesting cavities. Mallards and blue-winged teals were the only other dabbling ducks recorded in the field survey. These two species were found in the beaver ponds that were relatively open. Migrating blue geese were recorded over the study area; however, the basin does not provide the habitat required for geese to land and rest or feed. Some rails and gallinules are presumed to occur along the edges of the beaver ponds (Lowery, 1974a).

4. Non-Game Birds. A total of 143 non-game bird species occur within the study area. None of the non-game species directly affect the state's economy; however, many of these species are direct and important links in the food chain of other species of animals which could provide some monetary input. Also, these non-game species

provide an aesthetic and scientific value in the areas of bird watching, nature photography, and research. Common herons found in or near the wetlands include the great blue heron, common egret, snowy egret, little blue heron, green heron, and yellow crowned-night heron. The cattle egret frequents open fields where they feed upon insects stirred up by the cattle. Woodpeckers commonly found are the pileated, red-bellied, red-headed, downy, and hairy woodpeckers. Yellow-bellied sapsucker and common flicker are other woodpeckers found, but are not as common, within the study area. The red-tailed hawk, red-shouldered hawk, and broad-winged hawk are common raptors which frequent the area. The barred owl is another common bird of prey. Common insectivorous birds include the Eastern kingbird, blue-gray gnatcatcher, ruby-crowned kinglet and great crested flycatcher. Other passerine birds which frequent the study area include the blue jay, common crow, Carolina chickadee, tufted titmouse, Northern mockingbird, brown thrasher, cedar waxwing, white-eyed and red-eyed vireos, yellow-breasted chat, American redstart, Eastern meadowlark, red-winged blackbird, common grackle, summer tanager, indigo and painted buntings, field and white-throated sparrows, cardinal, and the prothonotary, Northern parula, common yellowthroat, yellow-throated, and hooded warblers.

5. Reptiles and Amphibians. A total of 65 reptile and amphibian species are known to occur within the study area. An additional fourteen reptiles and one amphibian are anticipated to occur in the basin. The Western cottonmouth *(Agkistrodon piscivorous)* and the Southern copperhead *(Agkistrodon contortrix contortrix)* were frequently observed during field studies in the basin. The most common water snake observed was the broad-banded water snake *(Natrix fasciata confluens)*. Other Colubrids frequently recorded were the Texas rat snake *(Elaphe obsoleta lindeimeri)*, the rough green snake *(Opheodrys aestivus)*, and the speckled kingsnake *(Lampropeltis getulus holbrooki)*. Another reptile which was one of the more common of the herptiles in the area, is the three-toed box turtle *(Terrapene carolina triunguis)*. The ground skink *(Eumeces laterale)* was another common reptilian resident of the basin. Frogs and toads which commonly occurred within the project area were the bronze frog *(Rana clamitans)*, bullfrog *(Rana catesbeiana)*, and Fowler's toad *(Bufo woodhousei fowleri)*. The marbled salamander *(Ambystoma opacum)* was the most frequently recorded salamander. (Appendix F.)

6. Insects. By occupying every available niche, the insects have become the most common group of animals to be found in the area. The orders represented in the study ranged from the primitive Collembola to the Lepidoptera and Coleoptera. Most numerous of the insects were the mosquitoes. Butterflies and moths of the order Lepidoptera were also abundant as were the beetles of the order Coleoptera. Along the streams, representatives of the orders Odonata (dragonflies and damselflies) and Ephemeroptera (mayflies) were frequently observed. Some insects are considered pests to agricultural crops and thus represent an enormous potential loss to the state's economy. However, other insects also effect the economy by being predacious upon these pests and thus alleviating some of the agronomic problems. Also these and other insects play a vital role in the food chain of other animals.

(b) Aquatic.

1. Fishes. Fish samples were taken at an accessible point where each transect crossed the Grand Bayou (Refer to Appendix A, Methodology). A total of three, thirty foot drags with a twenty foot seine were made at each point. The seine had a mesh size of .6 cm. Bluegill *(Lepomis macrochirus)* proved to be the most abundant fish species. Other sunfishes that were very common included the redear *(Lepomis microlophus)*, longear *(Lepomis megalotis)*, and warmouth *(Lepomis gulosus)*. The grass pickerel *(Esox americanus vermiculatus)*, and pirate perch *(Aphredoderus sayanus)* and the mosquitofish *(Gambusia affinis)* were other fishes frequently collected. Table III-6 lists the fish that were collected and the locations of the samples taken. Other fish known or presumed to be found within the study area are listed in Appendix G, Fishes.

2. Zooplankton. Zooplankton samples were taken at four (4) sample sites with a standard plankton net (Plate III-7). Three three-minute drags were made at each site. The zooplankters proved to be highly diversified and abundant. The most common taxon was the larvae of the culicid mosquitoes (Table III-7). Other common arthropods include representatives from the order Cladocera and Copepoda. *Daphnia* and *Cyclops* were the most abundant representatives of these two orders, respectively. Nematodes were also well represented with a total of eleven occurring at all four stations. *Keratella* and *Lecane* were rotifers commonly found. *Difflugia* and *Vorticellidae* were frequently identified protozoans representing the Classes Sarcodina and Ciliata, respectively. Coelenterates were also represented with a total of four *Hydra spp.* These were probably scraped from their place of attachment to enter as plankton. Most of the different taxa occurred at fifty percent or more of the stations (Table III-7). Only two taxa, the nematodes and the culicid larvae, were found at all stations. This abundance of mosquito larvae indicates the slow, stagnant flow of the stream which frequently occurs in this season. None of the zooplankters provide a direct monetary input for the economy; however, they represent a vital link in the food chain of organisms, and this could affect the economy.

3. Benthic Invertebrates. The benthic macroscopic invertebrates samples were taken at four locations (three samples at each site) along the Grand Bayou (Plate III-7). Each sample area was approximately 1/25 of a square meter in size and each sample was washed using a sieve with a mesh size of .039 inches (one millimeter). Samples identified comprised three phyla: Arthropoda, Annelida, and Mollusca (Table III-8). The class Insecta of the phylum Arthropoda was the most commonly found benthic organism. *Chironomus sp.* (order Diptera) and *Coptotomus sp.* (order Coleoptera) were the two most common representatives of insects which were found during the sampling period. Annelids which were commonly found to occur within the study area include leeches of the class Hirudinea and members of the families Lumbriculidae and Naididae of the class Oligochaeta. Only three genera of mollusks were represented in the samples. These three were *Sphaerium, Musculium* and *Anodonta*. The soils of the Grand Bayou are mostly gray silt loam which

TABLE III-6

FISHES COLLECTED FROM GRAND BAYOU
MAY 1979

SCIENTIFIC NAME	COMMON NAME	LOCATIONS-TRANSECTS: A	B*	E	F	G	H	I	Totals
Aphredoderus sayanus	Pirate Perch	1		3	3				7
Esox a. vermiculatus	Grass Pickerel	1			1	1			3
Gambusia affinis	Mosquitofish	31	9	12	10	5			67
Fundulus chrysotus	Golden Topminnow			1					1
Fundulus notatus	Blackstripe Topminnow					1		2	3
Fundulus olivaceus	Blackspotted Topminnow		1						1
Lepomis gulosus	Warmouth Sunfish				1		1		2
Lepomis macrochirus	Bluegill Sunfish		11	9	30	48	32	5	135
Lepomis megalotis	Longear Sunfish	1	2		7		2		12
Lepomis microlophus	Redear Sunfish			3	9	6		1	19
Lepomis punctatus	Spotted Sunfish				1				1
Lepomis symmetricus	Bantam Sunfish				5	7	1		13
Lepomis spp.	Sunfish (Fry)	2		6	7		2	2	19
Micropterus salmoides	Largemouth Bass			1					1
Notropis texanus	Weed Shiner	2							2
Notropis spp.	Shiners (Fry)				8				8
Noturus gyrinus	Tadpole Madtom					1			1

*Points at transects C and D were not accessible due to the sharp slope of the banks and the numerous logs, bushes, and cypress knees.

TABLE III-7

ZOOPLANKTON COUNTS[1]
GRAND BAYOU, MAY 1979

CLASSIFICATION	Pt. 1 Esperenza Rd.	Pt. 2 Hwy. 784	Pt. 3 Hwy. 507	Pt. 4 Black Lake	TOTALS:
Protozoa					
Class Ciliata					
Order Holotrichia					
Paramecium sp.			1	1	2
Order Peritrichia					
Family Vorticellidae	5		1		6
Vorticella sp.				1	1
Class Sarcodina					
Order Testacida					
Difflugia sp.	1	3	3		7
Order Centrohelidia					
Acanthocystis sp.				1	1
Coelenterata					
Class Hydrozoa					
Order Hydroida					
Hydra sp.		1	1	2	4
Rotifera			1		1
Class Monogonota					
Order Ploima					
Keratella sp.				2	2
Lecane sp.	1			3	4

TABLE III-7

ZOOPLANKTON COUNTS[1]
GRAND BAYOU, MAY 1979
CONT.

CLASSIFICATION	Pt. 1 Esperenaa Rd.	Pt. 2 Hwy. 784	Pt. 3 Hwy. 507	Pt. 4 Black Lake	TOTALS:
Nematoda	3	1	4	3	11
Arthropoda					
Class Crustacea					
Order Cladocera		2	2	2	6
Daphnia sp.			3	1	4
Pleuroxus striatus	1				1
Simocephalus sp.			2		2
Order Ostracoda	1		1		2
Order Copepoda	1		1		2
Canthocamptus sp.			1		1
Cyclops sp.			6	3	9
Order Anostraca					
Eubranchipus sp.				1	1
Class Insecta					
Exoskeleton	1	2	1		4
Order Diptera					
Family Culicidae Larvae	3	5	5	8	21
Order Trichoptera					
Larva		1			1

[1]These are actual counts recorded as described in Appendix A. Methodology.

TABLE III-8

BENTHIC COUNTS[1]
GRAND BAYOU, MAY 1979

CLASSIFICATION	Pt. 1 Esperenza Rd.	Pt. 2 LA Hwy 784	Pt. 3 LA Hwy 507	Pt. 4 Black Lake	TOTALS:
Arthropoda					
Class Insecta					
Order Coleoptera					
Family Elmidae		2			2
Family Dytiscidae					
Coptotomus sp.		8			8
Order Diptera					
Family Chironomidae					
Chironomus sp.		7		2	9
Order Ephemeroptera					
Family Ephemeridae					
Hexagenia sp.			1		1
Order Hemiptera					
Exoskeleton	2		1	1	4
Mollusca					
Class Pelecypoda					
Family Sphaeridae					
Sphaerium sp.	2	4			6
Musculium sp.	3	2			5
Family Unionidae					
Anodonta grandis	1	1			2
Annelida					
Class Hirudinea	2	4		1	7
Class Oligochaeta					
Family Lumbriculidae	5	6			11
Family Naididae		1		4	5

[1]These are actual counts recorded as described in Appendix A, Methodology.

should be a good habitat for benthic organisms. However, the Grand Bayou is dry at certain times of the year (Table III-3). Therefore, the habitat is restricted and in turn, populations are limited. Table III-8 lists the benthic organisms that were recorded in the survey.

4. Epibenthic Invertebrates. The epibenthic organisms were recorded during the fish studies incorporating the same methodology that was used for the fish samples. As was mentioned above, the soils of the stream channel are primarily composed of a gray, silty loam. This soil condition and the detritus produced from the dense overstory, provides a fairly adequate habitat for the crustaceans, especially crawfish. The only two groups of crustaceans encountered during the field surveys were the crawfish of the family Astacidae and the freshwater shrimp of the family Palaemonidae. The shrimp were collected only in flooded areas with herbaceous plants or in areas which had stands of aquatic herbaceous plants. The crawfish were abundant in these areas also, but they were collected from the main stream of the channel as well. The crawfish family Astacidae was represented by the genera *Procambarus* and *Orconectes*. Representatives of the genus *Cambarus* were not collected; however, this is a common genus and thus does probably occur within the study area. No gastropods were collected, although members of several families, especially Amnoicolidae and Planorbidae, are presumed to exist within the study area (U.S. Army, 1975).

c. Public Hunting Areas. There is only one wildlife management area located near the study area owned or leased by the State of Louisiana. This area is known as the Loggy Bayou Wildlife Management area and is approximately 12 miles north of Coushatta in Bossier Parish. The Loggy Bayou area has a total of 3,699 acres that are open to the public for hunting. Several species that abound in the area include deer, quail, doves, rabbits, squirrels, and ducks (Brunett and Wills, 1978). The Northwest Fish and Game Preserve is located in Natchitoches Parish near Black Lake. This preserve is governed by the Northwest Fish and Game Preserve Commission. The Commission follows the laws and recommendations as set aside by the Louisiana Department of Wildlife and Fisheries. International Paper Company and other private timber companies own approximately 38,549 acres in Red River Parish alone (Burns, 1975), upon which hunting is allowed.

d. Rare and/or Endangered Animal Species. The Office of Endangered Species, U.S. Fish and Wildlife Service, Department of Interior, issued the report Endangered and Threatened Wildlife and Plants, October 1, 1980. This current report, plus the 1973 publication entitled Threatened Wildlife of the United States (also known as the Red Book), were used to examine whether or not rare and/or endangered animal species exist in the area of Red River Parish. Species listed in these publications are considered to be so few in number or so threatened by present circumstances, as to be in danger of extinction.

(1) Reptiles.

(a) American Alligator. The reptile once considered by the federal government to be endangered which could occur within the study area is the American Alligator (Alligator mississippiensis). However, populations of the alligator have shown an increase in recent years, resulting in its delisting from the endangered list in north Louisiana. The alligator is currently listed by the U.S. Fish and Wildlife Service "threatened under the similarity of appearance" clause in Red River Parish (Federal Register, August 10, 1981, Vol. 46, No. 153). Only the young alligators prefer heavily vegetated areas, while adults and sub-adults prefer remote open bodies of water (O'Neil, 1977). No population has been observed in any of the field surveys in the study area.

(b) Louisiana Pine Snake. Although it is not considered endangered or threatened, the Louisiana pine snake *(Pituophis melanoleucus ruthveni)* is considered rare because of its limited numbers and range (Ozarks Regional Commission, 1976). The study area is within the limits of the snake's range; therefore, the populations of the Louisiana pine snake could be influenced by any of the projects.

(2) Birds. Three birds are listed in the Federal Register that may possibly occur within the study area. They are the Southern bald eagle *(Haliaeetus leucocephalus leucocephalus)*, the red-cockaded woodpecker *(Dendrocopus borealis)*, and the ivory-billed woodpecker *(Campephilus principalis)*. All are endangered species in Louisiana.

(a) Southern Bald Eagle. The primary nesting sites in Louisiana are located in the estuarine areas along the Gulf Coast. Since fish is a favorite food, the bald eagle remains fairly close to, and requires, a relatively large body of water. Some bald eagles migrate north during late spring and summer (Lowery, 1974a). It would be during this migration that an occurrence of the bald eagle within the study area would be most probable; although none were recorded in any of the field surveys.

(b) Red-Cockaded Woodpecker. Long-leaf pine forests are preferred by the red-cockaded woodpecker, although it does occur in other open old age pine forest (Lowery, 1974b). No records were made during field surveys of sightings of the woodpecker. However, the red-cockaded woodpecker is, "Known to inhabit Caddo, Natchitoches, Grant, and Rapides Parishes," (U.S. Army, 1977a). Therefore, it is possible that the red-cockaded woodpecker does occur in the pine-hardwood regions along the edges of the study area.

(c) Ivory-Billed Woodpecker. The ivory-billed woodpecker *(Campephilus principalis)* is another species listed as endangered. However, it is now believed to be extinct. The last authentic report of the ivory-billed woodpecker in Louisiana was in May, 1971. The sighting was south of U.S. Highway 90, at least 113 miles from the study area (Lowery, 1974a).

(d) Bachman's Warbler. The warbler *(Vermivora bachmanii)* became known to science in 1833 when observed near Charleston, S.C. The bird was observed near Mandeville, Louisiana between February 27 and March 20 in 1886, 1888 and 1891. Since that time, fewer than a dozen have been observed in Louisiana (Lowery, 1974). Lowery said, "It is indeed the most rarely observed American warbler, (1974). No evidence of its existence in the study area has been recorded. It is an endangered species.

(e) Eskimo Curlew. The curlew *(Numenius borealis)* is listed as endangered and is known to have been sited in Louisiana and other parts of the coastal United States (Lowery, 1974), however it has not been sited in the study area and is not likely to be found there because it is a part of the sea-loving sandpiper family.

(f) Arctic Peregrine Falcon. This bird *(Falco peregrinus tundrius)* has never been seen in the study area and the prospect of its being there is remote (Lowery, 1974). This falcon is an endangered species.

(3) Mammals. The cougar *(Felis concolor)* is the only endangered mammal that could possibly occur within the study area. The range of the red wolf *(Canis rufus)* originally included the study area; however it has since been extirpated throughout most of its former range, and now small populations possibly exist in extreme southwestern Louisiana and southeastern Texas (Lowery, 1974b).

(a) Florida Panther. The original range of the Florida Panther *(Felis concolor coryi)* covered nearly all of the United States and extended down into Central America. Due to heavy trapping and hunting, the cougar has been extirpated throughout most of its former range. The most extensive range in Louisiana is believed to include the Mississippi River Valley and the Upper Atchafalaya River Basin. However, some of the most recent sightings in Louisiana were cited by the Corps of Engineers, as follows:

> On November 30, 1963, two Caddo Parish law enforcement officers killed an adult cougar at Keithville, Louisiana, 13 miles south of Shreveport. On March 3, 1972, a single sighting was made of a cougar by Joe H. Murphy at Dorcheat Bayou near Sibley, Louisiana, in Webster Parish (U.S. Army, 1975).

The Corps of Engineers cited two other authenticated observations that were in other portions of the state. Considering the information referenced above, the possibility of the cougar occurring in the area does exist.

(b) Red Wolf. The red wolf *(Canis rufus)* is an endangered species. According to Lowrey, 1974 b, the possibility of the red wolf in the study area is remote, although the species may exist in the parishes or along the Mississippi in northern Louisiana or in the southwestern portion of the state.

e. Rare and/or Endangered Plant Species. There is no official record for endangered or threatened plants for Louisiana. The unofficial list, which appears in the Louisiana State Comprehensive Outdoor Recreation Plan (1977), coincides with the species list of the Smithsonian Institute (1975). The only plant listed by both agencies that could possibly be found within the study area is the snapdragon *(Agalinus caddoensis)*.

3.05 ARCHEOLOGICAL/HISTORICAL/CULTURAL

a. Red River. There is one known site along this alternative corridor. A systematic survey of this route has not been conducted, however, so it is presently impossible to provide additional information on this site or any possible new sites.

b. Grand Bayou. Twenty-three archeological sites are known within the proposed Grand Bayou pool area and its perimeter. Tables III-9 and III-10 indicate the sites and their associated geological and vegetational zones. It can be seen that the Prairie Terrace and the Pine and Hardwood zones offer the highest probability for site locations.

3.06 DEMOGRAPHIC ELEMENTS

a. Population of Red River Parish, 1930-1977. The 1980 Census is not yet official, therefore, the latest official Census estimates for the population of Red River Parish are for the year 1977. Previous population projections do not take into account the impact of three major projects on Red River Parish as follows:

--construction of the Louisiana North-South Expressway (I-49), which is scheduled to traverse Red River Parish in the decade of the late 1980's or early 1990's.

--development of a navigable Red River waterway, scheduled to traverse Red River Parish, with completion dates established for the mid to late 1980's.

--mining and processing of lignite coal in the officially designated "Energy Impact Area" of four parishes of which Red River is centrally located. Activities associated with the lignite coal are in early stages now. Mining and processing, and the attendant economic and demographic impacts, will continue through the 1980's, 1990's, and into the 21st century. In the impact area are approximately one billion tons of lignite coal.

TABLE III-9

ARCHEOLOGICAL SITES WITHIN AND AROUND
THE PROPOSED GRAND BAYOU POOL
AND THEIR ASSOCIATED GEOLOGICAL ZONES

(Based on a Sample Survey of the Proposed Project Area)

Site Number	Logansport Formation	Possible Logansport Formation	Montgomery Terrace	Possible Montgomery Terrace	Prairie Terrace	Possible Prairie Terrace	Undiff. Alluvium
16 RR 61							X
16 RR 64	X						
16 RR 65			X				
16 RR 66			X				
16 RR 67					X		
16 RR 68					X		
16 RR 69							X
16 RR 70					X		
16 RR 71					X		
16 RR 72							X
16 RR 73					X		
16 RR 74						X	
16 RR 75					X		
16 RR 76					X		
16 RR 77	X						
16 RR 78	X						
16 RR 79					X		
16 RR 80					X		
16 RR 82	X						
16 RR 85					X		
16 RR 86					X		
16 RR 87					X		
16 RR 92					X		
Total	4	0	2	0	13	1	3

TABLE III-10

ARCHEOLOGICAL SITES WITHIN AND AROUND
THE PROPOSED GRAND BAYOU POOL
AND THEIR ASSOCIATED VEGETATION ZONES

(Based on a Sample Survey of the Proposed Project Area)

Site Number	Pine and Hardwoods	Agriculture	Dry Bottomland Hardwoods	Wet Bottomland Hardwoods
16 RR 61			X	
16 RR 64	X			
16 RR 65	X			
16 RR 66	X			
16 RR 67		X		
16 RR 68	X			
16 RR 69			X	
16 RR 70			X	
16 RR 71	X			
16 RR 72			X	
16 RR 73		X		
16 RR 74	X			
16 RR 75		X		
16 RR 76		X		
16 RR 77	X			
16 RR 78	X			
16 RR 79	X			
16 RR 80	X			
16 RR 82	X			
16 RR 85	X			
16 RR 86	X			
16 RR 87		X		
16 RR 92		X		
Total	13	6	4	0

The Office of the Governor, State of Louisiana, submitted a report to the U.S. Department of Energy in 1979 (Designation Report, Public Law 95-620: the Powerplant and Industrial Fuel Use Act of 1978, dated June 30, 1979) which documented through the use of industry reports that 5,445 new industrial jobs will be created by ten known industries in the period from 1980-1986 (See Section 1). The report enumerated only known industries with announced plans. When family members are included in the estimates, an estimated 9,822 persons are expected to populate the area by 1984 (According to a report issued to the Federal Regional Council by Louisiana Governor David Treen in March of 1980). That untitled report is available from the Office of the Governor.

These projections do not break down expected population increase according to parishes, however. Instead the report concerns a four-parish area: Red River, Natchitoches, Sabine, and DeSoto.

In his report, the Governor of Louisiana stated on page 4, "The northwestern Louisiana Energy Triangle will be a boom area .... Because of the large energy infrastructure that will be developed there, opportunities beyond the decade of 2020 will be for an extended energy center which could utilize western coal and other energy sources including biomass. This will be true because the utilities will have invested more than $3 billion for plant construction. Unless technology changes dramatically, those plants will have an extended life. The immediate concern, however, is coping with the stress-strain relationships that will be caused in the next ten years. Areas that will require special attention are listed, in part, below: .... water systems."

The highest recorded population of Red River Parish occurred in 1930 (Table III-11). From 1930 through 1970, the population decreased. Preliminary census estimates for 1977 indicate a slight increase in population.

TABLE III-11

POPULATION OF RED RIVER PARISH, LOUISIANA, 1930-1977

Year	Population
1930	16,089
1940	15,881
1950	12,113
1960	9,978
1970	9,226
1977*	9,526

*Preliminary U.S. Census estimate.

SOURCE: Louisiana Almanac, 1970-1980
James Calhoun, Editor

b. Population Profile, 1970.

(1) Race. In 1950, the population of Red River Parish was equally divided between whites and nonwhites. Since then the proportion of whites has increased slightly, although the actual population of whites and nonwhites has declined (Table III-12).

TABLE III-12

RACIAL COMPOSITION OF POPULATION IN RED RIVER PARISH, LOUISIANA, 1950-1970

Year	White		Nonwhite	
	Number	Percent	Number	Percent
1950	6,057	50.0	6,056	50.0
1960	5,232	52.4	4,746	47.6
1970	5,337	57.8	3,889	42.2

SOURCE: Statistical Profile of Red River Parish, 1973, Public Affairs Research Council of Louisiana, Inc. Baton Rouge, Louisiana

(2) Age and Sex. Females comprise a slightly larger proportion of the population of Red River Parish than do males. The proportion of persons 65 years of age and older has increased in the parish, while the younger age category (under 18) has steadily decreased (Table III-13).

TABLE III-13

AGE AND SEX CHARACTERISTICS OF RED RIVER PARISH, LOUISIANA, 1950-1970

NUMBER

YEAR	MALE			FEMALE			
	Under 18	18 to 64	65 and over	Under 18	18 to 64	65 and over	TOTAL
1950	2,597	2,833	534	2,535	3,097	517	12,113
1960	2,074	2,181	575	2,036	2,541	571	9,978
1970	1,759	2,043	562	1,727	2,459	676	9,226
PERCENT							
1950	21.4	23.4	4.4	20.9	25.6	4.3	100.0
1960	20.8	21.9	5.8	20.4	25.5	5.7	100.1*
1970	19.1	22.1	6.1	18.7	26.7	7.3	100.0

*Does not total to 100.0 due to rounding.

SOURCE: Statistical Profile of Red River Parish, 1973, Public Affairs Research Council of Louisiana, Inc., Baton Rouge, Louisiana.

(3) Population Projections. Available projections show a continued decrease in the population of Red River Parish. Although census estimates of population show a slight increase, other projections show a continually declining population due to the fact that they were based on historical data which were available in the 1970's. None of the existing projections take into account the impact on population expected as a result of lignite mining and processing, development of the Red River waterway into a navigable body of water, and the construction of the Louisiana North-South Expressway (I-49). No new projections are available which take into account these developments. In order to take this growth into account a completely new set of projections are required.

For the purposes of this report, using figures developed by the Governor's Office indicating that 5,445 new industrial jobs will be created in the four-parish Energy Impact Area and making the assumption that for each job there will be a multiplying factor of three, it can be projected that the area's population will increase by 16,335 (including family members and support persons). What percentage of these people will actually locate residential quarters in Red River Parish is not known yet, although all the new major electricity generating plants will be located in Red River Parish, according to industry sources, specifically Cajun Electrical Cooperative, Central Louisiana Energy Company, and Southwest Electric Power Company. If one-quarter of the in-migrating population locate in Red River Parish, the population of that parish will increase by more than 4,000 persons, a conservative estimate, according to Coushatta Mayor Truman Crawford. Thus Table III-14 includes four sets of existing projections and one set of new projections which take into account the new population impacts.

TABLE III-14

POPULATION PROJECTIONS,
RED RIVER PARISH, LOUISIANA

YEAR	PROJECTION				
	A^1	A^2	A^3	A^4	A^5
(6)					
1970	9,226	9,226	9,226	9,226	9,226
1975	9,439	9,018	--	8,743	9,439
1976	9,370	--	--	--	9,370
1985	--	8,810	9,153	8,255	13,370

A^1 = Estimates of the Louisiana Economy, Louisiana Tech University, Ruston, Louisiana

A^2 = Projections to the Year 2000 of Louisiana Population and Households, UNO, New Orleans, Segal, et al., 1976

A^3 = Population Projections to 1980 and 1990, LSUNO, New Orleans; Christou and Segal, 1973

A^4 = Population Projections by Age, Race, and Sex for Louisiana and its Parishes, 1970-1985, LSU, Baton Rouge; Burford and Murzyn, 1972

A^5 = Column A^1 plus 4,000, beginning in 1984, per para, 3 above

6 = Actual 1970 Census

3.07 ECONOMIC ELEMENTS

a. Employment. No official Census employment data is available beyond 1970. In 1970, 2,715 residents of Red River Parish of a work force of 2,945 (excludes military personnel) were employed. The unemployment rate was 7.8 percent. The primary areas of employment were in agriculture, forestry, fisheries, and manufacturing as are shown in Table III-15. These figures do not include existing and projected new employment in the lignite-related mining and manufacturing areas.

TABLE III-15

EMPLOYMENT BY MAJOR INDUSTRY
RED RIVER PARISH, LOUISIANA

Employed by Major Industry	1950		1960		1970	
	Number	Percent	Number	Percent	Number	Percent
Total	3,345	100.0	2,552	100.0	2,715	100.0
Agriculture, forestry & fisheries	1,886	56.4	652	25.6	340	12.5
Mining	50	1.5	56	2.2	67	2.5
Construction	160	4.8	270	10.6	240	8.8
Manufacturing	128	3.8	252	9.9	574	21.1
Railroad	56	1.7	23	0.9	28	1.0
Trucking service	13	0.4	12	0.5	22	0.8
Other transport	24	0.7	40	1.6	46	1.7
Communications	10	0.3	12	0.5	13	0.5
Utilities & sanitary	31	0.9	29	1.1	34	1.2
Wholesale trade	27	0.8	51	2.0	108	4.0
Food & dairy	87	2.6	80	3.1	79	2.9
Eating & drinking	48	1.4	41	1.6	86	3.2
Other retail	175	5.2	244	9.6	183	6.7
Finance, ins. & real estate	24	0.7	42	1.6	24	0.9
Business and repair service	40	1.2	42	1.6	53	2.0
Private households	151	4.5	292	11.3	186	6.9
Other personal service	61	1.8	56	2.2	29	1.1
Entertainment	9	0.3	0		24	0.9
Hospitals	15	0.4	13	0.5	64	2.3
Education	167	5.0	160	6.3	206	7.6
Other prof. service	26	0.8	44	1.7	36	1.3
Public administration	74	2.2	109	4.3	72	2.7
Other	83	2.5	32	1.3	201	7.4

SOURCE: Statistical Profile of Red River Parish, 1973, Public Affairs Research Council of Louisiana, Inc., Baton Rouge.

b. Income. The median annual family income in Red River Parish was $4,563 in 1969. The median income for Louisiana was $7,530. Forty percent of the families reported income below the poverty level. The median earnings for males was $4,520; females had a median of $1,804 (Table III-16).

TABLE III-16

MEDIAN EARNINGS OF SELECTED OCCUPATION GROUPS
RED RIVER PARISH, LOUISIANA, 1969

Male, Total	$ 4,620
Professional, managers, & kindred	8,256
Craftsmen, foremen, & kindred	5,813
Operatives & kindred	4,647
Laborers, except farm	2,667
Female, Total	1,804
Clerical & kindred	3,000
Operatives, including transportation	2,238

SOURCE: Statistical Profile of Red River Parish, 1973
Public Affairs Research Council of Louisiana, Inc.
Baton Rouge

c. Agricultural and Forestry Production.

(1) Crops. Red River Parish had a total of 21,300 acres in the production of five major crops. These crops include cotton, corn, soybeans, wheat, and sorghums. Soybeans account for the most acreage with a total of 11,500 acres (Table III-17).

TABLE III-17

CROP YIELD AND PRODUCTION
RED RIVER PARISH, LOUISIANA, 1976

Crop	Acreage Harvested	Yield/Acre	Production
Cotton	5,100	439.0 pounds	4,660 bales
Corn	1,100	55.0 bushels	60,500 bushels
Soybeans	11,500	29.0 bushels	334,000 bushels
Wheat	1,100	33.0 bushels	36,300 bushels
Sorghums	2,500	31.0 bushels	77,500 bushels
TOTAL	21,300		

SOURCE: Agricultural Statistics for Louisiana, 1973-1976. Lonnie L. Fieider, Jr. and Sam L. Guy, Louisiana State University and Agricultural and Mechanical College.

(2) Timber and Pulpwood Production. During 1977 a total of 9,056,740 board feet of sawtimber and 45,021 cords of pine and hardwood pulpwood were severed in Red River Parish. The estimated value of this production was $1,038,358 (Table III-18).

TABLE III-18

TIMBER SEVERED AND ESTIMATED STUMPAGE VALUE
RED RIVER PARISH, 1977

Species	Timber Severed	Stumpage Value ($)
[1] Sawtimber		
Cypress	-	-
Oak	990,176	39,607
Ash	-	-
Pine	7,035,890	703,589

TABLE III-18 (Cont'd)

Species	Timber Severed	Stumpage Value ($)
[1]Sawtimber (Cont'd)		
Gum	116,245	4,650
Cottonwood & Willow	2,003	90
Other Hardwoods	912,426	41,059
[2]Pulpwood		
Pine	32,656.55	212,268
Hardwood	12,364.87	37,095

[1]Sawtimber in board feet, Doyle scale.
[2]Pulpwood in standard cords.

SOURCE: "1977 Timber and Pulpwood Production in Louisiana", Louisiana Department of Natural Resources, Office of Forestry, 1978.

d. Sales Tax Revenue. The Red River Parish School Board collects a one percent sales tax. These tax receipts provide a measure of economic activity in the parish in that the actual average monthly tax receipts from 1975 to 1978 increased from $15,016 to $25,123. When the collection is adjusted to 1967 dollars, the amounts are $9,314 and $12,858, respectively (Table III-19). When a new public water supply is developed for Red River Parish, coupled with expansion in the energy sector, attendant economic activities will cause an increase in tax receipts. The actual amount of future tax increases has not been projected and is not available for inclusion in this report.

TABLE III-19

AVERAGE MONTHLY SALES TAX RECEIPTS,
ACTUAL AND ADJUSTED TO 1967 DOLLARS
RED RIVER PARISH, LOUISIANA

Year	Monthly Average ($)		Annual Percent Change[2]	
	Actual[1]	Adjusted[2]	Actual	Adjusted
1975	15,016	9,314	-	-
1976	17,782	10,429	18.42	11.97
1977	22,881	12,607	28.68	20.88
1978	25,123	12,858	9.80	1.99

SOURCE: [1]Louisiana Business Review. Louisiana State University, Division of Research, College of Business Administration. 1975-1978, Baton Rouge, Louisiana.

[2]SUNBELT RESEARCH CORPORATION.

3.08 LAND USE

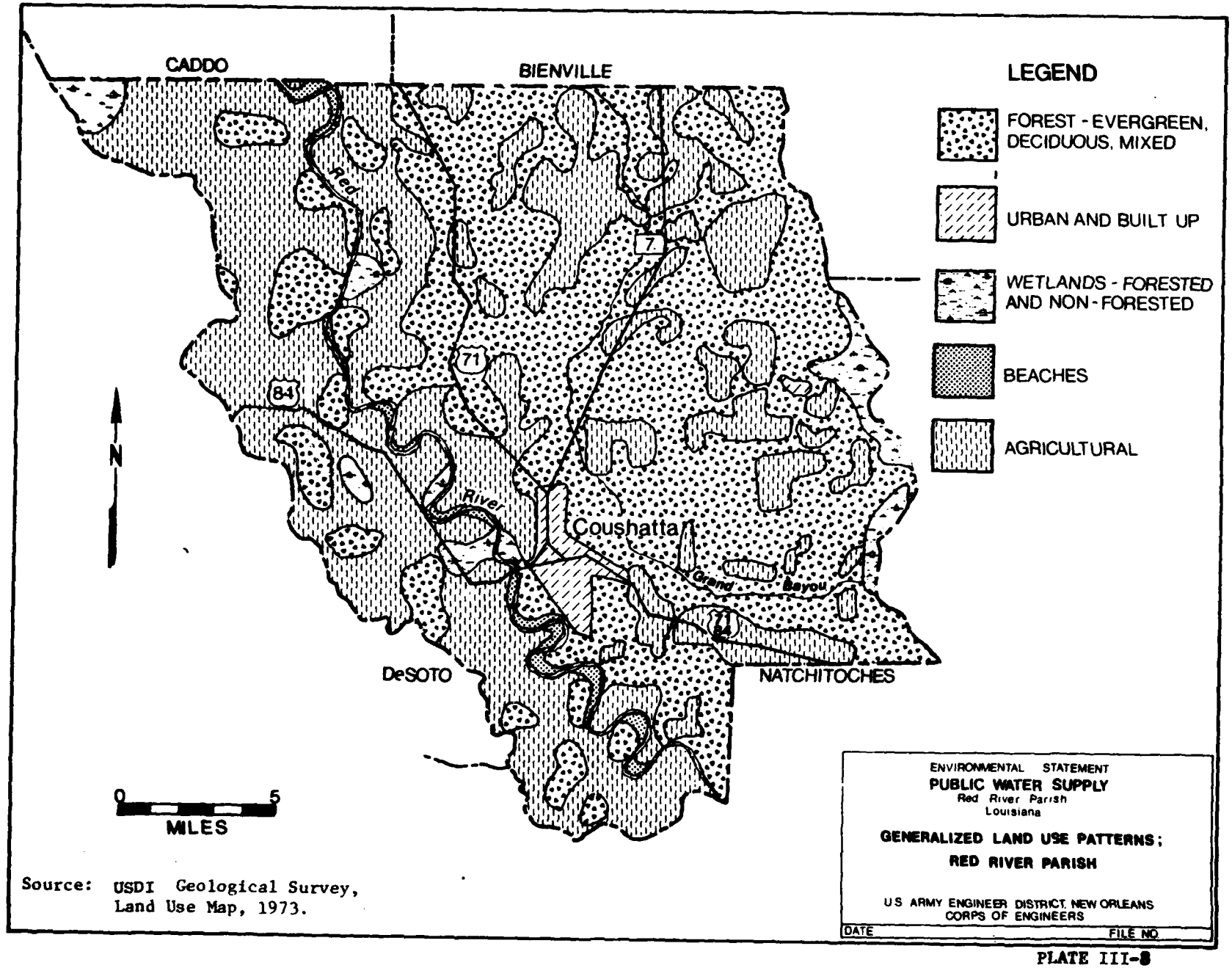
Red River Parish has a total of 253,203 acres. Of this total, 44 percent is used for agricultural purposes. Forested land comprises approximately 50 percent of the parish. Sixty percent of the forested land is considered evergreen forest, 22.6 percent is deciduous forest, and 17.4 percent is mixed. The remaining six percent of the total area is comprised of waterways, water bodies, and urban areas. Plate III-8 represents the land use patterns of Red River Parish (Please refer to Future Land Use, Red River Parish, 1978 for more details.)

The future land use of Red River Parish will be dramatically changed after lignite mining begins in the mid-1980s. It is now projected that mining will occur in the western and northern portions of the parish. It is also likely that a larger percentage of the land will be devoted to industrial and urban purposes.

3.09 DEVELOPMENTS

a. Water Resources.

(1) Red River Navigation. This project includes the construction and maintenance of a 9 by 200 foot navigation channel, with five locks and dams and related bank stabilization, from the Mississippi



Source: USDI Geological Survey, Land Use Map, 1973.

PLATE III-8

River to Shreveport, Louisiana. Recreation is an integral part of the project and facilities will be developed at lock and dam sites, at selected sites along the navigation channel, and at oxbow lakes formed by channel realignment. (Refer to Final Supplement No. 1 to the Final Environmental Statement, Red River Waterway, Louisiana, Texas, Arkansas, and Oklahoma, and Related Projects; Mississippi River to Shreveport, Louisiana Reach; U.S. Army Engineer District, New Orleans, Louisiana, February, 1977, for further details.)

(2) Existing Reservoirs. (See Appendix B for water quality data.)

(a) Lake Bistineau. Lake Bistineau is an impoundment of Bayou Dorcheat in northwest Louisiana. The lake lies in three parishes (Webster, Bossier, and Bienville). The earthfill dam was completed in 1935 and enlarged in 1951. The reservoir is used for flood control and conservation. The dam contains a 1,200 foot concrete spillway equipped with twelve adjustable gates and a fish ladder (USDI, 1978).

(b) Black Lake. Black Lake is a 13,500 acre reservoir located approximately eighteen miles south of Coushatta in Natchitoches Parish, Louisiana. Construction was completed in 1934, but additional work was done in 1949. The lake is divided into two distinct sections by Louisiana Highway 9. The area west and north of Highway 9 is thickly populated with trees and other vegetation and is known as Black Lake. The area to the east and south of the highway is primarily open water and is known as Clear Lake. The reservoir is used primarily for recreation (Stokes, 1971).

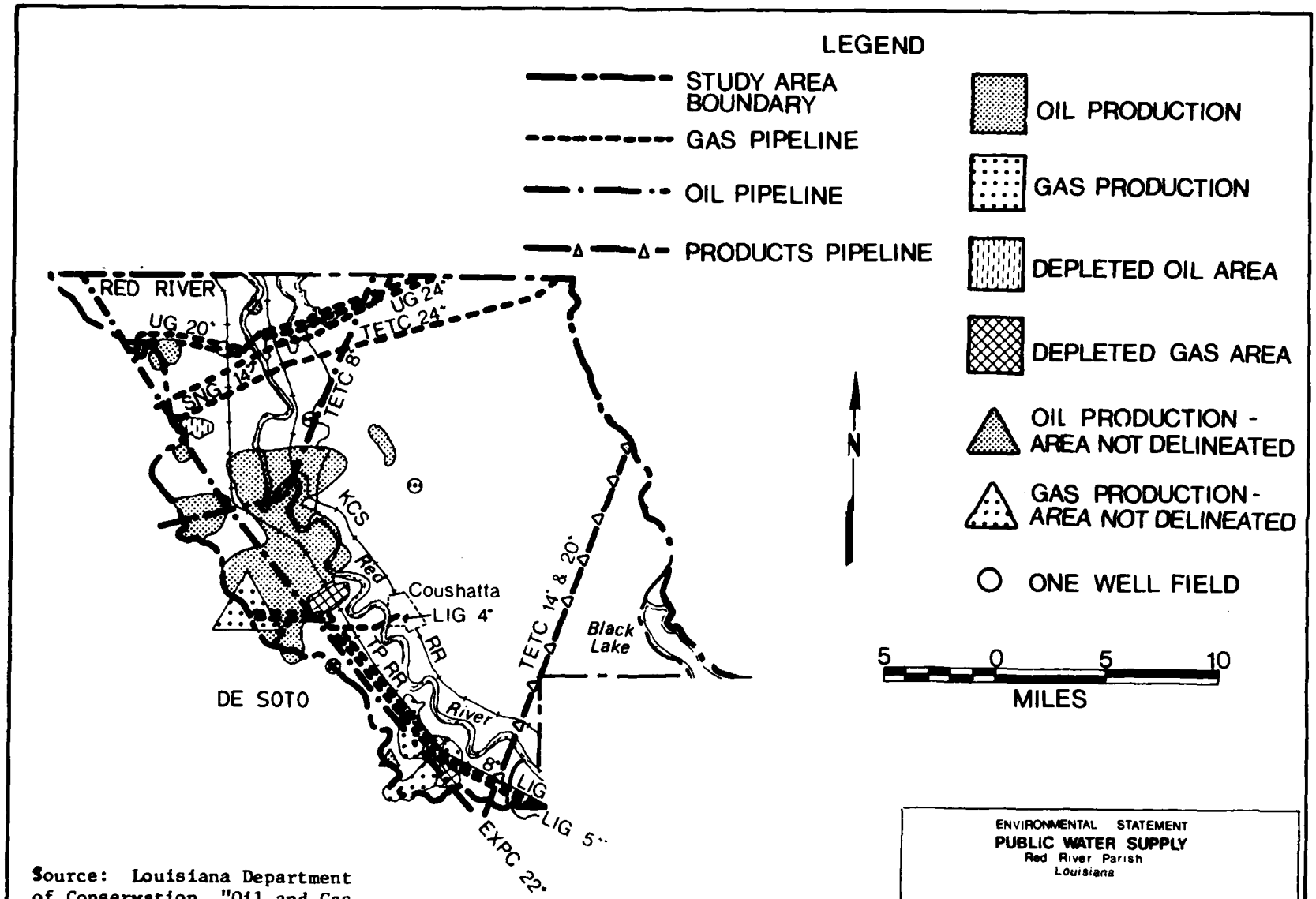
b. Railways. The Kansas City Southern Railway (KCS) and the Texas Pacific Railway (TP) have trackage which roughly parallels the Red River. Both railroads operate between Shreveport and Alexandria. The KCS provides service on the east side of the Red River and TP on the west side.

c. Airports. The Coushatta-Red River Parish airport is a general aviation facility located 2.5 miles southeast of Coushatta. The runway is 5,000 feet long. Services and fuel are not available at the airport.

d. Highways. A total of seven state highways cross Red River Parish. Two federal highways, 71 and 84, also cross Red River Parish. Several parish roads connect these highways. (Refer to Plate II-3 for details of highway locations.)

e. Minerals.

(1) Oil and Gas. Only a limited number of oil and gas fields have been discovered in Red River Parish. Most of the fields are located along the western boundary and extend into De Soto Parish (Plate III-9).



Source: Louisiana Department of Conservation, "Oil and Gas Map of Louisiana," 1973.

ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana

OIL AND GAS FIELDS AND PIPELINES

US ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE FILE NO

PLATE III-9

TABLE III-22 (cont'd)

SOURCE: Louisiana Lignite, D. Pope Meagher and L.C. Aycock
Geological Pamphlet No. 3
Department of Conservation
Louisiana Geological Survey, 1942

Seven companies have obtained exploratory drilling permits for lignite in areas which encompass all of Webster and Red River Parishes and the majority of Bossier, Bienville, and Natchitoches Parishes (Sunbelt Research Corporation, 1979).

f. Power Transmission Lines. Three electrical power transmission lines cross the study area. The three lines are owned by Gulf States Utilities, Central Louisiana Electric Company, and Louisiana Power and Light Company. The Gulf States Utilities line is a major transmission line that runs northeast from the hydroelectric plant located at the Toledo Bend Reservoir dam and has a voltage of 500 KV (U.S. Department of Energy, 1978).

Still, Red River Parish produces more barrels of oil than 32 other parishes in the state. The natural gas production of Red River Parish is somewhat lower, producing more cubic feet of natural gas than only 25 of the 64 parishes in the state. The natural gas production in Red River Parish in 1974 was 2,511,849 thousand cubic feet. (Refer to Table III-20) (Louisiana Department of Conservation, 1974).

TABLE III-20

OIL AND GAS PRODUCTION, 1974

	Crude Oil		Natural Gas	
Parish	Barrels	% of Total Produced In Five Parishes	1000 cubic ft. @ 15,025# Abs.	% of Total Produced In Five Parishes
Bienville	57,509	0.87	58,595,629	34.94
Bossier	1,798,403	27.13	42,767,681	25.50
Natchi-toches	2,942,357	44.39	17,749,441	10.58
Red River	923,859	13.94	2,511,849	1.50
Webster	906,698	13.68	46,094,369	27.48
TOTALS	6,628,826	100.01*	167,718,969	100.00

*Not exactly 100 due to rounding.

SOURCE: "Louisiana Annual Oil and Gas Report, 1974"
Louisiana Department of Conservation

(2) Sand and Gravel. Sand is classified as being a naturally occurring mineral material ranging in size from 0.0029 inch to 0.187 inch. Gravel is the incoherent granular rock which is coarser than 0.187 inch. Several exposures of sand and gravel are located in Red River Parish. These exposures are a portion of the north-south Quaternary Alluvial Valleys of the tributaries of the Red River. No extensive commercial dredging is presently taking place on the Red River in Red River Parish. Most of the outcrops of Red River Parish occur along the Black Lake Bayou drainage system and are of either Bentley or Montgomery Age (Woodward and Gueno, 1941). Table III-21 lists the sand and gravel production of Red River Parish.

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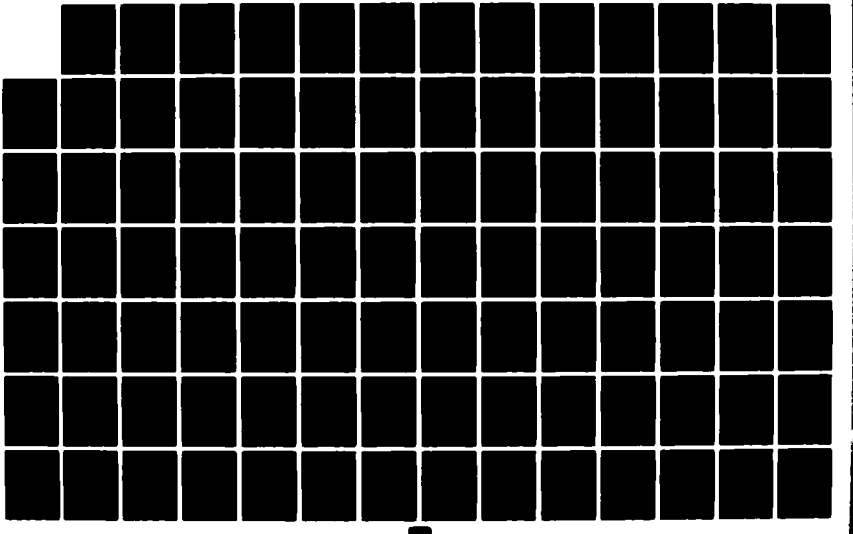

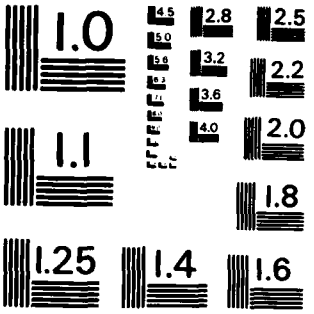

TABLE III-21

SAND AND GRAVEL PRODUCTION
RED RIVER PARISH, LOUISIANA
1974 & 1975

Year	No. of Mines	Production (1000 Short Tons)	Value (1000 Dollars)
1974	3	51	166
1975	2	W	71

W = Withheld to avoid disclosing confidential data.

SOURCE: The Mineral Industry of Louisiana, 1975, Owens W. Jones and Leo W. Hough, Bureau of Mines, United States Department of the Interior and the Louisiana Geological Survey.

(3) Lignite. Lignite is classified as an immature coal at an intermediate stage between peat and bituminous coal. The lignite fields located within the study area are associated with the Wilcox Formation. The most extensive Louisiana lignite range is found in DeSoto Parish (in the Dolet Hills) which borders Red River Parish on the west. This field extends into Red River Parish. Separate lignite outcrops do occur on the east side of the Red River as well. An extensive study of the lignite outcrops found in Louisiana was conducted by the Department of Conservation, Louisiana Geological Survey, in 1942. Table III-22 lists the location and descriptions of the lignite fields which occur in three parishes of the study area as a result of the 1942 survey.

TABLE III-22

LIGNITE FIELDS WITHIN THE STUDY AREA

Parish	Township	Range	Thickness	Stratigraphic Position		
				Group	Formation	Member
Red River	14N	10W	3'6"	Midway	Hall Summit	Loggy Bayou
Red River	14N	9W	0'4"	Midway	Hall Summit	Loggy Bayou
Natchitoches	8N	9W	0'8"	Wilcox	Pendelton	Loggy Bayou
Natchitoches	10N	7W	2'5"	Wilcox	Pendelton	Loggy Bayou
Webster	19N	9W	1'8"	Claiborne	Sparta	Loggy Bayou

SECTION 4.

ENVIRONMENTAL CONSEQUENCES

4.01 DIRECT EFFECTS AND THEIR SIGNIFICANCE

a. Beneficial effects.

(1) Meets purpose. Water availability is a primary consideration in determining whether or not an alternative meets the intended purpose. Each alternative under consideration is adequate in terms of water quantity except for the no action alternative.

(2) Potential habitat development.

(a) Fisheries. No direct beneficial impacts upon fisheries will result from a pipeline from Red River. Grand Bayou Reservoir would produce 2,700 surface acres of prime fisheries habitat that averages ten feet deep. The steep gradient of the intermittent and main stream channels would create structures around which fish would gather. The gentle slope along the north shore would create a spawning habitat if properly maintained. As was discussed in earlier sections, the plankton and macroscopic invertebrates are numerous and diversified enough to sufficiently sustain a food chain for game and commercial fish.

(b) Waterfowl. The creation of Grand Bayou Reservoir would produce a resting point for migratory waterfowl. Geese, diving ducks, and dabbling ducks would be found in the area as a result of the reservoir. Moreover, the large shallow areas found along the north shore of the proposed lake would provide feeding grounds for all types of waterfowl. Four to five hundred acres of shoreline waterfowl habitat are estimated to be produced as a result of implementation of the reservoir (USDI, 1979). Still, the majority of the lake would serve merely as a resting point for most game waterfowl.

(c) Forest edge. Pipeline right-of-ways from the Red River would create a strip along either side of the right-of-way which would be considered a forest edge community. This type of habitat is by far the most diversified of any found within the study area and would therefore serve as a niche for various species of wildlife. The total acreage of forest edge communities produced from a pipeline from Red River would be approximately 36 acres considering a 15 foot strip on either side of the right-of-way. Depending upon restrictions placed upon shoreline development, a forest edge community could be created

along the Grand Bayou Reservoir that would amount to a total of 62 acres.

b. Adverse effects.

(1) Land resources.

(a) Red River. Bossier City is the only known municipality located in Louisiana that withdraws water from the Red River. Bossier was required to construct a settling pond (2,000 acre feet) in order to allow a majority of the suspended materials in the Red River water to fall from suspension. This was accomplished by constructing a 100 acre pond which is 20 feet deep. This settling pond contains approximately a 100-day supply of water, based on Bossier City's average day consumption (Howell, 1979). An equivalent storage supply for Red River Parish, would require construction of a 1700 acre-feet pond. (85 surface acres by 20 foot depth.)

(b) Grand Bayou. A reservoir on Grand Bayou would result in the irretrievable loss of 2900 acres of land resources. Most of this land, however, is in the alluvial floodplain of Grand Bayou. Therefore, this land is not used for agricultural or timber production. This land does provide excellent habitat for various species of wildlife. The land consists of primarily bottomland hardwoods, the larger portion being dry.

(2) Vegetational resources.

(a) Red River. Before treatment can begin on water from the Red River the water must first be pumped into a "holding" or "settling" pond in order to allow siltation of particulate matter from the water. Land will also be required for the treatment plant. A total of approximately 115 acres of terrestrial vegetation will be irreversibly lost. This includes 85 acres for a holding pond (20' depth) and 30 acres for the treatment plant and a "buffer" zone around the pond.

(b) Grand Bayou. The reservoir itself as proposed will require 2,700 acres of terrestrial vegetation to be cleared, all of which will be inundated. An additional 1.5 feet above mean pool level (up to 140' N.G.V.D.) is proposed to be cleared. This will mean an additional 200 acres along the shoreline that will be cleared. Most of the vegetation to be cleared will consist of dry bottomland hardwoods (46%). Wet bottomland hardwoods comprise 22%. A small percentage (8%) of the basin is comprised of agricultural land. The pine-hardwoods which lie mostly around the periphery of the basin comprise approximately 24 percent of the 2900-acres to be cleared. Table II-5 shows land classifications and Plate III-6 shows these various habitat areas.

(3) Wildlife resources.

(a) Red River. A pipeline from Red River will have a

minimal impact on the wildlife of the area. However, as mentioned above, a "settling" pond will have to be constructed; thus, the terrestrial wildlife in the immediate area of construction will be displaced. Those animals which are too slow for displacement (turtles, salamanders, etc.) might be irretrievably lost.

(b) Grand Bayou. The bottomland and the pine-hardwoods found within the project area are prime habitat for a diversity of animals (see Section 3.04b). Displacement and relocation of animals would be detrimental to most. The pipeline and maintenance roads could possibly cause an adverse effect. Those animals which did survive the displacement would then be in competition for food and cover with the other inhabitants in the relocation area. Several beaver ponds are located within the project area which have recently been described as providing valuable ecosystems for aquatic and non-aquatic, game and non-game wildlife (Hair, et al., 1978). The beaver ponds are especially important to the woodduck and mallard populations within the basin. According to the results of a Habitat Evaluation Procedure (HEP), the bottomland hardwoods found within the project area of the Grand Bayou Reservoir are of a high quality (U.S. Department of the Interior, 1979). Table IV-1 lists the values per acre of prime bottomland hardwoods. As a comparison, moderate and low quality bottomland hardwoods are also listed. From this table, the value of the bottomland hardwoods which would be lost as a result of the construction of the reservoir can be calculated.

Man-days lost for small game hunting, large game hunting, and Wildlife Oriented Recreation (WOR) would be 773.68, 1221.6, and 1018, respectively. A total annual value of $15,351.44 is calculated for the value of these bottomland hardwoods. When separated into the different categories this figure represents $2,321.04 for small game hunting, $10,994.40 for large game hunting, and $2,036 for WOR. The most trapped furbearer in the bottomland hardwoods is the Northern Raccoon *(Procyon lotor)*. The value per acre in this habitat type for the raccoon would be $.191 (U.S. Army, 1977). This calculates to a total value of $388.88 for the Grand Bayou project area. These figures are annual values.

TABLE IV-1

MAN DAYS AND VALUE PER ACRE OF BOTTOMLAND HARDWOODS

	HIGH QUALITY		MODERATE QUALITY		LOW QUALITY	
	Man-Days	$	Man-Days	$	Man-Days	$
Small Game	.38	1.14	.32	.96	.17	.51
Large Game	.60	5.40	.48	4.32	.31	2.79
Wildlife Oriented Recreation (WOR)	.50	1.00	.50	1.00	.50	1.00

Source: "Value of Wetlands and Bottomland Hardwoods", New Orleans

Table IV-1, continued.
District, U.S. Army Corps of Engineers, Environmental Quality Section, Table 23, July, 1977.

(4) Archeological/Cultural.

(a) Red River. Because this alternative involves only a pipeline, adverse impacts can be minimized by routing the line around any cultural resources. Table IV-2 indicates the possible adverse impacts of the alternatives.

(b) Grand Bayou. At least twenty-three sites are expected to suffer irreversible adverse impacts once the Grand Bayou Reservoir is created (see Table IV-2). Additional sites may be adversely effected since the twenty-three known sites were determined by a sample-based survey. The impacts will be caused by total inundation and/or erosion along the banks of the reservoir. Of the twenty-three known sites, impacts will be caused by total inundation of 14 sites and possible erosion of another nine sites along the reservoir banks. (See Appendix K for proposed agreement regarding potential archeological/cultural sites.)

TABLE IV-2
DIRECT ADVERSE IMPACTS ON CULTURAL RESOURCES

Alternative	Prehistoric Component	Historic Component
Red River	NONE	NONE
Grand Bayou	23	3*
No Action	NONE	NONE

*These three sites have both prehistoric and historic components.

(5) Modifications.

(a) Red River. No modifications of existing pipelines, powerlines, highways, railroads or bridges are expected to occur if water is to be withdrawn from Red River.

(b) Grand Bayou. Major modifications will be necessary if a reservoir is constructed on Grand Bayou. The following modifications will be necessary: (For further details refer to Feasibility and Development Plan, Vol. I, Grand Bayou Reservoir, Red River Parish, Louisiana.)

1. Highway Modifications.

a. Esperenza Road - This is a parish road which is located at the northern most area of the reservoir site. The proposed

modification is to eliminate the four (4) existing wooden bridges and to replace them with one 200 foot concrete bridge. In addition, the new bridge and approximately 2850 feet of the existing road will be raised to 148.0'N.G.V.D.

b. Louisiana Highway No. 784. This highway crosses the reservoir site approximately three miles upstream from the dam site. Two concrete deck bridges are proposed to be replaced with one concrete structure with a minimum length of 200 feet. Also another bridge located on this highway crosses a finger of the proposed reservoir on the northern edge. The concrete deck bridge at this point will be replaced with a 60 foot concrete deck bridge. Again, the new bridge and existing road will be raised to 148'N.G.V.D. The portion of the road to be raised at this bridge will be approximately 200 feet on either side of the bridge.

c. Louisiana Highway No. 155. The elevation and structure of the bridges on Highway No. 155 which crosses Grand Bayou are presently adequate, since this highway is located in an area which would be effected only in extreme backwater. However, it is proposed that work be done to improve the slope along the highway for protection against erosion.

2. Pipeline Modifications. One 20" products pipeline and one 14" products pipeline owned by the Texas Eastern Transmission Corporation bisect the proposed reservoir site near the damsite. The pipelines are not weighted, although, Texas Eastern was warned by the parish government to weight the pipelines because of the possibility of the construction of a reservoir. The approximate total length to be weighted is 8000' each. The parish is now requesting that Texas Eastern bear the cost of modification if the reservoir is constructed.

(6) Short-term construction impacts. During the construction of either alternative, the same basic inconveniences and impacts are going to occur. Some of these include dust, noise, and smoke production. These impacts would be greater at the reservoir site than at the pipeline construction site. Refer to the Feasibility and Development Plan Grand Bayou Reservoir, Red River Parish, Louisiana, Vol. IV 1976, for details of construction impacts which would be encountered.

(7) Long-term pollution impacts. The two alternative projects, namely the Red River Water Supply Project and Grand Bayou Reservoir, will attract industries, businesses and additional population into the service area. This development brings along additional pollutional problems related to water, air, land and noise.

The Red River project and the Grand Bayou project, which need long maintenance roads (ten miles and five miles respectively) along the force main rights-of-way, will create additional pollution associated

with the pipeline maintenance and other traffic on the road.

The roadways may induce land development along them. The Red River alternative effects will be more severe due to the longer force main. The intake structure-pump houses for both the projects will be sources of noise for any existing or future homes nearby. This may also disturb the nearby wildlife. The large volume of surplus earth created after construction of the Red River alternative holding pond might pose a long-term pollution problem for natural drainage ways. The two alternative projects require water treatment plants and the resultant waste chemical sludge disposal will be comparatively greater for the Red River project than the Grand Bayou project. It was estimated that the sludge to be disposed of by the Red River project would be in excess of 5 tons of solids per day. The treatment plant related noise would be more for the Red River alternative than the Grand Bayou alternative because of more complex treatment facilities.

Construction of a reservcir on Grand Bayou will result in the creation of many miles of new shoreline. This shoreline may be subject to wind induced wave erosion from the reservoir. Erosion can present a problem to property owners in terms of "lost" land and also increases the suspended solids level of the reservoir water which in turn can increase the rate of sedimentation.

The phenomenon of wave development is discussed in the following excerpts from Water Resources Engineering by Ray K. Linsley and Joseph B. Franzini (3rd Edition, McGraw Hill, 1979).

> "When wind begins to blow over a smooth surface, small waves, called capillary waves, appear in response to the turbulent eddies in the wind stream. These waves grow in size and length as a result of the continuing push of the wind on the back of the waves and of the shearing or tangential force between the wind and the water. As the waves grow in size and length, their speed increases until they move at speeds approaching the speed of the wind. Because growth of a wave depends in part upon the difference between wind and wave speed, the growth rate approaches zero as the wave speed approaches the wind speed.
>
> "Earth dams must have sufficient freeboard at the maximum pool level so that waves cannot wash over the top of the dam. Waves in reservoirs may also damage shoreline structures and embankments adjacent to the water and interfere with navigation. Part of the design of any reservoir is an estimate of wind set-up and wave height.

"Wind set-up is the tilting of the reservoir water surface caused by the movement of the surface water toward the leeward shore under the action of the wind. The current of surface water is a result of tangential stresses between the wind and the water and of differences in atmospheric pressure over the reservoir. The latter, however, is typically a smaller effect. As a consequence of wind set-up, the reservoir water surface is above normal still-water level on the leeward side and below the still-water level on the windward side. This results in hydrostatic unbalance and a return flow at some depth must occur. The water-surface slope which results is that necessary to sustain the return flow under conditions of bottom roughness and cross-sectional area of flow which exist. Wind set-up is generally larger in shallow reservoirs with rough bottoms."

Another possible effect of the reservoir construction is the creation of pools of stagnant water which provide breeding areas for mosquitoes. Mosquitoes lay a raft-like mass of eggs on or near water. Within a few days or weeks, depending on the species, the eggs hatch into larvae. Mosquitoes can transmit yellow fever, malaria and other diseases among humans and thus their spread must be controlled.

Construction of the pipeline for the Red River and Grand Bayou alternative will involve clearing of the corridor. Erosion will be induced by the alteration of existing drainage patterns and removal of vegetation. Wind erosion will also be possible in the areas of disturbed soil. These effects can be minimized by proper construction procedures such as sprinkling the loose soil and reseeding the construction area.

The water storage reservoir (holding pond) required for the Red River water supply alternative will involve similar problems with regard to mosquito breeding as the Grand Bayou Reservoir alternative. The size of the storage reservoir is much smaller than the Grand Bayou Reservoir, thus, control of mosquitoes under this alternative will be easier to accomplish than for the Grand Bayou Reservoir.

(8) Displacements. The following is a statement found in Part 2, Page 7 of Vol. 4 of the Feasibility and Development Plan, Grand Bayou Reservoir, Red River Parish, Louisiana concerning displacement of households as a result of construction of the reservoir:

"An investigation of the area to be flooded by the Reservoir reveals that only four, and possibly five, families will have to be relocated. Accessibility between families after the reservoir is constructed will not be seriously hampered, due to the absence of roads through the flooded area and the bridging of

the major road that will cross the Reservoir."

No churches or cemeteries will need to be relocated. As was mentioned before, a final alignment has not been made for the Red River pipeline; consequently, a definite number of households, churches, and cemeteries that would necessarily be relocated cannot be stated. However, because of the flexibility of the route a pipeline may take, there is reason to believe that these problems can be avoided.

4.02 INDIRECT EFFECTS AND THEIR SIGNIFICANCE

a. Beneficial effects.

(1) Population. Based on 1980 industry reports, an increased population is projected for Red River Parish in the decades of the 1980s and 1990s. Prior to announcements by Cajun Electrical Cooperatives, Central Louisiana Electric Company and Southwest Electrical Company regarding their plans to build facilities in the area, a series of statewide population projections were developed. Those projections are given in this report in Table III-14. But because this projection did not take account of new population growth expected to occur because of lignite mining and lignite processing, plus the fact that these projections did not anticipate the development of the large containerboard plant by International Paper Company between Coushatta and Mansfield, it was necessary to develop a new set of population projections. Further, when the engineering studies were done regarding the proposed Grand Bayou Reservoir, these developments were not known. Thus, all the population projections used as a basis for determining future water needs are conservative, i.e., more demand will be made for water than the engineers contemplated. Although the original research was based on a projected population of 9,200 to 9,400, the actual population of Red River Parish is expected to approximate 13,370 by 1985. Beyond 1985, the population is expected to continue to increase.

(2) Commercial development. Data in the feasibility study indicates that the number of commercial establishments in Red River Parish is increasing (Ozarks Regional Commission, 1976) (Table IV-3). These figures were compiled, however, before major announcements regarding the lignite industry in Red River Parish were announced. In the future the number of commercial establishments will be appreciably more than the number today because they will serve the expanding energy sector.

TABLE IV-3

COMMERCIAL ESTABLISHMENTS, RED RIVER PARISH, LOUISIANA

YEAR	NO ACTION	GRAND BAYOU ALTERNATIVE	RED RIVER ALTERNATIVE
1970	357	-	-
1975	371	-	-
1980	399	399	300
1990	426	434	324
2000	450	465	345
2010	475	497	378

SOURCE: Feasibility and Development Plan, Grand Bayou Reservoir, Ozarks Regional Commission, 1976.

(3) Employment. The availability of an adequate public water supply will stimulate employment in Red River Parish and will make it possible for the municipalities to develop water supplies that would enhance subdivision developments to accommodate new employees who will be working in the lignite and related employment centers in Red River Parish. The number of workers in the parish has steadily increased since 1960 (Table IV-4). The employment figures represent full-time jobs.

TABLE IV-4

EMPLOYMENT, RED RIVER PARISH, LOUISIANA

YEAR	ALTERNATIVE		
	NO ACTION	GRAND BAYOU	RED RIVER
1960	2,552	-	-
1970	2,715	-	-
1975	2,717	-	-
1980	2,844	2,844	2,844
1990	5,713	5,787	5,787
2000	5,888	6,046	6,046

NOTES:

1) Source: Feasibility and Development Plan, Grand Bayou Reservoir, Ozarks Regional Commission, 1976; Designation Report, Public Law 95-620; Powerplant and Industrial Fuel Use Act of 1978, State of Louisiana, Office of the Governor, June 30, 1979.

2) Projections do not include impact of the Red River Waterway or the lignite related development.

(4) Projected total amount annual retail sales. Projected annual retail sales for Red River Parish have been calculated. These projections include the effects of assumed future price inflation at a rate of five percent per year as applied to the consumers price index. Sales in the parish are expected to increase (Table IV-5). The provision of an adequate public water supply will stimulate sales through the establishment of new commercial developments. Recreation related commercial enterprises associated with the Grand Bayou reservoir alternative is expected to contribute to an additional volume of retail sales. The annual recurring costs of amortizing, operating, and maintaining recreational facilities are not included in the numbers shown in Table IV-5.

TABLE IV-5

PROJECTED ANNUAL RETAIL SALES, RED RIVER PARISH, LOUISIANA
(SALES IN THOUSANDS)

YEAR	NO ACTION	PROJECT	
		RED RIVER ALTERNATIVE	GRAND BAYOU ALTERNATIVE
1975	$12,100	$12,100	$12,100
1980	16,300	16,300	16,372
1990	29,000	29,800	30,054
2000	51,700	53,700	54,202
2010	92,100	96,400	97,363

NOTES:
1) Source: Feasibility and Development Plan, Grand Bayou Reservoir, Ozarks Regional Commission, 1976.

2) Estimation does not include data related to the Red River Waterway and lignite related development.

(5) Land Value. Implementation of the Grand Bayou Reservoir alternative will increase the value of land adjoining the reservoir. The valuation increase phenomena is evidenced from the three similar developments in north Louisiana (Table IV-6).

TABLE IV-6

UNIMPROVED LAKEFRONT PROPERTY VALUATION CHANGE
BEFORE AND AFTER RESERVOIR DEVELOPMENT
(ALL FIGURES ADJUSTED TO 1967 DOLLARS)

LOCATION/DATES[1]	ADJUSTED 1967 $ PER ACRE[2]
	$
Lake Sibley, Natchitoches Parish:	
before (1963-64)	137
after (1974)	3,047
Lake D'Arbonne, Union Parish:	
before (1963)	1,317
after (1968) (5th year)	3,786
Lake Claiborne, Claiborne Parish:	
before (1955)	784
after (1968) (2nd year)	2,390

[1]Feasibility and Development Plan, Grand Bayou Reservoir, Red River Parish, Louisiana. Ozarks Regional Commission, March, 1976.

[2]Sunbelt Research Corporation.

b. Adverse effects.

(1) Red River. Construction of over 50,000 L.F. of pipeline, and 85 acres of storage facility will have adverse environmental effects. These impacts can and will be minimized through environmentally sound operation procedures.

(a) Wetlands. The 85 acres required for a storage basin could be located near Coushatta away from areas classified as wetlands.

(b) Siltation. Water from the Red River, under its current conditions, would cause a siltation problem which would contribute to the proliferation of aquatic plants and to pumping equipment maintenance.

(c) Aquatic weed. A holding facility will constitute an ideal environment for the growth of plants such as cattails *(Typha latifolia)*, alligator weed *(Alternanthera philoxeroides)*, smartweed *(Polygonum spp.)*, and water hyacinth *(Eichornia crassipes)*. These and other species are normally considered a nuisance and must therefore be controlled by periodic drawdowns.

(d) Archeological/Cultural Impacts. No archeological/cultural impacts would be expected from the construction of a holding facility, although intensive investigations of the site would be required. Because a relatively small site is required, the ultimate site could probably be located away from areas with archeological and cultural value.

(2) Grand Bayou. Three major impacts could be created indirectly as a result of the reservoir. The three secondary impacts include (a) deterioration of wetlands below the dam site, (b) siltation and the resulting aquatic weeds, and (c) braiding of Grand Bayou near the headwaters of the reservoir. These impacts can and will be minimized through environmentally sound operations procedures.

(a) Wetlands. Approximately 1980 acres of land within the confines of 140' N.G.V.D. contours below the dam site is classified as bottomland hardwoods. During late Winter or early Spring, most of this area is inundated, at which time the several small beaver ponds existing in the basin are filled. The only major beaver pond (approximately 100 acres) located below the dam site is also recharged during these floods. However, this particular beaver pond is also fed by Robertson Branch, an intermittent stream that has a drainage area of 1.47 square miles (Plate III-4). The design of the dam as described in the Feasibility and Development Plan is such that it incorporates an open, uncontrollable spillway. The spillway will be 200 feet wide and the crest will be at 138.5 feet N.G.V.D. Once the spillway is filled, any excess water will escape via the spillway. The result would be similar to the naturally occurring floods. During extended periods of drought no water will be flowing over the spillway, however, a minimum flow of 3.75 cfs will be released from the reservoir. As Grand Bayou exists today, a "zero flow" situation occurs normally in most years in one or more of the months from July through November; so that the bottomland hardwoods will essentially remain in their existing state. Furthermore, the induced clearing upon these bottomland hardwoods has been estimated by the Soil Conservation Service to be zero (Slayton, 1979).

The Grand Bayou alternative will have minimal or no adverse effects on Black Lake, located downstream of the reservoir site, since it has been agreed, as a mitigation measure, to allow a minimum flow from the reservoir of 3.75 CFS of water (see Section 4.04-Mitigation). As can be seen from Table III-3, the present mean monthly flow on Grand Bayou frequently drops below this amount during the summer months. In addition, Grand Bayou comprises only 15 percent of the total drainage area of Black Lake.

(b) Siltation. Once the reservoir has reached its pool level, the silt carried by the Grand Bayou will be deposited as the waters enter the reservoir. The deposition of the silt will compound the problem of the already shallow areas of the upper end of the lake. The silt deposition will also, in turn, enhance the proliferation of aquatic plants such as cattails.

(c) Aquatic Weed. Grand Bayou Reservoir will constitute an ideal environment for the growth of plants such as cattails (Typha latifolia), alligator weed (Alternanthera philoxeroides), smartweed (Polygonum spp.), and water hyacinth (Eichornia crassipes). These and other species are normally considered a nuisance and must therefore be controlled by periodic drawdowns. The prescribed draw-

down usually occurs every 3 to 5 years from September to January. This procedure has been shown to adequately control the problem of aquatic vegetation in many Louisiana lakes (Lantz, 1974; Manning and Sanders, 1975; Goldsby and Sanders, 1977).

(d) Archeological/Cultural impacts. Nine cultural resource sites are known to exist adjacent to the proposed reservoir. These sites are mostly atop hills on land presently containing scattered homesites and farms. If the reservoir is constructed, then recreational camps along with ramps and access roads will probably be built. The construction of such facilities will more than likely adversely impact both known and unrecorded archeological sites.

(3) Pollution. As no recreation is to be expected to occur along the pipeline (with the exception of hunting), solid waste pollution should not be a problem along the right-of-way site. The only other activity which could take place along the pipeline right-of-way besides hunting, would be motorcycle riding. The particular sport of motorcross is ever increasing in popularity and could thus produce some solid waste and noise pollution along the pipeline. On the other hand, as mentioned above, a reservoir would attract many outdoor recreation enthusiasts that would participate in various activities such as skiing, fishing, and swimming. These activities will result in solid waste and other types of pollution. However, the effect of solid waste and sewage resulting from Grand Bayou Reservoir user activities can be minimized through State Board of Health approved disposal facilities and regulations. As an example, this could involve trash dumpsters for solid waste disposal which would be emptied in a satisfactory area landfill. Sewage could be treated by cesspool, package treatment plant or land treatment. Refer to Volume III of the Feasibility and Development Plan, Grand Bayou Reservoir, Red River Parish, Louisiana, 1976, for further details of the suggested sanitation facilities and regulations. Additional engineering work is required to quantify accurately the quantity of wastes and recommended disposal methods. The water treatment plant would produce a sludge which must be disposed. Treatment plant sludge is generally dewatered by one of several methods and reduced to a stable, non-odorous cake which is transported to a sanitary landfill.

(4) Erosion. In the event that motorcross riding (as mentioned above) occurred along the pipeline, the tires of the motorcycles would disturb the herbaceous vegetation and topsoil, thus creating an erosion problem. The shoreline along the Grand Bayou Reservoir would be subjected to erosion also, as a result of the wave action, especially in high activity areas. Construction of the treatment plant (both alternatives) and the storage basin (Red River alternative) would create disruption of existing vegetation and would increase the likelihood of wind and water induced erosion.

4.03 POSSIBLE CONFLICTS

a. Compatibility with land use plans.

(1) Red River. The Master Plan for the Red River Waterway is currently being developed. The plan has several proposed parks with facility developments that could serve to satisfy much of the recreational needs of Red River Parish. Included in this proposed development is a city water front park in Coushatta and other major sites within 20 miles of Coushatta.

(2) Grand Bayou. Due to the level, poorly drained soils and periodic inundation of the Grand Bayou Basin, the immediate area is used only as woodlands. No forest management or agricultural practices are being applied. The future land use plan for this area includes the construction of the Grand Bayou Reservoir and the adjacent parks (Coordinating and Development Council of Northwest Louisiana, 1976 and 1978).

b. Policies and controls.

(1) Red River. Any proposed water withdrawal from the Red River should be reviewed by the Corps of Engineers to allow coordination of these plans with the planned improvements associated with the Red River Waterway project.

(2) Grand Bayou. Since the proposed reservoir site is entirely within the boundaries of Red River Parish, there would not be any conflicts with other parish governmental departments. The Black Lake Bayou Recreation and Water Conservation District of Red River Parish has been appointed by the Red River Parish Police Jury to establish and govern the rules and regulations of the proposed Grand Bayou Reservoir.

c. General. The following possible conflicts are expected to arise during the course of implementation of any of the alternatives given below:

(1) Red River Alternative.

(1-a) Possible strong public reaction against the water quality and the associated public health hazards.

(1-b) Possible complaints from land owners against land acquisition for pipeline right-of-way.

(1-c) Possible land acquisition problems relative to a large parcel of land (115) acres near urbanized areas for locating the storage reservoir and water treatment plant.

(1-d) Possible conflicts with other utility companies and the railroad company.

(1-e) Possible objections by the environmental groups for any damage that might be caused to the environment.

(1-f) Possible conflicts regarding possible changes in pool elevations.

(2) Grand Bayou Reservoir Alternative.

(2-a) Possible conflicts with the five households that are likely to be displaced.

(2-b) Possible conflicts with the concerned road authorities in relocating the roads.

(2-c) Possible conflicts with bridge authorities for relocating the bridges.

(2-d) Conflict with various utility companies whose pipelines need to be relocated.

(2-e) Conflict with power transmission line authorities for relocating their lines.

(2-f) Conflicts with land owners for transmission pipeline right-of-way, reservoir dam construction and treatment plant location near an urbanized area.

(2-g) Possible objections by environmental groups for any damage the project may cause to the environment.

(3) No Action Alternative.

(3-a) Possible public dissatisfaction and health problems as existing aging water systems deteriorate further and are placed under higher demands as lignite coal associated activities attract more persons in to the area.

(3-b) Possible financial hardships on municipalities which are forced to upgrade water treatment and distribution facilities.

(3-c) Possible water shortages due to increased demand and lack of new supply sources.

(3-d) Possible loss of potential revenue and employment opportunities from lignite coal related development due to the fact that municipalities may not be able to supply adequate water to new working force and small industries that desire to locate in the vicinity.

4.04 MITIGATION

a. Constructional mitigation.

(1) Turbidity and sedimentation. Turbidity and possible sedimentation will occur periodically along the pipeline at any stream crossing. These problems will be minimal since most or all of the streams which will be crossed are intermittent streams. Thus, they are narrow and the construction will not disturb the water flow for any extended length of time. Also, there is the possibility that the streams will be dry during construction. On the other hand, turbidity and sedimentation could be a major impact during construction of a reservoir on Grand Bayou. However, it has been proposed that clearing and other construction practices begin at the northern end of the site, at the perimeter and work toward the middle of the basin so that siltation will be mitigated by the buffer zones (Ozarks Regional Commission, 1976). For further details of mitigating siltation during construction of the reservoir, refer to Vol. IV of the Feasibility and Development Plan, Grand Bayou Reservoir, Red River Parish, Louisiana, 1976.

(2) Pollution. In order to mitigate any pollution problems that might arise, it is recommended that the construction contractor for any of the alternatives be required to follow the EPA guidelines. These include strict enforcement of such regulations as petroleum products storage, run-off and sedimentation.

(3) Mitigation and Compensation Plans.

(a) General. Compensation land for either the Grand Bayou alternative or the Red River alternative will provide at least 11,093 Habitat Units and will be purchased and managed by the State of Louisiana. The applicant has secured an approval from the International Paper Company to buy approximately 6000 acres of mixed timber land near Sicily Island, Catahoula Parish, Louisiana. This tract of land will be a State of Louisiana Wildlife Management Area in perpetuity. In 1980, the Louisiana Legislature approved the purchase and allocated funds for same in the Capital Outlay Bill which was signed into law by Gov. David C. Treen. For the Grand Bayou Reservoir approximately 2900 acres of land will be cleared while the Red River alternative involves 115 acres for the storage facilities and treatment plant in addition to a corridor of approximately 9.8 miles long and 20 feet wide for the transmission line. This plan for mitigation was worked out with the active technical assistance and guidance from the U.S. Department of Interior, Fish and Wildlife Service, and the Louisiana Department of Wildlife and Fisheries. (See Appendix M.)

(b) Grand Bayou Reservoir. In May 1979, a Habitat Evaluation Procedure (HEP) was performed in the proposed reservoir site. This HEP was formulated by the U.S. Fish and Wildlife Service and was performed by biologists from the U.S. Corps of Engineers, cooperating agencies and the contractor. The following is a discussion of mitigation measures which resulted from the HEP and which may be implemented upon initiation or completion of the reservoir.

An appreciable amount of timber will be left in the shallow coves in the reservoir especially at the southern end. This will provide habitat for woodducks, water snakes, raccoons, fish, and non-game waterfowl.

As stated previously, Grand Bayou normally floods every spring and remains in this state of inundation for several weeks. The Ogee Spillway which is incorporated into the design of the dam (Feasibility Study), will provide the overbank flooding below the reservoir during the late winter and early spring floods.

The applicant will provide a minimum flow of 3.75 cubic feet per second (c.f.s.) so that the stream fish population below the dam site can be maintained. This 3.75 c.f.s. is above the normal flow during the low flow period from July to September. A multi-level outlet extended from a 6' x 6' concrete drawdown chute (Ozarks Regional Commission, 1976) will provide the required minimum flow; and at the same time provide a mixed discharge of water so that a temperature difference can be reached.

The applicant will construct a marked access route to the stream on the downstream side of the dam. This will provide access for fisherman to the tailwater of the reservoir where sportfishes are expected to concentrate.

The applicant will have to incorporate into his regulations lake management planning practices. This should include fish and wildlife management planning and control of problematic aquatic vegetation and algae. The recommended procedure will be to to collect fish and aquatic vegetation samples every year during the month of July. Then, if the lake proved to have an excessive standing crop of forage fish or problematic aquatic plants, the lake would be drawndown. The drawdown would be initiated in early September and continued until January when the late winter floods would refill the reservoir. This practice has been reported by many scientists to slow down the eutrophication process (Lantz, 1974; Manning and Sanders, 1975; Goldsby and Sanders, 1977; Richardwon, 1975; Manning and Johnson, 1975; Lantz, 1974b). An operational rule will be developed to insure alternative controls of problematic vegetation in the unlikely event of low water volumes in the September through January periods that would threaten potable water supplies.

The applicant will seek technical assistance from appropriate agencies, both state and federal, to insure optimum successes in the relocation of animals. The fact that the habitat will be modified and that animals must be relocated is evident, thus the less restrictive means available today will be used to insure proper location. A definite relocation plan will be developed in cooperation with the Louisiana Department of Wildlife and Fisheries.

Simultaneously, the applicant will seek technical assistance from appropriate agencies, both state and federal, in the development of a lake management plan. Because the proposed new reservoir will be primarily a public water supply and secondarily a recreational area, the plan must take cognizance of those particular objectives. A

detailed plan will be developed for algae and aquatic weed control and optimum fishery habitat provision.

(4) Relocation of wildlife to a new habitat.

(a) Red River. Relocation impact during construction of a pipeline and appurtenances from Red River will be negligible since the area impacted is expected to be very small.

(b) Grand Bayou. Approximately 2900 acres will be cleared if the proposed reservoir is constructed. Consequently, many wildlife species will be displaced creating a problem of competition and relocation. Trapping and transporting wildlife to new locations away from construction sites has proven to be a safe and reasonably economical method of relocation. However, because of the abundance of similar habitat adjacent to the study area, trapping would not be feasible. Because adjacent areas are at carrying capacity, loss of habitat will result in a corresponding loss of wildlife in the immediate area.

1. Relocation sites. The proposed reservoir site is bordered along the south by U.S. Highway 71-84. Along the highway and to the south of it the land is used for agricultural purposes and human habitation. To the east of the proposed site is the Black Lake Bayou drainage system. This stream is designated as a natural and scenic stream; thus the basin has been left virtually unchanged so that the majority of the basin is still bottomland hardwoods. The area to the north is very rural with sporadic private farms. The habitat in this area is mostly pine-hardwoods with scattered stream bottoms. Northwest of the proposed reservoir site is the upper reaches of the Grand Bayou drainage basin. This area is locally known as the Chicot Swamp. The area encompasses several thousands of acres and is comprised mostly of bottomland hardwoods. The areas to the north and northwest are the best locations due to close proximity, absence of physical barriers, and similarity of habitats. The area south and southwest of the proposed reservoir site would not be suitable because of the more dense human population.

2. Procedures. In order to "drive" the wildlife to the specified relocation sites and away from the southern area, harvesting and clearing operations need to begin in the middle along the southern edge of the proposed reservoir site. From this point, the harvesting and clearing would proceed to the center of the basin and at the northern end, harvesting and clearing would begin at the perimeters, thence to the east and to the west northwest, simultaneously. This will help to drive the animals in the direction toward the relocation sites. Consequently, the populations will be distributed somewhat evenly so that competition is lessened. Additionally, when adjacent areas are at carrying capacity, this would allow state and federal wildlife officials to measure integration and assist when necessary in relocation.

3. Environmental constraints. The harvesting and clearing operations will be performed during the late spring and summer months because the Grand Bayou basin is normally inundated during the winter and early spring months. Clearing during the summer will not be in conflict with the mating or nesting seasons. In addition, the competition for food and shelter in the relocation sites will not be as severe as it would be if clearing began in the fall or winter. Obviously, these procedures will not be one hundred percent effective, but this will definitely aid in a more even distribution.

4. Operational/administrative constraint. Approximately fifty percent of the land within the proposed reservoir site is owned by the International Paper Company (IPC). The remaining land is owned by private individuals or smaller timber companies. The timber companies and some individuals will like to harvest the merchantable timber before clearing begins. Therefore the applicant will necessarily have to maintain control over the schedule and procedures of the harvesting process; or the applicant can compensate the landowners for the marketable timber. The selective harvest will have a minimal effect in the relocation process; however, clearing will be the major factor and should thus follow the plans outlined in the above sections.

5. OCE Guidance on mitigation and conditioning of permits. The U. S. Corps of Engineers seeks to mitigate or to avoid fish and wildlife losses; to insure that land acquisition associated with mitigation will be adequate for these purposes; and, accordingly, to reserve the right to require special conditions as a part of the permitting process when deemed to be in the public interest.

SECTION 5

PUBLIC INVOLVEMENT

5.01 PUBLIC INVOLVEMENT PROGRAM

a. Public Hearings.

(1) On February 20, 1979, a public meeting was held at the parish courthouse in Coushatta, Louisiana. The purpose of this meeting was to give all interested persons a chance to express opinions and views regarding the quantity and quality of water available to the residents and other users in that area and to express opinions and views regarding the desirability or non-desirability of constructing a dam, spillway and appurtenances to form a reservoir for municipal and industrial water supplies. The meeting was attended by more that 350 persons. There was extensive testimony for the proposed Grand Bayou Reservoir project and there were no expressions of opposition. Since February 20, 1979, the Grand Bayou Reservoir project has been discussed often in meetings of the Red River Parish Police Jury, the City of Coushatta and other public bodies in public meetings. Additionally, the proposed project has had wide coverage in the local news media.

(2) On September 28, 1978, a scoping meeting was held in Baton Rouge. This meeting was attended by federal, state, and local officials, plus interested citizens. Officials from the Louisiana Department of Transportation and Development, the Louisiana Office of Public Works, the U.S. Fish and Wildlife Service, the Louisiana Wildlife and Fisheries, the Louisiana Forestry Commission, the U.S. Army Corps of Engineers and the permit applicant. The purpose of that meeting was to discuss affects on the environment and mitigation alternatives. Important issues evolving from that meeting included impacts to bottomland hardwoods due to construction and inundation, fish and wildlife resources losses, construction economics, socio-economic impacts and alternative water supplies.

b. Preparers and contributors to the E.I.S.

(1) Table V-1 is a listing of all persons who researched and wrote the E.I.S.

(2) Table V-2 is a listing of all persons who contributed in the preparation of the E.I.S.

TABLE V-1

5.01

LIST OF PREPARERS

SUNBELT RESEARCH CORPORATION

NAME	EXPERTISE/DISCIPLINE	EXPERIENCE	ROLE IN PREPARING EIS
Mr. Jerome Fournier	Geography	2 years Environmental Planning	Physical Geography, Geology
Dr. Sherwood Gagliano (consultant)	Geography, Anthropology	16 Years Environmental, Archeological, Cultural Studies	Geomorphology Anthropology
Dr. Raymond Germany (consultant)	Aquatic Biology	1 Year Marine Biologist and Icthyologist, Gulf Coast Research Laboratory; 3 Years Research Assistant, Texas Department of Wildlife and Fisheries; 1 Year Aquatic Biologist, Enviro-Med Laboratories, Inc.	Aquatic Biologist
Mr. Jeff Harris	Civil Engineering	3 Years Civil/Environmental Engineering	Engineering Aspects
Mr. Chris Ingram	Ichthyology Mammalogy	2 Years Lab Assistant, Southeastern Louisiana University	Wildlife Biologist
Dr. William J. Long	Planning, Economics	17 Years Urban Planning	Demographic, Economics, and Planning
Mr. Lawrence McKenzie, III (Project Director/Study Manager)	Physical Geography	9 Years Environmental Research	Geomorphology, Climatology
Dr. A. V. Peddada, P.E.	Civil Engineering	22 Years Civil/Environmental Engineering	Engineering Aspects
Mr. Alexander Weissman, P.E.	Civil Engineering	22 Years Civil/Environmental Engineering	Engineering Aspects

TABLE V-2

5.02

LIST OF CONTRIBUTORS

(REVIEWERS AND COMMENTORS OF EIS)

CORPS OF ENGINEERS

NAME	EXPERTISE/DISCIPLINE	EXPERIENCE	ROLE IN COORDINATING E.I.S.
Baehr, Lloyd F., Dr.	Botanist	4 years Environmental Studies, 2 years Regulatory Functions Studies, Corps of Engineers, New Orleans District	Regulatory Functions and Botanical Aspects
Bush, Rick, Mr.	Recreation Planner	2 years Recreation Planning, Corps of Engineers, New Orleans District	Recreation Aspects
Decker, Charles W., Mr.	Civil Engineer	11 years Chief, Regulatory Functions Branch, Corps of Engineers, New Orleans District	Regulatory Functions
Gilino, Gary D., Mr.	Civil Engineer	2 years Regulatory Functions-Waterways Protection, Corps of Engineers, New Orleans District	Regulatory Functions-Jurisdictional Determination
Lacy, Robert D., Jr., Mr.	Economist	9 years Economics/Planning, Corps of Engineers, New Orleans District	Socio-Economics and Planning Aspects
Montz, Glen N., Dr.	Botanist	5 years Environmental Studies, 3 years Aquatic Growth Control Studies, Corps of Engineers, New Orleans District	Aquatic Growth Control and Botanical Aspects
Reece, Dave, Mr.	Fishery Biologist	4 years, Florida Game and Fish Commission, 3 years with Corps of Engineers, New Orleans District	Effects on Fishery Resources, Environmental Impacts
Ryan, Thomas M., Mr.	Archaeologist	1 year, Chief, Cultural Resources Section and 2 years as archaeologist, Corps of Engineers, New Orleans District	Cultural Resources Management
Shelton, Calvin W., Mr.	Engineer/Civil Engineer	28 years, Corps of Engineers, Little Rock and New Orleans District	Engineering Input, Project Manager, Red River Waterway Project

TABLE V-2 CONTINUED

LIST OF CONTRIBUTORS

CORPS OF ENGINEERS

NAME	EXPERTISE/DISCIPLINE	EXPERIENCE	ROLE IN COORDINATING EIS
Speed, Donald C., Mr. (Corps EIS Coordinator For Project)	Fishery & Wildlife Biologist/Environmental Specialist	4 1/2 years Fish and Wildlife Management Planning, 2 1/2 years Environmental Studies, Corps of Engineers; 12 years Fishery Biology Experience (other agencies)	EIS Coordination for Project, Effects on Biological and Environmental Resources, Botanical and Zoological Nomenclature
Utes, Richard V., Mr.	Engineer/Civil Engineer	9 years Environmental Coordinator for EA's, EIS's, Corps of Engineers, New Orleans District	Environmental Coordination
Weber, John C., Mr.	Zoology	3 1/2 years Chemist, Texas Parks and Wildlife Department; 8 1/2 years Environmental Planning and Regulatory Functions, Corps of Engineers, New Orleans District	Chief, Environmental Analysis Branch
Zimny, Raymond E., Mr.	Engineer/Civil Engineer	3 years, Corps of Engineers, New Orleans District	Engineering Input, Effects on Water Quality, Study Manager, Red River Waterway Project

c. List of organizations from whom comments on the draft E.I.S. were requested.

(1) Table V-3 is a listing of persons, agencies, and other organizations which received copies of the draft E.I.S.

(2) Table V-4 is a listing of persons, agencies, and other organizations which responded to the draft E.I.S. Correspondence and replies to the correspondence are presented in Appendix L of this report.

(3) Appendix L contains all letters of response regarding the Draft Environmental Impact Statement. Next to each letter of response is a letter to the responder from the U.S. Corps of Engineers in which responses and comments are specifically addressed.

(4) Comments and response information for this final E.I.S. are given on page V-II.

TABLE V-3
5.03
LIST OF ORGANIZATIONS FROM WHOM COMMENTS ARE REQUESTED

Federal

J. Bennett Johnston, US Senator
Russell B. Long, US Senator
Corinne C. Boggs, US Congresswoman
John B. Breaux, US Congressman
Jerry Huckaby, US Congressman
Robert L. Livingston, US Congressman
Gillis W. Long, US Congressman
W. Henson Moore, US Congressman
Charles Roemer III, US Congressman
William "Billy" Tauzin, US Congressman
US Department of Interior, Office of the Secretary, Washington, D.C.
US Department of Interior, Assistant Secretary for Program Development and Budget, Office of Environmental Project Review, Washington, DC
US Department of the Interior, Regional Director, National Park Service, Santa Fe, New Mexico
US Department of the Interior, Director, Bureau of Outdoor Recreation, SC Region, Albuquerque, New Mexico
Advisory Council on Historic Preservation, Lakewood, Colorado
US Fish and Wildlife Service, Regional Director, Atlanta, Georgia
US Fish and Wildlife Service, Area Manager, Jackson, Mississippi
US Fish and Wildlife Service, Field Supervisor, Vicksburg, Mississippi
US Fish and Wildlife Service, Field Supervisor, Lafayette, Louisiana
Environmental Protection Agency, Administrator, Washington, DC
Environmental Protection Agency, Regional Administrator, Region VI, Dallas, Texas
Environmental Protection Agency, Permits and Enforcement Branch, Dallas, Texas
US Department of Commerce, Deputy Assistant Secretary for Environmental Affairs, Washington, DC
US Department of Commerce, Regional Director, National Marine Fisheries Service, St. Petersburg, Florida
US Department of Commerce, Area Supervisor, National Marine Fisheries Service, Water Resource Division, Galveston, Texas
US Department of Agriculture, Regional Forester, Forest Service Atlanta, Georgia
US Department of Agriculture, State Conservationist, Soil Conservation Service, Alexandria, Louisiana
US Department of Transportation, Division Engineer, Federal Highway Administration, Baton Rouge, Louisiana

TABLE V-3 CONTINUED

US Department of Commerce, National Oceanic and Atmospheric Administration, Office of Ecology and Conservation, Rockville, Maryland
US Department of Transportation, Commander, Second Coast Guard District, St. Louis, Missouri
US Department of Health, Education and Welfare, Regional Director, Public Health Service, Region VI, Dallas, Texas
US Department of Health, Education and Welfare, Water Resources Activity, Vector Biology and Control Division, Atlanta, Georgia
US Department of Housing and Urban Development, Regional Administrator, Region VI, Dallas, Texas
US Department of Energy, Director, Federal Energy Administration, Environmental Impact Division, Office of Environmental Programs, Washington, DC
US Department of Energy, Advisor on Environmental Quality, Federal Power Commission, Washington, DC
US Army Engineer Division, Lower Mississippi Valley, Attention: LMVCO-N, Vicksburg, Mississippi
US Army Engineers, Shreveport Area Office, Area Engineer, Shreveport, Louisiana
Heritage Conservation and Recreation Service, South Central Region, Albuquerque, New Mexico
Interagency Archeological Services - Atlanta - Heritage Conservation and Recreation Service, Atlanta, Georgia

State

Donald G. Kelly, Louisiana Senator
H. M. "Mutt" Fowler, Louisiana Representative
Office of the Governor, Baton Rouge, Louisiana
Office of the Lieutenant Governor, Baton Rouge, Louisiana
Office of the Attorney General, Baton Rouge, Louisiana
Office of Intergovernmental Relations, Office of the Governor, Baton Rouge, Louisiana
Louisiana Department of Health and Human Resources, Office of Health Services and Environmental Quality, New Orleans, Louisiana
Louisiana Department of Transportation and Development, Office of Public Works, Baton Rouge, Louisiana
Louisiana Department of Transportation and Development Office of Public Works, Alexandria, Louisiana
Louisiana Department of Transportation and Development, Office of Highways, Impact Engineer, Baton Rouge, Louisiana
Louisiana Department of Transportation and Development, Office of Management and Finance, Project Control Engineer, Baton Rouge, Louisiana
Louisiana Department of Agriculture, Commissioner, Baton Rouge, Louisiana
Louisiana Department of Commerce, Secretary, Baton Rouge, Louisiana
Louisiana Department of Wildlife and Fisheries, Secretary, New Orleans, Louisiana
Louisiana Department of Wildlife and Fisheries, Refuge Division, Chief, New Orleans, Louisiana
Louisiana Department of Wildlife and Fisheries, Game Division, Chief, Baton Rouge, Louisiana
Louisiana Department of Wildlife and Fisheries, Fish Division, Baton Rouge, Louisiana

TABLE V-3 CONTINUED

Louisiana Department of Wildlife and Fisheries, Coordinator, Environmental Section, Baton Rouge, Louisiana
Louisiana Department of Wildlife and Fisheries, Supervisor District Office Number 3, Tioga, Louisiana
Louisiana Department of Wildlife and Fisheries, Supervisor, District Office Number 1, Minden, Louisiana
Louisiana State Parks and Recreation Commission, Baton Rouge, Louisiana
Louisiana Archeological Survey and Antiquities Commission, State Archeologist, Baton Rouge, Louisiana
Louisiana Air Control Commission, New Orleans, Louisiana
Louisiana Public Service Commission, Baton Rouge, Louisiana
Louisiana Department of Natural Resources, Office of Forestry Baton Rouge, Louisiana
Louisiana Department of Natural Resources, Office of Conservation, Baton Rouge, Louisiana
Louisiana Department of Natural Resources, Office of State Lands, Baton Rouge, Louisiana
Louisiana Department of Natural Resources, Office of Environmental Affairs, Water Pollution Control Division, Baton Rouge, Louisiana
Louisiana Department of Culture, Recreation, and Tourism, Division of Archaeology and Historic Preservation, State Historic Preservation Officer, Baton Rouge, Louisiana
Louisiana Department of Justice, Environmental Section, New Orleans, Louisiana
Louisiana Joint Legislative Committee on Environmental Quality, Louisiana Legislature, Baton Rouge, Louisiana
Louisiana State Planning Office, Baton Rouge, Louisiana
Louisiana State Soil and Water Conservation Committee, Louisiana State University, Baton Rouge, Louisiana
Louisiana State University, Associate Director, Sea Grant Program, Center for Wetland Resources, Baton Rouge, Louisiana
Louisiana State University, Curator of Anthropology, Department of Geography and Anthropology, Baton Rouge, Louisiana
University of New Orleans, Coordinator, Environmental Impact Section, Department of Environmental Affairs, New Orleans, Louisiana
Saline Lake Game and Fish Preserve, Winnfield, Louisiana
Northwest Regional Clearinghouse, c/o Coordinating and Development Council of Northwest Louisiana, Shreveport, Louisiana
Red River Waterway Commission, Baton Rouge, Louisiana

Local

President, Red River Parish Police Jury, Coushatta, Louisiana
President, Winn Parish Police Jury, Winnfield, Louisiana
President, Natchitoches Parish Police Jury, Natchitoches, Louisiana
Mayor, Town of Coushatta, Coushatta, Louisiana
Mayor, Village of Hall Summit, Hall Summit, Louisiana
Board of Commissioners of Red River-Bayou Pierre Levee and Drainage District, Coushatta, Louisiana
Black Lake Bayou Recreation and Water Conservation District of Red River Parish, Coushatta, Louisiana
Coushatta-Red River Chamber of Commerce, Coushatta, Louisiana
Grand Bayou Reservoir Commission, Coushatta, Louisiana
Saline Soil and Water Conservation District, Ringgold, Louisiana

Environmental

Ecology Center of Louisiana, Inc., New Orleans, Louisiana
Orleans Audubon Society, New Orleans, Louisiana

TABLE V-? CONTINUED

Ouiska Chitto Audubon, Kinder, Louisiana
National Audubon Society, Library, New York, New York
National Audubon Society, Southwestern Regional Office,
Regional Representative, Austin, Texas
Delta Chapter, Sierra Club, New Orleans, Louisiana
Delta Chapter, Sierra Club, Baton Rouge, Louisiana
National Sierra Club, San Francisco, California
National Wildlife Federation, Washington, DC
Louisiana Wildlife Federation, Baton Rouge, Louisiana
Louisiana Wildlife Federation, Water Control Projects Committee,
Chairman, New Iberia, Louisiana
Wildlife Management Institute, Washington, DC
Wildlife Management Institute, Southcentral Representative,
Dripping Springs, Texas
The Conservation Foundation, Washington, DC
Environmental Defense Fund, New York, New York
Trout Unlimited, San Antonio, Texas
Natural Resources Defense Council, Washington, DC
Environmental Information Center, Inc., New York, New York
League of Women Voters of the US, Baton Rouge, Louisiana
The Fund for Animals, Inc., Field Agent, Jefferson, Louisiana
Louisiana Environmental Professionals Association, Metairie, Louisiana

Others

Shreveport Area Council of Governments, Shreveport, Louisiana
The Coordinating and Development Corporation, Shreveport, Louisiana

TABLE V-4

5.04

LIST OF ORGANIZATIONS FROM WHOM COMMENTS WERE RECEIVED

Federal	Page
US Department of Interior, Office of the Secretary, Washington, D.C.	L-2
Advisory Council on Historic Preservation, Lakewood, Colorado	L-3
US Fish and Wildlife Service, Field Supervisor, Lafayette, Louisiana	L-4
Environmental Protection Agency, Regional Administrator, Region VI, Dallas, Texas	L-5
US Department of Commerce, Deputy Assistant Secretary for Environmental Affairs, Washington, DC	L-8
US Department of Agriculture, State Conservationist, Soil Conservation Service, Alexandria, Louisiana	L-10
US Department of Transportation, Division Engineer, Federal Highway Administration, Baton Rouge, Louisiana	L-11
US Department of Transportation, Commander, Second Coast Guard District, St. Louis, Missouri	L-12
US Department of Health, Education and Welfare, Water Resources Activity, Vector Biology and Control Division, Atlanta, Georgia	L-13
US Department of Housing and Urban Development, Regional Administrator, Region VI, Dallas, Texas	L-15
State	
Donald G. Kelly, Louisiana Senator	L-16
Louisiana Department of Wildlife and Fisheries, Secretary, New Orleans, Louisiana	L-17
Louisiana Department of Culture, Recreation, and Tourism, Division of Archaeology and Historic Preservation, State Historic Preservation Officer, Baton Rouge, Louisiana	L-18
Environmental	
Wildlife Management Institute, Washington, DC	L-19

5.05 RESPONSE INFORMATION

All Responses to this final E.I.S. must be directed to:

District Engineer
Corps of Engineers
Department of the Army
P. O. Box 60267 Attn: LMNOD-SA
New Orleans, Louisiana 70160

As provided in Paragraph 17-b of ER 200-2-2(d), 25 August 1980, a thirty (30) day review period has been established. The deadline for responses will be that established by the Notice of Availability published in the Federal Register and the Special Public Notice to be issued by the New Orleans District announcing availability of the final E.I.S.

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APPENDIX A

METHODOLOGY

Appendix A

METHODOLOGY

A. Botanical

(1) Terrestrial. The terrestrial vegetation of the Grand Bayou Reservoir area was sampled by means of plots located along transects. The transects were surveyed to lie perpendicular to the axis of the Grand Bayou basin and run from 140 foot to 140 foot N.G.V.D. contour across the basin. Each transect was approximately one mile from the other. The first transect, Transect A, is located approximately one mile from the mouth of Grand Bayou. At some point along the transect, selected at random using Stockton's random number tables (Stockton, 1966), a "starting point" was established. At this "starting point", and every 700 feet along the transect thereafter, a 10 meter x 10 meter plot was established. These plots were the sample units in which the vegetation of the area was identified and counted for density values. When a plot happened to be located in a grassland, it was reduced to one square meter. To determine the density value, the plants were divided into groups according to size: one inch to one foot high; 1.1 foot to ten feet high; one inch to three inches in diameter at breast height (DBH); four inches to nine inches DBH; and ten inches and over DBH. Vegetational analysis of the other areas (Lake Bistineau, Black Lake, Red River) were determined using land use maps, aerial photographs and published literature. Transect locations are shown on Plate III-6.

(2) Aquatic. Phytoplankton counts for Grand Bayou were taken at four locations along the stream (Plate III-7). At each location whole water samples were taken at a depth of one foot below the surface of the water. The samples were then preserved in four percent formalin and transported back to the laboratory. Here the phytoplankton was identified utilizing a Sedgewick-Rafter cell. Thirty fields at 150x magnification were examined in each cell for phytoplankton. The phytoplankton communities of other alternatives were determined strictly through literature research.

B. Zoological

(1) Terrestrial

(a) Mammals. There was no mammal field survey per se; however, during every field trip into the project area, mammals were recorded by sight, sound, or signs. Literature and museum research also played a role in determining the mammals found within the study area.

(b) Birds. The birds within the Grand Bayou Reservoir project area were studied along the same transect lines established for the vegetational analysis. As well as recording bird sightings during other field trips into the area, a complete study was performed specifically for the birds. Every 200 feet along each transect, bird counts would be made. Each count lasted for five minutes and songs as well as sightings were recorded. Special care was taken to prevent a duplicate recording from previous counts along the transect.

(c) Reptiles and Amphibians. The herpetological counts were made along the same transect lines. Along each transect, a strip approximately 25 feet wide was thoroughly searched. Also, "herp" sightings were recorded during every field trip into the area. Museum and literature research also provided information concerning the reptiles and amphibians of the study area.

(2) Aquatic.

(a) Fish. Fish samples were taken at points where each transect crossed the Grand Bayou, with the exception of Transects "C" and "D" (Table III-6). At these points, three 30' drags were made with a 20' seine. Fish were identified, counted, recorded, and then released. Representatives of each species from each sampling point were collected and preserved in ten percent formaldehyde. Fishes that were not easily identifiable in the field were preserved and later identified in the laboratory. Museum and literature research also aided in providing information about the fishes in the drainage basins of all the alternatives.

(b) Benthos. Samples to determine the diversity of the benthic communities were taken at the same locations along Grand Bayou as the plankton samples (Table III-8). Three samples were taken at each location. Each sample area measured 1/25 of a square meter and each sample was washed through a sieve which had a mesh size of .039 inches. The samples were preserved in 4 percent formaldehyde and brought back to the laboratory for identification.

(c) Zooplankton. The zooplankton samples were taken at the same sites as the phytoplankton samples (Table III-7). Three samples were collected at each site with a standard plankton net. Each sample consisted of a three minute sweep just below the surface of the water. The samples were then preserved in four percent formaldehyde and transferred back to the laboratory. Here the zooplankters were identified in the same manner as was the phytoplankton.

C. Water Quality

The test procedures used for determining water quality in Grand Bayou were either from the 14th edition of Standard Methods for the Examination of Water and Wastewater; Methods for Chemical Analysis of Water and Wastes, 1976 (EPA); or Annual Book of Standards, Part 23, Water Atmospheric Analysis, 1972.

APPENDIX B

WATER QUALITY

TABLE B-1

WATER QUALITY

STORET System

07354500 54882
32 22 45.0 093 21 10.0 2
RED RIVER AT COUSHATTA, LA
22031 LOUISIANA
101691

11EPRD 02111204 /TYPA/AMBNT/STREAM
DEPTH 0
INDEX 320045 0
MILES 932.11 10.00

	PARAMETER			NOBS	AVE	MAX	MIN	BEG-DATE	END-DATE
10	WATER	TEMP	CENT	105	20.3	31.0	3.5	69/10/29	75/10/29
70	TURB	JKSN	JTU	29	68.4	360.0	10.0	74/10/10	75/10/29
75	TURB	HLGE	PPM SIO2	18	77.9	368.0	10.0	73/07/25	74/09/25
76	TURB	TRBIDMTR	HACH FTU	11	58.6	170.0	10.0	75/03/12	75/09/23
80	COLOR	PT-CO	UNITS	68	53	500	5	69/10/29	75/10/29
95	CNDUCTVY	AT 25C	MICROMHO	105	514	1260	153	69/10/29	75/10/29
300	DO		MG/L	105	8.4	13.0	5.4	69/10/29	75/10/29
310	BOD	5 DAY	MG/L	84	3.4	8.8	0.3	69/10/29	75/10/29
330	COD MUD	DRY WGT	MG/KG	1	6000	6000	6000	75/09/09	75/09/09
340	COD	HI LEVEL	MG/L	85	25	116	0	69/10/29	75/10/29
400	PH		SU	95	7.62	8.40	6.60	69/10/29	75/10/29
405	CO2		MG/L	28	6.1	29.0	1.5	72/01/16	75/10/29
410	T ALK	CACO3	MG/L	64	100	220	48	69/10/29	75/10/29
440	HCO3 ION	HCO3	MG/L	64	122	268	58	69/10/29	75/10/29
445	CO3 ION	CO3	MG/L	82	0	0	0	69/10/29	75/10/29
496	LOSS ON	IGNITION	MG/KG	1	5560.00	5560.00	5560.00	75/09/09	75/09/09
550	OIL-GRSE	TOT-SXLT	MG/L	43	1.4	12.0	0.0	74/02/28	75/10/29
553	OIL-GRSE	MUD-HEXN	MG/KG	1	0.00	0.00	0.00	75/09/09	75/09/09
600	TOTAL N	N	MG/L	35	0.88	1.60	0.54	74/07/02	75/10/29
605	ORG N	N	MG/L	45	0.644	1.400	0.060	74/02/28	75/10/29
608	NH3-N	DISS	MG/L	33	0.032	0.570	0.000	69/10/29	73/04/05
610	NH3-N	TOTAL	MG/L	45	0.057	0.190	0.000	74/02/28	75/10/29
615	NO2-N	TOTAL	MG/L	37	0.015	0.120	0.000	74/02/28	75/10/29
618	NO3-N	DISS	MG/L	21	0.08	0.50	0.02	71/12/29	73/09/11
620	NO3-N	TOTAL	MG/L	36	0.082	0.410	0.000	74/02/28	75/10/29
625	TOT KJEL	N	MG/L	36	0.802	1.500	0.440	74/07/02	75/10/29
626	ORGAN. N	MUD D WT	MG/KG-N	1	220.00	220.00	220.00	75/09/09	75/09/09
630	NO2&NO3	N-TOTAL	MG/L	43	0.1	0.4	0.0	74/03/13	75/10/29
650	T PO4	PO4	MG/L	24	0.43	1.40	0.04	69/10/29	72/01/16
660	ORTHOPO4	PO4	MG/L	6	0.68	0.95	0.15	72/10/18	73/04/05
665	PHOS-TOT		MG/L P	54	0.983	4.000	0.039	71/10/21	75/10/29
668	PHOS MUD	DRY WGT	MG/KG-P	1	510.0	510.0	510.0	75/09/09	75/09/09
671	PHOS-DIS	ORTHO	MG/L P	6	0.222	0.310	0.050	72/10/18	73/04/05
680	T ORG C	C	MG/L	42	9.1	19.0	4.2	74/03/13	75/10/29
900	TOT HARD	CACO3	MG/L	47	133	300	60	69/10/29	73/09/11
902	NC HARD	CACO3	MG/L	47	39	132	3	69/10/29	73/09/11
915	CALCIUM	CA,DISS	MG/L	47	38.6	80.0	19.0	69/10/29	73/09/11
916	CALCIUM	CA-TOT	MG/L	6	40.7	68.0	28.0	74/07/16	75/10/02
925	MGNSIUM	MG,DISS	MG/L	47	9.9	25.0	1.4	69/10/29	73/09/11
927	MGNSIUM	MG,TOT	MG/L	6	11.6	19.0	7.4	74/07/16	75/10/02
929	SODIUM	NA,TOT	MG/L	5	48.40	88.00	22.00	74/10/10	75/10/02
930	SODIUM	NA,DISS	MG/L	49	49.70	50.00	8.20	69/10/29	74/07/16
931	SODIUM	ADSRTION	RATIO	47	1.8	4.0	0.5	69/10/29	73/09/11
932	PERCENT	SODIUM	%	49	40	54	1	69/10/29	74/07/16
935	PTSSIUM	K,DISS	MG/L	49	3.30	6.50	1.30	69/10/29	74/07/16
937	PTSSIUM	K,TOT	MG/L	5	4.40	6.00	3.40	74/10/10	75/10/02
940	CHLORIDE	CL	MG/L	53	75	230	11	69/10/29	75/10/02
945	SULFATE	SO4-TOT	MG/L	53	43	120	10	69/10/29	75/10/02
950	FLUORIDE	F,DISS	MG/L	47	0.20	0.40	0.00	69/10/29	73/09/11
955	SILICA	DISOLVED	MG/L	47	6.1	9.7	0.6	69/10/29	73/09/11

TABLE B-1 CONT.

```
01350500        54882
32 00 45.0 093 21 10.0  2
RED RIVER AT COUSHATTA, LA
22031 LOUISIANA
                    101691

[illegible]                 02111204      /TYPA/AMBNT/STREAM
                    DEPTH     0
INDEX 3.0045   0
MILES  932.11   10.00
```

PARAMETER				NOBS	AVE	MAX	MIN	BEG-DATE	END-DATE
1000	ARSENIC	AS,DISS	UG/L	2	0	0	0	73/07/25	73/09/11
1002	ARSENIC	AS,TOT	UG/L	42	3	22	0	74/02/28	75/10/29
1003	ARSENIC	SEDMG/KG	DRY WGT	1	1.00	1.00	1.00	75/09/09	75/09/09
1025	CADMIUM	CD,DISS	UG/L	2	0	1	0	73/07/25	73/09/11
1027	CADMIUM	CD,TOT	UG/L	33	1	5	0	74/02/28	75/10/29
1028	CD MUD	DRY WGT	MG/KG-CD	1	10.00	10.00	10.00	75/09/09	75/09/09
1029	CHROMIUM	SEDMG/KG	DRY WGT	1	10.00	10.00	10.00	75/09/09	75/09/09
1032	CHROMIUM	HEX-VAL	UG/L	2	10	10	10	73/07/25	73/09/11
1034	CHROMIUM	CR,TOT	UG/L	40	10	30	0	74/[illegible]	75/10/29
1040	COPPER	CU,DISS	UG/L	2	0	0	0	73/07/25	73/09/11
1045	IRON	FE,TOT	UG/L	38	4760	32000	370	74/02/28	75/10/29
1046	IRON	FE,DISS	UG/L	9	43	130	0	72/10/18	73/09/11
1049	LEAD	PB,DISS	UG/L	2	0	0	0	73/07/25	73/09/11
1051	LEAD	PB,TOT	UG/L	37	10	61	0	74/02/28	75/10/29
1052	LEAD	SEDMG/KG	DRY WGT	1	10.00	10.00	10.00	75/09/09	75/09/09
1082	STRONTIUM	SR,TOT	UG/L	2	175	192	162	74/05/13	74/06/27
1090	ZINC	ZN,DISS	UG/L	2	0	0	0	73/07/25	73/09/11
1092	ZINC	ZN,TOT	UG/L	33	41	153	5	74/02/28	75/10/29
1093	ZINC	SEDMG/KG	DRY WGT	1	[illegible]	[illegible]	[illegible]	75/09/09	75/09/09
1170	FE MUD	DRY WGT	MG/KG-FE	1	[illegible]	[illegible]	[illegible]	75/09/09	75/09/09
31501	TOT COLI	MFIMENDO	/100ML	34	[illegible]	[illegible]	600	69/10/29	75/10/15
31610	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	71/01/26	71/01/26
31615	FEC COLI	[illegible]	/100ML	3	[illegible]	[illegible]	4700	70/12/22	71/03/17
31616	FEC COLI	[illegible]	/100ML	61	[illegible]	[illegible]	62	70/01/07	75/10/29
31679	FECSTREP	[illegible]	/100ML	61	[illegible]	[illegible]	16	69/12/03	75/10/29
32230	CHLRPHYL	A	MG/L	[illegible]	[illegible]	[illegible]	[illegible]	74/[illegible]	75/10/29
32231	CHLRPHYL	B	MG/L	27	0.[illegible]	0.[illegible]4	0.000	74/04/[illegible]	75/10/29
70299	RES-SUSP	AT 180 C	MG/L	[illegible]	[illegible]	[illegible]	0	69/10/29	75/10/29
70300	RESIDUE	TOTAL-180	C MG/L	[illegible]	[illegible]	[illegible]	98	69/10/29	75/10/29
70301	DISS SOL	SUM	MG/L	47	[illegible]	[illegible]	95	69/10/29	73/09/11
70303	DISS SOL	TONS PER	AC-FT	89	[illegible]	[illegible]	[illegible]	69/10/29	75/10/29
71846	AMMONIA	DISS-NH4	MG/L	7	[illegible]	0.[illegible]	0.09	72/01/16	73/04/[illegible]
71850	NITRATE	TOT-NO3	MG/L	5	2.	1.[illegible]	3	74/02/28	74/06/20
71851	NITRATE	DISS-NO3	MG/L	47	[illegible]	[illegible]	0.0	69/10/29	73/09/11
71885	IRON	FE	UG/L	45	[illegible]	170.00	0.00	69/10/29	73/09/11
71887	TOTAL N	AS NO3	MG/L	35	3.6	[illegible]	2.4	74/02/[illegible]	75/10/29
71900	MERCURY	HG,TOTAL	UG/L	42	0.[illegible]	[illegible]	0.0	73/07/25	75/10/29
71921	MERCURY	SEDMG/KG	DRY WGT	1	0.2	0.2	0.2	75/09/09	75/09/09

ENTER PARM CODE, 'NEXT STATION', OR 'ALL'

TABLE B-1 CONT.

STREET DATE 79/08/30

07352490
31 53 40.0 93 00 10.0 2
CLEAR LAKE NEAR CLARENCE, LA.
22069 LOUISIANA
101691

/TYPE/AMBNT/STREAM

112WRD
0000 CLASS 00

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00001	SAMPLOC	FT FROM	RT BANK	2	1.000000	.000000	.000000		.000000	1.000000	1.000000	70/02/17	70/07/09
00080	COLOR	PT-CO	UNITS	2	9.99999	.000153	.012353	.001235	.008735	10.00000	10.00000	70/02/17	70/07/09
00095	CNDUCTVY	AT 25C	MICROMHO	2	109.500	612.504	24.7488	.226017	17.5000	127.000	92.0000	70/02/17	70/07/09
00310	BOD	5 DAY	MG/L	2	1.35000	3.645000	1.90919	1.41421	1.35000	2.70000	.000000	70/02/17	70/07/09
00400	PH		SU	2	6.40000	.000000	.000000		.000000	6.40000	6.40000	70/02/17	70/07/09
00410	T ALK	CACO3	MG/L	2	13.0000	18.00000	4.24264	.326357	3.00000	16.0000	10.0000	70/02/17	70/07/09
00440	HCO3 ION	HCO3	MG/L	2	16.0000	32.0000	5.65685	.353554	4.00000	20.0000	12.0000	70/02/17	70/07/09
00445	CO3 ION	CO3	MG/L	2	.000000	.000000	.000000		.000000	.000000	.000000	70/02/17	70/07/09
00605	ORG N	N	MG/L	1	.460000					.460000	.460000	70/02/17	70/02/17
00608	NH3-N	DISS	MG/L	1	.000000					.000000	.000000	70/02/17	70/02/17
00900	TOT HARD	CACO3	MG/L	2	16.0000	.000244	.015625	.000977	.011049	16.0000	16.0000	70/02/17	70/07/09
00902	NC HARD	CACO3	MG/L	2	3.00000	18.0000	4.24264	1.41421	3.00000	6.00000	.000000	70/02/17	70/07/09
00915	CALCIUM	CA-DISS	MG/L	2	4.45000	.245010	.494985	.106446	.350007	5.00000	4.30000	70/02/17	70/07/09
00925	MGNSIUM	MG-DISS	MG/L	2	1.10000	.080000	.282843	.257130	.200000	1.30000	.900000	70/02/17	70/07/09
00930	SODIUM	NA-DISS	MG/L	2	13.5000	24.5000	4.94975	.366648	3.50000	17.0000	10.00000	70/02/17	70/07/09
00931	SODIUM	ADSRTION	RATIO	2	1.45000	.245002	.494977	.341363	.350001	1.80000	1.10000	70/02/17	70/07/09
00932	PR-CENT	SODIUM	%	2	60.5000	84.5000	9.19239	.151940	6.50000	67.0000	54.0000	70/02/17	70/07/09
00935	PTSSIUM	K-DISS	MG/L	2	1.80000	.080000	.282843	.157135	.200000	2.00000	1.60000	70/02/17	70/07/09
00940	CHLORIDE	CL	MG/L	2	20.5000	60.5002	7.77819	.379424	5.50001	26.0000	15.0000	70/02/17	70/07/09
00945	SULFATE	SO4-TOT	MG/L	2	5.20000	11.5200	3.39411	.547438	2.40000	8.60000	3.80000	70/02/17	70/07/09
00950	FLUORIDE	F-DISS	MG/L	2	.100000	3.72E-08	.000000		.000000	.100000	.100000	70/02/17	70/07/09
00955	SILICA	DISOLVED	MG/L	2	6.90000	1.99998	1.41421	.204958	.999997	7.90000	5.90000	70/02/17	70/07/09
70300	RESIDUE	DISS-180	C MG/L	2	72.5000	84.5000	9.19239	.126792	6.50000	79.0000	66.0000	70/02/17	70/07/09
70301	DISS SOL	SUM	MG/L	2	63.5000	112.496	10.6066	.167030	7.49987	71.0000	56.0000	70/02/17	70/07/09
70303	DISS SOL	TONS PER	ACRE-FT	2	.100000	.000200	.014142	.141420	.010000	.110000	.090000	70/02/17	70/07/09
71851	NITRATE	DISS-NO3	MG/L	2	.650000	.436399	.660681	1.01643	.450000	1.10000	.200000	70/02/17	70/07/09
71856	NITRITE	DISS-NO2	MG/L	1	.000000					.000000	.000000	70/02/17	70/02/17

TABLE B-1 CONT.

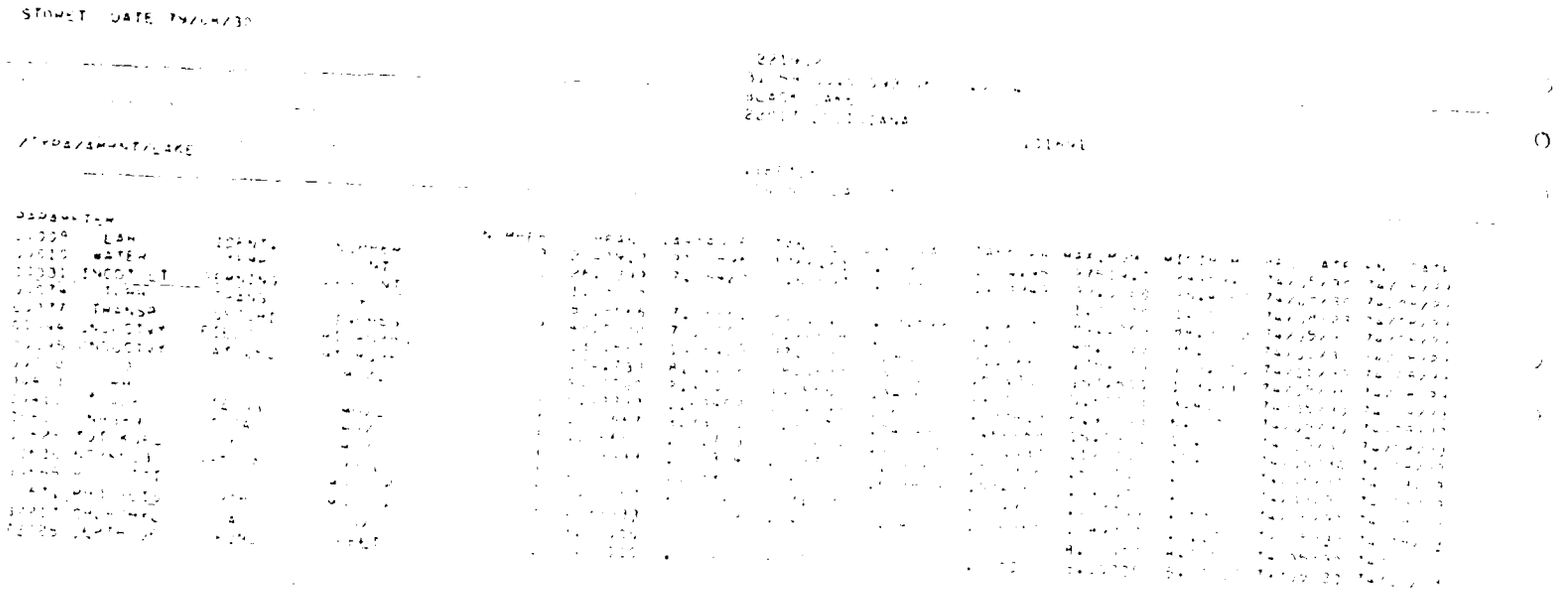

TABLE B-1 CONT.

STORET DATE 79/06/30

221901
31 58 00.0 093 03 00.0 4
BLACK LAKE
22017 LOUISIANA
101691

/TYPE/AMBNT/LAKE

LIEBALES
0010 CLASS 00

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00008	LAB	IDENT.	NUMBER	4	25947.5	3121152	1766.68	.067982	883.339	27518.0	24457.0	74/05/30	74/06/23
00010	WATER	TEMP	CENT	4	28.9250	2.42251	1.52398	.052670	.761989	30.0000	25.8000	74/05/30	74/08/23
00031	INCDT LT	REMNING	PERCENT	2	1.00000	.000000	.000000		.000000	1.00000	1.00000	74/05/30	74/08/23
00076	TURB	TRANS	*	4	88.3999	2.47917	1.57454	.017812	.787268	89.6000	86.3000	74/05/30	74/08/23
00077	TRANSP	SECCHI	INCHES	1	54.0000					54.0000	54.0000	74/05/30	74/05/30
00094	CNDUCTVY	FIELD	MICROMHO	4	122.500	41.0000	6.40312	.052270	3.20156	127.000	113.000	74/05/30	74/08/23
00095	CNDUCTVY	AT 25C	MICROMHO	4	112.750	14.6281	3.85073	.034153	1.92537	117.700	108.300	74/05/30	74/08/23
00300	DO		MG/L	3	5.66666	1.21345	1.10157	.194395	.635991	6.40000	4.40000	74/05/30	74/08/23
00400	PH		SU	4	6.87500	.132566	.320257	.046583	.160128	7.10000	6.40000	74/05/30	74/08/23
00410	T ALK	CACO3	MG/L	4	12.7500	10.2500	3.20156	.251103	1.60078	16.0000	10.0000	74/05/30	74/08/23
00610	NH3-N	TOTAL	MG/L	4	.070000	.000200	.014142	.202036	.007071	.080000	.050000	74/05/30	74/08/23
00625	TOT KJEL	N	MG/L	4	.725000	.129167	.359398	.495721	.179699	1.20000	.400000	74/05/30	74/08/23
00630	NO2&NO3	N-TOTAL	MG/L	4	.042500	.001025	.032016	.674013	.016008	.080000	.020000	74/05/30	74/08/23
00665	PHOS-TOT		MG/L P	4	.095750	.001335	.036537	.381584	.018268	.134000	.064000	74/05/30	74/08/23
00671	PHOS-DIS	ORTHO	MG/L P	4	.04-250	.001900	.043592	.903458	.021796	.086000	.010000	74/05/30	74/08/23
32217	CHLRPHYL	A	UG/L	2	15.0000	33.6199	5.79826	.386551	4.09999	19.1[illegible]00	[illegible].3000	74/05/30	74/08/23
72025	DEPTH OF	POND	FEET	2	7.00000	2.00000	1.41421	.202030	1.00000	8.0[illegible]	.00000	74/05/30	74/08/23

TABLE B-1 CONT.

STORET DATE 79/08/30

07349250 Station #
32 19 20.0 093 25 02.0 2
LAKE BISTINEAU NEAR RINGGOLD, LA
22013 LOUISIANA
101691

/TYPA/AMBNT/STREAM

112WRD Agency Code
0000 CLASS 00

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00001	HSAMPLOC	FT FROM	RT BANK	2	1.000000	.000000	.000000		.000000	1.000000	1.000000	70/02/17	70/07/14
00010	WATER	TEMP	CENT	10	19.1000	92.3222	9.60844	.503060	3.03846	30.0000	4.00000	68/12/09	70/09/01
00060	STREAM	FLOW	CFS	5	721.199	136167	369.008	.511658	165.025	1100.00	300.000	70/01/21	70/09/01
00080	COLOR	PT-CO	UNITS	12	17.5833	38.4472	6.20058	.362961	1.78995	30.0000	5.00000	68/12/09	70/09/01
00095	CNDUCTVY	AT 25C	MICROMHO	15	220.267	10488.8	102.415	.464959	25.4434	532.000	135.000	56/11/23	70/09/01
00310	BOD	5 DAY	MG/L	2	.700000	.979999	.989949	1.41421	.700000	1.40000	.000000	70/02/17	70/07/14
00400	PH		SU	16	6.44374	.077311	.278049	.043150	.069512	7.10000	6.00000	43/05/25	70/09/01
00405	CO2		MG/L	4	10.6500	107.017	10.3449	.971351	5.17244	26.0000	3.60000	43/05/25	58/06/18
00410	T ALK	CACO3	MG/L	16	15.2500	44.8565	6.69825	.439229	1.67456	30.0000	7.00000	43/05/25	70/09/01
00440	HCO3 ION	HCO3	MG/L	16	18.5625	65.0514	8.06507	.434536	2.01652	36.0000	8.00000	43/05/25	70/09/01
00445	CO3 ION	CO3	MG/L	12	.124E-06	.511E-13	.226E-06	1.80907	.652E-07	.499E-06	.000000	68/12/09	70/09/01
00605	ORG N	N	MG/L	1	.200000					.200000	.200000	70/02/17	70/02/17
00608	NH3-N	DISS	MG/L	1	.000000					.000000	.000000	70/02/17	70/02/17
00900	TOT HARD	CACO3	MG/L	16	31.9999	125.473	11.2015	.350047	2.80037	62.0000	17.0000	43/05/25	70/09/01
00902	NC HARD	CACO3	MG/L	16	16.8125	83.6289	9.14488	.543935	2.28622	39.0000	6.00000	43/05/25	70/09/01
00915	CALCIUM	CA,DISS	MG/L	15	9.41333	5.99126	2.44771	.260025	.631995	16.0000	5.30000	56/11/23	70/09/01
00925	MGNSIUM	MG,DISS	MG/L	15	1.75333	1.18125	1.08685	.619881	.280625	5.10000	.800000	56/11/23	70/09/01
00930	SODIUM	NA,DISS	MG/L	14	26.8571	261.211	16.1620	.601780	4.31948	78.0000	15.0000	56/11/23	70/09/01
00931	SODIUM	ADSATION	RATIO	14	2.05000	.595014	.771372	.376279	.206158	4.30000	1.30000	56/11/23	70/09/01
00932	PERCENT	SODIUM	%	14	62.1428	28.1334	5.30409	.085353	1.41758	73.0000	53.0000	56/11/23	70/09/01
00935	PTSSIUM	K,DISS	MG/L	14	2.25000	.222700	.471911	.209738	.126123	3.20000	1.50000	56/11/23	70/09/01
00940	CHLORIDE	CL	MG/L	16	54.3124	944.909	30.7394	.565974	7.68484	146.000	26.0000	43/05/25	70/09/01
00945	SULFATE	SO4-TOT	MG/L	15	5.33333	3.40956	1.84650	.346219	.476764	10.00000	3.20000	56/11/23	70/09/01
00950	FLUORIDE	F,DISS	MG/L	13	.169230	.063974	.252930	1.49459	.070150	1.00000	.499E-06	58/06/18	70/09/01
00955	SILICA	DISOLVED	MG/L	15	7.83999	25.0211	5.00211	.638025	1.29154	23.0000	1.40000	56/11/23	70/09/01
01055	MANGNESE	MN	UG/L	1	30.0000					30.0000	30.0000	68/12/09	68/12/09
70300	RESIDUE	DISS-180	C MG/L	11	125.454	1012.69	31.8227	.253660	9.59492	170.000	81.0000	68/12/09	70/09/01
70301	DISS SOL	SUM	MG/L	15	116.733	3004.21	54.8471	.469850	14.1615	290.000	67.0000	56/11/23	70/09/01
70302	DISS SOL	TONS/DAY		5	270.340	32001.3	178.889	.661719	80.0016	505.000	91.4000	70/01/21	70/09/01
70303	DISS SOL	TONS PER	ACRE-FT	15	.144000	.004997	.070691	.384193	.018252	.390000	.110000	56/11/23	70/09/01
71850	NITRATE	TOT-NO3	MG/L	3	.366666	.083334	.288676	.787298	.166667	.700000	.200000	56/11/23	58/06/18
71851	NITRATE	DISS-NO3	MG/L	12	.466666	.051515	.226970	.486364	.065521	.900000	.100000	68/12/09	70/09/01
71856	NITRITE	DISS-NO2	MG/L	1	.000000					.000000	.000000	70/02/17	70/02/17
71885	IRON	FE	UG/L	12	19.1667	590.149	24.2930	1.26745	7.01278	90.0000	.000000	58/01/08	70/09/01

TABLE B-1 CONT.

STORET DATE 74/08/30

220304
32 24 24.0 093 22 03.0 3
LAKE BISTINEAU
22119 LOUISIANA
101691

/TYPE/AMOUNT/LAKE

11EPALES
0005 CLASS 00

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00008	LAB	IDENT.	NUMBER	5	259+3.4	.199E+08	4465.59	.171801	1997.12	30742.0	21950.0	74/03/21	74/11/11
00010	WATER	TEMP	CENT	5	19.2920	17.6614	4.20254	.217839	1.87943	26.7400	16.8100	74/03/21	74/11/11
00074	TURB	TRANS	%	5	88.7800	13.6035	3.68829	.041544	1.64945	93.4000	85.0000	74/03/21	74/11/11
00077	TRANSP	SECCHI	INCHES	2	44.0000	200.000	14.1421	.321412	10.0000	54.0000	34.0000	74/05/31	74/11/11
00094	CNDUCTVY	FIELD	MICROMHO	5	134.600	1208.81	34.7680	.258306	15.5487	194.000	108.000	74/03/21	74/11/11
00095	CNDUCTVY	AT 25C	MICROMHO	5	148.360	552.547	23.4637	.158154	10.4933	186.100	126.800	74/03/21	74/11/11
00300	DO		MG/L	5	6.05000	1.10340	1.05043	.173624	.525214	7.00000	4.60000	74/03/21	74/11/11
00400	PH		SU	5	6.01400	.339512	.582676	.096887	.260581	6.80000	5.42000	74/03/21	74/11/11
00410	T ALK	CACO3	MG/L	5	10.2000	3.20007	1.78887	.165637	.800009	14.0000	10.0000	74/03/21	74/11/11
00610	NH3-N	TOTAL	MG/L	5	.040000	.000100	.010000	.166670	.004472	.070000	.050000	74/03/21	74/11/11
00625	TOT KJEL	N	MG/L	5	.640000	.033000	.181660	.283843	.081241	.800000	.400000	74/03/21	74/11/11
00630	NO2&NO3	N-TOTAL	MG/L	5	.060000	.001150	.033912	.565194	.015166	.100000	.020000	74/03/21	74/11/11
00665	PHOS-TOT		MG/L P	5	.048200	.000065	.008044	.090178	.003597	.103000	.043000	74/03/21	74/11/11
00671	PHOS-DIS	ORTHO	MG/L P	5	.030600	.000185	.013591	.441250	.006078	.046000	.018000	74/03/21	74/11/11
32217	CHLRPHYL	A	UG/L	3	16.5000	464.750	21.6737	1.31356	12.5133	41.5000	3.00000	74/03/21	74/11/11
72025	DEPTH OF	POND	FEET	3	6.33333	5.33339	2.30941	.364644	1.33334	9.00000	5.00000	74/03/21	74/11/11

TABLE B-1 CONT.

STONET DATE 79/08/30

220303
32 24 57.0 093 21 18.0 3
LAKE BISTINEAU
22119 LOUISIANA
191A91

/TYPA/AMMNT/LAKE

11EPALES
0015 CLASS 00

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00003	LAB	IDENT.	NUMBER	8	25133.2	.134E+08	3668.63	.145967	1297.05	30740.0	21947.0	74/03/21	74/11/11
00010	WATER	TEMP	CENT	4	21.1637	20.6636	4.54673	.214788	1.60716	26.8700	16.6300	74/03/21	74/11/11
00074	TURB	TRANS	%	8	88.3624	12.5117	3.53719	.039760	1.25059	92.9000	84.0000	74/03/21	74/11/11
00077	TRANSP	SECCHI	INCHES	3	35.0667	66.3345	8.14460	.228353	4.70228	45.0000	30.0000	74/03/21	74/11/11
00094	CNDUCTVY	FIELD	MICROMHO	4	119.875	55.2678	7.43424	.062017	2.62840	130.000	111.000	74/03/21	74/11/11
00095	CNDUCTVY	AT 25C	MICROMHO	8	129.800	314.402	17.9438	.137472	6.34874	146.900	106.300	74/03/21	74/11/11
00300	DO		MG/L	6	5.49999	3.72408	1.92979	.350871	.787832	7.00000	1.80000	74/03/21	74/11/11
00400	PH		SU	8	6.21374	.332833	.576917	.092845	.203971	7.00000	5.35000	74/03/21	74/11/11
00410	T ALK	CACO3	MG/L	4	11.2500	3.66246	1.90663	.169456	.674801	15.0000	10.0000	74/03/21	74/11/11
00610	NH3-N	TOTAL	MG/L	8	.050000	.000057	.007559	.151184	.002673	.060000	.040000	74/03/21	74/11/11
00625	TOT KJEL	N	MG/L	8	.597500	.021250	.145775	.244124	.051539	.800000	.400000	74/03/21	74/11/11
00630	NO2&NO3	N-TOTAL	MG/L	8	.066250	.001227	.035028	.528689	.012383	.110000	.020000	74/03/21	74/11/11
00665	PHOS-TOT		MG/L P	8	.059000	.000089	.009411	.136398	.003327	.085000	.040000	74/03/21	74/11/11
00671	PHOS-DIS	ORTHO	MG/L P	8	.019875	.000099	.009963	.527654	.003523	.031000	.005000	74/03/21	74/11/11
32217	CHLRPHYL	A	UG/L	3	18.6667	594.043	24.2408	1.30129	14.0243	46.6000	2.50000	74/03/21	74/11/11
72025	DEPTH OF	POND	FEET	3	13.3333	8.33350	2.88678	.216508	1.66668	15.0000	10.0000	74/03/21	74/11/11

TABLE B-1 CONT.

STORET DATE 79/08/30

220302
32 23 45.0 093 25 25.0 3
LAKE BISTINEAU
22015 LOUISIANA
101691

/TYPA/AMBNT/LAKE

LIEPALES
0016 CLASS 00

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00000	LAB	IDENT.	NUMBER	8	25130.5	.13E+08	3669.11	.146002	1297.23	30738.0	21944.0	74/03/21	74/11/11
00010	WATER	TEMP	CENT	8	21.5175	22.3516	4.72775	.219717	1.67151	27.3300	17.0000	74/03/21	74/11/11
00076	TURB	TRANS	%	8	89.0500	15.9405	3.99881	.044905	1.41379	93.4000	84.0000	74/03/21	74/11/11
00077	TRANSP	SECCHI	INCHES	3	37.3333	41.3340	6.42915	.172209	3.71187	42.0000	30.0000	74/03/21	74/11/11
00094	CNDUCTVY	FIELD	MICROMHO	4	117.625	718.253	26.8058	.227892	9.47730	160.000	95.0000	74/03/21	74/11/11
00095	CNDUCTVY	AT 25C	MICROMHO	8	127.875	1541.55	39.5165	.309025	13.9712	187.600	90.1000	74/03/21	74/11/11
00300	DO		MG/L	6	6.53333	.476721	.662360	.096931	.270407	7.80000	6.00000	74/03/21	74/11/11
00400	PH		SU	8	6.53750	.269985	.519600	.079480	.183706	7.20000	5.76000	74/03/21	74/11/11
00410	T ALK	CACO3	MG/L	8	10.2500	.214286	.462910	.045162	.163663	11.0000	10.0000	74/03/21	74/11/11
00610	NH3-N	TOTAL	MG/L	8	.048750	.000098	.009910	.203291	.003504	.060000	.040000	74/03/21	74/11/11
00625	TOT KJEL	N	MG/L	8	.562500	.022679	.150595	.267724	.053243	.800000	.400000	74/03/21	74/11/11
00630	NO2&NO3	N-TOTAL	MG/L	8	.043750	.000298	.017269	.394834	.006105	.080000	.030000	74/03/21	74/11/11
00665	PHOS-TOT		MG/L P	8	.052625	.000100	.009999	.170561	.003535	.076000	.040000	74/03/21	74/11/11
00671	PHOS-DIS	ORTHO	MG/L P	8	.015000	.000048	.006949	.463253	.002457	.021000	.005000	74/03/21	74/11/11
32217	CHLRPHYL	A	UG/L	3	9.13333	33.4533	5.78384	.633272	3.33933	15.4000	4.00000	74/03/21	74/11/11
72025	DEPTH OF	POND	FEET	3	12.4667	9.13350	3.05504	.241190	1.76385	16.0000	10.0000	74/03/21	74/11/11

TABLE B-1 CONT.

STORET DATE 79/08/30

220301
32 19 51.0 093 25 55.0 3
LAKE BISTINEAU
22015 LOUISIANA
101691

/TYPA/AMBNT/LAKE

11EPALES
0008 CLASS 00

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00008	LAB	IDENT.	NUMBER	6	25741.8	.1616+08	4022.62	.156268	1642.23	30708.0	21942.0	74/03/21	74/11/11
00010	WATER	TEMP	CENT	7	20.4114	19.2510	4.42165	.212463	1.67123	27.2600	17.5100	74/03/21	74/11/11
00074	TURB	TRANS	%	7	89.5428	9.18745	3.03141	.033854	1.14577	93.4000	86.0000	74/03/21	74/11/11
00077	TRANSP	SECCHI	INCHES	3	51.6667	82.3333	9.07392	.175624	5.23883	60.0000	42.0000	74/03/21	74/11/11
00094	CNDUCTVY	FIELD	MICROMHO	7	97.0000	35.0000	5.91608	.060991	2.23607	102.000	84.0000	74/03/21	74/11/11
00095	CNDUCTVY	AT 25C	MICROMHO	7	105.586	16+.323	12.9739	.122876	4.90369	115.300	79.7000	74/03/21	74/11/11
00300	DO		MG/L	5	7.79999	1.10016	1.04888	.134472	.469075	8.60000	6.00000	74/03/21	74/11/11
00400	PH		SU	6	6.70166	.185498	.430595	.064267	.175830	7.30000	6.15000	74/03/21	74/11/11
00410	T ALK	CACO3	MG/L	6	10.0000	.000000	.000000		.000000	10.0000	10.0000	74/03/21	74/11/11
00610	NH3-N	TOTAL	MG/L	6	.033333	.000107	.010328	.309840	.004216	.050000	.020000	74/03/21	74/11/11
00625	TOT KJEL	N	MG/L	6	.514666	.033667	.183486	.355134	.074908	.700000	.300000	74/03/21	74/11/11
00630	NO2&NO3	N-TOTAL	MG/L	6	.033333	.000337	.018349	.478658	.007491	.060000	.020000	74/03/21	74/11/11
00665	PHOS-TOT		MG/L P	6	.051833	.000009	.002927	.056475	.001195	.055000	.047000	74/03/21	74/11/11
00671	PHOS-DIS	ORTHO	MG/L P	6	.011333	.000022	.004676	.412607	.001909	.018000	.007000	74/03/21	74/11/11
32217	CHLRPHYL	A	UG/L	3	7.43333	22.6635	4.76062	.640442	2.74854	12.0000	2.50000	74/03/21	74/11/11
72025	DEPTH OF	POND	FEET	3	9.00000	1.00000	1.00000	.111111	.577350	10.0000	8.00000	74/03/21	74/11/11

1

TABLE B-1 CONT.

WASTEWATER ANALYSES REPORT

Enviro-Med Laboratories, Inc.

Service to ____
Address ____
Attention ____
Title ____
Sample No ____ Sample Type GRAB
Date Collected (1) 8-9-79 Time 1510
Date Collected (2) ____ Time ____
Date Received 8-9-79 Time 1845
Collected By ____ Brought In EML

File No ____ Report No 1
Invoice No C9085 Date 9-26-79
P.O. No ____ RPD ____

MISCELLANEOUS CHARGES

1. Total Miles ____ at ____ /mile ____
2. Labor Time ____ at ____ /hr ____
3. Shipping Charges (bus) ____

Logged in by Hma Preserved yes

15462 RWF # and Source: SAMPLE NO 1 — GRAND BAYOU; SAMPLE NO 2 — RWF # and Source ____

PARAMETER	Ref	S1 Conc	S1 lbs per day	S1 Date Begun	S1 Time Begun	S1 Date Completed	S1 Time Completed	S1 Analyst	S1 ✓	S2 Conc	S2 lbs per day	S2 Date Begun	S2 Time Begun	S2 Date Completed	S2 Time Completed	S2 Analyst	S2 ✓
Acidity	273																
Alkalinity Bicarbonate	278																
Carbonate	278																
Total	278																
Coliform Fecal	937																
Total	935	22x18		8-9	1800	8-10	1700	RB/TW	✓								
Fecal Strep	942																
BOD5	543	4.3		8-9	1800	8-14	1800	AB/RB	✓								
Chloride	304	22.5		8-14	11:00	8-14	12:15	BDB	✓								
COD	550	318		8-13	10 00	8-13	4.00	Bm	✓								
Cyanide T	361																
Diss Oxygen	450	4 9		8-9	1515	8-9	1520	Hma	✓								
Flow (MGD)																	
Fluorides	[illegible]	0.06		8 14	2 00	8-14	2 45	Bm	✓								
Hardness	202																
Nitrogen Ammonia	165	0.05		8-10	10:30	8-10	11.00	Bm	✓								
Total Kjeldahl	[illegible]	2.8		8-10	11.00	8-10	2.00	Bm	✓								
Nitrate	[illegible]	0.06		8/10	2[00]	8/10	3[30]	[illegible]	✓								
Nitrite	[illegible]																
Organic	[illegible]																
Total																	
Oil & Grease	515																
Pesticides Chlorinated	Pe			8-10	0900	8-			✓								
Organo Phos	PEA																
pH	400	7.1		8-9	1510	8-9	1515	Hma	✓								
Phenols	514																
Phosphates Total	481	0.08		8-08	11.00	8-08	13.00	BDB	✓								
Ortho	481																
Solids Total	35																
Total Diss	94	90.0		8-13	1400	8-19	0930	MGG	✓								
Total Susp	92																
Volatile Diss	[illegible]																
Volatile Susp	95																
Fixed Diss	35																
Fixed Susp	95																
Specific Cond	71																
Sulfur Sulfate	496	0.0		8-08	8:00	8-08	11:00	BDB	✓								
Sulfide	[illegible]																
Sulfite	[illegible]																
[illegible]	132	SONTZH		8 08	8 00	8 08	11:00	BDB	✓								
Temp	[illegible]	.31		8-9	1515	8-9	1515	Hma	✓								
TOC	512																
Turb NTU	[illegible]																
[illegible]	[illegible]																
BOD STd		227.0		8-7	1900	8-12	1900	TSW	✓								

Chemist Biologist

Dr. Robert W. Flournoy, President

Unless otherwise stated all data is recorded in units of mg/l or ppm

[illegible]

[illegible] 8-10 [illegible]

TABLE B-I CONT.

Enviro-Med Laboratories, Inc.

ANALYTICAL REPORT
TRACE METALS

Lab No. / Report No. 1
Work Order No. C9085 Date 9-26-79
P.O. No. RPD

MISCELLANEOUS CHARGES

Date Collected 8-9-79 Time 1510

Date Received 8-9-79 Time 1845

Logged In By Gmo

SAMPLE NO 1 — SAMPLE NO 2

15462 EML # and Source GRAND BAYOU

PARAMETER	Pg Ref	Result	Date Begun	Time Begun	Date Completed	Time Completed	Analyst	✓
[illegible]	144							
[illegible]	AA							
[illegible]	282	K0.01	8-14	3:00	8-14	4:40	BM	✓
[illegible]	144	K0.8	8-13	1600	8-13	1630	RH	✓
[illegible]	261							
[illegible]	144	K0.001	8-10	1515	8-10	1600	RH	✓
[illegible]	144							
[illegible]	144	K0.003	8-10	1130	8-10	1215	RH	✓
[illegible]	148							
[illegible]	148							
Total	148	L52	8-10	1445	8-10	1510	RH	✓
Diss.	148							
[illegible]	151	K0.01	8-10	1050	8-10	1120	RH	✓
[illegible]	AA							
[illegible]	148							
[illegible]	148							
[illegible]	156	K0.002	8-14	1330	8-14	1500	RH	✓
[illegible]	144							
[illegible]	148							
[illegible]	144							
[illegible]	159	K0.2	8-13	1300	8-13	1430	RH	✓
[illegible]	148	K0.002	8-13	1030	8-13	1100	RH	✓
[illegible]	144							
[illegible]	144							
[illegible]	144							
[illegible]	144							
[illegible]	152							
[illegible]	148							

Chemist Biologist — Dr. Robert W. Fousnoy, President

... Test Procedures published in Federal Register ... Wednesday, December 1976 ... Standard Methods for the Examination of Water and Wastewater ... Methods for ... 1976 ...

... duplicate ... 8-10 ... methodologies are in control

... regulatory agencies ... to be notified within 5 days of ... compliance conditions

4/79

TABLE B-1 CONT.

DRINKING WATER ANALYSES REPORT

Service to: Sunbelt Research Corp
Address: 727 Spain St.
Baton Rouge, La.
Attention: Lawrence McKenzie
Title: President

ENVIRO-MED LABORATORIES, INC.
414 W. California
Ruston, LA 71270
318-255-0060 or 255-0064

Sample Source: Grand Bayou

File No. _____ Report No. _____

Sample No: 15462 Samrle Type: Water/ grab
Date Collected: 8-9-79 Time: 1510
Date Received: 8-9-79 Time: 1845
Date Analyzed: 8-23-79
Performed By: Ken Baughman
Collected By: Aringe

Date _____ Invoice No. _____

INORGANIC

CONTAMINANT	MCL*	DETECTED LEVELS	CONTAMINANT	MCL*	DETECTED LEVELS
Arsenic, As	0.05		Lead, Pb	0.05	
Barium, Ba	1.0		Mercury, Hg	0.002	
Cadmium, Cd	0.01		Nitrate, NO_3-N	10	
Chromium, Cr	0.05		Selenium, Se	0.01	
Fluoride, F	1.4-2.4		Silver, Ag	0.05	

Reanalysis 9-24-79

ORGANIC

Endrin	0.0002	< 0.0002	Toxaphene	0.005	< 0.005
Lindane	0.004	< 0.004	2, 4-D	0.1	< 0.1
Methoxychlor	0.1	< 0.1	2,4,5-TP(Silvex)	0.01	< 0.01

RESULTS EXPRESSED IN mg/l (ppm) UNLESS OTHERWISE DESIGNATED *MCL - MAXIMUM CONTAMINANT LEVELS

Respectfully submitted,
ENVIRO-MED LABORATORIES, INC.

Kenneth J. Baughman
Chemist/Biologist/Bacteriologist

Robert W. Flournoy
Dr. Robert W. Flournoy, President

Turbidity _____ (NTU)

Total Coliform _____ (N/100ml)

Comments:

METHODS: Methods used for inorganic analyses are Environmental Protection Agency approved as specified in the 1976 Federal Register, Volume 41, No. 232. Organic analyses methods are according to the Environmental Protection Agency Manual " Analysis of Pesticide Residues in Human and Environmental Samples". Turbidity and Total Coliform procedures are from the 14th Edition of "Standard Methods for the Examination of Water and Wastewater".

APPENDIX C

VEGETATIONAL SPECIES RECORDED IN GRAND BAYOU AREA

TABLE C-1

VEGETATIONAL SPECIES RECORDED
IN GRAND BAYOU AREA

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Acer drummondii Drummond Red Maple	C,D,E		121	87	26	16	3
Aesculus pavia Red Buckeye	C		1				
Alternanthera philoxeroides Alligator weed	D,A	3					
Amaranthus spp. Pigweed	D		7				
Ampleopsis arborea Peppervine	B,C,D,E		22	37			
Andropogon virginicus Broomsedge	B		17				
Apium leptophyllum Marsh Parsley	C,D,E	1	5				
Aralia spinosa Hercules' Club	C,E		14	50	12		
Arisaema dracontium Green Dragon	D,E		28				
Arisaema triphyllum Jack-in-the-Pulpit	C,D,E		36				
Arundinaria tecta Switch Cane	C,D,E		129				
Ascyrum hyperiocoides St. Andrews' Cross	C,E		3	1			
Baccharis halimifolia Marsh Elder	A,D		3	2			

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Baptista leucantha Indigo	C		2				
Berchemia scandens Rattan vine	B,C,D,E	2	8	39			
Callicarpa americana French Mulberry	C,E		11	34			
Campsis radicans Trumpet Creeper	B,C,D,E		26	8			
Cardamine bulbosa Bulb Bittercress	D,E		177				
Carex spp. Sedge	A,D	1					
Carpinus caroliniana Hornbeam	D,E		66	175	52	17	6
Carya aquatica Bitter Pecan	C,D,E			2			
Carya tomentosa Mockernut Hickory	C,E		2	2	6	1	1
Carya spp. Hickory	C,D,E		31	35	8	4	1
Cassia fasiculata Partridge Pea	A,B,C,D,E	1	5				
Cassia spp. Cassia	C,D	1	2				
Chionanthus virginia Fringetree	C		27	9			
Cirsium florida Sow Thistle	B		2				

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Cnidoscolus stimulosus Bullnettle	B,C		22				
Cornus florida Flowering Dogwood	C,D		31	44	18	8	
Coronopus didymus Swinecress	C		12				
Crataegus marshalli Parsley Hawthorn	C,D,E		63	82	8		
Crataegus viridus Green Hawthorn	D,E			25		1	
Crataegus spp. Hawthorn	C,D,E		6				
Croton capitatus Wooly Croton	B		24				
Cyperus esculentus Yellow Nutsedge	B		2				
Cyperus spp. Nutsedge	B		15				
Dichondra carolinensis Dichondra	B	1	94				
Diospyros virginiana Persimmon	C		6	7			
Eleocharis spp. Spikerush	A,D	2	42				
Erythrina herbacea Coral Bean	C		22				
Eupatorium capillifolium Dogfennel	B		23				

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Eupatorium perfoliatum Thoroughwort	C		8	83			
Eupatorium spp. Yankee Weed	B,C		11				
Fagus grandifolia Carolina Beech	C,E			3		1	
Fraxinus carolina Carolina Ash	D,E		10	12	2	3	1
Fraxinus pennsylvanica Green Ash	D,E		4	10	5		
Fraxinus spp. Ash	C,D,E		3	6	1		
Forestiera accuminata Swamp Privet	D			1			
Gelsemium sempervirens Yellow Jessamine	C,D,E		35				
Georgia pellucida Moss	D,E		2				
Geranium carolinianum Wild Geranium	B		2				
Gleditsia triacanthos Honey Locust	D,E			2			
Gnaphalum obtusifolium Rabbit Tobacco	B,C,E		44				
Halesia diptera Silverbell	C,D,E			47	3		
Hamamelis virginiana Witch Hazel	C,D,E		48	35	8		

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Heliantheum canadense Rock Rose	A,D,E		17				
Helianthus spp. Sunflower	B,C,E		21	34			
Hibiscus lasiocarpos Wooly Rose-Mallow	D			33			
Hydrocotyle ranunculoides Water Pennywort	D		99				
Hypericum cistifolium St. John's Wort	C,E		4				
Ilex decidua Deciduous Holly	D,E			64	26		
Ilex opaca American Holly	C,D,E		22	9	15	1	
Ilex vomitoria Yaupon	C,E		33	47			
Iris giganticaerulea Giant Blue Iris	D			3			
Itea virginica Virginia Willow	D			4			
Juncus effusus Soft Rush	A,D		98				
Juniperus virginiana Southern Red Cedar	C			1			
Lamium amplexicauile Henbit	B,C		15				
Leersia virginica White Grass	D	3	161				

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Leersia lenticularis Catchfly Grass	D	1	9				
Lespedeza sp. Lespedeza	B		67				
Liquidambar styraciflua Sweetgum	B,C,D,E		41	87	27	12	8
Lolium perenne Rye Grass	B	1					
Lonicera japonica Honeysuckle	B,C,D,E	3					
Magnolia virginiana Sweetbay	C,D,E			2	6	1	
Mazus japonicus Monkeyface	B		15				
Mitchella repens Patridge Berry	C,D,E	9	8				
Mnium spp. Moss	D	1					
Morus rubra Red Mulberry	D,E		2				
Myrica cerifera Wax Myrtle	C,E		97	49			
Nyssa aquatica Tupelogum	D,E		4	17	3	1	1
Nyssa sylvatica Blackgum	C,D,E		1	22	16	4	
Osmunda cinnamomea Cinnamon Fern	C		1				

TABL C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Ostrya virginiana Hophornbeam	D				1		
Oxalis stricta Yellow Wood Sorrel	B,C,D,E		25				
Panicum sphaerocarpon Panic Grass	B,C,D,E	3	16				
Panicum spp. Panic Grass	B,C,D,E	3	13				
Panicum virgatum Switch Grass	B,E		22				
Parthenocissus quinquefolia Virginia Creeper	C,D,E	7	35				
Paspalum notatum Bahia Grass	B		2				
*Paspalum urvillei** Vasey Grass	C		4				
Peltandra virginica Arrow Arum	D		32				
Pinus elliottii Slash Pine	C,E		1		1	4	5
Pinus taeda Loblolly Pine	C,E		11	12	12	17	20
Plagiothecum striatellum Moss	D,E	2					
Planera aquatica Water Elm	D			4			
Plantago major Plantain	B,C,E		24				

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Podophyllum peltatum Mandrake	C		70				
Polygonum spp. Smartweed	A,D		133				
Polypodium polypodioides Ressurection Fern	C,D,E						
Polytrichum sp. Moss	C,D,E		107				
Prunella vulgaris Self-Heal	B,C,E		1				
Prunus angustifolia Chickasaw Plum	C,D,E		2	2	2		
Prunus caroliniana Cherry Laurel	C		6				
Prunus mexicana Mexican Plum	C,D,E			2	6	2	
Prunus serotina Black Cherry	C				1		
Pteridium aquilinum Bracken Fern	C		6				
Quercus alba White Oak	C,D,E		27	68	5	2	1
Quercus lyrata Overcup Oak	D,E		4	8	12	11	2
Quercus marilandica Blackjack Oak	C,E		8	5	3		
Quercus michauxii Cow Oak	D,E		8	19	4		

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Quercus nigra Water Oak	C,D,E		9	36	21	15	13
Quercus obtusa Obtusa Oak	D,E			5	1	9	1
Quercus phellos Willow Oak	C,D,E		238	119	37	3	1
Quercus rubra Red Oak	C,E		1	7	10	8	
Quercus spp. Oak	C,D,E		148				
Quercus stellata Post Oak	C,E		4	1	9	9	
Rhamnus caroliniana Carolina Buckthorn	C		6	5			
Rhododendron canescens Wild Azalea	D,E		2	13			
Rhus copallinum Winged Sumac	C,E		16	16			
Rhus glabra Smooth Sumac	C,E			2			
Rhus quercifolia Poison Oak	C		12				
Rhus radicans Poison Ivy	C,D,E	21	43	5			
Rubus spp. Dewberry	B,C,D,E	3	179	53			
Sabal minor Palmetto	D			20			
Salix nigra Black Willow	D			9			

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Sassafras albidum Sassafras	C,E		10	8		1	
Saururus cernuus Lizards' Tails	D	2	107				
Scirpus spp. Rush	A,D		10				
Senecio glabella Butterweed	C,D,E		58				
Silphium perfoliatum Rosinweed	C		1				
Smilax bona-nox Bona-Nox Greenbriar	C,E			15			
Smilax glauca Cat Briar	C		4				
Smilax rotundifolia Greenbriar	C,D,E		28	18			
Smilax spp. Greenbriar	C,D,E	3	79	44			
Smilax walteri Small Greenbriar	C	1					
Solidago spp. Goldenrod	B		45				
Spartina cynosuroides Hog Cane	D			26			
Sphagnum cymbifolium Sphagnum Moss	C	1					
Stenotaphurm secundatum St. Augustine Grass	B	137					

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Styrax grandifolia Bigleaf Snowbell	C,D,E		2	11	2		
Symplocos tinctoria Horsesugar	C,E		3	17	1		
Taxodium distichum Baldcypress	D		1				
Tradescantia spp. Spiderwort	D,E	3	83				
Trichostema dichotomum Blue Curls	B		2				
Trillium sessile Wake Robin	C,E		16				
Ulmus americana American Elm	C,D,E		65	45	16	6	2
Ulmus alata Winged Elm	C,D,E		36	49	10	4	
Vaccinium aboreum Tree Huckleberry	C,D,E		13	26	8	1	
Vaccinium spp. Huckleberry	C		52	310			
Verbascum spp. Mullein	C		9				
Viburnum dentatum Arrowwood	C,D,E		33	34	4		
Viburnum nudum Possumhaw Viburnum	C,E		7	8	1	1	
Viburnum spp. Arrowwood	C,D,E		30	6			

TABLE C-1, VEGETATIONAL SPECIES, CONT.

Scientific Name Common Name	Habitat Found	Ground Cover	Numbers Recorded in 50 Plots (Total) 1"-1'	1.1'-10'	1"-3" DBH**	4"-9" DBH**	10"+ DBH**
Viola rosacea Violet	C,D,E	5	161				
Viola spp. Violet	C,D,E		13				
Vitus labrusca Fox Grape	C	1	2	1			
Vitus rotundifolia Muskadine	C,D,E	2	86	110	1		
Vitis spp. Grape Vines	C,D,E			137			
Wisteria macrostachya Wild Wisteria	D			4			

*Ground Cover- at least 100 individuals per 10 meter x 10 meter plot

**DBH- Diameter at breast height

A= Marsh
B= Agriculture
C= Pine Hardwoods
D= Wet Bottomland Hardwoods
E= Dry Bottomland Hardwoods

APPENDIX D

MAMMALS
ANTICIPATED SPECIES WITHIN STUDY AREA

TABLE D-1
MAMMALS ANTICIPATED SPECIES WITHIN STUDY AREA

Scientific Name	Common Name	Parish Where Known To Exist* (RR,N,B)**
Didelphidae		
Didelphis virginiana	Virginia Opossum	RR,N,B
Soricidae		
Blarina brevicauda	Short-Tailed Shrew	RR,N,B
Cryptotis parva	Least Shrew	B
Talpidae		
Scalopus aquaticus	Eastern Mole	N,B
Vespertilionidae		
Myotis austroriparius	Southeastern Myotis	N
Pipistrellus subflavus	Eastern Pipistrelle	N
Eptesicus fuscus	Big Brown Bat	N
Lasiurus borealis	Red Bat	RR,N
Lasiurus cinereus	Hoary Bat	N
Lasiurus seminolus	Seminole Bat	N
Nycticeius humeralis	Evening Bat	N,B
Plecotus rafinesquii	Rafinesque's Big-Eared Bat	N
Molossidae		
Tadarida brasiliensis	Brazilian Free-Tailed Bat	N
Dasypodidae		
Dasypus novemcinctus	Nine-Banded Armadillo	RR,N,B
Leporidae		
Sylvilagus floridanus	Eastern Cottontail	RR,N,B
Sylvilagus aquaticus	Swamp Rabbit	RR,N,B
Sciuridae		
Sciurus carolinensis	Gray Squirrel	RR,N,B
Sciurus niger	Fox Squirrel	RR,N,B
Glaucomys volans	Southern Flying Squirrel	N,B
Marmota monax	Woodchuck	B

TABLE D-1

MAMMALS ANTICIPATED SPECIES WITHIN THE STUDY AREA

CONT.

Scientific Name	Common Name	Parish Where Known To Exist* (RR,N,B)**
Geomyidae		
Geomys bursarius	Plains-Pocket Gopher	RR,N,B
Castoridae		
Castor canadensis	American Beaver	RR,N,B
Cricetidae		
Oryzomys palustris	Marsh Rice Rat	N,B
Reithrodontomys fulvescens	Fulvous Harvest Mouse	RR,N,B
Reithrodontomys humulis	Eastern Harvest Mouse	
Peromyscus leucopus	White Footed Mouse	N
Peromyscus gossypinus	Cotton Mouse	N,B
Ochrotomys nuttalli	Golden Mouse	N,B
Sigmodon hispidus	Hispid Cotton Rat	N,B
Neotoma floridana	Eastern Wood Rat	RR,N,B
Microtus pinetorum	Woodland Vole	B
Muridae		
Rattus rattus	Roof Rat	RR,N,B
Rattus norvegicus	Norway Rat	N,B
Mus musculus	House Mouse	RR,N,B
Cadromyidae		
Myocastor coypus	Nutria	N,B
Canidae		
Canis latrans	Coyote	N,B
Canis rufus	Red Wolf	N,B
Vulpes fulva	Red Fox	
Urocyon cinereoargenteus	Gray Fox	RR,N,B
Ursidae		
Euarctos americanus	American Black Bear	N,B
Procyonidae		
Procyon lotor	Northern Raccoon	RR,N,B

TABLE D-1
MAMMALS ANTICIPATED SPECIES WITHIN STUDY AREA
CONT.

Scientific Name	Common Name	Parish Where Known To Exist* (RR,N,B)**
Mustellidae		
Mustela frenata	Long-Tailed Weasel	
Mustela vison	North American Mink	N
Mephitis mephitis	Striped Skunk	RR,N
Lutra canadensis	Nearctic River Otter	
Felidae		
Lynx rufus	Bobcat	RR,N
Cervidae		
Odocoileus virginianus	White-Tailed Deer	RR,N,B

*Personal Observations and/or Museum Documentation
**Red River, Natchitoches, Bossier (and/or Bienville) Parishes, respectively
Source for Museum Documentations: Lowery, George H., Jr., The Mammals of Louisiana and Its Adjacent Waters. Louisiana State University Press, 1974.

APPENDIX E

BIRDS KNOWN OR PRESUMED TO OCCUR IN THE GRAND BAYOU AREA

TABLE E-1

BIRDS KNOWN OR PRESUMED TO OCCUR IN THE GRAND BAYOU AREA

Family Name	Scientific Name	Common Name	Presumed or Occurrence in Red River Parish			
			Known	Resident	Winter	Summer
Anhingidae	*Anhinga anhinga*	American anhinga	K	X		
Anatidae	*Chen caerulescens*	Snow goose	K		X	
	Anas platyrhynchos	Mallard	P		X	
	Anas discors	Blue-winged teal	K	X+	X	
	Aix sponsa	Wood duck	K	X		
Cathartidae	Cathartes aura	Turkey vulture	K	X		
	Coragyps atratus	Black vulture	K	X		
Accipitridae	*Accipiter cooperii*	Cooper's hawk	K	X*	X	
	Accipiter striatus	Sharp-shinned hawk	P			
	Buteo jamaicensis	Red-tailed hawk	K	X+	X	
	Buteo lineatus	Red-shouldered hawk	K	X		
	Buteo platypterus	Broad-winged hawk	K	X+		X
	**Circus cyaneus*	Marsh hawk	P		X	
	**Aquila chrysaetos*	Golden eagle	P		X	
	***Haliaeetus leucocephalus*	Bald eagle	P	X+	X	
Falconidae	*Falco sparverius*	American kestrel	K	X		
Meleagrididae	*Meleagris gallopavo*	Wild turkey	K	X		
Phasianidae	*Colinus virginianus*	Bobwhite	K	X		
Ardeidae	*Egretta thula*	Snowy egret	K	X		
	Casmerodius albus	Great egret	K	X		
	Bubulcus ibis	Cattle egret	K	X		
	Ardea herodias	Great blue heron	K	X		
	Butorides virescens	Green heron	K	X+		X
	Florida caerulea	Little blue heron	K	X+		X
	**Nycticorax nycticorax*	Black-crowned night heron	P	X		
	Nyctanassa violacea	Yellow-crowned night heron	K	X+		X
	**Ixobrychus exilis*	Least bittern	P			X
	**Botaurus lentiginosus*	American bittern	P		X	
Rallidae	**Porphyrula martinica*	Purple gallinule	P			X
	**Gallinula chloropus*	Common gallinule	P	X+		X

TABLE E-1

BIRDS KNOWN OR PRESUMED TO OCCUR IN THE GRAND BAYOU AREA
CONT.

Family Name	Scientific Name	Common Name	Presumed or Known	Occurrence in Red River Parish: Resident	Winter	Summer
Charadriidae	*Charadrius vociferus*	Killdeer	K	X		
Scolopacidae	**Philohela minor*	American woodcock	P		X	
	**Capella gallinago*	Common snipe	P		X	
Columbidae	*Columba livia*	Rock dove	K	X		
	Zenaida macroura	Mourning dove	K	X		
Cuculidae	*Coccyzus americanus*	Yellow-billed cuckoo	K			X
	Geococcyx californianus	Greater roadrunner	K	X		
Tytonidae	**Tyto alba*	Barn owl	P	X		
Strigidae	*Otus asio*	Common screech owl	K	X		
	**Bubo virginianus*	Great horned owl	P	X		
	Strix varia	Barred owl	K	X		
Caprimulgidae	**Caprimulgus carolinensis*	Chuck-will's widow	K			X
	Caprimulgus vociferus	Whip-poor-will	P			X
	**Chordeiles minor*	Common nighthawk	P			X
Apodidae	*Chaetura pelagica*	Chimney swift	K			X
Trochilidae	*Archilochus colubris*	Ruby-throated hummingbird	K			X
Alcedinidae	*Megaceryle alcyon*	Belted kingfisher	K	X+	X	
Picidae	*Colaptes auratus*	Common flicker	K	X		
	Dryocopus pileatus	Pileated woodpecker	K	X		
	Centurus carolinus	Red-bellied woodpecker	K	X		
	Melanerpes erthrocephalus	Red-headed woodpecker	K	X		
	Sphyrapicus varius	Yellow-bellied sapsucker	K		X	
	***Dendrocopus borealis*	Red-cockaded woodpecker	P	X		
	Dendrocopus villosus	Hairy woodpecker	K	X		
	Dendrocopus pubescens	Downy woodpecker	K	X		
Tyrannidae	**Muscivora forficata*	Scissor-tailed flycatcher	P			X
	Tyrannus tyrannus	Eastern kingbird	K			X
	Myiarchus crinitus	Great crested flycatcher	K			X
	Sayornis phoebe	Eastern phoebe	K		X	
	Empidonax traillii	Willow flycatcher	K			X
	Empidonax virescens	Acadian flycatcher	P			X
	Contopus virens	Eastern wood pewee	K			X

TABLE E-1

BIRDS KNOWN OR PRESUMED TO OCCUR IN THE GRAND BAYOU AREA
CONT.

Family Name	Scientific Name	Common Name	Presumed or Known	Occurrence in Red River Parish: Resident	Winter	Summer
Hirundinidae	*Hirundo rustica*	Barn swallow	K			X
	°Riparia riparia	Bank swallow	P			X
	Progne subis	Purple martin	K			X
Corvidae	*Cyanocitta cristata*	Blue jay	K	X		
	Corvus brachyrhynchos	Common crow	K	X		
	°Corvus ossifragus	Fish crow	P	X		
Paridae	*Parus carolinensis*	Carolina chickadee	K	X		
	Parus bicolor	Tufted titmouse	K	X		
Sittidae	*°Sitta carolinensis*	White-breasted nuthatch	P	X	X	
	°Sitta canadensis	Red-breasted nuthatch	P			
	°Sitta pusilla	Brown-headed nuthatch	P	X		
Certhiidae	*°Certhia familiaris*	Brown creeper	P		X	
Troglodytidae	*°Troglodytes aedon*	Northern house wren	P		X	
	°Troglodytes troglodytes	Winter wren	P		X	
	°Thryomanes bewickii	Bewick's wren	P		X	
	Thryothorus ludovicianus	Carolina wren	K	X		
	Telmatodytes palustris	Marsh wren	K	X		
Mimidae	*Mimus polyglottos*	Northern mockingbird	K	X		
	Dumetella carolinensis	Gray catbird	K			X
	Toxostoma rufum	Brown thrasher	K	X		
Turdidae	*Turdus migratorus*	American robin	K	X+	X	
	Hylocichla mustelina	Wood thrush	K			X
	Catharus guttatus	Hermit thrush	K		X	
	Sialia sialis	Eastern bluebird	K	X		
Sylviidae	*Polioptila caerulea*	Blue-gray gnatcatcher	K	X		
	°Regulus satrapa	Golden-crowned kinglet	P		X	
	Regulus calendula	Ruby-crowned kinglet	K		X	
Motacillidae	*°Anthus spinoletta*	Water pipit	P		X	
Bombycillidae	*Bombycilla cedrorum*	Cedar waxwing	K		X	
Laniidae	*Lanius ludovicianus*	Loggerhead shrike	K	X		
Sturnidae	*Sturnus vulgaris*	European starling	K	X		

TABLE E-1

BIRDS KNOWN OR PRESUMED TO OCCUR IN THE GRAND BAYOU AREA

CONT.

Family Name	Scientific Name	Common Name	Presumed or Known	Occurrence in Red River Parish: Resident	Winter	Summer
Vireonidae	*Vireo solitarius*	Solitary vireo	K		X	
	Vireo griseus	White-eyed vireo	K			X
	**Vireo bellii*	Bell's vireo	P			X
	Vireo flavifrons	Yellow-throated vireo	K			X
	Vireo olivaceus	Red-eyed vireo	K			X
	**Vireo gilvus*	Warbling vireo	P			X
Parulidae	*Mniotilta varia*	Black-and-white warbler	K			X
	Protonotaria citrea	Prothonotary warbler	K			X
	**Limnothlypis swainsonii*	Swainson's warbler	P			X
	***Vermivora bachmanii*	Bachman's warbler	P			X
	**Vermivora pinus*	Blue-winged warbler	P			X
	**Vermivora celata*	Orange-crowned warbler	P			X
	Parula americana	Northern parula warbler	K		X	
	Dendroica petechia	Yellow warbler	K			X
	Dendroica coronata	Yellow-rumped warbler	K			X
	**Dendroica cerulea*	Cerulean warbler	P		X	
	Dendroica dominica	Yellow-throated warbler	K			X
	Dendroica pinus	Pine warbler	K	X		
	**Seiurus aurocapillus*	Ovenbird	P		X	
	**Seiurus motacilla*	Louisiana waterthrush	P			X
	Geothlypis trichas	Common yellowthroat	K	X		
	**Geothlypis formosa*	Kentucky warbler	P			X
	Icteria virens	Yellow-breasted chat	K			X
	Wilsonia citrina	Hooded warbler	K			X
	Setophaga ruticilla	American redstart	K			X
Ploceidae	*Passer domesticus*	House sparrow	K	X		
Icteridae	*Sturnella magnae*	Eastern meadowlark	K	X		
	Agelaius phoeniceus	Red-winged blackbird	K	X		
	Euphagus carolinus	Rusty blackbird	K		X	
	Euphagus cyanocephalus	Brewer's blackbird	K		X	
	Quiscalus quiscula	Common grackle	K	X		
	Molothrus ater	Brown-headed cowbird	K	X		
	Icterus spurius	Orchard oriole	K			X
	**Icterus galbula*	Northern Oriole	K	X+		X

TABLE E-1

BIRDS KNOWN OR PRESUMED TO OCCUR IN THE GRAND BAYOU AREA
CONT.

Family Name	Scientific Name	Common Name	Occurrence in Red River Parish			
			Presumed or Known	Resident	Winter	Summer
Thraupidae	*Piranga rubra*	Summer tanager	K			X
Fringillidae	*Cardinalis cardinalis*	Northern cardinal	K	X		
	Guiraca caerulea	Blue grosbeak	K			X
	Passerina cyanea	Indigo bunting	K			X
	Passerina ciris	Painted bunting	K	X+		X
	**Carpodacus purpureus*	Purple finch	P		X	
	**Spinus tristis*	American goldfinch	P		X	
	**Spiza americana*	Dickcissel	P	X+		X
	Pipilo erythrophthalmus	Rufous-sided towhee	K	X		
	**Passerculus sandwichensis*	Savannah sparrow	P		X	
	**Ammodramus savannarum*	Grasshopper sparrow	P		X	
	**Ammodramus henslowii*	Henslow's sparrow	P		X	
	**Ammospiza leconteii*	Le Conte's sparrow	P		X	
	**Pooecetes gramineus*	Vesper sparrow	P		X	
	**Chondestes grammacus*	Lark sparrow	P			X
	Junco hyemalis	Dark-eyed junco	K		X	
	**Aimophila aestivalis*	Bachman's sparrow	P	X		
	Spizella passerina	Chipping sparrow	K	X		
	Spizella pusilla	Field sparrow	K	X		
	**Zonotrichia leucophrys*	White-crowned sparrow	P		X	
	Zonotrichia albicollis	White-throated sparrow	K		X	
	Passerella iliaca	Fox sparrow	P		X	
	**Melospiza lincolnii*	Lincoln's sparrow	P		X	
	Melospiza georgiana	Swamp sparrow	K		X	
	Melospiza melodia	Song sparrow	P		X	

[1]Anticipated species from Louisiana Birds. George H. Lowery, Jr., 1974. Louisiana State University Press, Baton Rouge, Louisiana.

*Were not recorded in field surveys.

**Threatened or endangered species.

+Species may set up residence in the area, but more probable in season marked.

APPENDIX F

REPTILES AND AMPHIBIANS KNOWN IN THE GRAND BAYOU AREA

TABLE F-1

REPTILES AND AMPHIBIANS KNOWN
IN THE GRAND BAYOU AREA

Family Name	Scientific Name	Common Name	Abundance
Chelydridae	*Chelydra serpentina*	Common snapping turtle	C
	Macroclemys temminicki	Alligator snapping turtle	C
Kinosternidae	*Kinosternon subrubrum hipocrepis*	Mississippi mud turtle	A
	Sternotherus carinatus	Razor-backed musk turtle	V
	Sternotherus odoratus	Stinkpot	A
Emydidae	*Chrysemys concinna hieroglyphica*	Slider	C
	Chrysemys floridana hoyi	Missouri slider	C
	**Chrysemys picta dorsalis*	Southern painted turtle	C
	Chrysemys scripta elegans	Red-eared turtle	A
	**Deirochelys reticularia*	Chicken turtle	C
	Graptemys kohni	Mississippi map turtle	C
	Graptemys pseudographica ouachitensis	Ouachita map turtle	U
	Terrapene carolina triunguis	Three-toed box turtle	C
Trionychidae	**Trionyx muticus*	Smooth softshell turtle	U
	**Trionyx spiniferus pallidus*	Pallid spiny softshell	U
Iguanidae	*Anolis c. carolinensis*	Green anole	C
	Sceloporus undulatus hyacinthinus	Northern fence lizard	A
Teiidae	*Cnemidophorus sexlineatus*	Six-lined racerunner	U
Scincidae	**Eumeces anthracinus*	Southern coal skink	U
	Eumeces fasciatus	Five-lined skink	A
	Eumeces laterale	Ground skink	A
	Eumeces laticeps	Broad-headed skink	C
	Eumeces septentrionalis obstusirostris	Southern prairie skink	R
Anguidae	*Ophisaurus a. attenuatus*	Western slender glass lizard	U
Coluberidae	**Cemophora coccinea*	Northern scarlet snake	R
	Coluber constrictor anthicus	Buttermilk snake	C
	Diadophis punctatus	Mississippi ringneck snake	U
	**Elaphe guttata*	Corn snake	U
	Elaphe obsoleta lindheimeri	Texas rat snake	C
	Elaphe o. obsoleta	Black rat snake	V
	Farancia abacura reinwardti	Western mud snake	C
	Heterodon platyrhinos	Eastern hognose snake	C
	Lampropeltis c. calligaster	Prairie kingsnake	U
	Lampropeltis getulus holbrooki	Speckled kingsnake	C
	Lampropeltis triangulum amaura	Louisiana milk snake	U
	Masticophus f. flagellum	Eastern coachwhip	U
	Natrix c. cyclopion	Green water snake	C
	Natrix erythrogaster flavigaster	Yellow-bellied water snake	V
	Natrix fasciata confluens	Broad-banded water snake	V
	Natrix r. rhombifera	Diamond-backed water snake	V
	Opheodrys aestivus	Rough green snake	C

TABLE F-1, REPTILES AND AMPHIBIANS, CONT.

Family Name	Scientific Name	Common Name	Abundance
Coluberidae (Cont.)	**Pituophus melanoleucus ruthveni*	Louisiana pine snake	R
	Regina grahami	Graham's water snake	C
	Regina rigida	Glossy water snake	U
	Storeria dekayi wrightorum	Midland brown snake	V
	**Storeria occipitomaculata*	Red-bellied snake	U
	**Tantilla gracilis*	Flat-headed snake	U
	Thamnophis p. proximus	Western ribbon snake	A
	Thamnophis s. sirtalis	Eastern garter snake	U
	Virginia striatula	Rough earth snake	C
	**Virginia valeriae elegans*	Western smooth earth snake	U
Elapidae	*Micrurus fulvius tenere*	Texas coral snake	U
Viperidae	*Agkistrodon c. contortrix*	Southern copperhead	C
	Agkistrodon piscivorus leucostoma	Western cottonmouth	V
	Crotalus horridus atricaudatus	Canebrake rattlesnake	U
	**Sistrurus miliarius streckeri*	Western pigmy rattlesnake	U
Sirenidae	*Siren intermedia nettingi*	Western lesser siren	C
Amphiumidae	*Amphiuma tridactylum*	Three-toed amphiuma	C
Ambystomatidae	*Ambystoma maculatum*	Spotted salamander	U
	Ambystoma opacum	Marbled salamander	C
	Ambystoma talpoideum	Mole salamander	U
	Ambystoma texanum	Small-mouthed salamander	C
Salamandridae	*Notophalamus viridescens louisianensis*	Central newt	V
Plethodontidae	*Desmognaths fuscus brimleyorum*	Central dusky salamander	R
	**Eurycea quadridigitata*	Dwarf salamander	R
Pelobatidae	*Scaphiopus holbrooki*	Hurter's spadefoot	U
Bufonidae	*Bufo woodhousei fowleri*	Fowler's toad	A
	Bufo w. woodhousei	Woodhouse's toad	V
Hylidae	*Acris c. crepitans*	Northern cricket frog	A
	Hyla cinerea	Green treefrog	V
	Hyla crucifer	Northern spring peeper	V
	Hyla squirrela	Squirrel treefrog	C
	Hyla versicolor	Gray treefrog	C
	Pseudacris triseriata feriarum	Upland chorus frog	V
Microhylidae	*Gastrophryne carolinensis*	Eastern narrow-mouthed toad	C
Ranidae	**Rana areolata*	Southern crawfish frog	C
	Rana catesbeiana	Bullfrog	V
	Rana c. clamitans	Bronze frog	V
	Rana palustris	Pickeral frog	U
	Rana utricularia	Southern Leopard frog	V

Abundance Classes: A= Abundant; V= Very Common; C= Common; U= Uncommon; R= Rare.

*Anticipated species from Feasibility and Development Plan, Ozarks Regional Commission.

APPENDIX G

FISHES KNOWN OR ANTICIPATED TO OCCUR IN THE GRAND BAYOU DRAINAGE AREA

TABLE G-1

FISHES KNOWN OR ANTICIPATED TO OCCUR IN THE GRAND BAYOU DRAINAGE AREA

Family Name	Scientific Name	Common Name	Abundance
Petromyzontidae	*Ichthyomyzon castaneus	Chestnut Lamprey	U
Amiidae	Amia calva	Bowfin	C
Lepisosteidae	Lepisosteus oculatus	Spotted Gar	C
	Lepisosteus osseus	Longnose Gar	C
	*Lepisosteus platostomus	Shortnose Gar	C
	*Lepisosteus spatula	Alligator Gar	C
Hiodontidae	*Hiodon alosoides	Goldeneye	U
	*Hiodon tergisus	Mooneye	U
Clupeidae	*Alosa chrysochloris	Skipjack Herring	U
	Dorosoma cepedianum	Gizzard Shad	A
	Dorosoma petenense	Threadfin Shad	A
Esocidae	Esox americanus vermiculatus	Grass Pickerel	A
	Esox niger	Chain Pickerel	A
Catostomidae	Carpiodes carpio	River Carpsucker	C
	Erimyzon oblongus	Creek Chubsucker	V
	Erimyzon sucetta	Lake Chubsucker	V
	Ictiobus bubalus	Smallmouth Buffalo	C
	*Ictiobus cyprinellus	Bigmouth Buffalo	U
	*Ictiobus niger	Black Buffalo	U
	Minytrema melanops	Spotted Sucker	C
	Moxostoma poecilurum	Blacktail Redhorse	C
Cyprinidae	Cyprinus carpio	European Carp	C
	*Hybognathus hayi	Cypress Minnow	U
	Hybognathus nuchalis	Silvery Minnow	C
	Notemigonus chrysoleucas	Golden Shiner	V
	Notropis atherinoides	Emerald Shiner	V
	Notropis atrocaudalis	Blackspot Shiner	U
	Notropis chalybaeus	Ironcolor Shiner	U
	Notropis chrysocephalus isolepis	Southern Striped Shiner	C
	Notropis fumeus	Ribbon Shiner	U
	Notropis lutrensis	Red Shiner	C
	*Notropis maculatus	Taillight Shiner	U
	Notropis texanus	Weed Shiner	V
	Notropis umbratilis	Redfin Shiner	A
	Notropis venustus	Blacktail Shiner	A
	Notropis volucellus	Mimic Shiner	C
	Notropis emiliae	Pugnose Minnow	C
	Pimephales vigilax	Bullhead Minnow	A
	Semotilus atromaculatus	Creek Chub	U

TABLE G-1, FISHES, CONT.

Family Name	Scientific Name	Common Name	Abundance**
Ictaluridae	*Ictalurus melas*	Black Bullhead	C
	Ictalurus natalis	Yellow Bullhead	A
	Ictalurus punctatus	Channel Catfish	A
	Noturus gyrinus	Tadpole Madtom	U
	Noturus nocturnus	Freckled Madtom	U
	Noturus phaeus	Brown Madtom	R
	Pylodictis olivaris	Flathead Catfish	C
Anguillidae	*Anguilla rostrata*	American Eel	U
Cyprinodontidae	*Fundulus chrysotus*	Golden Topminnow	V
	Fundulus notti	Starhead Topminnow	C
	Fundulus notatus	Blackstripe Topminnow	U
	Fundulus olivaceus	Blackspotted Topminnow	A
Poecilliidae	*Gambusia affinis*	Mosquitofish	A
Aphredoderidae	*Aphredoderus sayanus*	Pirateperch	V
Percichthyidae	**Morone chrysops*	White Bass	U
	**Morone mississippiensis*	Yellow Bass	C
Centrarchidae	*Centrarchus macropterus*	Flier	V
	Elassoma zonatum	Banded Pigmy Sunfish	C
	Lepomis cyanellus	Green Sunfish	A
	Lepomis gulosus	Warmouth	A
	Lepomis humilis	Orangespotted Sunfish	U
	Lepomis macrochirus	Bluegill	A
	Lepomis marginatus	Dollar Sunfish	U
	Lepomis megalotis	Longear Sunfish	A
	Lepomis microlophus	Redear Sunfish	A
	Lepomis punctatus	Spotted Sunfish	U
	Lepomis symmetricus	Bantam Sunfish	C
	Micropterus punctulatus	Spotted Bass	A
	Micropterus salmoides	Largemouth Bass	A
	Pomoxis annularis	White Crappie	C
	Pomoxis nigromaculatus	Black Crappie	V
Percidae	**Ammocrypta vivax*	Scaly Sand Darter	U
	Etheostoma chlorosomum	Bluntnose Darter	C
	Etheostoma fusiforme	Swamp Darter	U
	Etheostoma gracile	Slough Darter	C
	Etheostoma histrio	Harlequin Darter	R
	Etheostoma parvipinne	Goldstripe Darter	R
	Etheostoma proeliare	Cypress Darter	C
	Etheostoma whipplei	Redfin Darter	U
	Percina caprodes	Logperch	U
	Percina maculata	Blackside Darter	U
	Percina sciera	Dusky Darter	U

TABLE G-1, FISHES, CONT.

Family Name	Scientific Name	Common Name	Abundance**
Sciaenidae	*Aplodinotus grunniens*	Freshwater Drum	V
Atherinidae	*Labidesthes sicculus*	Brook Silverside	A

* Anticipated species.

** Abundance classes: A= Abundant; V= Very common; C= Common; U= Uncommon; R= Rare

SOURCE: Feasibility and Development Plan, Grand Bayou Reservoir, Red River Parish, Louisiana, Ozarks Regional Commission, March, 1976.

APPENDIX H

DAM CONSTRUCTION AND SEDIMENT ANALYSIS

APPENDIX H

DAM CONSTRUCTION AND SEDIMENT ANALYSIS

A. Grand Bayou Reservoir

(1) Dam Construction - Plate H-1 reproduced from Grand Bayou Reservoir Feasibility and Development Plan, shows a cross section of the proposed dam along with the types of soils required for the fill material. There are two types of "select" materials required: a sand-silt-clay impervious core and a select clay to be used as an impervious seepage blanket.

(2) Sediment Analysis - Plate H-2 presents an analysis of soil samples taken near the dam site. From this exhibit it can be seen that several types of soils are available including soils with plasticity indexes of 15-20 which could be used for the impervious layers. The remainder of the common fill can be taken from the reservoir bottom.

Plate H-3 presents a chemical analysis of the soil samples taken near the dam site. The chemical interaction between the water and soil is not expected to create any problems because the material proposed for discharge is substantially the same as the substrate of the proposed disposal site.

AD-A135 266 PUBLIC WATER SUPPLY RED RIVER PARISH LOUISIANA(U) ARMY ENGINEER DISTRICT NEW ORLEANS LA APR 82 3/3

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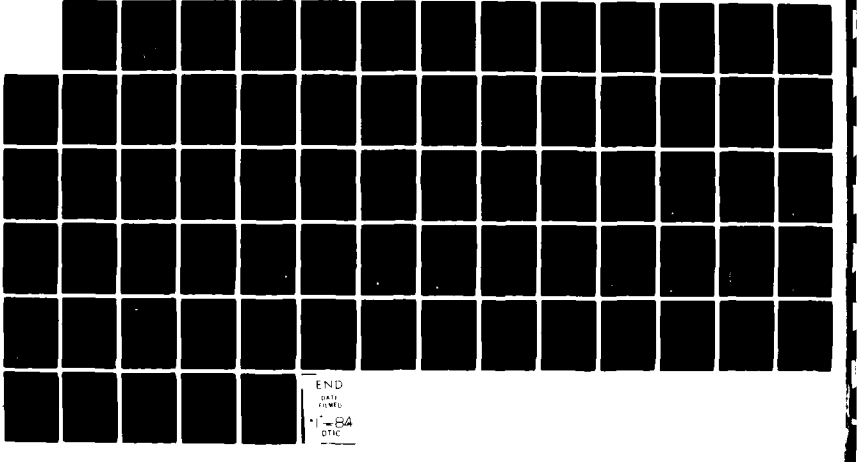

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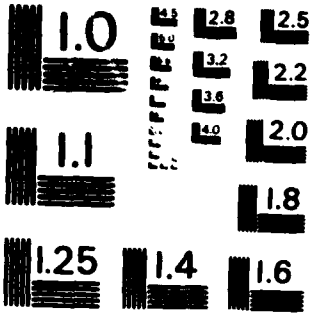
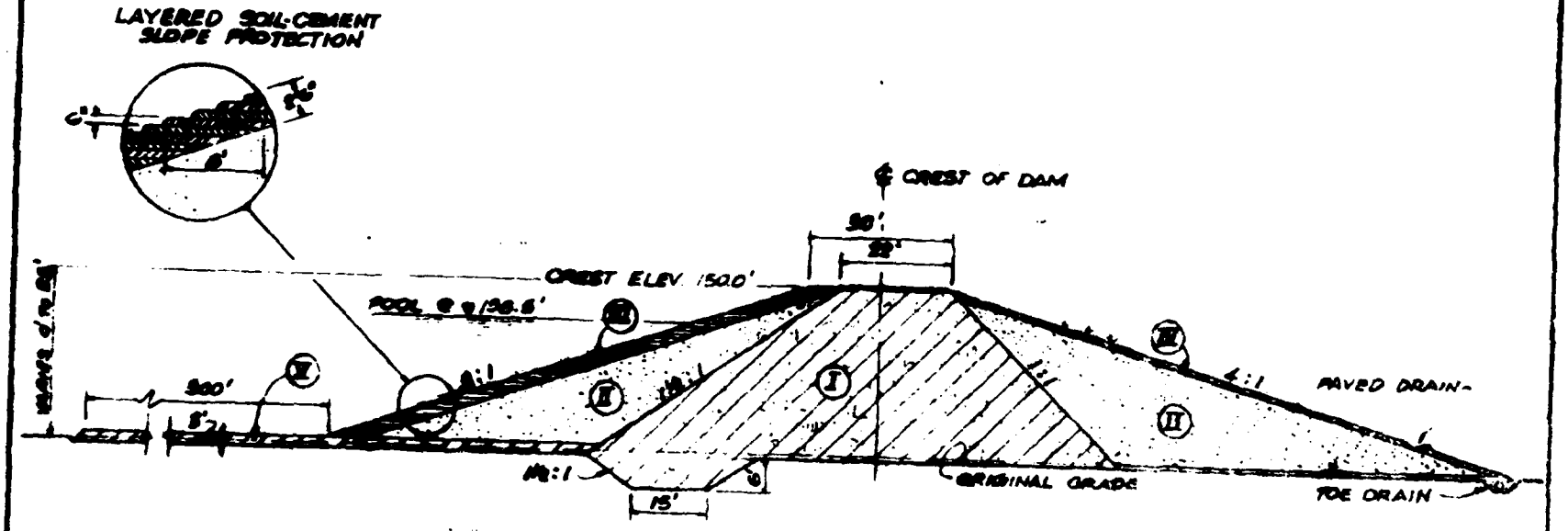


ZONAL DESCRIPTION

ZONE I - SELECT SAND, SILT, CLAY; IMPERVIOUS CORE
ZONE II - COMMON FILL; PERVIOUS EMBANKMENT
ZONE III - LAYERED SOIL CEMENT; SLOPE PROTECTION
ZONE IV - SALVAGED TOP SOIL; SLOPE PROTECTION
ZONE V - SELECT CLAY; IMPERVIOUS SEEPAGE BLANKET



TYPICAL DAM CROSS-SECTION

NO SCALE

ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana

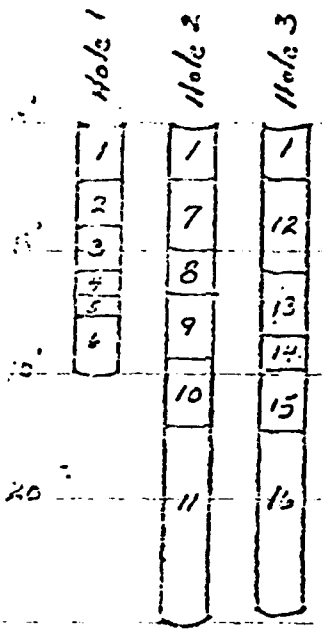
DAM DETAILS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE FILE NO

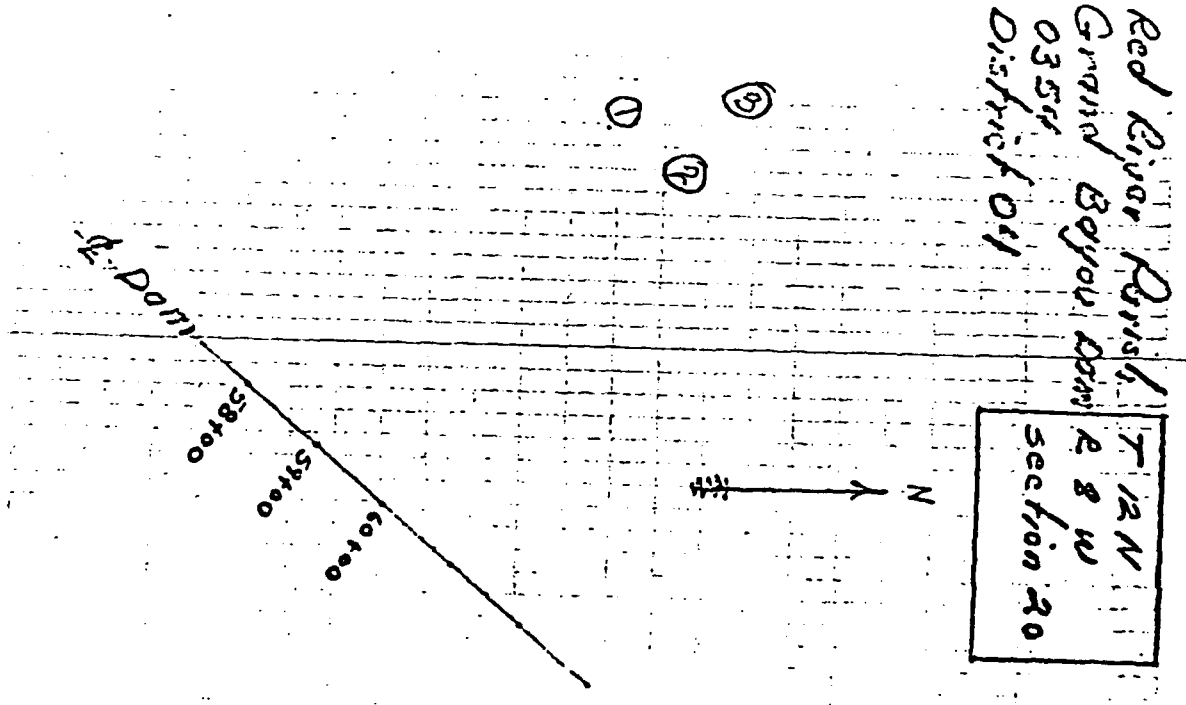
PLATE H-I

Plate H-2



S-001	A-4(3)	Sandy Loam	PI 0	
S-002	A-4(2)	Clay Loam	LL 26	PI 9
S-003	A-4(2)	Sandy Loam	PI 0	
S-004	A-4(3)	Sandy Loam	PI 0	
S-005	A-6(6)	Clay Loam	LL 27	PI 12
S-006	A-6(7)	Clay Loam	LL 27	PI 12
S-007	A-6(5)	Clay Loam	LL 28	PI 11
* S-008	A-6(8)	Clay Loam	LL 33	PI 16
* S-009	A-6(8)	Clay Loam	LL 34	PI 15
S-010	A-6(8)	Clay Loam	LL 28	PI 11
S-011	A-4(8)	Silty Loam	LL 26	PI 7
S-012	A-6(4)	Clay Loam	LL 26	PI 11
* S-013	A-6(11)	Lt silty Clay	LL 39	PI 20
* S-014	A-6(9)	Lt Silty Clay	LL 34	PI 16
S-015	A-6(6)	Clay Loam	LL 28	PI 13
* S-016	A-6(12)	Silty Clay	LL 34	PI 20

* samples 8, 9, 13, 14, 16 have a PI of 15 or more



WEST-PAINE Laboratories INC
[illegible] • BATON ROUGE LA 70808

Recd 5/21/80

George Cramer
DOTD Lab
925-6763

Plate H-3

Leachate Analyses on Soil Samples

for

Department of Transportation
Materials Laboratory
P.O. Box 44205
Capitol Station
Baton Rouge, LA. 70804

May 15, 1980

80-276

WEST-PAINE Laboratories INC
7979 GSRI RD • BATON ROUGE, LA 70808

Department of Transportation
Materials Laboratory
May 15, 1980

Four soil samples were received on May 2, 1980 and analyzed for Fluoride, Metals, Nitrate, Organic Phosphorus and Pesticides. The samples were extracted according to the procedure listed in the Federal Register Volume 43, Number 243, on December 18, 1978. Hundred grams of sample was extracted into 2 liters of deionized water and pH was adjusted according to the procedure described by the Environmental Protection Agency. The water extracts were analyzed according to the Environmental Protection Agency approved methods listed in the Federal Register Volume 44, Number 244, on December 18, 1979. Results of the analyses are reported in Tables I, II, and III.

TABLE I

Sample	Arsenic	Barium	Cadmium	Chromium	Mercury
	mg/L of Extract				
1	<.005	<0.2	<.005	<.05	<.0005
2	<.005	<0.2	<.005	<.05	<.0005
3	<.005	<0.2	<.005	<.05	<.0005
4	<.005	<0.2	<.005	<.05	<.0005
Quality Assurance	.040	1.0	.025	.25	.002
Analysis	.041	1.0	.023	.23	.002

Sample	Lead	Selenium	Silver	Fluoride	Nitrate	Organic Phosphorus
	mg/L of Extract					
1	<.005	<.005	<.01	<0.1	<1	<.1
2	<.005	<.005	<.01	<0.1	<1	<.1
3	.006	<.005	<.01	<0.1	<1	<.1
4	<.005	<.005	<.01	<0.1	<1	<.1
Quality Assurance	.025	.052	.25	1.0	1.0	.25
Analysis	.024	.043	.26	1.0	1.1	.25

WEST-PAINE Laboratories INC.
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Department of Transportation
Materials Laboratory
May 15, 1980
Continued.....

TABLE II

Sample	Endrin	Lindane	Methoxychlor	Toxaphene	2,4-D	2,4,5-TP
	µg/L of Extract					
1	<.001	<.0001	<.001	<.001	<.001	2.7
2	<.001	0.017	<.001	<.001	<.001	1.4
3	<.001	0.0003	<.001	<.001	<.001	1.7
4	<.001	<.0001	<.001	<.001	<.001	1.5

TABLE III

Sample	Total Chlorinated Hydrocarbons *
	µg/L of Extract
1	8.4
2	5.4
3	5.2
4	5.6

*Total Chlorinated Hydrocarbons were calculated in reference to Aldrin Standard.

Sham L. Sachdev

Sham L. Sachdev, Ph.D., C.I.H.
Executive Vice President

APPENDIX I

RED RIVER ALTERNATIVE - DETAILED ANALYSIS

WITHDRAWAL OF WATER FROM THE RED RIVER

The Red River flows immediately adjacent to the Town of Coushatta and provides a readily available water supply source with adequate quantities. The quality of water from the Red River is not particularly good and thus requires considerable treatment before it can be used for potable purposes.

The most economical location for a raw water intake would be near the town. While investigating upstream discharges, however, it was determined that International Paper Company (IPC) is presently constructing a containerboard mill which is located near Mansfield, Louisiana, and which will discharge into the Red River at a point approximately 13 river miles upstream of Coushatta. The expected mill effluent characteristics are given in the Environmental Assessment prepared by Engineering-Science-Austin, Texas. (Refer to Table I-1). It has been determined that IPC can not move its discharge further downstream because of engineering and topographic limitations associated with the overland treatment process.

Placing the intake for a public water supply a short distance downstream from a major waste discharge is undesirable. Several factors which require consideration are presented below.

1) As a general rule, surface waters such as the Red River are not preferred sources of public water supply (due to the variety and nature of organic and inorganic loads) unless other alternatives are not readily available.

2) The quality of Red River varies substantially, even over relatively short periods of time. As an example, data taken from the Red River at Coushatta indicates fecal coliform levels ranging from 62 to 38,000 (number/100 ml), with a mean value of 4964 in 87 tests. Other parameters exhibit similar ranges of fluctuation. The variable quality characteristic complicates the treatment process. A related problem is that an upset in the process at the container-board complex could cause a substantial change in the effluent quality. This would create a change in the chemical composition of the water taken in at the intake and could render the treatment process incapable of providing adequately treated drinking water.

3) The dissolved oxygen deficit calculation done in the Environmental Assessment indicates that the IPC effluent is projected to lower the dissolved oxygen (D.O.) concentration of the Red River from approximately 6.63 mg/l at the point of discharge to about 6.0 mg/l at a point about 8.5 miles downstream of the discharge. (The minimum

TABLE I-1

ESTIMATED RAW WASTEWATER AND
ANTICIPATED TREATED EFFLUENT CHARACTERISTICS
FOR THE INTERNATIONAL PAPER COMPANY-1 MILL

PARAMETER	Concentration mg/l unless specified		
	RAW WASTE	TREATED EFFLUENT	
Calcium (Ca)	31	Avg. yearly	30
		Avg. summer	36
Sodium (Na)	476	Avg. yearly	430
		Avg. summer	515
Potassium (K)	1.8		2.0
Sulfates (SO_4)	76	Avg.	76
		Max.	110
Chlorides	39	Avg.	39
		Max.	60
Nitrate (NO_3)	0.22		Negligible
Dissolved Solids	2,513	Avg. yearly	2,513
		Max.	3,630
Hardness (as $CaCO_3$)	92	Avg.	160
		Max.	180
Sulfides	<10		<1
BOD	597	Avg.	<45
		Max.	<89*
Color (units)	1,007	Avg.	<290
		Max.	<436 *
Phenol	Unknown		Negligible
Surfactants	Unknown		Negligible
Aluminum	1.7		<1.0
Total Solids	2,635	Avg. yearly	2,538
		Max.	4,050
Total Suspended Solids	122	Avg.	<102
		Max.	<205*
pH (units)	7.5-11.0		~7.0
Temperature			Ambient

NOTE: Unless specified all values are best estimates.

* Based upon EPA's development document for Effluent Limitation Guidelines and New Source Performance Standards, for unbleached kraft and semichemical pulp segments of the pulp, paper, and paperboard mills Point Source Category, of 9,000 gal/ton. These values are not intended to represent limitations for permitting of the discharge. See the application for the NPDES permit filed with this document.

acceptable stream D.O. is 5.0 mg/l.) The point of minimum D.O. concentration occurs near the location of the proposed Coushatta water intake. (See Plate I-1). This shows that water taken from this point in the river is undergoing active degeneration (critical point has not been reached yet) and that the decomposition of organic wastes is not complete. This factor tends to make the water treatment plant handle additional chemical (organic/inorganic) load which increases the treatment cost.

4) The IPC plant intends to utilize an overland flow method of land treatment for wastewater treatment. The land treatment process has a number of advantages and has been used successfully in municipal and industrial applications. The projected effluent characteristics for the IPC containerboard complex were modeled using the Campbell Soup Company facility in Paris, Texas. This facility has been operational for over 15 years and has provided reliable treatment. The wastes from a containerboard complex differs greatly from food processing wastes. The actual quality of the IPC effluent will not be known until the plant becomes operational. However, the effluent quality is expected to comply with NPDES requirements to be issued by EPA. Anticipated BOD and TSS removal is 95% and 85% respectively. This removal level is predicated on the "design" performance of the system. Actual performance is sometimes less effective.

Proper treatment of the wastewater depends to a large extent on the soil characteristics. Two soil parameters at the proposed IPC land treatment site, pH and nutrient supply, are not suitable for the land treatment process and require augumentation. The soil pH is slightly acidic (5.0) and requires lime treatment to bring it to a neutral level. Nitrogen and phosphorus may also be added to provide proper nutrients for vegetation growth. These requirements become a maintenance problem over the life of a facility and are often neglected.

5) The Red River is currently being made navigable by a program involving bank stabilization, channel straightening, and a series of locks and dams. Navigation on the river is certainly desirable from an economic standpoint but it does create the possibility of oil spills and other pollutants from the boats and barges using the river. Such an accident upstream of the proposed water intake could force the shutdown of the pumping station until the condition is alleviated.

6) It is not desirable to locate an intake structure of a public water supply downstream of an effluent discharge point. Irrespective of the assurances of a high quality effluent from the IPC plant, public health risks however small, cannot be taken if an alternative take-off point or source exists.

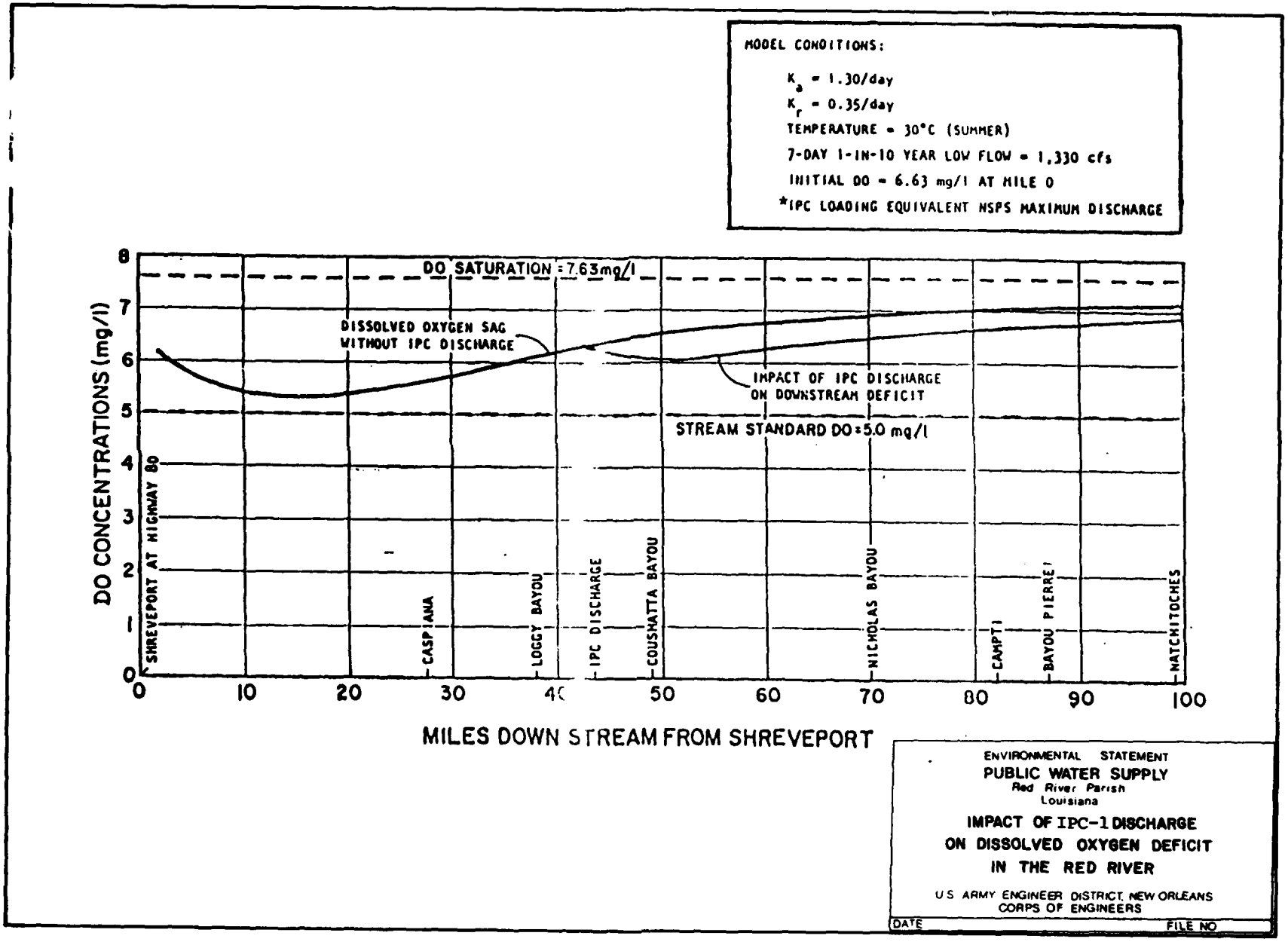
MODEL CONDITIONS:
K_a = 1.30/day
K_r = 0.35/day
TEMPERATURE = 30°C (SUMMER)
7-DAY 1-IN-10 YEAR LOW FLOW = 1,330 cfs
INITIAL DO = 6.63 mg/l AT MILE 0
*IPC LOADING EQUIVALENT NSPS MAXIMUM DISCHARGE
DO SATURATION = 7.63mg/l
DISSOLVED OXYGEN SAG WITHOUT IPC DISCHARGE
IMPACT OF IPC DISCHARGE ON DOWNSTREAM DEFICIT
STREAM STANDARD DO = 5.0 mg/l
DO CONCENTRATIONS (mg/l)
0
1
2
3
4
5
6
7
8
SHREVEPORT AT HIGHWAY 80
CASPIANA
LOGGY BAYOU
IPC DISCHARGE
COUSHATTA BAYOU
NICHOLAS BAYOU
CAMPTI
BAYOU PIERRE
NATCHITOCHES
0
10
20
30
40
50
60
70
80
90
100
MILES DOWN STREAM FROM SHREVEPORT
ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana
IMPACT OF IPC-1 DISCHARGE
ON DISSOLVED OXYGEN DEFICIT
IN THE RED RIVER
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE
FILE NO

PLATE I-1

Public health considerations take precedence over other considerations.

7) The proposed water storage facility (100 days) should mitigate to a large extent, the possible upsets mentioned and will allow flexibility of operation for the treatment plant.

The preceding discussion enumerated several points which indicate that the raw water intake should not be located downstream of the IPC discharge. There exists a reasonable doubt regarding the quantity, quality, and consistency of the wastewater discharge. Since public health is at stake no assumptions or unnecessary risks should be made.

For the purpose of this preliminary design and for the reasons enumerated in paragraphs 1-7 above, the raw water intake will be located on the Red River north of the International Paper Company discharge point. Plate I-2 indicates the proposed intake location and pipeline alignment.

This alternative will involve an intake structure/pumping station located on the Red River, approximately 9.8 miles of transmission pipeline, a sedimentation/storage basin, treatment and distribution system. Each of these components will be briefly described below.

Intake Structure/Pumping Station - The intake structure must be located to operate within the range of stage elevations of the Red River. Suitable bar screens and trash racks are required. The structure must be designed to prevent interference with river traffic.

The pumping station must be capable of pumping an average flow of 5.57 MGD against a head of 85'. It is assumed for the purpose of this analysis that three equal capacity pumps (2 primary plus 1 spare) will be used.

Preliminary calculations are presented subsequently.

Transmission Pipeline - A 9.8 mile transmission pipeline is required to transport Red River water from the intake to a storage reservoir at Coushatta. The coefficient of pipeline roughness is taken as C=110. Normally, this would be somewhat low for a fresh water pipeline, however, it is felt that the composition of Red River water (high suspended solids, high iron content) justifies the use of a lower factor.

The pipeline alignment is shown paralleling the Kansas City Southern railroad right-of-way. The actual location may vary based on the availability of easements and the existence of natural and/or man-made obstacles.

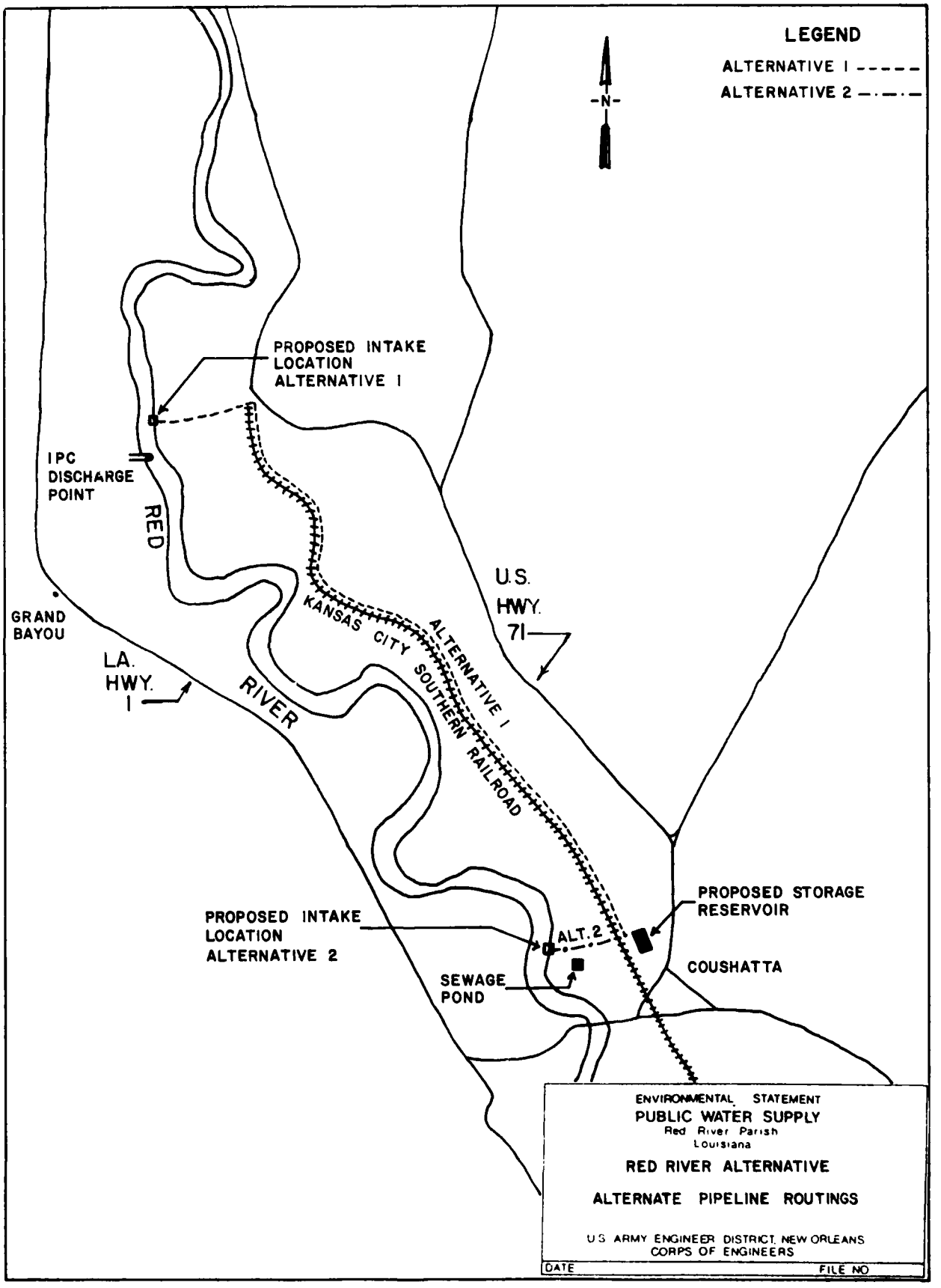
LEGEND
ALTERNATIVE 1 - - - - -
ALTERNATIVE 2 —·—·—
N
PROPOSED INTAKE LOCATION ALTERNATIVE 1
IPC DISCHARGE POINT
RED
RIVER
GRAND BAYOU
LA. HWY. 1
U.S. HWY. 71
KANSAS CITY SOUTHERN RAILROAD
ALTERNATIVE 1
PROPOSED INTAKE LOCATION ALTERNATIVE 2
ALT. 2
SEWAGE POND
PROPOSED STORAGE RESERVOIR
COUSHATTA
ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana
RED RIVER ALTERNATIVE
ALTERNATE PIPELINE ROUTINGS
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE
FILE NO

PLATE I-2

Storage Basin - The highly variable quantity of the water in the Red River combined with the generally poor water quality suggests the necessity of a sedimentation/storage basin prior to the treatment process. A storage reservoir will allow sedimentation of suspended solids and will provide for natural attrition of pathogens present in the water. More than half of the pathogens in water will die within the first two days and 90 percent will die by the end of the week.

The relatively large size of the basin (100 day capacity) will also provide a great deal of flexibility of operation of the treatment plant during periods of drought, pollutant spills on the river, or any drastic changes of river quality caused by unexpected events. However, an early warning system may have to be built-in to shut down the intake promptly.

The required size of the storage reservoir can only be determined after a detailed analysis of the water characteristics and treatment requirements. Bossier City, Louisiana withdraws water from the Red River and stores it in a 2000 acre-foot (100 acres by 20 foot depth) basin. This is equivalent to approximately 100 days of usage at the average consumption. Using this same criteria for the sizing of the proposed storage reservoir at Coushatta the required volume becomes:

$$\text{Vol. Reg'd} = 5{,}600{,}000 \text{ gal/day} \times 100 \text{ days} \times \frac{1 \text{ ft}^3}{7.48 \text{ gal}} \times 1/20' \text{ Depth}$$

$$\text{Vol. Reg'd} = 3{,}723{,}262 \text{ ft}^2 = 85 \text{ acres}$$

The reservoir will be located in the immediate vicinity of Coushatta for the purpose of this report. Although an alternative location would be near the proposed intake structure it is felt that this area would be remote and inconvenient for maintenance purposes.

Preliminary Calculation of Pumping Station Characteristics:

- Capacity, Q = 5.57 mgd = 3870 gpm
- Length of Force Main L = 9.8 miles = 51,744 Ft.
- Static Head = 43'
- Force Main diameter D = 27"
- Friction Losses (F.L.) at c=110 is 42' (from $\text{F.L.} = \frac{4.67}{D^{4.67}} \times \frac{(Q)^{1.85}}{(C)}$
- Total Dynamic Head (TDH) = 43' + 42' = 85'
- Velocity (V) = 2.17 fps.

Using standard manufacturer's pump curves a preliminary selection of the required pumps has been made as follows:

Assume a three pump system (equal capacity, 2 primary, 1 spare

pump). Each pump should have a capacity of 1935 GPM @ 85' Head. Typical pump efficiency = 85%. Typical motor efficiency = 90%. Overall efficiency = .77 = 77%. Therefore, horsepower required for each pump =

$$H.P. = \frac{(1935\ GPM)\ (85')}{3960\ (0.77)} \quad \text{from H.P.} = \frac{(GPM)(TDH)}{3960\ (Eff.)}$$

H.P. = 54 - USE Standard 60 H.P. Motor.

Water Treatment Facility - A general description of the process units required to treat Red River water can be given but at this point a detailed design is not feasible. The major components and their primary functions are listed below.

Raw Water Storage Basin - Provides sedimentation and natural attrition of pathogens. The addition of Copper Sulfate will probably be re-required to prevent algae growth. Also acts as an equalization basin for water quantity and quality variations.

Prechlorination - Reduces fecal coliform concentration, tastes and odors, and chlorides.

Mixing, Coagulation, and Sedimentation - Effective for the removal of fecal coliform, turbidity, color, calcium carbonate, and iron.

Rapid Sand Filtration - Further reduction of items listed under Mixing, Coagulation, and Sedimentation.

Chlorination - Final chlorination as required to provide a safe and potable water.

Treated water will be stored in a clear well prior to pumping into the distribution system.

Sludge Handling Facilities - A treatment plant capable of handling the projected design flows (5.6 MGD) will produce approximately 10,000 pounds per day of sludge (60,000 gpd at 2% concentration). Some method of sludge processing (dewatering and stabilization) and temporary storage (sand beds, sludge lagoons, etc.) will be required. Ultimate disposal facilities such as an approved landfill will also have to be provided. These facilities must be capable of drying sludge in times of high humidity and rainfall.

Plate I-3 presents a flow schematic for the proposed water treatment.

Table I-2 gives an estimated cost of the project in terms of 1976 dollars.

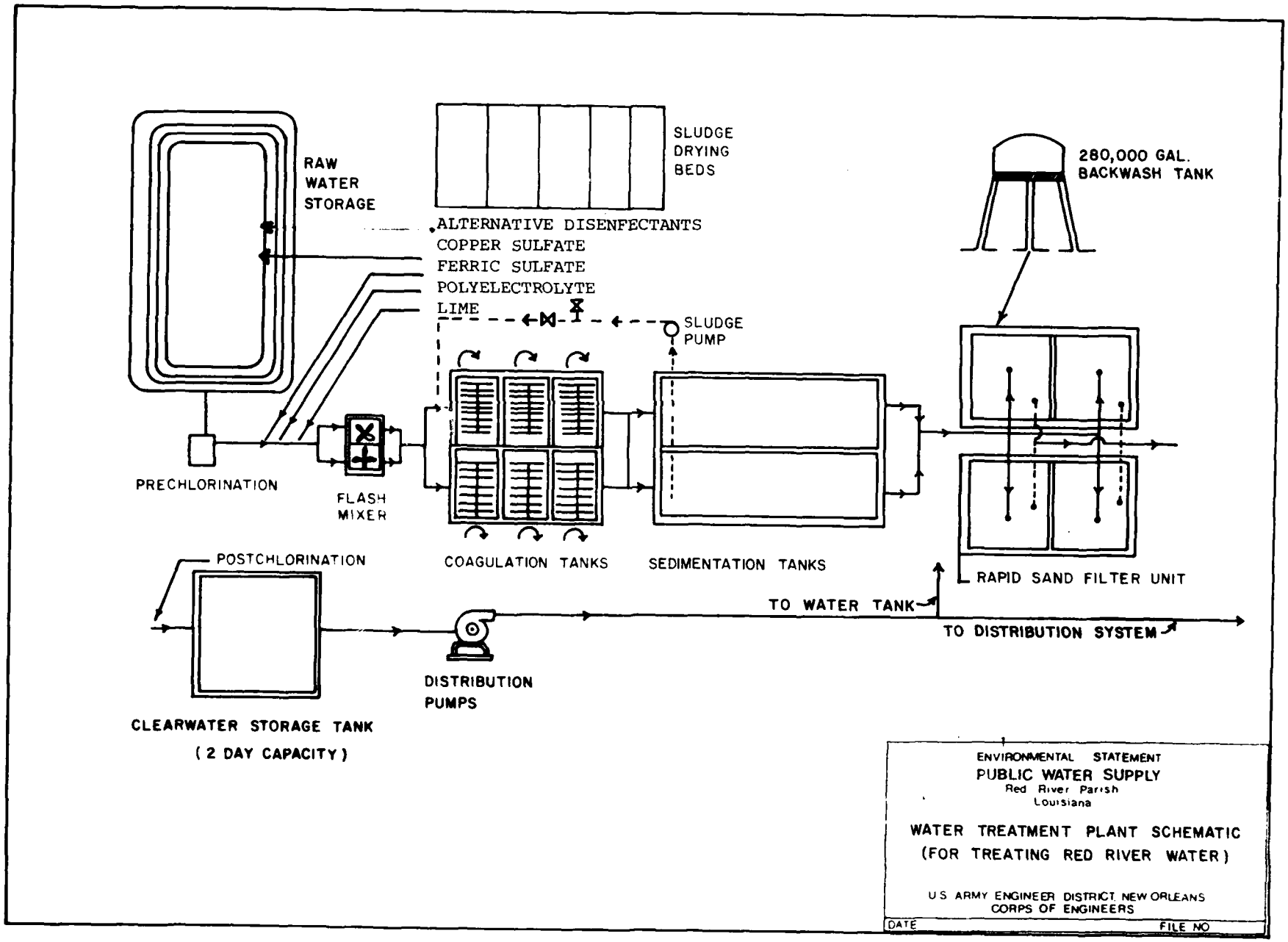
RAW
WATER
STORAGE
SLUDGE
DRYING
BEDS
280,000 GAL.
BACKWASH TANK
ALTERNATIVE DISENFECTANTS
COPPER SULFATE
FERRIC SULFATE
POLYELECTROLYTE
LIME
SLUDGE
PUMP
PRECHLORINATION
FLASH
MIXER
COAGULATION TANKS
SEDIMENTATION TANKS
RAPID SAND FILTER UNIT
POSTCHLORINATION
TO WATER TANK
TO DISTRIBUTION SYSTEM
DISTRIBUTION
PUMPS
CLEARWATER STORAGE TANK
(2 DAY CAPACITY)
ENVIRONMENTAL STATEMENT
PUBLIC WATER SUPPLY
Red River Parish
Louisiana
WATER TREATMENT PLANT SCHEMATIC
(FOR TREATING RED RIVER WATER)
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE
FILE NO

PLATE I-3

Table I-3 presents a summary of the Grand Bayou Reservoir costs for comparison. All figures are taken from the Feasibility and Development Plan and are in terms of the 1976 dollars.

Table I-4 gives the present worth and estimated annual cost of operation and maintenance for the Red River Alternative and the Grand Bayou Reservoir Alternative.

Table I-5 presents a summary of project costs.

Table I-6 gives information concerning the physical features of the proposed reservoir.

TABLE I-2

RED RIVER WATER SUPPLY SYSTEM
COST ESTIMATES
(1976 $)

No.	ITEM	Qty.	Unit Cost	Total Cost
1	27 inch diameter R-C-P force main	51,744 L.F.	$40/L.F.	$2,069,760
2	Intake well, pump station, mech./ electrical equip.	1 ea	lump sum	$1,000,000
3	Excavation & embankment work for reservoir.	1,600,000c.y.	$2.60/cy	$4,160,000
4	Land clearance for the reservoir	115 acres	$850/acre	$ 97,750
	TOTAL:			$7,327,510
5	Add for appurtenant works/structures for force main, reservoir, lift station, and misc. works and contingency			$1,099,130
6	Land acquisition	115 acres	$500/acre	$ 57,500
7	Right-of-way for force main	35 acres	$500/acre	$ 17,500
8	Total item 4 thru 7			$8,501,640
9	Add for Engineering Legal, Adm, etc. @ 15% of item 8			$1,275,240
10	Total Project Cost items 8 & 9			$9,776,880

All unit prices are the same as the ones used in the Feasibility Study Report for Grand Bayou Reservoir except for the cost of land which has been increased by $100/acre due to its proximity to urbanized areas.

TABLE I-3

GRAND BAYOU RESERVOIR
COST ESTIMATES
(YR 1976 $)

No.	ITEM	Qty.	Unit Cost	Total Cost
1	Reservoir Project Cost*	1 each	L.S.	$11,750,000
2	Force Main to Treatment Works 24" Ø **	25,000 L.F.	$36/L.F.	$ 900,000
3	Lift Station Appurtenant Structures **	1 each	L.S.	$ 500,000
4	Engineering, legal, adm. @ 15% of items 2 and 3			$ 210,000
5	Total Project Cost			$13,360,000

NOTES:

* Given in FDP. including estimates of cost of right-of-way and mitigation lands. Vol. II-A, Schedule C-1.

** Costs added to make the two alternatives compatable.

TABLE I-4

PRESENT WORTH AND ESTIMATED ANNUAL COST
OF O&M REPAIR (1976 $)

1.	Red River Water Supply Reservoir & Pumping & Pipeline O & M and Repair @ 2½% of cost of items 1 thru 5, table I-2 =	$ 210,670
2.	Grand Bayou Reservoir Project O & M and Repair	
	1. F.D.P. Vol II-A Schedule C-6=$32,700	
	2. Add for Vegetation Control, Dam Maintenance = $10,000	
	3. Transmission to treatment plant @ 2½% of items 2 & 3 of Table I-3 = $35,000	
	TOTAL: =	$ 77,000
	COST DIFFERENTIAL O & M AND REPAIR FOR RED RIVER RESERVOIR PROJECT	$ 133,670
Average Annual Cost allowing 7% for 15 years =		$ 133,670 x (2.05)
	=	$ 274,024
Present worth of O & M @ 7% interest, 30 year period, P.W.F. = 12.409		$ 3,400,364

TABLE I-5

SUMMARY OF PROJECT COSTS
(ESTIMATED YR 1976 $)

I. RED RIVER WATER SUPPLY SYSTEM (Reservoir & Transmission to Treatment Plant)	
a. Project Construction Cost (Table I-2) =	$9,776,880
b. Present worth of Annual O & M and Repair Cost differential (Table I-4) =	$3,400,364
TOTAL PRESENT WORTH OF PROJECT =	$13,177,244
II. GRAND BAYOU RESERVOIR PROJECT	
Grand Bayou Dam and Reservoir Project Cost (Table I-3)	$13,360,000

TABLE I-6

RESERVOIR PHYSICAL FEATURES

Crest of Dam	Pool Stage	Approximate Volume in Acre Feet*	Surface Area of Lake	Area of Watershed by Square Miles
150.0'	138.5'	24,300	2,700 acres	135.84

SOURCES: Sunbelt Research Corporation, March, 1982.

* Acre-foot: the volume that would cover one acre to a depth of one foot.

APPENDIX J

LETTERS

February 29, 1980

Mr. Charles Whitehead, Sec.-Treas.
Northwest Louisiana Game and Fish Reserve
P.O. Box 697
Natchitoches, Louisiana 71457

Dear Mr. Whitehead:

For the past several years our commission has actively pursued a search for a reliable supply of good quality water for use by municipalities and industries in Red River Parish. Withdrawal of water from Black Lake is an alternative source which is currently being considered.

The supply of water selected for Red River Parish must meet demands for a period of thirty years. During project year one, approximately 1.5 to 2.0 million gallons per day will be required. By the fifteenth year the demand will be 3.5 to 4.0 million gallons per day and 7.5 to 8.0 million gallons per day by the thirthieth year.

Users would bear the responsibility for construction and maintenance of necessary intake treatment and transmission facilities.

In order to insure that these potential users will have a dependable water supply at a stated price for a 30 year period in the amounts listed above (3.5 mgd to 8.0 mgd), your agency is being asked if such quantity and quality of water is available and if a contract providing terms stated above can and will be entered into by your agency and our commission.

Your prompt attention to this request will be appreciated due to the urgent need of water in Red River Parish.

Cordially,

John K Kelly

John Kelly, President
Grand Bayou Reservoir Commission

cc: Dr. Bill Long
Sunbelt Research

LAW OFFICES OF
WHITEHEAD AND McCOY

CHARLES R. WHITEHEAD JR.
KENNETH D. McCOY JR.
GREGORY N. WAMPLER

300 ST. DENIS STREET · P. O. BOX 697 · (318) 352-6481
NATCHITOCHES, LOUISIANA 71457

March 13, 1980

Mr. John Kelly, President
Grand Bayou Reservoir Commission
Coushatta, Louisiana 71019

Re: Northwest Louisiana Game & Fish Preserve Commission

Dear Mr. Kelly:

Your letter of February 29, 1980 on behalf of the Grand Bayou Reservois Commission has been received.

Your request concerning withdrawal of water from Black Lake as an alternative source for municipal and industrial uses has been discussed by the commission members.

Unfortunately, because of the current water demands within Natchitoches Parish by users and prospective need for the water from Black and Clear Lakes in the future, the Northwest Louisiana Game & Fish Preserve Commission, with regrets, will not be able to make any commitment to furnish any water to the Grand Bayou Reservoir Commission.

Yours very truly,

NORTHWEST LOUISIANA GAME & FISH PRESERVE COMMISSION

By: C. R. Whitehead, Jr.
Secretary-Treasurer

CRW/lh

February 29, 1980

Mr. Burton Angelle, Secretary
Department of Wild Life and Fisheries
400 Royal Street
New Orleans, Louisiana 70130

Dear Mr. Angelle:

For the past several years our commission has actively pursued a search for a reliable supply of good quality water for use by municipalities and industries in Red River Parish. Withdrawal of water from Lake Bistineau is an alternative source which is currently being considered.

The supply of water selected for Red River Parish must meet demands for a period of thirty years. During project year one, approximately 1.5 to 2.0 million gallons per day will be required. By the fifteenth year the demand will be 3.5 to 4.0 million gallons per day and 7.5 to 8.0 million gallons per day by the thirthieth year.

Users would bear the responsibility for construction and maintenance of necessary intake treatment and transmission facilities.

In order to insure that these potential users will have a dependable water supply at a stated price for a 30 year period in the amounts listed above (3.5 mgd to 8.0 mgd), your agency is being asked if such quantity and quality of water is available and if a contract providing terms stated above can and will be entered into by your agency and our commission.

Your prompt attention to this request will be appreciated due to the urgent need of water in Red River Parish.

Cordially,

John Kelly

John Kelly, President
Grand Bayou Reservoir Commission

cc: Dr. Bill Long
Sunbelt Research

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
400 ROYAL STREET
NEW ORLEANS 70130

J. BURTON ANGELLE
SECRETARY

EDWIN EDWARDS
GOVERNOR

March 27, 1980

Mr. John Kelly, President
Grand Bayou Reservoir Commission
P. O. Box 308
Coushatta, LA 71019

Dear Mr. Kelly:

I am in receipt of your recent letter pertaining to the request of the Grand Bayou Reservoir Commission to withdraw water from Lake Bistineau over a thirty year period for municipal and industrial use in Red River Parish. This lake provides very high quality recreation and the Louisiana Department of Wildlife and Fisheries can not allow the use of the lake in any manner which might jeopardize this activity. In view of the above, we find it necessary to deny withdrawal of water as requested.

If you need further justification for this denial, please let me know.

Sincerely yours,

J. Burton Angelle

J. Burton Angelle
Secretary

JBA:KCS:csg
cc:
Senator Don Kelly
Rep. H. M. Fowler

Copy

PINEVILLE KRAFT CORPORATION

P. O. BOX 570

PINEVILLE, LOUISIANA 71360

WOOD PRODUCTS

POST OFFICE BOX 102
COUSHATTA, LOUISIANA

March 20, 1980

Mr. Chris Ingram
SUNBELT RESEARCH CORP.
727 Spain Street
Baton Rouge, La. 70802

Dear Chris:

Attached is a water analysis report from our Boiler treatment vendor indicating test results from four samples taken over the past two years. The total water requirements for our plant are satisfied from three on-site water wells. The water hardness level is high and is a major expense for our Boiler operation to correctly-chemically treat the water.

I do not have a number for annual water usage as we do not meter from our wells, but certainly the quality of the water is not desirable, and, perhaps, we are on the same water table as is the town of Coushatta's current water supply.

Hopefully, this information will be of some benefit to you in proceeding in your endeavor to improve the area's long-range water requirements.

Sincerely yours,

PINEVILLE KRAFT CORPORATION

Henry Conly

Henry Conly
Plant Manager

HC/vl
Attachment
cc: John Kelly/Member Coushatta Town Council
File

JACKIE D. HUCKABAY, M. D.
RES. PHONE 932-5885

FRED S. WILLIS, M. D.
RES. PHONE 932-5885

L. S. Huckabay, M. D. Memorial Hospital

OFFICE PHONE 932-5786 -:- POST OFFICE BOX 369

COUSHATTA, LOUISIANA 71019

April 3, 1980

Sunbelt Research Corporation
727 Spain Street
Baton Rouge, LA 70802

ATTENTION: Dr. Bill Long,
Chairman of the Board

Dear Mr. Long,

We are very much interested in the Grand Bayou Lake because of the severe problems associated with extremely poor water in the Coushatta, Red River Parish area.

I operate a hospital here, as well as living in the community, and use the city water which is very far below standards. For example, in corrosiveness, our hospital plumbing system has extreme problems. The circulating pump for the hot water system has to be replaced approximately every three months, at a cost of $150.00. The hospital is less than ten years old and at the time of its construction the best possible copper piping was used because of the water problems, and we have still had to go into the slab on some three occasions because of the corrosiveness and the fact that the pipes have been eaten away. In addition, we have an x-ray developing machine which normally last about 8-10 years. We are now operating on our third x-ray developer and this is felt to be due primarily to the poor condition of the water.

There is, of course, from the medical aspect, a possibility of health hazards which are very great. There are definite foreign matters in the water which is higher than the desirable State standards, I am sure. I do not know of any specific infective episodes due to the city water but they do use very high levels of chlorine in an effort to keep the bacterial counts down, and to the point on occasions the chlorine is very objectionable.

Another point of the extreme corrosiveness and scale deposit associated with the water is the fact that hot water tanks rarely last over three years in this area. I know personally that most appliance centers will not sell

in the area because of the problems with guarantees. They are unable to meet their guarantees because the hot water tanks as well as the ice making machines usually have severe repair problems before the normal guarantee time has expired.

It appears that the Grand Bayou Reservoir is probably the best source for the water we need in our area. I would appreciate your help and consideration in aiding us to obtain this water source.

Sincerely,

L.S.HUCKABAY, M.D. MEMORIAL HOSPITAL, IN

Jackie D. Huckabay, M.D.

JDH:drb

APPENDIX K

PROPOSED MEMORANDUM OF AGREEMENT

PROPOSED MEMORANDUM OF AGREEMENT

WHEREAS, the Corps of Engineers may issue a permit to the Grand Bayou Reservoir Commission for construction of the Grand Bayou Dam and Reservoir Project, Red River Parish, Louisiana; and,

WHEREAS, the Corps, in consultation with the Louisiana State Historic Preservation Officer (SHPO), has determined that this undertaking as proposed may have an adverse effect upon cultural properties eligible for the National Register of Historic Places (National Register); and,

WHEREAS, pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320) and Section 800.4(d) of the regulations of the Advisory Council on Historic Preservation (Council), "Protection of Historic and Cultural Properties" (36 CFR Part 800), the Corps has requested the comments of the Council; and,

WHEREAS, pursuant to Section 800.6 of the Council's regulations, representatives of the Council, the Corps, the Commission, and the Louisiana SHPO have consulted and reviewed the undertaking to consider feasible and prudent alternatives to avoid or satisfactorily mitigate the adverse effect;

NOW, THEREFORE, it is mutually agreed that the undertaking will be implemented in accordance with the following stipulations to satisfactorily mitigate adverse effects on the above-mentioned properties:

STIPULATIONS

1. The permit to be issued by the Corps for the proposed undertaking will be conditioned to require that:

   a. the applicant may commence construction on a segment of the project when the intensive cultural properties investigation is completed on that segment in a manner consistent with 36 CFR Part 66, Appendix B, "Guidelines for the Location and

Identification of Historic Properties Containing Scientific, Prehistoric, Historical, or Archaeological Data" and Appendix C, "Professional Qualifications" (Attachment #1), and the results are reported to the Louisiana SHPO for review and comment. The project area shall include the conservation pool, all construction areas including associated recreation, water pipelines, intake structures, borrow and disposal areas, relocations, and clearing and grubbing operations. The Commission shall carry out the mitigation plan, including completing the final report, prior to closing the gates of the dam or filling the reservoir, provided that cultural resource mitigation expenditures to the Commission not exceed one million dollars or the cost of mitigation, whichever is smaller.

b. the applicant shall avoid any ground disturbing activities that will result in an adverse effect in the vicinity of cultural properties. Those properties discovered during construction that appear to meet the Criteria for inclusion in the National Register (36) CFR Part 1202) will be avoided until the Corps has been notified by the applicant of the discovery. The Corps will notify the Department of the Interior (DOI) pursuant to 36 CFR Part 800.7. At that time, DOI will make a determination and recommend further action within 48 hours or construction may proceed. If avoidance is not possible, DOI shall be requested to provide plans and funds for immediate mitigation, construction may proceed. For those cultural properties which appear to meet the Criteria for inclusion in the National Register, the Corps, in consultation with the SHPO, shall seek determinations of eligibility from the Secretary of the Interior, pursuant to 36 CFR Part 1204.3.

c. the Commission voluntarily assumes mitigation costs up to one million dollars. The money will be spent following recommendations from a committee made up of one member from each agency signing this Memorandum of Agreement (Agreement). It is understood that construction areas will have priority for mitigation funds in order not to delay the project. The applicant agrees to avoid any ground disturbing activities of National Register-eligible sites until the mitigation effort is completed or there are no more funds available from the Commission or the Secretary of the Interior. Funds from Interior will not reduce the responsibility of the Commission below the commitment specified in 1.a. above.

d. pursuant to 33 CFR Part 325, Appendix C, Section 9 and 11, of the Corps' permitting regulations, the Corps will encourage the Commission to cooperate with and assist the Department of the Interior to develop a cooperative program for data recovery. Such a program will have as its goal professional and expeditious recovery of known cultural properties and those encountered during construction. The DOI shall be requested to take steps to carry out the mitigation program in accordance with the authority granted by PL 93-291. The DOI shall be further requested to keep the Corps, SHPO, and Commission informed of its activities through periodic reports.

e. alterations in location or design of the undertaking will be submitted by the applicant to the Corps and the Louisiana SHPO for review and approval prior to implementation.

f. during construction, the Corps will be allowed to make occasional inspections by a qualified archaeologist as defined in 36 CFR Part 66, Appendix C. The Commission will provide annual reports to the Corps,

SHPO, and Council on the progress of construction and archaeological work.

g. the Commission shall incorporate the conditions of this permit in all right-of-way documents and agreements allowing destructive use, which may include but are not limited to pipeline trenches, channelization, and bulldozing.

h. all artifacts shall be deposited, after analysis, in a permanent repository agreeable to the Corps and SHPO.

2. The mitigation plan will be reviewed and approved by the Corps, Council, and SHPO before the permit is issued. The plan will include, but is not limited to, the following:

a. establishment of a problem-oriented, theoretical research design for evaluation of site significance and as a guide to mitigation activities.

b. preservation, avoidance, and/or recovery of cultural properties affected by the project.

c. procedures for recovery of information when cultural properties are encountered during construction or in other emergency situations. Procedures must include prompt notification of the Corps and the SHPO.

d. methodological and analytical considerations to resolve regional archaeological and historical problems addressable by data likely to be gathered in these investigations.

e. correlations of sites and problems for selection of the most efficient mitigation effort. This selection should consider different levels of both potential site destruction and problem resolution in arriving at the final recommended mitigation plan.

f. development of a popular report of research results and a final

technical report describing data from the mitigation program and results thereof.

g. informing construction personnel of the presence of cultural properties and the establishment of procedures to consider such properties in all project activities that may have an effect on the properties.

3. Failure to carry out the terms of this Agreement requires that the Corps again request the Council's comments in accordance with 36 CFR Part 800. If the Corps cannot carry out the terms of the Agreement it shall not take or sanction any action or make any irreversible commitment that would result in an adverse effect with respect to National Register or eligible properties covered by the Agreement or would foreclose the Council's consideration of modifications or alternatives that could avoid or mitigate the adverse effect until the commenting process has been completed. Should the current Cultural Resources Management Program of the New Orleans District be revised or superceded or the regulations of the council revised, the ratifying parties will mutually determine whether the provision of the Agreement will continue to apply.

4. If any of the signatories to this Agreement determine that the terms of the Agreement cannot be met or believes a change is necessary, that signatory shall immediately require the consulting parties to consider an amendment or addendum to the Agreement. Such an amendment or addendum shall be executed in the same manner as the original Agreement.

5. Within 90 days after carrying out the terms of the Agreement, the Corps shall provide a written report to all signatories to the Agreement on the actions taken to fulfill the terms of the Agreement.

Executive Director (date)
Advisory Council on Historic Preservation

District Engineer (date)
Corps of Engineers, New Orleans District

Louisiana State Historic Preservation (date)
Officer

Chairman (date)
Advisory Council on Historic Preservation

Concur:

Chairman, Grand Bayou (date)
Reservoir Commission

NOTE: The Corps of Engineers, New Orleans District is in the process of coordinating the proposed Memorandum of Agreement with the responsible parties involved. This proposed Agreement has not been fully executed but does outline our plans for insuring that cultural resources are afforded adequate consideration and that compliance with the National Historic Preservation Act is fulfilled.

APPENDIX L

United States Department of the Interior
OFFICE OF THE SECRETARY
SOUTHWEST REGION
POST OFFICE BOX 2088
ALBUQUERQUE, NEW MEXICO 87103

MAY 07 1981

Colonel Thomas A. Sands
District Engineer
New Orleans District, Corps of
Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Sands:

We have reviewed the Draft Environmental Impact Statement for the Public Water Supply, Red River Parish, Louisiana, and have the following comments.

Cultural Resources

From the standpoint of cultural resource impacts Alternative No. 1 could have less impact because the pipeline can be routed around any cultural resources. In the summary on page X, it is stated that procedures for compliance with historic preservation, legislation, and regulations will be followed in coordination with the State Historic Preservation Officer (SHPO). We encourage early completion of these procedures, especially the cultural resources surveys and other necessary studies for the location, identification, and evaluation of the resources. The final statement should include a summary of these findings along with correspondence from the SHPO concerning the project.

Mineral Resources

I-1

No information is presented on the impacts of the alternatives on mineral resources. However, possible impacts appear to be insignificant. Several abandoned or inactive sand and gravel pits lie within the area of the proposed Grand Bayou Reservoir, but loss of these resources would be minimal. Depending on the dam design, if Alternative No. 2 is adopted, such sand and gravel deposits may be useful in construction. Alternative No. 1 impacts only the area covered by a pipeline, settling pond, and water treatment plant whereas Alternative No. 2 impacts a much larger area. Because Red River Parish contains few mineral resources, it would appear that neither alternative should have a major impact on mineral resources.

We suggest that the final environmental statement contain a map of suitable size and scale showing the location of each planned facility, together with a brief narrative statement on the mineral resource consequences and mitigation measures, if any, for each alternative.

Water Resources

On pages VII and II-11, it is stated that existing wells have a present capacity of less than 7 percent of the proposed Grand Bayou Reservoir's design capacity of nearly 8 mgd (year 2000). Yet table 1 shows groundwater usage of 7.02 mgd in 1975 and a projected usage of even more in 1980. This apparent discrepancy should be clarified.

The section on Water Quality would be improved if it included information concerning effects of the proposed Grand Bayou impoundment on the quality of inflow to Black Lake.

Thank you for the opportunity to comment.

Sincerely,

Raymond P. Church

COE RESPONSE

This is to acknowledge receipt of your comments on the DEIS for the proposed public water supply in Red River Parish. The issues you raised will be addressed in the final EIS.

00-S

Advisory Council On Historic Preservation

1522 K Street, NW
Washington, DC 20005

Reply to:

Lake Plaza South, Suite 810
44 Union Boulevard
Lakewood, CO 80228

April 10, 1981

Colonel Thomas A. Sands
District Engineer
Department of the Army
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Sands:

The Council has received and reviewed the draft environmental statement (DES) for the proposed Grand Bayou Reservoir in Red River Parish, Louisiana, and notes that numerous historic and cultural properties that may be eligible for inclusion in the National Register may be affected by this undertaking.

L-2

Pursuant to its responsibilities under Section 102(2)(c) of the National Environmental Policy Act of 1969, the Council has determined that the DES is inadequate because it does not demonstrate compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320) as implemented through the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800).

Until the requirements of Section 106 and the regulations are met, the Council considers the DES to be incomplete in its treatment of the cultural properties. To remedy this deficiency, the Council will provide substantive comments on the undertaking's effect on the cultural properties through the process detailed in Section 800.4 of its regulations. Please call Jane King at FTS 234-4946 to assist you in completing this process as expeditiously as possible to avoid any unnecessary delays in the implementation of this undertaking.

Sincerely,

Louis S. Wall
Chief, Western Division
of Project Review

COE RESPONSE

This is to acknowledge receipt of your comments on the Grand Bayou Reservoir DEIS. Pursuant to your request, an agreement incorporating requirements of 16 U.S.C. Sec. 470 f as amended, 90 Stat. 1320 and 36 CFR Part 800 will be included as a part of the final EIS.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

POST OFFICE BOX 4305
111 EAST MAIN STREET
LAFAYETTE, LOUISIANA 70502

April 23, 1981

District Engineer
U.S. Army Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Sir:

Reference is made to special public notice LMNOD-SP(Grand Bayou)132 dated April 9, 1981. In this notice the New Orleans District states that it has published a Draft Environmental Impact Statement (DEIS), titled Public Water Supply Red River Parish, Louisiana. The DEIS discusses the proposed work included in public notice LMNOD-SP (Grand Bayou)132, dated December 27, 1977. The Black Lake Bayou Recreation and Water Conservation District of Red River Parish has requested a Department of the Army permit to install and maintain a 2,700-acre reservoir with a dam, spillway, and appurtenances across Grand Bayou approximately 7.5 miles east of Coushatta, Louisiana. The purpose of the reservoir is to provide recreation, and municipal and industrial water supply. The following comments are provided under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

L-3

In an October 30, 1979, letter, the FWS recommended that compensation and mitigation measures should be incorporated into project plans. According to our review of the DEIS the applicant has substantially included those compensation and mitigation measures as an integral part of the project. Therefore, we will not oppose issuance of the requested permit.

Sincerely yours,

Cary W. Kerlin

Cary W. Kerlin
Field Supervisor

cc: La. Dept. of Wildlife and Fisheries, Baton Rouge, La.
Area Office, FWS, Jackson, Ms.
Regional Office, FWS, Atlanta, Ga. Attn: Dennis Chase
EPA, Dallas, Texas

COE RESPONSE

This is to acknowledge and thank you for your comments re: USCE LMNOD-SP-Grand Bayou DEIS.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

June 2, 1981

Colonel Thomas A. Sands
New Orleans District Engineer
Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Sands:

We have completed our review of the Draft Environmental Impact Statement (EIS) on the proposed Grand Bayou Reservoir Project to be located in Red River Parish, Louisiana. This EIS is prepared as a result of the Black Lake Bayou Recreation and Water Conservation District application to the New Orleans District Corps of Engineers to install and maintain a dam, spillway, and appurtenances to form a reservoir for municipal and industrial water supply with attendant incidental recreational value. Water for domestic users will be furnished to the entire portion of the Parish located on the east side of the Red River. Non-domestic users are located in the vicinity of Coushatta, Louisiana. The project location is across Grand Bayou at a point 4.1 miles above the mouth of the waterway approximately 7.5 miles east of Coushatta. Alternatives to the reservoir proposal include: groundwater withdrawal, Red River water withdrawal, and No Action. Funds for construction will be provided by the State of Louisiana.

L-4

The following comments are offered for your consideration. The comments express this Agency's views and position on the proposed project action, while addressing the adequacy of this Draft EIS. These comments should provide assistance for development of the Final EIS.

1. The EIS needs to be strengthened in presenting sufficient data for EPA to totally agree that the Red River is probably the least desirable choice as a raw water supply source for the city of Coushatta and Red River Parish. Review of the Draft EIS reveals that the Red River had greater quantities of some constituents than the water in Grand Bayou. However, data from the Grand Bayou in some instances is based on one-time grab samples which may or may not be indicative of its average water quality. More information on the comprehensive sampling program should be included in the Final EIS to allow for substantiation of the conclusions presented in the Draft EIS.

2. The major problem we see using the Red River is the discharge from International Paper Company (IP). We believe the Red River could be utilized if some provision is made for the high colored discharge from IP. If the IP discharge is located below the Red River water supply intake, it appears the Red River water could be treated as easily and satisfactorily as the Grand Bayou water by properly trained operators.

   The financial burden as discussed in the Draft EIS of using the Red River is the 2.1 million dollars cost to construct the raw water transmission line above the IP discharge. This cost at the present is to be paid by the Black Lake Bayou Recreation and Water Conservation District. Other alternatives that should be considered and presented in the Final EIS include the possibilities such as having both the city of Coushatta and IP help pay for the raw water line or having IP relocate their discharge significantly below the proposed water supply intake. These alternatives should be investigated by the Water Conservation District before any further decisions are made. The findings and conclusions reached should be presented in the Final EIS.

3. The EIS needs to be strengthened in the analysis of the expected reservoir water quality and the associated impacts due to land inundation. The nature and composition of vegetative cover and soils within the reservoir area can directly influence the overlaying water quality subsequent to impoundment. Water quality changes resulting from initial inundation of the reservoir and continuing for varying periods up to several years may affect both consumptive withdrawals and downstream uses. Substantial depletion of dissolved oxygen, organic enrichment, increases in iron, manganese, nutrients, increased algae growth, and eutrophication are just a few such changes that need to be considered and evaluated. Such information is essential to insure that water quality of the proposed impoundment will be of substantially better quality for domestic water supply than that which could be provided by the alternatives considered. This matter should be carefully discussed in the Final EIS.

4. The Draft EIS does not sufficiently address compliance with Executive Order (E.O.) 11990. This order recognizes the significant values provided by wetlands and requires each Federal agency to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance their natural and beneficial values. This Executive Order establishes Federal policy to discourage unnecessary alteration or destruction of important wetlands as contrary to public interest. Wetlands considered to perform functions important to the public include:

   a. Wetlands which serve important natural biological functions, including food chain production, general habitat, nesting, spawning, rearing, and resting sites for aquatic or land species;

b. Wetlands set aside for study of the aquatic environment or as sanctuaries or refuges;

c. Wetlands the destruction or alteration of which would affect detrimentally the natural drainage characteristics, sedimentation patterns, salinity distributions, flushing characteristics, current patterns, or other environmental characteristics;

d. Wetlands which are significant in shielding other areas from wave action, erosion or storm damage;

e. Wetlands which serve as valuable storage areas for storm and floodwaters;

f. Wetlands which are prime, natural recharge areas, and;

g. Wetlands which through natural water filtration process serve to purify water.

The Draft EIS indicates construction of the Grand Bayou Reservoir will directly affect and modify 2700 acres of habitat much of which is composed of Upland and Bottomland Hardwoods. However, the document fails to identify the amount of resources considered wetlands.

E-5

In accordance with E.O. 11990 and the above prescribed wetland policy, the Corps is directed to avoid undertaking or providing assistance for new construction in wetlands unless there is no practical alternative and the proposed action will include all practicable measures to minimize harm to important wetland resources. Therefore, we believe for the EIS to appropriately address and evaluate the extent of wetland impacts, the Final EIS should identify the wetland areas to be affected and their relative importance using the established public interest criteria. Once completed, the EIS should evaluate and substantiate whether or not this project conforms with the prescribed intent of E.O. 11990. This matter should be thoroughly discussed in the Final EIS.

5. The Draft EIS fails to identify the amount of acreage and the extent of impact to the areas considered prime agricultural land. It is EPA's policy to consider the protection of the Nation's environmentally significant agricultural lands from irreversible conversion to uses which result in their loss as an environmental or essential food production resource. Therefore, we believe the direct or indirect effects of the proposed undertaking on prime farmland should be evaluated as to its environmental and economic significance. This can be accomplished by contacting the United States Department of Agriculture, State Land Use Committees or the State Conservationist of the Soil Conservation Service. All mitigation measures available to minimize prime farmland losses should be considered. Full discussion on this concern should be included in the Final EIS.

6. The illustration of the water treatment facility on page I-10 shows sludge drying beds. The Final EIS should examine whether the humidity and rainfall in this area will allow for effective evaporation and drying of sludge on these beds. If the sludge cannot be properly dried, some other alternative for sludge disposal should be investigated.

7. In reference to discussions on page I-9 regarding proper water treatment, we recommend that the water treatment plant include facilities for feeding alternate disinfectants to control formation of trihalomethanes. This should be done regardless of which alternative source is selected.

These comments classify your Draft EIS as ER-2. Specifically, we are expressing environmental reservations regarding the potential impacts of the proposed alternative to both wetland and prime farmland resources. We ask that the alternatives considered in the Draft EIS and those recommended in our comment letter be further evaluated and compared from all aspects including both environmental consequences and economic costs (e.g., prime farmland and wetland losses versus cost of Red River alternative). Furthermore, we request that the Final EIS verify that water from the proposed impoundment will be of substantially better quality as a domestic raw water supply when compared to the alternatives considered, in particular the Red River alternative. In addition to these concerns, we are requesting that the Final EIS provide further impact assessment to both wetland and prime farmland resources and discuss the proposed action conformance to the respective protection policies identified in our preceding comments.

Definitions of the categories are provided on the enclosure. Our procedure is to categorize the EIS on both the environmental consequences of the proposed action and on the adequacy of the EIS at the draft stage, whenever possible.

We appreciated the opportunity to review the Draft EIS. Please send our office five (5) copies of the Final EIS at the same time it is sent to the Office of Federal Activities, U.S. Environmental Protection Agency, Washington, D.C.

Sincerely,

Frances E. Phillips

Frances E. Phillips
Acting Regional Administrator

Enclosure

ENVIRONMENTAL IMPACT OF THE ACTION

LO - Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER - Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to re-assess these aspects.

EU - Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

ADEQUACY OF THE IMPACT STATEMENT

Category 1 - Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 - Insufficient Information

EPA believes the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3 - Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement. If a draft statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make a determination.

COE RESPONSE

1. Water Quality. The E.I.S. has been changed to incorporate your request for more data on water quality. Please see "Beneficial/Adverse Impacts"(pages viii and ix) and the section on "Water Quality," pages II-15,16.

2. The International Paper Company's (IP) discharge was stated in your letter as a "major problem" for which consideration should be given. On review and in discussions with IP management, we find that the discharge point for the IP has already been approved by the E.P.A. and, secondly, that the discharge point can not be moved because the discharge goes through a land treatment process integrally related to the area's topography. Regarding payment for the transmission line north of the IP discharge, both the City of Coushatta and IP feel the costs of the line are legitimate project costs which must be borne by the project.

3. The matter of expected reservoir water quality, per your recommendation, is discussed in Section 2.05 of the E.I.S. (page II-20) and also on page III-6.

4. Executive Order (E.O.) 11990 refers to Federal projects and/or Federal lands. The proposed Grand Bayou Reservoir is a project fully supported by non-Federal funds. However, in the spirit of E.O. 11990, all efforts have been made to comply with the intent of E.O. 11990. (See page III-13.) E.O. 11990 states: "(b) This Order does not apply to the issuance by Federal agencies of permits, licenses, or allocation to private parties for activities involving wetlands on non-Federal property." In Section 1 (a)(1) and 1(a)(2), all references are made to "Federal lands....," "federally undertaken, financed....," and "Federal activities or programs...." The U.S. Corps of Engineers will not assist in the proposed project's design, construction or funding.

5. The E.I.S., per your recommendation, addresses prime farmlands and identifies two percent of the area to be impounded as prime farmlands.

6. The project's engineers have determined that sludge can be properly dried.

7. The comment regarding disinfectants has been addressed in the final E.I.S.

Thank you very much for your valuable comments. The issues you raised have been addressed in the final E.I.S.

OD-S

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Policy
Washington, D.C. 20230

Colonel Thomas A. Sands
District Engineer, Corps of Engineers
New Orleans District
Department of the Army
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Sands:

This is in reference to your draft environmental impact statement entitled, "Public Water Supply, Red River Parish, Louisiana." The enclosed comment from the National Oceanic and Atmospheric Administration is forwarded for your consideration.

Thank you for giving us an opportunity to provide this comment, which we hope will be of assistance to you. We would appreciate receiving four copies of the final statement.

L-7

Sincerely,

Robert T. Miki
Deputy Assistant Secretary
for Regulatory Policy (Acting)

Enclosure Memo from: Robert B. Rollins
National Ocean Survey
NOAA

COE RESPONSE

A search of Survey Br records shows that there are no active bench marks or geodetic monuments in the subject area.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Rockville, Maryland 20852

OA/C52x6:JVZ

TO: PP/EC - Thomas K. Bick

FROM: OA/C5 - Robert B. Rollins

SUBJECT: DEIS #8104.08 - Public Water Supply, Red River Parish, Louisiana

The subject statement has been reviewed within the areas of the National Ocean Survey's (NOS) responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

Geodetic control survey monuments may be located in the proposed project area. If there is any planned activity which will disturb or destroy these monuments, NOS requires not less than 90 days' notification in advance of such activity in order to plan for their relocation. NOS recommends that funding for this project includes the cost of any relocation required for NOS monuments. For further information about these monuments, please contact Mr. John Spencer, Director, National Geodetic Information Center (OA/C18), or Mr. Charles Novak, Chief, Network Maintenance Branch (OA/C172), at 6001 Executive Boulevard, Rockville, Maryland 20852.

L-8

10TH ANNIVERSARY 1970-1980
National Oceanic and Atmospheric Administration
A young agency with a historic tradition of service to the Nation

COE RESPONSE

A search of Survey Br records shows that there are no active bench marks or geodetic monuments in the subject area.

United States Department of Agriculture

Soil Conservation Service

3737 Government Street
Alexandria LA 71301

May 7, 1981

Colonel Thomas A. Sands
District Engineer
Corps of Engineers
P. O. Box 60267
New Orleans, LA 70160

Dear Colonel Sands:

Re: LMKOD-SA(Grand Bayou)132

As requested, we have reviewed the Draft Environmental Impact Statement for the Public Water Supply, Red River Parish. Your evaluation should include the impact of the two proposed alternatives on prime and unique farmland.

Prime farmlands are those whose value derives from their general advantage as cropland due to soil and water conditions. The land does not have to be presently in row crops to be classified as prime farmland. Prime farmland can be cropland, pastureland, forestland, or other land, but not urban builtup land.

L-9

Unique farmland is land other than prime farmland that is devoted to one of the following uses: sugarcane, citrus, catfish ponds or crawfish ponds.

Enclosed is the soil survey report for Red River Parish, issued April 1980. The soil legend found on the last fold-out page of this report has the mapping units marked in red that are classified as prime farmland.

The Grand Bayou alternative will result in the inundation of 2,700 acres. Some of this land is classified as prime farmland. The source given on page III-4 should be changed from USDI to USDA.

We appreciate the opportunity to provide these comments on the draft EIS.

Sincerely,

Alton Meagan
State Conservationist

Attachment

cc: Norman Berg, Chief, SCS, Washington
Edward E. Thomas, Assistant Chief, SE, SCS, Washington, D.C
Billy H. Johnson, Director, STSC, SCS, Fort Worth
Director, Environmental Services, SCS, Washington, D C.

The Soil Conservation Service is an agency of the Department of Agriculture

SCS-AS-1
10-79

COE RESPONSE

This is to acknowledge receipt and to thank you for your comments regarding the DEIS for the proposed Grand Bayou Reservoir project. Your suggestions are being included in the final EIS. According to our research, less than 2% of the proposed reservoir will consist of prime farm lands. We share your concern and the nation's concern for the preservation of prime farmlands and that is primarily why we have designed a small reservoir.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
P. O. BOX 1850
AUSTIN BRANCH, LOUISIANA 70821

April 8, 1981

IN REPLY REFER TO

Draft Environmental Impact Statement
Grand Bayou Reservoir
Red River Parish, Louisiana
LMHOD-SA (Grand Bayou)132

Colonel Thomas A. Sands, CE
District Engineer
Corps of Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Sands:

Your March 31, 1981, letter requested comments on the subject draft environmental impact statement. The document identifies the necessary work to the highway system to implement the proposed Grand Bayou Reservoir.

We are not aware of any other proposed highway projects that would conflict with the proposed Grand Bayou Reservoir.

We appreciate having had the opportunity to review the document.

Sincerely yours,

J. B. McDonald
Division Administrator

L-10

COE RESPONSE

This is to acknowledge receipt and to thank you for your comments regarding the DEIS for the proposed Grand Bayou Reservoir.

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS
Commander (dpl/eis)
Second Coast Guard
District
1430 Olive Street
St. Louis, MO 63103

16475
Ser 232
11 May 1981

Department of the Army
Attn: LMNOD-SA (Grand Bayou) 132
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, LA 70160

Gentlemen:

We have reviewed the draft environmental impact statement for Grand Bayou Reservoir in Red River Parish, Louisiana. We have no comment to offer on this document.

Thank you for the opportunity to review this environmental impact statement.

Sincerely,

C. E. Johnson Jr.

C. E. JOHNSON, JR.
Environmental Protection Specialist
By direction of the District Commander

Copy to:
COMDT (G-MEP-7)
DOT SECREP Region VI
DOT (tas), Office of Environmental Affairs

L-11

COE RESPONSE

This is to acknowledge receipt and thank you for your review of the DEIS for the proposed Grand Bayou Reservoir.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta, Georgia 30333

(404) 262-6649

May 11, 1981

Colonel Thomas A. Sands
District Engineer
Department of the Army
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Sands:

We have reviewed the Draft Environmental Impact Statement (EIS) for the proposed Grand Bayou Reservoir in Red River Parish, Louisiana. We are responding on behalf of the U.S. Public Health Service and are offering the following comments for your consideration in preparing the final document.

In general, we have major concern regarding the environmental impact of the proposed Grand Bayou Reservoir and the lack of information on water quality and wetlands effects. Information on the future water quality conditions (including the trophic condition) in the 2,700 acre lake and in downstream waters is necessary and should be provided in a supplement or a revised Draft EIS. Before any decision is made on whether the preferred project proposal should proceed, it is imperative that a detailed investigation be made of the short-term and long-term effects that this project will have upon water quality and compliance with applicable water quality standards for both lake and downstream waters.

I-12

Once future water quality conditions have been accurately predicted (using the best available methologies), it will be possible to determine if the water quality in the proposed reservoir and its discharge could comply with applicable standards. If applicable standards cannot be achieved and could not be practically achieved with mitigative measures, we would recommend that the proposed reservoir not be approved for construction. Alterations of or design modifications to the reservoir project would depend upon the effectiveness of mitigative and control measures in meeting and maintaining compliance with water quality standards and the designated uses. Such treatment measures include the use of pollution abatement controls for point and nonpoint sources in the watershed, such as soil conservation and land treatment measures, compatible land use practices, reservoir management techniques, etc. It is our view that the proposed reservoir project not be approved unless construction is accompanied by a specific program of water quality improvement and soil conservation in the watershed at least sufficient to assure that water quality standards applicable to the proposed designated uses will be met.

In comparing the water quality of the Red River and the Grand Bayou at Coushatta, Table III-2 should be revised to indicate the average values found for each parameter so that a more realistic comparison can be made. While the STORET sheets indicate that the range of water quality data for Red River is based upon many samples over either four or six years of monitoring, no indication is made in the EIS of the amount of sampling (number of observations and years of sampling) that has been conducted on the Grand Bayou.

In discussing the suitability of Red River and Grand Bayou water as a potable water source, representative average water quality values should be compared to EPA's water quality criteria as well as applicable water quality standards. The practicality and costs of treating expected water quality levels should be included in cost computations for each alternative. The possibility of using Black Lake and/or some other local lakes as an indication of what future water quality conditions might occur should also be considered. Any discussion of stratification should include water quality effects to the lake's hypolimnion and epilimnion and during any spring and fall overturns. Table III-4 reveals a total dissolved solids value of 1024 ppm for some locations in Black Lake, which is a few miles downstream of the proposed reservoir. Is this in error?

Even though a considerable amount of ground water is available in the area, we realize its use is ". . .primarily limited to non-potable uses such as irrigation" (p.vi). In projecting water usage for the Red River Parish, we suggest making projections separately for both potable uses and industrial uses since these uses are why the reservoir is being constructed. While other uses will also benefit from the reservoir, it appears from Table 1 that other sources are available in sufficient quantity.

The water quality and flood control benefits provided by the 2,700 acres of bottomland hardwoods should also be disclosed. The existence of any important recharge area in the area of impact should be discussed.

While we agree that unnecessary health risks should not be made, it is interesting that the existence of a treated waste water discharge is used as justification for not locating a raw water intake downstream. Is this same justification also used locally to discourage or prevent the development and discharge of wastewaters upstream of a water supply intake?

We understand that the Black Lake is a 13,500 acre lake and was constructed for conservation and recreational purposes. Was this lake constructed for any other purposes such as water supply? Were any Federal funds involved in this reservoir's construction? If so, were any of the cost benefits attributable to future water supply? We believe additional efforts should be made to obtain permission to buy and withdraw water from Black Lake. To eliminate future evaluation of this alternative on the basis of a refusal from the Northwest Louisiana Fish and Game Reserve Commission to commit any waters for the Red River Parish public water supply seems inappropriate. If sufficient quality water does exist to meet both the needs of the Natchitoches Parish and the Red River Parish without significantly impacting the conservation and recreational purposes of Black Lake, then consideration should be given to using the same

Page 3 - Colonel Thomas A. Sands

acquisition procedures that would be used to acquire the lands for the Grand Bayou Reservoir. Can the State of Louisiana provide any assistance in acquiring additional public water rights from Black Lake if impacts are considered insignificant?

Please send us a copy of the supplement and/or revised EIS when it becomes available. Thank you for the opportunity to review this Draft EIS. Should you have any questions regarding our comments, please feel free to contact Robert Kay of my staff at FTS 8-236-6649.

Sincerely yours,

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

L-13

COE RESPONSE

This is to acknowledge receipt of your comments regarding the DEIS for the proposed Grand Bayou Reservoir. Your comments were well taken and have been addressed in appropriate sections of the EIS, particularly on page II-20 under new paragraph 2.05.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FORT WORTH REGIONAL OFFICE
221 WEST LANCASTER AVENUE
P.O. BOX 2905
FORT WORTH, TEXAS 76113

REGION VI

IN REPLY REFER TO:

April 30, 1981

Colonel Thomas A. Sands
District Engineer
New Orleans District
Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Sands:

The Draft Environmental Impact Statement for the Public Water Supply (Grand Bayou Reservoir), Red River Parish, Louisiana, has been reviewed in the Department of Housing and Urban Development's New Orleans Area Office and Fort Worth Regional Office and the following comment is applicable:

> The displacement of any existing parklands as well as the loss of some three thousand man-days of hunting and wildlife oriented recreation (Page IV-3) are of concern to this office and should be mitigated. Any planned parklands development in the project area should be presented in the statement.

HUD does not oppose this project.

Sincerely,

Victor J. Hancock
Environmental Clearance Officer

L-14

COE RESPONSE

This is to acknowledge receipt and to thank you for your comments regarding the DEIS for the proposed Grand Bayou Reservoir. No parks will be taken and no new parks are planned. However, the mitigation plan opens 6,000 acres of land for wildlife oriented education and recreation.

SENATE

STATE OF LOUISIANA

DON KELLY
State Senator
District 31

P. O. Box 756

COMMITTEES:
Transportation
Judiciary A
Natural Resources

April 16, 1981

Ltc. Charles E. DeMeese
Acting District Engineer
Department of Army
New Orleans District Corp. of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Re: LMNOD-SP (Grand Bayou) 132

Dear Col. DeMeese:

This is to acknowledge receipt of your statement of Special Public Notice dated April 9, 1981 concerning the above captioned.

Please be advised that I represent the 31st Senatorial District which includes Red River Parish, Louisiana and have been an ardent supporter of the Grand Bayou Reservoir project.

I would like to make only one comment concerning the notice and that involves your statement relative to the adverse impact caused by the proposed inundation. Please understand that I do not disagree with the findings that the inundation will cause the loss of approximately 2700 acres of terrestrial vegetation along with an additional 200 acres of land along the shoreline resulting in the elimination of additional wildlife habitat. As a proponent of the project, I cannot argue with the determination made by the United States Department of Wildlife & Fisheries.

On the other hand, somewhere in the record it should be noted that the U. S. Wildlife & Fisheries did not oppose the project but did set up mitigation properties to be purchased by the State of Louisiana to offset this loss. This action was, in fact, done and was approved by the U. S. Department of Wildlife & Fisheries. The details of the state acquisition of mitigation properties may be found in the 1980 Capital Outlay Bill of the first special session of the 1980 Louisiana Legislature. The State of Louisiana through general funds acquired some 6500 acres near Sicily Island, Louisiana for a wildlife management area and the U.S. Department of Wildlife & Fisheries deemed this in satisfaction of their mitigation requirements.

If I may assist the Corp. or E.P.A. or anyother U.S. governmental department in this matter further, please feel free to advise.

With kindest regards, I am

Yours very truly,

Don Kelly, Senator

COE RESPONSE

This is to acknowledge and thank you for your concern and comments re: USCE LMNOD-SP (Grand Bayou) 132 Draft Environmental Impact Statement.

DEPARTMENT OF WILDLIFE AND FISHERIES
400 ROYAL STREET
NEW ORLEANS 70130

JESSE J. GUIDRY
Secretary

DAVID C TREEN
Governor

April 28, 1981

District Engineer
U.S. Army Corps of Engineers
P.O. Box 60267
New Orleans, La. 70160

RE: LMNOD-SA (Grand Bayou) 132
DEIS Public Water Supply
Red River Parish, La.

Dear Sir:

We have reviewed the above referenced document and we find that most of the concerns of this department have been adequately addressed therein. We find that many of our previous recommendations have been incorporated into the document including the compensation-mitigation measures which we feel are increasingly vital to the ecological health of Louisiana.

Therefore, in consideration of the efforts of all parties involved in the formulation of this plan and of the agreements reached, we offer no objection to the issuance of this permit.

Sincerely,

Jesse J. Guidry
Secretary

JJG:[illegible]:clg
cc: FWS, Lafayette
EPA, Dallas

L-16

COE RESPONSE

This is to acknowledge receipt and to thank you for your comments re: LMNOD-SA (Grand Bayou EIS).

OD-S

STATE OF LOUISIANA
DEPARTMENT OF CULTURE, RECREATION AND TOURISM
OFFICE OF PROGRAM DEVELOPMENT

DAVID C. TREEN
Governor

ROBERT B. DeBLIEUX
Assistant Secretary

MRS. LAWRENCE H. FOX
Secretary

May 11, 1981

Col. Thomas A. Sands
District Engineer
New Orleans District
Corps of Engineers
P. O. Box 60267
New Orleans, LA 70160

Re: DEIS, Proposed Grand Bayou Reservoir, Red River Parish, LA

Dear Colonel Sands:

My staff has reviewed the above-referenced draft EIS at your request, and the document recognizes that both the Grand Bayou Reservoir and the alternate Red River pipeline may affect both known and unknown cultural resources.

We will be glad to review both alternatives' effects on cultural resources when we receive the cultural resources survey reports. If you have any questions, please contact my staff in the Division of Archaeology and Historic Preservation.

Sincerely,

Robert B. DeBlieux
State Historic Preservation Officer

RBD/JKK/bc

L-17

DIVISION OF ARCHAEOLOGY AND HISTORIC PRESERVATION
P. O. Box 44247 Baton Rouge, La. 70804 504 342-8882

COE RESPONSE

This is to acknowledge and thank-you for your concern and comments regarding the DEIS, proposed Grand Bayou Reservoir, Red River Parish, La.

It is our understanding that the cultural resources survey reports for this proposed project have already been forwarded to your office for review and comments.

Wildlife Management Institute

709 Wire Building, 1000 Vermont Ave., N.W., Washington, D.C. 20005 • 202 / 347-1774

DANIEL A. POOLE
President
L. R. JAHN
Vice-President
L. L. WILLIAMSON
Secretary
NICK S. PARKER
Board Chairman

PLEASE REPLY TO:
Murray T. Walton
Southcentral Representative
Star Route 1A, Box 38G
Dripping Springs, Texas 78620
512-858-3473

May 9, 1981

District Engineer
U.S. Army Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Sir:

The Wildlife Management Institute has reviewed the Draft Environmental Impact Statement, Public Water Supply, Red River Parish, Louisiana. This document appears to adequately address the alternatives for supplying an adequate public water supply.

It is unfortunate that water from an existing source is not available, necessitating the construction of Grand Bayou Reservoir and the attendant loss of bottomland wildlife habitat. However, the Institute notes that a base flow discharge of 3.75 cfs will be made from the proposed reservoir and that approximately 6,000 acres near Sicily Island, Louisiana will be purchased by the State of Louisiana as mitigation. We strongly support these project features.

Thank you for the opportunity to comment on this document.

Sincerely,

Murray T. Walton
Southcentral Representative

L-18

COE RESPONSE

This is to acknowledge receipt and to thank you for your review of the DEIS for the proposed Grand Bayou Reservoir.

APPENDIX M

HABITAT EVALUATION

/

United States Department of the Interior

FISH AND WILDLIFE SERVICE

P.O. Box 4305
Lafayette, Louisiana
70502

October 30, 1979

District Engineer
U.S. Army Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Sir:

The Fish and Wildlife Service (FWS) has reviewed public notice LMNOD-SP(Grand Bayou)132, dated December 27, 1977. The Black Lake Bayou Recreation and Water Conservation District of Red River Parish has requested a Department of the Army permit to install and maintain a 2,900-acre reservoir with a dam, spillway, and appurtenances across Grand Bayou approximately 7.5 miles east of Coushatta, Louisiana. The purpose of the reservoir is to provide recreation and municipal and industrial water supply. The following comments are provided to assist you and the applicant in the development of measures needed to mitigate adverse project effects on fish and wildlife resources. This report does not fulfill our total responsibilities under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

PROJECT DESCRIPTION

Grand Bayou Reservoir will be formed by the construction of a dam across Grand Bayou in Sections 20 and 29, Township 12 North, Range 8 West. A total of 1 million cubic yards of select clay and common fill will be used to construct the dam to a length of 5,000 feet. The source of this fill was not specified in the public notice. The top elevation of the dam will be 152 feet mean sea level (m.s.l.); this elevation varies from zero to 35 feet above the natural contour. The reservoir will have an east-west orientation with the dam forming the eastern shore. An ogee spillway, 200 feet wide with a crest elevation of 138.5 feet m.s.l., will be installed on the southern end of the dam and will discharge overflow water down a 600-foot-long concrete chute, into a stilling basin, and through a dredged canal to Grand Bayou. A drainage structure is to be installed in the dam consisting of a 6-foot by 6-foot reinforced concrete culvert which will have a motorized slide gate mounted in a collection box on the upstream side of the dam. The structure

will allow for lake drawdown to 115 feet m.s.l. (23.5 feet below full pool), permitting aquatic vegetation control and fisheries management. The reservoir will have a pool stage of 138.5 feet m.s.l. and a volume of 29,000 acre-feet. The average depth of this reservoir will be 10.0 feet and the maximum depth will be 23.5 feet. The surcharge elevation will be 147.5 feet m.s.l. Data pertaining to the proposed reservoir are summarized in Table 1.

Table 1. Pertinent Data on Proposed Grand Bayou Reservoir

Drainage Area	135.0 square miles
Proposed Pool Stage	138.5 feet mean sea level (m.s.l.)
Lake Area at Pool Stage	2,900.0 acres
Lake Volume at Pool Stage	29,000.0 acre-feet
Maximum Lake Depth	23.5 feet
Average Lake Depth	10.0 feet
Surcharge	9.0 feet
Surcharge Elevation	147.5 feet m.s.l.
Dam Elevation	152.0 feet m.s.l.

DESCRIPTION OF THE AREA

The Grand Bayou watershed is about 22 miles long, averages 5 miles in width, and drains approximately 135 square miles. Grand Bayou originates near Ringold in Bienville Parish, and flows into Black Lake near Alpha in Red River Parish. This sluggish, meandering stream is lined by high banks and receives inflow from numerous small tributaries. The estimated width of the bayou varies from 10 to 20 feet. The bayou's depth varies with rainfall; it is intermittent in some reaches, while deep permanent pools exist in other segments.

Approximately 56 percent of Red River Parish is comprised of woodlands. The project area extends from Louisiana Highway 155 to the mouth of Grand Bayou and includes those lands below the 140-foot m.s.l. contour line. It consists of upland forests located on the gently rolling hills, bottomland forests adjacent to Grand Bayou, and pastures.

EXISTING FISH AND WILDLIFE RESOURCES

The important fish and wildlife habitat types in the Grand Bayou area include mixed pine-hardwood forest, seasonally flooded bottom-

land hardwood forest (wetland type 1)[1], and streams with associated riparian vegetation. The vegetation of the mixed pine-hardwood forest consists of loblolly and shortleaf pines, white oak, southern red oak, post oak, blackjack oak, hickories, American beech, black gum, American beautyberry, winged sumac, blackberry, greenbriar, peppervine, and trumpet creeper. Common tree species in the forested bottomlands include water oak, willow oak, water locust, honey locust, hackberry, bitter pecan, pecan, sweetgum, American elm, cottonwood, and sycamore. Understory vegetation includes roughleaf dogwood, flowering dogwood, wax myrtle, yaupon, arrow-wood, American beautyberry, hawthorns, redbud, poison ivy, greenbriar, rattanvine, muscadine, honeysuckle, blackberry, and dewberry. Riparian vegetation along Grand Bayou is dominated by water elm and scattered baldcypress. The habitat types and acreages within the project area are listed in Table 2.

Table 2. Major wildlife habitat types and acreages found within the 140-foot m.s.l. contour line in the Grand Bayou Reservoir Project Area.

Habitat type	Acres above dam	Acres below dam	Acres total
Stream	19.4	11.5	30.9
Agricultural	295.4	125.2	420.6
Pine forest	0.0	45.0	45.0
Pine-hardwood forest	568.1	482.6	1050.7
Fresh marsh	0.0	9.9	9.9
Bottomland hardwood forest	2036.5	1346.2	3382.7
Total	2919.4	2020.4	4939.8

Grand Bayou supports a moderate fishery, as evidenced by "yoyos" and set lines seen along its banks in the project area. Standing and fallen timber provides valuable instream cover for spawning and feeding fishes. Grand Bayou also provides important spawning and nursery habitat for the fishes in Black Lake, which is a popular fishing impoundment. Important sport and commercial fishes found in Grand Bayou include largemouth bass, bluegill, redear sunfish,

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1. Shaw, S.P., and C.G. Fredine. 1971. Wetlands of the United States. U.S. Fish and Wildlife Service Circular 39. 67 pp.

warmouth, white crappie, channel catfish, flathead catfish, buffalofishes, carp, gars, and freshwater drum.

Game mammals associated with the wooded tracts in the project area include white-tailed deer, gray squirrel, fox squirrel, swamp rabbit, eastern cottontail, and raccoon. Commercially important furbearers that occur in this habitat are gray fox, red fox, coyote, bobcat, beaver, raccoon, opossum, and mink. Game birds are represented by American woodcock, wild turkey, mourning dove, and bobwhite with the latter two species mainly confined to forest edges. Other wildlife present includes nine-banded armadillo, bats, eastern wood rat, white-footed mouse, numerous songbirds, hawks, owls, crow, grackle, woodpeckers, snakes, toads, frogs, skinks, salamanders, and turtles. Mallard, wood duck, and green heron occur only along the bayou and in the seasonally flooded bottomland hardwoods. During a recent on-site investigation by FWS biologists, numerous deer stands and empty shotgun shells were noted, indicating moderate to heavy hunting activity. Much of the bottomlands in the project area are owned by timber companies that control hunting access to the land.

PROJECT IMPACTS

The project will result in a loss of the 2,900 acres of terrestrial habitat above the dam, of which 295 acres are agricultural land, 568 acres are pine-hardwoods, and 2,037 acres are bottomland hardwoods, and will eliminate the existing stream and associated riparian habitat along an 8 mile-long segment of Grand Bayou located above the dam. The following adverse project impacts on the fishery resources of the area are anticipated:

1) inundation of approximately 8 miles of Grand Bayou will destroy valuable stream-fish habitat and eliminate those species intolerant of a reservoir (lentic) environment;

2) the stream below the dam may not receive sufficient reservoir outflow to maintain existing fish populations; and

3) the Black Lake fishery will lose the fish recruitment capability associated with the impacted reaches of Grand Bayou.

Grand Bayou Reservoir is expected to provide fishing opportunities similar to other area impoundments such as Lake Bistineau and Black Lake. During the early years of the project, fish biomass and numbers will increase dramatically, thereby providing good sport fishing. Largemouth bass, white crappie, and bluegill should dominate the reservoir during these early years. As the reservoir ages, these fish populations will be partially replaced by such

species as gizzard shad, carp, carpsucker, buffalofishes, catfishes, and sunfishes. Angler success and the abundance of popular sport fish species will deline correspondingly. After the initial peak productive period, it is projected that this reservoir will provide a good quality fishery for such gamefish species as channel, blue, and flathead catfishes, white crappie, largemouth bass, and smaller sunfishes. It is anticipated that frequent summer water level drawdowns will occur that would favor the maintenance of the fishery. The exposure of large acreages of lake bottom during drawdown periods would permit oxidation of exposed areas and the growth of herbaceous and woody vegetation. Subsequent reflooding of these areas would provide nursery areas for small fish and permit the release of nutrients into the aquatic food chain, thereby contributing to the productivity of the fishery.

The terrestrial wildlife existing in the area will be eliminated by the inundation of the associated terrestrial habitat. However, habitat for waterfowl, shorebirds, and wading birds will be created by formation of aquatic vegetation stands, mudflats, and shallow water zones along the shoreline. In the Grand Bayou Reservoir Feasibility and Development Plan, it is projected that by the fifteenth year of operation the increased demand for water will periodically lower the pool stage 4 feet m.s.l. thereby exposing approximately 600 acres of lake bottom. This additional acreage of exposed lake bottom will be colonized by emergent vegetation and will increase the available habitat for waterfowl, shorebirds, and wading birds.

The reservoir will overflow during high rainfall periods in late winter and spring, and natural water levels and flooding below the dam will be much like that found in the area before construction. However, during low rainfall periods when evaporation and withdrawals from the reservoir exceed inflow, no flow will occur in Grand Bayou below the dam other than that contributed by small creeks which flow in the bayou below the dam and by dam seepage.

In addition to the direct impacts resulting from inundation, the indirect impact of induced perimeter development is expected to occur above the 140-foot contour. According to the Grand Bayou Reservoir Feasibility and Development Plan, an additional 228 acres of forested land will be converted to other uses such as camps and subdivisions during the life of the project. This induced clearing is directly attributable to this project.

DISCUSSION

General

Bottomland hardwood forests comprise one of the most productive terrestrial ecosystems in North America. These forested wetlands are being converted to agricultural lands at an alarming rate. In northern Louisiana alone, bottomland hardwoods were cleared at the rate of 110,000 acres per year between 1962 and 1968. Bottomland hardwoods in Red River Parish originally totaled 120,730 acres. By 1961, only 56,100 acres remained, and by 1968 this area was reduced to 44,760 acres. Based on the 1962-68 clearing rate, it is predicted that by 1985 only 17,220 acres of this productive forest will exist in Red River Parish[2]. Due to this alarming recent reduction of Louisiana's bottomland hardwoods and the current nationwide FWS emphasis on preserving bottomland hardwoods, the FWS must seek means to minimize or compensate for any further destruction of this scarce resource.

In order to assure adequate compensation of the project-related losses of valuable fish and wildlife habitat, the Fish and Wildlife Service proposes that adequate land be acquired (in fee title) near the project area and dedicated to fish and wildlife conservation and public use. This compensation land should be transferred to the LDWF and incorporated into their network of state wildlife management areas, as the LDWF has the experience and capability of providing the necessary management. The determination of the compensation acreage needed to offset wildlife losses is explained in the following sections.

Habitat Evaluation Procedures Analysis

The extent and value of the habitats to be impacted by this project were evaluated by biologists from the FWS, the Louisiana Department of Wildlife and Fisheries (LDWF), the U.S. Army Corps of Engineers (USACE), and Sunbelt Research Corporation (SRC). These biologists evaluated the pine-hardwood and bottomland hardwood habitat types according to the Habitat Evaluation Procedures (HEP) formulated by the Fish and Wildlife Service. By mutual agreement, the other habitat types were not evaluated due to their limited extent and/or low value to wildlife. The impacts attributed to this project were evaluated on the basis of the 30-year project life utilized in the feasibility study.

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2. Yancey, R.K. 1970. Our vanishing delta hardwoods. Louisiana Conservationist 22:26-31.

The HEP rely on the assumption that all habitat has inherent value to wildlife and that project impacts on wildlife habitat can be measured and compared. These procedures provide biologists with a standardized method of evaluating habitat. A list of species (usually 10) indigenous to the study area is selected by the study participants for use in assessing each habitat type. Written criteria are used to evaluate habitat suitability for each species, and are prepared prior to field assessment. With HEP, habitat suitability for each wildlife species is rated between 0 and 1, with 0 being the poorest habitat and 1 being the best habitat possible for the habitat type being evaluated. The scores for all evaluation species are then summed to obtain a summation score for each sample plot. The summation scores for all sample plots within a given habitat type are then averaged; this average is the Habitat Unit Value (HUV) for that habitat type. An example of HEP scoring for several bottomland hardwood sites and the calculation of the HUV is given in Figure 1.

The evaluation elements (species) used for the pine-hardwood and bottomland hardwood habitat types are listed in Table 3. Three sample sites were evaluated in the pine-hardwood habitat type, and the HUV was found to be 7.1. Seven bottomland hardwood sites were evaluated, and the HUV was found to be 6.9.

The product of the value (HUV) and the quantity (acres) of any given habitat type for various target years during the 30 year life of the project yields the number of target year habitat units (HU's) of that habitat type. Subtracting the annualized "with the project" HU's from the annualized "without the project" HU's gives a measure of the net project related losses or gains of fish and wildlife resources.

Table 4 summarizes the results of the HEP study. This study revealed that, with the project, there would be annualized losses of 9,838 bottomland hardwood HU's and 4,930 pine-hardwood HU's and an annualized gain of 2,419 mudflat HU's due to mudflat habitat creation.

In order to determine compensation requirements, a common HU equivalence had to be calculated for each habitat type (HU's are not interchangeable or equivalent among different habitat types). This was done by performing a pairwise comparison of the following relative importance criteria for each habitat type: vulnerability; productivity; scarcity; and recreational value. The results of this exercise indicate that bottomland hardwoods have a Relative Importance Value (RIV) of 1.0, pine-hardwoods and mudflats each have a RIV of .5 and openlands have a RIV of .25. Thus, the loss of 4,930 pine-hardwood HU's is equivalent to the loss of 2,465 bottomland hardwood HU's and the gain of 2,419 mudflat HU's is equivalent to the gain of 1,210 bottomland hardwood HU's for a net loss of 11,093 bottomland hardwood HU's.

Figure 1. Example of HEP scoring sheet.

U S FISH AND WILDLIFE SERVICE
DIVISION OF ECOLOGICAL SERVICES

FISH AND WILDLIFE HABITAT FIELD EVALUATION SHEET

Page 1 of 1 pages

PROJECT NAME: Grand Bayou Reservoir

DATE: May 22-23, 1979

ALTERNATIVE PLAN: Without the project

HABITAT CODE:

HABITAT TYPE: Bottomland Hardwood

EVALUATION ELEMENTS

SAMPLE SITE IDENTIFICATION NUMBER	Water Snake	Mallard	Wood Duck	Woodpecker	Passerines	Raccoon	Squirrels	Beaver	Rabbits	Deer	LINE TOTAL
D1	.3	.1	.2	.5	.8	.7	.7	.2	.5	.8	4.8
B1	.3	.1	.3	.8	.9	.7	.8	.3	.5	.8	5.5
B3	.9	.8	1.0	.9	.9	.9	.9	1.0	.9	.8	9.0
B4	.3	.1	.3	.8	.9	.8	.9	.3	.7	.8	5.9
E3	.6	.4	.5	.9	.9	.8	.8	.5	.7	.8	6.9
F2	.6	.7	.8	.9	.9	.8	.9	.6	.6	.8	7.6
G2	.9	.7	.9	.9	.9	.9	.9	1.0	.9	.8	8.8
TOTAL EVALUATION ELEMENT VALUES											48.5

Grand Total of All Evaluation Elements = 48.5 / Number of Sample Sites 7

HABITAT TYPE UNIT VALUE: 6.93

MANAGEMENT POTENTIAL UNIT VALUE (Wildlife habitat only):

INSTRUCTIONS

In order to evaluate the impact of the plan on the fish and wildlife habitat, it is necessary to know the value of the habitat itself. Here, each habitat type is assigned a value according to its worth for fish or wildlife. These resources are to be evaluated separately, and impacts and compensation needs are also computed separately. To determine this habitat type unit value, the evaluation team will complete a Form No. 3-1101 for each habitat type as follows:

1. Select ten representative species that are dependent to some degree on the habitat type being evaluated and which best express its diversity. These will be used in rating the sample sites. List them across the top of the chart at the left. The reasons for selecting these particular species should be noted and appended to this form. The objective is to consider the full range of animal life in assessing habitat quality. Normally ten species are selected, however the number of species used to evaluate a particular habitat type may vary. If an other number is chosen, the rationale for this must be noted on the back of this form. These species, or evaluation elements, may not vary within a habitat type.

2. Select a number of sample sites agreeable to all members of the evaluation team. This number may vary with different habitat types.

3. Rate the capability of the habitat to meet the requirements of each of the evaluation elements on a scale of 1 through 10 at each sample site, the higher rating being given to the more desirable sites. All evaluation elements must be rated at each sample site.

4. The key criteria involved in making the above judgement should be recorded on the back of this form or on a separate sheet and attached.

5. Sum the values in each Evaluation Element column vertically, and write this number at the bottom of the column.

6. Sum each Sample Site line horizontally and sum the Total Evaluation Element Column. Write

SIGNATURE OF LEAD PLANNING AGENCY REPRESENTATIVE

LEAD PLANNING AGENCY

SIGNATURE OF STATE REPRESENTATIVE

STATE AGENCY: La. Dept. of Wildlife & Fisheries

SIGNATURE OF FWS REPRESENTATIVE

ES FIELD OFFICE: Lafayette, Louisiana

Form No. 3-1101 (MAY 1976)

(Over)

the totals in the spaces provided. Note that if more than ten evaluation elements are used, a second Form No. 3-1101 must be used and the line totals from one sheet carried forward to the second.

. Divide the Grand Total of All Evaluation Elements by the Number of Sample Sites. If ten evaluation elements were used, this number is the Habitat Type Unit Value for the habitat type being evaluated, and this number should be written in the box provided at the bottom of the Form No. 3-1101. If more or fewer than ten evaluation elements are used, then the number obtained by this division operation must be prorated, for example: if only five evaluation elements are used, then the quotient must be multiplied by 10/5. If twelve evaluation elements were used, then the quotient must be multiplied by 10/12. This product is the Habitat Type Unit Value in these cases and is the number that should be written down in the box at the bottom of the form.

(Additional instructions for wildlife habitat types)

8. Using professional judgement, the evaluation team now estimates the increase in wildlife habitat type unit value possible by proper management of the resources present. This is the Management Potential Unit Value. Write this number at the bottom of the form in the box provided. The sum of this number and the Habitat Type Unit Value must not exceed 100. If they do, the Management Potential Unit Value must be reduced accordingly.

9. For wildlife habitat, an interspersion value may be determined. If this is done, the evaluation continues on Form No. 3-1102.

Table 3. Evaluation elements, habitat types, number of sample sites and Habitat Type Unit Values for the Grand Bayou Reservoir Habitat Evaluation Procedures.

Evaluation Elements	Pine-Hardwoods	Bottomland Hardwoods
Mallard		X
Wood duck		X
Bobwhite	X	
Wild turkey	X	
Woodpeckers	X	X
Passerine birds	X	X
Water snake (*Natrix* sp.)		X
Raccoon	X	X
Gray squirrel and fox squirrel	X	X
Beaver		X
Small mammals	X	
Eastern cottontail and swamp rabbit	X	X
White-tailed deer	X	X
Number of sample sites	3	7
Habitat type unit value	7.1	6.9

Table 4. Wildlife habitat losses/gains attributed to the Grand Bayou Reservoir project.

Habitat Type	Annualized HU change	Relative Importance Value 1/	Equivalent bottomland hardwood HU change 2/
Bottomland Hardwoods	-9,838 3/	1.0	-9,838
Pine-Hardwoods	-4,930 4/	.5	-2,465
Mudflats	+2,419	.5	+1,210
Net Project impact			-11,093

1/ The determination of relative importance values is described on page 7 of this report. These calculations are available at the Lafayette, Louisiana, Field Office of the FWS for review.

2/ This value is the product of the annualized HU change and the relative importance value.

3/ Bottomland hardwoods in the project area are expected to be cleared and converted to agricultural land at a rate of 2.8% per year without the project. Thus, the HU loss attributed to the project does not include -4,039 annualized HU's which would have been lost without the project.

4/ Includes the annualized loss of 937 HU's resulting from induced perimeter development.

Compensation Determination

Purchase of productive wildlife habitat does not increase fish and wildlife resources and thus does not replace project related fish and wildlife losses. Only by increasing the productivity of the purchased land can replacement be effected. Therefore, in order to determine the compensation acreage, we first had to calculate the management potential.

We have assumed that the potential compensation land will have the same HUV (6.9) as the bottomland hardwood sites evaluated during the HEP study and that management by the LDWF can increase the HUV to 8.8 over the life of the project (annualized HUV with management will be 8.1). Thus, the management potential (annualized increase in the HUV) is 1.2. However, predicted future clearing rates on compensation lands required further modification of the management potential calculation. Based on available data, 59% (annualized value of 35%) of the bottomland hardwoods will be cleared during the next 30 years without the project and converted to openland with an HUV of 3.6 (annualized equivalent bottomland hardwood HUV of .9). Thus, purchase of compensation land will enhance that land by precluding clearing. A credit factor is used to give project sponsors credit for this. Approximately 35% of the area would have an annualized HUV of .9 and a management potential of 7.2 (8.1-0.9) while the remainder of the area (65%) would maintain the management potential of 1.2. The weighted average HUV of these figures is: (.35 X 7.2) + (.65 X 1.2) = 3.3 HU's per acre.

The compensation acreage requirement is determined by dividing the annualized habitat unit loss by the annualized management potential projected for the compensation land. Thus, complete compensation for project-related wildlife losses would be obtained by purchase and managment of 3,362 acres (11,093 HU's ÷ 3.3 HU's per acre).

Wildlife Management Plan

The compensation land will be managed through the use of a Wildlife Management Plan. The objective of the Wildlife Management Plan is to increase the productivity, and thereby the HUV, to its maximum practical level in as short a time as possible. Not only will this plan protect the area from future degradation, it will also employ biologically sound principles of fish and wildlife management aimed at providing the maximum possible yield of fish and wildlife resources without endangering the available food sources.

Timber stand improvement will be the major tool utilized in this management plan. When necessary and compatible with indentifiable

management goals, supplemental food sources, whether native or commercial, will be planted and maintained. Once suitable habitat has been developed, turkey stocking will be performed. Wood duck boxes will be installed in and around the numerous bayous, sloughs, and other areas of permanent water. The timber management practices which will be employed and their value to wildlife are as follows:

1. Selective cutting

   Selective cutting favoring mast producers and den trees will yield direct improvement to deer, squirrel, turkey, and waterfowl with increased food supplies. Squirrel, wood ducks, raccoons, raptors, and songbirds will benefit from increased available nesting habitat. Indirectly, this practice will open up the overstory and midstory canopy allowing increased understory development, offering year-round food supplies. Raptors and predatory mammals will also benefit from this activity with increased food sources. Selective cutting on the area will be continual on a 3-5 year rotational schedule. This schedule will maintain the productivity of the understory by restricting successional development. In addition, selective cutting will allow increased light penetration to the forest floor which will increase the quantity and quality of available browse for deer.

2. Maintained openings

   Selected sites of 2-5 acres will be cleared to a 20-30 percent overstory and midstory canopy cover. The preserved overstory canopy will be selected on the basis of mast production and the presence of den sites. The understory will be maintained in an early successional stage with areas of bare soil available. These sites will be located on the highest available ground and as close to the permanently wet areas as possible. These areas will enhance small mammal and game bird populations, especially turkey during the brood rearing season due to increased cover and insect populations. These openings will serve as refuge areas during high water periods, offering sufficient food supplies to sustain wildlife populations until the high water recedes. Raptors and predatory mammals will also be attracted to these openings for feeding purposes. Food supplies and available dusting areas will make the opening especially attractive to songbird populations. These sites will be maintained on a 3-4 year rotation to assure they do not become too overgrown to be useful.

3. No activity

   Selected areas of exceptional esthetic value, such as a mature

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oak forest, will be set aside as natural areas with no management practices installed. Activity within the cypress/tupelo swamps will be limited to structural measures to assure the continuance of historical water level fluctuations, and the placement of wood duck boxes.

In addition to the above timber management practices, supplemental food sources will be supplied where necessary. These plantings, where feasible, will be restricted to existing openings, and particular attention will be directed towards plantings in areas that can expect early winter flooding. This activity will provide an additional food source for migratory waterfowl. High ground planting will be exceptionally beneficial when wildlife populations are concentrated during extended periods of high water.

Fencing will be installed where necessary to deter unlawful entry and grazing by free-ranging domestic animals. This will allow natural regenerations to continue unhindered by overgrazing. The fence will be maintained continually with repairs made as necessary. Where possible, fence right-of-ways will be managed as maintained openings.

The implementation of the above management practices will increase the HUV of the acquired lands. The expected direct results of this management plan will initially be slight. However, after 10 years, management will significantly increase mast production, the number of den and nest sites, and natural regeneration of understory vegetation. These HUV increases will continue and eventually will greatly expand the wildlife populations in the management areas. The indirect results of this management will be the improved water quality and the increased fishery value of downstream water bodies due to a reduction in sediment and pesticide transport.

According to the LDWF, the general cost of implementing the above managmenet plan would include a one time expenditure of $160,700 to implement initial development and an annually incurred operation and maintenance cost of $11,350. The initial development cost and a substantial portion of the annual operation and maintenance cost would not be needed if the area were an addition to an existing wildlife management area.

Additional mitigatory features that should be provided in the project plan include leaving standing timber in the shallow coves of the reservoir. This would provide cover to waterfowl and provide habitat for fish and other aquatic organisms. The reservoir should be designed and operated to provide overbank flooding below the dam during seasons when such floods normally occur (late winter and early spring). This overbank flooding will provide downstream bottomland hardwoods with seasonal inundation which simulates natural conditions.

A detailed fishery management plan for Grand Bayou Reservoir should be developed and utilized. This plan should include annual fish sampling and aquatic vegetation mapping. These practices will provide data necessary for fishery biologists to manage the reservoir. These management practices may include drawdowns, fish stocking, commercial fishing, and weed control. These techniques will allow the fishery to reach the maximum sustainable yield, will prevent stunting due to unbalanced fish populations, and will maximize recreational use.

To compensate for the loss of 8 miles of stream habitat and to improve the reach of Grand Bayou below the dam for stream fisheries, a minimum flow below the dam of 3.75 cubic feet per second (c.f.s.) is recommended. This figure is the median average of the monthly flow for the low-flow period (July, August, September, and October) for the years 1956 to 1973. This minimum flow will provide additional fishery benefits and will partially compensate for the project related stream habitat loss. A multi-level outlet may be necessary to allow a mixed discharge of warm surface waters and cooler subsurface waters to provide ambient flows for downstream fish populations. Adequate bank-fisherman access should be provided immediately below the discharge area to allow full public use of sportfishes expected to concentrate in the tailwater of the reservoir.

RECOMMENDATIONS

Based on the above considerations, the following measures are recommended in order to mitigate and compensate for adverse fish and wildlife impacts associated with this project:

(1) purchase and management of 3,362 acres of bottomland hardwoods near the project area;

(2) leave standing timber in the shallow coves of the lake;

(3) provide overbank flooding below the dam as much as practical;

(4) provide for minimum flow releases of 3.75 c.f.s. for maintenance of downstream fish populations;

(5) provide a multi-level outlet to allow a discharge of ambient flows for downstream fish populations, if necessary;

(6) provide adequate bank-fisherman access below the dam; and

(7) provide for lake management practices, when necessary, such as drawdowns, weed control, or other management techniques.

The Fish and Wildlife Service is most willing to discuss these recommendations with representatives of the applicant, the LDWF, and the USACE. It is possible that the project design can be modified to reduce the environmental impacts and to subsequently reduce the compensation requirements. If the recommendations suggested in this report are adhered to, the Fish and Wildlife Service will not oppose issuance of the requested permit.

Please advise us of your action on our recommendations.

Sincerely yours,

Cary W. Kerlin

Cary W. Kerlin
Field Supervisor