

Geological Survey Program



Derric Iles, CPG
State Geologist - Administrator

Geological Survey Program Staff

Permanent staff

- State Geologist – Administrator
- Natural Resources Administrator
- Senior Secretary
- Senior Geologist – 6
- Senior Hydrologist – 3
- Geologist – 2
- Hydrologist
- Cartographer
- Civil Engineering Technician – 3
- Word Processing Supervisor
- Natural Resources Technician

Seasonal - Intern staff

- Drilling assistant – 3
- Water sampling assistant
- Geologic mapping assistant
- Natural resources assistant

21 full time FTEs

- 18 located in Vermillion
- 3 located in Rapid City

~345 years of
combined experience

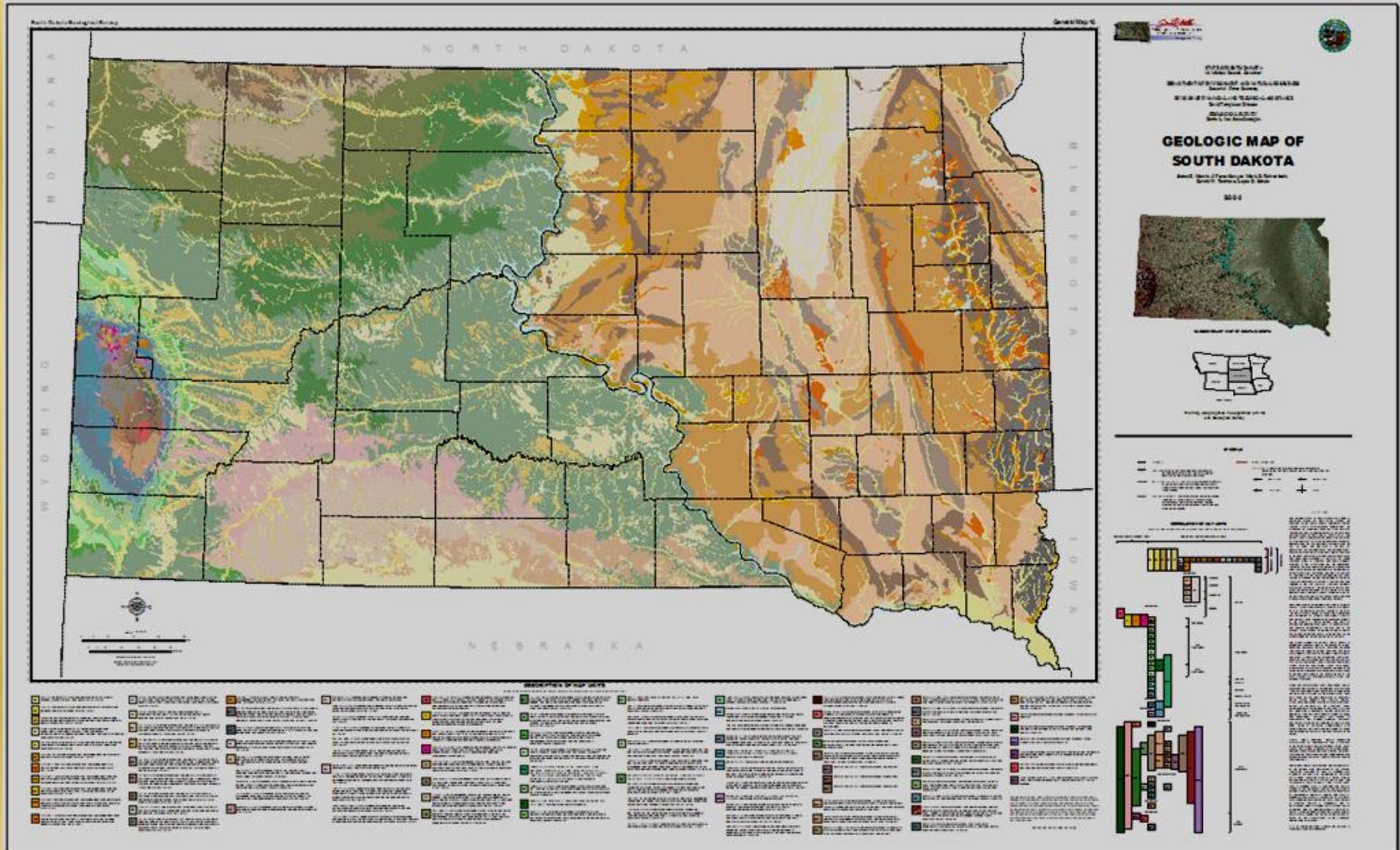
Examples of the value and uses of geologic and hydrologic information

- Geologic and hydrologic information provides a scientific basis for resource development, land-use planning, and regulatory activities.
- Development and protection of our state's resources, particularly ground water, are dependent on detailed knowledge of the subsurface.
- Geologic maps delineate sand and gravel resources.
- Geologic maps and information are used to locate and assess mineral, oil, natural gas, and geothermal resources.
- Geologic and hydrologic information is used in waste-site evaluations and clean-up.
- Geologic and aquifer maps are used in the siting of pipelines.
- Geologic maps are used in geologic-hazards analysis and seismic evaluations.

Geologic Mapping

1:500,000 scale

Geologic Map of South Dakota

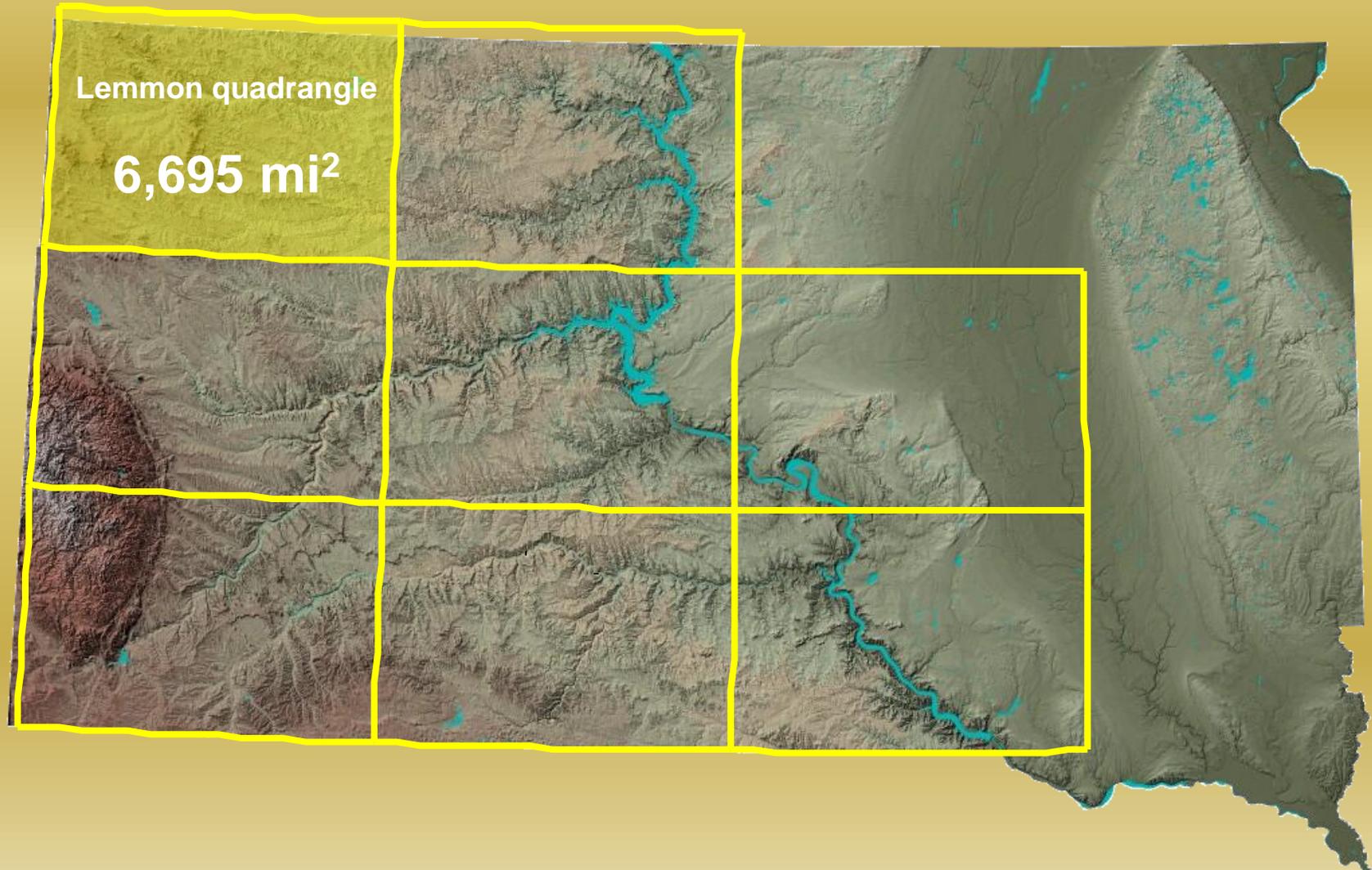


Available in Adobe PDF, shapefile, and paper format (42 x 68 inches)

Geologic Mapping

1:250,000 scale

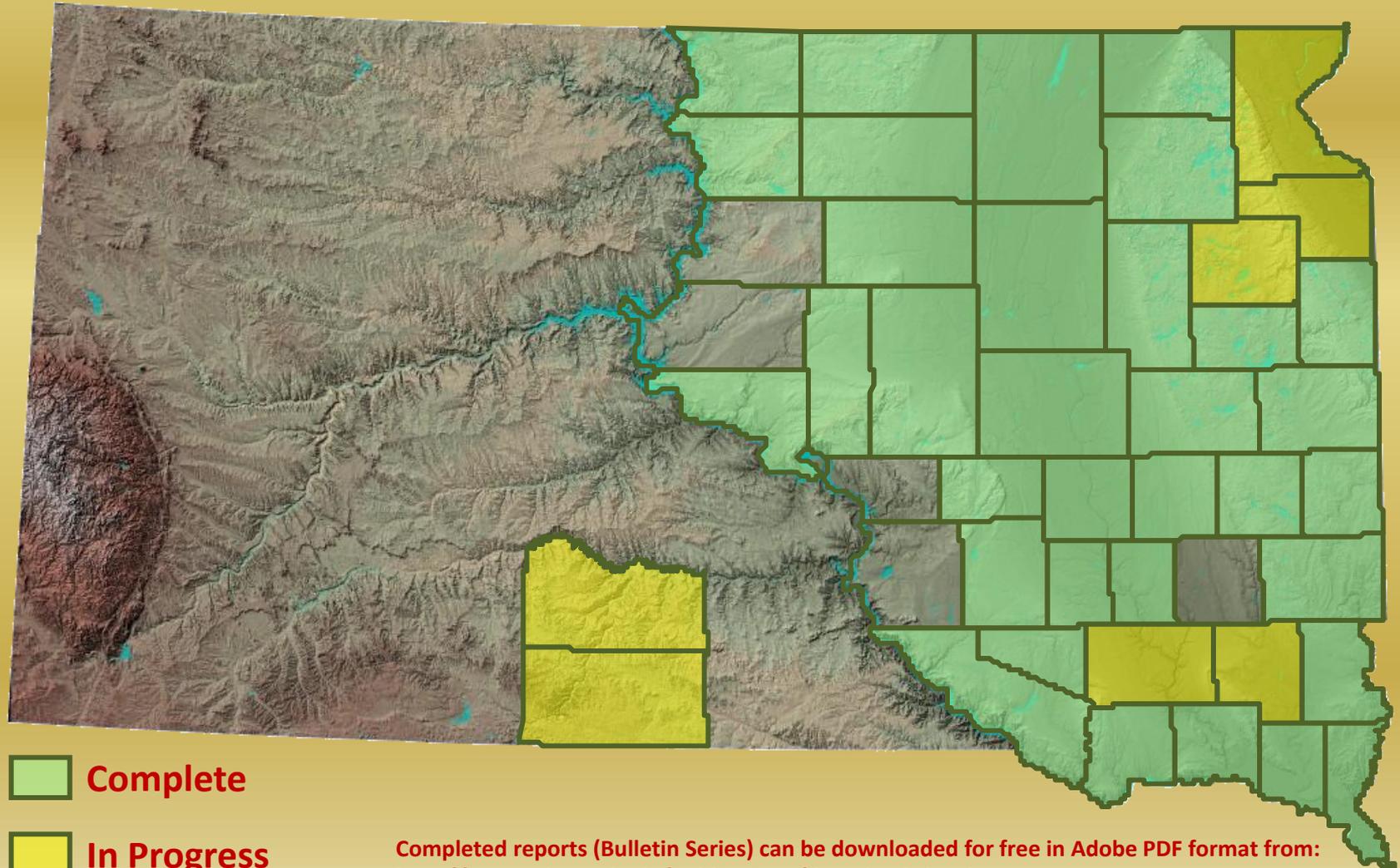
1° x 2° quadrangles



Geologic Mapping

1:100,000 scale

county by county



Brookings County Surface Geology

1:100,000 scale

Bulletin 40 - Plate 4

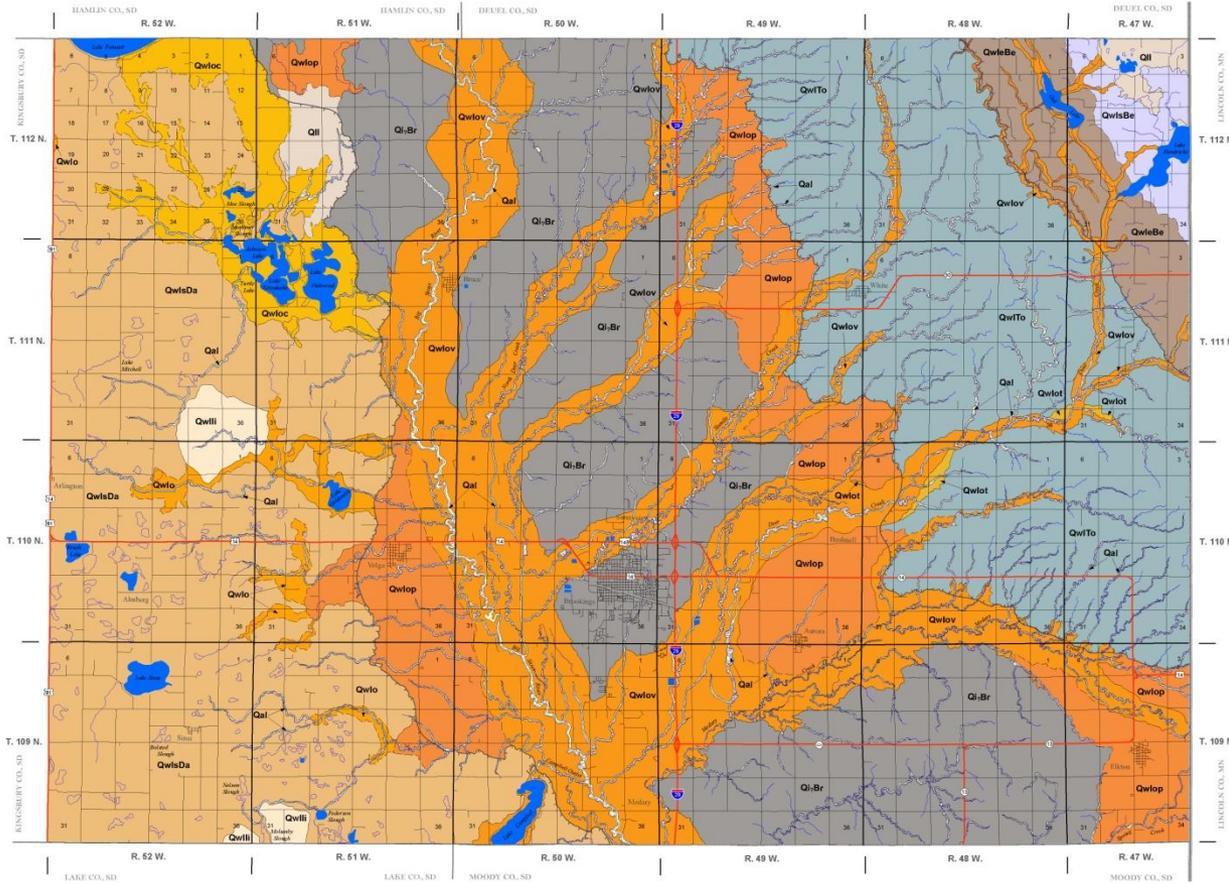
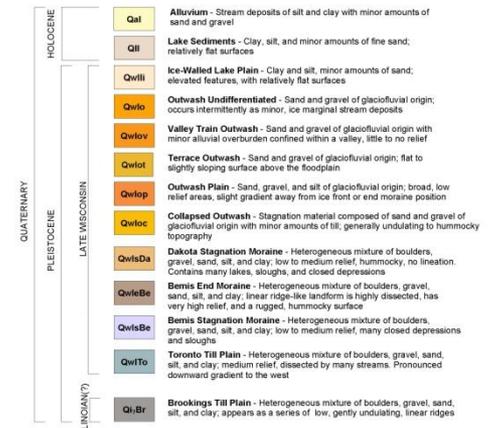


Plate 4. Geology and landforms of Brookings County, South Dakota.

Department of Environment and Natural Resources
Division of Financial and Technical Assistance
Geological Survey

Bulletin 40 - 2009
Layne D. Schulz
Martin J. Jarrett



For township section numbering system, see T. 112 N., R. 52 W.



Scale: 1:100,000
0 1 2 3 4 5 6 Miles

0 1 2 3 4 5 6 Kilometers



Available online in Adobe PDF format or in paper format (36 x 19 inches)

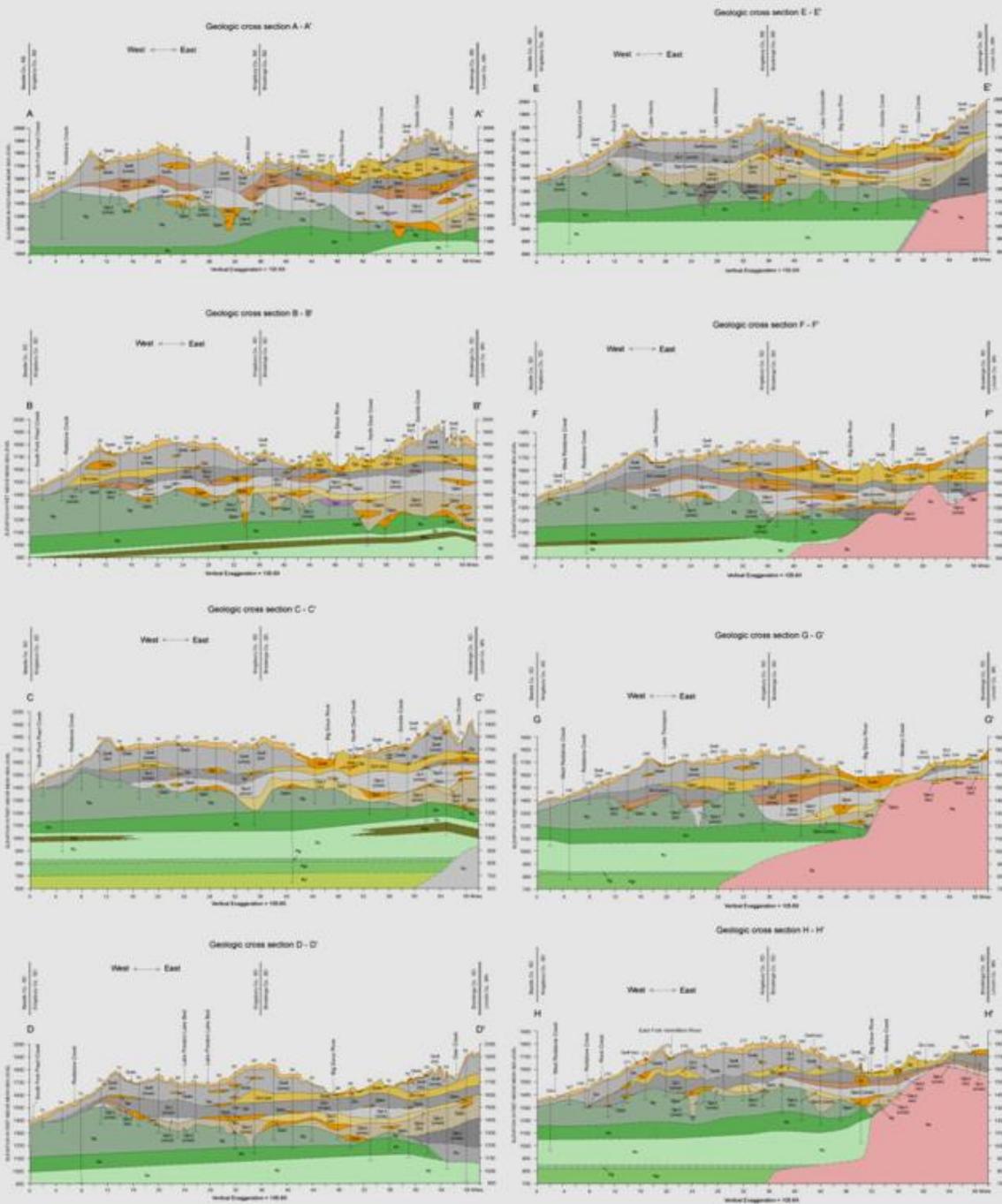


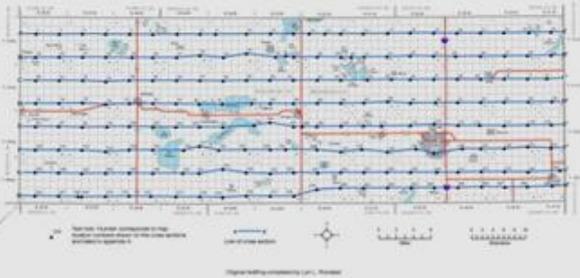
Plate 3. Index map and geologic cross sections in Brookings and Kingsbury Counties, South Dakota.

Department of Environment and Natural Resources
Division of Mineral and Technical Assistance
Geological Survey

October 40 - 2009
Layne D. Schulz
Martin J. Janoff



Index map of Brookings and Kingsbury Counties showing locations of stratigraphic cross sections and test holes.



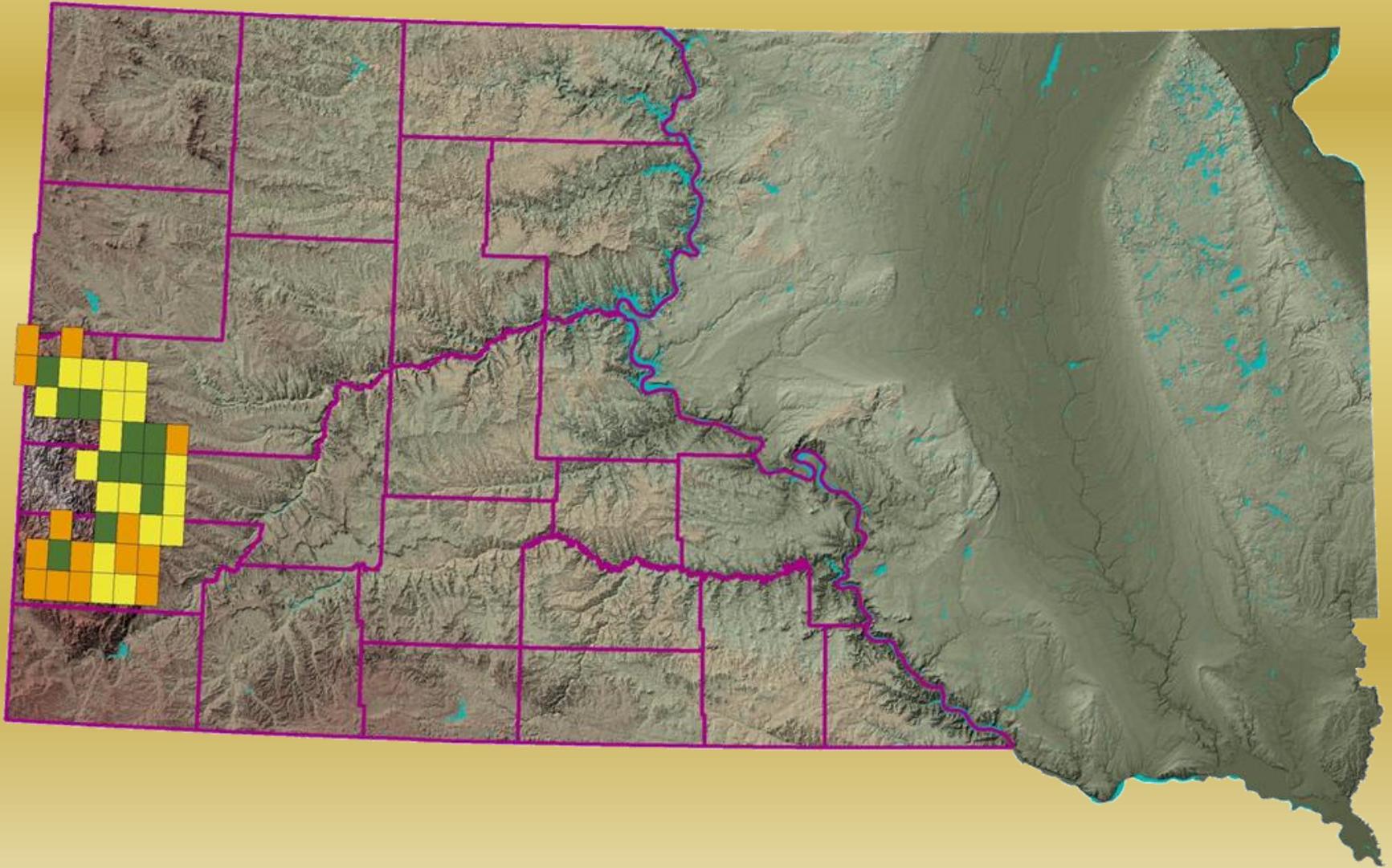
Example of cross sections from the geologic report for Brookings County.

Geologic Mapping

1:24,000 scale

7.5 minute quadrangles

~55 mi²

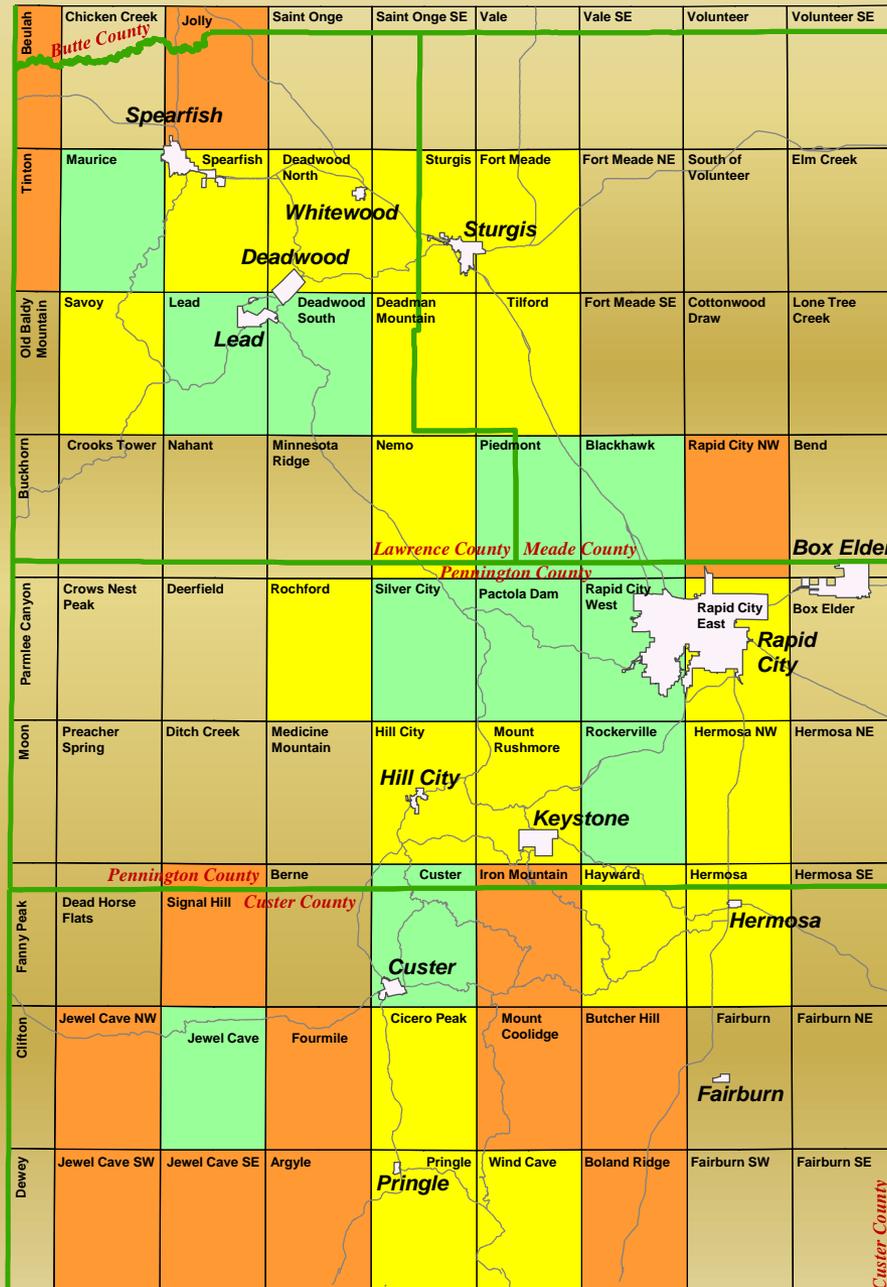




Status of 1:24,000-scale Geologic Mapping in the Black Hills, South Dakota

- Complete
- In Progress
- Planned

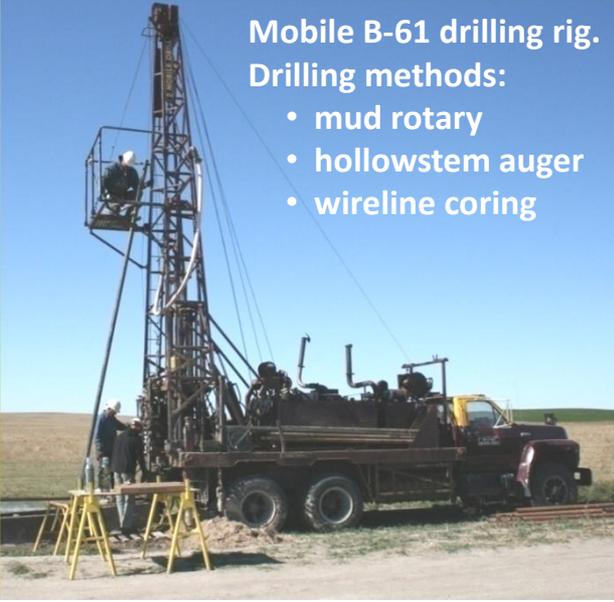
Index Map



Completed 7.5 minute (1:24,000 scale) geologic quadrangle maps can be downloaded for free in Adobe PDF and shapefile format from:
<http://www.sdgs.usd.edu/publications/downloads.html>

Mobile B-61 drilling rig.
Drilling methods:

- mud rotary
- hollowstem auger
- wireline coring



Enid Drill
Systems
M-51

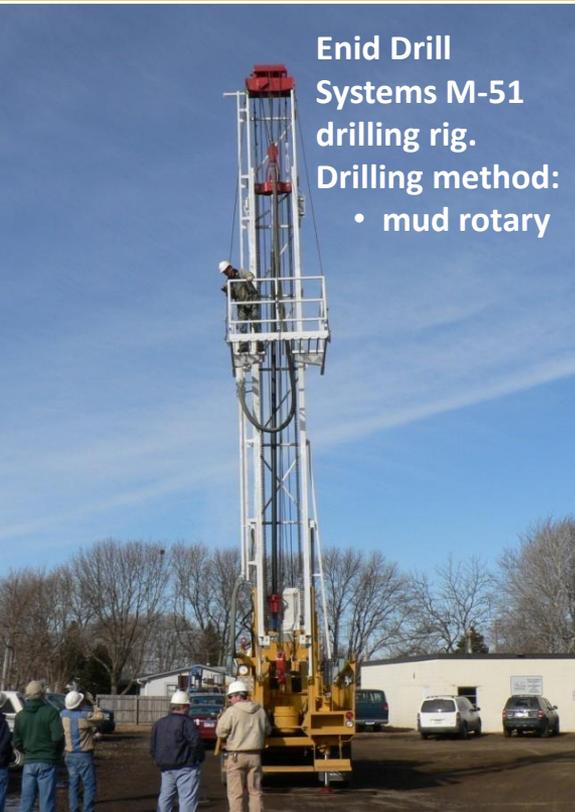


Mobile B-61

Drilling And Coring Capabilities



Enid Drill
Systems M-51
drilling rig.
Drilling method:
• mud rotary



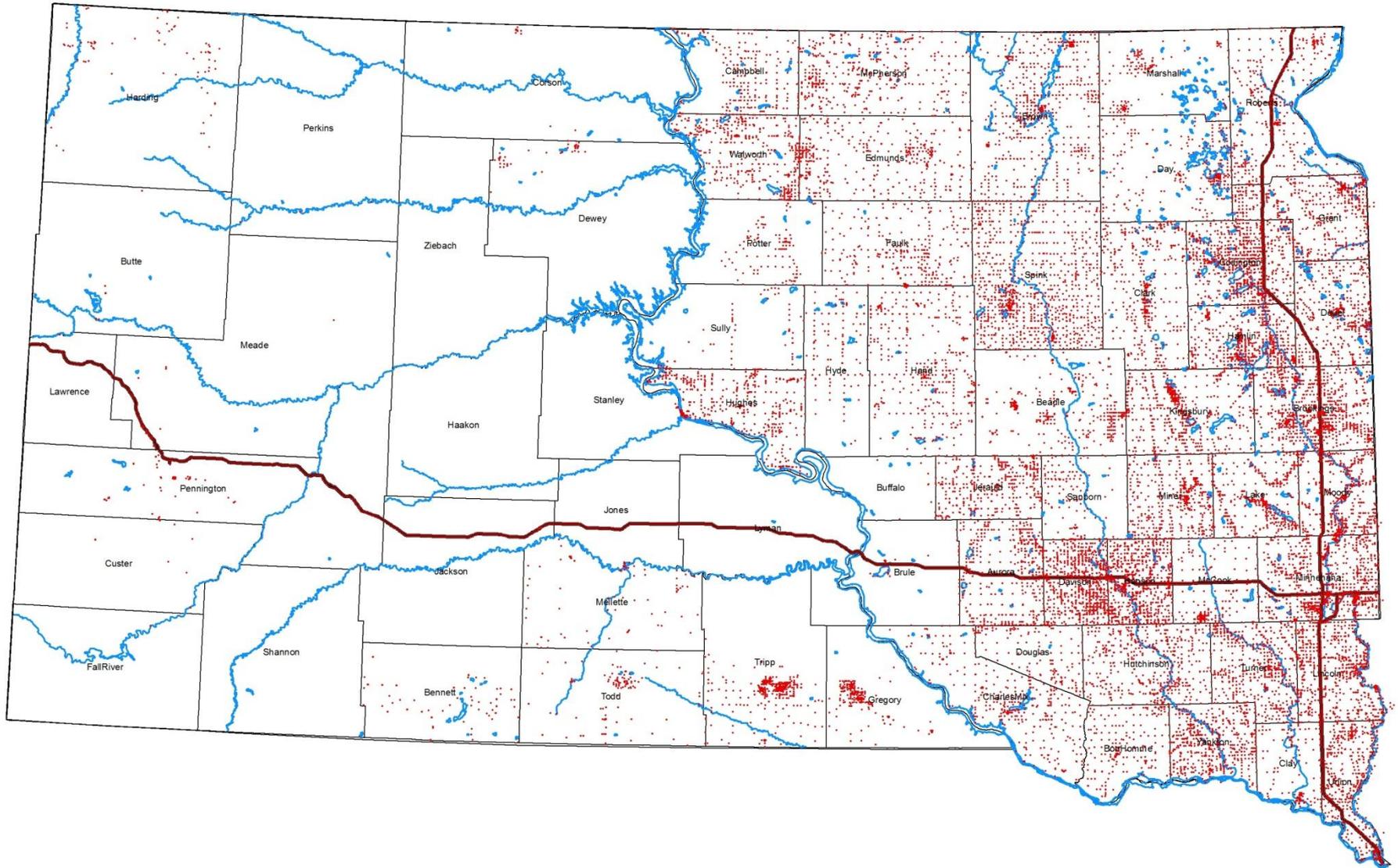
Mobile B-61



Mobile B-61



>22,747 test holes and wells drilled by the Geological Survey Program



Location Information

Legal Location: SW SW SE SE SEC. 35, T. 038 N., R. 36 W.

County: BENNETT Location: 038N36W35DDCC

Basin: WHITE Latitude: 43 12' 55"

Hydrologic Unit Code: 10140203 Longitude: 101 32' 09"

Land Owner: Ground Surface Elev. (ft.): 3026 T

Project Information

Project: ARIKAREE AQUIFER STUDY

Drill Date: 05/23/2007 Geologist: D. FILIPOVIC

Company: SDGS Geologist's Log: X

Drilling Method: ROTARY Driller: S. JENSEN

Test Hole Number: R2-2007-07 Driller's Log:

Samples: Total Drill Hole Depth (ft.): 507.0

Geophysical Information

Spontaneous X Potential: Single Point Resistivity: X

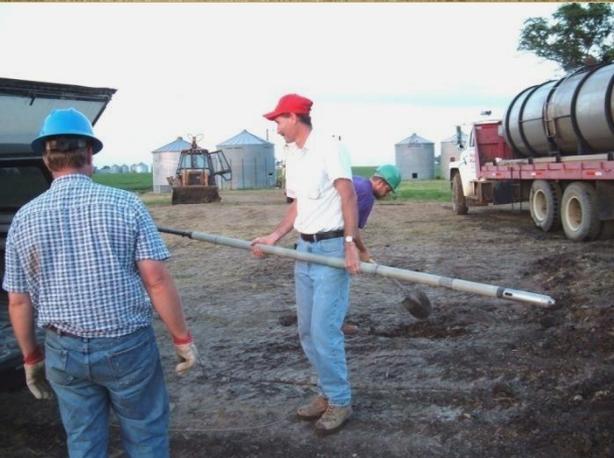
Natural X Gamma: Extra:

Notes

HOLE PLUGGED WITH BENTONITE GROUT FROM 507 TO 0 FEET.

Lithologic Information

<u>Elevation (ft.)</u>	<u>Depth (ft.)</u>	<u>Description</u>
3026.0 - 3024.0	0.0 - 2.0	TOPSOIL
3024.0 - 2993.0	2.0 - 33.0	SILTSTONE, LIGHT-GRAY (ASH HOLLOW FORMATION)
2993.0 - 2911.0	33.0 - 115.0	SAND, OLIVE TO GRAY, FINE; SOME GRAVEL; QUARTZ; SOME LAYERS OF ASH; SOME SANDSTONE, OLIVE TO GRAY, FINE, SILTY
2911.0 - 2886.0	115.0 - 140.0	SAND AND SANDSTONE, OLIVE TO GRAY, FINE; SOME CLAY, LIGHT-GRAY; SOME LAYERS OF ASH
2886.0 - 2816.0	140.0 - 210.0	SILT, TAN TO REDDISH
2816.0 - 2726.0	210.0 - 300.0	SANDSTONE, DARK-GRAY; SOME SAND AND SILT, TAN TO GRAY, VERY FINE
2726.0 - 2519.0	300.0 - 507.0	SILT AND SILTSTONE, TAN TO REDDISH, CLAYEY

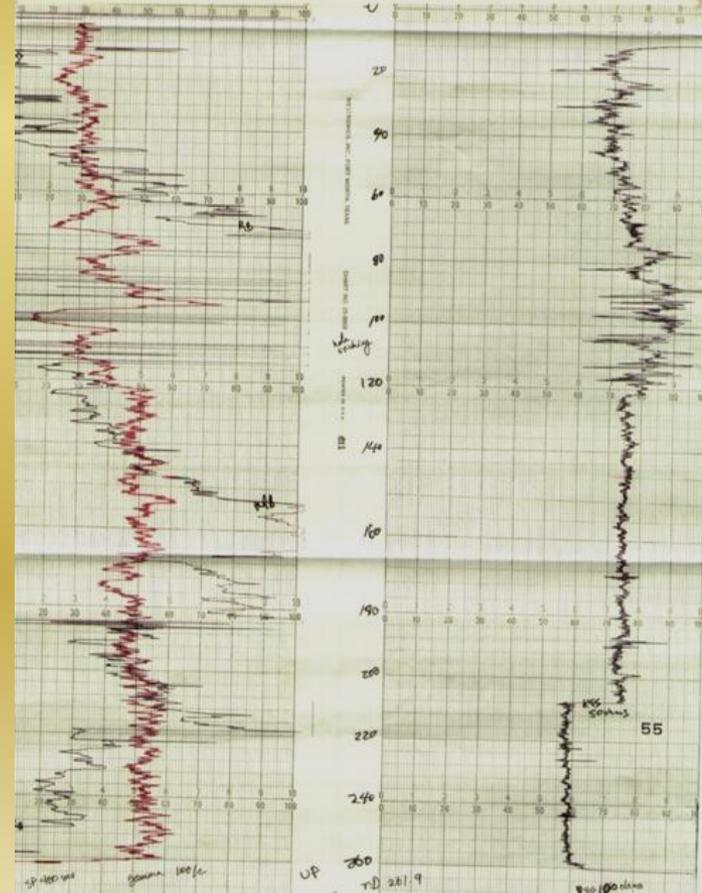


Down-hole Geophysical Logging

- Natural Gamma
- Single Point Resistance
- Spontaneous Potential
- 16 & 64 Normal Resistance
- Lateral Resistance
- Temperature
- Fluid Resistance
- Fluid Conductivity
- Caliper
- Induction

101-59-21 AAAA

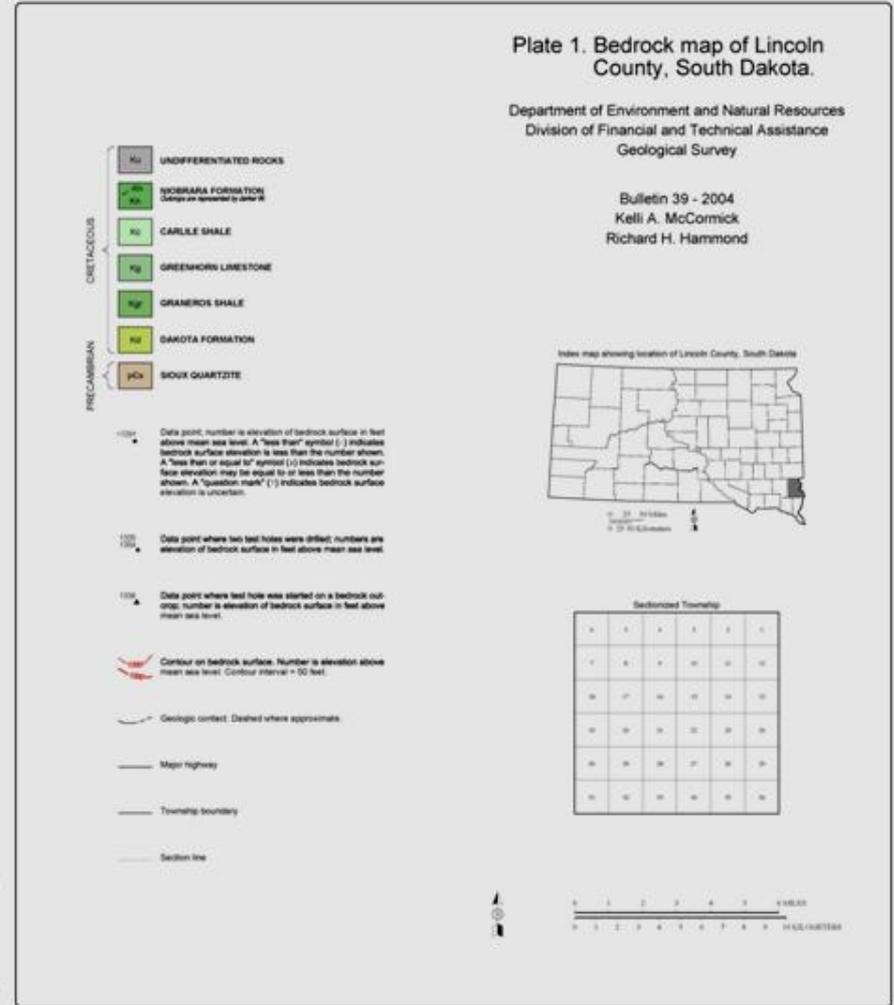
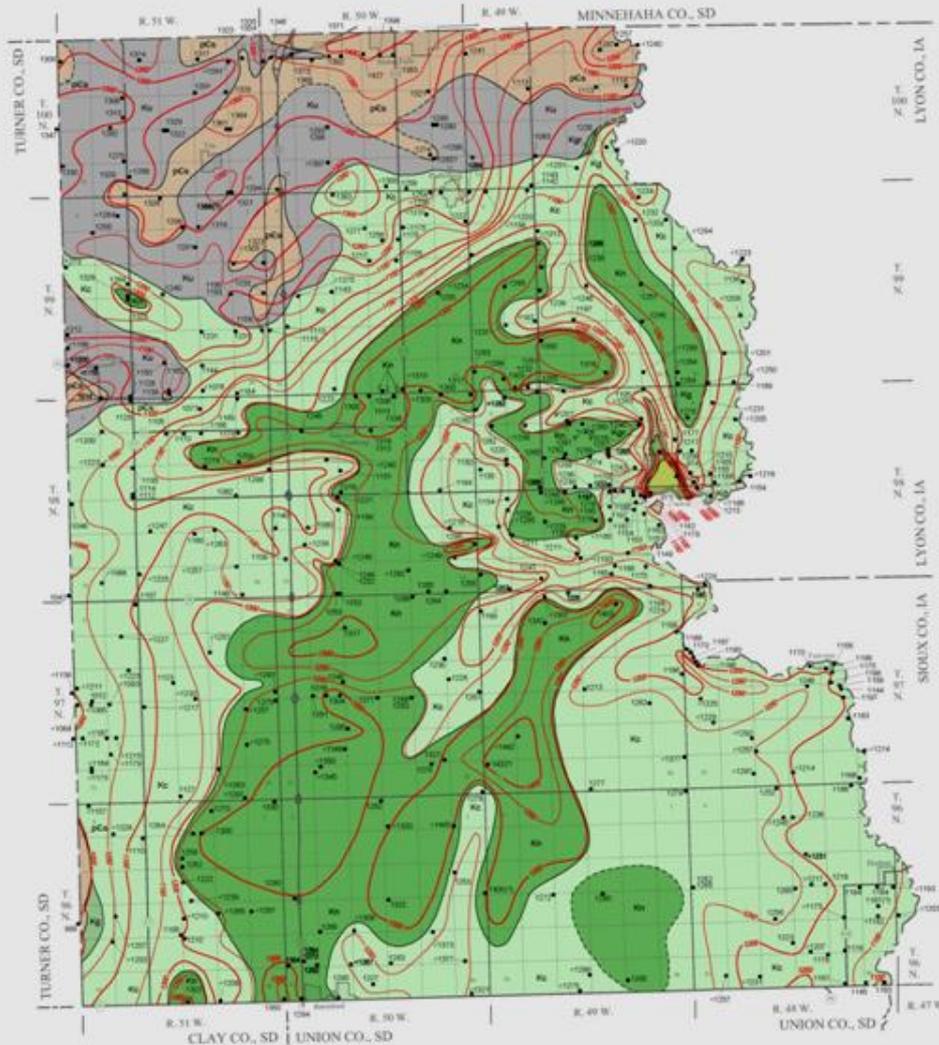
SOUTH DAKOTA GEOLOGICAL SURVEY DEPARTMENT OF NATURAL RESOURCE DEVELOPMENT			
COMPANY <u>South Dakota State Geological Survey</u>		ELEVATION _____	
LOCATION <u>N24, N14, N14, N14, T. 11N, R. 59W, Sec. 21</u>		K. B. _____	
WELL <u>DN 15-79</u>		O. L. <u>1342 - 7 1/2' top</u>	
COUNTY <u>HARDEY</u>		STATE <u>SOUTH DAKOTA</u>	
LOGGING UNIT _____		LOGGING UNIT _____	
DATE <u>6/25/79</u>	RUN No. 1	RUN No. 2	MUD
FIRST READING <u>7</u>			
LAST READING <u>26.2</u>			
FOOTAGE LOGGED <u>255</u>			
BOTTOM (DINER) <u>260</u>			
CASING (from top)			
CASING (DINER)			
CASING SIZE			
BIT SIZE <u>4 1/2"</u>			
BIT SIZE			
LOGGED BY <u>L. A. ROUSE</u>		WITNESSED BY _____	
REMARKS _____			
BOTTOM HOLE FORMATION _____			
GAMMA RAY <u>2852</u> COUNTS/SECOND			
SELF POTENTIAL <u>-400</u> MILLIVOLTS/INCH			
RESISTANCE <u>50</u> OHMS/INCH			



**A product made possible
by the drilling activities**

Lincoln County Bedrock Geology

1:100,000 scale



Available online in Adobe PDF or paper format (36 x 22 inches)

Assistance is provided to DENR's Water Rights Program, the Dept. of Transportation, the Dept. of Agriculture, and the private well drilling industry

- Installation of new observations wells (at least 1,033)
- Repair or abandonment of damaged or obsolete wells
- Plugging of flowing test borings
- Providing ground-water quality information
- Geophysical logging of test holes and wells



Statewide Ground Water Quality Monitoring Network



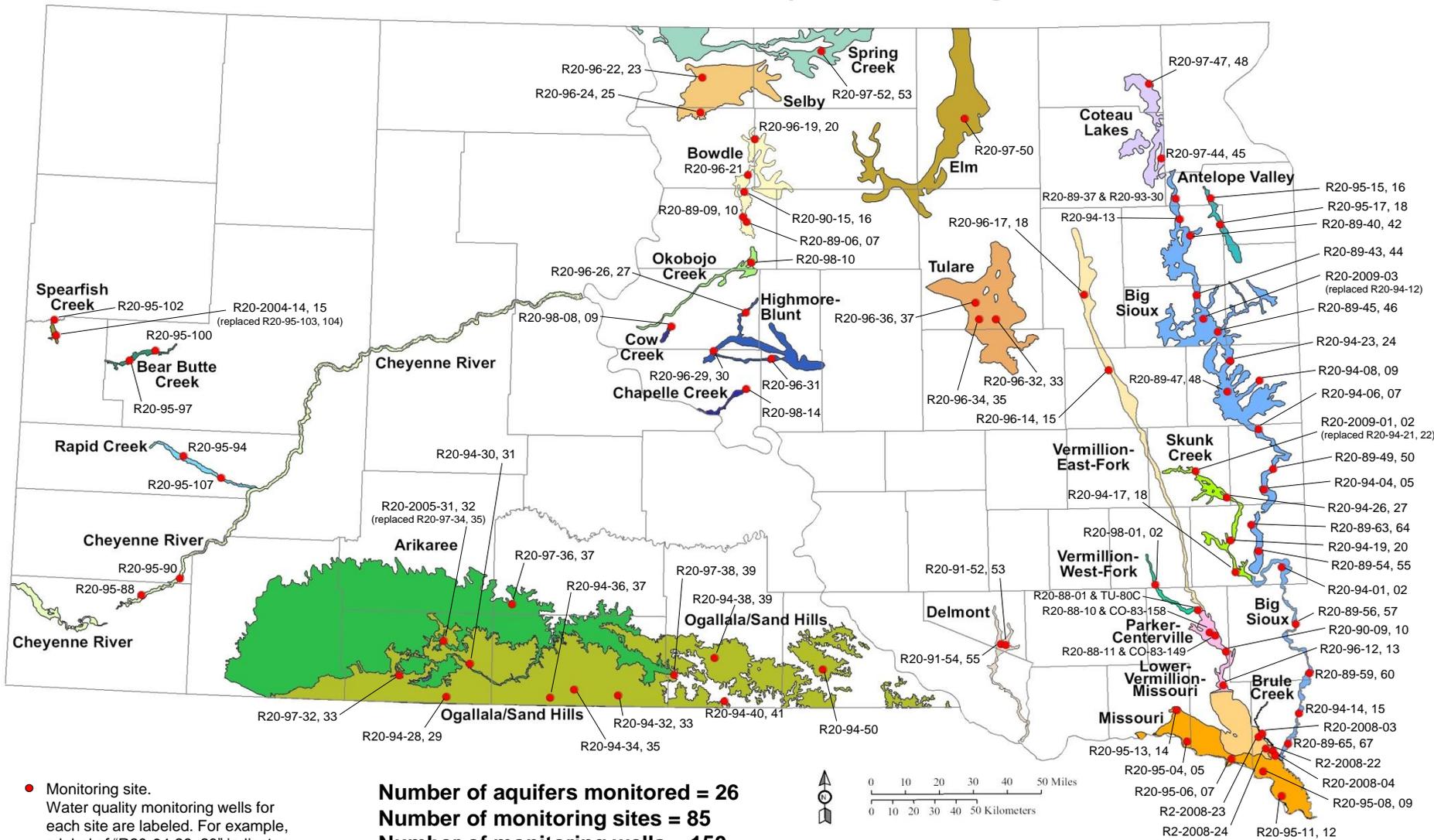
The network is monitored for:

- Common Inorganics (includes nitrate)
- Trace Metals
- Radionuclides
- Volatile Organic Compounds
- Pesticides



**A typical monitoring site
in eastern South Dakota**

Aquifers and Monitoring Sites in the Statewide Ground Water Quality Monitoring Network



● Monitoring site.
 Water quality monitoring wells for each site are labeled. For example, a label of "R20-94-28, 29" indicates that wells R20-94-28 and R20-94-29 exist at that site.

2009 sampling results

Nitrate: 26% of monitored sites had nitrate concentrations that were ≥ 10 mg/L



Pesticides: were detected at 10% of the monitored sites

Aquifer Delineation



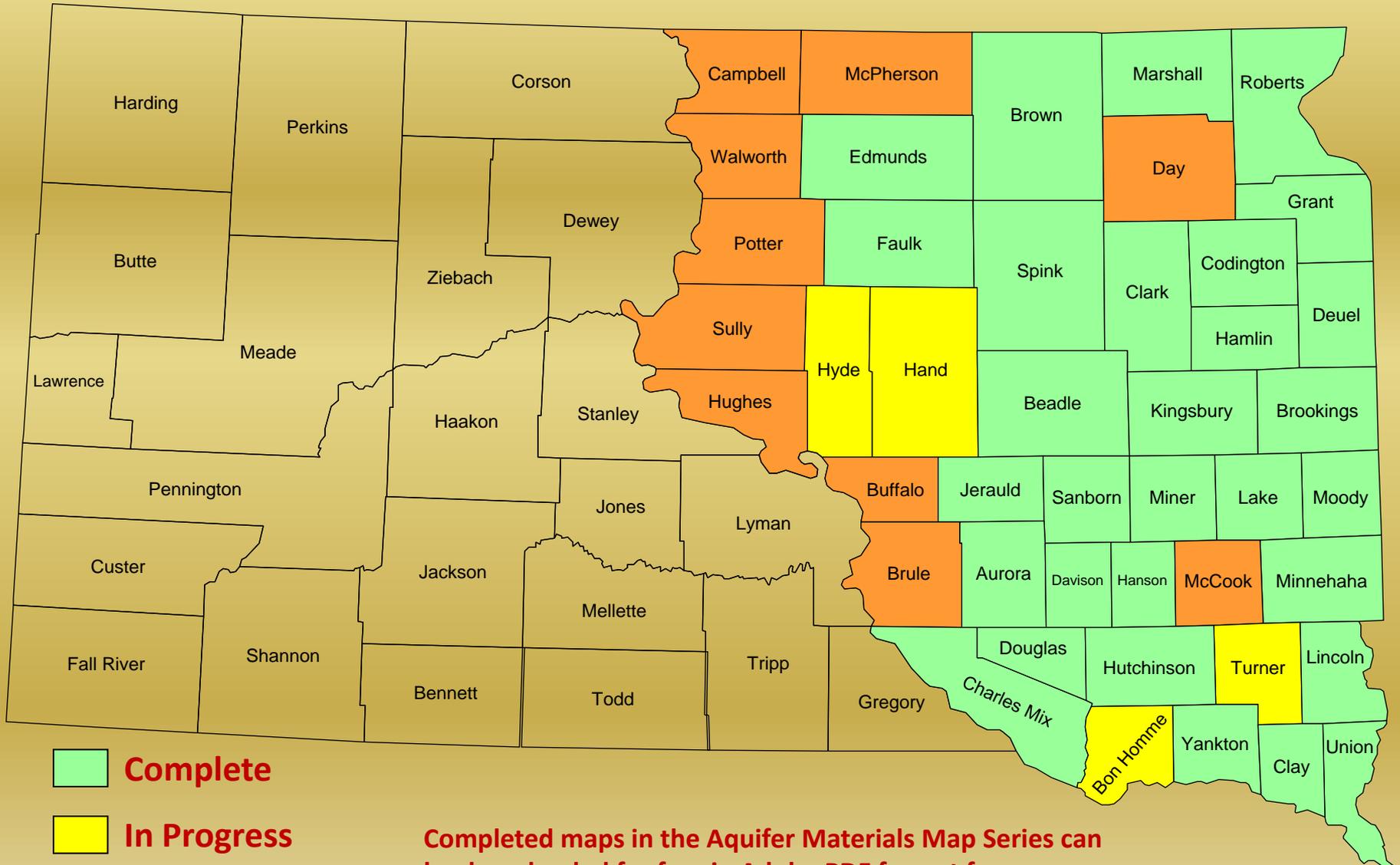
Mapping of the subsurface geology through drilling and well installation

Mapping of the surface geology



Measurement of water levels and water chemistry

Status of "Aquifer Materials" Mapping



 **Complete**

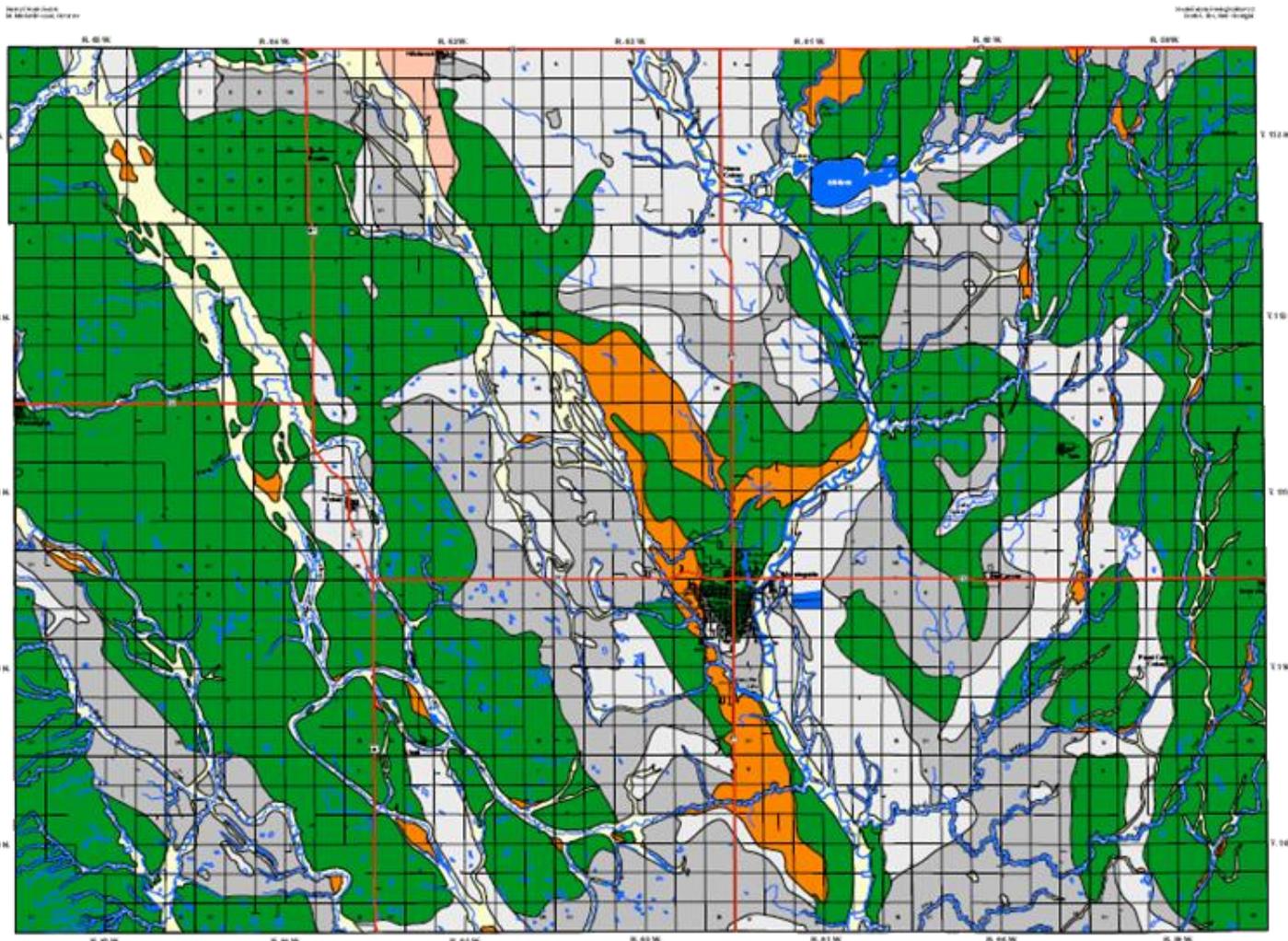
 **In Progress**

 **Planned**

Completed maps in the Aquifer Materials Map Series can be downloaded for free in Adobe PDF format from:
<http://www.sdgs.usd.edu/publications/downloads.html>

First Occurrence of Aquifer Materials in Beadle County, South Dakota

Department of Environment and Natural Resources
 Division of Financial and Technical Assistance
 Geological Survey
 Aquifer Materials Map 15
 Layne D. Schulz, 2003



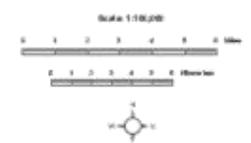
Explanation

This map is intended for use as a first occurrence map to assist in aquifer evaluation. The map shows the approximate distribution of aquifer materials. The map shows a distribution of aquifer materials. This map is not intended to be used as a guide for the location of aquifer materials. The map is not intended to be used as a guide for the location of aquifer materials. The map is not intended to be used as a guide for the location of aquifer materials.

- First occurrence is generally less than or equal to 50 feet below land surface**
 - Alluvial:** Consists of alluvial materials, such as sand and gravel, that are generally less than 50 feet below land surface.
 - Sand and Gravel:** First occurrence is generally less than 50 feet below land surface.
 - Sand and Gravel:** First occurrence is generally less than 50 feet below land surface. They are not used as a guide for the location of aquifer materials.
 - First occurrence is generally greater than 50 feet and less than or equal to 100 feet below land surface**
 - Sand and Gravel:** They are not used as a guide for the location of aquifer materials.
 - First occurrence is generally greater than 100 feet below land surface**
 - Till and Clay:** Consists of alluvial materials, such as sand and gravel, that are generally more than 100 feet below land surface.
- Major highway
— Road
— Railroad
— River or stream
● Lake
○ Spring or water table
- Beadle County, South Dakota, 1:100,000 scale

This map was prepared in the following order and published in the following order:

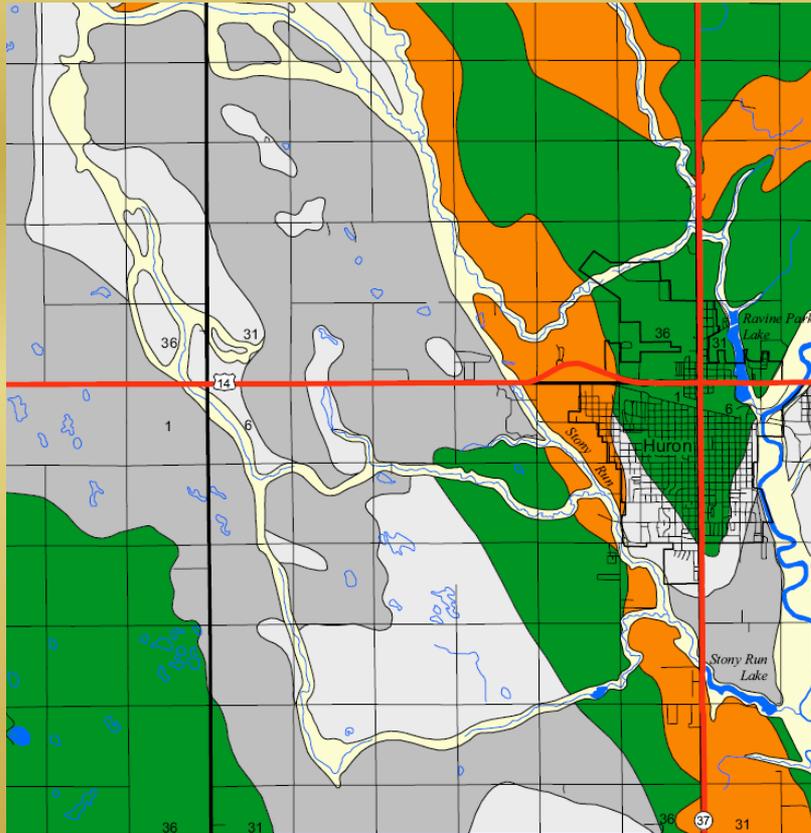
1. **Map 15:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 2. **Map 14:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 3. **Map 13:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 4. **Map 12:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 5. **Map 11:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 6. **Map 10:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 7. **Map 9:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 8. **Map 8:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 9. **Map 7:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 10. **Map 6:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 11. **Map 5:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 12. **Map 4:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 13. **Map 3:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 14. **Map 2:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.
 15. **Map 1:** First Occurrence of Aquifer Materials in Beadle County, South Dakota. Geological Survey, Department of Environment and Natural Resources, 2003.



Publication Date: May 10, 2003

Example of a map in the Aquifer Materials map series (actual size of the publication is 29 x 40 inches)

Example of map detail



Depth categories corresponding to permitting requirements

First occurrence is generally less than or equal to 50 feet below land surface



Alluvium: Consists of silt, sand, and clay; some gravel is present in most major stream valleys



Eolian Sediments: Windblown silt and fine sand; occurs at land surface



Sand and Gravel: First occurrence is generally at land surface



Sand and Gravel: First occurrence is generally below land surface. May not be uniform in depth and thickness and may be discontinuous in lateral extent.

First occurrence is generally greater than 50 feet and less than or equal to 100 feet below land surface



Sand and Gravel: May not be uniform in depth and thickness and may be discontinuous in lateral extent

First occurrence is generally greater than 100 feet below land surface



Niobrara Formation: Consists of calcareous marl and chalky limestone

Map is based on an analysis of 5,215 test hole and well logs and 7 reports on geology and ground water.

Oil & Gas Initiative

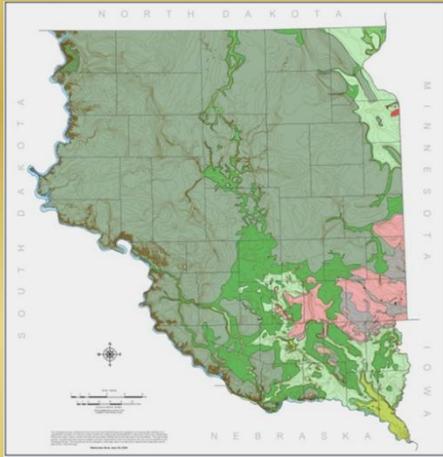


Purpose: To create, compile, and disseminate information having the potential to aid economic development in South Dakota related to the exploration and development of oil and gas resources.



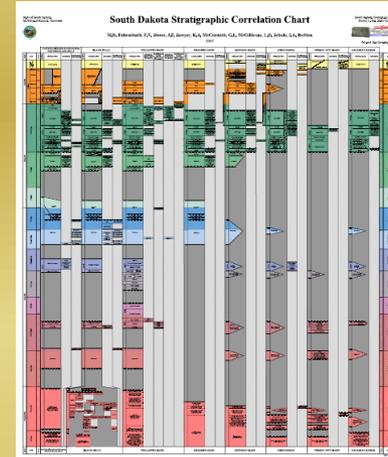
Oil & Gas Initiative Products

Bedrock
map of
eastern
South
Dakota

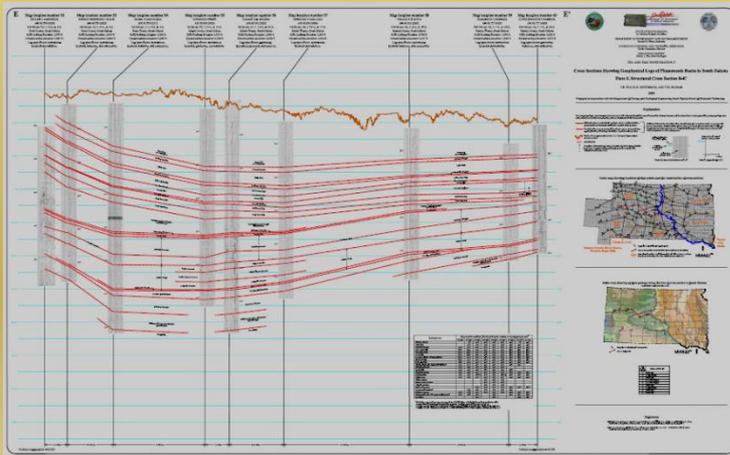


In-progress Products

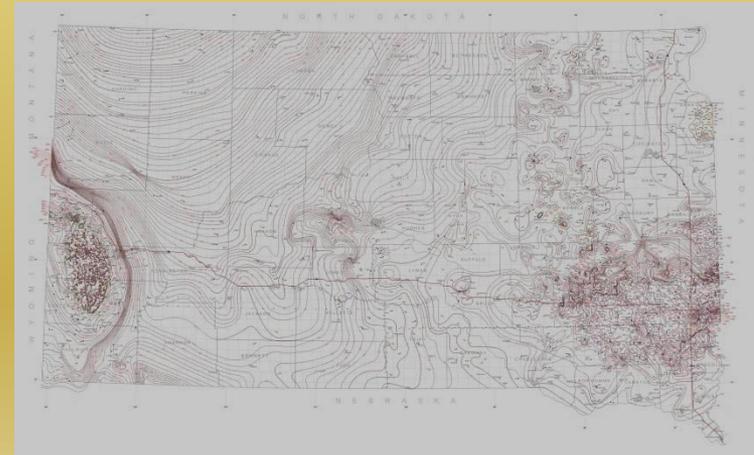
Unit elevation maps
Unit thickness maps
Reports and maps
Oil & gas well logs
Test hole logs
Geophysical logs
Online databases



Stratigraphic
correlation
chart



16 statewide cross sections



Elevation map of the Precambrian surface

Online databases

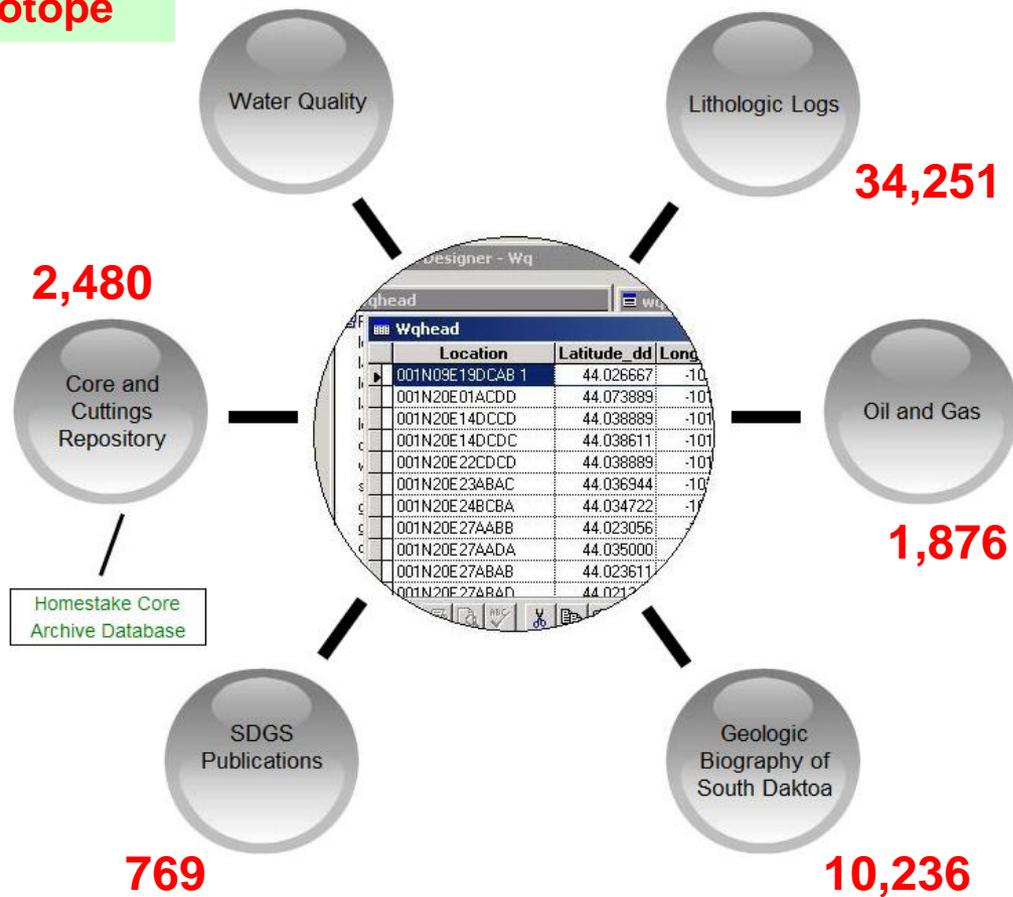


8,180 Inorganic
144 Organic
3,096 Pesticide
483 Isotope

- SD
- DEM
- Job
- SDG
- Em
- and Comments
- Directions
- Google Map
- USD Campus Map
- Site Navigation
- SDGS Home
- Publications & Maps
- Digital Base Data
- Online Databases
- Geology of SD
- Current Projects
- Web Resources
- FAQ
- About SDGS
- Events
- BHDMA

Google Custom Search

Online Databases



Homestake Core Archive

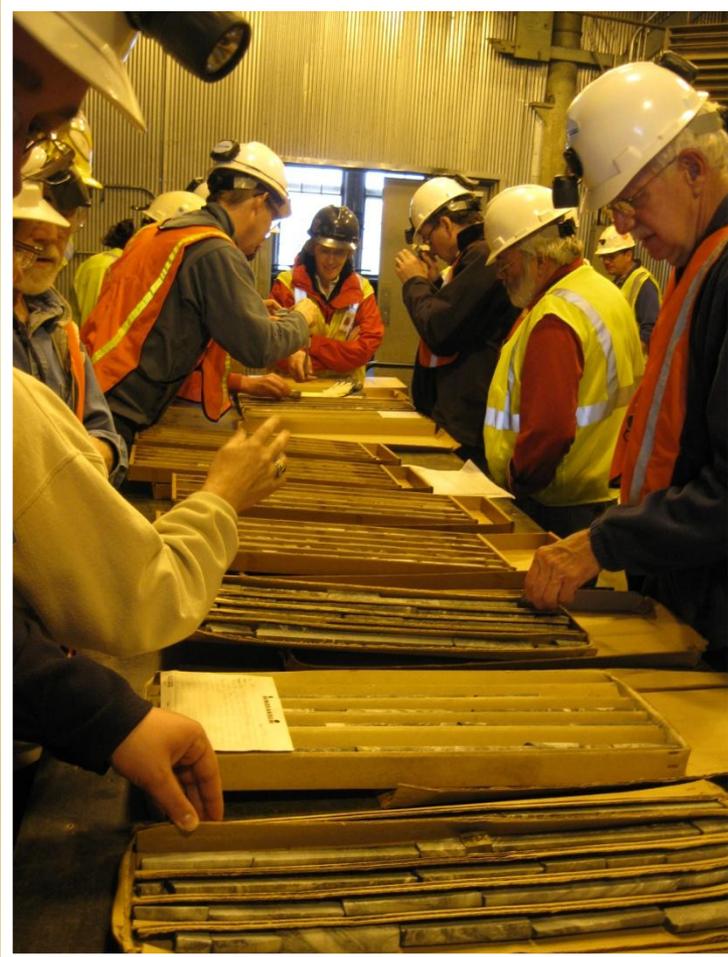
- The rock core was donated to the State of South Dakota by Homestake Mining Company as part of the mine transfer.
- The Geological Survey Program inventoried more than 39,760 boxes of core that comprise the majority of the Homestake Core Archive.
- The archive represents approximately 1,738 drill holes.
- Information about each box of core had to be recovered from various files.
- A searchable database for the core was developed for use by scientists and DUSEL personnel.



Examples of some core in the Homestake Core Archive.

Conservatively estimated to be worth about 19.8 million dollars.

Scientists use the core to understand subsurface geology and to design experiments.



Questions?

South Dakota Department of
Environment & Natural Resources



*Protecting
South Dakota's
tomorrow...today!*



1 Stop Permitting

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Land

Water

Permits/Forms

Funding

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Center, USD
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Vermillion, SD 57069
(605) 677-5227 (Telephone)
(605) 677-5895 (Fax)

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South Dakota Geological Survey

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Association](#)



State mineral: rose quartz

Source: [SD Museum of Geology](#)



State gemstone: Fairburn
agate



State fossil: triceratops

Homestake Core Archive Database - A searchable, [online database](#) of core archived at the Homestake Deep Underground Science and Engineering Laboratory is being constructed.