



FIGURE 3.—STRATIGRAPHIC SECTIONS MEASURED IN THE GLEN ULLIN QUADRANGLE.

TABLE 1.—Analyses of lignite samples from drill cores of the Fort Union Formation, Glen Ullin quadrangle, Morton County, N. Dak.

Field No.	Location of drill hole	Sample interval depth (ft)	Lignite bed sampled	Member of Fort Union Formation	USBM lab. No.	Analysis, in percent					Heating value (Btu)	USGS lab. No.	Major elements																	Minor elements																						
						Moisture	Volatiles matter	Fixed carbon	Ash	Sulfur			MgO	CaO	Na ₂ O	K ₂ O	eU	Ash in sample	Al	Fe	Mg	Ca	Ti	Mn	Ag	B	Ba	Be	Co	Cr	Cu	La	Mo	Nb	Ni	Pb	Se	Sr	V	Y	Zn	Zr	Ga	Ge	Li	Yb						
GUC-1-1	NE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 20, T. 138 N., R. 88 W.	120.0-129.9 (partings removed; actual thickness 9.0 ft.)	Spring Valley	Sentinel Butte	I-42080	42.7	24.6	28.4	6.3	0.8	6,140	D137670	0.46	1.29	0.36	0.02	<0.001	20.0	1.5	G	1.5	5.0	0.07	0.03	N	0.07	0.3	N	N	N	0.0007	0.003	N	0.0010	L	0.002	0.001	N	L	0.001	N	0.15	0.005	L	0.002	N	0.01	L	0.001	N	N	0.0002
GUC-2-1	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, T. 139 N., R. 88 W.	162.6-166.4	Unnamed	Tongue River	I-42083	39.1	25.9	27.2	7.8	.7	6,490	D137671	.50	1.69	1.27	.04	.001	11.5	10.0	5.0	2.0	G	.3	.03	N	.15	.7	0.0015	0.002	.007	.03	N	.0070	.002	.003	0.007	.005	N	.7	.020	.030	N	.03	.007	N	N	.0020					
GUC-3-1	SW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, T. 139 N., R. 88 W.	65.2-67.3	Haymarsh Creek	Sentinel Butte	I-42088	37.6	26.1	25.8	10.5	.6	6,400	D137672	.65	1.48	1.26	.10	.001	17.3	10.0	7.0	5.0	7.0	.15	.03	N	.10	.07	.0020	.003	.007	.01	N	.0020	.003	.005	.007	.005	N	.15	.010	.015	N	.03	.007	N	N	.0015					
GUC-3-2	SW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, T. 139 N., R. 88 W.	85.0-89.6	Tavis Creek(?)	Tongue River	I-42091	38.9	24.1	25.6	11.4	.5	6,020	D137673	.54	1.35	1.29	.22	<.001	16.0	7.0	3.0	5.0	7.0	.3	.03	N	.10	.10	.0010	.002	.005	.007	N	.0015	.003	.003	.003	.003	N	.20	.015	.010	N	.05	.005	N	N	.0010					

TABLE 2.—Abundance of selected major and minor elements in ash of lignite outcrop samples from the Glen Ullin quadrangle, Morton County, N. Dak.

(Samples collected by J. D. Vine, assisted by C. S. V. Barclay. Total carbon determined by induction furnace by Dorothy Koehn. Semiquantitative spectrographic analyses by A. L. Sutton, Jr. Results are based on their identity with geometric brackets whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.28, 0.18, 0.12, and so forth, and are reported arbitrarily as midpoints of these brackets, 1, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, respectively. The precision of a reported value is approximately plus or minus one bracket at 65-percent, or two brackets at 95-percent confidence. Approximate visual lower limits of detection for Ag is 0.00005; Be 0.0001; Co 0.0005; La 0.005; Nb 0.001; Pb 0.001; Se 0.0005; Sr 0.001; Y 0.001; Zn 0.02; Ga 0.0005; Ge 0.001; Li 0.005; Yb 0.0001. Figures in percent by weight; G, greater than 10 percent; N, not detected; not looked for.)

Field No.	Location	Lignite bed sampled	Member of Fort Union Formation	USGS lab. No.	Ash in sample	Total carbon	Al	Fe	Mg	Ca	Ti	Mn	Ag	B	Ba	Be	Co	Cr	Cu	La	Mo	Nb	Ni	Pb	Se	Sr	V	Y	Zn	Zr	Ga	Ge	Li	Yb
V-490	Roadcut, SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 18, T. 139 N., R. 88 W.	Local bed, 1.5 ft thick, approximately 20 ft above Spring Valley-Richter lignite zone.	Sentinel Butte	D124847	16.6	40.8	G	G	5.0	G	0.20	0.015	N	.....	0.05	0.002	0.01	0.007	0.02	0.015	0.007	0.001	0.1	0.005	.....	N	0.15	0.02	0.02	N	.....	N	.....
V-492A	Roadcut, SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, T. 139 N., R. 89 W.	Spring Valley bed, 3.3 ft thick	D124849	11.6	45.9	7.0	G	2.0	G	.15	.07	0.00013	.001	.01	.005	.007	.005	.0015	.001	.015	.005	N	.30	.01	.015	0.07	N	N
V-493A	Roadcut, SE. cor. SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, T. 138 N., R. 89 W.	Tavis Creek bed; 6-in. interval at top of 11.5-ft bed.	Tongue River	D124851	24.2	38.2	7.0	5.0	5.0	7.0	.20	.03	.0002	.....	1.0	.0007	.0007	.003	.005	.003	.0015	.002	.005	.02	.....	N	.30	.007	.007	N	.....	N	.....
V-493B	.....	Same bed as 493A; 6-in. interval 2-2½ ft below top of bed.	.....	D124852	15.6	44.0	G	1.5	5.0	5.0	.20	.07	N	.....	.7	.0002	.0003	.002	.005	.003	.0015	.0015	.0015	.005	.....	N	.15	.007	.003	N	.....	N	.....
V-493C	.....	Same bed as 493A and B; 6-in. interval 3½-4 ft below top of bed.	.....	D124853	25.2	39.5	G	3.0	2.0	3.0	.50	.10	N	.....	1.0	.0002	.0005	.005	.01	.01	.001	.002	.001	.007	.....	N	.10	.01	.005	N	.....	N	.....
V-494A	Roadcut, SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T. 138 N., R. 89 W.	Local bed in Spring Valley-Richter lignite zone; 6-in. interval at top of 8.0-ft lignite bed.	Sentinel Butte	D124854	11.4	45.4	G	G	1.5	7.0	.30	.03	N	.....	1.0	.0007	.01	.015	.02	.015	.002	.002	.05	.007	.....	N	.30	.02	.015	N	.....	N	.....
V-494B	.....	Same bed as 494A; interval 3-3½ ft below top of bed.	.....	D124855	11.6	44.4	7.0	7.0	1.5	G	.07	.05	N	.....	.2	.0005	.007	.007	.01	.01	.002	N	.03	.002	.....	N	.30	.02	.01	N	.....	N	.....
V-494C	Same bed as 494A and B; interval 8.0-8.8 ft below top of bed.	D124856	7.5	46.8	G	7.0	7.0	G	.10	.20	N	1.0	.0015	.01	.002	.005	.005	.001	N	.02	.003	N	.50	.005	.015	.10	N	N
V-495A	Coulee bank, near center W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 32, T. 139 N., R. 88 W.	Local bed approximately 25 ft below base of Tavis Creek bed.	.....	D124857	20.0	45.4	7.0	5.0	3.0	5.0	.30	.05	N	.....	.7	.001	.001	.01	.007	.003	.002	.0015	.005	.007	.....	N	.15	.015	.01	N	.....	N	.....

GEOLOGIC MAP AND LIGNITE DEPOSITS OF THE GLEN ULLIN QUADRANGLE,
MORTON COUNTY, NORTH DAKOTA

By
C. S. Venable Barclay
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