RIVER BEND STATION ENVIRONMENTAL REPORT

OPERATING LICENSE STAGE

SUPPLEMENT 8

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Supplement to Environmental Report -

Operating License Stage

River Bend Station

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Stone & Webster Engineering Corporation
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The following instructions are for the insertion of Supplement 8 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 1.2-1, Sheets 1, 2, and 3 of 4	Table 1.2-1, Sheets 1, 2, and 3 of 4
Q&R 1-i/- Q&R 1.0-1/-	Q&R 1-i/- Q&R 1.0-1/-
2-i/2-ii	2-i/2-ii
2.3-9/2.3-10	2.3-9/2.3-10

VOLUME 2

REMOVE	INSERT
2.5-13/2.5-14	2.5-13/2.5-14
---	2.5-14a/2.5-14b
2.5-21/-	2.5-21/-
Table 2.5-36, Sheet 1 of 2	Table 2.5-36, Sheet 1 of 2

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Table A1-5 (of Attachment A to Appendix 2B)	Table A1-5 (of Attachment A to Appendix 2B)
Table 2C-4	Table 2C-4
Table 2C-9	Table 2C-9
Table 2C-10	Table 2C-10
Table 2C-11	Table 2C-11
Table 2C-12	Table 2C-12
Table 2C-13	Table 2C-13
Table 2C-14	Table 2C-14
Q&R 2-i/Q&R 2-ii	Q&R 2-i/Q&R 2-ii
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Q&R 2.4-1/Q&R 2.4-2	Q&R 2.4-1/Q&R 2.4-2
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5.4-5/5.4-6	5.4-5/5.4-6
5.5-3/5.5-4	5.5-3/5.5-4
---	5.5-4a/5.5-4b
7A-iii/7A-iv	7A-iii/7A-iv
7A.4-1/-	7A.4-1/-
---	Table 7A.4-1 (immediately following pg 7A.4-1)
Table 7A.6-3, sheets 1 and 2 of 2	Table 7A.6-3, sheets 1 and 2 of 2

TABLE 1.2-1

FEDERAL, STATE, AND LOCAL AUTHORIZATIONS

Agency	Authorization Required	Authority	Date of Request	Status	
U.S. GOVERNMENT					
Army Corps of Engineers	Dredging and maintenance of a slip, construction and maintenance of intake and discharge structures, and a barge dock	Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C 403); FWPCA Section 404 (P.L. 92-500, 86 Stat 816)	9/5/74	Permit No. LMNOD-SP (Mississippi) 870 issued 10/15/76. Extension granted 7/7/78. Additional extension granted 1/16/80.	
	Construction of transmission lines across Mississippi River	Section 10 of the Rivers and Harbors Act of 1899	7/18/77	Permit No. LMNOD-SP (Mississippi River) 990 Issued 10/31/77.	8
	Construction of transmission lines across Thompson Creek	Section 10 of the Rivers and Harbors Act of 1899	8/2/79	Permit No. LMNOD-SP (Thompson Creek) 6 Issued 2/13/80. (Route II)	4 | 8
	Construction of transmission lines across Thompson Creek	Section 10 of the Rivers and Harbors Act of 1899	10/27/81	Permit No. LMNOD-SP (Thompson Creek) 7 Issued 1/15/82. (Route III)	4 | 8
	Construction of transmission line across Comite River	Section 10 of the Rivers and Harbors Act of 1899	8/25/81	Permit No. LMNOD (Comite River) 6 Issued 4/8/82.	4
Nuclear Regulatory Commission	Limited Work Authorization	Atomic Energy Act of 1954 as amended, and 10CFR50	6/25/75	Issued 9/5/75.	
	Construction Permit	Atomic Energy Act of 1954 as amended, anJ 10CFR50	9/24/73	Construction Permit No. CPPR 145 and CPPR 146 issued 3/25/77. Extension granted 12/27/82.	4

TABLE 1.2-1 (Cont)

Agency	Authorization Required	Authority	Date of Request	Status
	Construction Permit Amendment and Unit 1 Joint Ownership	Atomic Energy Act of 1954 as amended, and 10CFR50	10/26/79	Granted 10/3/80.
	Operating License	Atomic Energy Act of 1954 as amended, and 10CFR50	4/81	Application submitted and under review. | 4
	Special Nuclear Materials License	Atomic Energy Act of 1954 as amended, and 10CFR70	Six months prior to delivery of in-core detectors.	Future
	By-Product Nuclear Material License	10CFR30	12/9/82	Application submitted and under review. | 4
Federal Aviation Administration	River crossing by transmission towers	14CFR77	7/14/77	Approval granted 7/28/77.
Environmental Protection Agency	NPDES permit for construction	FWPCA Section 402 (P.L. 92-500)	5/21/75	Permit No. LA0047112 issued 12/18/75. Request for additional discharge granted 4/29/76.
	NPDES permit for operation	FWPCA Section 402 (P.L. 92-500)	9/5/74	Permit No. LA0042731 issued 8/4/78. Supercedes Permit No. LA0047112. | 4
	Training Center Sanitary Waste Discharge	FWPCA Section 402 (P.L. 92-500)	6/30/82	Permit No. LA0063886 issued 7/16/83. | 4 | 8

TABLE 1.2-1 (Cont)

Agency	Authorization Required	Authority	Date of Request	Status	
STATE OF TEXAS					
Public Utility Commission	Certificate of Public Convenience and Necessity to construct, own, and operate Units 1 and 2 and transmission lines	Article 1446C of Vernons Annotated Civil Statutes, Public Utility Regulatory Act	10/14/77	Approval granted 3/21/78 under Docket Number 857.	4
STATE OF LOUISIANA					
Stream Control Commission (LSCC) (Now Water Pollution Control Division of Office of Environmental Affairs)	Waste water discharge permit	La. Revised Statutes of 1950, Title 56, Section 1439(5)	6/25/74	Approval granted 10/25/74. Request for additional discharge granted 11/21/78.	
			1/5/83	Request for additional outfalls submitted.	4
	Training Center Sanitary Waste Discharge	La. Revised Statutes of 1950, Title 56, Section 1439(5)	6/30/82	Permit No. WP0302 effective 11/23/82.	
	Certification for EPA Permit (Section 401 Certification)	FWPCA Section 401 (P.L. 92-500)	12/2/74	LSCC refused to act 12/13/74. This constitutes waiver of Section 401 requirements.	
Department of Natural Resources	Industrial landfill	La. Sanitary Code, Chapter X, para. 10.52	10/4/79	Approval granted 11/19/79. Interim permits were rescinded 1/28/83, due to State's determination of exclusion from regulation.	8
	Hazardous waste generator identification number	Act 449, 1979 Legislature, and Hazardous Waste Management Program Rules and Regulations	1/21/80	Granted 1/22/80.	

CHAPTER 1

QUESTION AND RESPONSES

TABLE OF CONTENTS

QUESTION E100.1 | 8

In addition to other requested information, provide a summary and brief discussion, in table form, by section, of differences between currently projected environmental effects (including those that would degrade and those that would enhance environmental conditions) and the effects discussed in the environmental report submitted at the construction permit stage.

RESPONSE

Refer to Section 1.3 and Table 1.3-1 for the information requested.

CHAPTER 2

ENVIRONMENTAL DESCRIPTIONS

TABLE OF CONTENTS

CHAPTER 2

TABLE OF CONTENTS (CONT)

At Clinton, located 32 km (20 mi) northeast of the site, there is about a 5-m (15-ft) hydraulic-head drop from water levels in Zone 1 to water levels in Zone 2. This difference in hydraulic head is believed to be due to heavy pumpage in the Baton Rouge area. Water in the sand units of Zone 1 has a lower sodium bicarbonate content than water in the sand units of Zones 2 and 3[9]. The Zone 1 Aquifer is separated from the Upland Terrace Aquifer by several hundred feet of clay that contains some interbedded sand layers. This confining zone should prevent any vertical leakage between the two aquifers.

Zone 2 contains sand units of Pliocene and/or Miocene age which are believed to be equivalent to the "1,700-foot" sand and "2,000-foot" sand in the Baton Rouge area and to the Homochitto Member of the Pascagoula Formation in southern Mississippi[9]. The combined thicknesses of the sand units in Zone 2 range between 30 m (100 ft) near Norwood to 100 m (330 ft) near St. Francisville (Fig. 2.3-12)[9].

At Clinton, there is about a 10-m (30-ft) hydraulic-head drop from water levels in Zone 2 to water levels in Zone 3. This is believed to be due to heavy pumpage in the Baton Rouge area. The water in Zone 2 has an intermediate sodium bicarbonate content compared to water in Zones 1 and 3[9]. The sand units in Zone 2 are separated from the sand units in Zone 1 by 46 to 61 m (150 to 200 ft) of clay.

Zone 3 consists of the deepest sand units containing fresh water (fresh water is considered to contain less than 250 mg/l chloride). These Miocene deposits are believed to | 8
be equivalent to the "2,400-foot" sand and the "2,800-foot" sand in the Baton Rouge area, and to the Hattiesburg Formation and part of the Catahoula Sandstone in southern Mississippi[9]. The combined thicknesses of the sand units in this zone, excluding the sand unit of the Catahoula Sandstone which underlies the "2,800-foot" sand, range from about 24 m (80 ft) near St. Francisville to 120 m (395 ft) at Slaughter (see Fig. 2.3-12)[9].

At Clinton, Zone 3 is differentiated from Zone 2 by a hydraulic head that is 10 m (30 ft) lower and by a greater sodium bicarbonate content[9]. The sand units in Zone 3 are separated from the sand units of Zone 2 by several tens of feet of clay[9].

2.3.1.2.2 Configuration of the Piezometric Surface in the Unconfined Aquifer

A network of 39 piezometers and observation wells was installed at the site for the purpose of monitoring fluctuations in groundwater levels in the Alluvial Aquifer, the Upland Terrace Aquifer, and the Tertiary Zone 1 and Zone 3 Aquifers. Water level and hydraulic-head measurements have been made in most of these installations since 1972. Table 2.3-6 lists the construction characteristics and depth of installation of each piezometer and observation well.

Water level and hydraulic-head data measured in piezometers and observation wells emplaced in the Upland Terrace Aquifer were used to construct a series of piezometric surface maps. Fig. 2.3-13 shows the configuration of the piezometric surface in the Upland Terrace Aquifer on March 15, 1976. This figure shows the normal configuration of the piezometric surface in the unconfined aquifer beneath the plant site at this time of year.

The hydraulic gradient in the Upland Terrace Aquifer, as shown in Fig. 2.3-13, slopes toward the Mississippi River at a rate of 2.7 m/km (14 ft/mi). This value represents the normal hydraulic gradient in the Upland Terrace Aquifer at the site at this time of year.

Hydraulic-head data will continue to be collected during the operation of the plant as necessary to monitor changes in groundwater levels.

The maximum recorded water level at the plant site is
59.4 ft above mean sea level, as recorded by piezometer T1,
which is emplaced in the Upland Terrace Aquifer, as shown in
Figure 8 of FSAR Appendix 2G. The maximum recorded water
level in the Tertiary Zone 1 Aquifer is 69.1 ft above mean
1 sea level, as recorded in piezometer P9, located
approximately 2,000 ft north-northeast of the plant site, as
shown in Fig. 2.3-16. The maximum recorded water level in
the Tertiary Zone 3 Aquifer is 34.1 ft above mean sea level,
as recorded in observation well T14, located approximately
6,300 ft southwest of the plant site, as shown in
Fig. 2.3-16. The maximum recorded water level in the
Mississippi River Alluvial Aquifer is 38.7 ft above mean sea
level, as recorded in piezometer B449, located approximately
11,300 ft west-southwest of the plant site, as shown in
Fig. 2.3-16.

and along Thompson Creek on the West and East Feliciana Parish line[31].

Other recreational opportunities are available in West Feliciana Parish. These include bicycling, motor biking, hiking, and horseback riding. West Feliciana hosts the Louisiana Jambalaya, an annual pedal bike ride which attracts approximately 200 riders from a wide area. It is held the weekend after Thanksgiving in the St. Francisville area. Trail riding on motorbikes is permitted in the Angola vicinity and on Crown Zellerbach land.

Popular hiking areas are located in the Tunica Hills northwest of St. Francisville, where the topography features high bluffs and waterfalls; Thompson's Creek; and Bayou Sara, north of Bains, LA. Horseback riding is often permitted on Crown Zellerbach lands or along pipeline rights-of-way.

Although there are no designated scenic rivers in West Feliciana, the parish is traversed by the Great River Road, a state-designated scenic drive along US Highway 61. The Great River Road is envisioned as a national parkway along the Mississippi from its source to the mouth of the river at the Gulf of Mexico[32].

2.5.3 Historic and Archaeological Sites and Natural Landmarks

2.5.3.1 Historic Significance

The ruins of a nineteenth century sugar mill were discovered on the River Bend site. The mill operated circa 1850 to 1862 and was part of the Magnolia Plantation, owned by William Johnston Fort. The mill site has been designated as 16WF-36 by the State Historic Preservation Officer. An
8 investigative report[40] concludes that it was fairly typical of the antebellum, steam-powered mills in Louisiana and that it does not meet the criteria for inclusion on the National Register of Historic Places. The River Bend area contains several examples of the development of a primary agrarian culture from colonial, antebellum, Civil War, and reconstruction times to the present. There are numerous buildings of historic value, either because of associations with events or people of historic significance, or because of unique architectural characteristics defining particular areas of cultural development.

The National Register of Historic Places identifies 12 National Historic properties and 2 nominated properties within 16 km (10 mi) of the reactor site. Table 2.5-35, along with Fig. 2.5-17, identifies and locates these and other historic sites. Highly visited historic sites are described in the following paragraphs.

The Port Hudson Battlefield, a National Historic Landmark, is located about 11.8 km (7.4 mi) south-southeast of the site. Here, 6,500 Confederate troops held 30,000 Union troops from May 21 until July 6, 1863. Port Hudson was the last Confederate Mississippi River fort to fall to the Union. Two hundred fifty-eight ha (633 acre) of this site has been designated a State Commemorative Area due to its historical, cultural, and memorial significance. The Port Hudson National Cemetery is on the south central portion of the battlefield. The cemetery and State Commemorative Park are open daily to the public.

Oakley Plantation is the closest National Register property to River Bend Station. It is famed as the place where John James Audubon first became acquainted with the wildlife of the Feliciana country, and is now the site of the Audubon Memorial State Park. Oakley House, built in 1799, is a museum filled with memorabilia of the naturalist painter. The museum is located on State Highway 965, 6.4 km (4 mi) east of St. Francisville and 5.6 km (3.5 mi) north-northeast of the site.

Propinquity, in St. Francisville, is also about 5.5 km (3.4 mi) from the site. The house was built in 1809 by John Mills, an American Revolutionary War soldier, who discovered Bayou Sara in 1790. Propinquity was restored in 1966 and now features guestrooms furnished with antiques.

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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 3
Survey of River Bend Station Transmission Line B [Route I]. June 1978. (For Gulf States Utilities Company, Beaumont, TX)

40. Shuman, Malcolm K. and Orser, Charles E. Historical and Archaeological Investigation of the Ruins of a
Nineteenth Century Sugar Mill (16WF-36) in West 8
Feliciana Parish, Louisiana, February 10, 1984. (For Gulf States Utilities Company, Beaumont, TX)

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 Substation	Plain sherds found in earthen mound	3 8
2	16XEF3	Spot Find No. 2	Approx 8.7 km east of River Bend, under Route III	Prehistoric campsite; ceramic fragments found	3
3	16XEF2	Spot Find No. 1	Approx 5.4 km east of River Bend on Route III	Gravel flakes and chips on mound site	3
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	3
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	3
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	3
10	16EF7 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	16EB847	-----	Approx 300 m west of Route II and 700 m south of Point L	Civil War breastwork, 15 m long and 2 m high	3
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 A1-5

STAFF GAUGE READINGS OF APRIL 1983 FLOOD

	Water Surface Elevation (ft-msl)				
Day	Low Point of River Road	Upstream of Culverts	Downstream of Culverts	Crown-Zellerbach Bridges	
4/22/83	[1,2]	41.90	40.40	38.20	
4/23/83	-	42.40	41.00	38.90	
4/24/83	-	42.80	41.30	39.00	
4/25/83	-	43.10	41.70	39.50	
4/26/83	-	43.40	41.90	39.70	
4/27/83	44.25	43.50	42.05	39.90	
4/28/83	[2]	43.80	42.30	40.10	
4/29/83	-	43.90	42.50	40.25	
4/30/83	-	44.10	42.50	40.50	
5/1/83	-	44.20	42.70	40.50	
5/2/83	-	44.30	42.70	40.50	
5/3/83	-	44.25	42.70	40.50	
5/4/83	-	44.30	42.70	-	
5/5/83	-	44.10	42.70	40.40	
5/6/83	-	44.10	42.70	40.40	
5/7/83	-	44.00	42.50	40.40	
5/8/83	-	44.10	42.60	40.50	
5/9/83	-	44.20	42.70	40.50	
5/10/83	-	44.40	42.90	40.65	
5/11/83	-	-	-	-	
5/12/83	45.40	44.50	43.10	40.95	
5/13/83	[2]	44.80	43.35	41.10	
5/14/83	-	45.00	43.50	41.30	
5/15/83	-	45.80	43.80	41.50	
5/16/83	-	45.30	43.80	41.50	
5/17/83	-	46.00	44.50	42.30	
5/18/83	47.50	[3]	45.10	43.00	
5/19/83	[2]	[4]	[4]	43.70	
5/20/83	-	-	-	-	
5/21/83	-	-	-	45.70	
5/22/83	-	-	-	46.80	
5/23/83	-	-	-	47.30	
5/24/83[2]	-	-	-	-	8

[1] Flow from river to Bayou at low point of River Road for the entire flood period.
[2] High floodwater precluded daily gauge reading.
[3] Water level above maximum reading of staff gauge.
[4] Water is covering road above culverts (>46.00 ft-msl).

TABLE 2C-4

2000 POPULATION DISTRIBUTION
WITHIN 10 MILES OF RIVER BEND STATION

Direction	Distance (miles) 0-1	1-2	2-3	3-4	4-5	5-10	Total 0-10
N	0	109	103	37	444	622	1,315
NNE	15	291	34	48	7	280	675
NE	8	26	19	0	72	3,058	3,183
ENE	0	36	19	25	76	1,543	1,699
E	6	14	0	26	17	306	369
ESE	3	0	23	96	23	902	1,047
SE	0	0	5	0	148	2,710	2,863
SSE	0	0	3	0	0	492	495
S	0	5	0	0	0	1,199	1,204
SSW	0	0	0	9	333	1,207	1,549
SW	0	0	0	0	0	5,173	5,173
WSW	0	0	0	3	3	5,056	5,062
W	0	0	2	0	6	0	8
WNW	0	0	214	918	27	27	1,186
NW	25	24	117	1,216	520	485	2,387
NNW	19	164	103	40	36	549	911
TOTAL	76	669	642	2,418	1,712	23,609	29,126

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TABLE 2C-9

1980 POPULATION DISTRIBUTION
WITHIN 50 MILES OF RIVER BEND STATION

Direction	Distance (miles) 0-10	10-20	20-30	30-40	40-50	Total 0-50	
N	1,040	732	2,524	1,205	3,787	9,288	
NNE	537	529	984	2,141	2,267	6,458	
NE	2,383	2,403	3,173	2,710	3,209	13,878	
ENE	1,272	3,678	3,099	2,215	2,971	13,235	
E	276	2,831	5,059	3,116	12,575	23,857	
ESE	766	16,151	17,095	9,386	11,375	54,773	
SE	2,057	33,718	90,914	37,980	19,150	183,819	
SSE	356	28,932	156,266	30,299	22,983	238,836	
S	984	2,798	6,378	12,500	4,410	27,070	
SSW	1,270	2,923	3,978	2,429	6,046	16,646	
SW	4,245	3,599	2,378	5,202	17,203	32,627	
WSW	4,145	1,465	2,643	4,875	35,262	48,390	8
W	6	1,409	3,139	2,480	4,925	11,959	
WNW	905	631	1,560	4,743	11,176	19,015	8
NW	1,547	1,816	4,764	1,424	3,744	13,295	
NNW	725	813	947	1,496	2,554	6,535	
TOTAL	22,514	104,428	304,901	124,201	163,637	719,681	

TABLE 2C-10

1985 POPULATION DISTRIBUTION
WITHIN 50 MILES OF RIVER BEND STATION

Direction	Distance (miles) 0-10	10-20	20-30	30-40	40-50	Total 0-50
N	1,074	753	2,574	1,232	3,938	9,571
NNE	553	546	1,004	2,168	2,321	6,592
NE	2,533	2,561	3,252	2,732	3,234	14,312
ENE	1,353	3,920	3,301	2,254	3,050	13,878
E	295	3,025	5,536	3,151	13,471	25,478
ESE	828	17,872	19,161	11,262	13,417	62,540
SE	2,261	37,363	101,324	44,001	22,531	207,480
SSE	391	32,022	172,955	33,320	26,144	264,832
S	1,040	3,026	6,894	13,052	4,661	28,673
SSW	1,341	3,110	4,174	2,650	6,724	17,999
SW	4,477	3,796	2,532	5,705	19,203	35,713
WSW	4,364	1,544	2,772	5,090	36,892	50,662
W	6	1,483	3,289	2,592	5,150	12,520
WNW	967	662	1,643	5,034	11,864	20,170
NW	1,944	1,878	4,924	1,509	3,963	14,218
NNW	744	839	965	1,542	2,628	6,718
TOTAL	24,171	114,400	336,300	137,294	179,191	791,356

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TABLE 2C-11

1990 POPULATION DISTRIBUTION
WITHIN 50 MILES OF RIVER BEND STATION

Direction	Distance (mi) 0-10	10-20	20-30	30-40	40-50	Total 0-50
N	1,117	782	2,669	1,278	4,116	9,962
NNE	574	568	1,041	2,227	2,391	6,801
NE	2,718	2,753	3,382	2,778	3,290	14,921
ENE	1,449	4,218	3,550	2,310	3,150	14,677
E	315	3,259	6,021	3,198	14,399	27,192
ESE	895	19,547	21,218	13,287	15,609	70,556
SE	2,464	40,891	111,533	50,281	26,153	231,322
SSE	426	35,020	189,149	36,336	29,503	290,434
S	1,097	3,263	7,428	13,651	4,930	30,369
SSW	1,412	3,307	4,383	2,886	7,454	19,442
SW	4,719	4,002	2,690	6,248	21,315	38,974
WSW	4,599	1,627	2,918	5,349	38,812	53,305
W	6	1,563	3,456	2,724	5,414	13,163
WNW	1,007	697	1,734	5,349	12,612	21,399
NW	2,030	1,956	5,129	1,602	4,202	14,919
NNW	779	871	1,001	1,600	2,711	6,962
TOTAL	25,607	124,324	367,302	151,104	196,061	864,398

8

TABLE 2C-12

2000 POPULATION DISTRIBUTION
WITHIN 50 MILES OF RIVER BEND STATION

Direction	Distance (miles) 0-10	10-20	20-30	30-40	40-50	Total 0-50
N	1,315	871	2,771	1,328	4,377	10,662
NNE	675	638	1,081	2,319	2,480	7,193
NE	3,183	3,221	3,597	2,900	3,433	16,334
ENE	1,699	4,935	4,151	2,415	3,352	16,552
E	369	3,810	6,983	3,254	16,285	30,701
ESE	1,047	22,667	25,254	17,925	20,579	87,472
SE	2,863	47,403	130,981	63,761	33,889	278,897
SSE	495	40,540	218,957	41,898	36,149	338,039
S	1,204	3,664	8,332	14,566	5,390	33,156
SSW	1,549	3,654	4,715	3,364	8,997	22,279
SW	5,173	4,385	2,995	7,404	25,654	45,611
WSW	5,062	1,784	3,206	5,889	42,799	58,740
W	8	1,719	3,803	2,998	5,967	14,495
WNW	1,186	777	1,903	5,967	14,074	23,907
NW	2,387	2,288	5,955	1,783	4,662	17,075
NNW	911	1,000	1,040	1,690	2,858	7,499
TOTAL	29,126	143,356	425,724	179,461	230,945	1,008,612

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TABLE 2C-13

2010 POPULATION DISTRIBUTION
WITHIN 50 MILES OF RIVER BEND STATION

	Distance (miles)					Total
Direction	0-10	10-20	20-30	30-40	40-50	0-50
N	1,504	996	3,175	1,518	4,832	12,025
NNE	772	730	1,237	2,583	2,689	8,011
NE	3,794	3,851	4,109	3,145	3,723	18,622
ENE	2,025	5,902	4,960	2,600	3,646	19,133
E	440	4,536	8,008	3,395	18,348	34,727
ESE	1,219	25,656	29,265	23,091	26,065	105,296
SE	3,273	53,537	149,808	78,239	42,677	327,534
SSE	567	45,789	247,317	47,662	43,943	385,278
S	1,330	4,144	9,433	15,876	5,988	36,771
SSW	1,709	4,070	5,170	3,929	10,765	25,643
SW	5,707	4,840	3,359	8,759	30,549	53,214
WSW	5,604	1,969	3,581	6,642	48,293	66,089
W	9	1,904	4,267	3,381	6,727	16,288
WNW	1,358	868	2,102	6,732	15,882	26,942
NW	2,736	2,614	6,787	2,006	5,240	19,383
NNW	1,046	1,145	1,187	1,867	3,081	8,326
TOTAL	33,093	162,551	483,765	211,425	272,448	1,163,282

TABLE 2C-14

2020 POPULATION DISTRIBUTION
WITHIN 50 MILES OF RIVER BEND STATION

	Distance (miles)					Total
Direction	0-10	10-20	20-30	30-40	40-50	0-50
N	1,741	1,163	3,739	1,782	5,371	13,796
NNE	898	851	1,458	2,956	2,952	9,115
NE	4,546	4,621	4,802	3,489	4,127	21,585
ENE	2,422	7,088	5,958	2,838	4,008	22,314 | 8
E	524	5,414	9,067	3,571	20,540	39,116
ESE	1,417	28,455	33,222	28,862	32,156	124,112
SE	3,687	59,178	167,790	93,781	52,389	376,825
SSE	643	50,652	273,578	53,357	52,477	430,707
S	1,466	4,650	10,594	17,323	6,643	40,676
SSW	1,881	4,514	5,666	4,556	12,724	29,341
SW	6,278	5,323	3,756	10,281	35,875	61,513
WSW	6,191	2,164	4,016	7,544	54,860	74,775
W	9	2,104	4,813	3,840	7,637	18,403
WNW	1,570	969	2,315	7,588	17,905	30,347
NW	3,164	3,016	7,808	2,257	5,888	22,133
NNW	1,212	1,332	1,391	2,091	3,349	9,375
TOTAL	37,649	181,494	539,973	246,116	318,901	1,324,133

CHAPTER 2

QUESTIONS AND RESPONSES

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CHAPTER 2

QUESTIONS AND RESPONSES

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4) Most floodwaters in the upper Bayou are diverted to the Mississippi River over the low point of River Road, even in the natural condition. The existence of River Access Road slightly increases the amount of overflow at the low point of River Road." 7

A portion of the Upper and Lower Bayou is not GSU property as indicated in Figure 4.3-1. Flood levels presented in Attachment A of Appendix 2B indicate that the offsite impact of flooding would be minimal. 7

As discussed in Section 4.2.1, "There are no significant hydrological alterations offsite or within the transmission corridors due to plant construction." Other than normal debris loads during floods, there is no potential for offsite areas to be affected by debris generated onsite during floods.

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QUESTION E291.13 (2.4)

References for Section 2.4 (p. 2.4-53). Provide copies of References 37, 38, and 39 for ER Section 2.4 or, if previously submitted to NRC, provide date and other identifying information regarding their submittals.

RESPONSE

Copies of these documents are provided under separate cover.

QUESTION E290.9

Mention is made in various places that natural resources of the River Bend site not needed for energy production will be managed (e.g., Table 2.4-5 certain forest will be maintained in a particular seral stage; page 2.4-9 an effort will be made to retain Needle Lake in a primitive condition, as wood duck habitat; page 2.4-19 deer herds onsite and vicinity are managed). Provide plans for management of these natural resource areas during plant operation.

RESPONSE

GSU has had a long-standing commitment to the concept of dedicating portions of the River Bend site not devoted to public utility use to educational and research purposes. This commitment will be fulfilled by managing certain parts of the site in cooperation with university, state, and federal forestry and wildlife specialists. A long-term agreement will be established with the Louisiana State University (LSU) School of Forestry and Wildlife Management, which will provide for additional participation of the Louisiana Department of Wildlife and Fisheries and the U.S. Fish and Wildlife Service, since a federal Cooperative Wildlife Research Unit exists at LSU.

The long-term availability of the site will be especially useful for extended time-series ecological research. To the extent possible, GSU will provide logistical and funding
8 support for the educational and research programs. Such programs would include, but are not limited to, studies of procedures for reforestation of construction-related spoil areas and methods for the management of unharvested deer herds.

The maintenance of diverse plant and animal communities is recognized as an overriding guideline in the natural resource management program. The upland forest communities are notably diverse, and a concerted effort will be made to maintain this variety (Table 2.4-5). For example, old growth southern pine (including loblolly) is generally rare in the area because of logging practices and fire suppression. Maintenance of at least some loblolly stands will involve selective removal of undesirable deciduous undergrowth and other competition (e.g., by controlled burning). Forest types which are rare in their mature state, such as bottomland hardwoods, will be permitted to succeed to their climax state.

Populations of terrestrial game and non-game animals onsite will be managed to enhance population health and diversity. The present population of deer will be maintained within the carrying capacity of the site. This is important for both the health of the deer themselves and the protection of vegetation. Deer herd maintenance efforts will be achieved, in part, through research activities, which will include developing methods for population control other than direct harvesting. Herd thinning methods, such as hunting, will only be used where GSU and LSU personnel determine that it is absolutely necessary.

Aquatic habitats will be managed to support diverse wildlife
and to enhance their educational value. For example, the
primary management approach for the floodplain slough known
as Needle Lake will be the maintenance of present hy- 8
drological characteristics with as little interference as
possible (Section 2.4.1.1.3.2). Waterfowl, especially wood
ducks (Aix sponsa) will be managed at the site by providing
sufficient feeding and nesting areas through creation of the
Wildlife Management Lake in a natural state. Breeding sites
could be provided by the creation of dead tree snags
(through water level manipulation or girdling) and by the
placing of wood duck nesting boxes. Many other species of
waterfowl, as well as aquatic and amphibious tetrapods and
fishes, will use these two water bodies.

3.6.1.3.2 Biofouling Control

Chlorination facilities are provided for biofouling control in the condenser cooling water and service water systems. Chlorine will be either generated onsite by a sodium
hypochlorite generating facility or purchased as 8
commercial-grade sodium hypochlorite solution, delivered to the plant by truck. The onsite generating facility includes a salt storage and dissolving system, electrolytic cell, hypochlorite solution tank, pumps, controls, and residual chlorine analyzers. Purchased hypochlorite will be loaded directly into the hypochlorite solution tank and diluted
to a concentration suitable for controlled injection 8
into the circulating and service water systems. The frequency and duration of chlorination of condenser cooling water and service water systems for each

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A portion of one corridor passes through Baker, Louisiana, paralleling the Illinois Central Gulf Railroad and Highway 19. Due to its location, some impacts (e.g., traffic congestion at intersections, slowing of trains) will possibly occur during construction. These impacts should be of short duration and minimal.

Since the transmission corridor routes are located within or adjacent to existing utility corridors and rights-of-way, existing access and local roads will be used for maintenance purposes. No significant modifications have or will occur in offsite areas as a result of transmission line construction.

4.1.3 Historic and Archaeological Sites

4.1.3.1 The Site and Vicinity

No historic properties have been disturbed or destroyed during plant construction. The ruins of a nineteenth century sugar mill exist on the River Bend property and are discussed in Section 2.5.3.1. GSU has no plans to develop 8
the site on which it is located and will preserve it by limiting intrusion of the public. An archaeological investigation of the site and vicinity, discussed in Section 2.5.3.2, indicated that Indians traversed the site, 8
but that archaeological remains did not indicate long-term village occupation. Therefore, nothing of archaeological significance has been disturbed or destroyed.

4.1.3.2 Transmission Corridors and Offsite Areas

Section 2.5.3 discusses the historic and archaeological sites along the transmission rights-of-way. The sites which are within 2 km of the transmission corridors are Port Hudson Battlefield, Baker Heritage Museum, and 13 archaeological sites.

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 manner that would minimize the impacts on the Port Hudson Battlefield and also maintain good engineering practices.

In accordance with 36CFR800, a Memorandum of Agreement has been executed between the Federal Advisory Council on Historic Preservation, the NRC, and the State of Louisiana, Department of Culture, Recreation, and Tourism - Division of Archaeological Historic Preservation. The Memorandum sets forth the agreed-upon mitigation measures which GSU must follow in order to protect historic and cultural properties within the Port Hudson National Historic Landmark.

Reference - 4.1

1. Louisiana State Planning Office. Land Use and Data Analysis Program, U.S. Geological Survey, 1972. Released November 1975.

A landfill exists onsite for the disposal of construction
debris and residue from incinerated solid waste. The
landfill occupies approximately 6 ha (15 acres) adjacent to
the primary spoil area for which no clearing was required.
Since the landfill and associated incinerator will be used 8
only for the construction period, these facilities are
considered excluded from regulation by the Louisiana Solid
Waste Management Division. The area occupied by the
landfill will be revegetated when the facility is no longer
needed.

With the return of vegetation in those areas not subject to frequent disturbance during plant operation, animal communities can be expected to reestablish themselves; soil invertebrates will likely be first, followed by birds and small mammals. The absence of forest-type cover and the early successional stage of the fields will discourage many birds and large mammals from living within the cleared areas. Areas to be maintained open and grass-covered (no reforestation) are likely to attract only a limited variety of wildlife except where such open areas adjoin forest, creating an ecotone habitat.

The permanent 13.8-ha (34-acre) Wildlife Management Lake will be created by damming a stream outlet in the old railroad tram near Alligator Bayou and filling the natural drainage area in the bluffs behind. The lake and its environs should prove attractive to animals, especially waterfowl, amphibians, and some reptiles, partially offsetting the loss of habitat caused by the construction of the plant.

Species of special status at the River Bend Station site are discussed in Section 2.4. All of the commercially and recreationally important species are subject to the occasional removal of individuals from their population in the course of statewide hunting or population management programs. As such, the loss of a few additional individuals due to construction of River Bend Station should not have a significant impact on these species.

Endangered or threatened species which might occur at the site include the bald eagle (Haliaeetus leucocephalus), Arctic peregrine falcon (Falco peregrinus tundrius), and American alligator (Alligator mississipiensis). Species of special scientific interest include the worm-eating warbler (Helmitherus vermivorus) and black and white warbler (Mmiotilta varia). Of these, only the alligator breeds onsite. With the addition of the Wildlife Management Lake to the site and the limited impact to prime alligator

habitat in Alligator Bayou, plant construction should have little or no impact on the alligator. There should be only a minimal impact on the remaining species due to the removal

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of potential resting and feeding areas because of the infrequency of their visits and the availability of similar habitat in the area.

4.3.1.2 Transmission Corridors and Offsite Areas

4.3.1.2.1 Impact on Vegetation

Descriptions of the impacts of construction on the terrestrial ecosystems of the transmission line routes (corridors) for River Bend Station - Unit 1 are derived from the literature and from field surveys conducted along the corridors[1,2]. Data pertinent to the transmission routes and lines are presented in Tables 2.2-6 through 2.2-9 and Fig. 2.4-5 through 2.4-10.

4.3.1.2.1.1 Route I

Segment A to B

The first 1.7 km (1.07 mi) of Route I, Segment A to B (Fig. 2.4-5 and 2.4-6 and Table 2.2-6) is on River Bend property and is combined with the first part of Route II. This combined segment required a corridor cleared to a width of 185.5 m (609 ft) (corridor widths are converted from feet to the nearest 0.5 m) and to a length of 1.2 km (0.73 mi) through forest land, requiring the clearing of 21.8 ha (53.89 acres) of medium quality upland hardwood forest.

Segment B to C

From Point B to its junction with Big Cajun No. 2 (Point C) (Fig. 2.4-6), Route I crosses 0.9 km (0.54 mi) of forest on the east bank of the Mississippi River and 0.2 km (0.14 mi) of willow (*Salix nigra* and *S. interior*) on the west side of the river. The height of towers used in crossing the Mississippi River permitted the wires to be strung above the forest canopy and reduced the total area of clearing required to 1.6 ha (3.97 acres) of upland hardwood. The remainder of this segment crosses mostly unimproved pasture, where no clearing was necessary.

Segment C to D

From the switchyard at Big Cajun No. 2 (Point C), Route I extends 3.0 km (1.9 mi) west and south to Point D (Fig. 2.4-6), crossing 2.2 km (1.35 mi) of pasture and 0.8 km (0.48 mi) of low quality bottomland hardwood forest. This section required the clearing of 4.3 ha (10.59 acres) of forest.

4.6 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

An environmental monitoring program has been established and implemented at the River Bend Station site to check on the day-to-day effects of construction activities and to ensure compliance with laws, regulations and guidelines set by various regulatory agencies and with commitments made in licensing proceedings.

The environmental monitoring program is supervised by the Site Environmental Protection Officer. The program includes 8
frequent inspections of the site and meetings to discuss the results of the inspections and develop measures to mitigate the effects of planned or ongoing construction activities. The results of inspections and meetings are documented and filed. Corrective measures are taken on out-of-compliance observations and checked for effectiveness.

An environmental audit program further ensures conformance with the environmental monitoring program and effectiveness of actions taken to resolve previous out-of-compliance audit items. A report is prepared after the audit describing the findings. The report includes a list of items requiring corrective or preventive action, a review of corrective action for items previously recorded, and recommendations. Deficiencies are held as open items until satisfactory corrective/preventive action has been completed. A file is maintained on all audit reports.

Impacts and/or potential impacts from River Bend Station construction are detailed in previous sections of this chapter. The following serves as a summary of these impacts and the mitigative and precautionary measures used to minimize adverse effects on the environment.

4.6.1 Noise

The effect of site construction noise to the local area was reduced by restricting the operation of major noise sources to daytime hours, by using major internal combustion equipment equipped with mufflers, by constructing the North Access Road which minimizes construction traffic on State Highway 965, and by reducing the volume of truck traffic on US Highway 61 by trucking coarse fill over an extended period and stockpiling.

Objectionable offsite noise level, during the site preparation period, identified in Section 4.4 as the construction activity producing the greatest noise level, were not a significant or recurring problem. No explosives were utilized during construction.

4.6.2 Erosion

Several erosion and storm water runoff control measures have been utilized throughout the construction period. The most effective form of erosion control has proved to be the reestablishment of vegetation on exposed soil. This is accomplished by reseeding and/or by natural recolonization. Where possible, gentle slopes are formed and mulch applied to stabilize topsoil until revegetation occurred. Macadam, gravel, and crushed rock were laid in high volume traffic areas to control erosion.

Erosion control structures and biodegradable chemical stabilizers were used on the primary spoil pile and the excavation slopes, the predominant areas of erosion, and helped in reducing the quantity of eroded material. Despite the control measures taken, some erosion continued at the primary spoil pile. Sediment deposition due to runoff from the primary spoil pile has occurred in the Wildlife Management Lake. An assessment of this condition will be made and the appropriate mitigative measures will be implemented prior to lake construction. At the present time the sedimentation rate in the lake basin has been substantially reduced by the aforementioned control measures. Although detailed long-range plans for the uses
2 of the Wildlife Management Lake have yet to be made, any conceivable use would not be affected by the sediments already deposited in the basin. Once the lake is constructed, it will be necessary to ensure that erosion controls are effective.

Berms and terraces have been constructed to funnel construction runoff into drainage ditches and natural streams. Concrete mats, riprap, energy dissipators, and other drainage control devices were employed along some of these ditches and streams, and in areas of potentially severe erosion. These measures significantly contributed to the control of erosion.

Specific examples include the stilling basin placed near the mouth of East Creek and the relocation of West Creek to a Fabriform-lined channel. The stilling basin dissipates energy from the construction dewatering flow prior to its entry into Grants Bayou, thus lessening the stream's erosive

than steep slopes and cultipacking in areas running perpendicular to the slope. In order to further reduce the extent of erosion, other control measures are being assessed for future use.

River bank erosion at the embayment area has been controlled by gentle sloping and by employing riprap.

Prior to plant operation the Army Corps of Engineers plans to construct a revetment composed of an articulated concrete mattress for stabilization of the east bank of the Mississippi River. The revetment will be tied into the embayment slope protection and will extend upstream and downstream for several miles.

Upon completion of Unit 1 construction, exposed tracts of land will be seeded to promote vegetation where practical. At the conclusion of Unit 2 construction activities, the construction-related facilities utilized by both units and any additional facilities or laydown areas required during Unit 2 construction will be removed. The land will then undergo final grading, seeding and landscaping. Grass cover also will be utilized to restore and stabilize areas affected by erosion and areas affected by deposition of eroded sediments.

4.6.3 Dust

Dust control is accomplished by paving or applying asphalt binders to the construction roads and by water sprinkling. No sprays were required to prevent dust blowing from the coarse fill stockpile.

4.6.4 Traffic

Construction of the North Access Road connecting US Highway 61 and State Highway 965 has minimized both congestion and noise on State Highway 965. Truck traffic on US Highway 61 was reduced by transporting coarse fill over an extended period and stockpiling.

Rush hour traffic generated by the construction work force congests US Highway 61 where it intersects North Access Road and State Highway 965, and the St. Francisville-New Road ferry crossing. These snarls are short-term and local residents have acclimated to the rush hours, generally avoiding travel at these times. A traffic light placed at the intersection of North Access Road and US Highway 61 has assisted in alleviating traffic congestion.

4.6.5 Effluents and Wastes

Construction activities result in temporary discharges into site water bodies and the Mississippi River. Effluents and wastes discharged into local streams comply with limits established in the National Pollutant Discharge Elimination System (NPDES) permit, thus minimizing impact to the receiving body.

6 Effluent from the sewage treatment plant empties into East Creek near Grants Bayou. The low level of residual chlorine in the effluent stream is reduced by the time the effluent reaches East Creek; therefore, chlorine has no effect at the point of release into East Creek. Sanitary wastes from the chemical toilets are transported to an offsite disposal facility. Effluent from the toilet facility at the switchyard is treated in a septic tank and transmitted to the soil through approved filter fields in the switchyard.

In order to comply with NPDES discharge criteria, waste water from the concrete batch plant is treated for suspended solids and high pH prior to its release into Upper West Creek.

Prior to plant operation, plant water conveyance and storage systems will be flushed. The final discharge will be in compliance with the limitations established by the EPA and the State of Louisiana.

River Bend Station will generate approximately 252,000 cu yd
of construction wastes, 75 percent combustible and
8 25 percent noncombustionible. Combustible wastes (paper,
cardboard cartons and wood boxes) are burned onsite and the
resulting ashes together with noncombustible wastes (metals,
concrete, fire retardant materials and roofing insulation)
unsuitable for salvage are buried in a landfill.

8

The incinerator consists of an above ground burn pit and an
air curtain destructor. The air curtain destructor swirls a
curtain of air into the pit increasing the burning rate 3 to
4 times that of open burning. The air curtain also tends to
trap the resulting smoke until it is consumed by the intense
8 heat. A permit to operate the incinerator was obtained from
the Louisiana Air Quality Control Division.

Incineration residue is about 1 percent of the original waste volume. After incineration the ashes are removed, hauled to the landfill and buried. The landfill has the capacity to dispose of construction debris and residue from incinerated solid waste generated during the construction of River Bend Station. Upon completion of construction the landfill will be revegetated. 8

Salvageable construction materials are accumulated in designated areas and disposed of as the job progresses.

4.6.6 Surface Water

Construction activities have changed the site surface water hydrological setting but have not significantly altered drainage characteristics.

Design measures were taken to maintain pre-River Access Road construction flow patterns through Alligator Bayou. A culvert system consisting of fourteen 6-ft diameter culverts was placed in the road embankment. Comparison between the preconstruction and construction periods indicates only a slight variation in water levels upstream and downstream of the road during inundation of Alligator Bayou due to storm runoff (Appendix 2B). In addition, culverts were placed beneath roadways for stormwater runoff and for crossings of West Creek to provide passage for surface waters.

West Creek was relocated to a Fabriform-lined channel to reduce both erosion and plant flooding, due to local storms. The channel will be cleaned of silt and debris as necessary to maintain its flow characteristics.

The cooling tower blowdown and clarifier sludge discharge pipelines will be buried so that they do not interfere with surface water flow in Alligator Bayou and West Creek.

The nature of the other setting alterations (Section 4.2) did not require any mitigative action to limit their hydrological impact.

A permanent storm drainage system is being installed in and around the site area to carry off storm water, thus preventing plant flooding and mitigating erosion. The system outfalls to East and West Creeks.

4.6.7 Groundwater

Mitigative measures beyond that noted in Section 4.2.2.2 were not necessary. Dewatering activities are monitored to assure no adverse interference on other area wells. Shortly

after termination, groundwater levels in the Upland Terrace Aquifer are expected to return to predewatering levels.

4.6.8 Land Use

4.6.8.1 Site and Vicinity Land-Use Protection/Restoration

The site has no unique land-use or scenic value, as described in Sections 2.2 and 4.1. However, some protective and restorative measures are being taken. These are:

1. Much of the material excavated during the site preparation phase was reused for constructing the switchyard, roads, and other structures. Excavated material will also be used in the construction of dikes for the Wildlife Management Lake and as backfill in the main excavation area. Excavated material unsuitable for use will be spoiled in select areas and revegetated.

2. Chemicals required during construction are stored, received, transported, and used in a manner to ensure no release to the environment.

3. A permanent fire protection system is being installed. The yard portion of the fire protection system has been operable since the site preparation period and will remain so throughout the life of the plant.

4. A 13.8-ha (34.2-acre) Wildlife Management Lake and visitor information center will be constructed and made available for educational purposes.

5. Vegetation will screen the plant from US Highway 61.

6. GSU is developing plans for a comprehensive land (Table 2.4-5) and game management program.

7. Use of the North and River Access Roads by nearby property owners is limited. Local residents are allowed to travel the River Access Road when other area roads are flooded.

The station has had only localized effects on the surrounding parishes. No land-use protection or restoration plans are being made for the River Bend Station vicinity.

5.4.2.1 Radioactivity in Surface Waters

For the preceding liquid pathways, a dilution factor of 11.4 (the near-field dilution factor) and a travel time of 0 hr were used to determine doses from ingestion of fish, invertebrates, and duck, and exposure from swimming, boating, and shoreline recreation activities. A dilution factor of 24,800 and a hold up time of 41.3 hr (includes 29.3 hr travel time to point of withdrawal, plus 12 hr processing/distribution time) were used to determine doses from potable water and irrigated vegetables.

Concentrations of radioactive effluents in water affected by operation of the plant were calculated according to the methods set forth in Regulatory Guide 1.113[3]. The specific rationale is discussed in Section 5.3.2.1.1.

5.4.2.2 Radioactivity in Air

Three points of gaseous release from the station were considered. These points and the mode of release are:

Release Point 1 - Radwaste Building, Continuous Release
Release Point 2 - Plant Exhaust Duct, Continuous Release
Release Point 3 - Plant Exhaust Duct, Intermittent Release

The analysis for the gaseous pathways required specific meteorological dispersion (CHI/Q) and deposition (D/Q) factors for each of the above releases. Where CHI/Q and D/Q values are indicated in this section, a reference number (i.e., CHI/Q 1) is provided to indicate the release point being considered. The doses for the gaseous pathways were calculated by summing the doses from each release point.

Atmospheric dispersion factors (CHI/Q) and deposition factors (D/Q) utilized in evaluating the releases of gaseous effluents were calculated according to the methods set forth in Regulatory Guide 1.111[4]. The specific rationale is discussed in Section 2.7.5. Table 5.4-1 presents the CHI/Q and D/Q atmospheric dispersion and depostion factors used in this analysis.

5.4.2.3 Radionuclide Concentrations

5.4.2.3.1 Liquid Effluents

The radionuclides released with the liquid effluents are rapidly diluted in the receiving water. An annual average blowdown flow rate of 4,400 gpm for normal two-unit operation was used for the dose calculations. A dilution factor of 11.4 was calculated for activities taking place within the vicinity of the mixing zone. Table 5.4-2

presents the concentrations of various radionuclides in the discharge, closest accessible shoreline, edge of initial mixing zone, and the first public water intake (Bayou Lafourche, Peoples Water Service Co.). The dilution factors have been calculated using annual average effluent flow rates for two-unit operation and the annual average dilution for the receiving water. Dilution factors are calculated using the methodology in Regulatory Guide 1.113. A description of the hydrologic modeling is given in Section 5.3.2.1.1.

Bioaccumulation factors are used to calculate doses to primary organisms (fish, invertebrates, and aquatic plants) and subsequent doses to the secondary predatory animals. With the exception of the site-specific bioaccumulation factors presented in Table 5.4-3, the bioaccumulation factors from Regulatory Guide 1.109, Rev. 1 (fish and invertebrates), and Regulatory Guide 1.109, Rev. 0, (algae), were used to calculate the doses to man.

The Mississippi River is not used within 80 km of the station for irrigation, but this pathway was conservatively considered for maximum individual dose estimates. It was assumed that the first downstream water supply, Peoples Water Service Co., is used for irrigation and has a radionuclide concentration listed in Table 5.4-2. The maximum individual resident's garden was assumed to be irrigated each day during a continuous growing season at a rate equivalent to the area's average annual rainfall (0.104 l/sq m/hr). Maximum individual consumption rates of garden vegetation taken from Regulatory Guide 1.109[5] were used to calculate the estimated doses.

5.4.2.3.2 Gaseous Effluents

Radionuclides emitted in the gaseous effluents accumulate on the ground throughout the life of the plant. Table 5.4-4 lists the ground plane concentrations of radionuclides at a point 1,260 m northwest of the plant. The concentrations at this point represent the maximum offsite deposition at an occupied location. These concentrations are calculated using the approach outlined in Regulatory Guide 1.109, along with the assumption of a 20 yr midpoint of plant life. Relative deposition rates are calculated using the methodology in Regulatory Guide 1.111. A description of the atmospheric modeling appears in Section 2.7.5.

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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
in Upper Grants Bayou at least 70 percent of the time. For 2
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

Mississippi River channel bed elevations deemed acceptable by the U.S. Army Corps of Engineers.

5.5.1.4 Effects on Aquatic Life

As discussed in Section 3.6, there are several sources of liquid effluent from River Bend Station. The impact to 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 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 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 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 rapidly diluted to sublethal level. The 700 ug/l isopleth is estimated to be 2.6 m (8.5 ft) wide at the surface and would extend only 9 m (30 ft) downstream of the discharge under conditions of extreme low river flow. For average river flow the 700 ug/l isopleth would extend 10.4 m (34 ft) and would not reach the surface. Under no condition would the 700 ug/l isopleth be expected to contact the shoreline or the river bottom. Water velocities within this isopleth

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APPENDIX 7A

LIST OF TABLES

APPENDIX 7A

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7A.4 CONTAINMENT ANALYSIS

The RBS containment employs the BWR Mark III design (Figure 7A.4-1) as opposed to the Mark I design utilized by the RSS BWR. The Grand Gulf Generating Station also uses the Mark III design. The Grand Gulf containment is fully analyzed in the GG1 PRA[2]. While both designs employ the pressure suppression concept, the major differences are that RBS uses the freestanding steel containment in lieu of the reinforced concrete containment, and does not require drywell vacuum breakers and containment sprays.

7A.4.1 Containment Event Tree

The containment event tree for the RBS analysis was developed from the GG1 containment event tree. The containment event tree is shown on Figure 7A.4-2.

Containment failure probabilities for sequences γ, δ, α, and shown in Figure 7A.4-2 were developed from GG-RSSMAP[2] probability data. Containment failure probabilities are listed by BWR release category in Table 7A.4-1. 8

TABLE 7A.4-1

ACCIDENT SEQUENCE CONTAINMENT FAILURE MODE PROBABILITIES AND RELEASE CATEGORIES[1]

Sequence	Release Category Probabilities (per reactor-year) 1	2	3	4[2]
T_1PQI	$\alpha = 0.01$	$\delta = 1.0$		
$T_{23}PQI$	$\alpha = 0.01$	$\delta = 1.0$		
T_1PQE			$\gamma = 0.5$	$\delta = 0.5$
$T_{23}PQE$			$\gamma = 0.5$	$\delta = 0.5$
SI	$\alpha = 0.01$	$\delta = 1.0$		
T_1QW		$\delta = 1.0$		
$T_{23}QW$		$\delta = 1.0$		
$T_{23}C$		$\delta = 1.0$		
T_1QUV			$\gamma = 0.5$	$\delta = 0.5$

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[1] Reference 2, Table 5-4, pages 5-27 and 5-28.

[2] Sequence β in RSSMAP only contributed to release Category 4 at a rate of 0.007 per reactor-year. For those dominant sequences at River Bend Station β is assumed to be a negligible contributor to release Category 4 compared to δ.

TABLE 7A.6-3

CRAC2 COMPUTER CODE ISOTOPIC INPUT DATA[1]

Element	Isotope	Quantity (curies)
Cobalt	Co-58[3]	7.05×10^5
	Co-60[3]	2.62×10^5
Krypton	Kr-85	8.39×10^5
	Kr-85m	2.08×10^7
	Kr-87	3.47×10^7
	Kr-88	5.21×10^7
Rubidium	Rb-86[2]	1.56×10^5
Strontium	Sr-89	6.95×10^7
	Sr-90[2]	1.08×10^7
	Sr-91	8.68×10^7
Yttrium	Y-90[2]	1.11×10^7
	Y-91	8.97×10^7
Zirconium	Zr-95	1.30×10^8
	Zr-97	1.33×10^8
Niobium	Nb-95	1.30×10^8
Molybdenum	Mo-99	1.48×10^8
Technetium	Tc-99m	1.30×10^8
Ruthenium	Ru-103	1.27×10^8
	Ru-105	6.95×10^7
	Ru-106	4.63×10^7
Rhodium	Rh-105	6.95×10^7
Tellurium	Te-127	1.04×10^7
	Te-127m[2]	1.05×10^6
	Te-129	2.49×10^7
	Te-129m[2]	4.19×10^6
	Te-131m	1.24×10^7
	Te-132	1.10×10^8
Antimony	Sb-127	8.10×10^6
	Sb-129	2.60×10^7
Iodine	I-131	7.81×10^7
	I-132	1.10×10^8
	I-133	1.59×10^8
	I-134	1.71×10^8
	I-135	1.48×10^8
Xenon	Xe-133	1.59×10^8
	Xe-135	2.14×10^7
Cesium	Cs-134[2]	2.01×10^7
	Cs-136[2]	4.73×10^6
	Cs-137[2]	1.42×10^7
Barium	Ba-140	1.39×10^8
Lanthanum	La-140	1.45×10^8

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TABLE 7A.6-3 (Cont)

Element	Isotope	Quantity (curies)
Cerium	Ce-141	1.33×10^{8}
	Ce-143	1.19×10^{8}
	Ce-144	1.01×10^{8}
Praseodymium	Pr-143	1.16×10^{8}
Neodymium	Nd-147	5.21×10^{7}
Neptunium	Np-239[(2)]	1.46×10^{9}
Plutonium	Pu-238[(2)]	3.59×10^{5}
	Pu-239[(2)]	2.94×10^{4}
	Pu-240[(2)]	5.02×10^{4}
	Pu-241[(2)]	1.16×10^{7}
Americium	Am-241[(2)]	1.80×10^{4}
Curium	Cm-242[(2)]	5.79×10^{6}
	Cm-244[(2)]	7.96×10^{5}

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[(1)] Isotopic inventory provided by NSSS supplier, General Electric Company (Reference 44), adjusted to 2,894, MWt, except as noted. 8

[(2)] NUREG/CR-3108 (Reference 38) data corrected to values consistent with an end-of-cycle 2,894 MWt BWR. 8

[(3)] RSS data (Reference 1) corrected to values consistent with an end-of-cycle 2,894 MWt BWR. BWR 6-specific data from GE was not available for these isotopes.