SOUTH DAKOTA GEOLOGICAL SURVEY

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STATE OF SOUTH DAKOTA

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GEOLOGY of the WEWELA QUADRANGLE SOUTH DAKOTA

EXPLANATION

Qds — Dune Sand
(Dune sand derived from Ash Hollow and Valentine formations.)

Qal — Alluvium
(Floodplain deposits in valleys of major streams; 2–20 ft thick.)

Qc — Colluvium
(Colluvial sand and silt derived by slump and slope-wash of Valentine and Ash Hollow formations.)

Qts — Terrace Sand
(Stream terrace deposits of sand and silt derived locally, mostly from Ash Hollow and Valentine formations; up to 13 ft thick.)

Qtg — Terrace Gravel
(Stream terrace deposits of nodular and concretionary material derived from the formations exposed locally in grain sizes mostly larger than ¼ inch; thickness up to 13 ft.)

QUATERNARY — RECENT / PLEISTOCENE

Tpa — Ash Hollow Formation
(Light-gray to olive-gray fine tuffaceous arkosic sandstone and siltstone, mostly moderately cemented by calcite and silica to plaster-like "mortar bed"; weathers light-gray; many small tubules or fossil rootlets of silica and caliche; thin sandy limestones and lenses of volcanic ash locally; thickness 35 ft.)

Tpv — Valentine Formation
(Gray to olive-green fine tuffaceous arkosic sand and silt, slightly calcareous in part, poorly consolidated; weathers to light-tan unconsolidated silt and fine sand; local lentils of olive or greenish silty clay, soft white slabby limestone that weathers light-gray, and Bijou sandstone; thickness at least 132 ft.)

Tb — Bijou Facies
(Local fine sands and silts of the Valentine formation very well cemented by siliceous or opaline material to a hard dense greenish arkosic sandstone; weathers very light-gray; conchoidal fractures; thickness 2 ft.)

UNCONFORMITY

Tob — Brule Formation
(Upper unit: medium-gray light-brown olive and pinkish bentonitic clays, silts, and fine clayey quartzose sandstones, mostly poorly indurated; small light-tan or gray siliceous and calcareous nodular concretions; at least 189 ft thick. Lower unit: sandy and silty clay, medium blush-gray; weathers light yellow-gray or olive; locally well cemented by silica to a waxey-lustered claystone with a hackly fracture; cemented zones contain small spherical brown "pea-ball" concretion; at least 40 ft thick.)

OLIGOCENE

UNCONFORMITY

Kpu — Pierre Formation
(Upper unit—probably Elk Butte member: medium brownish-gray to light-gray marine clay-shale, mostly noncalcareous, weathers yellowish-brown; local thin bands of clayey limestone with cone-in-cone structure; local thin siderite laminae weather to limonite flakes; 80–115 ft. thick. Lower unit—probably Mobridge member: dark-gray marine clay-shale, slightly calcareous, blocky; 110 ft. thick. Thickness of Pierre exposed 223 ft.)

UPPER CRETACEOUS — CRETACEOUS

TERTIARY

Contact
(dashed where approximately located)

× Gravel Pit

⚒ Quarry

X BM 2082
Bench Mark
(monument showing exact altitude above sea level)

X 2277
Spot Altitude

▲ WEWELA
Triangulation Station
(monument marking exact geographic location)

House, School, and Church

Wewela Quadrangle

Geology by S.G. Collins, 1957
Assisted by T.J. French

Vertical and horizontal control surveyed from triangulation and level lines of Federal surveys

Map drafted by J.R. Lancaster, 1958

APPROXIMATE MEAN DECLINATION, 1951

Scale 1:62 500

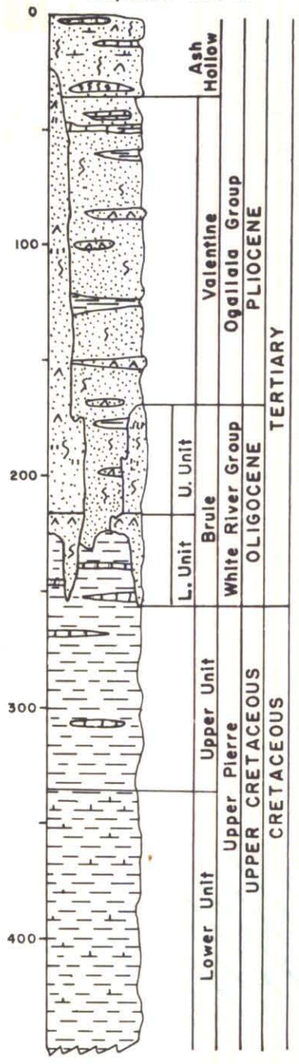
1 0 1 3 4 Miles

Vermillion, South Dakota
1958

Quadrangle Location

Tertiary Sediments

Columnar Section of Exposed Rocks



Key to Columnar Section

- Sand and Silt
- Shale
- Limestone
- Calcareous Shale
- Calcareous Sand
- Volcanic Ash
- Bentonite
- Siliceous Cement

INTRODUCTION

The Wewela quadrangle was mapped during the summer of 1957 under the supervision of Dr. A. F. Agnew, State Geologist, and Dr. R. E. Stevenson, Project Geologist, as a part of the general surface mapping of the South Dakota Geological Survey's program of studying the economic geology of the State. Robert Schoon and William Sevon generously cooperated in field and subsurface correlations. Thanks are extended to the many farmers and ranchers who furnished valuable information about the area.

The mapped area occupies about 220 square miles of the south-central part of Tripp County along the Nebraska state line.

The quadrangle lies in the Missouri Plateau section of the Great Plains physiographic province in the area of Tertiary sediments of south-central South Dakota. The main topographic features are rolling lowlands in the major drainages, flat poorly drained middle elevations, and sandstone-capped buttes with small undrained mesas at the divides. The Keyapaha River drains the southern three-fourths of the area, crossing it with a gradient of approximately 10 feet per mile. Its tributaries from the south include Timber Creek, Cottonwood Creek, and Lost Creek. The only major tributary that drains from the north is Rahn Lake Creek. The northern one-fourth of the quadrangle is very poorly drained by small tributaries to Thunder Creek (north and east of mapped area) and Dog Ear Creek (to the north); both of these streams flow northward to the White River. Dog Ear Lake (center of quadrangle) is the only natural permanent body of water, although numerous stock dams are scattered throughout the area. Local relief is generally less than 200 feet, but on the southern slope of Turtle Butte a difference in altitude of 359 feet was measured within a horizontal distance of less than two miles. The maximum relief measured in the quadrangle was 412 feet.

The villages of Wewela (pop. 32) and Millboro (pop. 26) are the only settlements, and the rural population is relatively sparse, about one family per square mile. Farming and ranching are the major occupations. The area has a well developed network of unsurfaced farm roads which, owing to the sandy nature of the soil, are passable except in extreme conditions of rain or snow. Unsurfaced roads on clays of the Pierre Formation or on parts of the White River Formations become impassable gumbo when wet. U. S. Highway 183 through Wewela is the only hard-surfaced road, and the route north from Millboro toward Winner (north of the quadrangle) is graveled.

The climate is typical of the temperate high plains. Temperature ranges from below zero to above 100 degrees. Rainfall in the area averages 18 inches yearly, according to records of U. S. Soil Conservation Service. Strong winds are the rule, prevailing from the northwest in winter and from the south in summer.

EXPOSED ROCKS

The Cretaceous Pierre Formation, a thick marine shale, underlies the entire quadrangle, and crops out at lower altitudes along major drainage valleys. In the northern and southwestern parts of the quadrangle the Pierre is overlain mostly by the continental deposits of the Oligocene White River Group and the Pliocene Ogallala Group. Quaternary deposits of silt, sand, and gravel occur on slopes and as terraces along stream valleys. Dunes have developed locally from the fine sands of the Ogallala Group.

Cretaceous System

Pierre Formation (Meek & Hayden, 1862)

The Pierre shale (Kpu), named from exposures near Ft. Pierre (90 miles north of the quadrangle), is best exposed along the slopes of the Keyapaha River valley and its major tributaries, and is present in subsurface throughout the quadrangle. Much of its outcrop area, particularly south of the Keyapaha River, is covered by recent alluvial and colluvial deposits. The maximum thickness of exposed Pierre measured in the area was 223 feet. The lithologic characteristics of the formation in the Keyapaha quadrangle differ from both the members of Searight (1937) and the units of Agnew (1957) so as to make assignments based on their criteria doubtful. However, low-lying exposures along Thunder Creek about 15 miles north of the quadrangle show a lithology identifiable as Virgin Creek (Searight, 1937). As the attitude of the bedrock is nearly horizontal in the surrounding region, the exposures in the Keyapaha quadrangle are assumed to correspond generally to the Upper Pierre unit of Agnew (1957), and to the Elk Butte and Mobridge Members of Searight (1937). Two distinct lithologic units are recognizable within the area, but scarcity of exposures of the lower unit precluded any attempt to separate it in mapping.

Lower Unit (not Agnew, 1957).--As exposed in creek bottoms in the center of sec. 27, T. 95 N., R. 76 W., and in the northwestern corner of sec. 22, T. 96 N., R. 76 W., and as reported from water wells, this unit is a dense blocky very dark-gray clay shale that splits easily along the bedding. The shale is very uniform in texture, non-bloating, slightly calcareous, and hard. It weathers to medium light-gray polygonal flakes with a dull luster. No fossils were found. This unit corresponds in stratigraphic position with the Mobridge Member of Searight (1937). At least 110 feet is present in the lower slopes of the major drainages.

Upper Unit (not Agnew, 1957).--This unit includes exposures along the upper valleys of creeks, and the southern and eastern slopes of Turtle Butte. The shale varies from medium brownish-gray to very light-gray on fresh surfaces, but where weathered is usually stained yellow-brown, buff-orange, or red-brown by iron oxides. It is finely laminar in structure, weathering to fine polygonal flakes. The shale is slightly calcareous in some places, but is predominantly free of calcite. Most exposures show bands of thin concretionary layers of ironstone (limonitic in weathered exposures, but probably originally siderite) four to ten feet apart stratigraphically. In weathering, this material normally remains on the surface as a thin residual scatter of orange to red-brown fragments half an inch to four or five inches in diameter. The unit is locally very slightly silty in the highest exposures. Thin (one to four inches) discontinuous layers of yellow-brown clayey limestone with poorly developed cone-in-cone structure are present locally. The only fossil noted was a very poorly preserved specimen of the cephalopod Baculites. This unit probably corresponds to Searight's (1937) Elk Butte Member. The upper limit of the unit is the undulatory post-Cretaceous erosion surface, which varies in elevation as much as thirty-five feet. A zone of deep weathering exists at this surface of disconformity (Interior Formation of Ward, 1922; Interior Paleosol of Schultz, and others, 1955), which is at least 60 feet thick in an exposure three miles west of the town of Wewela.

Tertiary System

The Tertiary rock units exposed in the quadrangle are the Oligocene Brule Formation, filling the lows of the post-Cretaceous unconformity surface at the middle elevations, and unconformably overlain by the Pliocene Ogallala Group, which forms the sandy plains and buttes of the uplands. Both units consist of continental deposits of fluviatile and lacustrine origin, derived from the west.

Oligocene Series. Brule Formation (Darton, 1899)

The Brule Formation (Tob), named for the Brule Indians of southwestern South Dakota, is the only representative of the White River Group (Meek & Hayden, 1858) mapped in the Wewela quadrangle. About 50 miles northwest, in the White River quadrangle (Agnew, 1957), both the Brule and the underlying Chadron Formations were recognized. As much as 15 feet of sediments with the lithologic characteristics of the Chadron Formation are also found in the Keyapaha quadrangle (Schoon, Sevon, 1958), which adjoins the Wewela on the west, and in the Witten quadrangle (Schoon, 1958), which adjoins the Wewela on the northwest. However, as paleontologic evidence is lacking and the lithologic characteristics of the Chadron Formation are either absent in the Wewela quadrangle or so poorly developed as to escape notice, all the Oligocene sediments are arbitrarily assigned to the Brule Formation, which is divided into two lithologic units.

Lower Unit.-- The lower unit is well-exposed in its full thickness only in the gullies draining the western end of Turtle Butte (sec. 8, T. 95 N., R. 76 W.), and also crops out extensively along the lower Keyapaha River valley in the western half of the area. The unit consists mostly of silty and sandy clay in which the sand is almost pure quartz grains, medium to fine in size, and angular to subangular. The clay matrix, where unweathered, imparts a medium bluish-gray color to the unit. Locally, secondary silica cements the mixture into a well indurated claystone that is resistant to weathering. These silicified zones, where exposed, commonly are very light yellow-gray or light-olive, and show bright orange or brown limonite stains along small fractures. The silicified claystone exhibits a dull waxey luster on freshly broken surfaces, and a very rough or hackly fracture. Where the silt content is high, the fracture is less typical. The silicified zones commonly contain small spherical brown concretions two to five mm. in diameter. The unit resists weathering where well cemented, and develops topographically into a discontinuous scarp that supports terrace-like flats over considerable areas, especially along the Keyapaha valley in the western part of the quadrangle. A 40-foot section of this unit was measured at the western end of Turtle Butte, and a 27-foot thickness was determined by a drill hole penetrating the underlying Pierre shale in the SE¼ sec. 9, T. 95 N., R. 77 W.

Upper Unit.--The upper unit is exceedingly variable in composition both vertically and laterally. It is predominantly a succession of more or less bentonitic clays, silts, and clayey fine quartzose sandstones that are locally slightly cemented by calcite or silica, but are mostly poorly indurated. The color ranges from medium-gray to light-brownish, olive, greenish, and pink. In the one complete section exposed at the western end of Turtle Butte the grayish and brownish silts and clayey quartzose sandstones occur in the lower part, with 44 feet of light-pink poorly lithified siltstone that weathers to a hummocky topography, at the top. Elsewhere this pink silt is quite well indurated by secondary silica. In some areas it lies directly upon the Cretaceous. Small light-tan or gray irregular and nodular concretions, both calcareous and siliceous, appear in most of the silt and clay bodies.

The Brule Formation as a whole, and especially the upper unit, is extremely variable in thickness owing to the deep post-Oligocene disconformity at the contact with the overlying Ogallala Group. The thickest continuous section of the upper unit of the Brule measured was 128 feet, but 189 feet was spliced together from exposures within a lateral distance of about five miles. The Brule Formation ranges up to a maximum thickness of 235 feet. No fossils were found.

Pliocene Series. Ogallala Group (Darton, 1898)

The Ogallala Group was named from exposures near Ogallala Station in western Nebraska (about 170 miles southwest of the Wewela quadrangle). It is represented in this quadrangle by the Valentine Formation, the Ash Hollow Formation, and the Bijou facies.

Valentine Formation (Barbour and Cook, 1917).--The Valentine Formation (Tpv), named from exposures east of the town of Valentine, Nebraska (about 35 miles southwest of the Wewela quadrangle), lies on the Pierre and Brule Formations, filling the depressions in the post-Oligocene surface and covering all but the highest occurrences of the Brule. Good exposures of the Valentine are few. It is poorly cemented, so slumps and washes easily, giving rise to flat topography (except where dune development is extensive), with poor drainage. Where the clay beds of the underlying formations occur near the surface, the water table is usually perched, which causes swampy areas. The Valentine consists primarily of fine poorly consolidated gray to olive-green arkosic (W. H. Taft, personal communication, 1958) sand and silt. The lower part shows considerable variation, containing local interbedded lentils of clay, limestone, and siliceous arkosic sandstone. Exposed at the west end of Turtle Butte are two layers of soft to hard finely crystalline white limestone that weathers to a creamy or light-gray color, and has a slabby fracture. These beds are three and four feet thick, are separated by four feet of tuffaceous clay and silt, and overlie 13 feet of limey tuffaceous silt and fine sand. These limestones appear to be of small areal extent. Many lenses of olive or greenish-gray clay occur throughout the formation, varying in thickness from fractions of an inch to several feet. None appear to persist laterally for more than a mile, except for one layer in sec. 31, T. 95 N., R. 76 W., about four miles southwest of Turtle Butte, which was traced several miles. This layer is a compact partly calcareous greenish waxey clay five to seven feet thick, which occurs about 35 feet below the lowest exposure of the Ash Hollow "mortar beds." A more typical exposure is present along U. S. Highway 183, three miles north of Wewela, where a very local three-foot layer of olive-drab or greenish-gray silty clay occurs.

The upper part of the Valentine Formation is mostly a blocky poorly cemented well-sorted fine- to very-fine arkosic sand, light olive-green in color where freshly exposed. Locally it is slightly to moderately calcareous. Small irregular siliceous and calcareous concretions appear throughout the formation. Irregular lentils and isolated boulders of the Bijou siliceous sandstone are also found.

Accurate thicknesses were almost impossible to determine, owing to poor exposures of the lower part. Thicknesses of 132 feet and 108 feet were measured at the western end of Turtle Butte and in the section on U. S. Highway 183 north of Wewela, but the maximum thickness may be somewhat greater. No fossils were found in place, although scattered bone fragments were noted at several locations.

Ash Hollow Formation (Lugn, 1939).--The Ash Hollow Formation (Tpa) was named from exposures in Ash Hollow Canyon, near Lewellen, Nebraska (about 170 miles southwest of the quadrangle). In the Wewela quadrangle the Ash Hollow lies conformably on the Valentine Formation, and unconformably on the Brule Formation where the Valentine is absent, forming the caprock of the flat, undrained divides at the highest elevations. It consists of fine tuffaceous arkosic (W. H. Taft, personal communication, 1958) sandstone and siltstone, moderately cemented in most places by calcite and silica to a plaster-like appearance, which has earned the cemented zones the term "mortar beds." The sandstone is a very light olive-gray to light-gray on fresh surfaces, but on weathered surfaces it is normally discolored to a medium-gray by lichens. Many veinlets and tubules of silica and caliche, possibly the remains of plant rootlets, occur in the sandstone, causing it to weather to a rough and pitted or characteristic "boxwork" surface. The Ash Hollow is fairly uniform in composition, but thin (one- to four-inch) layers of soft sandy limestone were observed locally. Near Turtle Butte a layer of dirty to nearly pure volcanic ash of variable thickness (up to three feet) is present near the base of the formation. The Ash Hollow carries a characteristic fossil flora of hackberry seeds, and Turtle Butte was named for the fossil turtles found there by early explorers. Teeth and bones of the following Pliocene vertebrates were found: camel, rhinoceros, gomphotherids, and the horses Pliohippus sp. and Nannippus sp. (Identifications by Morton Green, South Dakota School of Mines and Technology). The average thickness of the formation in the quadrangle is about 35 feet, with a variation of less than 10 feet among measured section.

Bijou facies (Stevenson, 1953).--The Bijou facies (Tb) was named from outcrops in the Bijou Hills (about 40 miles northeast of the quadrangle). As redescribed by Stevenson (1958), it consists of fine sand and silt with some clay pebbles, cemented by siliceous or opaline material to a hard dense greenish sandstone. In the Wewela quadrangle the Bijou is a facies of the Valentine Formation. The sandstone occurs mostly as boulders and small lenses disseminated widely in the Valentine sands, and it commonly does not constitute a mappable unit. Locally, however, lenses of considerable extent occur, and as the material is very resistant to erosion, these lenses weather to sharply defined topographic highs or small mesas. The writer has mapped the Bijou only where it exhibits this characteristic topography. This sandstone consists of the fine silt and sand of the Valentine Formation exceedingly well lithified by greenish secondary silica cement (opal or chalcedony). The Bijou sandstone weathers light-gray, and breaks into conchoidal fragments where exposed. It is present in lenticular masses as much as two feet in thickness.

SURFICIAL DEPOSITS

Quaternary deposits in the quadrangle consist of alluvial and colluvial silt, sand, and gravel. These consist of material reworked from the rock units exposed locally. The coarser size fraction is mostly the relatively soft calcareous and siliceous concretionary nodules of the Ogallala Group, silica-cemented material from the Brule Formation, and limonite flakes from the Pierre shale. The silt and sand is derived from the Ogallala and Brule sediments, and consists of more than 90 percent quartz.

Older stream terraces occur at random altitudes, normally less than 100 feet above the present streams. The deposits are designated Terrace sand (Qts) where they consist mostly of silt and sand, or Terrace gravel (Qtg) where they consist mostly of grains larger than a quarter of an inch in diameter. These deposits range up to 13 feet in thickness.

Colluvial and alluvial sands, derived by slumping and slopewash from the Ogallala sediments, cover the middle and lower slopes in many places, and are mapped as Colluvium (Qc).

Sandy deposits 2 to 20 feet thick form floodplains in the valleys of the Keyapaha River and its major tributaries. These are designated Alluvium (Qal).

Areas where Dunes (Qds) are extensively developed are mapped, although minor dune topography is a characteristic of the Ogallala Group as a whole.

SUBSURFACE ROCKS

Subsurface information was obtained from the General Crude #1 Rural Credit oil test in the NW¼SE¼ sec. 33, T. 95 N., R. 77 W., drilled in 1956. A sample study of the well was made by the writer in 1957 for the files of the State Geological Survey. Formation tops were based on the sample study and electric log analysis, although correlation is partly from company records (table 1).

Table 1.--Summary log of General Crude #1 Rural Credit oil test

Era	Period	Formation	Thickness	Character of Rocks
Quaternary and Cenozoic	Pleistocene and Tertiary	Ogallala (?) and White River	308'	Fine to medium angular quartz sand with basal conglomerate.
Mesozoic	Cretaceous	Pierre	834'	Dark marine clay-shale, in part calcareous.
		Niobrara	220'	Calcareous medium dark-gray, white-speckled clay-shale, chalk, and crystalline dolomite.
		Carlile	176'	
		Greenhorn	50'	White to gray sugary limestone.
		Graneros	158'	Shaly sandstone and limestone.
		Newcastle	112'	Brown dolomite and gray shale.
		Skull Creek	72'	Sandstone and gray silty shale.
		Fall River	88'	Silvery gray fine quartz sandstone and silty shale.
	Jurassic	Lakota and Upper Jurassic	468'	Dark shale and fine angular sandstone.
		Minnekahta	90'	White to pale red limestone.
Paleozoic	Pennsylvanian	Minnelusa (?)	217'	Coarse angular quartz sand and red shale.
	Ordovician	Red River	68'	White limey fine-grained dolomite.
Precambrian			---	Dark biotite granite.

STRUCTURAL GEOLOGY

The bedrock in the quadrangle is nearly flat-lying, as it rests on a broad structural high separating the Dakota (Williston) basin to the north from the Central Nebraska basin to the southeast. The only useful datum plane exposed at the surface is the Valentine-Ash Hollow contact, and dips measured on this plane were negligible. Electric logs of three wells drilled by the General Crude Oil Company, the #1 Rural Credit (southwestern part of quadrangle), the #1 Assman (four miles northwest of the quadrangle), and the #1 Shippy (half a mile east of the quadrangle), provide subsurface structural data. The Greenhorn Formation dips 3 feet per mile N. 85° W., and the Precambrian unconformity surface dips 7 feet per mile S. 57° W.

ECONOMIC GEOLOGY

Stone, gravel, sand, volcanic ash, and ground water are the only mineral resources so far exploited in the quadrangle, although clay, oil and gas, and uranium minerals are potential economic deposits.

Stone.--The Bijou facies contains sandstone of a very durable character, which is excellent as crushed rock for concrete or bituminous aggregate in construction or road surfacing. The sandstone has also been used locally as a building stone for farm and ranch buildings. The silica-cemented siltstone and claystone of the Brule Formation has been used as surfacing material on rural roads, although its quality is not good for this purpose.

Gravel.--The Quaternary gravels in the quadrangle are of uniformly poor quality, owing to their high content of silt, calcareous material, and relatively soft pebbles of sandstone. These gravels have been used locally for road surfacing, but are better suited for use as sub-base material in road work.

Sand.--Most of the sand available in the area is too fine to be used successfully in concrete mix, but some coarser deposits are present in the terraces along the Keyapaha River. Fine sand of high purity, suitable as plaster sand, is present almost everywhere in the areas covered by the Ogallala Group.

Volcanic Ash.--Large quantities of this excellent abrasive material are present in the Valentine Formation and near the base of the Ash Hollow Formation. The purity of the deposits is variable, but is locally high. The ash has been quarried commercially in the Turtle Butte area (SE¼NW¼SE¼ sec. 9, T. 95 N., R. 76 W.).

Ground Water.--Ground water of good quality in sufficient quanitites for household and livestock needs is available throughout the area underlain by the Brule and Valentine Formations, and also in the areas of the Ash Hollow Formation, although deeper wells are required to reach it in the Ash Hollow (80 to 120 feet). Water is difficult to locate in the Pierre shale, and is very hard. Variable quantities and qualities of water can be found at shallow depths in some of the terrace deposits along the major drainages. Partial chemical analysis of typical samples taken from wells within the quadrangle are depicted below (table 2).

Table 2.--Chemical analysis of water from selected wells in the Wewela quadrangle.

Water Source	Parts Per Million										Specific Conductance Micromhos
	Fe	Mg	Na	K	Ca	SO_4	Cl	NO_3	Total Solids	Hardness as $CaCO_3$	
Tpv (1,2)	0.0	15	8	9	99	35	14	23	497	294	710
Tow (3)	0.0	10	21	6	106	55	20	32	634	305	905
Kp (4)	0.0	12	72	16	44	60	11	0	518	161	740

Analysis by Dr. Oscar Olson, Station Biochemistry, South Dakota Agricultural Experiment Station, State College, Brookings, South Dakota, 1957.
Location of samples:
1. Sec. 13, T. 96 N., R. 76 W.)
2. Sec. 28, T. 95 N., R. 77 W.) (analyses averaged)
3. Sec. 17, T. 96 N., R. 75 W.
4. Sec. 33, T. 96 N., R. 76 W.

Clay suitable for brick manufacture is plentiful in the Pierre Formation, and in the Brule.

Oil, gas, and uranium may possibly occur within the area, as they are found elsewhere in the Great Plains area in the rock units represented here; however, no evidence was found in the Wewela quadrangle.

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