

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GEOPHYSICAL AND LITHOLOGIC LOGS FOR 1979
DRILLING IN WILLIAMS COUNTY, NORTH DAKOTA

By
John M. Spencer

Open-File Report 80-646
1980

This report has not been edited for conformity
with U.S. Geological Survey editorial standards
or stratigraphic nomenclature.

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List of abbreviations:

bl	-	blue
brn	-	brown
cbncl	-	carbonaceous
clayst	-	claystone
cps	-	counts per second
dk	-	dark
gn	-	green
gy	-	gray
ironst	-	ironstone
limest	-	limestone
lt	-	light
sandst	-	sandstone
siltst	-	siltstone
T.C.	-	time constant
T.D.	-	total depth
unconsol	-	unconsolidated
yel	-	yellow

GEOPHYSICAL AND LITHOLOGIC LOGS FOR 1979 COAL

DRILLING IN WILLIAMS COUNTY, NORTH DAKOTA

By John M. Spencer

INTRODUCTION AND ACKNOWLEDGMENTS

Under U.S. Geological Survey contract no. 14-08-0001-17427, Crandall Drilling Company drilled 56 test holes in Williams County, North Dakota. These holes were drilled to complete the drilling project in northern Williams County. Previous drilling in the project was reported by Cook and Spencer (1979). The hole locations are shown in figure 1. The purpose of the drilling was to obtain information on thickness and extent of coals in the area.

U.S. Geological Survey personnel collected drill cuttings for lithologic control. These cuttings were used in conjunction with the geophysical logs to determine the lithologic logs presented in this report. The lithologic logs have been generalized to 10-foot intervals. The strip logs presented are based on the lithologic logs and are not interpretations of the geophysical logs, with the exceptions of the tops and bottoms of lignite beds. All measurements are in feet, to convert to meters, multiply by 0.3048.

Field work was done by John M. Spencer, assisted by Leslie L. Tomac.

REFERENCE

Cook, S. M., and Spencer, J. M., 1979, Geophysical and lithologic logs for 1978 coal drilling in Mountrail, Renville, Ward, and Williams Counties, North Dakota: U.S. Geological Survey Open-File Report 79-912, 124 p.

WILLIAMS COUNTY, NORTH DAKOTA

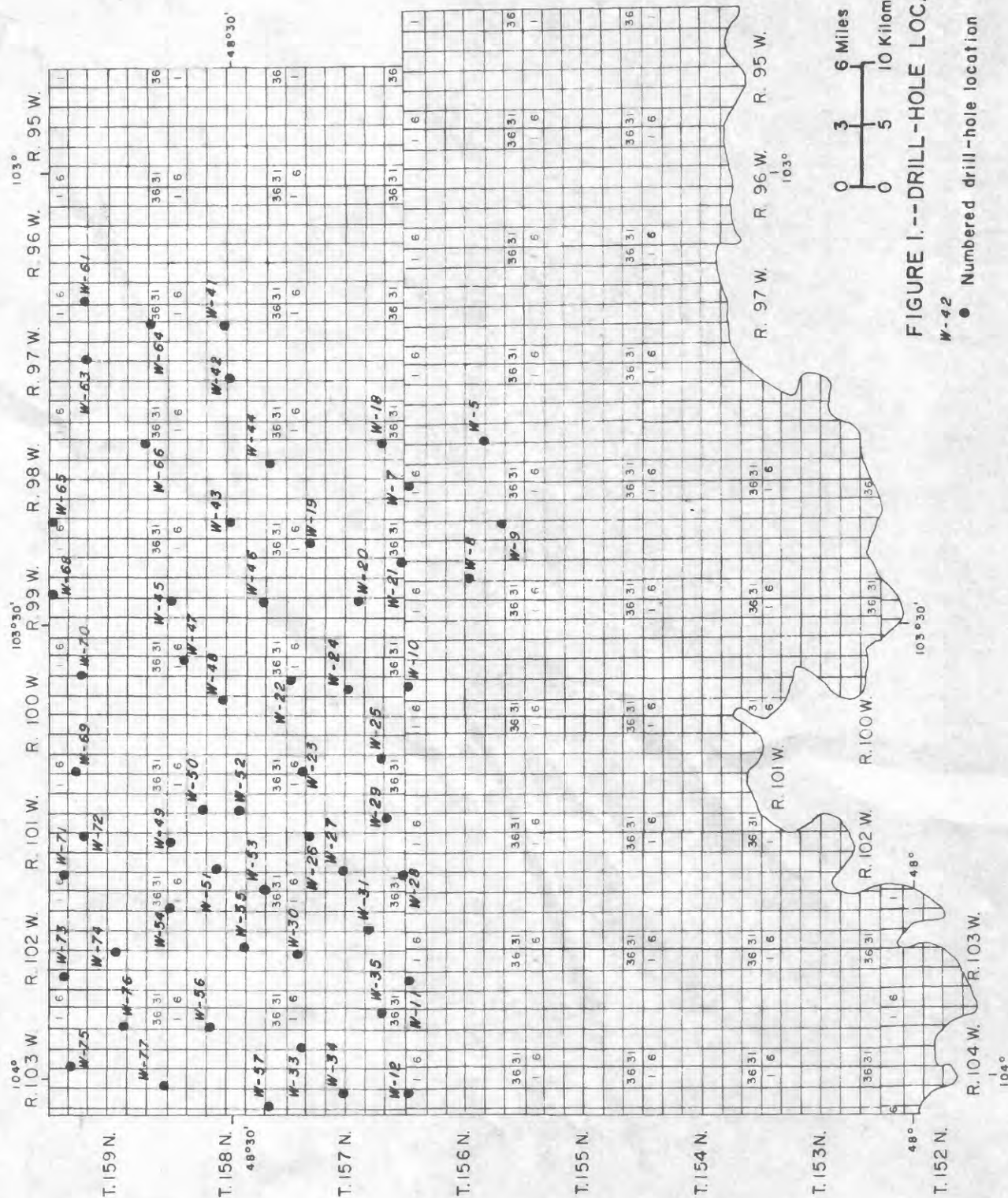


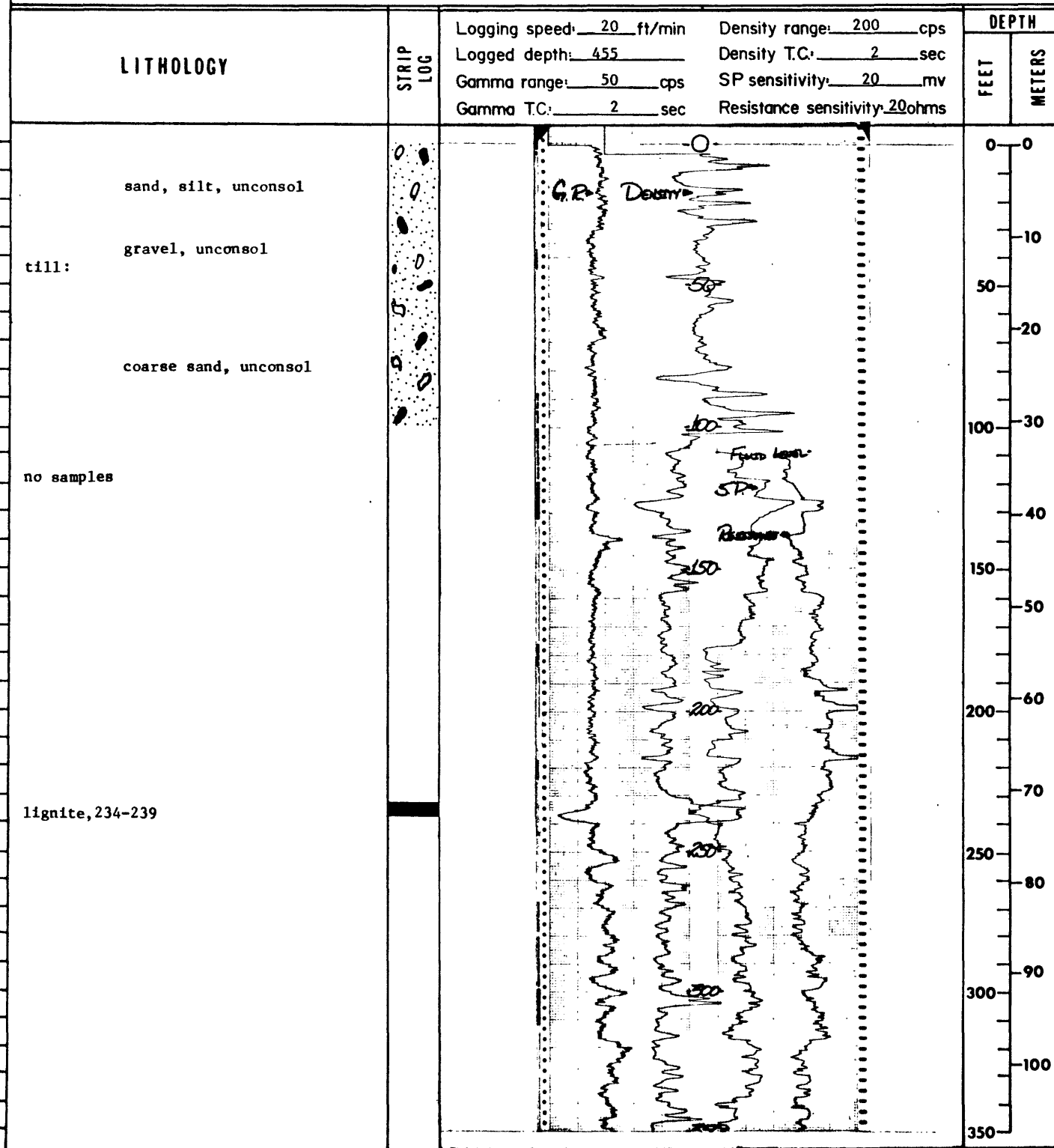
FIGURE 1.--DRILL-HOLE LOCATION MAP

W-42
● Numbered drill-hole location

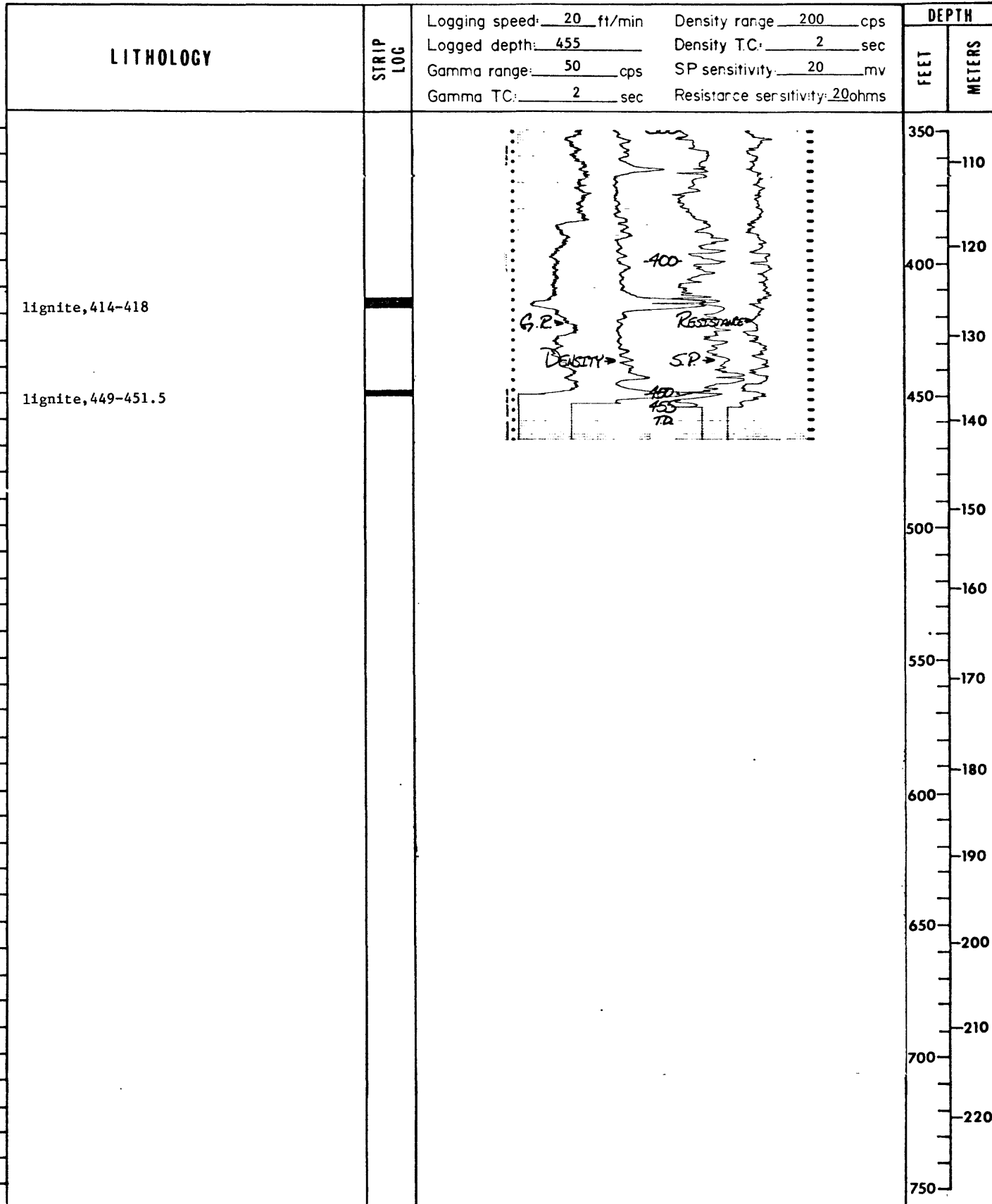
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 5
SHEET 1 OF 2

AREA Williams County		QUAD NAME Epping	
DATE STARTED 6/17/79	DATE COMP. 6/17/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 21 T. 156 N., R. 98 W., FOOTAGE LOC. 15		RWK FSL 112	FWL 2351 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 460 CORING -----	
DRILLING AGENCY: Crandall Drilling	DRILL TYPE: -----		DEPTH TO WATER 109 ft
LITHOLOGY RECORDED BY Spencer	GEOPHYSICAL LOGS RECORDED BY Nelson		
REMARKS:			



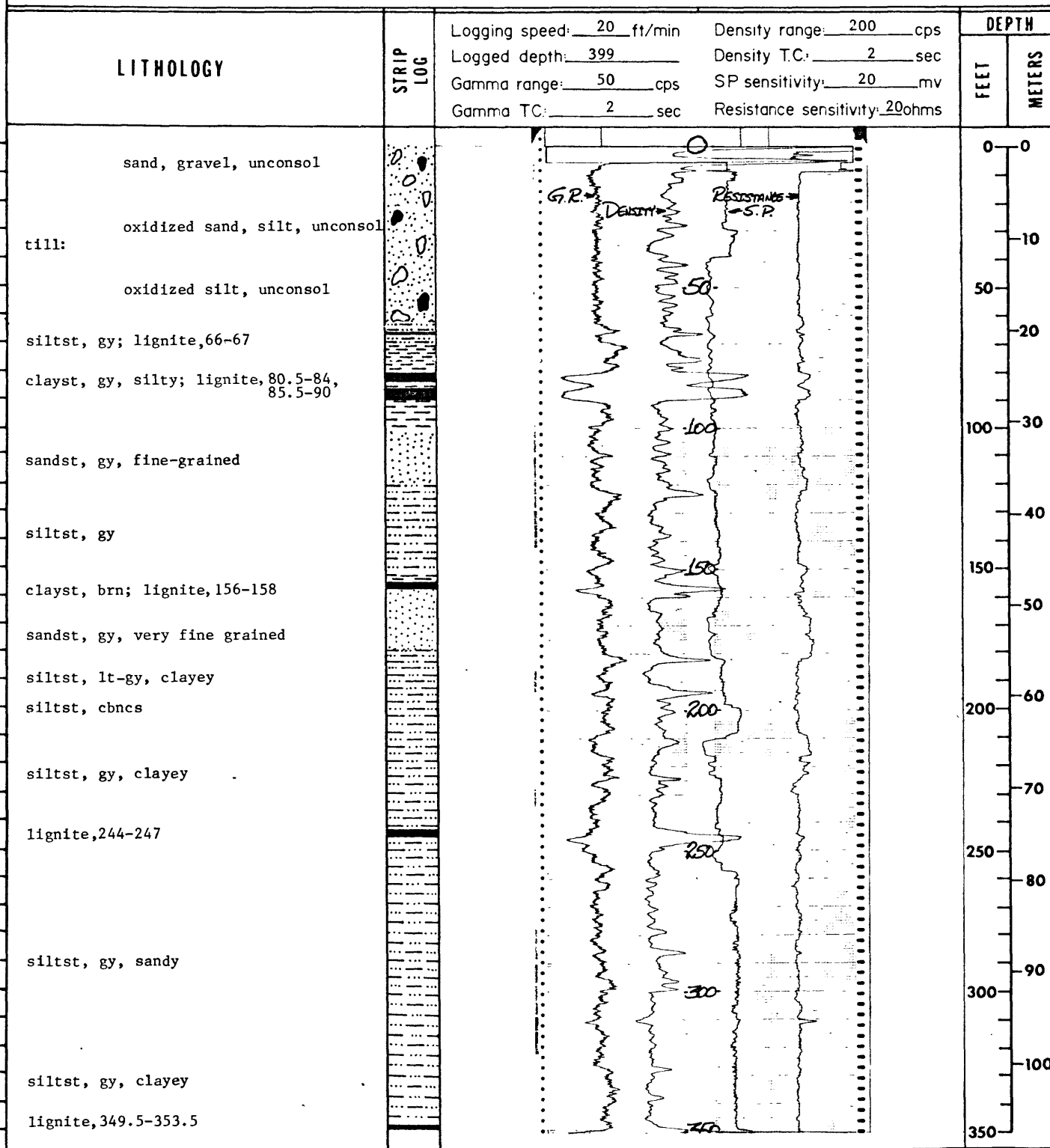
REMARKS:



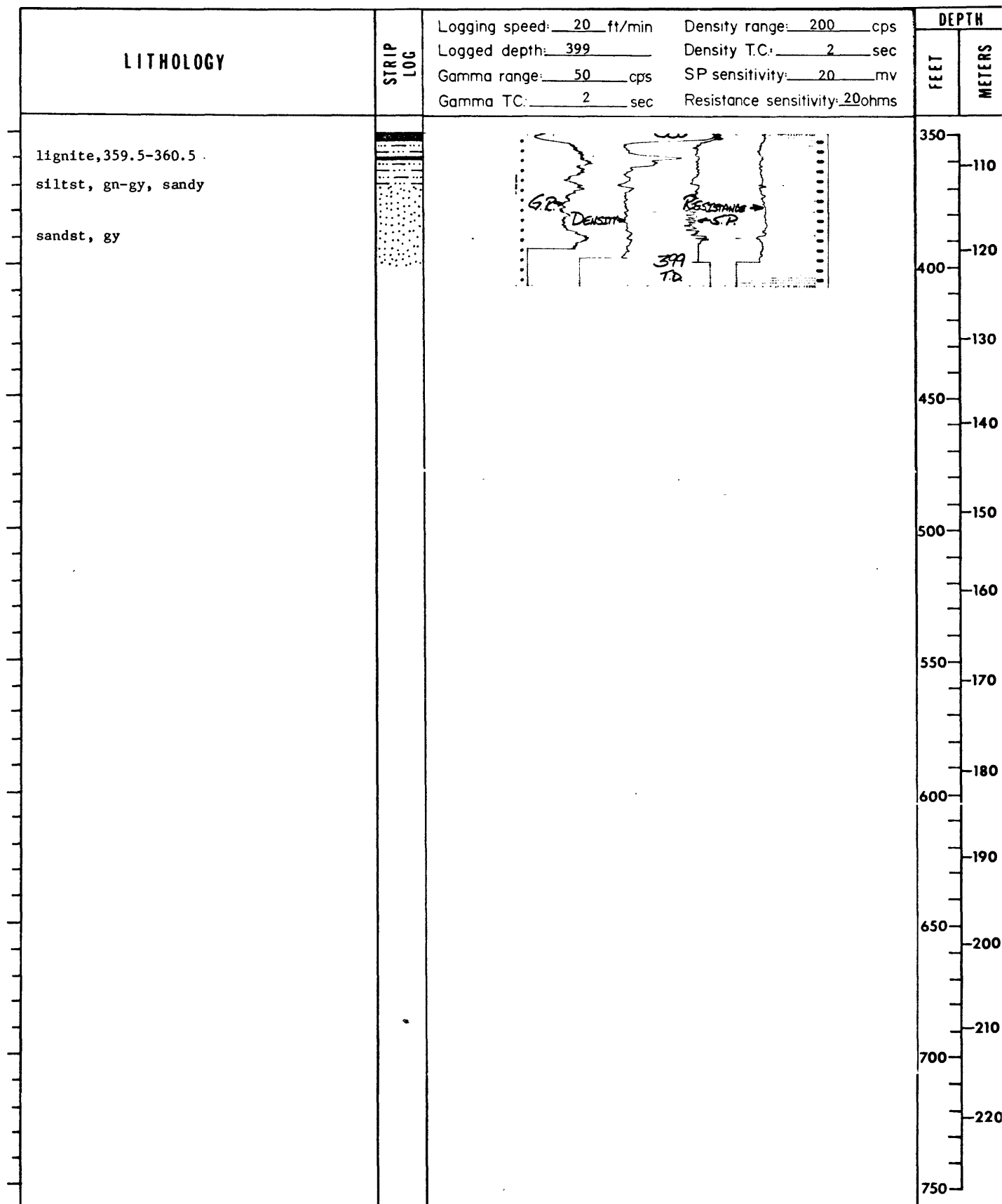
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 7
SHEET 1 OF 2

AREA Williams County		QUAD NAME Epping	
DATE STARTED 6/18/79	DATE COMP. 6/18/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 1 T.156 N., R. 99 W., FOOTAGE LOC. 15		FNL XXX 10 FEL XXX	GROUND ELEV 2272 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 400 CORING -----	TOTAL DEPTH 400 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 9 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



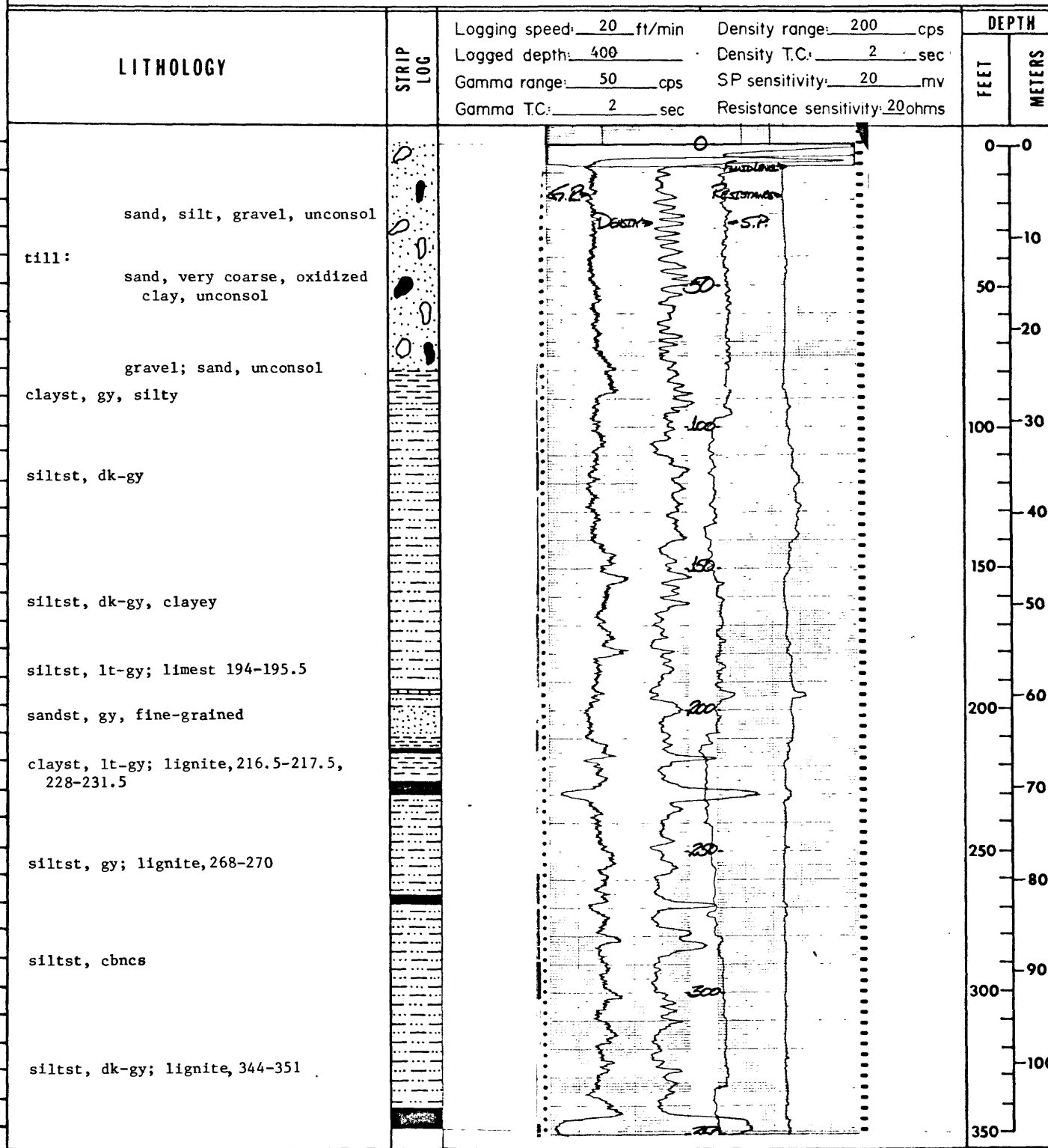
REMARKS:



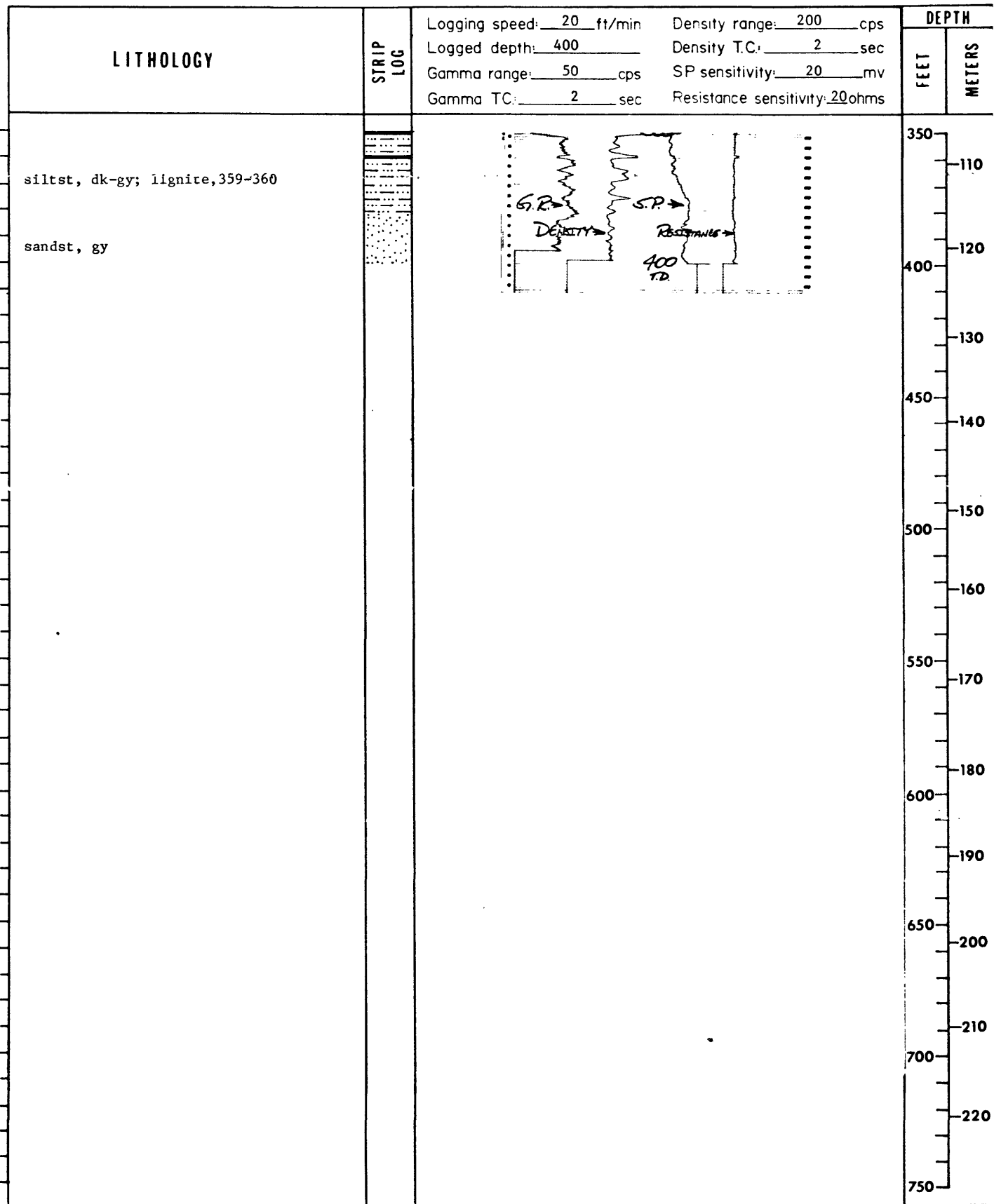
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 8
SHEET 1 OF 2

AREA Williams County		QUAD NAME Spring Brook	
DATE STARTED 7/1/79	DATE COMP. 7/1/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 20 T. 156 N., R. 99 W., FOOTAGE LOC. 95		FNL 20 FWL 20	GROUND ELEV 2282 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 400 CORING -----	TOTAL DEPTH 400 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 8 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS: Power line nearby			



REMARKS:

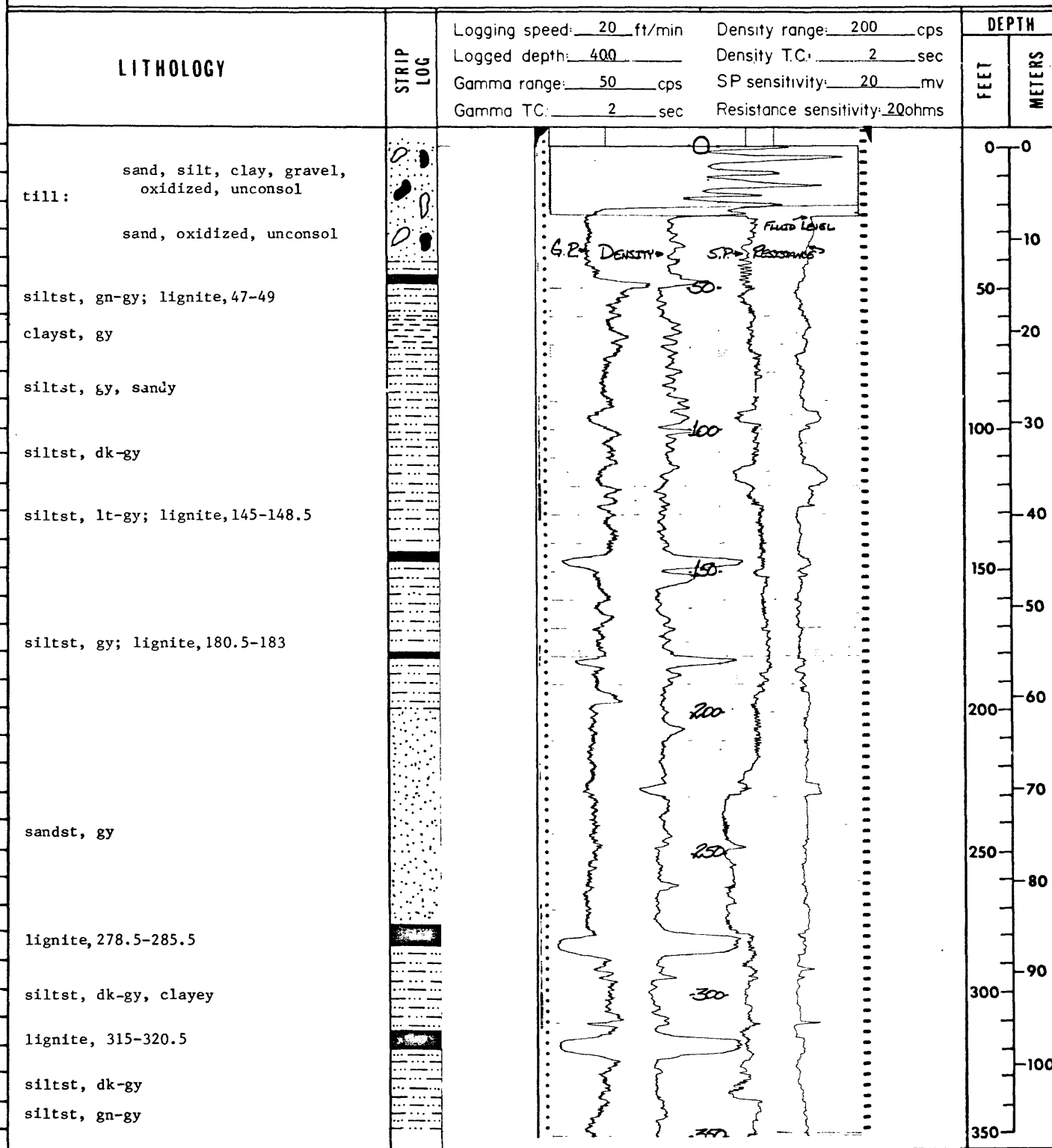


UNITED STATES GEOLOGICAL SURVEY

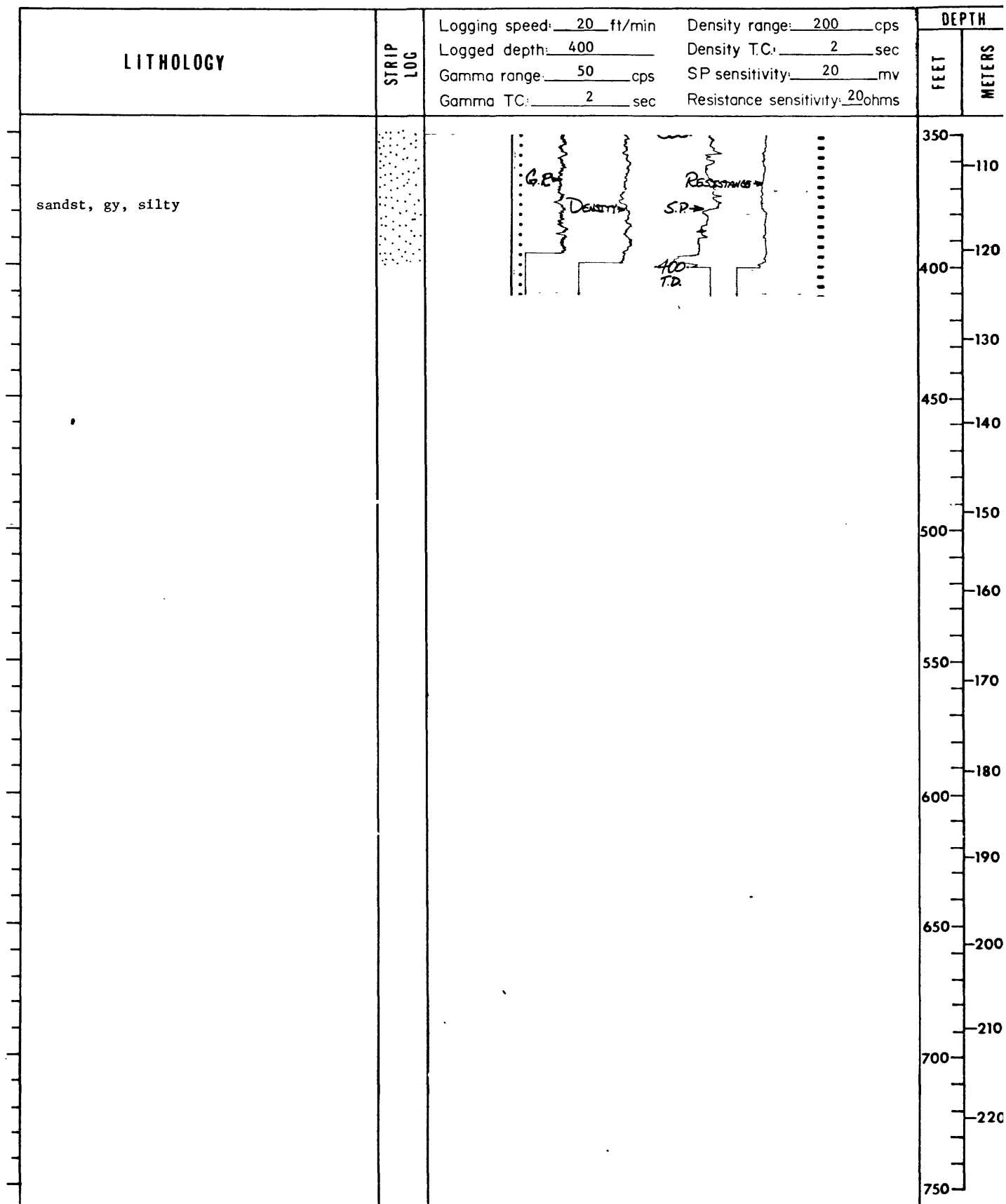
HOLE NO W 9
SHEET 1 OF 2

AREA Williams County		QUAD NAME Spring Brook	
DATE STARTED 6/17/79	DATE COMP. 6/17/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 27 T. 156 N., R. 99 W., FOOTAGE LOC. 25		YENK FSL 83	FEL 83
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 400	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

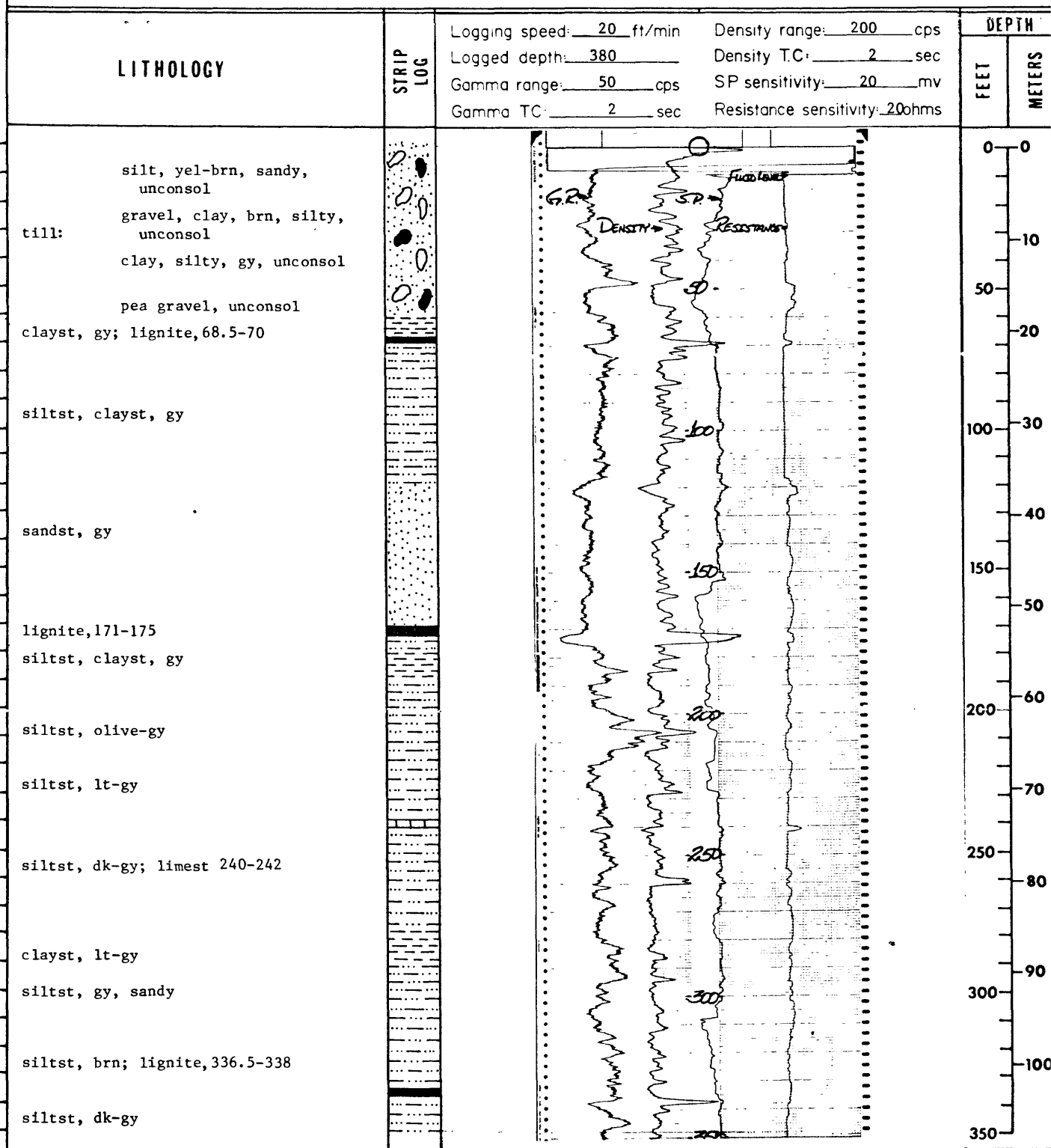


UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 10
SHEET 1 OF 2

AREA Williams County		QUAD NAME Marmon SE	
DATE STARTED 6/28/79	DATE COMP. 7/1/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 5 T.156 N., R.100 W., FOOTAGE LOC. 5		FNL 890	FEL 1948 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 380	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



HOLE NO W 10
SHEET 2 OF 2

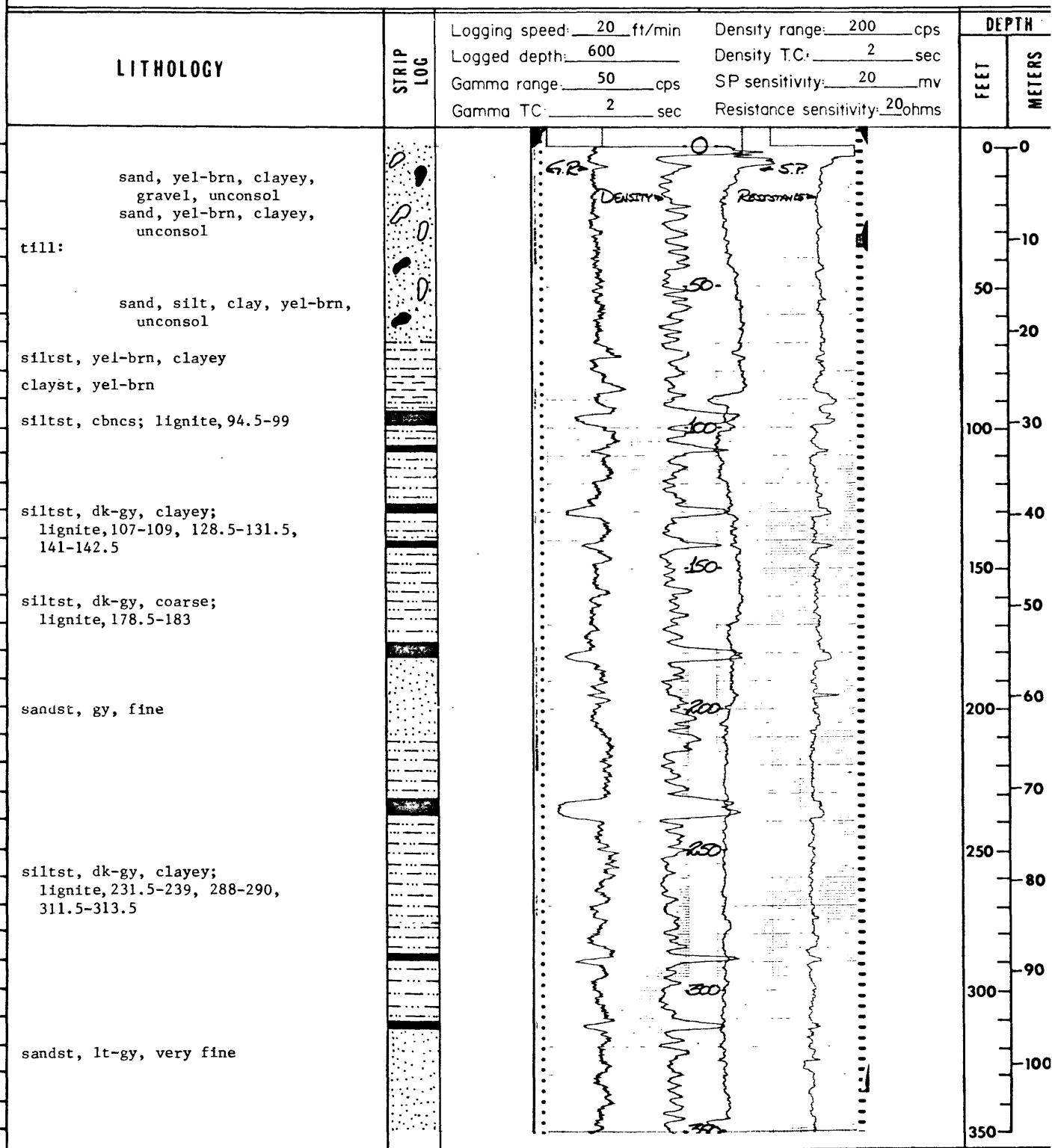
LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min		Density range: <u>200</u> cps		DEPTH	
		Logged depth: <u>380</u>		Density T.C.: <u>2</u> sec		FEET	METERS
		Gamma range: <u>50</u> cps		SP sensitivity: <u>20</u> mv			
		Gamma TC <u>2</u> sec		Resistance sensitivity: <u>20</u> ohms			
siltst, dk-gy						350 110 120 400 130 450 140 500 150 160 550 170 180 600 190 650 200 700 210 750 220	

UNITED STATES GEOLOGICAL SURVEY

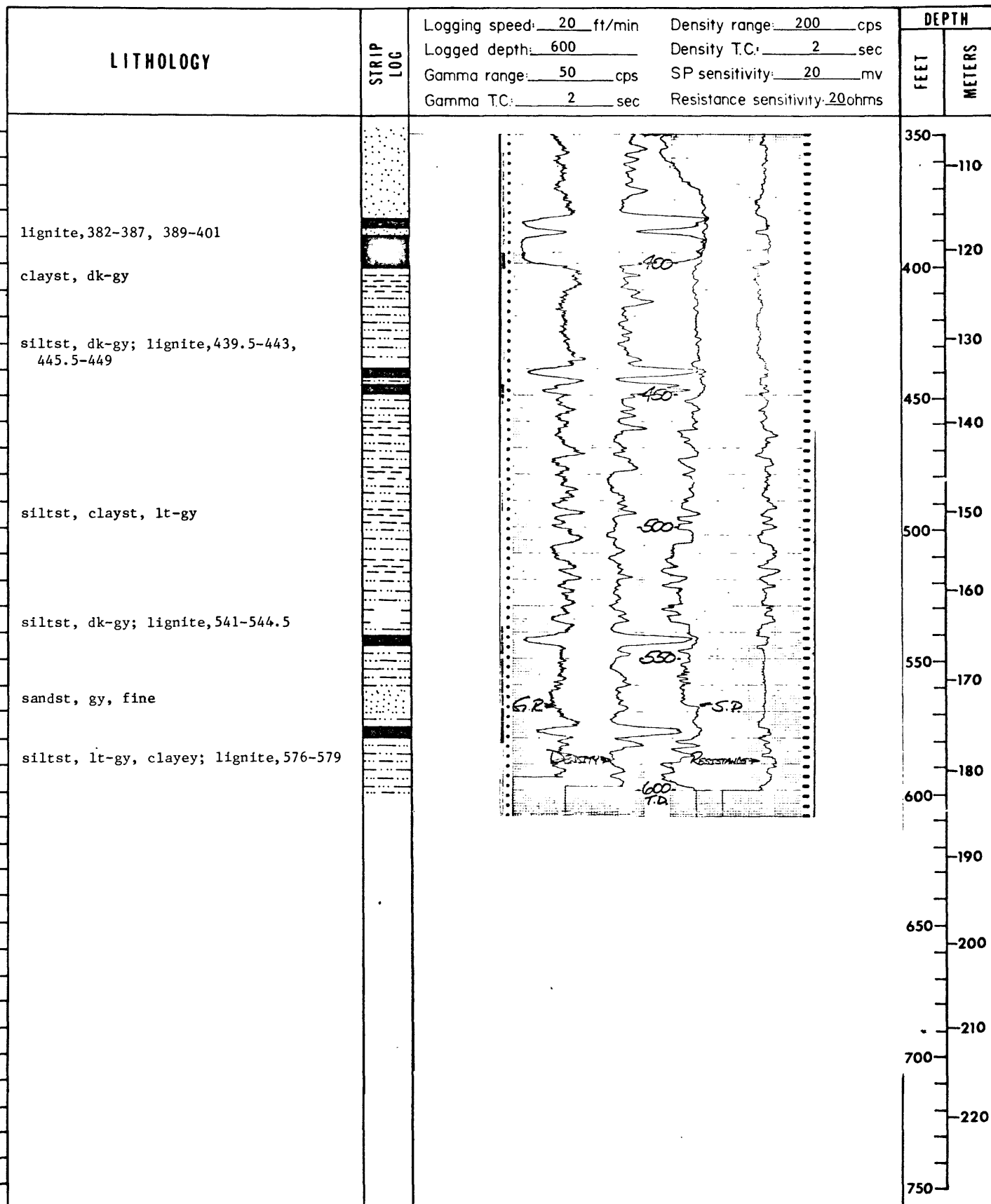
HOLE NO W 11
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bonetraill SW	
DATE STARTED 7/10/79	DATE COMP. 7/10/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 2 T.156 N., R. 103 W., FOOTAGE LOC. 75		FNL 1345 FEL	GROUND ELEV 2319 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 600 CORING -----	TOTAL DEPTH 600 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 4 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

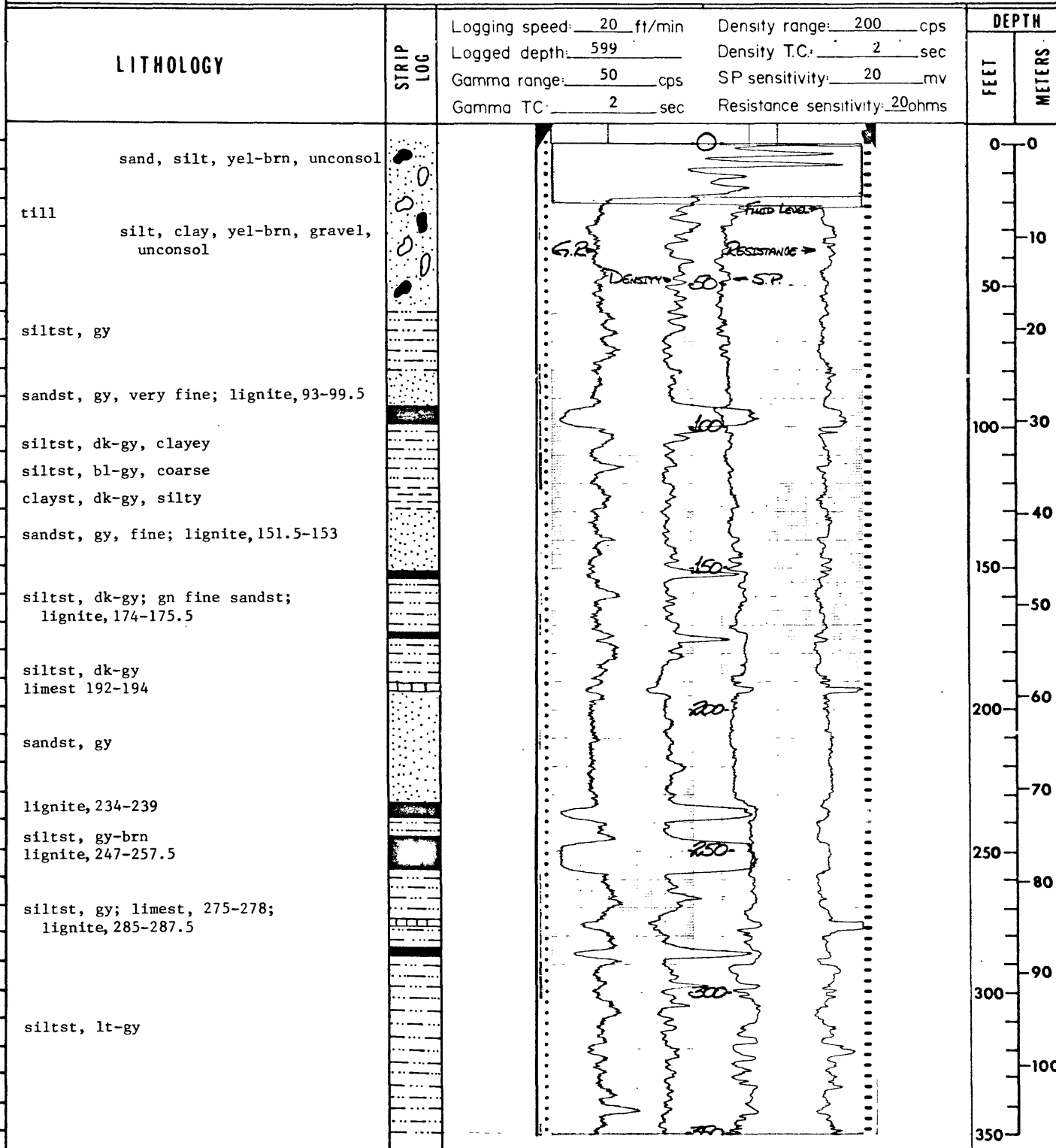


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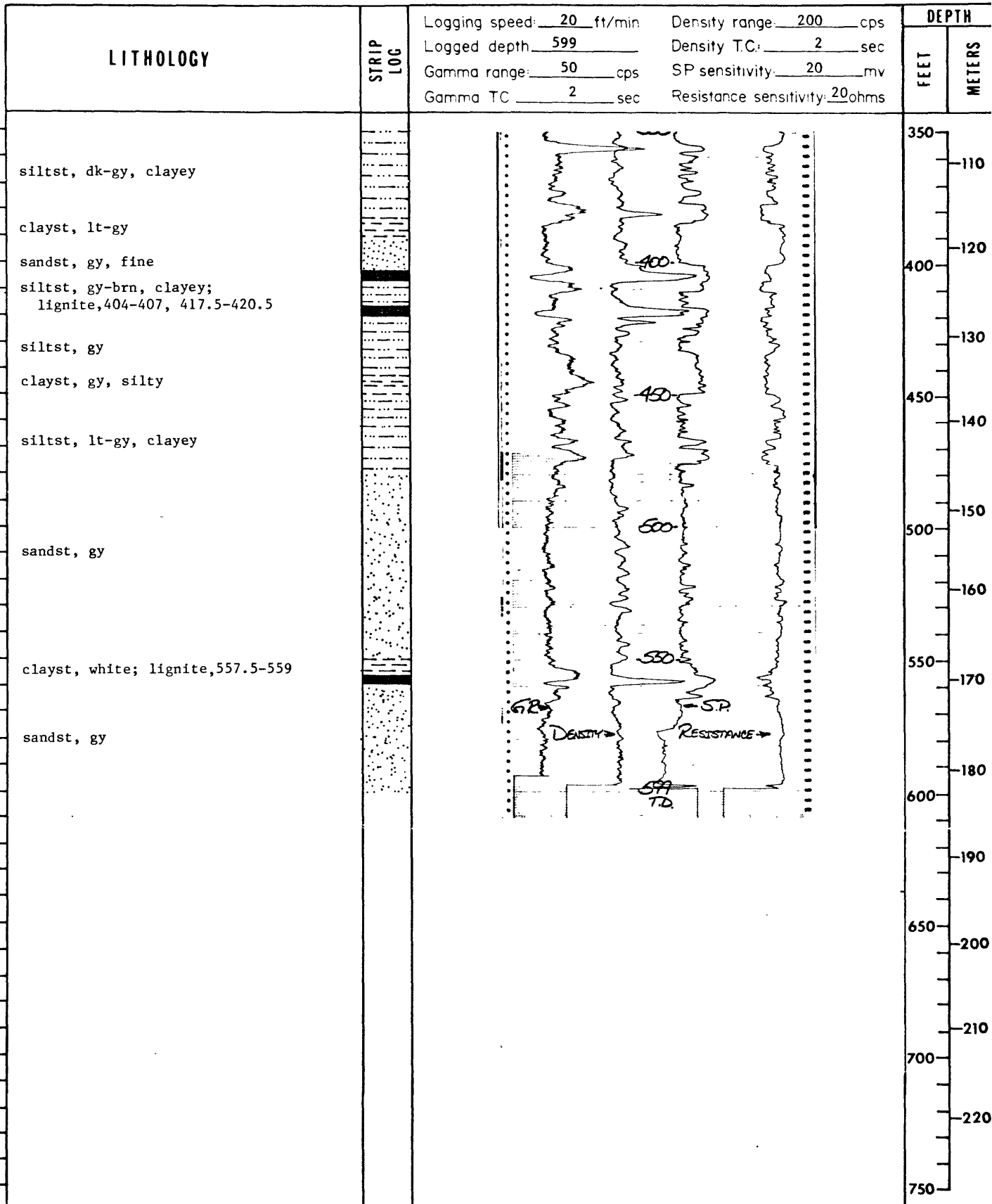
HOLE NO W 12
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bull Butte	
DATE STARTED 7/9/79	DATE COMP. 7/9/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 2 T.156 N., R. 104 W., FOOTAGE LOC. 35		FNL 265	FEL 2388 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE 600	TOTAL DEPTH 600 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 23 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

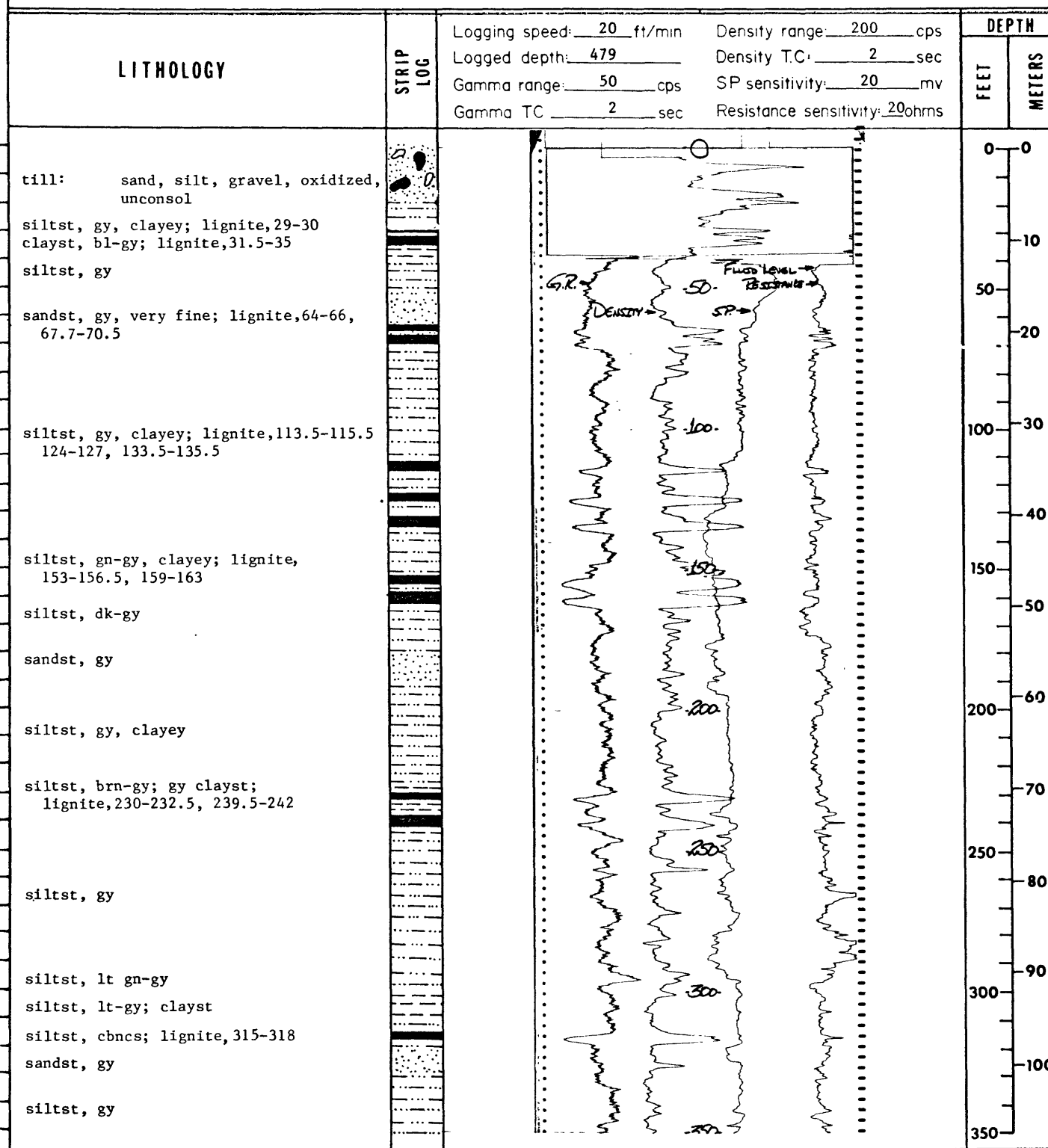


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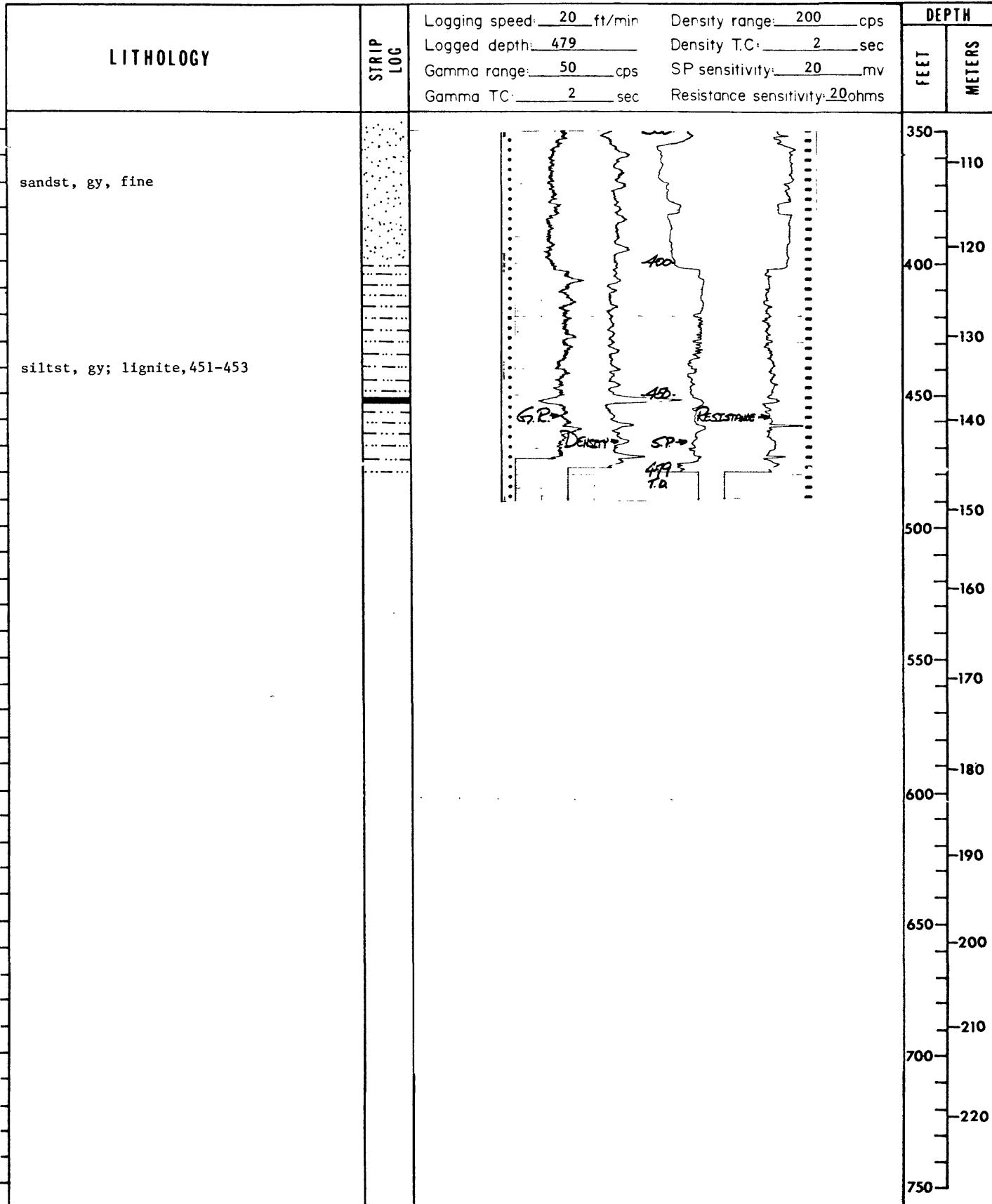
HOLE NO W 18
SHEET 1 OF 2

AREA Williams County		QUAD NAME Epping NE	
DATE STARTED 6/16/79	DATE COMP. 6/16/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 26 T.157 N., R. 98 W., FOOTAGE LOC. 5		FOOTAGE 45	GROUND ELEV 2361 ft
SIZE AND BIT TYPE: 5-inch drag		ROTARY 480	TOTAL DEPTH 480 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 42 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

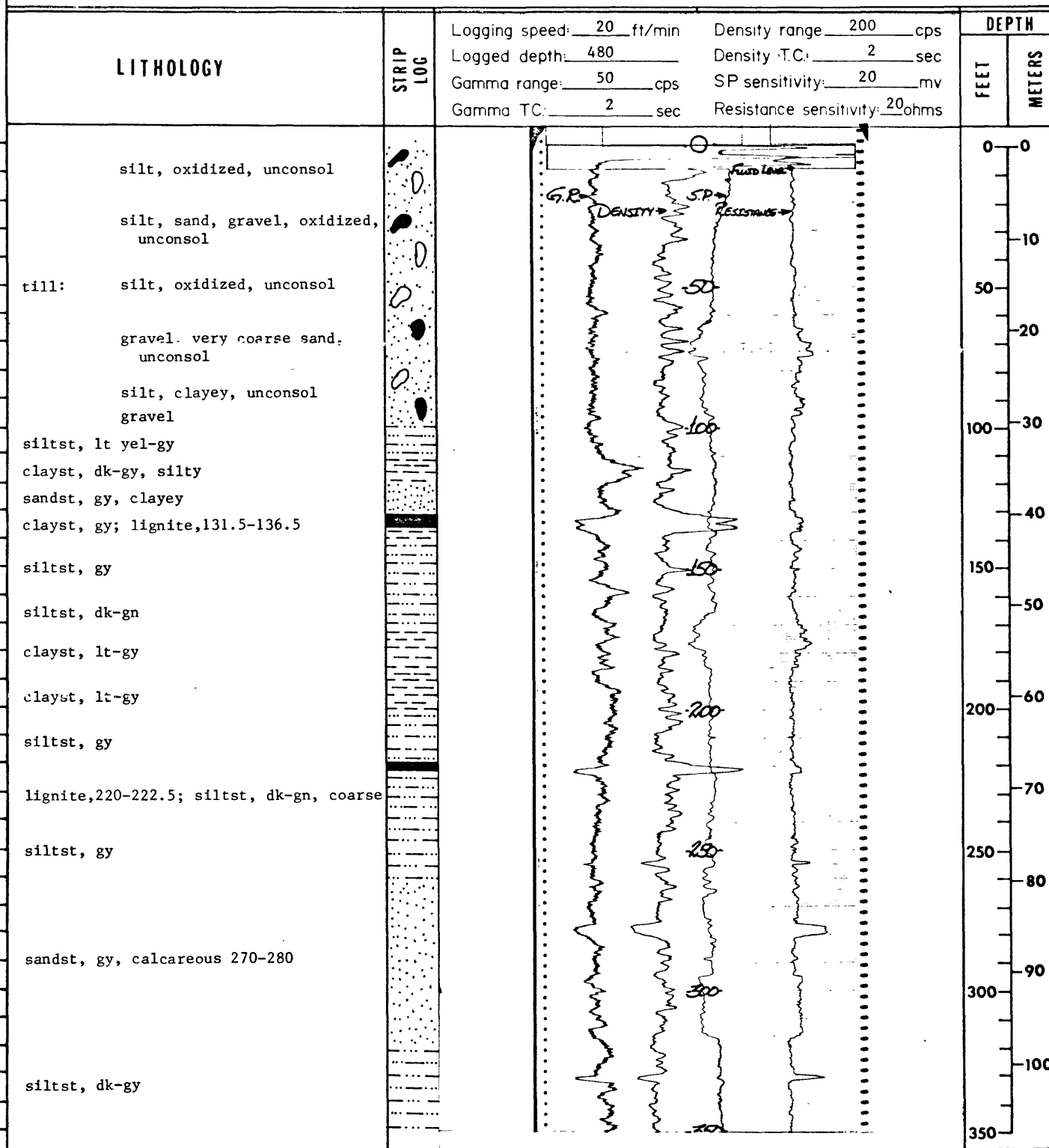


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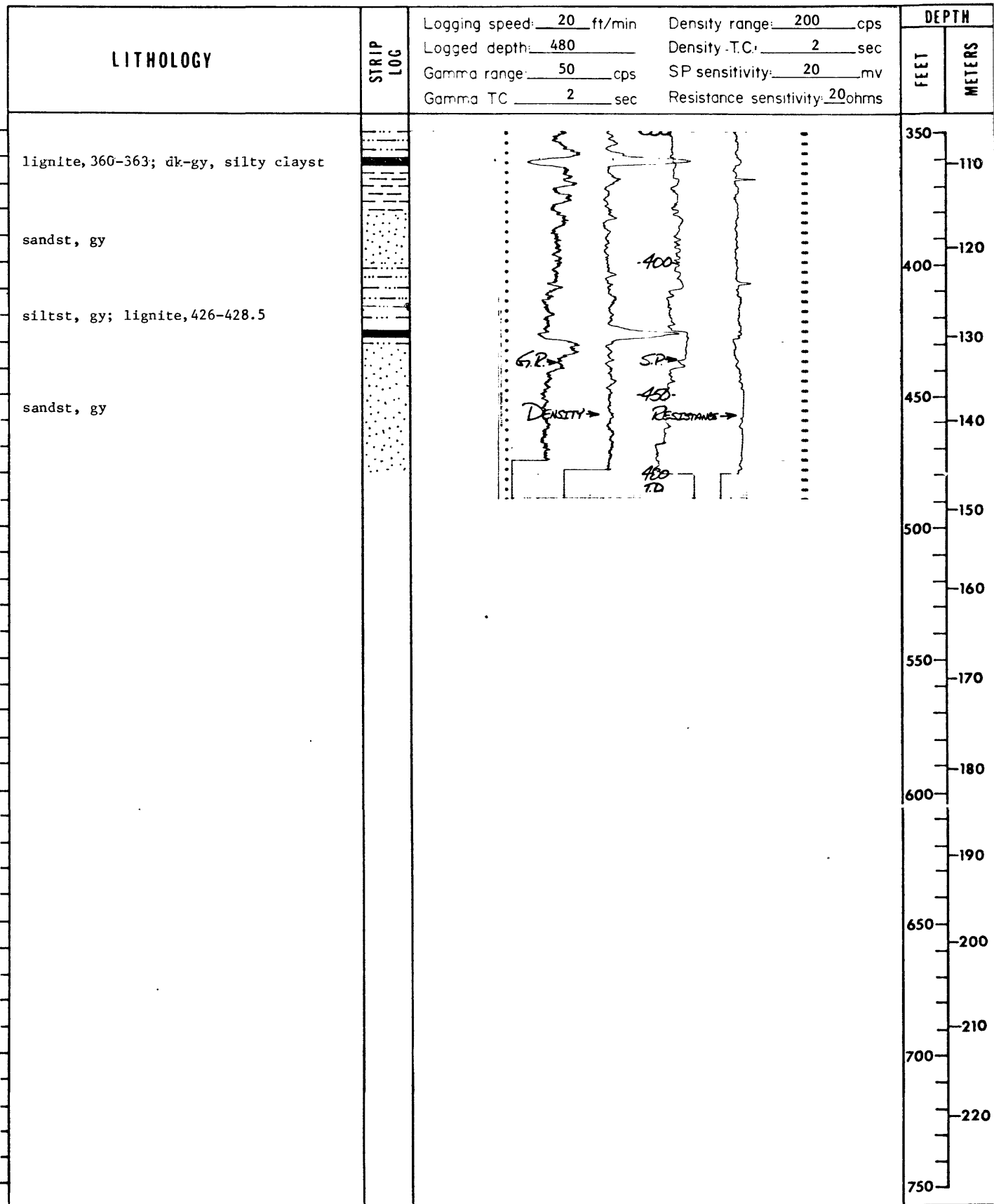
HOLE NO W 19
SHEET 1 OF 2

AREA Williams County		QUAD NAME Epping NW	
DATE STARTED 6/18/79	DATE COMP. 6/18/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 12 T.157 N., R. 99 W., FOOTAGE LOC. 85		FNL 22 FEL 22	GROUND ELEV 2285 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE 480	TOTAL DEPTH 480 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 8 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

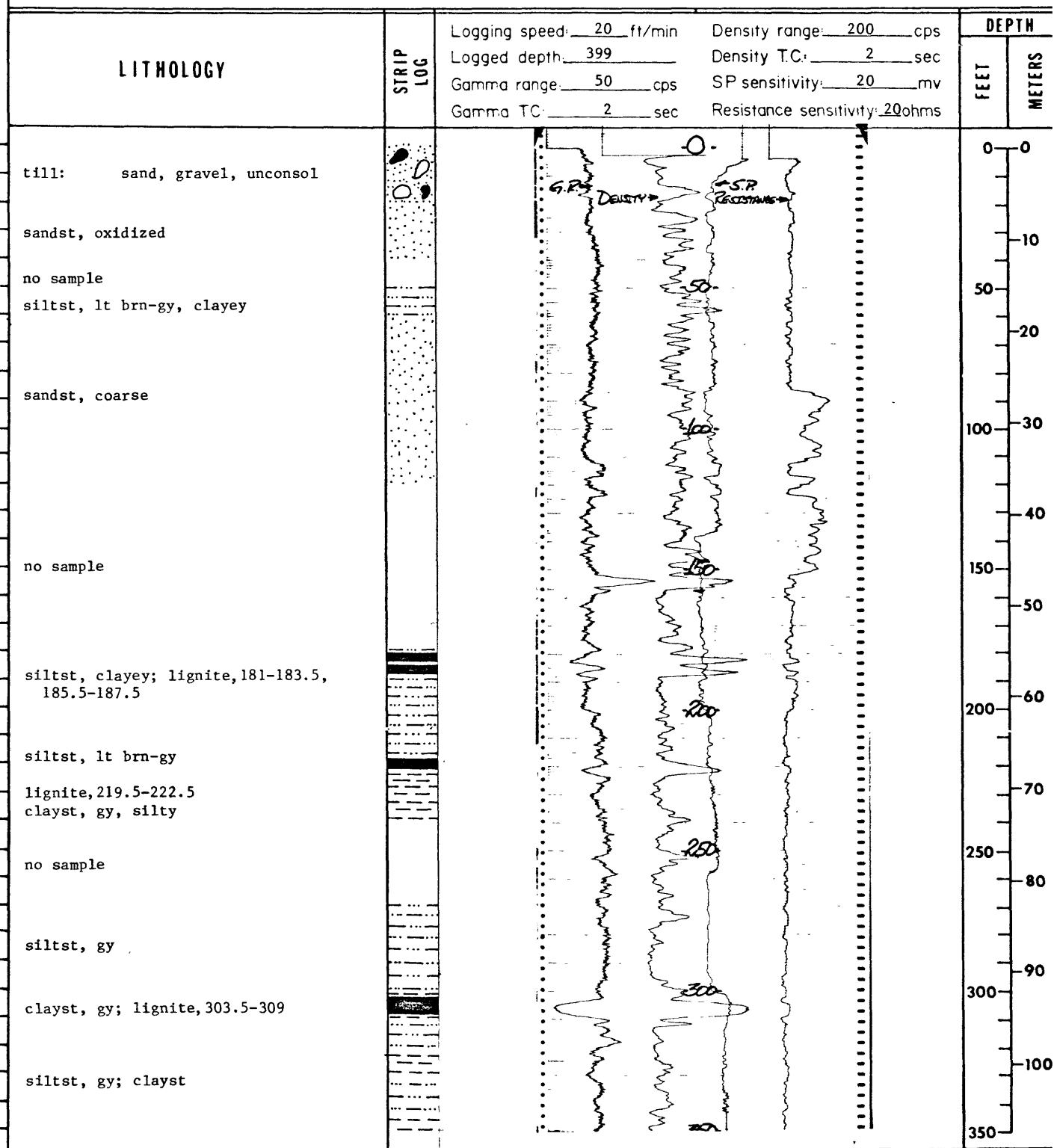


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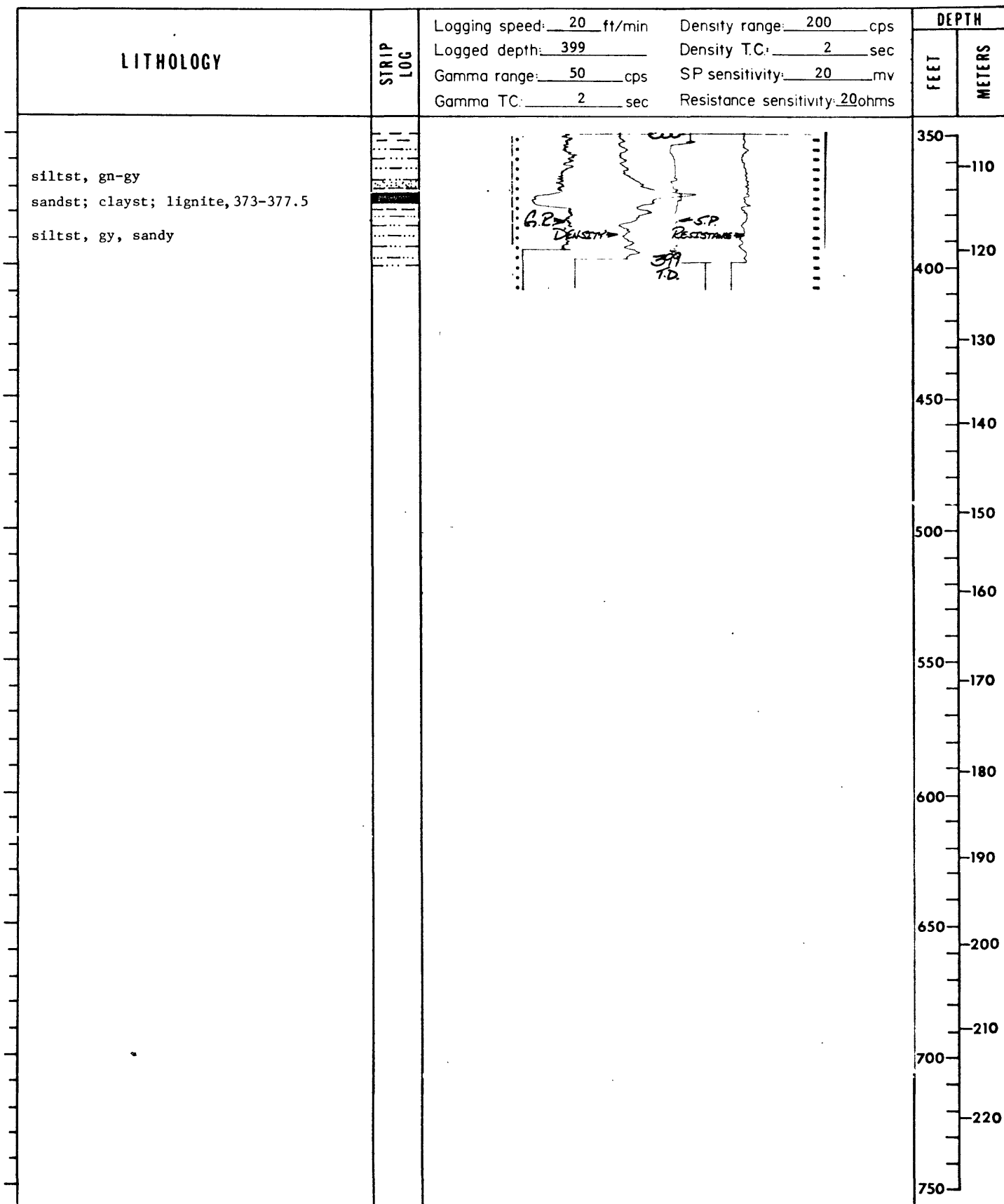
HOLE NO W 20
SHEET 1 OF 2

AREA Williams County		QUAD NAME Epping NW	
DATE STARTED 6/19/79	DATE COMP. 6/19/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 21 T.157 N., R. 99 W., FOOTAGE LOC. 2620		FNL 35 FEL	GROUND ELEV 2214 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 400 CORING -----	TOTAL DEPTH 400 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 4 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

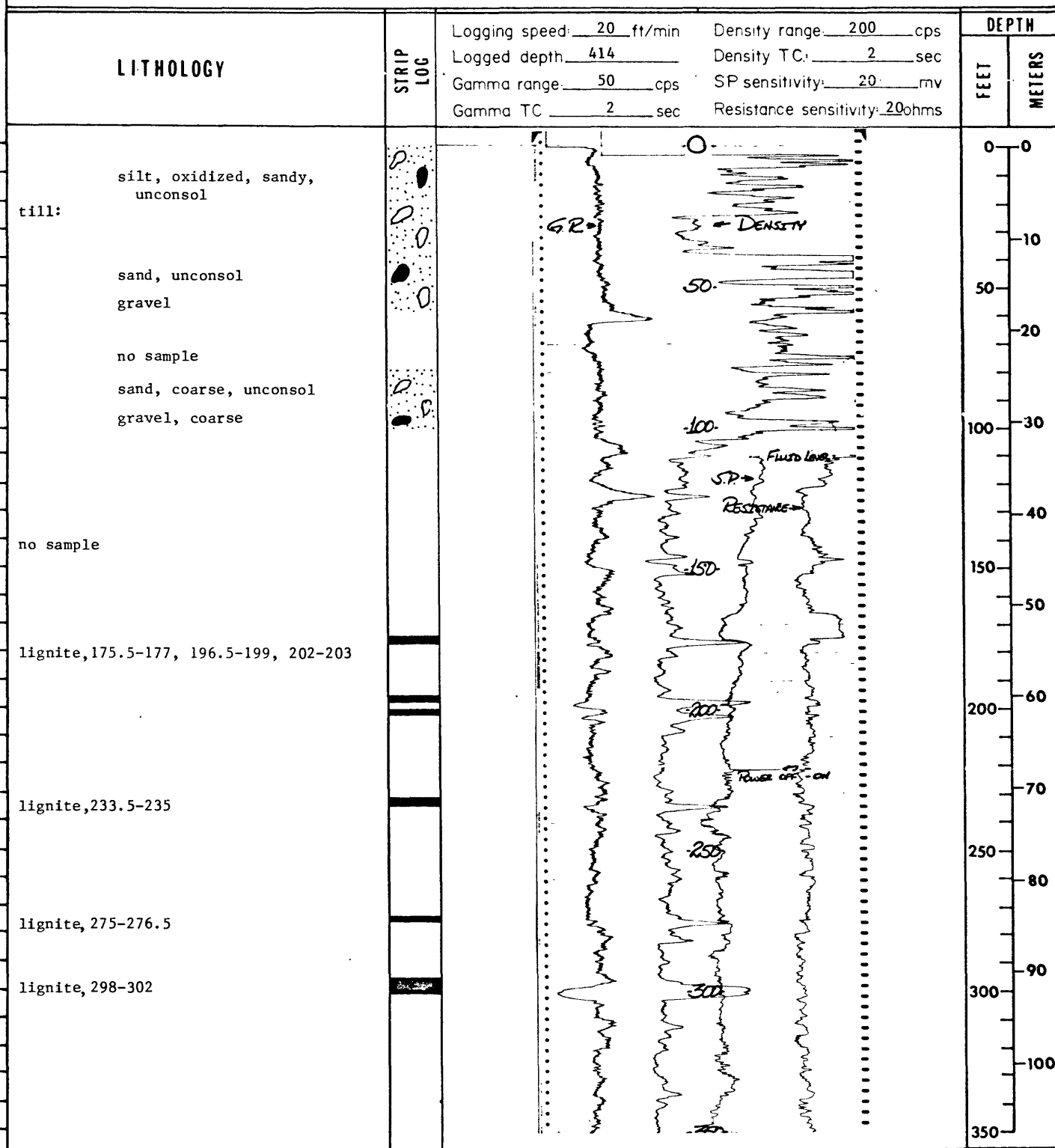


UNITED STATES GEOLOGICAL SURVEY

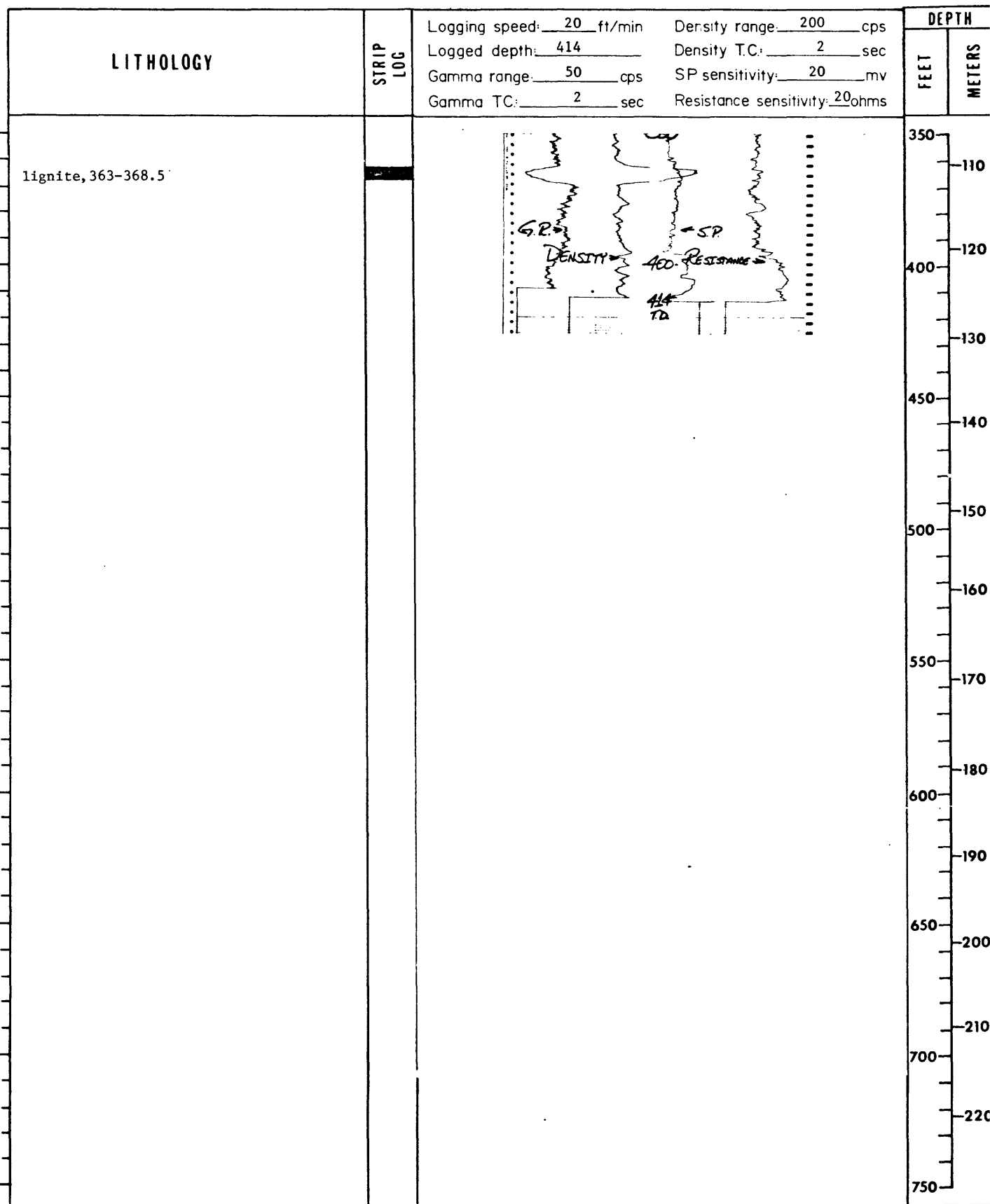
HOLE NO W 21
SHEET 1 OF 2

AREA Williams County		QUAD NAME Springbrook	
DATE STARTED 6/18/79	DATE COMP. 6/18/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 35 T. 157 N. R. 99 W. FOOTAGE LOC. 23		FSL 6 FEL	GROUND ELEV 2253 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 420 CORING -----	TOTAL DEPTH 420 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 110 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

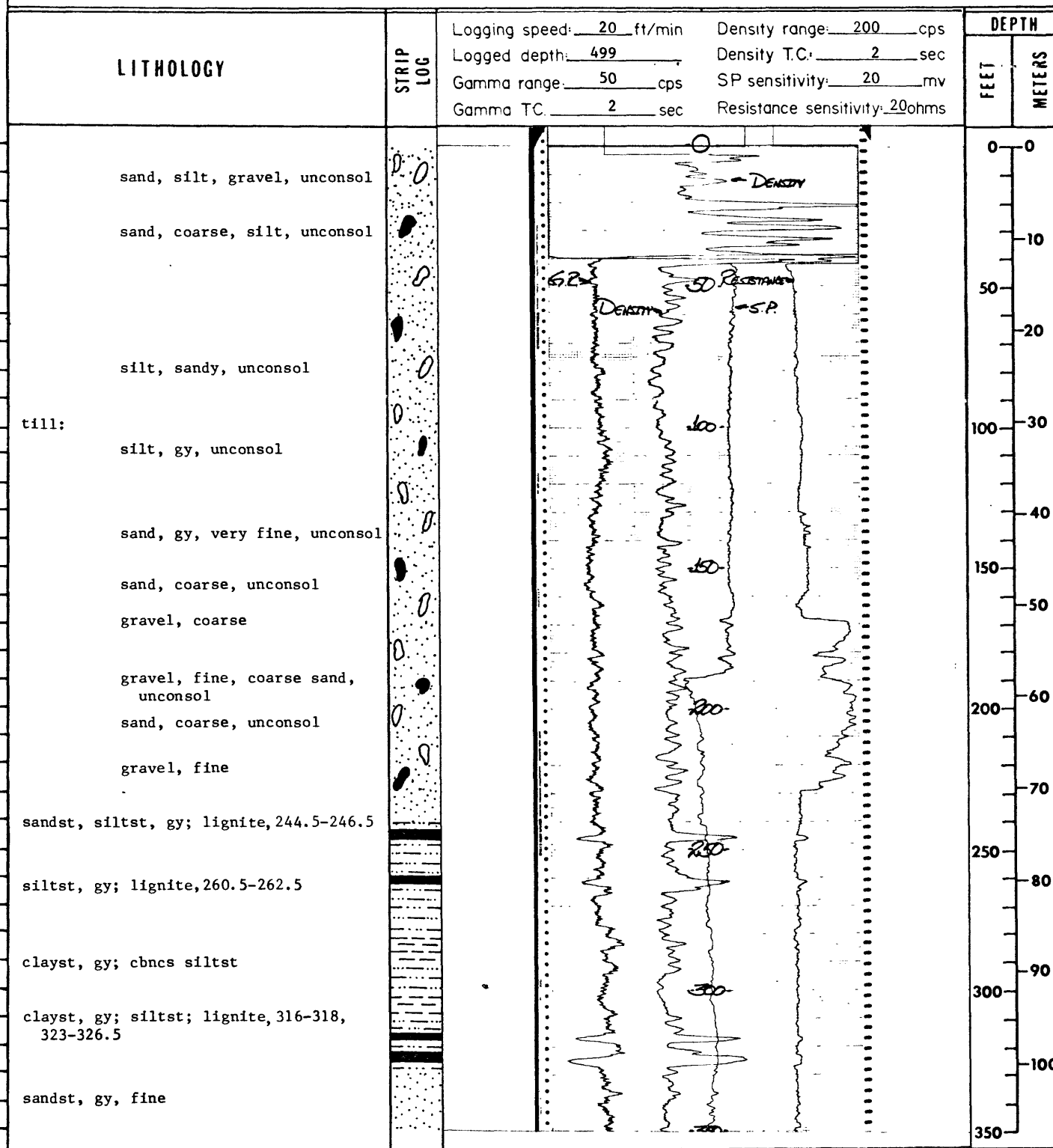


UNITED STATES GEOLOGICAL SURVEY

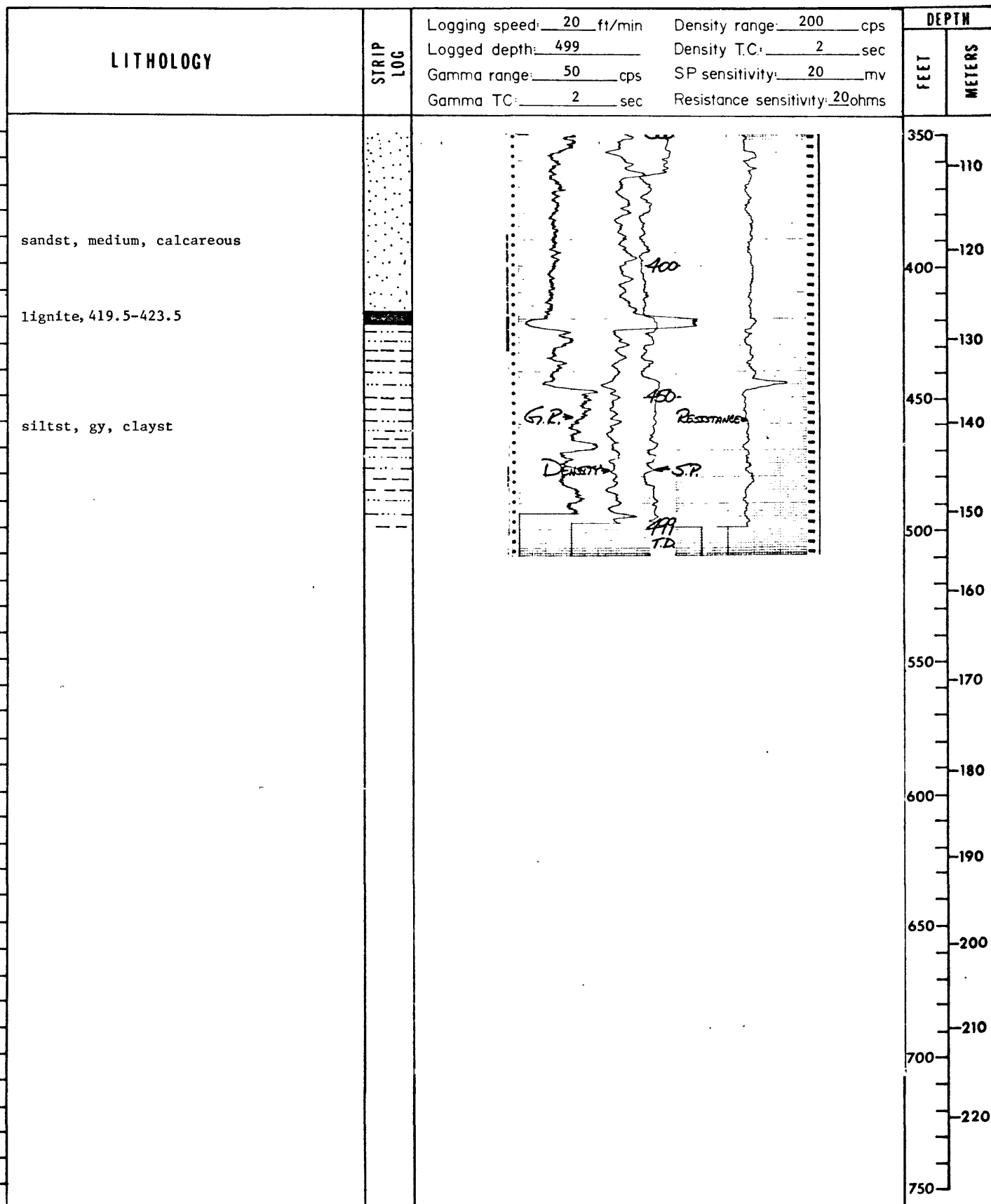
HOLE NO W 22
SHEET 1 OF 2

AREA Williams County		QUAD NAME Twin Lakes	
DATE STARTED 6/23/79	DATE COMP. 6/23/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 2 T. 157 N., R. 100 W., FOOTAGE LOC. 15		FNL 115 FEL 115	GROUND ELEV 2206 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 500 CORING -----	TOTAL DEPTH 500 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 40 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

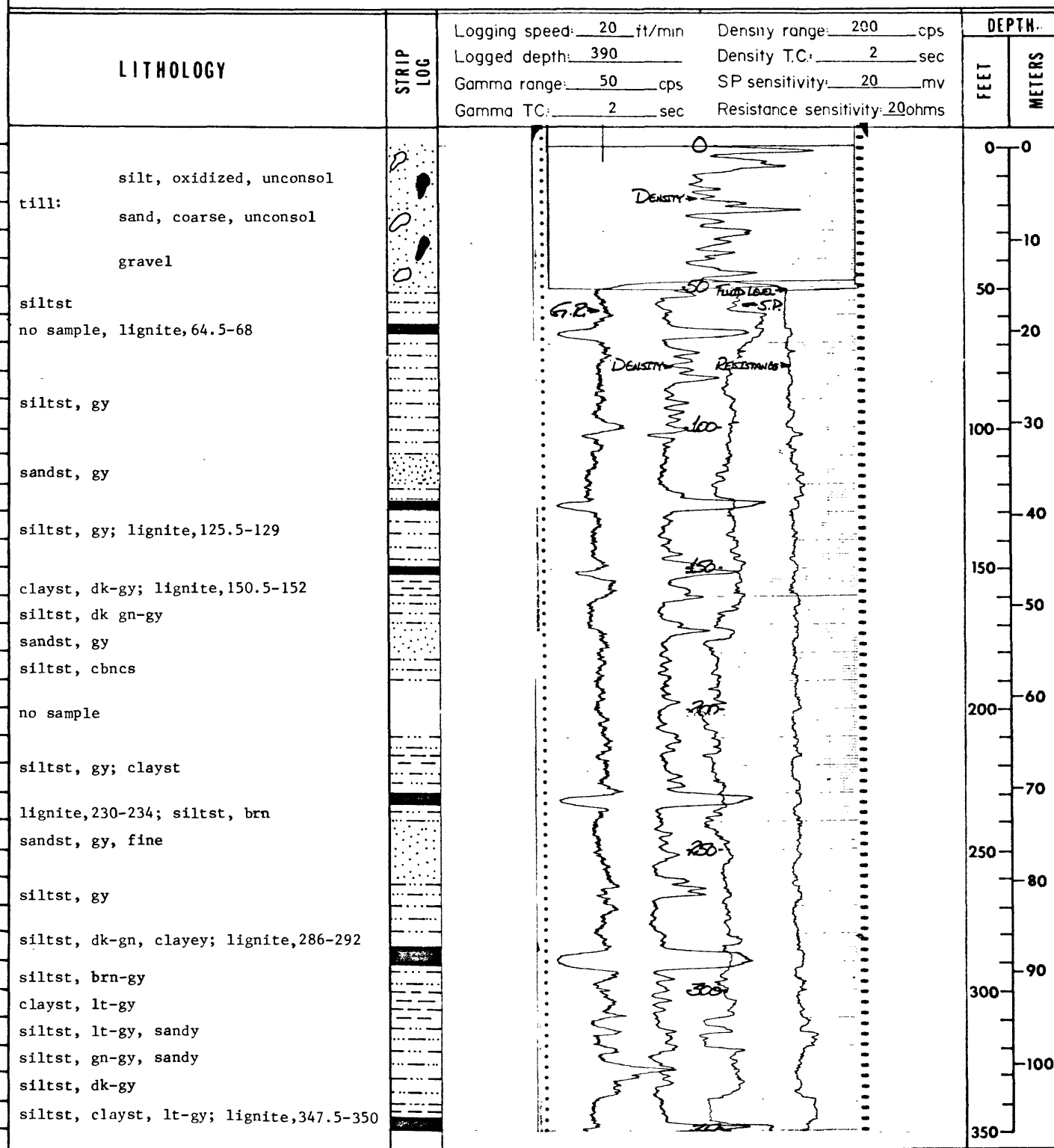


UNITED STATES GEOLOGICAL SURVEY

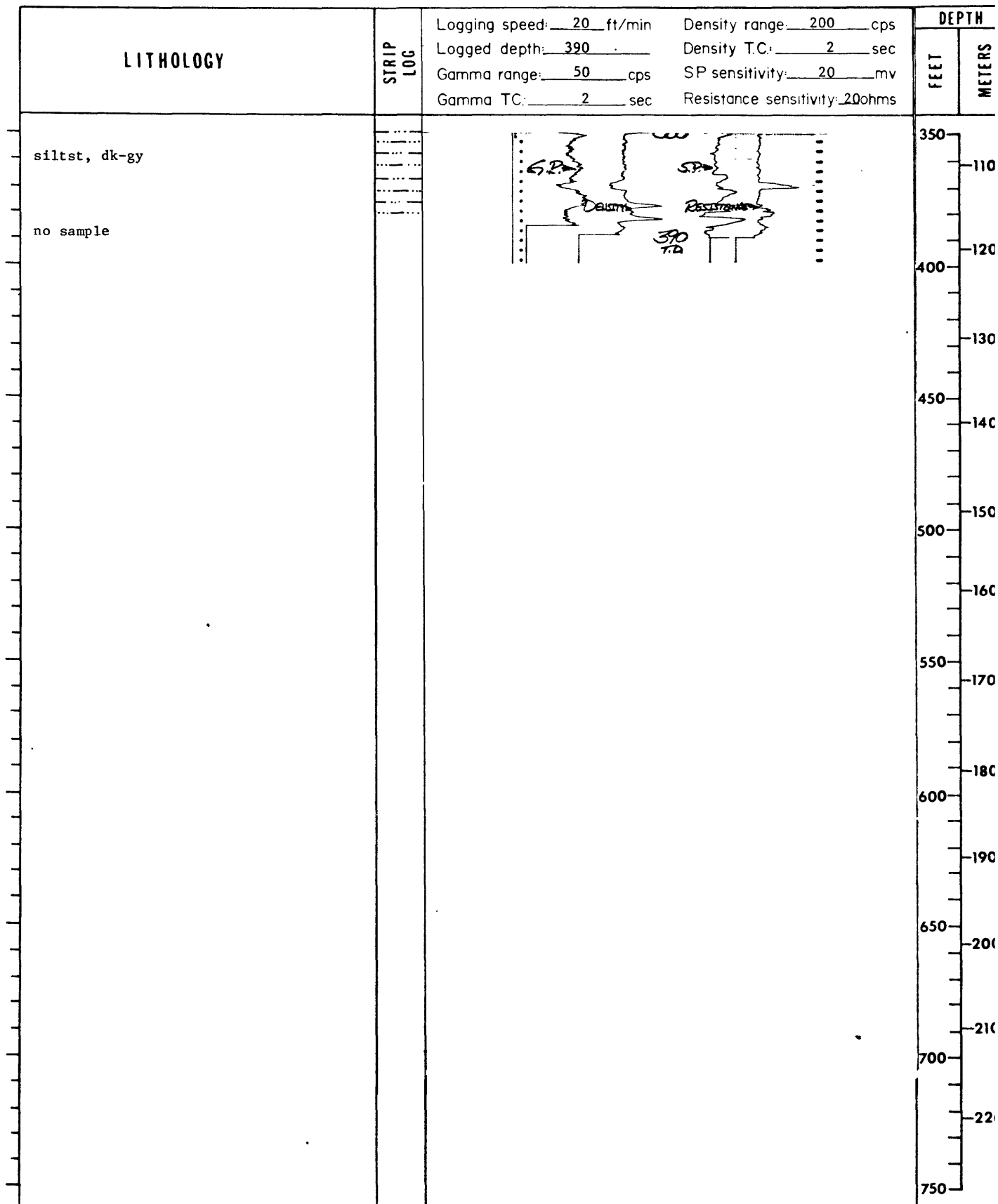
HOLE NO W 23
SHEET 1 OF 2

AREA Williams County		QUAD NAME Blacktail Lake	
DATE STARTED 7/2/79	DATE COMP. 7/2/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 6 T.157 N., R. 100 W., FOOTAGE LOC. 5		XMMX FSL 38	XMMX FWL
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 395	CORING -----
DRILLING AGENCY: Crandall Drilling	DRILL TYPE: -----		GROUND ELEV 2133 ft
LITHOLOGY RECORDED BY Spencer	GEOPHYSICAL LOGS RECORDED BY Nelson		TOTAL DEPTH 395 ft
DEPTH TO WATER 51 ft			

REMARKS:



REMARKS:

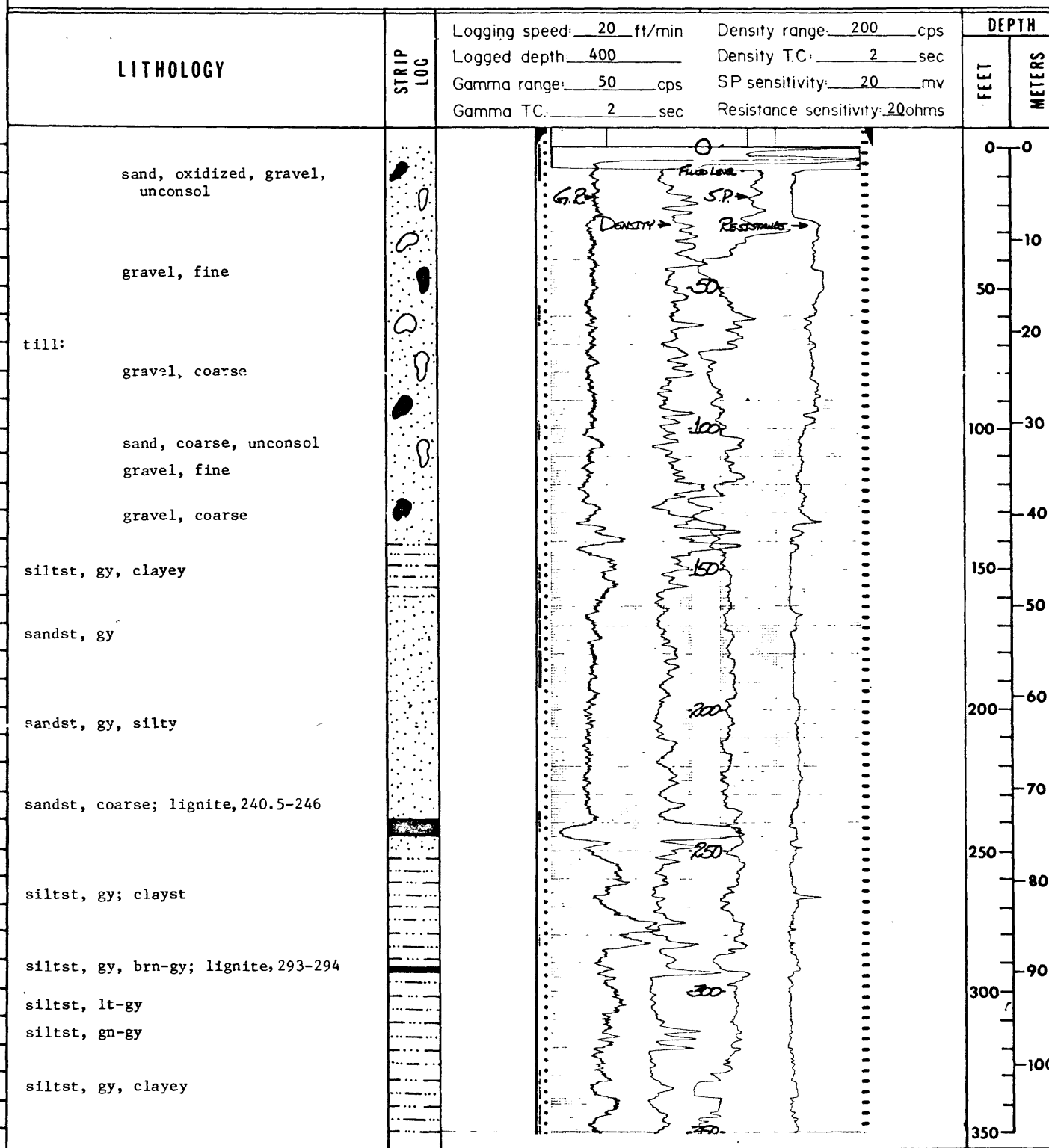


UNITED STATES GEOLOGICAL SURVEY

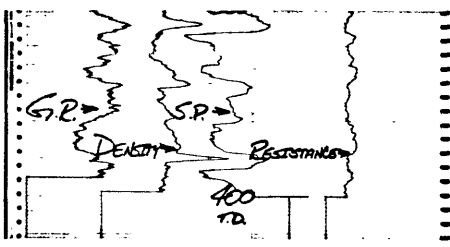
HOLE NO W 24
SHEET 1 OF 2

AREA Williams County		QUAD NAME Twin Lakes	
DATE STARTED 6/28/79	DATE COMP. 6/28/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 23 T.157 N., R.100 W., FOOTAGE LOC. 35		FNL 712 FEEL 712	GROUND ELEV 2051 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 400 CORING -----	TOTAL DEPTH 400 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 8 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

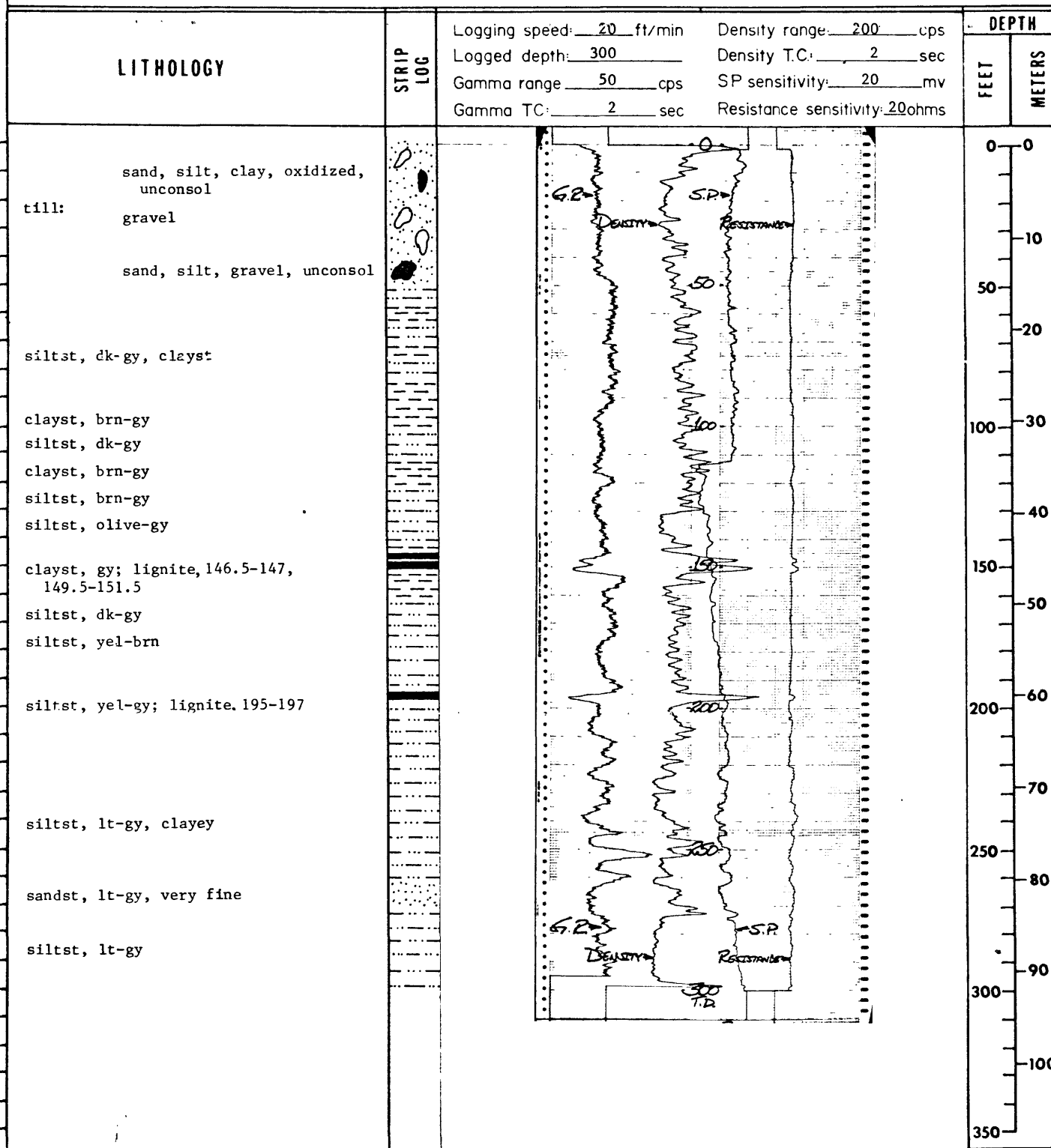
LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min		Density range: 200 cps	
		Logged depth: 400		Density T.C.: 2 sec	
		Gamma range: 50 cps		SP sensitivity: 20 mv	
		Gamma TC: 2 sec		Resistance sensitivity: 20 ohms	
siltst, gn					
siltst, lt-gy, clayey					

UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 25
SHEET 1 OF 1

AREA Williams County		QUAD NAME Blacktail Lake	
DATE STARTED 7/1/79	DATE COMP. 7/1/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 30 T.157 N., R. 100 W., FOOTAGE LOC. 35.		XXX FSL 75	FEL XXX GROUND ELEV 1999 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 300 CORING -----	
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

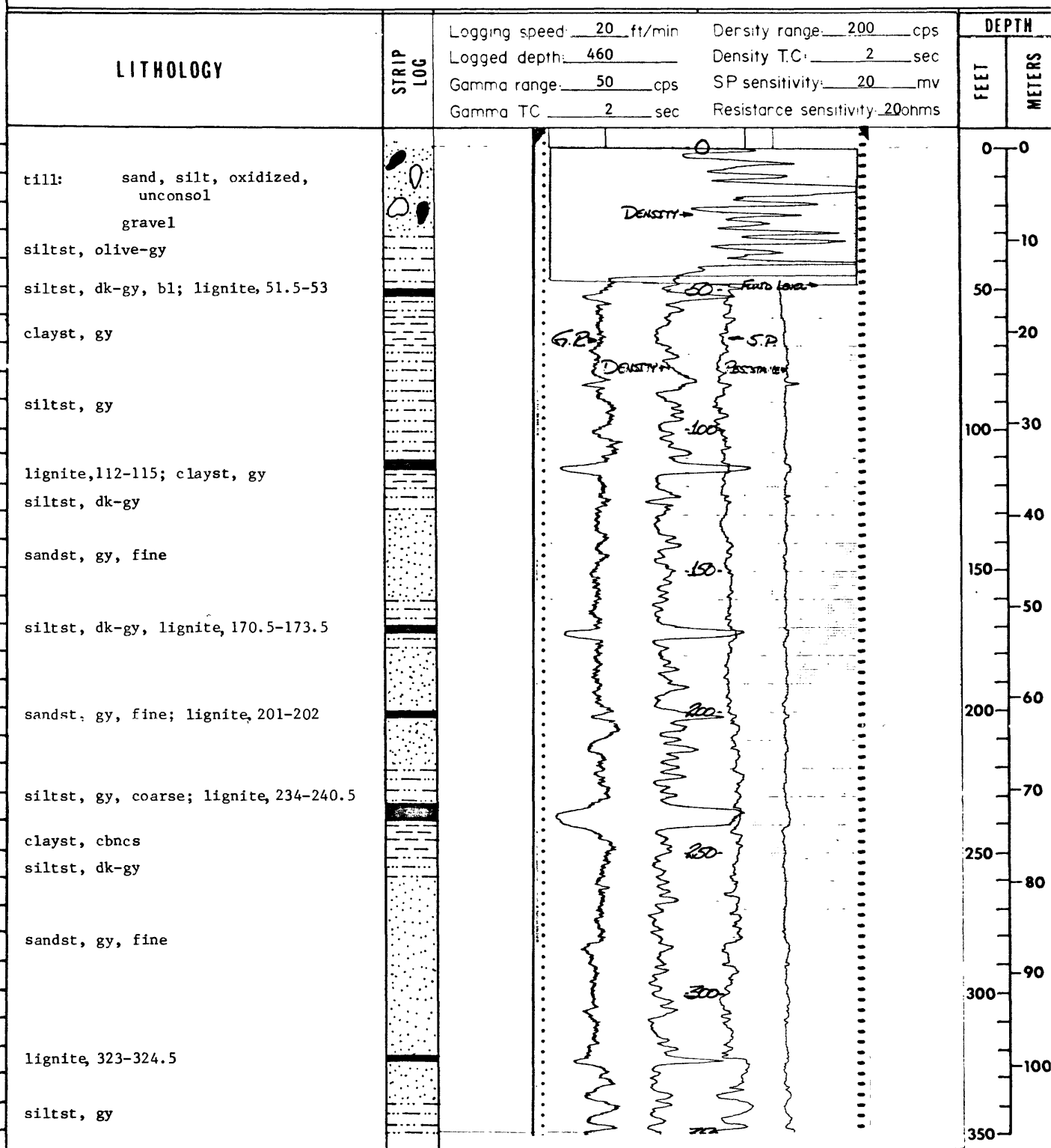
REMARKS:



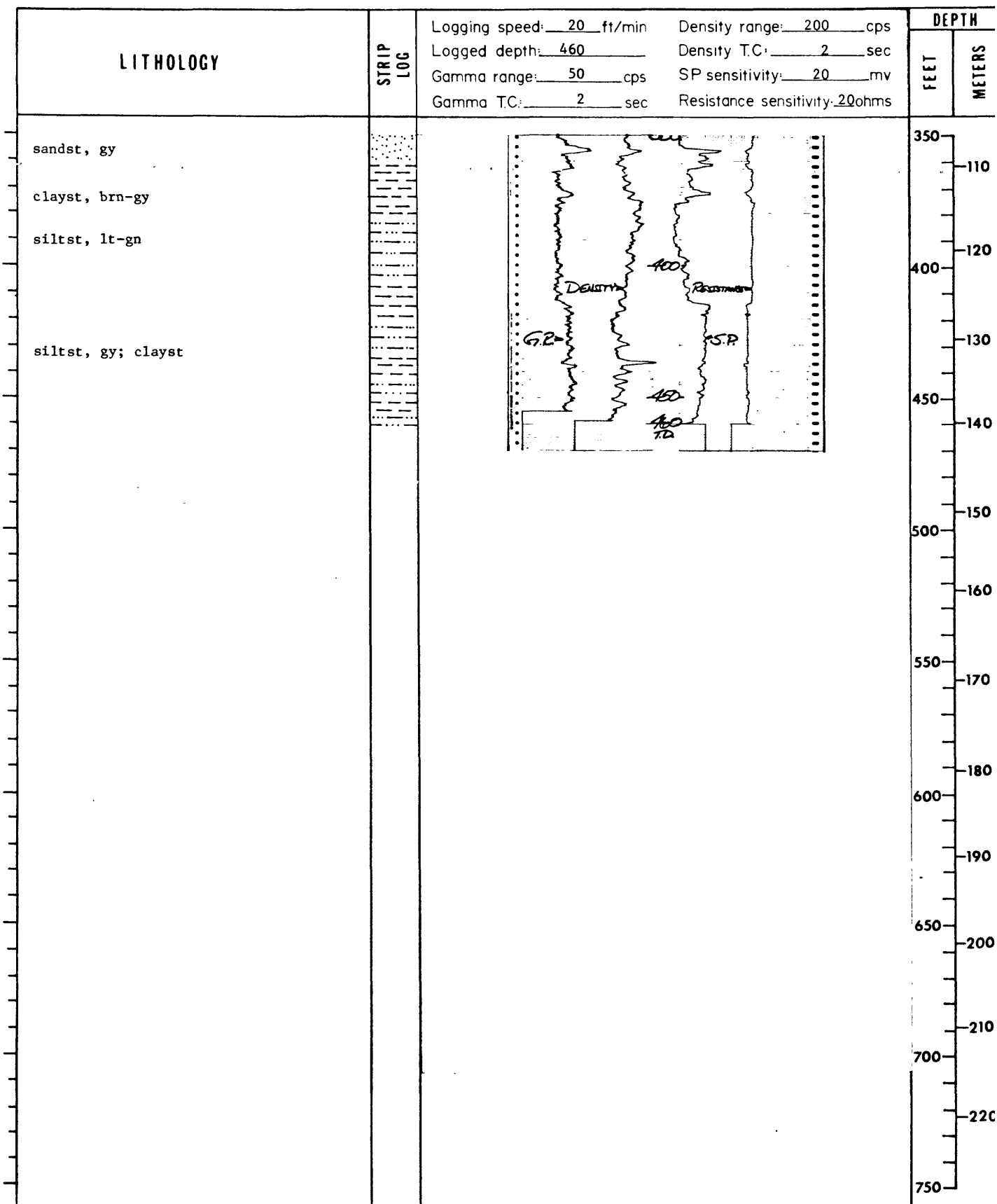
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 26
SHEET 1 OF 2

AREA Williams County		QUAD NAME Blacktail Lake	
DATE STARTED 7/2/79	DATE COMP. 7/2/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 9 T.157 N., R.101 W., FOOTAGE LOC. 85		FNL XXX 8	FEL XWXX
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	GROUND ELEV 2234 ft
		ROTARY 460	CORING ----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	TOTAL DEPTH 460 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



REMARKS:



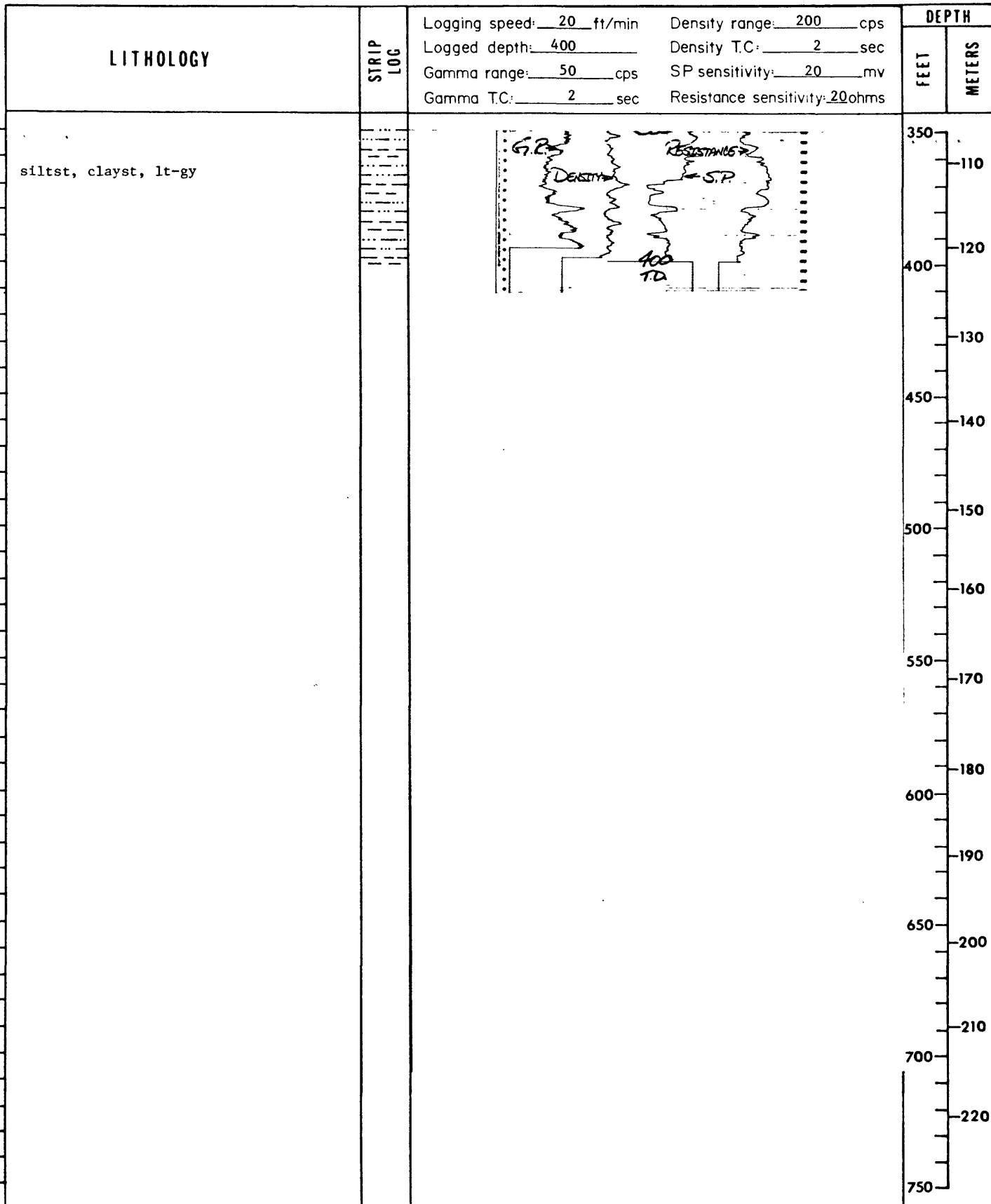
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 27
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bonetraill	
DATE STARTED 7/11/79	DATE COMP. 7/11/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 17 T.157 N., R.101 W., FOOTAGE LOC. 345		FOOTAGE 185	GROUND ELEV 2216 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE 400	TOTAL DEPTH 400 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 24 ft
LITHOLOGY RECORDED BY Tomac		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			

LITHOLOGY	STRIP LOG	LOGGING DATA		DEPTH	
		Logging speed: 20 ft/min Logged depth: 400 Gamma range: 50 cps Gamma TC: 2 sec	Density range: 200 cps Density T.C.: 2 sec SP sensitivity: 20 mv Resistance sensitivity: 20 ohms	FEET	METERS
clayst, siltst, gy-brn				0	0
clayst, gn-gy; lignite, 35-40, 43.5-46				10	
sandst, gy				20	
siltst, gy; lignite, 74-77				30	
siltst, clayst, gy; lignite, 90.5-92, 114-119				40	
siltst, brn-gy, gn; clayst				50	
sandst, gy				60	
siltst, clayst, gy; lignite, 166-171, 188-189.5				70	
siltst, clayst, gn-gy				80	
sandst, gy, very fine				90	
siltst, clayst, gy; lignite, 245.5-247, 249.5-258.5				100	
siltst, clayst, brn-gy					
sandst, gy; lignite, 293-295.5, 299-300					
no sample					
siltst, clayst, gy					
lignite, 336-339					
sandst, siltst, gy-brn					

REMARKS:



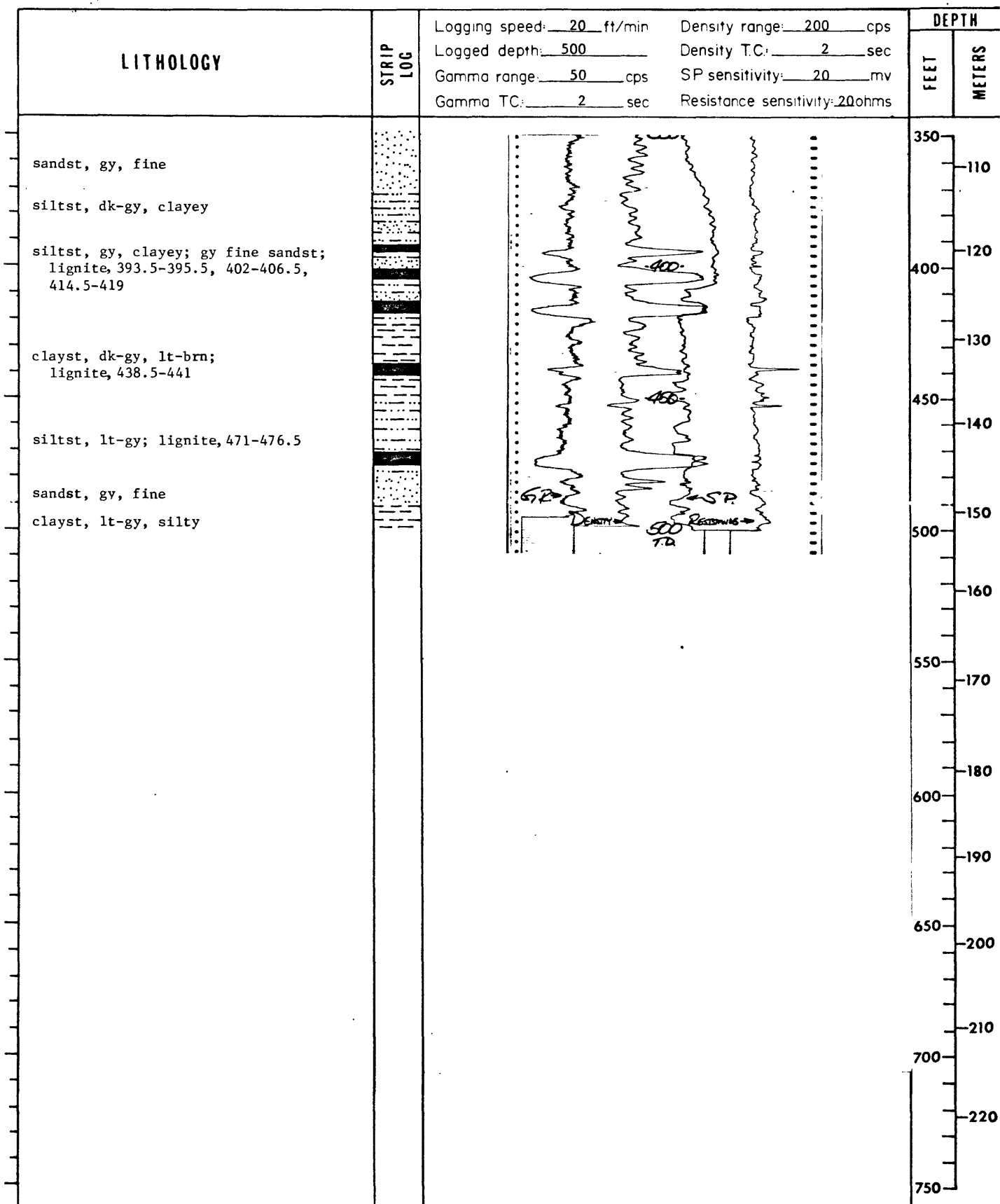
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 28
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bonetraill SE	
DATE STARTED 7/11/79	DATE COMP. 7/11/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 31 T.157 N., R.101 W., FOOTAGE LOC. 350		XXX FSL 2 FEL XXX	GROUND ELEV 2393 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 500 CORING -----	TOTAL DEPTH 500 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 6 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min Density range: 200 cps Logged depth: 500 Density T.C.: 2 sec Gamma range: 50 cps SP sensitivity: 20 mv Gamma TC: 2 sec Resistance sensitivity: 20 ohms	DEPTH	
			FEET	METERS
till: silt, yel-brn, sandy, unconsol			0	0
sand, gravel, unconsol			10	
siltst, gy-brn, sandy			20	
siltst, yel-gy			30	
siltst, gy, clayey			40	
siltst, cbnccs; brn silty clayst; lignite, 90-93, 94-95, 99.5-102; gn clayst			50	
siltst, gy			60	
sandst, gy, fine			70	
lignite, 160.5-163.5; dk-gy siltstone			80	
clayst, gn, silty			90	
sandst, dk-gy			100	
clayst, siltst, dk-gy			200	
sandst, gy			300	
clayst, dk-gy, lt-brn; lignite, 253-260.5			350	
clayst, dk-gy; gn siltst				
siltst, dk-gy, clayey; limest				
sandst, lt-gy				
clayst, dk-gy, silty; lignite, 326.5-334.5, 340.5-342				

REMARKS:



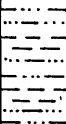
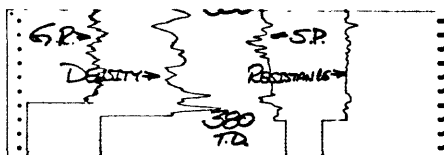
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 29
SHEET 1 OF 2

AREA Williams County		QUAD NAME Blacktail Lake	
DATE STARTED 7/1/79	DATE COMP. 7/1/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 34 T. 157 N., R. 101 W., FOOTAGE LOC. 48		FNL XXXX 8 FEL XXXX	GROUND ELEV 2171 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 380 CORING -----	
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min Density range: 200 cps Logged depth: 380 Density TC: 2 sec Gamma range: 50 cps SP sensitivity: 20 mv Gamma TC: 2 sec Resistance sensitivity: 20 ohms		DEPTH	
		FEET	METERS		
siltst, yel-brn, sandy				0	0
clayst, yel-brn, silty				10	
siltst, brn; lignite, 20-21.5				50	
no sample				20	
siltst, clayst, yel-brn				100	30
sandst, yel-brn; ironst				150	40
sandst, brn				200	50
sandst, gy; lignite, 117-122				250	60
siltst, gy, clayey				300	70
siltst, dk-gy				350	80
sandst, dk-gy, fine					90
siltst, dk-gy; lignite, 189.5-196.5, 201-203					100
siltst, lt-gy; lignite, 240.5-243, 254-258					110
clayst, dk-gy, brn; lignite, 268.5-272					120
siltst, dk-gy; clayst					130
sandst, calcareous					140
siltst, clayst, lt-gy		150			

REMARKS:

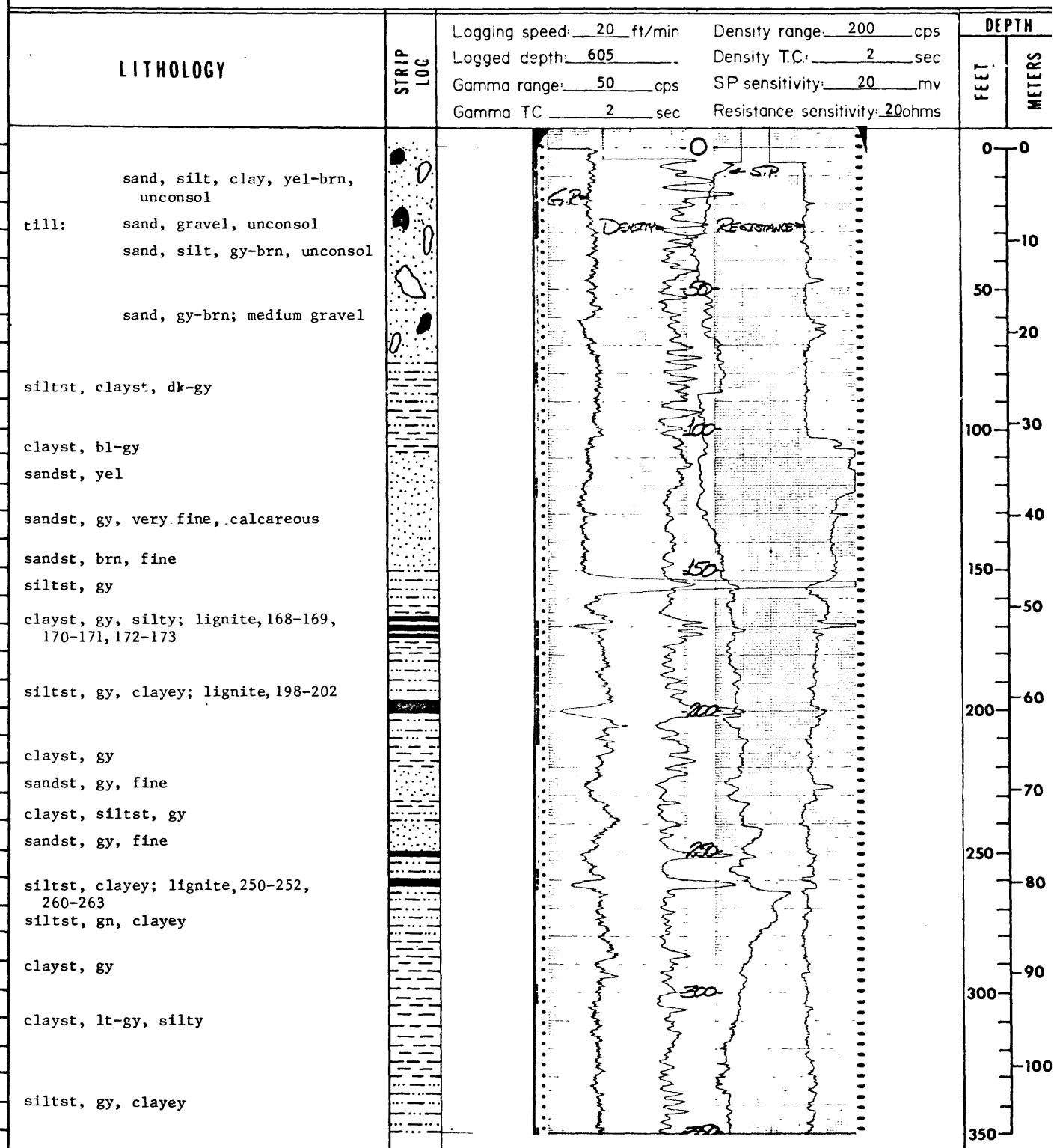
LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min Density range: <u>200</u> cps Logged depth: <u>380</u> Density T.C.: <u>2</u> sec Gamma range: <u>50</u> cps SP sensitivity: <u>20</u> mv Gamma TC: <u>2</u> sec Resistance sensitivity: <u>20</u> ohms		DEPTH	
		FEET	METERS	FEET	METERS
siltst, sandst, lt-gy				350	110
				400	120
				450	130
				500	140
				550	150
				600	160
				650	170
				700	180
				750	190
					200
					210
					220
					230
					240
					250
					260
					270
					280
					290
					300
					310
					320
					330
					340
					350
					360
					370
					380

UNITED STATES GEOLOGICAL SURVEY

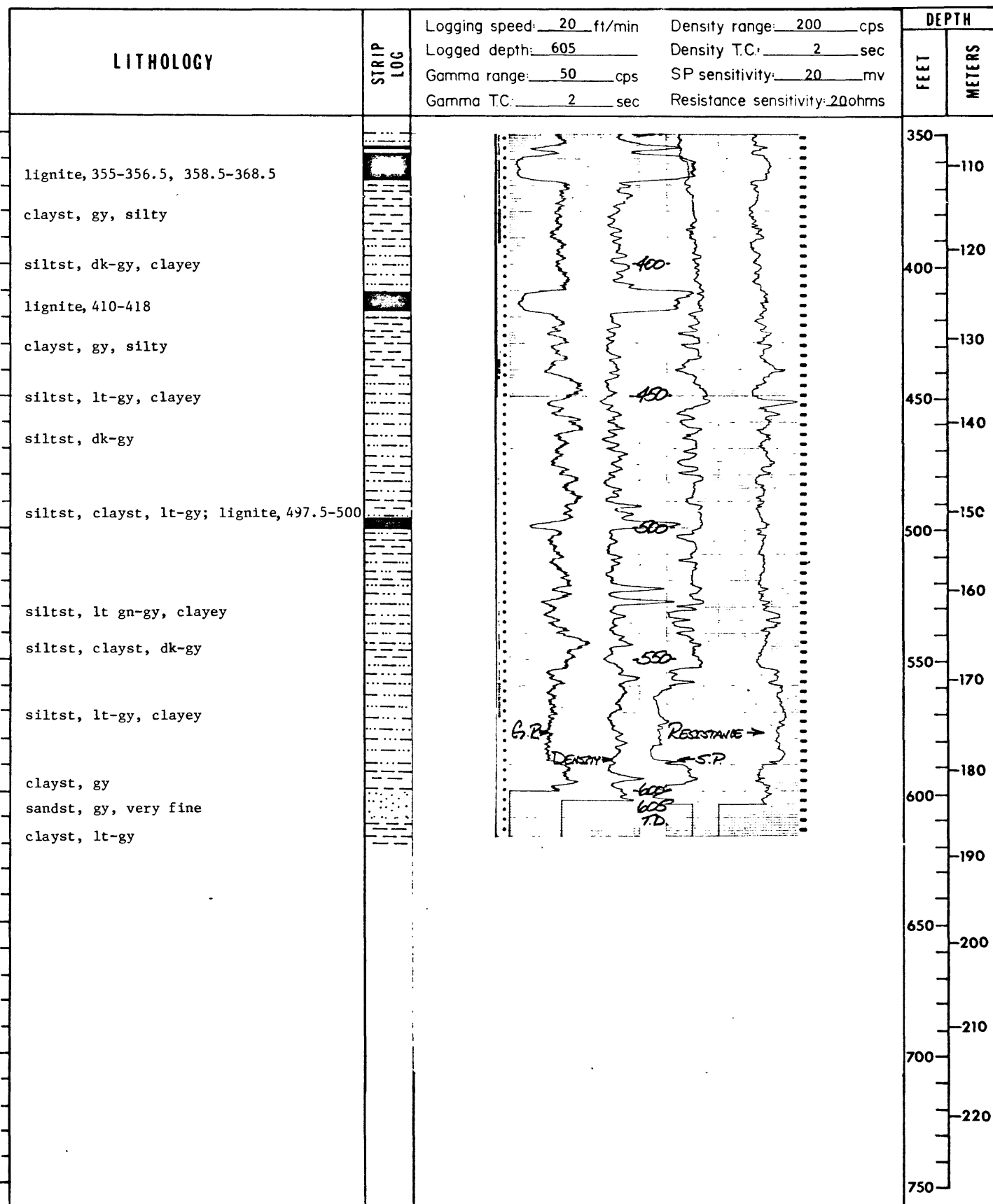
HOLE NO W 30
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bonetraill	
DATE STARTED 7/11/79	DATE COMP. 7/11/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 4 T.157 N., R.102 W., FOOTAGE LOC. 2595		FNL XXX 565 FEL XXX	GROUND ELEV 2411 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 620 CORING -----	TOTAL DEPTH 620 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 5 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:




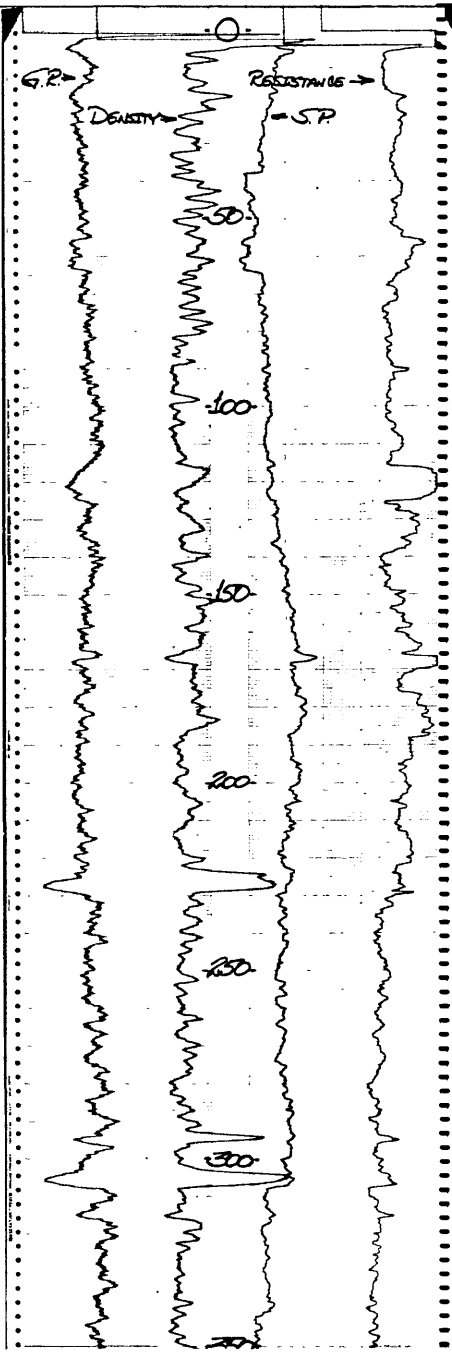
















REMARKS:



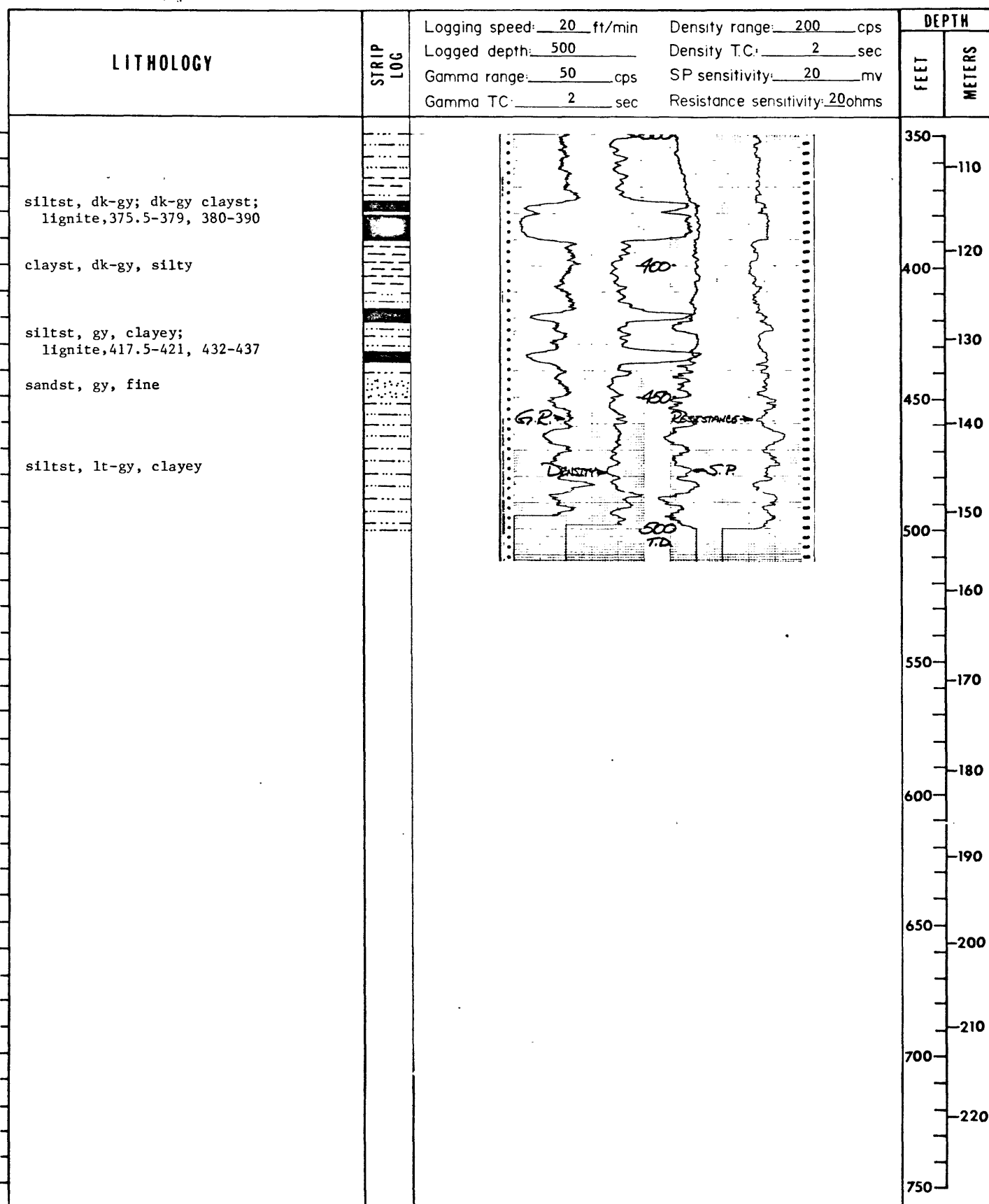
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 31
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bonetraill	
DATE STARTED 7/10/79	DATE COMP. 7/10/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 26 T.157 N., R.102 W., FOOTAGE LOC. 11		FNL XXX 43 FEL FWL	GROUND ELEV 2375 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 500 CORING -----	TOTAL DEPTH 500 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 5 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min Density range: 200 cps Logged depth: 500. Density T.C.: 2 sec Gamma range: 50 cps SP sensitivity: 20 mv Gamma TC: 2 sec Resistance sensitivity: 20 ohms	DEPTH	
			FEET	METERS
sand, silt, yel-gy, unconsol silt, lt yel-gy, clay, unconsol			0	0
			10	
			50	
till: silt, yel-brn, sandy, unconsol			20	
silt, gy-brn, unconsol			100	30
sand, olive-gy silt, unconsol			200	60
gravel			300	90
siltst, dk-gy			40	
siltst, dk-gy, yel-gy			150	50
clayst, gy			250	80
siltst, yel			350	100
siltst, dk-gy, clayey				
sandst, yel, very fine				
siltst, yel				
sandst, gy; dk-gy clayey silt; lignite, 223.5-229				
siltst, gy; white clayst				
siltst, dk-gy, clayey; lignite, 293.5-295, 303.5-307.5				
siltst, dk-gn				
siltst, gy, clayey				

REMARKS:

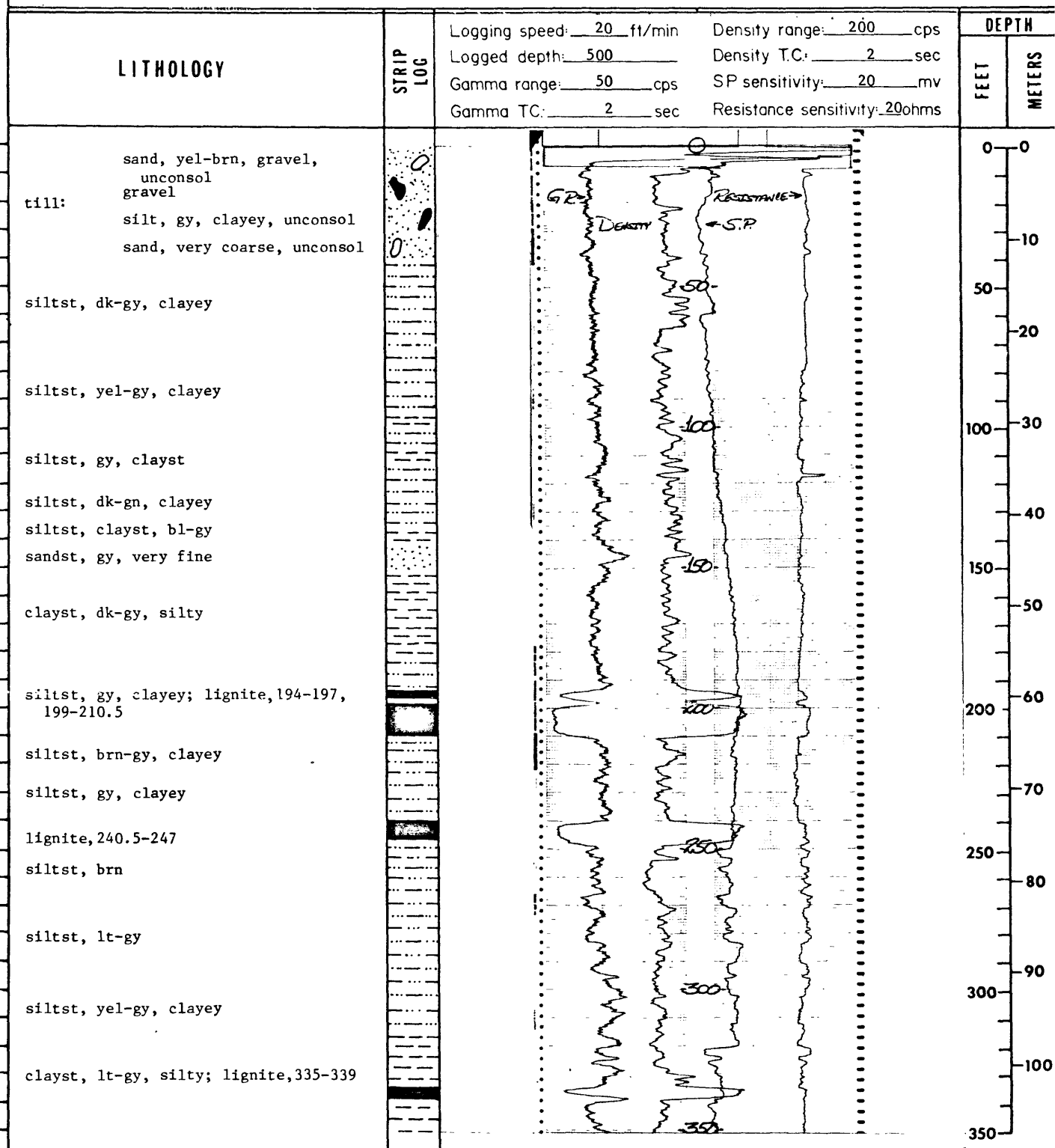


UNITED STATES GEOLOGICAL SURVEY

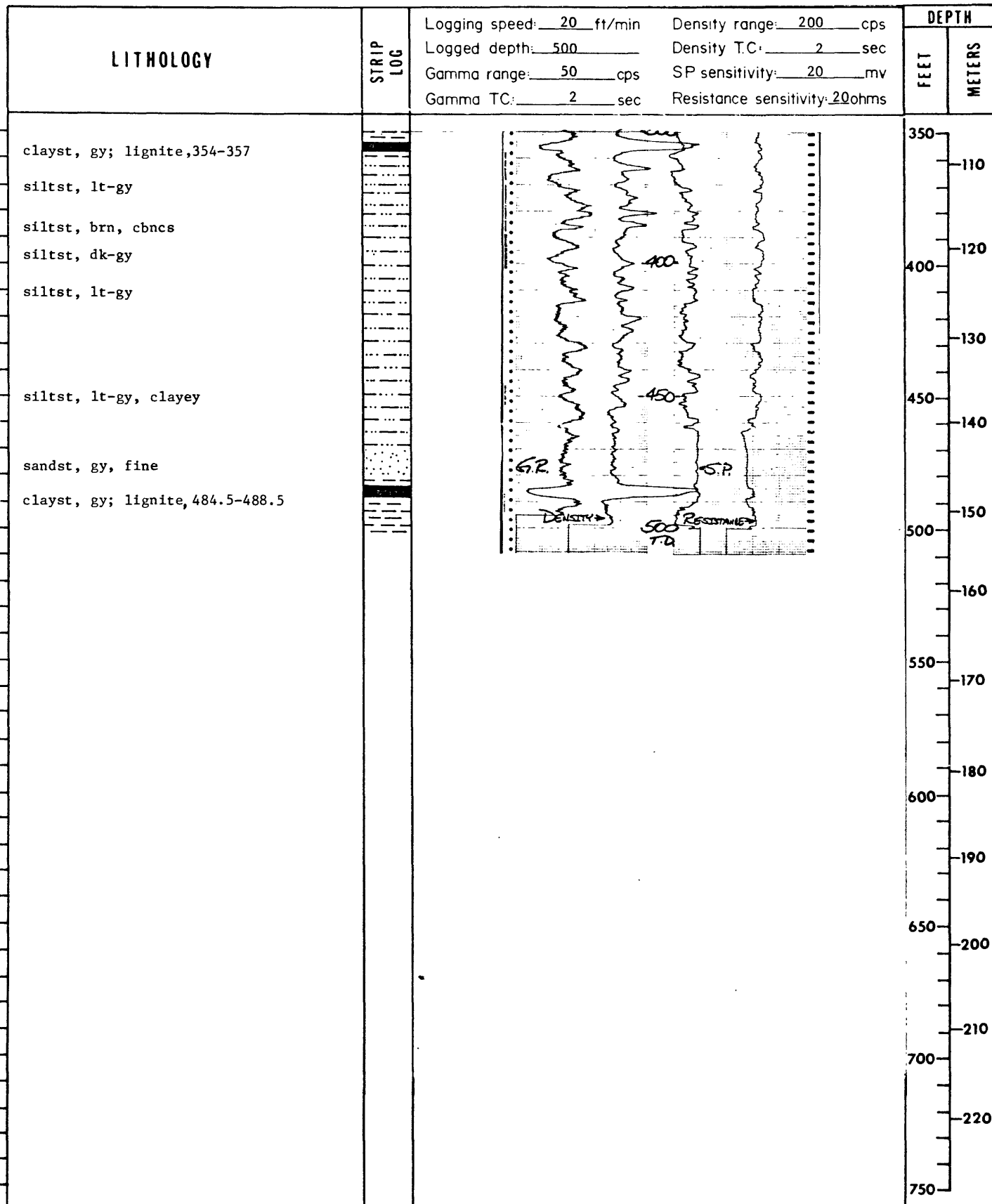
HOLE NO W 33
SHEET 1 OF 2

AREA Williams County		QUAD NAME West Bonetrail	
DATE STARTED 7/9/79	DATE COMP. 7/9/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 2 T.157 N., R.103 W., FOOTAGE LOC. 33		XXX FSL 7 XXX FWL	GROUND ELEV 2320 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 500 CORING -----	TOTAL DEPTH 500 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 9 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

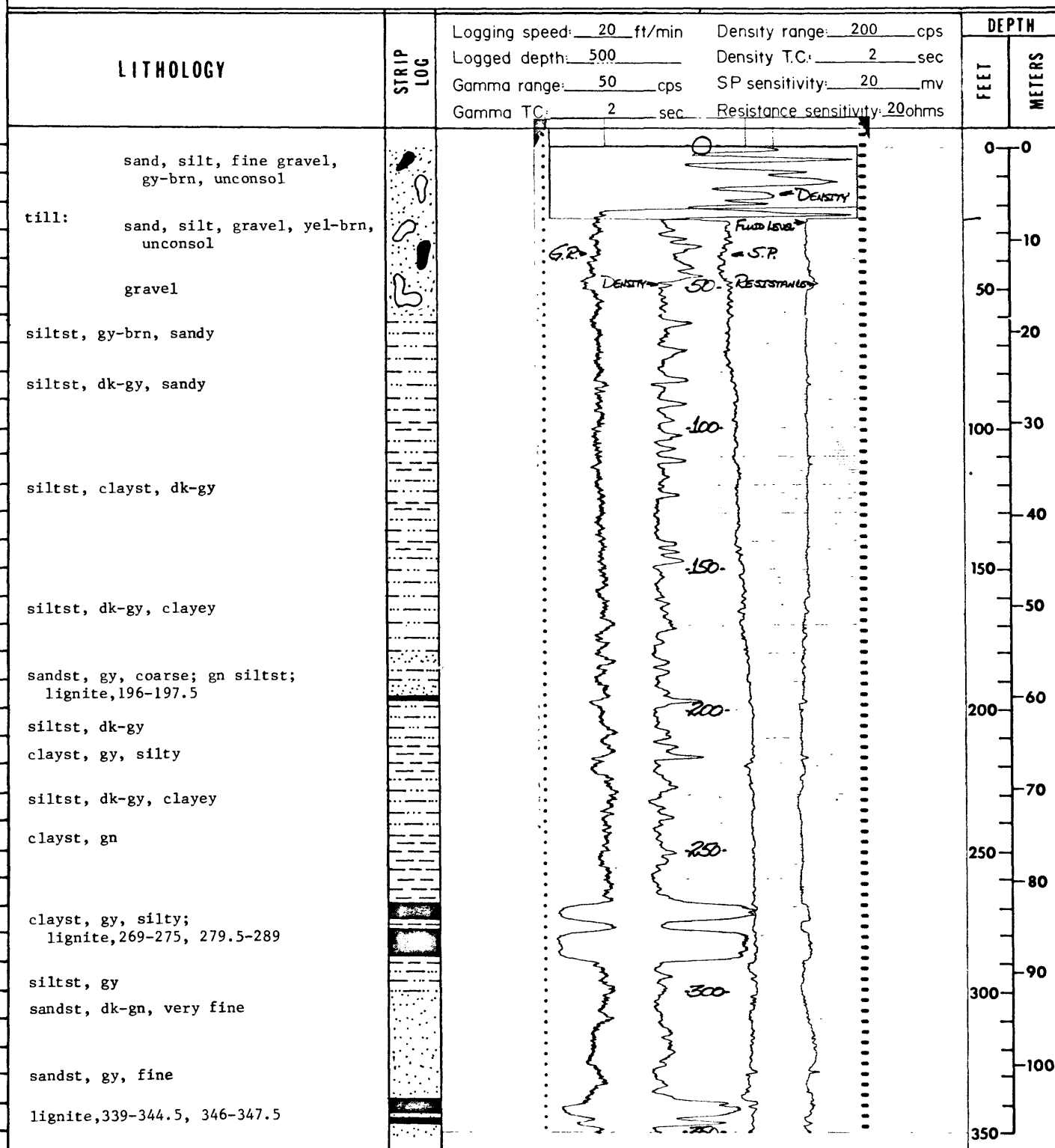


UNITED STATES GEOLOGICAL SURVEY

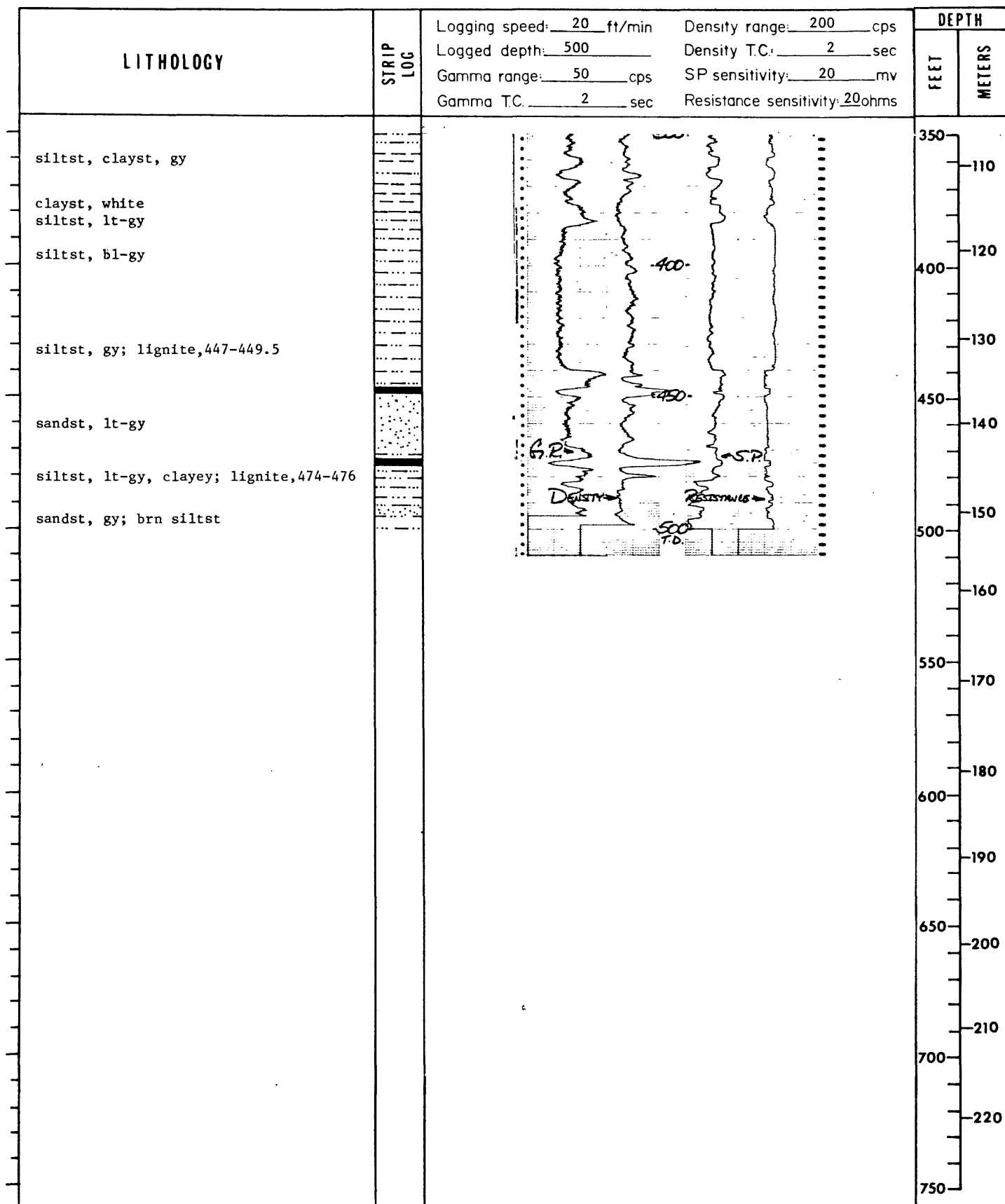
HOLE NO W 34
SHEET 1 OF 2

AREA Williams County		QUAD NAME Brush Mountain	
DATE STARTED 7/9/79	DATE COMP. 7/9/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 17 T.157 N., R.103 W., FOOTAGE LOC. 235		XXX FSL 2	FEL XXX GROUND ELEV 2413 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 500 CORING -----	TOTAL DEPTH 500 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 26 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



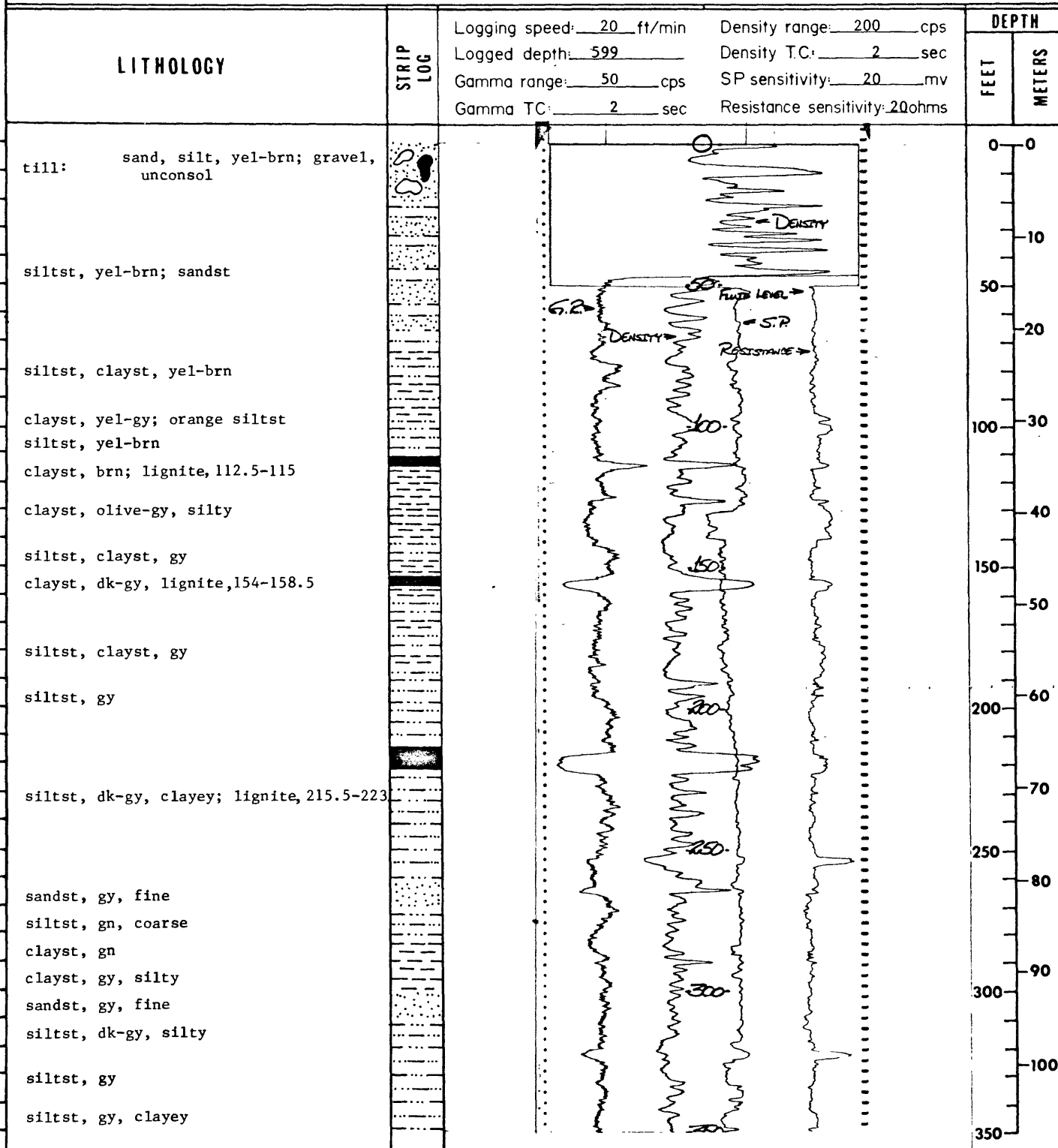
REMARKS:



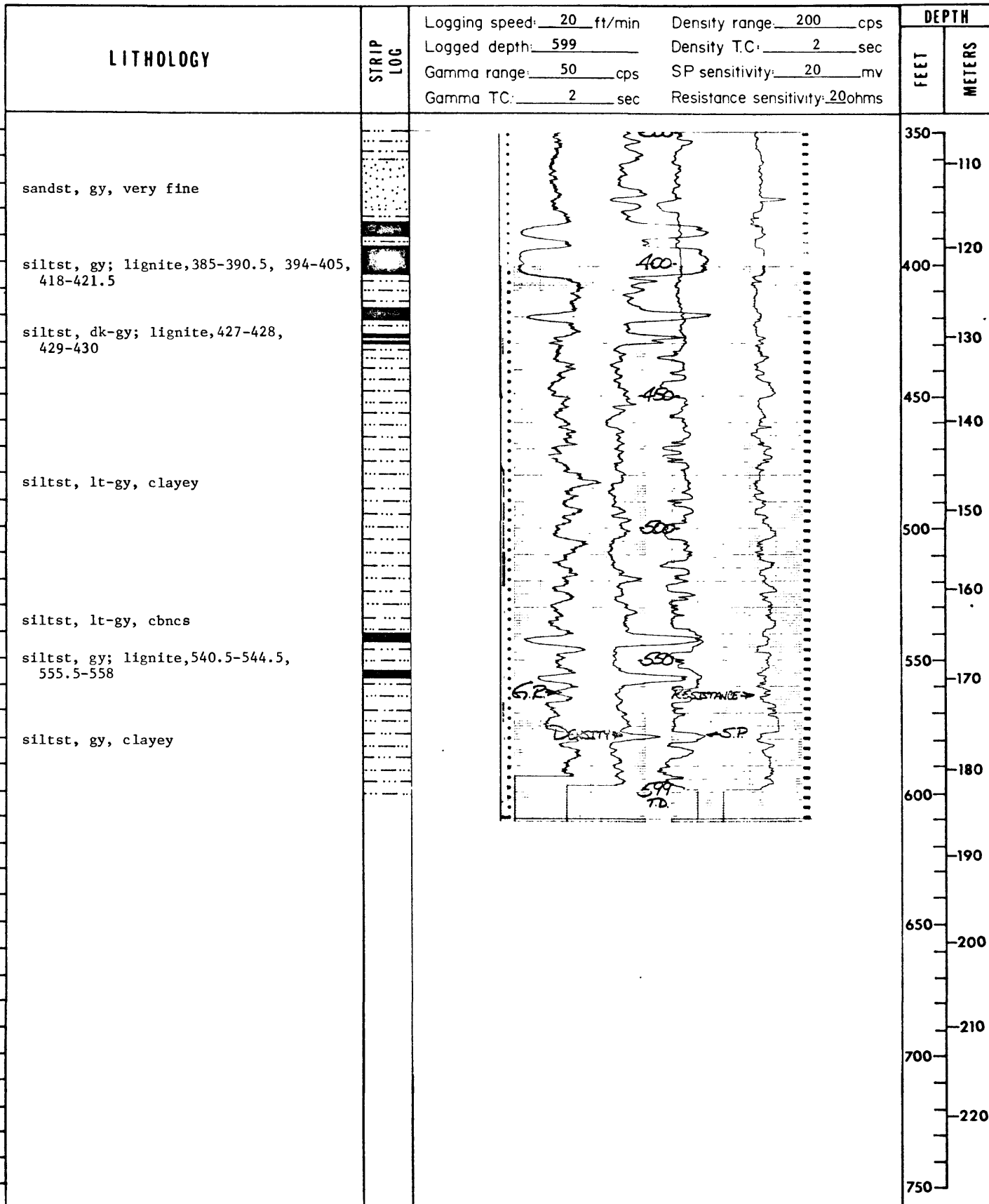
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 35
SHEET 1 OF 2

AREA Williams County		QUAD NAME West Bonetrail	
DATE STARTED 7/10/79	DATE COMP. 7/10/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 25 T.157 N., R.103 W., FOOTAGE LOC. 8		XXL FSL 82	FEL XXL
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 600	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



REMARKS:

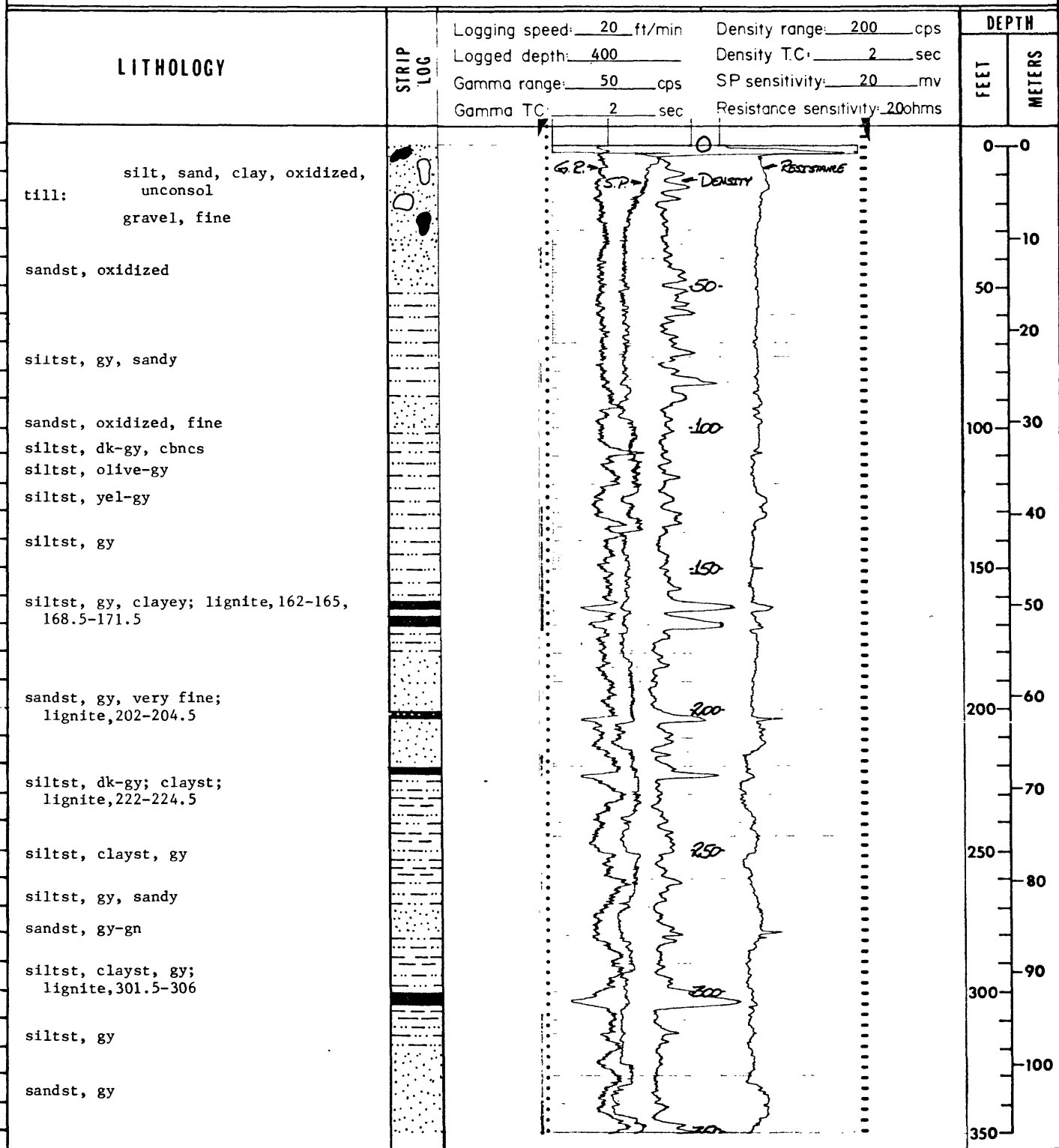


UNITED STATES GEOLOGICAL SURVEY

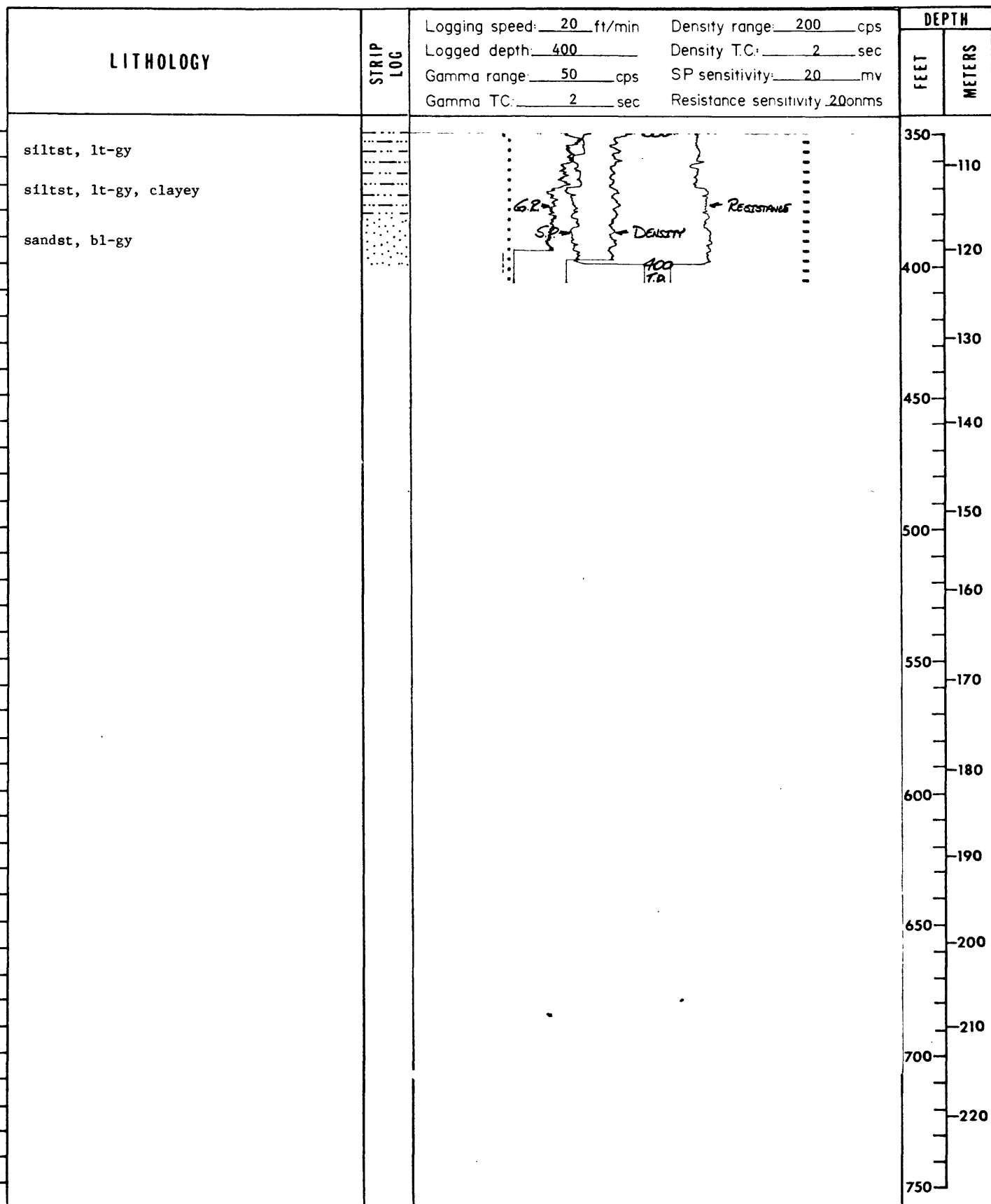
HOLE NO W 41
SHEET 1 OF 2

AREA Williams County		QUAD NAME Tom Berg Lake	
DATE STARTED 6/15/79	DATE COMP. 6/15/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 14 T.158 N., R.97 W., FOOTAGE LOC. 95		XXX FSL 1	FEL XWX
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 400	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

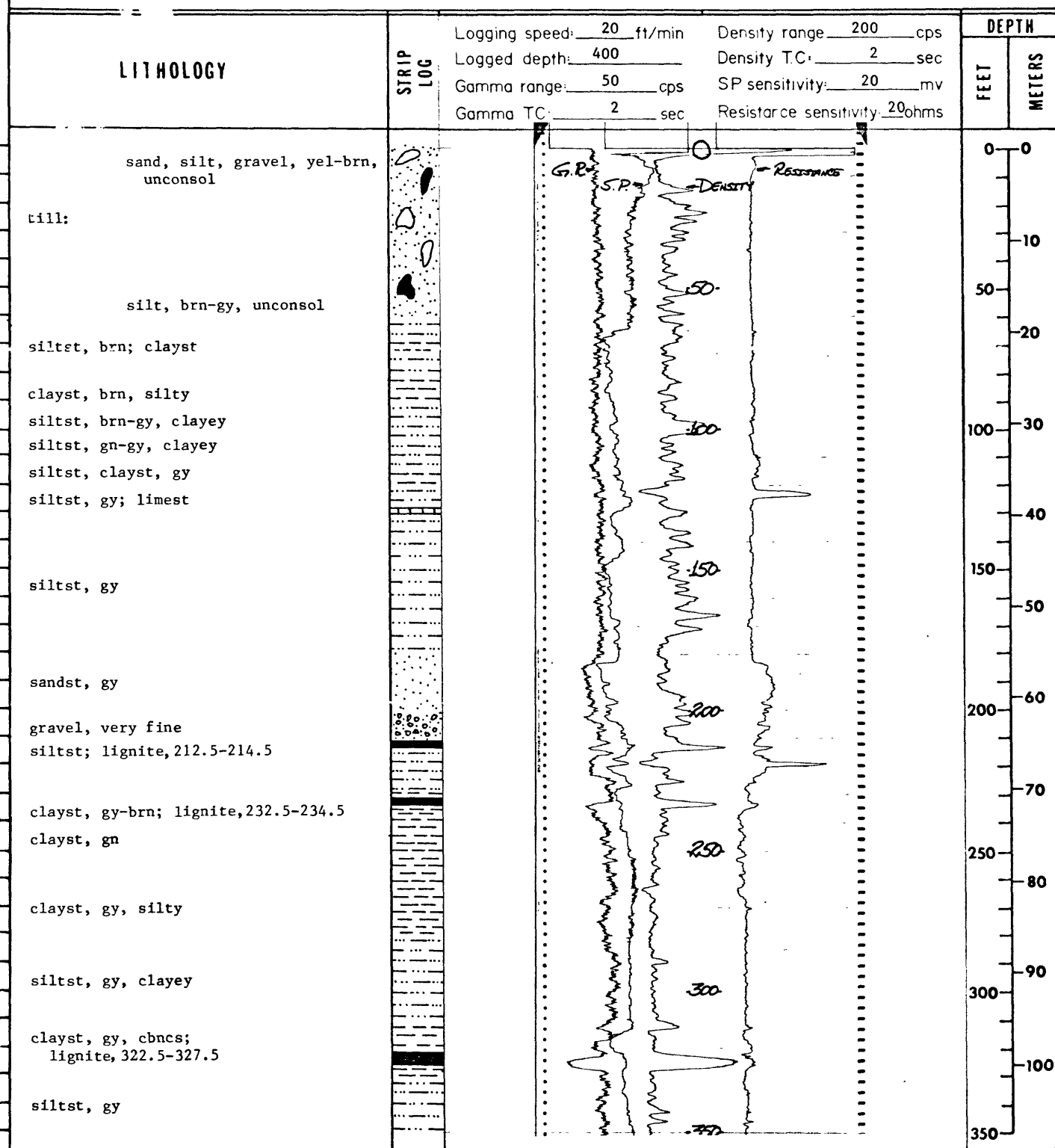


UNITED STATES GEOLOGICAL SURVEY

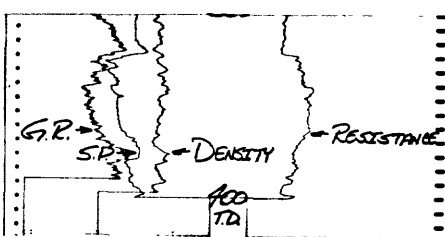
HOLE NO W 42
SHEET 1 OF 2

AREA Williams County		QUAD NAME Tom Berg Lake	
DATE STARTED 6/16/79	DATE COMP. 6/16/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 21 T. 158 N., R. 97 W., FOOTAGE LOC. 35		FNL 50 XXX	*** FWL
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 400	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

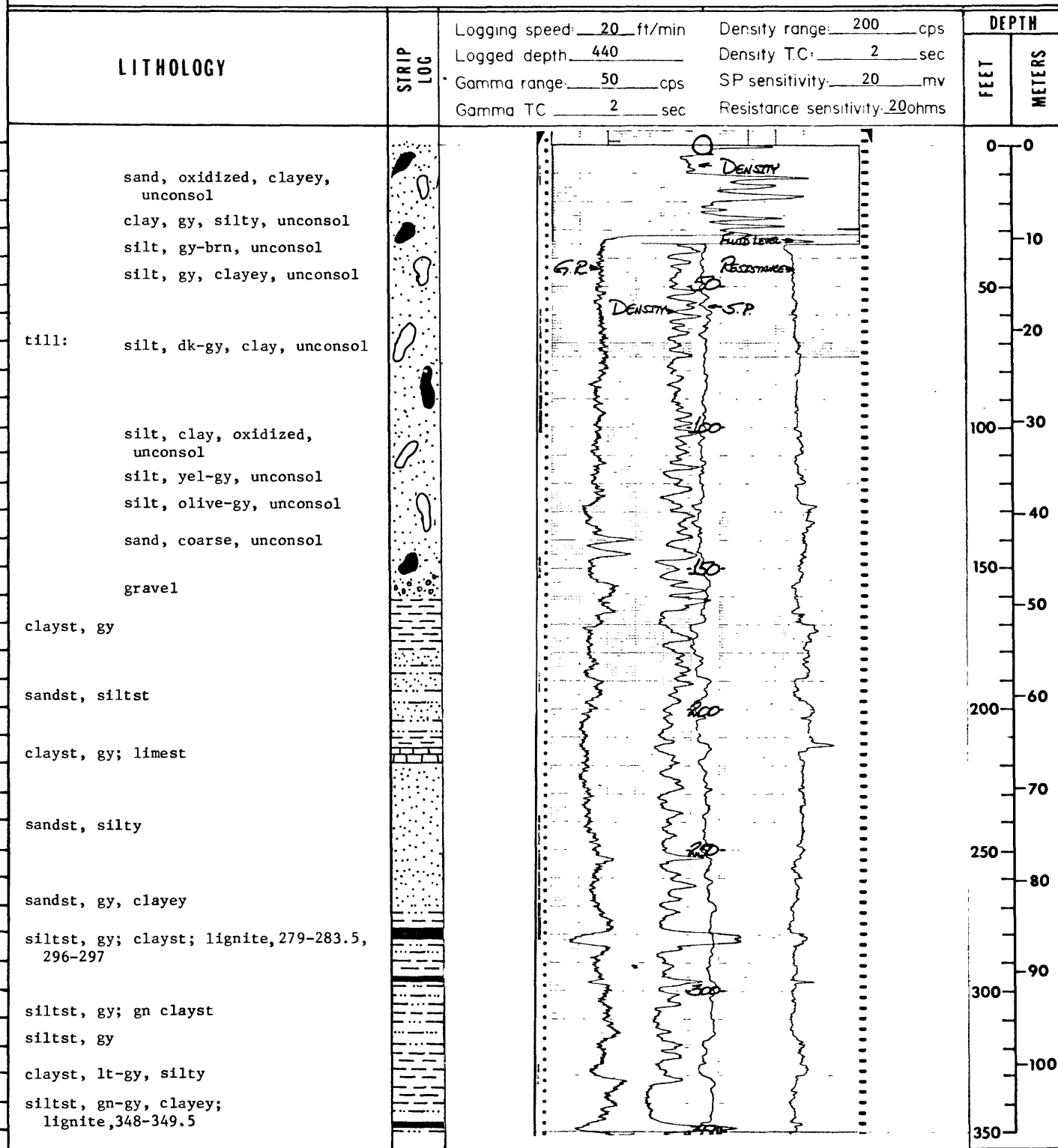
LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min Density range: <u>200</u> cps Logged depth: <u>400</u> Density T.C.: <u>2</u> sec Gamma range: <u>50</u> cps SP sensitivity: <u>20</u> mv Gamma TC: <u>2</u> sec Resistance sensitivity: <u>20</u> ohms		DEPTH	
		FEET	METERS		
siltst, gy, clayey siltst, lt-gy		350	110		
		400	120		
		450	130		
		500	140		
		550	150		
		600	160		
		650	170		
		700	180		
		750	190		
		800	200		
		850	210		
		900	220		
		950	230		
		1000	240		

UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 43
SHEET 1 OF 2

AREA Williams County		QUAD NAME Alamo	
DATE STARTED 6/20/79	DATE COMP. 6/20/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 19 T. 158 N. R. 98 W. FOOTAGE LOC. 95		FNL XXXX 5	FEL KMX GROUND ELEV 2233 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 440	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

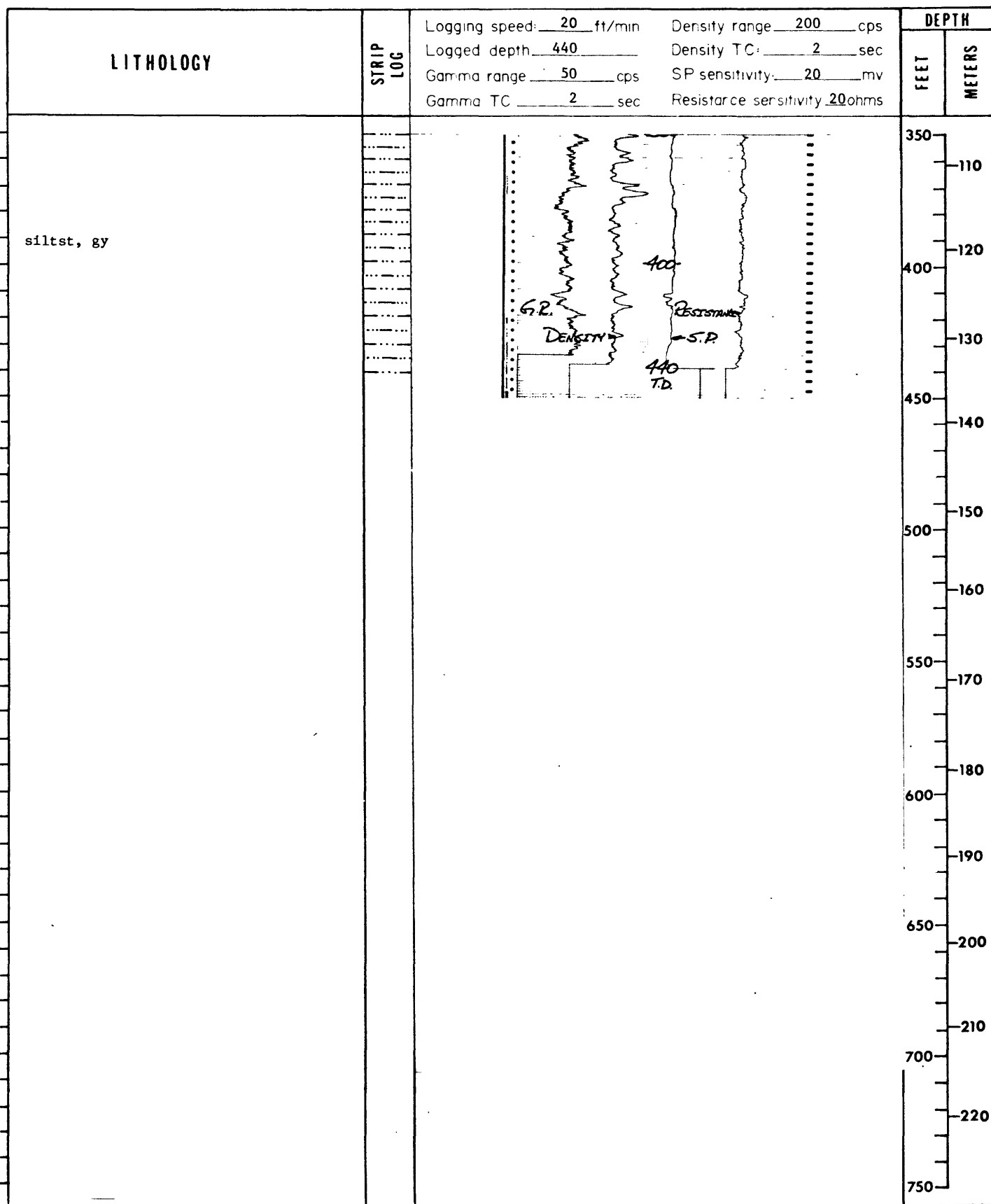
REMARKS:



UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 43
SHEET 2 OF 2

REMARKS:

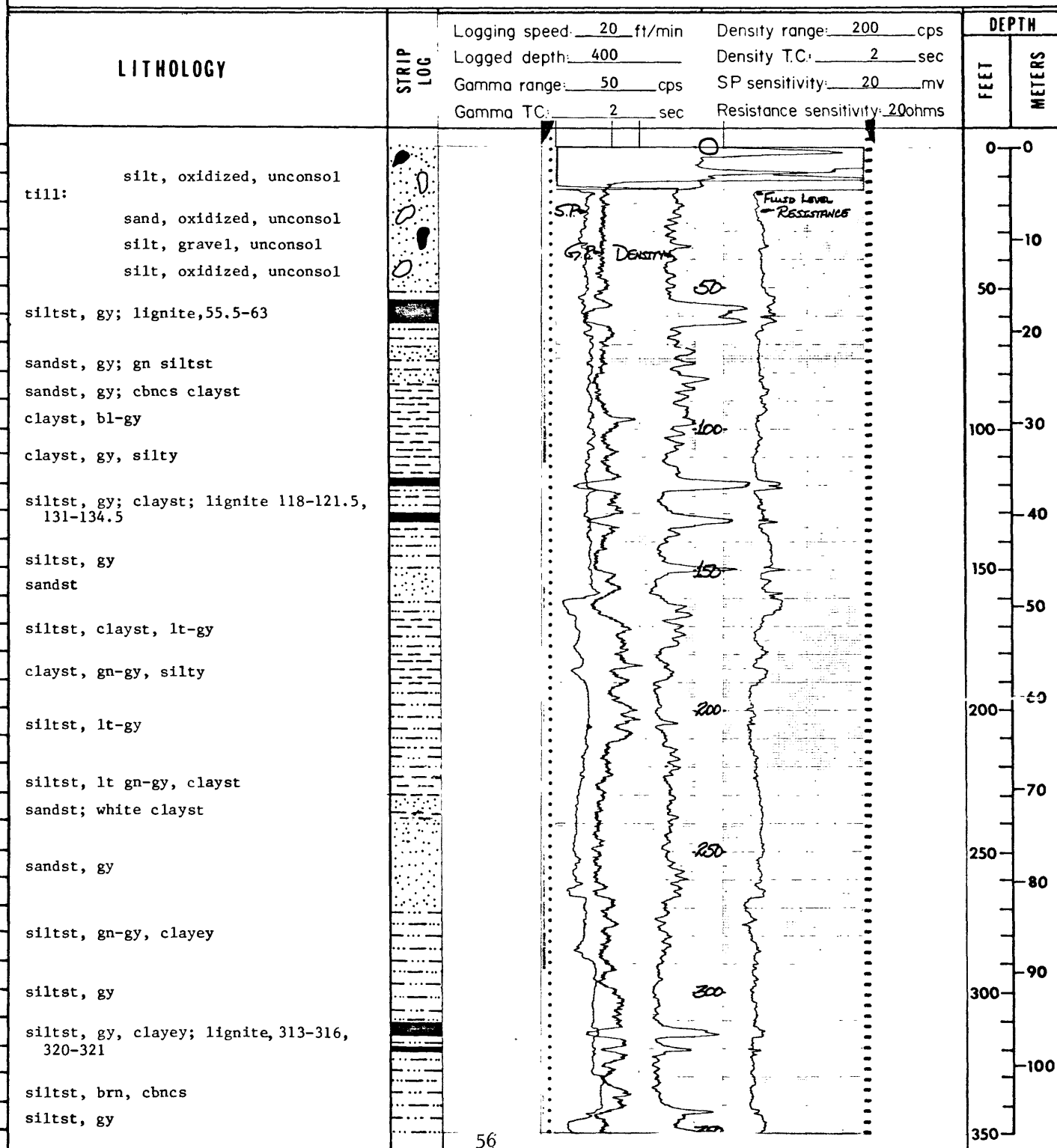


UNITED STATES GEOLOGICAL SURVEY

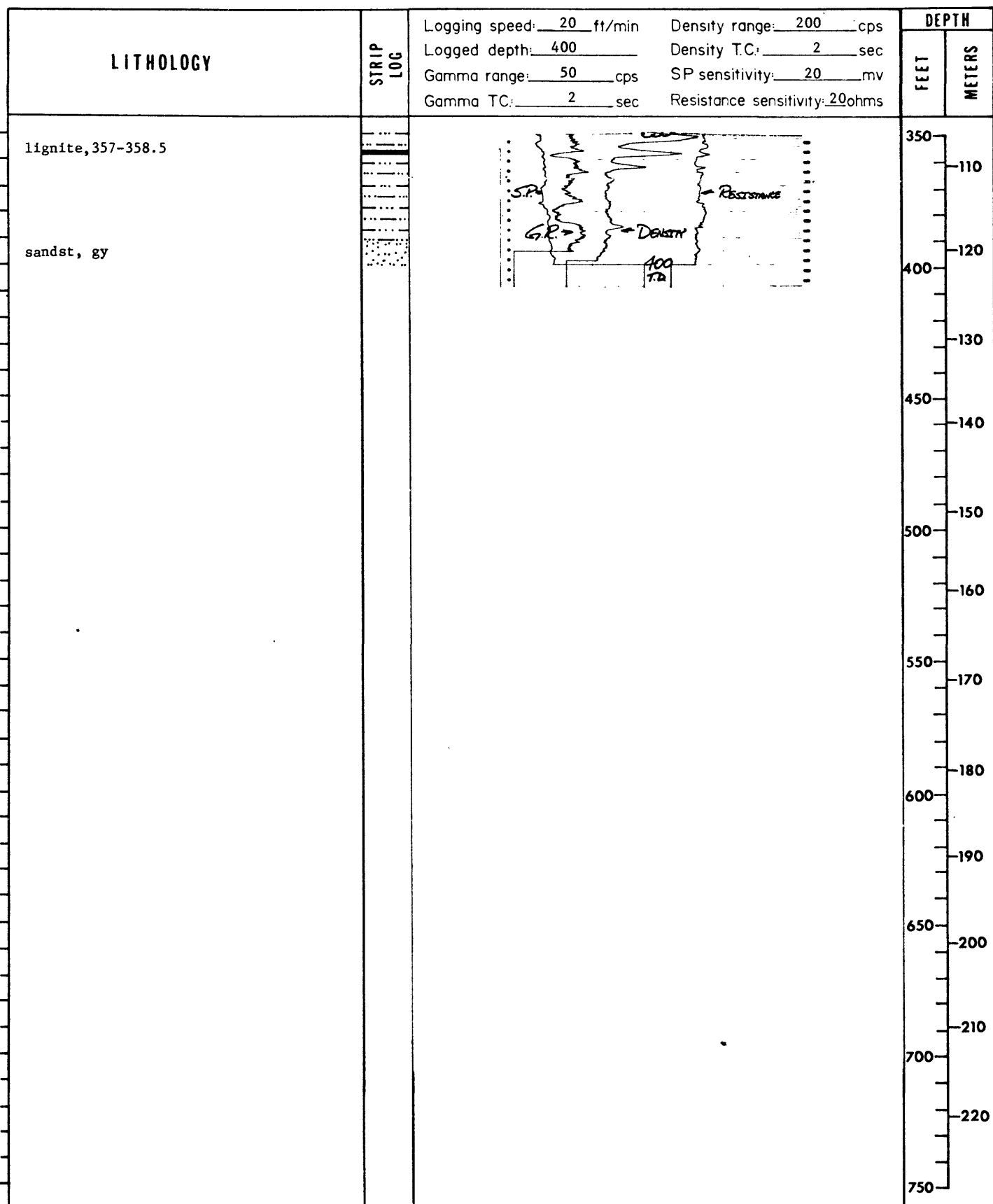
HOLE NO W 44
SHEET 1 OF 2

AREA Williams County		QUAD NAME Epping NE	
DATE STARTED 6/16/79	DATE COMP. 6/16/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 34 T. 158 N., R. 98 W., FOOTAGE LOC. 20		FNL XXX 5	FEL RXX
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 400	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:



UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 45
SHEET 1 OF 1

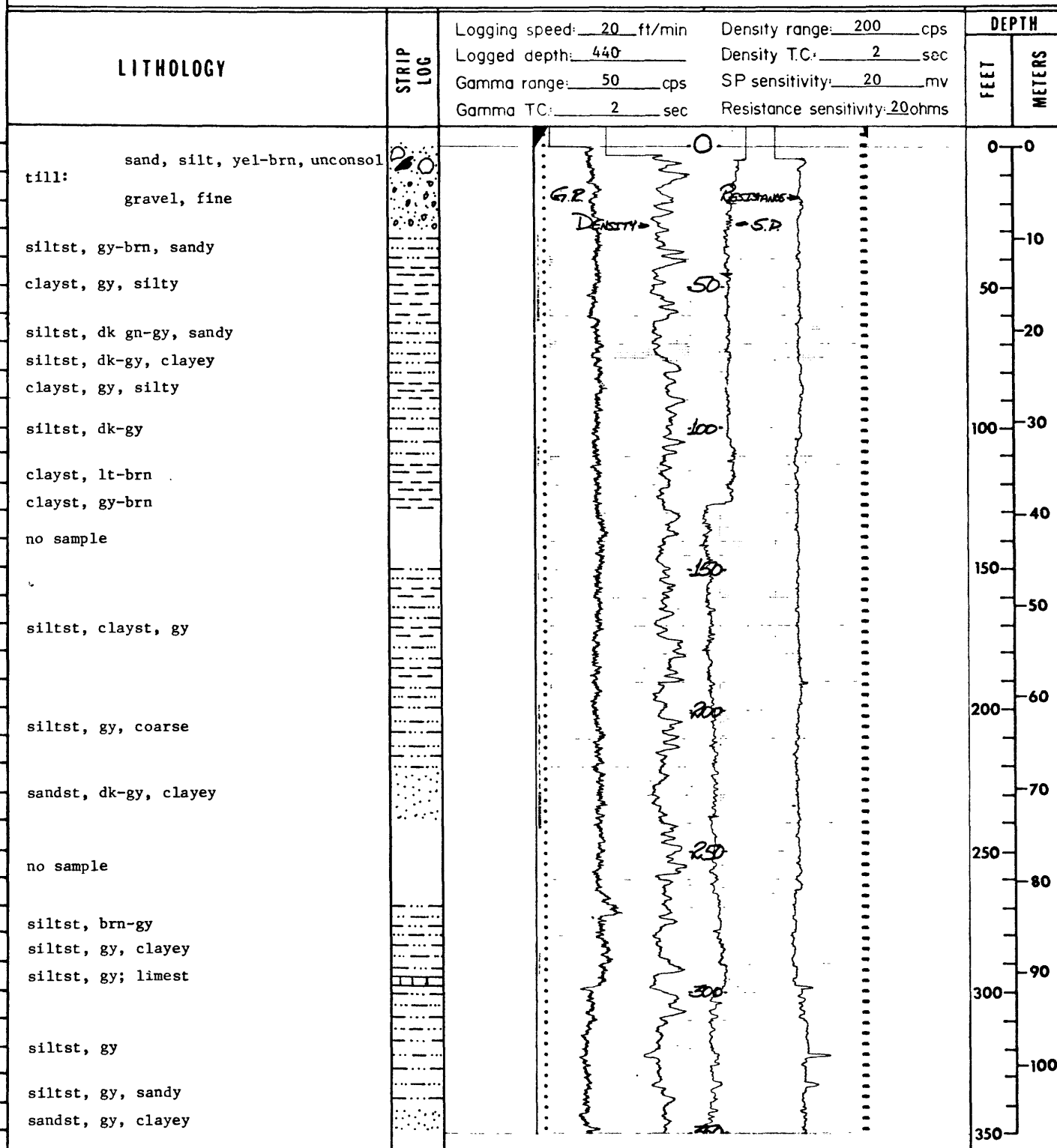
AREA Williams County		QUAD NAME Alamo	
DATE STARTED 6/21/79	DATE COMP. 6/21/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 4 T. 158 N, R. 99 W, FOOTAGE LOC. 65		FNL FSK 40	FEL FWK 40
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 340	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min Density range: 200 cps Logged depth: 340 Density T.C.: 2 sec Gamma range: 50 cps SP sensitivity: 20 mv Gamma T.C.: 2 sec Resistance sensitivity: 20 ohms		DEPTH	
		FEET	METERS		
sand, silt, oxidized, unconsol	○			0	0
silt, clay, coarse sand, gravel, unconsol	●			10	3
silt, gy, sandy, unconsol	○			50	15
till	●			20	6
silt, yel-gy, clayey; sand, unconsol	●			30	9
silt, yel-gy; gy clay, unconsol	○			40	12
sand, coarse; silt	○			50	15
gravel, fine	●			60	18
siltst, dk gn-gy; lignite, 165-166.5	■			70	21
siltst, cbncs; gy clayst; lignite, 185.5-187.5	■			80	24
siltst, lt-gy, clayey	■	90	27		
siltst, gy; lt-gy clayst	■	100	30		
siltst, dk-gy	■	110	33		
sandst, gy, clayey	○	120	36		
no sample	○	130	39		

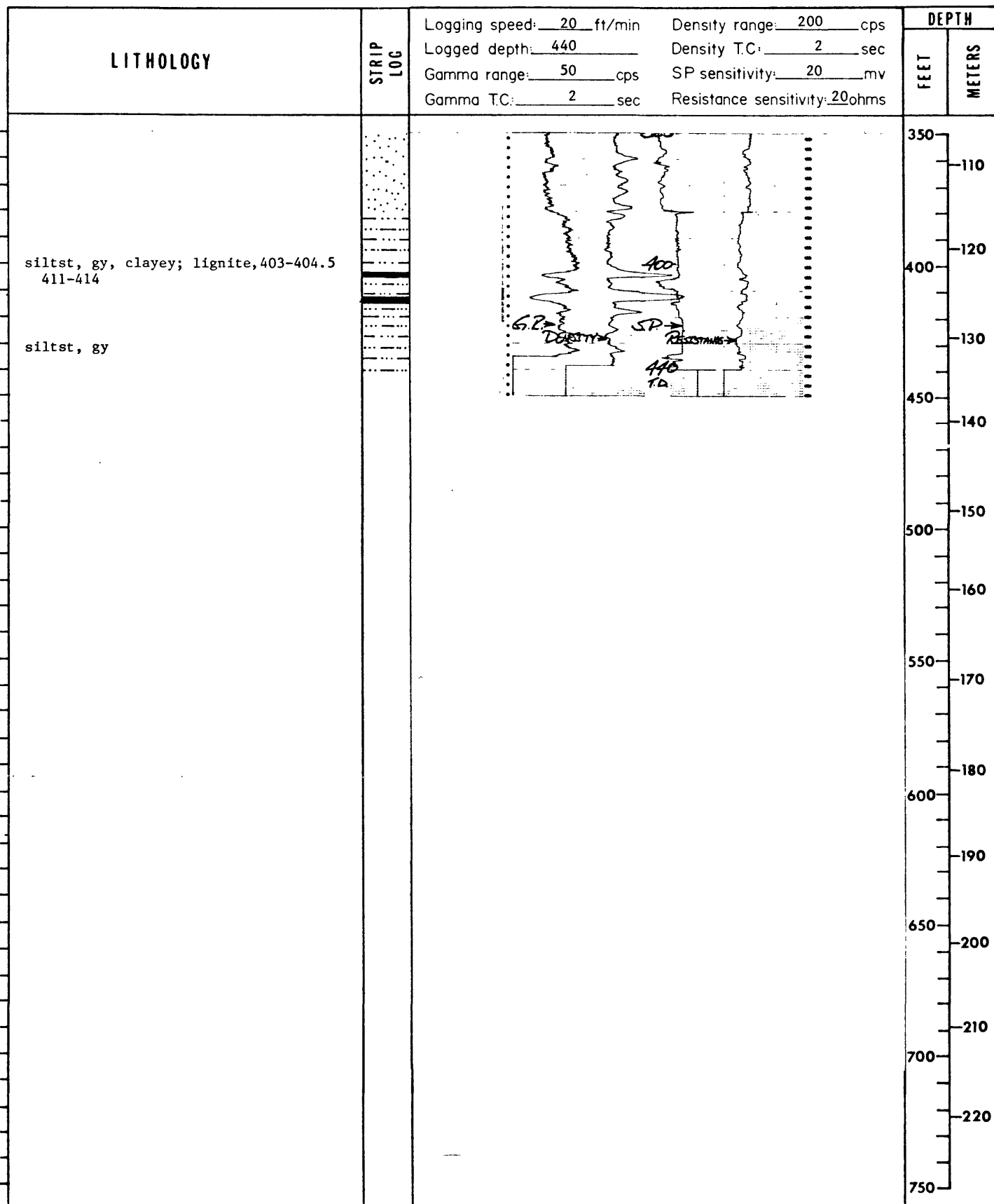
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 46
SHEET 1 OF 2

AREA Williams County		QUAD NAME Epping NW	
DATE STARTED 6/19/79	DATE COMP. 6/19/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 28 T. 158 N., R. 99 W., FOOTAGE LOC. 10		XMB FSL 40	FEL XWX
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	GROUND ELEV 2215 ft
		ROTARY 440	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	TOTAL DEPTH 440 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



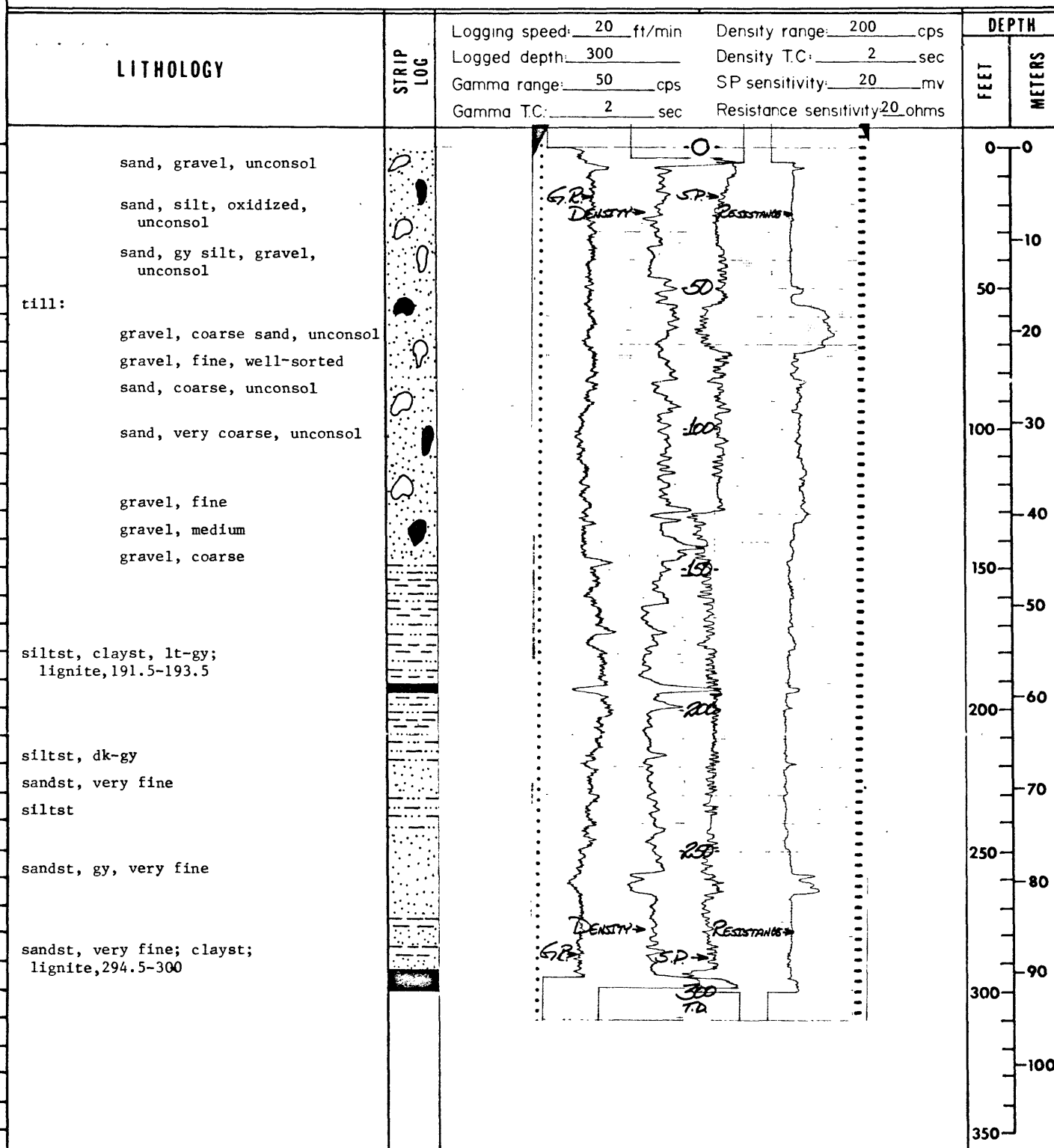
REMARKS:



UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 47
SHEET 1 OF 1

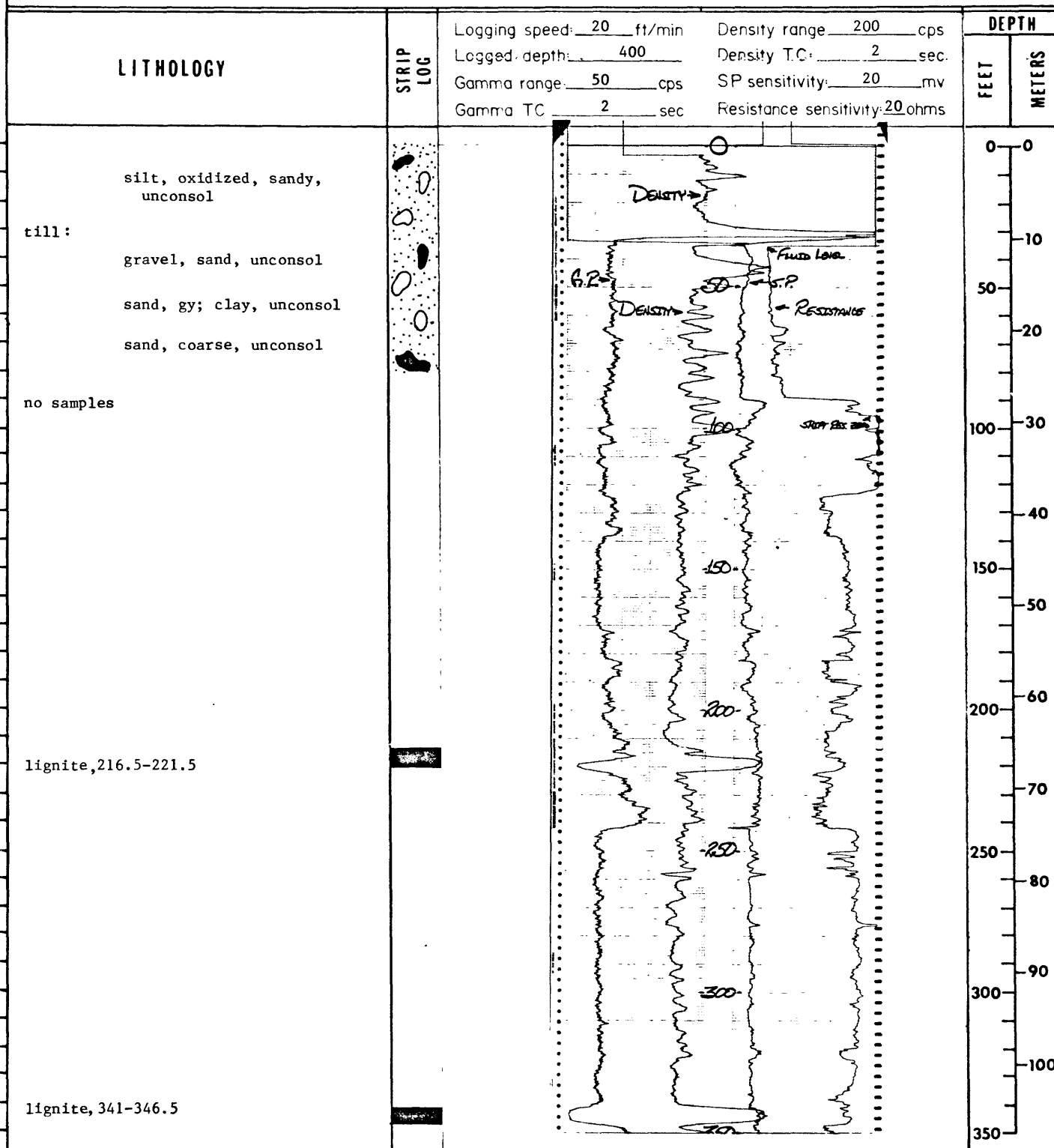
AREA Williams County		QUAD NAME Appam	
DATE STARTED 6/22/79	DATE COMP. 6/22/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 1 T.158 N., R.100 W., FOOTAGE LOC. 10		XXV FSL 72 FEL XXV	GROUND ELEV 2089 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 300	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 48
SHEET 1 OF 2

AREA Williams County		QUAD NAME Appam	
DATE STARTED 6/22/79	DATE COMP. 6/22/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 15 T. 158 N., R. 100 W., FOOTAGE LOC. 1800		XMK FSL 30	FEL XMK
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 400	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



REMARKS:

LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min Density range: <u>200</u> cps Logged depth: <u>400</u> Density T.C.: <u>2</u> sec Gamma range: <u>50</u> cps SP sensitivity: <u>20</u> mv Gamma TC: <u>2</u> sec Resistance sensitivity: <u>20</u> ohms		DEPTH	
		FEET	METERS		
				350	110
		400	120		
		450	130		
		500	140		
		550	150		
		600	160		
		650	170		
		700	180		
		750	190		
			200		
			210		
			220		

UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 49
SHEET 1 OF 2

AREA Williams County		QUAD NAME Zahl	
DATE STARTED 7/5/79	DATE COMP. 7/5/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 4 T. 158 N., R. 101 W., FOOTAGE LOC. 395		FNL X88 2410	GROUND ELEV 2144 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 360 CORING -----	
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min Logged depth: 360 Gamma range: 50 cps Gamma TC: 2 sec	Density range: 200 cps Density T.C.: 2 sec SP sensitivity: 20 mv Resistance sensitivity: 20 ohms	DEPTH	
				FEET	METERS
till: silt, clay, yel-brn, gravel, unconsol				0	0
silt, clay, unconsol				10	
sand, very coarse, very fine gravel				50	
siltst, clayst, yel-brn				20	
siltst, clayst, dk-gy				100	30
no sample				40	
clayst, gy, sandy; cbncs clayey silt; lignite, 110-111, 122-128				150	50
siltst, gn-gy				200	60
siltst, lt-gy; clayst				250	80
siltst, dk-gy				300	90
siltst, clayst, gy				350	100
sandst, gy, very fine					
siltst, gy					
siltst, dk-gy, lt brn-gy					
siltst, clayst, gy; lignite, 270-272.5, 279.5-281					
siltst, gy, coarse					
siltst, lt-gy, cbncs					
siltst, lt-gy					
sandst, gy, very fine					
siltst, lt-gy, clay zones					

UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 49
SHEET 2 OF 2

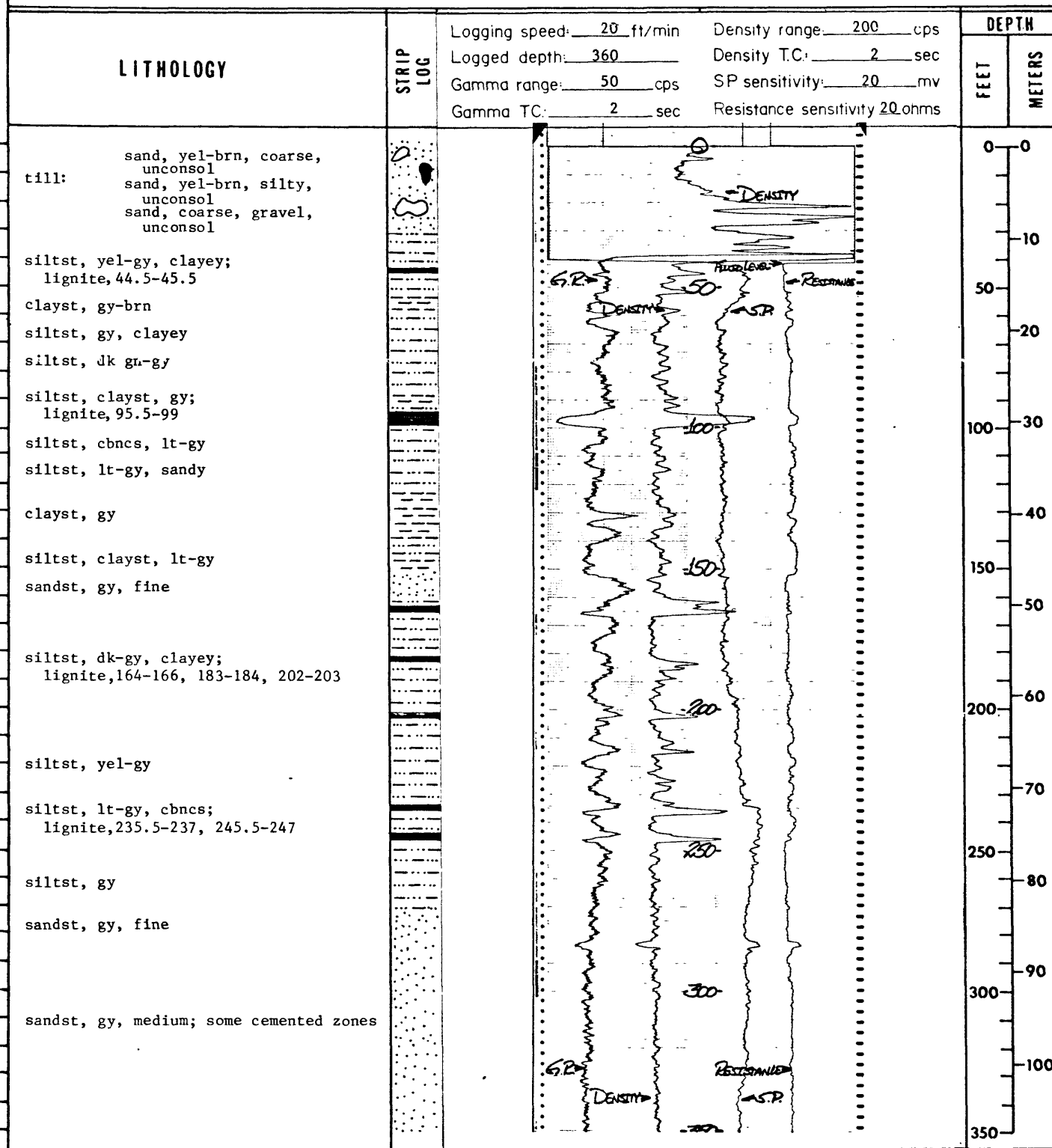
REMARKS:

LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min		Density range: <u>200</u> cps		DEPTH	
		Logged depth: <u>360</u>		Density T.C.: <u>2</u> sec		FEET	METERS
siltst, lt-gy, clay zones		Gamma range: <u>50</u> cps		SP sensitivity: <u>20</u> mv		350	110
		Gamma T.C.: <u>2</u> sec		Resistance sensitivity: <u>20</u> ohms			
						400	120
						450	140
						500	150
						550	170
						600	180
						650	200
						700	210
						750	220

UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 50
SHEET 1 OF 2

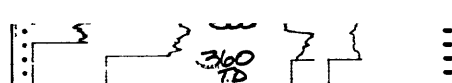
AREA Williams County		QUAD NAME Zahl	
DATE STARTED 7/3/79	DATE COMP. 7/3/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 11 T. 158 N., R. 101 W., FOOTAGE LOC. 5		XMK FSL 30	XXX FWL
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	GROUND ELEV 2062 ft
		ROTARY 360	CORING -----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	TOTAL DEPTH 360 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 50
SHEET 2 OF 2

REMARKS:

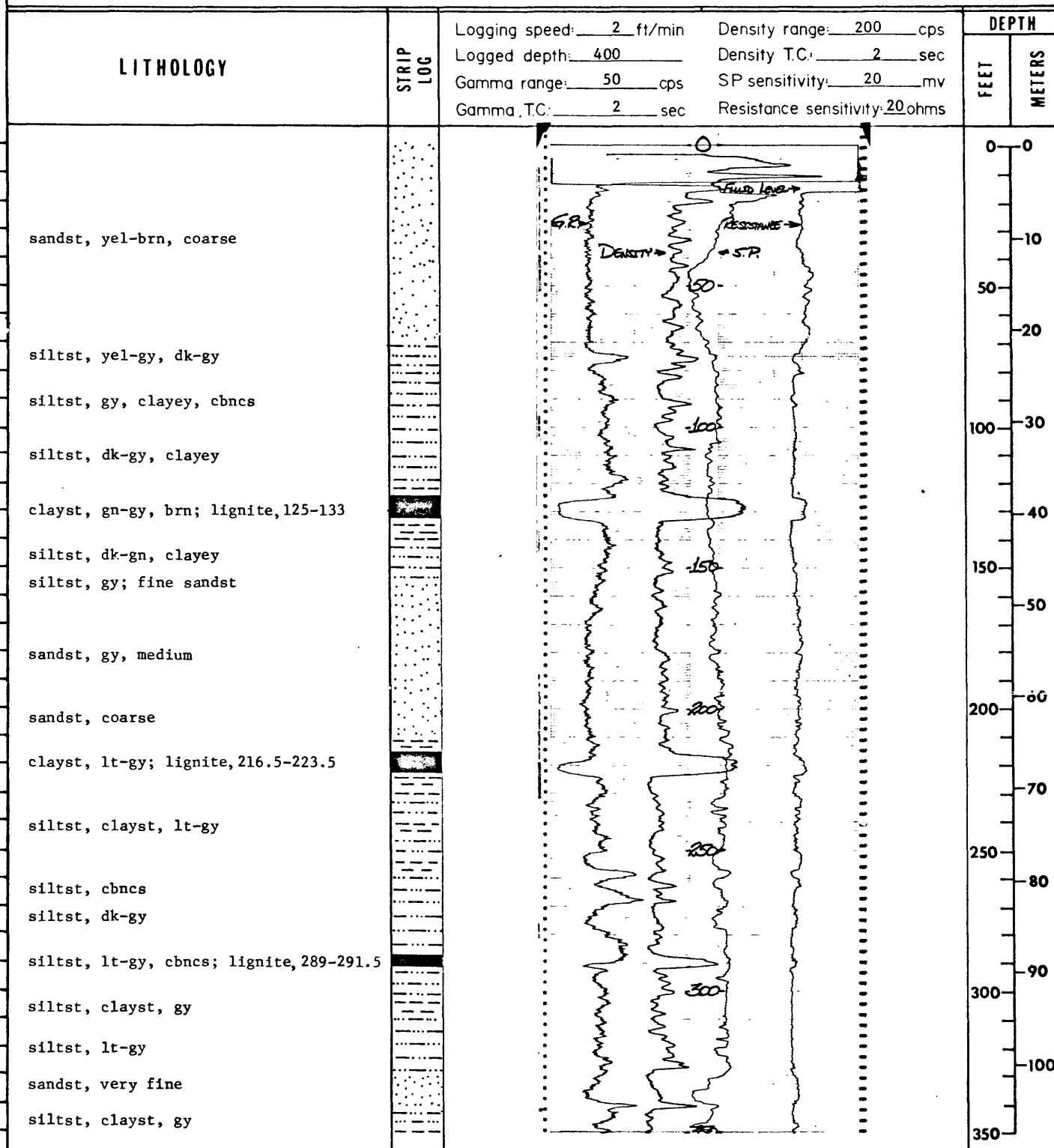
LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min		Density range: <u>200</u> cps		DEPTH	
		Logged depth: <u>360</u>		Density T.C.: <u>2</u> sec		FEET	METERS
sandst, gy, medium; some cemented zones		Gamma range: <u>50</u> cps		SP sensitivity: <u>20</u> mv		350	
		Gamma TC: <u>2</u> sec		Resistance sensitivity: <u>20</u> ohms		110	
						120	
						130	
						140	
						150	
						160	
						170	
						180	
						190	
						200	
						210	
						220	
						750	

UNITED STATES GEOLOGICAL SURVEY

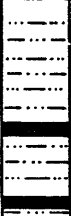
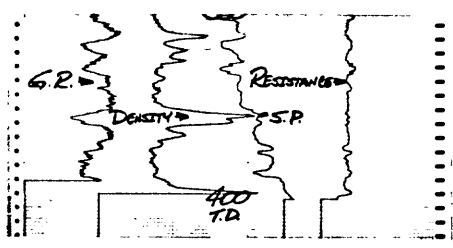
HOLE NO W 51
SHEET 1 OF 2

AREA Williams County		QUAD NAME Hanks	
DATE STARTED 7/3/79	DATE COMP. 7/3/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 17 T. 158 N., R. 101 W., FOOTAGE LOC. 2617		GROUND ELEV 2193 ft	
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 400 CORING ---	TOTAL DEPTH 400 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ---	DEPTH TO WATER 17 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

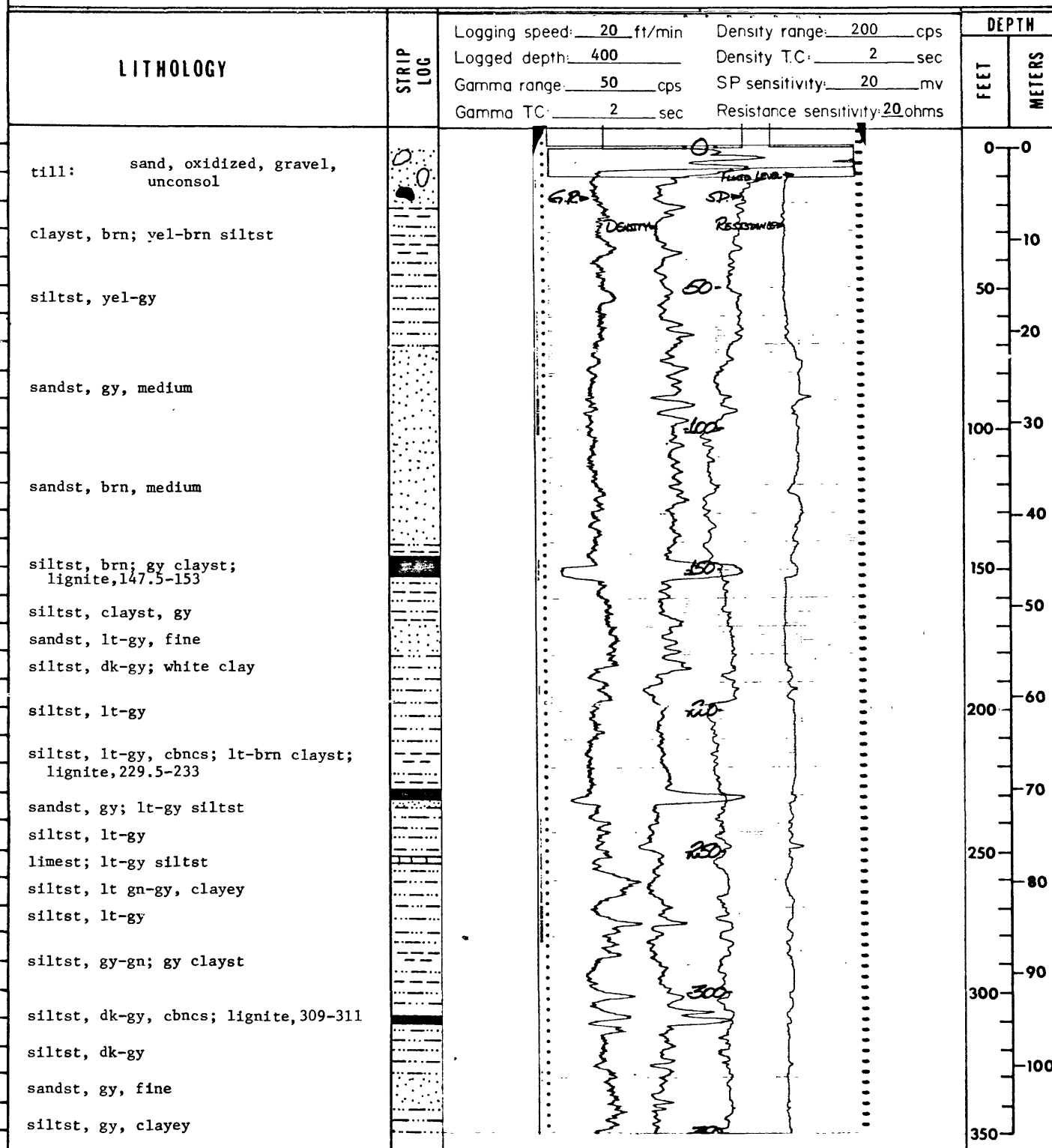
LITHOLOGY	STRIP LOG	Logging speed: <u>2</u> ft/min Density range: <u>200</u> cps Logged depth: <u>400</u> Density T.C.: <u>2</u> sec Gamma range: <u>50</u> cps SP sensitivity: <u>20</u> mv Gamma T.C.: <u>2</u> sec Resistance sensitivity: <u>20</u> ohms		DEPTH	
		FEET	METERS		
siltst, lt-gy; lignite, 377-380, 397-399				350 — 110 — 120 — 130 — 140 — 150 — 160 — 170 — 180 — 190 — 200 — 210 — 220 — 750	110 — 120 — 130 — 140 — 150 — 160 — 170 — 180 — 190 — 200 — 210 — 220 — 750

UNITED STATES GEOLOGICAL SURVEY

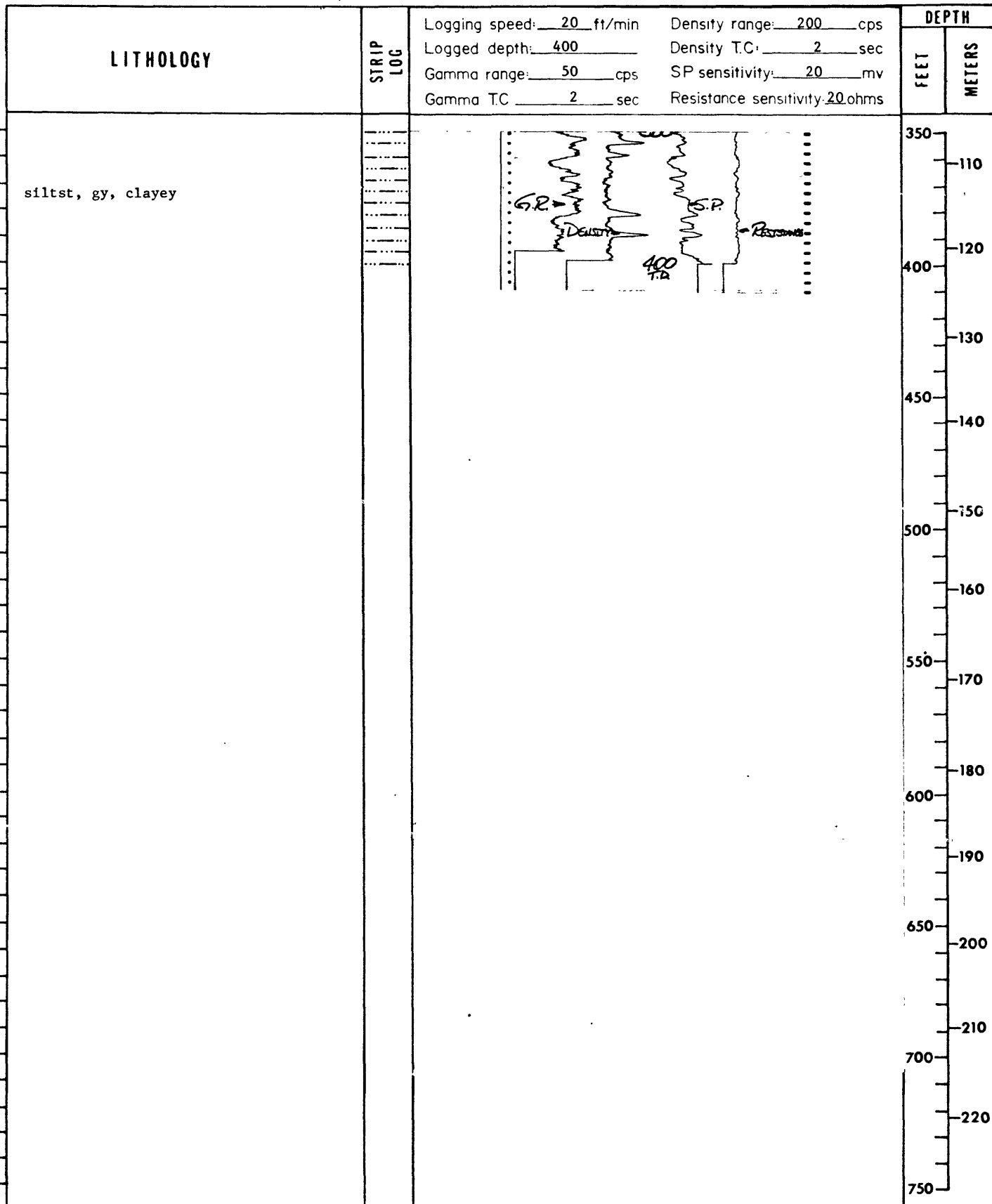
HOLE NO W 52
SHEET 1 OF 2

AREA Williams County		QUAD NAME Blacktail Lake	
DATE STARTED 7/2/79	DATE COMP. 7/2/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 23 T.158 N., R. 101 W., FOOTAGE LOC.		2230	GROUND ELEV 2158 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 400 CORING ---	TOTAL DEPTH 400 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ---	DEPTH TO WATER 11 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

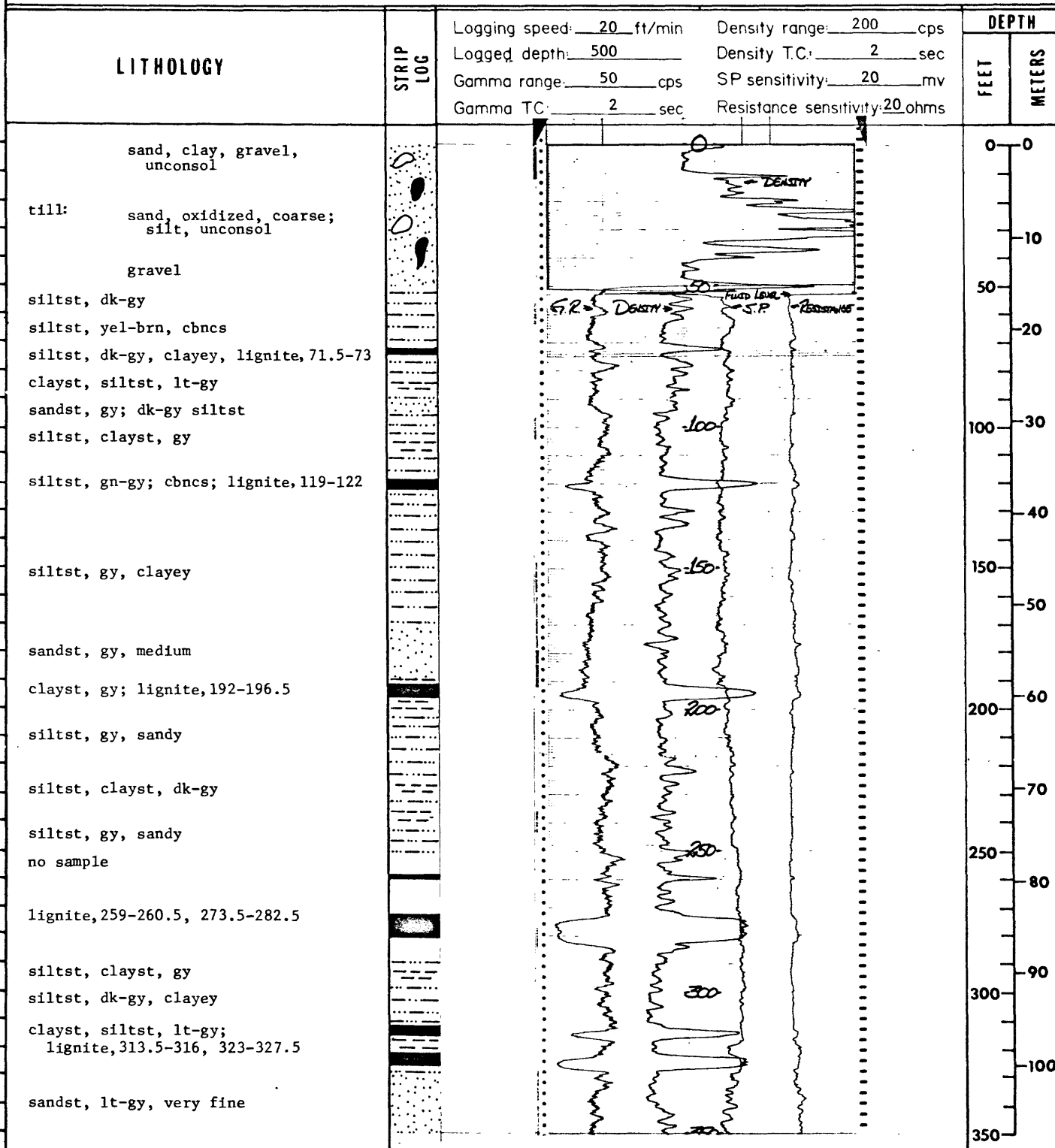


UNITED STATES GEOLOGICAL SURVEY

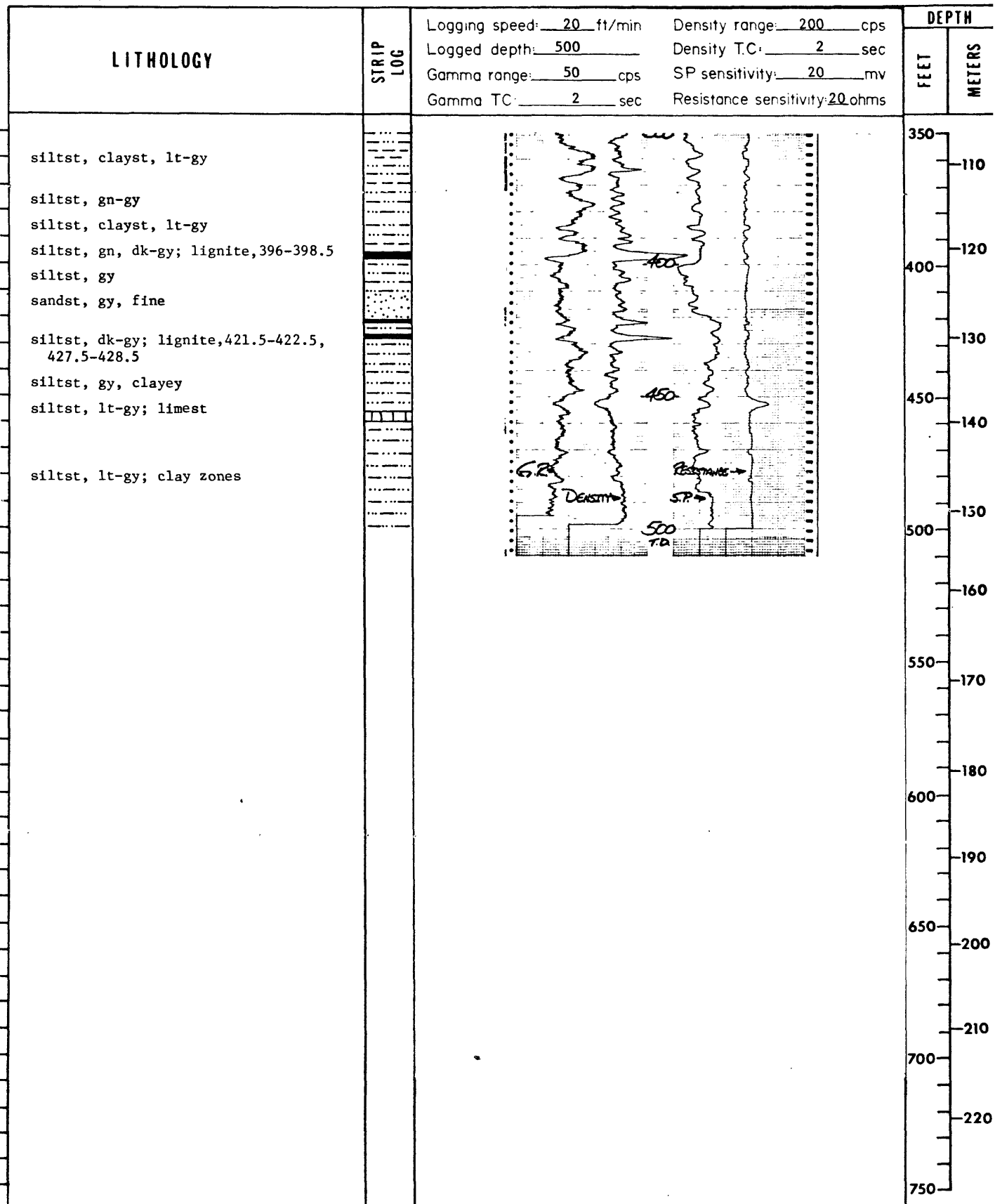
HOLE NO W 53
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bonetraill	
DATE STARTED 7/4/79	DATE COMP. 7/4/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 30 T.158 N., R. 101 W., FOOTAGE LOC.		6 SEMI FSL 132 SEMI FWL	GROUND ELEV 2306 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 500 CORING ---	TOTAL DEPTH 500 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	DEPTH TO WATER 53 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

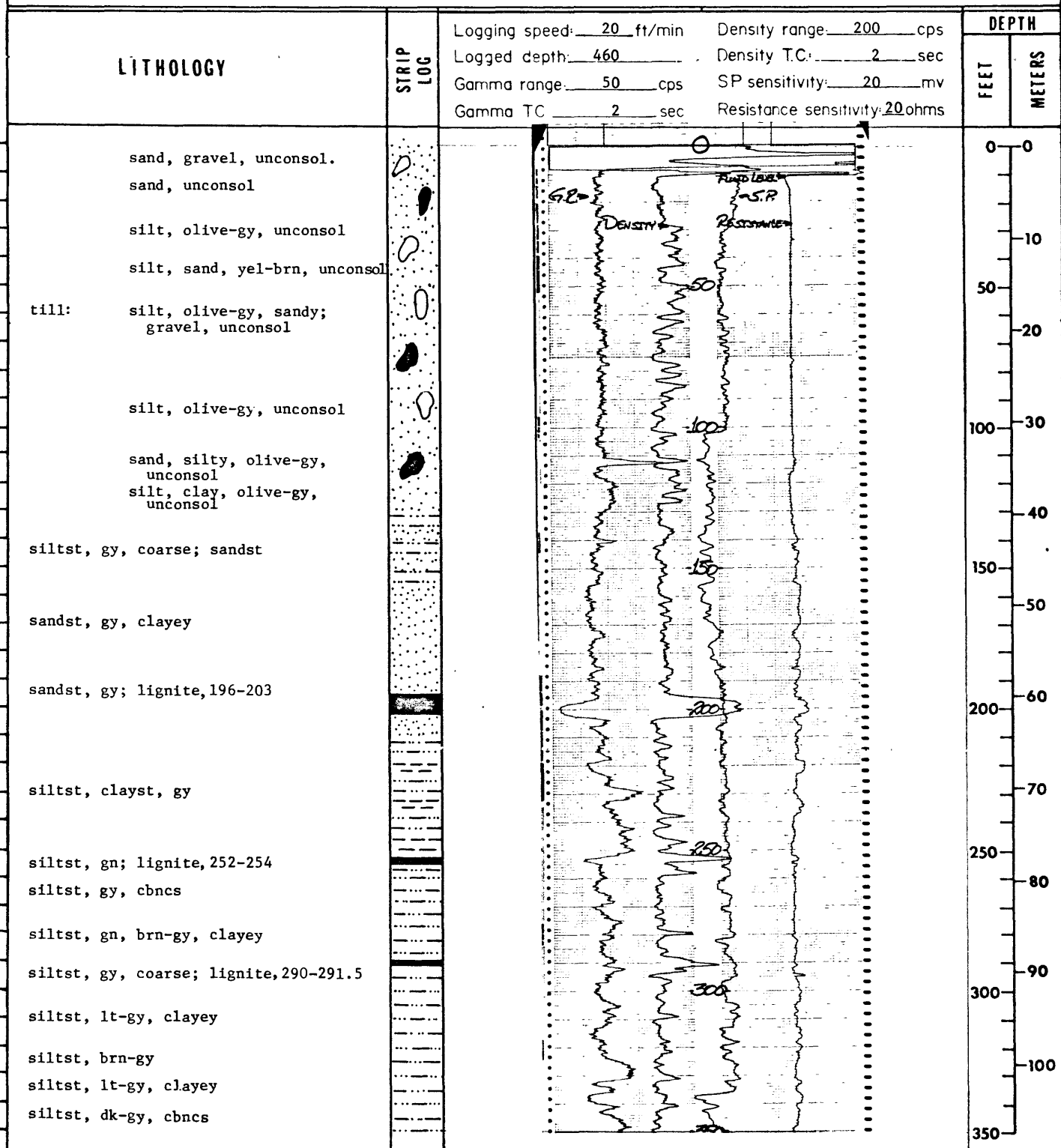


UNITED STATES GEOLOGICAL SURVEY

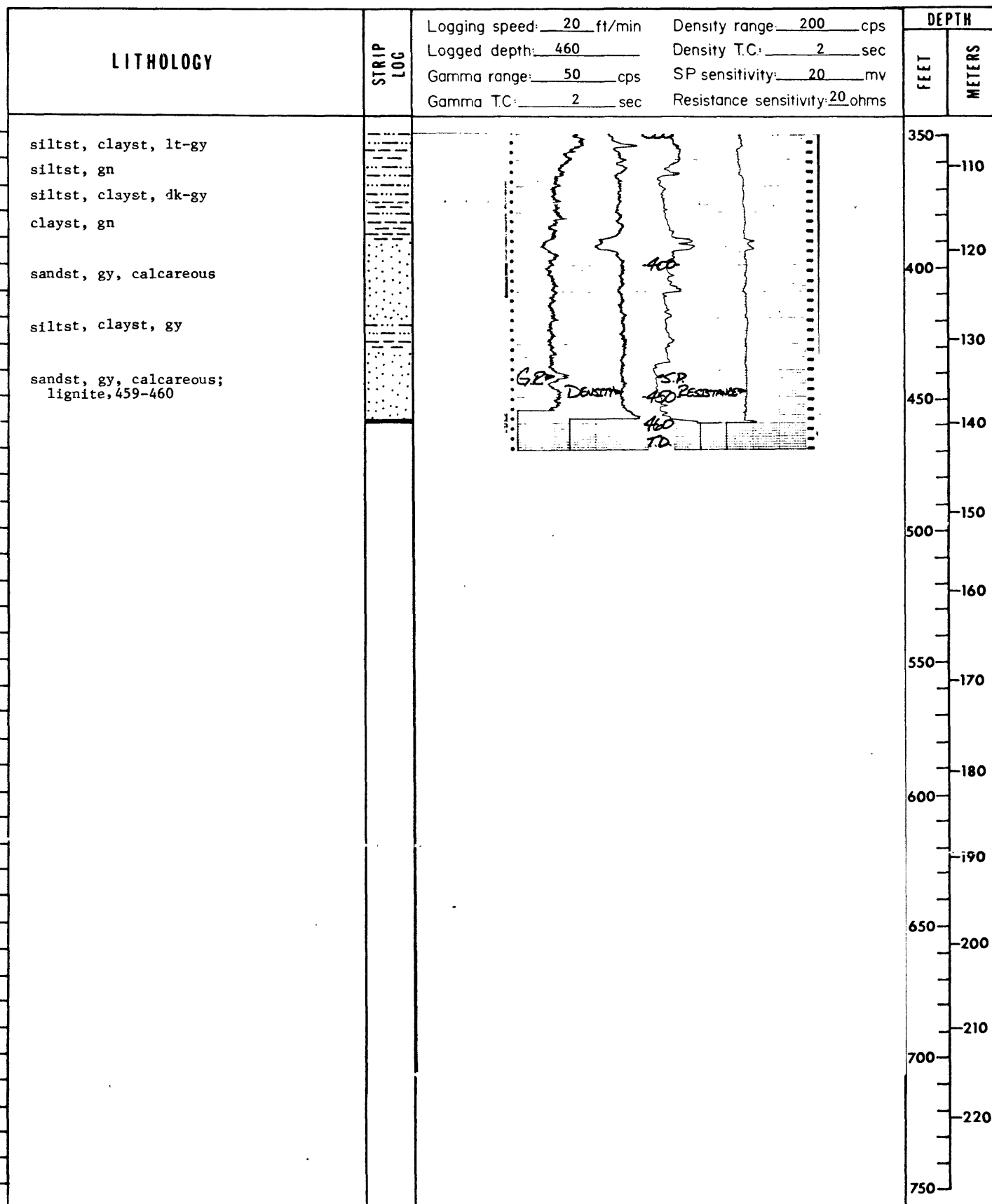
HOLE NO W 54
SHEET 1 OF 2

AREA Williams County		QUAD NAME Hanks	
DATE STARTED 7/4/79	DATE COMP. 7/4/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 1 T.158 N., R. 102 W., FOOTAGE LOC.		325 FNL 3 FWL	GROUND ELEV 2257 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 460 CORING ---	TOTAL DEPTH 460 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ---	DEPTH TO WATER 11 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



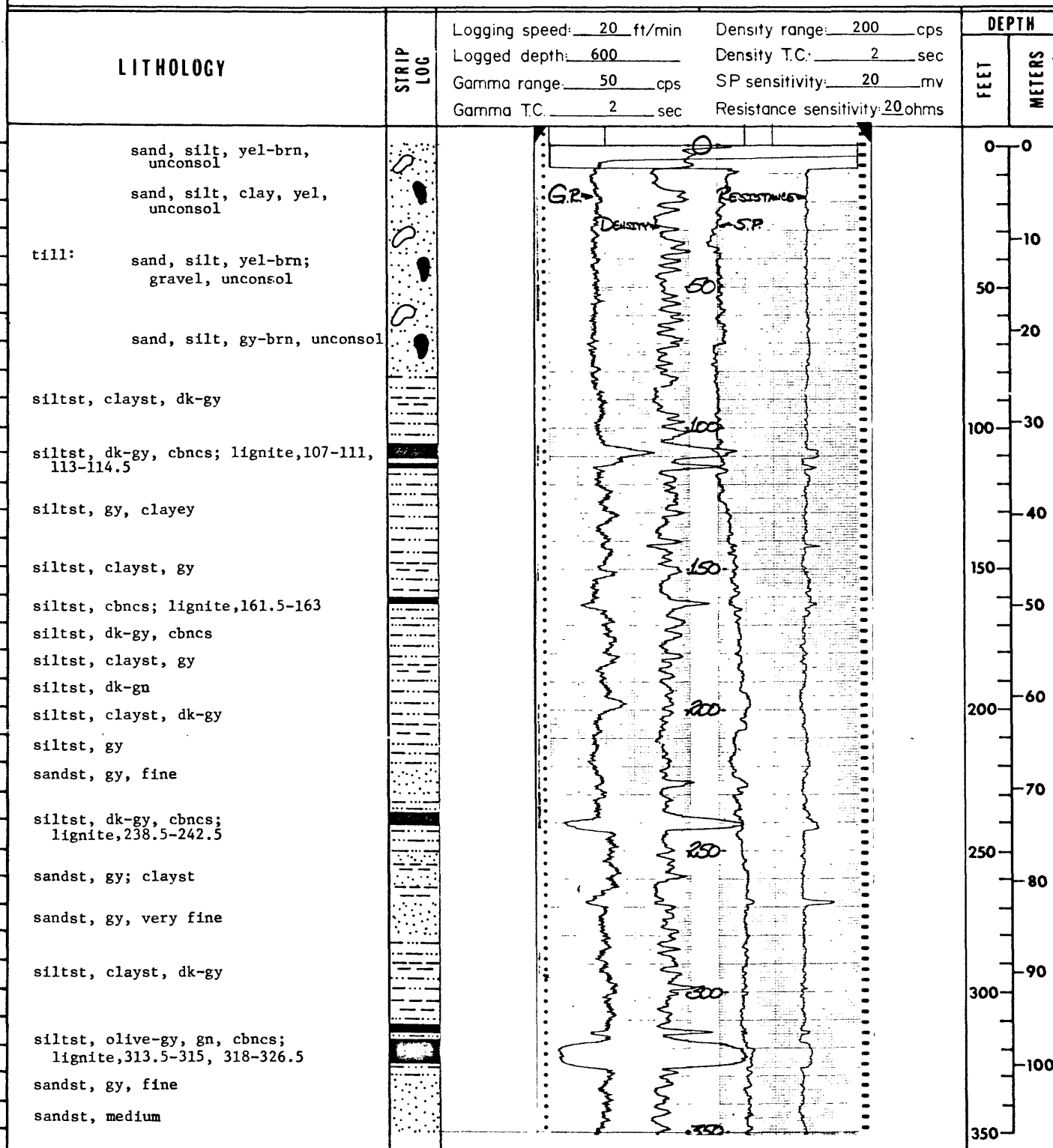
REMARKS:



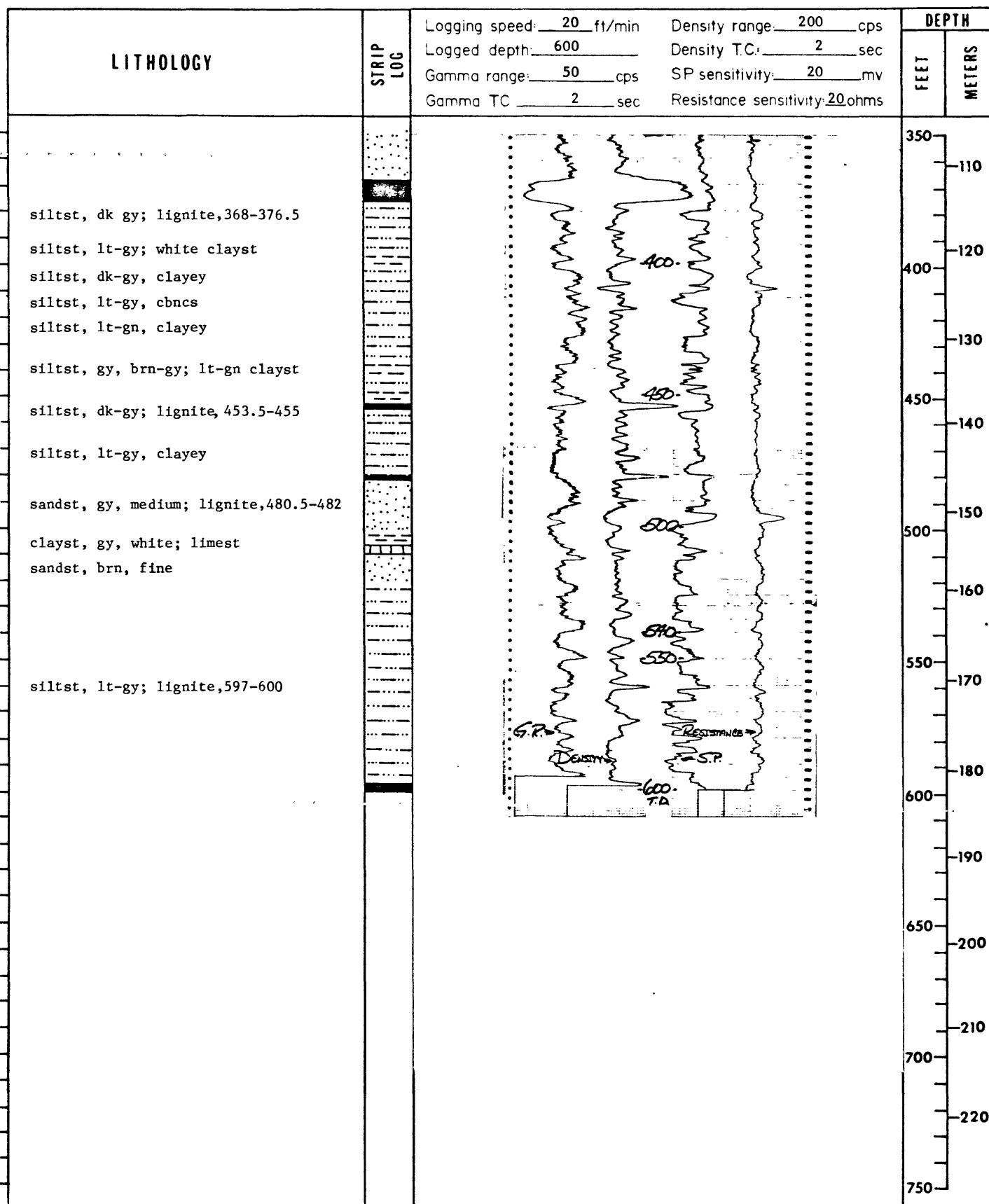
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 55
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bonetrail	
DATE STARTED 7/7/79	DATE COMP. 7/7/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 22 T.158 N., R. 102 W., FOOTAGE LOC.		105 XXX FSL 35 XXX FWL	GROUND ELEV 2402 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 600 CORING ---	
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	TOTAL DEPTH 600 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



REMARKS:

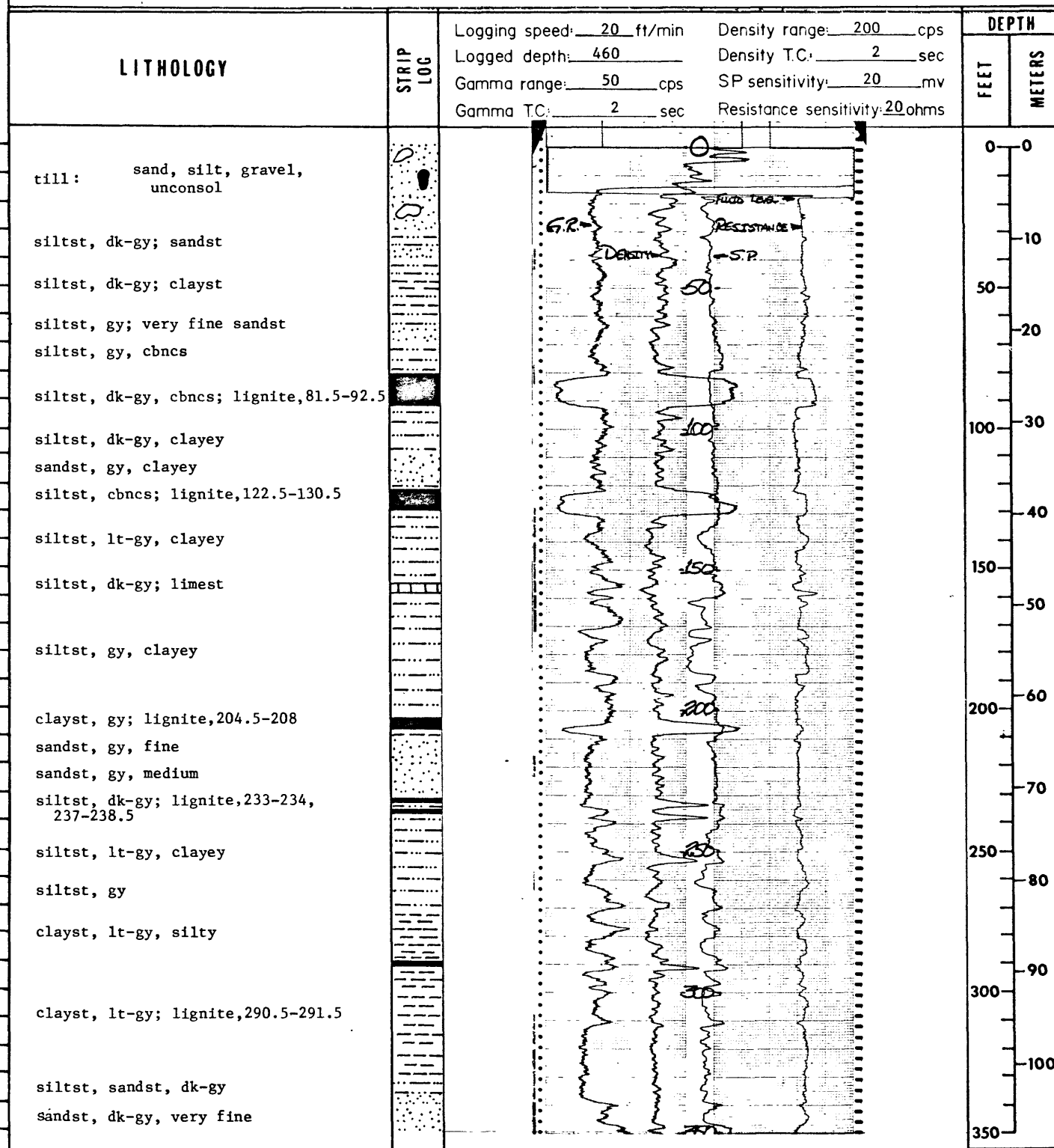


UNITED STATES GEOLOGICAL SURVEY

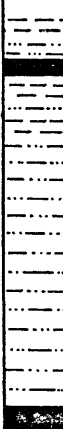
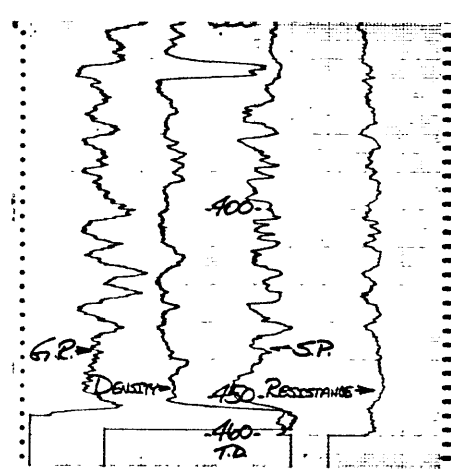
HOLE NO. W-56
SHEET 1 OF 2

AREA Williams County		QUAD NAME Grenora	
DATE STARTED 7/8/79	DATE COMP. 7/8/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 13 T.158 N., R.103 W., FOOTAGE LOC. 6		FNL 415 XCEL FWL	GROUND ELEV 2236 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 460 CORING ---	TOTAL DEPTH 460 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 18 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min Logged depth: 460 Gamma range: 50 cps Gamma TC: 2 sec	Density range: 200 cps Density T.C.: 2 sec SP sensitivity: 20 mv Resistance sensitivity: 20 ohms	DEPTH	
				FEET	METERS
clayst, dk-gy; cbnca siltst; lignite, 361-365 siltst, clayst, lt-gy siltst, dk-gy, cbnca siltst, lt-gy siltst, lt-gy, clayey siltst, lt-gy, cbnca siltst, dk-gy siltst, lt-gy, clayey siltst, dk-gy; lignite, 453-460				350 110 400 120 130 450 140 500 150 160 550 170 600 180 650 190 700 200 210 220 750	

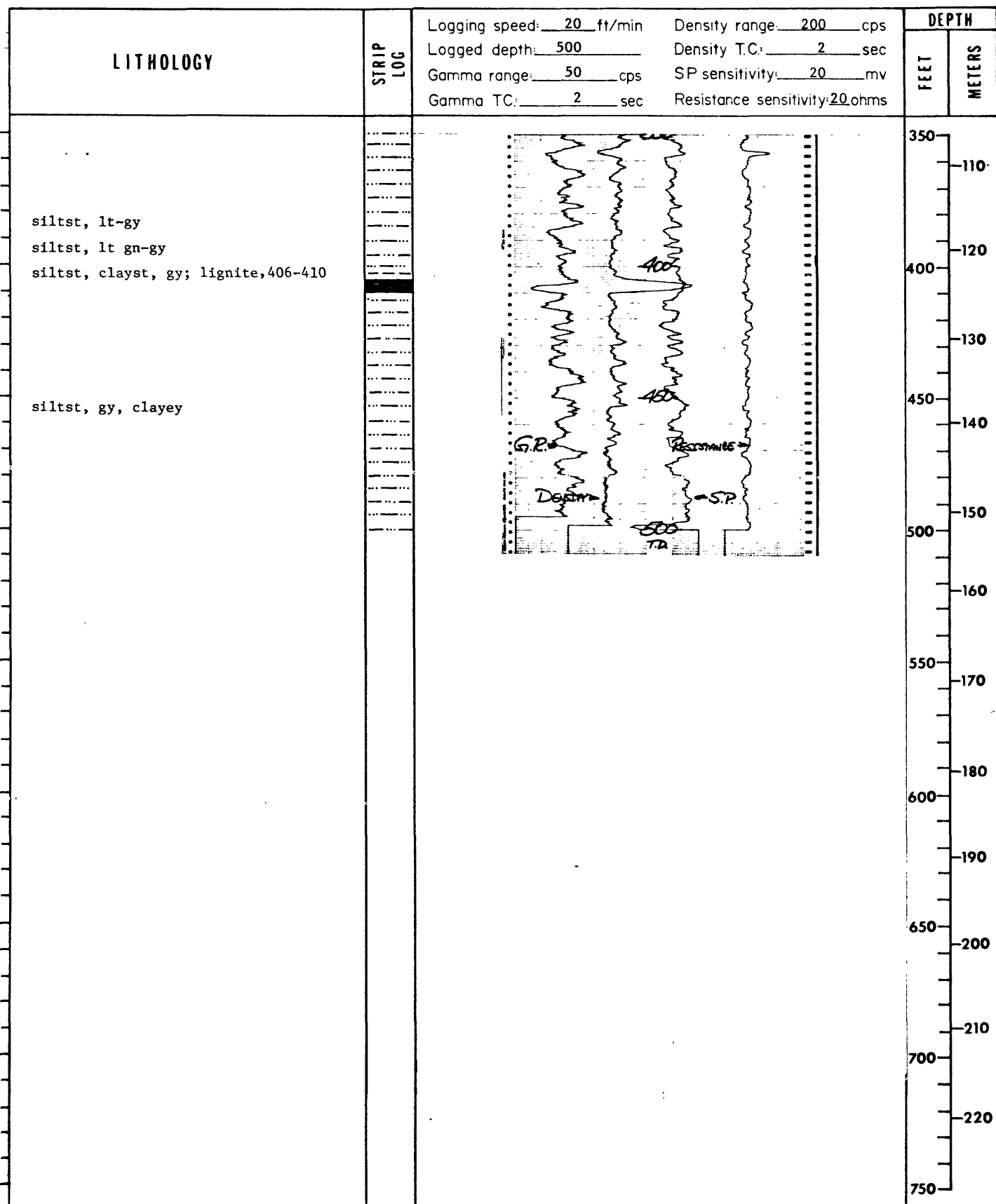
UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 57
SHEET 1 OF 2

AREA Williams County		QUAD NAME Brush Mountain	
DATE STARTED 7/8/79	DATE COMP. 7/8/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 32 T. 158 N. R. 103 W. FOOTAGE LOC.		100 FNL XXX 3 XXX FWL	GROUND ELEV 2278 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 500 CORING ---	
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	TOTAL DEPTH 500 ft DEPTH TO WATER 13 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min Logged depth: 500 Gamma range: 50 cps Gamma TC: 2 sec Density range: 200 cps Density T.C.: 2 sec SP sensitivity: 20 mv Resistance sensitivity: 20 ohms	DEPTH	
			FEET	METERS
silt, sand, gravel, yel-brn, unconsol till: silt, gravel, dk-gy, unconsol silt, sand, gravel, yel-brn, unconsol siltst, dk-gy, clayey siltst, dk-gy, coarse lignite, 90.5-101 siltst, dk-gy, sandy sandst, gy, fine sandst, gy, clayey sandst, gy, medium; lignite, 145-152 siltst, gy, clayey siltst, gy siltst, lt-gy; lignite, 201.5-202.5 siltst, clayst, gy; lignite, 230.5-233 clayst, gy, silty sandst, gy, medium; lignite, 255.5-258 siltst, lt-gy; limest siltst, lt-gy, coarse siltst, gy, clayey, cbncc siltst, lt-gy siltst, gy, clayey			0 10 20 30 40 50 60 70 80 90 100 350	0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60 63 66 69 72 75 78 81 84 87 90 93 96 99 102 105 108 111 114 117 120 123 126 129 132 135 138 141 144 147 150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198 201 204 207 210 213 216 219 222 225 228 231 234 237 240 243 246 249 252 255 258 261 264 267 270 273 276 279 282 285 288 291 294 297 300 303 306 309 312 315 318 321 324 327 330 333 336 339 342 345 348 351 354 357 360 363 366 369 372 375 378 381 384 387 390 393 396 399 402 405 408 411 414 417 420 423 426 429 432 435 438 441 444 447 450 453 456 459 462 465 468 471 474 477 480 483 486 489 492 495 498 501 504 507 510 513 516 519 522 525 528 531 534 537 540 543 546 549 552 555 558 561 564 567 570 573 576 579 582 585 588 591 594 597 600 603 606 609 612 615 618 621 624 627 630 633 636 639 642 645 648 651 654 657 660 663 666 669 672 675 678 681 684 687 690 693 696 699 702 705 708 711 714 717 720 723 726 729 732 735 738 741 744 747 750 753 756 759 762 765 768 771 774 777 780 783 786 789 792 795 798 801 804 807 810 813 816 819 822 825 828 831 834 837 840 843 846 849 852 855 858 861 864 867 870 873 876 879 882 885 888 891 894 897 900 903 906 909 912 915 918 921 924 927 930 933 936 939 942 945 948 951 954 957 960 963 966 969 972 975 978 981 984 987 990 993 996 999 1002 1005 1008 1011 1014 1017 1020 1023 1026 1029 1032 1035 1038 1041 1044 1047 1050 1053 1056 1059 1062 1065 1068 1071 1074 1077 1080 1083 1086 1089 1092 1095 1098 1101 1104 1107 1110 1113 1116 1119 1122 1125 1128 1131 1134 1137 1140 1143 1146 1149 1152 1155 1158 1161 1164 1167 1170 1173 1176 1179 1182 1185 1188 1191 1194 1197 1200 1203 1206 1209 1212 1215 1218 1221 1224 1227 1230 1233 1236 1239 1242 1245 1248 1251 1254 1257 1260 1263 1266 1269 1272 1275 1278 1281 1284 1287 1290 1293 1296 1299 1302 1305 1308 1311 1314 1317 1320 1323 1326 1329 1332 1335 1338 1341 1344 1347 1350 1353 1356 1359 1362 1365 1368 1371 1374 1377 1380 1383 1386 1389 1392 1395 1398 1401 1404 1407 1410 1413 1416 1419 1422 1425 1428 1431 1434 1437 1440 1443 1446 1449 1452 1455 1458 1461 1464 1467 1470 1473 1476 1479 1482 1485 1488 1491 1494 1497 1500 1503 1506 1509 1512 1515 1518 1521 1524 1527 1530 1533 1536 1539 1542 1545 1548 1551 1554 1557 1560 1563 1566 1569 1572 1575 1578 1581 1584 1587 1590 1593 1596 1599 1602 1605 1608 1611 1614 1617 1620 1623 1626 1629 1632 1635 1638 1641 1644 1647 1650 1653 1656 1659 1662 1665 1668 1671 1674 1677 1680 1683 1686 1689 1692 1695 1698 1701 1704 1707 1710 1713 1716 1719 1722 1725 1728 1731 1734 1737 1740 1743 1746 1749 1752 1755 1758 1761 1764 1767 1770 1773 1776 1779 1782 1785 1788 1791 1794 1797 1800 1803 1806 1809 1812 1815 1818 1821 1824 1827 1830 1833 1836 1839 1842 1845 1848 1851 1854 1857 1860 1863 1866 1869 1872 1875 1878 1881 1884 1887 1890 1893 1896 1899 1902 1905 1908 1911 1914 1917 1920 1923 1926 1929 1932 1935 1938 1941 1944 1947 1950 1953 1956 1959 1962 1965 1968 1971 1974 1977 1980 1983 1986 1989 1992 1995 1998 2001 2004 2007 2010 2013 2016 2019 2022 2025 2028 2031 2034 2037 2040 2043 2046 2049 2052 2055 2058 2061 2064 2067 2070 2073 2076 2079 2082 2085 2088 2091 2094 2097 2100 2103 2106 2109 2112 2115 2118 2121 2124 2127 2130 2133 2136 2139 2142 2145 2148 2151 2154 2157 2160 2163 2166 2169 2172 2175 2178 2181 2184 2187 2190 2193 2196 2199 2202 2205 2208 2211 2214 2217 2220 2223 2226 2229 2232 2235 2238 2241 2244 2247 2250 2253 2256 2259 2262 2265 2268 2271 2274 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2877 2880 2883 2886 2889 2892 2895 2898 2901 2904 2907 2910 2913 2916 2919 2922 2925 2928 2931 2934 2937 2940 2943 2946 2949 2952 2955 2958 2961 2964 2967 2970 2973 2976 2979 2982 2985 2988 2991 2994 2997 3000 3003 3006 3009 3012 3015 3018 3021 3024 3027 3030 3033 3036 3039 3042 3045 3048 3051 3054 3057 3060 3063 3066 3069 3072 3075 3078 3081 3084 3087 3090 3093 3096 3099 3102 3105 3108 3111 3114 3117 3120 3123 3126 3129 3132 3135 3138 3141 3144 3147 3150 3153 3156 3159 3162 3165 3168 3171 3174 3177 3180 3183 3186 3189 3192 3195 3198 3201 3204 3207 3210 3213 3216 3219 3222 3225 3228 3231 3234 3237 3240 3243 3246 3249 3252 3255 3258 3261 3264 3267 3270 3273 3276 3279 3282 3285 3288 3291 3294 3297 3300 3303 3306 3309 3312 3315 3318 3321 3324 3327 3330 3333 3336 3339 3342 3345 3348 3351 3354 3357 3360 3363 3366 3369 3372 3375 3378 3381 3384 3387 3390 3393 3396 3399 3402 3405 3408 3411 3414 3417 3420 3423 3426 3429 3432 3435 3438 3441 3444 3447 3450 3453 3456 3459 3462 3465 3468 3471 3474 3477 3480 3483 3486 3489 3492 3495 3498 3501 3504 3507 3510 3513 3516 3519 3522 3525 3528 3531 3534 3537 3540 3543 3546 3549 3552 3555 3558 3561 3564 3567 3570 3573 3576 3579 3582 3585 3588 3591 3594 3597 3600 3603 3606 3609 3612 3615 3618 3621 3624 3627 3630 3633 3636 3639 3642 3645 3648 3651 3654 3657 3660 3663 3666 3669 3672 3675 3678 3681 3684 3687 3690 3693 3696 3699 3702 3705 3708 3711 3714 3717 3720 3723 3726 3729 3732 3735 3738 3741 3744 3747 3750 3753 3756 3759 3762 3765 3768 3771 3774 3777 3780 3783 3786 3789 3792 3795 3798 3801 3804 3807 3810 3813 3816 3819 3822 3825 3828 3831 3834 3837 3840 3843 3846 3849 3852 3855 3858 3861 3864 3867 3870 3873 3876 3879 3882 3885 3888 3891 3894 3897 3900 3903 3906 3909 3912 3915 3918 3921 3924 3927 3930 3933 3936 3939 3942 3945 3948 3951 3954 3957 3960 3963 3966 3969 3972 3975 3978 3981 3984 3987 3990 3993 3996 4000

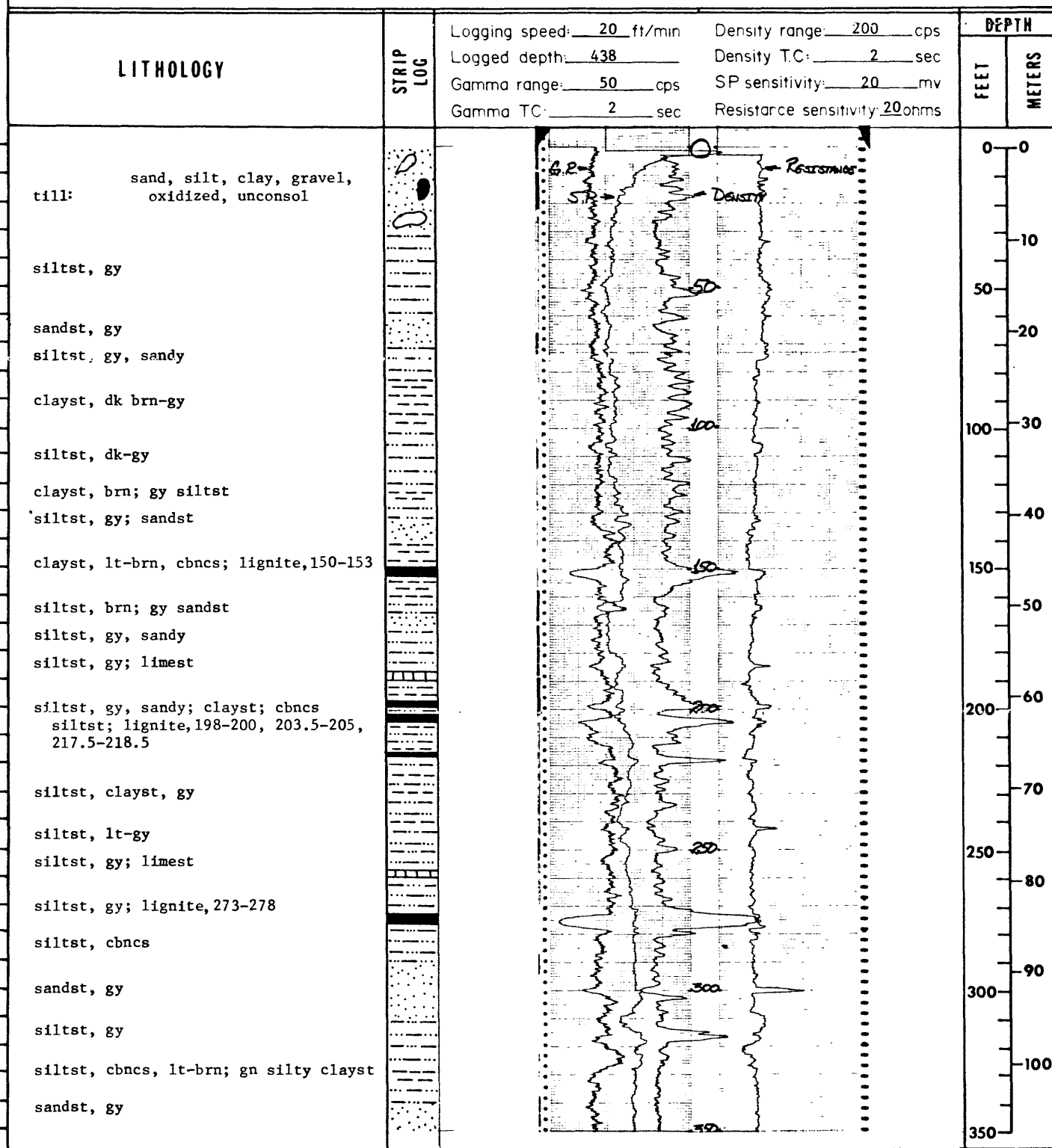
REMARKS:



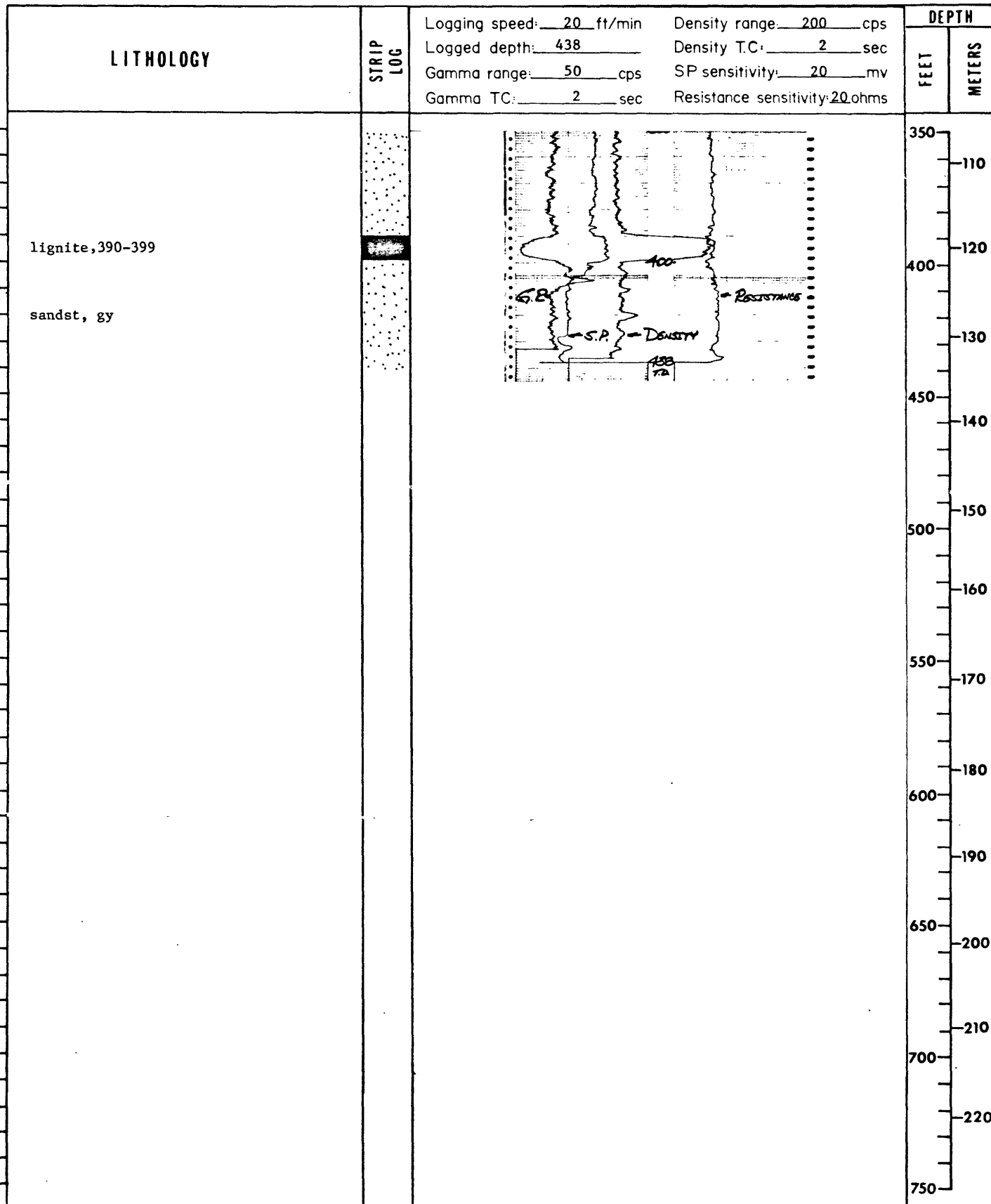
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 61
SHEET 1 OF 2

AREA Williams County		QUAD NAME Tom Berg Lake	
DATE STARTED 6/14/79	DATE COMP. 6/14/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 7 T.159 N., R. 96 W., FOOTAGE LOC.		15 XXX FSL	5 XXX FWL
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 440	CORING ---
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ---	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



REMARKS:

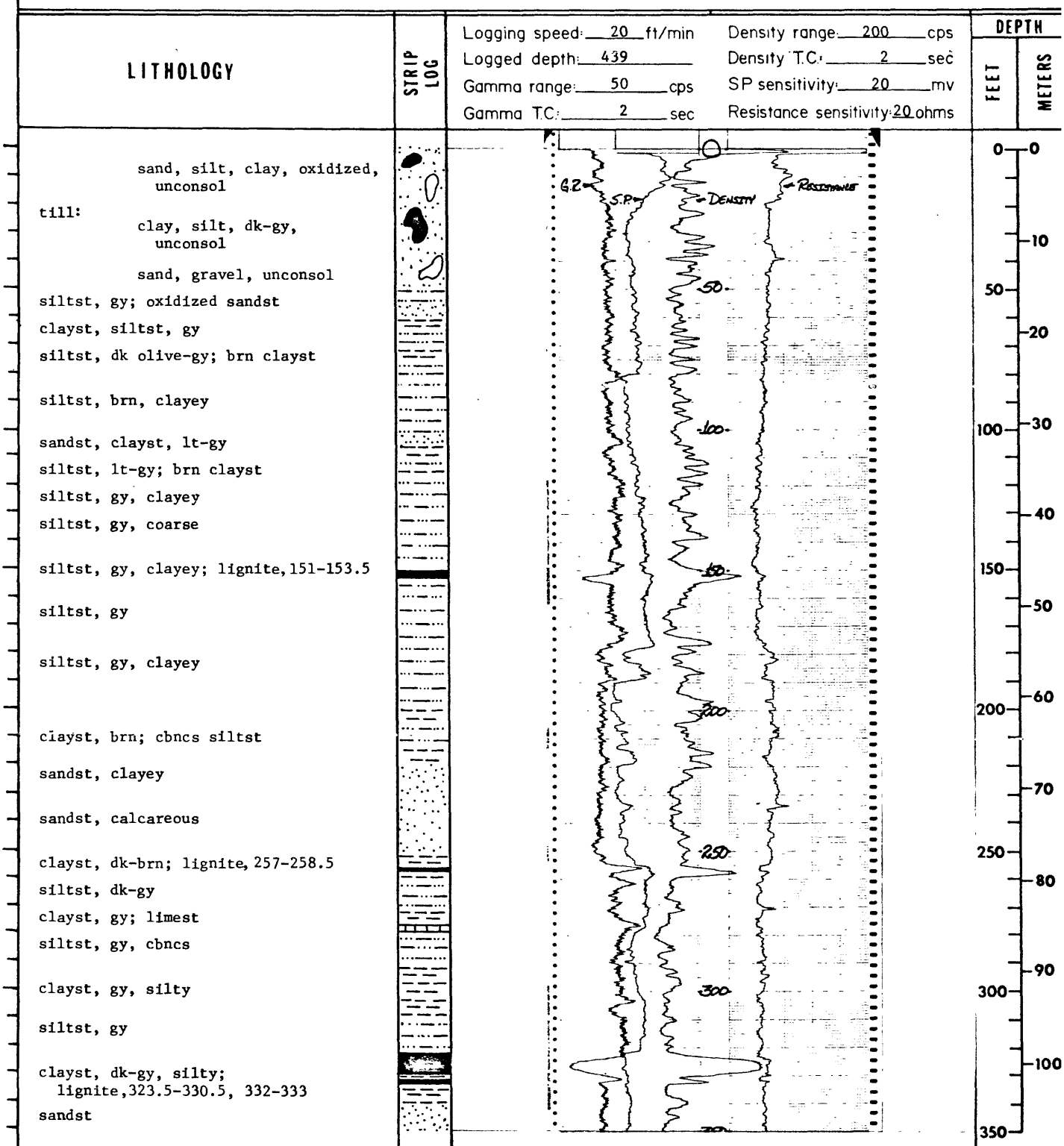


UNITED STATES GEOLOGICAL SURVEY

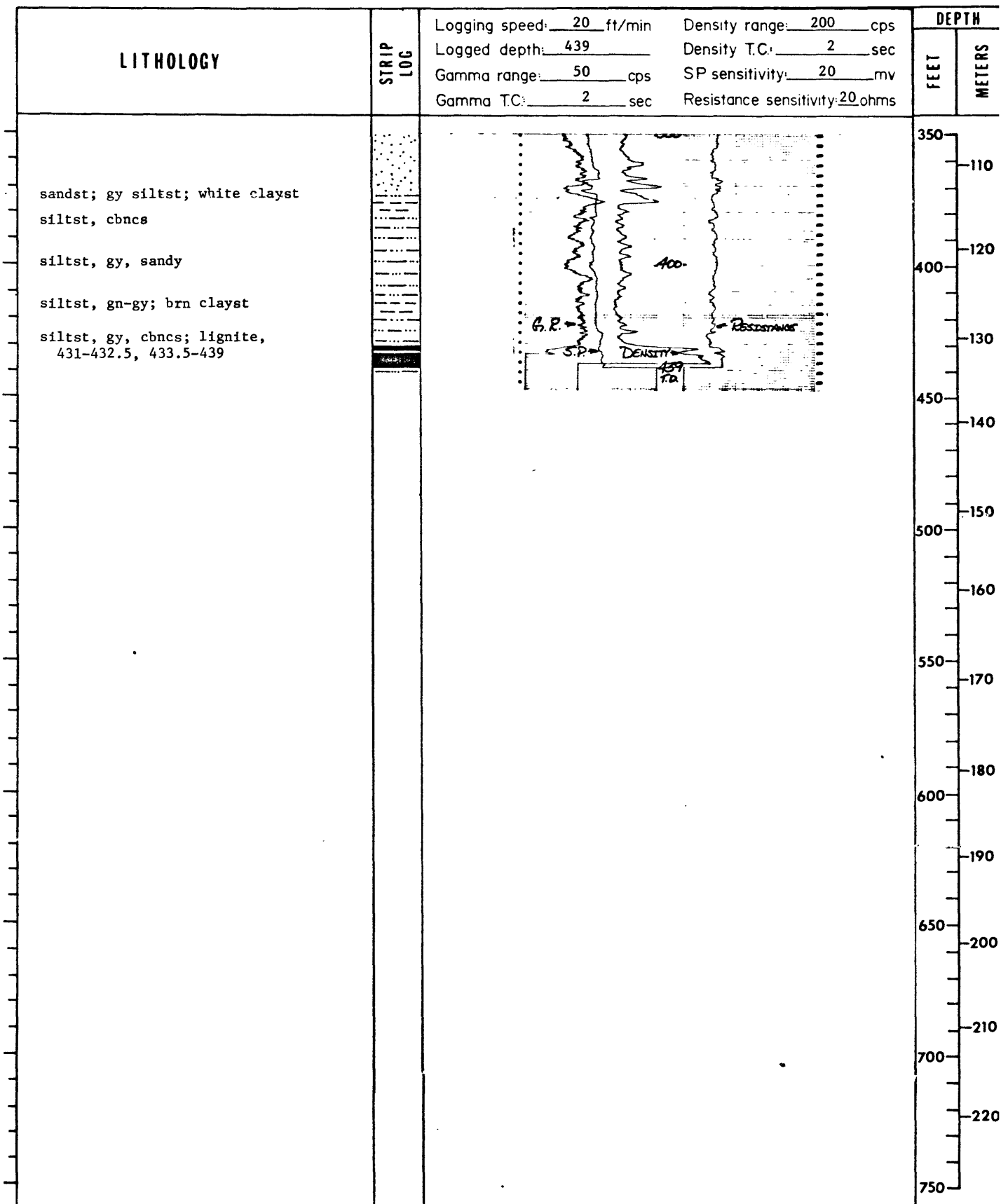
HOLE NO 63
SHEET 1 OF 2

AREA Williams County		QUAD NAME Tom Berg Lake	
DATE STARTED 6/15/79	DATE COMP. 6/15/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 10 T.159 N., R. 97 W., FOOTAGE LOC.		40	25
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 440	CORING ---
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ---	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



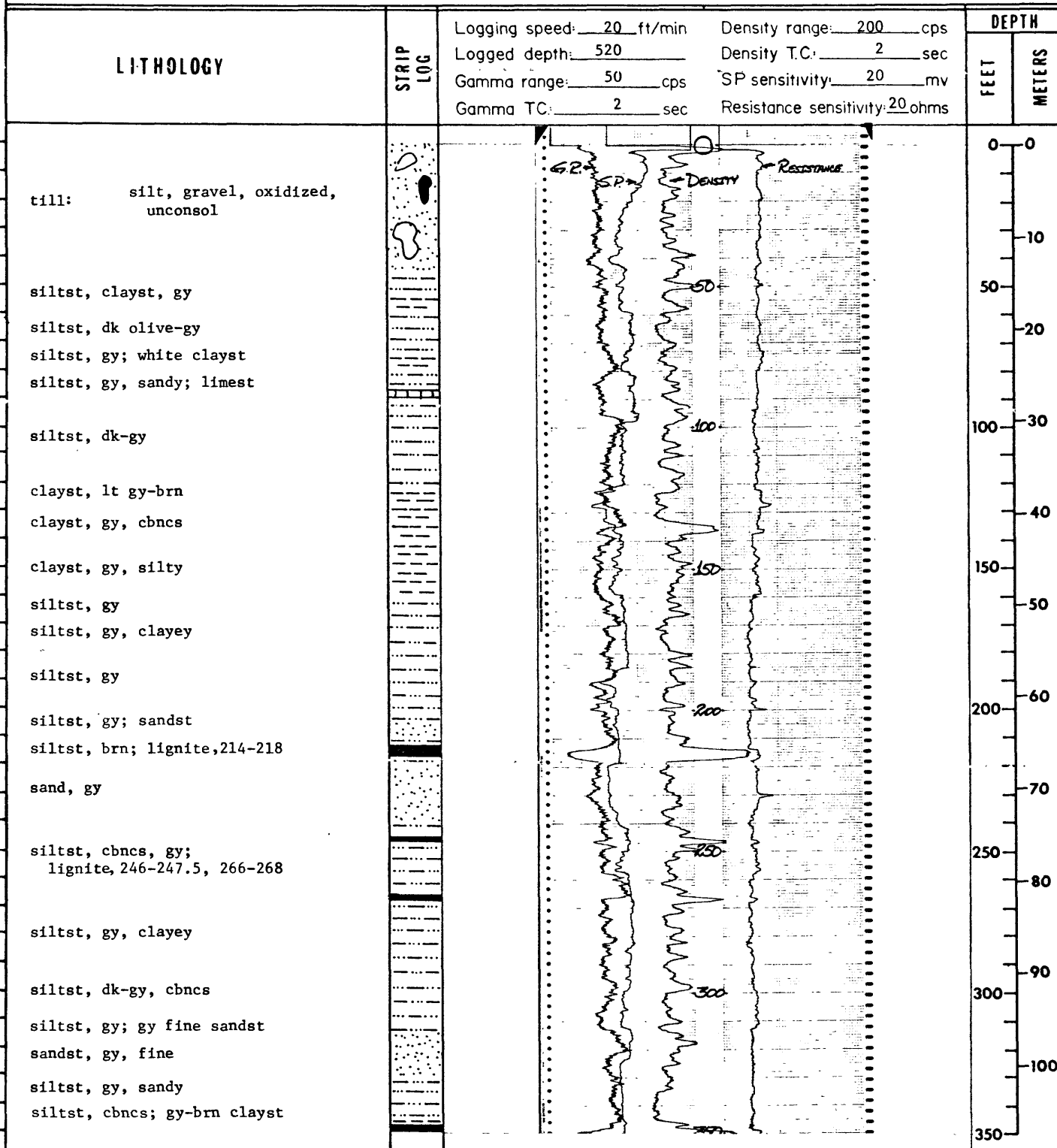
REMARKS:



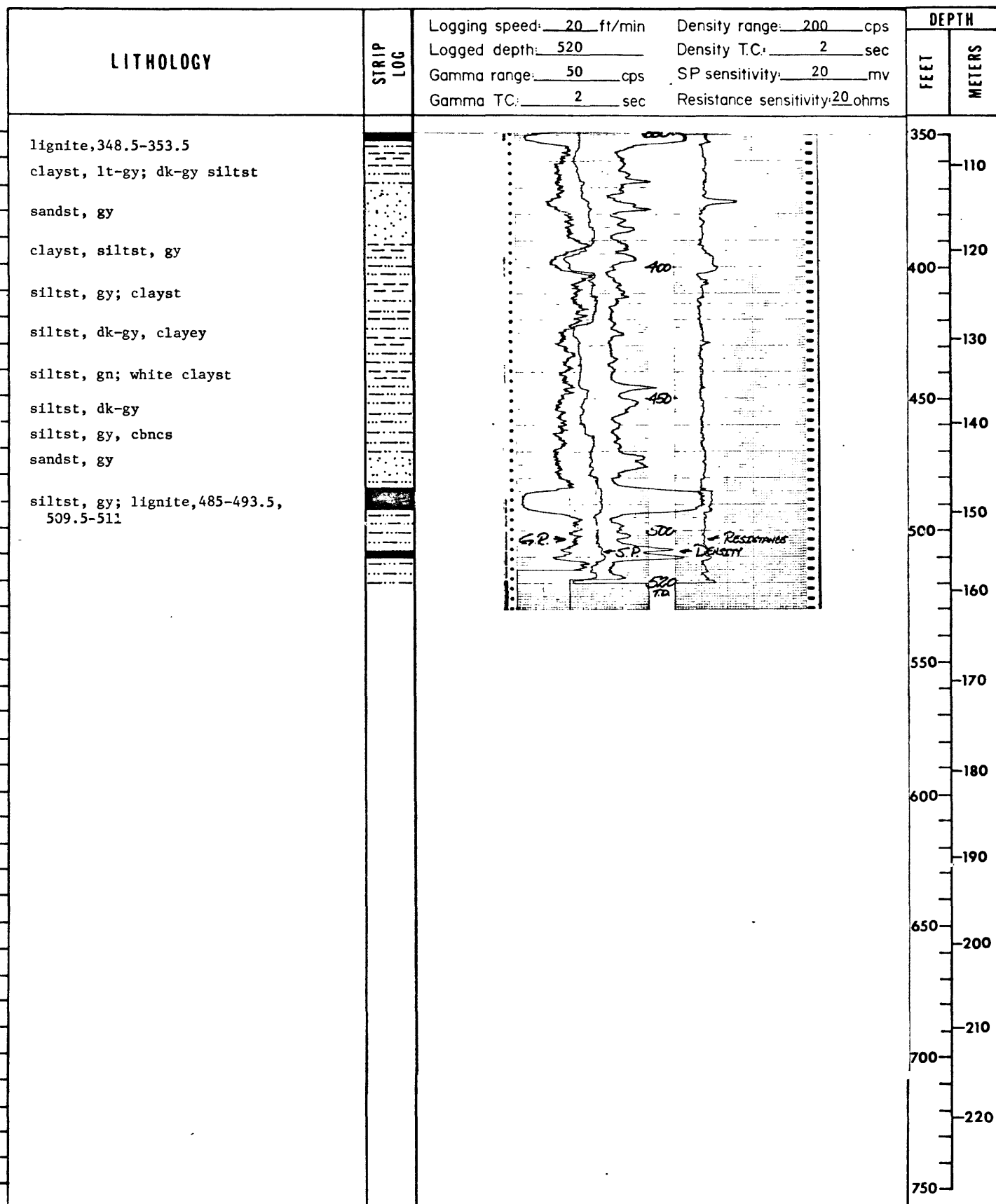
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 64
SHEET 1 OF 2

AREA Williams County		QUAD NAME Tom Berg Lake	
DATE STARTED 6/15/79	DATE COMP. 6/15/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 35 T. 159 N., R. 97 W., FOOTAGE LOC.		40 FNL YES	10 FEL XXX
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 520	CORING ---
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ---	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



REMARKS:

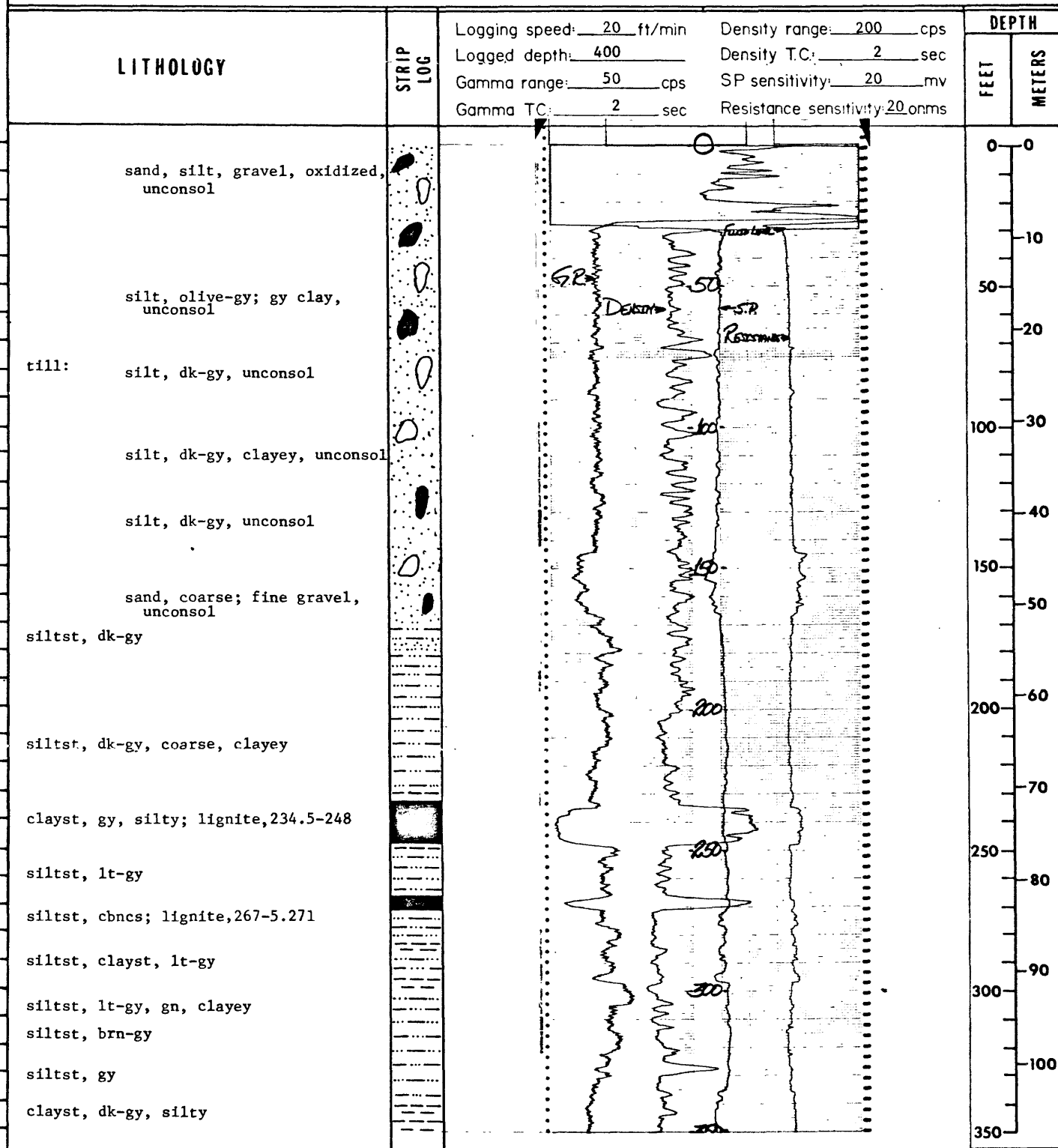


UNITED STATES GEOLOGICAL SURVEY

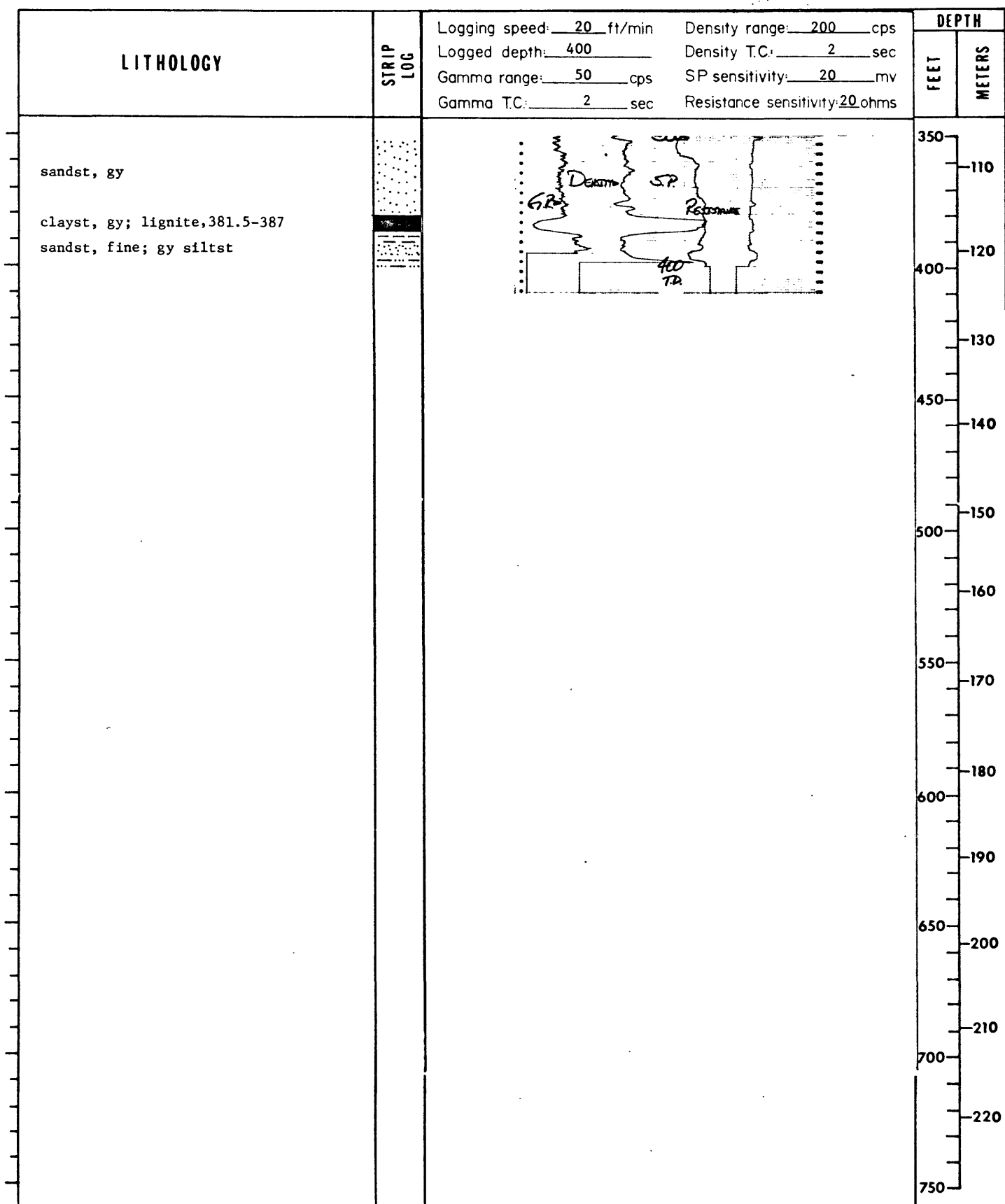
HOLE NO W 65
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bright Water Lake	
DATE STARTED 6/20/79	DATE COMP. 6/20/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 6 T. 159 N., R. 98 W., FOOTAGE LOC.		3 FNL XXX 165 FEL RXX	GROUND ELEV 2237 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 400 CORING ---	TOTAL DEPTH 400 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	DEPTH TO WATER 30 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:



UNITED STATES GEOLOGICAL SURVEY

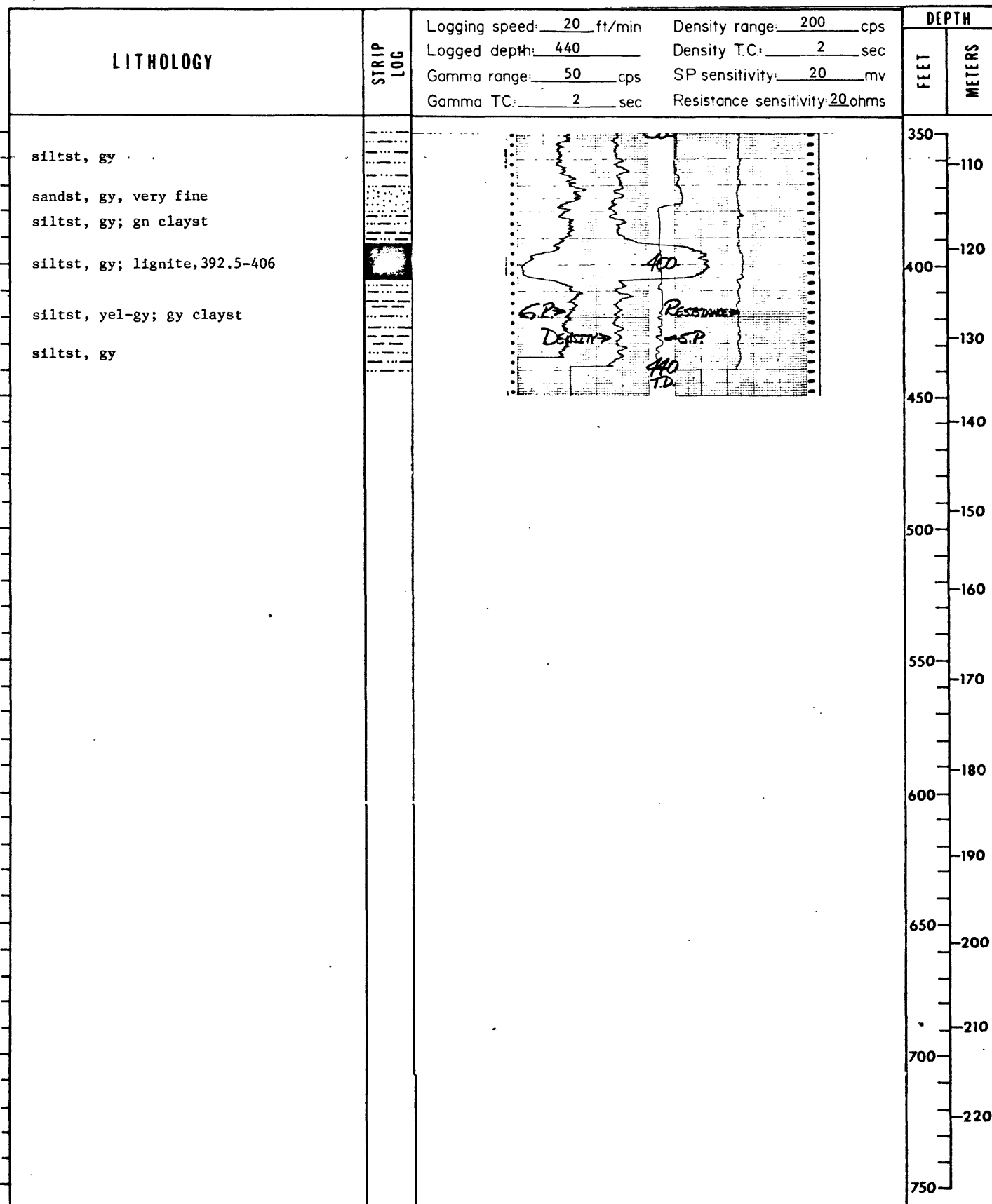
HOLE NO W 66
SHEET 1 OF 2

AREA Williams County		QUAD NAME Corinth	
DATE STARTED 6/20/79	DATE COMP. 6/20/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 26 T. 159 N., R. 98 W., FOOTAGE LOC.		5 <small>KKK FSL</small> 75 <small>FEL KKK</small>	GROUND ELEV 2276 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 440 CORING ----	TOTAL DEPTH 440 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	DEPTH TO WATER 4 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min Density range: 200 cps Logged depth: 440 Density T.C.: 2 sec Gamma range: 50 cps SP sensitivity: 20 mv Gamma TC: 2 sec Resistance sensitivity: 20 ohms		DEPTH	
		FEET	METERS		
till: silt, sandy, oxidized, uncon				0	0
silt, gy-brn, sandy, unconsol				10	
sand, gravel, brn clay, unconsol				50	
siltst, clayst, yel-gy				20	
siltst, white; limest				100	30
siltst, gy, coarse				40	
sandst, gy, fine				150	50
clayst, gy; lignite, 122-124				60	
siltst, gy				200	60
clayst, dk-gy; cbncls siltst; lignite, 150.5-152				70	
siltst, clayst, gy				250	80
clayst, gn-gy, silty				80	
siltst, clayst, dk-gy				300	90
clayst, gn; limest				100	
siltst, brn				350	100
sandst, gy, fine					
sandst, medium to coarse					
siltst, gy, clayey					
clayst, gy; siltst, cbncls; lignite, 281-285.5, 296-298					
siltst, gy					
siltst, dk-gy, cbncls					
siltst, gn, coarse					

90

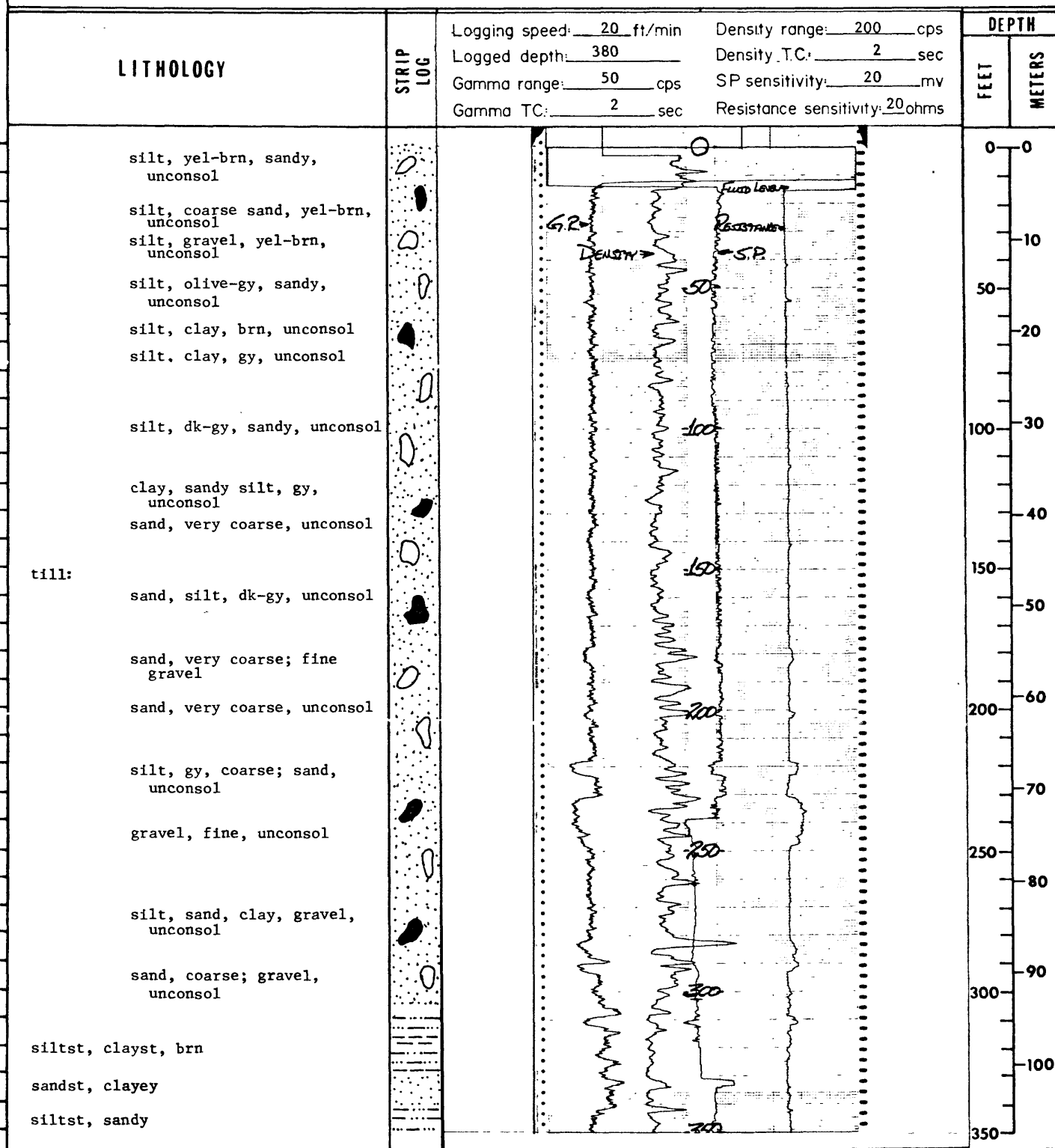
REMARKS:



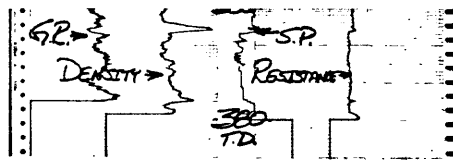
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 68:
SHEET 1 OF 2

AREA Williams County		QUAD NAME Bright Water Lake	
DATE STARTED 6/21/79	DATE COMP. 6/21/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 3 T. 159 N., R. 99 W., FOOTAGE LOC.		70 FNL XBSL	25 XBSL FWL
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 380	CORING ---
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



REMARKS:

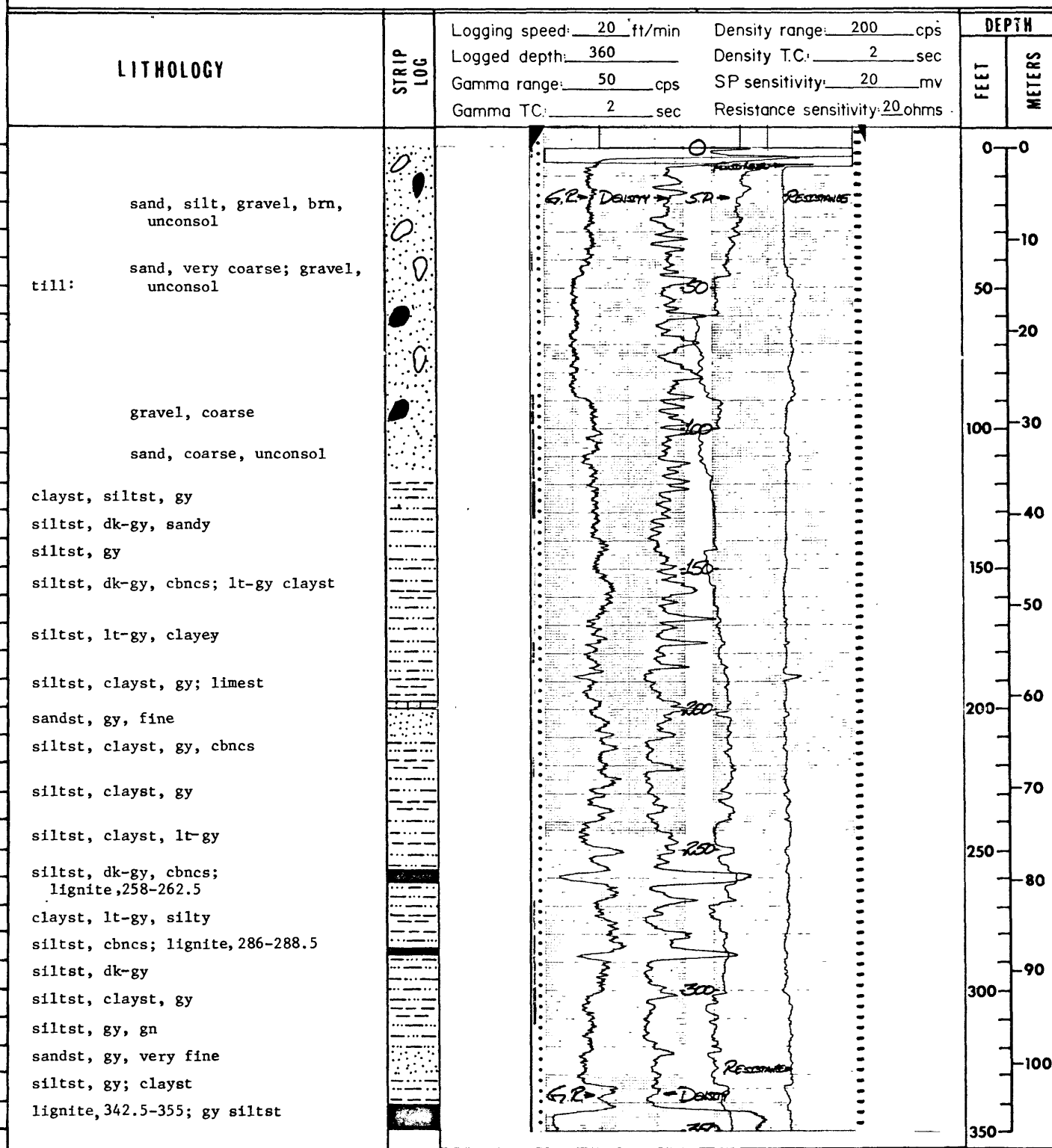
LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min		Density range: <u>200</u> cps		DEPTH	
		Logged depth: <u>380</u>		Density T.C.: <u>2</u> sec		FEET	METERS
		Gamma range: <u>50</u> cps		SP sensitivity: <u>20</u> mv			
		Gamma TC: <u>2</u> sec		Resistance sensitivity: <u>20</u> ohms			
no sample		350	110				
		400	120				
		450	130				
		500	140				
		550	150				
		600	160				
		650	170				
		700	180				
		750	190				
		800	200				
		850	210				
		900	220				
		950	230				
		1000	240				
		1050	250				
		1100	260				
		1150	270				

UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W 69
SHEET 1 OF 2

AREA Williams County		QUAD NAME Zahl	
DATE STARTED 7/5/79	DATE COMP. 7/5/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 7 T.159 N., R. 100 W., FOOTAGE LOC.		2640 XXX FSL 55 XXX FWL	GROUND ELEV 2088 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 360 CORING ---	TOTAL DEPTH 360 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 7 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

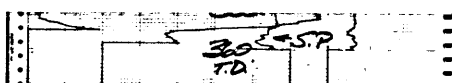
REMARKS:



UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 69
SHEET 2 OF 2

REMARKS:

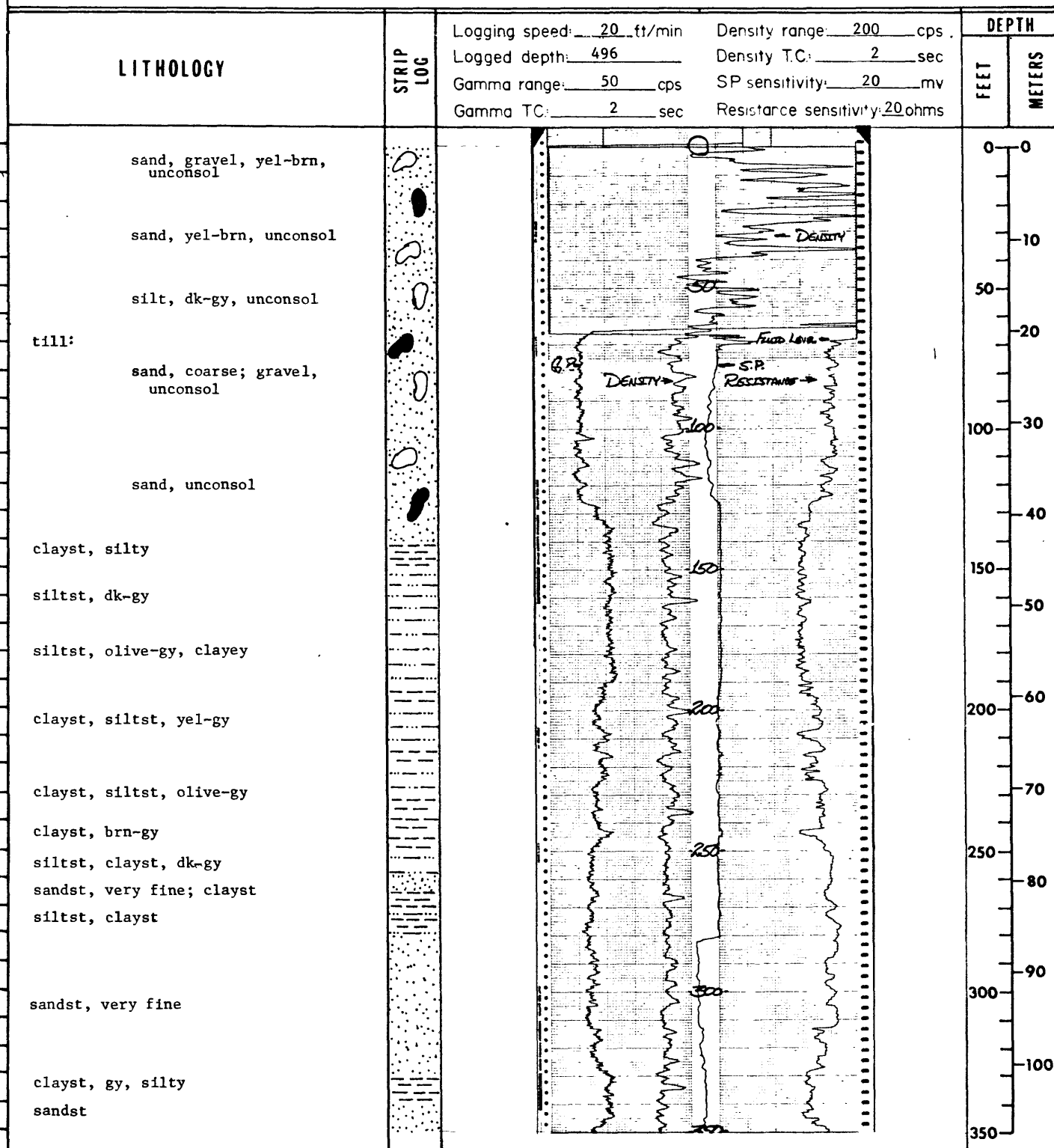
LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min		Density range: <u>200</u> cps		DEPTH	
		Logged depth: <u>360</u>		Density T.C.: <u>2</u> sec		FEET	METERS
lignite, 342.5-355; gy siltst		Gamma range: <u>50</u> cps		SP sensitivity: <u>20</u> mv		350	
		Gamma TC: <u>2</u> sec		Resistance sensitivity: <u>20</u> ohms		110	
						120	
						130	
						140	
						150	
						160	
						170	
						180	
						190	
						200	
						210	
						220	
						230	
						240	
						250	
						260	
						270	
						280	
						290	
						300	
						310	
						320	
						330	
						340	
						350	
						360	
						370	
						380	
						390	
						400	
						410	
						420	
						430	
						440	
						450	
						460	
						470	
						480	
						490	
						500	
						510	
						520	
						530	
						540	
						550	
						560	
						570	
						580	
						590	
						600	
						610	
						620	
						630	
						640	
						650	
						660	
						670	
						680	
						690	
						700	
						710	
						720	
						730	
						740	
						750	

UNITED STATES GEOLOGICAL SURVEY

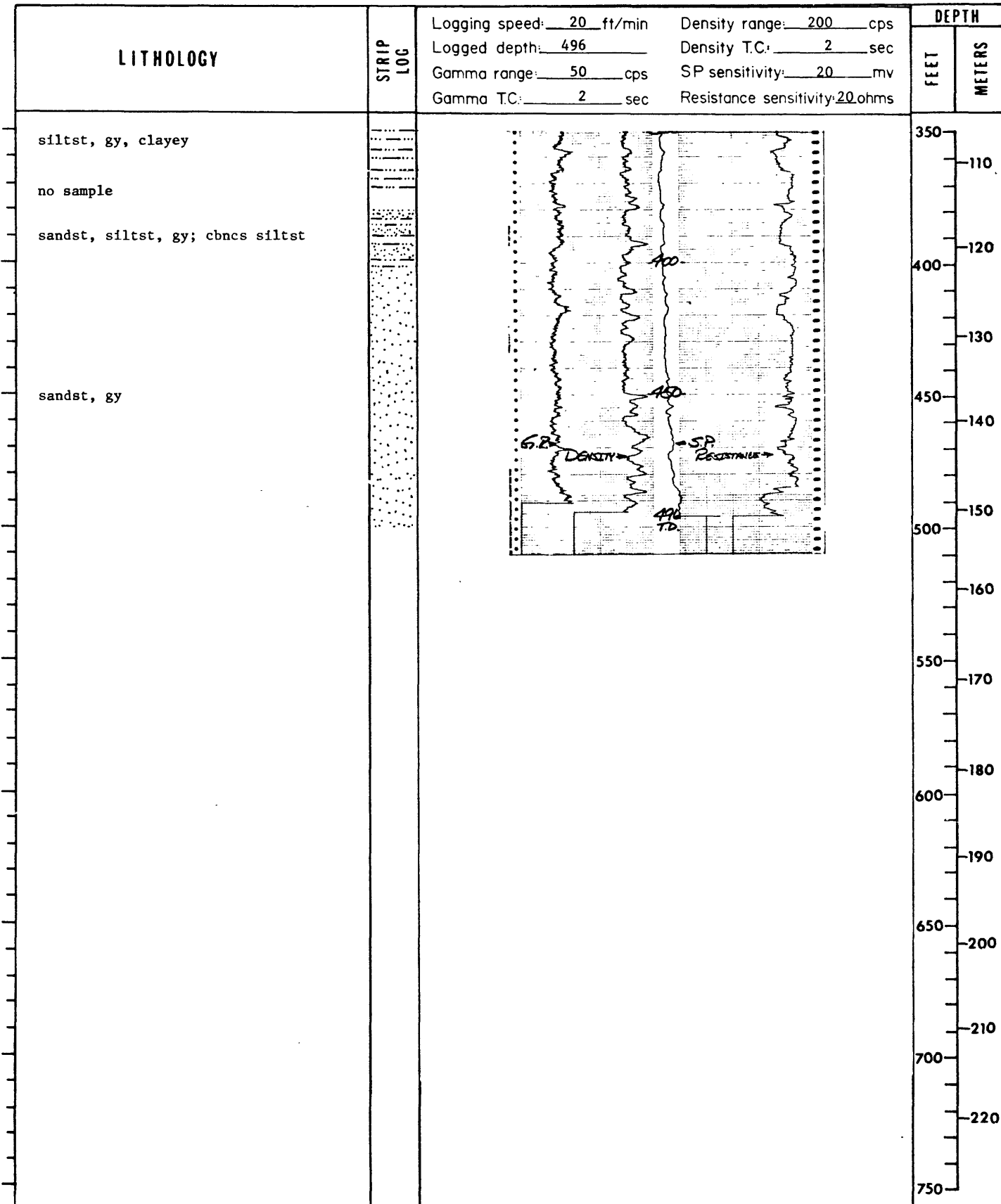
HOLE NO W 70
SHEET 1 OF 2

AREA Williams County		QUAD NAME Appam	
DATE STARTED 6/21/79	DATE COMP. 6/21/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 12 T.159 N., R.100 W., FOOTAGE LOC.		500 500 FSL 8 500 FWL	GROUND ELEV 2195 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 500 CORING ----	TOTAL DEPTH 500 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 69 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



REMARKS:

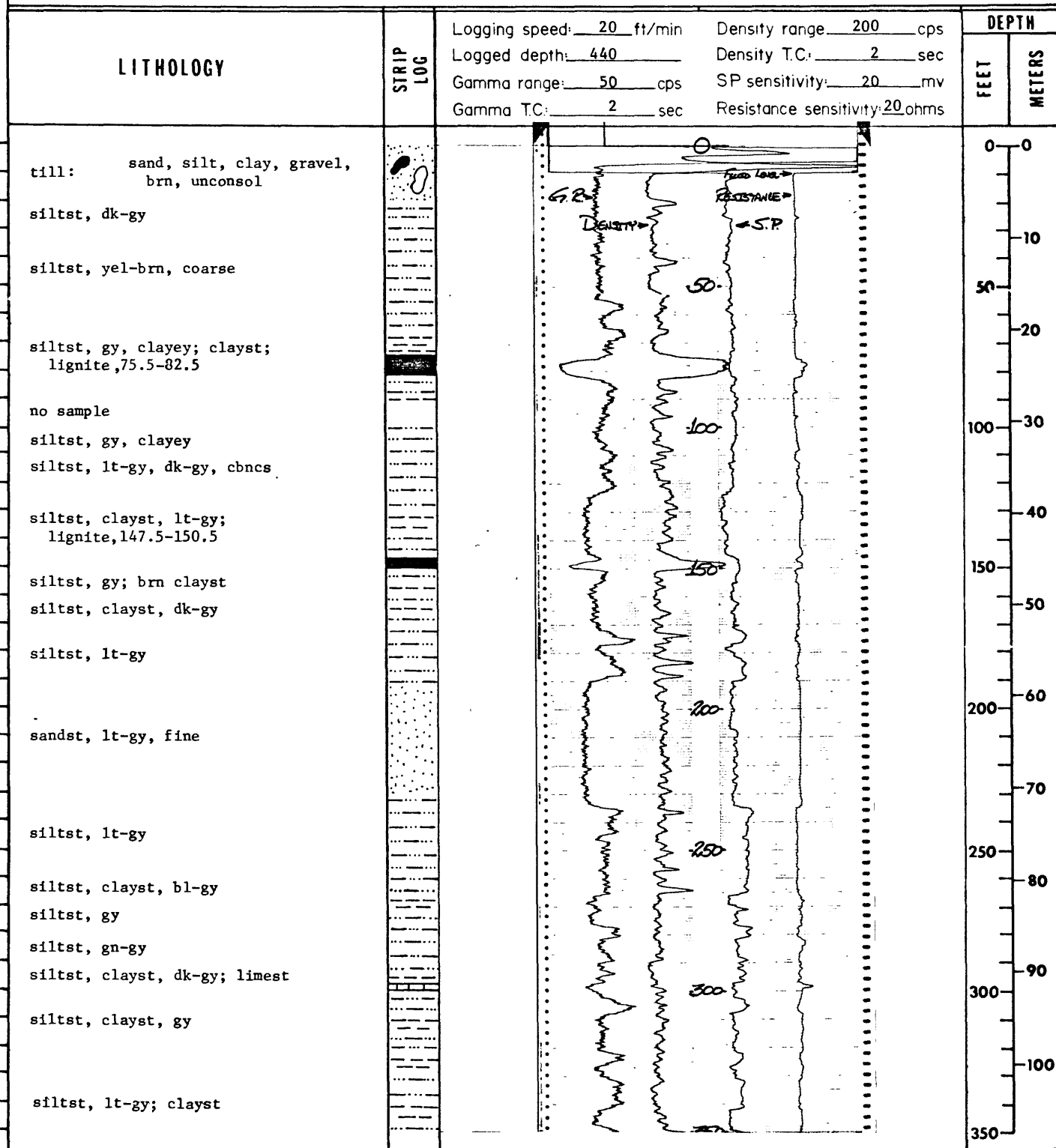


UNITED STATES GEOLOGICAL SURVEY

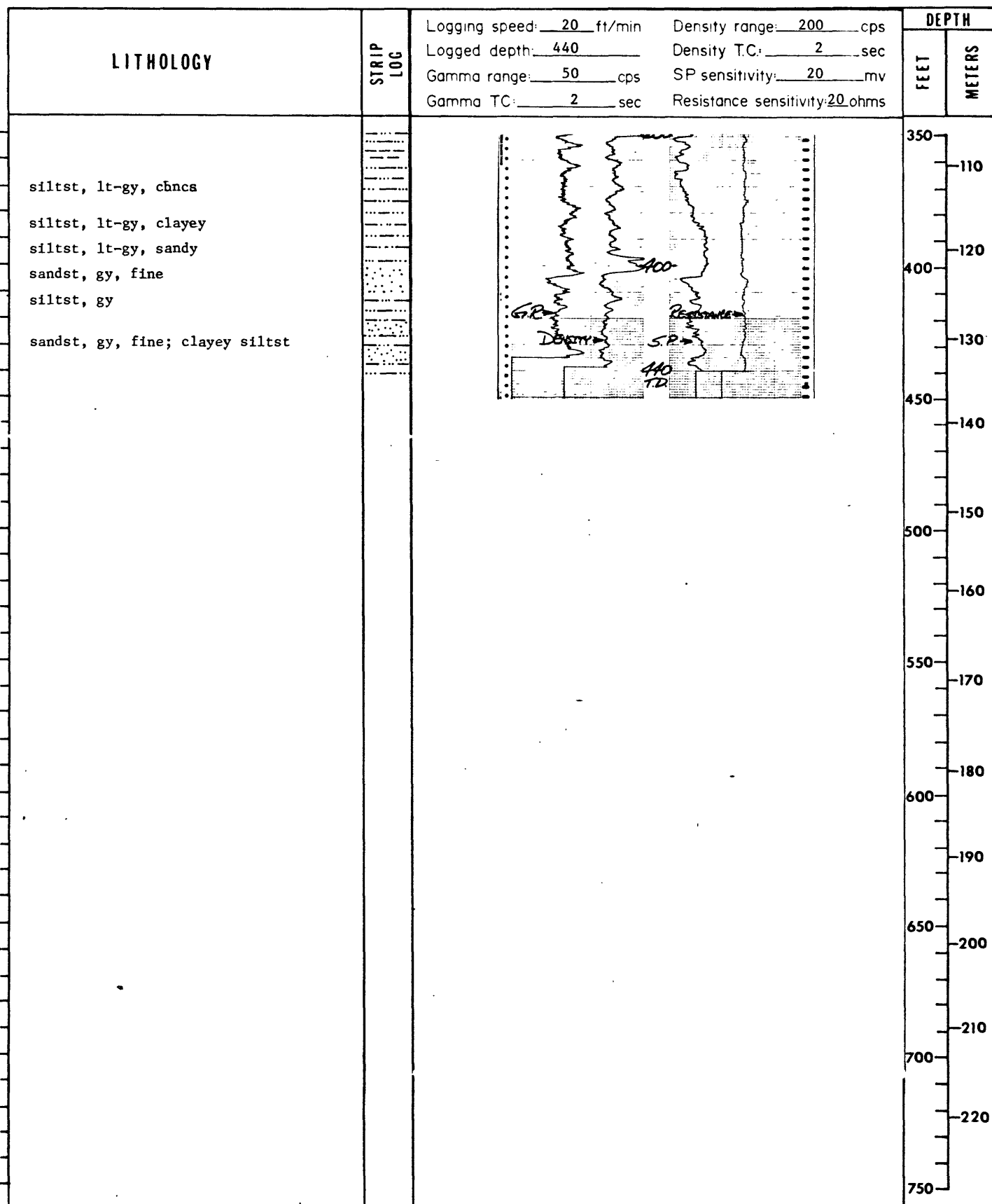
HOLE NO W 71
SHEET 1 OF 2

AREA Williams County		QUAD NAME Hanks	
DATE STARTED 7/5/79	DATE COMP. 7/5/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 6 T.159 N., R. 101 W., FOOTAGE LOC.		105 XXM FSL 15 FEL XXM	GROUND ELEV 2232 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE ROTARY 440 CORING ----	TOTAL DEPTH 440 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	DEPTH TO WATER 10 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	

REMARKS:



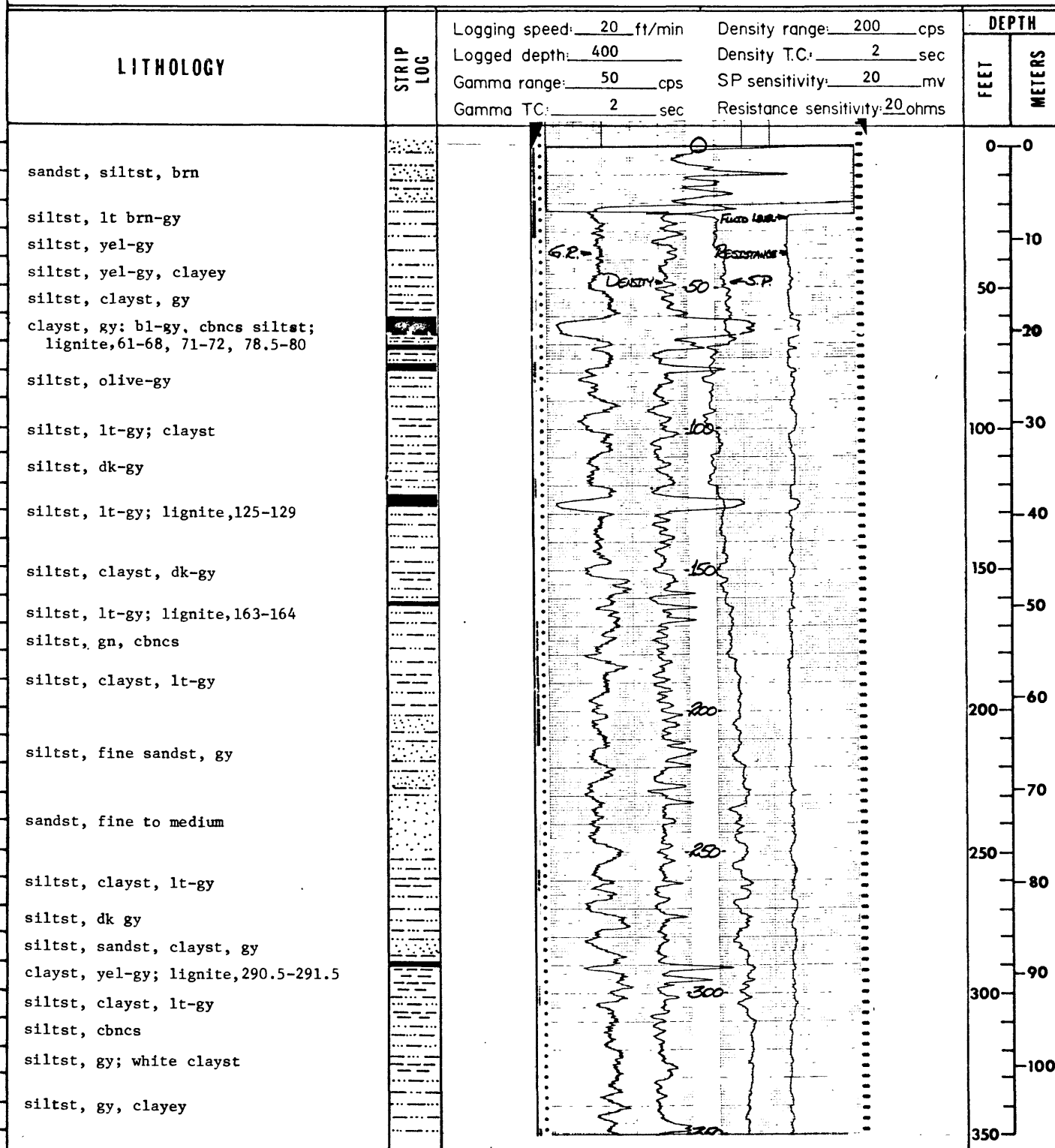
REMARKS:



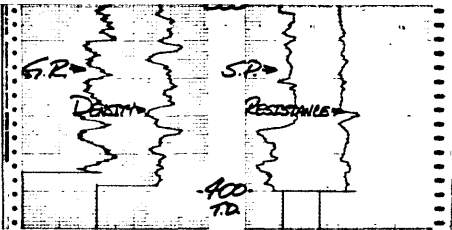
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 72
SHEET 1 OF 2

AREA Williams County		QUAD NAME Zahl	
DATE STARTED 7/5/79	DATE COMP: 7/5/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 9 T.159 N., R. 101 W., FOOTAGE LOC.		42	43
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 400	CORING ----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



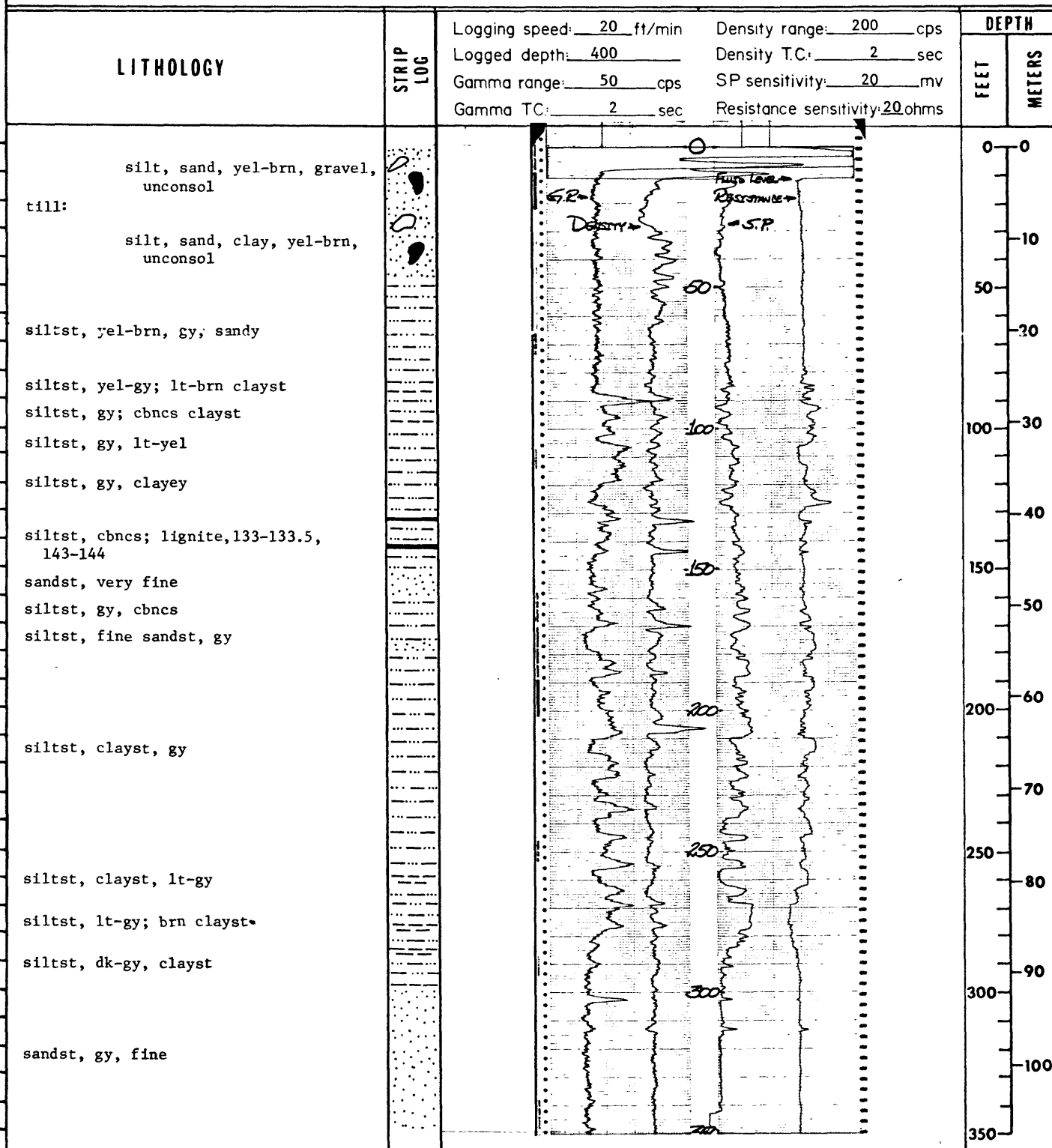
REMARKS:

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min		Density range: 200 cps		DEPTH	
		Logged depth: 400	Density T.C.: 2 sec	Gamma range: 50 cps	SP sensitivity: 20 mv	FEET	METERS
siltst, gy, sandy, cbnca siltst, dk-gy, gn, clayey siltst, white clayst siltst, lt-gy, sandy siltst, gy, clayey						350 110 120 130 140 150 160 170 180 190 200 210 220 750	


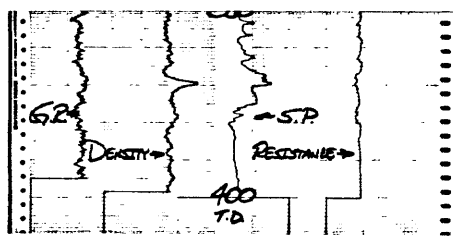
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 73
SHEET 1 OF 2

AREA Williams County		QUAD NAME Grenora	
DATE STARTED 7/6/79	DATE COMP. 7/6/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 5 T.159 N., R. 102 W., FOOTAGE LOC.		33 <small>XMM FSL</small>	1330 <small>FEL XMM</small>
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 400	CORING ---
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	
LITHOLOGY RECORDED BY Spencer, Tomac		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



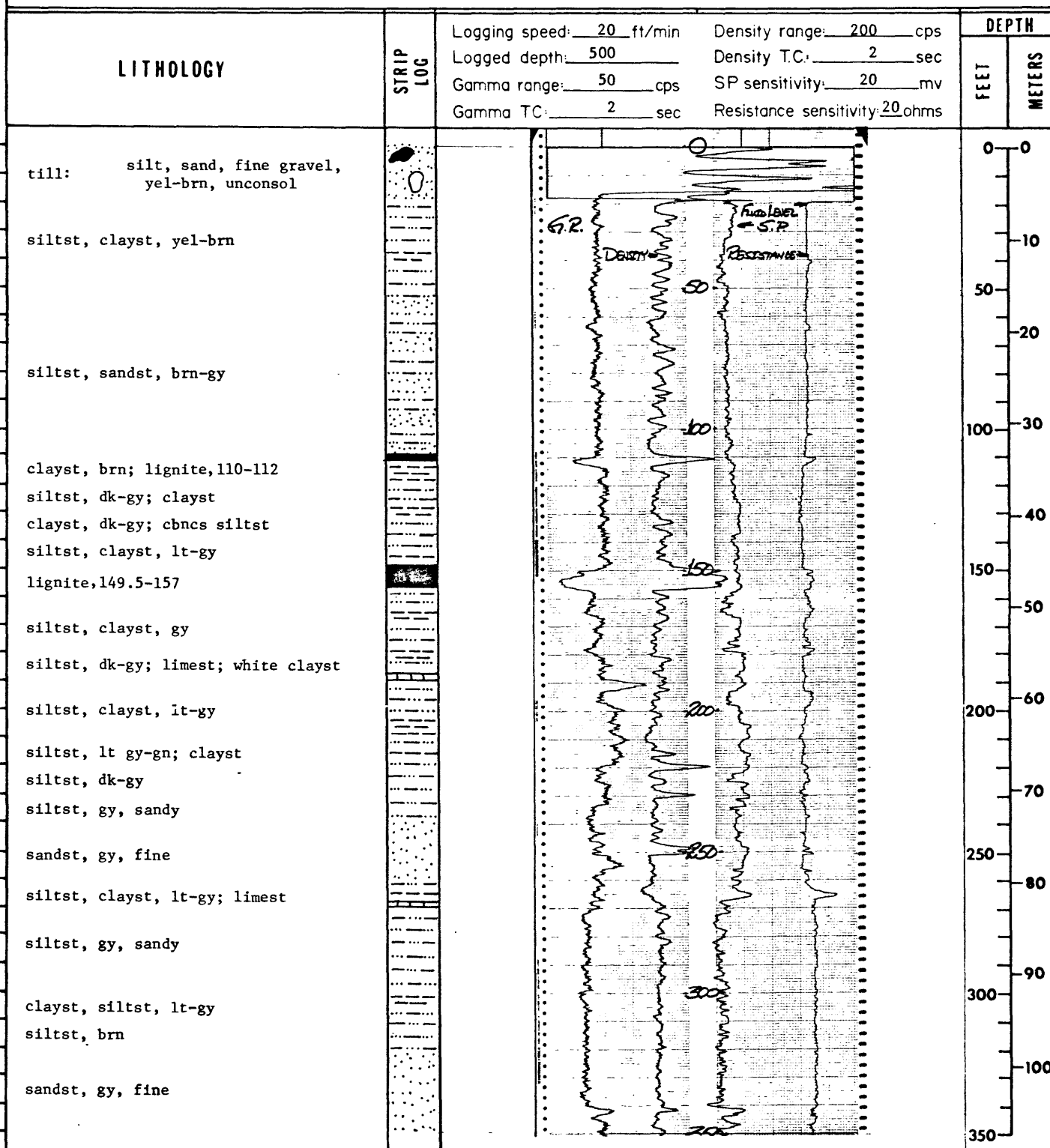
REMARKS: —

LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min Density range: <u>200</u> cps Logged depth: <u>400</u> Density T.C.: <u>2</u> sec Gamma range: <u>50</u> cps SP sensitivity: <u>20</u> mv Gamma T.C.: <u>2</u> sec Resistance sensitivity: <u>20</u> ohms		DEPTH	
		FEET	METERS		
sandst, gy, fine				350	110
				400	120
				450	130
				500	140
				550	150
				600	160
				650	170
				700	180
				750	190
				800	200
				850	210
				900	220
				950	230
				1000	240

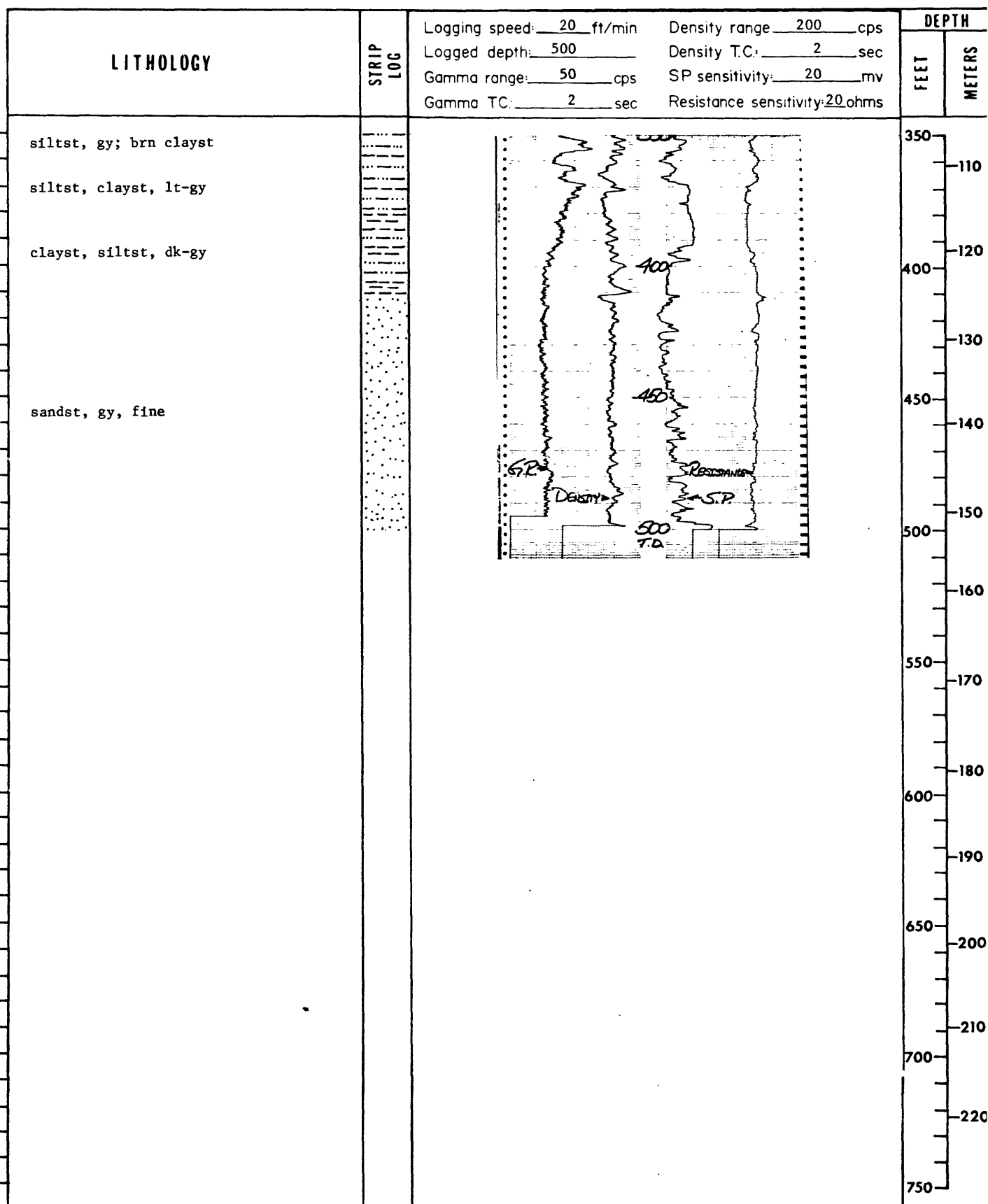
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 74
SHEET 1 OF 2

AREA Williams County		QUAD NAME Hanks	
DATE STARTED 7/7/79	DATE COMP. 7/7/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 21 T. 159 N, R. 102 W, FOOTAGE LOC.		2610 FNL XBSL 41 FEL XSWL	GROUND ELEV 2300 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 500	CORING ----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



REMARKS:



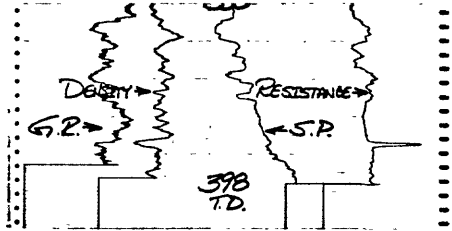
UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 75
SHEET 1 OF 2

AREA Williams County		QUAD NAME Grenora	
DATE STARTED 7/6/79	DATE COMP. 7/6/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 10 T. 159 N, R. 103 W., FOOTAGE LOC. 255		FNL 3 XREF FWL	GROUND ELEV 2057 ft
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE 400	TOTAL DEPTH 400 ft
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: -----	DEPTH TO WATER 5 ft
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			

LITHOLOGY	STRIP LOG	Logging speed: 20 ft/min Logged depth: 398 Gamma range: 50 cps Gamma T.C.: 2 sec Density range: 200 cps Density T.C.: 2 sec SP sensitivity: 20 mv Resistance sensitivity: 20 ohms	DEPTH	
			FEET	METERS
sand, very coarse; gravel, unconsol silt, yel, brn, unconsol silt, clay, brn, unconsol silt, dk olive-gy, sandy, unconsol silt, clay, dk-gy, unconsol silt, sand, dk-gy, unconsol gravel, medium silt, dk-gy, sandy, unconsol till: clay, dk-gy, silty, unconsol gravel, fine silt, gy, cbnccs, unconsol silt, gy; fine gravel, unconsol silt, dk-gy, sandy, unconsol silt, dk-gy, unconsol sand, dk-gy, coarse, unconsol gravel, medium to coarse			0	0
			10	
			20	
			30	
			40	
			50	
			60	
			70	
			80	
			90	
100				
350				

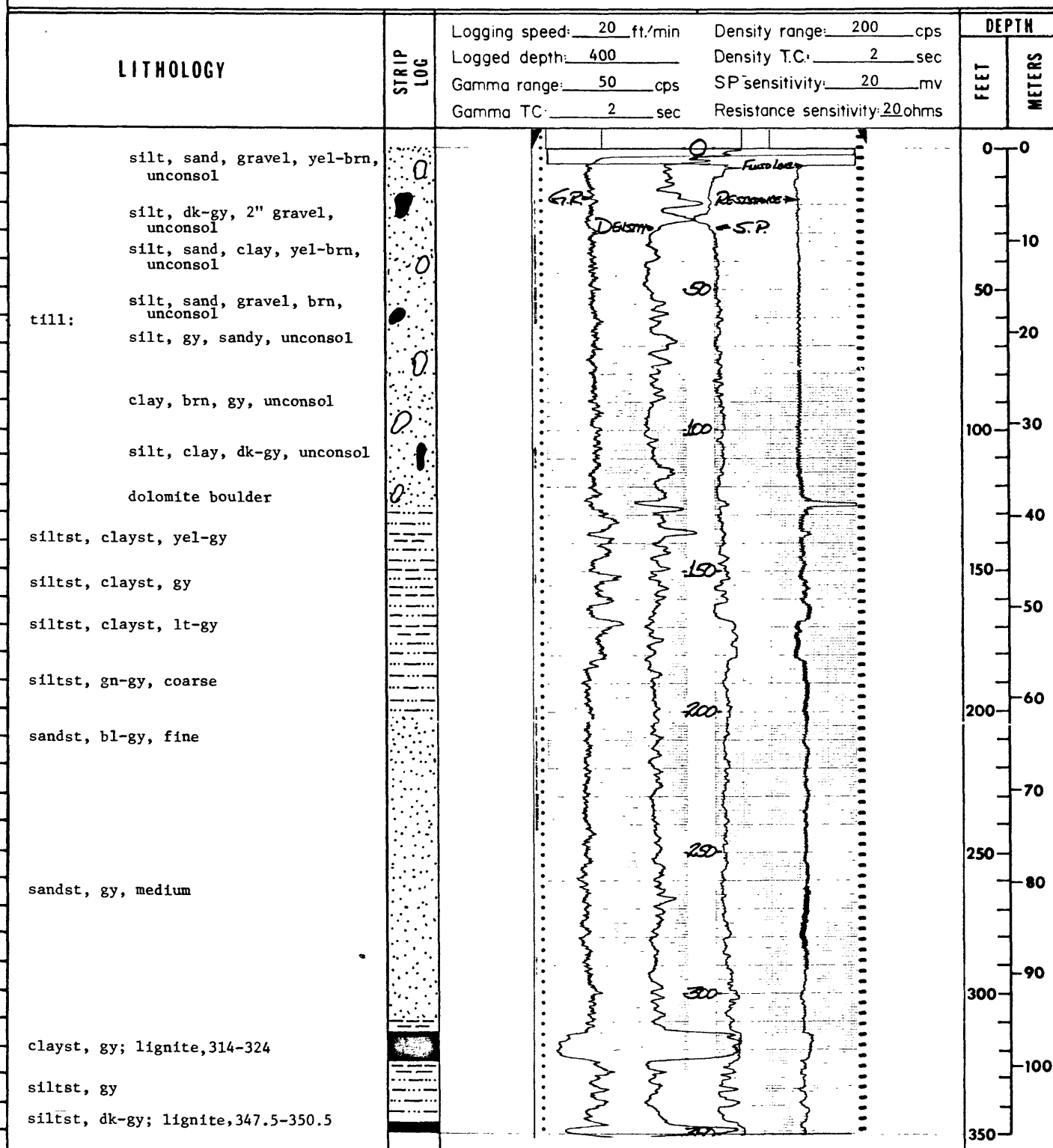
REMARKS:

LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min Logged depth: <u>398</u> Gamma range: <u>50</u> cps Gamma T.C.: <u>2</u> sec	Density range: <u>200</u> cps Density T.C.: <u>2</u> sec SP sensitivity: <u>20</u> mv Resistance sensitivity: <u>20</u> ohms	DEPTH	
				FEET	METERS
siltst, clayst, lt-gy clayst, dk-gy; cbncs siltst no sample siltst, clayst, gy; limest				350	110
				400	120
				450	130
				500	140
				550	150
				600	160
				650	170
				700	180
				750	190
					200
					210
					220

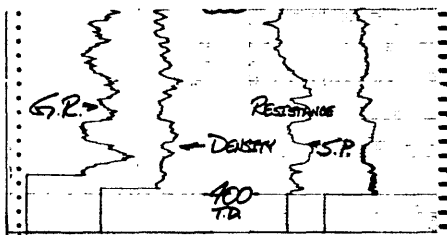
UNITED STATES GEOLOGICAL SURVEY

HOLE NO. W-76
SHEET 1 OF 2

AREA Williams County		QUAD NAME Grenora	
DATE STARTED 7/6/79	DATE COMP. 7/7/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 24 T. 159 N., R. 103 W., FOOTAGE LOC.		35 FWL FSL	55 FWL FSL
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 400	CORING ----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS: Power line overhead affected resistance.			



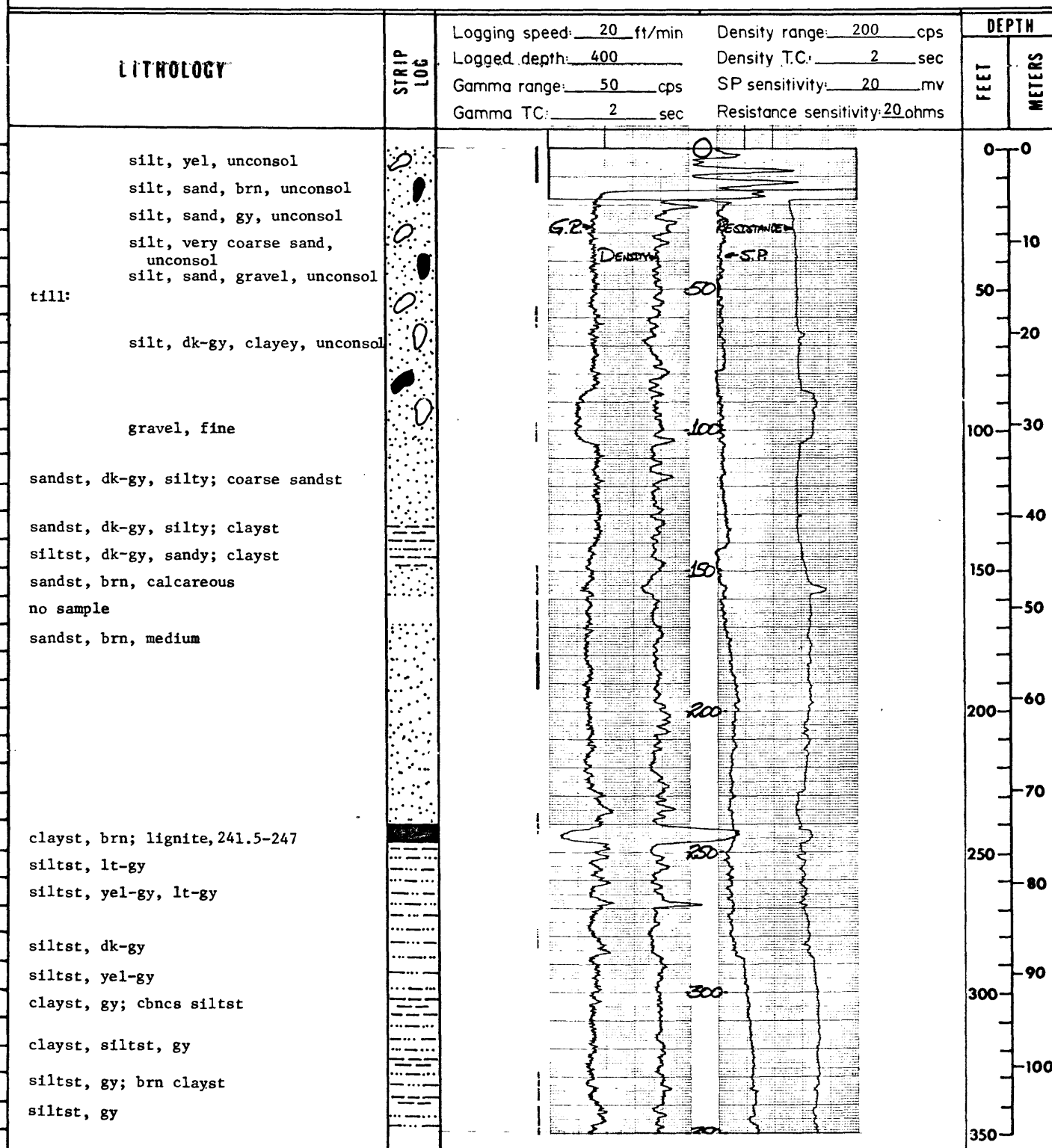
REMARKS:

LITHOLOGY	STRIP LOG	Logging speed: <u>20</u> ft/min Logged depth: <u>400</u> Gamma range: <u>50</u> cps Gamma T.C.: <u>2</u> sec	Density range: <u>200</u> cps Density T.C.: <u>2</u> sec SP sensitivity: <u>20</u> mv Resistance sensitivity: <u>20</u> ohms	DEPTH	
				FEET	METERS
siltst, gy siltst, dk-gy				350 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750	

UNITED STATES GEOLOGICAL SURVEY

HOLE NO W 77
SHEET 1 OF 2

AREA Williams County		QUAD NAME Brush Lake	
DATE STARTED 7/8/79	DATE COMP. 7/8/79	COUNTY Williams	STATE North Dakota
LOCATION: SEC. 33 T. 159 N., R. 103 W., FOOTAGE LOC.		155	11
		XXM FSL	XXM FWL
SIZE AND BIT TYPE: 5-inch drag		FOOTAGE	
		ROTARY 400	CORING ----
DRILLING AGENCY: Crandall Drilling		DRILL TYPE: ----	
LITHOLOGY RECORDED BY Spencer		GEOPHYSICAL LOGS RECORDED BY Nelson	
REMARKS:			



REMARKS:

LITHOLOGY	STRIP LOG	DEPTH	
		FEET	METERS
		</	