R. CHRISTOPHER GOODWIN & ASSOCIATES, INC.

cultural resource management and preservation planning

August 22, 2014

Randy Denmon, P.E., P.L.S.
Denmon Engineering, Inc.
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Monroe, LA 71211
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RE: INTERIM REPORT ON THE PHASE IA CULTURAL RESOURCES INVESTIGATION OF THE PROPOSED BEE BAYOU, HOLLY RIDGE NORTHWEST, AND HOLLY RIDGE NORTHEAST PROJECT ITEMS IN RICHLAND PARISH, LOUISIANA

Dear Mr. Denmon,

This interim report presents the results of the Phase Ia cultural resources investigation conducted by R. Christopher Goodwin & Associates, Inc. (RCG&A) for Denmon Engineering, Inc. in January 2014. This undertaking included a desktop survey, windshield survey, and preliminary walkover of the proposed Bee Bayou, Holly Ridge Northwest, and Holly Ridge Northeast project items in Richland Parish, Louisiana (Figures 1 and 2). This project entails the development of portions of these three noncontiguous areas, each measuring approximately 111 ha (275 ac).

Each of the proposed project items is located in Richland Parish, Louisiana, and is situated between US-80 and I-20 and between the towns of Rayville and Delhi, Louisiana (Figure 2). The proposed Bee Bayou project item is located south of US-80, east of LA-583, and is bounded to the northwest by Bee Bayou and to the southeast by Cow Bayou. Approximately 4.8 km (3.0 mi) to the east along I-20 lies the proposed Holly Ridge Northwest project item. This area is bounded by US-80 to the north, I-20 to the south, LA-183 to the east, and Hurricane Bayou to the west. Finally, the proposed Holly Ridge Northeast project item is located immediately to the east of LA-183 and extends 1.2 km (0.77 mi) to the east, bounded by the low-lying vegetated area associated with Big Creek. The Holly Ridge Northeast area also is bounded to the north and south by US-80 and I-20, respectively. Overall the terrain throughout these areas is traversed by numerous bayous and creeks, and each of the project items is located on a terrace above one of these waterways.

Nature of the Work Performed

R. Christopher Goodwin & Associates, Inc. conducted an archeological and architectural inventory of the proposed Bee Bayou, Holly Ridge Northwest, and Holly Ridge Northeast project items, i.e., a 1.6 km (1.0 mi) buffer zone around the limits of each project item. A windshield survey and preliminary walkover of each area also was undertaken; the goals of this research were to identify and to evaluate all cultural resources (archeological sites, cultural resources loci, standing structures, cemeteries, and traditional cultural properties) situated within the limits of the proposed project items that may be impacted adversely by

future construction. All work was performed in accordance with the procedures outlined in the National Historic Preservation Act of 1966, as amended; the Archaeological and Historic Preservation Act of 1974; the Archaeological Resources Protection Act of 1979, as amended; and Title 36 of the Code of Federal Regulations, Parts 60-66 and 800, as appropriate. Additionally, this survey effort abides by the standards promulgated in Archeology and Historic Preservation: the Secretary of the Interior's Guidelines, and Louisiana's Comprehensive Archaeological Plan (Smith et al. 1983). As a result of field survey, 38 archeological loci and one single historic standing structure were identified (Figure 2).

Project Personnel

Dr. Dave D. Davis and Dr. Charlotte Donald Pevny, R.P.A., served as Co-Principal Investigators and supervised all aspects of this project. In addition, Dr. Pevny served as Project Manager for this investigation. Mr. Peter Cropley, B.A., acted as Project Archeologist and supervised the field effort with the assistance of Mr. Tyler Leben, B.A. Mr. Cropley and Mr. Leben were aided in the field by Ms. Leslie Clements, B.A.; Ms. Lucinda Freeman, M.A.; Ms. Genevieve Jones, B.A., Ms. Jordan Krummel, M.A., Mr. Jesse Lynch, B.A., Ms. Sabreina Slaughter, B.A., Ms. Kelin Verrette, B.A., and Mr. Caleb Wells, B.A.

Ms. Raegan Buckley, M.A.; Ms. Emily Meaden, B.A., and Ms. Haley Holt Mehta, M.A. conducted previous investigations for the desktop study. Ms. Mehta authored the previous investigations section in this interim report and compiled the tables. Ms. Susan Barrett Smith, B.A., conducted a cartographic review and authored the historical overview for this study. The graphics presented in this document were completed by Mr. Craig Matthews, B.A., and Mr. David Stitcher, B.A. Ms. Heidi R. Post, B.A., and Mr. Andy Carter, B.A., produced this document.

Previous Investigations

To ensure that all potential impacts to known historic properties will be addressed prior to pipeline construction, a review was undertaken of those previously completed cultural resources investigations, recorded archeological site locations, recorded historic standing structures, and properties listed on the National Register of Historic Places situated within 1.6 km (1.0 mi) of the currently proposed Bee Bayou, Holly Ridge Northwest, and Holly Ridge Northeast project items. This review was conducted by R. Christopher Goodwin & Associates, Inc. of data currently on file at the Louisiana Department of Culture, Recreation and Tourism, Office of Cultural Development, Divisions of Archaeology and Historic Preservation, in Baton Rouge, Louisiana. In total, four previously completed cultural resources surveys, nine previously recorded archeological sites, and one historic standing structure were identified within the vicinity of the three proposed project areas (Tables 1-3). No previously recorded properties listed on the National Register of Historic Places (NRHP) were noted. Results of this review are presented by project item moving from west to east, i.e., results for the Bee Bayou area are followed by those for the Holly Ridge Northwest area, and finally, by the results for the Holly Ridge Northeast area.

In addition, limited cartographic research was undertaken to aid in the identification of areas with a high probability for containing archeological sites. A map study was utilized to infer the general history of the project region. Numerous maps were researched, supplemented by selected documents that referenced habitation and cultivation of the land parcels encompassing the project corridors and compressor station. While many of the researched maps depicted the project region, none gave any indication of settlement or land usage prior to 1853. No roads, land claims, or plantations were noted in the immediate vicinity of the project areas (La Tourette 1948, 1953). By 1860, portions of the three project areas (Bee Bayou, Holly Ridge NW, and Holly Ridge NE) were depicted as owned by William W. Pugh (McCerren et al. 1860). The Vicksburg, Shreveport and Texas Railroad, situated south of the project area, was first depicted in 1860

(ibid.). Union troops used this line to advance towards Monroe in 1863, then most likely used the same route to withdraw. (Goins and Caldwell 1995).

Bee Bayou

No previously recorded cultural resources surveys, archaeological sites, or properties listed on the NRHP were located within 1.6 km (1.0 mi) of the proposed Bee Bayou project item, the westernmost of the three project areas. However, one historic standing structure was identified 1.5 km (0.95 mi) southeast of the Bee Bayou project boundary (Table 3). This standing structure is a bungalow that was constructed c. 1940, and the NRHP eligibility of this structure currently has not been assessed.

Holly Ridge Northwest

The proposed Holly Ridge Northwest project area is located approximately 4.8 km (3.0 mi) east of the Bee Bayou project area and directly west of the Holly Ridge Northeast project area. A total of three previously recorded cultural resources surveys and one archaeological site were identified within 1.6 km (1.0 mi) of this project item; no historic standing structures or properties listed on the NRHP were identified. Of the three previously recorded cultural resources surveys identified, two were sponsored by the United States Army Corps of Engineers Vicksburg District (Cochran 2013; Price and Heartfield 1977), and one was associated with the construction of a planned pipeline project (Espenshade and Brockington 1987; Table 1). All three of these investigations involved Phase I level cultural resources survey efforts; however, one investigation also involved Phase II cultural resources testing for NRHP eligibility. While no archaeological sites identified through these surveys are located within the Holly Ridge Northwest project area, one site (Site 16RI5) is located approximately 1.5 km (0.95 miles) to the north (Table 2). Site 16RI5, a twentieth century historic artifact scatter, was deemed not eligible for inclusion in the NRHP, and no further work was recommended for this site. Again, no historic standing structures or properties listed on the NRHP were identified with 1.6 km (1.0 mi) of the proposed Holly Ridge Northwest project area.

Holly Ridge Northeast

A total of four previously recorded cultural resources surveys and eight archaeological sites were identified within 1.6 km (1.0 mi) of the Holly Ridge Northeast project area, which is directly east of the Holly Ridge Northwest project area. Three these cultural resources surveys also were located within the vicinity of the Holly Ridge Northwest project area and are discussed above (Cochran 2013; Espenshade and Brockington 1987; Price and Heartfield 1977). One of these traversed the Holly Ridge Northeast project area. This survey consisted of a desktop study with no associated fieldwork that identified no cultural resources in Holly Ridge Northeast project vicinity (Price and Heartfield 1977). The remaining previously recorded survey was associated with a private sector endeavor in connection with the construction of a planned pipeline project and can be classified as a Phase I cultural resources survey (Barnes 1994; Table 1). No historic standing structures or properties listed on the NRHP were identified.

While previous surveys identified no archaeological sites within the boundaries of the Holly Ridge Northwest project item, eight sites are located within 1.6 km (1 mile) of this area (Table 2). Of these, just one site was deemed eligible for inclusion on the NRHP. Those sites not eligible for inclusion on the NRHP consisted of one prehistoric grinding station of unknown cultural affiliation (Site 16RI241), one late nineteenth to early twentieth century tenant house scatter (Site 16RI80), one Industrial period cemetery and farmhouse (Site 16RI238), and four sites with both prehistoric and historic components. Three of the four multi-component sites consist of prehistoric chipping stations of unknown cultural affiliation and tenant

houses dating to the Industrial Period (Sites 16RI239, 16RI242, and 16RI245). The remaining multi-component site (Site 16RI244), which can also be categorized as a prehistoric chipping station and Industrial period tenant house, was also assigned a Paleoindian and Neoindian cultural affiliation due to the presence of a Dalton point and a grog-tempered ceramic sherd.

The final site located within the vicinity of the Holly Ridge Northeast project area, the Watson's San Patrice Site (Site 16RI243), was determined eligible for inclusion on the NRHP. Site 16RI243 consists of a Paleoindian chipping station and Tchefuncte camp site with prehistoric (Neoindian) and historic (Industrial) period debris. The artifacts collected from this site included two San Patrice *var. St. Johns* projectile points, two "Alba-like" projectile points, one Tammany Punctated ceramic rim sherd, and two Baytown Plain ceramic body sherds.

Predictions of Archeologically Significant Areas Based on Geology, Soils, and Geomorphology

Utilizing topographic relief, a number of inferences can be made about archeological site location and preservation. These inferences take into consideration a combination of natural, geological, biological, and cultural processes, and the results of both previous archeological surveys and recorded cultural resource sites. Factors that influence prehistoric occupation, and to a lesser degree historic occupation, include proximity to water, ground slope or elevation, and their location near areas characterized by multiple ecozones. Occupation sites are anticipated within areas of high elevation, e.g., on natural ridges located near water. Conditions like these were taken into account when evaluating archeological site potential throughout the project areas.

Because the geomorphology of the proposed project items and the surrounding areas strongly influences the occurrence and subsequent preservation of the archeological materials initially deposited within the area, a brief review of the processes that may affect site preservation and human settlement are included in this discussion. The proposed undertaking is restricted to Richland Parish, in the northeast portion of Louisiana, and primarily consists level to gently undulating terraces that formed in loess over stream deposits (Allen 1993:1). Specifically, the proposed Bee Bayou, Holly Ridge Northwest, and Holly Ridge Northeast project items fall within areas where the elevation varies from less than 27 m to slightly over 27 m (70 to 90 ft) above mean sea level (amsl).

The U.S. Department of Agriculture, Soil Conservation Service General Soil Maps for Richland Parish, Louisiana (Allen 1993), depict several soil associations within the three proposed project items. The descriptions below and in Table 4 are drawn from this source. The soils present within the three project items can be grouped into two general categories: 1) soils associated with late Pleistocene terraces and loess deposits, and 2) soils associated with alluvial plains.

The first category includes the Deerford, Dexter, Egypt, Gigger, Gilbert, and Necessity soil series (Table 4). These soils are found on terraces and formed in late Pleistocene loess, silty, and loamy deposits. These associations include soils that are level or gently sloping (i.e., 0 to 5 per cent), and well to poorly drained soils that are slowly to moderately permeable. They consist primarily of silt loams and silty clay loams. Typically, these soils are restricted to broad flats or convex ridges, the side slopes of these ridges, the shallow depressions between ridges, and along extant or abandoned drainages.

The second soil category consists of the Forestdale and Perry soil series (Table 4), which occur along stream terrace and natural levees. Specifically, the Perry series soils are associated with alluvial deposition of the Arkansas and Mississippi Rivers. These poorly drained and very slowly permeable alluvial soils are level or very gently sloping (i.e., 0 to 1 per cent). The Forestdale and Perry soil series typically are comprised of clays and silty clays.

In summary, soils associated with the late Pleistocene terraces adjacent to drainages, such as like Gilbert and Gigger, are more likely to contain archeological sites particularly when these soils are near rivers and streams.

Interim Results of Field Survey

During the course of this survey, three survey areas, each measuring approximately 111 ha (275 ac), were examined for cultural resources. Survey methodology was limited to a walk-over survey consisting of semi-systematic pedestrian survey and visual inspection. Each of the three survey areas was traversed several times by archeologists on foot. Special attention was given to landforms identified to possess a high probability for the presence of cultural resources. Trimble GPS handsets were employed, in conjunction with aerial mapping, to ensure that the entirety of each area was examined while not exceeding the project area.

A total of 38 archeological loci and one standing structure were identified during this survey. The majority of the loci are historic artifact scatters, although several prehistoric stone and ceramic loci also were identified. Due to the limited field methodology employed during this survey, there was not enough data gathered to make informed recommendations regarding the National Register status of these sites. Additional survey including systematic surface collection, site delineation (i.e., close interval shovel testing), and comprehensive mapping of these cultural resources is recommended. In particular, the loci have not been delineated to establish the vertical and horizontal dimensions of the identified sites, verify the presence or absence of buried, intact deposits, and thoroughly test areas with limited ground surface visibility for cultural materials. Without delineation it is impossible to determine whether these 38 cultural resources locations are actual archeological sites or simply isolated finds (i.e., non-sites). If these loci do in fact meet the LA SHPO's requirements site designation, then delineation also is necessary to determine their eligibility for inclusion in the National Register of Historic Place. The standing structure should be similarly assessed.

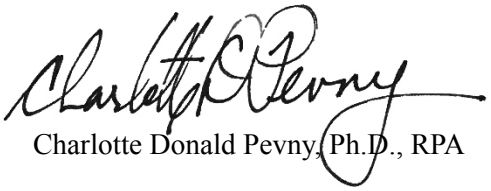
Conclusions

In our original proposal, we stated that delineation would cost $2500.00 per site (n=39), with an additional $5000.00 to write a full findings report. Therefore, the total cost would be $102,500.00. Realizing that keeping costs to a minimum is an important goal to NELEA for the economic development of northeast Louisiana, we have lowered the cost of site delineation to $1912.00 per site. This brings the cost of delineation down to roughly $74,568.00, plus the $5000.00 to write a full report, for a total cost of **$79,568.00** (about a 20% decrease). This cost includes site delineation, completion of sites forms, analysis of recovered artifacts, and writing the results of analysis for the 38 archeological loci and the single standing structure.

To reiterate, without site delineation and completion of a cultural resources report, the current undertaking would not fulfill the Louisiana State Historic Preservation Office (LA SHPO) or Federal Section 106 requirements. Delineating the boundaries of all 38 loci and assessing the standing structure will provide an assessment of eligibility that is needed to complete site forms and write a report; without submitting a full report and site forms to the LA SHPO, due diligence has not been completed. In that case, if a Section 106 review should be triggered in the future in association with the Bee Bayou, Holly Ridge North West, or Holly Ridge Northeast parcels, the LA SHPO would report that the three areas have not been surveyed and any prospective client would then have to re-fund the work just completed by RCG&A.

If you have any questions or concerns, please do not hesitate to contact me or Dr. Dave Davis by phone or email.

Sincerely,



Charlotte Donald Pevny, Ph.D., RPA

Project Manager

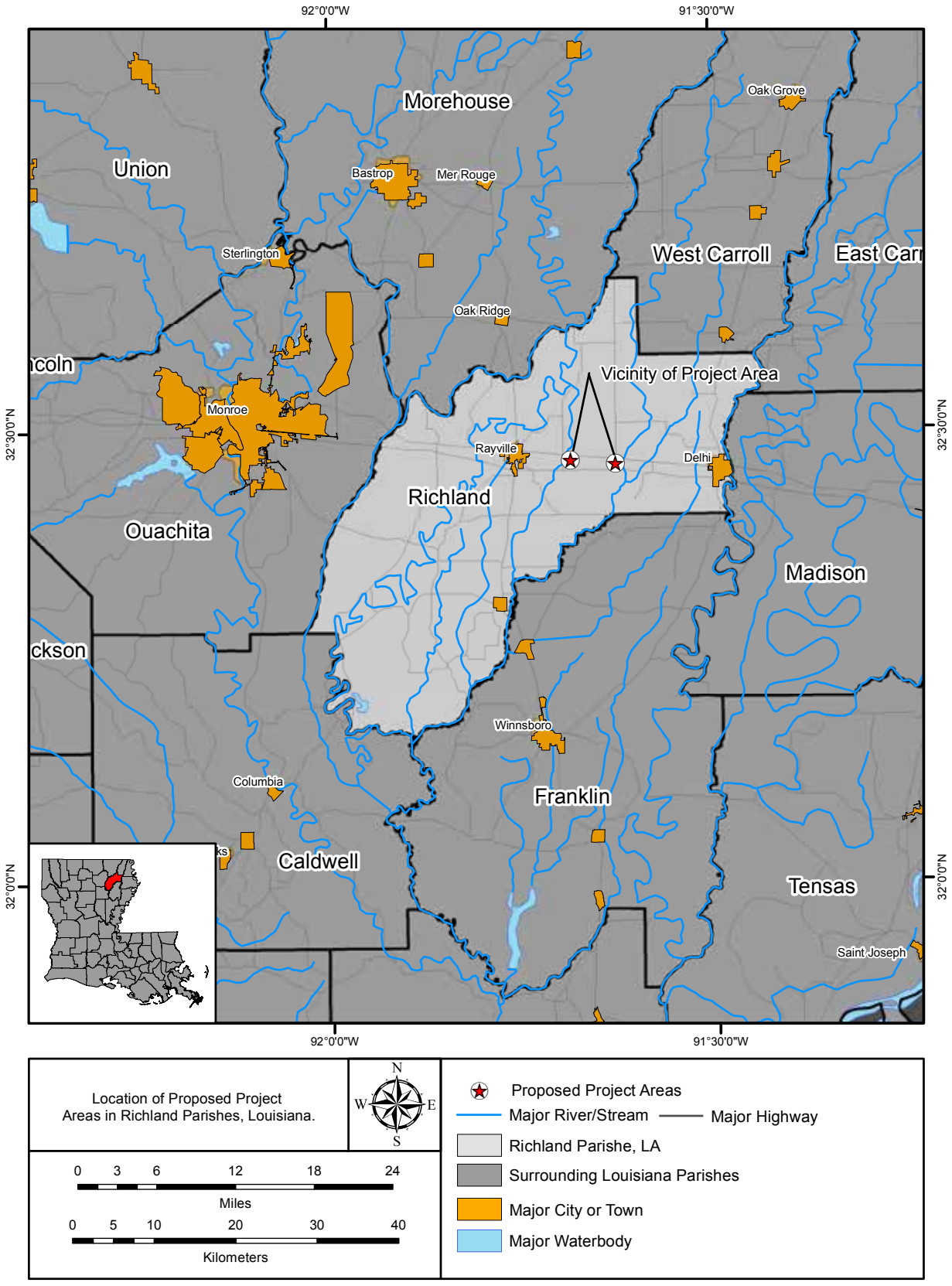


Figure 1 **Map excerpt showing the location of the proposed Bee Bayou, Holly Ridge Northwest, and Holly Ridge Northeast Project items in Richland Parish, LA.**

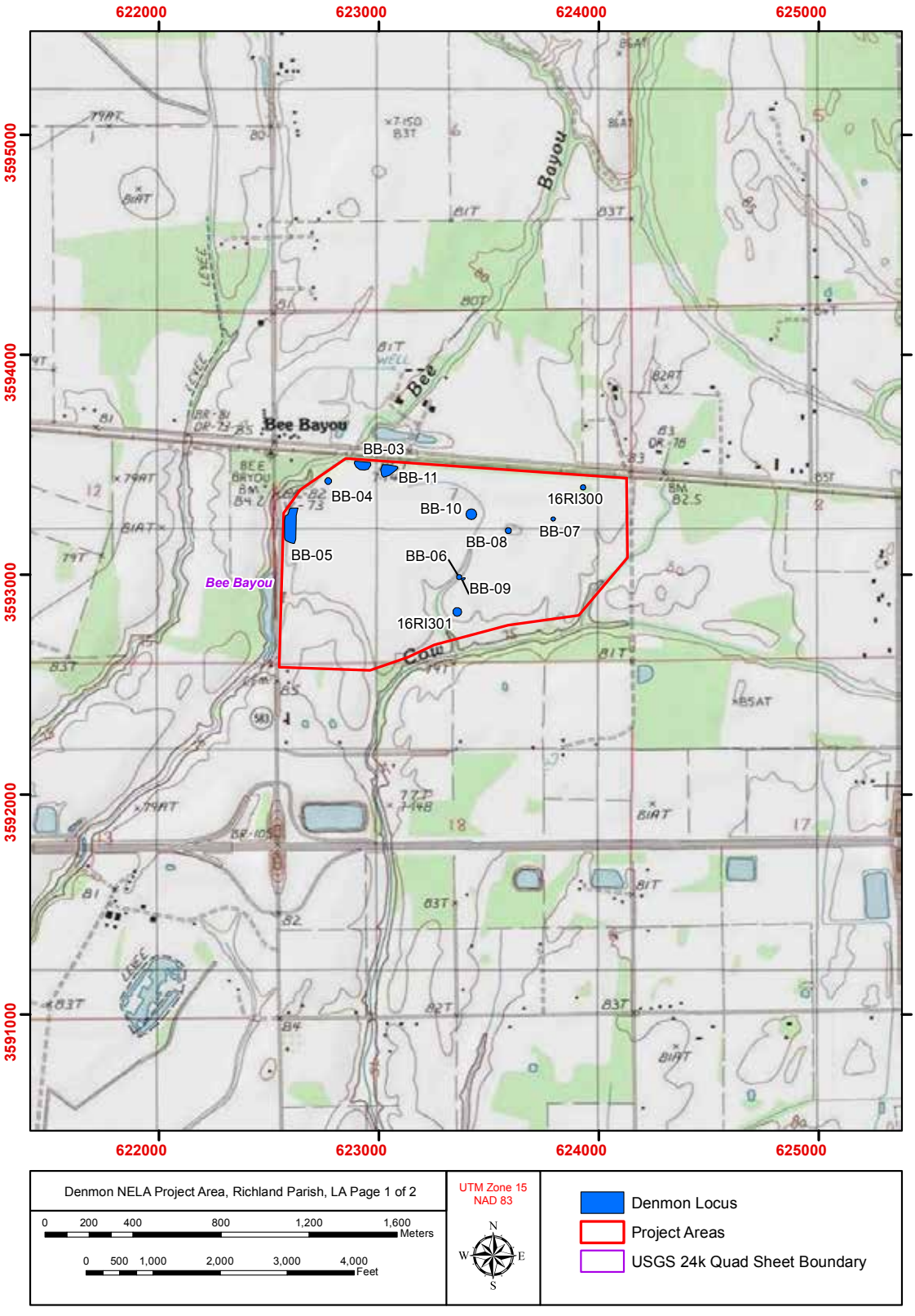


Figure 2 **USGS Quadrangle excerpt showing the location of the proposed Bee Bayou Project item and the location of newly identified loci.**

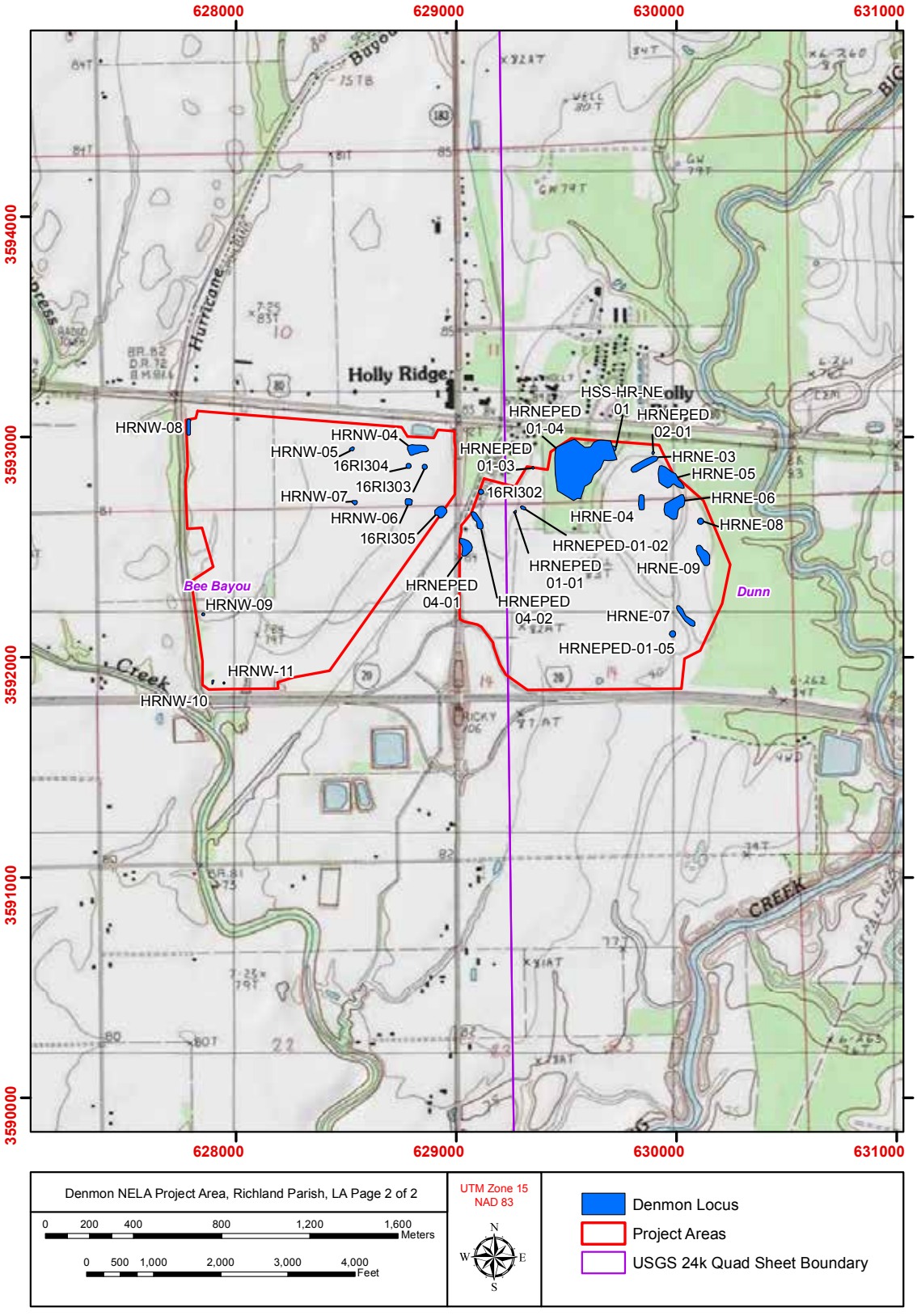


Figure 2
Sheet 2

USGS Quadrangle excerpt showing the location of the proposed Holly Ridge Northwest and Holly Ridge Northeast Project items and the location of newly identified loci.

Table 1 Previously recorded cultural resources surveys within 1.6 km (1.0 mi) of the proposed Bee Bayou, Holly Ridge Northeast and Holly Ridge Northwest Project areas.

Report Number	Title (Author/Date)	Field Methodology	Results
22-0091	*A Cultural Resource Reconnaissance of Portions of Big and Big Colewa Creeks; Richland Parish, Louisiana* (Price and Heartfield 1977)	Desktop survey	No cultural resources were identified.
22-1183	*Archaeological Survey and Testing of the Proposed ANR Pipeline; Ouachita, Morehouse, and Richland Parishes, Louisiana* (Espenshade and Brockington 1987)	Desktop survey, surface survey, shovel testing, and unit excavation	A desktop survey revealed the presence of three previously recorded sites in or near the pipeline corridor. Surface survey and shovel testing resulted in the documentation of 13 previously unrecorded sites. Of these 16 (four prehistoric, nine historic, and three historic/prehistoric) sites, a total of seven were deemed potentially eligible for inclusion in the NRHP. Excavation of the seven potentially eligible sites resulted in a determination of eligiblity for two sites: 16MO60 (Archaic lithic scatter and late nineteenth to early twentieth century artifacts) and 16MO103 (Plaquemine/Mississippi Period artifact scatter).
22-1835	*An Archaeological Survey of the Proposed NorAm, Inc., 24" Gasline, FM-63, Richland and Franklin Parishes, Louisiana* (Barnes 1994)	Desktop survey and shovel testing	Desktop survey revealed the presence of 16 sites within a mile of the pipeline right-of-way. These 16 sites consisted of eight prehistoric sites (16FR3, 16MA215-218, 16RI67, 16RI219 and 16RI241) and eight sites consisting of both prehistoric and historic components (16RI4, 238, 239, 240, 242, 243, 244, and 245). Shovel testing resulted in the documentation of two previously unrecorded sites: 16RI256 (a prehistoric lithic scatter) and 16RI257 (a demolished tenant house). Neither site was recommended as eligible for the NHRP and no further work was recommended.
22-4252	*An Intensive Phase I Cultural Resources Survey of 32 Pole Locations along Entergy's Proposed Oakridge to Dunn Transmission Right-of-Way, Morehouse and Richland Parishes, Louisiana (Negative Findings)* (Cochran 2013)	Desktop survey, surface survey, and shovel testing	No cultural resources were identified.

Table 2. Previously recorded archeological sites within 1.6 km (1.0 mi) of the proposed Bee Bayou, Holly Ridge Northeast and Holly Ridge Northwest Project areas.

Site Number	USGS 7.5 Quad	Landform	Soil Series	Nearest Water	Site Description	Cultural Affiliation	Field Methodology	NRHP Eligibility
16RI5	Baskinton	Alluvial Plain	Gilbert silt loam	Hurricane Bayou	Tenant house scatter	Twentieth century house site	Surface collection	Not eligible
16RI80	Baskinton	Floodplain	Gilbert-Egypt silt loams	Big Creek tributary	Tenant house scatter	Late nineteenth to early twentieth century	Surface survey	Not eligible
16RI238	Dunn	Alluvial Terrace	Gigger-Gilbert silt loams	Big Creek	Cemetery and farm house	Industrial	Surface survey	Not eligible
16RI239	Dunn	Alluvial Terrace	Gigger-Gilbert silt loams	Big Creek	Prehistoric chipping station, tenant house	Unknown prehistoric and Industrial	Surface survey	Not eligible
16RI241	Dunn	Alluvial Terrace	Gigger silt loam	Big Creek	Grinding station	Unknown prehistoric	Surface survey	Not eligible
16RI242	Dunn	Alluvial Terrace	Gigger-Gilbert silt loams	Big Creek	Prehistoric chipping station, tenant house	Unknown prehistoric and Industrial	Surface survey	Not eligible
16RI243	Dunn	Alluvial Terrace	Gigger-Gilbert silt loams	Big Creek	Paleoindian chipping station, Tchefuncte camp site	Paleoindian, Tchefuncte, Neoindian, Industrial Period	Surface survey	Eligible
16RI244	Dunn	Alluvial Terrace	Gigger-Gilbert silt loams	Big Creek	Prehistoric chipping station, domestic tenant home	Paleoindian, Neoindian, Industrial	Surface survey	Not eligible
16RI245	Dunn	Erosional Ridge	Gilbert silt loam	Big Creek	Prehistoric chipping station, tenant house	Unknown prehistoric and Industrial	Surface survey	Not eligible

Table 3 Previously recorded historic standing structures within 1.6 km (1.0 mi) of the proposed Bee Bayou, Holly Ridge Northeast and Holly Ridge Northwest Project areas.

Structure #	USGS 7.5' Quadrangle	Address	Name	Type	Style	Construction Date	NRHP Eligibility	Recorder
42-00098	Bee Bayou	2 miles east Bee Bayou, turn right South 1 mile	n/a	Bungalow	No Style	c 1940	No Data	Whatley 1993

Table 4 Typical pedons for the U.S. Department of Agriculture, Soil Conservation Service soil series noted within the proposed Bee Bayou, Holly Ridge Northeast and Holly Ridge Northwest Project areas.

Soil Series	Horizon	Depth (cm)	Depth (in)	Munsell	Texture
Soils on terraces					
Deerford	Ap	0-15	0-6	Yellowish brown (10YR 5/4)	Silt loam
	E	15-25	6-10	Pale brown (10YR 6/3) mottled with yellowish brown (10YR 5/6)	Silt loam
	E/B	25-43	10-17	E: Light brownish gray (10YR 6/2) Bt: Yellowish brown (10YR 5/6)	Silt loam
	Btn1	43-74	17-29	Light brownish gray (10YR 6/2) coated and yellowish brown (10YR5/6) uncoated, mottled with strong brown (7.5YR 5/8)	Silty clay loam
	Btn2	74-101	29-40	Light brownish gray (10YR 5/6) coated and yellowish brown (10YR 5/6) uncoated, mottled with pale brown (10YR 6/3)	Silty clay loam
	BCn	101-130	40-51	Yellowish brown (10YR 5/6) mottled with pale brown (10YR 6/2)	Silt loam
	Cn	130-152	51-60	Dark yellowish brown (10YR 4/4)	Silt loam
Dexter, 1-5% slopes	Ap	0-15	0-6	Brown (10YR 4/3)	Silt loam
	BA	15-25	6-10	Dark brown (7.5YR 4/4)	Silt loam
	Bt1	25-43	10-17	Dark brown (7.5YR 4/4) mottled with reddish brown (5YR 4/4)	Silty clay loam
	Bt2	43-64	17-25	Dark brown (7.5YR 4/4) mottled with reddish brown (5YR 4/4)	Clay loam
	Bt3	64-81	25-32	Reddish brown (5YR 4/4) mottled with yellowish brown (5YR 4/6)	Clay loam
	2BC1	81-112	32-44	Reddish brown (5 YR 4/4)	Loam
	2BC2	112-150	44-59	Dark brown (7.5YR 4/4) with few pale brown (10YR 6-3) streaks	Fine sandy loam
	3C	150-152	59-60	Dark brown (7.5YR 4/4)	Loamy fine sand
Egypt	Ap	0-15	0-6	Brown (10YR 5/3)	Silt loam
	E	15-40	6-16	Light brownish gray (10YR 6/2) mottled with yellowish brown (10YR 5/6)	Silt loam
	B/E	40-53	16-21	Bt: Strong brown (7.5YR 5/6) E: Grayish brown (10YR 5/6)	Silt loam
	Bt1	53-84	21-33	Yellowish brown (10YR 5/6) mottled with grayish brown (10YR 5/2)	Silty clay loam
	Bt2	84-104	33-41	Brown (10YR 5/6) mottled with grayish brown (10YR 5/2)	Silt loam
	Btn1	104-140	41-55	Yellowish brown (10YR 5/4 and 5/6)	Silt loam
	Btn2	140-152	55-60	Yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4)	Silty clay loam
Gigger, 1-3% slopes	Ap	0-15	0-6	Dark brown (10YR 3/3)	Silt loam
	Bt1	15-38	6-15	Dark brown (7.5YR 4/4)	Silt loam
	Bt2	38-61	15-24	Brown (7.5YR 4/4 and 5/4)	Silt loam
	Btx1	61-86	24-34	80 per cent dark yellowish brown (10YR 4/4) and 20 per cent brownish gray (10YR 6/2) and grayish brown (10YR 5/2), mottled with yellowish brown (10YR 5/6)	Silt loam
	Btx2	86-114	34-45	Dark brown (7.5YR 4/4) with light brownish gray (10YR 6/2) seams	Silt loam
	Btx3	114-137	45-54	Dark brown (7.5YR 4/4) with light brownish gray (10YR 6/2) seams, mottled with yellowish brown (10YR 5/4)	Silt loam
	2Bt	137-152	54-60	Dark brown (7.5YR 4/4) with light brownish gray (10YR 6/2) streaks and pale brown seams (10YR 6/3)	Loam

Table 4, continued

Soil Series	Horizon	Depth (cm)	Depth (in)	Munsell	Texture
Soils on terraces					
Gilbert	Ap	0-15	0-6	Dark grayish brown (10YR 4/2) mottled with dark yellowish brown (10YR 4/4)	Silt loam
	Eg	15-40	6-16	Light brownish gray (10YR 6/2) mottled with yellowish brown (10YR 6/2)	Silt loam
	B/E	40-58	16-23	Bt: Grayish brown (10YR 5/2) E: Light brownish gray (10YR 6/2) Mottled with strong brown (7.5YR 5/6)	Bt: Silty clay loam E: Silt loam
	Btg1	58-99	23-39	Grayish brown (10YR 5/2) mottled with brown (10YR 4/3)	Silty clay loam
	Btg2	99-111	39-44	Grayish brown (10YR 5/2) mottled with light yellowish brown (10YR 6/4) Tongues of light brownish gray (10YR 6/2) silt loam that decrease in thickness with increase in depth	Silty clay loam
	Btng	111-152	44-60	Grayish brown (2.5Y 5/2) mottled with yellowish brown (10YR 5/6)	Silty clay loam
Necessity	Ap	0-18	0-7	Brown (10YR 5/3)	Silt loam
	Bt	18-40	7-16	Yellowish brown (10YR 5/4 and 5/6) mottled with light brownish gray (10YR 6/2)	Silty clay loam
	B/E	40-69	16-27	Bt: Yellowish brown (10YR 5/6) E: Light brownish gray (10YR 6/2) Mottled with dark yellowish brown (10YR 4/6)	Bt: Silty clay loam E: Silt loam
	Egypt	69-79	27-31	Light brownish gray (10YR 4/6) mottled with yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/6)	Silt loam
	Btx1	79-104	31-41	Dark yellowish brown (10YR 4/6) mottled with faint yellowish brown (10YR 5/6) and brownish gray (10YR 6/2)	Silt loam
	Btx2	104-130	41-51	Yellowish brown (10YR 5/6) mottled with light grayish brown (10YR 6/2)	Silt loam
	BC	130-152	51-60	Yellowish brown (10YR 5/4 and 5/6) mottled with brown (7.5YR 5/4)	Loam
Soils in alluvial plains					
Forestdale	Ap	0-10	0-4	Dark grayish brown (10YR 4/2)	Silty clay loam
	Btg1	10-25	4-10	Gray (10YR 5/1) mottled with yellowish brown (10YR 5/6)	Silty clay
	Btg2	25-46	10-18	Gray (10YR 5/1) mottled with yellowish brown (10YR 5/6)	Silty clay
	Btg3	46-86	18-34	Gray (10YR 5/1) mottled with dark yellowish brown (10YR 5/3)	Silty clay
	2BCg1	86-109	34-43	Gray (10YR 5/1) mottled with dark yellowish brown (10YR 4/4)	Silty clay
	2BCg2	109-152	43-60	Grayish brown (10YR 5/2) mottled with olive brown (2.5Y 4/4)	Silt loam
Perry, occasionally flooded	Ap	0-15	0-6	Dark gray (10YR 4/1) mottled with yellowish brown (10YR 5/6)	Clay
	Bg1	15-35	6-14	Gray (10YR 5/1) mottled with strong brown (7.5YR 5/6)	Clay
	Bg2	35-53	14-21	Gray (10YR 5/1) mottled with dark brown (10YR 4/3)	Clay
	2Bw	53-79	21-31	Dark reddish brown (5YR 3/4)	Clay
	2Bk1	79-104	31-41	Reddish brown (5YR 4/3)	Clay
	2Bk2	107-152	41-60	Reddish brown (5YR 4/4)	Clay

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