

**M** Map location number 111  
ROSEBUD SIOUX TRIBE 1 TRIBAL LAND  
API 40 121 20001  
NW NW sec. 7, T. 38 N., R. 31 W.  
Todd County, South Dakota  
Kelly bushing elevation: 2,736 ft  
Ground surface elevation: 2,730 ft  
Log type shown: gamma ray

Map location number 99  
WILLIAM JENSEN RANCH  
API 40 095 60041  
NW sec. 15, T. 42 N., R. 30 W.  
Mellette County, South Dakota  
Ground surface elevation: 2,140 ft  
Log types shown: spontaneous potential and resistivity

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 71  
PHILLIPS 1 STATE  
API 40 117 05001  
NW SE sec. 36, T. 5 N., R. 27 E.  
Stanley County, South Dakota  
Kelly bushing elevation: 1,854 ft  
Ground surface elevation: 1,854 ft  
Log types shown: spontaneous potential and resistivity

Map location number 60  
CITIES SERVICES 1 BARRICK  
API 40 117 05008  
SW NE sec. 18, T. 9 N., R. 28 E.  
Stanley County, South Dakota  
Kelly bushing elevation: 2,082 ft  
Ground surface elevation: 2,070 ft  
Log types shown: gamma ray, resistivity, and conductivity

Map location number 51  
CARTER 1 LOCKS  
API 40 117 05011  
SE SE sec. 12, T. 9 N., R. 27 E.  
Stanley County, South Dakota  
Kelly bushing elevation: 1,795 ft  
Ground surface elevation: 1,786 ft  
Log types shown: spontaneous potential and resistivity

Map location number 38  
GULF 1 JEWETT  
API 40 041 20001  
NW NW sec. 13, T. 13 N., R. 27 E.  
Dewey County, South Dakota  
Kelly bushing elevation: 2,319 ft  
Ground surface elevation: 2,309 ft  
Log types shown: spontaneous potential, resistivity, and conductivity

Map location number 24  
HERNDON 1 MERKEL  
API 40 041 05005  
SE SE sec. 27, T. 17 N., R. 27 E.  
Dewey County, South Dakota  
Kelly bushing elevation: 1,909 ft  
Ground surface elevation: 1,902 ft  
Log types shown: spontaneous potential and resistivity

**M'**



STATE OF SOUTH DAKOTA  
M. Michael Rounds, Governor  
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES  
Steven M. Primer, Secretary  
DIVISION OF FINANCIAL AND TECHNICAL ASSISTANCE  
David Tompkins, 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 13. Structural Cross Section M-M'**

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2009

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

**Explanation**

The youngest geologic contact (intercepted 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 intercepted for this cross section.

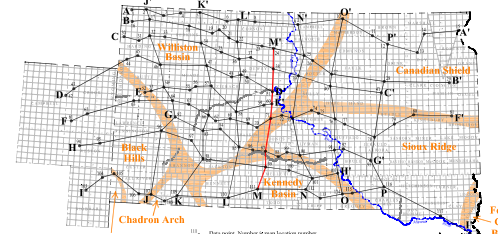
— Correlation line at a unconformable geologic contact. Intercepted from a geophysical log or lithologic description. Questioned where uncertain  
— Correlation line at an unconformable geologic contact. Intercepted from a geophysical log or lithologic description. Questioned where uncertain  
— Profile of land surface derived from U.S. Geological Survey digital elevation models  
••••• Bentonite bed  
| Boundary of nonconformity change. Boundary shown in orange on index map below. Boundary and interpretation generally outside units of Faltensback and others (2007)

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 nor 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.

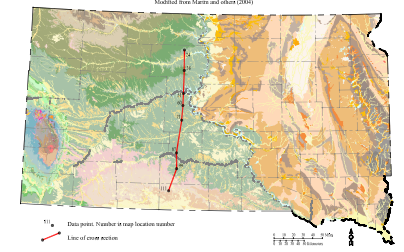
Depth of well, in feet, below Kelly bushing or ground surface  
Mean sea level elevation in feet  
Marker for a geologic contact  
Datum for cross section is mean sea level

Horizontal and vertical scale of cross section  
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**



Map location number	Surface geologic unit
111	Chadron Arch
99	Pierre Shale
87	Pierre Shale
71	Pierre Shale
60	Pierre Shale
51	Pierre Shale
38	Pierre Shale
24	Pierre Shale

Geologic unit	Map location number (M.N.) and depth, in feet, to top of geologic unit											
	M.N.111	M.N.99	M.N.87	M.N.71	M.N.60	M.N.51	M.N.38	M.N.24	M.N.111	M.N.99	M.N.87	M.N.71
Niobrara Formation	1,932	1,660	1,530	1,70	1,680	1,65	1,490	1,380	1,932	1,660	1,530	1,70
Carlisle Shale	1,270	1,100	1,270	800	1,120	800	1,250	1,050	1,270	1,100	1,270	800
Greenhorn Limestone	2,087	1,685	1,625	1,180	1,500	1,225	1,612	1,612	2,087	1,685	1,625	1,180
Belle Fourche Shale	1,680	1,550	1,675	1,280	1,520	1,270	1,675	1,675	1,680	1,550	1,675	1,280
Clay Spur Sandstone	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170
Niobrara Sandstone or Dakota Sandstone	2,345	1,795	1,690	1,505	1,621	1,620	2,330	2,180	2,345	1,795	1,690	1,505
Iron River Group	2,480	2,170	2,160	1,850	2,140	1,940	2,490	2,490	2,480	2,170	2,160	1,850
Perrine, Triassic, and Jurassic and Pennsylvanian	2,500	2,020	2,045	1,690	2,020	2,045	2,500	2,500	2,500	2,020	2,045	1,690
Mission Formation	3,040	2,575	2,120	1,800	2,510	2,110	2,610	2,495	3,040	2,575	2,120	1,800
Headspite member	3,180	2,635	2,170	2,445	2,240	2,240	3,180	3,180	3,180	2,635	2,170	2,445
Highwood Limestone	2,900	2,350	2,742	2,460	2,340	2,340	2,970	2,970	2,900	2,350	2,742	2,460
Madison Group	3,290	2,495	2,495	3,040	2,720	2,490	3,290	3,290	3,290	2,495	2,495	3,040
Devonian and Pennsylvanian	3,410	3,410	3,410	3,410	3,410	3,410	3,410	3,410	3,410	3,410	3,410	3,410
Red River Formation	3,470	2,570	2,570	2,570	2,570	2,570	3,470	3,470	3,470	2,570	2,570	2,570
Precambrian	3,570	2,695	2,695	3,580	3,580	3,580	3,570	3,570	3,570	2,695	2,695	3,580

If Kelly bushing elevation and ground surface elevation are listed on the cross section for particular M.N., the depths to top of geologic units were measured from the Kelly bushing. If only a ground surface elevation is listed, the depths to top of geologic units were measured from the ground surface. A high is used for geologic units only if it could be measured from the geophysical log or lithologic description. Depth is quoted where measured (e.g., 1,470 ft). For list of geologic units that may be present in Perrine, Triassic, and Jurassic and Pennsylvanian or Niobrara and Greenhorn, see Faltensback and others (2007). For list of geologic units that may be present in Devonian and Pennsylvanian in the Williston Basin, see Faltensback and others (2007).

**References**

Faltensback, M.D., Smith, F.V., Swartz, G.J., McCormick, K.A., McElroy, G.L., Scholz, L.D., and Rodhe, J.A., 2007, *Geologic map of South Dakota*, South Dakota Geological Survey Oil and Gas Investigation 1.  
Merritt, D.L., Swartz, G.J., Faltensback, M.D., Yonkers, D.W., and Scholz, L.D., 2004, *Geologic map of South Dakota*, South Dakota Geological Survey General Map 10, scale 1:500,000.

Vertical exaggeration = 52.8X

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