4840 0047

(254) Item 48

SUMMARY REPORT
OF THE
EXPLORATION POTENTIAL OF TENNECO MINERALS HOLDINGS
IN THE TONOPAH MINING DISTRICT
NYE-ESMERALDA COUNTIES, NEVADA

SOME PLATES AND OR MAPS TOO LARGE TO COPY FOR COMPLETE REPORT SEE FILE

BY

FRED T. SAUNDERS
SR. EXPLORATION GEOLOGIST

MARCH 1984

EXPLORATION POTENTIAL OF TENNECO MINERALS HOLDINGS IN THE TONOPAH MINING DISTRICT NYE-ESMERALDA COUNTIES, NEVADA

SUMMARY

Tenneco Minerals controls 108 patented and 11 unpatented mining claims covering formerly productive properties in the Tonopah mining district, Nye County, Nevada.

Tonopah is a bonanza silver/gold camp with a production history of some nine million tons of ore averaging 20 opt silver and 0.20 opt gold from fissure veins in Tertiary volcanics. Principal operating period was from 1902 to 1929 when major mines closed because of low metal prices.

Exploration targets, at depths of ±1000 feet, remain at both the east and west ends of the district where the vein systems have been downdropped by faulting. Targets in both areas are expected to be some 2-3 million tons at historical grades.

Tenneco is seeking exploration proposals from interested parties to further explore and develop deep, untested parts of the Tonopah district.

LOCATION

The Tonopah Mining District is located midway between Reno and Las Vegas in Nye and Esmeralda counties of south central Nevada (Figure 1). The district is situated at the southern end of the San Antonio Mountains at an elevation of approximately 6000 feet. Tonopah is accessible by U.S. Highways 6 and 95, both major routes of travel, and by the Nye county airport located eight miles east of Tonopah.

LAND POSITION

Tenneco Minerals controls 108 patented and 11 unpatented mining claims in the Tonopah mining district.

The patented claims were acquired from Summa Corporation in April of 1977 and carry a 2% net smelter return royalty. The eleven unpatented claims are controlled wholly by Tenneco.

The land controlled by Tenneco covers approximately two thirds of the formerly productive area in the district. It includes three of the four largest producers in the district; the Tonopah Mining Company (Mizpah mine), the Tonopah Belmont Company, and the West End Consolidated Company. The other major producer was the Tonopah Extension Company currently under lease to Chevron Resources.

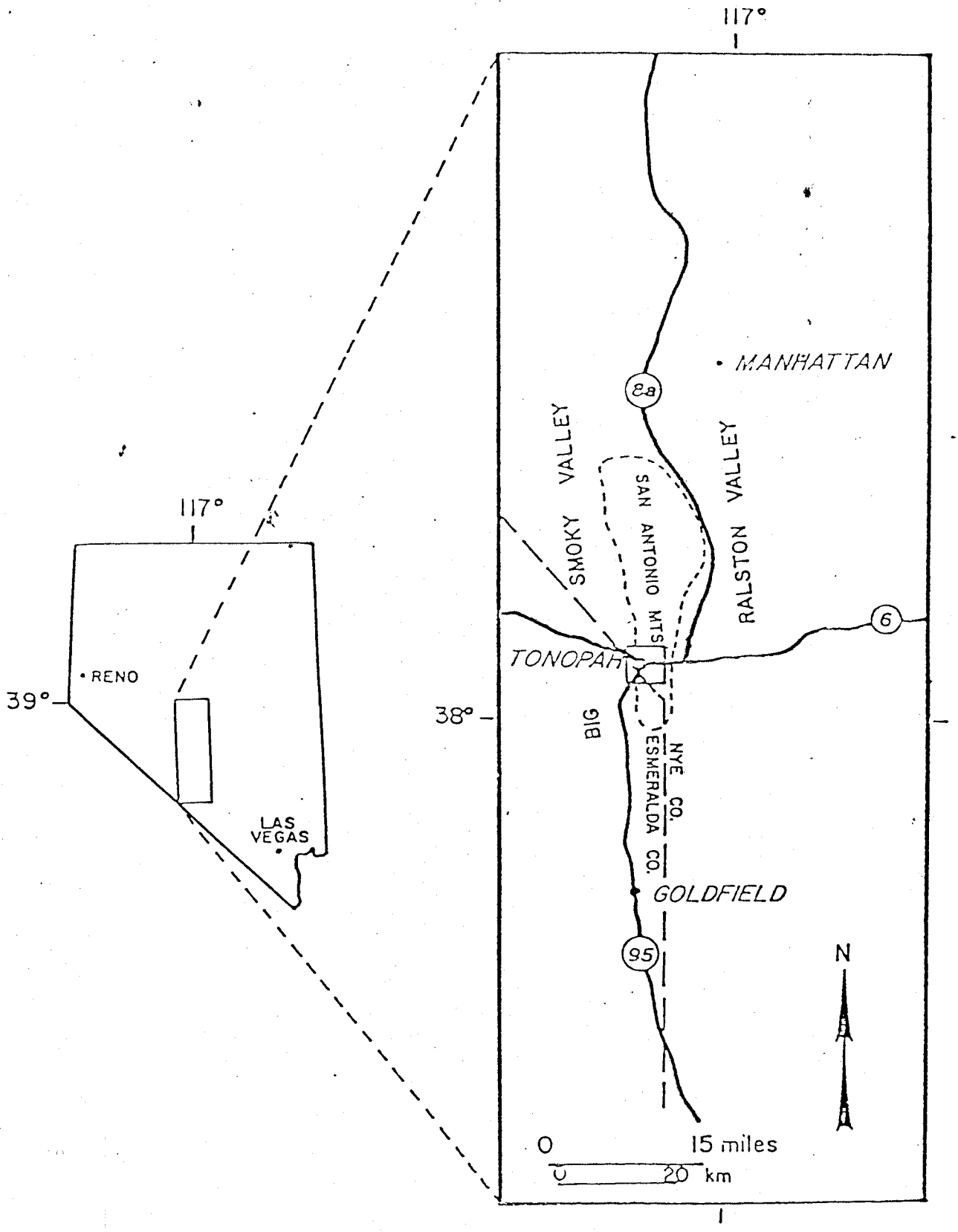


Figure 1: Location Map.

Surface rights have been severed on several of the claims lying within the town of Tonopah, but all minerals are reserved to Tenneco. Title reports are available for inspection through Tenneco's Land Department in Denver.

HISTORY

The Tonopah district was discovered in May of 1900 by Jim Butler. The camp boomed when Butler granted leases on his five original claims in 1901 and sold his remaining holdings to the Tonopah Mining Company a year later. Production steadily increased yearly until its peak in 1918 when the ore mined was valued at over $9,000,000. Mining operations gradually declined from 1918 till 1929, when the low price of silver at 29¢ an ounce caused the major companies to close down. Small scale leasing operations continued until 1948 (Carpenter, 1953).

Total recorded production is 8,800,000 tons from which 1,861,000 ounces gold and 174,153,000 ounces silver were recovered (Bonham & Garside, 1979). Average grades were .20 opt gold and 20 opt silver.

REGIONAL GEOLOGY

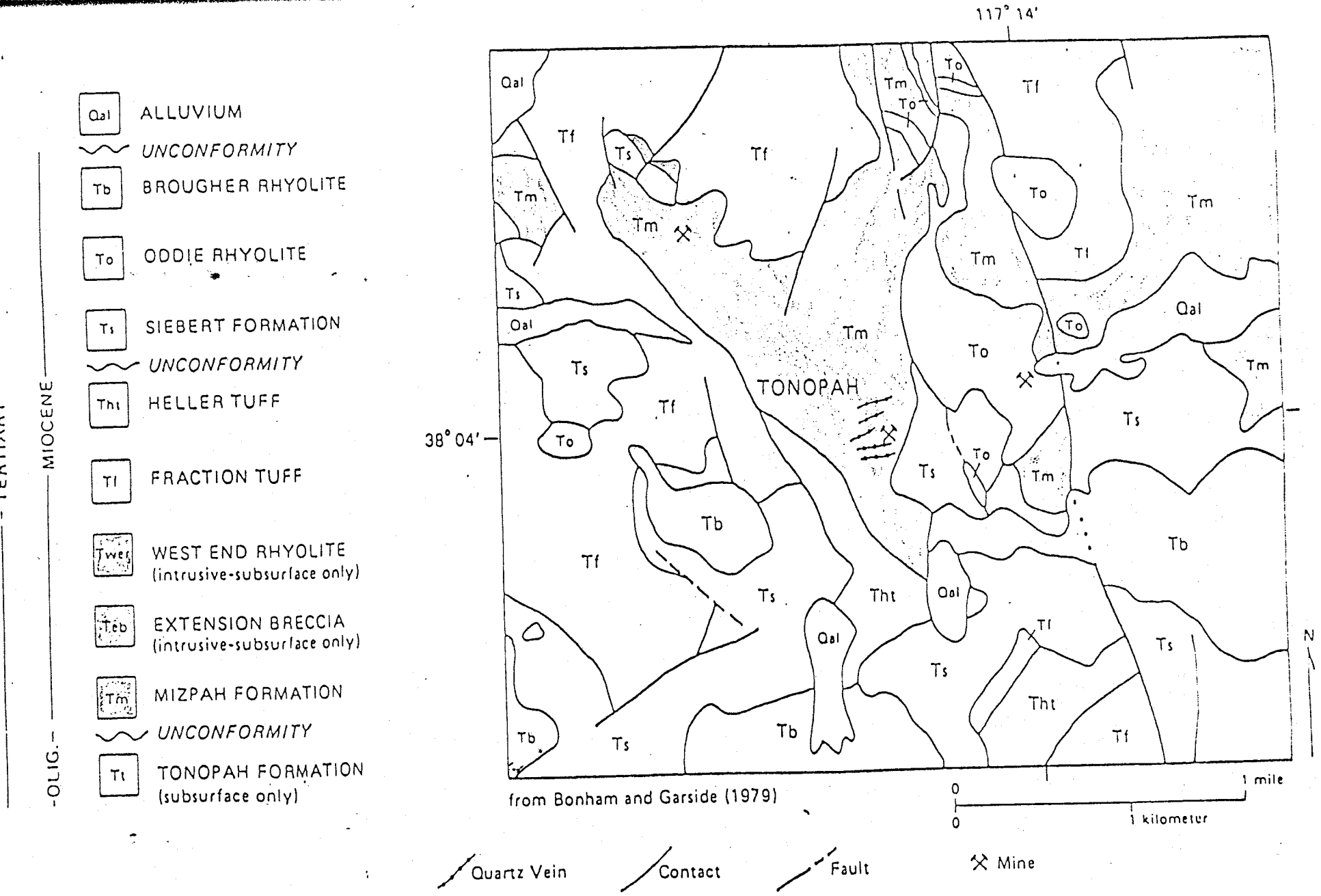
The Tonopah mining district is located at the south end of the San Antonio Mountains, a small north-south trending range in Central Nevada.

The area is underlain by a thick sequence of intermediate to felsic Tertiary volcanics and volcanoclastics that are dissected by a strong N-S fault set and a subsidiary E-W fault set. Paleozoic and Mesozoic sedimentary and intrusive rocks underlie parts of the northern end of the range.

DISTRICT GEOLOGY

The geology of the Tonopah district has been described in numerous publications. The Nolan bulletin (1935) contains the classical description of the district and includes detail on the underground geology unvailable elsewhere. The recent work by Bonham and Garside (1979) is a comprehensive study of surface geology. Fahley's unpublished thesis (1981) examines the controls of mineralization using fluid inclusion data.

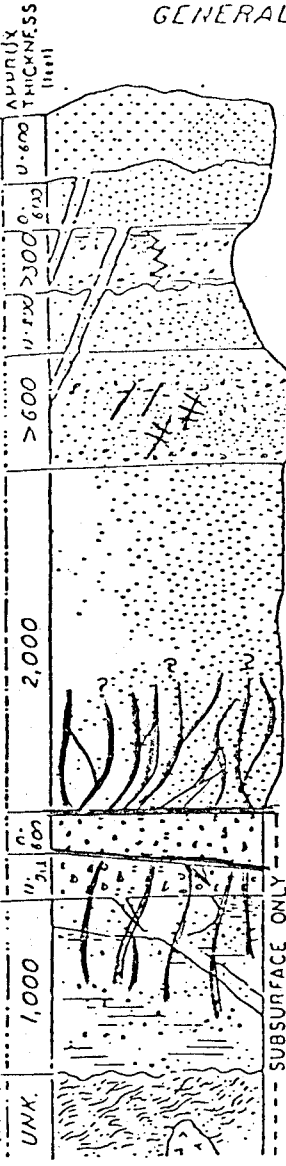
Geology of the district is illustrated in generalized fashion on Figure 2. Stratigraphic section, description of the rock units and position of mineralization within the stratigraphy is shown on Figure 3. All of the units present at surface, and to explored depths in the mines, are volcanics of early Oligocene to late Miocene age.



Generalized geologic map of the Tonopah area.

Figure 2

GENERALIZED STRATIGRAPHIC COLUMN AND RELATIONSHIP OF MINERALIZATION



UNIT	DESCRIPTION	
BROUGHER RHYOLITE	GRAY TO LIGHT BROWN, PORPHYRITIC, FLOW BANDED RHYOLITE DOMES	
ODDIE RHYOLITE	PINK TO GRAY OR WHITE, SLIGHTLY PORPHYRITIC RHYOLITE PLUGS AND DIKES	
SIEBERT FORMATION	WHITE TO GRAY OR BROWN, POOR- TO WELL-SORTED EPICLASTIC VOLCANIC SILTSTONE, SANDSTONE, AND CONGLOMERATE	DISSEMINATED MINERALIZATION HASBROUCK & THREE HILLS
HELLER TUFF	TAN TO GRAY OR VIOLET, CRYSTAL-VITRIC QUARTZ LATITE ASH-FLOW TUFF	
FRACTION TUFF KING TONOPAH MEMBER	BROWN TO GRAY, LITHIC-VITRIC RHYOLITE ASH-FLOW TUFF, TUFF-BRECCIA, AND MINOR EPICLASTIC VOLCANIC SILTSTONE AND SANDSTONE	STOCKWORK MINERALIZATION OF DIVIDE MINES
MIZPAH FORMATION	PURPLISH-BROWN TO BLACK, PORPHYRITIC ANDESITE TO TRACHYANDESITE FLOWS, BRECCIAS, AND MINOR DACITE INTRUSIONS	
		HIGH ANGLE VEINS OF CENTRAL & EASTERN MINES
WEST END RHYOLITE	LIGHT GREEN, FINE TO MEDIUM GRAINED, INTRUSIVE RHYOLITE BRECCIA	LOW ANGLE CONTACT VEINS OF WEST END & TONOPAH EXT. MINES
EXTENSION BRECCIA	RED, COARSE GRAINED, INTRUSIVE RHYOLITE BRECCIA	
TONOPAH FORMATION	ORANGE TO PINK OR GRAY, VITRIC AND VITRIC-LITHIC ASH-FLOW TUFF, AND MINOR VOLCANICLASTIC ROCKS AND FLOW BANDED RHYOLITE DOMES AND FLOWS	HIGH ANGLE VEINS OF EASTERN AND EXTREME WESTERN MINES
? ?	SHALE, SILTSTONE, AND MINOR CHERT AND LIMESTONE INTRUDED BY GRANITIC STOCKS AND DIKES	

Generalized stratigraphic column of the Tonopah district. Stratigraphic nomenclature is after Bonham and Garside (1979).
Modified from Fahley 1981

Figure 3

A brief geologic history of the district is summarized below:

1. Accumulation of Tonopah Formation.
2. Eruption of Mizpah andesite.
3 Pre-mineral NS and NW faulting with vertical displacement up to 2000 feet.
4. E-W low angle faulting of the complex Tonopah fault.
5. Intrusion of Extension breccia and West End rhyolite along Tonopah fault.
6. Mineralization (believed associated with West End rhyolite).
7. Post-mineral faulting along NW faults.
8. Deposition of Fraction, Heller, and Seibert tuffs.
9. Rejuvination of N-S faults.
10. Intrusion of Oddie rhyolite and Brougher rhyodacite.
11. Erosion to present day level.

ALTERATION & MINERALIZATION

Hydrothermal alteration halos in the Tonopah district display zonation patterns characteristic of epithermal vein systems. Outward from the veins is a narrow zone of quartz-sericite-adularia which sharply grades into an argillic zone where groundmass and phenocrysts are totally altered to clay minerals. The argillic zone grades into a propylitic zone which includes a district wide albitization of the plagioclase. In the more intense propylitic zones calcite forms in open spaces and fractures and the groundmass and ferromagnesian minerals are chloritized. The width and intensity of the alteration zones is a function of depth and host rock.

The veins in the Tonopah district can be classified into two types:

A. Flat veins (0-30°) associated with Tonopah fault and intrusion of West End Rhyolite. These veins dominate in western part of district.

B. High angle veins (50-90°) in hanging wall branches of Tonopah fault. This system dominates in eastern part of the district.

Mineralogically and texturally the veins are very similar with quartz, sericite, adularia, rhodochrosite, pyrite, sphalerite, galena, chalcopyrite, and gold being deposited early then replaced by quartz, argentite, pyrargyrite, and polybasite (Fahley, 1981). Supergene enrichment was only significant in the near surface and outcropping veins in central part of the district.

TENNECO EXPLORATION PROGRAM

The initial objective of Tenneco and its predecessors in Tonopah was the development of reserves in the King Tonopah mine and

exploration for similar, undeveloped veins outside the main district. This work proved inconclusive, however, and emphasis was later placed on general evaluation of the main district. Targets considered included the following:

1. Faulted extensions of high grade vein systems.
2. Stringer and breccia zones in the wall rocks adjacent to the veins.
3. Disseminated deposits as replacements of favorable units.

Work completed during this evaluation included:

1. Geologic mapping of district.
2. Compilation of underground data for the entire district.
3. Development of cross sections from composite mine working maps.
4. Rock chip and underground sampling in the central outcropping part of the district.
5. Core drilling - 12,262 feet in the King Tonopah area and 8,233 feet in the West End area.
6. Rotary drilling - 4,405 feet in the West End area, and 3,434 feet in the central part of district.
7. Soil geochem sampling - 12 square miles north of Tonopah, one square mile southwest of Tonopah.
8. Sampling of dumps and tailings.

EXPLORATION POTENTIAL

Best opportunity for significant new discovery in Tonopah is with potential downfaulted extensions of the formerly productive vein systems at either end of the district. Figure 4 is a simplified representation of these ideas showing general structural elements, depth to targets and anticipated target size. It overlays Figure 5 which shows the Tenneco claim position and major shafts in the district.

Target 1 - Extension of the West End-Ohio vein systems across the Monarch Pittsburg fault. The West End Mining Company did only limited exploration across the fault before closing their mines. Figure 6 is a cross sectional view of these two veins on the West End property and their relation to the Tonopah fault system. These veins occupy the south limb of the domal shaped Tonopah fault. The mineralization on the north limb of the fault was mined semi-continuously along a 5000 foot strike length and downdip to a depth of 2400 feet. The south limb was mined for 1800 feet along strike before being faulted off by Monarch Pittsburg fault. The downdip potential was never tested below 800' depth as the veins crossed property lines and were in litigation during most of the mining period.

A target size of 2 million tons grading 15 to 20 opt silver and .15 to .20 opt Au from 15-50 foot thick flat lying veins is considered realistic.

Target 2 - Extension of the Belmont vein system across the Halifax fault. The Belmont veins, which were mined for approximately 1000 feet along strike between the 700 and 1400 foot levels, produced over 2,000,000 tons of ore grading 30 opt silver and .30 opt gold. The eastern extension of the vein system was faulted off by Halifax fault (see Figures 7 & 8). The Halifax Mining Company explored for the faulted eastern extension of the vein system, but found only limited segments within the large Halifax fault zone. Area beyond this fault zone is effectively unexplored.

Fluid inclusion work by Fahley shows temperatures in Belmont veins are similar to those in the Mizpah system indicating that the hydrothermal system is continuing in this direction. This, along with the fact that segmented vein sections were found within the Halifax fault zone suggests that significant extensions may exist, even further east on down thrown side of the fault. This area has a potential for 2 million tons of 20 opt Ag and .20 opt Au from multiple, 10-30 foot thick, high angle veins.

ADDITIONAL POTENTIAL

Tonopah Belmont Mine - The Tonopah Belmont mine was thoroughly sampled several times since its closure. This data suggests some 300,000 to 500,000 tons of developed ore, at district grades of 20 opt silver and 0.20 opt gold, remains in the mine. A similar tonnage, at lower grade, remains as gob in old stopes.

Dumps & Tailings - Extensive sampling of dumps and tailings on Tenneco property indicates potentially significant low grade surface reserves:

Dumps - 1,050,000 tons @ 2.00 opt Ag, 0.02 opt Au
Tailings - 1,446,000 tons @ 1.40 opt Ag, 0.01 opt Au

Preliminary metallurgical tests indicate 70% recoveries by cyanidation methods for dump and tailings ore.

CONCLUSIONS

The Tonopah district offers opportunity for discovery of high grade gold-silver ores in deep vein systems. Tenneco is seeking joint venture proposals from mining companies with demonstrated capability in the exploration, development and exploitation of such deposits.

FS/dc

REFERENCES

Bonham, H.F., and Garside, L.J., 1979, Geology of the Tonopah Lone Mountain, Klondike, and Northern Mud Lake Quadrangles, Nevada: Nevada Bureau of Mines and Geology, Bulletin 92, 142 pages.

Carpenter, J.A., Elliott, R.R., and Sawyer, B.F.W., 1953, The History of Fifty Years of Mining at Tonopah, 1900-1950: Nevada University Nevada Bull., v. 47, no 1., 153 pages.

Fahley, M.P., 1981, Fluid Inclusion Study of the Tonopah District, Nevada: M.A. Thesis, Colorado School of Mines. Unpublished, 102 pages.

Nolan, T.B., 1935, The Underground Geology of the Tonopah Mining District, Nevada: University Nevada Bull., 29.

Tenneco Minerals
A Tenneco Company

1802 North Carson St., #226
Carson City, Nevada 89701
(702) 883-2236

March 19, 1984

Hecla
Denver 865-2311

Mr. E. Tomany
P. O. Box 452
Tonopah, Nevada 89049

Dear Mr. Tomany:

Enclosed please find copy of a brief report summarizing the exploration potential of Tenneco mineral properties in the Tonopah mining district, Nye County, Nevada. Tenneco is seeking proposals for further exploration and development of these properties from interested parties.

More detailed information is available for your review at the Tenneco office in Carson City until 31 May 1984. Please call either myself or Fred Saunders should you wish to make arrangements for this review.

Yours very truly,

TENNECO MINERALS

John Prochnau

JP/dc

Tenneco Minerals
A Tenneco Company

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Lakewood, Colorado 80227
(303) 987-6200
Telex 287358

April 1, 1985

Mr. Ed Tomany
P.O. Box 452
Tonopah, Nevada 89049

Re: Tonopah Joint Venture

Dear Ed:

This letter will confirm our telephone conversation last week regarding the type of deal that Tenneco is looking for with respect to its Tonopah properties. Without getting into many details, Tenneco is interested in pursuing a Joint Venture arrangement at Tonopah which would contain the following basic terms:

1. Tenneco would allow a partner to earn an undivided 50% interest in Tenneco's mineral interests in the Tonopah District by performing a predetermined dollar amount of exploration and development work and making annual payments to Tenneco over a defined period of time. The annual payments to Tenneco during the earn-in period would be recoverable by the partner out of first production from the property.

2. Tenneco would reserve ownership of its surface real estate and the existing mine dumps and tailings and would retain all income generated from those reserved interests. Tenneco will however, contribute any surface rights needed by the venture for exploration, development and mining operations at no cost to the venture.

3. The venture agreement would provide that after a partner earned its 50% interest, both parties could proceed as equal partners by sharing all further expenditures 50-50. Or if one party elected not to contribute to further expenditures, the other party could proceed and the interest of the non-contributing party would be reduced pursuant to a dilution formula.

Ed, this outlines the basic concepts we are looking for. To cover one other point that I mentioned on the phone, I am enclosing a Tonopah land map showing the area in and around town where Tenneco would have the right to dispose of surface real estate without getting its partner's consent. On the balance of the property, we would be obligated to have the consent of our partner prior to diposing of any surface interests. The reason for this concept is that there are many small property matters (requests for town lots, easements, etc) that frequently arise in the area around town. It would be very burdensome to have to get a partner's approval for each of these transactions. On the outlying areas we feel that it would be appropriate to contact a partner prior to disposing of surface interests to make sure that the sale of the property would not interfere with any anticipated mining or related activities.

I'll look forward to hearing from you after you have had the opportunity to review this with the company you are in contact with.

Yours very truly,

TENNECO MINERALS COMPANY

L. Steve Wagner

L. Steve Wagner
Land Manager

LSW/rf
cc: N.K. Muncaster
J.L. Wilson

TONOPAH GRADE/TONNAGE

	1	2	3	4	5	6
1	Year	Tons	Au ozs	Ag ozs	Au opt	Ag opt
2	1900	1				
3	1901	2534	9774	623516	3.857	246.06
4	1902	11258	26463	2434453	2.351	216.24
5	1903	9055	25298	2404180	2.794	265.51
6	1904	22703	18703	2115191	0.824	93.17
7	1905	91651	58357	5369439	0.637	58.59
8	1906	106491	63114	5697928	0.593	53.51
9	1907	214608	57250	5330398	0.267	24.84
10	1908	273176	78585	7172386	0.288	26.26
11	1909	278743	67742	7872967	0.243	28.24
12	1910	365139	111442	10422869	0.305	28.54
13	1911	404375	114479	10868268	0.283	26.88
14	1912	479421	107219	10144987	0.224	21.16
15	1913	574542	126445	11563437	0.220	20.13
16	1914	531278	128117	11388452	0.241	21.44
17	1915	516337	107836	10171374	0.209	19.70
18	1916	455140	93925	8734726	0.206	19.19
19	1917	470122	74481	7068737	0.158	15.04
20	1918	501190	62300	5929920	0.124	11.83
21	1919	268658	37339	3568875	0.139	13.28
22	1920	387489	51136	4816055	0.132	12.43
23	1921	367909	48335	4623901	0.131	12.57
24	1922	472865	57053	5436080	0.121	11.50
25	1923	371946	53571	5176306	0.144	13.92
26	1924	285707	56216	5032043	0.197	17.61
27	1925	197409	33073	3070409	0.168	15.55
28	1926	127252	21967	2052956	0.173	16.13
29	1927	125790	22256	2167694	0.177	17.23
30	1928	103109	20079	1900315	0.195	18.43
31	1929	121477	20059	1965595	0.165	16.18
32	1930	114499	19656	1931194	0.172	16.87
33	1931	16534	9583	823872	0.580	49.83
34	1932	10604	8791	646687	0.829	60.99
35	1933	4786	4679	400379	0.978	83.66
36	1934	11890	6024	513032	0.507	43.15
37	1935	196710	10708	874860	0.054	4.45
38	1936	39387	4586	5388	0.116	0.14
39	1937	118407	11289	916513	0.095	7.74

TONOPAH GRADE/TONNAGE

	1	2	3	4	5	6
40	1938	19598	9181	715266	0.468	36.50
41	1939	18767	6925	596173	0.369	31.77
42	1940	11879	4252	358018	0.358	30.14
43	1941	11243	4121	377534	0.367	33.58
44	1942	68155	3710	334712	0.054	4.91
45	1943	5123	1709	159141	0.334	31.06
46	1944	4121	1029	91215	0.250	22.13
47	1945	1845	596	48434	0.323	26.25
48	1946	2268	911	75840	0.402	33.44
49	1947	1993	941	76091	0.472	38.18
50	1948	1723	468	45938	0.272	26.66
51	1949	91	38	3817	0.418	41.95
52	1950	64	24	2336	0.375	36.50
53	1951					
54	1952		2	1		
55	1953					
56	1954					
57	1955	241	26	2038	0.108	8.46
58	1956	650	290	25909	0.446	39.86
59	1957	203	48	4713	0.236	23.22
60	1958					
61	1959					
62	1960					
63	1961					
64						
65	TOTAL	8798156	1862201	174152558	0.212	19.79
66						
67	Note: Production data from King Tonopah Mine (1958-61) not included.					
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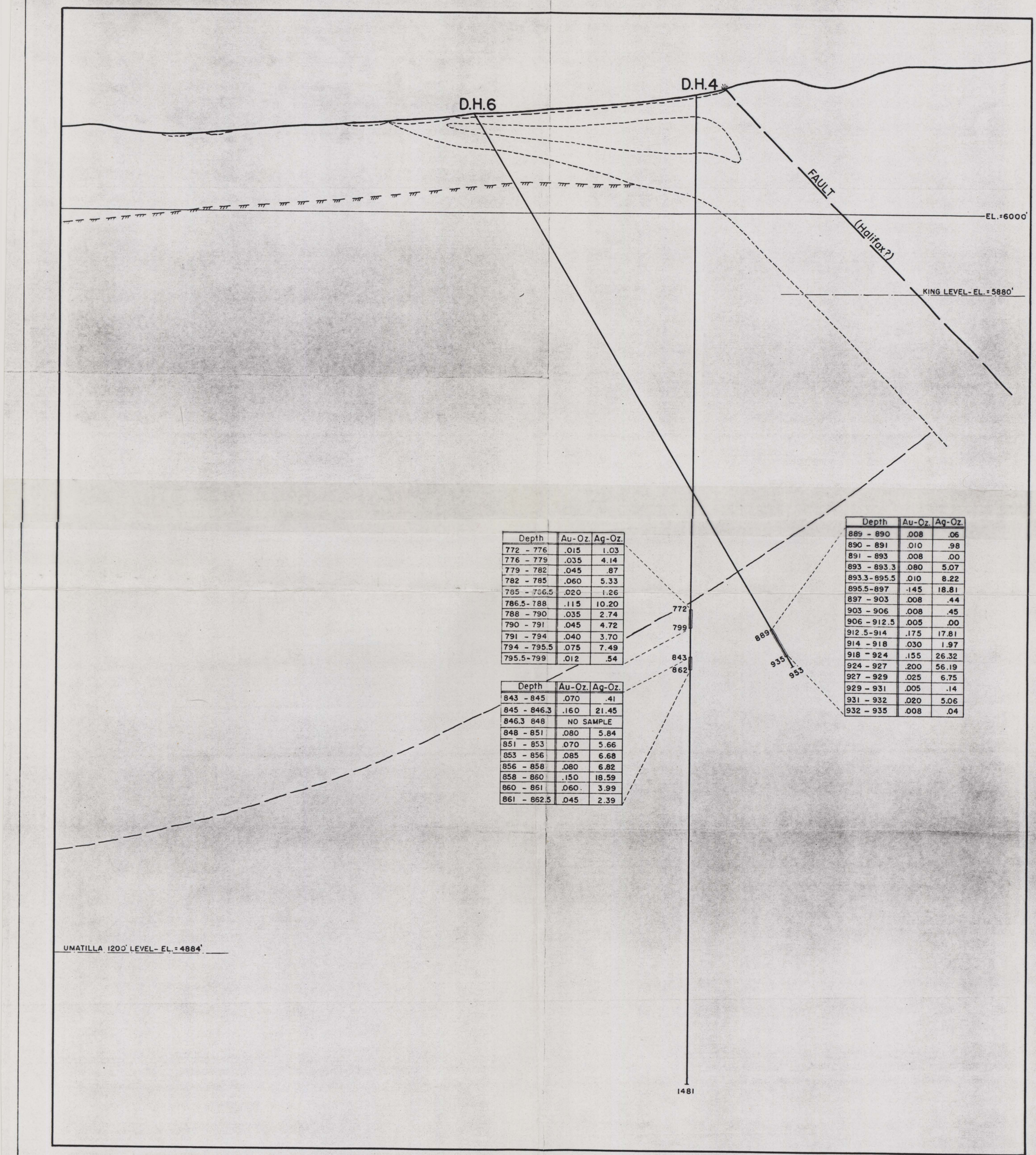
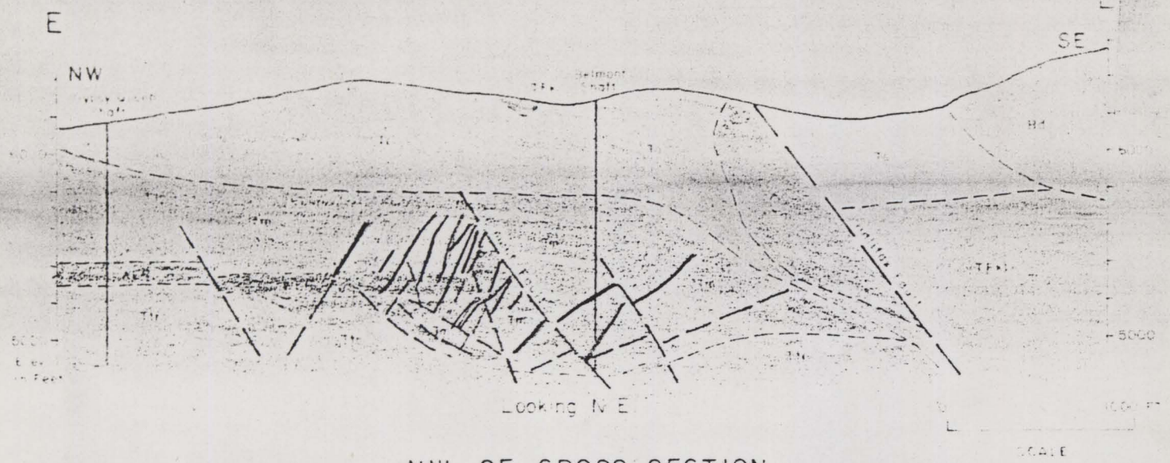


Depth	Au-Oz.	Ag-Oz.
772 - 776	.015	1.03
776 - 779	.035	4.14
779 - 782	.045	.87
782 - 785	.060	5.33
785 - 786.5	.020	1.26
786.5 - 788	.115	10.20
788 - 790	.035	2.74
790 - 791	.045	4.72
791 - 794	.040	3.70
794 - 795.5	.075	7.49
795.5 - 799	.012	.54

Depth	Au-Oz.	Ag-Oz.
843 - 845	.070	.41
845 - 846.3	.160	21.45
846.3 848	NO SAMPLE	
848 - 851	.080	5.84
851 - 853	.070	5.66
853 - 856	.085	6.68
856 - 858	.080	6.82
858 - 860	.150	18.59
860 - 861	.060	3.99
861 - 862.5	.045	2.39

Depth	Au-Oz.	Ag-Oz.
889 - 890	.008	.06
890 - 891	.010	.98
891 - 893	.008	.00
893 - 893.3	.080	5.07
893.3 - 895.5	.010	8.22
895.5 - 897	.145	18.81
897 - 903	.008	.44
903 - 906	.008	.45
906 - 912.5	.005	.00
912.5 - 914	.175	17.81
914 - 918	.030	1.97
918 - 924	.155	26.32
924 - 927	.200	56.19
927 - 929	.025	6.75
929 - 931	.005	.14
931 - 932	.020	5.06
932 - 935	.008	.04



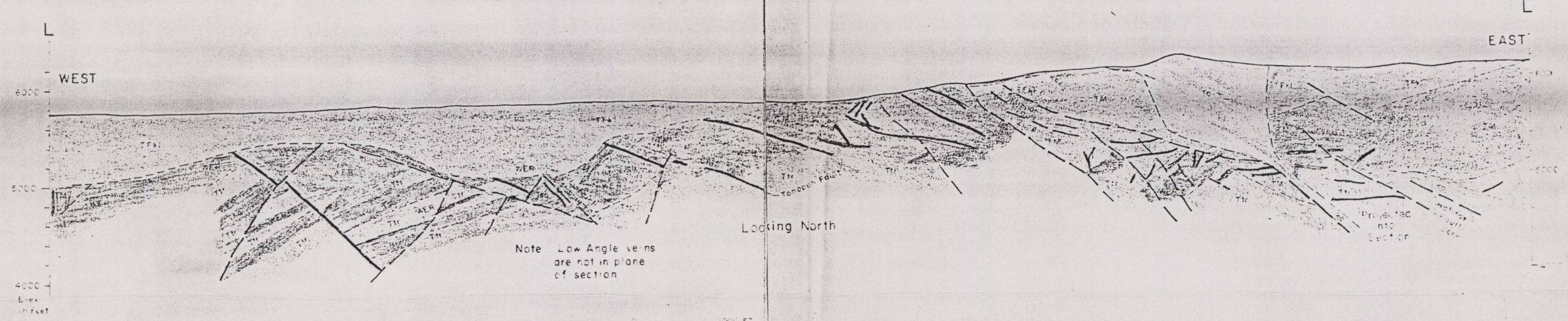
NW-SE CROSS SECTION
THROUGH EASTERN PART OF DISTRICT
AFTER FAHLEY 1981

FIGURE 7

EXPLANATION

Bd	Brougher dacite
To	Oddie Rhyolite
Ts	Siebert Tuff
TFkl	Fraction
WER	West End Rhyolite
Tm	Mizpah Andesite
Ttr	Tonopah Fm
Tsg	Sand Grass Andesite

No Vertical Exaggeration



LONGITUDINAL SECTION
THROUGH 5400 N COORDINATE
MODIFIED FROM NOLAN WORK

FIGURE 8

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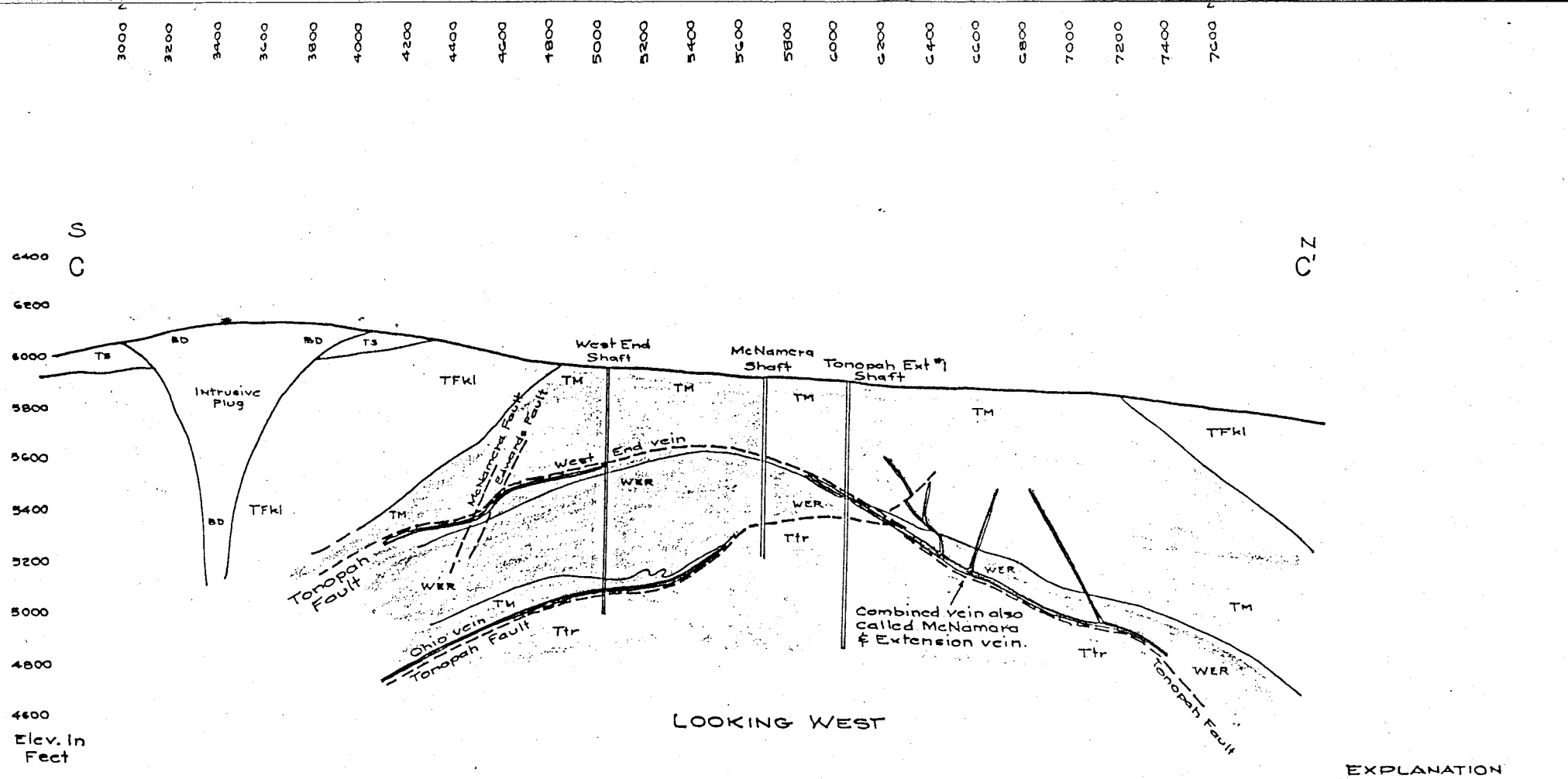


EXPLANATION

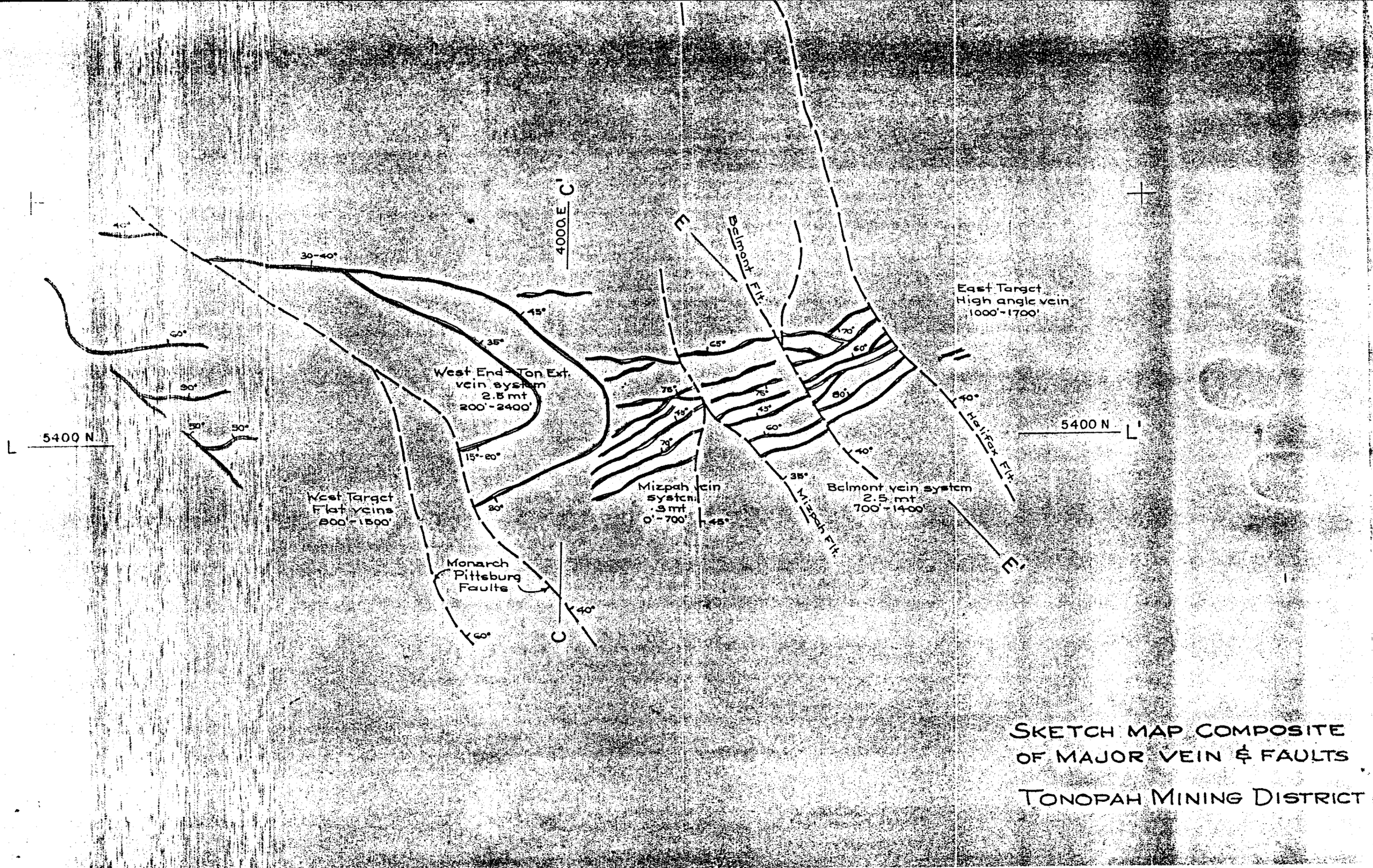
- Bd — Brougher Dacite
- Ts — Siebert Tuff
- TFkl — Fraction Breccia
- WER — West End Rhyolite
- TM — Mizpah Andesite
- Ttr — Tonopah Formation

N S CROSS SECTION THROUGH 4000 E. COORDINATE TONOPAH MINING DISTRICT NYE COUNTY, NEVADA

0 — 1000 FEET

Scale

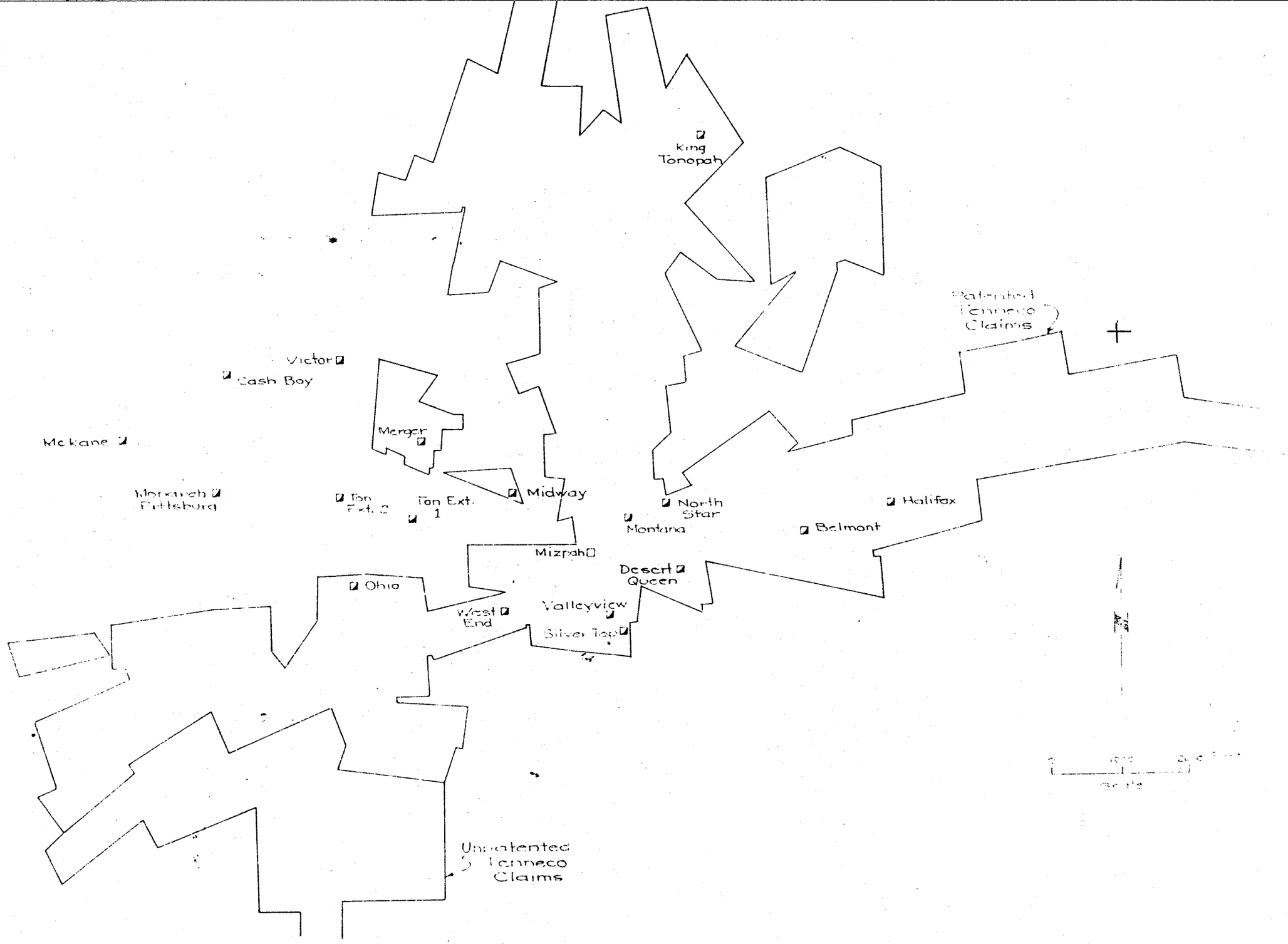
Figure 6



SKETCH MAP COMPOSITE OF MAJOR VEIN & FAULTS

TONOPAH MINING DISTRICT

(254) Item 48


King Tonopah
Victor
Cash Boy
Merger
McKane
Midway
Ton Ext. 1
Ton Ext. 2
Montana
North Star
Halifax
Belmont
Mizpah
Desert Queen
Ohio
West End
Valleyview
Silver Top
Unpatented Tenneco Claims