

COLORADO GEOLOGICAL SURVEY

GEOPHYSICAL AND LITHOLOGICAL LOGS
FROM THE 1980 COAL DRILLING AND
CORING PROGRAM, DENVER EAST $\frac{1}{2}^{\circ} \times 1^{\circ}$ QUADRANGLE

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INTRODUCTION

The Colorado Geological Survey, under United States Geological Survey grant #14-08-0001-G-577, continued its exploratory coal drilling program in the Denver East $\frac{1}{2}^0 \times 1^0$ Quadrangle. The program was designed to evaluate the coal resources of the quadrangle especially near the Denver Metropolitan Area. As in the case of the first phase of the drilling program, the drilling was performed by Teton Exploration Drilling Co., Inc. of Casper, Wyoming, and the geophysical logging was performed by Frontier Logging Corp. of Broomfield, Colorado.

The second phase of the drilling program was needed to fill gaps left from the first phase of the drilling program. As in the first phase, holes were drilled in the Antelope Flats-Deer Trail Area which contains the Laramie Formation coals, and the Watkins-Lowry Area which contains the Denver Formation lignites.

Ten holes were drilled and geophysically logged with a coal suite (single point resistance, focused density, caliper, and natural gamma) logging tool. Hole CGS-30c was twinned and cored between 346'-367', 422'-442', and 595'-627'. The coal samples were sent to Commercial Testing and Engineering Co. for analysis.

Lithologies were compiled using cores, drill cuttings, and geophysical logs. Similarity of rock types permits the omission of full descriptions. Many lithologies have been combined in the descriptions to accomodate the reduced scale of logs presented in this report. Drill logs from phase one of the program may be found in CGS Open File 80-1.

Unless otherwise noted all measurements are given in feet; to convert feet to meters multiply feet by 0.3048.

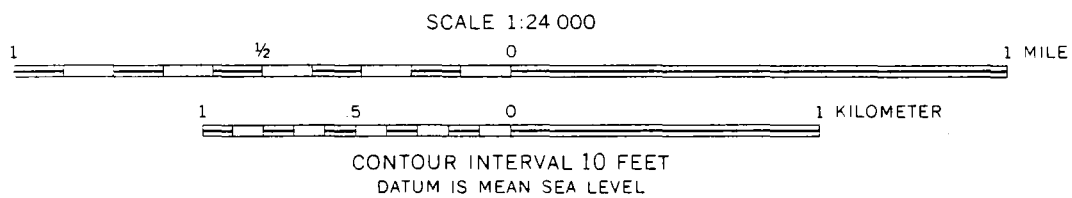
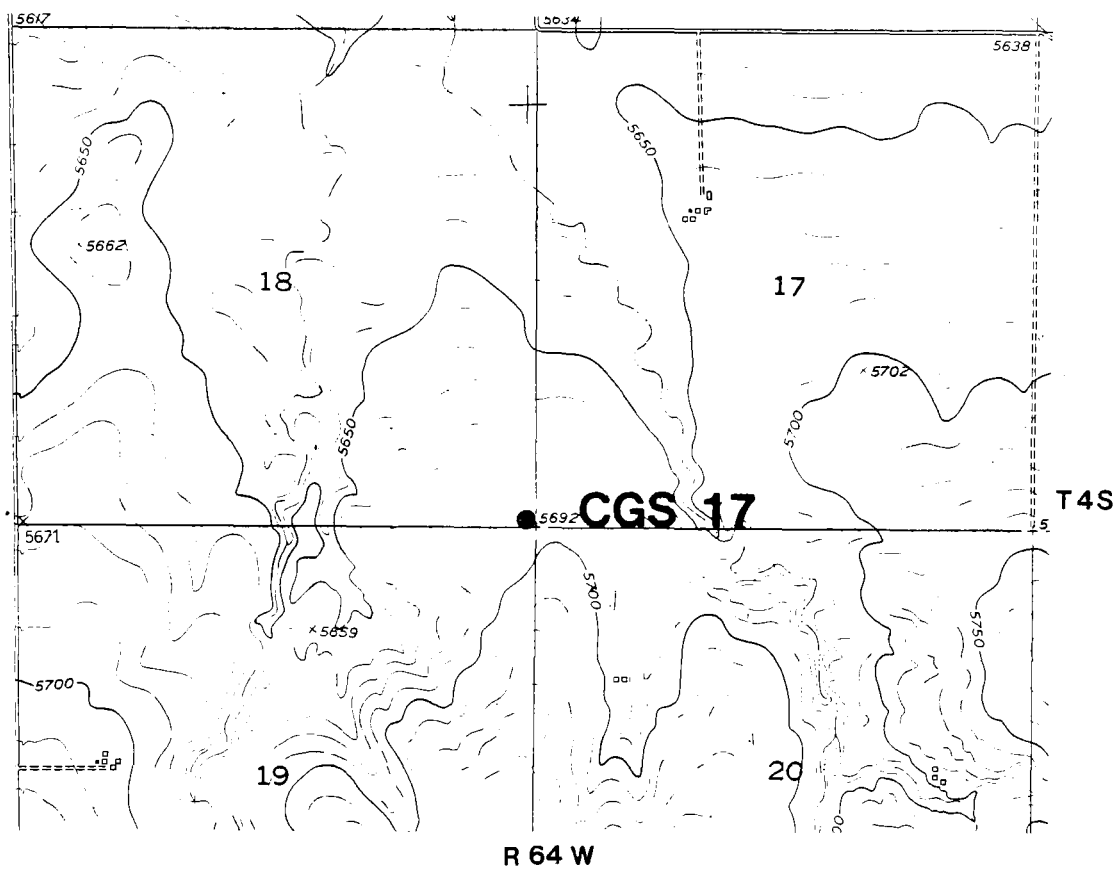


Figure 1.--Location of drill holes in the Watkins quadrangle

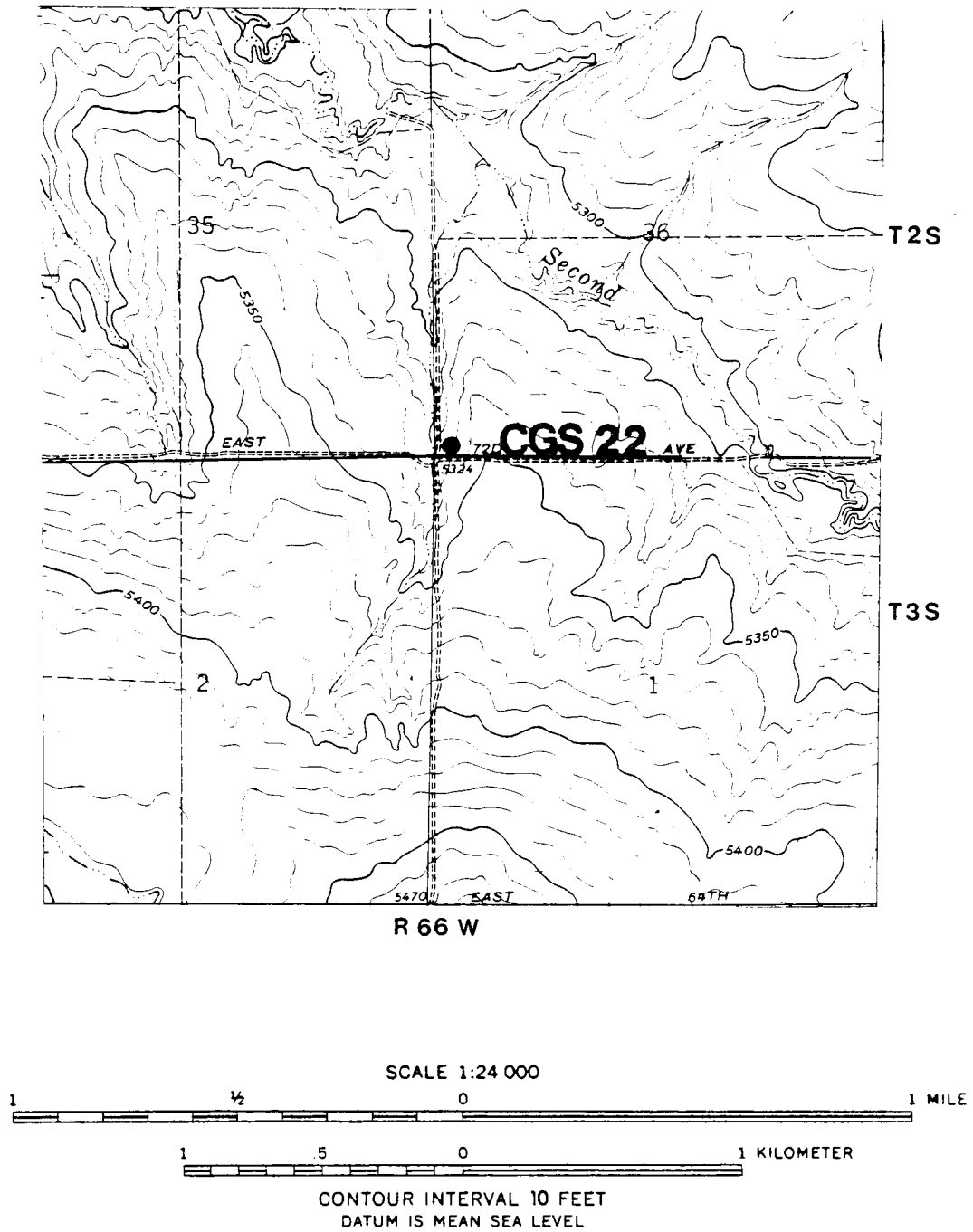


Figure 2.--Location of drill holes in the Box Elder School quadrangle

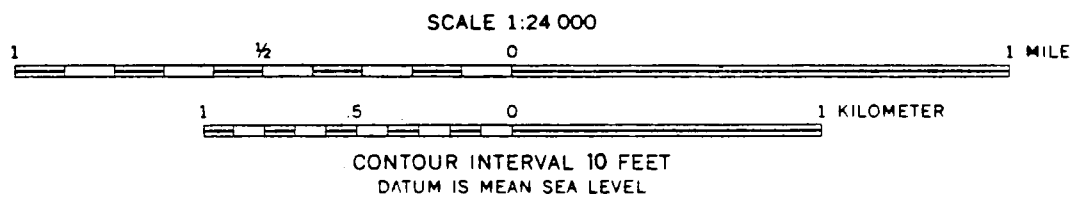
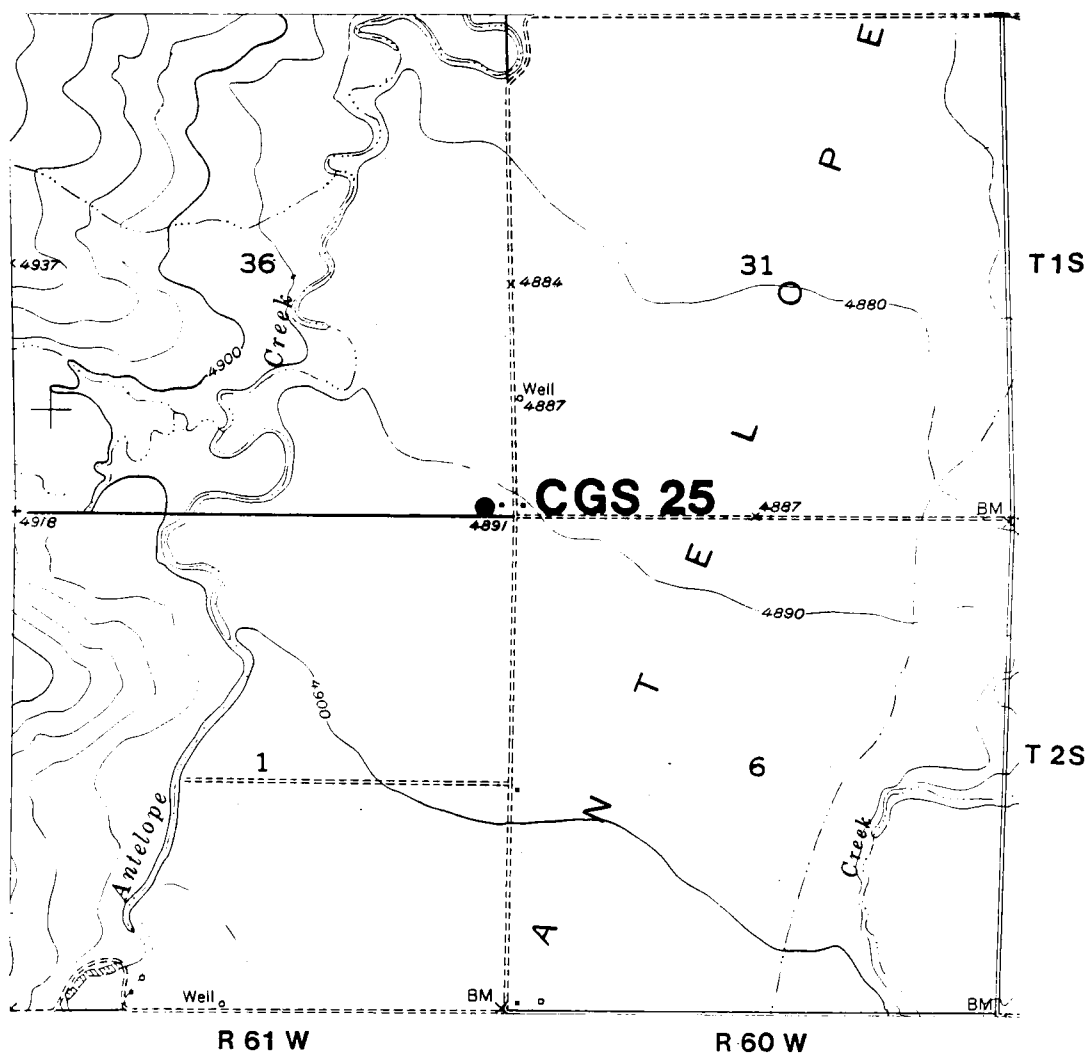


Figure 3.--Location of drill holes in the Leader NW quadrangle

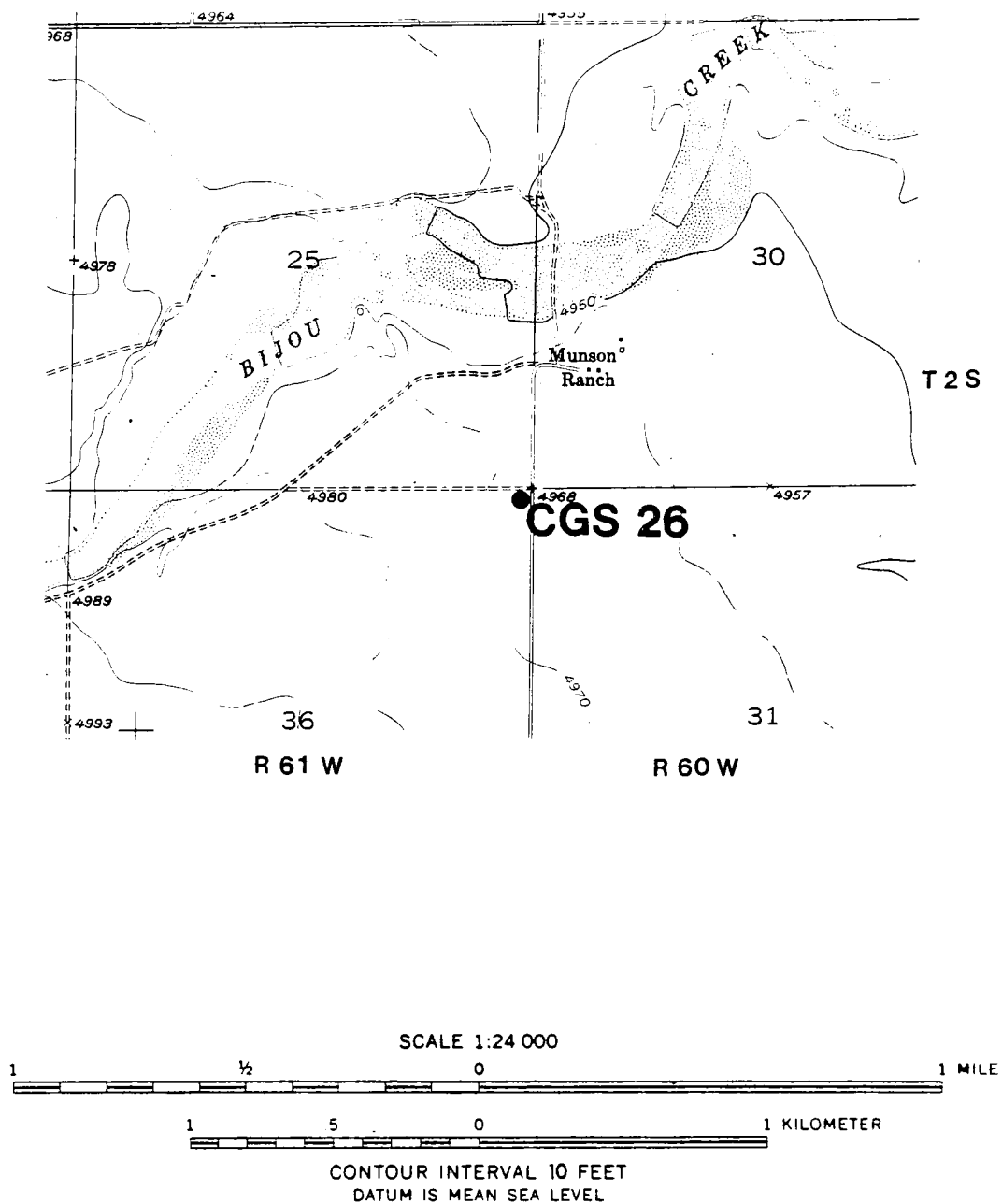


Figure 4.--Location of drill holes in the Leader SW quadrangle

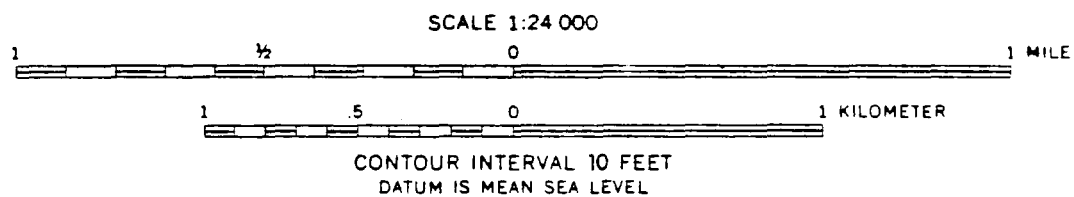
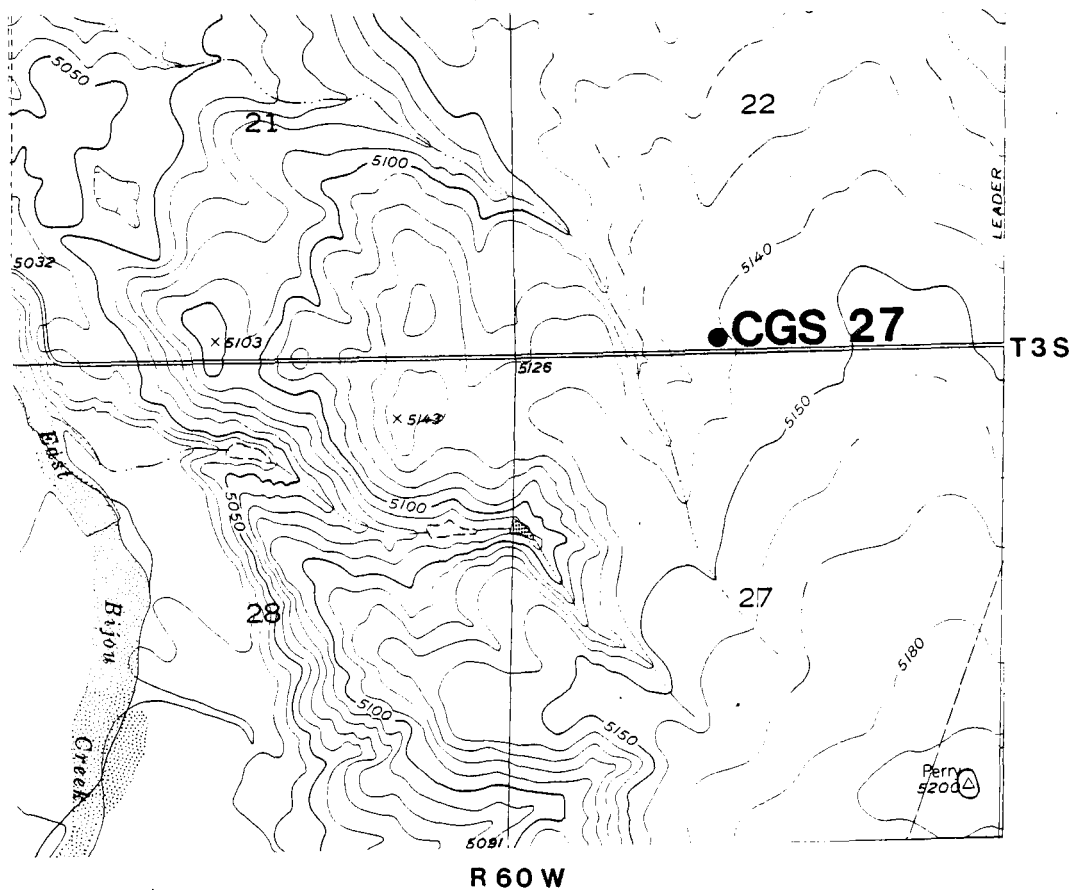


Figure 5.--Location of drill holes in the Leader SE quadrangle

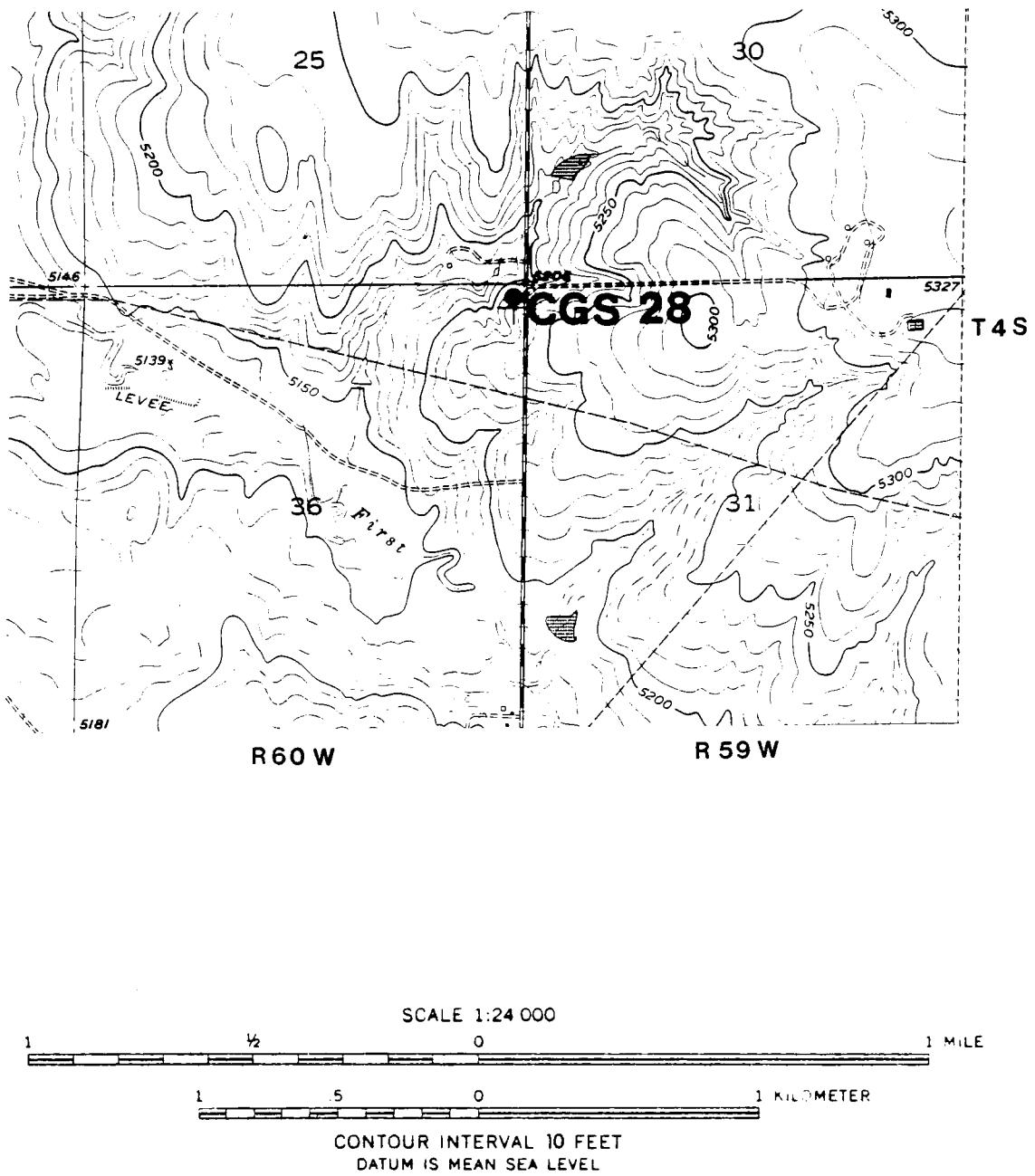


Figure 6.--Location of drill holes in the Peoria quadrangle

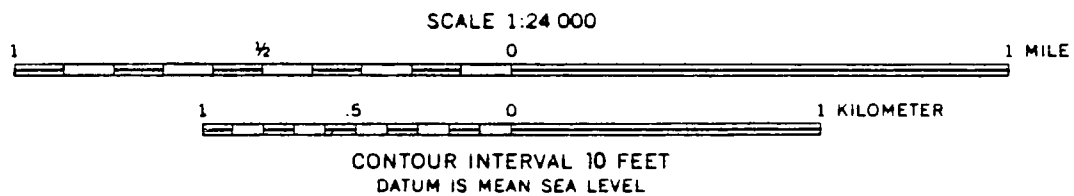
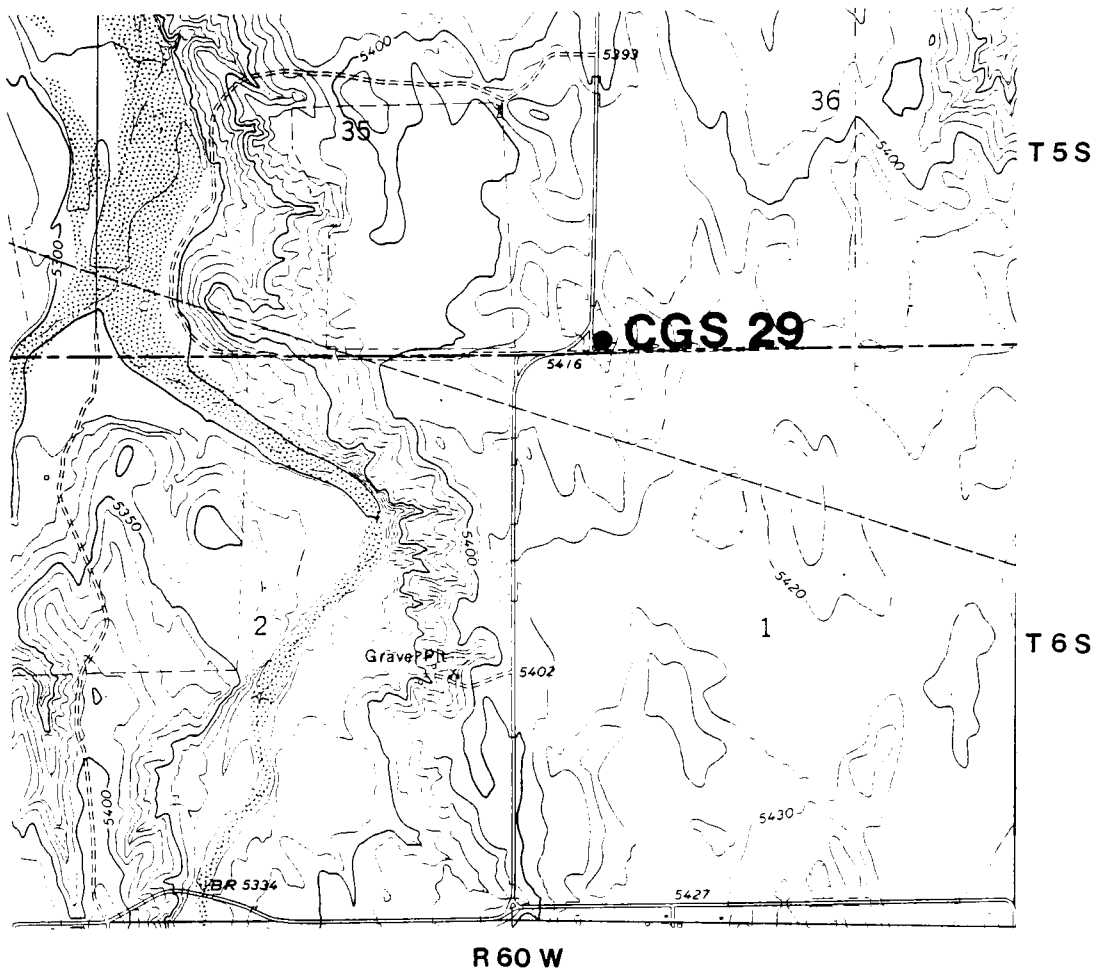
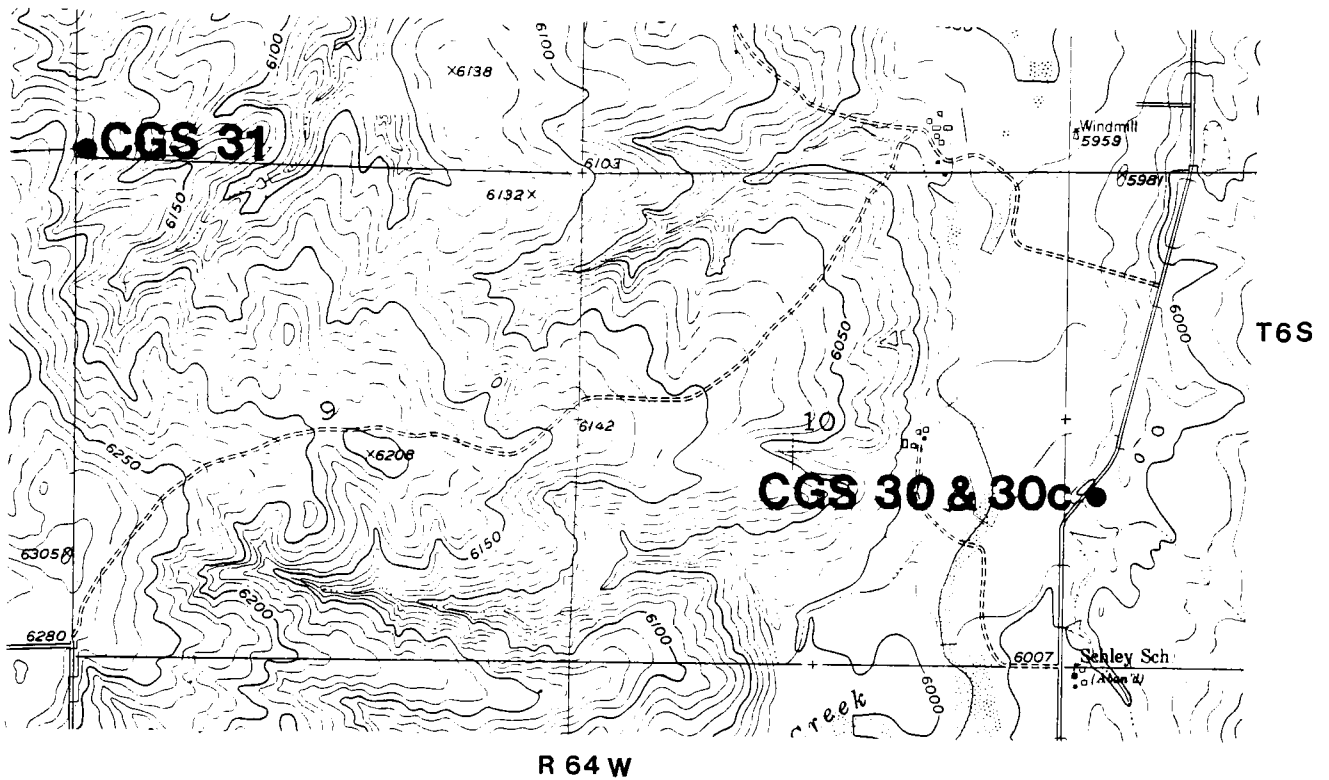


Figure 7.--Location of drill holes in the Deer Trail quadrangle



39° 32' 25"
104° 31' 49"

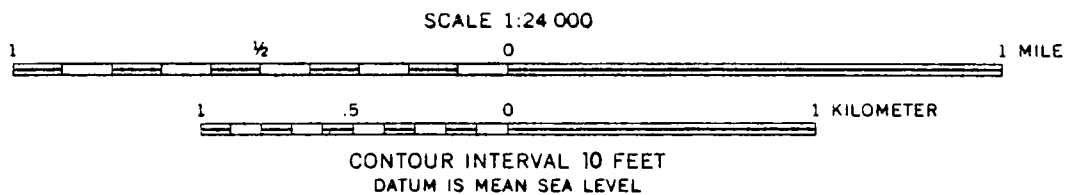


Figure 8.--Location of drill holes in the Watkins SE quadrangle

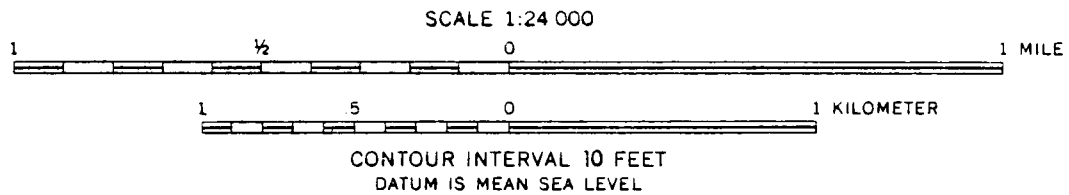
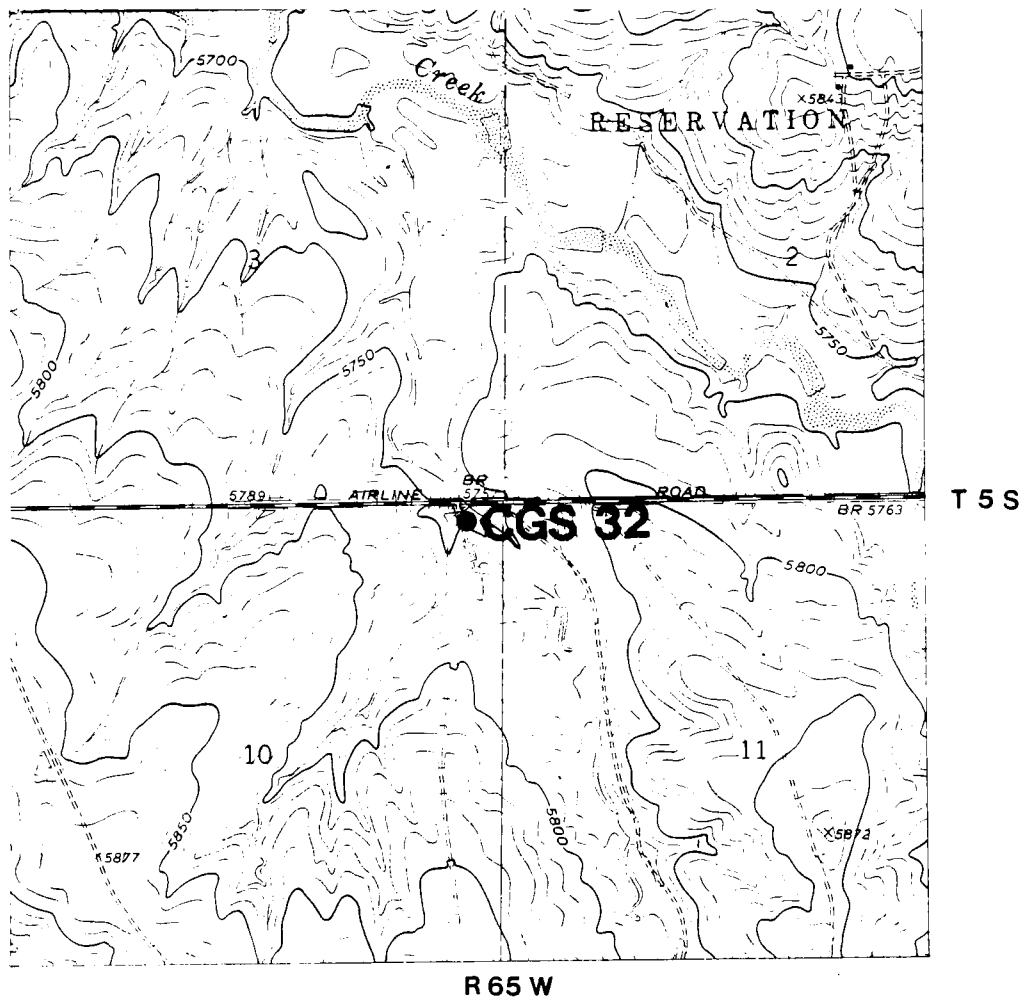


Figure 9.--Location of drill holes in the Coal Creek quadrangle

COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-17 State Colorado County Arapahoe Date logged 3/19/80 Elev.(ft) 5692

Location: T. 4 S., R. 64 W., secs. SESE18 Cored: Yes No X

Drilled depth 320 Logged depth 320 Drilling Medium Mud Fluid level G.L.

Geophysical logs:

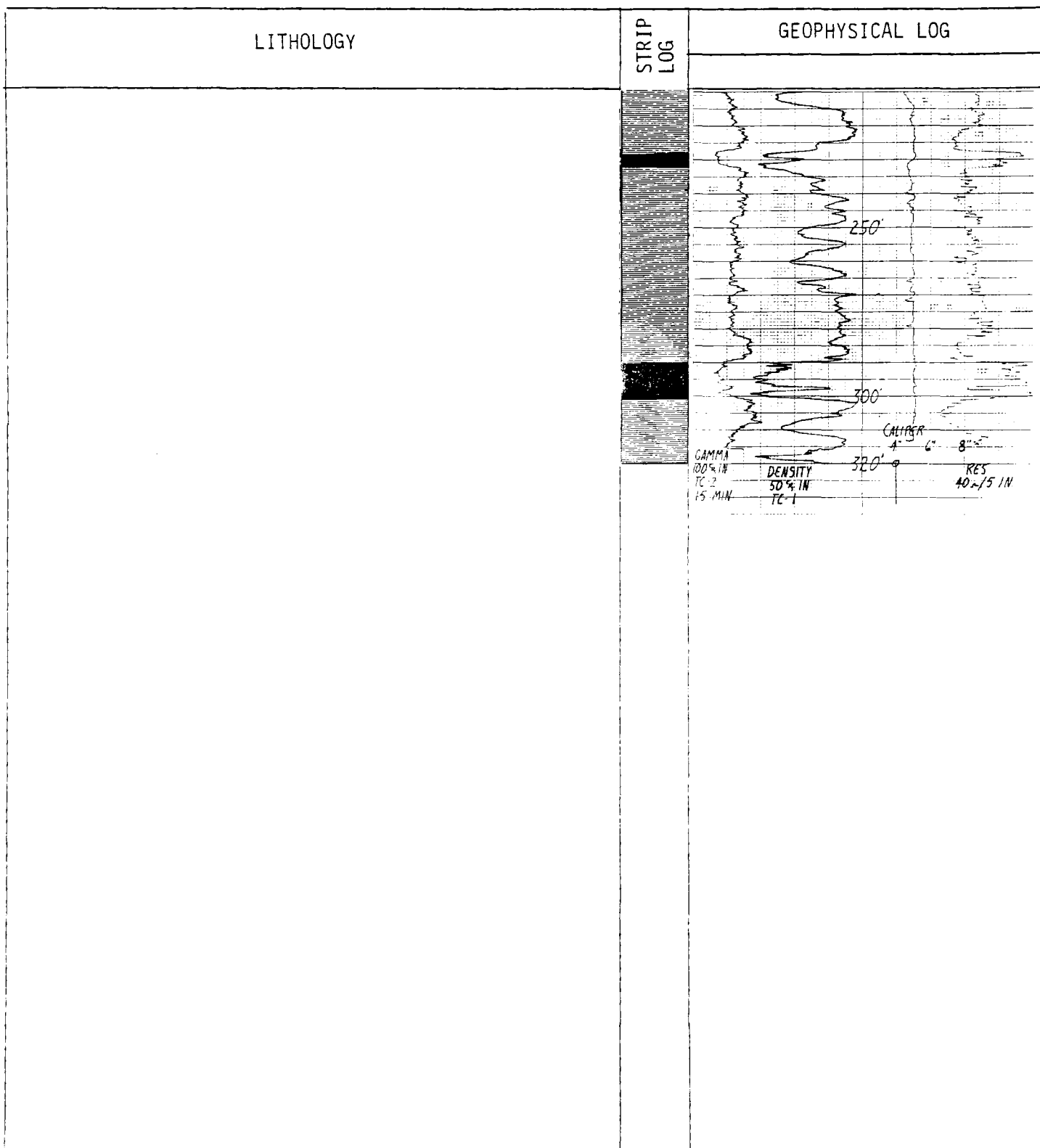
Gamma (G):	T.C. 2	Scale 10/cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 50 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 2 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/5in	Logging speed 15	fpm

Remarks: Watkins Quadrangle

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOG	
Quaternary				
0-5	Sandy silt; brown			
Denver Formation				
5-10	Claystone; gray light gray			
10-60	As above; brown; oxidized to 35; iron concretions at 15			
60-62	Carbonaceous claystone; dark brown			
60-90	Claystone with occasional thin very fine to fine argillaceous sandstone lenses; blue-gray			
90-92	Carbonaceous claystone			
92-102	Lignite with many clay splits; brown black			
102-105	Claystone; gray			
105-188	Very fine argillaceous sandstone; slightly calcareous			
160-161				
188-198	Lignite; brown black			
198-228	Claystone; occasionally silty gray			
228-232	Lignite; brown black			
232-290	Claystone with occasional thin sandstone lenses gray			
290-301	Lignite; brown black			
301-320	Claystone becoming sandy at 315; gray			

COLORADO GEOLOGICAL SURVEY

Hole No. CGS-17 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-22 State Colorado County Adams Date logged 3/19/80 Elev.(ft)5324

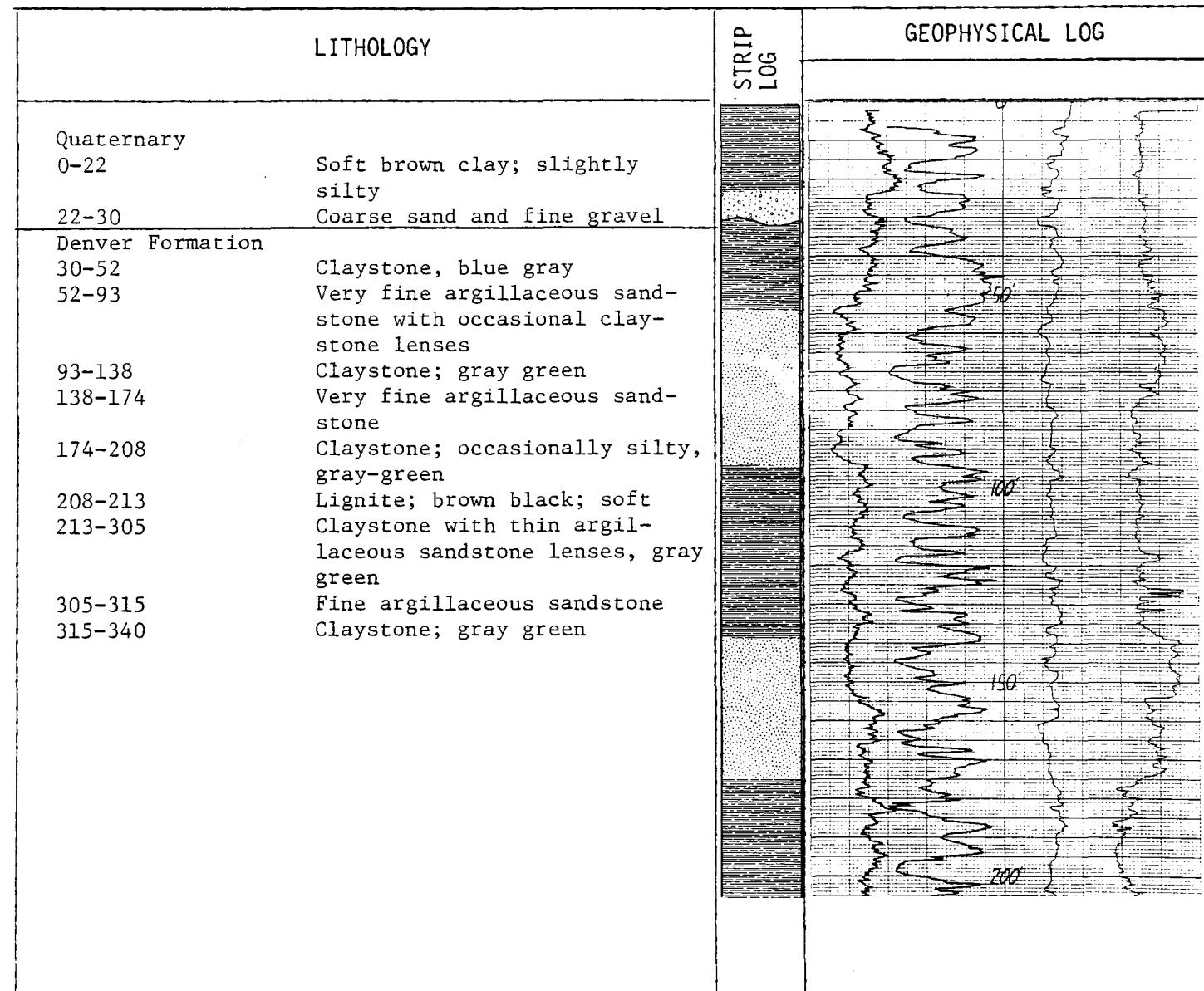
Location: T. 3 S., R.66 W., secs. SWSW 36 Cored: Yes No X

Drilled depth 380 Logged depth 340 Drilling Medium Mud Fluid level 2.5

Geophysical logs:

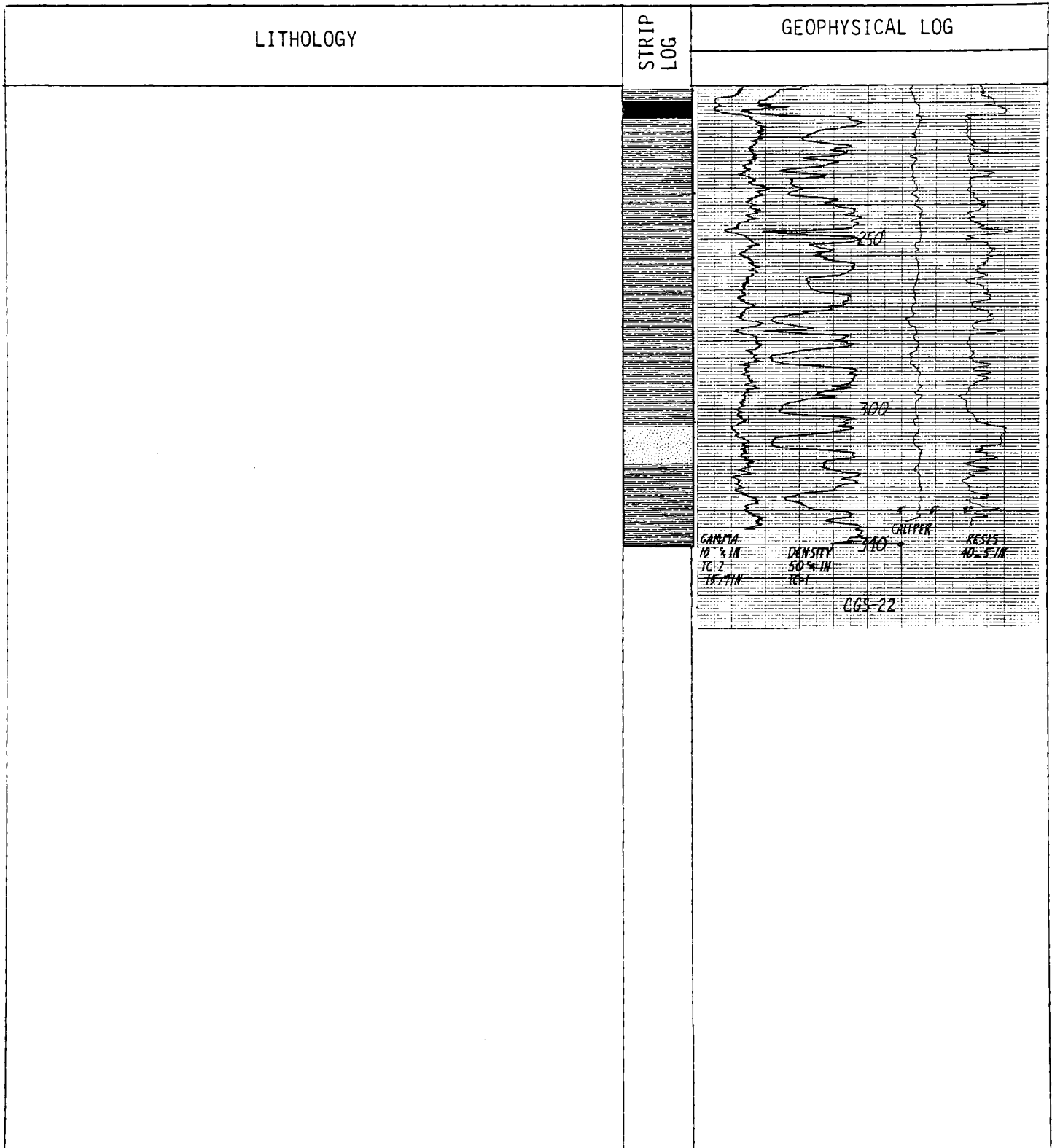
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 50 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 2 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/5in	Logging speed 15	fpm

Remarks: Box Elder School Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-22 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-25 State Colorado County Adams Date logged 3/26/80 Elev.(ft) 4893

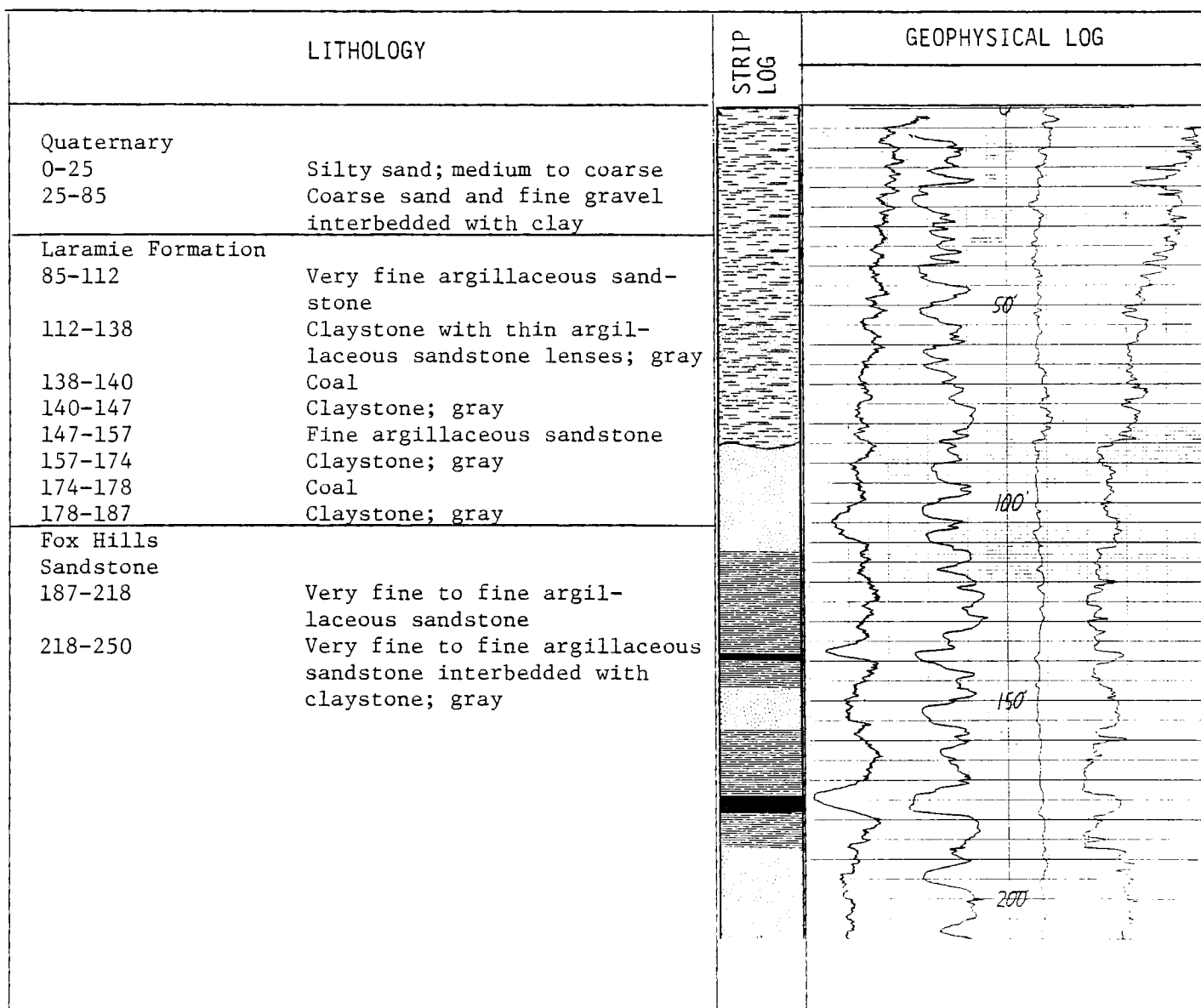
Location: T. 1 S., R. 61 W., secs. SESE 36 Cored: Yes No X

Drilled depth 250 Logged depth 250 Drilling Medium Mud Fluid level 5

Geophysical logs:

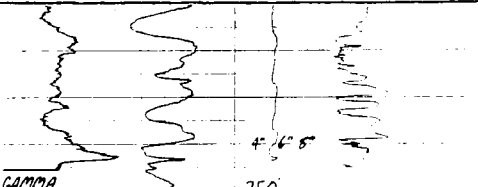
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/5in	Logging speed 15	fpm

Remarks: Leader NW Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-25 - Continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG			
					
		GAMMA 10% IN. TC-2 15/11/11	DENSITY 100% IN. TC-1	250' CALIPER RESISTANCE 40-5 IN.	
		CGS-25			

COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-26 State Colorado County Adams Date logged 3/26/80 Elev.(ft) 4968

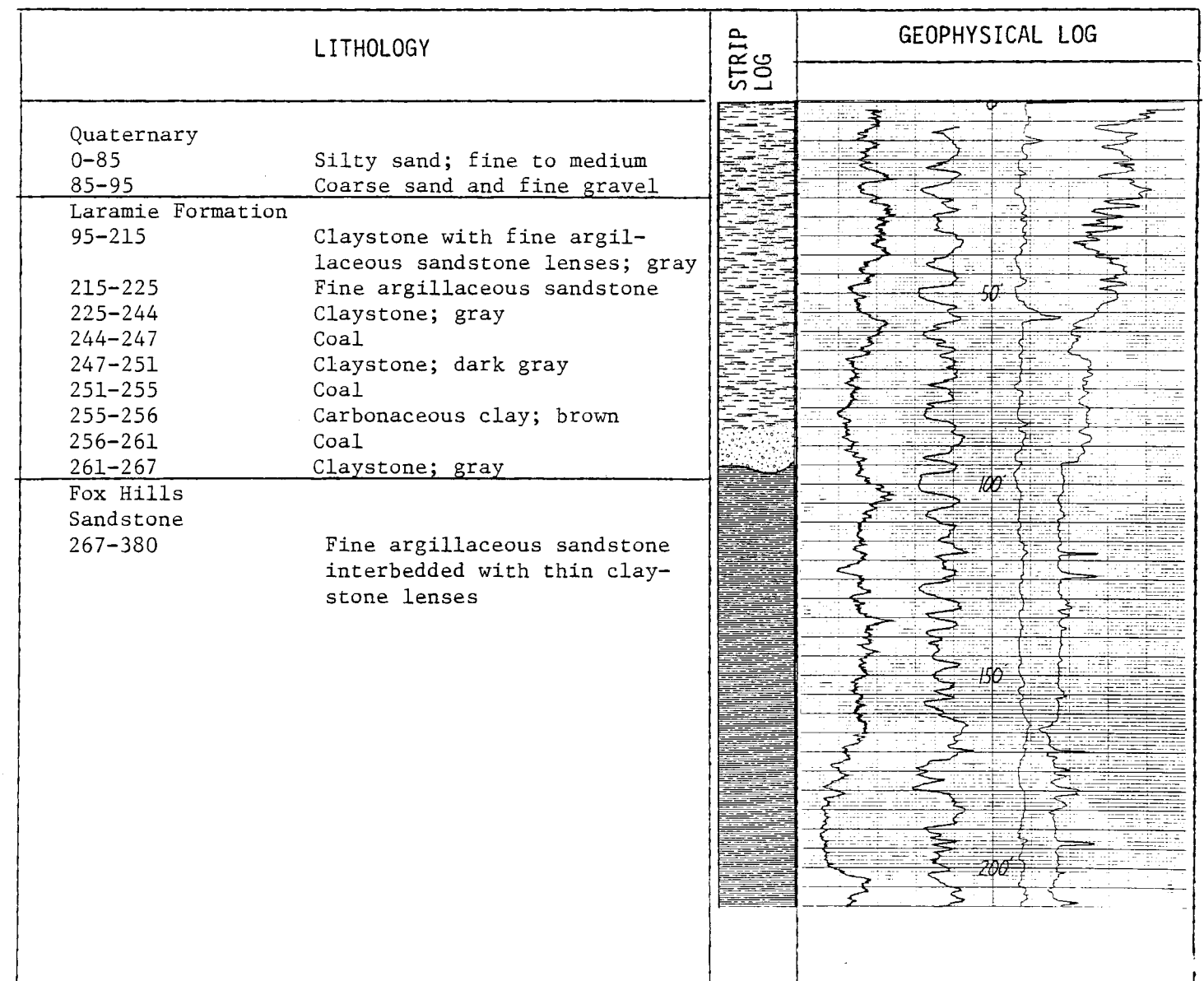
Location: T. 2 S., R. 61 W., secs. NENE 36 Cored: Yes No X

Drilled depth 380 Logged depth 380 Drilling Medium Mud Fluid level 2

Geophysical logs:

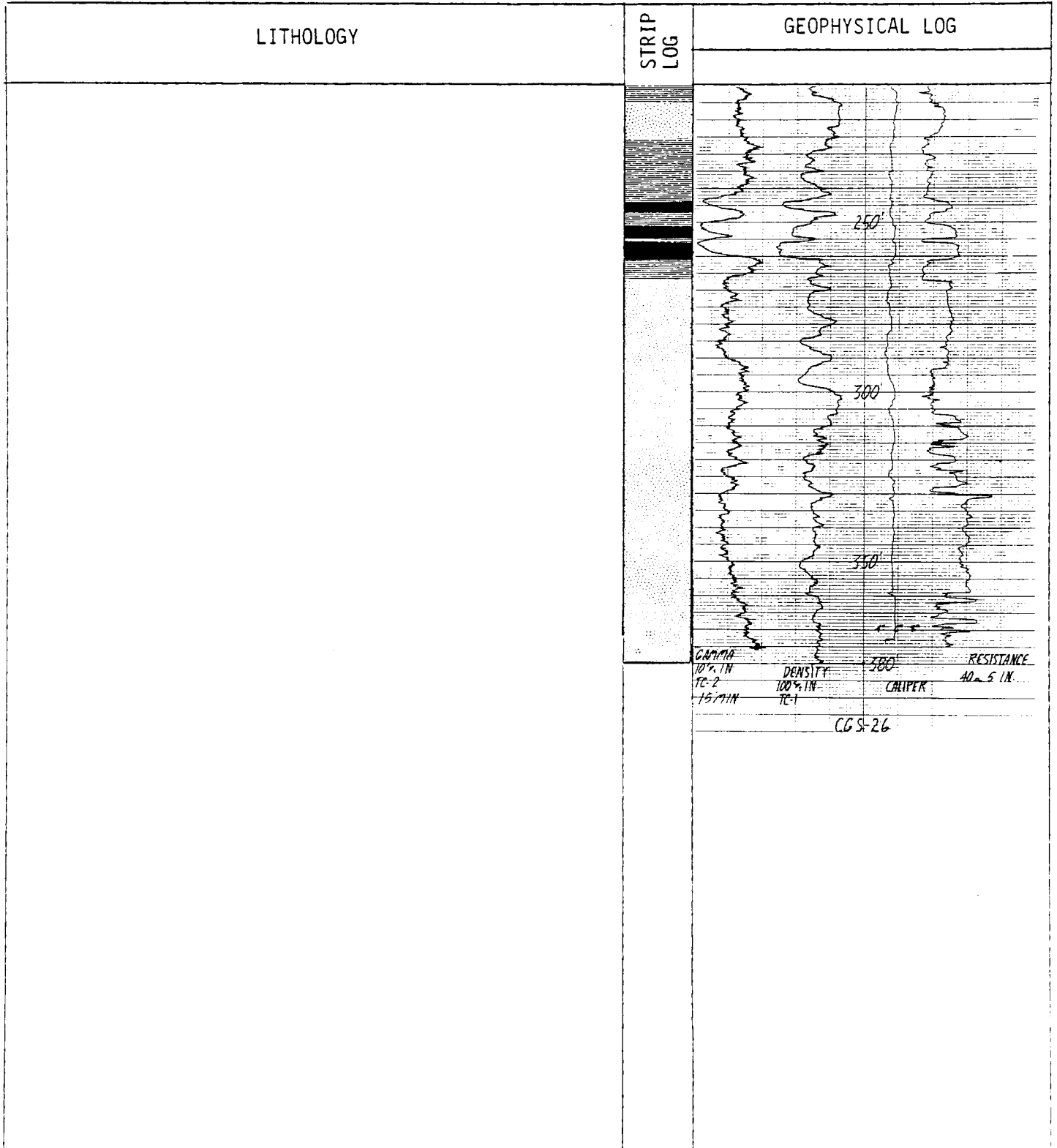
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/5in	Logging speed 15	fpm

Remarks: Leader SW Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-26 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-27 State Colorado County Adams Date logged 3/25/80 Elev.(ft) 5154

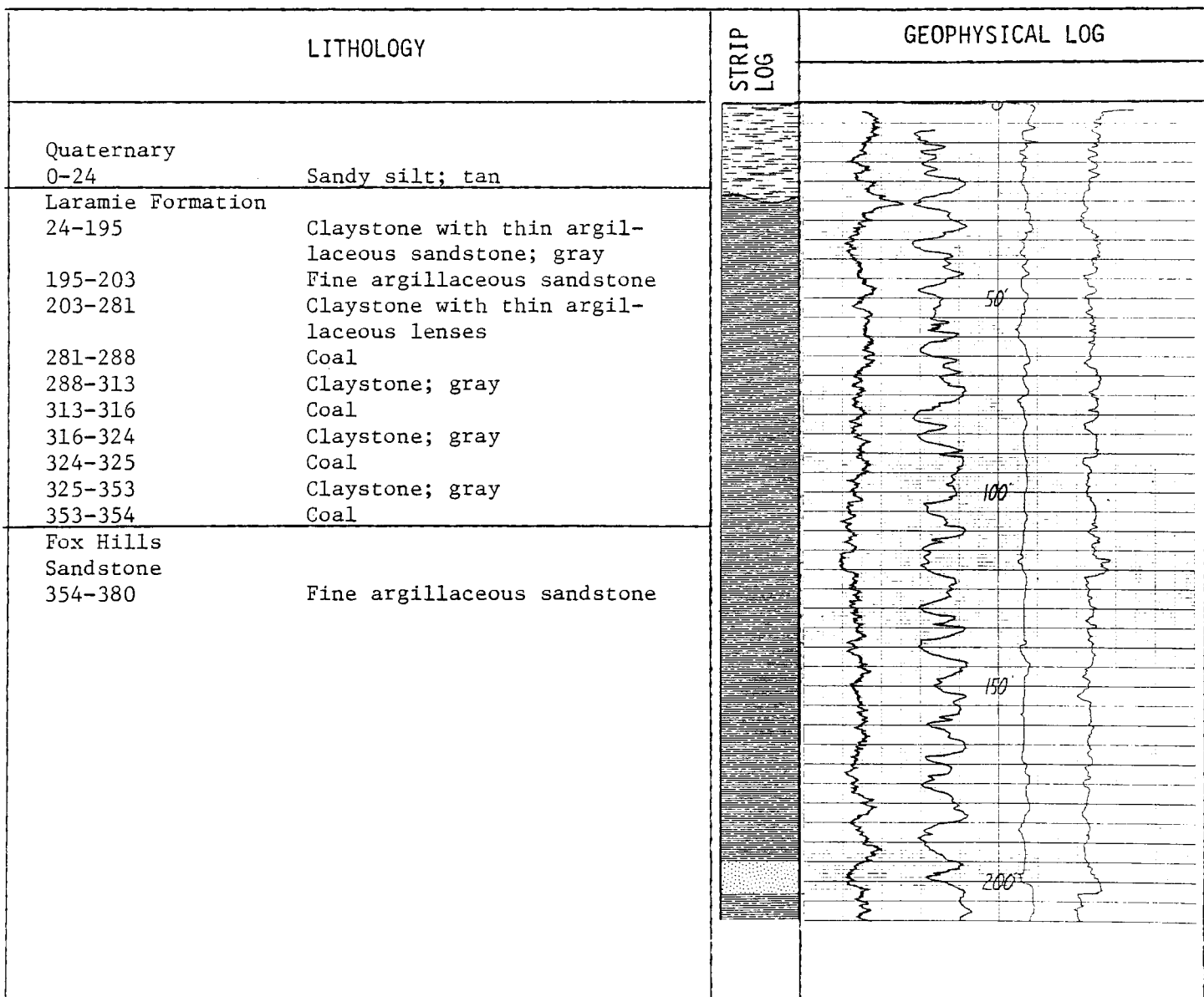
Location: T. 3 S., R. 60 W., secs. SWSW 22 Cored: Yes No x

Drilled depth 380 Logged depth 380 Drilling Medium Mud Fluid level 2

Geophysical logs:

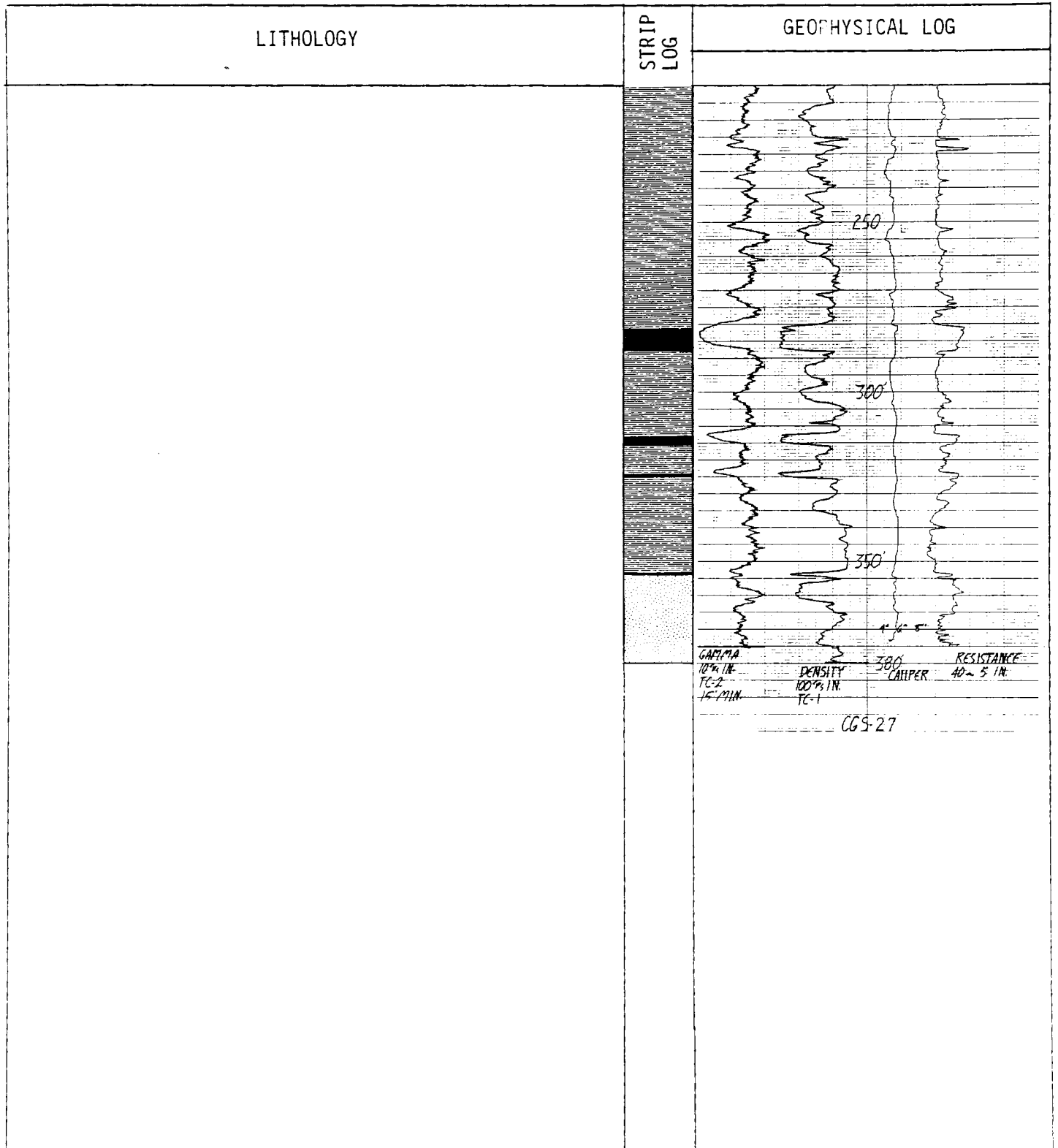
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/in	Logging speed 15	fpm

Remarks: Leader SE Quadrangle



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-27 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-28 State Colorado County Arapahoe Date logged 3/25/80 Elev.(ft) 5215

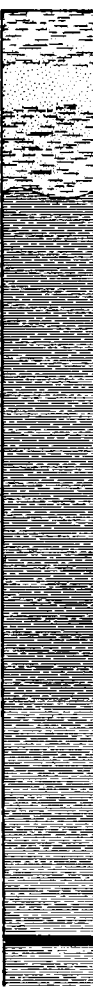
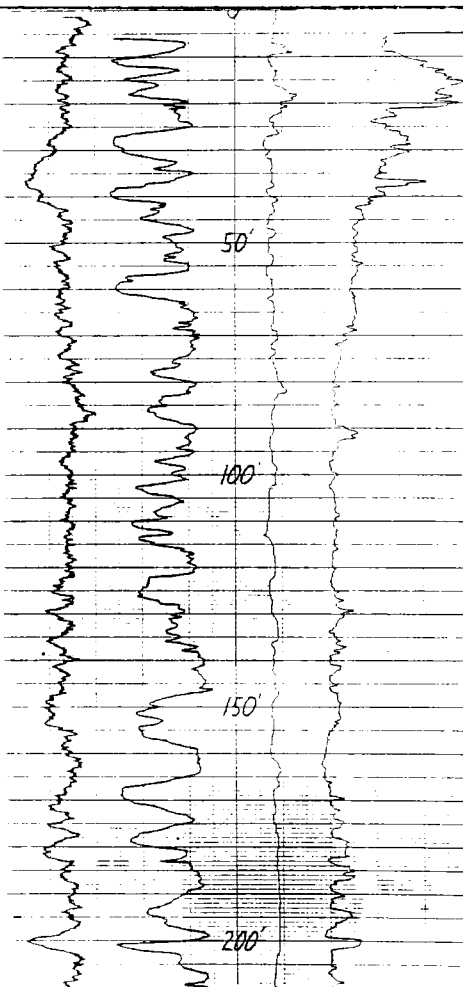
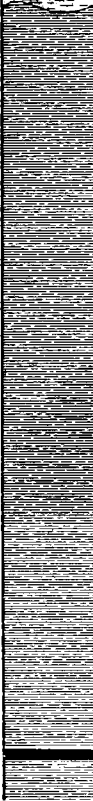
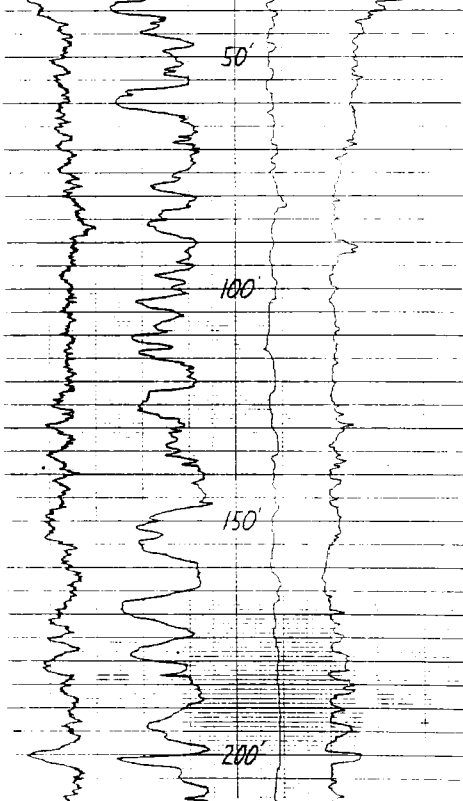
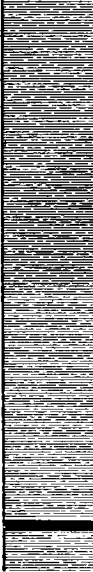
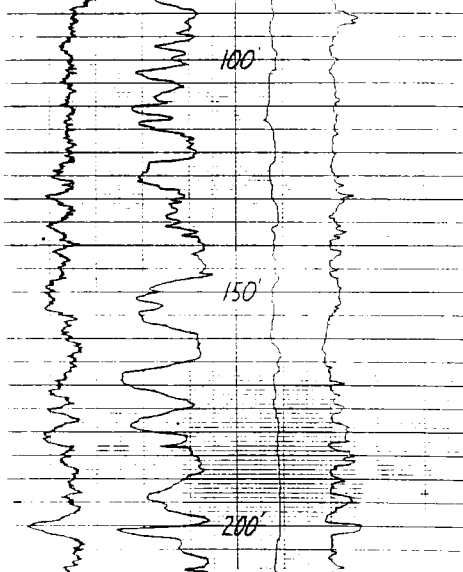
Location: T. 4 S., R.60 W., secs. NENE 36 Cored: Yes No X

Drilled depth 280 Logged depth 280 Drilling Medium Mud Fluid level 5

Geophysical logs:

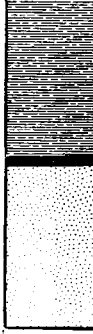
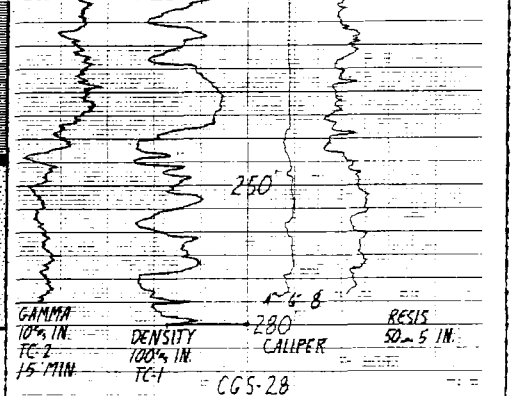
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 50 ohm/in	Logging speed 15	fpm

Remarks: Peoria Quadrangle

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
Quaternary 0-12 Sandy silt; brown 12-20 Coarse sand 20-39 Sandy silt brown		
Laramie Formation 39-132 Claystone; gray; occasionally silty 132-133 Carbonaceous clay; dark brown 133-199 Claystone; gray 199-201 Coal; black 201-243 Claystone; gray 243-245 Coal; black		
Fox Hills Sandstone 245-280 Very fine argillaceous sandstone		

COLORADO GEOLOGICAL SURVEY

Hole No. CGS-28 - Continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
		 GAMMA 10% IN. DENSITY 100% IN. RESIS 50% IN. TC-2 TC-1 CGS-28

COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 10 QUADRANGLE

Hole No. CGS-29 State Colorado County Arapahoe Date logged 3/25/80 Elev.(ft) 5414

Location: T. 5 S., R.59 W., secs. SWSW 36 Cored: Yes No X

Drilled depth 400 Logged depth 400 Drilling Medium Mud Fluid level 2

Geophysical logs:

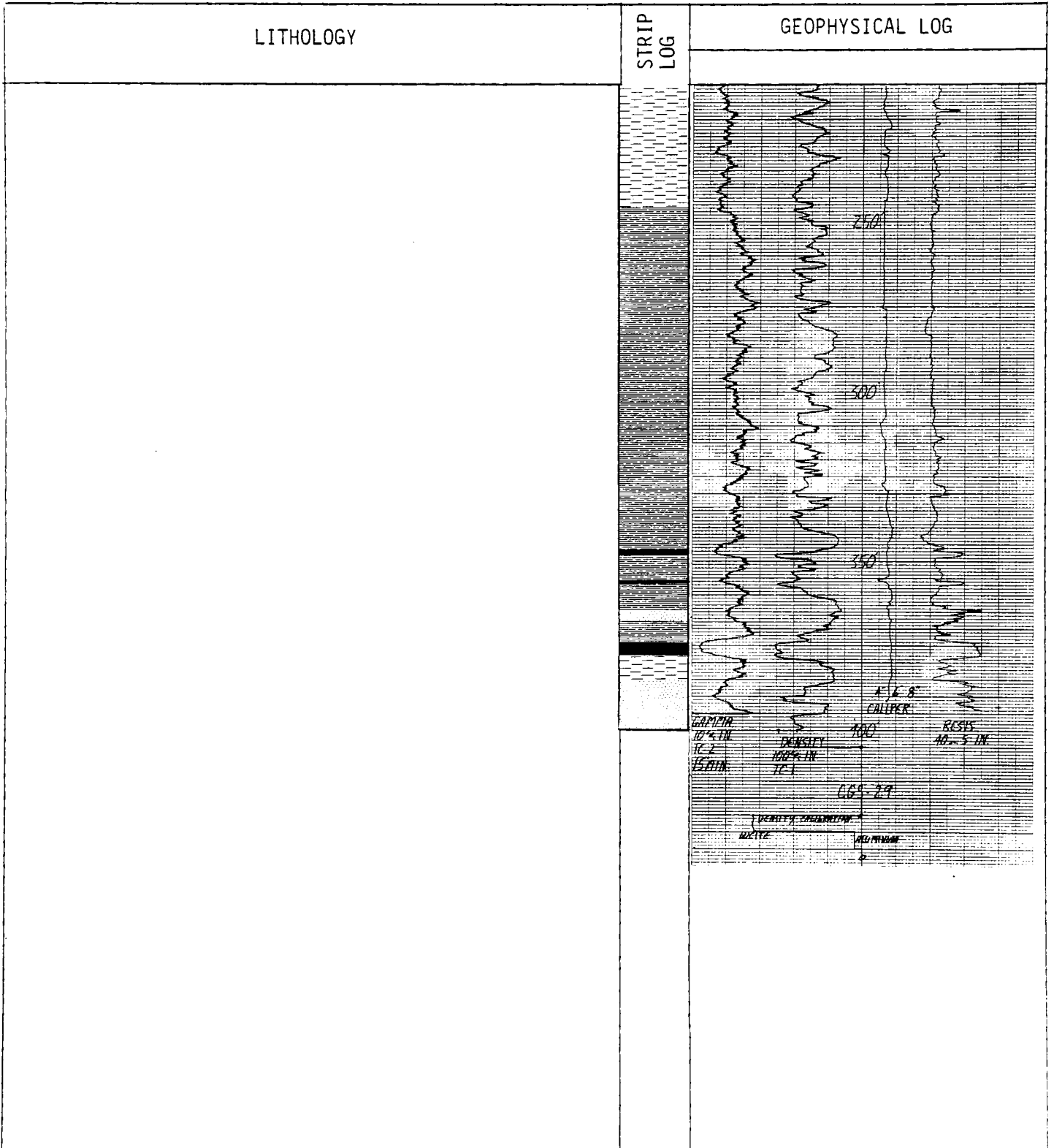
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 100 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 4 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/in	Logging speed 15	fpm

Remarks: Deer Trail Quadrangle

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
Quaternary 0-14 Sandy silt tan-brown 14-55 Coarse sand interbedded with clay lenses		
Laramie Formation 55-164 Very fine argillaceous sandstone 164-200 Claystone; gray 200-246 Siltstone; light gray 246-328 Claystone; gray 328-330 Carbonaceous clay; brown 330-347 Claystone; gray 347-349 Coal 349-356 Claystone; gray 356-357 Coal 357-364 Claystone; gray 364-368 Fine argillaceous sandstone 368-374 Claystone; gray 374-378 Coal 378-385 Siltstone; light gray		
Fox Hills Sandstone 385-400 Very fine argillaceous sandstone		

COLORADO GEOLOGICAL SURVEY

Hole No. CGS-29 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-30 State Colorado County Elbert Date logged 3/23/80 Elev.(ft) 5993

Location: T. 6 S., R. 63 W., secs. SWSW 11 Cored: Yes X No

Drilled depth 720 Logged depth 720 Drilling Medium Mud Fluid level G.L.

Geophysical logs:

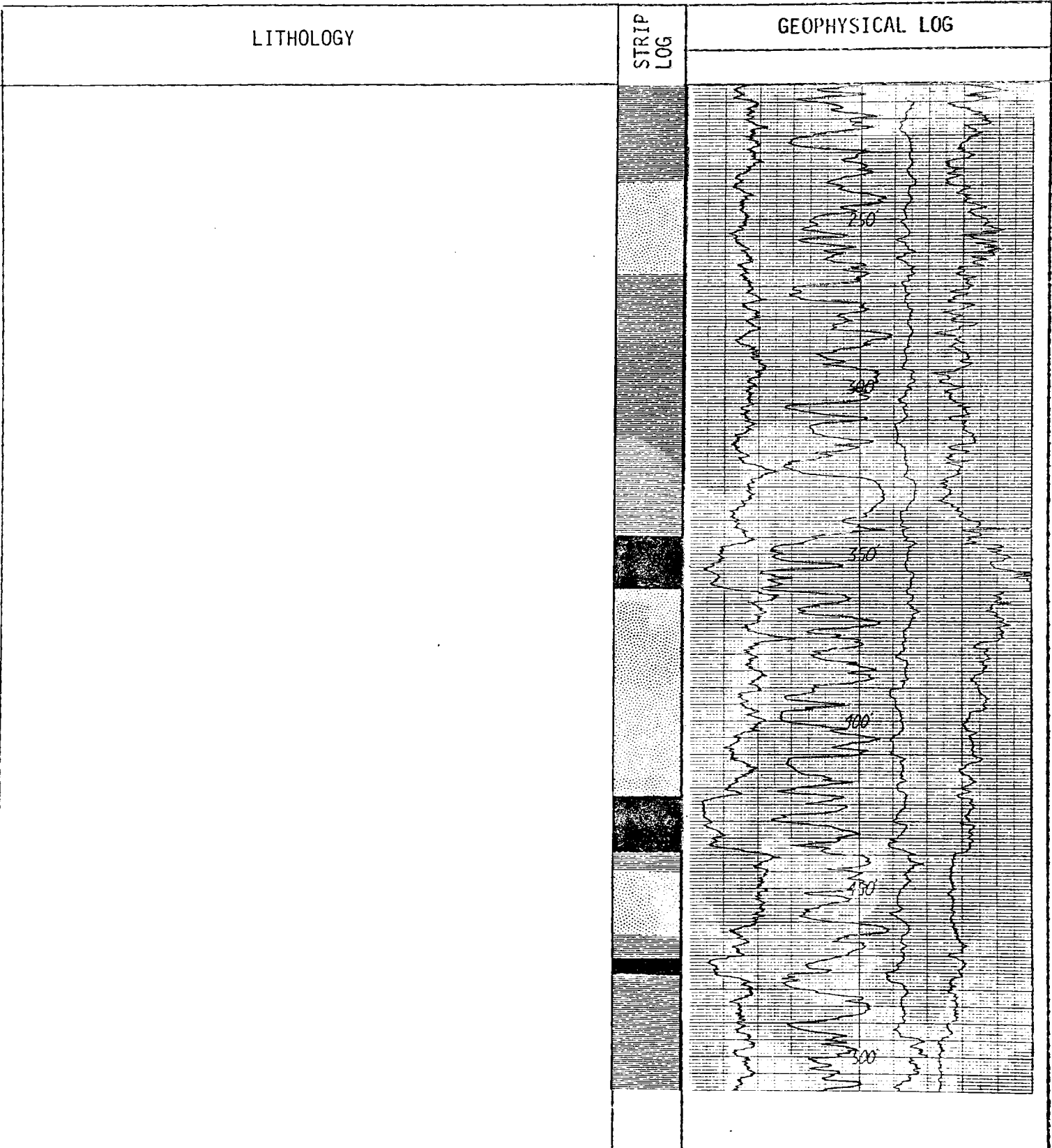
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 50 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 2 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 60 ohm/5in	Logging speed 15	fpm

Remarks: CGS-30c offset 20ft and cored
Watkins SE Quadrangle

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
Quaternary		
0-21 Fine to medium sand		
21-37 Coarse sand and fine gravel		
Dawson Arkose		
37-48 Claystone; gray green		
48-89 Very fine to fine argillaceous sandstone with occasional siltstone lenses		
89-139 Claystone gray green		
139-160 Fine argillaceous sandstone		
Denver Formation		
160-239 Claystone gray green		
239-266 Fine to medium argillaceous sandstone; coarsening downward		
266-345 Claystone with occasional sandstone lenses		
345-361 Lignite brown black		
361-423 Fine argillaceous sandstone		
423-439 Lignite; brown black; many clay-splits		
439-445 Claystone; gray		
445-464 Fine to medium argillaceous sandstone		
464-471 Claystone; gray		
471-476 Lignite; brown black		
476-591 Claystone with thin argillaceous sandstone lenses		
591-620 Lignite; brown black; many clay splits		
620-687 Claystone with thin argillaceous sandstone lenses		
687-693 Lignite; brown black		
693-720 Claystone with thin argillaceous sandstone lenses		

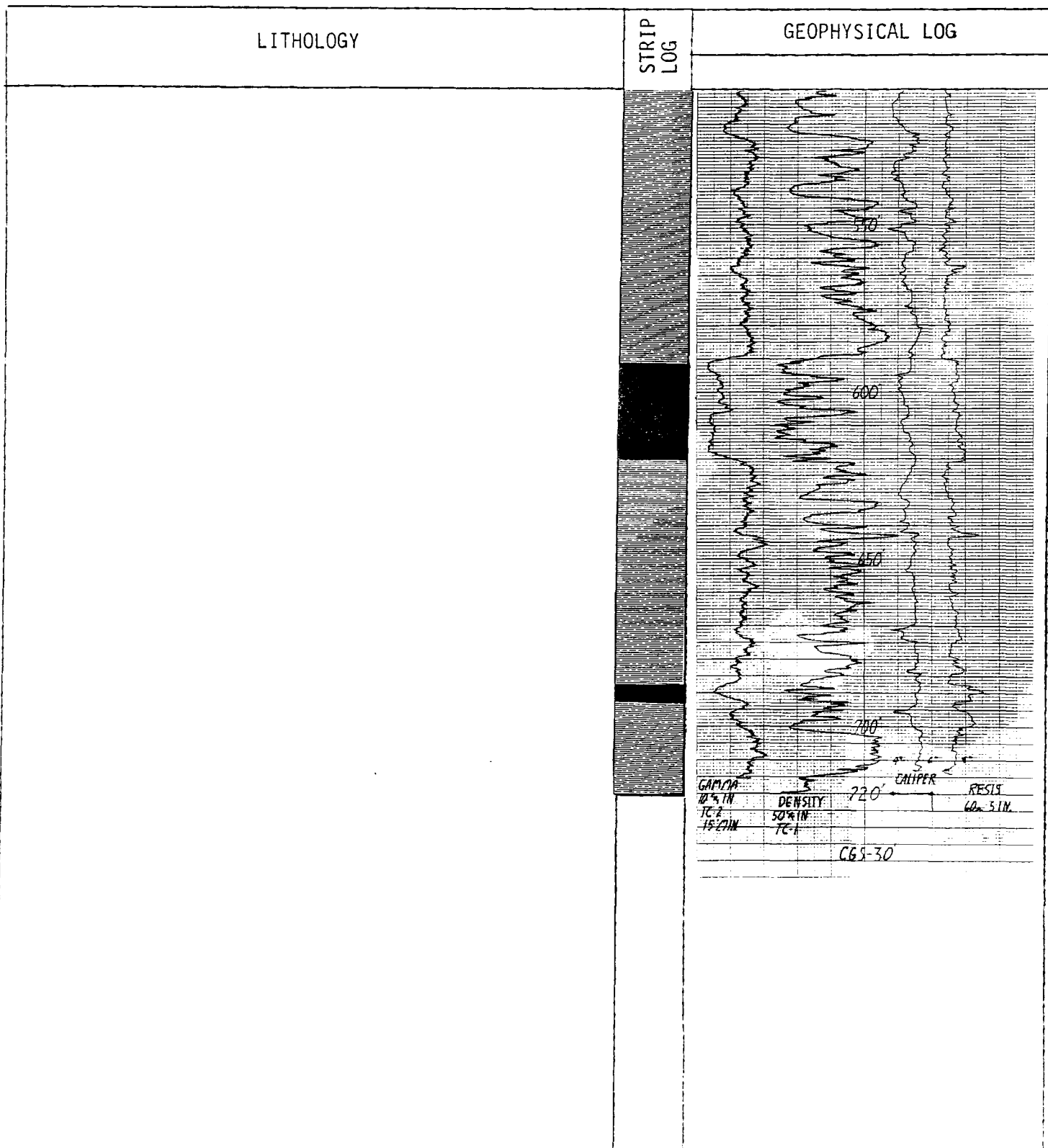
COLORADO GEOLOGICAL SURVEY

Hole No. CGS-30 - Continued



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-30 - Continued



COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-31 State Colorado County Elbert Date logged 3/21/80 Elev.(ft) 6187

Location: T. 6 S., R.64 W., secs. SWSW 4 Cored: Yes No X

Drilled depth 900 Logged depth 900 Drilling Medium Mud Fluid level G.L.

Geophysical logs:

Gamma (G):	T.C. 2	Scale	10 cps/in	Logging speed	15	fpm
Density (DEN)	T.C. 1	Scale	50 cps/in	Logging speed	15	fpm
Caliper (C):		Scale	2 in/in	Logging speed	15	fpm
Resistance (Res):		Scale	50 ohm/5in	Logging speed	15	fpm

Remarks: Watkins SE Quadrangle

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOG	
Quaternary 0-6	Sandy silt; brown			
Dawson Arkose 6-30	Claystone; slightly sandy; weathered; tan yellow			
30-88	Fine to medium argillaceous sandstone			
88-134	Claystone; gray green			
134-237	Fine to coarse argillaceous sandstone; occasionally arkosic; contains thin claystone lenses			
Denver Formation 237-276	Claystone; gray green; occasional argillaceous sandstone lenses			
276-305	Very fine to medium argillaceous sandstone			
305-360	Claystone with occasional argillaceous sandstone lenses			
360-413	Fine to coarse argillaceous sandstone			
413-448	Siltstone; gray			
448-460	Fine argillaceous sandstone			
460-487	Claystone gray green			
487-552	Fine argillaceous sandstone			
552-602	Claystone; gray green; occasionally silty with thin argillaceous sandstone lenses			
602-614	Lignite; brown black			
614-651	Claystone; gray green; occasionally silty with thin argillaceous sandstone lenses			

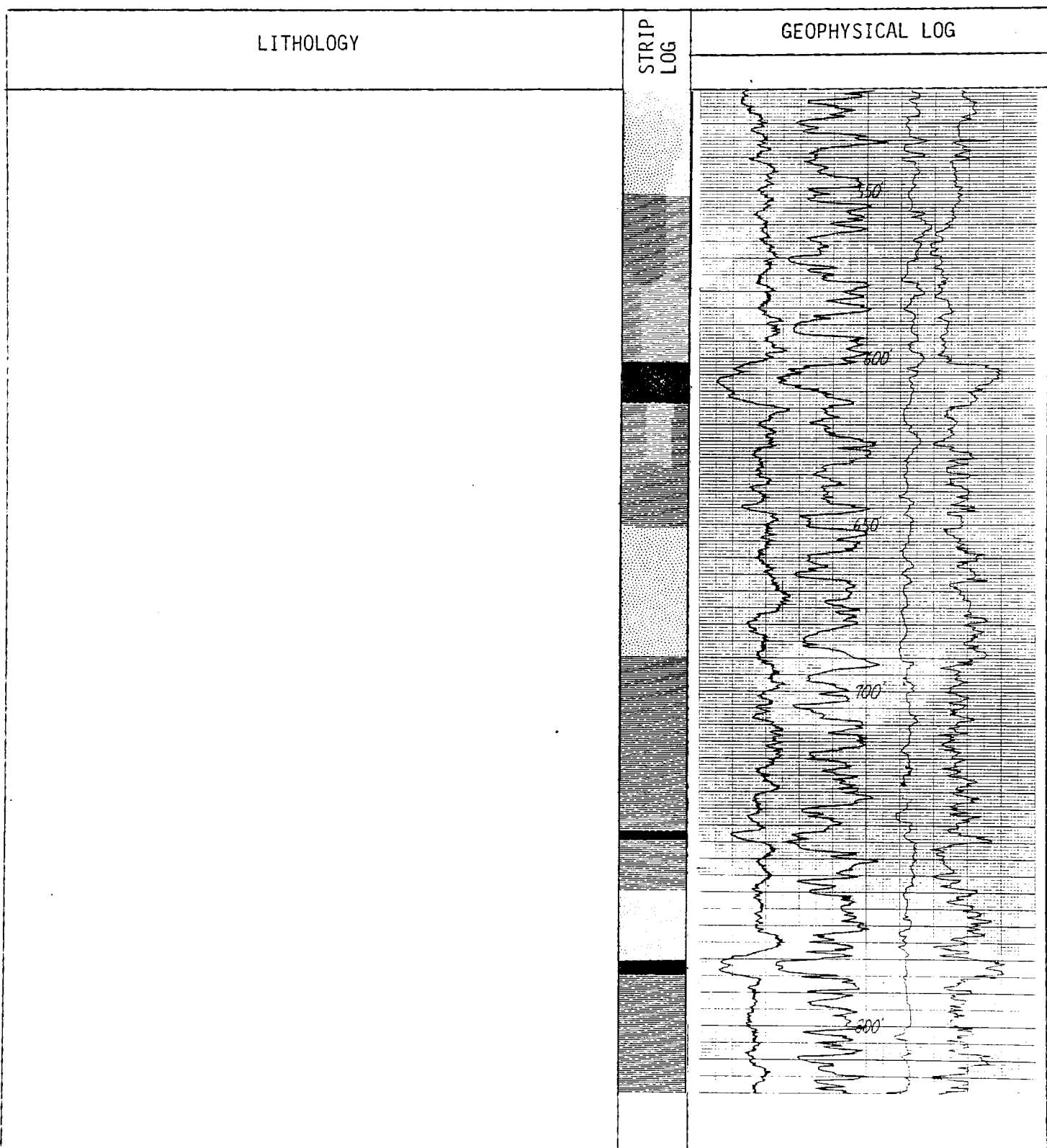
COLORADO GEOLOGICAL SURVEY

Hole No. CGS-31 - Continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
651-690 Fine to medium argillaceous sandstone		
690-743 Claystone; occasionally silty; gray green		250
743-745 Lignite; brown black		
745-760 Claystone; occasionally silty; gray green		
760-781 Fine argillaceous sandstone		
781-785 Lignite; brown black		
785-833 Claystone; gray green		
833-859 Siltstone; gray		200
859-887 Lignite very dirty and carbonaceous clay; brown dark brown		
887-900 Claystone; gray		150
		100
		50

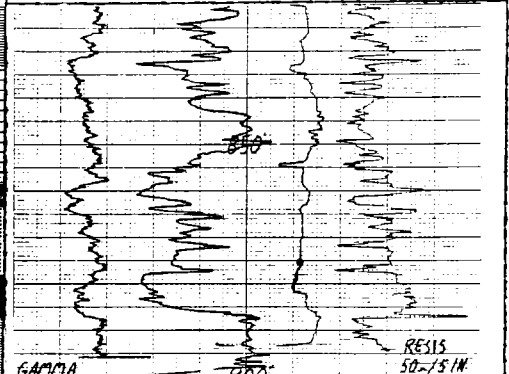
COLORADO GEOLOGICAL SURVEY

Hole No. CGS-31 - Continued



COLORADO GEOLOGICAL SURVEY

Hole No. CGS-31 - Continued

LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
		 GAMMA 10% IN TC-2 15/71N DENSITY 50% IN TC-1 CALIPER 4" 6" 8" RESIS 50-15 IN

COLORADO GEOLOGICAL SURVEY

DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-32 State Colorado County Arapahoe Date logged 3/20/80 Elev.(ft) 5755

Location: T. 4 S., R. 65 W., secs. NENE 10 Cored: Yes No x

Drilled depth 580 Logged depth 580 Drilling Medium Mud Fluid level 4

Geophysical logs:

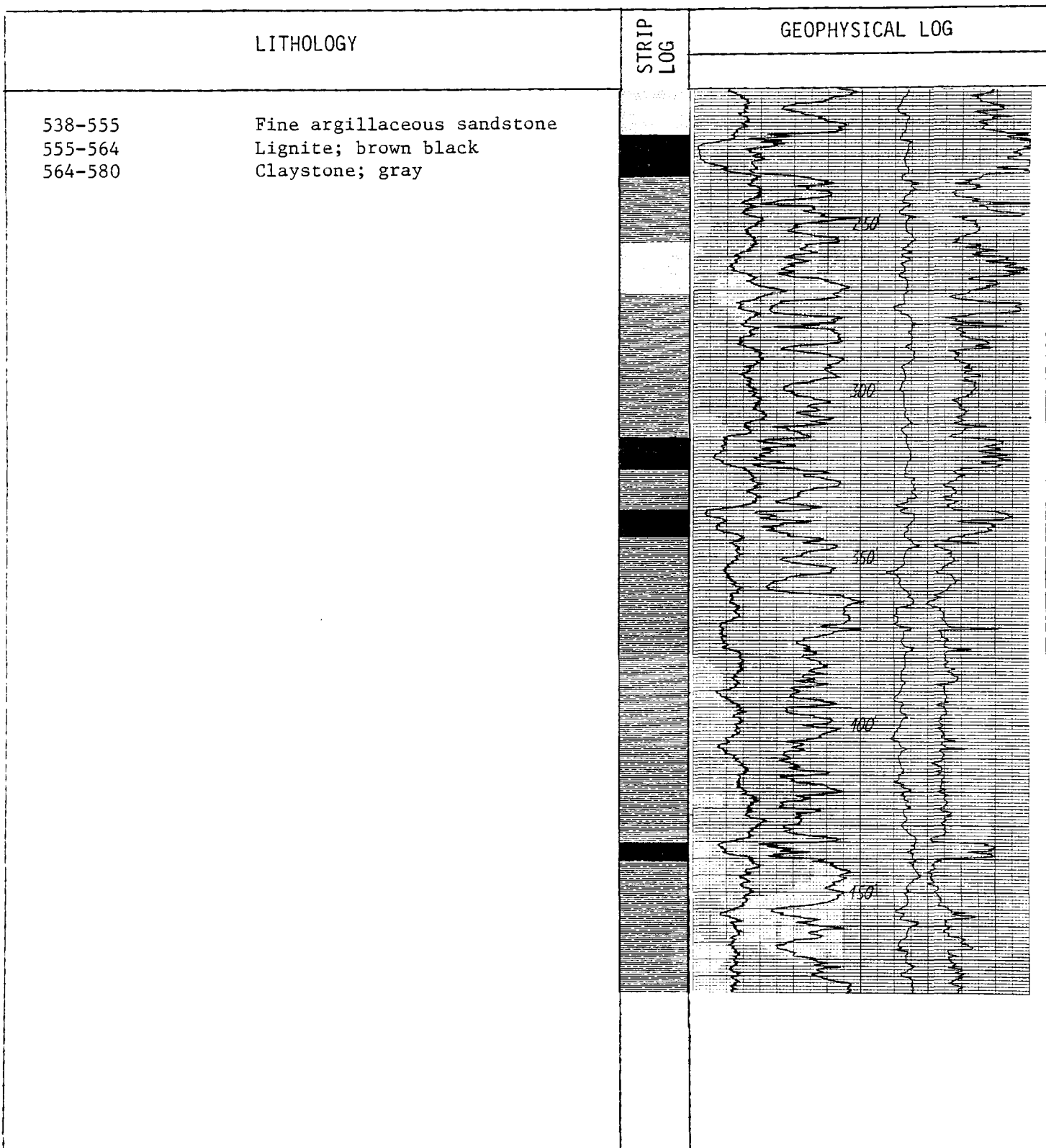
Gamma (G):	T.C. 2	Scale 10 cps/in	Logging speed 15	fpm
Density (DEN)	T.C. 1	Scale 50 cps/in	Logging speed 15	fpm
Caliper (C):		Scale 2 in/in	Logging speed 15	fpm
Resistance (Res):		Scale 40 ohm/in	Logging speed 15	fpm

Remarks: Coal Creek Quadrangle

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOG	
Quaternary				
0-15	Fine to medium silty sand			
15-25	Coarse sand and fine gravel			
Denver Formation				
25-106	Claystone with very fine argillaceous sandstone lenses; gray green; occasionally silty			
106-115	Fine to medium argillaceous sandstone			
115-120	Lignite; brown black			
120-132	Claystone gray-green			
132-166	Fine to medium argillaceous sandstone			
166-168	Lignite and carbonaceous clay; brown			
168-195	Claystone; occasionally silty; gray			
195-223	Fine argillaceous sandstone			
223-235	Lignite; brown black			
235-255	Claystone; gray			
255-270	Fine argillaceous sandstone			
270-314	Claystone with occasional siltstone lenses			
314-323	Lignite; brown black			
323-335	Claystone, gray			
335-343	Lignite; brown black			
343-435	Claystone; gray green			
435-440	Lignite; brown black			
440-508	Claystone; gray-green; with argillaceous sandstone lenses			
508-514	Lignite; brown black			
514-538	Claystone; gray-green; with argillaceous sandstone lenses			

COLORADO GEOLOGICAL SURVEY

Hole No. CGS-32 - Continued



COLORADO GEOLOGICAL SURVEY

Hole No.CGS-32 - Continued

LITHOLOGY

STRIP
LOG

GEOPHYSICAL LOG

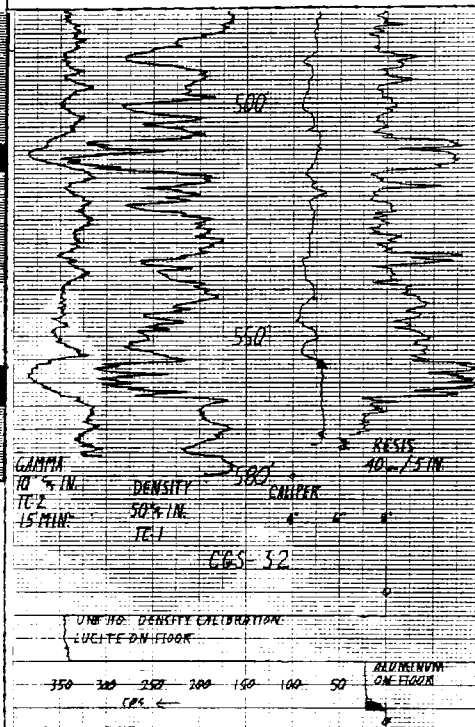


TABLE 1

COAL-ANALYSIS REPORT

ORGANIZATION: COLORADO GEOLOGICAL SURVEY
 SAMPLE ID: #1, CGS-30c CORE SAMPLE, COAL
 INTERVAL SAMPLED: 346'-362'

OPR: DENVER FMTN, PALEOCENE AGE MINE: DRILL HOLE, UNNAMED BED
 STATE: CO COUNTY: ELBERT BED: DEPTH INT.
 TOWN: -

DATE OF SAMPLING: 3/22/80 DATE RECEIVED: 6/26/80 DATE OF REPORT: 7/11/80
 COLLECTOR: K. BRAND

	COAL AS RECD.	COAL MOIST FREE
PROXIMATE ANALYSIS		
MOISTURE	27.75	N/A
VOLATILE MATTER	21.84	30.23
FIXED CARBON	14.30	19.79
ASH	36.11	49.98
ULTIMATE ANALYSIS		
	X	
HYDROGEN	2.34	3.24
CARBON	23.67	32.76
NITROGEN	0.49	0.68
SULFUR	0.51	0.71
OXYGEN (DIFF)	9.12	12.62
ASH	36.11	49.98
CHLORINE		
HEATING VALUE BTU/LB	4164	5764
SULFUR FORMS		
SULFATE		
PYRITIC		
ORGANIC		
EQUILIBRIUM MOISTURE	24.36	
MOIST, MINERAL MATTER FREE, BTU	6753	
APPARENT RANK LIGNITE A		

NOTE: ANALYSIS INCLUDES ALL CLAY PARTINGS

TABLE 1 CON'T

<u>MINERAL ANALYSIS OF ASH</u>	<u>PERCENT WEIGHT IGNITED BASIS</u>
SILICA, SiO_2	51.87
ALUMINA, Al_2O_3	33.47
TITANIA, TiO_2	1.36
FERRIC OXIDE, Fe_2O_3	2.68
LIME, CaO	3.95
MAGNESIA, MgO	0.52
POTASSIUM OXIDE, K_2O	1.38
SODIUM OXIDE, Na_2O	0.37
SULFUR TRIOXIDE, SO_3	3.49
PHOS. PENTOXIDE, P_2O_5	0.20
UNDETERMINED	0.71
	100.00
ALKALIES AS Na_2O , DRY COAL BASIS	= 0.64
SILICA VALUE	= 87.89
BASE: ACID RATIO	= 0.10
ESTIMATED VISCOSITY AT CRITICAL VISCOSITY	
TEMPERATURE OF XXXXX °F = XXXXX POISES	
T_{250} TEMPERATURE = >2900 °F	
FOULING INDEX = <0.2	
SLAGGING INDEX = <0.6	

TABLE 2
COAL-ANALYSIS REPORT

ORGANIZATION: COLORADO GEOLOGICAL SURVEY
SAMPLE ID: #2, CGS 30c CORE SAMPLE, COAL
INTERVAL SAMPLED: 422'-442'

OPR: DENVER FMTN, PALEOCENE AGE MINE: DRILL HOLE, UNNAMED BED
STATE: CO COUNTY: ELBERT BED: DEPTH INT.
TOWN: -

DATE OF SAMPLING: 3/22/80 DATE RECEIVED: 6/26/80 DATE OF REPORT: 7/11/80
COLLECTOR: K. BRAND

	COAL AS RECD.	COAL MOIST FREE
PROXIMATE ANALYSIS		
MOISTURE	30.92	N/A
VOLATILE MATTER	22.67	32.82
FIXED CARBON	20.97	30.36
ASH	25.44	36.82
ULTIMATE ANALYSIS		
HYDROGEN	2.52	3.65
CARBON	30.67	44.40
NITROGEN	0.59	0.85
SULFUR	0.26	0.37
OXYGEN (DIFF)	9.59	
ASH	25.44	36.82
CHLORINE	0.01	0.01
HEATING VALUE BTU/LB	5164	7476
SULFUR FORMS		
SULFATE	0.00	0.00
PYRITIC	0.01	0.02
ORGANIC	0.25	0.35
EQUILIBRIUM MOISTURE	28.87	
MOIST, MINERAL MATTER FREE, BTU	7079	
APPARENT RANK LIGNITE A		
NOTE: ANALYSIS INCLUDES ALL CLAY PARTINGS		

TABLE 2 CON'T

<u>MINERAL ANALYSIS OF ASH</u>	<u>PERCENT WEIGHT IGNITED BASIS</u>
SILICA, SiO_2	55.32
ALUMINA, Al_2O_3	28.34
TITANIA, TiO_2	1.20
FERRIC OXIDE, Fe_2O_3	2.56
LIME, CaO	6.67
MAGNESIA, MgO	0.86
POTASSIUM OXIDE, K_2O	1.00
SODIUM OXIDE, Na_2O	0.27
SULFUR TRIOXIDE, SO_3	2.61
PHOS. PENTOXIDE, P_2O_5	0.72
UNDETERMINED	0.45
	100.00
ALKALIES AS Na_2O , DRY COAL BASIS	= 0.34
SILICA VALUE	= 84.57
BASE: ACID RATIO	= 0.13
ESTIMATED VISCOSITY AT CRITICAL VISCOSITY	
TEMPERATURE OF XXXXX °F = XXXXX POISES	
T_{250} TEMPERATURE = >2900 °F	
FOULING INDEX = <0.2	
SLAGGING INDEX = <0.6	

TABLE 3

COAL-ANALYSIS REPORT

ORGANIZATION: COLORADO GEOLOGICAL SURVEY
 SAMPLE ID: #3, CGS 30c CORE SAMPLE, COAL
 INTERVAL SAMPLED: 595'-610'

OPR: DENVER FMTN, PALEOCENE AGE MINE: DRILL HOLE, UNNAMED BED
 STATE: CO COUNTY: ELBERT BED: DEPTH INT.
 TOWN: -

DATE OF SAMPLING: 3/22/80 DATE RECEIVED: 6/26/80 DATE OF REPORT: 7/11/80
 COLLECTOR: K. BRAND

	COAL AS RECD.	COAL MOIST FREE
PROXIMATE ANALYSIS		
MOISTURE	26.98	N/A
VOLATILE MATTER	21.91	30.00
FIXED CARBON	17.67	24.21
ASH	33.44	45.79
ULTIMATE ANALYSIS		
HYDROGEN	2.55	3.49
CARBON	25.84	35.39
NITROGEN	0.46	0.63
SULFUR	0.34	0.34
OXYGEN (DIFF)	10.38	14.22
ASH	33.44	45.79
CHLORINE	0.01	0.01
HEATING VALUE BTU/LB	4521	6192
SULFUR FORMS		
SULFATE	0.01	0.02
PYRITIC	0.04	0.06
ORGANIC	0.29	0.39

EQUILIBRIUM MOISTURE 25.94

MOIST, MINERAL MATTER FREE, BTU 7048

APPARENT RANK LIGNITE A

NOTE: ANALYSIS INCLUDES ALL CLAY PARTINGS

TABLE 3 CON'T

<u>MINERAL ANALYSIS OF ASH</u>	<u>PERCENT WEIGHT IGNITED BASIS</u>
SILICA, SiO_2	53.46
ALUMINA, Al_2O_3	31.73
TITANIA, TiO_2	1.26
FERRIC OXIDE, Fe_2O_3	2.58
LIME, CaO	4.65
MAGNESIA, MgO	0.92
POTASSIUM OXIDE, K_2O	1.21
SODIUM OXIDE, Na_2O	0.36
SULFUR TRIOXIDE, SO_3	2.66
PHOS. PENTOXIDE, P_2O_5	0.36
UNDETERMINED	0.81
	100.00
ALKALIES AS Na_2O , DRY COAL BASIS	= 0.53
SILICA VALUE	= 86.77
BASE: ACID RATIO	= 0.11
ESTIMATED VISCOSITY AT CRITICAL VISCOSITY	
TEMPERATURE OF XXXXX °F = XXXXX POISES	
T_{250} TEMPERATURE = >2900 °F	
FOULING INDEX = <0.2	
SLAGGING INDEX = <0.6	

TABLE 4

COAL-ANALYSIS REPORT

ORGANIZATION: COLORADO GEOLOGICAL SURVEY
 SAMPLE ID: #4, CGS 30c CORE SAMPLE, COAL
 INTERVAL SAMPLED: 610'-627'

OPR: DENVER FMTN, PALEOCENE AGE MINE: DRILL HOLE, UNNAMED BED
 STATE: CO COUNTY: ELBERT BED: DEPTH INT.
 TOWN: -

DATE OF SAMPLING: 3/22/80 DATE RECEIVED: 6/26/80 DATE OF REPORT: 7/11/80
 COLLECTOR: K. BRAND

	COAL AS RECD.	COAL MOIST FREE
PROXIMATE ANALYSIS		
MOISTURE	26.37	N/A
VOLATILE MATTER	20.76	28.20
FIXED CARBON	18.16	24.66
ASH	34.71	47.14
ULTIMATE ANALYSIS		
HYDROGEN	2.27	3.08
CARBON	26.64	36.18
NITROGEN	0.60	0.81
SULFUR	0.29	0.39
OXYGEN (DIFF)	9.06	12.32
ASH	34.71	47.14
CHLORINE	0.06	0.08
HEATING VALUE BTU/LB	4524	6144
SULFUR FORMS		
SULFATE	0.00	0.00
PYRITIC	0.04	0.05
ORGANIC	0.25	0.34

EQUILIBRIUM MOISTURE 25.22)

MOIST, MINERAL MATTER FREE, BTU 7195

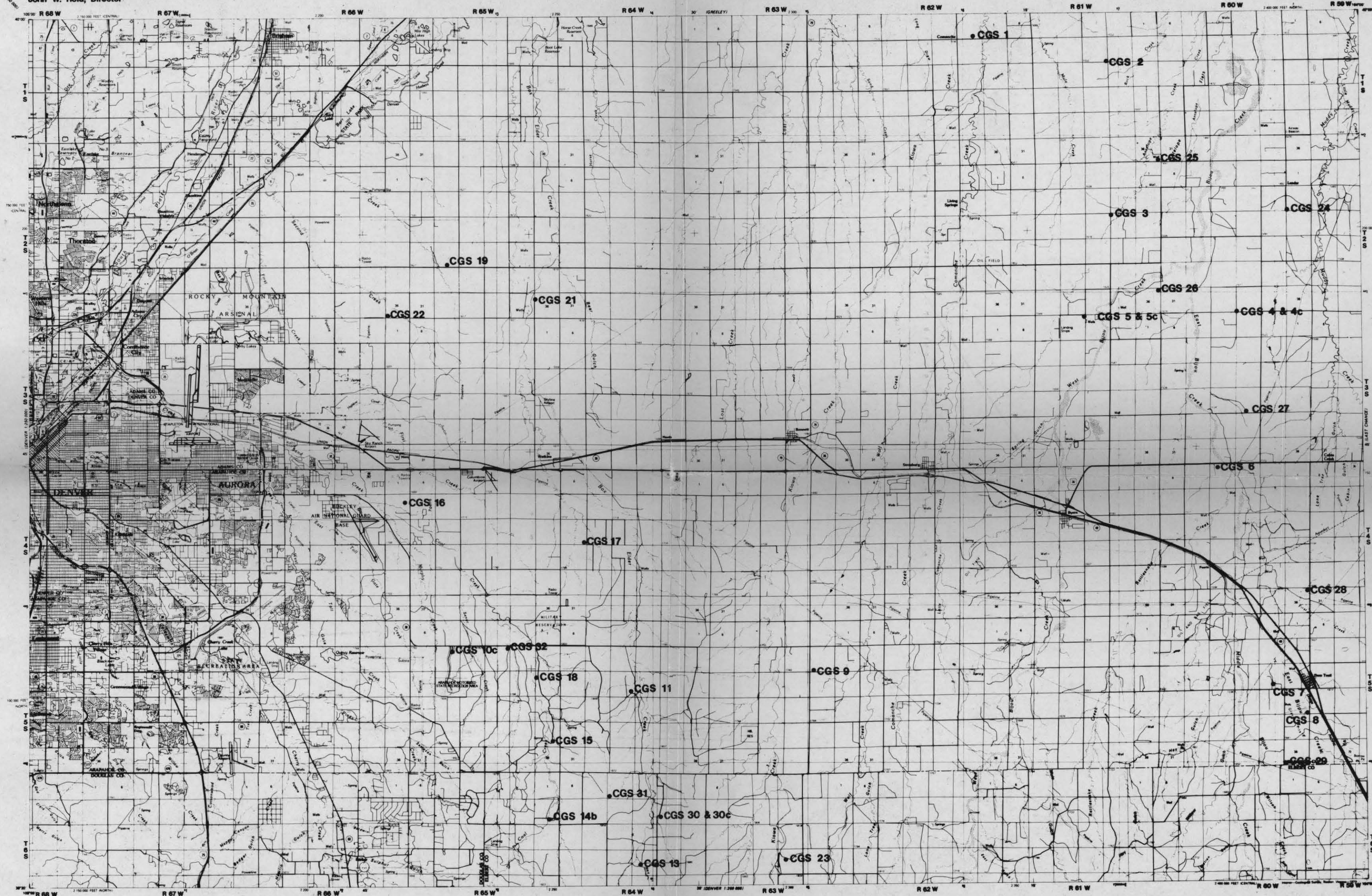
APPARENT RANK LIGNITE A

NOTE: ANALYSIS INCLUDES ALL CLAY PARTINGS

TABLE 4 CON'T

<u>MINERAL ANALYSIS OF ASH</u>	<u>PERCENT WEIGHT IGNITED BASIS</u>
SILICA, SiO_2	58.95
ALUMINA, Al_2O_3	28.15
TITANIA, TiO_2	1.07
FERRIC OXIDE, Fe_2O_3	2.43
LIME, CaO	4.27
MAGNESIA, MgO	0.98
POTASSIUM OXIDE, K_2O	1.36
SODIUM OXIDE, Na_2O	0.31
SULFUR TRIOXIDE, SO_3	2.55
PHOS. PENTOXIDE, P_2O_5	0.20
UNDETERMINED	<u>0.00</u>
	100.27
ALKALIES AS Na_2O , DRY COAL BASIS	= 0.57
SILICA VALUE	= 88.47
BASE: ACID RATIO	= 0.11
ESTIMATED VISCOSITY AT CRITICAL VISCOSITY	
TEMPERATURE OF XXXXX °F = XXXXX POISES	
T_{250} TEMPERATURE = >2900 °F	
FOULING INDEX = <0.2	
SLAGGING INDEX = <0.6	

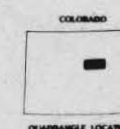
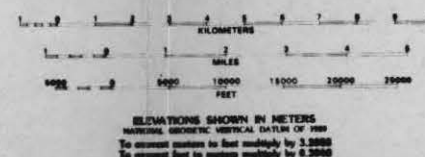
INDEX MAP OF DRILL HOLE LOCATIONS, DENVER EAST QUADRANGLE



Produced by the Geological Survey
in cooperation with the Soil Conservation Service
Compiled from USGS 1:50,000-scale topographic maps
dated 1969-1970. See index for dates of individual maps.
Partially revised from aerial photographs taken 1975-76
and other source data. Revised information not field checked
May 1979.

Projection and 10 000-meter grid, zone 13,
Universal Transverse Mercator
60 000-meter grid scale based on Colorado coordinate
system, north and central zones. 1927 North American datum.

• Completed CGS Drill Hole Location



LEGEND

Proposed stream, lake
Intermittent stream, lake
Village or locality
Landmark structure
Public park or recreation area
Forest or game land area
Other public area or
Military or Indian reservation

ROAD CLASSIFICATION

Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Road on other road
Trail

DENVER EAST, COLORADO
SHEET 104 BY 13-2 1:50,000 SCALE 1979