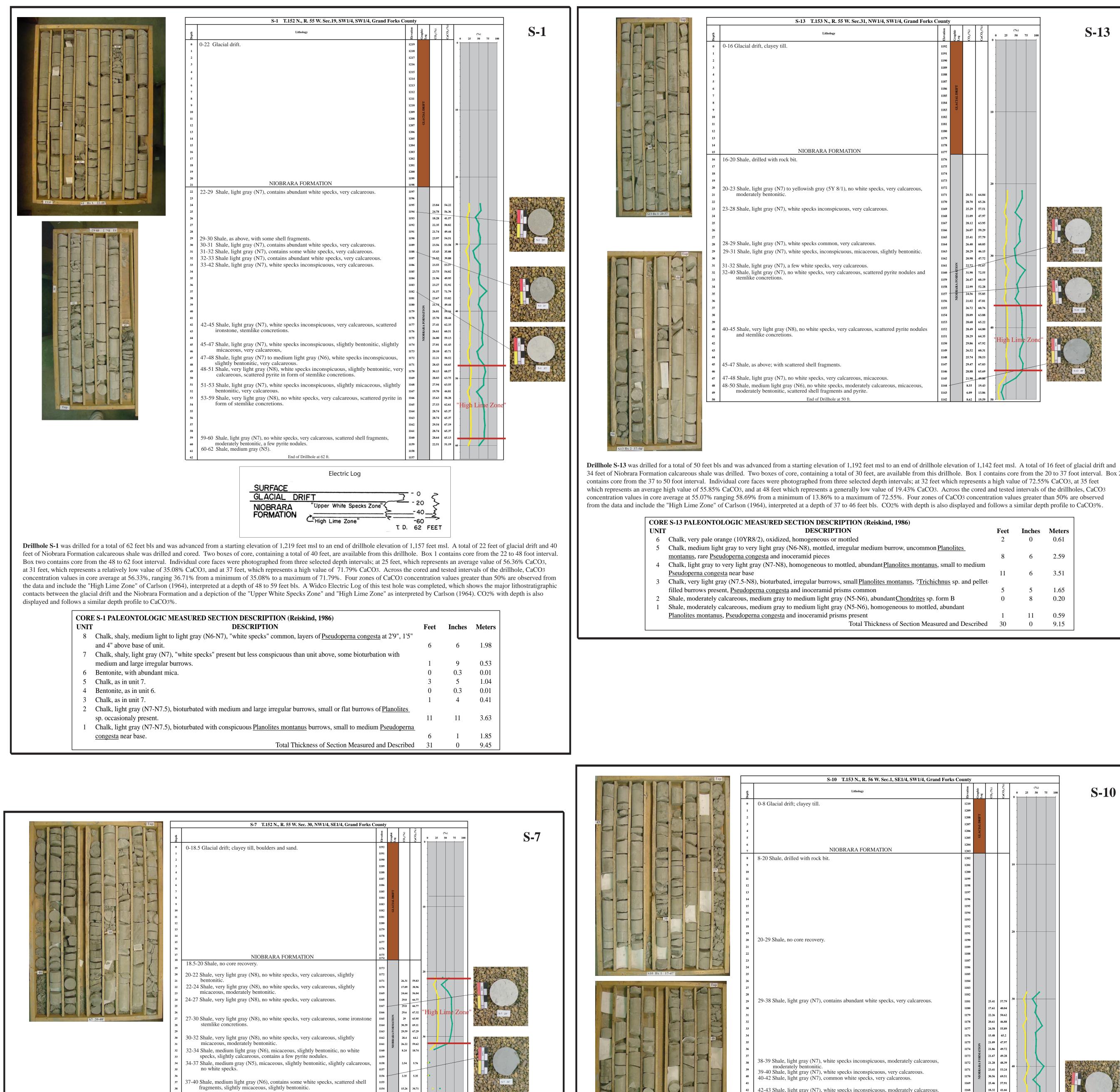
## **Cement Rock Mineral Resources - Shawnee-McCanna Area, Grand Forks County, North Dakota - Available Core Summary**



Drillhole S-7 was drilled for a total of 40 feet bls and was advanced from a starting elevation of 1,192 feet msl to an end of drillhole elevation of 1,152 feet msl. A total of 18.5 feet of glacial drift and 21.5 feet of Niobrara Formation calcareous shale was drilled. One box of core, containing a total of 20 feet, is available from this drillhole. Box 1 contains core from the 20 to 40 foot interval. Individual core faces were photographed from two selected depth intervals; at 25 feet, which represents an average high value of 66.77% CaCO3, and at 36 feet, which represents a low value of 5.35% CaCO3. Across the cored and tested intervals of the drillhole, CaCO3 concentration values in core average at 47.20% ranging 63.76% from a minimum of 5.35% to a maximum of 68.00%. One zone of CaCO3% values greater than 50% is observed from the data and include the "High Lime Zone" of Carlson (1964), interpreted at a depth of 21 to 31 feet bls. CO2% with depth is also displayed and follows a similar depth profile to CaCO3%. **CORE S-7 PALEONTOLOGIC MEASURED SECTION DESCRIPTION (Reiskind, 1986)** 

UNIT	DESCRIPTION	Feet	Inches	Meters
8	Chalk, light gray to very light gray (N7-N8), mottled, abundant Planolites montanus.	4	5	1.35
7	Chalk, very light gray (N7.5-N8), homogeneous and mottled, abundant Pseudoperna congesta.	1	0	0.31
6	Chalk, very light gray (N7.5), mottled, small diameter Planolites montanus burrows.	4	11	1.5
5	Chalk, very light gray (N7.5), with abundant, large Pseudoperna congesta in a concentrated layer.	0	1	0.03
4	Chalk, light gray (N7), mottled, <u>Planolites montanus</u> common.	0	8	0.2
3	Section missing.	0	2	0.05
2	Shale, calcareous, medium gray to medium light gray (N5-N6), homogeneous to mottled, common flat Planolites sp.,			
	Chondrites sp. form A Pseudoperna congesta.	3	0	0.91
1	Shale, moderately calcareous, medium gray (N5-N5.5), with Chondrites sp. form A burrows and flat pyritized			
	<u>Planolites</u> sp. common.	4	4	1.32
	Total Thickness of Section Measured and Described	18	8	5.67

CEMENT ROCK MINERAL RESOURCES OF THE SHAWNEE-McCANNA AREA The Cretaceous age Niobrara Formation was cored in ten test holes in the Shawnee-McCanna area. The stratigraphic thickness of Niobrara Formation sampled by these cores was pproximately 80 feet. CO2 and CaCO3 analyses of the cores indicate that one zone (and perhaps a few others) ten feet in thickness and about 100 feet below the top of the Niobrara Formation exists at a depth of less than 50 feet below land surface. This "High Lime Zone" consistently analyzes relatively higher than the rest of the Niobrara Formation, although some samples and intervals approach this same quality. The "High Lime Zone" is present in a band about one half mile wide and at least four miles long extending from Sec. 30, T. 152 N., R. 55 W. north-westward to Sec. 31, T. 153 N., R. 55 W. in Grand Forks County, North Dakota (Carlson, 1964).

On the basis of the drillhole information, the Niobrara Formation may be subdivided into four lithologic units which (in descending order) are the 1) Upper White Specks Zone, 2) High Lime Zone, 3) Non-White Specked Zone; and 4) Lower White Specks Zone. These are informal unit designations that apply specifically to the Shawnee-McCanna prospect area. The High Lime Zone thickness is generally consistent at 10 feet. Thicknesses of other zones have not been determined as the Upper White Specks Zone is missing at most locations. Drillholes were generally terminated in the upper ten feet of the Non-White Specked Zone. Shale from the High Lime Zone is readily distinguished by its consistently lighter color than overlying beds and resence of stem-like concretionary structures throughout. A three foot zone in the lower portion of the High Lime Zone is harder and consistently analyzes higher in CaCO3 content. A light gray (N7) shale, which contains few or no white specks, overlies the High Lime Zone and is included in the Upper White Specks Zone simply based on color and CaCO3 content. This shale tends to thicken towards the south and is approximately 10 to 15 feet thick in the Shawnee-McCanna area (Carlson, 1964).



The mission of the North Dakota Geological Survey is threefold:

*nvestigate* and report on the geology of North Dakota, emphasizing the state's energy resources and stressing applied research leading to economic benefits or quality of life improvements for residents of the state; *Provide* public service, and to collect, create, and disseminate geologic and map-related information, and:

Administer regulatory programs and act in an advisory capacity to other state, federal, and local agencies.

đ	S-13 T.153 N., R. 55 W. Sec.31, NW1/4, SW1/4, Grand Forks	Elevation	I	(%)	CaCO <sub>3</sub> (%)				(%)	75 10*	<b>S-13</b>
Depth		Eleva	Graphic Log	CO <sub>2</sub> (%)	CaC	0 0 †	2	25	50 7	75 100	
0	0-16 Glacial drift, clayey till.	1192				-					
1		1191				-					
2 3		1190 1189									
4		1188									
5		1187									
6		1186	RIFT								
7		1185	U TV								
8		1184	GLACIAL DRIF			-					
9		1183	9			10 -					
10		1182 1181									
11 12		1181				-					
13		1179									
4		1178									
5	NIOBRARA FORMATION	1177		ļ		]					
6	16-20 Shale, drilled with rock bit.	1176									
7		1175									
8		1174									
•		1173				20 -					
D 1	20-23 Shale, light gray (N7) to yellowish gray (5Y 8/1), no white specks, very calcareous, moderately bentonitic.	1172 1171		28.51	64.84	-			1		
2	moderately bencomme.	1170		28.70	65.26	-		/			
3	23-28 Shale, light gray (N7), white specks inconspicuous, very calcareous.	1169		25.29	57.51	-					なが多くたちを見てい
4		1168		21.09	47.97						
5		1167		28.12	63.95			<u> </u>	1		1 Here
26		1166		26.07	59.29						
7	28-29 Shale, light gray (N7), white specks common, very calcareous.	1165		25.41	57.79			ļ			
28 29	29-31 Shale, light gray (N7), white specks common, very categories.	1164 1163		26.40 20.29	60.05 46.15	-					S-13 32
10	29-51 Shale, light gray (107), while speeks, medispleuous, meaceous, slightly bencomite.	1162		20.29	47.72	30 -	_		-	<b>—</b>	TA CERTARY AL
31	31-32 Shale, light gray (N7), a few white specks, very calcareous.	1161	ION	22.72	51.67	$\square$					
32	32-40 Shale, light gray (N7), no white specks, very calcareous, scattered pyrite nodules and	1160 ·	-	31.90	72.55			$\left \right\rangle$			和社会和任何
3	stemlike concretions.	1159	FORM	26.47	60.19						State and the
4		1158	RARA	22.99	52.28				$\mathbf{+}$		
5		1157 -	NIOB	24.56	55.85				1		
6 7		1156 1155		21.02 26.72	47.81 60.76						A STATISTICS
8		1155		28.09	63.88			l.			S-13 35°
•		1153		28.68	65.22						がないなない。
0	40-45 Shale, very light gray (N8), no white specks, very calcareous, scattered pyrite nodules	1152		28.49	64.80	40 -		-			意大いかなるとないなう
1	and stemlike concretions.	1151		28.29	64.35		Ui~	hт	im	7.00	
2		1150		29.86	67.92		нığ		ime	Zon	1 Hork
13		1149		26.52	60.31				1		
4		1148		25.74	58.53						
5 6	45-47 Shale, as above; with scattered shell fragments.	1147 1146		29.47 28.88	67.03						STAR STAR
ю 7	47-48 Shale, light gray (N7), no white specks, very calcareous, micaceous.	1146		28.88	65.69 4 <del>9.8</del> 0	$\square$					A BARANESS
8	48-50 Shale, medium light gray (N6), no white specks, moderately calcareous, micaceous,	1145		8.55	19.43		1				CAN THE A MAR O
49	moderately bentonitic, scattered shell fragments and pyrite.	1143		6.09	13.86		<				
50	End of Drillhole at 50 ft.	1142		8.62	19.59	50					

Feet Inches Meters

2 0 0.61

8 6 2.59

11 6 3.51

5 5 1.65

0 8 0.20

1 11 0.59

**S-10** 

Total Thickness of Section Measured and Described3009.15

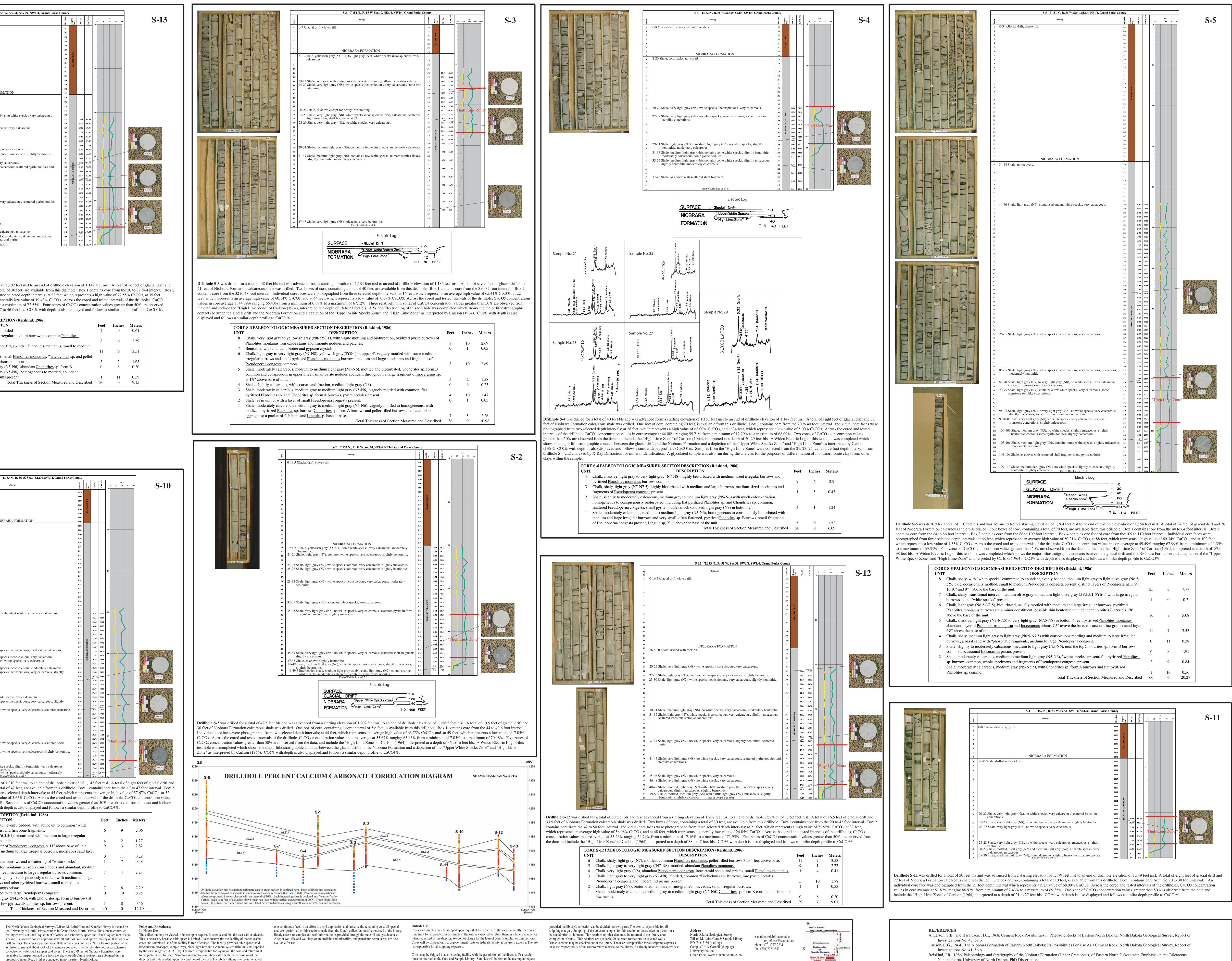
S-10 T.153 N., R. 56 W. Sec.1, SE1/4, SW1/4, Grand Forks Cour

DESCRIPTION

-8 Glacial drift; clayey till.

light iron stain, shell fragments at 22. displayed and follows a similar depth profile to CaCO3%. DESCRIPTION <u>Planolites montanus</u> iron oxide stains and limonite nodules and patches. Bentonite, with abundant biotite and gypsum crystals <u>Pseudoperna congesta</u> common. at 1'9" above base of unit. Shale, as in unit 3, with a layer of small <u>Pseudoperna congesta</u> present. aggregates; a pocket of fish bone and Lingula sp. hash at base. 5 Glacial drift; clayey till. f stemlike concretions, slightly micaceous. slightly micaceous 47-48 Shale, as above; slightly bentonitic

NIOBRARA FORMATION 8-20 Shale, drilled with rock bit. 20-29 Shale, no core recovery. 29-38 Shale, light gray (N7), contains abundant white specks, very calcareous. 38-39 Shale, light gray (N7), white specks inconspicuous, moderately calcareous, 39-40 Shale, light gray (N7), white specks inconspicuous, very calcareous. 40-42 Shale, light gray (N7), common white specks, very calcareous. 42-43 Shale, light gray (N7), white specks inconspicuous, moderately calcareous. 43-49 Shale, light gray (N7), white specks inconspicuous, very calcareous, slightly 49-50 Shale, light gray, abundant white specks, very calcareous. 50-52 Shale, light gray (N7), white specks inconspicuous, very calcareous, slightly 52-60 Shale, very light gray (N8), no white specks, very calcareous, scattered ironstone emlike concretions 60-62 Shale, very light gray (N8), no white specks, very calcareous, scattered shell 62-66 Shale, very light gray (N8), no white specks, very calcareous, slightly bentonitic. 66-67 Shale, light gray (N7), no white specks, slightly bentonitic, very calcareous, 67-68 Shale, medium gray (N5), no white specks, slightly calcareous, moderately **Drillhole S-10** was drilled for a total of 68 feet bls and was advanced from a starting elevation of 1,210 feet msl to an end of drillhole elevation of 1,142 feet msl. A total of eight feet of glacial drift and 60 feet of Niobrara Formation calcareous shale was drilled. Two boxes of core, containing a total of 42 feet, are available from this drillhole. Box 1 contains core from the 17 to 47 foot interval. Box 2 contains core from the 47 to 68 foot interval. Individual core faces were photographed from three selected depth intervals; at 45 feet, which represents an average high value of 57.67% CaCO3, at 52 feet, which represents a high value of 69.26% CaCO3, and at 68 feet, which represents a low value of 5.65% CaCO3. Across the cored and tested intervals of the drillhole, CaCO3 concentration values in core average at 55.49% ranging 64.13% from a minimum of 5.65% to a maximum of 69.78%. Seven zones of CaCO3 concentration values greater than 50% are observed from the data and include the "High Lime Zone" of Carlson (1964), interpreted at a depth of 57 to 66 feet bls. CO2% with depth is also displayed and follows a similar depth profile to CaCO3%. CORE S-10 PALEONTOLOGIC MEASURED SECTION DESCRIPTION (Reiskind, 1986) Feet Inches Meters 9 Chalk, shaley, medium light gray to light olive gray (N6-5Y6/1), evenly bedded, with abundant to common "white specks," uncommon <u>Pseudoperna congesta</u>, <u>Inoceramus</u> prisms, and fish bone fragments. 6 9 2.06 8 Chalk, shaley, medium light gray to light olive gray (N6.5-5Y6.5.5/1), bioturbated with medium to large irregular burrows, "white specks" uncommon, gradational with adjucent units. 4 2 1.27 9 3 2.82 Chalk, light gray (N7), well-indurated, vaguely burrowed, layer of Pseudoperna congesta 6' 11" above base of unit. 6 Chalk, medium gray to light gray (N6-N7), with conspicuous medium to large irregular burrows, micaceous sand layer (?bentonite) 3" above base of unit. 0 11 0.28 5 Chalk, indurated, light gray (N7), with medium to large irregular burrows and a scattering of "white specks". 1 7 0.48 4 Chalk, well-indurated, light gray (N7-N7.5), pyritized <u>Planolites montanus</u> burrows conspicuous and abundant, medium 7 4 2.23 to large <u>Pseudoperna congesta</u>, especially common in lower 2 feet, medium to large irregular burrows common. Chalk, well-indurated, light gray to very light gray (N7-N8), vaguely to conspicuously mottled, with medium to large irregular burrows, a few pyritized <u>Planolites montanus</u> burrows and other pyritized burrows, small to medium <u>Pseudoperna congesta</u> common along with occasional <u>Inoceramus</u> prisms. 7 6 2.29 Chalk, light gray (N7) with some thin sandy layers, bioturbated, with large Pseudoperna congesta. 0 10 0.25 Shale, slightly calcareous, medium dark gray to medium light gray (N4.5-N6), with Chondrites sp. form B burrows at



Willson M. Laird Core and Sample Library Hours of Operation Monday - Friday 8:00 am to 5:00 pm

the top as small, chalk-filled, light gray (N7) tubes in shale; a few pyritized <u>Planolites</u> sp. burrows present.

The North Dakota Geological Survey's Wilson M. Laird Core and Sample Library is located on **Policy and Procedures:** the University of North Dakota campus in Grand Forks, North Dakota. The climate controlled Williston Basin and about 95% of the samples collected. The facility also houses an extensive collection of water-well samples and cores. There is 299 feet of Niobrara Formation core

available for inspection and use from the Shawnee-McCanna Prospect area obtained during

previous Cement Rock Studies conducted in northeastern North Dakota.

Total Thickness of Section Measured and Described40012.19

1 8 0.56

binocular microscopes, sample trays, black light box and a camera system (film must be supplied by the user, suggested ASA 100). The user is responsible for laying out the core and returning it to the pallet when finished. Sampling is done by core library staff with the permission of the

## Fred J. Anderson

Nanoplankton, University of North Dakota, PhD Dissertation.

DeMers Avenue