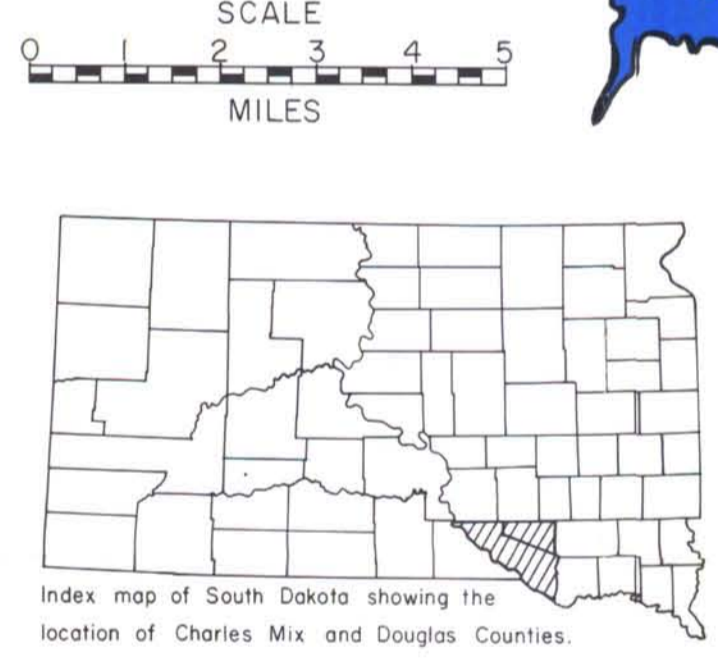


EXPLANATION

- Alluvium**—Black humic silty clay, stratified, sand and gravel; 0 to 15 feet thick along minor streams; up to 150 feet thick along Missouri River.
- Colluvium**—Yellow to dark-gray silty clay or silt, poorly stratified; 0 to 10 feet thick.
- Loess**—Yellow silt or sandy silt, calcareous, 0 to 10 feet thick.
- Terrace**—Flat or sloping terrace along Missouri River, locally underlain with alluvium, till, outwash or loess; 0 to 90 feet thick.
- Outwash terrace**—Sand and gravel outwash terrace, some silty fine sand; iron-carbonate cementing common; 0 to 30 feet thick.
- Valley outwash**—Predominantly sand and gravel with some fine sand or silt; flat to nearly flat, 0 to 30 feet thick.
- Collapsed outwash**—Collapsed outwash deposits of variable texture; may contain some till. Qwloc I—Yellow silt and sandy silt, calcareous, local relief 10 to 20 feet; 0 to 15 feet thick. Qwloc II—Fine to coarse sand, relief 10 to 20 feet, 0 to 15 feet thick. Qwloc III—Fine to coarse sand and gravel, maximum local relief 30 feet; 0 to 30 feet thick.
- Undifferentiated outwash**—Undifferentiated bodies of outwash material; Qwluo I—Mostly silt, clayey silt, and fine sand; 0 to 10 feet thick; Qwluo II—Coarse sand or sand and gravel; mostly ice contact origin, 0 to 20 feet thick.
- Till (ground moraine)**—Boulder-clay till, calcareous, oxidized portion yellow-brown to reddish-brown; unoxidized dark olive-gray to black; Qwtg I—low relief; Qwtg II—high relief.
- Till (stagnation drift)**—Boulder-clay till, calcareous; varies locally from clay rich till to sandy gravelly till; Qwtls I—Low relief; Qwtls II—High relief; Qwtls III—Stagnation drift characterized by oblong to ovate disintegration ridges composed of till.
- Till (glacially modified bedrock)**—Glacially modified stream-eroded bedrock topography, till generally less than 50 feet thick; bedrock outcrops common; local relief highly variable, integrated drainage.
- Till (end moraine)**—Boulder-clay till, calcareous; oxidized portion yellow to reddish brown, unoxidized portion dark-gray to black; forms discontinuous elongate ridge up to 15 feet high.

- Herrick gravel**—Gravelly medium to coarse sand, stratified, quartz and feldspar dominant; pinkish color due to feldspar content; as much as 80 feet thick; western derived fluvial deposit; fossiliferous.
- Ogallala undifferentiated**—Light greenish-brown clay, silty clay and loose fine sand; a green massive orthoquartzite conglomerate as much as 6 feet thick locally present; sparsely fossiliferous; 40 feet thick.
- Fort Randall Formation**—Light brown to pink siltstones and clay; 5 foot zone of barite crystals or "rock rose" zone about 50 feet above base; sparsely fossiliferous; 60 to 120 feet thick.
- Pierre Shale undifferentiated**—Light gray to black marine claystone and shale; locally calcareous; marl and chalky zones occur throughout; manganese and iron-carbonate concretions common; bentonitic; about 600 feet thick.
- Niobrara Marl**—Light gray to dark bluish-gray limestone and marl; weathers to dark yellowish-orange; microfossils include *Ostrea* and *Inoceramus*; microfossils predominantly Foraminifera; about 150 feet thick.



6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Sectionalized Township

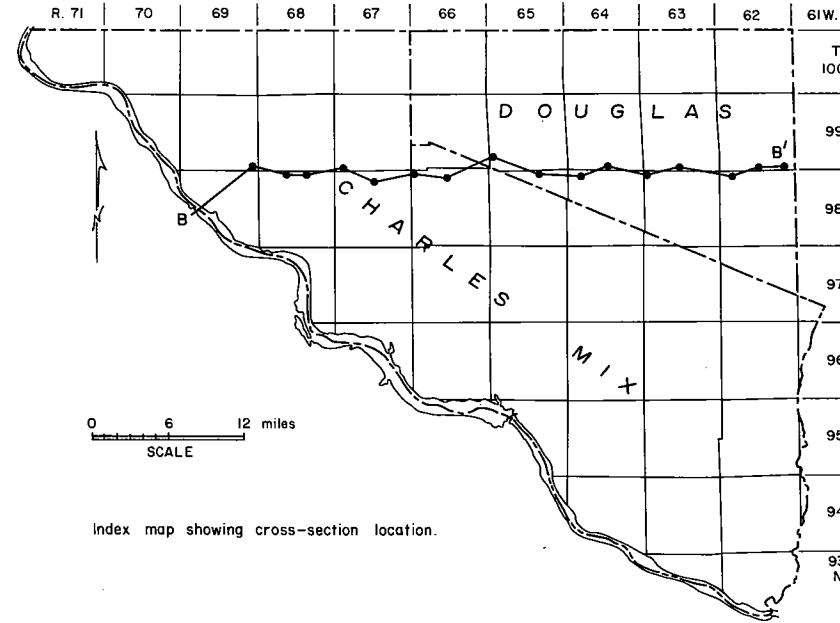
Geology by
Lynn S. Hedges, 1967-68-69
Basemaps from South Dakota
Department of Highways.
General Highway Map of Charles Mix
County 1959, and Douglas County, 1968.
drafted by Rich Markus

MAP SHOWING GEOLOGY AND LANDFORMS OF CHARLES MIX AND DOUGLAS COUNTIES, SOUTH DAKOTA.

SOUTH DAKOTA GEOLOGICAL SURVEY
BULLETIN 22
PLATE 1

- Geologic Contact dashed where approximately located
- Meltwater channel
- Intermittent lake or slough
- Lake
- Ice-contact face
- Intermittent stream
- Gravel pit

Plate 2. Stratigraphic section B-B'



RECENT	Qal-alluvium	
QUATERNARY	Qwloc-collapsed outwash	
	Qwlou-undifferentiated outwash	
	Qwlt-till	may include older deposits where undifferentiated.
	Qwlo-outwash (buried)	
PLEISTOCENE	Qia-alluvium	
	Qit-till	
	Qio-outwash	
KANSAN	Qkw-fluvial deposit; Wagner Formation	
	Qkt-till	
MIOCENE-PLIO	Qko-outwash	
	Tpo-Ogallala undifferentiated	
	Tpf-Fort Randall Formation	
UPPER CRETACEOUS	Kp-Pierre Shale	
	Kn-Niobrara Marl	
	Kc-Carlile Shale	
	Kcc-Codell sandstone member; Carlile Shale	

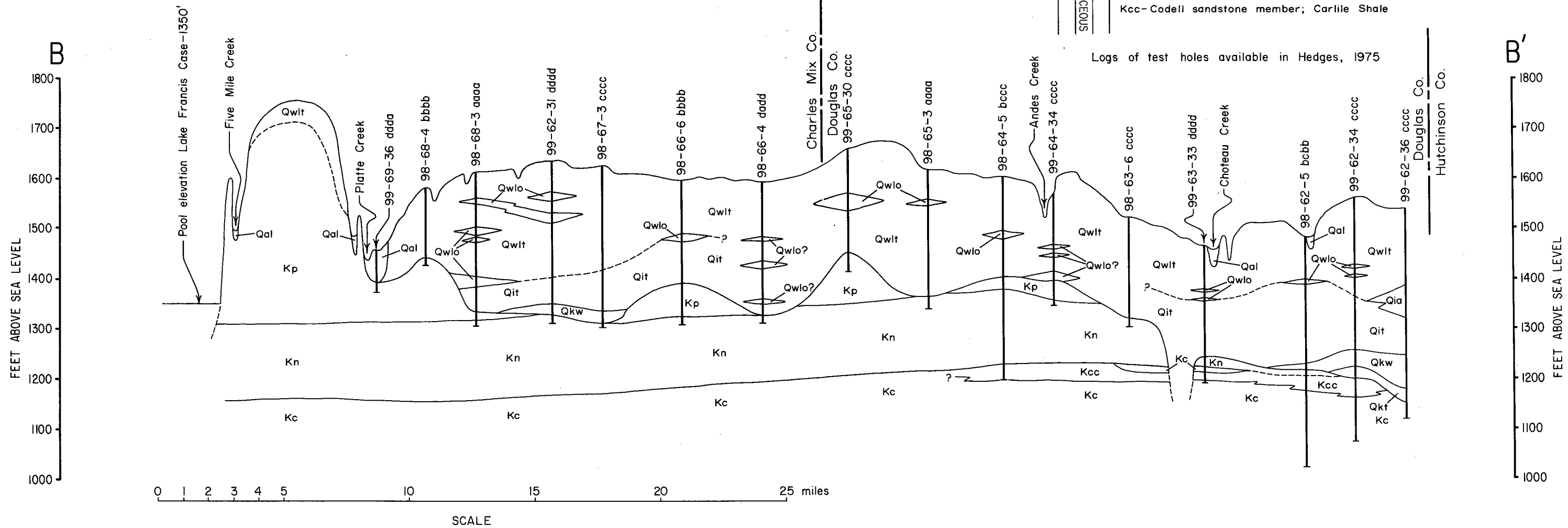
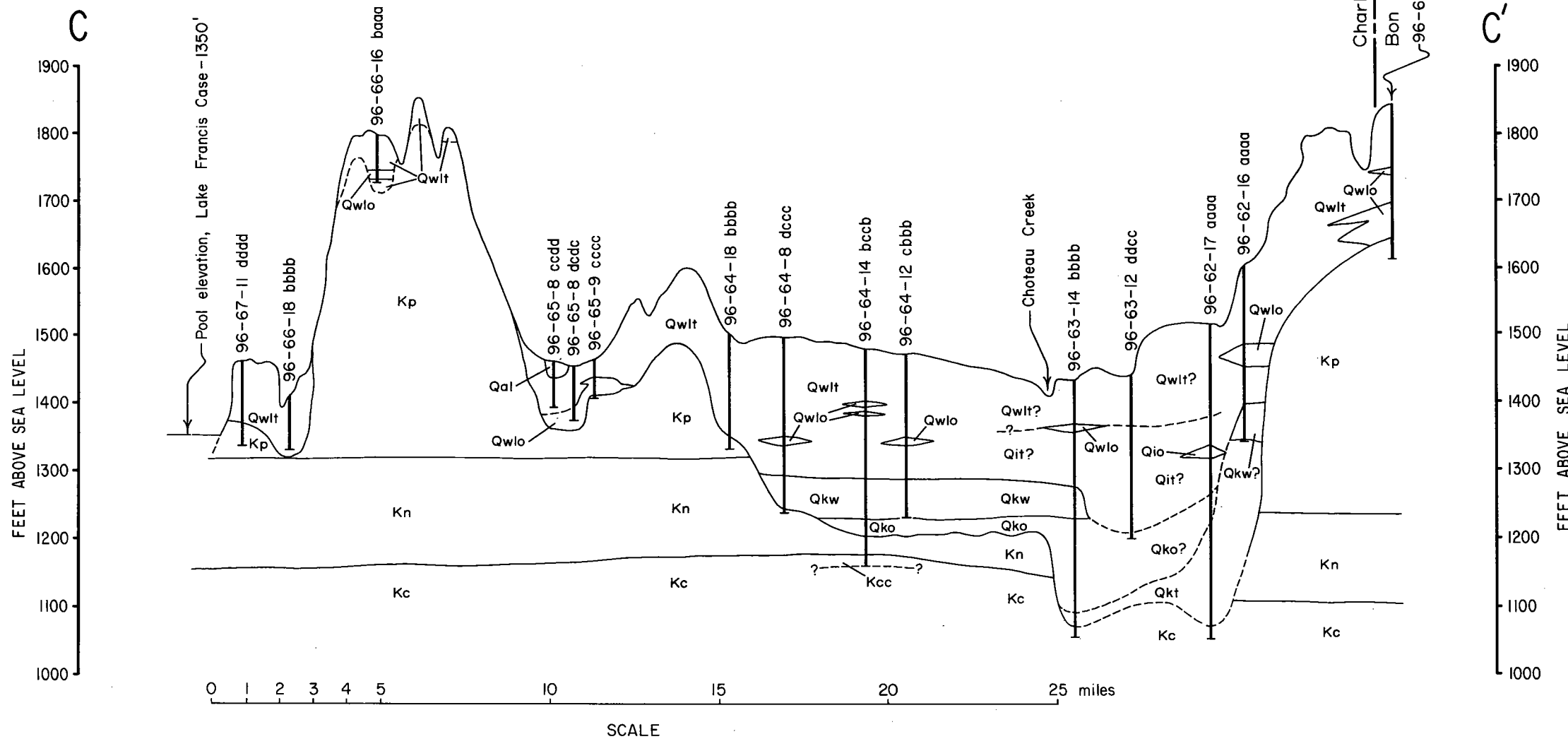
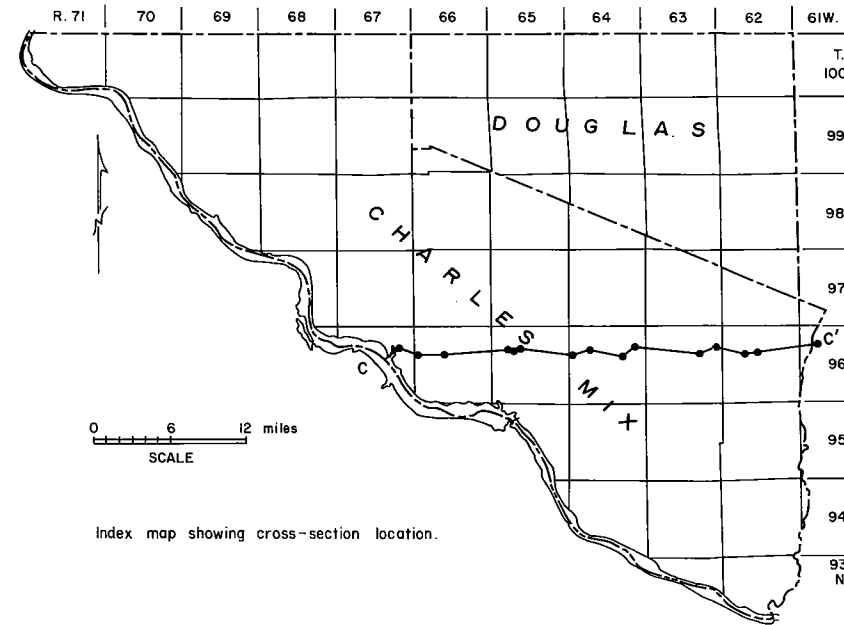


Plate 3. Stratigraphic section C-C'



RECENT	Qal-alluvium
LATE WISCONSIN	Qwloc-collapsed outwash
	Qwlou-undifferentiated outwash
	Qwit-till } may include older deposits where undifferentiated.
QUATERNARY	Qwlo-outwash (buried)
	Qia-alluvium
PLEISTOCENE	Qit-till
	Qio-outwash
KANSAN	Qkw-fluvial deposit; Wagner Formation
	Qkt-till
MIOCENE-PLIO	Qko-outwash
	Tpo-Ogallala undifferentiated
TERTIARY	Tpf-Fort Randall Formation
	Kp-Pierre Shale
UPPER CRETACEOUS	Kn-Niobrara Marl
	Kc-Carlile Shale
	Kcc-Codell sandstone member; Carlile Shale

Logs of test holes available in Hedges, 1975

RECENT	Qal-alluvium	
	Qwloc-collapsed outwash	
LATE WISCONSIN	Qwlou-undifferentiated outwash	
	Qwlt-till	
	Qwlo-outwash (buried)	may include older deposits where undifferentiated.
	Qia-alluvium	
PLEISTOCENE	Qit-till	
	Qio-outwash	
	Qkw-fluvial deposit; Wagner Formation	
KANSAN	Qkt-till	
	Qko-outwash	
MIOCENE-PLIO	Tpo-Ogallala undifferentiated	
	Tpf-Fort Randall Formation	
TERTIARY CRETACEOUS	Kp-Pierre Shale	
	Kn-Niobrara Marl	
	Kc-Carlile Shale	
	Kcc-Codell sandstone member; Carlile Shale	

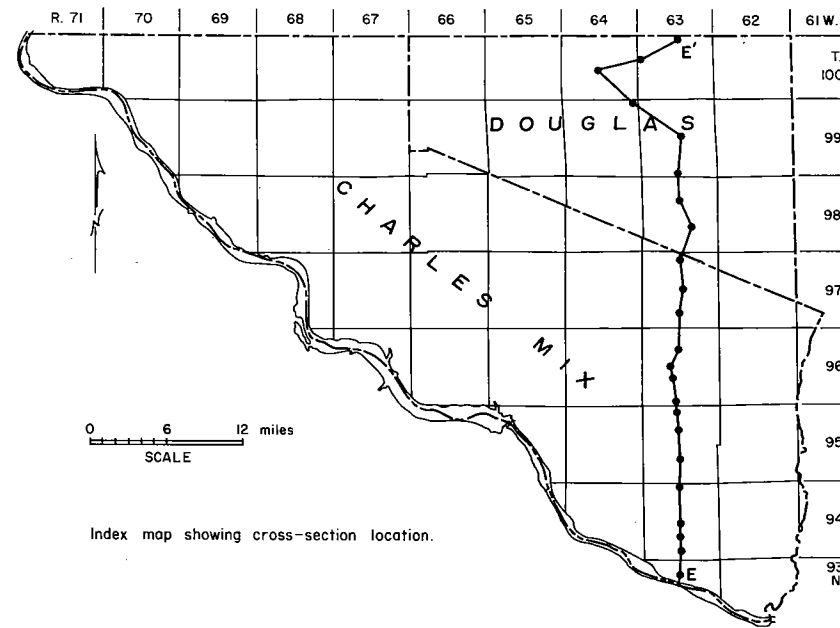


Plate 4. Stratigraphic section E-E'.

Logs of test holes available in Hedges, 1975

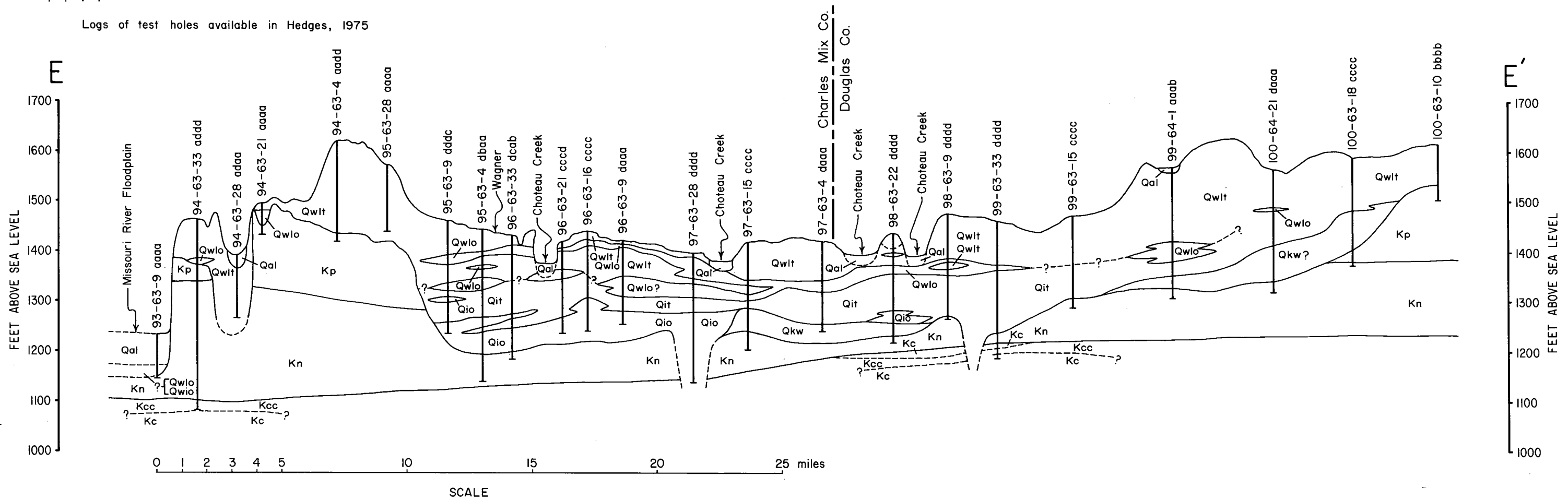
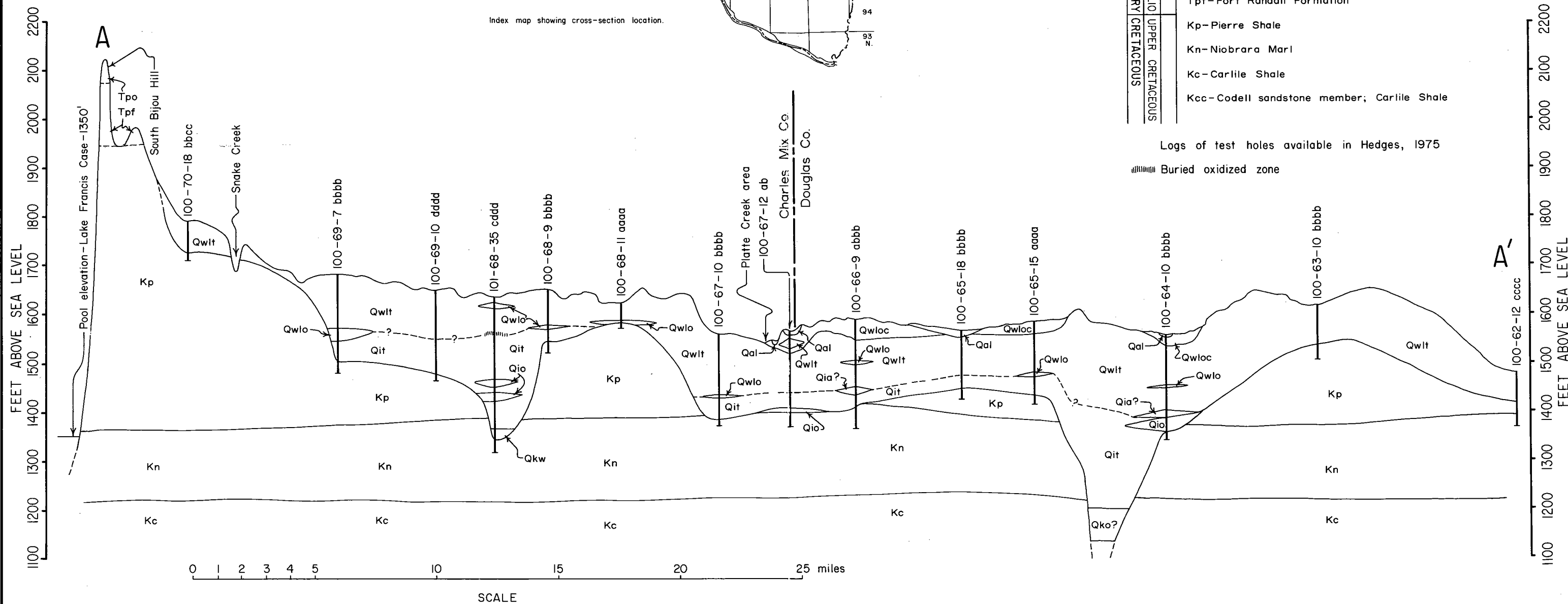
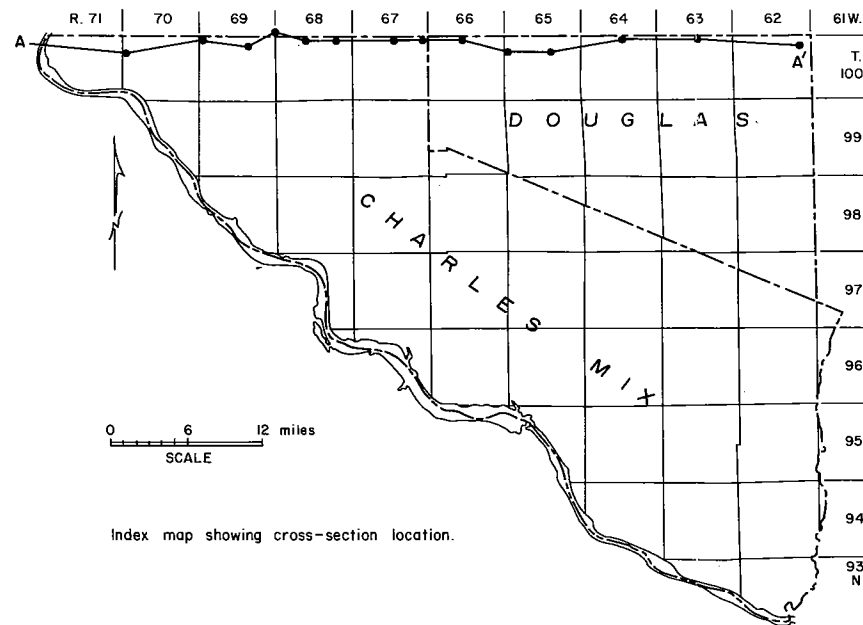


Plate 5. Stratigraphic section A-A'

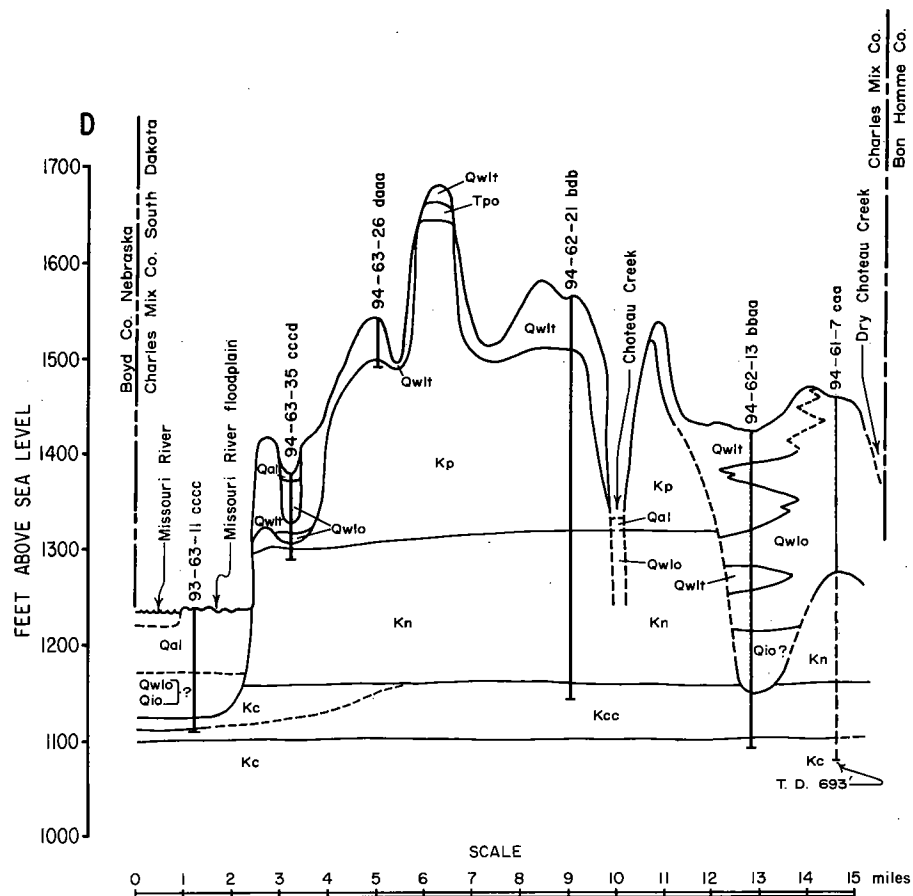


RECENT	Qal-alluvium
	Qwloc-collapsed outwash
LATE WISCONSIN	Qwlou-undifferentiated outwash
	Qwit-till
QUATERNARY	Qwlo-outwash (buried) } may include older deposits where undifferentiated.
	Qia-alluvium
	Qit-till
	Qio-outwash
PLEISTOCENE	Qkw-fluvial deposit; Wagner Formation
	Qkt-till
KANSAN	Qko-outwash
	Tpo-Ogallala undifferentiated
MIOCENE-PLIO	Tpf-Fort Randall Formation
	Kp-Pierre Shale
TERTIARY	Kn-Niobrara Marl
	Kc-Carlile Shale
	Kcc-Codell sandstone member; Carlile Shale
UPPER CRETACEOUS	

Logs of test holes available in Hedges, 1975

▨ Buried oxidized zone

Plate 6. Stratigraphic section D-D'.



RECENT	Qal	alluvium
	Qwloc	collapsed outwash
LATE WISCONSINIAN	Qwlo	undifferentiated outwash
	Qwit	till
	Qwlo	outwash (buried)
PLEISTOCENE	Qia	alluvium
	Qit	till
	Qio	outwash
	Qkw	fluvial deposit, Wagner Formation
	Qkt	till
	Qko	outwash
MIOCENE-PLIOCENE	Tpo	Ogallala undifferentiated
	Tpf	Fort Randall Formation
	Kp	Pierre Shale
	Kn	Niobrara Marl
	Kc	Carlile Shale
TERTIARY	Kcc	Codell sandstone member; Carlile Shale

may include older deposits where undifferentiated.

Logs of test holes available in Hedges, 1975.

