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GEOPHYSICAL AND LITHOLOGICAL LOGS FROM THE 1980 COAL DRILLING AND CORING PROGRAM, DENVER EAST ½° × 1° QUADRANGLE

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Open File Report 80-9 1980 USGS Grant #14-08-0001-G-577

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ILLUSTRATIONS

Plate 1 DENVER EAST ½° x 1° QUADRANGLE------ Attached

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 $\frac{1}{2}$ ° x 1° 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.

- 1 -

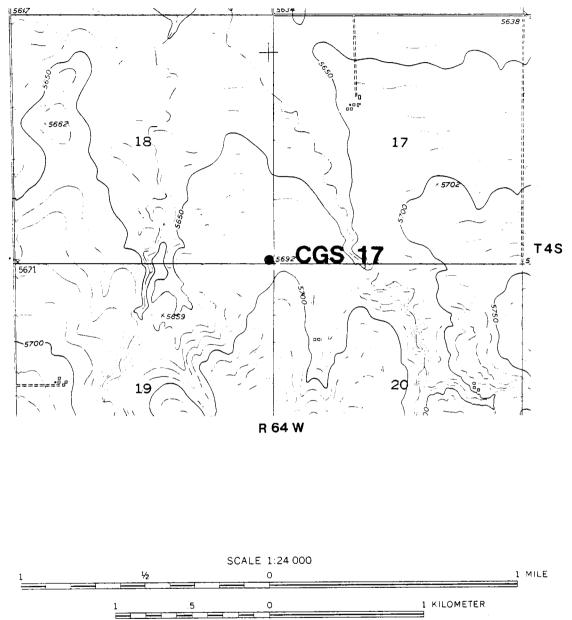




Figure 1.--Location of drill holes in the Watkins quadrangle

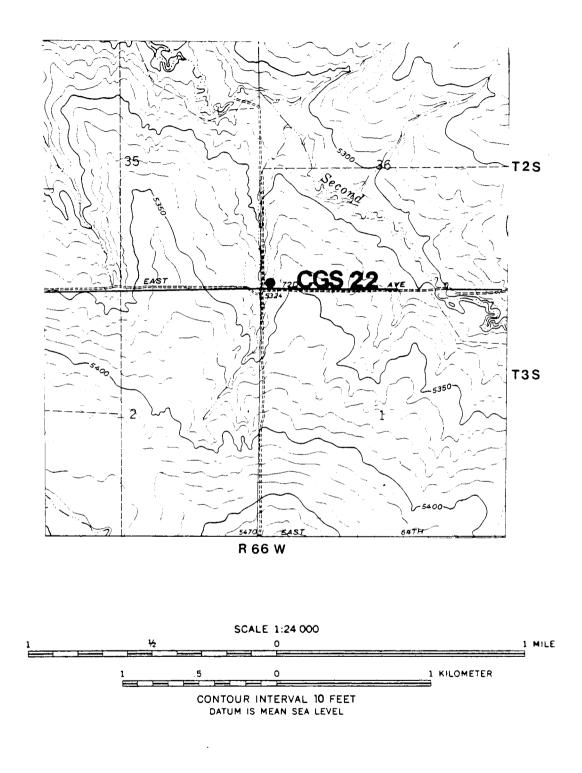


Figure 2.--Location of drill holes in the Box Elder School quadrangle

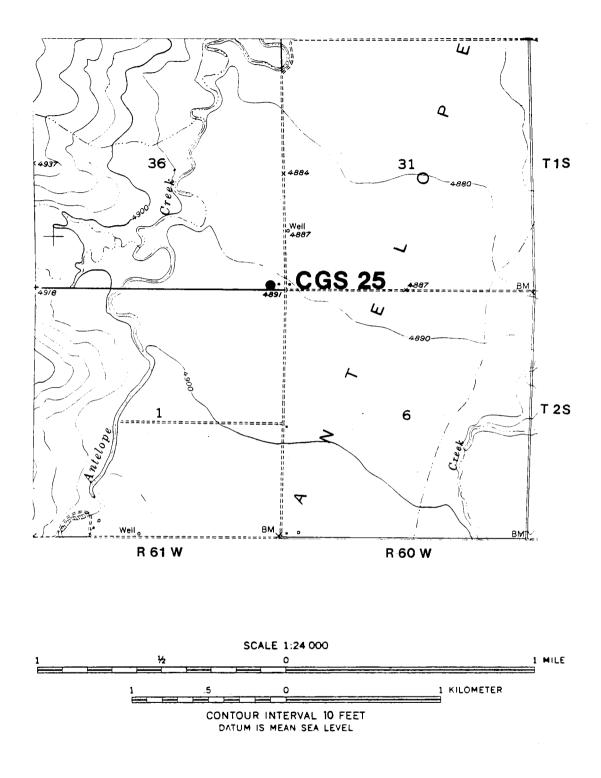


Figure 3.--Location of drill holes in the Leader NW quadrangle

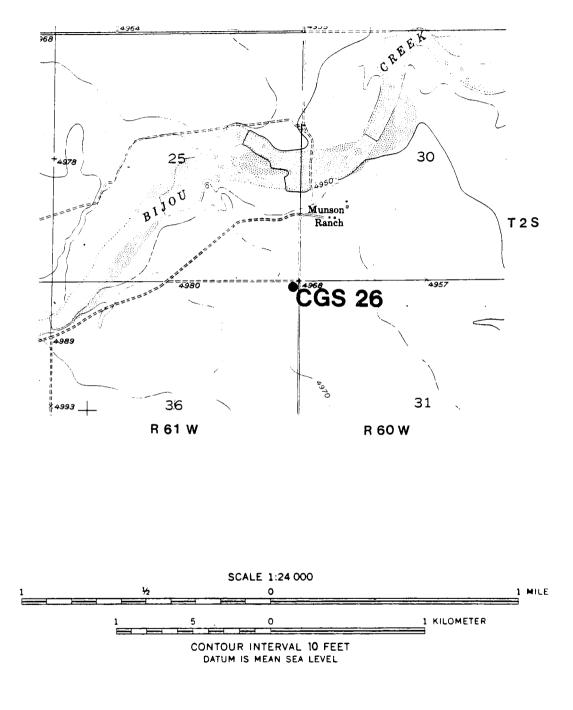


Figure 4.--Location of drill holes in the Leader SW quadrangle

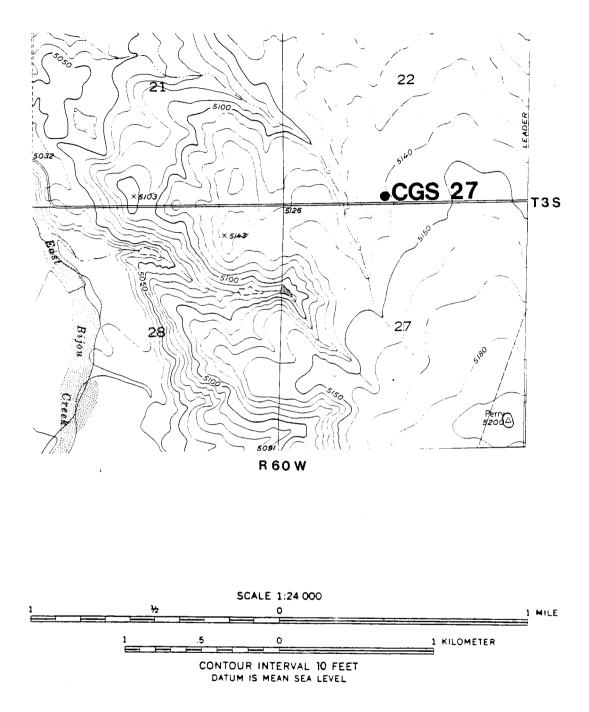


Figure 5.--Location of drill holes in the Leader SE quadrangle

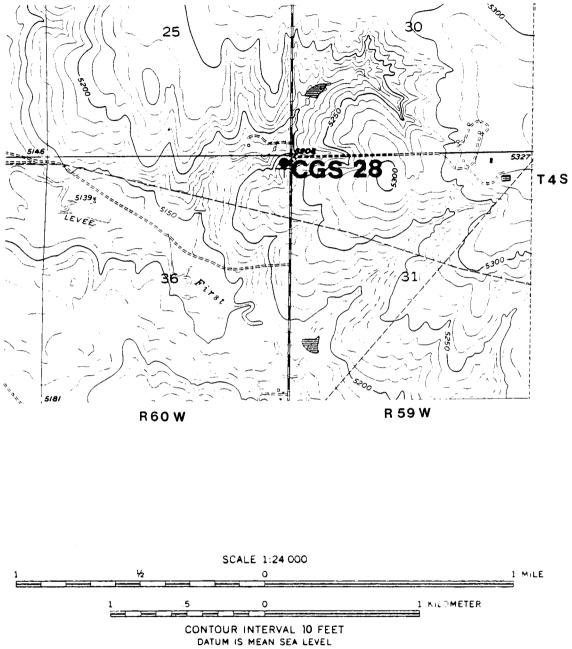
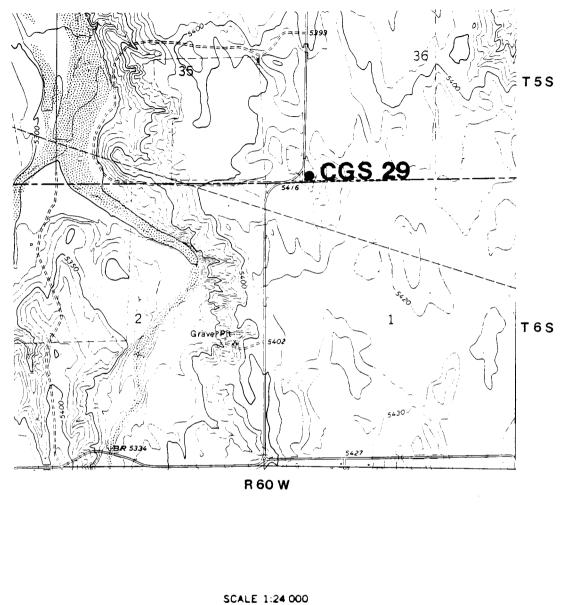


Figure 6.--Location of drill holes in the Peoria quadrangle



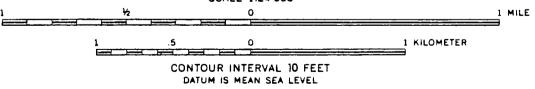
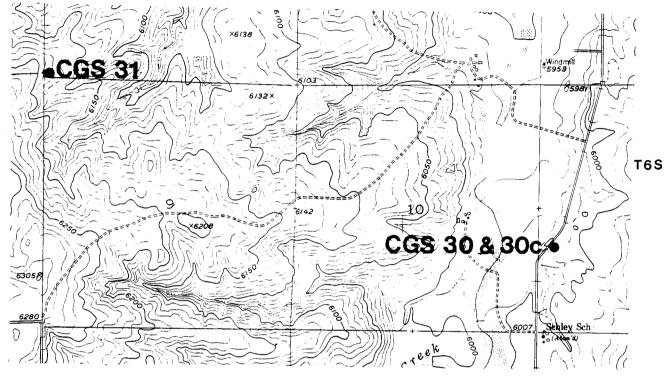


Figure 7.--Location of drill holes in the Deer Trail quadrangle '



R 64 W

	39'3	2'	25"
)	υ ų ²	31	' 4 9 "

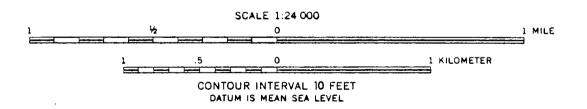


Figure 8.--Location of drill holes in the Watkins SE quadrangle

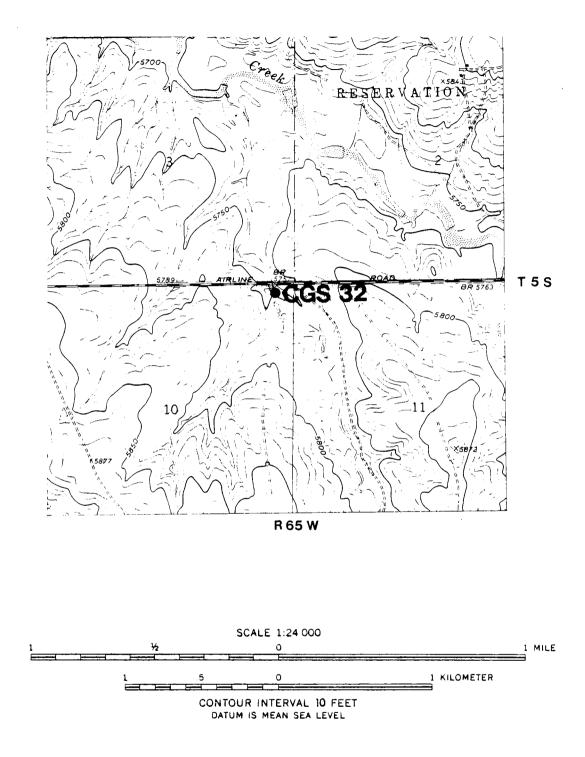


Figure 9.--Location of drill holes in the Coal Creek quadrangle

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

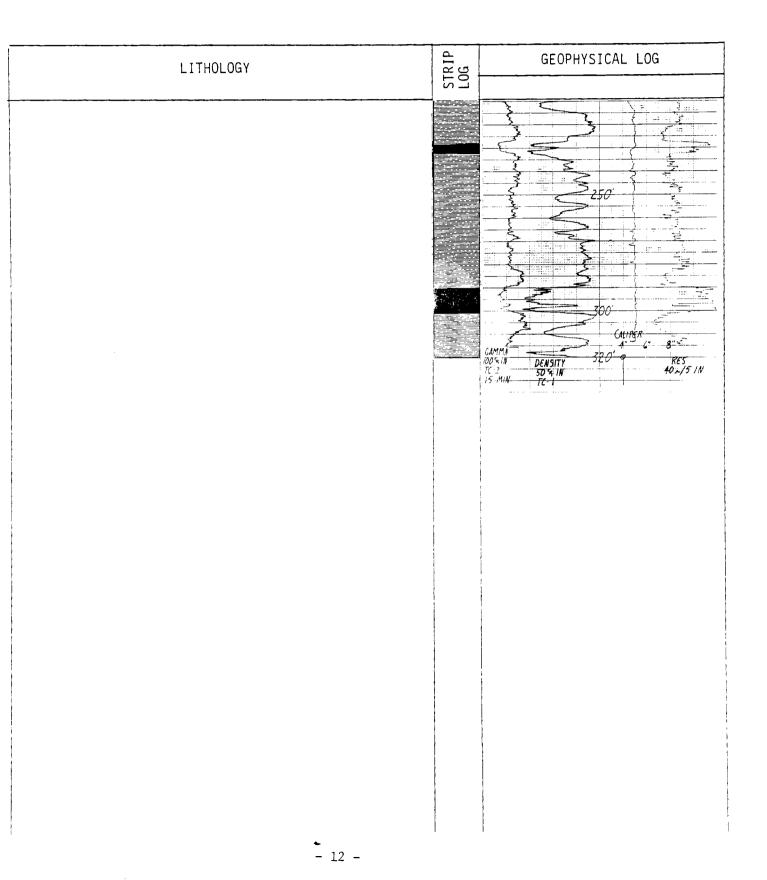
Hole No. CGS-17	State Colorad	o County	Arapahoe Da	ate lo	igged 3/1	.9/80 E 1	lev.(ft	:)5692
Location: T. 4	S., R. 64 W.,	secs. SE	SE18		Cored:	Yes	; N	lo x
Drilled depth 320	Logged dep	oth 320	Drilling Medium	Mud		Fluid	level	G.L.
<u>Geophysical logs</u> : Gamma (G): T.C Density (DEN) T.C Caliper (C): Resistance (Res):	. 1	Scale 10 Scale 50 Scale 2 Scale 40) cps/in 1 in/in		Logging Logging Logging Logging	speed speed	15 15	fpm fpm fpm fpm

Remarks: Watkins Quadrangle

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

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Hole No. $_{CGS-17}$ - Continued



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

Remarks: Box Elder School Quadrangle

	LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
		LO T	
Quaternary 0-22	Soft brown clay; slightly		
	silty		
22-30	Coarse sand and fine gravel		
Denver Formation 30-52 52-93	Claystone, blue gray Very fine argillaceous sand- stone with occasional clay- stone lenses		
93-138	Claystone; gray green		
138-174	Very fine argillaceous sand-		
	stone		
174-208	Claystone; occasionally silty, gray-green		
208-213	Lignite; brown black; soft		
213-305	Claystone with thin argil- laceous sandstone lenses, gray green		
305-315	Fine argillaceous sandstone		
315-340	Claystone; gray green		

Hole No.cGS-22 - Continued

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LITHOLOGY	GEOPHYSICAL LOG	

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

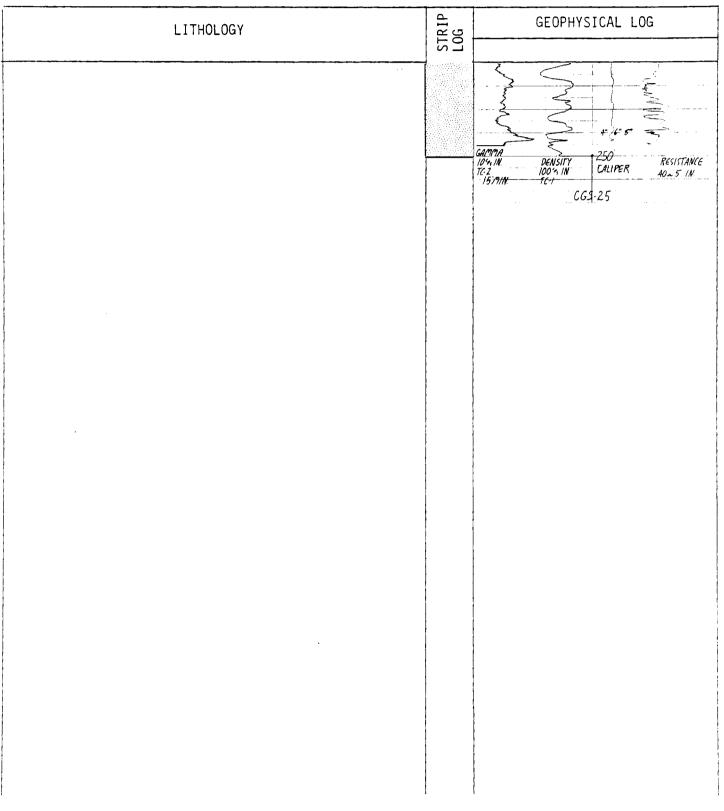
Hole No. CGS-25	State Colorad	do County	Adams	Date 1	ogged 3/3	26/80E1	ev.(ft)4893
Location: T. 1	S., R. 61 W.,	secs. SES	SE 36		Cored:	Yes	i N	οX
Drilled depth 250	Logged dep	oth 250	Drilling	Medium Mud		Fluid	level	5
Geophysical logs: Gamma (G): T. Density (DEN) T. Caliper (C): Resistance (Res):		Scale 10 Scale 100 Scale 4 Scale 40) cps/in in/in		Logging Logging Logging Logging	speed speed	15 15	fpm fpm fpm fpm

Remarks: Leader NW Quadrangle

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LITHOLOGY	STRIP 06	GEOPHYSICAL LOG
LITHOLOGY Quaternary 0-25 Silty sand; medium to coarse 25-85 Coarse sand and fine gravel interbedded with clay Laramie Formation 85-112 Very fine argillaceous sand- stone 112-138 Claystone with thin argil- laceous sandstone lenses; gray 138-140 Coal 140-147 Claystone; gray 147-157 Fine argillaceous sandstone 157-174 Claystone; gray 174-178 Coal 178-187 Claystone; gray Fox Hills Sandstone 187-218 Very fine to fine argil- laceous sandstone 218-250 Very fine to fine argillaceous sandstone interbedded with claystone; gray	LOG	GEOPHYSICAL LOG

Hole No. CGS-25 - Continued



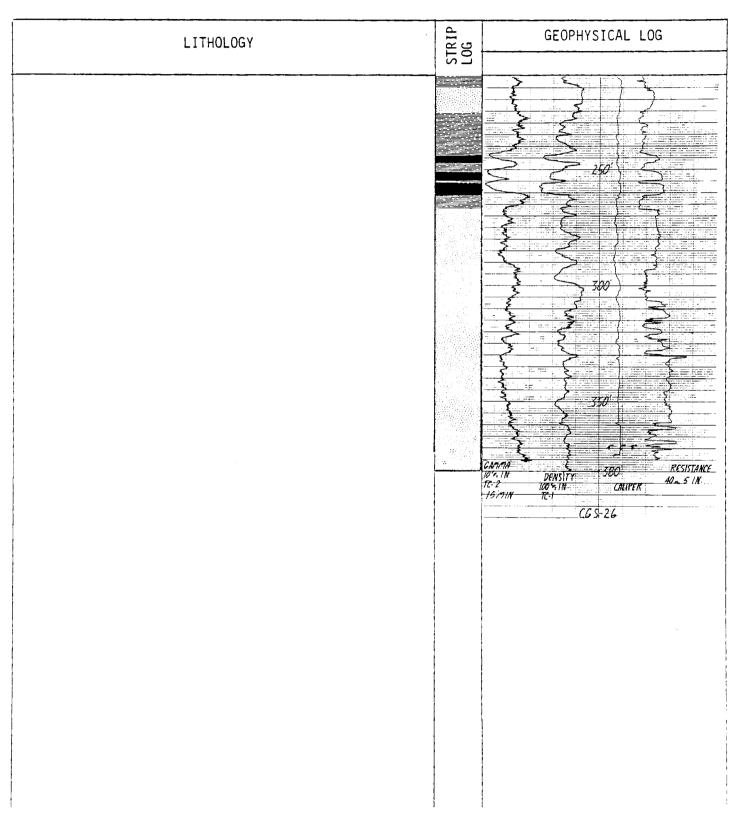
DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-26	State Colorad	do C <mark>ount</mark> y	· Adams	Date 10	ogged 3/2	_{6/80} E1	ev.(ft	.) ₄₉₆₈
Location: T. 2	S., R. 61 W.,	secs. NI	ene 36		Cored:	Yes	: N	lox.
Drilled depth 380	Logged de	pth 380	Drilling M	ledium Mud		Fluid	level	2
Geophysical logs: Gamma (G): T. Density (DEN) T. Caliper (C): Resistance (Res):		Scale 10 Scale 100 Scale 4 Scale 40	0 cps/in		Logging Logging Logging Logging	speed speed	15 15	fpm fpm fpm fpm

Remarks: Leader SW Quadrangle

	LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
Quaternary 0-85 85-95 Laramie Formation 95-215 215-225 225-244 244-247 247-251 251-255 255-256 256-261 261-267 Fox Hills Sandstone 267-380	Silty sand; fine to medium Coarse sand and fine gravel Claystone with fine argil- laceous sandstone lenses; gray Fine argillaceous sandstone Claystone; gray Coal Carbonaceous clay; brown Coal Claystone; gray Fine argillaceous sandstone interbedded with thin clay- stone lenses		
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Hole No. CGS-26 - Continued



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

Hole No. CGS-27	State Colora	io County A	dams Da	te logged 3/3	25/80 E]	ev.(ft)	5154
Location: T. 3	S., R. 60 W.,	secs. SWSW	22	Cored:	Yes	No	X
Drilled depth 380	Logged de	pth 380 Dr	illing Medium	Mud	Fluid	level	2
Geophysical logs: Gamma (G): T. Density (DEN) T. Caliper (C): Resistance (Res):		Scale 10 c Scale 100 c Scale 4 i Scale 40 o	ps/in n/in	Logging Logging Logging Logging	speed speed	15 15	fpm fpm fpm fpm

Remarks: Leader SE Quadrangle

	LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
Quaternary 0-24	Sandy silt; tan		
Laramie Formation	banay skiet, can		
24-195	Claystone with thin argil- laceous sandstone; gray		
195-203	Fine argillaceous sandstone		
203-281	Claystone with thin argil-		
	laceous lenses		
281-288	Coal		<u> </u>
288-313	Claystone; gray		\$ \$ \$ }
313-316	Coal		
316-324	Claystone; gray		
324-325	Coal		
325-353	Claystone; gray Coal		
<u>353-354</u> Fox Hills	CUAL		
Sandstone			
354-380	Fine argillaceous sandstone		
	5		
			3 3 1
			200
	- 19 -		•

Hole No. CGS-27 - Continued

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LITHOLOGY	STRIP LOG	GEOFHYSICAL LOG
		250/2 250/2 30

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

Hole No. CGS-28	State Colorado County	Arapahoe Date 1	ogged 3/2	25/80 Elev.(ft) 5215
Location: T. 4	S., R.60 W., secs. N	ENE 36	Cored:	Yes	No X
Drilled depth 280	Logged depth 280	Drilling Medium Mud	l	Fluid leve	5
Geophysical logs: Gamma (G): T. Density (DEN) T. Caliper (C): Resistance (Res):) cps/in 4 in/in			fpm fpm fpm fpm

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Remarks: Peoria Quadrangle

Quaternary 0-12 Sandy silt; brown 12-20 Coarse sand 20-39 Sandy silt brown Laramie Formation 39-132 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 245-280 Very fine argillaceous sand-stone 50' 150'		LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
	0-12 12-20 20-39 Laramie Formation 39-132 132-133 133-199 199-201 201-243 243-245 Fox Hills Sandstone	Coarse sand Sandy silt brown Claystone; gray; occasionally silty Carbonaceous clay; dark brown Claystone; gray Coal; black Claystone; gray Coal; black Very fine argillaceous sand-		

Hole No.CGS-28 - Continued

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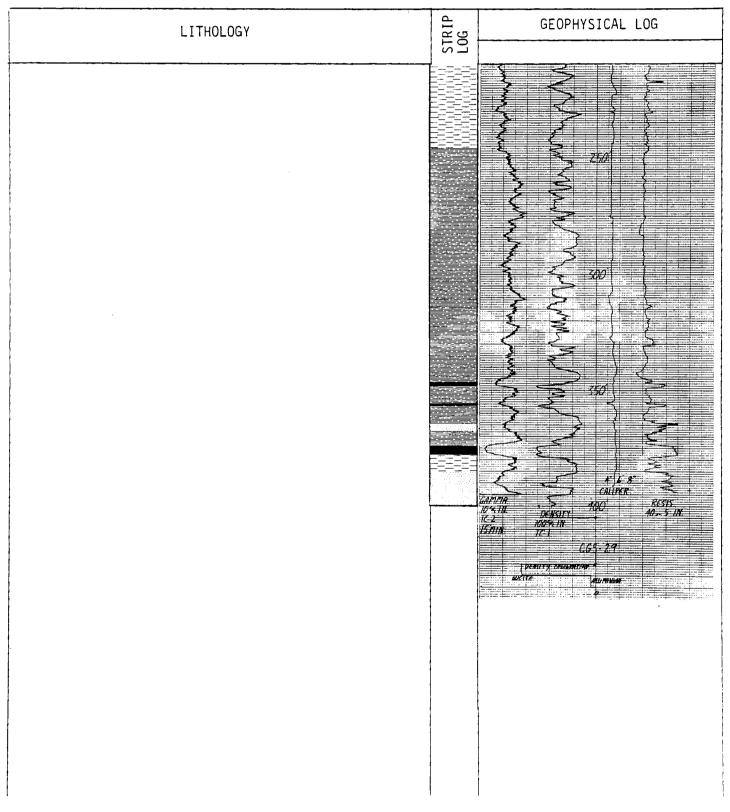
DRILL-HOLE LOG, DENVER EAST 1/2° X 1° QUADRANGLE

Hole No. CGS-29	State Colora	do County	Arapahoe	Date 10	ogged 3/2	25/80E1	ev.(ft) 5414
Location: T. 5	S., R.59 W.	, secs. SW	SW 36		Cored:	Yes	s N	οХ
Drilled depth 400	Logged de	epth 400	Drilling M	edium Mud		Fluid	level	2
Geophysical logs: Gamma (G): T. Density (DEN) T. Caliper (C): Resistance (Res):	C. 2 C. 1	Scale 10 Scale 10 Scale 4 Scale 4	0 cps/in 4 in/in		Logging Logging Logging Logging	speed speed	15 15	fpm fpm fpm fpm

Remarks: Deer Trail Quadrangle

LITHOLOGY Quaternary 0-14 Sandy silt tan-brown 14-55 Coarse sand interbedded with clay lenses Laramie Formation 55-164 Very fine argillaceous sand- stone 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	GEOPHYSICAL LOG
Sandstone 385-400 Very fine argillaceous sand- stone	

Hole No. CGS-29 - Continued



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

Hole No. CGS-30	State Colora	do County	Elbert	Date 1	ogged 3/2	23/80E1	ev.(f	t)5993
Location: T. 6	S., R.63 W.,	secs. SU	USW 11		Cored:	Yes	X	No
Drilled depth 720	Logged de	pth 720	Drilling	Medium Mud		Fluid	level	G.L.
Geophysical logs: Gamma (G): T Density (DEN) T Caliper (C): Resistance (Res):	.C. 1	Scale 10 Scale 50 Scale 2 Scale 60) cps/in		Logging Logging Logging Logging	speed speed	15 15	fpm fpm fpm fpm

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

	LITHOLOGY	STRIP LOG	GEOPHYSICAL LOG
0			
Quaternary 0-21	Fine to medium sand		
21-37 Dawson Arkose	Coarse sand and fine gravel		
37-48	Claustonet gray grass	8	
48-89	Claystone; gray green		
40-09	Very fine to fine argillaceous sandstone with occasional		$\left\{ \left\{ \left$
	siltstone lenses		
89-139			
139-160	Claystone gray green Fine argillaceous sandstone		
Denver Formation	rine argillaceous sandstone		8 3 3 3
160-239	Claustone grou groon		
239-266	Claystone gray green Fine to medium argillaceous		
239-200	-		
266-345	sandstone; coarsening downward		
266-343	Claystone with occasional		2215
245 261	sandstone lenses		
345-361	Lignite brown black		
361-423	Fine argillaceous sandstone		
423-439	Lignite; brown black; many		
100 115	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 argil-		
501 (00	laceous sandstone lenses		
591-620	Lignite; brown black; many clay splits		
620-687	Claystone with thin argil-		\$ 29 } 5
020 007	laceous sandstone lenses		
687-693	Lignite; brown black		
693-720	Claystone with thin argil-		
	laceous sandstone lenses		
	- 25	-	

Hole No. CGS-30 - Continued

LITHOLOGY	GEOPHYSICAL LOG

Hole No. cGs-30 - Continued

LITHOLOGY	GEOPHYSICAL LOG
	Chrome Density Control Density Testing Control Density Control Density
- 27	-

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

Hole No. CGS-31	State Colora	do Count	y Elbert	Date 1	ogged 3/2	1/80 Elev	.(ft) 6187
Location: T. 6	S., R.64 W.,	secs. S	WSW 4		Cored:	Yes	No X
Drilled depth 900	Logged de	pth 900	Drilling Med	dium Mud		Fluid lev	/el G.L.
Geophysical logs: Gamma (G): T. Density (DEN) T. Caliper (C): Resistance (Res):		Scale Scale Scale Scale	10 cps/in 50 cps/in 2 in/in 50 ohm/5in		Logging Logging	speed 15 speed 15 speed 15 speed 15	fpm 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		
1	sandstone; occasionally		
- -	arkosic; contains thin clay-		
	stone lenses		
Denver Formation			
237-276	Claystone; gray green; occa- sional argillaceous sandstone lenses		
276-305	Very fine to medium argil- laceous 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; occa- sionally silty with thin argil- laceous sandstone lenses	-	
602-614	Lignite; brown black		
614-651	Claystone; gray green; occa-		
	sionally silty with thin argil	-	
	laceous sandstone lenses		

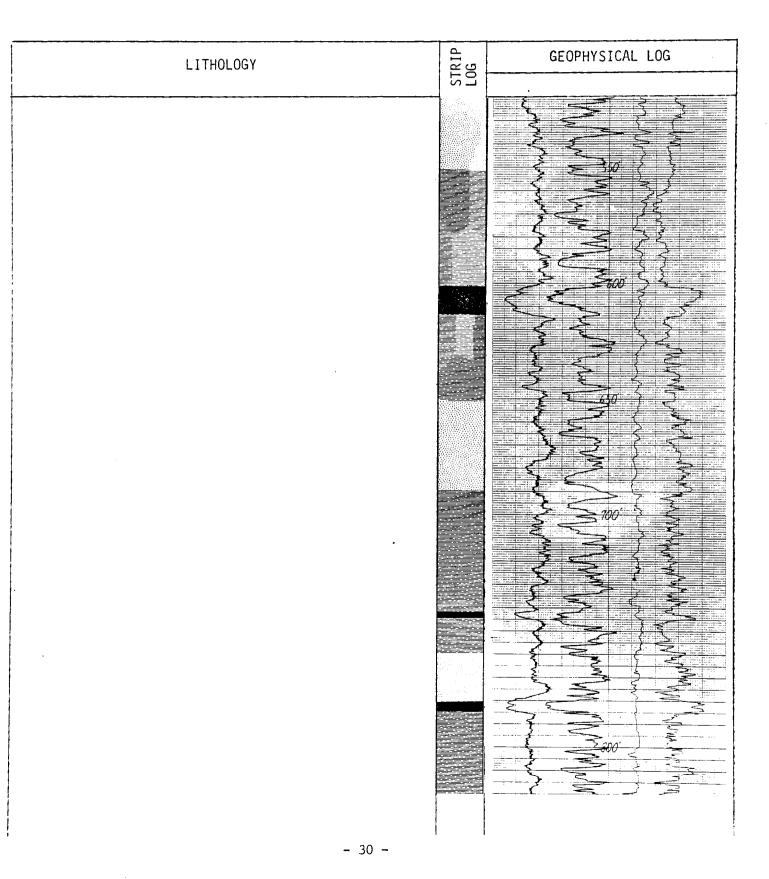
Hole No. CGS-31 - Continued

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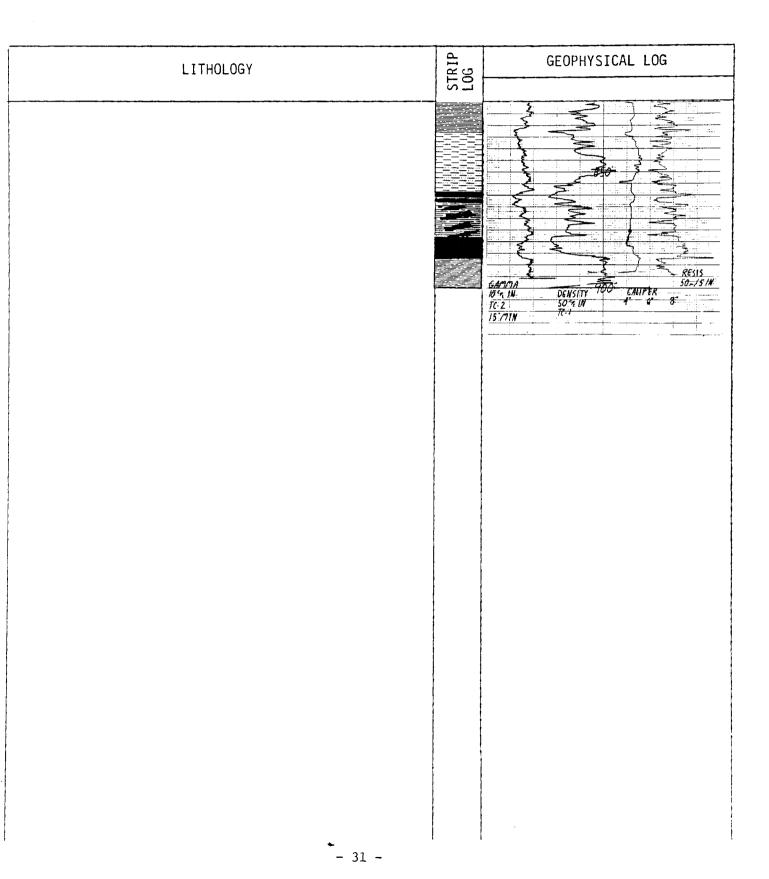
651-690 690-743 743-745 745-760 760-781 781-785 785-833 833-859 859-887 887-900	Fine to medium argillaceous sand stone Claystone; occasionally silty; gray green Lignite; brown black Claystone; occasionally silty; gray green Fine argillaceous sandstone Lignite; brown black Claystone; gray green Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown Claystone; gray	T STRIP LOG	
690-743 743-745 745-760 760-781 781-785 785-833 833-859 859-887	<pre>stone Claystone; occasionally silty; gray green Lignite; brown black Claystone; occasionally silty; gray green Fine argillaceous sandstone Lignite; brown black Claystone; gray green Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown</pre>		
743-745 745-760 760-781 781-785 785-833 833-859 859-887	Claystone; occasionally silty; gray green Lignite; brown black Claystone; occasionally silty; gray green Fine argillaceous sandstone Lignite; brown black Claystone; gray green Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown		
745-760 760-781 781-785 785-833 833-859 859-887	Lignite; brown black Claystone; occasionally silty; gray green Fine argillaceous sandstone Lignite; brown black Claystone; gray green Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown		
745-760 760-781 781-785 785-833 833-859 859-887	Claystone; occasionally silty; gray green Fine argillaceous sandstone Lignite; brown black Claystone; gray green Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown		
760-781 781-785 785-833 833-859 859-887	gray green Fine argillaceous sandstone Lignite; brown black Claystone; gray green Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown		
781-785 785-833 833-859 859-887	Lignite; brown black Claystone; gray green Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown		
785–833 833–859 859–887	Lignite; brown black Claystone; gray green Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown		
785–833 833–859 859–887	Claystone; gray green Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown		
833-859 859-887	Siltstone; gray Lignite very dirty and carbona- ceous clay; brown dark brown		
859-887	Lignite very dirty and carbona- ceous clay; brown dark brown		
	ceous clay; brown dark brown		
887-900			
887-900	Claystone; gray		
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		a series and the series of the	

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Hole No. CGS-31 - Continued



Hole No. CGS-31 - Continued



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

Hole No. CGS-32	State Colorado	County	Arapahoe Date	logged 3/2	0/80 E1	lev.(ft)) 5755
Location: T. 4	S., R. 65 W., se	CS. NE	NE 10	Cored:	Yes	s No	σх
Drilled depth 580	Logged depth	5 80	Drilling Medium Mud		Fluid	level	4
Geophysical logs: Gamma (G): T. Density (DEN) T. Caliper (C): Resistance (Res):	C. 1 Sc Sc	ale 50 ale 2	cps/in cps/in in/in ohm/in	Logging Logging Logging Logging	speed speed	15 15	fpm fpm fpm fpm

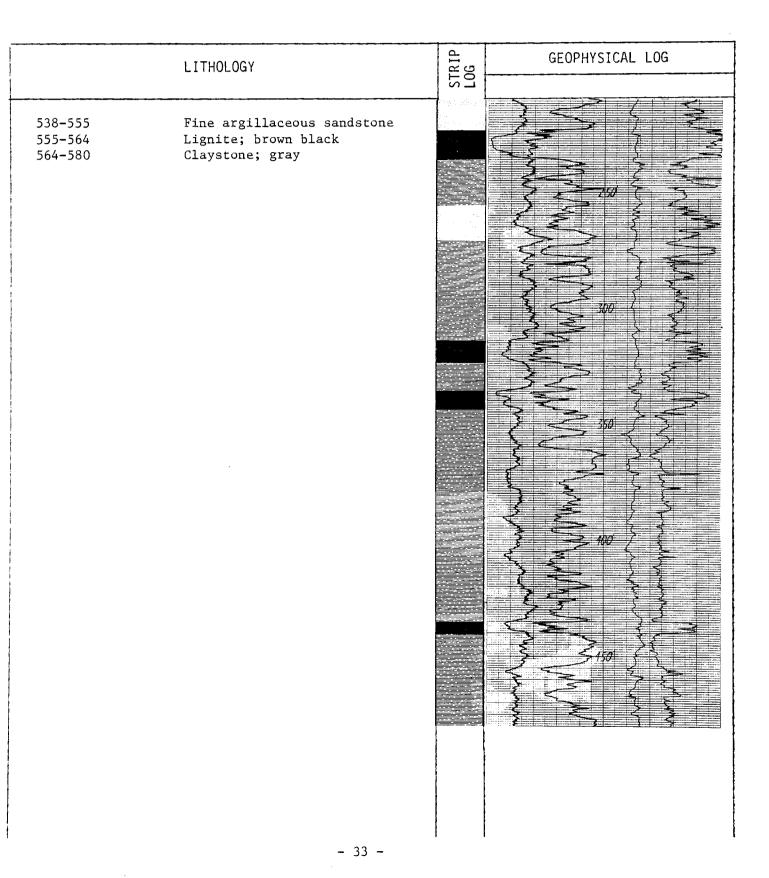
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Remarks: Coal Creek Quadrangle

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOG
		STF LOC	
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		│ <mark>╭³ _┲ →</mark> ╱
195-223	Fine argillaceous sandstone		
223-235	Lignite; brown black		
235-255	Claystone; gray		
255-270	Fine argillaceous sandstone		
270-314	Claystone with occasional silt-		
	stone 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		1
	argillaceous sandstone lenses	ł	

Hole No. CGS-32 - Continued



Hole No.CGS-32 - Continued

LITHOLOGY		STRIP LOG	GEOPHYSICAL LOG
		LOG	Sold Sold Sold Sold Sold Sold Sold Sold
	- 34 -		

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.	٧	COAL IOIST FRE	E
PROXIMATE ANALYSIS MOISTURE VOLATILE MATTER FIXED CARBON ASH		21.84 14.30		N/A 30.23 19.79 49.98	
ULTIMATE ANALYSIS HYDROGEN CARBON NITROGEN SULFER OXYGEN (DIFF) ASH CHLORINE HEATING VALUE BTU/LB		23.67 0.49 0.51 9.12 36.11		3.24 32.76 0.68 0.71 12.62 49.98	
SULFUR FORMS SULFATE PYRITIC ORGANIC	· · · · · · · · · · ·		• • • • • • • • • • • • • • • • • • • •		
EQUILIBRIUM MOISTURE	• • • • • • • • •	•••••	. 24.36		
MOIST, MINERAL MATTER FREE,	, BTU 67	53			
APPARENT RANK LIGNITE A					
NOTE: ANALYSIS INCLUDES AL	L CLAY PAF	RTINGS			

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MINERAL ANALYSIS OF ASH	PERCENT WEIGHT IGNITED BASIS
SILICA, SIO	51.87
ALUMINA, A1 ₂ 0	33.47
TITANIA, TIO ₂	1.36
FERRIC OXIDE, Fe ₂ 0 ₃	2.68
LIME, CaO	3.95
MAGNESIA, MgO	0.52
POTASSIUM OXIDE, K ₂ O	1.38
SODIUM OXIDE, Na ₂ O	0.37
SULFUR TRIOXIDE, SO ₃ PHOS. PENTOXIDE, P ₂ 0 ₅ UNDETERMINED	3.49 0.20 <u>0.71</u> 100.00
ALKALIES AS Na ₂ 0, 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

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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 FRE	EE
PROXIMATE ANALYSIS MOISTURE VOLATILE MATTER FIXED CARBON ASH	••••••••••	30.92 22.67 20.97 25.44	• • • • • • • • • • • • • • • • • • •	32.82	• • • • • • • • • • • • • • • • • • •
ULTIMATE ANALYSIS HYDROGEN CARBON NITROGEN SULFER OXYGEN (DIFF) ASH CHLORINE		2.52 30.67 0.59 0.26 9.59 25.44 0.01		44.40 0.85 0.37	
HEATING VALUE BTU/LB	•••••	5164	•••••	7476	••••
SULFUR FORMS SULFATE PYRITIC ORGANIC	•••••	0.00 0.01 0.25	•••••	0.00 0.02 0.35	•••••
EQUILIBRIUM MOISTURE	•••••	• • • • • • • • • •	. 28.87		
MOIST, MINERAL MATTER FREE,	BTU 707	79			
APPARENT RANK LIGNITE A					

NOTE: ANALYSIS INCLUDES ALL CLAY PARTINGS

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PERCENT WEIGHT IGNITED BASIS MINERAL ANALYSIS OF ASH SILICA, Si0 55.32 ALUMINA, A1²0₃ TITANIA, Ti0₂ 28.34 1.20 FERRIC OXIDE, Fe₂0₃ 2.56 6.67 LIME, CaO 0.86 MAGNESIA, MgO POTASSIUM OXIDE, K20 1.00 SODIUM OXIDE, Na₂0 0.27 SULFUR TRIOXIDE, SO3 2.61 PHOS. PENTOXIDE, P205 0.72 UNDETERMINED 0.45 100.00 ALKALIES AS Na₂0, 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

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SLAGGING INDEX = <0.6

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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.	٨	COAL 10IST FRI	EE
PROXIMATE ANALYSIS MOISTURE VOLATILE MATTER FIXED CARBON ASH	•••••	26.98 21.91 17.67 33.44	•••••	N/A 30.00 24.21 45.79	• • • • • • • • • • • • • • • • • • •
ULTIMATE ANALYSIS HYDROGEN CARBON NITROGEN SULFER OXYGEN (DIFF) ASH CHLORINE		2.55 25.84 0.46 0.34 10.38 33.44 0.01		3.49 35.39 0.63 0.34 14.22 45.79 0.01	
HEATING VALUE BTU/LB	•••••	4521	••••	6192	•••••
SULFUR FORMS SULFATE PYRITIC ORGANIC	•••••	0.01 0.04 0.29	•••••	0.02 0.06 0.39	•••••
EQUILIBRIUM MOISTURE	••••	• • • • • • • • • •	. 25.94		
MOIST, MINERAL MATTER FREE,	BTU 70	048			
APPARENT RANK LIGNITE A					
NOTE: ANALYSIS INCLUDES AL	L CLAY PAR	TINGS			

MINERAL ANALYSIS OF ASH	PERCENT WEIGHT IGNITED BASIS
SILICA, SiO ALUMINA, A1 ₂ 0 TITANIA, Ti0 ₂	53.46 31.73 1.26
FERRIC OXIDE, Fe ₂ 0 ₃ LIME, CaO MAGNESIA, MgO POTASSIUM OXIDE, K ₂ 0 SODIUM OXIDE, Na ₂ 0	2.58 4.65 0.92 1.21 0.36
SULFUR TRIOXIDE, SO ₃ PHOS. PENTOXIDE, P ₂ O ₅ UNDETERMINED	2.66 0.36 <u>0.81</u> 100.00
ALKALIES AS Na ₂ 0, DRY COAL BASIS SILICA VALUE BASE: ACID RATIO ESTIMATED VISCOSITY AT CRITICAL VIS TEMPERATURE OF XXXXX °F = XXXXX POI 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: -

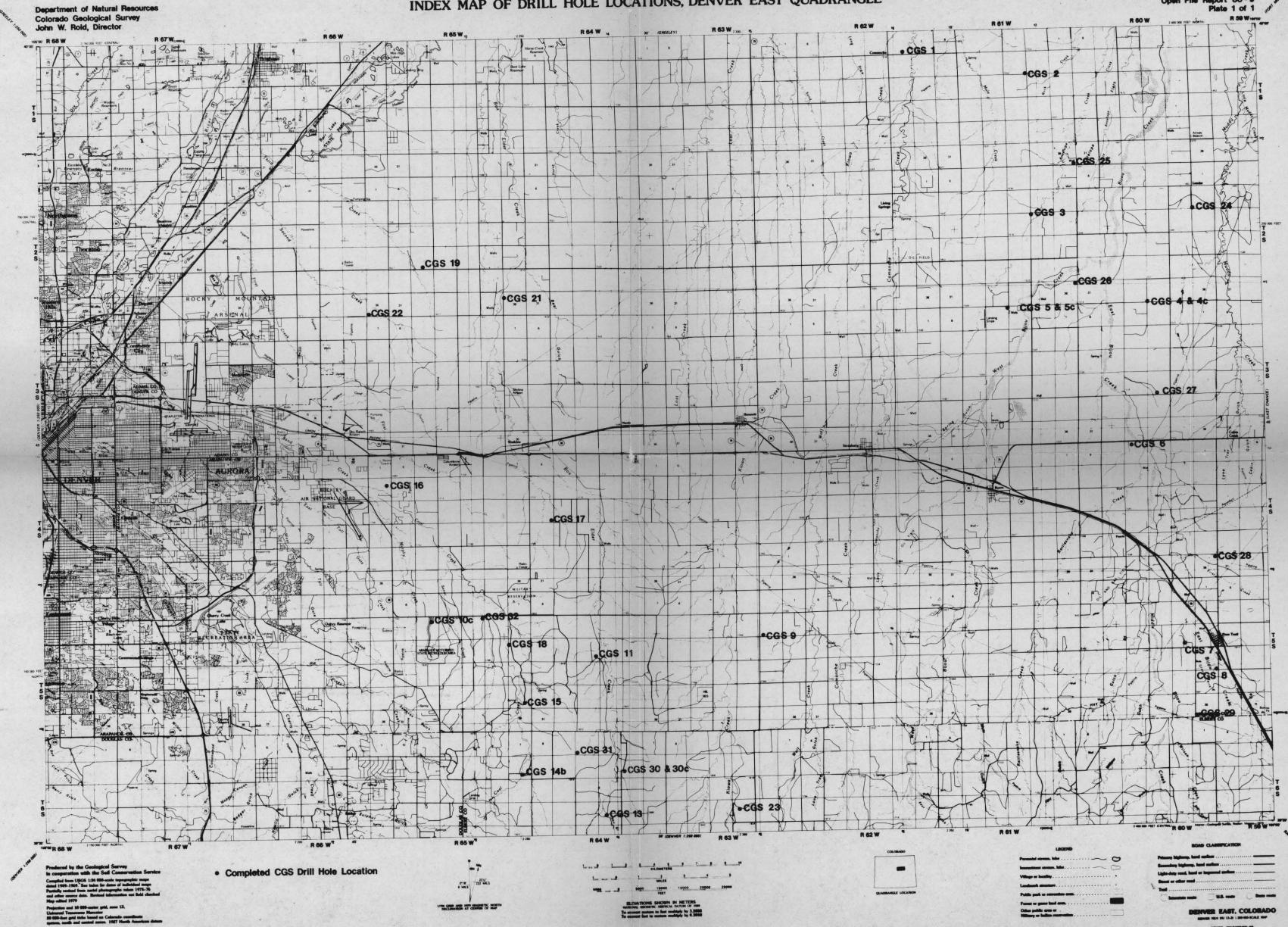
DATE OF SAMPLING: 3/22/80 DATE RECEIVED: 6/26/80 DATE OF REPORT: 7/11/80 COLLECTOR: K. BRAND

		COAL AS RECD.	Μ	COAL IOIST FRE	EE
PROXIMATE ANALYSIS MOISTURE VOLATILE MATTER FIXED CARBON ASH	· · · · · · · · · · · · · · · · · · ·	26.37 20.76 18.16 34.71	•••••	N/A 28.20 24.66 47.14	• • • • • • • • • • • • • • • • • • •
ULTIMATE ANALYSIS HYDROGEN CARBON NITROGEN SULFER OXYGEN (DIFF) ASH CHLORINE		2.27 26.64 0.60 0.29 9.06 34.71 0.06		3.08 36.18 0.81 0.39 12.32 47.14 0.08	
HEATING VALUE BTU/LB	•••••	4524	••••	6144	•••••
SULFUR FORMS SULFATE PYRITIC ORGANIC	•••••	0.00 0.04 0.25	••••	0.00 0.05 0.34	••••
EQUILIBRIUM MOISTURE	••••	• • • • • • • • • •	. 25.22)		
MOIST, MINERAL MATTER FREE,	BTU 71	195			
APPARENT RANK LIGNITE A					
NOTE: ANALYSIS INCLUDES AL	L CLAY PART	FINGS			

MINERAL ANALYSIS OF ASH	PERCENT WEIGHT IGNITED BASIS
SILICA, SIO ALUMINA, A1 ₂ 0 ₃ TITANIA, TIO ₂	58.95 28.15 1.07
FERRIC OXIDE, Fe ₂ 0 ₃ LIME, CaO MAGNESIA, MgO POTASSIUM OXIDE, K ₂ O SODIUM OXIDE, Na ₂ O	2.43 4.27 0.98 1.36 0.31
SULFUR TRIOXIDE, SO ₃ PHOS. PENTOXIDE, P ₂ O ₅ UNDETERMINED	$2.55 \\ 0.20 \\ 0.00 \\ 100.27$
ALKALIES AS Na ₂ 0, DRY COAL BASIS SILICA VALUE BASE: ACID RATIO ESTIMATED VISCOSITY AT CRITICAL VIS TEMPERATURE OF XXXXX °F = XXXXX POI T ₂₅₀ TEMPERATURE = >2900 °F	
FOULING INDEX = <0.2 SLAGGING INDEX = <0.6	

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INDEX MAP OF DRILL HOLE LOCATIONS, DENVER EAST QUADRANGLE



This map complies with antional map accuracy standards

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