Breland, F.C., Jr., 2004, Coalbed methane potential in Louisiana, *in* Warwick, P.D., ed., Selected presentations on coal-bed gas in the eastern United States, U.S. Geological Survey Open-File Report 2004-1273, p. 27-35.

Coalbed Methane Potential in Louisiana[1]

By F. Clayton Breland, Jr.[2]

Introduction and discussion

Recent reports indicate that while gas resource numbers may be increasing, domestic production has not kept pace with domestic demand (Duval and Chabrelle, 2001). Alternative sources of gas including unconventional accumulations such as coalbed methane (CBM) must be explored and developed domestically to offset increasing demand for natural gas. Most recent estimates of CBM resources of 1,777 trillion cubic feet (Tcf) Gas-In-Place (GIP) compared to 1,431 Tcf of U.S. conventional natural gas are indeed impressive (Scott, 2001). Presently, CBM supplies more than 7% of total domestic natural gas production and is projected to increase as a percentage of domestic production as more producing wells come on line in CBM basins nationally (Scott, 2001).

CBM production has been established in a number of basins in the U.S., notably from Paleozoic coals in the east and from younger, thicker coals in the west. However, very limited drilling activity has been conducted in the Gulf Coast Tertiary basin to define the CBM resource specifically. The age, thickness, and quality of the Gulf Coast coals have generally been considered a negative contributing factor in the potential development of the resource. With the success of CBM in the Tertiary-aged coals of the Powder River basin, a closer look at the CBM potential of the Gulf Coast coals is warranted. By way of comparison, according to the Gas Technology Institute (2001), the Powder River basin contains 1,300 billion short tons (bst) estimated in-place coal with 39 Tcf estimated coalbed GIP and 24 Tcf recoverable gas, and the Gulf Coast Coal Region has 400 bst estimated in-place coal with 8 Tcf estimated coalbed gas-in-place.

Initial evaluation of the coal resource in Louisiana was conducted by the Louisiana Geological Survey (LGS) (Meager and Aycock, 1942; Roland and others,1976) and focused on the distribution of surface and near-surface coals. Coals are mined at the surface in central northwestern Louisiana, in and around the Dolet Hills vicinity in De Soto Parish where the Wilcox Group (Paleocene-Eocene) crops out. The coals are generally confined to the lower Tertiary Wilcox Group and to a lesser extent to the overlying Eocene Claiborne and Jackson Groups. The coals appear to be widely distributed and some deposits are as thick as 10 ft. The coals are classified as lignites based on an average calorific value of 7,480 Btu per pound. Sulfur content is low, averaging 0.91 weight percent as received (ar) (Williamson, 1986).

Coates (1979) and Coates and others (1980) conducted research on the distribution and depositional environment of Wilcox lignites in the west-central Louisiana subsurface using well logs. These studies indicated that in the study area, the Lower Wilcox is a progradational delta complex to the east and a marginal delta plain to the west. They also noted that the Lower Wilcox is the major lignite-bearing interval containing as many as 35 coal seams (fig. 2). In an adjacent area with abundant subsurface data to the east, LGS has recognized the presence of numerous coal beds in the Lower Wilcox, with total coal thickness of a little more than 100 ft (fig. 3).

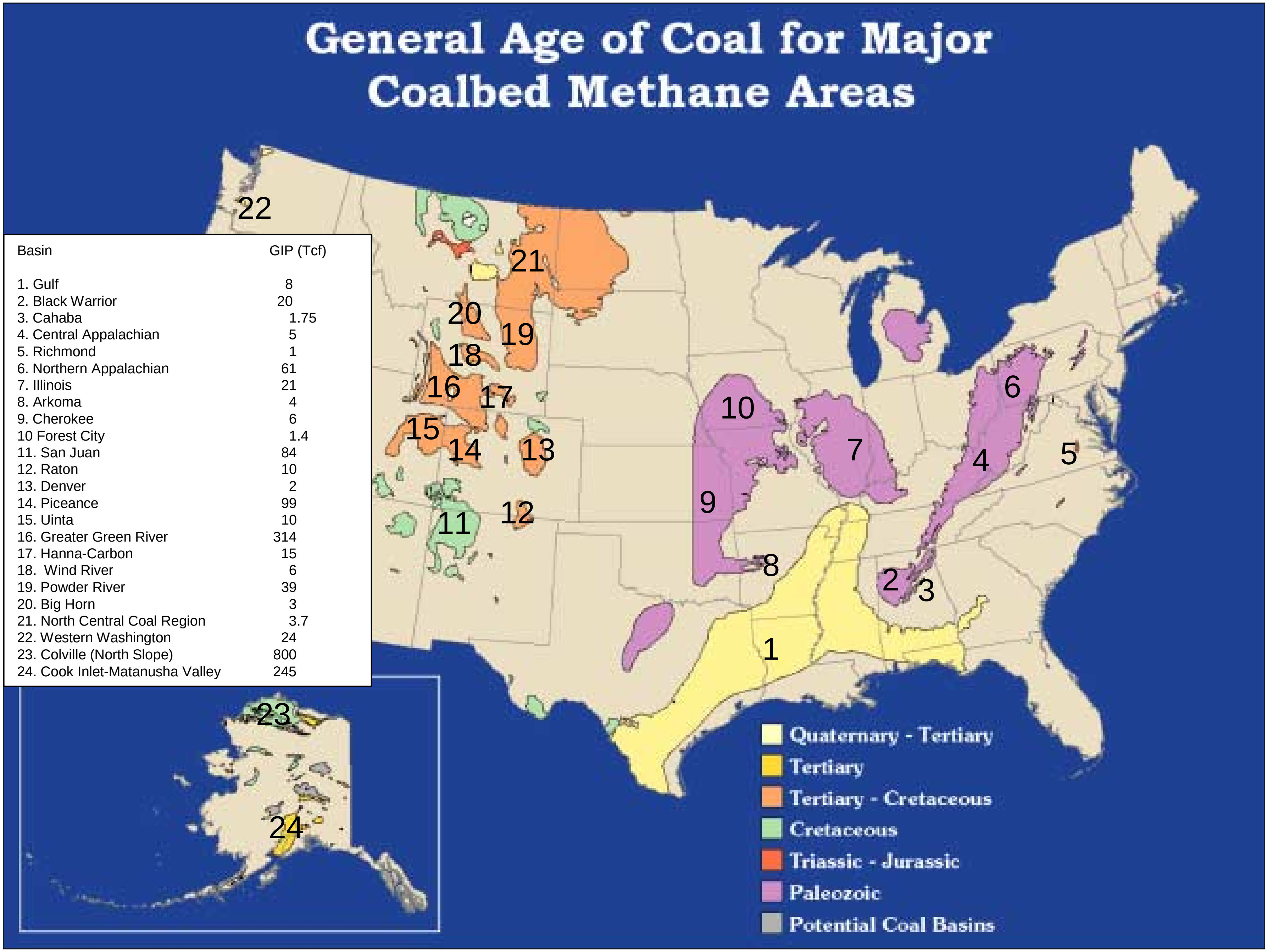
Warwick and others (2000) drilled two CBM test wells in Panola County, Texas, near Dolet Hills and reported calorific values above 8,300 Btu/lb, the boundary between lignite and subbituminous coal from shallow samples collected from 350 ft to 370 ft. Sulfur content averaged 0.52 percent (ar). Desorption analysis of the

[1] Modified from unpublished short course notes from Short Course #4, Coalbed methane potential in the U.S. and Mexican Gulf Coast, Gulf Coast Association of Geological Societies/Gulf Coast Section SEPM – 52nd Annual Convention, Austin, TX, October 30, 2002.
[2] Louisiana Geological Survey, Baton Rouge, LA

samples yielded an average gas content of 11 scf/ton dry-ash free (daf). Published adsorption values (Pratt and others, 1999) from the Powder River basin have similar adsorption values as those obtained from samples from the Texas wells. Isotope work on the Texas gas samples indicated a transitional biogenic/thermogenic mixed origin for the coal gases. Echols (1995) reported that analysis of gas samples from Paleocene-Eocene Wilcox conventional gas reservoirs in Winn Parish, Louisiana, believed to be sourced by CBM, were 99.94 percent methane and biogenic in origin.

Drilling in central North Louisiana in the prolific conventional Paleocene-Eocene Wilcox trend established the presence of numerous coal beds (fig. 4). Investigations by LGS initially defined a Central Louisiana Coalbed Methane basin (CELCOM), from detailed study of Caldwell and LaSalle, Parishes, Louisiana (Echols, 2000). There is every indication, based on previous work, (such as Coates and others, 1980; Rogers, 1983), that CELCOM extends to the southwest and northeast portions of North Louisiana (fig. 2). In fact, the name CELCOM was used for reference purposes only and is actually only a small portion of the entirety of the Gulf Coast Tertiary Coalbed Methane Basin which covers parts of seven southeastern states.

The first CBM production in Louisiana (and the Gulf Coast Tertiary CBM basin) was established in the Russell coal bed in April 1989 in Section 21, T14N, R4E, Caldwell Parish with the Torch Operating Co. #3 Greer well (figs. 2 and 5). The Torch #3 Greer came in flowing at 50 thousand cubic feet of gas per day (Mcfg/d) and 65 barrels of water per day (bblw/d) but was plugged and abandoned in 1989. More recently and in the same coal, the Woods Oil and Gas Co. IPCO #1 (completed 3/9/01) in Section 5, T11N, R3E, produced 15 Mcfg/d and almost no water (figs. 2 and 6). In an effort to stimulate gas flow, the IPCO #1 was water fraced approximately five months after completion. The procedure had the opposite effect of reducing gas flow and the well was later plugged and abandoned. In the area of detailed study in Caldwell and LaSalle Parishes, LGS has determined that the Russell coal is generally between 12 and 15 ft thick and calculated (using 13.5 ft as average thickness, coal specific gravity of 1.30, and 115 standard cubic ft of gas per ton of coal) an estimate of 63.3 billion cubic ft of coalbed methane gas GIP for the Russell coal in T11N-R3E. Based on other coalbed studies in east Texas (Griffiths and Pilcher, 2000), this GIP may be relatively low. More knowledge gained from tests and production from coalbed methane wells in the North-Central Louisiana should, however, provide more reliable estimates.



Basin	GIP (Tcf)
1. Gulf	8
2. Black Warrior	20
3. Cahaba	1.75
4. Central Appalachian	5
5. Richmond	1
6. Northern Appalachian	61
7. Illinois	21
8. Arkoma	4
9. Cherokee	6
10 Forest City	1.4
11. San Juan	84
12. Raton	10
13. Denver	2
14. Piceance	99
15. Uinta	10
16. Greater Green River	314
17. Hanna-Carbon	15
18. Wind River	6
19. Powder River	39
20. Big Horn	3
21. North Central Coal Region	3.7
22. Western Washington	24
23. Colville (North Slope)	800
24. Cook Inlet-Matanusha Valley	245

Figure 1. Coal map of the United States with Gas-In-Place (GIP) estimates in trillions of cubic feet (Tcf). Base map from USGS unpublished data; GIP estimates from Gas Technology Institute (2001).

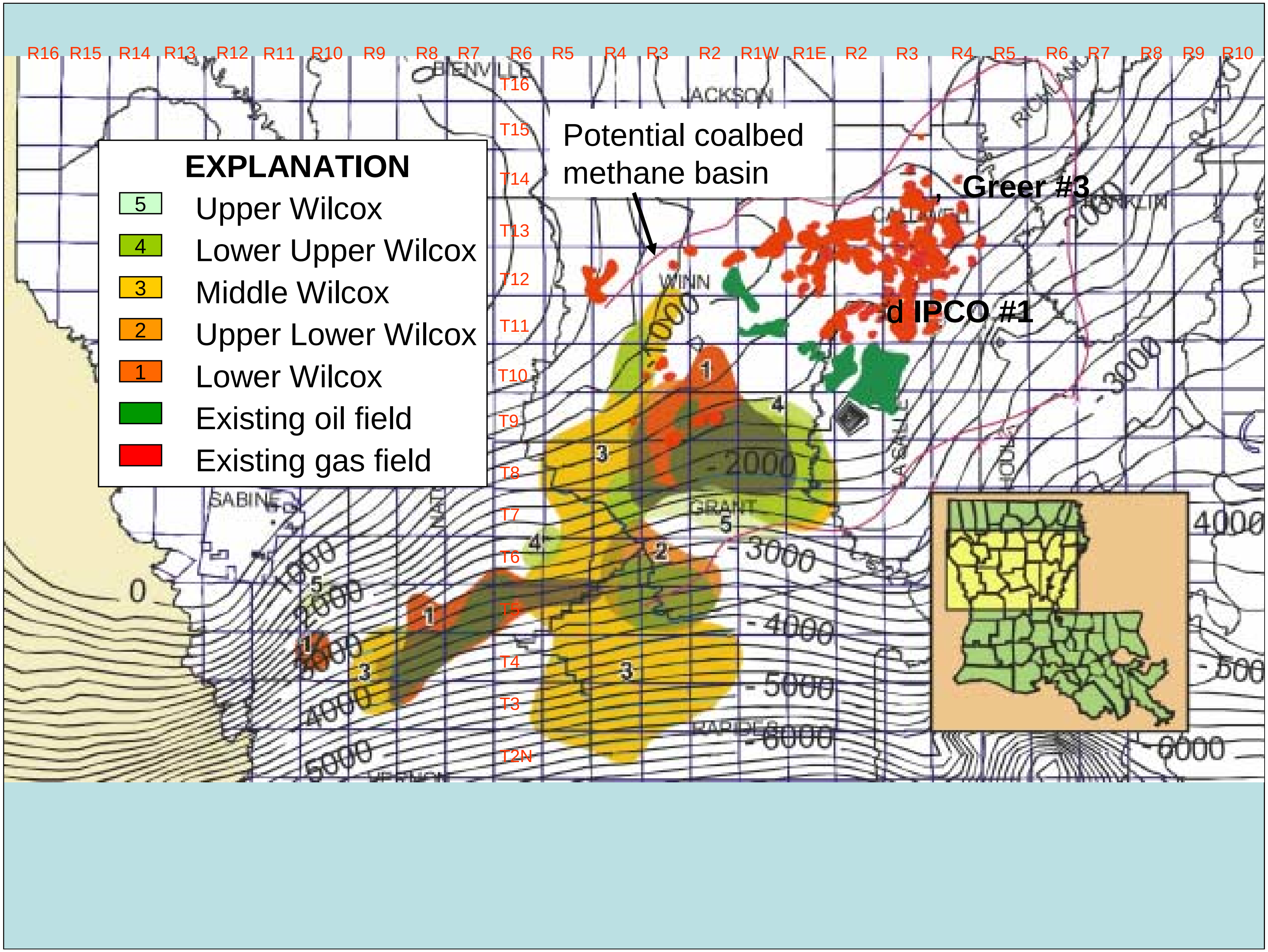


Figure 2. Structure map showing top (elevation below sea level; contour interval = 200 ft) of the Wilcox Group and location of existing oil and gas fields. The potential outline (red line) of a coalbed methane basin is indicated (from Echols, 2000). The distributions of Wilcox coal-bearing facies (1-5, modified from Coates and others, 1980) in North-Central Louisiana are also shown. The locations of two wells that have produced coal gas are indicated. Blue grid lines indicate Township and Range (red labels).

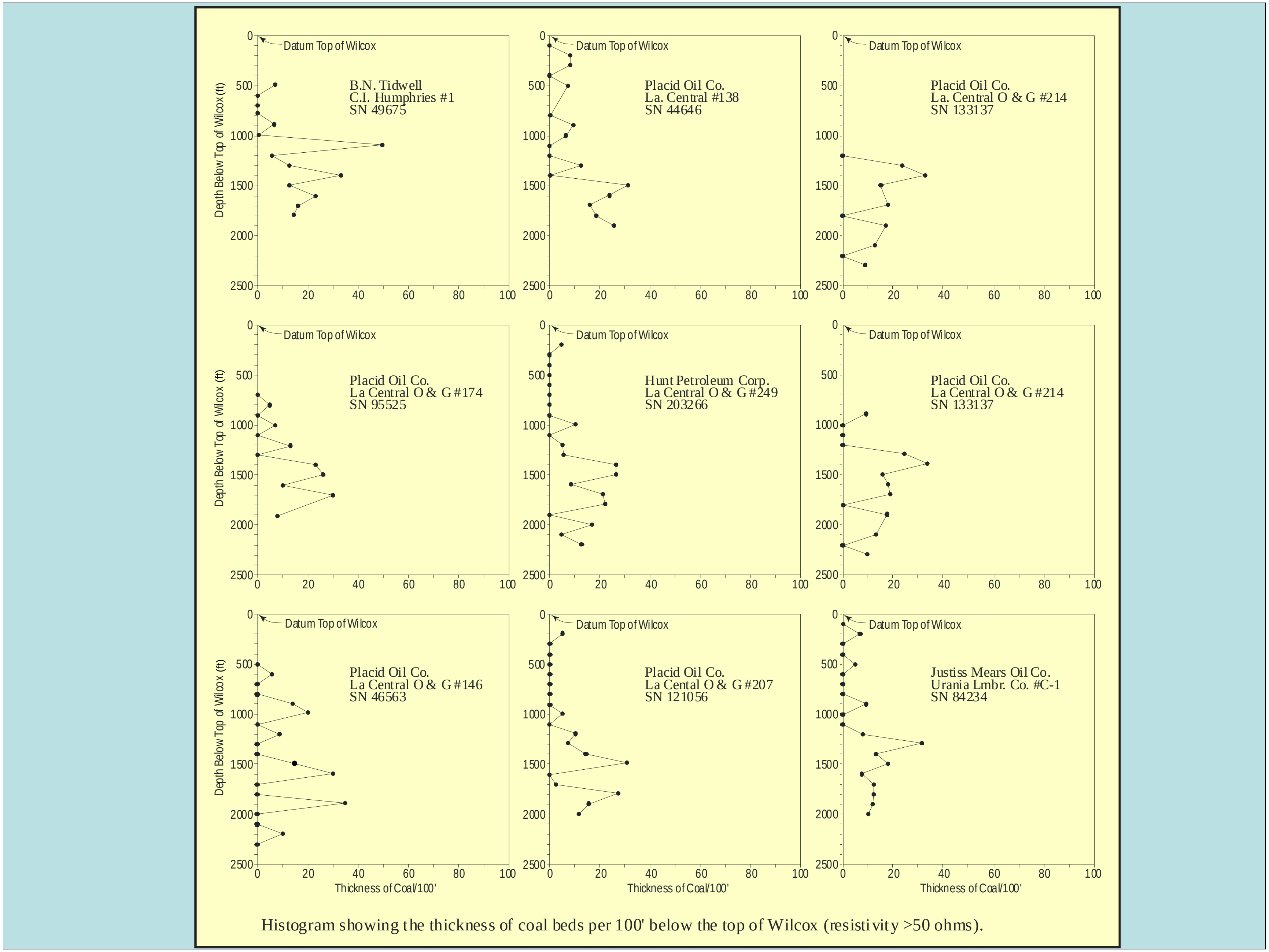


Figure 3. Histograms showing cumulative thickness of coal beds in each 100 ft interval below the top of the Wilcox Group (resistivity > 50 ohms). All wells are in LaSalle Parish, Township 10 N, Range 3 E (see fig. 2). SN = Louisiana well serial number.

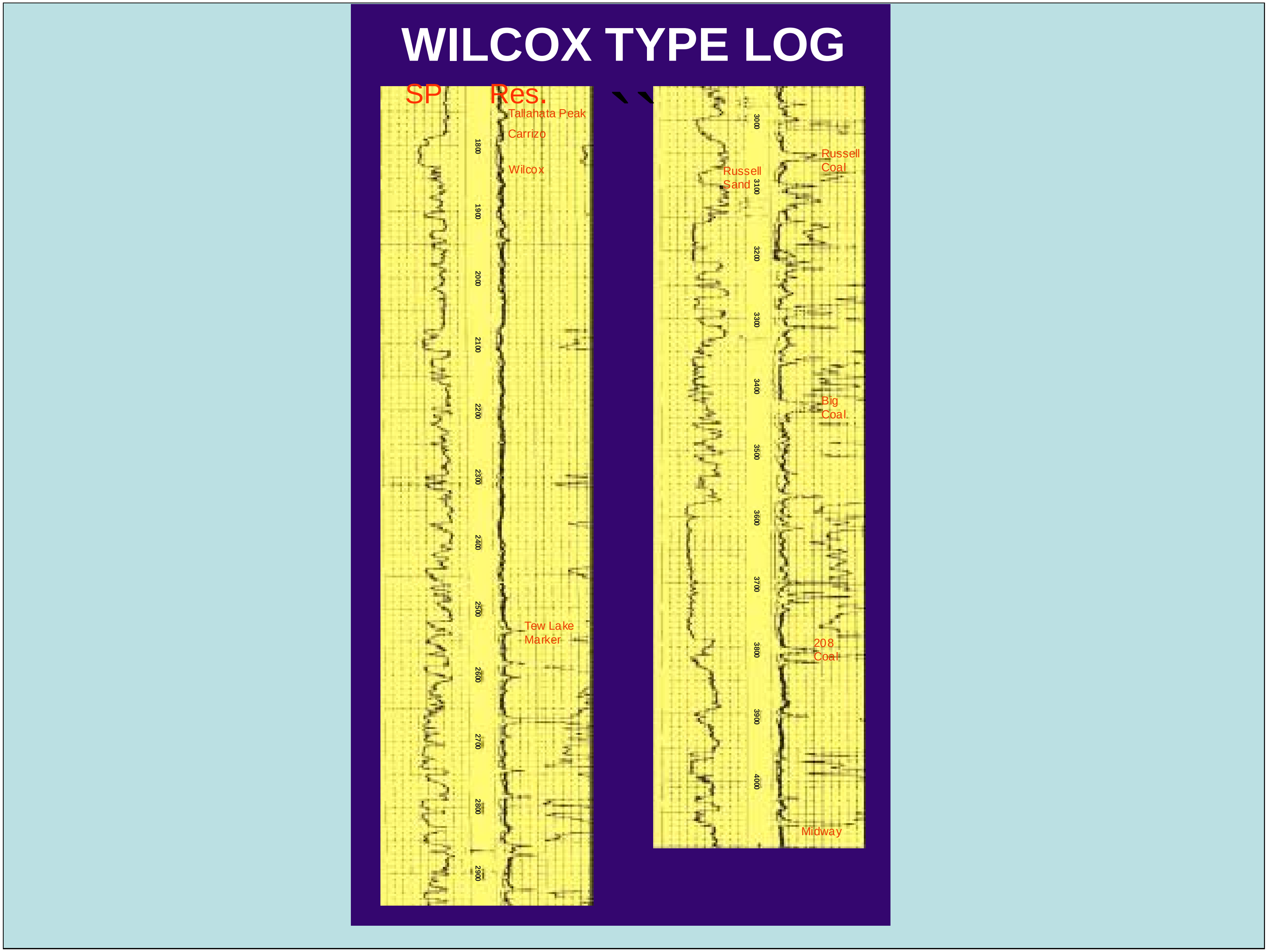


Figure 4. Type well logs (spontaneous potential, SP, and resistivity, Res.) for the coal-bearing Wilcox Group in Caldwell and LaSalle parishes in north Louisiana. Type log selected for the area is the Placid Oil Co., #214 Louisiana O&G Co., sec 15, T10N, R3E, LaSalle Parish (Olla Field), modified from Echols (2001).

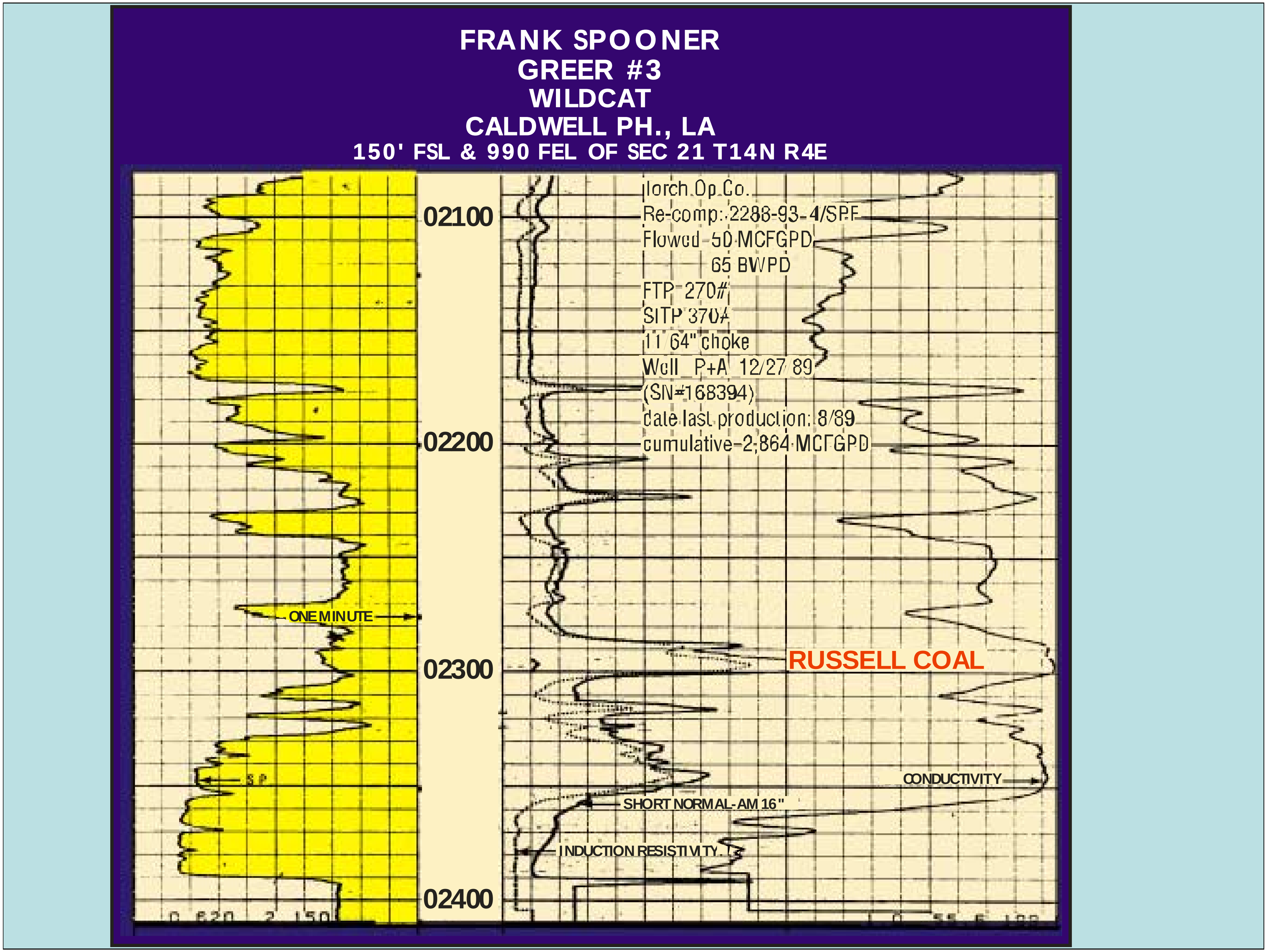


Figure 5. Portion of the electric log showing the Russell coal zone in the Greer # 3 well.

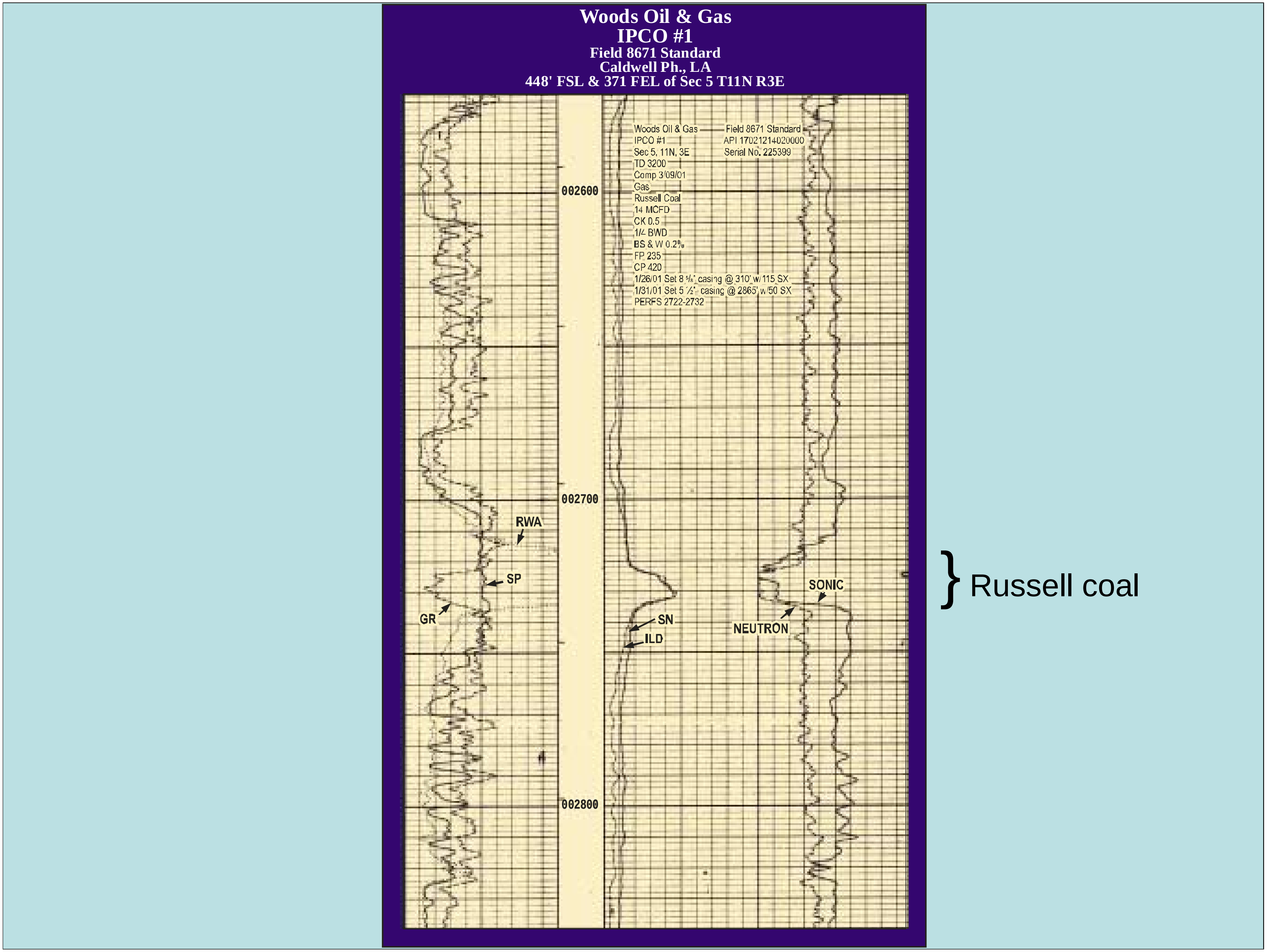


Figure 6. Portion of the electric log showing the Russell coal zone in the IPCO #1 well. GR = gamma ray; SP = spontaneous potential; RWA = apparent formation water resistivity; SN = short normal log; ILD = deep induction log

Literature Cited

Coates, E.J. , 1979, The Occurrence of Wilcox Lignite in West-Central Louisiana: Baton Rouge, Louisiana State University, M.S. thesis, 249 p.

Coates, E.J., Groat, C.G., Hart, G.F., 1980, Subsurface Wilcox Lignite in West-Central Louisiana, Transactions Gulf Coast Association of Geological Societies, v. 30, p. 309-332.

Duval, B. and Chabrelle, M..F., 2001, Strategic Trends and Challenges in Gas Exploration, 2001 American Association of Petroleum Geologists Annual Convention, June 3-6, 2001, Denver, Colorado, Official Program, v. 10, p. A54.

Echols, J.B., 1995, Coalbed Methane--A Production Energy Source in the Paleocene-Eocene Wilcox of Central Louisiana and Southwest Mississippi, Basin Research Institute Bulletin, v. 5, p. 3-6.

Echols, J.B., 2000, Coalbed Methane--Louisiana's Unexplored Energy Resources, Basin Research Institute Bulletin, v. 9, p. 18-27.

Echols, J.B., 2001, The producibility of coalbed methane from Wilcox coals in Louisiana: Gulf Coast Association of Geological Societies Transactions, v. 51, p. 75-84.

Gas Research Institute, 1999, North American coalbed methane resource map: Gas Research Institute Gas Tips, Chicago, Illinois, vol. 5, no. 2, 1 sheet.

Gas Research Institute, 2001, North American coalbed methane resource map: Gas Research Institute Gas Tips, Chicago, Illinois, 1 sheet.

Griffiths, J.C., and Pilcher, R.C., 2000, Coalbed methane potential of the upper Texas Gulf Coast, in Coalbed and Coal Mine Methane Conference, Denver, Colorado, March 27-28, 2000 [Proceedings]: New York, Strategic Research Institute, unpaginated.

Meager, D.P. and Aycock, L.C., 1942, Louisiana Lignite, Louisiana Geological Survey Pamphlet., no. 3, 56 p.

Pratt, T.J., Mavor, M.J., and DeBruyn, R.P., 1999, Coal gas resource and production potential of subbituminous coal in the Powder River Basin: 1999 International Coalbed Methane Symposium Proceedings, Tuscaloosa, p. 23-34.

Roland, H.L., Jr., Jenkins, G.M., and Pope, D.E., 1976, Lignite--evaluation of near-surface deposits in northwest Louisiana, Louisiana Geological Survey, Department of Conservation, Mineral Resources Bulletin no. 2., 39 p.

Rogers, J.S., 1983, The occurrence of deep basin lignite in the Wilcox Group of northeast Louisiana: Baton Rouge, Louisiana State University, M.S. thesis, 165 p.

Scott, A., 2001, EMD Takes Unconventional Role: American Association of Petroleum Geologists Explorer, August, 2001, p. 55.

Warwick, P.D., Barker, C.E., SanFilipo, J.R., and Morris, L.E., 2000, Preliminary results from the coal-bed methane drilling in Panola County, Texas: U.S. Geological Survey Open File Report 00-0048, 30 p.

Williamson, D.R., 1986, Lignites of northwest Louisiana and the Dolet Hills lignite mine, in Finkelman, R.B., and Casagrande, D.J., eds., Geology of Gulf Coast lignites: Houston, Environmental and Coal Associates, p. 13-28.