# RIVER BEND STATION ENVIRONMENTAL REPORT

## OPERATING LICENSE STAGE

## SUPPLEMENT 3

Acknowledgement of Receipt of

Supplement to Environmental Report-

Operating License Stage

River Bend Station

Please sign, date, and return this sheet to:

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Lead Licensing Engineer
Stone & Webster Engineering Corporation
3 Executive Campus
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Receipt of Supplement ____3____ to the Environmental Report - Operating License Stage is acknowledged.

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## SUPPLEMENT 3 INSERTION INSTRUCTIONS RIVER BEND STATION ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

The following instructions are for the insertion of Supplement 3 into the RBS ER-OLS. Remove the pages, tables, and/or figures listed in the REMOVE column and replace them with the pages, tables, and/or figures listed in the INSERT column. Dashes (---) in either column indicate no action required.

Vertical bars have been placed in the margins of inserted pages and tables to indicate revision locations.

VOLUME 1

| REMOVE | INSERT |
|---|---|
| Table 1.3-1, Sheet 1 | Table 1.3-1, Sheet 1 |
| --- | Tab, "QUESTIONS AND RESPONSES - CHAPTER 1." Insert immediately in front of page Q&R 1-i/-[(1)]. |
| Page 2-i/ii | Page 2-i/ii[(2)] |
| Page 2.2-19/20 | Page 2.2-19/20 |
| Page 2.3-1/1a | Page 2.3-1/1a |
| Page 2.3-5/5a | Page 2.3-5/5a[(3)] |
| Page 2.3-17/18 | Page 2.3-17/17a |
| --- | Page 2.3-17b/18 |

(1) This tab was inadvertently omitted from the Supplement 2 package.

(2) Continues to be shown as Supplement 1/Supplement 2.

(3) Continues to be shown as Supplement 2/Supplement 1.

VOLUME 2

| REMOVE | INSERT |
|---|---|
| Page 2.5-15/16 | Page 2.5-15/16 |
| --- | Page 2.5-16a/16b |
| Page 2.5-21/- | Page 2.5-21/- |
| Table 2.5-36 (2 sheets) | Table 2.5-36 (2 sheets) |
| Fig. 2.5-18 | Fig. 2.5-18 |

VOLUME 3

| REMOVE | INSERT |
| --- | --- |
| Page Q&R 2-i/ii | Page Q&R 2-i/ii |
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| Page Q&R 2.3-21/- | Page Q&R 2.3-21/22 |
| --- | Page Q&R 2.3-23/24 |
| --- | Page Q&R 2B-3/4. Insert immediately after page Q&R 2B-1/2. |
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| --- | Page 3.4-4a/4b |
| --- | Page 3.4-4c/4d |
| --- | Fig. 3.4-3a |
| Page Q&R 3-i/- | Page Q&R 3-i/- |
| Page Q&R 3.4-1/- | Pages Q&R 3.4-1/2 and Q&R 3.4-3/- |
| Page 4-i/ii | Page 4-i/ii |
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| Page 4.2-1/2 | Page 4.2-1/2 |
| --- | Page 4.2-2a/2b |
| Page 4.2-3/4 | Page 4.2-3/4 |
| Page 4.2-4a/4b | Page 4.2-4a/4b |
| --- | Table 4.2-1. Insert immediately after page 4.2-7/-. |
| Page Q&R 4-i/- | Page Q&R 4-i/- |
| --- | Page Q&R 4.5-1/-. Insert immediately after page Q&R 4.3-1/-. |

VOLUME 4

| REMOVE | INSERT |
|---|---|
| Page 5.5-3/4 | Page 5.5-3/4 |
| Table 5.8-7 | Table 5.8-7[1] |
| Page 6.2-3/4 | Page 6.2-3/4[2] |

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[1] Continues to be shown as Supplement 2.

[2] Page 6.2-4 continues to be shown as Supplement 2.

TABLE 1.3-1

SUBSTANTIVE INFORMATIONAL CHANGES
FROM CONSTRUCTION PERMIT STAGE

| ER-OLS Section | Change | Reason for Change |
|---|---|---|
| 1.1 | Operating date for Unit 1 rescheduled; Unit 2 presently unscheduled. | Financial constraints and reduced load growth projections |
| 1.1 | 30 percent ownership of Unit 1 by Cajun Electric Power Cooperative (CEPCO) | For CEPCO, to acquire needed capacity; for GSU, to acquire the financing necessary for timely completion of River Bend Station |
| 2.1 | Additional site acreage acquired | Acquired property for access from US Highway 61 |
| 2.2, 3.7 | Deletion of transmission line Routes D and E; route designation changes; minor alignment changes in Routes I, II, III (formerly B, C, A, respectively) | a) The siting of and need to interconnect with Big Cajun No. 2 plant<br>b) Design improvement allowing combination of 500-kV and 230-kV switchyards on originally planned 230-kV site 3 |
| 2.3, Appendix 2B | Hydrology study on Alligator Bayou Crossing | Assess potential hydrological impact of substituting culverts for originally proposed bridge |
| 2.3, 4.2 | Dewatering operation performed over two separate periods | Temporary suspension of construction during site preparation |
| 3.4 | High-level platform type intake structure design to a low-level screened intake | Improved safety, cost, and technology |

# CHAPTER 2

## ENVIRONMENTAL DESCRIPTIONS

## TABLE OF CONTENTS



1

CHAPTER 2

TABLE OF CONTENTS (CONT)

and vocational-technical schools throughout the state[27]. Those schools within 80 km of River Bend Station are listed in Table 2.2-17.

State correctional institutions within 80 km of River Bend Station are given in Table 2.2-18.

Major public lands intended for recreation or preservation are identified in Tables 2.2-19 and 2.2-20 and Fig. 2.2- 8. Within the 80-km radius, Homochitto National Forest in Mississippi includes portions of all four counties. Within the National Forest, there are two game preserves and a recreational site for swimming, fishing, and camping.

The Louisiana State Parks System includes state parks, commemorative areas, preservation areas, and experiment stations[33]. Those within the 80-km radius are identified in Table 2.2-19. Wildlife areas in which hunting and fishing are permitted are identified in Table 2.2-20[34,35]. There are no wildlife refuges within 80 km of River Bend Station.

References - 2.2

1. Telephone conversation between J.K. Jackson and C.S. Ellis of Stone & Webster Engineering Corporation, Boston, MA, and J. Perry, Agent for Woodville District, Illinois Central Gulf Railroad, Slaughter, LA, December 18, 1979.

2. Telephone conversation between C.S. Ellis of Stone & Webster Engineering Corporation, Boston, MA, and B. Phipps and J. Butler of American Telephone & Telegraph Long Lines Division, December 21, 1979.

3. Supplemental Environmental Information Document, River Bend Nuclear Power Station. Prepared for Cajun Electric Power Cooperative, Inc. by Bovay Engineers, Inc., Baton
3 Rouge, LA, February 1980.

4. Louisiana Population Estimates by District and Parish, Table III, Louisiana Technical University, Division of Business Research, Ruston, LA, February 1979.

5. Telephone conversation between C.S. Ellis of Stone & Webster Engineering Corporation, Boston, MA, and N. Wagoner, Louisiana Department of Transportation and Development, Baton Rouge, LA, December 26, 1979.

6. Telephone conversation between C.S. Ellis of Stone & Webster Engineering Corporation, Boston, MA, and Attorney S.P. Dart, an owner of the former Dipple and Enette Field, St. Francisville, LA, January 22, 1980.

7. Telephone conversation between C.S. Ellis of Stone & Webster Engineering Corporation, Boston, MA, and C. Taylor, Maintenance Section, Louisiana Department of Transportation and Development, Baton Rouge, LA, January 22, 1980.

8. Telephone conversation between C.S. Ellis of Stone & Webster Engineering Corporation, Boston, MA, and Staff, Redi-Mix Concrete, St. Francisville, LA, December 20, 1979.

9. Telephone conversation between C.S. Ellis of Stone & Webster Engineering Corporation, Boston, MA, and F. Metz, Joan of Arc Co., St. Francisville, LA, December 20, 1979.

10. Telephone conversation between C.S. Ellis of Stone & Webster Engineering Corporation, Boston, MA, and

## 2.3 WATER

### 2.3.1 Hydrology

#### 2.3.1.1 Surface Water

River Bend Station is located above the Mississippi River floodplain on elevated, gently sloping terrain at approximately River Mile 262. The plant is separated from the river by a natural levee formed above the river bank and by the lower floodplain area which is crossed by Alligator Bayou and its tributaries.

The river location of the station site is midway between Bayou Sara Bend and False River cutoff on a 6-mi reach of straight river channel alignment. At the station site the channel width is approximately 1,700 ft, but it increases in width downstream to more than 4,000 ft within 4 mi.

Current velocities were examined as part of a hydrographic survey conducted in 1972 (Appendix 2A). The highest current velocities are on the eastern side of the river where the channel deepens along the bank bounding the site. A river cross section showing channel current velocities and directions is presented in Appendix 2A, Exhibit 19. Channel current velocities are similar to those measured at Tarbert Landing, Mississippi, about 44 river miles upstream of the site. Main channel velocities during the period 1966-1970 at that location had a range of 3.0 to 9.5 fps. During the site hydrographic study, the river stage was approximately 8 ft above average annual stage, and velocities varied from slack bank currents to 8.3 fps in the main channel. The high energy, turbulent character of the flow exerts an erosive force on the river channel and bank. Based on observations by the Army Corps of Engineers, the long-term average bank erosion rate along this portion of the river is about 8 ft per year[1].

As discussed in Section 4.6.2, the U.S. Army Corps of Engineers will install concrete revetment on the Mississippi River Channel in the site vicinity. Work is presently scheduled to begin in the fall of 1984. The design of the 3
cooling tower makeup water intake structure is discussed in Section 3.4.2.1. Fig. 3.4-4 shows that the intake structure 1
is protected against river-induced erosion by covering the embayment slopes with 2-ft-thick riprap, which is placed over a 1 1/2-ft-thick gravel base. Together these measures ensure a continuous plant water supply.

A cross section showing the topography between the river and
1 the plant is presented in Fig. 2.3-1. A topographic map of
the site is provided in Fig. 4.3-1. A bathymetric survey
map showing the river channel contours near the embayment
area is presented in Fig. 2.3-2.

The Mississippi River at Bayou Sara (River Mile 265.4) has a drainage area of 1,129,400 sq mi. Of this area, about 1 percent (13,000 sq mi) is in Canada, and the rest is located mainly in the central United States. Tributaries to the river extend into the state of New York in the East and into Wyoming and Montana in the West. The drainage area is

valley with relatively steep slopes. The channel and valley become broader in the downstream direction. Within the Mississippi River floodplain, the bayou flows in a shallow 2
trough between the Mississippi River natural levee and the escarpment bounding the valley. In that region, the stream flows through a small, standing water body known locally as Needle Lake. The lake is about 1,700 ft long and 40 ft in average width (about 1.5 acres). Water depth is normally about 3 ft. A rise in water level due to local storms floods the surrounding sump area.

Alligator Bayou is subject to short periods of high runoff or storm floods, and extended drought periods of zero flow. The U.S. Geological Survey has maintained a crest stage gauge on Alexander Creek from 1953 to the present (noncontinuous). The drainage area at this point in the creek is 23.9 sq mi. The estimated flood flow distribution for Alligator Bayou, based on Alexander Creek data, is shown in Fig. 2.3-11. This figure also shows the estimated flood flows for the West Fork Thompson Creek flow gauge (1950-1970). During flood flows Alligator Bayou carries an increased sediment load and provides an appreciable amount of sediment deposition within the floodplain area. Most sedimentation occurs as Alexander Creek leaves the hills and enters the alluvial valley. Channel length from the headwater to the southern GSU property line is about 18 mi. A profile of the channel bed is shown in Fig. 2.3-10.

River Access Road, extending from the plant to the Mississippi River, has been constructed across Alligator Bayou for the purpose of providing access to the intake structure and barge slip area and as a means of conveyance of heavy construction loads. This road will remain after plant construction is completed. Culverts have been placed in this roadway to allow passage of flow through Alligator Bayou to Thompson Creek and the Mississippi River. Appendix 2B presents a study of the effects of River Access Road construction on Alligator Bayou hydrology. Section 4.6.2
details the effects of plant features on erosion, explaining 1
the various erosion control measures which have been undertaken.

Several small farm ponds are located in the site vicinity. Locations of these ponds and approximate sizes are presented in Section 4.2.

Local drainage courses subjected to extremely severe assumed meteorological and geological conditions could cause limited flooding at the site. The design flooding condition is the unlikely event of one-half the Probable Maximum Flood on

West Creek and Grants Bayou in combination with the Operational Basis Earthquake and severe winds which could cause flooding to 95.1 ft msl at West Creek. The plant area

30, 365, 3,650 and 14,600 days. A discussion of the input parameters and assumptions used in this analysis is presented in Section 2.4.13.2.5 of the FSAR.

Fig. 2.3-22 shows that after 40 yr (14,600 days) of continuous pumping, drawdown of the Zone 3 piezometric surface is predicted to be less that 4 m (13 ft) at a distance of 30 m (100 ft) from the wells and is predicted to be less than 2 m (7 ft) at a distance of 3,050 m (10,000 ft) from the wells. As a result, a localized cone of depression will form around the wells in the piezometric surface of the Zone 3 Aquifer and will cause a localized reversal of the hydraulic gradient.

It is predicted that pumping the two Zone 3 wells at 6.3 l/s (100 gpm) each for 40 yr will cause approximately 1.8 m (6 ft) of hydraulic-head decline in the St. Francisville water supply wells that are located approximately 4.9 km (16,000 ft) from the plant area (Fig. 2.3-21). This is equivalent to an annual rate of decline of 0.046 m/yr (0.15 ft/yr). This is an insignificant amount compared to the regional decline in hydraulic head of 0.9 to 1.2 m/yr (3.0 to 3.9 ft/yr) in the Zone 3 Aquifer due to pumpage in 3
Baton Rouge (Section 2.3.1.2). The three water supply wells operated by the town of St. Francisville are the nearest wells to the plant in the Zone 3 Aquifer. The rate of hydraulic head decline in the Zone 3 Aquifer at the site from pumpage in St. Francisville is estimated to be small. Thus the cumulative rate of hydraulic head decline is expected to be on the order of 1.25 m/yr (4.05 ft/yr), and the majority of this decline is attributed to groundwater withdrawals in the Baton Rouge area.

Ground subsidence at the site due to hydraulic head decline from Baton Rouge groundwater withdrawals is discussed in 3
FSAR Section 2.5.4.1.1. Evaluations have indicated no measurable subsidence at the site to date; however, a very conservative projection of possible subsidence at the site for the next 40 yr indicates a value of 0.03 m (0.11 ft). Assuming a composite saturated aquifer thickness of 250 m (820 ft), a porosity of 12 percent, and that all aquifer compaction results in porosity decrease, a subsidence of 0.03 m corresponds to a porosity decrease of 0.113 percent. This porosity loss is not expected to have a noticeable effect on aquifer permeability.

The third well at the plant, labeled No. 72 on Fig. 2.3-20, was emplaced in the Upland Terrace Aquifer to a depth of 46 m (150 ft). This well is equipped with a 50-l/s (800-

gpm) pump and was installed to provide water for fire protection.

Drawdown of the piezometric surface in the Upland Terrace Aquifer due to pumping this well at 50 l/s (800 gpm) for 12.5 hr, which is the time required to fill the fire protection storage tanks, was analyzed. Fig. 2.3-22 displays the predicted values of drawdown versus distance from the well after 12.5 hr of continuous pumping at 50 l/s (800 gpm). This figure shows that drawdown at a distance of 305 m (1,000 ft) is predicted to be less than 6 cm (0.2 ft). It also shows that, beyond a distance of 400 m (1,300 ft) from the well, no drawdown is predicted to occur. As a result, a very localized cone of depression will form around this well and will locally reverse the hydraulic gradient in the immediate vicinity of the plant. The cone of depression is predicted to extend a maximum of 335 m (1,100 ft) from the well after 12.5 hr of pumping. Therefore, drawdown in the Upland Terrace Aquifer due to pumping this well will be contained entirely on the site property. A discussion of

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the input parameters and assumptions used in this analysis is presented in FSAR Section 2.4.13.2.5.

2.3.2.1.4 Drawdown in the Upland Terrace Aquifer Due to Construction Dewatering

During construction dewatering, which took place from May 1976 to May 1977 and from May 1979 to the time in 1981 when it was no longer required, the piezometric surface in the Upland Terrace Aquifer was lowered so that construction could occur. The dewatering system was designed and operated by Wellpoint Dewatering Corporation, New York, NY, in accordance with engineer-specified requirements. The dewatering system consisted of 44 30-cm (12-in) diameter wells that were emplaced to el -35 to -45 ft into the top of the clay layer immediately below the deepest large sand layer in the Upland Terrace Aquifer. The wells were drilled in a rectangular pattern around the periphery of the excavation. Each well was equipped with a 44-l/s (700-gpm) vertical turbine pump. Inside the rectangular area, a series of 30-cm (12-in) diameter sand drains was used to transmit perched water down to the Upland Terrace Aquifer. Additional descriptive information regarding the excavation and the dewatering system is provided in FSAR Section 2.5.4.5.

The average discharge rate of the dewatering system during the first phase of dewatering, from May 1976 to May 1977, was approximately 490 l/s (7,700 gpm). The maximum discharge rate was approximately 1,370 l/s (21,700 gpm). Fig. 2.3-23 shows the weekly discharge rate of the dewatering system. Initially it was necessary to operate the system at a high discharge rate in order to get the piezometric surface drawn down to a sufficiently low level to allow construction to proceed. After, this initial period, during which the Upland Terrace Aquifer was being dewatered, it was not necessary to operate the system at as high a discharge rate. After August 1976, the discharge rate was decreased as the groundwater flow system approached steady-state conditions in response to the pumping stress (Fig. 2.3-23.)

The hydrographs of piezometers and observation wells in the Upland Terrace Aquifer in Fig. 2.3-24 show the response of the aquifer to the operation of the dewatering system. Maximum drawdown of the piezometric surface of the Upland Terrace Aquifer occurred in March 1977. After this time, water levels began to rise and eventually attained

Grace Episcopal Church, Louisiana's second oldest Protestant church, was built in 1827 in St. Francisville, Acts of Incorporation and Investiture followed in 1829. Shelled during the Civil War, the church began a rebuilding program with final restoration in the 1880s. The church is located in the center of St. Francisville, approximately 5.7 km (3.5 mi) west-northwest of the site.

Both Propinquity and Grace Episcopal Church in St. Francisville are within the historic district that was nominated for inclusion in the National Register of Historic Places in the Spring of 1979. The area covers more than four blocks. Bounded by Royal and Ferdinand Streets, the district includes private homes, a court house, law offices, a bank, and town hall. The West Feliciana Historical Society is attempting to extend these boundaries in order to further preserve St. Francisville history[33].

The Cottage, a series of buildings erected from 1795 to 1859, was originally the home of "The Fighting Butler Family." Andrew Jackson is known to have stopped there after the Battle of New Orleans. The Cottage contains much of the original furniture, and 15 plantation outbuildings are still standing. It is situated on US Highway 61, approximately 11.2 km (7.0 mi) north-northwest of the site. Overnight accommodations are available in the home.

Rosedown Plantation, listed by the state of Louisiana as a place of historic interest, is located about 5.8 km (3.6 mi) northwest of the site on State Highway 10. Rosedown Plantation was a Spanish grant made in 1789. Daniel Turnbull built the present Rosedown in 1835. The house and the 17th century style gardens at Rosedown are completely restored and stand as a museum of the Old South.

2.5.3.2 Archaeological Significance

An archaeological investigation was performed through archival research and foot investigation in December 1971 and was updated on October 9, 1972. From these investigations it was learned that Indians traversed the area but no archaeological remains were found that were indicative of long-term village occupation[34]. Sites 4 and 5 on Fig. 2.5-18 locate the areas where historic campsite artifacts were found. Additional information is found in Section 2.5.3.4.

### 2.5.3.3 Natural Landmarks

There are no natural landmarks within 16 km (10 mi) of the site listed in the National Register of Natural Landmarks through December 1979.

### 2.5.3.4 Historic and Archaeological Significance Along Transmission Rights-of-Way

The only National Register of Historic Places property within 2 km (1.2 mi) of any of the three transmission corridors is the Port Hudson Battlefield, which is 11.8 km (7.4 mi) south-southwest of River Bend, crossed by Route II. Section 2.2.2 describes the corridor. The archaeological significance of this area is discussed in the following paragraphs.

Route II passes within 2 km (1.2 mi) of the Baker Heritage Museum, a site of historic interest recognized by the state of Louisiana and local communities. The museum is on Mississippi and Adams Streets in Baker, Louisiana, one block east of State Road 19. The museum includes a general store and rural life exhibits housed in a turn-of-the-century home[35-37].

3 Eighteen archaeological and historical sites, five of which pertain to the Port Hudson Battlefield area, are located within 2 km (1.2 mi) of the transmission corridors. These sites were located through use of archaeological files and maps, and subsequent foot investigations and construction surveys by state archaeologists. The locations attest to the presence of peoples during prehistoric and historic eras and include mounds, campsites, forts, villages, and house sites. Table 2.5-36 and Fig. 2.5-18 locate and identify the archaeological and historical sites within 2 km (1.2 mi) of the transmission corridors.

Prior to construction, an archaeological investigation of the River Bend site was performed by Robert W. Neuman, a professional archaeologist from Louisiana State University. His investigation uncovered three campsite areas around Site 5 on Fig. 2.5-18. However, the artifacts did not indicate long-term village occupation or mound sites. Several other sites are located partially or totally within the transmission corridors[39]. Among these are the Riddle
3 Cemetery at Site 6 (Spot Find No. 1) and the Civil War breastworks at Sites 8, 9, and 18. Sites identified as 8 through 11 and 18 are located within the Port Hudson Battlefield site.

Prior to the construction of the original transmission lines near the Port Hudson Battlefield area, the GSU right-of-way department established the transmission line route in a

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33. Telephone conversation between Elizabeth Dart, President of the West Feliciana Historical Society, St. Francisville, LA, and Loretta Garcia, Stone & Webster Engineering Corporation, Boston, MA, January 21, 1980, 1 pm.

34. Neuman, Robert W. An Archaeological Survey of the River Bend Station, West Feliciana Parish, LA, December 1971. Addendum, October 9, 1972. (For Gulf States Utilities Company, Beaumont, TX)

35. Louisiana Office of Tourism. A Traveler's Guide to Louisiana, pamphlet.

36. Louisiana Office of Tourism. Louisiana, What a Way to Get Away, 8th ed., tour guide.

37. Capital Economic Development District. Have a Capital Time in the Capital District, pamphlet, Fall 1974.

38. Neuman, Robert W. Cultural Resource Survey of the Gulf States Utilities Transmission Line Right-of-Ways, Louisiana, August 1978. (For Gulf States Utilities Company, Beaumont, TX)

39. Neuman, Robert W. An Archaeological and Historical Site Survey of River Bend Station Transmission Line B [Route I]. June 1978. (For Gulf States Utilities Company, Beaumont, TX) 3

TABLE 2.5-36

ARCHAEOLOGICAL AND HISTORICAL SITES WITHIN THE RIVER BEND STATION TRANSMISSION SYSTEM

| Map Ref. No.(1) | Survey No.(2) | Site Name | Location | Description |
|---|---|---|---|---|
| 1 | 16IV7 | Mays Place Camp | Approx 1.5 km east of Webre Station | Plain sherds found in earthen mound |
| 2 | 16XEF3 | Spot Find No. 2 | Approx 8.7 km east of River Bend, under Route III | Prehistoric campsite; ceramic fragments found |
| 3 | 16XEF2 | Spot Find No. 1 | Approx 5.4 km east of River Bend on Route III | Gravel flakes and chips on mound site |
| 4 | 16WF19a | ----- | Combined switchyards area, onsite | Small concentration of sherds (ceramic pots) |
| 5 | 16WF19b-d | ----- | Onsite along old tram line, just north of Route I. | Three campsite spoil piles with many sherds |
| 6 | 16WF31 | Riddle Cemetery | SE of Point J, adjacent to Route II | Cemetery with gravestones and unmarked graves |
| 7 | 16WF4 | Riddle Mounds | Approx 1.5 km east of Point J | Two mounds with site collection done |
| 8 | 16EF18 | Port Hudson No. 2 (Commissary Hill) | Approx 300 m south of Sandy Creek on Route II | Civil War breastwork about 1 m high and 40 m long |
| 9 | 16EF19 | Port Hudson No. 3 | Approx 1.5 km northwest of Point L on Route II | Three Civil War breastworks 3 to 4 m in height |
| 10 | 16EF7<br>16XEF1 | Port Hudson Campsite and Artillery Ridge, etc | West of Foster Creek and east of Sandy Creek, within 2 km NE of Route II | Scattered Civil War debris sites |
| 11 | 16EBR47 | ----- | Approx 300 m west of Route II and 700 m south of Point L | Civil War breastwork, 15 m long and 2 m high |
| 12 | 16PC31 | Waterloo | Just north of False River Channel and Mississippi River confluence, within 2 km of Route I | Historic Town and associated landing area, foundations and chimneys visible |

TABLE 2.5-36 (Cont)

| Map Ref. No.(1) | Survey No. (2) | Site Name | Location | Description | |
|---|---|---|---|---|---|
| 13 | 16WBR3 | Smithfield No. 3 | About 1.2 km SW of Point E, along Route I | Mound, 12 m in diameter | |
| 14 | 16WBR2 | Pitcher Place (No. 1 and 2) | West of Route I, about about 3 km south of Smithfield No. 3, near Bucche | Indian mounds in hectare site | |
| 15 | 16IV2 | Peter Hill | East side of Bayou Grosse Tete, approx 0.6 km north of Route I, near Point G | Two mounds in plowed field with pottery finds | |
| 16 | 16IV18 | ----- | 1.6 km north of Point G, Route I, on north side of Bayou Grosse Tete | Plain body sherds collected in plowed field | |
| 17 | 16IV16 | South of Rosedale Plantation | 1.3 km north of Point G near west bank of Bayou Grosse Tete, Route I | Plain sherds found in low earth mound | 3 |
| 18 | 16EBR52 | _____ | Approx 400 m south of Point L on Route II | Civil War breastwork, 2 m high and 6-8 m wide at base | 3 |

(1)Map reference numbers refer to Fig. 2.5-18.
(2)Survey numbers represent Louisiana State and Louisiana State University site reference numbers. The "16" stands for Louisiana and the letters correspond to the parish of the find.

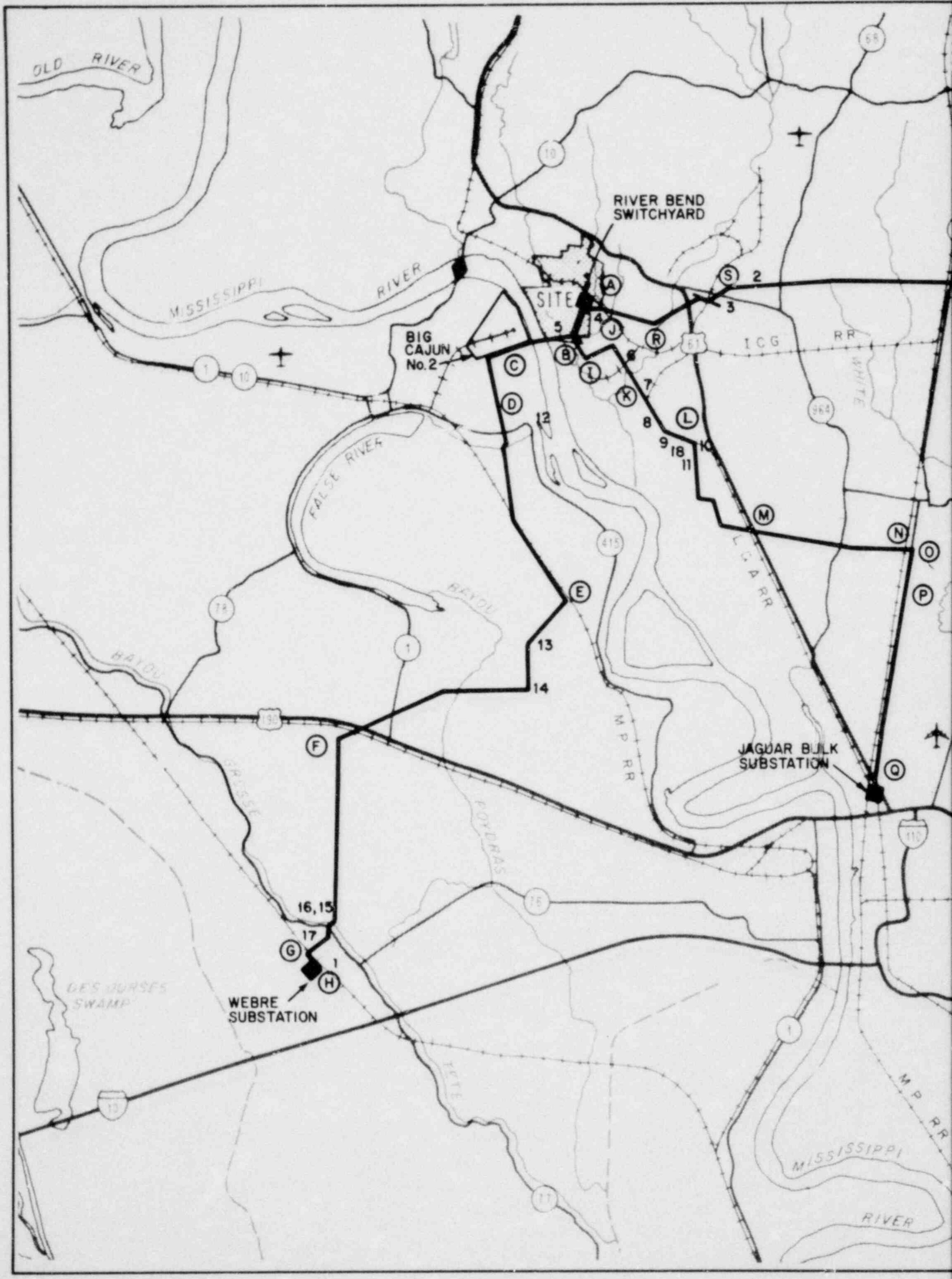
Sources: Neuman, R. W. Cultural Resource Survey of the Gulf States Utilities Transmission Line Right-of-Ways, Louisiana, August 1978. 3

Neuman, R. W. An Archaeological Survey of the River Bend Station, West Feliciana Parish, Louisiana, December 1971, with Addendum, October 1972.

Consolidated Site Records, Louisiana Archaeological Survey, archives of the Louisiana Office of Historic and Archaeological Preservation. 3

Archaeological Site Data, Coastal Environments, Inc., Baton Rouge, LA, archives of the Louisiana Office of Historic and Archaeological Preservation. 3

Neuman, R. W. An Archaeological and Historical Site Survey of River Bend Station Transmission Line B [Route I]. June 1978. 3


OLD RIVER
MISSISSIPPI RIVER
RIVER BEND SWITCHYARD
SITE
BIG CAJUN No. 2
FALSE RIVER
BAYOU
ICG RR
WHITE
MP RR
JAGUAR BULK SUBSTATION
WEBRE SUBSTATION
DES OURSES SWAMP
GROSSE
POYDRAS
TETE
MISSISSIPPI
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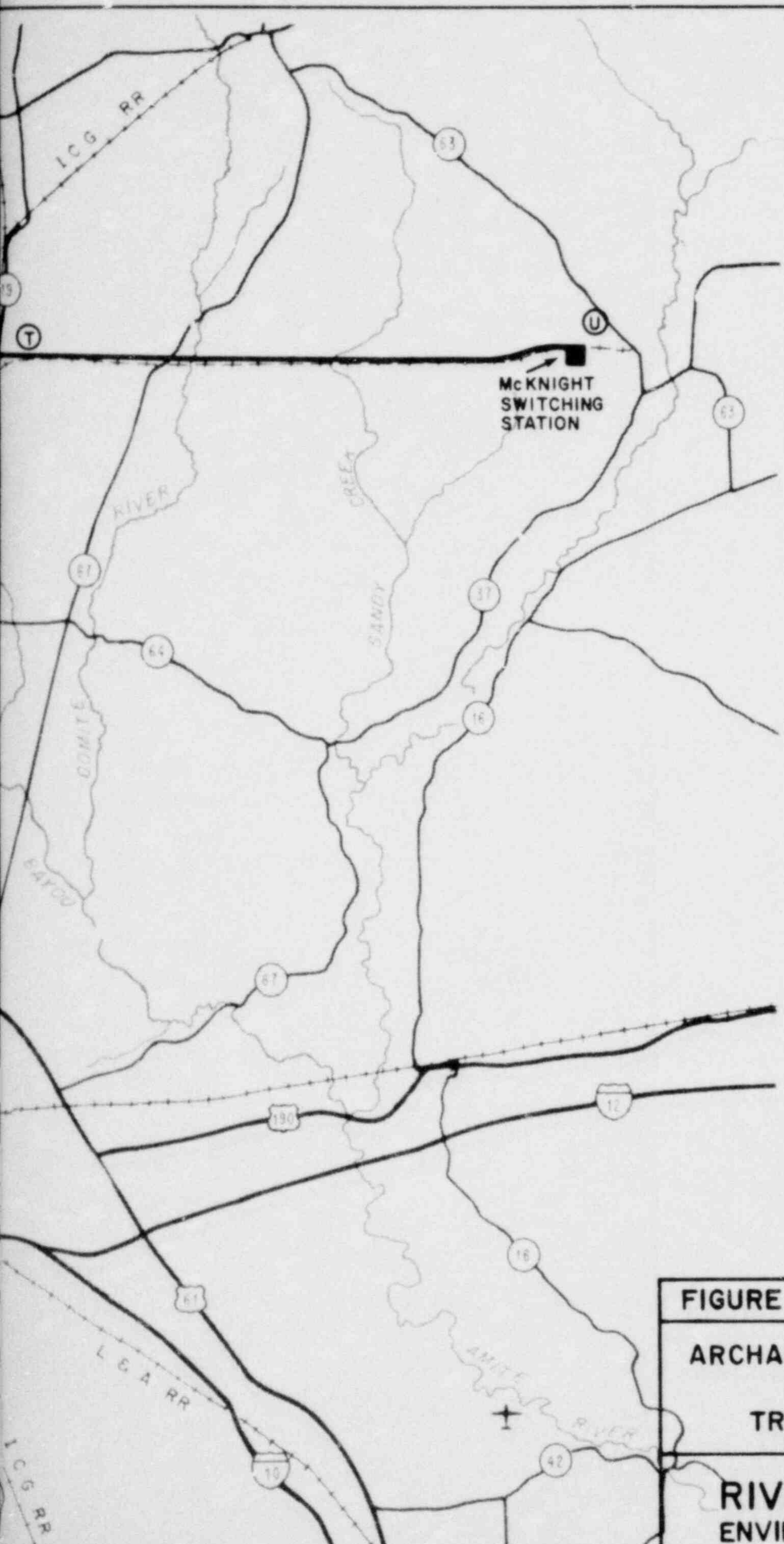


LEGEND:

TRANSMISSION LINE ROUTES

ROUTE I

ROUTE II

ROUTE III

(A) DESIGNATED LINE SEGMENT POINTS

NOTE
THE NUMBERS REFER TO ARCHEOLOGICAL SITES IN TABLE 2.5-36

0 5
SCALE- MILES

0 5 10
SCALE-KILOMETERS

FIGURE 2.5-18

ARCHAEOLOGICAL AND HISTORICAL SITES ALONG THE TRANSMISSION CORRIDORS

RIVER BEND STATION
ENVIRONMENTAL REPORT-OLS

# CHAPTER 1

## QUESTIONS AND RESPONSES

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# CHAPTER 2

## QUESTIONS AND RESPONSES

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QUESTION E470.2 (2.2)

Provide definitive data on agricultural productivity for 160 annular sectors to 50 miles (e.g., edible crops, meat, and milk). General production information by parish is not adequate.

RESPONSE

Tables 2.2-12a, 2.2-12b, and 2.2-15a show agricultural production by annular sector to a distance of 80 km. Since the Environmental Report was prepared using metric measurements, these tables were prepared to conform and, therefore, only show 144 annular sectors instead of 160 which result when annular sectors are designated in miles. 2

QUESTION E290.6 (2.2)

References (p.2.2-20). Please provide the staff with a copy of Reference 3, "Supplemental Environmental Information Document," October 1979.

RESPONSE

Copies of this document are provided under separate cover.

QUESTION E291.12 (2.3.3)

Provide complete reference citing of the Draft Environmental Impact Statement for Big Cajun No. 2 - Unit 3.

RESPONSE

Copies of the Final Environmental Impact Statement for Big Cajun No. 2 - Unit 3 are provided under separate cover.

QUESTION E240.27 (2.3.3.1)

There appears to be a potential for loss of make up water and interruption of normal power generation due to sediment induced cavitation in the intake pumps. In the ER section 2.3.3.1.1 it is stated that suspended sediment concentrations at Red River Landing and Baton Pouge range from about 10 to 2,500 mg/l. In the FSAR Section 2.4.11.5 it is stated that by the time influent turbidity consistently exceeds the ambient turbidity level, sediment deposition within the recession would have begun to affect intake operation. Discuss operational procedures and the method to be used in determining turbidity. In light of the significant range of observed suspended sediment concentrations in the Mississippi River, discuss how ambient turbidity is determined. Also, what are the maximum sediment concentrations at which the intake pumps can operate without incurring cavitation. Finally, discuss the likelihood of sediment induced cavitation outages.

RESPONSE

The response to this request is provided in revised Section 3.4.1.2.

QUESTION E240.28 (2.3.1.1)

The Mississippi River bathymetric survey results shown in Figure 2.3-2 show a channel upstream of the intake structure with depths up to -70 feet MSL. With reference to this figure, locate and describe in detail the sandbar growth discussed in FSAR Section 2.4.11.5 with respect to operability of the intake and discharge facilities.

RESPONSE

FSAR Section 2.4.11.5 refers to sandbar growth and sedimentation in the River Bend Station embayment, not the Mississippi River main channel. Fig. 2.3-2 is not of sufficient detail to present embayment sedimentation characteristics. The predicted sedimentation characteristics of the embayment are presented in FSAR Appendix 2E, and its potential impact on intake and discharge capability is discussed in revised Section 3.4.1.2.

QUESTION E240.34 (2.3.2.1)

In your discussion of drawdown due to groundwater pumping at the plant for operational purposes, no mention is made of drawdown due to the cumulative effects of St. Francisville and Baton Rouge withdrawals. Please provide this discussion along with an analysis of probable aquifer permeability loss due to compaction/subsidence.

RESPONSE

The response to this request is provided in revised Section 2.3.2.1.3.

QUESTION E240.32 (App. 2B)

Evaluate the effects of flooding of Alligator Bayou on erosion of the natural levee between Alligator Bayou and the Mississippi River. Estimate the number of additional days per year of overtopping of the levee due to the emplacement of the existing culverts. Describe what this will do to the rate of erosion of the levee which existed before the construction of the culvert section. Discuss the sensitivity of the results of your analysis to assumed levels of culvert blockage of 25, 50, and 75 percent.

RESPONSE

The response to this request is provided in revised Section 4.2.1 and Table 4.2-1.

QUESTION E240.33 (App. 2B)

Evaluate the effects of flooding of Alligator Bayou on access to the plant's Mississippi River Intake structure. Take into account the effect of Mississippi River Flooding on access using River Road. Estimate the number of days per year, on the average, that access to the intake structure is limited due to flooding. Also discuss what effect (if any) this limited access will have on the operation of the plant. Discuss the sensitivity of the results of your analysis to assumed levels of culvert blockage of 25, 50, and 75 percent.

RESPONSE

The response to this request is provided in revised Section 4.2.1.

CHAPTER 3

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3.4.1.3 Discharges to Mississippi River

The Mississippi River will be subject to liquid discharges during plant operation. Discharge from the heat dissipation system will consist of blowdown from the main cooling water system. Additions to this flow are treated liquid radwastes and neutralized demineralizer wastes. The thermal aspect of the discharge is covered in this section. Sections 3.5 and 3.6 complete the description of the discharge characteristics.

The rate of blowdown from the main cooling water system into the Mississippi River will be constant depending on the number of station units operating.

Blowdown discharge flow rate, temperatures, and concentration factors are listed on the basis of monthly averages in Table 3.4-2. The two-unit discharge is a constant 4,400 gpm, with a maximum temperature of 96°F. A discussion of thermal plume predictions is contained in Section 5.3.2.1.

3.4.1.4 Discharges to Air

At the design condition, the mechanical-draft cooling towers require approximately 90 x $10^6$ cfm of ambient air to dissipate the waste heat from River Bend Station. About 1,950 MWt of waste heat will be dissipated to the atmosphere from each unit. Since the air passing through the cooling tower is mechanically induced, the discharged airflow remains fairly constant. Exit air temperatures are proportional to the wet-bulb temperature of the ambient air.

The mechanical-draft cooling towers planned for use at the River Bend Station site are expected to provide the only plant effluents with a potential for influencing local meteorology. The effluent types of concern are commonly described as visible plumes (fog) and cooling tower drift. Each of these effluent types and their impacts on local weather are described in Section 5.3.3.

3.4.2 Component Descriptions

3.4.2.1 Intake System

The cooling tower makeup water system is composed of three parts: river intake screens and piping, pumphouse, and piping from the pumphouse to the clarifiers at the plant site. The cooling tower makeup water treatment plant is discussed separately in Section 3.6.

The intake screens and piping and a barge slip for barge unloading are located in a man-made recession on the Mississippi River near River Mile 262 (Fig. 3.4-3). The recession is approximately 600 ft in length along the river by 450 ft in width, with a dredged bottom at el -12 ft msl. The recession design is based on model studies conducted by Colorado State University and described in FSAR Appendix 2E. Four recessions of varying configuration were modeled to determine the characteristics of surface and bottom velocities, sedimentation, surface debris accumulation, recirculation potential, and intake back-flushing. Bank Recession Model 4 (FSAR Appendix 2E) was selected as the prototype for the River Bend Station embayment on the basis of its preferred performance characteristics.

3 The blowdown discharge line is located downstream of this recession to avoid recirculation. FSAR Appendix 2E states that an outfall location downstream of Section x = 61.0 ft (model scale) in Bank Recession Model 4 would prevent recirculation. This is based on studies of velocity patterns at low, normal, and high river stages. Appendix 2E, Fig. VI-38, shows the Model 4 configuration. In comparison with FSAR Fig. 2.4-30, the embayment has been constructed about 100 ft downstream of the Model 4 layout, requiring a downstream outfall location of about model scale x = 62 ft. The outfall, shown on FSAR Fig. 2.4-30, is at about model scale x = 67 ft and beyond the effect of recirculation.

The entrance to the pumphouse structure is at el +60 ft-6 in msl to protect pumps and motors from the project design flood level with wave runup. Three pumps, each sized for 16,000 gpm, are housed inside the structure. The pumps are mounted at floor el +10 ft-0 in msl and their columns extend to floor el -15 ft msl at their suction elbows. River water is conveyed to the pumps by two suction pipelines leading to a common manifold within the pumphouse structure. A wedge-wire intake screen is mounted at the entrance to each suction pipeline. The intake screens are octagonal shaped and are sized so that the average entrance velocity is less than 0.5 fps. The velocity of the water flowing by the intake screens will be approximately 0.1, 0.2, and 0.7 fps at low, average, and high water river stages, respectively. These flows will not affect operation of the pumps. If fouling occurs, the screens will be cleaned by backwashing facilitated by the backwash connection located at el 18 ft msl in the pumphouse structure.

3 Based on studies presented in FSAR Appendix 2E, the neck-shaped portion of the bank along the upstream end of the

recession minimizes the amount and rate of sediment deposition and trash carried into the recession. FSAR Appendix 2E Fig. VI-56 and VI-58 show the predicted locations in Bank Recession Model 4 of surface debris accumulation and initial sediment deposition, respectively. Fig. 3.4-3a shows the estimated initial sediment deposition locations for the River Bend Station embayment, based on the Model 4 results. It can be seen that initial deposition is not in the immediate intake area. From FSAR Appendix 2E, the predicted yearly sediment transport into the Model 4 recession is about 14 acre-ft. The distribution of this sediment will not be uniform throughout the embayment, but should tend to follow the pattern of initial deposition.

The base of each intake screen is at el -7.5 ft msl, giving a normal separation of 4.5 ft to the embayment dredged bottom. With this separation and the estimated sedimentation rate, it is anticipated that monitoring and subsequent sediment removal will be required every other year to minimize any impact to intake operation. However, the interval between embayment soundings will be modified to correspond to the rate of embayment sedimentation incurred during station operation.

As discussed in this appendix, the rate of sedimentation in the recession is dependent on the amount of sediment carried along the east bank. Data from water quality sampling sites along the Mississippi River have generally shown that the concentration of sediment is only slightly greater in the river channel than along the banks, as discussed in Section 2.3.3.1.1. Therefore, the rate of embayment sedimentation is directly related to the overall river sediment load, and the seasonal fluctuation in embayment sedimentation can be expected to follow the pattern of river sediment load. The sediment transport capability of the river flow is proportional to the velocity; therefore, floods carry larger amounts of suspended sediment. Data from the river reach including the site verify this, with annual spring floods producing the highest river sediment loads. Extreme floods such as have occurred in 1973, 1974, and 1975 have the potential to increase the embayment sedimentation rate above the predicted magnitude. The sedimentation monitoring schedule will consider the impact of extreme floods.

3

As discussed in Section VII of FSAR Appendix 2E, extreme floods have the potential to modify channel bathymetry and hydraulic characteristics. The flood of 1973 caused a shift in channel thalweg away from the embayment toward the channel center. The result was a measured reduction in post-flood channel velocity near the embayment and a predicted reduction in embayment sedimentation. Comparison and analysis of recession monitoring records can identify shifts in the sedimentation rate and will be used to establish the interval between embayment soundings.

Based on makeup water pump design and operating conditions, the potential for loss of makeup water leading to interruption of normal power generation due to sediment-induced cavitation in the intake pumps is considered non-existent. Cavitation, as normally associated with a pump, can be defined as the formation of vapor bubbles in the low-pressure (suction) end of the pump which collapse in the high-pressure (discharge) end and subject the pump to liquid hammer. If left uncontrolled, cavitation will lead to undesirable conditions such as pitting and excessive vibration. To prevent cavitation, the available net positive suction head (NPSH) must be greater than the required NPSH specified by the pump manufacturer. Since the system design includes provision for more than the minimum required NPSH to be available over the full range of operating conditions, cavitation is not expected to occur. Turbidity in the working fluid will affect the rate of wear of the pump parts in contact, but will not lead to
3 cavitation as previously defined. At higher levels of suspended solids, more abrasion and wear of the metal will occur, causing a decreased pump life. If a makeup water pump fails to produce the required flow, it will be taken out of operation. A spare full-flow pump is available (FSAR Section 9.2.11.2). Any interruption of makeup water flow would be temporary and not of sufficient duration to interrupt normal power generation.

The makeup water pumps are capable of operating at the desired rate over the entire range of suspended solids expected in the makeup water without failure due to significant pump abrasion, clogging, or mechanical failure due to high loads or impact shocks.

The ambient suspended solids level of Mississippi River water near St. Francisville averages 163 ppm annually, with a reported monthly maximum of 463 ppm (Table 3.6-2). These levels are generally representative of the river water at the depth of the intake structure. Data are based on a monthly sampling program conducted by USGS at St. Francisville and do not reflect temporary turbidity excursions up to the 2,500 ppm detected by the U.S. Army Corps of Engineers at Red River Landing and Baton Rouge. Turbidity, as determined by USGS, will be used to determine ambient levels and trends. Normally, ambient turbidity

should correlate with turbidity of the water pumped for
cooling tower makeup. Monitoring of sedimentation
deposition in the embayment area will be conducted
periodically, and sediment removal will occasionally be
required. This will prevent excessive sediment buildup from
causing a higher than ambient level of turbidity in the
makeup water. Turbidity of the makeup water is continuously
monitored and recorded at the inlet to each clarifier
(Section 3.6.1.2). Each turbidity analyzer is set to alert 3
the operator of abnormally high turbidity by annunciating on
the water treatment system control panel. Based on the
recorder charts, the operator can determine whether any
action is required (such as adjusting the chemical feed or
sludge recirculation rate) or if the rise is a transient
condition requiring only surveillance. The expected level
of suspended solids in the makeup water under all conditions
will not affect operation of the makeup water pumps,
clarifiers, or other system components.

The intake screens and suction piping are supported by 12-in-diameter steel friction piles driven to the Holocene sands. Fig. 3.4-4 shows a profile view of the intake screens and suction piping leading to the pumphouse. The pipe support members between the piles do not extend above el +0.25 ft msl. The pile members support the suction pipelines to the recession slope, after which the pipelines are buried until entering the pumphouse structure. Riprap is placed to minimize possible erosion of the natural bank which covers the suction pipes.

The barge slip consists of a graded gravel platform with a 10:1 slope. This unloading facility will allow a barge to be grounded and the cargo directly unloaded.

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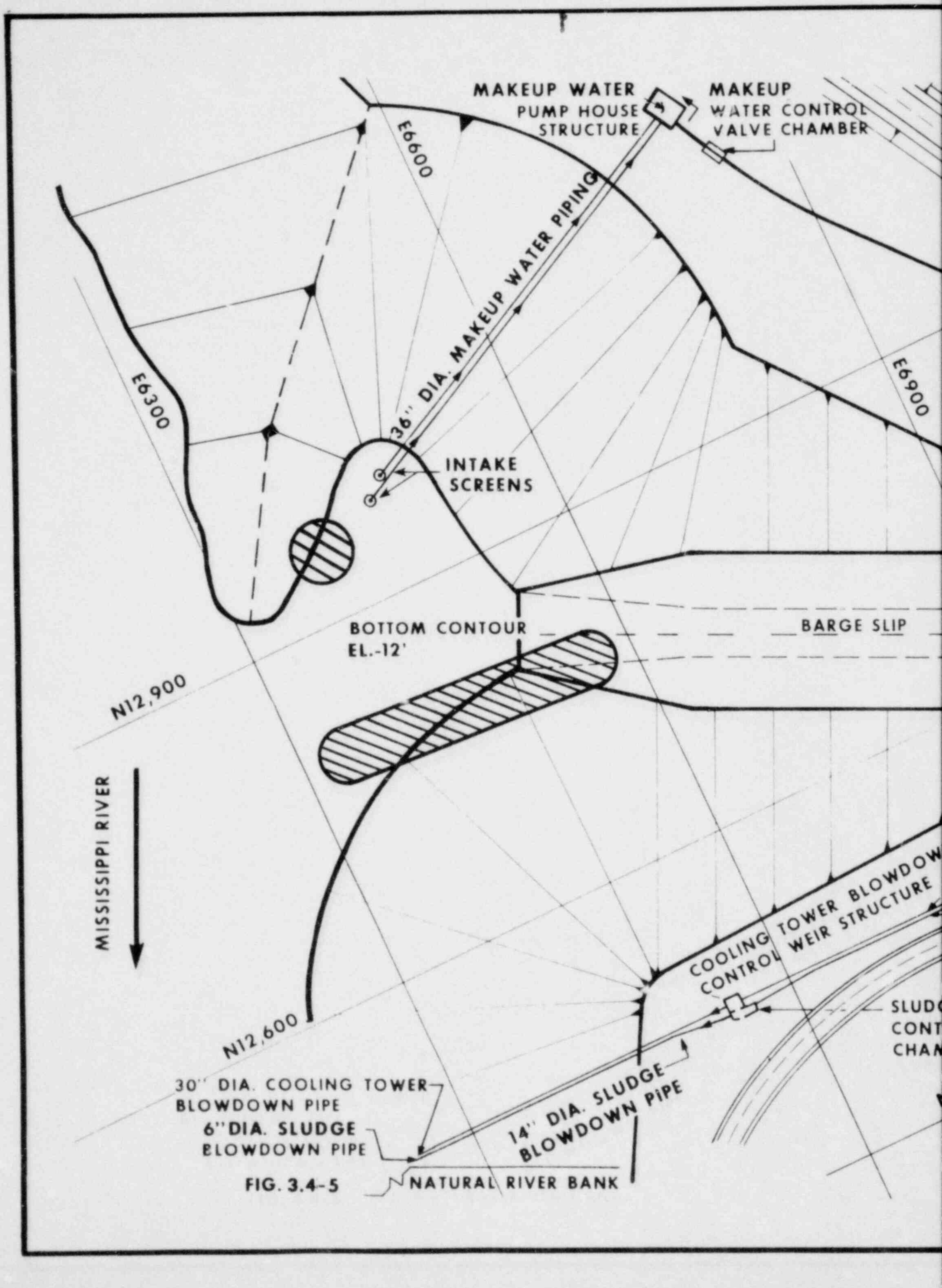
MAKEUP WATER
PUMP HOUSE
STRUCTURE
MAKEUP
WATER CONTROL
VALVE CHAMBER
E6600
36" DIA. MAKEUP WATER PIPING
E6300
E6900
INTAKE
SCREENS
BOTTOM CONTOUR
EL.-12'
BARGE SLIP
N12,900
MISSISSIPPI RIVER
COOLING TOWER BLOWDOWN
CONTROL WEIR STRUCTURE
N12,600
30" DIA. COOLING TOWER
BLOWDOWN PIPE
6" DIA. SLUDGE
BLOWDOWN PIPE
14" DIA. SLUDGE
BLOWDOWN PIPE
NATURAL RIVER BANK
FIG. 3.4-5

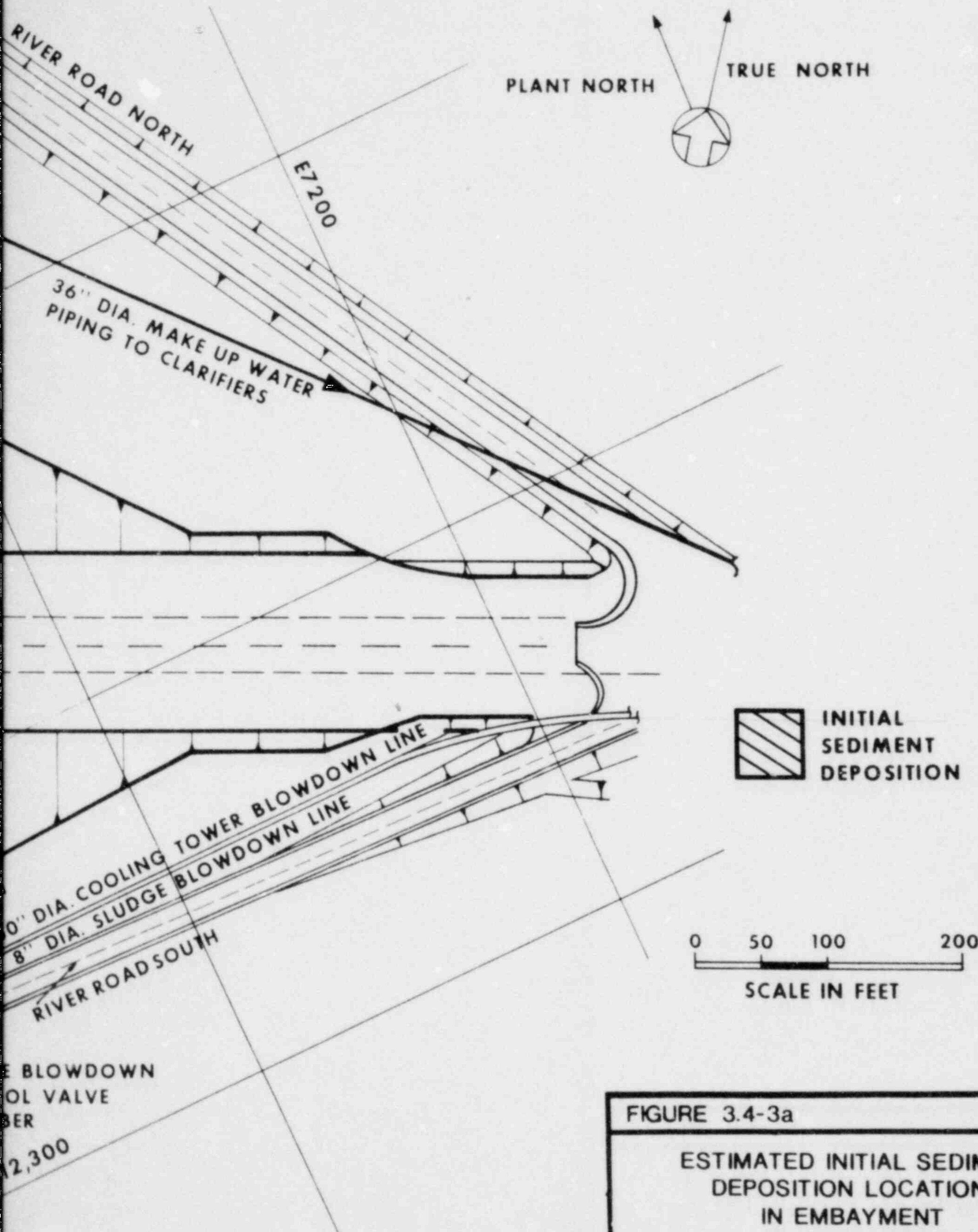


FIGURE 3.4-3a

ESTIMATED INITIAL SEDIMENT DEPOSITION LOCATIONS IN EMBAYMENT

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# CHAPTER 3

## QUESTIONS AND RESPONSES

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QUESTION E291.5 (3.4)

Indicate whether thermal and/or chemical treatments will be used in the backwash treatment of the intake structure.

RESPONSE

No design provision is included for thermal and/or chemical treatments in the backwash of the intake structure.

QUESTION E240.29 (FSAR 2.4.11.5/ER-OLS 3.4)

It is stated that sandbars form gradually along the passageway upstream of the makeup water intake structure embayment. Provide drawings showing the configuration of the embayment and bargeslip, indicating location and aerial extent of sandbar growth.

RESPONSE

The response to this request is provided in revised Section 3.4.1.2 and Figure 3.4-3a. See also response to Question E240.28.

QUESTION E240.30 (FSAR 2.4.11.5/ER-OLS 3.4)

It is stated that with periodic maintenance dredging, intake operation is unaffected by sediment and that soundings of the makeup water intake embayment will be performed periodically, but not less than once every other year. Discuss the extent to which sandbar growth can occur during significant floods of fairly long duration such as those that occurred in 1973, 1974, and 1975 and how the occurrence of such a flood is accounted for in the scheduling of sediment deposition monitoring.

RESPONSE

The response to this request is provided in revised Section 3.4.1.2.

# CHAPTER 4

# ENVIRONMENTAL IMPACTS OF CONSTRUCTION

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## 4.2 HYDROLOGICAL ALTERATIONS AND WATER USE IMPACTS

### 4.2.1 Hydrological Alterations

Groundwater Alterations

No irreversible alterations to the groundwater table in the site area were made during the initial phase of the construction dewatering program, which took place between May 11, 1976 and May 23, 1977. During this period, the groundwater level in the Upland Terrace Aquifer was drawn down about 60 ft. Dewatering was accomplished by 44 12-in-diameter wells, each equipped with a 700-gpm pump. Maximum dewatering flow was about 21,700 gpm (48.3 cfs), and the average value was 7,700 gpm (17.2 cfs). Groundwater levels after construction are similar to the preconstruction levels. Piezometer readings made at the site 1 yr after completion of this period of dewatering showed that the cone of depression had disappeared, the natural groundwater gradient had returned, and the groundwater level had recovered to within 10 ft of the preconstruction level. A second period of dewatering commenced in May 1979 at an average daily rate of about 3,000 gpm (6.7 cfs). It is anticipated that the dewatering system will be shut down by April 1981 and will then not be further required during Unit 1 construction. From the experience gained during the first dewatering period, as discussed in Section 2.3.2.1.4, it is estimated that the groundwater level will recover in a similar manner to the first dewatering period.

Surface Water Alterations

Station construction has altered the natural surface water hydrological setting. Features of these alterations are depicted in Fig. 2.1-3.

Dewatering flow was conveyed from the plant area to Grants Bayou. This has caused no irreversible impact to that stream. The annual flood for Grants Bayou is in excess of 1,000 cfs, and storms frequently occur in the basin which produce streamflows greater than the dewatering flow. No significant impact to channel characteristics has been detected from the routing of dewatering flow to Grants Bayou.

River Access Road, located between the intake embayment area on the Mississippi River and the plant area, is constructed across Alligator Bayou on the floodplain of the river. This road was constructed for the purpose of providing access to the embayment area and for the transportation of heavy construction loads, and will remain during the operational phase of the plant. Fourteen 6-ft-diameter corrugated-metal culverts are provided in the road embankment to allow overbank Mississippi River flood flow and Alligator Bayou flow to pass from the upper bayou to the lower bayou according to the preconstruction pattern. A description of the estimated hydrological impact of construction of River Access Road is provided in Appendix 2B and Section 4.3.2.

In addition to the study presented in Appendix 2B, an analysis was performed to determine, in greater detail, the potential impact of culvert blockage during a storm in the Alligator Bayou basin. Culvert blockage was assumed at 0, 25, 50, and 75 percent. Table 4.2-1 presents the results.

It can be seen that culvert blockage slightly increases the overtopping duration. However, it has a relatively insignificant effect on Upper and Lower Bayou water levels, because the conveyance of the overtopped portion of River Road is sufficient to carry the peak portion of a site flood with relatively low head at River Road, stabilizing the bayou water level.

However, overtopping the levee for these intermittent and relatively short periods erodes a 100- to 150-ft-long section of River Road and forms gullies between the road and
3 the Mississippi River. Erosion is localized and will not impact the overall levee erosion rate in the area. Additionally, installation of the Army Corps of Engineers revetment in the near future will stabilize the river bank and minimize the impact of levee overtopping. In an effort to mitigate road washouts, erosion repair work has been performed to maintain the existing road profile and prevent extension of erosion gullies back into Alligator Bayou.

Based on the performance of the culvert emplacement to date, it is anticipated that a continued program of surveillance and erosion repair will maintain River Road and the surrounding area during the period of station construction. Alternative drainage schemes at River Access Road may be investigated during plant operation if levee overtopping and erosion prove extensive and not easily controlled by maintenance.

An excavated embayment has been constructed in the Mississippi River along the east bank at about River Mile 262.5. A barge slip and the plant makeup water intake screens are located in the embayment, which provides protection from main channel debris and navigation. Access to the embayment area is obtained from the north and south by River Road, which runs parallel to the river along the natural levee, and from the east (and the plant area) by River Access Road. Embayment banks are gently sloped and employ riprap protection to -12 ft msl (about 19 ft below mean low water level) to reduce the effects of river bank erosion. Riprap stone size is 16 to 20 in. The natural bank erosion rate (no slope stabilization) is estimated to be 8 ft/yr (Section 2.3). By agreement with the Army Corps of Engineers, dredged material from embayment construction has been deposited at acceptable bed elevations in the river. Bottom elevation in the embayment is -12 ft msl. Periodic dredging of the embayment may be required due to sediment transport in the river (Section 2.3).

The effect on access to the intake structure due to floods on Alexander Creek/Alligator Bayou and the Mississippi River has been evaluated. River Access Road is the primary access route from the station to the intake structure on the river. While access to the intake is possible via River Road along the levee, there are currently no plans for use of this route by station personnel. Therefore, the impact of flooding on River Road access to the intake structure is not a significant concern.

The potential for culvert blockage at River Access Road has no impact on intake structure access. The levee along the river is at a lower elevation than River Access Road. Flood flow unable to pass through the culverts due to blockage would pond in the Upper Bayou and flow over the levee to the river prior to topping River Access Road and inhibiting intake structure access.

3

River Access Road has a finished grade of 50 ft msl across the bayou and at the intake embayment. The entryway to the intake structure is at 60.5 ft msl, 10.5 ft above finished grade. Based on a study of historical stage (1956-1979) at Bayou Sara, LA, 3 mi upstream of the site, the following information is applicable to the Mississippi River at the River Bend Station embayment (see Section 2.3 for a detailed description of site hydrology):

| | |
|---|---|
| Mean annual stage | 20.4 ft msl |
| Mean annual flood | 38.9 ft msl |
| 10-yr flood | 46.4 ft msl |
| 25-yr flood | 50.4 ft msl |
| Project design flood | 54.5 ft msl |
| Maximum daily recorded stage | 52.1 ft msl |
| Maximum monthly average recorded stage | 49.2 ft msl |
| Exceeding 40 ft msl | 5% (18 days/yr) |
| Exceeding 45 ft msl | 1% (4 days/yr) |

Exceeding 50 ft msl <1%

Based on a statistical review of the stage data, it is estimated that access to the intake structure via River Access Road may be limited for 1 to 2 days per year. The data base includes four of the most severe floods in recorded history (1973, 1974, 1975, and 1979); however, the
3 water level at the site exceeded 50 ft msl during only two periods in the 24-yr data base, the two greatest Mississippi River floods which occurred in 1973 and 1979.

It is anticipated that the slight potential for limited access to the intake structure will have no impact on station operation. The intake structure can be accessed by a boat if necessary during a flood period.

Intake system hydrodynamics and flow patterns in the embayment are discussed in Section 5.3.1.

The cooling tower blowdown pipeline and the clarifier sludge discharge pipeline exits the plant area adjacent to one another and cross Alligator Bayou along the south side of River Access Road. Both pipes exit to the Mississippi River within the riprapped portion of the river embankment, approximately 400 ft downstream from the centerline of the embayment. The pipelines are buried in the roadbed and do not interfere with surface water flow in Alligator Bayou and West Creek. The discharge outfalls are discussed in Section 3.4. Potential impacts of discharge from these pipelines are discussed in Sections 5.3.2 and 5.5. The centerline of both outfalls is at -3 ft msl, about 10 ft below mean low water. There is no impact to river navigation.

A reach of West Creek in the plant area has been relocated to a 2,850-ft-long Fabriform-lined channel to reduce the potential for erosion and plant flooding due to local storms. Creek flow is directed into the lined channel by a drop structure. Channel slope is approximately 0.002 ft/ft (0.2 percent). The channel cross section is trapezoidal with a 10-ft depth, bottom width of 50 ft, and 3H : 1V side slopes. The interface of the downstream end of the lined channel and the existing stream bed is protected by riprap to minimize channel undercutting.

Plant construction has resulted in the removal of all but about 750 ft of East Creek, a small debris-clogged drainage course formerly about 3,500 ft long. An additional 1,150 ft of unlined channel, which drains to East Creek, will convey sewage treatment plant effluent (less than 1 cfs) and storm water runoff to Grants Bayou.

North Access Road, constructed to permit plant access to State Highway 965 and US Highway 61, passes over West Creek about 1,500 ft upstream of the drop structure and over West Fork Grants Bayou about 2,000 ft upstream of the plant area. The bridges at these points have no significant effect on water levels at either stream due to bridge size and height above normal and flood levels.

Prior to construction, 24 ponds existed within the site property boundary with a total surface area of about 28.6 acres. Five ponds were removed during construction having a combined total surface area of about 1.7 acres. Fig. 4.2-1 shows the location of ponds within the site property boundary.

To offset the removal of these ponds, one pond, called the Wildlife Management Lake, will be constructed at the River Bend site. Normal water surface elevation will be about 50 ft msl. This water level will be controlled by a concrete spillway about 26.5 ft wide located at the tramway bordering Alligator Bayou. At this water level, the surface area is about 34.2 acres, storage is about 196 acre-ft, and the average depth is slightly less than 6 ft. The spillway embankment will be constructed from onsite construction spoil material. Access to the lake will be constructed from River Access Road. The final plans for future use of the lake are being investigated.

A variety of erosion control measures have been implemented at the site during plant construction, including the stockpiling and use of topsoil, seeding, mulching, drainage channels, and energy dissipators. Site soils are highly erodible. Sediment deposition due to runoff from the primary spoil pile has occurred in the Wildlife Management Lake and in a small portion of the floodplain near the tramway entrance to the lake. Sediment deposition due to runoff from plant construction areas has also occurred in portions of East Creek and West Creek. The drainage and water quality characteristics of these streams have not been significantly altered. Mitigative action taken to minimize erosion is discussed in Section 4.6.

During the final phase of plant construction and the initial
phase of operation, all areas cleared for construction or
used as stockpile and equipment laydown areas will be
replanted with vegetative cover to minimize erosion.
Vegetative cover will also be used to restore and stabilize
any areas affected by erosion and deposition of eroded
sediments. This will involve the use of grass seed, lime
and fertilizer, mulch, binding or mulch anchoring, topsoil,
1 fill, sod, flumes, drainage ditches, and/or energy
dissipators, and other appropriate measures as necessary.
All seed will comply with guidelines published in the
Louisiana Standard Specifications for Roads and Bridges[1].

Onsite erosion will be monitored and controlled as described
1 above and in Section 4.6.

Sediment production (erosion) and deposition caused by
construction of the plant, the intake and outfall
structures, the barge slip, or River Access Road are not
expected to have any residual adverse impact upon plant
operation, since these and adjoining areas will be restored
to minimize erosion and subsequent deposition. Periodic
1 dredging in the embayment area will be necessary and will
result in a temporary increase in suspended solids in the
intake water which will be removed by the clarification
system (Section 3.6.1.2).

Improvements to the riverbank bordering the River Bend site
are planned by the U.S. Army Corps of Engineers to begin in
3 the fall of 1984 and be completed in early 1985
(Section 4.6.2). No significant adverse operational impact
is expected to result from these activities. Conversely,
the revetments will have a beneficial effect through
stabilization of the riverbank. The erosion protection
provided in the design and construction of the embayment
area was engineered to take into account U.S. Army Corps of
Engineers plans and methods for revetment in order to ensure
3 continuity at the connecting points. Since it was not a
factor in the functional design of the embayment area,
revetment construction is not expected to impact plant
operation should the improvements be delayed until after
plant operation begins.

There are no significant hydrological alterations offsite or within the transmission corridors due to plant construction.

### 4.2.2 Water Use Impacts

#### 4.2.2.1 Construction Effects on Water Quality

There are no irreversible effects on the regional water quality due to plant construction activities. The major effect of the construction activities was the temporary increase in the turbidity of East and West Creeks, due to storm runoff from land areas cleared for construction. Wastewater from the concrete batch plant has been discharged to Upper West Creek after being treated in the wash pits. Discharge to the wash pits has been about 500 gpd (0.001 cfs). Construction waste streams are periodically inspected to ensure compliance with NPDES permits. A discussion of construction effluent monitoring is included in Section 6.6.

During embayment construction, an increase in the turbidity of Mississippi River water, due to dredging activity, was localized and temporary. A discussion of sediment added to the river during embayment construction is presented in Section 4.3.2.1.

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TABLE 4.2-1

CULVERT BLOCKAGE AT ALLIGATOR BAYOU BASIN

| Percent Culvert Blockage | Rainfall Recurrence (years) 1 | | | 5 | | | 10 | | |
|---|---|---|---|---|---|---|---|---|---|
| | $E_1$ | $E_2$ | $T_0$ | $E_1$ | $E_2$ | $T_0$ | $E_1$ | $E_2$ | $T_0$ |
| 0 | 38.5 | 33.1 | 11 | 39.8 | 34.8 | 20 | 40.2 | 35.8 | 23 |
| 25 | 38.5 | 33.1 | 11 | 39.9 | 34.8 | 20 | 40.2 | 35.6 | 23 |
| 50 | 38.5 | 33.1 | 13 | 39.9 | 34.7 | 21 | 40.2 | 35.5 | 25 |
| 75 | 38.5 | 33.0 | 14 | 40.0 | 34.7 | 23 | 40.3 | 35.4 | 26 |

3

$E_1$ = maximum water surface elevation in Upper Bayou (ft msl)
$E_2$ = maximum water surface elevation in Lower Bayou (ft msl)
$T_0$ = hours of flow overtopping the River Road

Notes:
1. Fourteen culverts at River Access Road were considered (as installed)
2. Minimum River Road elevation approximately 37.3 ft msl

# CHAPTER 4

## QUESTIONS AND RESPONSES

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QUESTION E240.31 (4.5.2)

Discuss the status of Army Corps of Engineer's plans to construct revetments extending upstream and downstream of the makeup water intake structure. Also describe potential impacts of this construction if it is delayed until after the plant begins operation.

RESPONSE

The response to this request is provided in revised Sections 2.3.1.1 and 4.2.1.

| | |
|---|---|
| Effluent BOD (5-day) and suspended solids | <30 mg/l |

The sanitary waste system will discharge an estimated 10,500 gpd (0.016 cfs) of secondary treated effluent into the storm drainage system during normal station operation. Nonradioactive and oil-stripped floor and equipment drainage will add an estimated 43 gpm (0.1 cfs - intermittent flow expressed as continuous flow) to the storm sewer during normal operation. The treated effluent stream will frequently represent the total flow in Grants Bayou due to the intermittent nature of natural flow. It is estimated that station sanitary waste treatment plant effluent will comprise all or most (i.e., 50 percent or more) of the flow 2
in Upper Grants Bayou at least 70 percent of the time. For the remainder of the time (up to 30 percent), rainfall runoff from the upper bayou drainage area will exceed the treated effluent flow. The duration that this will occur will vary according to the length and intensity of each rainfall event.

During periods of high makeup water demand, the well water pumps will operate continuously and an intermittent overflow to the storm sewer system of excess well water is expected to occur at an estimated average continuous rate of 4 gpm.

The water quality of plant effluents discharged to local streams is expected to be within NPDES discharge limitations and will not violate state water quality critera.

Sludge resulting from clarification of the cooling system makeup water will be diluted to a solids concentration of 0.5 to 4.0 percent by weight and discharged to the Mississippi River at an average rate of 540 gpm (1.2 cfs). The sludge consists of raw river water, coagulated suspended solids, and a small amount of cationic polymer which serves as the electrolyte during flocculation. Considering the composition of the blowdown, the turbid nature of the river, and the presence of rapid mixing characteristics, it is estimated that the clarifier sludge discharge plume will be indistinguishable in the river within 61 to 91 m (200 to 300 ft) of the outfall. The U.S. Environmental Protection Agency and the Louisiana Stream Control Commission have approved the discharge of clarifier sludge to the Mississippi River at River Bend Station[(2)].

Dredging may be required periodically in the intake embayment due to the heavy sediment load in the Mississippi River. Disposal will be the same as for embayment construction, that is, dredged material will be placed below

biota resulting from the thermal component of these
discharges is discussed in Section 5.3.2.2. The impact
potential of the chemical constituents of these effluents is
discussed here.

The largest plant effluent source is the cooling tower
blowdown stream which discharges to the Mississippi River
downstream of the intake embayment. The chemical makeup of
this stream is determined by the ambient river water quality
(as treated and concentrated in the cooling system), and by
the addition of other effluent streams resulting from
station operation.

Table 5.5-2 lists the composition of this blowdown stream
based on cooling tower concentration of ambient river water,
and significant additions to the stream. Table 5.5-3
compares estimated concentrations of selected dissolved
3 2 constituents in the station discharge to their biological
effect. For most constituents, maximum concentrations at
the point of discharge are well below toxic levels. Only
for iron, calcium, and copper are potentially harmful levels
approached under conditions of maximum concentration. Since
average concentrations of iron and calcium are below these
levels, and the effluent is rapidly diluted to ambient
levels, these constituents would have no effect on aquatic
life.

Average copper concentrations during station operation
slightly exceed the 96 hr TLM for bluegill (Table 5.5-3) at
the point of discharge. However, because of the relatively
high river velocities at the discharge (1.3 m/sec-4.3 ft/sec
average), it is unlikely that a fish would remain at the
point of discharge long enough to be affected. Rapid
dilution takes place, so that within a short distance of the
discharge, concentrations will be well below toxic levels.
Furthermore, only a minor portion (conservatively, less than
one half) of the estimated copper discharge considered as
2 dissolved in the blowdown stream will appear in the form
harmful to aquatic life (i.e., ionic form). This is based
on research in regard to ionic copper removal processes and
3 field test data[3].

Copper concentrations above 2 mg/l (Table 5.5-3) could be
discharged during the first few months of station operation,
due to high initial erosion/corrosion rates of the condenser
tubing. Elevated levels would also occur at other times
during station operation when condenser tubing is replaced,
but it is unlikely that the initial maximum concentration
would be reached unless all condenser tubing is replaced at
the same time. These high copper concentrations would be

## TABLE 5.8-7

### RESIDENCE DISTRIBUTION FOR PRESENT OPERATING STAFF

| | | |
|---|---|---|
| West Feliciana Parish | | |
| St. Francisville | 20% | |
| East Feliciana Parish | | |
| Norwood | 2% | |
| Jackson | 2% | |
| | 4% | |
| East Baton Rouge Parish | | |
| Baton Rouge | 32% | |
| Baker | 24% | 2 |
| Zachary | 14% | |
| Pride | 2% | |
| | 72% | |
| Point Coupee' Parish | | |
| New Roads | 2% | |
| Jarreau | 2% | |
| | 4% | |
| Total | 100% | |

Airborne particulate samples will be collected by drawing air at $3 \times 10^{-2}$ cu m/min through a filter. After passing through the filter, the air passes through an iodine cartridge. The dust filters will be changed weekly or as required by dust loading, whichever is more frequent. After standing for 3 or 4 days to allow the daughter isotopes of radon and thoron to decay, the filters will be assayed weekly for gross beta activity and examined quarterly for gamma isotopes.

Airborne Iodine

The indicator and control sampling stations will utilize iodine cartridges, which will be replaced and assayed weekly for radioactive iodine-131.

6.2.1.1.2 Direct Radiation

Forty thermoluminescent dosimeter (TLD) stations will be established to measure offsite exposure due to direct radiation. An indicator station will be located in each of 16 compass directions surrounding the plant at the restricted area boundary. Another set of indicator stations will be located within a 6- to 10-km range of the site in each of the 16 compass directions. Five stations will be located in areas of special interest, such as local residences, schools, or milk animal pastures. These special locations are listed in Table 6.2-2. Three other stations will be maintained as control stations located at a distance of 15 to 30 km in the southwest, east, and north directions.

The indicator stations will contain two TLDs. One TLD will be replaced and read monthly, the other quarterly. The background stations will contain four TLDs. Two will be replaced and read monthly, the other two quarterly.

6.2.1.1.3 Ingestion

Milk

Milk appears to be the most direct and the most sensitive means for monitoring iodine-131 (the limiting isotope) in terrestrial pathways. The known locations of milk animals within a 5-km radius of the plant in 1980 are listed in Table 2.7-115. Samples from the three locations with the highest dose potential within a 5-km radius will be taken for gamma isotopic and iodine-131 analysis semimonthly when animals are on pasture, and monthly at other times. These locations are 1,600 m northwest, 1,400 m north, and 1,300 m north-northwest from the station. A sample from milking animals at a control location 15 to 30 km from the site in a southwest (least prevalent) wind direction also will be analyzed at the same frequency.

Food Products

Three samples of broadleaf vegetation grown in the offsite locations of the highest calculated annual average ground-level D/Q will be taken for gamma isotopic analysis on the edible portion of the plant, if milk samples are not available. This analysis will be done monthly when crops are available. Samples of broadleaf vegetation will be obtained from a 40 sq m onsite garden with the highest
2 calculated annual average ground-level D/Q, if offsite samples are not obtainable.

The potential radiological impact of station operation on nearby vegetable crops, including the sweet potato, was reviewed. No waterborne pathway to man exists via the sweet potato. Irrigation and surface and ground waters in the station vicinity do not reach the vegetable croplands, since there is no use of Mississippi River water for sweet potato or other vegetable crop. Impact to vegetables near the station from normal gaseous releases will be insignificant, as discussed in Section 5.4. The milk pathway provides a greater potential impact to man, and vegetable sampling will be conducted only if milk samples are not available.

6.2.1.1.4 Liquid Discharges

Surface Water

River water will be collected at the control station located approximately 4.2 km upriver from the plant liquid discharge outfalls, at the St. Francisville ferry crossing. River
1 water will also be collected at a point approximately 3.9 km downstream from the plant liquid discharge outfalls, near Crown-Zellerbach paper mill, where the plant effluent is completely mixed with river water. Composite samples for gamma isotopic analysis will be collected monthly, and composite samples for tritium analysis will be collected quarterly.

Drinking Water

A monthly composite sample of the raw intake at the first downriver water supply (Peoples Water Service Company - Bayou Lafourche, River Mile 175.5) will be collected and analyzed on the same schedule as that of surface water.