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Preliminary Assessment of Coal Resources for the Chemard Lake (Naborton No. 2) Coal Zone of the Lower Wilcox Group (Paleocene), Northwestern Louisiana

By Peter D. Warwick, Steven M. Podwysocki and Adam C. Schultz

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Contents

Figures

Table

Appendices

Preliminary Assessment of Coal Resources for the Chemard Lake (Naborton No. 2) Coal Zone of the Lower Wilcox Group (Paleocene), Northwestern Louisiana

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Introduction

The lower part of the Wilcox Group of northwest Louisiana contains shallow (<500 ft), coal deposits that are mined for use in mine-mouth electric power generating plants. The coal deposits, which are lignite A in rank (Troy and others, 1993), occur on the eastern part of the Sabine Uplift (fig. 1). The coal zones and associated strata in the assessment area generally dip away from the axis of the Red River – Bull Bayou anticline that is located in the north-central part of the assessment area (fig. 1). The Louisiana Sabine resource assessment area includes parts of four parishes: De Soto, Red River, Natchitoches and Sabine (fig. 2). The assessment area was selected because of its proximity to current mining areas, and the availability of stratigraphic data in the area. The assessment area is roughly 60 miles long and 15 miles wide and generally extends across the east central part of the Sabine Uplift in northwest Louisiana (fig. 2). More than 950 stratigraphic records from rotary and core drill holes were used to assess the resources of the Louisiana Sabine assessment area. Of the 950 drill holes, 210 are public data points and are located in or near the areas that have been permitted or proposed for surface mining (fig.2; Appendix 1). Most of the stratigraphic data used for this assessment were provided to the U.S. Geological Survey (USGS) on a confidential basis by various coal companies for use in regional studies. Eight coal-bearing zones were identified in the stratigraphic interval from the Naborton Formation to the Cow Bayou Formation in the Wilcox Group in northwestern Louisiana (fig 3a), but only the Chemard Lake (Naborton No. 2) coal zone was assessed in the Louisiana Sabine assessment area (figs. 2, 3b). The Chemard Lake (Naborton No. 2) bed was selected for assessment because it is generally persistent across the area, averages 5.8 ft in thickness, and ranges from <1 to 20 ft in thickness (fig. 3). The coal zones that were identified, but not assessed, were either too thin to be considered for mining, or lacked adequate stratigraphic coverage for resource assessment. A total of 1.1 billion short tons of coal with less than 500 ft of overburden were identified in this assessment of the Chemard Lake (Naborton No. 2) coal zone. Maps of the Chemard Lake (Naborton No. 2) coal zone were constructed to show the overburden, structure contour at the top of the coal zone, and cumulative coal-zone thickness. Preliminary reports on the coal quality and resources of other assessed areas in Gulf Coast region (fig. 1) can be found in Ruppert and others (2002) and Warwick and others (2002). The purpose of the present report is to provide a preliminary release of data for the Louisiana Sabine resource assessment block in advance of publication of the Gulf Coast regional assessment of coal resources, which is planned for a later date.

Stratigraphy

The stratigraphic nomenclature of the coal-bearing Paleocene-Eocene interval in northwest Louisiana, and its correlative relationship to units of similar age in adjacent States, has changed through recent years (fig. 4). Some of the first descriptions of the geology and stratigraphy of the coal-bearing interval in northwest Louisiana were by Glenk (1921) and Meagher and Aycock (1942). Glenk (1921) listed lignite occurrences from outcrop and well records across northern Louisiana. Meagher and Aycock (1942) also described lignite occurrences in Louisiana and

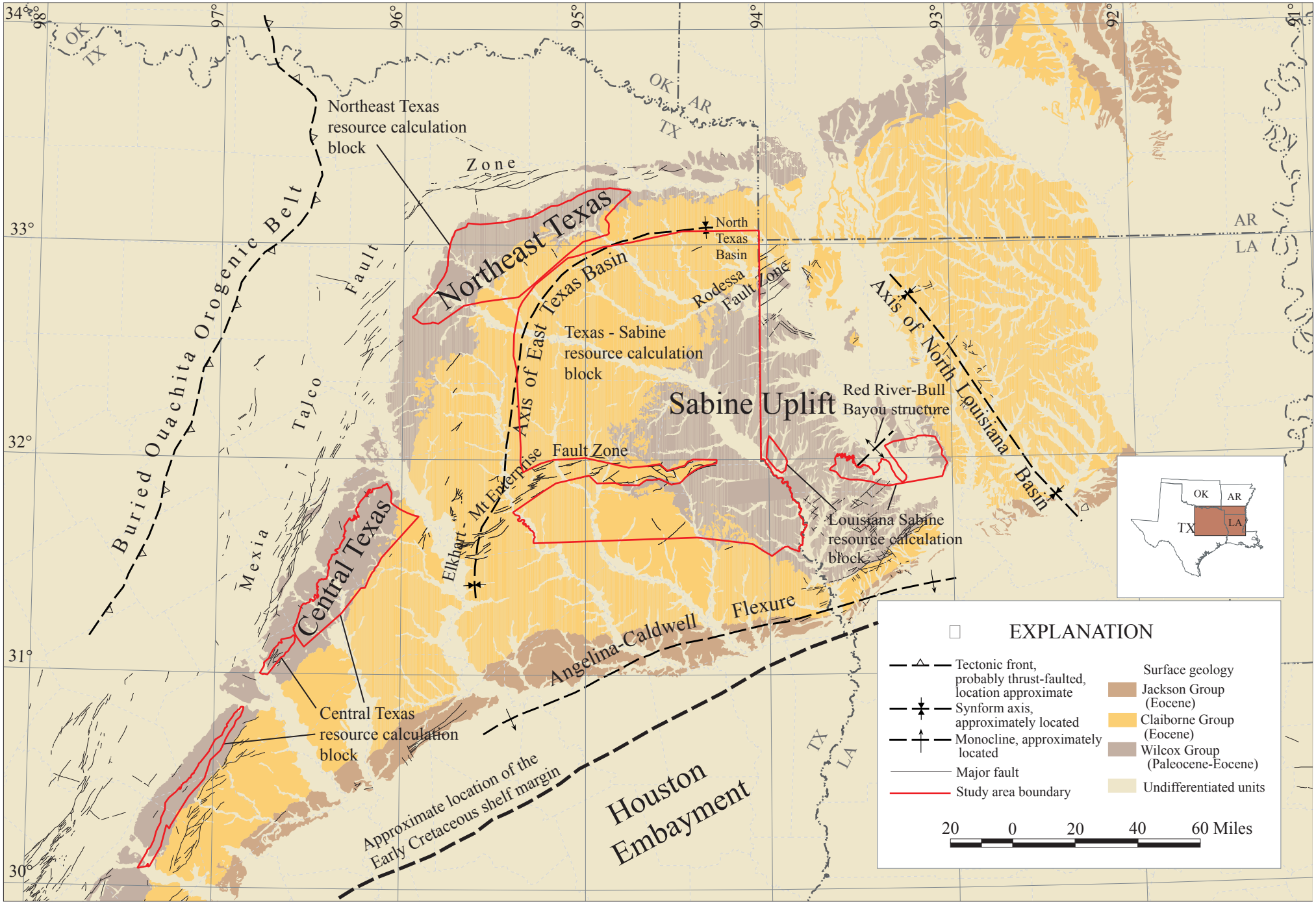

Figure 1. Generalized outcrop map of the coal-bearing units, structural features, and areas of study in northeast Texas and northwest Louisiana. Outcrops compiled from Barnes (1992), Haley (1993), Snead and McCulloh (1984), and Warwick and others (1997); structural features after Murray (1948), and Ewing (1991). Coal quality data and resource estimates for the resource calculation blocks can be found in Ruppert and others (2002) and Warwick and others (2002).

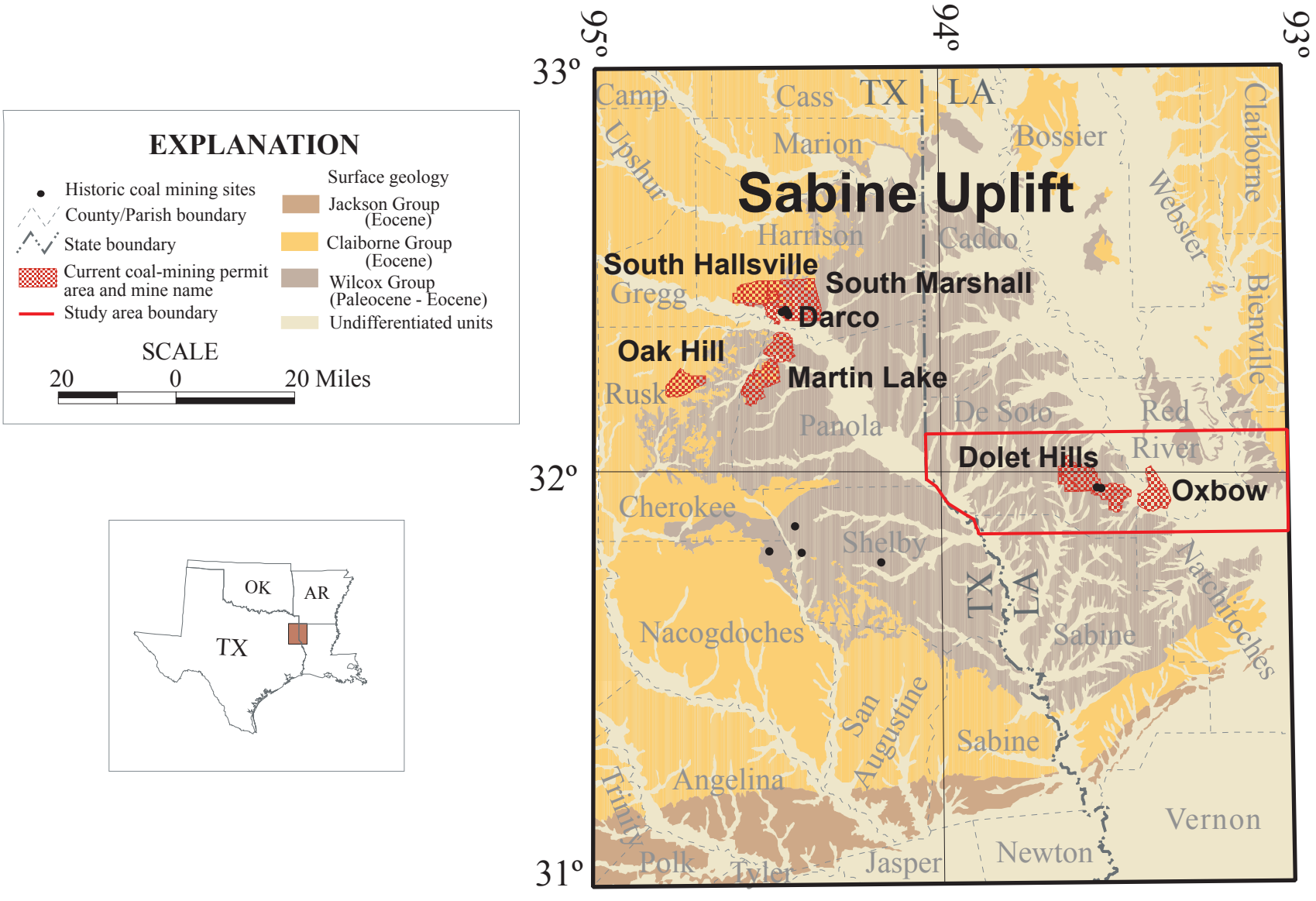

Figure 2. Location map for the northwest Louisiana Sabine assessment block, showing nearby mine permit boundaries, generalized coal-bearing geology, structural features, and historic mining localities (modified from Barnes,1992; Ewing, 1991; Haley, 1993; Snead and McCulloh, 1984; Warwick and others, 1997; Wood and Guevera, 1981; and unpublished data, Railroad Commission of Texas).

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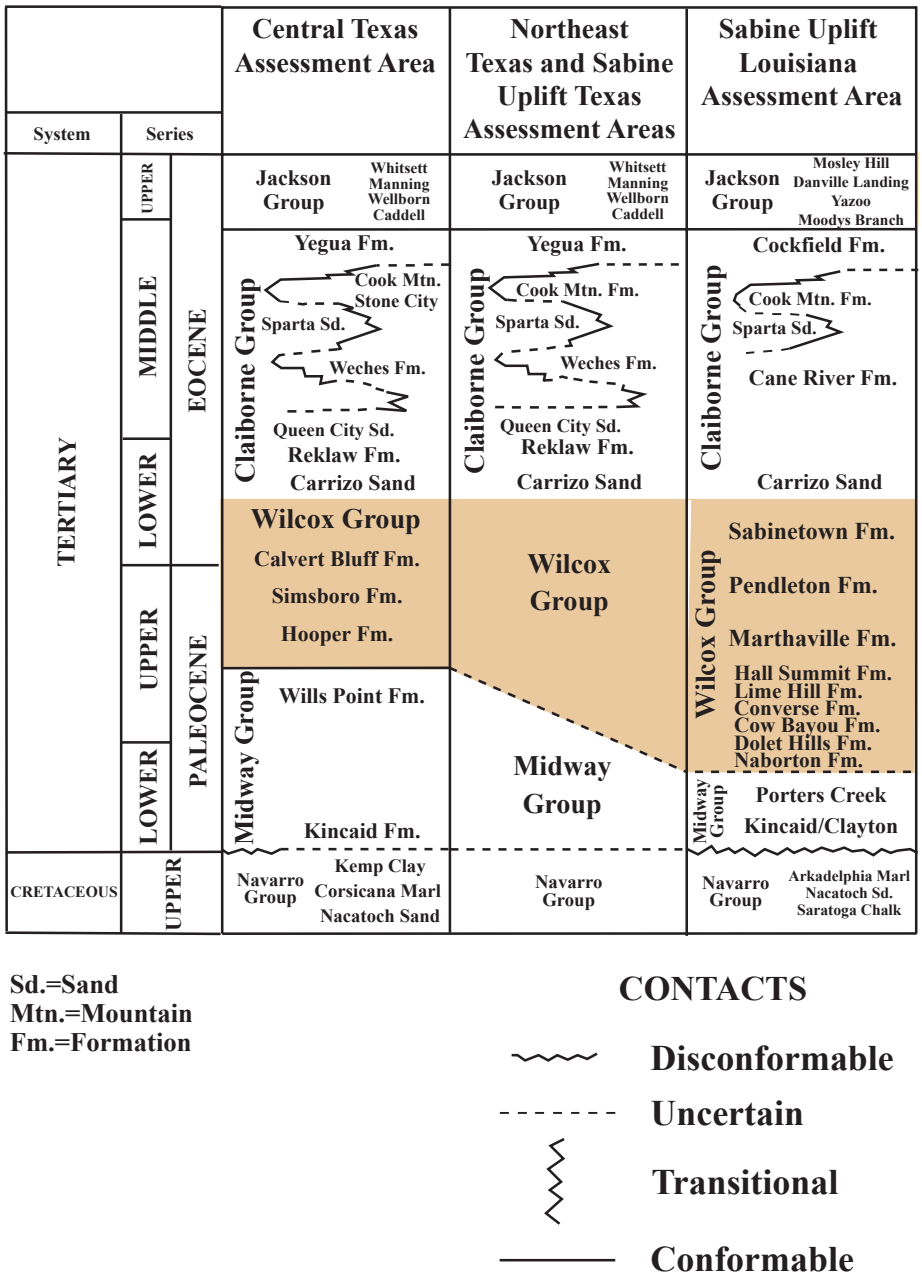

Figure 3. Generalized stratigraphic columns for the Wilcox Group and adjacent strata in the Sabine Uplift area. *A*, Regional correlation of stratigrahic units for northeast Texas and northwestern Louisiana. Wilcox Group strata are shaded brown (from Warwick and others, 1997). *B,* (Continued on next page.)

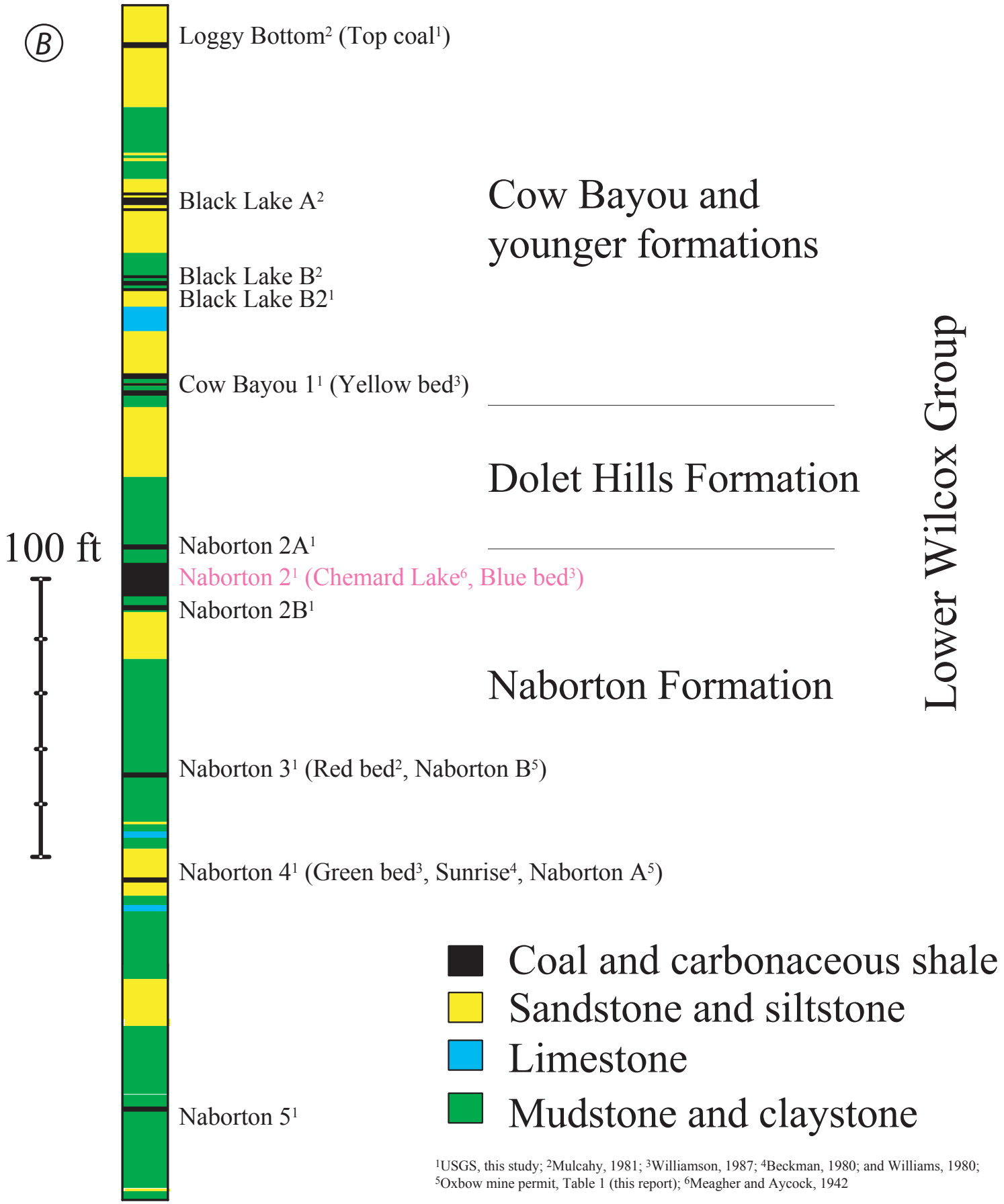

Figure 3. (continued) *B*, Generalized stratigraphic section in Louisiana Sabine coal mining area showing the position of coal zones and names. Names in parentheses are other common names used for each coal zone. Sources of zone or bed names are as follows: 1) USGS, this study, 2) Mulcahy, 1981, 3) Williamson, 1987, 4) Beckman, 1980, and Williams, 1980, 5) Oxbow mine permit, Table 1 (this report), 6) Meagher and Aycock, 1942.

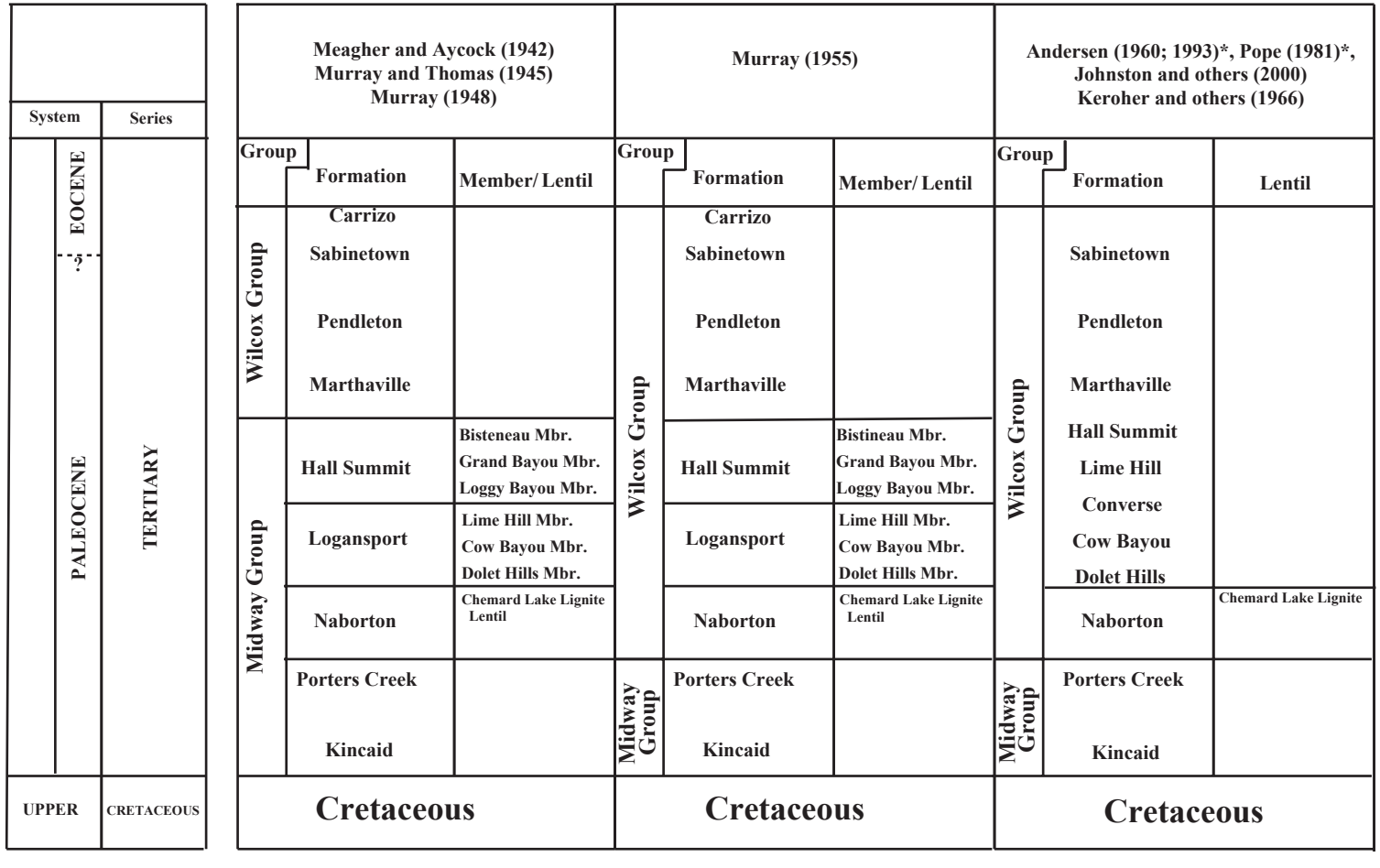

Figure 4. Stratigraphic chart that compares the stratigraphic nomenclature used by various workers in the coal-bearing area of northwestern Louisiana.

described the Chemard Lake Lignite Lentil (or bed) and placed it at the top of the Naborton Formation (Midway Group) (fig. 4). In a review of the geology of De Soto and Red River Parishes, Murray (1948) also assigned the Chemard Lake Lignite Lentil to the Naborton Formation of the Midway Group (Midwayan Stage, Paleocene; fig. 4). Later, in an effort to avoid confusion in the literature, Murray (1955; 1961) assigned all Midwayan and Sabinian stage (Paleocene – lower Eocene) lignitic sediments of the Gulf Coastal Plain to the lithostratigraphic, time-transgressive Wilcox Group (fig. 4). In the discussions of the geology of Sabine and Natchitoches Parishes, Andersen (1960, 1993) further subdivided the Wilcox Group by elevating several members previously described by Murray (1948) in De Soto and Red River Parishes, to formation status. In 1980, the Louisiana Geological Survey formally recognized these subdivisions of the Wilcox Group (Pope, 1981; Johnston and others, 2000; fig. 4). These are the subdivisions officially recognized by the U.S. Geological Survey (Keroher, 1966).

The lower Wilcox coal-bearing interval in the eastern part of the Sabine Uplift contains as many as 25 individual coal beds (Mulcahy, 1981). In the current study area, eight coal-bearing zones have been identified, but only one coal bed was selected for assessment (fig. 3b). The Chemard Lake coal zone (also known informally as Naborton No. 2, Blue, or Naborton C bed, following various exploration and mining company usages) was selected for assessment because it is generally persistent across the area, averages 5.8 ft in thickness, and ranges from < 1 to 20 ft in thickness (fig. 3b).

Other coal resource estimates for northeast Louisiana have been provided by Roland and others (1976) and Mulcahy (1981). Although their study areas are not the same as used in this report, in some cases their study areas partially overlap with the focus area of the present report. Roland and others (1976) studied the Chemard Lake coal zone in De Soto Parish, in an area smaller than that assessed in this study, and reported a total of 546 million short tons of coal resource. Mulcahy (1981) studied an area that is slightly smaller than this study, and reported a total of 1.9 billion short tons of coal resource for the area. The coal zone nomenclature used in this study generally follows that of Mulcahy (1981), Luppens (1986), Williamson (1987), Breyer and others (1993).

Several cross sections illustrate the character of the coal-bearing interval in north-central Louisiana (fig. 5a-d). Cross-section 1, which runs through the Dolet Hills Permit area, shows the southeasterly dip and depth to the Chemard Lake (Naborton No. 2) bed (fig. 5a and 5b). Cross-section 2 illustrates the stratigraphic relationship of the Chemard Lake (Naborton No. 2) bed to other deeper coal beds in the Oxbow coal mine permit area (fig. 5a and 5c). Cross-section 3, located in the western part of the assessment area, illustrates the localized thickening and splitting of the Chemard Lake (Naborton No. 2) bed (fig. 5a and 5d). In the western-most part of the line of cross-section 3, the Chemard Lake bed is about 20 ft thick. The stratigraphic distribution of coal beds in the upper part of the coal-bearing section is also shown on cross-section 3 (fig. 5a and 5d).

Methods

The methods used for calculating resources for the Louisiana Sabine assessment block generally follow those described by Roberts and others (1998), Tewalt (1998), and Roberts and Biewick (1999). Stratigraphic data were collected from a number of public and private sources. Public data sources are outlined on Table 1. Both public and private data were entered into a drill-hole data management software program (*StratiFact*) and correlations were made of the major coal zones. Definition of coal zones follows the procedure outlined in Wood and others (1983) where non-coal partings greater than 0.375 in were excluded from individual coal beds that comprise the coal zone. Coal beds separated by partings greater than the thickness of the over- or underlying coal bed constitute a coal zone. Resources were generally calculated on a zone basis according to the methods outlined in Wood and others (1983). Drill hole locations and surface elevations were checked against 1:100,000 scale USGS Digital Elevation Models (DEM) and 1:24,000 scale topographic maps. A margin of error of ± 25 ft was allowed for the surface elevations of the drill holes used in this assessment. Drill hole records that did not meet this criteria were excluded from the data set. Once the Chemard Lake (Naborton No. 2) coal zone was correlated and drill hole surface elevations checked, drill hole point names, and latitude/longitude values for point locations, coal-zone-top elevations, and cumulative coal zone thicknesses (Appendix 1) were imported into *EarthVision*, a gridding and modeling software package. A grid model was made for the structural top data (fig. 6a). The resulting grid created for the structural top of the coal zone was subtracted from the 1:100,000 scale DEM for the study area to produce a grid of overburden for the coal zone (fig. 6b). Outlines of areas on the coal zone structural top grid model where the top of the coal zone exceeded the value of the DEM were merged with digitized coal zone outcrop data from Roland and others (1976) and unpublished mine permit maps (table 1) to define areas where surface erosion has removed the coal zone (fig. 6b). The eroded areas were excluded from the resource calculations. Because the coal thickness data were separated into two groups, one in the eastern and the other in the western part of the assessment area,

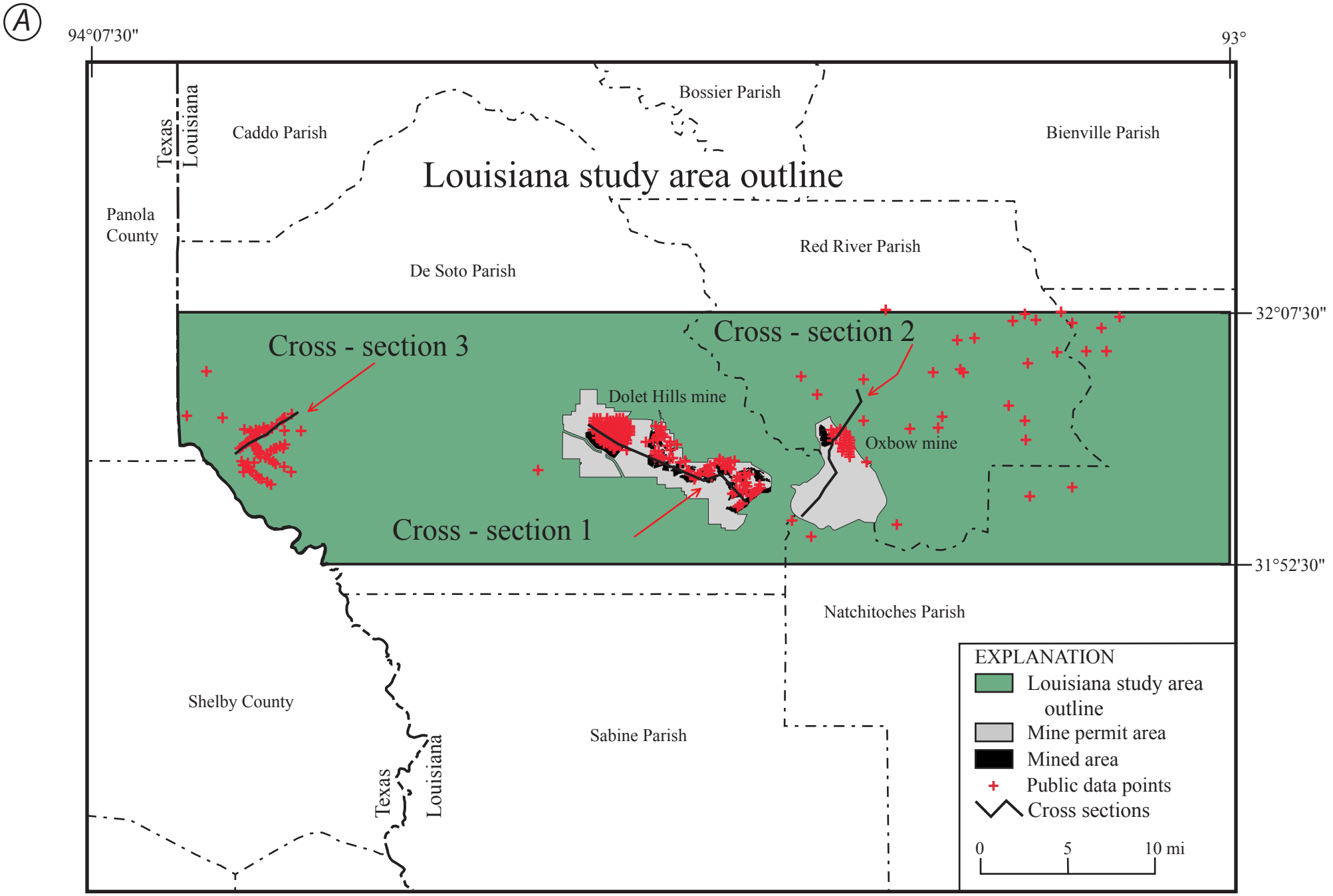

Figure 5. Location map for the northeast Louisiana Sabine assessment block and cross sections through the lower Wilcox coal-bearing interval. *A*, Location map showing lines of section, mine permit areas and public data points (Appendix 1).

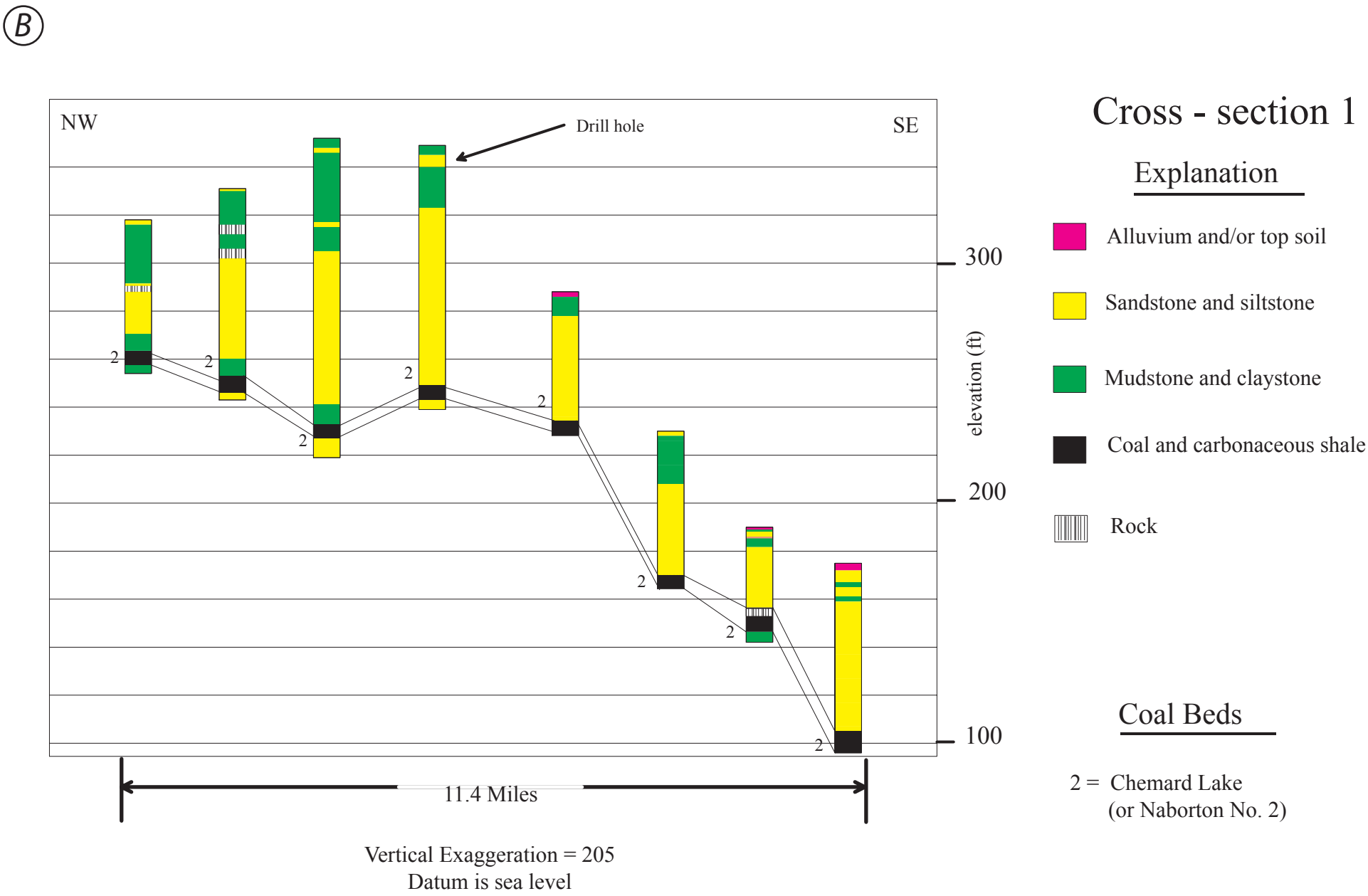

Figure 5. (Continued) Location map for the northeast Louisiana Sabine assessment block and cross sections through the lower Wilcox coal-bearing interval. *B*, Cross-section 1 through the Dolet Hills mining area that shows stratigraphy and regional dip of the Chemard Lake (Naborton No. 2) coal zone.

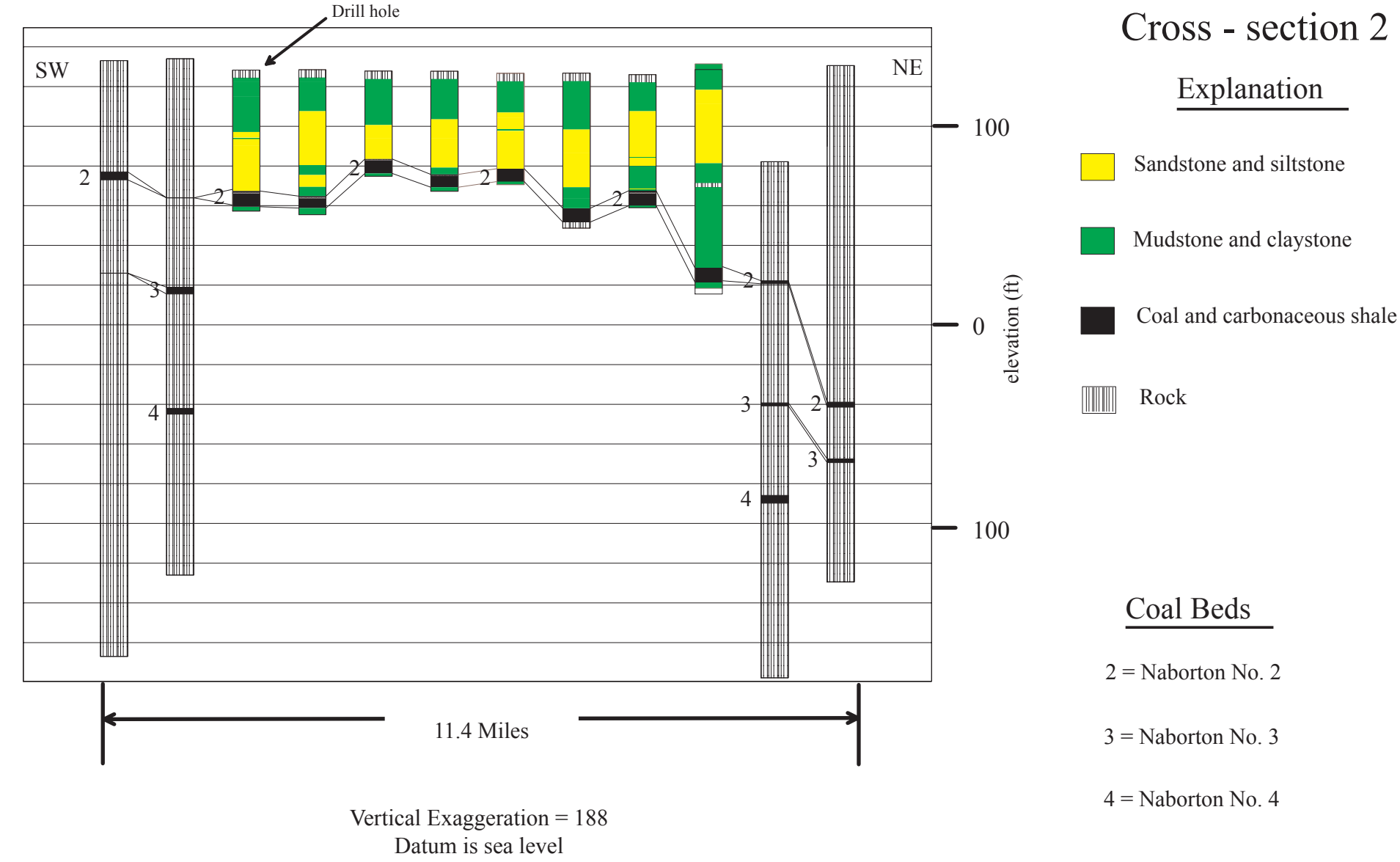

Figure 5. (Continued) Location map for the northeast Louisiana Sabine assessment block and cross sections through the lower Wilcox coal-bearing interval. *C*, Cross-section 2 through the Oxbow mining area that shows the Chemard Lake (Naborton No. 2) and lower coal zones. (See fig. 3b for sources of coal zone names).

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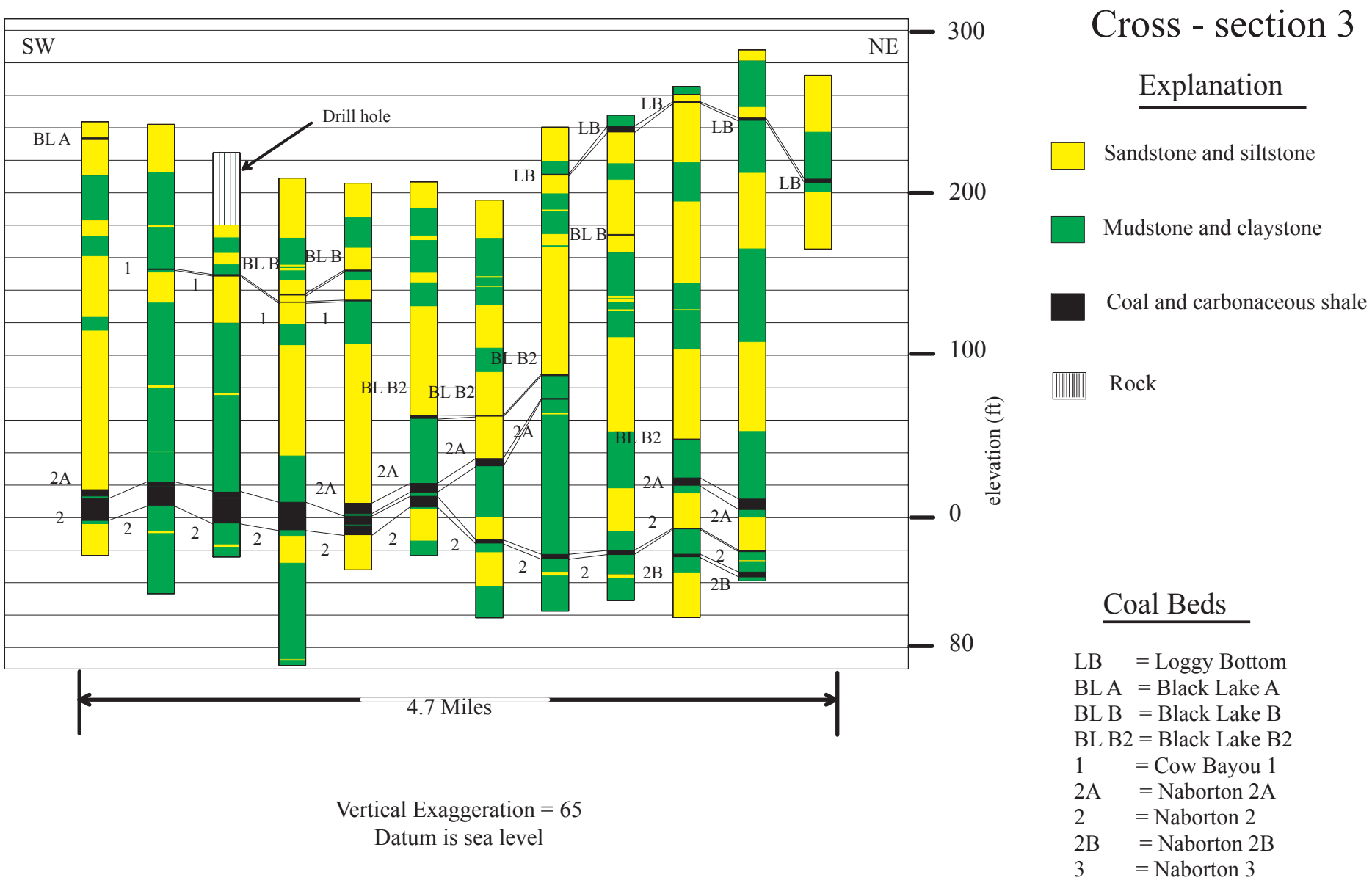

Figure 5. (Continued) Location map for the northeast Louisiana Sabine assessment block and cross sections through the lower Wilcox coal-bearing interval. *D*, Cross-section 3 through the western part of the resource study area that shows the thickening and rapid splitting of the Chemard Lake (Naborton No. 2) coal zone. Coal zones above the Chemard Lake zone are also shown. (See fig. 3b for sources of coal zone names).

cumulative coal zone thickness grids and contours were limited to the two areas with data (fig. 6c).

The resulting coal zone thickness and overburden grids were contoured in *EarthVision* generally following the thickness intervals for lignite and overburden suggested by Wood and others (1983). However, in some areas of the Gulf Coastal plain, coal beds as thin as 1.5 ft are currently mined, so the minimum mapped coal thickness category used in this study is 0 to 1.5 ft thick. For coal resource calculations, a minimum of 1.5 ft of coal thickness was used. The *EarthVision* contour maps (coal zone total coal thickness, overburden, and structure contour) were transferred to *ArcInfo* and unioned into one coverage that included 1) reliability circles based on public and private data points (areas defined were measured, indicated, inferred and hypothetical following Wood and others, 1983), 2) USGS 1:100,000 scale county boundaries, 3) USGS 7.5' topographic quadrangle boundaries, 4) coal zone eroded areas, and 5) mine permit boundaries (table 1). The unioned coverage was then transferred back in to *earthVision* for resource tonnage calculation using the volumetrics function of the software package. An average lignite density of 1.29 was used in the resource calculation (Wood and others, 1983). The resulting *earthVision* resource data table was converted to an ASCII text table and joined with the unioned resource coverage in *ArcView*. The resulting data attribute table was exported to an *Excel* spread sheet to produce resource pivot tables for the coal zone. Coal resources are reported in millions of short tons (Appendix II), and exclude eroded areas and areas within mine permitted boundaries.

Results

Maps

The Chemard Lake (Naborton No. 2) coal zone in the northwest Louisiana study area was evaluated for coal resources using the methods described above. The geologic character of the coal zone is illustrated on three maps: a structure contour of the top of the coal zone (fig. 6a); an overburden map (fig. 6b); and a total coal thickness map (fig. 6c). Public data point locations, lines of section, mine lease boundaries, and mined-out areas (as of 1998) are shown on figure 5a.

There are several general comments that can be made about the coal zone maps. The structure contour map (fig. 6a) illustrates the influence of the Red River – Bull Bayou dome structure (fig. 1) on the elevation of the Chemard Lake coal zone. The current coal mining areas are located near the crest of the Red River – Bull Bayou structure where the Chemard Lake coal zone is at its highest elevation. The coal zone generally dips to the east, south and west, away from the Red River – Bull Bayou structure. Accordingly, the amount of overburden increases to the east, south and west (fig. 6b), and the greatest amount of overburden generally occurs in the western part of the assessment area in De Soto Parish and adjacent Shelby and Panola Counties in Texas. Coal zone thickness trends are generally greatest near the areas of active mining, however an area of thick coal (>20 ft thick) is located in the western part of the assessment area (fig. 6c).

Coal Resources

A total of 1.1 billion tons of coal in the Chemard Lake (Naborton No. 2) coal zone was identified for the Northwest Louisiana resource area outside of mine permit areas (Appendix 2). Based on data from this study, most of the remaining coal resources are in the 2.5-5 ft and 5-10 ft thickness categories and are located in the De Soto and Red River Parishes (figs. 6c and 7). More than half of the Chemard Lake (Naborton No. 2) coal zone in the resource area is covered by 100 to 200 ft of overburden (figs. 6b, 7, and Appendix 2). An area of thick coal (>20 ft thick in the western part of the assessment area) is covered primarily by 200 to 500 ft of overburden (figs. 6b and 6c). The greatest amount of coal resources in the measured and indicated resource reliability categories are in De Soto Parish, followed by Red River and Natchitoches Parishes (fig. 7; Appendix 2).

Conclusions

The Louisiana Sabine assessment area is roughly 60 miles long and 15 miles wide and is situated on the eastern flank of the Sabine Uplift (fig. 1). The Chemard Lake (Naborton No. 2) coal zone contains approximately 1.1 billion short tons of coal resources in the zone outside mine permitted areas within the Louisiana Sabine

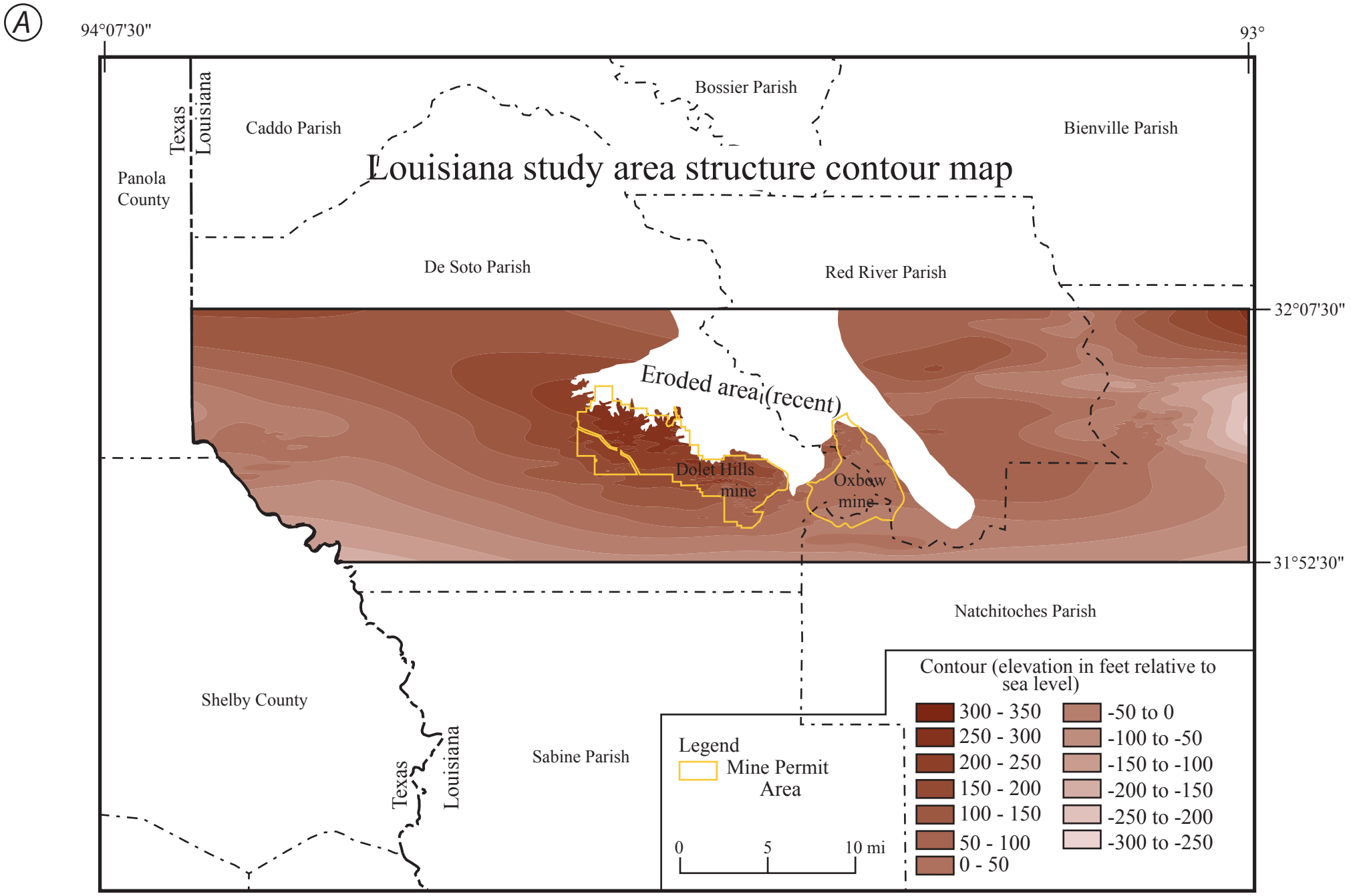

Figure 6. Geologic maps of the Chemard Lake (Naborton No. 2) coal zone. *A*, Structure contour map of the stratigraphic top of the Chemard Lake coal zone.

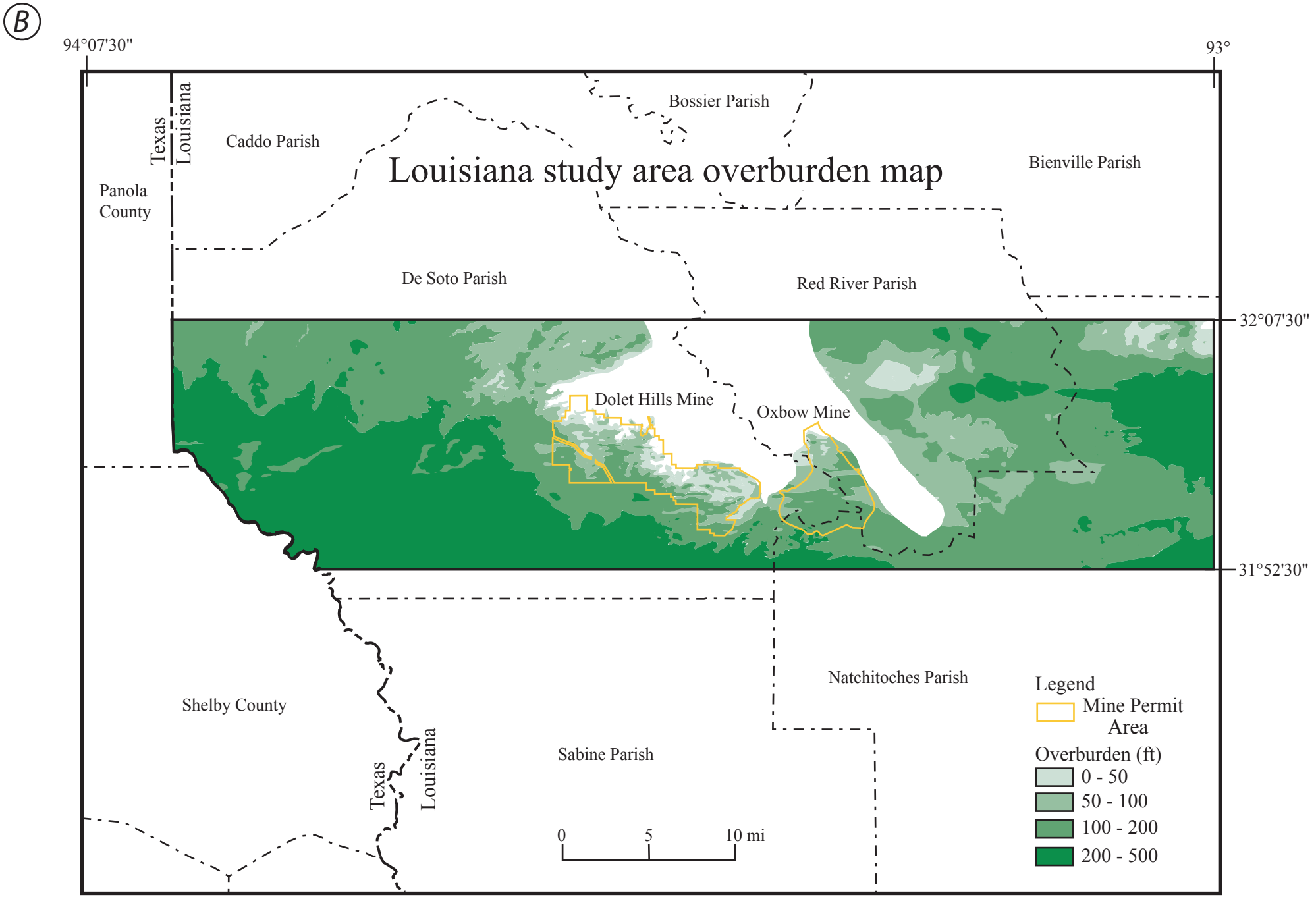

Figure 6. (Continued) Geologic maps of the Chemard Lake (Naborton No. 2) coal zone. *B*, Map of overburden thickness for the Chemard Lake coal zone.

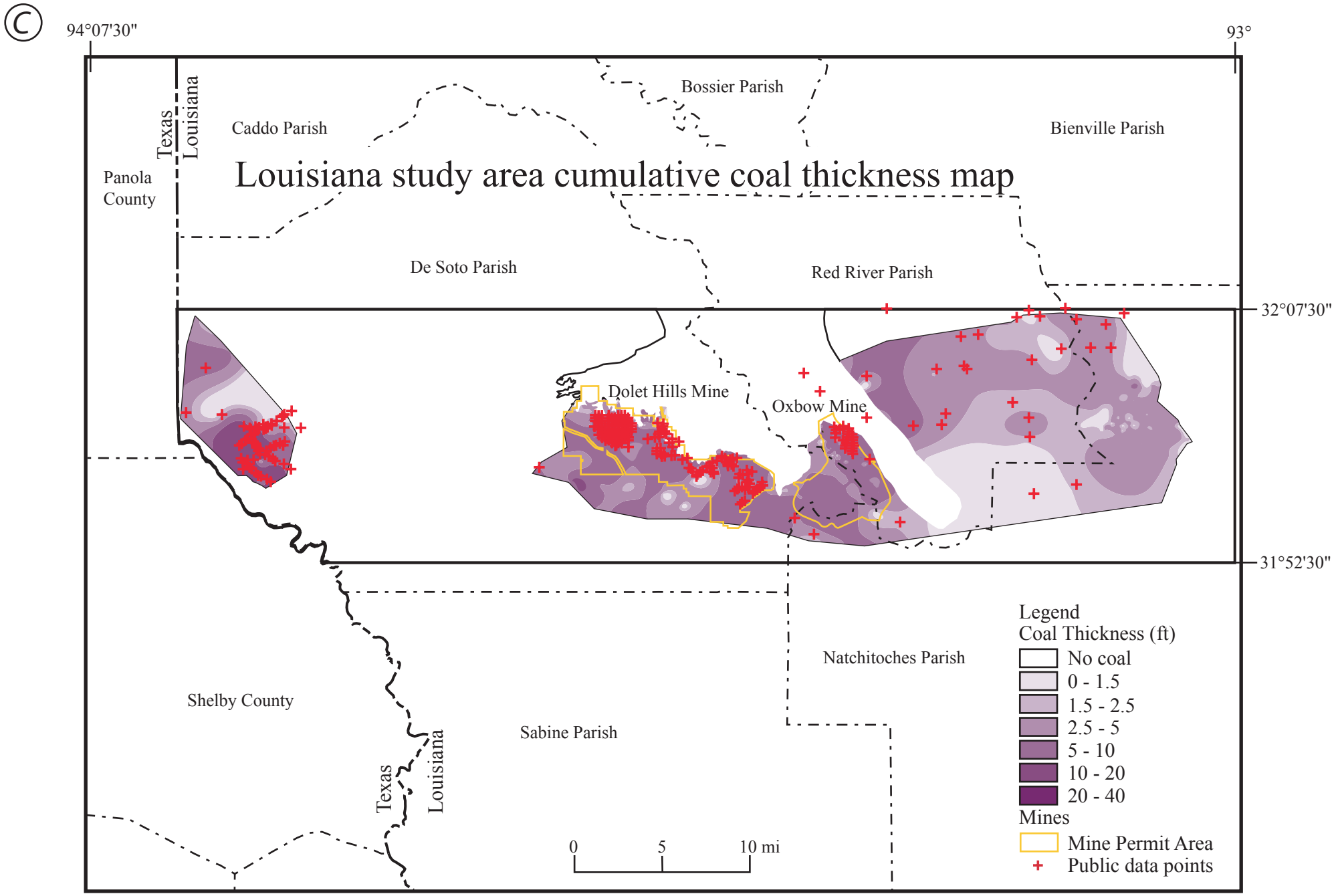

Figure 6. (Continued) Geologic maps of the Chemard Lake (Naborton No. 2) coal zone. *C*, Map of the cumulative coal bed thickness of the Chemard Lake coal zone.

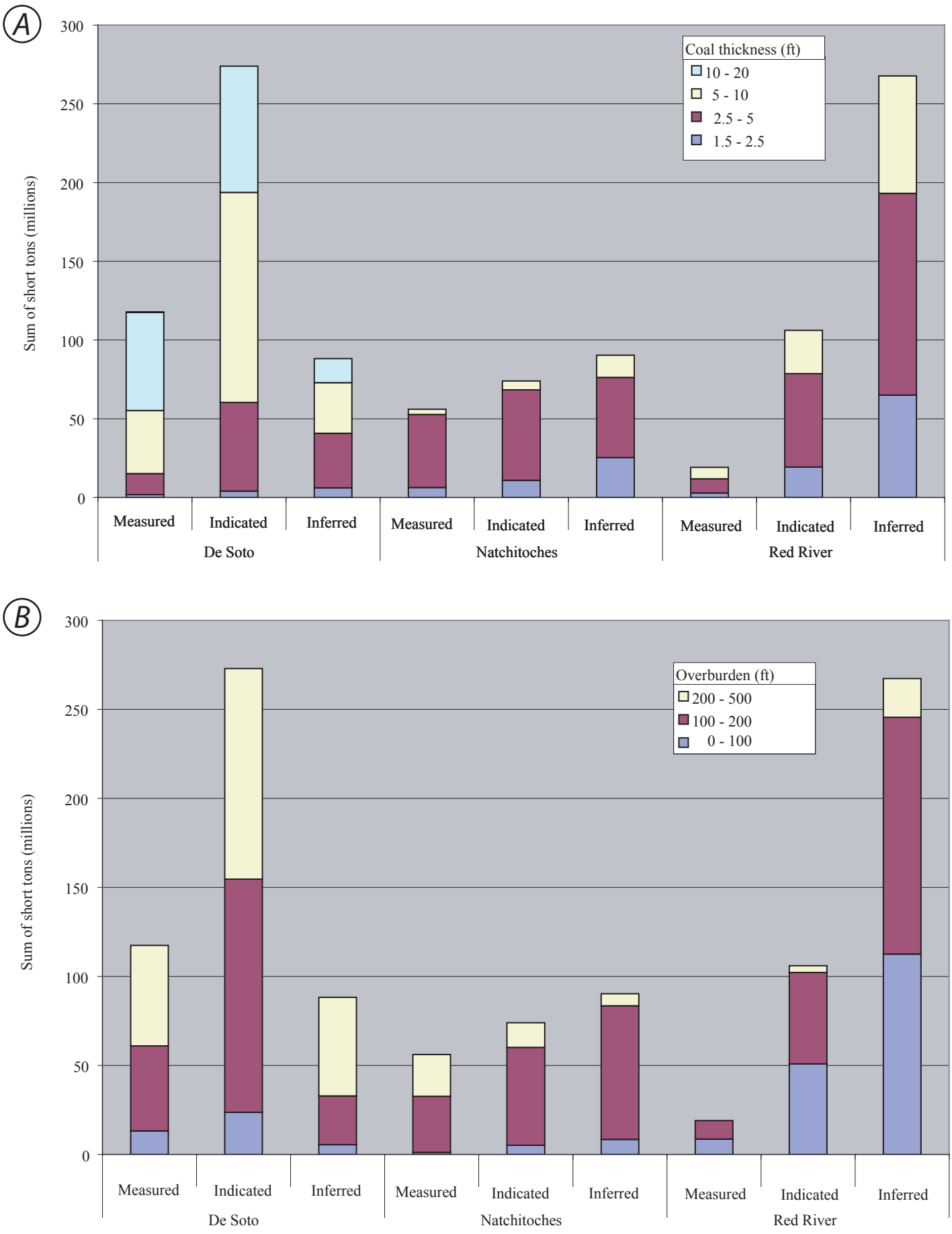

Figure 7. Coal resources and reliability categories (following Wood and others, 1983) for the Louisiana Sabine assessment block by A, Parish, reliability categories and coal zone thickness. B, Parish, reliability categories and overburden categories.

assessment area (fig. 7; Appendix 2). More than half of the Chemard Lake (Naborton No. 2) coal zone in the resource area is covered by 100 to 200 ft of overburden (figs. 6b, 7, Appendix 2).

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Table 1. Sources of public data for the northeast Texas study area.

1) Mine permit applications that are on file at the Louisiana Department of Natural Resources, Injection and Mining Division, Surface Mining Section, 625 North Fourth Street, P.O. Box 94275, Baton Rouge Louisiana 70804-9275, Phone 225-342-5515, Fax 225-342-3094, http://www.dnr.state.la.us/CONS/CONSERIN/Surfmine.ssi
   Permit – Dolet Hills Lignite Mine in eastern De Soto Parish
   Permit – Oxbow Lignite Mine in western Red River Parish
   Permit Application – Castor Bayou Mine Permit application in western De Soto Parish
   Note: Mine permit boundaries used in this study were digitized from mine boundaries depicted on maps (1998 and older) contained in the mine permits listed above.
2) Some stratigraphic data are from Roland and others (1976).
3) Abandoned mine locality data for Louisiana are from Meagher and Aycock (1942).
4) Some data were provided by the Louisiana Geological Survey, Louisiana State University, P.O. Box G, University Station, Baton Rouge, Louisiana 70893
6) Some data were provided on a confidential basis by coal mining companies working in northwestern Louisiana.
5) National Coal Resources Data System, USGS, Reston, Virginia

Appendix 1. Locations and intercepts for public data points used in the Louisiana Sabine assessment block. Hole locations are shown on figure 5*A*.

Appendix 1 Public data point locations with cumulative thickness of coal in the Chemard Lake (Naborton No. 2) coal zone, and coal zone top elevations (with reference to seal level). All permit data are on file at the Louisiana Department of Natural Resources, Injection and Mining Division, Surface Mining Section (table 1).

Point ID	Longitude	Latitude	Surface Elevation (ft)	Coal Zone Thickness (ft)	Zone Top Elevation (ft)	Mine Permit Data Source
D-1875	-93.98509	31.97182	222.00	11.00	-20.00	CASTOR BAYOU
D-2007	-93.97551	32.00059	209.00	13.50	13.50	CASTOR BAYOU
G-3005	-93.95520	32.00595	207.52	1.00	-8.48	CASTOR BAYOU
GQ-3009	-93.97826	31.99149	224.69	20.00	16.19	CASTOR BAYOU
LO85D004	-93.47117	31.94850	152.00	7.00	105.00	DOLET HILLS
LO85D009	-93.48361	31.94683	200.00	7.70	122.50	DOLET HILLS
LO85D012	-93.48792	31.94108	225.00	7.50	123.00	DOLET HILLS
LO85D017	-93.49103	31.94361	230.00	7.50	191.00	DOLET HILLS
LO85D019	-93.49392	31.94278	225.00	7.20	156.30	DOLET HILLS
LO85D03N	-93.47044	31.94514	180.00	7.50	123.50	DOLET HILLS
LO85D11N	-93.48489	31.94339	185.00	7.20	139.80	DOLET HILLS
LO85D16D	-93.48603	31.94839	195.00	6.40	153.00	DOLET HILLS
LO85D21N	-93.49550	31.94158	256.00	6.50	90.60	DOLET HILLS
LO85D23N	-93.49814	31.93958	180.00	6.80	134.40	DOLET HILLS
LO85E001	-93.49325	31.95642	175.00	7.50	116.60	DOLET HILLS
LO85E002	-93.49033	31.95547	195.00	2.20	134.50	DOLET HILLS
LO85E003	-93.49428	31.95283	190.00	7.10	156.50	DOLET HILLS
LO86B001	-93.48536	31.95650	180.00	7.80	119.30	DOLET HILLS
LO86B002	-93.48119	31.95878	190.00	7.70	148.90	DOLET HILLS
LO86F05N	-93.49600	31.97233	250.00	8.70	190.00	DOLET HILLS
LO86G05N	-93.52589	31.96350	272.00	2.00	208.00	DOLET HILLS
LPT-26	-93.96070	32.00135	203.54	14.00	16.54	CASTOR BAYOU
LPT-30	-93.96321	32.00532	191.89	5.00	-4.11	CASTOR BAYOU
LPT-41	-93.94381	32.01389	244.51	2.00	-34.99	CASTOR BAYOU
LPT-44	-93.95297	31.98417	252.04	10.00	-0.96	CASTOR BAYOU
LPT-48	-93.95379	31.97150	220.12	9.50	-5.38	CASTOR BAYOU
LPT-52	-93.94364	31.98477	239.68	8.00	8.68	CASTOR BAYOU
LPT-56	-93.95797	31.97374	238.96	6.00	-10.04	CASTOR BAYOU
OB840002	-93.48622	31.96017	195.00	8.80	168.00	DOLET HILLS
OB87D13N	-93.48108	31.93456	140.00	1.00	134.50	DOLET HILLS
OB87D22N	-93.47294	31.94425	185.00	7.25	130.00	DOLET HILLS
OB910040	-93.56911	32.00325	345.00	7.00	270.00	DOLET HILLS
OB910041	-93.56975	32.00058	335.00	7.00	297.00	DOLET HILLS
OB910042	-93.56733	31.99844	345.00	6.80	296.00	DOLET HILLS
OB910043	-93.56564	31.99594	380.00	7.00	230.00	DOLET HILLS
OB910044	-93.57236	31.99817	342.00	7.00	251.00	DOLET HILLS
OB910045	-93.57344	31.99550	325.00	7.00	285.50	DOLET HILLS
OB910046	-93.57242	31.99286	370.00	6.50	280.00	DOLET HILLS
OB910047	-93.56286	31.98722	300.00	6.00	206.00	DOLET HILLS
OB910048	-93.55319	31.98836	305.00	7.00	227.50	DOLET HILLS
OB910049	-93.55978	31.99108	310.00	7.10	260.50	DOLET HILLS
OB910050	-93.55956	31.98306	270.00	7.00	243.50	DOLET HILLS

OB910051	-93.56808	31.97656	300.00	8.00	238.00	DOLET HILLS
OB91039	-93.56856	32.00592	325.00	7.00	233.00	DOLET HILLS
OB94W01	-93.63569	32.01446	318.00	6.00	263.50	DOLET HILLS
OB94W02	-93.63246	32.01408	325.00	5.50	259.50	DOLET HILLS
OB94W03	-93.62924	32.01424	342.00	6.00	260.00	DOLET HILLS
OB94W05	-93.62246	32.01430	340.00	4.00	288.50	DOLET HILLS
OB94W06	-93.61310	32.01411	351.00	8.50	301.00	DOLET HILLS
OB94W07	-93.60988	32.01441	353.00	6.50	264.00	DOLET HILLS
OB94W08	-93.63566	32.01157	317.00	2.50	294.00	DOLET HILLS
OB94W09	-93.63243	32.01160	320.00	7.00	275.00	DOLET HILLS
OB94W12	-93.62275	32.01128	330.00	6.50	262.50	DOLET HILLS
OB94W13	-93.61953	32.01172	352.00	6.00	295.00	DOLET HILLS
OB94W14	-93.61663	32.01174	346.00	5.80	293.50	DOLET HILLS
OB94W15	-93.61308	32.01177	348.00	5.00	305.00	DOLET HILLS
OB94W16	-93.60985	32.01194	354.00	5.00	290.00	DOLET HILLS
OB94W17	-93.63563	32.00882	310.00	6.00	269.00	DOLET HILLS
OB94W18	-93.63304	32.00843	330.00	6.00	282.00	DOLET HILLS
OB94W19	-93.62917	32.00888	331.00	7.00	253.00	DOLET HILLS
OB94W21	-93.62272	32.00880	331.00	7.50	260.50	DOLET HILLS
OB94W22	-93.61949	32.00883	328.00	6.50	264.00	DOLET HILLS
OB94W23	-93.61660	32.00941	340.00	5.50	296.50	DOLET HILLS
OB94W24	-93.61304	32.00889	344.00	6.00	274.50	DOLET HILLS
OB94W25	-93.60982	32.00891	348.00	5.60	268.00	DOLET HILLS
OB94W26	-93.62979	32.00626	330.00	6.90	289.50	DOLET HILLS
OB94W28	-93.62269	32.00605	325.00	5.00	262.00	DOLET HILLS
OB94W29	-93.61946	32.00608	330.00	6.60	274.50	DOLET HILLS
OB94W30	-93.61656	32.00611	330.00	6.50	273.00	DOLET HILLS
OB94W31	-93.61301	32.00614	340.00	7.00	274.00	DOLET HILLS
OB94W32	-93.60978	32.00617	351.00	5.70	266.00	DOLET HILLS
OB94W33	-93.63652	32.00318	290.00	6.50	225.00	DOLET HILLS
OB94W34	-93.63265	32.00321	302.00	6.30	241.00	DOLET HILLS
OB94W35	-93.62927	32.00338	300.00	7.00	236.00	DOLET HILLS
OB94W36	-93.62604	32.00341	320.00	8.00	242.00	DOLET HILLS
OB94W37	-93.62265	32.00344	330.00	7.00	247.00	DOLET HILLS
OB94W38	-93.61620	32.00350	340.00	6.00	261.00	DOLET HILLS
OB94W39	-93.61298	32.00353	338.00	3.00	298.00	DOLET HILLS
OB94W40	-93.60975	32.00342	349.00	7.00	272.00	DOLET HILLS
OB94W41	-93.63294	32.00046	300.00	5.60	267.50	DOLET HILLS
OB94W42	-93.62923	32.00050	306.00	3.00	296.00	DOLET HILLS
OB94W43	-93.62601	32.00066	323.00	6.00	255.00	DOLET HILLS
OB94W44	-93.62262	32.00069	347.00	7.10	267.00	DOLET HILLS
OB94W45	-93.61939	32.00058	347.00	6.00	285.00	DOLET HILLS
OB94W46	-93.61617	32.00061	352.00	6.20	233.00	DOLET HILLS
OB94W47	-93.61278	32.00050	370.00	7.00	268.00	DOLET HILLS
OB94W48	-93.60955	32.00053	352.00	6.00	275.00	DOLET HILLS
OB94W49	-93.62904	31.99775	309.00	7.00	270.50	DOLET HILLS
OB94W50	-93.62581	31.99778	321.00	6.00	265.00	DOLET HILLS
OB94W51	-93.62259	31.99794	334.00	3.80	242.00	DOLET HILLS
OB94W52	-93.61936	31.99811	342.00	4.70	266.00	DOLET HILLS
OB94W53	-93.61646	31.99813	347.00	8.20	264.00	DOLET HILLS

OB94W54	-93.61323	31.99789	352.00	7.40	253.00	DOLET HILLS
OB94W55	-93.60968	31.99792	353.00	6.20	277.00	DOLET HILLS
OB94W56	-93.63223	31.99497	295.00	5.30	247.00	DOLET HILLS
OB94W57	-93.62900	31.99500	298.00	6.90	256.00	DOLET HILLS
OB94W58	-93.62578	31.99503	321.00	6.50	253.50	DOLET HILLS
OB94W59	-93.62239	31.99533	329.00	4.00	242.00	DOLET HILLS
OB94W60	-93.61933	31.99536	336.00	4.00	275.00	DOLET HILLS
OB94W61	-93.61642	31.99511	330.50	6.50	275.50	DOLET HILLS
OB94W62	-93.61272	31.99542	341.50	8.90	283.50	DOLET HILLS
OB94W63	-93.60965	31.99544	348.00	6.40	288.00	DOLET HILLS
OB94W64	-93.60642	31.99520	344.00	6.60	244.00	DOLET HILLS
OB94W65	-93.62897	31.99225	300.00	6.90	257.50	DOLET HILLS
OB94W66	-93.62574	31.99228	312.00	6.50	248.50	DOLET HILLS
OB94W67	-93.62252	31.99245	321.00	7.00	264.00	DOLET HILLS
OB94W68	-93.61930	31.99247	330.00	6.00	235.00	DOLET HILLS
OB94W69	-93.61639	31.99264	328.00	6.50	248.00	DOLET HILLS
OB94W70	-93.61316	31.99212	337.00	6.00	275.00	DOLET HILLS
OB94W71	-93.60962	31.99270	348.00	6.00	253.00	DOLET HILLS
OB94W72	-93.60623	31.99259	349.00	6.00	249.00	DOLET HILLS
OB94W73	-93.60301	31.99262	341.00	7.00	247.00	DOLET HILLS
OB94W74	-93.62571	31.98953	305.00	9.60	269.60	DOLET HILLS
OB94W75	-93.62249	31.98983	311.00	7.70	251.00	DOLET HILLS
OB94W76	-93.61926	31.98945	323.00	6.00	253.00	DOLET HILLS
OB94W77	-93.61281	31.98937	333.50	7.00	227.50	DOLET HILLS
OB94W78	-93.60959	31.98995	341.50	6.20	261.50	DOLET HILLS
OB94W79	-93.60958	31.98967	348.00	6.00	288.00	DOLET HILLS
OB94W81	-93.61923	31.98711	329.50	6.20	249.50	DOLET HILLS
OB94W83	-93.61310	31.98717	331.00	6.50	248.50	DOLET HILLS
OB94W84	-93.60955	31.98692	344.00	6.00	251.00	DOLET HILLS
OB94W85	-93.61597	31.98412	333.00	7.00	243.00	DOLET HILLS
OB95W01	-93.60666	32.01444	343.00	11.00	281.00	DOLET HILLS
OB95W05	-93.60656	32.00633	347.00	5.00	259.00	DOLET HILLS
OB95W10	-93.60652	32.00344	345.00	7.00	284.00	DOLET HILLS
OB95W19	-93.60310	32.00073	337.00	8.00	269.00	DOLET HILLS
OB95W26	-93.60339	31.99797	335.00	4.20	219.00	DOLET HILLS
OB95W27	-93.60001	31.99814	344.00	7.30	265.00	DOLET HILLS
OB95W45	-93.57688	31.99270	350.00	6.90	281.90	DOLET HILLS
OB95W80	-93.60313	31.98959	347.00	4.00	247.00	DOLET HILLS
OR95W09	-93.57430	32.00675	320.00	6.30	294.00	DOLET HILLS
OVB-C	-93.39456	32.00054	170.00	7.10	64.50	OXBOW
Q-3038	-93.93600	31.96118	191.29	10.00	-37.71	CASTOR BAYOU
Q-3426	-93.94294	31.96637	201.06	11.00	-26.94	CASTOR BAYOU
Q-3428	-93.98351	31.96792	236.60	13.50	14.10	CASTOR BAYOU
Q-3430	-93.96648	31.97607	202.15	12.50	4.15	CASTOR BAYOU
Q-3516	-93.96832	31.95508	198.52	20.50	1.52	CASTOR BAYOU
Q-3517	-93.97467	31.96130	193.34	14.00	4.84	CASTOR BAYOU
R-3050	-93.94480	32.01279	247.83	2.50	-20.17	CASTOR BAYOU
R-3055	-93.95885	32.00325	191.60	7.00	-3.40	CASTOR BAYOU
R-3075	-93.92618	32.00191	253.47	2.00	-3.53	CASTOR BAYOU
R-3080	-94.03945	32.01693	285.04	4.00	-62.00	CASTOR BAYOU

R-3089	-93.95012	32.00879	240.37	3.00	-22.63	CASTOR BAYOU
R-3147	-93.93528	32.01863	288.00	1.00	-20.00	CASTOR BAYOU
R-3149	-93.94246	32.01509	265.46	1.00	-6.54	CASTOR BAYOU
R-3202	-93.97659	32.00180	215.39	14.00	13.89	CASTOR BAYOU
R-3203	-93.97102	32.00288	198.67	13.50	9.67	CASTOR BAYOU
R-3204	-93.97509	31.99501	223.02	13.00	23.51	CASTOR BAYOU
R-3226	-93.98241	32.00346	253.51	19.00	1.52	CASTOR BAYOU
R-3235	-93.97264	31.99542	208.98	17.50	9.48	CASTOR BAYOU
R-3236	-93.96097	32.00277	212.51	18.50	44.51	CASTOR BAYOU
R-3240	-93.96005	32.00248	206.14	11.50	11.64	CASTOR BAYOU
R-3251	-93.94261	32.00220	252.98	5.50	-2.02	CASTOR BAYOU
R-3268	-93.97150	31.99699	211.00	19.00	25.00	CASTOR BAYOU
R-3279	-93.95499	32.00430	195.39	2.50	-13.61	CASTOR BAYOU
R-3291	-93.96302	32.00041	205.91	11.00	0.91	CASTOR BAYOU
R-3292	-93.95919	32.00241	206.59	6.50	32.10	CASTOR BAYOU
R-3300	-93.97288	31.98732	187.10	16.50	13.09	CASTOR BAYOU
R-3303	-93.94205	31.98843	254.99	8.50	30.14	CASTOR BAYOU
R-3322	-93.98441	31.98630	238.14	16.50	-1.01	CASTOR BAYOU
R-3335	-93.95061	31.98474	252.32	10.50	21.32	CASTOR BAYOU
R-3336	-93.95612	31.98242	265.14	9.00	4.14	CASTOR BAYOU
R-3339	-93.98093	31.98955	242.17	15.00	22.17	CASTOR BAYOU
R-3345	-93.96003	31.97916	277.88	17.00	21.88	CASTOR BAYOU
R-3346	-93.98692	31.98460	243.76	13.50	11.76	CASTOR BAYOU
R-3356	-93.96762	31.98157	186.45	12.50	19.95	CASTOR BAYOU
R-3357	-93.96814	31.97913	189.36	11.50	6.86	CASTOR BAYOU
R-3365	-93.94698	31.98675	242.76	9.50	-2.24	CASTOR BAYOU
R-3402	-93.96142	31.97540	254.60	3.50	17.10	CASTOR BAYOU
R-3405	-93.97889	31.97013	237.27	11.50	17.27	CASTOR BAYOU
R-3410	-93.97842	31.96616	200.59	14.50	10.59	CASTOR BAYOU
R-3413	-93.97280	31.97049	192.60	19.00	13.10	CASTOR BAYOU
R-3422	-93.97677	31.96305	199.50	13.00	2.00	CASTOR BAYOU
R-3440	-93.95148	31.96917	193.61	10.50	13.11	CASTOR BAYOU
R-3441	-93.97952	31.96589	205.81	9.50	-9.19	CASTOR BAYOU
R-3501	-93.95957	31.95130	183.00	9.00	-31.00	CASTOR BAYOU
R-3503	-93.95596	31.94879	191.02	13.00	-67.48	CASTOR BAYOU
R-3508	-93.97060	31.95773	192.30	19.00	-4.70	CASTOR BAYOU
R-3509	-93.96743	32.00247	212.28	13.00	-18.72	CASTOR BAYOU
R-3521	-93.98315	31.96113	210.87	12.00	7.87	CASTOR BAYOU
R-3534	-93.96552	31.95422	189.75	8.50	-4.25	CASTOR BAYOU
RR-3366C	-93.39999	32.00277	224.00	7.40	32.10	OXBOW
RR-3367C	-93.39119	32.00363	180.00	4.10	100.10	OXBOW
RR-3368C	-93.39806	31.99977	158.00	7.65	85.85	OXBOW
RR-3369C	-93.39860	31.99665	162.00	8.85	68.10	OXBOW
RR-3371C	-93.39895	31.99231	166.00	9.10	72.90	OXBOW
RR36610B	-93.39115	32.00116	126.97	6.10	73.67	OXBOW
RR36620B	-93.38578	32.00119	129.11	7.60	68.21	OXBOW
RR36630B	-93.38553	31.99830	129.28	5.80	65.68	OXBOW
RR36640B	-93.38655	31.99548	128.63	7.05	84.38	OXBOW
RR36650B	-93.38242	31.99542	129.09	6.70	51.19	OXBOW
RR36660B	-93.38663	31.99263	128.60	6.30	76.60	OXBOW

RR36670B	-93.38146	31.99259	128.23	7.20	48.93	OXBOW
RR36680B	-93.38748	31.98984	127.50	6.50	79.50	OXBOW
RR36690B	-93.38192	31.98980	128.13	7.50	39.13	OXBOW
RR36700B	-93.38819	31.98711	127.60	7.00	59.60	OXBOW
RR36710B	-93.38174	31.98695	128.19	6.10	62.29	OXBOW
RR36770B	-93.38891	31.98443	126.83	7.30	68.43	OXBOW
RR36780B	-93.38068	31.98449	127.46	6.50	60.41	OXBOW
RR36790B	-93.38918	31.98162	126.07	6.25	44.32	OXBOW
RR36800B	-93.38230	31.98159	127.76	7.65	60.01	OXBOW
RR36880B	-93.38754	31.97881	125.60	7.70	34.60	OXBOW
RR36890B	-93.38225	31.97885	126.60	7.10	32.40	OXBOW
RR36900B	-93.38173	31.97620	122.70	6.75	19.80	OXBOW
RR36910B	-93.39147	31.98959	127.00	6.75	83.50	OXBOW
W10-3298	-93.96903	32.00100	211.33	12.00	22.83	CASTOR BAYOU
W12-3367	-93.97274	31.98845	206.11	11.50	7.61	CASTOR BAYOU
W14-3367	-93.97064	31.98644	190.35	17.50	42.35	CASTOR BAYOU
W16-3367	-93.97022	31.98451	186.58	18.00	35.58	CASTOR BAYOU
W18-3367	-93.96991	31.98259	184.54	13.00	3.54	CASTOR BAYOU

Appendix 2. Coal resources for the Louisiana Sabine assessment block by parish, reliability, overburden, and coal zone thickness categories.

Appendix 2. Louisiana Sabine coal resources for the Chemard Lake (Naborton No. 2) coal zone in millions of short tons. The coal resources located within the mine permit areas are not included in this table. Numbers are rounded to two significant figures.

	Overburden (ft)	0 '- 100'			**0 - 100 Total**	100' - 200'					**100 - 200 Total**	200' - 500'					**200' - 500' Total**	**Grand total**
	Total coal thickness (ft)	1.5' - 2.5'	2.5' - 5'	5' - 10'		1.5' - 2.5'	2.5' - 5'	5' - 10'	10' - 20'	20' - 40'		1.5' - 2.5'	2.5' - 5'	5' - 10'	10' - 20'	20' - 40'		
Parish name	Reliability																	
De Soto	Measured	0.40	3.0	10	13	0.61	6.5	16	25	0.0039	48	0.76	3.9	14	37	0.10	56	120
	Indicated	0.38	5.2	18	24	2.1	37	77	15		130	1.6	13	39	65		120	270
	Inferred		5.2	0.33	5.5	0.57	11	16	0.11		27	5.5	19	16	15		55	88
De Soto total		0.79	13	28	42	3.3	54	100	40	0.0039	210	7.9	36	69	120	0.10	230	480
Natchitoches	Measured	0.21	0.63	0.33	1.2	4.4	25	2.5			31	1.7	21	0.59			23	56
	Indicated	0.57	4.6	0.018	5.2	8.8	41	5.1			55	1.4	12	0.60			14	74
	Inferred	2.2	6.3		8.5	23	42	10			75	0.16	2.6	4.1			6.8	90
Natchitoches total		3.0	12	0.35	15	36	100	17			160	3.3	36	5.3			44	220
Red River	Measured	0.77	3.4	4.4	8.6	2.0	5.4	2.8	0.053		10	0.088	0.011				0.10	19
	Indicated	2.8	27	21	51	15	30	6.3			51	1.2	2.6				3.8	110
	Inferred	18	47	48	110	47	59	27			130	0.71	21				22	270
Red River total		21	78	73	170	64	94	36	0.053		190	2.0	24				26	390
Grand Total		25	100	100	230	100	260	160	40	0.0039	560	13	95	74	120	0.10	300	1,100

Appendix 3 — ArcView shape files for the Louisiana Sabine assessment block.

The digital shape files used for the coal resource assessment of the Louisiana Sabine assessment block are listed below and are available for download from the data directory. Metadata for all digital files are also available.

Shape Files
lapermts.shp – outline of Louisiana coal mine permits
lasub_dp.shp – public data points used in this study (listed in Appendix 1)
lasub_ob.shp – Naborton No. 2 overburden
lasub_st.shp – Naborton No. 2 structure contour map
nb2iso_clpdd.shp – Naborton No. 2 isopach contour map

Metadata
lapermts.met – outline of Louisiana coal mine permits
lasub_dp.met – public data points used in this study (listed in Appendix 1)
lasub_ob.met – Naborton No. 2 overburden
lasub_st.met – Naborton No. 2 structure contour map
nb2iso_clpdd.met – Naborton No. 2 isopach contour map