Reconnaissance drilling during 1980 in the Goose Creek coal field, Cassia County, Idaho

by

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and nomenclature.
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English-Metric Conversion

[The metric system is not currently used to compute coal, oil, and gas
resources in the United States]

<table>
<thead>
<tr>
<th>English unit</th>
<th>multiplied by</th>
<th>Metric unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mile</td>
<td>=</td>
<td>1.609 Kilometers</td>
</tr>
<tr>
<td>Square mile</td>
<td>=</td>
<td>2.59 Square kilometers</td>
</tr>
<tr>
<td>Foot</td>
<td>=</td>
<td>.3048 Meter</td>
</tr>
<tr>
<td>Inch</td>
<td>=</td>
<td>2.54 Centimeter</td>
</tr>
</tbody>
</table>
INTRODUCTION

The Goose Creek coal field comprises an area of approximately 260 square miles in southern Idaho and adjacent parts of Nevada and Utah (fig. 1). Reconnaissance drilling was performed in the area during 1980 as part of a geological investigation conducted by the U.S. Geological Survey. Six holes were drilled on public domain in Cassia County, Idaho, to help determine the subsurface stratigraphy of uranium-bearing lignite reported in the area (Mapel and Hail, 1959).

Geologic setting

Lignite in the Goose Creek field is in several zones in the Idavada Volcanics of Miocene age (Mapel and Hail, 1959; Axelrod, 1964). These formations consist of interbedded volcanic ash, tuff, and fluvial and lacustrine sediments. The general stratigraphy and current nomenclature applied to the Tertiary in the Goose Creek field and vicinity are given in table 1.

Acknowledgments

The cooperation of the Bureau of Land Management and the U.S. Forest Service during this investigation was greatly appreciated. Mr. W. B. Whiteley and Mr. M. W. Cranney granted access through privately owned land in the area.
Figure 1.—Index map showing drill hole locations in the Goose Creek field, Cassia County, Idaho.
Table 1.—Stratigraphy and nomenclature of rock units in the Goose Creek field and vicinity (modified from Axelrod, 1964).

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Approx. thickness (feet)</th>
<th>Mapel and Hail (1959)</th>
<th>Axelrod (1964)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivine basalt flows and associated sedimentary rocks.</td>
<td>300</td>
<td>not in area</td>
<td>Banbury Basalt</td>
</tr>
<tr>
<td>Brown to gray quartz latite welded tuffs and flows; some vitric ash, and thin ashy sedimentary rocks locally.</td>
<td>700</td>
<td>Salt Lake Formation</td>
<td>Cougar Point Formation</td>
</tr>
<tr>
<td>White vitric ash and tuff; few quartz latite welded tuffs; thin sandstone, conglomerate, and lake beds.</td>
<td>1,500</td>
<td>lower</td>
<td>Jenny Creek Formation</td>
</tr>
<tr>
<td>Pumiceous shale and ash, carbonaceous shale, diatomite, sandstone, and conglomerate beds.</td>
<td>900</td>
<td>Payette(?) Formation</td>
<td>Beaverdam Formation</td>
</tr>
<tr>
<td>Quartz latite porphyry and rhyolite porphyry.</td>
<td>1,000</td>
<td>rhyolite</td>
<td>Jarbridge Rhyolite</td>
</tr>
<tr>
<td>Chiefly Paleozoic marine sediments; some Precambrian metasediments; Mesozoic granitics</td>
<td>2,000+</td>
<td>Pre-Tertiary rocks</td>
<td>Pre-Tertiary rocks</td>
</tr>
</tbody>
</table>
DESCRIPTION OF DRILLING PROGRAM

Drilling in the Goose Creek field was performed during August 1980, by Jim Feighny Drilling, Inc., under Government Contract Number 14-08-0001-18795. Nine drill holes were originally staked in an area south and west of Oakley, in Cassia County, Idaho. Only six of the holes were actually drilled, however, due to impassible conditions of existing roads. The locations of the drill sites are shown in figure 1; table 2 contains descriptive information for each hole, including location, ground elevation, and total depth drilled and intervals cored.

All drilling was done with a portable (truck-mounted) drill rig, using a heavy drilling mud to prevent caving of the hole wall. Drill cuttings were collected from each hole at 5-ft intervals with a fine-mesh wire strainer and used to construct preliminary lithologic logs of the holes, following the procedures outlined in Hobbs (1979).

Four of the six rotary holes, GC-1C, GC-2C, GC-3C, and GC-4C, were "twinned" (re-drilled within a few yards of the initial hole) in order to obtain core samples of the lignite and associated rock. Each of these holes was drilled with compressed air and a conventional core barrel fitted with a diamond-studded coring bit was used in obtaining the core samples.
Table 2.—Drill hole numbers, locations, surface elevations, and depths drilled for six drill holes in the Goose Creek field, Cassia County, Idaho

[Elevations estimated from topographic base maps. C after drill hole number indicates cored hole]

<table>
<thead>
<tr>
<th>Drill hole number</th>
<th>Location</th>
<th>USGS 7.5' quadrangle</th>
<th>Surface elevation (feet)</th>
<th>Total depth and [intervals cored] (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC-1C</td>
<td>SE 1/4, 33</td>
<td>Blue Hill</td>
<td>5,585</td>
<td>390 [80.0-170.0]</td>
</tr>
<tr>
<td>GC-2C</td>
<td>NW 1/4, 25</td>
<td>Blue Hill</td>
<td>5,250</td>
<td>645 [30.0-50.0; 205.0-235.0; 240.0-315.0]</td>
</tr>
<tr>
<td>GC-3C</td>
<td>NE 1/4, 14</td>
<td>Blue Hill</td>
<td>4,925</td>
<td>403 [240.0-250.0]</td>
</tr>
<tr>
<td>GC-4C</td>
<td>NW 1/4, 34</td>
<td>Oakley</td>
<td>4,900</td>
<td>520 [no core recovered]</td>
</tr>
<tr>
<td>GC-5</td>
<td>NE 1/4, 31</td>
<td>Ibex Peak</td>
<td>5,920</td>
<td>312</td>
</tr>
<tr>
<td>GC-9</td>
<td>SW 1/4, 1</td>
<td>Severe Spring</td>
<td>5,250</td>
<td>520</td>
</tr>
</tbody>
</table>

The following three holes were staked but were inaccessible to the drill rig

<table>
<thead>
<tr>
<th>Drill hole number</th>
<th>Location</th>
<th>USGS 7.5' quadrangle</th>
<th>Surface elevation (feet)</th>
<th>Total depth and [intervals cored] (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC-6</td>
<td>SE 1/4, 17</td>
<td>Ibex Peak</td>
<td>5,820</td>
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<tr>
<td>GC-7</td>
<td>W 1/2, 21</td>
<td>Ibex Peak</td>
<td>5,300</td>
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<tr>
<td>GC-8</td>
<td>NE 1/4, 26</td>
<td>Ibex Peak</td>
<td>5,230</td>
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</tbody>
</table>
In general, the lignite-bearing strata in the study area are poorly consolidated and difficult to sample using conventional coring methods. Rocks of the target intervals in core holes GC-1C and GC-2C were fairly incompetent, resulting in poor core recovery. Artesian water encountered at a depth of approximately 60 feet in core holes GC-3C and GC-4C was a major problem during the coring operations. Casing was used in hole GC-3C with limited success toward core recovery; GC-4C was abandoned.

Results of geophysical logging

Geophysical logs—natural gamma, gamma-gamma (density), resistivity, and caliper—were obtained for holes GC-1C, GC-2C, GC-3C, and GC-5. Spontaneous potential (S.P.) and neutron logs, in addition to the aforementioned logs, were obtained for holes GC-4C and GC-9 (no caliper log was made for GC-4C). Copies of the geophysical logs are included in the appendix.

Preliminary interpretation of the geophysical logs in conjunction with available core and cuttings indicate that bed thicknesses and lithologies vary widely from the basin interior to the margins. In particular, thickness and ash content of the lignite zones have high lateral variability, becoming increasingly thin and dirty towards the basin margins. Natural radioactivity of the lignite zones is anomalous in the southern and eastern parts of the study area, where the lignite is interbedded with sandstones.
REFERENCES


APPENDIX

Geophysical logs from six drill holes in the

Goose Creek field, Cassia County, Idaho
**EXPLANATION OF STRIP LOG PATTERNS**

**MAJOR LITHOLOGY**

- ![Alluvium; colluvium](image)
  - Alluvium; colluvium

- ![Air-fall tuff](image)
  - Air-fall tuff

- ![Tuff, water-laid, sandy, silty](image)
  - Tuff, water-laid, sandy, silty

- ![Altered volcanic ash (smectite)](image)
  - Altered volcanic ash (smectite)

- ![Welded tuff; vitrophyre](image)
  - Welded tuff; vitrophyre

- ![Sandstone, tuffaceous](image)
  - Sandstone, tuffaceous

- ![Sandstone, conglomeratic](image)
  - Sandstone, conglomeratic

- ![Siltstone, sandy, clayey](image)
  - Siltstone, sandy, clayey

- ![Carbonaceous shale; lignite](image)
  - Carbonaceous shale; lignite
HOLE NO.: GC-1C  GROUND ELEV. (EST.): 5,585 ft
LOCATION:  SE 1/4, sec. 33, T. 15 S., R. 21 E.
TOTAL DEPTH: 390 ft  CORED: YES

GEOPHYSICAL LOGS:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Scale</th>
<th>Logging Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURAL GAMMA (G)</td>
<td>2 sec 25 cps/log div</td>
<td>15 ft/min</td>
</tr>
<tr>
<td>DENSITY (DEN)</td>
<td>2 sec 154 cps/log div</td>
<td>15 ft/min</td>
</tr>
<tr>
<td>RESISTANCE (RES)</td>
<td>2 sec 30 Ω/log div</td>
<td>15 ft/min</td>
</tr>
<tr>
<td>CALIPER (CAL)</td>
<td>2 sec 1 in/log div</td>
<td>30 ft/min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth</th>
<th>Strip</th>
<th>Geophysical Logs</th>
<th>Depth</th>
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<tbody>
<tr>
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<td>300</td>
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</table>

Diagram showing log data with depth and scale details.
HOLE NO.: GC-2C  
GROUND ELEV. (EST.): 5,250 ft

LOCATION: NW 1/4, sec. 25, T. 16 S., R. 21 E.

TOTAL DEPTH: 645 ft  
CORED: YES  

GEOPHYSICAL LOGS:

<table>
<thead>
<tr>
<th>Log</th>
<th>Time (sec)</th>
<th>Scale</th>
<th>Logging Speed</th>
</tr>
</thead>
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<tr>
<td>Natural Gamma (G)</td>
<td>2</td>
<td>25 cps/log div</td>
<td>15 ft/min</td>
</tr>
<tr>
<td>Density (DEN)</td>
<td>2</td>
<td>154 cps/log div</td>
<td>15 ft/min</td>
</tr>
<tr>
<td>Resistance (RES)</td>
<td>2</td>
<td>30 Ω/log div</td>
<td>15 ft/min</td>
</tr>
<tr>
<td>Caliper (CAL)</td>
<td>2</td>
<td>1 in/log div</td>
<td>30 ft/min</td>
</tr>
</tbody>
</table>

**Diagram:**

<table>
<thead>
<tr>
<th>Depth (M)</th>
<th>Depth (FT)</th>
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<tbody>
<tr>
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</tbody>
</table>

**Graphs:**

- Geophysical logs showing variations in natural gamma, density, resistance, and caliper with depth.

**12**
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>STRIP LOG</th>
<th>GEOPHYSICAL LOGS</th>
<th>DEPTH</th>
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<tbody>
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<tr>
<td>0</td>
<td>500</td>
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</tbody>
</table>

13
HOLE NO.: GC-3C  GROUND ELEV. (EST.): 4,925 ft
LOCATION: NE 1/4, sec. 14, T. 15 S., R. 21 E.
TOTAL DEPTH: 403 ft  CORED: YES X NO

GEOPHYSICAL LOGS:

<table>
<thead>
<tr>
<th>T.C.</th>
<th>SCALE</th>
<th>LOGGING SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURAL GAMMA (G): 2 sec</td>
<td>25 cps/log div</td>
<td>15 ft/min</td>
</tr>
<tr>
<td>DENSITY (DEN): 2 sec</td>
<td>154 cps/log div</td>
<td>15 ft/min</td>
</tr>
<tr>
<td>RESISTANCE (RES): 2 sec</td>
<td>30 Ω/log div</td>
<td>15 ft/min</td>
</tr>
<tr>
<td>CALIPER (CAL): 2 sec</td>
<td>1 in/log div</td>
<td>30 ft/min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>STRIP LOG</th>
<th>G</th>
<th>DEN</th>
<th>RES</th>
<th>CAL</th>
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<td>G</td>
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</table>

Diagram showing geophysical logs with depth measurements in meters and feet.
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>STRIP LOG</th>
<th>GEOPHYSICAL LOGS</th>
<th>DEPTH</th>
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</tbody>
</table>
HOLE NO.: GC-4C  
GROUND ELEV. (EST.): 4,900 ft

LOCATION: NW 1/4, sec. 34, T. 14 S., R. 21 E.

TOTAL DEPTH: 520 ft  
CORED: YES  NO

GEOPHYSICAL LOGS: T.C.: SCALE: LOGGING SPEED:

- NATURAL GAMMA (G): 1 sec 20 cps/log div 15 ft/min
- DENSITY (DEN): 1 sec 200 cps/log div 15 ft/min
- RESISTANCE (RES): 1 sec 20 Ω/log div 25 ft/min
- CALIPER (CAL): -- -- --
- S. P. (SP): 1 sec 5 mv/log div 25 ft/min
- NEUTRON (N): 1 sec 50 cps/log div 15 ft/min

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>STRIP LOG</th>
<th>GEOPHYSICAL LOGS</th>
<th>DEPTH</th>
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17
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Diagram: GC-4

GAMMA S.P. "RESISTANCE
- 2000 CPM - 5 MV/DIV
- 200 OHM/DIV
- BIAS 35
- BIAS 232
- FULL SCALE: "GC-4"
HOLE NO.: GC-5  
GROUND ELEV. (EST.): 5,920 ft

LOCATION: NE 1/4, sec. 31, T. 15 S., R. 21 E.

TOTAL DEPTH: 312 ft  
CORED: YES  NO X

GEOPHYSICAL LOGS:  
T.C.:  
SCALE:  
LOGGING SPEED:

| NATURAL GAMMA (G) | 2 sec | 25 cps/log div | 15 ft/min |
| DENSITY (DEN)     | 2 sec | 154 cps/log div| 15 ft/min |
| RESISTANCE (RES)  | 2 sec | 30 Ω/log div   | 15 ft/min |
| CALIPER (CAL)     | 2 sec | 1 in/log div   | 30 ft/min |

DEPTH  STRIP LOG  GEOPHYSICAL LOGS  DEPTH
M  FT  G  DEN  RES  CAL  M  FT
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150 150 150 150 150 150 150 150
200 200 200 200 200 200 200 200

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**HOLE NO.: GC-5**

**CONTINUED (PG. 2)**
HOLE NO.: GC-9  
GROUND ELEV. (EST.): 5,250 ft

LOCATION: SW 1/4, sec. 1, T. 15 S., R. 20 E.

TOTAL DEPTH: 520 ft  
CORED: YES  

GEOPHYSICAL LOGS:

- NATURAL GAMMA (G): 1 sec 10 cps/log div 15 ft/min
- DENSITY (DEN): 1 sec 200 cps/log div 15 ft/min
- RESISTANCE (RES): 1 sec 20 \( \Omega \)/log div 25 ft/min
- CALIPER (CAL): 1 sec 1 in/log div 30 ft/min
- S. P. (SP): 1 sec 5 mv/log div 25 ft/min
- NEUTRON (N): 1 sec 50 cps/log div 15 ft/min

GEOPHYSICAL LOGS

DEPTH

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DEPHT
### HOLE NO.: GC-9

CONTINUED (PG. 2)

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**GEOPHYSICAL LOGS**

- **G**: Electrical Conductivity
- **SP**: Spontaneous Potential
- **RES**: Resistivity
- **CAL**: Calibration

**Diagram Details**

- Depth markings in meters and feet
- Graphical representation of geophysical data

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*NEUTRON 500 CPS*

*DENSITY 2000 CPS*

*FULL SCALE*

HOLE NO.: GC-9

CONTINUED (PG. 4)