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INVESTIGATIONS OF DOMESTIC RADIOACTIVE RAW MATERIALS
AND OTHER TRACE ELEMENTS

PREPARED FOR U. S. ATOMIC ENERGY COMMISSION

MONTHLY REPORT--MARCH 1952

TRACE ELEMENTS OFFICE
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INVESTIGATIONS OF DOMESTIC RADIOACTIVE RAW MATERIALS AND OTHER TRACE ELEMENTS

MONTHLY REPORT—MARCH 1952

SUMMARY

Significant data reported in March for projects in the U. S. Geological Survey's Trace Elements program are summarized below:

Reconnaissance, U. S.—Reserves at the Caribou mine, Boulder County, and at the Old Leyden mine, Jefferson County, Colorado, were recalculated during the month. Indicated and inferred reserves at the Caribou mine are 700 tons and 400 tons respectively, containing 0.3 percent uranium. Inferred reserves at the Old Leyden mine are 17,500 tons containing 0.2 percent uranium.

Airborne radiometric surveys, comprising 2,400 flight-miles, of California, Nevada, Arizona, and Utah have shown one very significant anomaly in the Rock Corral area, 50 miles northeast of San Bernardino, San Bernardino County, California. It is believed that the radioactivity is probably due to thorium.

Colorado Plateau, exploration.—A total of 2,750 tons of ore was found by 49,719 feet of drilling in Colorado on Horse Mesa, Atkinson Mesa, Dolores Bench, Spring Creek Mesa, and San Miguel Bench, Montrose County; and in Utah in the Yellow Cat area, Thompsons district, Grand County.

A contract for 40,000 to 60,000 feet of diamond drilling in the Spud Patch and Jo Dandy areas, Montrose and San Miguel counties, Colo., was awarded to Minerals Engineering Co.; drilling is expected to start about April 7. Bids for 50,000 to 75,000 feet of diamond drilling in the Long Park area, Montrose County, Colo., were opened in Denver on March 21. Bids for 14,000 to 21,000 feet of diamond drilling in the LaSal Creek (West Paradox Valley) area, Montrose County, Colo., and San Juan County, Utah, were to be opened in Denver on April 1.

Coal and lignite investigations and black-shale reconnaissance.—Total reserves of uranium-bearing coal, and carbonaceous shale and sandstone on La Ventana Mesa were estimated during the month to be about 563,000 tons containing 312 short tons of uranium. Of this total, there is about 89,000 tons of ore-grade uranium-bearing coal containing 134 short tons of uranium, or about 0.15 percent uranium in the coal and 0.3 percent in the ash (ash content estimated to be 50 percent).
Thorium and monazite investigations.—During the reconnaissance study of the metamorphic and igneous sequence in the Haputa area, Custer County, Colorado, and in neighboring areas, two new shear zones having moderate radioactivity were located but not studied in detail. A brief examination of another shear zone, at the request of a local rancher, showed moderate to strong radioactivity (probably due to thorium) along an 800-foot zone. Little new data are available for estimating the economic thorium values in the Wet Mountains area. Results on the amount of thorium and uranium in the shear zone cut by diamond drill-hole Ha-7 at a vertical depth of about 400 feet, are not yet established, but the amount of radioactivity suggests that possible economic thorium ore extends a considerable distance below the 200-foot depth proven in Ha-3.

During the month, plane-table mapping at 1:2,400 scale was completed of Site 6 on Sandy Run Creek, Rutherford County, North Carolina. No further drilling was done by the U. S. Bureau of Mines in the western monazite belt of the southeastern states.

Reports forwarded.—During the month, three Trace Elements Investigations Reports and thirteen Trace Elements Memorandum Reports were transmitted to the Atomic Energy Commission.

Other projects.—Work similar to that previously in progress was continued on the following projects, and no outstanding results pertaining to these projects were reported.

Reconnaissance, Alaska
Colorado Plateau, geologic studies
Northwest phosphate
Southeast phosphate
Laboratory investigations
Pre-Morrison studies (Colorado Plateau)
RECONNAISSANCE INVESTIGATIONS, DOMESTIC

The objectives of the investigations in the United States by Reconnais-
ance Group are to find uranium deposits that may come into production now
or in the foreseeable future, and to appraise known uraniferous deposits
and districts that are favorable for the presence of ore of minable grade.
Activities being undertaken to achieve these objectives consist of: (1)
the examination of promising areas located by the general public; (2) com-
piilation and analysis of geologic and economic data on the known radio-
active deposits; (3) research and systematic reconnaissance (including some
airborne and carborne radiometric reconnaissance) of favorable areas and de-
posits; and (4) geologic studies and, in some places, physical exploration
of deposits or districts known to contain important amounts of uranium.
The work achieved toward these objectives during the month is discussed be-
low. Exploration data are given in table 1; a summary of reserves of radio-
active material for current field projects is given in table 2.

Table 1.--Domestic reconnaissance data, March 1952

<table>
<thead>
<tr>
<th>Project</th>
<th>Number of holes</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This month</td>
<td>Total</td>
</tr>
<tr>
<td>Lost Creek schroeckingerite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auger (4-inch)drilling 1/</td>
<td>0</td>
<td>137</td>
</tr>
<tr>
<td>Bucket drilling 2/</td>
<td>0</td>
<td>70</td>
</tr>
<tr>
<td>Trenching 3/</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

1/ Recessed; to be resumed when time allows.
2/ Recessed; to be resumed presumably in April.
3/ Contract terminated February 1, 1952.
Property examinations

Three previously scheduled private property examinations were made in California; these are: (1) Harvard Hills, San Bernardino County; (2) the Conn property, 2½ miles south of Palmdale, Los Angeles County; and (3) the Curtis property (Lookout Lode claim) east of Lancaster, Los Angeles County. (See "California-Nevada reconnaissance" section.)

No private property examinations are scheduled for April and May.

Table 2.—Summary of reserves of radioactive material of current Reconnaissance field projects, March 1952

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
<th>Area</th>
<th>Material</th>
<th>Short tons (inferred)</th>
<th>Uranium (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>California-Nevada Reconnaissance 1/</td>
<td></td>
<td></td>
<td>---</td>
<td>375 2/</td>
<td>0.05–0.10 2/</td>
</tr>
<tr>
<td>Colorado</td>
<td>Boulder County</td>
<td>Caribou mine</td>
<td>Pitchblende-bearing veins</td>
<td>700 4/</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>400</td>
<td>0.30</td>
</tr>
<tr>
<td>Jefferson County</td>
<td>Leyden mine</td>
<td></td>
<td>Silicified carbonaceous silt</td>
<td>17,500</td>
<td>0.20</td>
</tr>
<tr>
<td>Larimer County</td>
<td>Copper King mine</td>
<td></td>
<td>Pitchblende, pyrite, and sphalerite veins</td>
<td>200</td>
<td>1.0</td>
</tr>
<tr>
<td>South Dakota</td>
<td>Fall River County</td>
<td>Craven Canyon area</td>
<td>Carnotite in Lakota fm.</td>
<td>150 4/</td>
<td>0.16–0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>210 4/</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>445</td>
<td>0.1–0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9,730</td>
<td>0.02–0.10</td>
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Table 2.—Summary of reserves of radioactive material of current Reconnaissance field projects, March 1952 (cont’d)

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
<th>Area</th>
<th>Material</th>
<th>Short tons (inferred)</th>
<th>Uranium (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utah</td>
<td>Kane County</td>
<td></td>
<td>Carnotite-bearing sandstone</td>
<td>8,800 4/</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>90,000</td>
<td></td>
</tr>
<tr>
<td>Wyoming</td>
<td>Sweetwater County</td>
<td>Red Desert</td>
<td>Schroeckingerite-bearing beds 2/</td>
<td>11,700 6/</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>do.</td>
<td>55,000 7/</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Uraniferous lignite beds</td>
<td>255,000,000 6/</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>do.</td>
<td>2,000,000,000 7/</td>
<td>0.005</td>
</tr>
</tbody>
</table>

1/ For details see section "California-Nevada reconnaissance" in February Monthly Report (pp. 18-20).
2/ The small tonnages reported this month are not included in total shown. (See section "California-Nevada reconnaissance.")
3/ Equivalent uranium.
4/ Indicated reserves.
5/ Does not include reserves for the extensions of the deposit found during the 1951 field season.
6/ Calculated ore (revised April 1951), Trace Elements Investigations Report 122.
7/ Potential ore (revised April 1951), Trace Elements Investigations Report 122.

Colorado Front Range

Central City district, Gilpin County

Office work during the month consisted of map compilation, report writing, and obtaining additional information on inaccessible underground workings in the district.
Lawson-Dumont district, Clear Creek County

Laboratory work consisted of thin-section study of rocks obtained during the 1951 field season from the Jo Reynolds and Martha E. areas.

A DMEA loan has been approved for work in the Larmartine tunnel, and the Bureau of Mines is preparing to drill several holes and to extend the drift, which is being developed at present by the owners.

Caribou mine, Boulder County

The reserves at the Caribou mine have been recalculated on the basis of new information (table 2).

A brief examination was made of new development work at the Caribou mine. The remainder of the month was spent in preparing reports and compiling data.

Prairie Divide district, Larimer County

It is reported that the shaft at the Copper King mine was at a depth of 142 feet and that the operators plan to cut a station at a depth of about 137 feet.

Reserves for the Copper King mine are listed in table 2; revision of these reserves is pending completion of field and laboratory work.

Leyden coal mine, Jefferson County

The inferred reserves at the Old Leyden coal mine were recalculated during the month on the basis of a re-analysis of available information. The revised reserves are shown in table 2. The former inferred reserves were 9,200 short
tons of material containing 0.2 percent uranium.

A report on this season's investigations is in preparation.

**Silver Reef, Washington County, Utah**

No field work in the Silver Reef area was done during the month. A report on exploration work is in preparation. Reserves have not been calculated for the area.

**Bullock claims, Kane County, Utah**

No field work was done during the month. Indicated and inferred reserves are shown in table 2.

**Thomas Range fluorite district, Juab County, Utah**

The drilling just completed on the Searle's Bell Hill property in the Thomas Range suggests that the assumed depth of 100 feet, used in 1950 for calculating ore reserves totalling 287,880 tons (TJ-136), was conservative. The recent drilling has disclosed ore at 255 feet below the workings existing in 1950, and suggests that ore bodies like the Bell Hill might be expected to continue at least to 350 feet below the surface. If this assumption is reliable, the total reserves of the district might be as high as 2½ times the figure estimated in 1950.

During 1950 and 1951, 6,570 tons were mined from the Bell Hill property. Mining is now proceeding at a rate of about 50 tons a day for a 5-day week. As of January (?) 1952, ore was being mined from an adit 90 feet below the surface. The ore above the 90-foot level to the open cut, with the exception
of pillars, had been stopeed. From the adit an inclined winze, 103 feet long, has been driven at 52 degrees in the ore and at the end of January 1952 was 169 feet vertically below the surface. Another level with three stopes as much as 40 feet long, had been started 25 feet below the adit. Present plans are to sink to the bottom of the ore, mine about half the ore in a series of stoping operations, and then drive a vertical raise to surface and pull the pillars from the bottom.

Work was continued on compilation of maps and petrologic studies. Revision of reserves of uraniferous fluorite in the Thomas Range district pend completion of the geologic work. (See TEI-136 for a discussion of the geology and properties involved, and the reserves calculated in 1950.)

White Signal-Black Hawk districts, Grant County, N. Mex.

Geologic mapping was continued in the Black Hawk district (about 20 miles west of Silver City) secs. 20, 21, 28, and 29, T. 18 S., R. 16 W., New Mexico principal meridian. This mapping is being done to determine the distribution and geologic setting of possible radioactive material, indications of which were noted in 1950. (See Trace Elements Memorandum Rept. 118.)

Boulder batholith, Montana

The study in Boulder batholith area, Mont. is part of a general program to find new deposits similar to those near Clancey and at the Free Enterprise mine, Jefferson County. Work on the project during the month was not re­ported.
Lost Creek schroeckingerite deposit, Sweetwater County, Wyoming

Work during the month consisted of laboratory beneficiation tests of schroeckingerite-bearing samples; mineralogic and petrologic studies of schroeckingerite; compilation of data; and preparation of cross-sections.

All of the samples collected during the recent exploration are not yet analysed and interpreted, but it appears from the data at hand that the recoverable schroeckingerite-bearing material contains 0.015 to 0.02 percent uranium instead of about 0.1 percent as previously estimated from field observations. Chemical and mineralogical investigations have been made in an attempt to determine the reasons for the discrepancies between chemical analyses of the ore and estimates of the uranium content based on visual measurements of the schroeckingerite present.

Although the uranium content is thus low, the work of the past season indicates that the reserves of the schroeckingerite-bearing material are probably much larger than previously known (see table 2 for reserves based on work in 1950), perhaps of the order of 1-2 million tons of material containing roughly 150-350 tons of uranium. As pointed out in previous reports, the recent investigations have extended the area known to contain schroeckingerite and its limit has not been established by the exploration thus far completed. (See monthly reports for October 1951, pp. 19-20, November 1951, pp. 18-19, and February 1951, p. 16.) Complete reserves of schroeckingerite-bearing material in the deposits known to date is being compiled as results become available.

The grade of the three bulk samples, which were taken during the exploration just recessed, was calculated by weighting planimetered areas
against the chemical analyses of ore and of host-rock samples. The ore samples
for which chemical analyses are available were taken from five-foot sections
of the ore bodies prior to the bulk sampling; the ore samples were taken in
the same manner as the bulk samples—by face cuts.

Sample LRP-Bulk No. 1 was confined to schroeckingerite ore-bodies and
was taken to represent the type of ore that could be obtained by careful
selective mining. Samples LRP-Bulk No. 2 and No. 3 were each taken from rec-

tangular areas to represent the type of ore that could be obtained relatively
easily by stripping methods in designated areas. Pertinent data for each of
the bulk samples is given below (each sample weights approximately 1000 pounds).

LRP-Bulk No. 1—Sample cut (about \( \frac{1}{2} \) inch deep) was confined to ore-bodies on
both the east and west walls of trench 2 from 571 to 651 feet. Exposures on
both walls were about 76 feet long and 0.5 to 3.0 feet wide (average 1.5 feet). 
Analytical face-cut samples from the ore bodies ranged from 0.006 to 0.031 per-
cent uranium. The calculated average grade of the bulk sample is 0.016 per-
cent uranium.

LRP-Bulk No. 2—Sample cut (about 5 inches deep) was confined to a rectangular
area (25 square feet) on the east wall of trench 2 from 638.5 to 648.5 feet. The ore body covers 17 of the 25 square feet, or 68 percent of the area
sampled; the remaining 32 percent of host rock would be obtained with the ore
by commercial stripping operations. Analytical face-cut samples from the ore
body ranged from 0.011 to 0.026 percent uranium, whereas those of the host rock
in this specific area ranged from 0.000 percent to 0.009 percent. The calculated average grade of the bulk sample is 0.015 percent uranium.

LRP-Bulk No. 3—Sample cut (about 2 inches deep) was confined to a rectangular
area (47 square feet) in the west wall of trench 2 from 673.5 to 688.5 feet.
The ore body covers 31 of the 47 square feet, or 66 percent of the area sampled;
the remaining 34 percent of host rock would be obtained with the ore by com-
mmercial stripping operations. Analytical face-cut samples from the ore body ranged from 0.009 to 0.024 percent uranium; whereas those of the host rock in
this specific area contained 0.000 percent. The calculated average grade of
the bulk sample is 0.010 percent uranium.
Craven Canyon area, Fall River County, South Dakota

Office work consisted of report preparation.

California-Nevada reconnaissance

Spot radiometric and geologic examinations were made of the "Conn" property, located 2½ miles south of Palmdale, Los Angeles County, Calif.; the Curtis (Lookout Lode claim) property, east of Lancaster, Los Angeles County, Calif.; and the Original and Pack Saddle claims, located 5 miles east of Amboy, San Bernardino County, Calif. Reconnaissance radiometric examinations were made of a number of pegmatite quarries and small, abandoned copper properties in the Granite Wells-Copper City area of northern San Bernardino County, Calif.

Preparatory to aerial radiometric surveys in the Mojave region, reconnaissance examinations were extended in the Rock Corral-Rancho Roquena area, at the east end of the San Bernardino Mountains and the Harvard Hills, San Bernardino County, Calif. Spot examinations were made of the Black Dog claim and the Conkey and Jinkins properties which are located in the vicinity of Rock Corral.

Photographic mosaics were prepared for 6 areas in the Mojave region; these areas include parts of the Soledad mining district, Kern County, Calif.; the Rock Corral-Rancho Roquena area; parts of the Yellow Pine mining district (Goodsprings quadrangle), Clark County, Nev.; the Harvard Hills; an area near Searles Station, Kern and San Bernardino Counties, Calif.; and an area between Twentynine Palms and White Tank, San Bernardino
County, Calif. Aerial traverse flight lines were laid out on the mosaics of these areas.

All of the following reserve figures are estimates and the grade figures are based entirely on counter readings.

**Conn property** - A sample, submitted by Mrs. Conn to the Atomic Energy Commission in 1949, assayed 1.3% U₃O₈. This sample probably came from the Colorado Plateau and not from the Conn property. No radioactive material was found on the property.

**Curtis property** - Probably less than 10 tons containing about 0.02 percent equivalent uranium.

**Original and Pack Saddle claims** - Probably less than 10 tons of thorium-bearing material. Grade unknown, but occurrence only weakly radioactive.

Preliminary Reconnaissance Reports on the Rainbow claims, Harvard Hills, Singer mine, Root Zinc mine, Copper Flower Quartz mine, Uranium No. 1 and Old Dad claims, and Golden Glow and Carnotite Lode claims were originally scheduled for transmittal during the month of March. (See February Monthly Report, pp. 18-20.) Work on the aerial radiometric surveys of the Mojave region, however, has delayed writing and transmittal of these reports, though they may be completed before the end of the month. Preliminary Reconnaissance Reports on the "Conn" property, the Curtis property, and the Original and Pack Saddle claims will probably be transmitted during the early part of April.

**Radon in natural gas**

Further arrangements were completed with Farrington Daniels at the University of Wisconsin for thermoluminescent analyses of several dozen carefully
selected samples with the objective of determining the past radiation history, particularly whether the present radioactive content has been constant through geologic time. The samples were collected from a well on which continuous radon measurements were made as the drill went down; a gamma-ray log of the well was also available.

Compilation and reduction of the radon data obtained during last summer's field season were continued.

Additional gas flow data were collected from the operating gas companies during the month. Some progress was made on reducing the pitot-tube data on gas flow for graphic plotting of the productive capacity of separate gas zones.

**Airborne detection**

During March, joint aeromagnetic-radioactivity surveys were completed as follows:

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
<th>Area</th>
<th>Flight miles</th>
<th>Terrane</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>San Bernardino</td>
<td>Rock Corral</td>
<td>370</td>
<td>Metamorphic and igneous</td>
</tr>
<tr>
<td></td>
<td>San Bernardino and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Riverside</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>San Bernardino</td>
<td>Harvard Hills</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kern</td>
<td>Bonanza Hills</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kern</td>
<td>Solidad</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clark</td>
<td>Searles Station</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Little Green</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td>Yavapai</td>
<td>Bagdad</td>
<td>45</td>
<td>Sedimentary</td>
</tr>
<tr>
<td>Arizona-</td>
<td></td>
<td>Carrizo Mtns.</td>
<td>360</td>
<td>Granitic</td>
</tr>
<tr>
<td>New Mexico</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado-Utah</td>
<td></td>
<td>Shiprock-</td>
<td>280</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monument Valley</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uravan</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td>2,405</td>
<td></td>
</tr>
</tbody>
</table>
Very pronounced anomalies were noted in the survey of the Rock Corral area, about 50 miles northeast of San Bernardino (28 miles north of Desert Hot Springs). The activity presumably is due to thorium-bearing rocks. A few small anomalies were recorded in the Solidad, White Tank, and Searles Station areas. Nothing of significance was noted in the other areas listed.

The plane returned to Washington, D. C., on March 26, for engine change and general overhaul during April. Areas in Wyoming are scheduled for survey during May.

In cooperation with the Los Alamos National Laboratory, the Frenchman Flat area was aeromagnetically surveyed at a 5,000-foot flight level.

The airborne radioactivity survey of Liberia was finally started in early March, and 1,200 traverse miles were flown as of March 20, 1952. Some results of interest were obtained and will be checked by additional flights in those areas.

Reports

Reports are being prepared on the completed phases of the following investigations.

(1) Uraniferous lignites in North Dakota, South Dakota, Montana, and Wyoming.

(2) Radiometric surveys of northeastern states. One report on New York remains to be completed.

(3) Uranophane at the Silver Cliff mine near Lusk, Niobrara County, Wyo.

(5) The tin, copper, and uranium deposits at Majuba Hill, Pershing County, Nev.

(6) Reconnaissance investigations for uranium in the Colorado Front Range.

(7) Geology of the area adjacent to the Free Enterprise uranium-silver mine, Jefferson County, Mont.

(8) Carnotite deposits at the Yellow Canary claims, Daggett County, Utah.

(9) Reconnaissance survey of the Sheeprock Mountains, Tooele County, Utah.

(10) Rare-earth and fluorite deposits of the Bear Lodge Mountains, Crook County, Wyo.

(11) Results of a preliminary study of mineral zoning in the Colorado Front Range pitchblende deposits.

(12) Uranium deposits in Grant County, N. Mex.

(13) Volcanic debris in uraniferous sandstones, and its possible bearing on the origin and precipitation of uranium.

(14) Central City pitchblende area, Gilpin County, Colo.

(15) Uranium minerals in sheared biotite schist of the Martha E. area, southwest of Idaho Springs, Colo.

(16) Bellevue-Hudson area, Lawson-Dumont district, Clear Creek County, Colo.

(17) Diamond-drilling at the Old Leyden mine, Jefferson County, Colo.

(18) Thucholite deposits near Placerville, San Miguel County, Colo.

(19) Selected papers on uranium deposits in the United States.
Reconnaissance Investigations
1. West Panhandle field, Tex.
2. Central City District, Colo.
3. Lawson-Dumont district, Colo.
4. Caribou mine, Colo.
5. Prairie Divide district, Colo.
6. Ralston Creek district, Colo.
7. Leyden coal mine, Colo.
8. Silver Reef, Utah
9. Bulloch claims, Utah
10. Thomas Range, Utah
16. Silver City district, N. Mex.
17. Lambrecht district, Mont.
18. Rangely district, Colo.
19. Paradox district, Colo.
20. Uravan district, Colo.
21. Slick Rock district, Colo.
22. Thompsons district, Colo.
23. Northwest Phosphate
Field Work

Field work on Alaskan reconnaissance investigations, currently recessed for the winter, will be resumed about June 1, 1952 with reconnaissance investigations scheduled for southeastern, south-central, southwestern, and east-central Alaska.

Reports

Reports on 25 Alaskan reconnaissance projects initiated prior to the 1951 field season (fig. 2) were in progress or temporarily recessed during March 1952. Preliminary information on these projects is available in the following monthly reports on domestic investigations:

- November 1949, pp. 19-29
- December 1949, pp. 13-15
- January 1950, pp. 16-18
- February 1950, pp. 21-23
- July 1950, pp. 18-19
- October 1950, pp. 13-15

The following reports on projects initiated prior to the 1951 field season have been forwarded to the Commission:

<table>
<thead>
<tr>
<th>Report</th>
<th>Title and author(s)</th>
<th>Date of transmittal</th>
<th>Project (figure 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMR-327</td>
<td>&quot;Radioactivity and mineralogy of placer concentrates from the Wiseman and Chandalar districts, Upper Yukon region, northeastern Alaska&quot;, by Max G. White, January 1952.</td>
<td>2/25/52</td>
<td>AK</td>
</tr>
</tbody>
</table>
The following reports are in process and probably will be transmitted to the Commission in April:

<table>
<thead>
<tr>
<th>Report</th>
<th>Title and author(s)</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEIR-46</td>
<td>&quot;Radioactivity investigations in the vicinity of Flat, Lower Yukon-Kuskokwim region, Alaska&quot;, by Max G. White and P. L. Killeen</td>
<td>R</td>
</tr>
<tr>
<td>TEIR-49</td>
<td>&quot;Reconnaissance for radioactive deposits in the Buckland-Kivalik district, Seward Peninsula, Alaska&quot;, by Walter S. West and John J. Matzko</td>
<td>P</td>
</tr>
</tbody>
</table>
Exploration of the carnotite deposits of the Colorado Plateau continued in the areas listed under "Drilling continuing" in table 3. Figures 3 to 9, inclusive, show the areas of exploration. The estimated reserves given in table 3 include all material in layers 1 foot or more thick containing at least 0.10 percent U\textsubscript{3}O\textsubscript{8} or 1.0 percent V\textsubscript{2}O\textsubscript{5}. For completed projects, the tonnages are taken from listings in final reports. Where projects are incomplete, tonnage figures are preliminary and are largely based on experience and visual estimates of the uranium and vanadium content of the cores.

During March a total of 49,719 feet was drilled, which is a 4 percent decrease under February. This total includes 11,753 feet of dry-hole, non-core drilling in the Yellow Cat area.

Brief interpretive comments for individual phases of the project follow.

Field work in progress

Paradox district, Montrose County, Colorado

LaSal Creek (West Paradox Valley) area.—Specifications were prepared during the month for a development drilling contract for 14,000 to 21,000 feet of diamond drilling to be done in the LaSal Creek (West Paradox Valley) area this calendar year. The bids will be opened in Denver on April 1, and drilling probably will start in early May.
### Table 3.—Summary of exploration, Colorado Plateau project, March 1952

<table>
<thead>
<tr>
<th>Project or activity</th>
<th>Drilling, radiometric scanning, and sampling</th>
<th>Indicated and inferred reserves found by drilling (short tons)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Drilling concluded, reports finished, combined totals</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Last month</td>
<td>This month</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,522.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>48</td>
<td>-14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
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<td>0</td>
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<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>54</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Drilling continuing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atkinson Mesa, Montrose Co., Colo.</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Dolores bench, Montrose Co., Colo.</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Spring Creek Mesa, Montrose Co., Colo.</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>San Miguel bench, Montrose Co., Colo.</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Yellow Cat area, Grand Co., Utah</td>
<td>265</td>
<td>278</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>265</td>
<td>278</td>
</tr>
<tr>
<td></td>
<td>Total drilling</td>
<td>317</td>
<td>292</td>
</tr>
<tr>
<td></td>
<td>Radiometric hole scanning</td>
<td>254</td>
<td>297</td>
</tr>
<tr>
<td></td>
<td>Radiometric core scanning</td>
<td>12</td>
<td>69</td>
</tr>
</tbody>
</table>
Figure 3.—Map of part of the Colorado Plateau, showing the areas of drilling.

- Drilling concluded, reports finished
- Drilling recessed or concluded
- Drilling during current month
- Drilling planned

Significant uranium-vanadium mine or group of mines
Horse Mesa area.—Drilling continued in the Horse Mesa area during March with seven rigs in operation at the start of the month. These rigs were moved from the area by March 19, when drilling was completed in the Horse Mesa area. Of the 14 holes completed during March, 8 (HM-130, 132, 133, 135, 136, 137, 139A, and 142) are in weakly mineralized rock that is below the cutoffs for ore (fig. 4). Each of these eight holes is assumed to be in a new deposit; however, like the other deposits found in this area, they are probably composed of radioactive carbonaceous material that does not approach ore grade. Thirteen of the holes were drilled on moderately spaced intervals to test semifavorable ground for deposits, and one hole was drilled on a close spacing to roughly outline a deposit.

No additional drilling is planned in the Horse Mesa area. The nature of the low grade material, the small size of the deposits found in the area, and the unfavorable character of the ground for containing minable ore deposits do not warrant further offset or exploratory drilling in the Horse Mesa area.

The remainder of the footage on the Moon and Horse Mesas contract (1,043 feet) will be drilled in the Atkinson Mesa area.

Atkinson Mesa.—Drilling continued on Atkinson Mesa during March with 14 diamond drills and 1 churn drill in operation at the end of the month. During the month 13 holes were completed, all in barren material (fig. 5). All holes were drilled on a wide-spaced pattern to obtain geologic information. Six of the holes were classed as favorable, thus extending the known favorable ground further northward into the central part of the mesa. Drilling on the Dolores bench (see below) during March proved the southward extension of this same
favorable area and discovered ore deposits in it adjacent to the deposit cut by drilling near the south rim of Atkinson Mesa during August. Most of the drilling in April probably will be on a moderate-spaced pattern in this large favorable area. As soon as ground conditions improve, the drilling will be resumed on a wide-spaced pattern.

Dolores bench.—Drilling continued on the Dolores bench during March with eight diamond-drill rigs. Of the 35 holes completed, 5 (Nos. 69, 71, 72, 73, and 91) are in material of ore grade and 5 (Nos. 57, 61, 65, 75, and 92) are in material below the cutoffs for ore (fig. 6). Each of these holes is classed as a new discovery, although it is possible they are in two or three large deposits of the type now being mined a short distance to the southeast on the bench. If so, these holes may later prove to be a major discovery. The five ore holes are in the same favorable area that extends northward into Atkinson Mesa and only a few thousand feet from an ore hole drilled from the top of Atkinson Mesa in August. These discoveries are on ground belonging to the U. S. Vanadium Co. The Company has started offset drilling around these discovery holes. The drilling during March was all done on a wide to moderate spacing to obtain geologic information. With the addition of a few close-spaced holes, the same type of drilling will continue in April.

Spring Creek Mesa.—Five drill rigs were in continuous operation on Spring Creek Mesa during March. Two additional rigs operated for part of the month. Seven holes, one of which was cored with a large (NX) diameter bit for experimental purposes, were completed; all are in barren ground (fig. 7). All holes were drilled on a wide-spaced pattern for geologic
information and were only semifavorable in character. This drilling served to further delimit the extent of favorable ground on the mesa, but found no new favorable areas. Drilling in April will continue on a wide-spaced pattern in areas where road conditions are favorable for water haulage.

San Miguel bench.—Drilling continued on the San Miguel bench during March with eight rigs in operation. All 10 of the completed holes were drilled in barren material (fig. 8). Improvement in drilling practices and equipment have notably increased the footage and core recovery. All drilling was done on a wide-spaced pattern for geologic information and proved the extension of two favorable areas known from previous drilling on the top of adjacent Spring Creek Mesa. Closer-spaced drilling to be done later in these favorable areas should discover ore deposits. The same type of drilling will be continued during April.

Long Park area.—Bids were opened on March 21 for a contract for 50,000 to 75,000 feet of drilling in the Long Park area. The low bidder was Minerals Engineering Company of Grand Junction, Colorado. If the contract is awarded on the basis of this bid, drilling will begin during April. If new bids are called for, drilling will be delayed until early May.

Jo Dandy area.—Bids were opened on March 7 for a contract for 40,000 to 60,000 feet of diamond drilling to be done in the Jo Dandy and Spud Patch (see below) areas. The low bidder was Minerals Engineering Company of Grand Junction, Colorado. For the Jo Dandy area, 30,000 to 45,000 feet of the contract footage is planned. This drilling probably will start in June or July, after drilling is concluded in the Spud Patch area (see below).
Slick Rock district, San Miguel County, Colorado

Spud Patch area.—For the Spud Patch area, 10,000 to 15,000 feet of drilling is planned under the contract that includes the drilling planned for the Jo Dandy area (see above). The Spud Patch drilling will start about April 7, weather permitting. This drilling will test previously found favorable ground for deposits, and will outline roughly both recent and new discoveries.

Thompsons district, Grand County, Utah

Yellow Cat area.—Diamond drilling and non-core, dry-hole drilling continued in the Yellow Cat area during March with six diamond-drill rigs and two wagon-drill rigs. Of the 55 diamond-drill holes completed during the month, 1 (No. 239) is in mineralized material that is below the cutoff of ore (fig. 9). Of the 158 wagon-drill holes completed during the month, 2 (Nos. W-367 and -383) are in ore and 19 (Nos. W-327, -329, -340, -342, -345, -347, -348, -352, -358, -359, -360, -369, -371, -380, -381, -385, -391, -394, and -406) are in mineralized material that is below the cutoffs for ore (fig. 9). Eleven deposits were discovered as a result of the drilling during March. Most of the diamond-drill holes were drilled on a wide-spaced pattern for geologic information and to delimit favorable ground. One new large favorable area was found by this drilling and several known favorable areas were further delimited. The wagon-drill holes were drilled on a moderate-to close-spaced pattern to search for deposits and to delimit favorable areas. The deposits in the Yellow Cat area are mostly small and spotty, and drilling with a wagon drill is the most economical type of exploration where the ground
has been found to be favorable by wide-spaced diamond-drill holes. One small ore deposit was discovered and offset by wagon-drill holes. Ten other mineralized areas also were found. Fifty-two holes were drilled to test geobotanical data. Two of these (W-367 and -383) are in ore and 13 (W-327, -329, -340, -345, -347, -359, -369, -371, -380, -381, -385, -391, and -394) are in mineralized material below the cutoffs for ore.

Drilling during April will follow the same plan as used during March.

Radiometric logging of drill holes

During the month, three Barnabys were used on the Colorado Plateau on a full time basis. Drilling projects on six areas were serviced.

One core drill hole located on the Hapatu Ranch near Westcliffe, Custer County, Colorado was logged on March 21. The footage logged amounts to 586 feet.

One hole drilled through the potash bearing Salado formation near Carlsbad, Eddy County, New Mexico was logged on February 25. This logging completed the field work done for the purpose of obtaining data to be used in the evaluation of gamma-ray and neutron logging as methods for locating and estimating the grade of saline potash deposits.

One Barnaby is being used on a full time basis for the logging of shot holes being drilled by a seismic exploration party of the Shell Oil Co. in the area lying between the Carrizo Mountains and the San Juan River in northeastern Arizona (Apache County). During the period of February 25 to March 6, inclusive, 67 holes having an aggregate footage of 8,798 feet were logged. Significant radioactivity anomalies were found in several holes. A total
of 103 holes having an aggregate footage of 13,312 feet had been logged in this area through March 6. The report on holes logged since March 6 has not been received.

Grade estimates in terms of equivalent uranium as determined from radioactivity anomalies appearing on gamma-ray logs have been made. Holes 1 through 150 and 901 through 1,302 on Outlaw Mesa, Mesa County, and holes 286 through 427 in the Legin group area, San Miguel County, have been completed.

During the coming month it is expected that three Barnabys will be used on a full time basis for the logging of drill holes on the Colorado Plateau. On Barnaby will be used for the logging of holes in other areas. Shop work will consist of maintenance and repair of equipment and making up-to-date drawings of equipment.

**Field work recessed or completed**

Areas in which exploration of the carnitite deposits of the Colorado Plateau was recessed or completed prior to March 1952, and for which final reports are not completed, are listed in table 3.

**Electrical resistivity studies**

Empirical and theoretical investigations of data obtained in deep resistivity measurements were continued during the month. Overhauling instruments and field equipment for use during the 1952 field season was started.
Radiometric scanning of core

The data on radiometric scanning of core are given in table 3. Since March 19, 1951, a cutoff of 0.035 percent equivalent U₃O₈ has been used as a lower limit for the selection of samples for uranium assay. Since August 8, 1951, a cutoff of 0.020 percent equivalent U₃O₈ has been used also as a lower limit for the reporting of equivalent U₃O₈ values, but these samples (between 0.020 and 0.035) are not submitted for chemical assay. Only core from holes that could not be probed by a gamma-ray field counter has been scanned completely.

Claim inventory and appraisal

Searching of public records for the recording and status of claims continued in March. The search disclosed 100 newly reported claims and numerous instruments (mine deeds, leases, and affidavits of labor) for 50 additional claims.

About five claims were found in the field and plotted on quadrangle maps. Office compilation of claim data for 12 topographic base claim maps was continued. Of these 12 maps, three were completed and transmitted to Washington and four are being prepared for publication.

Information to claim owners and lessees

The number of requests received from claim owners and lessees, or the Commission, for information on U. S. Geological Survey drilling on private ground or Commission-controlled ground, and the number of replies transmitted
are summarized in the following table:

<table>
<thead>
<tr>
<th></th>
<th>February 1952</th>
<th>March 1952</th>
<th>Total to date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of requests</td>
<td>5</td>
<td>6</td>
<td>94</td>
</tr>
<tr>
<td>Number of replies</td>
<td>4</td>
<td>4</td>
<td>88</td>
</tr>
</tbody>
</table>
COLORADO PLATEAU, GEOLOGIC STUDIES

Field work recessed

Stratigraphic studies

Data compilation and report preparation to complete the regional paleogeographic study of the ore-bearing Morrison formation were continued during March. The results of this work are summarized in a preliminary report (TEI 180). This work is preliminary to the preparation of a final report on the Morrison study.


Regional mapping

Southwestern Colorado.—Compilation of regional geologic maps and preparation of reports for publication in the Quadrangle Map Series were continued in March. The approximate status of various phases of this work on the eighteen 7½-minute quadrangles in southwestern Colorado is shown below:

- Compilation on topographic base maps from air photos... 95%
- Preparation of structure contour maps... 95%
- Preparation of structural sections... 95%
- Writing of texts to accompany geologic quadrangle maps... 10%
- Editorial review and criticism... 5%

A paper entitled "Structural development of Paradox Valley and Gypsum Valley anticlines" was presented by F. W. Cater, Jr., in Washington, D. C.,
Northeastern Arizona.—Work was resumed in March on the preparation of geologic maps and text covering the part of the area exclusive of the laccolithic complex of the Carrizo Mountains. It is expected that a preliminary geologic map of the Carrizo Mountains area, Apache County, Arizona, will be completed during calendar year 1952. The approximate status of various phases of the work on this project are summarized below:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary compilation from air photos at 1:20,000</td>
<td>85%</td>
</tr>
<tr>
<td>Checking preliminary compilation</td>
<td>43%</td>
</tr>
<tr>
<td>Photographic reduction to 1:40,000</td>
<td>43%</td>
</tr>
<tr>
<td>Editing and preparation of author's map copy</td>
<td>0%</td>
</tr>
<tr>
<td>Preparation of text</td>
<td>0%</td>
</tr>
</tbody>
</table>

Resource appraisal

Northeastern Arizona.—An interim report entitled "Preliminary appraisal of carnotite resources of the Carrizo Mountains area, San Juan County, New Mexico, and Apache County, Arizona" by J. D. Strobell, Jr., is in preparation. Office work was recessed in early March. Work on this resource appraisal project will probably be resumed in July or August 1952.

Slick Rock area.—The report entitled "Uranium and vanadium resources of the Slick Rock district, San Miguel County, Colorado," by R. D. Trace (TEI 162) is in preparation. (The results of the resource appraisal work in the Slick Rock area were summarized in the October 1951 Monthly Report, p. 51.)

Ground-water studies

Field and laboratory work on ground-water studies were completed in mid-September. The report on this work is in preparation. (The results of this
work were summarized in the October Monthly Report, p. 38.)

Geobotanical prospecting

Geobotanical studies were recessed in February when the geologist-in-charge was called to Washington on other work. (See section on Thompsons district under "Colorado Plateau, exploration").
PRE-MORRISON STUDIES (COLORADO PLATEAU)

Field work recessed

Regional mapping and detailed studies of the pre-Morrison ore-bearing formations (mainly Triassic) are being conducted by the Geological Survey's Pre-Morrison project. The principal objectives are to determine the distribution and character of the ore-bearing strata, and to study geologic relations that may be useful in guiding exploration and appraising the total resources. The progress and results of the work during March are reported below:

Stratigraphic studies

During March the sedimentary petrology laboratory continued analysis of samples of Triassic formations, particularly of the ore-bearing Shinarump conglomerate. Other pre-Morrison data collection and compilation has been recessed to further the work on the final report of the Morrison formation.

Monument Valley, Apache and Navajo Counties, Arizona

During the month of March the report on the Monument Valley area was given final review. A compilation of the geology and mine workings of the Monument No. 2 mine was prepared. A paper entitled "Scour channels at the base of the Shinarump conglomerate in the Monument Valley area, Arizona" was prepared and circulated for review. Field work will be resumed in May and will be completed sometime early in fiscal year 1953.
White Canyon, San Juan County, Utah

A report to the Conservation Division on the White Canyon area was transmitted to Washington in mid-March. Laboratory work on the mineralogy of the White Canyon ores was conducted in Washington in March, and about half of the month was spent in office work on photogeology on parts of the areas surrounding White Canyon. Field work will be resumed in May and will continue through the summer.

Capitol Reef, Wayne County, Utah

During March, work on a report was essentially completed. Laboratory analyses of specimens of sedimentary rocks collected in 1951 were completed and studies were started on some thin sections of Shinarump conglomerate. Field work will be resumed in May or June and will be continued through the summer.
NORTHWEST PHOSPHATE

Geologic Mapping

Compilation and drafting of the Dry Valley and Johnson Creek quadrangles, Caribou County, Idaho, were continued during March. Upon completion, these maps will be released in open file.

Stratigraphic and paleontologic studies

Field work on stratigraphic and paleontologic studies has been recessed for the winter. Abstracts and descriptions of the stratigraphic sections examined during the 1951 field season are being prepared for publication as Circulars.

A sixth report, containing analyses of stratigraphic samples of the Phosphoria formation, is in preparation for release in open file.
The objectives of the investigations of Southeast phosphate deposits are to appraise the uranium and phosphate reserves and resources of the phosphatic formations, to delimit the most highly uraniferous areas, and to determine the origin of the uranium and phosphate.

Resource appraisal and sampling

Study of overburden dumps at International Minerals and Chemical Corporation's Peace Valley mine and Swift and Company's Varn mine, Polk County, to determine the amount and grade of the discarded leached zone material was continued during the month. Plane-table mapping of the Varn mine was completed, and nine holes were drilled in the dumps of the Peace Valley mine. The samples obtained from this drilling will be analyzed mechanically by Thornton and Co., in Tampa, and chemically by the Geological Survey's Trace Elements Laboratory in Washington. A final report on this study pending the result of this sampling and mapping.

Reconnaissance examinations were made in northern Florida, Alabama, Georgia, and South Carolina to discover and appraise any new deposits of phosphate and to investigate old phosphate workings. A total of 21 holes totalling 1032 feet, was drilled in these states with a jeep-mounted auger.

Tracts of land for which records have been furnished by the local companies and individuals are listed in figure 10, sheet B. The progress in computing company data and in preparing isopach and contour maps is shown in figure 10 sheets, C, D, E, F, and G. Tabular data pertaining to
sampling activities are given in table 4.

Table 4.—Sampling and drilling data, Southeast phosphate project.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Samples taken</th>
<th>This Month</th>
<th>Total</th>
<th>This Month</th>
<th>Total</th>
<th>This Month</th>
<th>Total</th>
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</thead>
<tbody>
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<td>2/</td>
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<td>2/</td>
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<td>145</td>
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<td>Am. Cy. / (Tilghman)</td>
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<td>Am. Cy. / (Pinecrest)</td>
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<tr>
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<td>61 7/</td>
<td>139 7/</td>
<td>1,861 7/</td>
<td>3,153 7/</td>
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</tbody>
</table>

1/ Excludes gamma-ray logging. 5/ International Minerals and Chemical Corp.
2/ Not reported. 6/ Virginia-Carolina Chemical Corp.; drilling completed.
3/ Fiscal year 1951. 7/ Drilling by U. S. G. S.
4/ American Cyanamid Co.

Drilling

A total of 254 holes has been completed (about 400 holes are planned) by Wayne Thomas, consultant, on land owned by the Royster Guano Co., in secs. 11, 12, 14, 15, 22, and 23, T. 30 S., R. 25 E., Polk County. Holes drilled in this area to date, show an abnormally thick section of leached zone (in some places as thick as 60 feet), and very high readings on the gamma-ray logs, (as high as 6500 counts per minute or an estimated 0.07 percent equivalent uranium).

Logging of the American Cyanamid Company's wildcat drilling continued on holes drilled on the fringes of the known areas of economic phosphate.
deposits in the Bone Valley formation. The areas logged were near Wimauma, Hillsborough County, and on the Whidden property in Polk County.

Geologic studies

The study of relationships between the B.P.L. and uranium contents of phosphate products, initial results of which were reported in TEM-315, are being continued as a part of the study of the French tract of International Minerals and Chemical Corporation. Similar studies will be made on the Swift tract near Plant City, Hillsborough County, and on recent drilling of the American Cyanamid Company's Tilghman tract, Polk County and Pinecrest tract, Hillsborough County.

The remaining 30 holes of a planned total of 48 holes were drilled with the jeep-mounted auger drill and logged by the gamma-ray logging unit this month on the Royster property. This drilling was done to determine whether any relationship exists between radioactivity and elevation above sea level in small areas. The results will be reported next month.

Twelve samples were taken of one mine-face section at the Davison Chemical Company's Pauway mine in Polk County for detailed stratigraphic studies.

Radiometric logging of drill holes

A total of 110 holes aggregating 3,450 feet was logged radiometrically during March with the gamma-ray logging unit on lands owned by the Virginia-Carolina Chemical Corp., International Minerals and Chemical Corp., and Royster Guano Co. These logs are useful in gaining a quick approximation of the radioactivity of the deposits, and in making certain studies of the relationship of radioactivity to other features of the deposits. (See "Geologic studies" above.)
Reports

Preparation of reports was continued during March on: (1) the Virginia-Carolina Chemical Corp. drilling program on the Homeland and Clear Springs tracts, (2) the origin and distribution of phosphate (a talk based on this report, was given at the AIME-SEG meetings in New York); (3) the recent International Minerals and Chemical Corp. drilling program; (4) all recent drilling by American Cyanamid Co.; and (5) the distribution of uranium in the phosphate products of the matrix. No work was done during the month on the report concerning the use of local mining terminology.
LIGNITE AND COAL INVESTIGATIONS AND BLACK-SHALE RECONNAISSANCE

The objectives of the present investigations of lignite, coal, and black shale in the Rocky Mountains region are (1) to search for new uraniferous deposits; (2) to map, sample, and appraise, in a preliminary manner, the more promising of the known uraniferous deposits; and (3) to determine the possible sources of uranium found in lignite, coal, and black shale in order to guide future investigations.

Field investigations in the Rocky Mountain region were recessed for the winter in late November and early December 1951.

Two reports, one on reconnaissance of black shales in the western states during the 1951 field season and the other on the Fall Creek area, Bonneville County, Idaho, were transmitted to the Atomic Energy Commission during March. (See "Reports forwarded"). One report on the Pumpkin Buttes area, Campbell County, Wyoming was published as a Geological Survey Circular (No. 76) on March 24, 1952; this report will also be transmitted as a Trace Elements Memorandum Report. A summary of investigations in the Rocky Mountain region during the 1951 field season is also in preparation.

Total reserves of uranium-bearing coal, and carbonaceous shale and sandstone on La Ventana Mesa, Sandoval County, N. Mex. were estimated during the month to be about 563,000 tons containing 312 short tons of uranium. Of this total, about 89,000 tons of uranium-bearing coal contain 134 short tons of uranium, or about 0.15 percent uranium in the coal and 0.3 percent in the ash (ash content estimated to be 50 percent).
THORIUM AND MONAZITE INVESTIGATIONS

Wet Mountains–Haputa Ranch, Custer County, Colorado

One diamond-drill hole (Ha-7) was completed and one (Ha-8) was begun on Haputa ranch during the month. This drilling will probably be completed about early April.

During recent reconnaissance study of the metamorphic and igneous sequence in the Haputa ranch area, Custer County, Colo., and in neighboring areas, two new shear zones having moderate radioactivity were located but not studied in detail. A brief examination of another shear zone, at the request of a local rancher, showed moderate to strong radioactivity (probably due to thorium) along a 800-foot zone.

Little new data are available for estimating the economic thorium values in the Wet Mountains area. Results on the amount of thorium and uranium in the shear zone cut by diamond drill-hole Ha-7 at a vertical depth of about 400 feet, are not yet established, but the amount of radioactivity suggests that possible economic thorium ore extends a considerable distance below the 200-foot depth proven in Ha-3. Reserves will be calculated after the completion of drilling and assaying of core samples.

Mountain Pass, San Bernardino County, California

Office work on the Mountain Pass bastnaesite deposits during the month consisted of report preparation and map compilation. An open-file report, which includes two geologic maps of the area, was released for public inspection on March 14, 1952, at Survey offices in San Francisco, Salt Lake,
Southeastern monazite

The objectives of Southeastern monazite project are to search for and make reconnaissance appraisals of economically minable monazite placer deposits in the western Piedmont of North and South Carolina, and some similar deposits in Georgia and southern Virginia.

During the month, plane-table mapping (scale 1:2,400) of Site 6 on Sandy Run Creek, Rutherford County, N. C., was completed. The final map and cross-sections (scale 1:2,400) of Site 1 on Knob Creek, Cleveland County, N. C., were drafted. These maps are to be used in reports on results of churn drilling by the U. S. Bureau of Mines.

A review of samples collected during the field season of 1951 was made, and 40 samples were selected for spectroscopic examination for columbium, tantalum, tin, and tungsten.

Preparations were continued to permit commencing reconnaissance placer examinations in April. The jeep-mounted auger drill was transferred to this project from the Southeast phosphate project.

No further drilling was done by the U. S. Bureau of Mines in the western monazite belt.
LABORATORY INVESTIGATIONS

Tabular data pertaining to routine analytical work completed during the month are listed in table 5. A total of 47 samples was received by the Geological Survey from the public, including 20 public samples forwarded by the Atomic Energy Commission.

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<th>Project or material</th>
<th>Spectrographic determinations</th>
<th>Radio-</th>
<th>Chemical determinations</th>
<th>Other nations</th>
<th>Uranium nations</th>
<th>Samples received</th>
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<th>Washington Laboratory</th>
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<td>465</td>
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<td>1,697</td>
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<td>1</td>
<td>1</td>
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<td>281</td>
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<td>Oil-well drillings</td>
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<td>40</td>
<td>42</td>
<td>200</td>
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<td>Northwest phosphates</td>
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<td>0</td>
<td>41</td>
<td>200</td>
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<td>1,120</td>
<td>635</td>
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<td>925</td>
<td>90</td>
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<td>Total</td>
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<td>809</td>
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<td>1,812</td>
<td>7,405</td>
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Research

Detailed reports of progress in laboratory research projects are given in quarterly and annual reports. A report for the fourth quarter of calendar
year 1951 will probably be transmitted in April.

Chemical

Chemical research projects in progress are: (1) Determination of micro amounts of lead in minerals, rocks and ores as an aid in determining geologic age (no work was done during the month). (2) Study of immersion liquids of high refractive index and liquids of high specific gravity, (this is also a mineralogic study). This study is being continued on a part-time basis but will only be listed for those months during which work was done. (3) Continuing studies of methods for the determination of many different elements and compounds in radioactive rocks, minerals, and ores. (4) Statistical interpretation of chemical and radiometric analyses.

Mineralogic

Mineralogic research studies in progress are: (1) the Carnotite project, including lead and uranium isotope studies, studies of the minerals of the carnitite deposits, and study of the clays associated with the ore deposits; (2) the Phosphate project, including a study of the mineralogy and petrology of the Florida and northwest phosphate deposits and synthesis of apatite (no work was done during the month on this phase of the project); (3) properties of uranium minerals; (4) Colorado Front Range project, including the mineralogy and petrology of the veins and dikes in the Central City district, Gilpin County, the mineralogy and petrology of the fluorite deposits at James- town, Boulder County, and the mineralogy and petrology of the Copper King mine, Larimer County; and (5) mineralogy and petrology of lignites and shales.
Spectrographic

Spectrographic research projects in progress are: (1) detection of thorium in amounts as small as 0.001 percent; (2) detection of lead in amounts of less than one part per million to aid in geologic-age studies; and (3) continuing studies in methods of analysis.

Studies of germanium in lignite were completed in February (not reported in February report). These studies were conducted to determine if germanium volatilizes during ashing of lignites at 800°C in preparation for chemical analysis.

Radiometric

Radiometric research projects in progress are: (1) continuing studies to improve the counting methods; (2) development of a radiochemical method for the determination of uranium and thorium in monazite (no work was done during the month); (3) helium analysis; (4) thorium analysis; (5) alpha spectrograph; (6) mineral surface adsorption; (7) health physics; (8) quality of radiometric analyses.
REPORTS FORWARDED

Reports and memoranda prepared by the Trace Elements Office for transmittal to the Atomic Energy Commission include: (1) Trace Elements Investigations reports on specific areas, types of material, or laboratory and field techniques; (2) Trace Elements Memorandum reports on results of property examinations or preliminary appraisals of results of field projects, and on miscellaneous subjects (for planning purposes, many of the Memorandum reports are prepared only to inform the Atomic Energy Commission and Survey personnel, as quickly as possible, of the latest developments in the field projects); and (3) financial and administrative reports.

The reports listed below were transmitted to the Atomic Energy Commission during the month on the dates given.

Trace Elements Investigations Reports


216—"A spectrographic method for determining trace amounts of lead in zircon and other minerals," by C. L. Waring and Helen Worthing, 15 pp., 2 figs.; March 24, 1952.

Trace Elements Memorandum Reports

166—"Carnotite deposits in Craven and Coal Canyons, Fall River County, South Dakota," by W. E. Bales and R. L. Erickson, 17 pp., 2 figs.; March 31, 1952.

261—"Preliminary reserve statement 23, Reserve Block 8, Club Mesa, Montrose County, Colorado," by Leonid Bryner, and M. A. Cramer, 7 pp., 1 fig.; March 27, 1952.


299—"Interim report on exploration of the Moon Mesa and Horse Mesa areas, Mesa and Montrose Counties, Colorado," by J. H. Stewart, 7 pp., 1 fig.; March 13, 1952.


336—"Preliminary report on a uranium-bearing rhyolitic tuff deposit near Coaldale, Esmeralda County, Nevada," by D. C. Duncan, 8 pp.; March 6, 1952.


340—"Occurrence of uranium-bearing coal, carbonaceous shale, and carbonaceous limestone in the Fall Creek area, Bonneville County, Idaho," by J. D. Vine and G. W. Moore, 32 pp., 6 figs.; March 31, 1952.

345—"Claim map, Paradox quadrangle, Montrose County, Colorado," by R. D. Sample and H. F. Albee, 1 p., 1 fig.; March 28, 1952.


BERYLLIUM-BEARING ROCKS

All field work related to the investigation of beryllium-bearing rocks and supported by the Atomic Energy Commission was discontinued on June 30, 1950. With the exception of reports on the Pala and Rincon districts, San Diego County, California, preparation of reports was continued on the sub-projects listed in the February Monthly Report (p. 62).

During 1951 the California State Division of Mines published two reports on pegmatite studies conducted in cooperation with the U. S. Geological Survey. These are: Special Report 7-A, "Gem- and lithium-bearing pegmatites of the Pala district, San Diego County, California", by Richard H. Johns and Lauren A. Wright; and Special Report 7-B, "Economic Geology of the Rincon pegmatites, San Diego County, California", by John B. Hanley. Both reports are obtainable from the California State Division of Mines, Ferry Building, San Francisco 11, California.
PERSONNEL STATEMENT

The number of persons employed by each project are listed in the following table. This table will be revised when accurate data are available to show man-months expended for Trace Elements work supported by the Division of Raw Materials and the Division of Research of the Atomic Energy Commission.

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<th>Project</th>
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<tr>
<td>Airborne detection</td>
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<td>Reconnaissance, Alaska</td>
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<td>Colorado Plateau, exploration</td>
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</tr>
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<td>Colorado Plateau, geologic studies</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Colorado Plateau, Pre-Morrison studies</td>
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<td>9</td>
</tr>
<tr>
<td>Northwest phosphate</td>
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<td>8</td>
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<tr>
<td>Southeast phosphate</td>
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<td>15</td>
</tr>
<tr>
<td>Lignite and coal investigations and black-shale reconnaissance</td>
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<td>12</td>
</tr>
<tr>
<td>Thorium and monazite</td>
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<td>8</td>
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<tr>
<td>Laboratory Investigations</td>
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<td>109</td>
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<td><strong>Total</strong></td>
<td><strong>338</strong></td>
<td><strong>341</strong></td>
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GEOGRAPHIC INDEX

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Monument Valley area: 38
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