K

Map location number 109
WEBB 30-16 LINEHAN
API 40 113 20001
SE SE sec. 30, T. 37 N., R. 45 W.
Shannon County, South Dakota
Kelly bushing elevation: 3,017 ft
Ground surface elevation: 3,012 ft
Log types shown: spontaneous potential, resistivity, and conductivity

Map location number 98
PETROLEUM ENERGY 10-8 FEDERAL
API 40 103 20006
SE NE sec. 10, T. 4 S., R. 16 E.
Pennington County, South Dakota
Kelly bushing elevation: 2,458 ft
Ground surface elevation: 2,447 ft
Log types shown: spontaneous potential, resistivity, and conductivity

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 66
TRUE 1 KNOX GOVERNMENT
API 40 103 05018
NW NW sec. 29, T. 5 N., R. 17 E.
Pennington County, South Dakota
Kelly bushing elevation: 2,350 ft
Ground surface elevation: 2,340 ft
Log types shown: spontaneous potential and resistivity

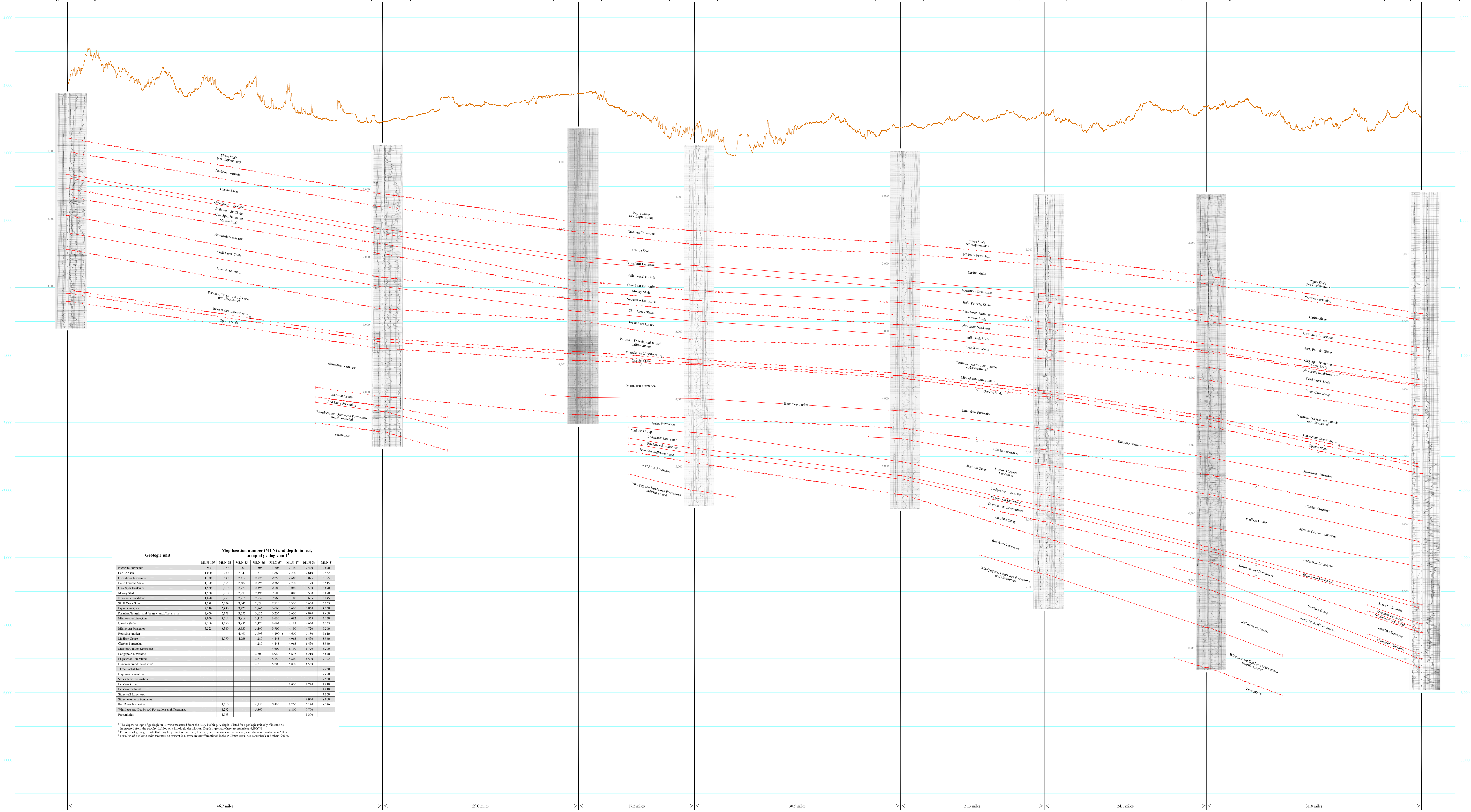
Map location number 57
HERNDON 1 OAKLAND
API 40 093 05036
NE SE sec. 20, T. 10 N., R. 17 E.
Meade County, South Dakota
Kelly bushing elevation: 2,367 ft
Ground surface elevation: 2,359 ft
Log types shown: spontaneous potential and resistivity

Map location number 47
EVANS 1 QUERBES TRUST CAPP
API 40 105 05001
NW NW sec. 9, T. 13 N., R. 16 E.
Perkins County, South Dakota
Kelly bushing elevation: 2,570 ft
Ground surface elevation: 2,558 ft
Log types shown: spontaneous potential and resistivity

Map location number 34
SHELL 1 VEAL
API 40 105 05003
SE SE sec. 7, T. 17 N., R. 15 E.
Perkins County, South Dakota
Kelly bushing elevation: 2,670 ft
Ground surface elevation: 2,656 ft
Log types shown: spontaneous potential and resistivity

Map location number 5
WEBB 3-2 SPENNY
API 40 105 20015
NW NE sec. 3, T. 22 N., R. 14 E.
Perkins County, South Dakota
Kelly bushing elevation: 2,501 ft
Ground surface elevation: 2,488 ft
Log types shown: gamma ray, spontaneous potential, and resistivity

K'



Geologic unit	Map location number (MLN) and depth, in feet, to top of geologic unit[1]							
	MLN-109	MLN-98	MLN-83	MLN-66	MLN-57	MLN-47	MLN-34	MLN-5
Niobrara Formation	800	1,070	1,900	1,505	1,703	2,110	2,490	2,890
Carlile Shale	1,000	1,260	2,040	1,710	1,860	2,230	2,610	2,982
Greenhorn Limestone	1,340	1,590	2,417	2,025	2,255	2,668	3,075	3,395
Belle Fourche Shale	1,390	1,665	2,482	2,095	2,363	2,770	3,170	3,515
Clay Spur Bentonite	1,550	1,810	2,770	2,395	2,580	3,080	3,500	3,870
Mowry Shale	1,550	1,810	2,770	2,395	2,580	3,080	3,500	3,870
Newcastle Sandstone	1,670	1,958	2,915	2,537	2,765	3,180	3,605	3,945
Skull Creek Shale	1,948	2,304	3,045	2,698	2,910	3,330	3,630	3,965
Inyan Kara Group	2,210	2,440	3,220	2,845	3,060	3,490	3,850	4,268
Permian, Triassic, and Jurassic undifferentiated[2]	2,450	2,772	3,355	3,125	3,235	3,620	4,040	4,400
Minnekahta Limestone	3,050	3,214	3,818	3,416	3,630	4,092	4,575	5,120
Opeche Shale	3,100	3,260	3,855	3,470	3,665	4,135	4,620	5,165
Minnelusa Formation	3,222	3,360	3,950	3,490	3,700	4,180	4,720	5,260
Roundtop marker			4,495	3,993	4,190(?)	4,650	5,180	5,610
Madison Group		4,070	4,755	4,280	4,445	4,965	5,430	5,960
Charles Formation				4,280	4,445	4,965	5,430	5,960
Mission Canyon Limestone					4,600	5,190	5,720	6,270
Lodgepole Limestone				4,500	4,940	5,635	6,210	6,640
Englewood Limestone				4,730	5,150	5,800	6,500	7,192
Devonian undifferentiated[3]				4,810	5,200	5,870	6,560	
Three Forks Shale								7,250
Duperow Formation								7,480
Souris River Formation								7,560
Interlake Group						6,030	6,720	7,610
Interlake Dolomite								7,610
Stonewall Limestone								7,930
Stony Mountain Formation							6,940	8,000
Red River Formation		4,210		4,950	5,430	6,270	7,130	8,136
Winnipeg and Deadwood Formations undifferentiated		4,292		5,360		6,810	7,700	
Precambrian		4,593					8,300	

[1] The depths to tops of geologic units were measured from the kelly bushing. A depth is listed for a geologic unit only if it could be interpreted from the geophysical log or a lithologic description. Depth is queried where uncertain [e.g. 4,190(?)].
[2] For a list of geologic units that may be present in Permian, Triassic, and Jurassic undifferentiated, see Fahrenbach and others (2007).
[3] For a list of geologic units that may be present in Devonian undifferentiated in the Williston Basin, see Fahrenbach and others (2007).

Vertical exaggeration = 52.8X

Vertical exaggeration = 52.8X

STATE OF SOUTH DAKOTA
M. Michael Rounds, Governor

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
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 11. Structural Cross Section K-K'

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.

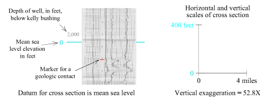
Correlation line at a conformable geologic contact. Interpreted from a geophysical log or lithologic description. Queried where uncertain

Correlation line at an unconformable geologic contact. Interpreted from a geophysical log or lithologic description. Queried where uncertain

Correlation 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

Bentonite bed



Datum for cross section is mean sea level

Horizontal and vertical scales of cross section

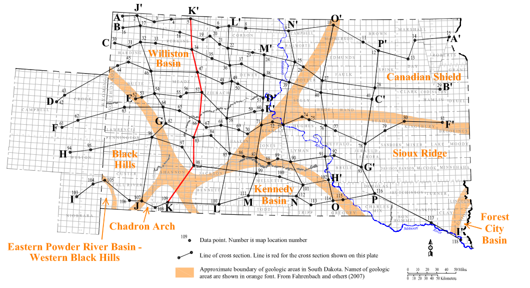
400 feet

0

0 4 miles

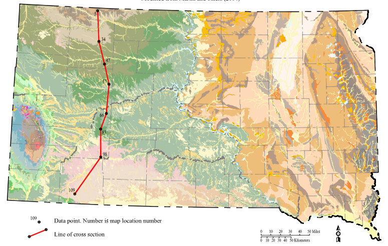
Vertical exaggeration = 52.8X

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



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

Modified from Martin and others (2004)



Map location number	Surface geologic unit
109	Alluvium
98	Terrace deposits
83	Fox Hills Formation
66	Pierre Shale
57	Pierre Shale
47	Hell Creek Formation
34	Ludlow Formation
5	Cannonball Formation

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.