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# SURVEY NOTES

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## Hillside Terrain Development Workshop

HILLSIDE TERRAIN
Development Workshop

Friday, November 18, 1977
11:45 a. m. - 5:00 p.m.
Hilton Hotel of Salt Lake
150 West 500 South
Salt Lake City, Utah 84101
Registration Closes November 14
Phone:(801)-582-5562

A meeting cosponsored by the Utah Chapter of the American Institute of Planners and the Utah Geological and Mineral Survey will be held November 18 to discuss the problems of hillside development in the Intermountain area. Guest speakers from California will share their successes with hillside development in comparable environments. Beach Leighton, of Leighton & Associates, Irvine, California, will discuss "Hillside grading, geological problems, and engineering approaches to terrain development." John Prescott, Senior Planner of City of Thousand Oaks, California, will follow with a talk on the subject, "Application of site analysis to political decision making."

Following the talks, a discussion will be held by a panel of experts from the professions of civil engineering, finance, architecture, and law. The audience will have a chance to participate in the discussions.

Bruce Kaliser, Chief Engineering Geologist with the Utah Geological and

*(continued on page 7)*

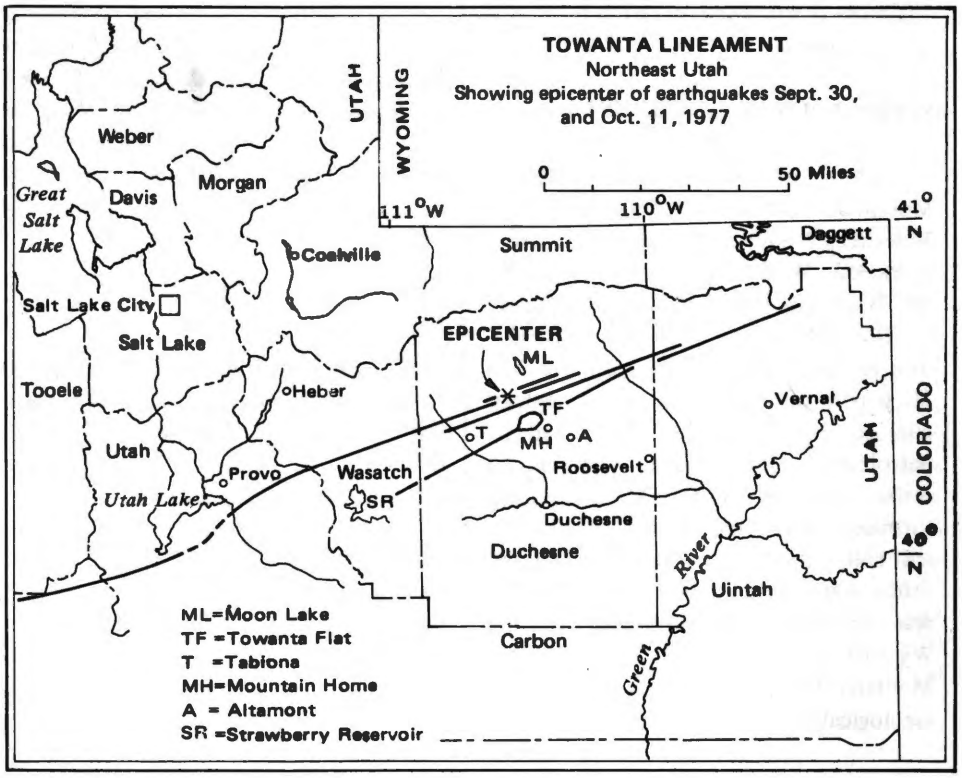
# EARTHQUAKES
## Shake Northwest Uinta Basin

In the pre-dawn hours of Friday, September 30, the northwest Uinta Basin was shaken by an earthquake which was felt over much of the northern part of the basin, principally in northern Duchesne County and eastward to Vernal in neighboring Uintah County. The University of Utah Seismograph Stations calculated the magnitude of the quake as 4.4 on the Richter scale and located the epicenter southwest of Moon Lake close to the valley of Rock Creek. Time of the quake was 4:19 A.M., and residents of the area reported feeling an aftershock at 7:00 A.M. A separate tremor registering 4.1 was felt at 1:56 A.M., October 11 in the same locale.

The initial quake was felt as a sharp shock by the scattered residents of the epicentral area and in nearby Talmage, Mountain Home, Boneta and Altamont. Rattling and shaking of buildings was reported, a few loose objects were knocked from walls and shelves, but no serious damage was evident. Inexplicably the quake was sharply and distinctly felt in the Grand Junction and Fruita (Colorado) area 150 miles southeast.

The earthquake took place in an area generally considered stable and free of seismic activity. However, in recent

*continued on page 3*



## LATEST RELEASES UGMS REPORTS OF INVESTIGATIONS

UGMS has unpublished Reports of Investigations on open-file. These recent reports may be examined at the UGMS offices:

**Report of Investigation No. 118,** *Assays of oil shale cuttings and cores, P. R. Spring and Hill Creek oil impregnated sandstone deposits,* by Howard R. Ritzma, July 1977, 20 p.

**Report of Investigation No. 119,** *Recommendations for selected individual wastewater disposal systems in the Roosevelt and Vernal areas, Duchesne and Uintah Counties, Utah,* by James Rogers, August 1977, 16 p.

**Report of Investigation No. 120,** *Sandstone spar in Trail Mountain Coal Mine, Emery County, Utah,* by Hellmut Doelling, September 1977, 6 p.

**Report of Investigation No. 121,** *Preliminary notes on alternate sites for a coal-fired power plant in Utah,* by Bruce N. Kaliser, October 1977, 15 p.

## NEW UGMS STAFF MEMBER

Archie Smith has joined the UGMS staff as an economic geologist. Archie received his degree in geology from BYU. His most recent experience has been with the U.S.Navy.

## SEVEN POUNDS OF THRUST

A 1977 guidebook, "Rocky Mountain Thrust Belt, Geology and Resources," edited by Heisey, Lawson, Norwood, Wach and Hale is on sale by the Wyoming Geological Association, P. O. Box 545, Casper, Wyoming 82602. The 787-page volume contains more than 50 papers on all aspects of the geology and geophysics of the region and its petroleum, coal and geothermal resources. Cost is $42.00, post paid. Profusely illustrated in black and white and color, the book contains 9 plates and other maps in the pocket. The volume was sponsored and produced by the Wyoming Geological Association, Montana Geological Society and Utah Geological Association.

# DIGGIN'S

## ENERGY MAP

Map 36, "Energy Resources Map of Utah", is near out-of-print status and will be replaced by a revised edition in 1978. Persons noting corrections and additions should call these to the attention of the Director's office, UGMS.

## GSA

The 31st Annual Meeting of the Rocky Mountain Section, Geological Society of America will be held April 28-29, 1978 at Provo, Utah. Host for the meeting is the Department of Geology, Brigham Young University.

## BASEMENT CONFAB

The Third International Conference on Basement Tectonics is scheduled for May 15-19, 1978 at Ft. Lewis College, Durango, Colorado. The first conference of this series was held in Salt Lake City in 1974.

## LAKE RESEARCH

Amoco Production Company has asked for permission to install two offshore weather monitoring stations in the Great Salt Lake and a third onshore station on State lands north of the lake. The three stations, which are expected to begin operation in late October or early November, will provide information to assist Amoco in planning for oil and gas exploration on the lake in 1978.

## OIL AND GAS LEASE BIDS

High bids totalling over $500,000 for oil and gas leases on 8,432.84 acres in Carbon County, Duchesne, Emery, Garfield and Grand Counties were received by the Bureau of Land Management on September 13. Fifty four bids were received on 25 parcels of land varying in size from 40 to 640 acres each. In addition to the amount bid, successful bidders will pay rental for use of the land and royalties on any gas or oil extracted. (from the BLM Utah News Digest).

## POTASH PROBE

Buttes Resources has applied for 22 potash prospecting permits totalling 51,158 acres near Moab. The review and hearing process has been favorable to date, and an exploration program is expected to begin in the near future.

## PUBLIC LANDS AGAIN

The U.S. Bureau of Land Management will again manage "public lands". The term "national resources lands" has been dropped, a result of legislation passed in October 1976.

## GEOLOGY UP TO DATE

*"Introduction to Geology, Physical and Historical",* 2nd edition by William Lee Stokes, Sheldon Judson and M. Dane Picard, Prentice Hall, 1978.

This thoroughly revised edition of the popular textbook, designed as a non-mathematical approach to Earth Science, relates astronomy, biology, chemistry and physics with geology. Plate tectonic theory is examined in depth, as are environmental problems such as earthquakes, and floods, and mineral and energy resources, shortages, and conservation.

## LERC "BURN" PROGRESSES

The *in situ* fire flood experiment in tar sand at Northwest Asphalt Ridge near Vernal was ignited August 28 and was burning successfully in mid- October. The reverse combustion experiment will be switched to forward combustion in mid-November and is expected to continue until mid-January. An emulsion of oil and water with gases is being recovered by pump and gas lift from the combustion zone which is about 350 feet below the surface. The work is directed by the Laramie Energy Research Center (LERC), U.S. Department of Energy (formerly U.S. Energy Research and Development Administration).

# Uinta Earthquake

*(continued from page 1)*

years detailed geologic mapping and careful field examinations in the Uinta Basin by UGMS have revealed subtle but definite indications of seismic activity of relatively recent age. A number of lines of fracturing and faulting, separate from the Uinta Mountains, strike N70°E along the south flank of the mountains and extend out into the basin to the south. These apparently reflect an ancient, deep-seated rupture of the earth's crust that can be traced from near the northeast corner of Utah nearly to the Nevada line. This fracturing and faulting is older than the Uintas and is apparently still active to some extent. The September 30 and October 11 earthquakes occurred along this line (lineament).

The lineament has very subtle but definite expression including lines of springs, sinkholes and caves, disturbed drainage lines, and in some places fault scarps with evidence of movement since the end of glacial time, perhaps as recently as 4,000 to a few hundred years. One such area is Towanta Flat four miles northwest of Mountain Home where well-defined fault scarps cutting across glacial outwash are as fresh-appearing as any along the Wasatch Front and equal in magnitude (scarp height).

The Towanta Flat area was described by Wallace R. Hansen of the U.S.Geological Survey in a short paper in the 1969 Intermountain Association of Geologists guidebook and later in U.S.G.S. Bulletin 1291. The lineament, dubbed "Towanta Lineament" by H.R. Ritzma, was described in a paper in Utah Geological Association Publication 5, 1976.

Bruce Kaliser, UGMS Engineering Geologist, and Howard Ritzma, UGMS Assistant Director, toured the earthquake area for two days after the first tremor and found a few indications of minor earth movement. One possible rock fall in Rock Creek Canyon and slump of a rock slab in Farnsworth Canal (dry) near Moon Lake were noted. Interviews in the area turned up a number of instances of persons awakened in advance of the quake by restless horses and barking and howling dogs. In two instances horses "raised a ruckus" in barns and corrals for half an hour before the quake. The two geologists also found road repairs in progress where the branch of the lineament on which the quake took place crosses the paved Forest Service Road leading to Moon Lake. The road obviously was not damaged by this quake, but the fault zone (lineament) does appear to coincide with a belt of very unstable ground about 100 feet wide. Where the road crosses this, repairs are required once or twice each year.

Also visited was the site where the Farnsworth Canal, which carries most of the area's irrigation water, disappeared into two sinkholes about 15 years ago. The large collapse features are located squarely astride the main branch of the Towanta Lineament where it cuts across the glacial outwash at Towanta Flat. Displacement of the glacial gravels (down to south) is displayed in the wall of one sinkhole. The canal was relocated when efforts to fill the sinkholes were unsuccessful.

Large gray slab of sandstone (left of center) slumped about 10 feet into dry bed of Farnsworth Canal 3 miles south-southeast of Moon Lake after earthquake. White stain (below level of pick on slab) marks high water level of canal. Slab is not stained in contrast to slab at right and cobbles and boulders right and left. White object to left of pick is hard hat.

# *Legal Matters*

One of UGMS' less known functions is its assistance and counsel to the office of the Attorney General and other State agencies in preparation and prosecution of various legal actions involving natural resources. Probably best known is the Survey's service performed over many years in legal actions leading to the State's ownership of Great Salt Lake. Possibly less well known, but of equal importance, has been the Survey's involvement in tangled problems such as mineral value of lands involved in the "lieu lands" exchange with the Federal Government boundaries of parks, monuments and other Federal reservations proposed for expansion, and litigation over whether Utah's oil and gas (or hydrocarbon) leases covered substances such as oil shale and coal.

Within the past few months UGMS Assistant Director Howard Ritzma has spent considerable time assisting the Attorney General's Office and the Department of Business Regulation in the lengthy and complex hearings concerning the relation of Mountain Fuel Supply to its wholly owned exploration subsidiary Wexpro.

"A lot of basic geology was involved in the matters in dispute," Ritzma explained. "Included were the structure and stratigraphy of the most important fields, the sequence of the producing formations, and the effect of depth, pressure and temperature on the hydrocarbons in the reservoir. There were very subtle and complex geologic and engineering concepts involved, and there is great difficulty in explaining these under the adversary system of legal hearings."

Another geologic/legal matter of recent importance which has involved UGMS is the conflict over oil exploration on State lands in the rugged Roan Cliffs of northwest Grand County. The State has designated the area "roadless," but the oil and gas leases pre-date the designation. Several matters remain to be settled, but it appears the Anschutz Corporation will be able to proceed with exploration of an important gas and oil prospect.

# UTAH PRODUCTION - 1977

## A Preliminary review

*by: Carlton H. Stowe*
*Mineral Information Specialist*

From all indications 1977 mineral production in Utah will not be as great as it was for 1976. That year, for the first time in Utah's mining history, mineral production exceeded the billion-dollar mark (Survey Notes, May 1977).

Assessed valuation of the mining industry this year dipped badly. Two factors - loss of over $50 million in net proceeds by Kennecott Copper Corporation, and some $20 million loss in oil and gas property - values account for a drastic fall in Utah's 1977 mineral property valuation of $430,542,437, a decrease of $70,591,361 from the $501,433,798 assessed in 1976. This valuation also fell short of the 1975 assessment of $493,052,022. Both mining and oil and gas properties suffered losses. Mining property valuation for 1977 is $215,297,103 compared to 1976's $266,863,332. 1977 oil and gas assessed valuation is $215,245,334 compared to 1976's $234,570,466.

Oil production dropped last year to slightly more than 35.3 million barrels. It is thought that the 1977 total should be about the same. Yet, increases noted in oil production have not sufficiently offset decreases to any extent that will greatly affect statistics. Most significant increase in production records will show up in final figures for the Pineview field in Summit County.

Gold production is expected to drop to about 183,000 troy ounces and copper production to around 180,000 tons. Coal production, however, should strengthen with increases upwards to the 8,000,000 ton class this year.

Yearly production values since 1972 have doubled due mainly to inflation. When translated to "constant" dollars the reduction in production values will be even more precipitous. In 1972 Utah's mineral value was $542 million. In 1976, $1,018 million (table 1).

A tally of yearly cumulative totals shows more than $16.7 billion produced in the state (table 2). (For a complete historical account of mineral production in Utah the reader is referred to Utah Geological & Mineral Survey Bulletin No. 106, "Utah Mineral Industry Statistics through 1973", April 1975).

*(continued on page 7)*

| | January | February | March |
|---|---|---|---|
| 1972 | | | |
| Copper | 19,107 | 20,204 | 21,956 |
| Lead | 2,090 | 1,536 | 1,865 |
| Zinc | 1,469 | 1,642 | 1,918 |
| 1973 | | | |
| Copper | 18,311 | 20,542 | 22,810 |
| Lead | 1,067 | 709 | 1,027 |
| Zinc | 1,677 | 1,470 | 1,434 |
| 1974 | | | |
| Copper | 14,211 | 18,657 | 22,132 |
| Lead | 924 | 949 | 1,062 |
| Zinc | 1,246 | 1,105 | 1,231 |
| 1975[1] | | | |
| Copper | 16,711 | 14.920 | 13,316 |
| Lead | 637 | 660 | 796 |
| Zinc | 1,086 | 1,032 | 1,268 |
| 1976[1] | | | |
| Copper | 14,128 | 13,294 | 15,823 |
| Lead | 1,683 | 1,873 | 1,816 |
| Zinc | 2,978 | 2,672 | 2,823 |
| 1977[1] | | | |
| Copper | 17,122 | 16,802 | 18,566 |
| Lead | 1,323 | 1,338 | 1,309 |
| Zinc | 1,886 | 2,316 | 1,883 |

Source: USBM Minerals Yearbooks
[1] Preliminary USBM-UGMS data

Table 1. Values of Utah's mineral production, 1972-1976

| Year | All minerals | All minerals except gold, silver, copper, lead, and zinc |
|---|---|---|
| 1972 | $ 542,809,000 | $ 218,680,000 |
| 1973 | 674,210,000 | 318,161,000 |
| 1974 | 952,045,000 | 525,931,000 |
| 1975[1] | 966,407,000 | 675,075,000 |
| 1976[1] | 1,018,161,000 | 698,481,000 |

Source: USBM Minerals Yearbooks.
[1] Preliminary USBM-UGMS data.

Table 2. Cumulative values of Utah's mineral industry production 1972-1976

| Year | All minerals | All minerals except gold, silver, copper, lead, and zinc |
|---|---|---|
| 1972 | $ 13,156,078,000 | $ 4,915,886,000 |
| 1973 | 13,830,288,000 | 5,234,047,000 |
| 1974 | 14,782,333,000 | 5,660,161,000 |
| 1975[1] | 15,748,140,000 | 5,951,493,000 |
| 1976[1] | 16,766,901,000 | 6,271,173,000 |

Source: USBM Minerals Yearbooks.
[1] Preliminary USBM-UGMS data

Table 4. Production of Utah's major nonferrous metals, 1972-1976

| | Copper | | Lead | | Zinc | | Gold | | Silver | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | tons | value | short tons | value | short tons | value | ounces | value | ounces | value | Total value five metals |
| 1972 | 259,507 | 265,735 | 20,706 | 6,224 | 21,853 | 7,758 | 362,413 | 21,237 | 4,300,000 | 7,245 | 308,199 |
| 1973 | 256,589 | 305,341 | 13,733 | 4,474 | 16,800 | 6,942 | 307,080 | 30,035 | 3,619,000 | 9,257 | 256,049 |
| 1974 | 230,593 | 356,497 | 10,510 | 4,729 | 12,619 | 9,060 | 254,909 | 40,719 | 3,208,000 | 15,109 | 426,114 |
| 1975[1] | 177,155 | 227,467 | 12,679 | 5,452 | 19,640 | 15,319 | 189,620 | 30,622 | 2,822,000 | 12,472 | 291,332 |
| 1976[1] | 185,760 | 260,064 | 15,965 | 7,376 | 22,155 | 16,395 | 184,565 | 22,701 | 3,008,000 | 13,144 | 319,680 |

Source: USBM Minerals Yearbooks
[1] Preliminary USBM-UGMS data

Table 3. Monthly production of major nonferrous metals in Utah, 1972-1976

| April | May | June | July | August | September | October | November | December | Total | Revised Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 21,697 | 23,727 | 23,537 | 13,674 | 23,635 | 23,055 | 24,259 | 22,462 | 17,790 | 255,103 | 259,507 |
| 1,677 | 1,924 | 1,783 | 1,910 | 1,862 | 1,711 | 1,515 | 1,309 | 1,520 | 20,702 | 20,706 |
| 1,812 | 2,062 | 2,001 | 2,249 | 2,144 | 2,089 | 1,937 | 1,681 | 1,775 | 22,779 | 21,853 |
| 23,104 | 22,475 | 22,958 | 20,692 | 22,667 | 21,216 | 23,861 | 20,185 | 19,039 | 257,860 | 256,589 |
| 1,230 | 1,593 | 1,202 | 1,113 | 1,173 | 1,196 | 1,119 | 1,285 | 1,152 | 13,861 | 13,733 |
| 1,346 | 1,377 | 1,330 | 1,205 | 1,232 | 1,498 | 1,339 | 1,210 | 1,446 | 16,564 | 16,800 |
| 20,114 | 21,627 | 21,599 | 14,712 | 21,708 | 19,515 | 19,207 | 17,720 | 18,886 | 230,088 | 230,593 |
| 1,280 | 1,085 | 956 | 803 | 795 | 694 | 680 | 615 | 731 | 10,574 | 10,510 |
| 1,490 | 1,049 | 1,138 | 938 | 837 | 891 | 1,002 | 775 | 966 | 12,668 | 12,619 |
| 15,003 | 17,794 | 16,682 | 10,054 | 15,203 | 15,937 | 15,549 | 14,104 | 13,352 | 178,685 | 177,155 |
| 624 | 1,531 | 1,198 | 1,044 | 1,169 | 960 | 1,007 | 1,430 | 1,670 | 12,726 | 12,679 |
| 892 | 1,978 | 1,936 | 1,566 | 1,920 | 1,832 | 2,159 | 2,166 | 2,411 | 20,146 | 19,640 |
| 16,214 | 14,381 | 12,620 | 13,817 | 14,727 | 18,252 | 17,405 | 17,501 | 17,598 | 185,760 | 185,760 |
| 1,627 | 760 | 804 | 713 | 989 | 1,390 | 1,352 | 1,529 | 1,429 | 15,965 | 15,965 |
| 2,586 | 1,350 | 1,076 | 719 | 1,178 | 1,761 | 1,662 | 1,656 | 1,694 | 22,155 | 22,155 |
| 18,428 | 19,734 | 8,269 | 5,555 | | | | | | | |
| 1,009 | 827 | 975 | 750 | | | | | | | |
| 2,232 | 1,581 | 1,776 | 1,455 | | | | | | | |

Table 5. Total cumulative production of Utah's nonferrous metals, 1972, 1976
(Reported in thousands of units)

| | Copper | | Lead | | Zinc | | Gold | | Silver | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | tons | value | short tons | value | short tons | value | ounces | value | ounces | value | Total value five metals |
| 1972 | 11,050 | 5,558,725 | 5,581 | 816,838 | 1,902 | 381,923 | 20,400 | 629,885 | 911,466 | 699,502 | 7,778,988 |
| 1973 | 11,307 | 5,864,066 | 5,595 | 821,237 | 1,919 | 388,865 | 20,707 | 659,920 | 915,085 | 708,759 | 8,442,847 |
| 1974 | 11,538 | 6,220,563 | 5,606 | 825,966 | 1,932 | 397,925 | 20,966 | 701,656 | 918,344 | 724,141 | 8,870,430 |
| 1975[1] | 11,715 | 6,448,030 | 5,618 | 831,418 | 1,951 | 413,244 | 21,154 | 732,204 | 921,077 | 736,246 | 9,161,762 |
| 1976[1] | 11,901 | 6,708,094 | 5,634 | 838,794 | 1,973 | 429,639 | 21,339 | 754,905 | 924,085 | 749,390 | 9,481,442 |

Source: USBM Minerals Yearbooks
[1] Preliminary USBM-UGMS data

## ROCKY RIDGES

by Greg McLaughlin

## FIRST OIL SHALE ROYALTY PAYMENT

A news item in the October 6 issue of the Vernal Express reports that Utah has just received its first royalty check from the production of oil from oil shale.

The oil was produced by Geokinetics, a group developing oil shale lands in southern Uintah County. Geokinetics has developed a true in-situ process that requires no mining, no removal of top soil, uses no water, and causes very little disturbance to the environment.

The process of extraction is different from other methods being tested or planned in the basin. Instead of a modified vertical in-situ method, Geokinetics uses a horizontal fired in-situ process which utilizes the thin layered shallow and surface shales ordinarily considered of little value. The shale beds are prepared for ignition by first being fractured and "fluffed up" by close-spaced explosive charges. This is the only process known which can recover oil from shallow beds without strip mining.

According to Charles R. Henderson, Uintah Basin Association of Governments Energy Planning Director, the oil is sold to a refinery in Roosevelt where it is blended with conventional crude oil.

At present Geokinetics is producing from an isolated school section; it hopes to lease a tract of land designated as in-situ tract but for which the Federal Environment Impact Statement has not been completed.

### SUPERBOARD MEETING

In the afternoon of September 15, all members of the Governing Boards in the Department of Natural Resources assembled in the auditorium of the State Office Building for a joint meeting. This innovative idea was introduced by Gordon Harmston, Executive Director of the Department of Natural Resources, as a means of orienting the new Governing Board members to the department, as well as expanding the outlook of the incumbent members. Each Division Director gave a brief resume of his organization's function. Many of these presentations were enhanced by audio-visual techniques.

That evening a dinner was held at the Hilton Inn at which Governor Matheson delivered a brief talk to the assembled Governing Board members and the Division Directors.

Gordon Harmston sent a memorandum to the Division Directors to express his appreciation for the fine presentations made at the "Super Board" meetings. He expects the event to be repeated many times in the coming years.

### NEW STAFF FOR URBAN AND ENGINEERING GEOLOGY

Urban and Engineering Section Chief Bruce Kaliser reports that recent authorization for an additional engineering geologist to the Section staff will enable him to better assist local political subdivisions in the state in their preparation of geologic ordinances.

In recent times local government planners and planning commissions have been addressing such essential matters as foothill development, earthquake hazard reduction and culinary water source protection by creating new ordinances and adding amendments to existing ones. If UGMS were to function as a clearing house for these ordinances, it would not be necessary for each community to "reinvent the wheel" when attacking these problems. UGMS is also called upon with increasing frequency to critique land development ordinances, to inspect terrain for which ordinances have been formulated, and to suggest modification and improvements of these ordinances.

The strengthening of UGMS' staff will greatly assist in providing requested geologic services to State agencies and local governments.

## NEW MAPPING

### Revises Outcrop Patterns

Field geologic mapping by Dr. Hellmut Doelling and others in the isolated ranges (islands) in and around the Great Salt Lake Desert indicates that several of these ranges contain a more diverse and complete stratigraphic sequence than that shown on the present state geologic map (northwest quarter) published in 1962.

The work, part of the UGMS county studies program, has been under way for a number of years in Box Elder County, one of the most geologically complex counties in Utah. Some of the revisions will considerably alter stratigraphic and structural concepts of the region.

The revised mapping will appear as part of a forthcoming bulletin on the geology and mineral resources of Box Elder County and will eventually be incorporated into the new state geologic map which gradually begins to take shape as the old map approaches "out-of-print" status.

### PROPOSED ALUNITE MINE FAILS IMPACT TEST

The Department of the Interior has released a final environmental statement for a proposed alunite processing plant and mine in Beaver County. The proposed development would produce annually 500,000 tons of alumina, 370,000 tons of potassium sulfate fertilizer, up to 1.7 million tons of phosphate fertilizer, and up to 20,000 tons of aluminum fluoride.

In an analysis of the project's final environmental impact statement, the Environmental Protection Agency said the plant would run afoul of clean air standards unless better air pollution equipment is installed or the plant is moved to a flatter location. The proposed operation would employ about 1,000 people.

## *Dike Investigated in Uintas*

There are igneous rocks in the Uintas, this much Dr. Andrew Godfrey, geologist for the U.S. Forest Service, Vernal, and Howard Ritzma, UGMS Assistant Director, can attest. On a windy, cold day in mid-September, the pair, on foot after helicopter transport, investigated the dike shown as a red dashed line on the state geologic map and the geologic map of Uintah County. Previous knowledge of the dike was mainly word-of-mouth information from the late G. Ernest Untermann, Utah Field House of Natural History, Vernal. Even location of the dike, quite different on the two maps, was not known with certainty. Dike rock sampled by Untermann in Lakeshore Basin south of Leidy Peak was dated at about 440 million years, late Ordovician or early Silurian (Ritzma: Utah Geology, v. 1, no. 1, p. 95). The dike intrudes Precambrian Uinta Mountain Group metasediments.

Two areas of exposure were found, a western locality in Deadman Lake cirque basin and another locality 2 miles to the east in the west wall and floor of the Lakeshore Basin cirque.

At Deadman Lake the dike is 35 feet thick and contains many interesting inclusions of country rock and some feldspar as fracture fillings. There is minor bleaching and vitrification of the quartzite wall rock and very little apparent mineralization. The dike at Deadman Lake is covered with mining claims, and the prospecting accounts for many of the exposures.

In the two miles between Deadman Lake and Lakeshore Basin, two shallow cuts and one water-filled shaft were noted but no outcrops or float of the dike rock were found.

In western Lakeshore Basin the dike varies from one to 50 feet wide. There is little or no alteration of the shales and quartzites at the contact and no apparent mineralization.

The dike rock is a dark green to black, coarse-grained gabbro, deeply weathered in most exposures. Careful sampling to obtain fresh rock will be necessary to determine the exact composition. The area investigated is at elevations ranging from 11,000 to 11,750 feet and is characterized by gently rolling surfaces veneered with residual frost-heaved quartzite slabs (felsenmeer). The rolling surfaces are incised by glacial cirques with steep, talus-banked walls.

Two other dikes noted by the U.S. Geological Survey occur 20 miles west near Gilbert Peak. More complete investigation of the Lakeshore Basin dike and the western Gilbert Peak localities is planned for the 1978 field season.

### PINEVIEW PRODUCTION BURGEONS

July oil production from Pineview field east of Coalville, Summit county, averaged 11,800 barrels per day from 11 wells. Production for the first seven months of 1977 has averaged a little over 10,000 barrels per day. The field, which began producing in late 1975, has produced 3.43 million barrels to the end of July 1977, 2.34 million of this in 1976. Production (gas and oil) is from the Jurassic Twin Creek Limestone and Nugget Sandstone.

### UTAH PRODUCTION

*(continued from page 4)*

Copper, lead, zinc, gold and silver yearly production totals have generally decreased since 1972 (table 4). However, value of the five metals produced has not changed much except for the high point reached in 1974 of $426 million. Mining of energy-based minerals, metals and nonmetals employs more than 14,000 people in Utah. In 1970, 12,700 people were employed in mining in the state. During 1975, 13,103 people were employed in the industry, and the Utah Department of Employment "Job Service" reports figures for 1976 show 13,944 people employed (Annual Report summary for 1976, issued October 1977). Layoffs in metals mining and oil exploration kept the industry's job growth rate comparatively down, but increased job availability is seen for 1977 from coal mining in particular. More than 3,200 employees are currently working in the coal mining industry of Utah.

### HILLSIDE TERRAIN DEVELOPMENT WORKSHOP

(continued from page 1)

Mineral Survey, has done areal engineering geologic mapping along the Wasatch Front, particularly in Davis County, where a major project has been completed. Recommendations for community ordinances to guide the planning and use of real estate situated on benchland and hillside slopes has led him to organize this workshop to acquaint professional planners, developers, financiers, and related professionals in this area with the solutions to geologically based problems and hazards relating to hillside properties.

Typical of such problems is the landslide that broke the foundation of a new school being constructed on Salt Lake City's north bench between 12th and 13th Avenue (See May, 1977 issue of Survey Notes). The landslide was in unstable Lake Bonneville sediments which may have moved after considerable grading and a month of unusually heavy rains. In the midsummer of 1977, residents in a new development in Bountiful were dismayed to find their yards and basements flooded with sediment following a summer storm. Damage from cloud-burst triggered floods is becoming more common as residences are built on higher Lake Bonneville benchlands (see February, 1977 Survey Notes).

The purpose of this workshop is to acquaint architects, lawyers and financiers with the techniques of hillside grading which are both geotechnically satisfactory and least disturbing to the environment. Obvious geological engineering considerations such as control of erosion, sedimentation and scarring are to be discussed as well as the more fundamental considerations of slope stability and earthquake induced failures. Solutions achieved by practicing professionals in the field will be presented. City and county planners in particular must wrestle with these problems with ever greater frequency.

## *"Lost" Rhoades Gold Mine*

Two prospectors from Price, Utah claim to have found the fabled "Lost" Rhoades gold mine, according to a story printed in the Uintah Basin Standard (9-8-77) and reprinted by the Mining Record (Denver, 9-24-77). Various versions of the mine legend involve mining by Indians, Spaniards, and early Mormon settlers and possibly the discovery of a cache of Spanish gold of unknown origin.

The locale of the mine is the Pole Creek Sink in Pole Creek Canyon on the south flank of the Uinta Mountains about 14 miles north-northwest of Neola. The sink is in the Madison Limestone (Mississippian) along the South Flank Fault where the Madison is faulted against ferruginous Uinta Mountain Group metasediments (Precambrian).

Almost coincident with the publicity on the mine, two UGMS geologists, Blair McCarthy and Bill Lawrence, paid a routine visit to the site in the course of a general gathering of data on Uinta Basin mineral resources. The mineralization noted appears to be typical of many small mineral deposits emplaced in the fault zones bounding the south flank of the Uintas, mostly iron, and not much else. The core of the Uintas is made up almost entirely of ancient sediments which are only slightly altered and metamorphosed and are totally devoid of major mineral deposits.

### USGS OPEN-FILE REPORTS MAY NOW BE PURCHASED BY MAIL

Starting October 1, 1977, copies of U. S. Geological Survey, Department of the Interior, open file reports may be purchased by mail from a single centrally-located facility at Denver, Colo.

Previously, copies of USGS open-file reports were made available for public inspection only, or copies could be obtained at purchaser's expense, not by mail, at designated Survey libraries, public inquiries offices, or other facilities.

The system of open-file reports was started during World War II when there was an urgent need for information on strategic minerals collected by the Survey to help in the war effort. By making the results of Survey field investigations and research available in open-file interim reports, pending formal publication, a time lag of several weeks or months is eliminated.

**HAPPY HOLIDAYS**
**from the**
**U G M S**
**Staff**

### *LAKE CONTINUES SUMMER DECLINE*

The level of Great Salt Lake continued to fall gradually during the summer months. Gage heights recorded by the U.S. Geological Survey are:

| Date | Boat harbor (south arm) | Saline (north arm) |
|---|---|---|
| August 1 | 4,199.75 | 4,198.60 |
| August 15 | 4,199.40 | 4,198.40 |
| September 1 | 4,199.25 | 4,198.35 |
| September 15 | 4,198.00 | 4,198.15 |
| October 1 | 4,198.90 | 4,198.05 |
| October 15 | 4,198.80 | 4,197.95 |

Walt Katzenberger, UGMS lake specialist, reported that salt began to precipitate on the bottom of the north arm between August 15 and September 1.

The level of the south arm on October 15 was 1.60 feet lower than on the same date in 1976.

**UTAH GEOLOGICAL AND MINERAL SURVEY**
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State of Utah—Department of Natural Resources
UTAH GEOLOGICAL AND MINERAL SURVEY
606 Black Hawk Way
Salt Lake City, Utah 84108

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