G — G'

Map location number 82
LION 1 GOVERNMENT LIBERTIN
API 40 093 05020
SW NE sec. 9, T. 4 N., R. 11 E.
Meade County, South Dakota
Kelly bushing elevation: 2,595 ft
Ground surface elevation: 2,586 ft
Log types shown: gamma ray, spontaneous potential, and resistivity

Map location number 83
ATLANTIC 1 KNOLL STATE
API 40 103 05016
SW NW sec. 16, T. 2 N., R. 16 E.
Pennington County, South Dakota
Kelly bushing elevation: 2,867 ft
Ground surface elevation: 2,857 ft
Log types shown: spontaneous potential and resistivity

Map location number 84
KERR MCGEE 1 CHUTE
API 40 055 05000
SW SW sec. 33, T. 3 N., R. 19 E.
Haakon County, South Dakota
Kelly bushing elevation: 2,632 ft
Ground surface elevation: 2,620 ft
Log types shown: spontaneous potential and resistivity

Map location number 85
KERR MCGEE 1 RENNING
API 40 071 20002
SE SE sec. 35, T. 1 S., R. 22 E.
Jackson County, South Dakota
Kelly bushing elevation: 2,426 ft
Ground surface elevation: 2,416 ft
Log types shown: spontaneous potential, resistivity, and conductivity

Map location number 86
CITIES SERVICE 1 VILHAUER A
API 40 071 05001
NE SW sec. 17, T. 2 S., R. 25 E.
Jackson County, South Dakota
Kelly bushing elevation: 2,332 ft
Ground surface elevation: 2,320 ft
Log types shown: gamma ray, resistivity, and conductivity

Map location number 87
GULF 1 SANDY
API 40 075 05055
NW SE sec. 21, T. 2 S., R. 27 E.
Jones County, South Dakota
Kelly bushing elevation: 2,188 ft
Ground surface elevation: 2,176 ft
Log types shown: spontaneous potential and resistivity

Map location number 88
GULF 1 HIGHT
API 40 075 05000
SE SE sec. 15, T. 3 S., R. 29 E.
Jones County, South Dakota
Kelly bushing elevation: 2,080 ft
Ground surface elevation: 2,070 ft
Log types shown: spontaneous potential and resistivity

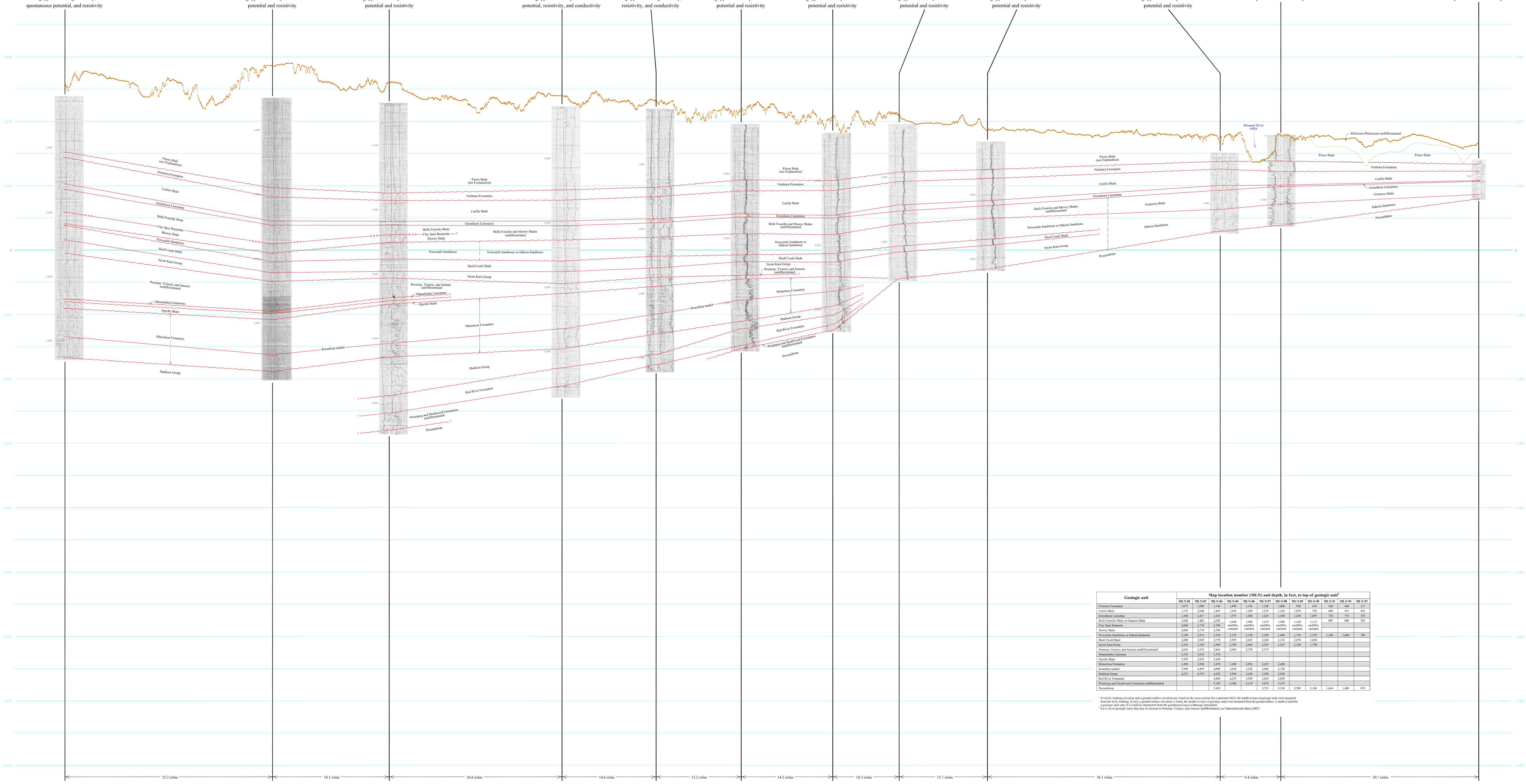
Map location number 89
GULF 1 HULCE
API 40 075 05056
NW NW sec. 29, T. 2 S., R. 31 E.
Jones County, South Dakota
Kelly bushing elevation: 2,132 ft
Ground surface elevation: 2,119 ft
Log types shown: spontaneous potential and resistivity

Map location number 90
GULF 1 WOLF STATE
API 40 085 05053
SW SW sec. 16, T. 104 N., R. 78 W.
Lyman County, South Dakota
Kelly bushing elevation: 1,860 ft
Ground surface elevation: 1,847 ft
Log types shown: spontaneous potential and resistivity

Map location number 91
GENERAL CRUDE 1 STRAKA
API 40 085 05001
NW NW sec. 22, T. 105 N., R. 72 W.
Lyman County, South Dakota
Kelly bushing elevation: 1,731 ft
Ground surface elevation: 1,724 ft
Log types shown: spontaneous potential and resistivity

Map location number 92
HARRY SAMSON WELL 2
API 40 015 60012
SE SW sec. 7, T. 105 N., R. 70 W.
Brule County, South Dakota
Ground surface elevation: 1,785 ft
Log types shown: spontaneous potential and resistivity

Map location number 93
WHITE LAKE CITY
API 40 003 60038
SW SW sec. 11, T. 103 N., R. 66 W.
Aurora County, South Dakota
Ground surface elevation: 1,650 ft
Log types shown: spontaneous potential and resistivity



Vertical exaggeration = 52.8X

Vertical exaggeration = 52.8X

Geologic unit	Map location number (MLN) and depth, in feet, to top of geologic unit[1]											
	MLN-82	MLN-83	MLN-84	MLN-85	MLN-86	MLN-87	MLN-88	MLN-89	MLN-90	MLN-91	MLN-92	MLN-93
Niobrara Formation	1,075	1,900	1,746	1,490	1,356	1,100	1,000	920	610	360	404	317
Carlile Shale	1,155	2,040	1,863	1,650	1,500	1,270	1,164	1,070	750	480	567	425
Greenhorn Limestone	1,560	2,417	2,183	1,975	1,840	1,625	1,540	1,430	1,093	730	776	570
Belle Fourche Shale or Graneros Shale	1,648	2,482	2,245	2,048 undiffer-entiated	1,908 undiffer-entiated	1,675 undiffer-entiated	1,580 undiffer-entiated	1,528 undiffer-entiated	1,172 undiffer-entiated	805	800	583
Clay Spur Bentonite	2,000	2,770	2,390									
Mowry Shale	2,000	2,770	2,390									
Newcastle Sandstone or Dakota Sandstone	2,180	2,915	2,510	2,270	2,130	1,930	1,840	1,730	1,370	1,100	1,068	788
Skull Creek Shale	2,208	3,045	2,770	2,595	2,425	2,260	2,132	2,070	1,694			
Inyan Kara Group	2,432	3,220	2,960	2,760	2,604	2,365	2,265	2,160	1,790			
Permian, Triassic, and Jurassic undifferentiated[2]	2,642	3,355	3,065	2,945	2,750	2,575						
Minnekahta Limestone	3,352	3,818	3,370									
Opeche Shale	3,395	3,855	3,420									
Minnelusa Formation	3,498	3,950	3,470	3,100	2,892	2,635	2,490					
Roundtop marker	3,940	4,495	4,080	3,650	3,320	2,960	2,720					
Madison Group	4,272	4,755	4,292	3,960	3,630	3,290	2,950					
Red River Formation			4,890	4,255	3,950	3,410	3,090					
Winnipeg and Deadwood Formations undifferentiated			5,160	4,540	4,110	3,670	3,235					
Precambrian			5,430			3,723	3,330	2,580	2,160	1,444	1,400	855

[1] If a kelly bushing elevation and a ground surface elevation are listed on the cross section for a particular MLN, the depths to tops of geologic units were measured from the kelly bushing. If only a ground surface elevation is listed, the depths to tops of geologic units were measured from the ground surface. A depth is listed for a geologic unit only if it could be interpreted from the geophysical log or a lithologic description.
[2] For a list of geologic units that may be present in Permian, Triassic, and Jurassic undifferentiated, see Fahrenbach and others (2007).

STATE OF SOUTH DAKOTA
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Steven M. Pirner, Secretary

DIVISION OF FINANCIAL AND TECHNICAL ASSISTANCE
David Templeton, Director

GEOLOGICAL SURVEY
Derric L. Iles, State Geologist

OIL AND GAS INVESTIGATION 2

Cross Sections Showing Geophysical Logs of Phanerozoic Rocks in South Dakota

Plate 7. Structural Cross Section G-G'

J.E. FOX, K.A. MCCORMICK, AND T.N. HAGGAR

2009

Prepared in cooperation with the Department of Geology and Geological Engineering, South Dakota School of Mines and Technology

Explanation

The youngest geologic contact interpreted in areas west of the Missouri River is the contact between the Niobrara Formation and the Pierre Shale. It is recognized that younger geologic units often exist above the Pierre Shale, but they were not interpreted for this cross section.

- Correlation line at a conformable geologic contact. Interpreted from a geophysical log or lithologic description. Queried where uncertain
- Correlation line at an unconformable geologic contact. Interpreted from a geophysical log or lithologic description. Queried where uncertain
- Correlation line at an unconformable geologic contact. Interpreted from Tomhave and Schulz (2004).

Correlation lines are not intended to show detailed structure or actual elevation of a geologic unit between data points. Correlation lines are not projected to land surface near the Black Hills even though some geologic units crop out. The generalized nature of the cross section does not lend itself to illustration of these outcrop areas.

- Profile of land surface derived from U.S. Geological Survey digital elevation models
- Profile of the bedrock surface east of the Missouri River. Queried where uncertain. Due to the scale of the cross section, bedrock outcrop areas are not shown. Modified from Tomhave and Schulz (2004)
- Bentonite bed
- Boundary of nomenclature change. Boundary shown in orange on index map below. Boundary and nomenclature generally coincide with Fahrenbach and others (2007)

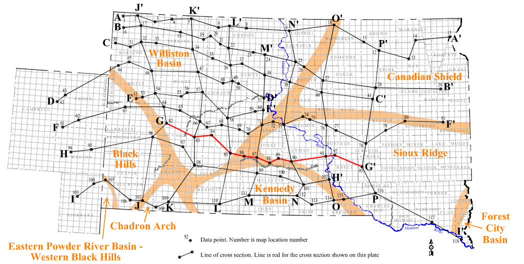
Depth of well, in feet, below kelly bushing or ground surface
Mean sea level elevation in feet
Marker for a geologic contact

Datum for cross section is mean sea level

Horizontal and vertical scales of cross section
400 feet
0
0 — 4 miles

Vertical exaggeration = 52.8X

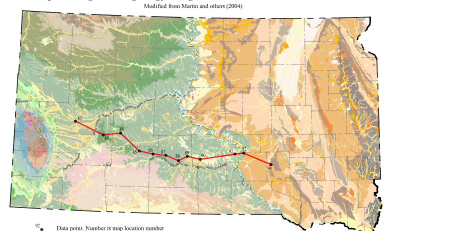
Index map showing locations of data points used for construction of cross sections



Data point. Number is map location number
Line of cross section
Approximate boundary of geologic areas in South Dakota. Names of geologic areas are shown in orange font. From Fahrenbach and others (2007)

Index map showing surface geology along the line of cross section in South Dakota

Modified from Martin and others (2004)

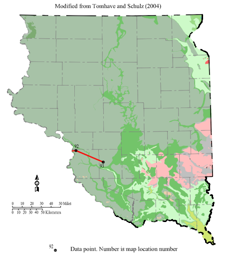


Data point. Number is map location number
Line of cross section

Index map showing bedrock geology along the line of cross section east of the Missouri River

Modified from Tomhave and Schulz (2004)

Map location number	Surface geologic unit	Bedrock geologic unit east of the Missouri River
82	Pierre Shale	
83	Fox Hills Formation	
84	Fox Hills Formation	
85	Terrace deposits	
86	Pierre Shale	
87	Pierre Shale	
88	Pierre Shale	
89	Pierre Shale	
90	Pierre Shale	
91	Pierre Shale	
92	Till, stagnation moraine	Pierre Shale
93	Till, stagnation moraine	Pierre Shale



Data point. Number is map location number
Line of cross section

References

Fahrenbach, M.D., Steece, F.V., Sawyer, J.F., McCormick, K.A., McGillivray, G.L., Schulz, L.D., and Redden, J.A., 2007, *South Dakota stratigraphic correlation chart:* South Dakota Geological Survey Oil and Gas Investigation 1.

Martin, J.E., Sawyer, J.F., Fahrenbach, M.D., Tomhave, D.W., and Schulz, L.D., 2004, *Geologic map of South Dakota:* South Dakota Geological Survey General Map 10, scale 1:500,000.

Tomhave, D.W., and Schulz, L.D., 2004, *Bedrock geologic map showing configuration of the bedrock surface in South Dakota east of the Missouri River:* South Dakota Geological Survey General Map 9, scale 1:500,000.