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SURVEY NOTES

Vol. 13 No. 3 Service to the State of Utah August, 1979

TWO GREAT SALT LAKE WELLS PRODUCE OIL

AMOCO PLANS FOUR MORE

Two of the five wells in the exploratory series drilled in the north arm of the Great Salt Lake by Amoco Production Company have recovered significant amounts of oil. These two, No. 1 State-D and the No. 2 State-West Rozel are located about 5 miles west-southwest of Rozel Point (see map, page 7) where seeps of thick, tarry, sulfurous oil have been known for more than a century. Production of this oil from shallow wells has been attempted sporadically for 75 years with little success. Although shut in, the cluster of shallow wells is officially designated as the Rozel Point Field.

The oil recovered by the two Amoco tests has turned out to be somewhat of a mixed blessing. It is similar to the Rozel Point crude oil – heavy, thick, tarry, and sulfurous. Analyses show it is heavier than water and solidifies between 100° and 115°F. The sulfur content, 7.0 to 11.5 percent, is possibly the highest ever reported from crude oil anywhere.

The oil found by Amoco in its Great Salt Lake exploratory program will present considerable difficulty in production, transport, and refining. Location of the discovery five miles offshore in a body of highly saline water also presents some formidable problems. The reservoir is fractured volcanic flow rock (basalt) at a depth of 2300 to 2700 feet.

Cost of the Amoco exploratory program to date is $23,000,000. Over $4,300,000 of this cost has been paid to the State of Utah in annual rentals on the 600,000 acre lease block. The terms of the oil and gas lease call for payment of 12.5% (1/8) royalty on oil produced from the leases. Development of an oil field, even one of modest size, could return a substantial annual income to the state treasury, perhaps as much as a million dollars.

Amoco will temporarily suspend exploratory drilling on the north arm of the lake and will move the barge and drilling rig across the railroad causeway into the south arm. Permits for four wells have been issued by the Utah Division of Oil, Gas and Mining. All are in the area west-southwest of the state park on the north tip of Antelope Island, mostly midway between Antelope and Carrington islands. (See map on page 7).

THRUST BELT BOX SCORE

Utah's six Thrust Belt fields have produced to the end of 1978 as follows:

RICH COUNTY - *Hogback Ridge* - Discovered 1977 Produced 1978 - (1 well - 1 pay zone) 1,024,761 mcf gas.

SUMMIT COUNTY - *Anschutz Ranch* - Discovered 1978 - not produced. *Elkhorn* - discovered 1977 - not produced.
Lodgepole - -Discovered 1977; Produced 1978- (3 wells 2 pay zones) 97,730 barrels oil.
Pineview - Discovered 1975; Produced 1975- (24 wells - 4 pay zones) 10,585,656 barrels oil, 10,746,545 mcf gas.
South Lodgepole - Discovered 1978 - not produced.

Pineview is the largest field in the Thrust Belt of Utah with a estimated reserve of 135 million barrels of oil and 135 billion cubic feet of gas. Elkhorn and Lodgepole are probably smaller fields, in the range of 25 and 10 million barrels respectively.

LANDSLIDE SLOWS CREEPER

Heber Creeper Railroad bed is dropped by landslide in Wasatch County. Note ends of rails above observer's head; disturbed rail in front of observer has been removed. UGMS is advising the State Division of Parks and Recreation so that the summer rail transit route of the Heber Creeper will not be interrupted during the tourist season. Two other slides are also proving troublesome this year and are being studied by the UGMS geologists of the Engineering Geology Section.
(continued on page 6).

DIGGIN'S

WHO OWNS UTAH LAKE?

The U. S. Army Corps of Engineers has threatened to force removal of the new Utah Lake State Park boat ramp constructed by the Division of Parks and Recreation because construction and operation were not sanctioned by the corps. Utah has responded by filing suit in U. S. District Court to determine once and for all ownership and jurisdictional rights at Utah Lake.

The legal dispute is reminiscent of the 10 years of litigation which ended in Utah's ownership of the Great Salt Lake and subsequent oil and gas leasing and exploratory drilling.

BURGIN MINE STUDY

Recently issued U. S. Geological Survey Professional Paper 1024, General Geology and Mines of the East Tintic Mining District, Utah and Juab Counties, Utah by H. T. Morris and T. S. Lovering contains additional sections on the Burgin and Trixie mines.

Lee Perry, geologist in the UGMS Economic Section, is one of the co-authors of the Burgin Mine study along with A. Paul Mogensen, W. M. Shephard, S. M. Smith and H. T. Morris. Perry was employed at Kennecott Copper during the study as mine geologist for the Burgin operation. Mogensen, Shephard and Smith are also former Kennecott geologists.

U – ORE ESTIMATE UP

Based on additional drilling and sampling in the south end of Lisbon Valley, Atlas Corporation has revised its previous estimate (Survey Notes, May 1979) of 4.5 million pounds of economically recoverable U_3O_8 upward to at least 6 million.

Production from the new property is expected to begin in 1979. Ore grade is high, about 15 pounds of uranium concentrate per ton compared to an industry average for the region of 3 to 4 pounds per ton.

BASIN AND RANGE FIELD TRIP

A four-day field trip sponsored by the Rocky Mountain Association of Geologists (Denver) and the Utah Geological Association will be held October 7 through 11 beginning and ending in Las Vegas, Nevada and with two nights (9 and 10) in Ely. A comprehensive symposium volume containing 55 papers and road logs will be published in conjunction with the trip. Editors are Harry D. Goode (for UGA) and Gary W. Newman (for RMAG).

Information on the trip can be obtained from officers of UGA and from RMAG, 1615 California Street, Suite 217, Denver, Colorado 80202, phone (303) 573-8621.

COAL–FIRED POWER PLANT PROPOSED

Two applications for alternate sites for a coal-fired 3,000 megawatt power plant have been filed with the Bureau of Land Management by Intermountain Power Project. The first application is for the Salt Wash site in Wayne County; the second is for a site near Lynndyl in Millard County. Applications are for rights-of-way on public lands.

Decision on the applications can not be taken by the BLM until an environmental impact statement for the proposed project has been completed. *Utah BLM News release, 4-23-79.*

GRAVITY SURVEY ON LAKE

The Division of State Lands has issued a permit for a gravity survey to be conducted across much of the Great Salt Lake. Gravity readings will be taken on a one-mile grid from a shallow draft, flat-bottomed boat and in shallow water and on-shore areas by helicopter, three-wheeled motorbikes, and on foot. About 1,100 to 1,300 stations will be required.

Photo Gravity, Houston, Texas will conduct the survey for oil exploration purposes.

THRUST BELT PREFERRED

In an effort to standardize nomenclature UGMS is encouraging its staff and other professionals in Utah to adopt the term "Thrust Belt" rather than "Overthrust Belt".

The term "thrust" is preferred because it describes the prevailing structure of the region without implying that overthrusting was the dominant process. Underthrusting appears to have been more important in many instances, and the term "thrust" describes the structure accurately no matter how it came about.

In southwest Wyoming and also in parts of Utah the term "Fold and Thrust Belt" is very descriptive, and UGMS will use this where it is appropriate. Many of the region's new oil fields have been discovered on the long narrow anticlinal folds that parallel the major north-south lines of thrusting.

IF YOU PASS COAL, COLLECT. . .

Black Diamonds is the name of a new game being played in Monongalia County, W. Va. schools. Upon her 12-year-old son's suggestion that she develop a game using coal information, Enid J. Portnoy, West Virginia University assistant professor of speech communication, created Black Diamonds. The game was co-developed by Sidney Katell, a WVU mineral resources research professor.

What a painless way to learn about coal! The object of the game is to develop a coal mine and send the coal to a power plant where it is used to generate electricity.

It may not replace Monopoly, but Black Diamonds portends a creative trend in mineral education for youngsters. For information, contact Enid J. Portnoy, Assistant Professor of Speech Communication, West Virginia University, 510 Knapp Hall, Morgantown, WV 26506. *from Communications Exchange by Carol Sheppard, Mining Congress Journal, 4-79.*

WHAT IS FUTURE OF FEDERAL MINERAL LEASING FUND

by Howard R. Ritzma
Assistant Director, Utah Geological & Mineral Survey

UGMS derives a significant part of its budget from the Federal mineral leasing fund which is generated by the leasing and production of minerals *on Federal lands* – bonus payments, rentals, royalties and fees. Historically about 90 to 95% of the fund is generated by oil and gas production. In the past year or two, coal leasing and production has reduced that percentage to 80 to 85%.

Federal lands are leased for oil and gas at $1.00 per year bonus and annual rentals. Leases within "known geologic structures" are sold by competitive bidding and may sell for hundreds of dollars per acre. Oil and gas production pays 12.5% royalty on gross income.

The increase in mineral receipts in 1978 appears to have been generated largely by increases in oil and gas prices plus, to a much lesser degree, increased coal leasing and production. Doubling the oil and gas lease bonus and royalty rate probably reversed what would have been a decline for that year.

The increase in State share of receipts is not expected to occur again.

HISTORIC SUMMARY

Fiscal Year	All Mineral Receipts-Utah	Payments To Utah	Notes
1972	$10,035,591	$ 3,762,034	
1973	11,390,247	4,272,391	
1974	13,355,492	5,008,557	
1975	14,151,247	5,306,947	
1976	19,313,361	7,534,726	(1)
1977	17,238,478	8,619,239	(2)(3)
1978	23,776,083	11,888,906	

(1) FY 1976 includes 15 months, 12 mo. FY plus 3 Mo. TQ, from change in Federal fiscal year.
(2) Congress increased State share from 37.5% to 50.0%.
(3) Lease bonus and rental rate doubled from 50 cents to $1.00 per acre in February 1977.

Factors Affecting Mineral Leasing Fund in Future

Oil and gas activity is expected to continue to generate more than 60% of the fund for the foreseeable future. Therefore the following factors operating in oil and gas exploration and production activity *on Federal lands* are of great importance in predicting future income generated by the fund.

1. *Availability of land for oil and gas leasing* – Severe limitations put on leasing by the Forest Service and BLM for environmental protection, wilderness studies, and wilderness designations are expected to reduce the amount of land available for oil and gas leasing. In particular, the BLM's multi-million-acre "lockup", temporary for "studies", and possibly permanent for wilderness, will drastically reduce availability of land for oil and gas leasing. This will tend to reduce income from bonuses and rentals on exploratory acreage.

2. *Accessibility and restrictive regulations* – Land classified as wilderness or in less restrictive categories is becoming less accessible and more difficult and expensive to explore and develop. Air quality and water quality regulations have become increasingly stringent forcing many operators to drastically restrict activity. Many wells will not be drilled and many producing wells abandoned prematurely resulting in reduced royalty income.

3. *Rates of production of oil and gas* – More that 95% of Utah's oil production comes from 7 giant and large fields: Greater Aneth, Greater Altamont-Bluebell, Greater Red Wash, Pineview, Lisbon, Upper Valley, and Bridger Lake.

Greater Aneth is located on the Navajo Indian Reservation and yields almost nothing to the mineral leasing fund. Greater Altamont–Bluebell is mostly on private, State, and Indian lands and yields almost nothing to the fund. Greater Red Wash is mostly on Federal land and yields about 20% of the total mineral leasing fund income. It is an old field (discovered 1951) and is in an advanced state of decline. Pineview, a relatively new field in the Overthrust Belt, is wholly on private land and yields nothing to the fund. Lisbon is on Federal land and yields royalty to the fund. However, it is an old field (discovered 1956) and is declining steadily. Upper Valley and Bridger Lake are of modest size and yield royalty to the fund. They are also older fields and declining steadily.

Generally, oil production can be expected to decline steadily on Federal lands in Utah. It will take extraordinary exploration activity and very lucky discovery rates to reverse this trend. This is not likely to happen.

Gas production on Federal land in Utah should remain about the same, sustained mostly by gas production in the Uinta Basin. This is the "tight gas sand" play which is expected to yield modest amounts per well for long periods of time.

4. *Location of exploration "plays" relative to concentrations of*

(continued on page 4)

MINERAL LEASING FUND

(continued from page 3)

Federal lands – The most important oil and gas "play" in Utah, at present and into the next decade, is located in the Thrust Belt of northern Utah and, to a lesser extent, in the "Hingeline" area through central and southern Utah. The pattern of land ownership in Utah is such that this area includes very little Federal land and much of that is National Forest in which oil and gas exploration has been restricted drastically. The Thrust and "Hingeline" play is not likely to yield much to the mineral leasing fund either in the near future or in the long term.

5. *Oil and gas prices* – Prices of oil and gas at the wellhead seem destined to rise unless controlled by Congress and/or presidential order. Whether they will rise rapidly enough to offset exploration and production declines is problematical. This seems to be the only undoubted plus factor of those which influence the mineral leasing fund.

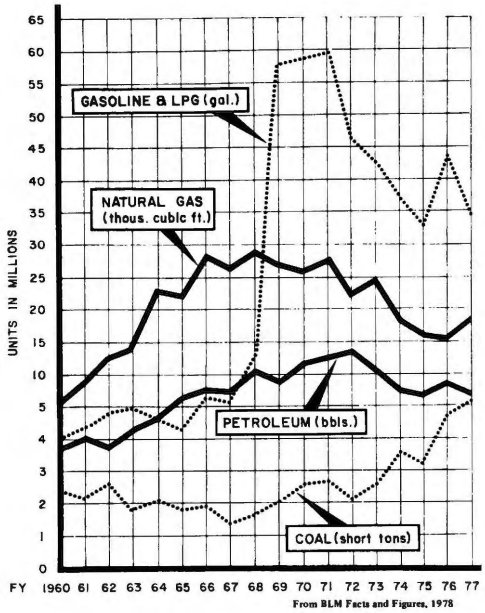
6. *Political considerations* – Many factors affecting the fund are set by Congressional action: rental and bonus payment rates, percentage of gross shared with the State, fee schedules, and royalty rates (the last could be raised on new leases). These are unpredictable. In particular, more stringent regulation (or nationalization) of the oil industry could be disastrous to the fund's future.

SUMMARY

Blending all of the factors together, it appears that the mineral leasing fund cannot be counted on to increase. Congressional action might actually cause it to decline. The fund's growth in FY 1976 through FY 1978 was caused by a number of artifically induced stimuli and not by natural production increases. These stimuli are not likely to recur and their net and long-term effects are expected to diminish.

The long-term trend of the fund is a levelling out and/or decline. This will be particularly emphasized if the trend is equated to constant dollars, not current dollars (depreciating).

MINERAL PRODUCTION
FROM
PUBLIC LANDS IN UTAH
(Selected Minerals)



From BLM Facts and Figures, 1978

CONTRIBUTIONS TO UTAH GEOLOGY

The spring issue of *Utah Geology* (Vol 6, no. 1) includes a report of a gravity study across Sevier Lake and several articles describing lithologic studies in central and southern Utah:

In a *Gravity Survey of the Sevier Lake Area, Millard County, Utah*, R. W. Case and K. L. Cook, describe a pronounced north-trending belt of gravity contours with a steep gravity gradient along the eastern margin of Sevier Lake, indicating a major north-south normal fault zone. This fault zone forms the east margin of the Sevier Lake graben. The graben probably consists of two separate fault blocks, the northern and the southern block. It is bordered on the west by the Black Hills horst, and on the east by the Cricket and Beaver Mountain horsts. The Sevier Lake graben contains up to 1,400 m of alluvium and/or volcanics along its deeper eastern margin. This valley fill acts as a reservoir for potentially valuable brines and soluble salts.

In central Utah, J. A. Campbell discusses the middle to late Cenozoic stratigraphy and the structural development of the Canyon Range. In late Eocene and early Oligocene time, deep canyons existed in the area. These were partially filled with the Fool Creek Conglomerate which is overlain unconformably in some parts of the range by the newly named Oak City Formation (Miocene). The Oak City consists of coalescing alluvial fans formed in response to Basin and Range faulting and westward tilting of the range block.

In southwestern Utah, R. L. Nielson and J. L. Johnson made a stratigraphic analysis of the Timpoweap Member of the Triassic Moenkopi Formation at its type locality in Timpoweap Canyon. The Timpoweap Member at this location contains three units which can be differentiated on the basis of lithology. The formation is interpreted to have been deposited during a transgression of the Triassic sea over the irregular erosional surface which had developed on the Harrisburg Member of the Permian/Kaibab Formation following the regression of the Kaibab sea.

In the same area, R. C. Blakey investigated the oil-impregnated carbonates in the Timpoweap Member, in Timpoweap Canyon and areas to the south. These rocks crop out at several localities near the Hurricane Cliffs in southwestern Utah and adjacent Arizona. The most significant deposits occur in porous algal carbonate rocks and may be in an extension of the Virgin Oil Field. Although these deposits have little economic potential, understanding them may be of value in the search for oil and gas in this region.

In eastern Utah, J. K. Gilland made a stratigraphic and geochemical analysis of a carbonate lens in the Jurassic Navajo Sandstone, near Moab. This lens, deposited in an intermittent fresh-water lake, is approximately 800 m long and 188 cm thick. Boron and vanadium values in the lens are those expected in fresh water environments. Reed-like plant remains and three-toed dinosaur tracks in the carbonate rock of the lens indicate that the lake was shallow.

JUST OFF THE PRESS

Circular 58 is the *Utah Mineral Industry Operator Directory, 1979*, compiled by Carlton Stowe. It is now available at $3.00 across the desk or $3.50 by mail.

Circular 59 is Carlton Stowe's annual compilation of the *Utah Mineral Industry Activity Review, 1978*, which has outgrown *Survey Notes*. Copies are available at the UGMS offices for $1.00 or $1.50 by mail.

Map 52 is a special topographic map of Provo and vicinity, covering most of Utah Valley and the Wasatch Front to the east. The 1:100,000 scale map extends from Bluffdale on the north to Mona Reservoir on the south. Copies may be obtained from the UGMS for $2.00 over the counter, or may be ordered by mail for $2.50 for a folded map and $3.50 for a rolled map in a tube.

LIBRARY GROWS

The UGMS Library has recently received two collections of geologic publications of Utah and the western U.S. The first collection was from the estate of the late Franklin Bradshaw and included many guidebooks of local and regional geological societies and associations, some long out of print and in scarce supply.

In June a very large collection of geologic publications from the Utah Mining Association, some 46 cartons, was turned over to UGMS. Cataloging and shelving of this material has just begun, but the collection already has begun to assume the aspects of a treasure trove.

BIBLIOGRAPHY OF UTAH GEOLOGY

Since the publication of the comprehensive Bulletin 103 in 1974, "Bibliography of Utah Geology 1950 to 1970" by W. R. Buss and N. S. Goeltz, annual bibliographies have been published as follows:

1970 – UGMS *Quarterly Review*, vol. 5/2, May 1971
1971 – UGMS *Quarterly Review*, vol. 6/2, May 1972
1972 – UGMS *Quarterly Review*, vol. 7/2, May 1973
1973 – *Utah Geology*, vol. 1/1, Fall 1974
1974 – *Utah Geology*, vol. 2/2, Fall 1975
1975 – *Utah Geology*, vol. 3/2, Fall 1976
1976 – *Utah Geology*, vol. 4/2, Fall 1977
1977 – *Utah Geology*, vol. 5/2, Fall 1978

Bibliography of Utah Geology 1977 was produced as a supplement to the main issue of *Utah Geology* and is also available as a separate publication, Circular 60, of the UGMS Circular series, for $1.00 per copy (over the counter).

The 1978 and 1979 bibliographies will be produced as separate publications in the UGMS circular series, and the compilation of ten years, 1970 through 1979, will be published as a bulletin as soon as possible after January 1981.

MSHA WARNS OF DANGER ON ABANDONED MINING PROPERTIES

The Labor Department's Mine Safety and Health Administration (MSHA) has issued a warning of extreme danger to amateur prospectors, adventure seekers and vacationers who are trespassing in quarries, sand and gravel pits, abandoned mines and other mining areas.

Don't venture into areas not open to the public and where you have no business; and be careful, watchful and responsible in seeing to it that your children obey the same rules.

Last year five persons drowned—four in ponds in abandoned quarries or sand and gravel pits and one by falling off a dredge where he was trespassing.

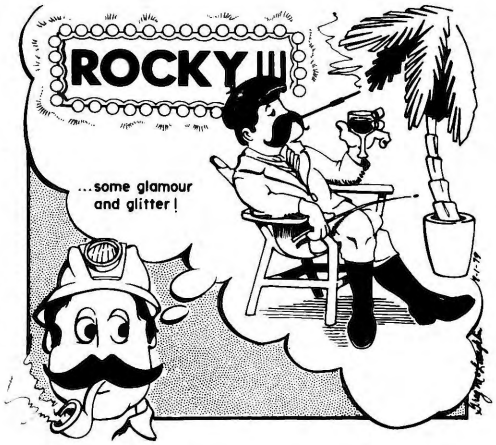
Six others died in underground abandoned mines—two asphyxiated by gasoline engine fumes, two by falling down shafts they were attempting to explore and two killed by explosives through amateurish ignorance of proper procedures.

Two victims were electrocuted in separate incidents while trespassing on coal mine sites; four others were killed by cave-ins of sand and gravel; and four died in falls over quarry walls.

MSHA is the Federal agency charged with enforcing mine safety and health regulations. *from NEWS, U. S. Department of Labor, 4-25-79.*

ROCKY RIDGES

by Greg McLaughlin



FOUNDATIONS SLIP – LOOK BEFORE YOU BUILD

Figure 1. Note landslide scarp through center of photograph (next to observer). Second home has already been evacuated. The problem situation was identified to Utah County cities by letter on March 1, 1978. Photograph taken April, 1979.

Figure 2. Foundation failure of water tank. Note reverse slope to foundation apron, resulting in impoundment of water against the steel tank.

The engineering Geologists of the UGMS are trained to anticipate geologic hazards in Utah, but only if they can examine the sites before the structures are built.

RICHFIELD QUADRANGLE REVIEW

The UGMS and USGS are planning to host a review of the 1 degree by 2 degree Richfield quadrangle intensive study map being prepared by the federal agency. The map is part of the Continental U. S. Mapping Project (CUSMAP) for areas of high potential for mineral resource values. All modern mapping techniques are being used. The USGS people working on the map will present the status of their work at the review.

The meeting will be held at the Hotel Utah Motor Lodge on December 13 and 14, and will be open to the public. Those employed by the mineral industry should find it of particular interest. Further details will be given at a later date.

TO ACADEMIA

Dr. Jock A. Campbell, Chief of the Petroleum Section of UGMS, has resigned and will join the geology faculty at West Texas State University, Canyon, Texas.

Greg McLaughlin, UGMS illustrator, has resigned to continue art studies at Art Center College of Design, Pasadena, California. Regretably, Rocky Ridges also leaves with Greg (see page 5).

EARTHQUAKE HISTORY OF UTAH [1]

Since settlement in 1847, some 1,000 earthquakes large enough to be felt have been reported in Utah. The largest of these had an intensity of IX on the modified Mercalli scale, or a magnitude of 6.7 on the Richter scale. Of the events felt in Utah, 119 have generated a maximum intensity of V or greater. Nineteen of these occurred within the four counties of Weber, Davis, Salt Lake and Utah.

Thirty eight of the reported earthquakes in Utah have created damage. An earthquake is considered damaging if dishes or windows were broken, plaster was cracked, or bricks toppled from the chimneys. Between 1950 and 1965 Utah experienced 13 damaging earthquakes, or an average of nearly one damaging earthquake per year.

Eight historical earthquakes have caused significant damage in the Ogden-Salt Lake City-Provo area. In 1909 an event of intensity VII in the Hansel Valley sent seiche waves over the Great Salt Lake railroad causeway, and broke windows in Salt Lake City. The 1934 Hansel Valley earthquake (intensity IX) severely damaged a brick building in Kosmo, produced two-foot scarps in recent alluvium (the only historic event in Utah to produce surface faulting), and caused rock slides in the epicentral area. This earthquake was as strong as the 1971 San Fernando, California event, but damage was small due to the low population density. In Salt Lake City, 80 miles away, walls were cracked, plaster fell and adjacent tall buildings swayed severely enough to bump one another.

Intensity VI earthquakes in 1910, 1943, 1949, and 1962 in Salt Lake Valley produced damage generally in the form of cracked walls, fallen plaster, toppled chimneys, and broken windows. The 1949 event ruptured a 10-inch watermain resulting in the loss of water to a large part of the city. An intensity-VI shock in 1915 caused minor damage in the Provo area.

By far the most damaging earthquake in Utah's history was the 1962 event near Richmond, north of Logan in the Cache Valley. Although moderate in size (magnitude 5.7 and intensity VII),

(continued from page 6)

the earthquake damaged three-fourths of the houses in Richmond, making nine unsafe to reoccupy. More than half the chimneys on the houses in Richmond were damaged. Several large buildings in Logan, about 12 miles from the epicenter, sustained major structural damage including cracked and distorted walls, fallen ceilings and parapets. Mudslides and rockfalls closed several highways in the foothills east of the epicenter and damaged water flumes and irrigation canals, causing minor flooding. The total dollar loss was estimated at $1 million.

The most recent damaging earthquake (magnitude 6.0) near Utah occurred in 1975 in Pocatello Valley, a sparsely populated area near the Utah-Idaho border. The population center receiving greatest damage was Malad City, about 14 miles northeast of the epicenter, where intensity VII was observed. In Malad City, intense ground shaking damaged chimneys in old buildings, cracked plaster walls, and produced cracks arround window and door frames in old and new constructions. A market and warehouse of concrete block construction was cracked. Windows were broken and parapets knocked down. In Pocatello Valley, although the amount of damage was low, the degree of damage was higher than Malad City. Several ranch houses reportedly shifted on their foundations, a full metal grain bin was split open, and several other bins at the same location were buckled or partially rotated. Some chimneys were snapped off at the roofline. Lurch cracks were found in the alluvium in the middle of the valley.

In Salt Lake City, 90 miles to the south, the shaking was felt by most residents, but although tall buildings swayed, there was no reported damage.

[1]Abstracted from Rogers, A. M., and others, 1976, *A study of Earthquake losses in the Salt Lake City, Utah area.* U. S. Geological Survey open file report 76-89; and Cook. K. L. and R. B. Smith, 1967, Seismicity in Utah, 1850 through June, 1965. Seismological Society of America Bulletin, v. 57, p. 689-718.

GREAT SALT LAKE WELLS PRODUCE OIL

(continued from page 1)

Amoco Drilling Program in Great Salt Lake.

SUMMARY OF AMOCO WELLS

NORTH BASIN

NORTH GUNNISON

Amoco No. 1 State - K Total depth 4,492 feet in Paleozoic carbonates. (D)

WEST ROZEL

Amoco No. 1 State - D Total depth 8,503 feet. Paleozoic carbonates about 6,325 feet. Tested heavy oil from basalt at 2,300 feet depth. (T)

Amoco No. 2 State - West Rozel

Total depth 2,700 feet (approx.) in Rozel Point Basalt. Pump tests recovered 8,000 barrels of heavy oil at rates as high as 1,500 barrels per day from 2,300 feet to total depth. (T)

SOUTH ROZEL

Amoco No. 1 State - J. Total depth 6,802 feet. Paleozoic carbonates at 6,000 feet. (D)

INDIAN COVE

Amoco No. 1 State - Indian Cove. Total depth 12,470 in Precambrian schist (no Paleozoic rocks penetrated). Precambrian at 12,450 feet. (D)

(T)= Temporarily abandoned.
(D)= Dry and abandoned.

SOUTH BASIN

Four wells have been located west and southwest of the state park on the north tip of Antelope Island. The two eastern wells are included in the Antelope prospect; the western pair are known as East Carrington. The easternmost location is proposed to 12,000 feet. Operations are scheduled to begin in late summer.

LAKE FALLS SHORT – AND FALLS

The Great Salt Lake fell short by a scant 0:10 foot of reaching the predicted high level of 4200.00′ made early in the season by the U. S. Geological Survey and fell *far* short of the informal guess made in the May 1979 Survey Notes – (which should teach amateur lake watchers a lesson).

A pervasive pattern of hot, very dry weather over much of the watershed tributary to the lake continued into midsummer and contributed to a steady fall in lake level.

Gages as read by the U. S. Geological Survey:

Date	BOAT HARBOR (South Arm)	SALINE (North Arm)
May 1	4199.85	4198.35
May 15	4199.90	4198.40
June 1	4199.80	4198.30
June 15	4199.50	4198.15
July 1	4199.25	4198.00
July 15	4198.90	4197.80

The high level, 4199.90, reached on May 15 was 0.35 lower than the peak of 4200.25 reached June 1, 1978, and continues a general downward trend in lake level which began in 1977.

GEOTHERMAL HEAT SOURCE FOUND IN CALIFORNIA

Seismic studies revealed the existance of a wedge-shaped body of molten rock (magma) under the Geysers-Clear Lake geothermal area in California, according to USGS scientists.

The magma body is apparently the source of the huge amount of heat at the world's largest geothermal electric power plant, located 100 miles north of San Francisco. The plant generates about 600 megawatts of electricity; its capacity is expected to double in the next three years.

Similar magma bodies have been located in other volcanic areas, such as Yellowstone National Park, Wyoming, and Long Valley, California. Both molten rock and fractured rock with the pore spaces filled with steam slow the seismic waves that travel through them to a significant degree. Seismic waves, produced by distant earthquakes, were found to have slowed down and changed their appearance when they passed under the steam-production zone at the Geysers. This low-speed zone lies about three miles below the surface, is from nine to twelve miles thick and wedge-shaped.

Similar studies may indicate the source and potential of geothermal energy in Utah.

DR. STOKES HONORED

Dr. William L. Stokes, whose contributions to the study of dinosaurs and the geologic history of Utah have earned him world-wide recognition, has been elected a fellow of the Explorers Club, an international organization of explorers and scientists.

Dr. Stokes has been a well-loved professor of geology at the University of Utah since 1947. He has written more than 200 scientific publications on western geology, and is the author of one widely-used text book and co-author of another.

As a tribute to his research and interest in dinosaurs, a newly discovered genus of two-legged dinosaur, discovered in the Cleveland-Loyd Quarry in Emery County, Utah in 1974, was named *Stokesosaurus clevelandi* in his honor.

UTAH GEOLOGICAL AND MINERAL SURVEY
SURVEY NOTES

State of Utah . . . . . Scott M. Matheson
Governor

Department of Natural Resources . . . . . Gordon E. Harmston
Executive Director

Utah Geological and Mineral Survey . . . . . Donald T. McMillan
Director

Editorial Advisor . . . . . Howard R. Ritzma
Editor . . . . . Martha R. Smith

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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Salt Lake City, Utah

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