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UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION II

# FINAL REPORT

DMEA-4795, Contract Idm-E1158 (Tungsten)
Tungsten Mountain Mining Company
Hilltop Mine
Churchill County, Nevada

by

B. H. Sheahan
U. S. Bureau of Mines

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U. S. Geological Survey

March 14, 1959

# INTRODUCTION

**Summary:**

The Hilltop mine or Tungsten Mountain mine, Churchill County, Nevada, was explored by Tungsten Mountain Mining Company, 511 Securities Building, Seattle 1, Washington in cooperation with the Defense Minerals Exploration Administration, Docket DMEA-4795, under Contract Idm-E1158, dated December 3, 1957. A provision of the contract provided for repayment of Government participation under Contract Idm-E707 (Docket DMEA-3180), dated September 13, 1954.

The purpose of the project was to explore for tungsten ore in the downward continuation of tactite bodies that had been exposed as a result of exploration by the Operator, a small part of which had been done with Government assistance (DMEA-3180, Contract Idm-E707).

Exploration was started December 3, 1957 and was completed January 31, 1959. The Operator's final report was received February 28, 1959. Expenditures under this contract were $31,218.50, of which Government participation at 75% was $23,418.88. Under the prior contract, expenditures were $576.00 and the Government's participation at 75% was $432.00.

An examination of the property to evaluate the exploration was made March 18, 1959 by B. H. Sheahan, U. S. Bureau of Mines and R. M. Smith, U. S. Geological Survey, accompanied by Arthur Lakes, agent and consultant for the Operator.

Work completed under the contract consists of 900 feet of drifting and crosscutting, and 600 feet of long hole drilling on the No. 4 adit level. Scheelite bearing tactite was discovered by the work which partly delineated several faulted segments of an ore body for 630 feet along the strike. Ore reserves discovered by the project are estimated to be 8,000 tons averaging 1 percent $WO_3$. Production may not be economically feasible in the near future because of the low price of scheelite concentrates.

Recommendations:

Certification of a discovery is recommended.

Although the work was successful and was well done, the target area has not yet been completely explored. Additional exploration on the same level for another faulted segment of ore south of the No. 4 adit is warranted. Additional exploration below the No. 4 adit is also warranted, and further Government assistance, if requested, should be given favorable consideration.

## LOCATION, ACCESSIBILITY, AND LOCAL FACILITIES

The Hilltop mine is in the Clan Alpine mining district, near the summit of the east flank of the Clan Alpine range at altitudes of 6,600 to 6,900 feet in Sec. 16, T. 21N., R. 38E., M. D. B. & M., Churchill County, Nevada.

To reach the property from Fallon, Nevada, travel east 58 miles on paved U. S. Highway 50 to Eastgate, then north 28 miles on an improved county road in Edwards Creek Valley, turn left near the Byers ranch and follow the Stone Gulch road 7 miles northwesterly to the mine. The last 3 miles of this access road has 15% grades. Snow storms often block travel to the mine area during winter months.

A small cabin and a trailer house at Byers ranch were used to accommodate the exploration crew of six men. Labor, supplies, and equipment are available at Fallon or at Reno, Nevada. Water is available at Stone Gulch and at the ranch. Power is supplied by diesel and gasoline driven engines.

## THE PROPERTY

### History and Ownership:

The initial tungsten discovery was made by G. G. Staggs and A. J. Quilici and the Hilltop claim was located November 25, 1951.

It was sold to Bennett W. Porter in the spring of 1953. An overriding 5% royalty, which had been retained by one of the owners, was purchased by Mr. Porter on August 25, 1955.

An application, DMEA-3180, submitted in November, 1953, requested assistance to construct 9,050 feet of roadway, surface trenching, and drifting. A field examination disclosed that most of the proposed work was already completed. An amended application dated April 21, 1954 requesting exploration assistance was approved and resulted in Contract Idm-E707, which was terminated July 23, 1956.

Tungsten Mountain Mining Company was incorporated in Nevada in 1954. Officers of the company are: Bennett W. Porter, President; Emil Mottman, Vice President; Raymond G. Rayne, Treasurer; and Freda Mills, Secretary. The corporation owns 21 unpatented lode mining claims, one unpatented placer claim, and one mill site.

Land included in the contract area was confined to four unpatented lode mining claims:

| Name of Claim | Book | Page |
|---|---|---|
| Hilltop | 26 | 314 |
| Porter No. 1 | 27 | 67 |
| Artel No. 1 | 28 | 173 |
| Heidi No. 1 | 27 | 142 |

**Development:**

The mine is developed to a depth of 275 feet by four adits. Total footage of drifts, crosscuts, and raises amount to 1,800 feet. Surface trenches total about 8,500 feet in length.

The main workings include the No. 1 adit, elevation 6,900 feet; No. 2 adit, elevation 6,875 feet; No. 3 adit, elevation 6,823 feet; and No. 4 adit, elevation 6,676 feet. All workings are accessible and in good condition except No. 2 adit. Most of the workings have required very little timber for ground support.

**Production:**

Mining was started in 1953 after completion of an access road to the No. 1 adit. Several shipments of high-grade tungsten ore were made to custom mills in Nevada and California. Shipment records compiled by the Operator follow:

| Dry Tons Sold | Net Units $WO_3$ | Grade Percent $WO_3$ |
|---|---|---|
| 384.95 | 715.47 | 1.86 |
| 535.06 | 828.16 | 1.86 |

There has been no ore shipped from the property since late 1955. Development work during the 1957 season disclosed ore in the No. 3 adit. About 900 tons of ore that was mined has been stockpiled.

## GEOLOGY

### Geologic Setting:

The Hilltop mine is near the crest of a prominent spur on the east side of the Clan Alpine range. In this area the oldest and most abundant rock is a shale unit, limy near the top, that has been tilted and intruded by granite and partly covered by volcanic rocks which have been completely eroded in the immediate vicinity of the mine.

The shale unit occupies the center of the range, is 2,000 feet or more thick, thin-bedded near the base, but is thick-bedded to massive mudstone near the top. In the upper part of the mudstone, a stratum 75 feet or less thick contains limy shale and a few lenticular limestone beds. These beds are a few feet thick, a few tens of feet

long, are discontinuous and en echelon, but are confined to the 75 foot stratum. The granite crops out on the east flank of the range east of the shale in an irregular stock about 4,000 feet across. It ranges in composition from granite to granodiorite.

North and west of the mine area the sedimentary and intrusive rocks in the center of the range are overlain by andesite and rhyolite tuffs, flows, and agglomerates in strata that strike north and dip gently west. From their attitude the volcanic rocks are inferred to be Tertiary in age.

Near the contact of the sedimentary rocks with the granite, the shales are metamorphosed to argillite and hornfels, and the limy beds are marbelized, silicified, or metasomatized to tactite, the host rocks of the tungsten minerals.

The sedimentary rocks have been tilted 40° - 70° E. and comprise a large homocline which strikes generally north. They are cut by faults, more numerous near the granite contact, along which the strata are rotated. Bedding faults are common, but steep northeast-trending normal faults of 1-60 feet displacement are prominent underground because the mineralized strata are offset by them.

One reverse fault that strikes N 30° W and dips about 15° NE, and has a dip slip of about 60 feet, displaces the limy strata in the mine area. This fault is exposed only in Adit No. 2. In the hanging wall of this fault, in Adit No. 1, and on the surface, the sedimentary rocks have been folded, or faulted, into an open syncline which plunges eastward. Below this fault (fault A, Fig. 2) in Adits No. 3 and No. 4 there is no evidence of this fold.

The limy stratum crops out for a strike length of about 900 feet in an embayment in the granite. As the stratum dips east and the contact dips west, the stratum is inferred to be cut off at depths ranging from 50 feet near the north end to 800 feet near the center.

Ore Deposits:

The ore bodies are faulted segments of scheelite-bearing tactite lenses from a few inches to 15 feet wide along several bedding planes in a limy stratum 75 feet wide and 900 feet long that may extend down the dip as much as 800 feet. A little ore occurs also in thin discontinuous stringers in hornfels adjacent to tactite.

By far the most abundant gangue mineral in the tactite is quartz, but pyrite is common, especially in the better grade ore. Garnet and epidote are locally abundant. Molybdenite in small amounts is commonly in tiny fractures with pyrite.

The ore minerals are scheelite and small amounts of powellite which occur principally disseminated in tactite, silicified limestone, and hornfels, but occur also as thin veinlets along fractures in all of these rocks. Individual crystals of scheelite range in size from microscopic to half an inch across, but the most abundant size is about 1/16th inch. The ore averages about 1 percent $WO_3$ but contains as much as 4 percent $WO_3$.

Several parallel or en echelon mineralized beds within the limy zone are indicated by the drifts, crosscuts, and drill holes, but in only one of these beds has ore in commercial widths been found. The largest ore body is explored by the upper levels - Adits No. 1 and No. 3 - where its indicated size is about 200 feet in diameter and 5 feet thick. It averages about 1.6 percent $WO_3$. Three other ore bodies, each in a different fault segment of the mineralized stratum, are explored by Adit No. 4 and were found to have strike lengths of 120, 150, and 70 feet. Because the fault segments rake steeply, (see longitudinal section, Operator's final report) the dip length is inferred to exceed the strike length, but the ore bodies have not been delineated in the dip direction. On the No. 4 level they average 3 to 4 feet thick and about 1.1 percent $WO_3$.

Other ore bodies are inferred south of the No. 4 adit along the strike of the mineralized stratum, and still others are inferred below the No. 4 adit along the dip of the stratum.

None of the ore bodies have been mined. The ore that was shipped or stockpiled was derived from exploratory workings.

Ore Reserves:

In preparing his final report (February 28, 1959), the Operator estimated reserves of all classes between the surface and a plane 50 feet below the No. 4 (DMEA) adit to be 26,000 tons, averaging 1.4% $WO_3$. This estimate has been carefully checked and found to be reasonable. Of this reserve 8,000 tons of measured and indicated ore averaging 1% $WO_3$ was discovered directly by the DMEA work in three blocks, each partly above and partly below the No. 4 adit. It is the DMEA work also that suggests that of the entire mineralized zone only half the area can be inferred to be ore.

The Operator did not estimate the reserves more than 50 feet below the No. 4 (lowest) adit because there are no exploratory openings in that part of the ore-bearing stratum. The actual limits of ore at depth are not known, but judging from the geometry of the geologic setting, the entire ore-bearing zone may contain reserves on the order of 70,000 tons that averages about 1% $WO_3$. These reserves

are in fault segments of the diamond-shaped ore-bearing stratum. The segments are inferred to total 1,000 feet long, about 800 feet along the dip and to average 4 feet thick, half of which may be ore. A factor of 12 cubic feet per ton was used in making this estimate.

## THE DMEA PROJECT

The purpose of the project was to explore for additional scheelite-bearing tactite bodies at an elevation 147 feet below the No. 3 adit. Stage I of a two stage project consisted of 600 feet of drifting from a site northwest of the main workings. Stage I also authorized 600 feet of long hole drilling at approximately right angles to the drift. Results of exploration under the first stage warranted work under the Stage II consisting of 300 feet of drifting, crosscutting, or raising.

A starting point for the DMEA work in No. 4 adit was established 70 feet from the portal as of December 3, 1957 and the project was completed January 31, 1959. Exploration work under the contract is shown on attached map (fig. 3) and is summarized as follows:

| Stage I | Authorized | Completed |
|---|---|---|
| Drifting size 5' x 7' in clear | 600 feet | 600 feet |
| Timbering | 200 feet | 189.5 feet |
| Long hole drilling | 600 feet | 600 feet |
| Assays for $WO_3$ | 60 | 48 |
| **Stage II** | | |
| Drifting and crosscutting size 5' x 7' in clear | 300 feet | 300 feet |
| Timbering | 100 feet | 0 |
| Assays for $WO_3$ | 40 | |

Amendment No. 1, dated September 30, 1958, provided additional time for completion of the work. The time of the contract was extended from 8 months to 14 months from the date of the contract. The period for payment of royalty was changed to eleven years from the date of the contract or until December 3, 1968.

The company did 17 feet of crosscutting at its own expense.

## Expenditures

| | |
|---|---|
| Estimated total amount of contract | $32,200.00 |
| Estimated Government participation at 75 percent | $24,150.00 |

**Units, unit costs and total expenditures**

| | | |
|---|---|---|
| Drifts and crosscuts | 900 feet | @ $32/ft. |
| Long hole drilling | 600 feet | @ $ 1.50/ft. |
| Timbering | 189.5 feet | @ $ 7.00/ft. |
| Assays for $WO_3$ | 48 | @ $ 4.00 each |

| | |
|---|---|
| Total expenditures: | $31,218.50 |
| Government's share at 75 percent | $23,413.87 |
| Government's share of expenditures Idm-E707 | $ 432.00 |
| Total amount of Government lien | $23,845.87 |
| | |
| Unexpended funds | $ 981.50 |
| Government's share of unexpended funds at 75 pct. | $ 736.12 |
| Value of production during operations, subject to DMEA royalty | none |

## Equipment

Work performed under the contract was on a unit-cost basis and all equipment was furnished by the Operator.

**Sampling:**

Thirty-three check samples were taken by the Bureau of Mines engineers during the period of the contract. In addition, nine check samples were taken of stockpiled ore and exposures prior to the start of exploration work under the contract. Of samples taken by the Operator only 48 were charged to the contract.

The location of check samples by the Bureau of Mines are indicated on attached map (fig. 3) and a description of the sample assays follow:

| Sample Number | Feet Width | % $WO_3$ | Description and remarks |
|---|---|---|---|
| 500 | grab | 1.46 | Represents 160 tons in lower stockpile |
| 501 | grab | 1.75 | Represents 85 tons in lower stockpile |
| 502 | grab | 0.20 | Represents 650 tons in stockpile near portal of No. 3 tunnel |
| 503 | 6.0 | 0.10 | Tactite in lower road cut at No. 4 portal site |
| 504 | 4.0 | 0.40 | Tactite and argillite near No. 4 portal site |
| 505 | 3.0 | 0.02 | 25-28 ft. point stub drift, No. 3 tunnel |
| 506 | 6.0 | 2.17 | Sulphide zone in tactite No. 3 tunnel |
| 507 | 3.0 | 2.23 | Tactite, south of raise No. 3 tunnel |
| 508 | 3.0 | 0.03 | Left wall end of No. 3 tunnel |
| 563 | 6.0 | 0.85 | Tactite No. 4 adit, Sta. 42 plus 23 ft. |
| 564 | 7.0 | 0.32 | Tactite No. 4 adit, Sta. 43 plus 9 ft. |
| 565 | | 0.46 | Tactite No. 4 adit, Sta. 43 plus 16 ft. |
| 569 | 7.0 | 1.73 | Tactite No. 4 adit, Sta. 43 plus 30 ft. |
| 570 | 3.0 | 2.12 | Tactite No. 4 adit, Sta. 43 plus 36 ft. |
| 573 | 4.0 | 0.17 | Tactite No. 4 adit, Sta. 41 plus 10 ft. |
| 574 | 5.0 | 0.79 | Tactite No. 4 adit, Sta. 42 plus 17 ft. |
| 575 | 2.5 | 0.09 | Tactite No. 4 adit, Sta. 47 plus 20 ft. |
| 576 | 2.0 | 0.01 | Tactite, No. 4 adit, Sta. at P. O. B. |
| 604 | 4.0 | <0.01 | Long hole 45 W. interval 36 to 40 feet. Sludge |

| Sample Number | Feet Width | % $WO_3$ | Description and remarks |
|---|---|---|---|
| 605 | 3.0 | 0.93 | Long hole 45 W., interval 52-55 feet. Sludge. |
| 606 | 4.0 | <0.01 | Long hole 43 E., interval 0-4'. Sludge. |
| 745 | 4.0 | 0.05 | Tactite at face No. 4 adit at P.O.B. plus 584 ft. |
| 746 | grab | 1.96 | Muck pile from face at 580 ft. |
| 751 | 1.0 | 0.01 | Tactite, west side of face at P.O.B. plus 615 ft. |
| 752 | 2.0 | 1.39 | Tactite, west side of drift at P.O.B. plus 590 feet. |
| 753 | 2.0 | 1.32 | Tactite, west side of drift at P.O.B. plus 602 ft. |
| 754 | 1.0 | 0.03 | Tactite, southwest side of drift at P.O.B. plus 552 ft. |
| 755-766 | 48 | <0.01 | Twelve samples of sludge from Long hole 53A 4.0 ft. intervals. Scheelite reported by Operator. |
| 767 | 2.0 | 2.49 | Tactite. West side of drift at Survey Sta. 47 plus 45 ft. |
| 768 | 2.0 | 1.26 | Tactite. West side of drift at Survey Sta. 47 plus 10 ft. |
| 769 | 2.0 | 4.10 | Tactite and scheelite east side of drift, Survey Sta. 43 plus 45 ft. |
| 770 | 2.0 | 0.03 | Tactite with sparse scheelite east side of drift at P.O.B. plus 65 ft. |

| Sample Number | Feet Width | % $WO_3$ | Description and remarks |
|---|---|---|---|
| 827 | grab | 0.37 | East half of dump No. 4 adit, tactite, limestone, etc. |
| 828 | grab | 0.06 | West half of dump No. 4 adit, tactite, limestone, etc. |

## Log of Long Hole Drilling

Drill hole locations are shown on attached map. The following is a summary of the results of the drilling.

| Hole Number | Feet Depth | Remarks |
|---|---|---|
| 42E | 53 | mostly meta sediments and granodiorite |
| 43 W 2 | 52 | meta sediments and limy rock |
| 43 W 1 | 32 | lost drill rods - meta sediments |
| 45 E | 56 | mostly hornfels, sparse scheelite 27-28 feet. Bottom in granodiorite |
| 45 W | 55 | meta sediments with sparse scattered scheelite and pyrite in tactite |
| 46 W | 32 | tactite 0 to 12 feet with sparse scheelite, 12 to 21 feet hornfels, and 21 to 32 feet granodiorite |
| 47 E | (22) | Lost drill rods. Hard meta sediments. Work not charged to contract |
| 47 W | 52 | Soft meta sediments |
| 48 E | 50 | Shattered mudstone. No scheelite |
| 48 W | 50 | Shattered mudstone. No scheelite |

| Hole Number | Feet Depth | Remarks |
|---|---|---|
| 50 E | 50 | Limestone and meta sediments |
| 50 W | 32 | Meta sediments and fault gouge |
| 53 E | 38 | Meta sediments. Sparse scheelite in fault gouge at 38 feet |
| 53 A | 48 | Meta sediments. Sparse scheelite |
| | 600 feet | |

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

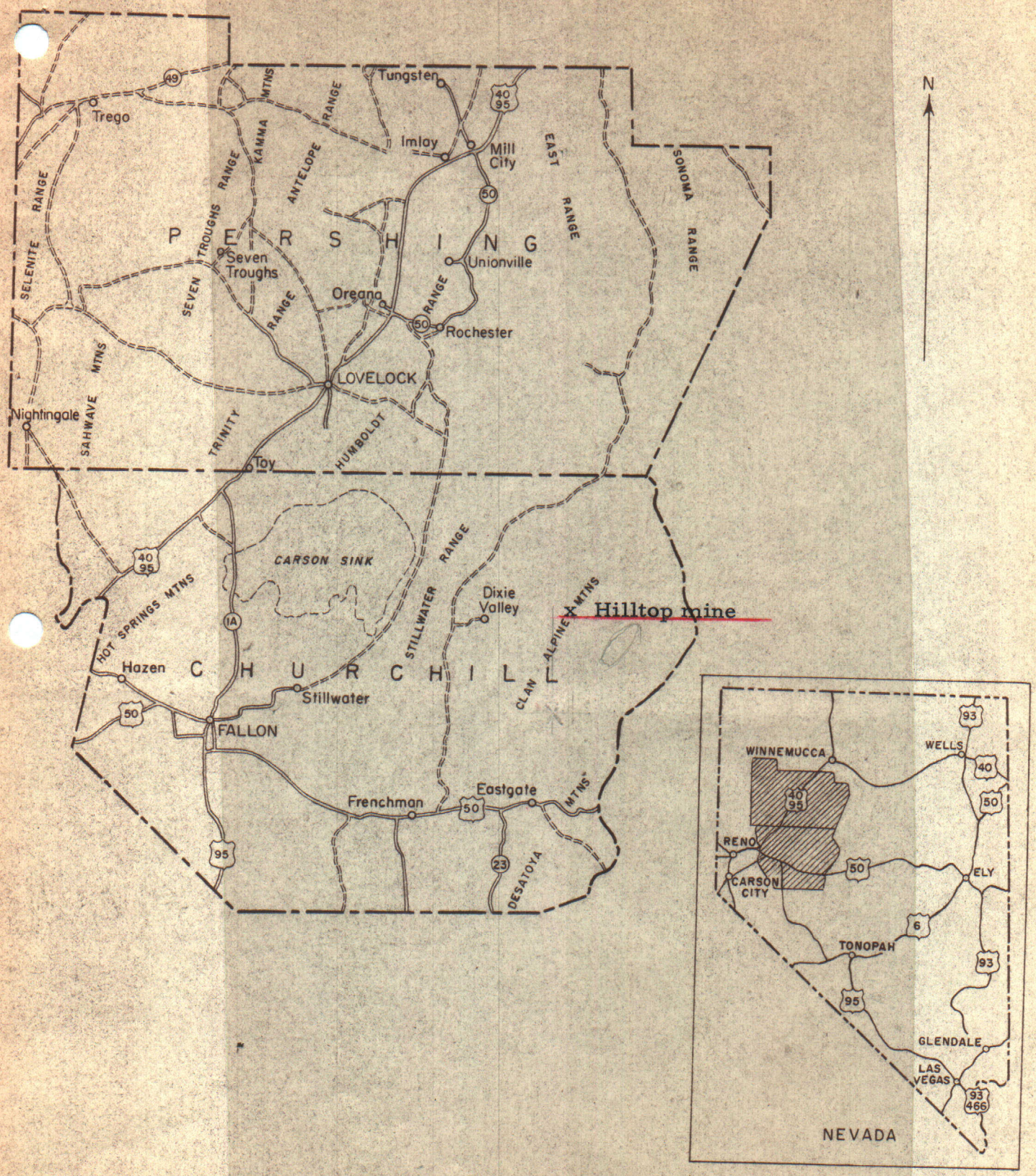
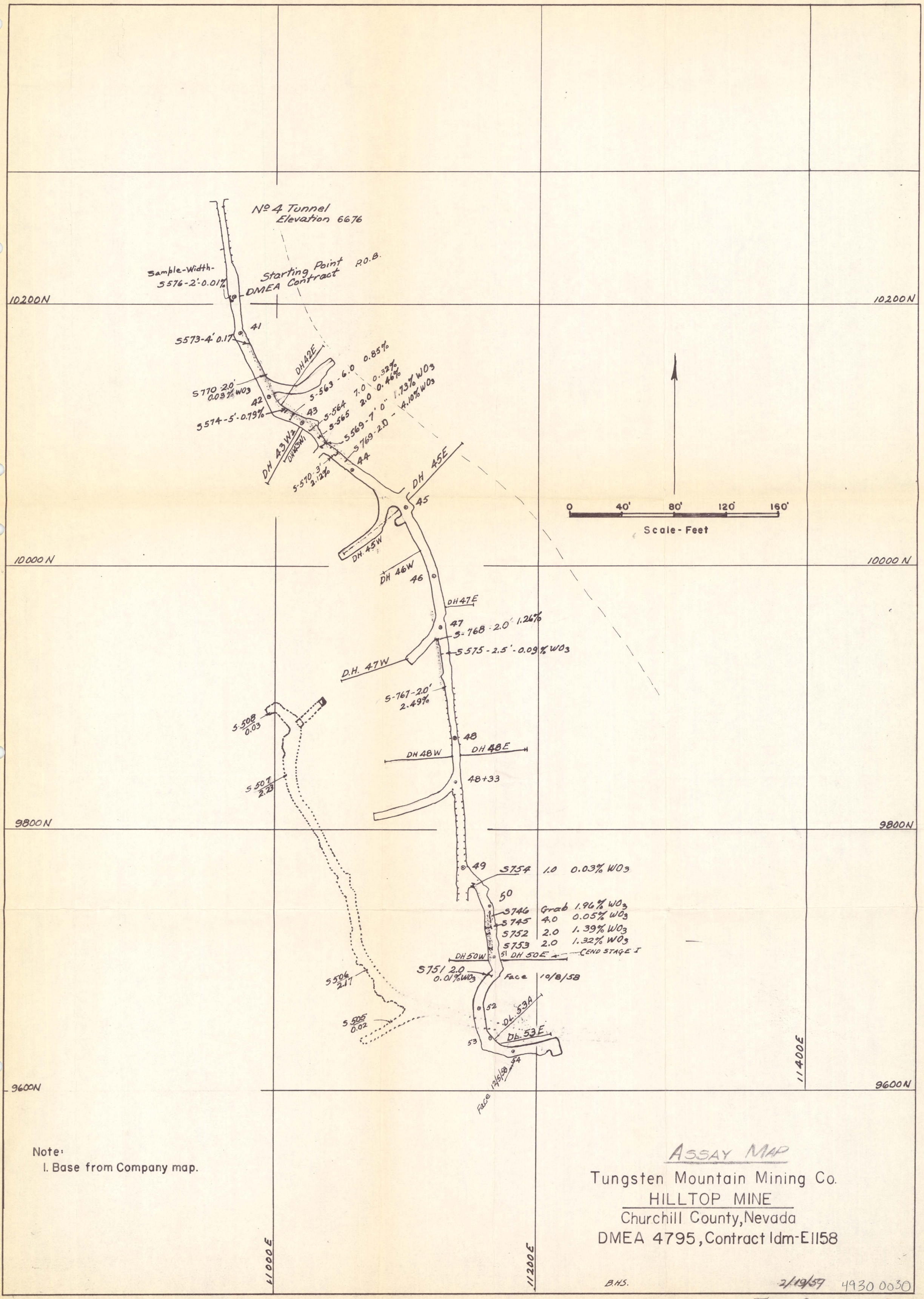



Figure 1. INDEX MAP OF CHURCHILL AND PERSHING COUNTIES, NEVADA

0 20 40 60 Miles




Note:
1. Base from Company map.

ASSAY MAP

Tungsten Mountain Mining Co.

HILLTOP MINE

Churchill County, Nevada

DMEA 4795, Contract Idm-E1158

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Fig. 3

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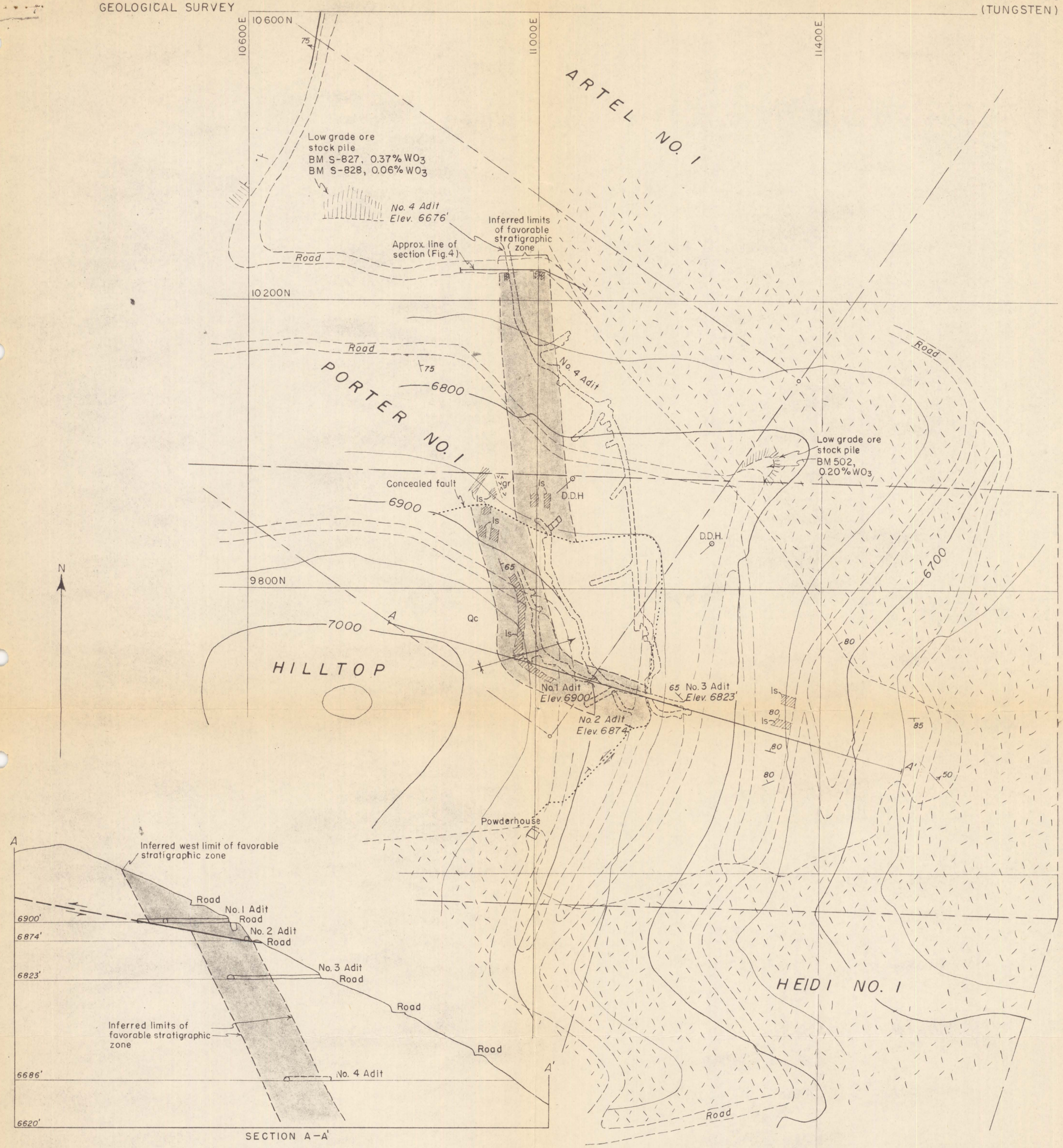


Figure 2. GEOLOGIC MAP AND SECTION OF THE HILLTOP MINE AREA
CHURCHILL COUNTY, NEVADA

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