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Toni:
File.

June 26, 1973

Mr. H. Clyde Davis, Director
Mineral Development
A-387-ASB
Brigham Young University
Provo, Utah 84601

Dear Clyde:

With reference to your letter of June 6, we have had a chance to review the material and find that our geologist, Dennis Temple, has done extensive work in the area and it is his opinion that the area does not justify Essex' study at this time. I have reviewed his report and your data, and we will probably not do further work on the area except for a possible visit by John Wilson, geologist at the Milford Mine, unless there is a particular question we could help you with.

I hope to be in Salt Lake in early August and will call you before making that trip.

Best regards,

Paul I. Eimon
Manager of Exploration

ESSEX INTERNATIONAL, INC.

PIE:td

cc: J.R. Wilson ✓

Note to J. Wilson: There is no great priority on this but you may want to look at it in your travels. Please return the enclosed material after you have looked it over.

Paul

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SPEEDISET ® MOORE BUSINESS FORMS, INC., 26

SPEED MEMO

Utah Mine District
Utah Springs
Fish
Millard County
Utah.

To Paul Eimon | At Tucson

Subject Utah Mine, Fish Springs District, Utah | Date June 11, 1973

I have worked in this area and particularly at the Beryllium properties, several miles to the southeast for at least 2½ years. Butler reports 18,459 tons, valued at $2,316,464.00 total production from the district. I would like to discuss the geology of the area with you. Present information does not justify effort.

PLEASE REPLY TO → Signed Bonnie C. Temple | At Tucson

Date | Signed

REPLIER—RETURN THIS COPY

Donald T. Nelson
Director

Church Education
Development
Brigham Young
University
A-362 ASB
Provo, Utah
84601

SXM

JUN 11 1972

RECEIVED

June 6, 1973

Paul Eimon
Essex International, Inc.
1704 West Grand
Tucson, Arizona 85705

Dear Paul:

This letter is in reference to our telephone conversation pertaining to the Utah Mine located in the Fish Springs Mining District west of Delta and the berylium open-pit mine of Topoz Mountain. Enclosed is a copy of the geologic report of this area by Butler and also a topo sheet indicating the location. The Utah Mine is owned by the Church, it consists of approximately 14 patented claims however, Utah Construction Company has had a sub-lease on these claims and have done some drilling in the western area of the property. They are willing to exercise the option of the old lease. I'd appreciate it if you would have Ken look at it and see if your company may be interested in the silver, lead, gold potential of this area.

Best regards,

Clyde Davis/as

Clyde Davis
Director, Mineral Development

aj6/7C
encl.

contain much pyrite, or limonite that has resulted from the oxidation of pyrite, together with chalcopyrite and its oxidation products and small amounts of other sulphides. The sulphides are said to contain considerable gold and silver, several mines averaging from $10 to $15 in precious metals. Much of the material, however, is not of sufficiently high grade for profitable shipment under ordinary conditions, and attempts at treatment in the district have thus far not been very successful.

In addition to the metalliferous deposits of the range there is an occurrence of topaz near Topaz Mountain. The writer did not visit this locality but according to descriptions the topaz occurs as disseminated crystals in altered volcanic rocks over a considerable area. It is not suitable for cutting.

Bixbyite, an oxide of iron and manganese (essentially $FeO.MnO_2$), has been described by Penfield and Foote[1] from the west side of the range south of the Dugway road, where it is said to be associated with topaz and decomposed garnet in an altered rhyolite.

Some mineralizing action in the volcanic rocks is evident, but so far as the writer is aware no ore deposits have been discovered.

FISH SPRINGS DISTRICT.

By B. S. Butler.

GENERAL FEATURES.

The Fish Springs district is in Juab County, at the north end of the Fish Springs Range, which is the northern extension of the House Range, from which it is separated by a low pass. The nearest railroad point prior to 1917 was Oasis, on the Los Angeles & Salt Lake Railroad, about 60 miles in a direct line from Fish Springs and about 70 miles by the freighting road. Gold Hill is now the nearest railroad point.

The range contains little timber suitable for either fuel or building. Lumber for buildings and the little required for the mines must be hauled from the railroad or from adjacent ranges, and the cost is high. Gasoline is generally used for power.

The water supply of the camp is obtained from the lowest level of the Utah mine, at a depth slightly below 800 feet.

Analysis of water from Utah mine.[2]

[Recalculated from hypothetical combinations in grains per gallon. Analyst, C. C. Crismon; date, September, 1901.]

	Parts per million.
Total solids	2,255
Volatile and organic matter	239
Silica (SiO_2)	18
Oxides of iron and aluminum ($Fe_2O_3+Al_2O_3$)	13
Calcium (Ca)	64
Magnesium (Mg)	67
Sodium and potassium (Na+K)	591
Sulphate radicle (SO_4)	164
Chlorine (Cl)	1,096

On the flat at the north end of the range several hot springs, some of which have a temperature above 100° F.,[3] furnish a considerable flow of rather highly mineralized water. Fish Springs, near the Thomas ranch, at the eastern base of the range, has a considerable flow of water of fair quality. Good drinking water is obtainable from the artesian wells at Callao.

Farm supplies are obtained from the ranches in Snake and Fish Springs valleys and from Deseret.

The cost of freighting ore from the camp to Oasis is about $12 per ton. Eight-horse teams are able to haul about 15,000 pounds when the roads are in good condition. Twelve to fourteen days are commonly required for the round trip. The total cost of freight from the mines to the smelters is about $15 per ton for ore valued at less than $100 per ton.

HISTORY AND PRODUCTION.

By V. C. Heikes.

The Fish Springs district was organized March 20, 1891. C. C. Van Alstine is reported to have discovered the first mineralized float, which led to the discovery of the Utah and Galena mines in 1890, which later became the principal producers of the district. From its discovery to 1914 the Utah mine has made regular shipments, which, for the full productive period, have averaged 48 cents per ton in gold, 128.35 ounces per ton of silver, and 44.04 per cent lead, a gross average value of $121.58 per ton. The mine has produced 12,997 dry tons of ore containing $6,227 in gold, 1,668,205 ounces of silver, 11,447,930 pounds of lead, valued, at each year's commer-

[1] Penfield, S. L., and Foote, H. W., Am. Jour. Sci., 4th ser., vol. 4, p. 105, 1897.

[2] Meinzer, O. E., Ground water in Juab, Millard, and Iron counties, Utah: U. S. Geol. Survey Water-Supply Paper 277, p. 126, 1911.

[3] Idem, p. 125.

cial prices, at $1,580,186. The dividends paid are reported to total $283,726. From 1891 to December, 1897, the dividends of the company amounted to $152,000, indicating a profit on the ore shipped of $45 per ton and a total cost per ton, including freight and sampling charges, of $76 per ton.

The Galena property adjoins the Utah on the west and is second in importance of production. It is reported to have yielded about 3,000 tons of ore, beginning in 1891, and shipping irregularly for the past ten years. The gross value of the ore produced was about $330,000, out of which $80,000 is said to have been returned in dividends.

The Emma claim was the next largest producer, Other producers are the Vulcan, Utah No. 2, Cactus, Spanish, Ada, Wild Cat, Early Harvest, and Last Chance claims.

Metals produced in Fish Springs district, 1891–1917.

Year.	Ore (short tons).	Gold.		Silver.		Copper.		Lead.		Total value.
		Fine ounces.	Value.	Fine ounces.	Value.	Pounds.	Value.	Pounds.	Value.	
1891–1898	7,325	183.12	$3,785	1,239,269	$892,273	.....	.....	5,886,940	$211,930	$1,107,988
1899	341	8.52	176	39,129	23,477	.....	.....	331,826	14,932	38,585
1900	505	12.62	261	71,495	44,327	.....	.....	480,390	21,137	65,725
1901	512	10.24	212	59,387	35,632	.....	.....	564,809	24,287	60,131
1902	923	18.29	378	88,659	46,989	.....	.....	998,483	40,938	88,305
1903	815	15.32	317	53,333	28,800	.....	.....	761,087	31,966	61,083
1904	846	16.74	346	90,932	52,059	.....	.....	652,806	28,560	80,965
1905	892	17.84	369	104,358	63,032	.....	.....	661,572	31,094	94,495
1906	1,161	22.72	470	115,995	77,717	.....	.....	1,022,205	58,266	136,453
1907	663	14.76	305	92,001	60,721	.....	.....	607,247	32,184	93,210
1908	914	29.99	620	124,542	66,007	.....	.....	885,092	37,174	103,801
1909	665	21.38	442	89,726	46,657	.....	.....	675,039	29,027	76,126
1910	729	17.79	368	90,390	48,810	.....	.....	717,929	31,589	80,767
1911	727	22.25	460	79,970	42,384	235	$30	637,054	28,667	71,541
1912	585	21.03	435	68,073	41,865	2,360	390	501,252	22,556	65,246
1913	246	6.71	139	25,705	15,527	1,442	224	184,879	8,135	24,025
1914	331	8.21	170	32,339	17,884	278	37	292,754	11,418	29,509
1915	31	1.05	22	3,923	1,989	.....	.....	28,412	1,335	3,346
1916	123	1.02	21	20,169	13,271	.....	.....	115,528	7,971	21,263
1917	125	.....	.....	10,208	8,411	.....	.....	63,824	5,489	13,900
	18,459	449.60	9,296	2,499,603	1,627,832	4,315	681	16,069,128	678,655	2,316,464

PHYSIOGRAPHY.

The elevation of the range in the north is about 7,000 feet and farther south is about 8,500. The elevation of the lower parts of the desert valleys is about 4,350 feet, giving a relief of over 4,000 feet. The range, especially on the east, rises abruptly from the desert plain in slopes that are mostly rugged and cut by narrow canyons. Striking features of this in common with other ranges of the region are the wave-cut terraces about its northern end that mark the higher stages of the predecessor of the Great Salt Lake. A road for light traffic crosses the range in the latitude of Fish Spring.

Physiographically, the range is similar to other Basin Ranges. Its block-fault character was recognized by Gilbert,[1] who says:

> The House Range was long ago recognized as a faulted monocline in which the direction of displacement is reversed midway. The northern third of the range [the Fish Springs Range] exhibits a westerly dip, and is faulted along the eastern base; the southern part has an easterly dip and is faulted on the western base.[2] This determination was subsequently confirmed by the discovery of a well-defined fault scarp in the vicinity of Fish Spring, and an obscure and probably very ancient scarp at the western base of the southern division.

That the range is in an immature stage of physiographic development is shown by its rugged character and its narrow canyons.

If the line of thermal springs represents the position of a strong fault along the front of the range [3] the retreat of the front of the range since it was uplifted has not been great.

[1] Gilbert, G. K., Lake Bonneville: U. S. Geol. Survey Mon. 1, p. 353, 1890.

[2] Gilbert, G. K., Report on the geology of portions of Nevada, Utah, California, and Arizona: U. S. Geog. and Geol. Surveys W. 100th Mer. Rept., vol. 3, pp. 27–28, 1875.

[3] Meinzer, O. E., op. cit., p. 126.

The position of Fish Springs Pass has apparently been determined by an east-west fault zone. At the north end of the range the old wave-cut terraces may be followed for long distances. They mark the water level at different stages of Lake Bonneville, the predecessor of the present Great Salt Lake.

GEOLOGY.

SEDIMENTARY ROCKS.

Sedimentary rocks make up a large part of the House Range. Those in the northern part (the only part examined by the writer) are predominantly limestone, interspersed with shaly and siliceous beds and at one horizon by several hundred feet of rather massive quartzite. South of Fish Springs Pass the quartzite outcrops near the divide, and north of the pass near the eastern base of the range.

Fossils were collected from the following localities: 141, float on the east side of Fish Springs Range, the material apparently coming from a horizon considerably below the quartzite; 142, divide just south of the trail from Fish Springs to the Thomas ranch just beneath the quartzite; 143, limestone overlying quartzite east of the Carnation mine. On these collections Edwin Kirk made the following report:

Locality 141. Fish Springs Range:
- Dinorthis fontinalis White.
- Dalmanella pogonipensis Hall and Whitfield.
- Orthis cf. O. tricenaria Conrad.
- Cystid plate genus?

Locality 142. Fish Springs Range:
- Orthis near O. hamburgensis Walcott.
- Dalmanella cf. D. electra Billings.
- Syntrophia calcifera Billings.
- Eccyliopterus michleranus? Hall.
- Bathyurus sp.
- Pliomera sp.
- Sponge n. gen. near Climacospongia.

Locality 143:
- Dalmanella near D. pogonipensis Hall and Whitfield.
- Raphistoma? sp.
- Maclurea annulata? Walcott.
- Asaphus sp.

These three lots contain fossils identical with those obtained by Mr. Walcott in the upper part of the Pogonip limestone of the Eureka district, Nevada. In correlation with formations in the East these beds might broadly be classed as Beekmantown.

From the fossil evidence it seems probable that all the sedimentary rocks in the northern part of the range are of Ordovician or Silurian age, though it is possible that the lowest beds, from which fossils were not collected, are of Cambrian age. Farther south, in the House Range, a considerable thickness of Cambrian sediments is exposed.

IGNEOUS ROCKS.

A large area of flow rocks west of the Fish Springs Range, mapped as basalts in early days, were not examined in the course of the present work, but will not improbably eventually be found to be of a type much more siliceous than basalt.

In the vicinity of the mining district the igneous rocks are confined to a few dikes in the sedimentary rocks. The largest of these up to 50 feet in thickness is near the Utah mine. It strikes generally east. This dike outcrops prominently near the western front of the range A smaller dike near the Emma mine on the south is of the same general character.

Much of the surface rock is stained reddish brown from iron. The freshest specimens collected consist of a light-gray groundmass containing rather abundant phenocrysts of quartz, orthoclase, and biotite. Under the microscope the rock is seen to consist essentially of phenocrysts of orthoclase, quartz, and biotite in a groundmass composed largely of quartz and orthoclase. In some specimens the groundmass is very finely crystalline and the minerals can not be positively determined. Apatite is a rather abundant accessory mineral, and most of the specimens contain secondary minerals, notably calcite, which is locally rather abundant. All the specimens examined are of essentially the same composition, and the rock may be classed as a granite porphyry.

STRUCTURE.

The general structure of the range is relatively simple, but the detailed structure is locally rather complex and will require careful mapping before it can be properly interpreted. The range has been outlined by north-south faults and has been relatively uplifted on the east. The beds have a westerly dip that is locally 35° but that averages considerably less. Lesser north-south faults range in extent from "slips" whose displacement can scarcely be detected to those whose displacement is measured in scores of feet; there is also east-west faulting that is especially marked near Fish Springs Pass, north of which the rocks have

been relatively lowered or thrown to the east several thousand feet. Numerous east-west fissures and faults of small throw have been occupied by dikes or have furnished the channels for the circulation of ore solutions. So far as observed, the east-west faults are the older and are cut off by the north-south faults, which (at least the "slips" seen in the mines) are apparently later than the granite porphyry dikes and the deposition of the ores.

ORE DEPOSITS.

All the ore deposits of the district are replacements of limestone, and all thus far developed are associated with the east-west fissuring. All of them are lead-silver ores, in which the silver content is uniformly high and the gold content low.

UTAH-GALENA FISSURE.

The most productive area thus far developed is associated with the Utah-Galena fissure zone, which trends east, south of and parallel to the largest granite porphyry dike of the district. The fissure dips more steeply than the dike; on the surface the two are about 50 feet apart and on the lowest or 800-foot level of the Utah mine they are nearly 100 feet apart. The ore bodies occur very irregularly. Many of them seem to follow the intersection of the fissures with certain of the limestone beds, but irregularity is too great to warrant any general statement. In prospecting it has been the custom to follow the fissures, even though they become very "tight" and show little indication of mineralization and even though they are interrupted by north-south faults or "slips." Many of these faint leads have been followed to valuable deposits.

Practically all the ore thus far extracted has come from a fissured area south of and underlying the granite porphyry dike. Small bodies of ore have been found at the contact, and the limestone in places has been replaced by sericitic muscovite, but more commonly the shoots lie at some distance though usually not more than 100 feet from the contact.

Some prospecting has been done on the north or hanging-wall side of the porphyry dike on the 800-foot level, and a little ore has been found. In several similar occurrences in the State the larger ore bodies lie on the footwall sides of dikes.

The limestone usually shows little alteration, even within a few feet of an important ore body, and much credit is due to the management of the Utah mine for the skill it has shown in the search for ore.

The primary mineralization in the Utah mine consists of galena and pyrite and a little sphalerite replacing the limestone. Secondary copper minerals in small amount have probably resulted from the alteration of chalcopyrite. Some oxidation of the ore continues to the deepest levels of the mine, and some shoots of ore have been largely altered to secondary minerals, though some bodies of galena ore show only slight alteration. The final products of alteration are commonly cerusite and limonite. Before the oxidation is complete sulphates are locally present in considerable abundance.

The galena alters along the cleavage plane, first to anglesite and then to cerusite. In the shoots where pyrite is present in considerable abundance the basic ferric-lead sulphate plumbojarosite is commonly formed. Shoots of ore in which this mineral is abundant were seen in the mine, and the writer was told that in some places it forms a casing around the high-grade ores. In the more highly oxidized shoots the plumbojarosite has been altered to limonite and cerusite. The writer did not get material in which silver minerals could be definitely determined. Some specimens of galena rich in silver do not contain a recognizable silver mineral. In the oxidized ore horn silver is said to occur.

Migration of the valuable metals appears to have been very slight. The galena was first altered to the sulphate, anglesite, or to plumbojarosite, both of which are relatively insoluble, and later to the carbonate, which is only slightly soluble, so that the lead moved very little. The same seems to have been true in large part for the iron. The pyrite was first altered to sulphate, which in part combined with lead compounds to form plumbojarosite and in part oxidized to limonite, and as already noted the plumbojarosite eventually altered to two relatively insoluble lead and iron minerals, cerusite and limonite. Copper shows more tendency to migrate; the replacement of galena by covel-

lite was noted, and though the ore as a whole contains little copper, the presence of considerable amounts of the secondary copper minerals in small areas suggests considerable migration and concentration of that metal. Silver, like lead, seems to have moved but little during oxidation, probably owing to the presence of abundant chlorine in the ground water (see analyses, p. 465), which caused the formation of the slightly soluble silver chloride as soon as the original silver mineral was altered.

Both the sulphide and oxidized ores are of high grade, and it is doubtful if they have been materially changed in metal content by oxidation, so that it may be expected that ores found at deeper levels will show no marked decrease in tenor.

Only high-grade ore and some associated second-grade ore have been extracted. Most of the second-grade ore can not be profitably shipped under present conditions and is left in the mine, from which it can be extracted cheaply.

The occurrence of the ore in the Galena mine, which is on the same fissure system, is similar to that in the Utah mine. The mine has been developed to a depth of 700 feet and considerable ore extracted. It has not been operated for several years and was not examined by the writer.

In 1918 a mill was built for the treatment of the low-grade ores of the district.

OTHER FISSURES.

The Emma mine has been developed on a fissure a few hundred feet south of the Utah-Galena fissure. The occurrence of the ores is very similar to that in the Utah mine, though the ore shoots are smaller and the ore zone not so extensive. As in the Utah mine, a small dike of the granite porphyry is closely associated with the ores.

The Meteor and other prospects have been operated on this fissure zone but were not active at the time of visit.

Still farther south the Carnation mine has been developed on another essentially parallel fissure. It was opened in the spring of 1912 by an inclined shaft 230 feet deep, which follows the dip of a north-south fault or "slip" that cuts the east-west ore fissure. All development at the time of visit had been east of the fault. The ore, as in other sections of the camp, occurs in irregular shoots, between which the fissure shows little mineralization. The ore mined has been of high grade.

DEEP CREEK RANGE.

By B. S. Butler.

GEOGRAPHY.

The Deep Creek range extends for nearly 50 miles along the western border of Utah in Tooele and Juab counties. The fortieth parallel of latitude crosses the range near its central part. To the west is the Deep Creek valley, a fertile agricultural section watered by streams from the high mountains of the southern part of the range. On the east the range is bordered to the north by the southward extension of the Great Salt Lake Desert and to the south by Snake Valley. Streams from the mountains supply several ranches in Snake Valley.

Prospecting and mining have been most extensive in the northern part of the range in the vicinity of Clifton and Gold Hill but have also been carried on at the Queen of Sheba mine on the west side of the range and on Trout Creek and Granite Creek on the east side of the range.

The nearest railroad point prior to 1917 was Wendover, on the Western Pacific Railroad, 40 to 50 miles from the more active part of the mineral region. In 1917 a railroad was completed from Wendover to Gold Hill. The old overland stage route from Salt Lake to the west passes through a low gap in the northern part of the range and furnished a route to St. Johns, on the Los Angeles & Salt Lake Railroad, which was the most convenient shipping point for the district.

The lack of cheap transportation has been a serious handicap in the development of the district. Only part of the ores are susceptible to milling, and the region has been too remote for cheap smelting, even if a suitable mixture of ores could be had. The advent of the railroad should greatly stimulate development and production.

In the southern and higher part of the range, including the Spring Creek, Willow Springs, Trout Creek, and Granite Creek areas excellent water is abundant, the melting snow from the higher parts of the range sup-

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FISH SPRINGS SW QUADRANGLE

UTAH–JUAB CO.

7.5 MINUTE SERIES (TOPOGRAPHIC)