UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

REGION IV

OFFICE OF
REGIONAL DIRECTOR

224 NEW CUSTOMHOUSE
DENVER 2, COLORADO

May 23, 1951

Memorandum

To: Landon Strobel, Executive Secretary, Defense Minerals Administration

From: DMA Field Team, Region IV

Subject: DMA Docket 21-50, Tennessee-Schuykill Project, Wallapai Mining District, Mohave county, Arizona

We are attaching the original and two copies of the report on DMA Docket 21-50, Tennessee-Schuylkill Project.

Also attached in a sealed envelope is a confidential letter regarding the competence of the management. From the statements made in this letter by Morris J. Elsing and Lloyd F. Farnham, both of whom are reputable mining engineers in Arizona, the competence of the applicants can well be questioned. This confidential letter should not be allowed in general circulation.

We concur with the recommendations made in the report.

The original brochure as been requested from the Tucson office and will be forwarded by air mail as soon as it is received in this office.

J. H. East, Jr.

J. H. East, Jr.

A. H. Koschmann

A. H. Koschmann

Attachments
Original by air mail
Two copies by regular mail

UNITED STATES
DEPARTMENT OF THE INTERIOR
OSCAR L. CHAPMAN, SECRETARY

DEFENSE MINERALS ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMA Docket XL-50 - TENNESSEE-SCHUYLKILL PROJECT
WALLAPAI MINING DISTRICT
MOHAVE COUNTY, ARIZONA

FOR GOVERNMENT USE ONLY

M. J. Elsing and
L. L. Parnham
Mining Engineers
U. S. Bureau of Mines

John H. Faick and
Calvin S. Bromfield
Geologists
U. S. Geological Survey

May 1951

Mining Division
Region IV

May 23, 1951

Memorandum

To: DMA Field Team, Region IV

From: Chief, Mining Division

Subject: DMA Docket 21-50, Tennessee Metals Co., Mohave county, Arizona

I have reviewed the reports by Kleing, Farnham of the Bureau of Mines and Falck and Bromfield of the Geological Survey and noted the confidential letter regarding competence of management.

I concur in the conclusions presented and the recommendation for denial of the loan.

P. T. Allsman

UNITED STATES
DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY
200 New Customhouse
Denver 2, Colo.

May 22, 1951

Memorandum

To: Field Team, Region IV

From: A. H. Koschmann

Subject: DMA Dockets No. 21 and No. 50 - Tennessee-Schuyekill Project, Vallapai Mining District, Mohave County, Arizona

I herewith transmit the geologic report (original and 11 copies) by John N. Faick and Calvin S. Bromfield, covering the above listed docket. This report and the joint recommendation that the loan be denied on the basis of economics have the approval of C. A. Anderson, Supervising Geologist, Arizona-New Mexico.

A. H. Koschmann

A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Attachment

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Registered Mail
Return Receipt Requested

May 18, 1951

Register - Ref. Rec. Reg.

Memorandum

To : Paul T. Allaman, Denver, Colorado

From : Chief, Arizona-New Mexico Br., Mining Div., Region IV

Subject : Report on DMA Bucket 21-50, Tennessee Metals Co.
Mohave County, Ariz.

Enclosed are original and 11 copies of Summary, Conclusions and Recommendations by Morris J. Klaing and Lloyd L. Farnham of the Bureau of Mines, and John Faisk and Calvin S. Brenfield of the Geological Survey; and the Engineering Report by Messrs. Klaing and Farnham.

This is a very good report and has my approval.

Walter R. Storms

cc: P. T. Allaman
C. A. Anderson
DMA 21-50
RF

WRStorms:fr

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

By Morris J. Elsing[1], L. L. Farnham[1], John M. Veitch[2], and C. S. Brownfield[2]

Tennessee Metals Corp. through its president, Ralph R. Langley, submitted an application to the Defense Minerals Administration for a loan of $350,000 to re-open the Tennessee Schuylkill mine, to rehabilitate its 150-ton flotation mill, and to put into production the Alpha, Summit, Copper Age, and other mines in the Wallapai district, Mohave County, Arizona. The application is a combination of DMA Docket 21 and 30. It was reviewed by the Lead-Zinc Branch of the Defense Minerals Administration and referred to the Field Team, Region IV, for investigation. The field investigation was made April 2 to 5, 1951.

The properties under lease by the applicant are at and within 10 miles of Chloride, Arizona, which is 23 miles northwest of Kingman, Arizona.

The Wallapai district occupies an area about 12 miles long by 4 miles wide in the central part of the Cerbat Range in northwestern Arizona. The rocks underlying this area are summarized below:

Quarternary	Olivine basalt flows and detritus
Tertiary	Brick volcanics
(Mineralization)	
Mesozoic(?)	Granite porphyry, diabase, and lamprophyre dikes
Pre-Cambrian	Coarse-grained, porphyritic, gneissoid granites, granite altered to schist, diorite, amphibolite, graphite schist, pegmatite.

1/ Mining Engineers, Bureau of Mines, Mining Division, Region IV, Arizona-New Mexico Branch, Tucson, Arizona.
2/ Geologists, Geological Survey

The ore deposits are mostly northwesterly trending fissure veins in pre-Cambrian host rocks, but are genetically related in space and time to the Mesozoic granitic intrusions. Commercial ores are confined to relatively small shoots scattered erratically along numerous extensive quartz veins. The common ore minerals are galena, sphalerite, chalcopyrite, and nearly all of the ores contain values in gold and silver.

The Tennessee-Schuylkill is the most important of the mines. From 1901 through 1948 it has produced 483,000 tons of ore from which was recovered approximately 43,500 ounces gold, 1,500,000 ounces silver, 400,000 pounds copper, 62,000,000 pounds lead and 72,000,000 pounds zinc. From 1939 through 1948, a total of 251,881 tons of ore were mined and milled. The average recovered grade of this production in the form of concentrates was 0.05 ounce gold and 2.1 ounces silver per ton with 0.05 percent copper, 4.1 percent lead and 5.5 percent zinc.

The second most important of the applicants' mines is the Summit which from 193[illegible] through 1948 produced approximately 30,000 tons of lead-zinc ore. The average grade of this ore is unknown but [illegible],90[illegible] tons mined in 1947 contained 0.05 ounce gold and 4.1 ounces silver per ton, with 0.5 percent copper, 3.8 percent lead and 5.5 percent zinc.

The Copper Age from 194[illegible] through 1949 produced 7,[illegible]72 tons with average mill heads of 0.045 ounce gold and 3.5 ounces silver per ton with 3.05 percent lead and 7.15 percent zinc.

The lead-zinc production of the Alpha and other mines is inconsequential.

With the exception of the Tennessee-Schuylkill mine none of the applicant's mines have measured or indicated ore. The ore reserves of the Tennessee-Schuylkill are as follows:

Summary of Ore Reserves - Tennessee-Schuylkill Mine

Class of Reserves	Tons	Ounces per ton Gold	Ounces per ton Silver	Copper	Percent Lead	Percent Zinc
Measured	29,503	0.07	2.0	-	3.3	7.[illegible]
Indicated	52,309	0.06	1.9	-	2.9	7.0
Inferred	93,017	0.06	1.4	-	3.4	6.4
Total	174,729	0.064	1.7[illegible]		3.22	6.96

Since the applicant proposes to treat ore from other mines not under lease to him it has been necessary to consider the possibilities of production from the entire district. The past history of some 100 producers in the district has been reviewed. All available production records of lead and zinc have been tabulated. The results of sampling in a score or more of mines has been studied. Widths of veins have been recorded.

An analysis of the costs of mining, milling and smelting, and the value of the ore at present prices of metals indicates that the Tennessee-Schuylkill, Summit, Alpha, Copper Age and other mines of

the applicant, as well as all other mines in the district, with the exception of two or three small lease operations, are very definitely sub-marginal.

Therefore, it is recommended that the application for a loan be denied.

Should the need for lead and zinc really become critical a substantial premium price for the Wallapai district would result in an annual production of at least two to three million pounds of lead and three to four million pounds of zinc.

The lead-zinc ore deposits have not been "bottomed" and it is possible that the production would be double that mentioned and would continue for many years, if an adequate incentive were provided.

Geology

John [illegible] Nick and Calvin [illegible] Brookfield
Geologists, [illegible] Geological Survey

Geology

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]ural ecology	1
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The [illegible]	5
Tennessee-Schuylkill Line	5
[illegible] Line	[illegible]
[illegible] Line	9
[illegible] Line	10
Copper [illegible] Line	10
[illegible] and [illegible] Lines	12

Mineral Geology

The Wallapai district in northwest Arizona occupies the central part of the Cerbat range. The district embraces an area about 12 miles long by 4 miles wide extending from about 6 miles northwest of Kingman to about 2 miles north of Chloride. The area includes several mining camps, the most important being Chloride, Mineral Park, Cerbat, and Stockton Hill.

The Wallapai district has been studied by a number of independent workers who have made substantial contributions to our knowledge of the geology and the mines of the region. Publications resulting from these studies are listed below.

Schrader, F. C., Mineral deposits in the Cerbat Range, Black Mountains, and Grand Wash Cliffs, Mohave County, Arizona: U. S. Geol. Survey Bull. 397, 1909.

Martin, C. F., Origin of Certain Rich Silver Ores near Chloride and Kingman, Arizona: U. S. Geol. Survey Bull. 750, pp. 17-39, 1924.

Herman, Robert H., Cerbat Mountains: Univ. of Arizona, Arizona Bur. of Mines Bull. 145, pp. 110-117, 1938.

Garrett, J. B., Tennessee-Gray Hill Mine: Univ. of Arizona, Arizona Bur. of Mines Bull. 145, pp. 117-119, 1938.

Schooler, Jacob and Allison, Paul F., Mining and Milling Methods and Costs at the Tennessee-Gray Hill Corporation Mine, Chloride, Arizona: U. S. Bureau of Mines Information Circular 7077, 1939.

Painter, Stanton L., Johnny Bull-Silver Knight Lead Mine Property, Cerbat Mountains, Mohave County, Arizona: U. S. Bureau of Mines Report of Investigations 3938, 1947.

Keary, J. J., Examination of Zinc-Lead Mines in the Wallapai Mining District, Mohave County, Arizona: Report of Investigations 4101, 1947.

[illegible], [illegible], [illegible] of [illegible] District
[illegible] Geology, Vol. 44, [illegible] 663-70[illegible], 1949.

[illegible], [illegible], [illegible] District, [illegible]
County, Arizona: Univ. of Arizona, Arizona Bur. of Mines Bull.
156, pp. 138-142, 1953.

The first relatively complete geological study of the district was made by Schrader[1]. His description and classification of the rocks as summarized by Gilman[2] is shown below.

Quaternary..... Lava flows and detritus.

Tertiary..... Thick volcanics.

(Mineralization)
Paleozoic (?)..... Granite porphyry, diabase, minette and rhyolite dikes.

Pre-Cambrian..... Coarse-grained, porphyritic, granitoid granites, granite altered to schist, diorite, amphibolite, graphite schist, pegmatite.

According to Gilman[3], the rocks of the district consist of pre-Cambrian crystalline rocks, chiefly of granitic composition, cut by large masses of Paleozoic (?) granite. Lavas are scattered throughout the area and remnants of volcanic rocks of probable Tertiary and Quaternary age lie around the margins of the district mountains.

Near Laurel Park in the central part of the district a large granite stock, of probable late Jurassic or early Cretaceous age, has intruded the pre-Cambrian granites, gneisses, and schists. The granite is medium-grained, porphyritic, and intensely altered. Numerous small stocks and irregular masses of greenish-black gabbro and associated

1/ Op. cit., pp. 139-148.
2/ Op. cit., p. 112.
3/ Op. cit., p. 139.

diabase dikes which occur most commonly in the southern part of the district are probably differentiation phases of the granite stock. Mineralizing solutions that formed the veins in the district are believed to be genetically related to the late Mesozoic (?) granitic intrusion.

According to Ferguson[1]:

"The ore deposits are associated with rocks of this group (Mesozoic) in space and time. The main faults cut across the masses of the pre-existing rocks or rocks that probably across the diabase, but granitic dikes and highly altered dikes with quartz phenocrysts intrude along the faults and are cut by the mineralized fissures. The lamprophyric dikes also intrude the main faults and are mineralized. The diabase has been seen to form one wall of veins and appeared to be older than the main faults."

Ore Deposits

The ore deposits occur in numerous quartz veins that commonly strike northwesterly and dip steeply to the northeast, but appreciable variation from this attitude is not uncommon. Veins are usually narrow, but range in width from a few inches to about 30 feet, and in general are persistent along the strike. Ferguson[2] reports the total aggregate length of the known veins to be about 65 miles. Ore shoots are distributed erratically along these veins.

The district has produced considerable quantities of primary sulfide and secondary enrichment ores. Only the primary sulfide ores will contribute to any substantial future production.

1/ op. cit., p. 113.
2/ op. cit., p. 111.

The mineralized [illegible] are generally quartz accompanied by pyrite, sphalerite, and minor amounts, which carry gold, silver, and a small amount of copper. Gold is reported in some areas of the [illegible]. The veins are relatively small and generally range in width from 1 to 4 feet and lengths of 10 to 50 feet. However, much larger ore bodies were found in the Tennessee and Colorado mine where dimensions as great as 400 feet horizontally and 700 feet vertically are reported.

According to Jerome[1]:

"Ore shoots appear to be localized where changes of strike or dip of the vein faults give rise to open spaces due to the reopening movements that occurred just before and during mineralization. Open space filling seems to have been most important as far as valuable vein minerals are concerned. Areas of faults cemented by either clay gouge or finely crushed rock were not tight enough for ore shoots."

The Reserves

The district is not capable of large production unless new finds similar to the Tennessee and Colorado are discovered, an unlikely possibility under existing conditions. No single mine in the district is capable of supplying a large tonnage of ore for any sustained period of operation, although there are many small mines each capable of producing small tonnage, which in the aggregate should be sufficient to supply a small custom mill for several years. A 100 ton per day custom mill, obtaining ore from mines in the district, could probably be supplied for several years under favorable economic conditions and judicious mining practice.

1/ Op. cit., p. 116.

The following table summarizes the status of ten lead-zinc producing mines in the district.

Mine	Measured	Indicated	Inferred
Tennessee-Schuylkill	29,303	70,000	100,000
Coleonia		20,000	100,000
Summit		6,000	12,000
Champion	300	6,000	6,000
Copper Cap		7,000	7,000
Banner		4,000	5,000
Mountain Lead	350		10,000

The Mines

Mineral/ reports the district contains 225 mines and about 1,000 prospects, and that 97 percent of the total lead and zinc produced has come from the Tennessee and Coleonia mines. At the present time all the mines and prospects are idle except some few leases working some of the smaller properties.

In connection with this examination only a few of the mines were visited with most attention being given to those most likely to contribute additional production, and those specifically referred to in the letter for which this examination was made.

Tennessee-Schuylkill Mine

The Tennessee-Schuylkill has been the largest producer of the Wallapai district. It has been developed to the 1500-foot level and extensively stoped above the 1100-foot level. The mine is credited with a production of 603,000 tons for the years 1941 to 1953, which includes the period of its greatest activity.

1/ Op. cit., p. 13.

[illegible] [illegible]/ [illegible]

[illegible] [illegible] [illegible] [

In addition to unusual [illegible] ore in the other parts of the mine there is [illegible] possibilities of ore extension in a [illegible] area of [illegible] stopes. In the vicinity of the shaftkill [illegible] intensively stoped above 1300-level, has [illegible] this [illegible] very little [illegible] or exploration. There is no information to indicate [illegible] this ore shoot terminates at the 1300-foot level, therefore it is assumed that an extension of it may be [illegible] with deeper exploration. [illegible] has [illegible] a length of 650 feet and average thickness of 4 feet. [illegible] these dimensions, this shoot is capable [illegible] about 240 tons [illegible] of depth or a total of 30,000 tons of [illegible] ore if mining could be extended an additional 125 feet in depth. Assays of ore on 1300-level indicate this ore should contain about 0.2 percent zinc, 4.1 percent lead, and small amounts of [illegible] silver.

Another ore shoot with excellent possibilities for extension in depth exists [illegible] between 700 and 1000-foot levels. On 1000-foot level this ore shoot was 340 feet long and 4 feet wide and may be expected to produce about 240 tons per foot of depth, about 20,000 tons of [illegible] ore, assuming that the ore shoot will extend [illegible] to the 1200-foot level. This ore may be expected to contain about 6.0 percent zinc, 2.7 percent lead and [illegible] silver.

A [illegible] on the 1600-foot level [illegible] ore shoot [illegible] above [illegible] a [illegible] amount of [illegible] ore of good [illegible]. The [illegible] ore shoot [illegible] between the 1300 and 1600-foot levels [illegible] may have been [illegible] extension [illegible] and [illegible] exploration.

information available on old maps indicates that exploration of the [illegible] vein, including extensions into the adjoining Hibbert and Gentry [illegible] mines, was not most adequate. It appears reasonable that thorough exploration will find additional ore shoots and extensions of those already known. It is impossible to predict this ore with any certainty but the possibility of finding an additional 100,000 tons of mineralized ore in such lower portions of the vein is not unlikely.

Coleman Mine

The Coleman mine was the second largest in the district having a reported production of [illegible],000,000 in lead, zinc, gold, and silver. The mine has been idle since 1917, and little reliable information is available. It was visited in connection with this examination as being a possible future source of ore. The mine is inaccessible and the lower levels are reported to be flooded, consequently only the surface workings and portions of the surface plant can be seen.

The Coleman vein occupies a northeasterly-trending fissure dipping 70° N. The country rock is largely granitoid granite of pre-Cambrian age. The vein, which has been worked by a 1,400-foot inclined shaft, has been [illegible] above the 1,[illegible]-foot level. The mine is reported to have been a great producer in the district, and unverified reports state [illegible] in the lower levels. It is impossible to determine how much ore may be available out of sight in order to future prospective production, but it is believed that 20,000 tons of mineralized ore may remain in undeveloped parts of the mine. It is also believed that 100,000 tons of mineralized ore may be found by new exploration along the strike of the vein.

Summit [illegible]

The Summit vein occupies a northwesterly fissure in [illegible] granite and schist. The vein can be traced for several hundred feet and varies in width up to about [illegible] feet. The ore is localized in 3 shoots, none of which are known to exceed 200 feet in length. The ore shoots are nearly vertical or rake steeply to the north. The principal minerals are galena, sphalerite and chalcopyrite in a quartz gangue.

The mine has been developed and largely stoped out to a depth of 300 feet, and has produced about 10,000 tons of ore. According to Emery[1], a total of 6000 tons of ore was shipped in the period from October, 1941 to April, 1946. The average lead content was 7.10 percent zinc and 0.76 percent copper. The precious-metal content per ton was .0738 ounce gold and 5.82 ounces silver.

At least two stopes on the Summit vein do not appear to have been mined out in depth. One of these, on the [illegible] the 150-level, has been mined by underhand stoping below this level, but has not been developed on the 300-foot level. This stope may easily contain 3000 tons of indicated ore above the 300-foot level. Another stope extends for 250 to 300 feet west of the main Summit shaft and has been mined from the 300-foot level to the surface. The ore does not appear to have been bottomed on the 300-foot level, and could extend to greater depths. A minimum of 5000 tons of indicated ore should be available from this ore shoot.

It appears probable that more ore than specified above will eventually be mined from these two stopes. In addition, another stope in the vicinity of the Summit shaft should yield more ore in depth, which does not appear to have been exhausted above the 150-foot level. The Summit vein is on a strong, persistent, well mineralized structure that should yield a [illegible] amount of deeper development work. Approximately 5000 tons of [illegible] and 12,000 tons of inferred ore are [illegible] exposed above the 500-foot level. This should be about the same [illegible] as the [illegible] stopes.

1/ [illegible], p. 79.

[illegible] ore

[illegible] ore, [illegible] [illegible] [illegible], [illegible] [illegible] [illegible] by two [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible], [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

to an unknown extent, another was about [illegible] feet [illegible] strike and 175 feet vertically. [illegible] shaft was sunk for a length of 50 feet and a depth of about 140 feet. The area of stope which was about [illegible] feet, at least two of the stopes pitch steeply to the northwest.

The ore was very irregularly low grade, 10,000 tons yielded 7.3 percent zinc, 1.6 percent lead, and 3.70 per ton in gold and silver.

Grab samples were taken from the southwest face of the upper and intermediate levels, both of which were low grade vein material. These assay as shown below.

Location	Lath	Zn	Pb	Au	Ag
Intermediate level	21 inches	1.[illegible]	2.7	0.00	2.6
Upper level	1[illegible]	0.2	1.0	0.04	1.0

There are two blocks of mineralized vein material that may constitute ore of a marginal grade. The block of low grade ore is exposed on the adit level from about 50 to 200 feet northwest of the shaft, the other is exposed in the southwest end of first level above end of the old stopes. The first block contains about 5,000 tons of ore, the other contains about 1000 tons, both of which are regarded as marginal ore of low grade. Further exploration may prove more favorable of the immediate area of the main adit, but there is potential in northwest drifts. This is a reasonable possibility, of finding about 7000 tons of low grade ore beyond the northwest end of the present workings.

The possibilities of finding a considerable tonnage of mineable ore in the formation are quite doubtful. The value of the expected ore may not be sufficient to warrant development and mining.

The topography is rugged in the most intensely mineralized area. This is advantageous as regards the possibility of development by tunnels rather than shafts, but disadvantageous from the standpoint of road construction. Only a few of the mines are more than 10 miles from either the Tennessee-Schuylkill or Keystone mills. The district is well provided with roads which are fairly easy to keep in condition.

HISTORY AND PRODUCTION

The early production of the Vallapai district was mainly gold and silver found in the oxidized zones of the lead-zinc veins. Most of the mines were discovered between 1863 and 1865. The earliest authentic records of the production of lead are from the Tennessee-Schuylkill mine in 1901. There was some production previous to this. The first production of zinc from this mine was in 1911. Other mines in the district produced zinc in some quantity as early as 1903 and perhaps before this date.

Records of the net smelter returns of the Colorado mine are available from 1903 to 1917 when the mill burned. During this period the net smelter returns totalled $2,620,359.26. No records are available that show the tonnage or grade of the ore except for 1917 when the grade was reported to be 11.3 percent zinc with 0.2 ounce gold and 4.4 ounces silver. The price of zinc was 9.046 cents per pound and the net smelter returns were $11.73 per ton of ore produced for 9 months of 1917. It is estimated that the Colorado produced 60,000,000 pounds of zinc.

The Tennessee has produced from 1901 through 1948 a total of 402,804 tons of ore containing 43,528 ounces gold, 1,560,277 ounces silver, 412,840 pounds copper, 41,909,645 pounds lead and 71,401,244 pounds zinc.

The production of the Tennessee-Schuylkill mine from 1901 through 1948 is shown in tables I and II.

If the mines on which the applicant has leases the Summit is next in importance to the Tennessee-Schuylkill. Reliable records of production are available from 1942 through 1948.

Summit Mine - Tonnage and Grade of Ore

Year	Tons	Gold	Silver	Copper	Lead	Silver	Reference
1942	44	0.13	5.8	0.64	4.0	7.5	1/
1943	(23 days)	0.13	5.0	0.80	4.3	4.5	2/
1944	3,131	0.06	5.2	0.68	4.2	7.3	3/
1945	3,473	0.07	4.0	0.92	3.9	4.1	4/
1946	4,543	0.08	4.2	0.57	3.8	5.5	5/
1947	6,986	0.05	4.1	0.50	3.4	5.5	5/
1948	620	0.05	5.2	0.44	5.8	4.9	6/

1/ Smelter settlement sheets.
2/ Arkansas Department of Mineral Resources.
3/ Tonnage from Mineral Yearbook, grade of 2,944 tons from smelter settlement sheets.
4/ Tonnage from Mineral Yearbook, grade of 2,497 tons from smelter settlement sheets.
5/ Tonnage and grade from Mineral Yearbook.
6/ Tonnage from Mineral Yearbook, grade of 331 tons from smelter settlement sheets.

TABLE 1. - Gold, silver, copper, lead, and zinc recovered from ores at the Tennessee Copper Mill, Columbia, Ariz., from 1901 to 1949

Year	Ore, tons	Gold, ounces	Silver, ounces	Copper, pounds	Lead pounds	Zinc pounds
1901	25,[illegible]	9	2,469	-	4,[illegible],678	-
1902	7,367	86	29,[illegible]	-	1,[illegible],640	-
1903	1,090	15	4,[illegible]	-	279,[illegible]	-
1907	154	14	2,847	235	[illegible]	-
1910	70	3	327	-	4,634	-
1911	998	79	2,634	1,837	97,578	87,186
1912	1,[illegible]	267	13,127	2,361	159,772	260,946
1913	29,486	1,378	104,924	16,348	4,708,278	4,233,642
1914	22,[illegible]	939	74,748	11,903	3,657,[illegible]	4,932,[illegible]
1915	47,633	2,381	271,366	45,000	6,884,[illegible]	8,951,839
1916	47,083	1,944	194,158	32,[illegible]	5,[illegible],377	7,517,627
1917	41,133	1,921	168,901	35,[illegible]	5,[illegible],136	8,382,860
1924	164	13	819	435	32,684	32,697
1929	58	4	387	183	13,142	13,[illegible]
1936 2/	12,233	2,870	40,850	24,[illegible]	1,433,000	1,[illegible],000
1937	39,990	10,467	138,948	188,000	4,[illegible],000	3,114,000
1938	[illegible]	9,643	207,[illegible]	86,500	3,798,430	5,449,[illegible]
1939 3/	11,[illegible]	1,[illegible]	24,[illegible]	22,280	674,[illegible]	1,624,[illegible]
1940	53,577	3,298	132,745	39,[illegible]	4,687,[illegible]	9,543,[illegible]
1941	15,150	2,843	113,[illegible]	11,146	4,884,[illegible]	4,330,500
1942	40,[illegible]	2,278	189,384	37,160	3,[illegible],[illegible]	3,383,[illegible]
1943	34,[illegible]	1,[illegible]	71,[illegible]	54,321	2,677,365	3,429,[illegible]
1944 4/	20,373	517	31,337	32,[illegible]	1,789,[illegible]	1,[illegible],[illegible]
1945 5/*	11,[illegible]	[illegible]	23,127	23,500	984,[illegible]	934,[illegible]
1946 6/*	3,[illegible]	112	7,[illegible]	7,811	278,418	381,[illegible]
1947*	11,141	304	16,921	23,[illegible]	749,420	1,143,[illegible]
1948*	14,915	292	17,951	19,320	693,500	1,279,[illegible]
1949	None					
1901-38	350,955	21,258	997,049	376,705	42,395,270	43,[illegible],889
1939-49	251,881	12,230	540,277	235,875	20,[illegible],375	27,355,[illegible]
1901-49	[illegible]	33,5[illegible]	1,537,3[illegible]	612,[illegible]	1,949,[illegible]	72,[illegible]

1/ Years 1901-38 compiled by C. A. Gerry, Division of Mineral Production and Exploration, Bureau of Mines, Salt Lake City, Utah, years 1939-49 from company records.
2/ Production 3.5 months
3/ Production 3 months
4/ Production 9 months
5/ Production 8 months
* Operated by contractors

TABLE II. - Gold, silver, copper, lead, and zinc recovered from ores at the Tonopah-Belmont Hill mine, Silverton, Ariz., from 1901, to 1949.[1]

Year	Ore Tons	Assay Ounces/Ton Gold	Silver	Copper	Values Percent Lead	Zinc
1901	25,885	-	0.1	-	8.6	-
1902	7,547	0.01	3.9	-	18.7	-
1903	1,096	0.01	4.0	-	17.8	-
1907	154	0.16	13.3	-	24.5	-
1910	70	0.05	1.8	-	4.8	-
1911	998	0.08	2.[illegible]	0.09	4.9	4.4
1912	1,359	0.20	9.7	0.08	1[illegible].9	9.6
1913	29,486	0.05	3.[illegible]	0.03	8.0	7.2
1914	22,081	0.03	3.4	0.03	8.3	11.2
1915	47,633	0.05	3.[illegible]	0.09	[illegible].3	8.8
1916	47,013	0.03	2.9	0.03	5.4	8.0
1917	41,133	0.05	3.9	0.07	6.1	10.2
1924	344	0.08	5.0	0.13	9.8	10.0
1929	58	0.08	5.3	0.03	13.1	11.2
1936[2]	12,233	0.23	3.3	0.10	5.9	4.1
1937	59,998	0.17	2.3	0.08	3.8	2.8
1938	54,898	0.18	2.0	0.08	3.5	3.0
1939[3]	11,702	0.07	2.1	0.09	2.9	4.9
1940	55,977	0.06	2.4	0.02	4.2	8.5
1941	45,150	0.06	2.5	0.01	5.4	4.8
1942	48,085	0.06	2.5	0.02	4.1	2.2
1943	36,286	0.03	1.9	0.02	3.5	4.5
1944[4]	20,393	0.03	1.5	0.02	4.4	4.7
1945[5]*	11,386	0.03	2.1	0.11	4.5	4.2
1946[5]*	3,496	0.02	2.0	0.11	4.0	5.5
1947*	11,111	0.02	1.7	0.11	3.4	5.2
1948*	14,915	0.02	1.7	0.06	2.3	4.3
1949	None	-	-	-	-	-
1901-38	390,925	0.09	2.8	0.05	5.9	6.2
1939-49	251,881	0.05	2.1	0.05	4.1	5.5
1901-49	642,806	0.07	2.5	0.05	5.1	5.9

1/ Years 1901-1938 compiled by C. E. Corry, Division of Mineral Production and Economics, Bureau of Mines, Salt Lake City, Utah. Years 1939-49 from company records.
2/ Production 3.5 months
3/ Production 3 months
4/ Production 9 months
5/ Production 8 months
* Operated by contractors

The following information regarding the history of the property is briefly outlined.[1] In 1924, the U. S. Smelting, Refining and Mining Co., operating on a lease, sank a vertical shaft. In 1930, the Keystone Mining Co. mined and shipped a considerable tonnage of ore. In 1942, the property was leased and sampled by Miles P. Kenney, engineer for the U. S. Smelting, Refining, and Mining Co. In December 1942, the El Dorado Rover Mining Co. leased the mine and shipped ore and did some development work with a $20,000 Reconstruction Finance Corporation loan.

A second Reconstruction Finance Corporation loan for $23,000 was granted but the company shut down and returned the loan because it was not thought possible to operate at a profit.

OWNERSHIP AND LITIGATION

The Tennessee-Schuylkill mine, now under lease to the Tennessee-Metals Corp., is owned by the Tennessee-Schuylkill Corp. Since the latter corporation has an indebtedness of approximately $130,000, title to the property is very insecure. According to W. P. Stuart, Collector of Internal Revenue and William McFee his assistant, creditors are withholding any attempt to press their claims in hope that the property can be put into production at an early date and that claims against the company can be paid on the basis of 10 percent of the net smelter returns. Mr. Stuart stated that he was unwilling to take action against the company because such action

[1] Grantham, [illegible], Bar Minerals Report "Summit Mine, Mohave Co., Arizona" 1944.

might still further complicate the situation by court action and the appointment of a receiver. Under such conditions he thought that there would be very little chance for the Internal Revenue Department to collect any substantial part of the amount owed them. Apparently other creditors are of the same opinion.

It is believed that the only safe way to operate the property would be to clear the title by the payment of its indebtedness. Whether this could be done for $100,000 instead of $150,000 actually owed the creditors is only a surmise. The applicant has included $100,000 for the liquidation of the indebtedness.

The Arizona Metals Co. supposedly owns the Alpha group and Summit mines. DMM Docket 90 includes a lease from Caroline Daniels Moore of Hubbard Woods, Illinois to Ralph F. Langley on the Alpha, Omega, Magnolia and Wallapai Queen patented claims. There is no lease from the Arizona Metals Co. to the Tennessee Metals Corp. The applicant claims to have a lease on the Copper Age mine but this was denied by one of the owners. The applicant claims leases or promises of leases on numerous other properties in the district.

DESCRIPTION OF THE DEPOSITS

The two most striking characteristics of the veins of the Wallapai district are their persistence in length and depth and the lack of continuity of the minable ore shoots. As seen in the accessible workings and as judged from numerous maps the veins can be classed as strong and persistent. On the other hand the ore shoots

are very erratic. In many places vein widths were from 5 to 7 feet from foot to hanging wall but minable ore was seldom more than 2 feet in width. It should be stated, however, that the better sections of the veins in the accessible workings have been mined. Ore stopes indicate that a width of 4 or 5 feet had been mined in places. Stope maps of the Tennessee-Schuylkill indicated the same characteristics of pinching and swelling but to a much more limited extent. Some ore shoots were mined for 700-800 feet in length with only minor pinches. The average of several hundred samples in the old workings show a vein width of 5.0 feet. Ore shoots on the lower levels average slightly less than 4 feet. The Calumet maps also show a long persistent ore shoot. The main ore shoot in the Summit was 225 feet long. The longest ore shoot in the Copper Age was approximately 175 feet long. An ore shoot in the Champion mine now being worked is producing ore running 10 to 12 percent lead and 12 to 15 percent zinc. The average width of the ore is approximately 2 feet. Scores of places were seen in the accessible workings in other mines where there was from 1 to 2 feet of ore but the length of these shoots was not sufficient to warrant stoping them.

MINERALS OF PROMISE

If the mines the applicant proposes to operate the only one with measured and indicated ore reserves is the Tennessee-Schuylkill. The present calculations of these reserves have been made from records

supplied by the company. Some of these records date back to 1912 and 1913 when the Needles Mining and Smelting Co. operated the property. In calculating these reserves, well over 1,000 samples have been used. A weighted average width with weighted average content of gold, silver, copper, lead and zinc have been obtained for each section of the mine sampled. A record of these averages has been shown on the accompanying longitudinal section of the Tennessee-Schuylkill mine (Fig. 1). While at the present time the grade and value of the ore is too low grade to be profitably mined it is believed that a permanent record should be kept of individual assays. Some day they will be of inestimable value and, therefore, every available assay and the calculations of average values has been placed in the appendix to this report.

Tennessee-Schuylkill Mine - Summary of Ore Reserves

Class of Reserves	Tons	Ounces per ton Gold	Silver	Percent Copper	Lead	Zinc
Measured	2,503	0.07	2.0	-	3.3	7.6
Indicated	52,209	0.06	1.9	-	3.9	7.8
Inferred	119,017	0.06	1.6	-	3.4	8.4
	174,729	0.064	1.7[illegible]	-	3.22	8.98

In the drifts and raises where samples have been taken at intervals of 5 feet along any considerable distance it has been assumed that measured ore extends for a distance of 25 feet in either direction from the sampled section of the drift or raise. With few exceptions indicated ore is assumed to extend for an

[illegible]

The [illegible] and [illegible] are consolidated under a single [illegible], [illegible], [illegible], [illegible], [illegible] long [illegible] and [illegible] in [illegible] properties.

[illegible] are located [illegible] and have been [illegible] developed by many hundreds of feet of shafts, adits, raises, [illegible]. The veins are parallel, nearly vertical, [illegible] nearly across [illegible]. The veins are small, averaging [illegible] 1 to 2 feet in width but are [illegible] persistent along the strike. A single [illegible] in the [illegible] was [illegible] a stringer [illegible] of [illegible] feet, and [illegible] 1.5 feet wide.

The [illegible] lotted [illegible] show that [illegible] 1/11 averaged 12.7 percent lead, [illegible] percent zinc, [illegible] percent copper, and 0.21 ounces of gold, [illegible] ounces of silver per ton.

The [illegible] in [illegible] indicate that the vein [illegible] 50 feet below the old workings. [illegible] only about 1000 tons [illegible] and [illegible] 2000 tons [illegible] ore remain in the mine.

The [illegible] and [illegible] exploited [illegible] from a narrow persistent vein. [illegible] it is reported by the [illegible], have produced 1000 tons of ore averaging 12 percent zinc, 2 percent lead, 4 ounces silver and .23 ounces gold per ton. The [illegible] 1000 tons of ore which the [illegible] averaged 10 percent zinc, 7 percent lead, 3.2 ounces silver and .1 [illegible] gold. [illegible] appear to be [illegible] and [illegible]

and it is reasonable to expect an additional [illegible] of ore in the ore, [illegible] along the northeast extension of the vein, and will contain about 12 percent zinc, 5 percent lead, 3 ounces of silver and .15 ounce gold.

TENNESSEE-SCOUTLAND PROJECT
WALLAPAI MINING DISTRICT
MOHAVE COUNTY, ARIZONA

Engineering

Engineering Report

By M. J. Kleing and
L. L. Fordham
Mining Engineers
U. S. Bureau of Mines

TENNESSEE-SCHUYLKILL PROJECT
WILLIAMS MINING DISTRICT
GRAHAM COUNTY, ARIZONA

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1	Longitudinal Section of Tennessee-Schuylkill mine showing ore reserves.	10

INTRODUCTION

The Tennessee Metals Corp., of which Ralph K. Langley is president, was formed and has acquired a lease on the mine and flotation mill of the Tennessee-Schuylkill Corp. as well as leases on the Summit, Alpha and other mines in the Wallapai district, Mohave County, Arizona.

Tennessee-Schuylkill Corp. has outstanding indebtedness of approximately $150,000. Some $50,000 is due the Internal Revenue Department for withholding taxes deducted from its former employees and not paid the Government. Approximately $100,000 is due Mohave County and State of Arizona, supply houses and individuals. The applicant believes that the entire indebtedness can be adjusted and liquidated for $100,000.

In order to rehabilitate the present flotation mill and the various mines and ultimately to increase milling facilities to 300 tons daily capacity the applicant requests a loan of $250,000. With the liquidation of the present indebtedness at $100,000 the loan requested becomes $150,000.

This application was reviewed by the Lead-Zinc Branch of the Defense Minerals Administration and referred to the Field Team, Region IV, for investigation.

ACKNOWLEDGMENT

Acknowledgments are made herewith to W. F. Stuart, Collector of Internal Revenue at Phoenix and to William McRae, his assistant. They gave valuable information relative to past financial difficulties of the Tennessee-Schuylkill Corp. and expressed a desire to be of further assistance. Ralph P. Langley, president of the Tennessee Metals Corp., the applicant, provided innumerable assay maps and other data covering the Tennessee-Schuylkill mine and other valuable information regarding the Summit, Alpha, Copper Age and other mines. W. V. Vincett, former mine superintendent of the Tennessee-Schuylkill, gave information relative to the former methods of mining and costs and other valuable information. John B. Faick and C. E. Brownfield, Geologists, U. S. Geological Survey, made a brief reconnaissance study of the entire district.

LOCATION AND ACCESSIBILITY

The Wallapai district is divided into four districts, - Chloride, Cerbat, Mineral Park and Stockton Hill. Most of the more than 200 mines in these districts are located on the sides of the Cerbat Mountain range. A paved highway skirts this range and branch dirt roads lead from the highway to the various mines. The railroad, shipping point, and supply center is Kingman, 23 miles southeast of the town of Chloride. The area in which most of the mines occur is 10 miles long and 4 miles wide with Chloride at the northwestern end.

MAP

BELONGS

HERE

#3

1 map.

additional 50 feet beyond the measured ore. Inferred ore has been calculated on the set formula. The method of calculation can be seen by reference to the longitudinal section (fig. 1). Eleven cubic feet of ore in place was taken as equivalent to one ton. A small amount of ore occurs on the 1,600 level. In the northern end of the mine inferred ore is assumed to go as deep as the 1,600 level. There is no evidence to assume that ore will not be found below the 1,600 level. The mine has not been "bottomed" and the fact that inferred ore has been shown to extend only to that level should not be interpreted to mean that this is the case.

PRESENT STATUS

Exploration and Development

The mines of the Wallapai district have been developed by many miles of underground workings from shafts and by tunnels. Only a small part of these workings are accessible. A considerable part of the development was done in the Tennessee and the Cedarwood mines from shafts. Both of these mines are accessible.

The mines the applicant has specifically named and which he proposes to operate are the Tennessee-Berryhill, Summit, Alpha and Copper Age. The Tennessee shaft is reported to be usable with minor repairs and most of the tunnels in the other mines are accessible.

Mining and Milling Facilities

The Tennessee shaft has one hoisting compartment, and a pipe and ladder compartment. Since the mine water is acid the probabilities are that much of the piping will have to be replaced. The mine and mill were shut down the latter part of 1948. The equipment there in use is still at the property.

The other mines to be opened are not equipped for production with the exception of compressors at the Summit. The Keystone mill which the applicant proposes to acquire, if he does not build a new mill, is in working condition with minor repairs and replacements.

PROJECT PROGRAM

Exploration and Development

The main source of the ore supply for operating the Tennessee-Schuylkill mill is the Tennessee-Schuylkill mine. It is proposed to put the Tennessee shaft into operating condition by replacing the present sheave wheel and putting on a new cable both of which the company has at the property. It is thought that approximately 200 feet of shaft guides will have to be replaced to put the shaft into operating condition to the 700 level. Water in the shaft stands between the 900 and 1,000 levels. It is not proposed to pump from the shaft until a crosscut 75 feet in length is driven to open up a shoot of ore on the 700 level. This ore shoot was sampled and assayed in 1912 and 1913 by the Semples Mining and Smelting Co., a subsidiary of the U. S. Smelting, Refining and Mining Co.

Having reopened the 700 level for production, it is proposed to start the mill and run it with the water supplied by pumping from the shaft. In the meantime it is proposed to drive a lower tunnel at the Summit to cut the Summit vein at a depth of 200 feet below the present lowest tunnel. To advance the crosscut tunnel to intersect the vein will require approximately 250 feet of work. It then is proposed to drift on the vein for 1,200 feet to get under the old Summit workings. Three raises are proposed, two of which are 200 feet high and a third 300 feet. To prepare the Summit mine for production on this program would necessitate 2,150 feet of work at a cost of approximately $50,000, and it will require alone to one year before an appreciable production could be made. The applicant reports that the vein width will be 6 feet. Some 70 samples in the upper workings indicate that the vein width is from 2 to 3 feet with a few samples showing a width of 5 feet.

It also is proposed to produce ore from the Alpha mine from a vein which shows 31 samples that average 24 inches in width with combined lead-zinc values of approximately 10 percent.

It is proposed to put the Copper Age or El Tro into production. There is no measured ore and little or no indicated ore.

Having obtained 150 tons per day from these sources with some custom ore, the applicant proposes to open the lower levels of the Tennessee-Schuylkill mine to produce 150 tons per day. He also

proposes to build another mill of 150 tons per day more centrally located to treat the ores from the Summit and other mines in that locality. He proposes as an alternative to erecting a new mill, the securing of the already existing Keystone custom mill of 70 tons capacity, which can be increased to a capacity of 150 tons.

Cost of Proposals

The following is the applicant's estimate of his capital requirements:

Tennessee mill equipment		$11,000.
Tennessee mine pumps		6,000.
Mining equipment		35,000.
Tools		3,000.
Supplies mine and mill		20,000.
Payroll 40 days		
Tennessee mill	$2,400	
Tennessee crescent	1,000	
Summit crescent	6,000	
Alpha crescent	2,600	
For development	$14,000	14,000.
Tennessee mine	$7,000	
Tennessee mill	7,000	
Copper Age	3,000	
For mining payroll	$17,000	17,000.
Working Capital Fund		
Overhead, aid to other mines, utilities, deposits, power		27,000.
Compressors and trucks		40,000.
		$175,000.
To increase milling facilities to 300 tons daily		75,000.
		$250,000.
To liquidate indebtedness of the Tennessee-Kelsey Hill Corporation		100,000.
	Total	$350,000.

At a cost of $350,000 the applicant proposes to put into production two mills, each of 150-tons daily capacity, and to make available sufficient production to keep them operating.

New Equipment and Facilities

The new equipment and facilities to put into operation the first step of the program, i.e., the production from the Tennessee-Schuylkill, Summit, Alpha and Copper Age ore are not great. Equipment at the Tennessee-Schuylkill mine and mill are approximately as they were when the property was shut down at the end of 1918. Some repairs are necessary at the mill. It is probable that the applicant's estimate of the cost of doing this is approximately correct. The Summit mine has a compressor and would require cars, track and some minor equipment. The Copper Age would have to be completely equipped with a compressor, track, cars, and the other necessary equipment for stoping operations. Ore bins would have to be built at this and the other properties. No estimate of this cost has been specifically shown.

Transportation, Including Assume Bonds

The main items for transportation and the economic handling of ore would be the construction of ore bins at all of the properties that the applicant proposes to operate. Transportation of ore to the Tennessee-Schuylkill mill would be done by contractors at a cost of from $1.50 to $2.00 per wet ton of ore.

The receiving bin for custom ore at the Tennessee mill is not suitable for receiving custom ore and would have to be changed to allow for more efficient dumping. An efficient sampler, a new crusher, and a belt conveyor to get the ore to the mill would have to be installed.

Manpower

Manpower is a very serious problem. Chloride is an almost abandoned mining camp. There are housing facilities available for a considerable number of men. There are several properties operating outside of the Wallapai district, but near Kingman. Of these the Antlers is the most important. These properties do not have living facilities comparable to Chloride. It is most likely that should operations be started at Chloride it would attract miners from properties already in operation. There is already a shortage of miners and it is believed that it will become increasingly difficult to meet the present labor requirements to say nothing regarding new operations that are now under way in areas outside of the Wallapai district. Mr. Langley stated that he proposed to pay a wage that was $1.00 higher than that paid in the copper camps so that he could obtain sufficient miners. The situation is less serious as respect to common labor.

Power

Ample power is available for the operation of the Tennessee-Schuylkill mine and mill. This power comes from a transmission line from the Hoover Dam. Operations at the other mines would be supplied with gasoline and fuel oils.

Water

There is a definite water shortage at the Tennessee-Schuylkill mill. At the start of operations it is proposed to depend largely upon mine water for the operation of the mill. This water is strongly acid and will require treatment before it can be used. After the mine has been unwatered the water problem is not simple. The mine does not make sufficient water to operate the mill. Formerly water was obtained by pumps installed at the Durbanilla mine. Apparently this supply is not now available as a late company report proposes that a pump and a 3-mile 2-inch pipe line be installed to augment the water supply.

PRODUCTION PLAN (AFTER COMPLETION OF PROJECT)

Time Schedule for Completion of Project

The applicant states "the Tennessee mine can be put in production at about 50 tons daily in 30 days time and the Tennessee mill can be reactivated for its 150 tons daily capacity in the same length of time. Within the same 30 days more than 50 tons of ore per day can be had from the Copper Age, Champion, Detroit, De La Fontaine and other mines or prospective mines in the district - thus the Tennessee mill can be supplied with capacity ore within 30 days time, provided proper equipment and financing is made available".

The applicant further states that production can be built up to 300 tons of ore daily in 6 to 9 months.

Rate of Production. Tons of Ore and Pounds of Recoverable Metal.

The applicant's statement that in 30 days the Tennessee mill can be supplied with 150 tons of ore daily and in from 6 to 9 months the daily production can be increased to 300 tons is fantastic.

Robert Paine, a very competent mill man, operated the Keystone mill for several years prior to closing it down in the latter part of 1943. The capacity of this mill is 70 tons per day. The average daily tonnage treated was approximately half of this capacity. As an ore buyer for this mill he has a very good idea of what the district as a whole can produce. He estimated a possible output of approximately 150 tons per day of a grade similar to the past production of the district.

It is estimated that an average grade for the district would be approximately 0.05 ounce of gold and 2.5 ounces silver, with 0.05 percent copper, 3.5 percent lead and 6.5 percent zinc. These average grades for lead and zinc are based on an unweighted average of ore shipped and the results of sampling from some 30 mines.

On the above basis the annual recovered base metals would be approximately

2,600,000 pounds of lead and

4,350,000 pounds of zinc.

This production is economically impossible at the present prices of metals.

Mining costs and yields

[illegible] and Paul F. Gleason show in Information Circular 7077[2] complete costs of mining and milling at the Tennessee-Chuckwill mine. During the first 9 months of 1938 a total of 40,288 tons of ore were mined and 41,411 tons were milled. The mine produced 4,476 tons per month. Assuming 30 operating days per month, mine production is at the rate of 134 tons per day.

In 1938, miners wages were $4.50 to $5.00 per shift and muckers and trammers received $4.00 per shift.

The present wage scale at Chloride as given by Mr. V. [illegible], Street mine superintendent of the Tennessee mine, is $14 to $15 per shift for miners and $13 to $14 per shift for muckers. Present day labor costs are, therefore, three times those of 1938.

The present approximate costs of the more important supplies for mining as obtained from Mr. [illegible] are tabulated below, [illegible] follows:

Fuse timber, [illegible]	$95 per [illegible] ft.
Dynamite powder	[illegible] per cwt
Fuse 3,000-foot lots	14.55 per [illegible] ft.
6,000 "	13.15 per [illegible] ft.
[illegible] 4 x 500 to 5,000	21.75 per [illegible]
Drills 14 and 16 lbs.	160.00 per ton
Drill steel 10-20-foot lengths	22.75 per cwt
Jack bits 200 - 400 lots	0.67 each
3/4-in pipe, black	11.[illegible] per [illegible] ft.
1-in " "	16.[illegible] per [illegible] ft.
[illegible]-in "	33.00 per [illegible] ft.
4-in " "	111.00 per [illegible] ft.

2/ Mining and milling methods and costs at the Tennessee-Chuckwill Corporation, Inc., Chloride, Ariz., Bur. of Mines I.C. 7077 1939.

The Tennessee ground is classed as heavy and requires that the square-set method of mining be used. In a few instances the cut-and fill method was used but costs were less only by the amount of timber used in square setting.

The costs given below include development but do not show the amount done.

TABLE 3 - Estimated Mining Costs, Tennessee-Pittsburgh Mine, Based on Costs of 9 months, 1936, Excluding $0.[illegible]

	Ratio of costs 1936 to 1935	Costs per Ton: Actual for 9 mos. 1936	Costs per Ton: Estimated for 1935
Salaries and wages:			
Supervision	1:2	$0.29	$0.57
Stoping and timbering	1:3	1.[illegible]	5.43
Tramming and hauling	1:3	.61	1.83
Pumping and drainage	1:3	.20	.61
Hoisting	1:3	.27	.82
Service men	1:3	[illegible]	[illegible]
Total salaries and wages		$3.[illegible]	$9.79
Drill steel and supplies	1:2	.15	.30
Lumber and timber	1:3.2	.64	2.03
Equipment and repair parts	1:3	.23	.67
Power	1:4	.33	.33
Explosives	1:1.7	.17	.28
Compensation insurance	1:3.4	.26	.90
Unemployment tax	1:3.8	.18	.57
Old-age benefit tax	1:4.7	.03	.14
Medical expense	1:2	.01	.02
Yard and camp 1/	1:3	.06	.18
Miscellaneous and office expense	1:3	.14	.42
		$5.[illegible]	$15.[illegible]

1/ One-half managing, engineering and office expense.

These costs do not include company overhead, depreciation, amortization and income taxes.

Statistical data for 1939 is as follows: Tons per man-shift underground is 1.44; explosives 0.807 pounds per ton ore; timber 20.0 board feet per ton; power 19.6 kilowatt hours per ton.

Milling methods and costs

The Tennessee-Schuylkill concentrator has a capacity of 150 tons per day. The method of concentration used is selective flotation. Two classes of concentrates are produced, (1) a lead concentrate which contains most of the gold, silver and copper and (2) a zinc concentrate with a small amount of gold and silver. The lead concentrate contains approximately 50 percent lead and the zinc concentrate contains approximately 54 percent zinc.

Labor costs in 1938 at the Tennessee-Schuylkill mill varied from $4 to $5 per shift. Present-day labor costs are three times those of 1938. Miscellaneous supplies have been calculated at twice those of 1938.

The estimated milling cost on the present day costs on the basis of treating 154 tons per day is $2.90 per ton. It would be a year or more before production could be built up to 150 tons of ore per day and with the small tonnage that would be treated at present, even considering custom ore, the milling cost would be at least $3.50 per ton.

This cost does not include company overhead, depreciation, amortization, or income taxes.

[illegible] Smelting [illegible] Mill lead [illegible] the grade of concentrates produced for a period of 4 years, [illegible], [illegible], [illegible] and [illegible], the recoveries of the various metals at the Herculaneum smelting were as follows:

	Percent [illegible] recovery of [illegible]	
	Lead Concentrates	Zinc Concentrates
Gold	75	10
Silver	72	8
Copper	80	1/
Lead	90	5/
Zinc	5/	75

1/ [illegible]

Smelting methods and costs

The concentrates from milling include a lead concentrate containing gold, silver and some copper, and a zinc concentrate containing gold and silver. No payment is made for the zinc in the lead concentrates and no payment is made for the lead and copper in the zinc concentrate.

Lead concentrates from [illegible] are [illegible] to the American Smelting and Refining Co. at [illegible], Texas and to the Nichols Copper Smelting, Refining and Mining Co. at [illegible], Ohio. Zinc concentrates are shipped to the Amarillo plant of the American Smelting and Refining Co. in Amarillo, Texas.

All smelter settlement sheets show that the basis for payment and smelting charges are essentially the same.

Payments for lead concentrates are approximately as follows:

Gold, [illegible] percent at $[illegible].62 per ounce; silver, 95 percent at $[illegible].30 per ounce; copper, [illegible] percent at market price less [illegible] cents per pound; lead, less 1.5 percent and 90 percent of the remainder at the market price less 2 cents.

Smelting charges for lead concentrates are as follows:

Base charge, $9.00 per ton; credit of [illegible] per unit for lead over 51.5 percent; freight, [illegible] from [illegible], $[illegible] per net ton or $[illegible].75 per dry ton; smelting, drill to Kansas, $2.00 per net ton or $[illegible].9 per dry ton.

Payments for zinc concentrates are approximately as follows:

Gold, 80 percent at $[illegible].21; silver, 85 percent at $[illegible].30 per ounce; copper, 65 percent at 8.5 cents less than market; zinc, 85 percent at market 17.5 cents less 2.45 cents.

Smelting charges for zinc concentrates are as follows:

Base charge, $[illegible] per ton; zinc equivalent charge $[illegible] for each cent [illegible] [illegible] cents per pound which amounts to $[illegible] per ton; labor equivalent [illegible] $7.50 per ton; iron penalty, [illegible] cents for each percent over 12 amounting to $[illegible] per ton; freight tax on smelter, $[illegible] per ton. These costs total $[illegible].12 per ton of concentrates.

The average grade of the measured, indicated and inferred ore reserves at the Tennessee-Amphill mine is 0.014 ounces gold and 1.76 ounces of silver per ton, with 3.22 percent lead and 6.98 percent zinc and a negligible amount of copper. On the basis of 1[illegible] tons of ore milled there will be 4.83 tons of lead concentrates and 9.71 tons of zinc concentrates with a grade as shown below:

Concentrates produced from 100 tons ore

Kind	Tons	Ounces per ton Gold	Ounces per ton Silver	Percent Lead	Percent Zinc	Grade of Concentrates
Lead	4.83	0.99	26.29	60.00	5.0	20.7
Zinc	9.71	0.07	1.45	3.00	54.0	10.3

Value of concentrates per ton

Kind	Gold	Silver	Copper	Lead	Zinc	Total
Lead	$12.49	$27.48	-	$157.75	1/	$212.92
Zinc	1.05	1.04	1/	1/	$156.52	159.36

1/ Not paid for.

Total value concentrates from 100 tons ore at mine before transportation and smelting

Lead 4.83 tons at $212.92 per ton		$1,028.40
Zinc 9.71 tons at 159.36 per ton		1,547.39
	Total value	$2,575.79

Total cost of transportation and smelting of lead and zinc concentrates

Kind	Tons	Per cent. ton concentrates Trucking	Freight	Smelting	Total	Grand Total
Lead	4.83	$2.29	$13.73	$6.95	$22.97	$109.[illegible]
Zinc	9.71	2.29	10.55	58.12	70.96	689.[illegible]
				Total costs		$798.52

The net value of 100 tons of ore in concentrates at the mill is $2,575.79 less $798.52 or $1,777.27, which is $17.77 per ton of ore.

Royalty

According to the lease agreement dated January [illegible], 19[illegible], the applicant, the Tennessee State Corp., is to pay the Tennessee-Schuylkill Corp. [illegible] percent of the net returns received from the sale of bullion, dross, concentrates, or other products derived from the leased property.

Should the applicant treat any custom ore in the Tennessee-Schuylkill mill he is to pay the Tennessee-Schuylkill Corp. [illegible] cents per ton for such ore treated.

Should the applicant transport any ore from neighboring properties not covered by this lease through the mill of the Tennessee-Schuylkill Corp. he is to pay the Tennessee-Schuylkill Corp. [illegible] cents per ton for such ore transported.

As Mr. Langley stated, [illegible] mentioned in the lease, the Tennessee State Corp. was to pay an additional royalty of [illegible] percent personally to Mr. [illegible], President of the Tennessee-Schuylkill Corp., presumably for services rendered for some personal advantage by this individual of the corporation.

Profit Sharing Method

The applicant proposes that if a loss for [illegible] in, rather than will repay the loss on the basis of [illegible] percent of the net smelter returns, and if the loss is for [illegible], repayment would be at the rate of [illegible] percent of the net smelter returns. This estimate of net smelter returns is based for gold on results [illegible] per ton on Tennessee ore.

The average repayment on a loan of [illegible] would be approximately [illegible] per ton of ore or $3.37 per ton on a [illegible] loan. The repayment of the loan on the basis of the average grade of the present ore reserves on the basis of a [illegible] loan would be [illegible] per ton of ore.

[illegible]

Capital requirements exclusive development

The capital requirements as stated by the applicant for a production of [illegible] tons per day from the Tennessee-Coquille are much too low. Before any production should be made, the Tennessee shaft should be sunk from the 1,400 to the 1,600 level and some 1,500 feet of work should be done on the 1,600 level so as to get below the known ore reserves. Several raises should be driven from the 1,400 to the 1,400 level for ventilation and extraction of ore. In the past, ore from the 1,400 level has been stoped from that level to the 1,350 level through a raise and then trammed to the shaft. Ventilation was bad on the workings in this section of the mine. Here pole [illegible] were paid [illegible] per shift than those working on the upper levels. The sinking of the shaft and the necessary drifts for extraction [illegible] would be in addition to the proposed expenditures as given by the applicant.

The expenditures for the development of the mill, mine, and camp have been very much underestimated. The minimum estimate for [illegible] of the mill is a million [illegible] which is double the estimate of [illegible]. If the investments of the company are limited to [illegible] the total capital requirements would be [illegible].

Mining Costs

It would take probably 6 months to build production up to 100 tons per day which would include 50 tons from the 700 level of the Homestake shaft and 50 tons from the other properties. It is estimated that costs for mining at the other properties would be no less than at the Homestake mine because the widths of the vein are definitely narrower. Estimated costs per ton are as follow on the basis of 100 tons of ore per day.

	Per Ton
Mining	$15.50
Milling	3.50
Trucking ore to mill	1.00 1/
Overhead	1.50
	$21.50
Royalty to Homestake Gold Mill Corp.	1.76
Royalty to Government (assumption)	2.67
	$25.93

1/ Trucking [illegible] per ton for ore located 41.0 per ton [illegible] 8 miles.

The above costs are based on accurate costs of mining and milling at the Tennessee-Schuylkill mine for a period of several years revised from 1938 to the present day costs of labor and supplies. Overhead, including administration, is probably under estimated. Ralph E. Langley has a very extravagant idea of managing a small property. He will be the general manager at $750 per month. He states in his application "the operating organization will include Walter Winsett, assistant manager, Thomas L. Chapman, E. M., consulting engineer and geologist, J. N. Payne, mill superintendent, Raymond L. Dyer, C. C. Patterson and J. K. Hatchick, mine superintendents, and other seasoned hay mem". The salaries for each of these men will vary from $300 to $400 per month.

The net smelter returns calculated on the basis of present ore reserves are $17.77 per ton. The Tennessee Metals Corp. pays a royalty to the Tennessee-Schuylkill Corp. of 10 percent of the net smelter returns.

The Tennessee Metals Corp. in its application proposes to pay the Government 15 percent of the net smelter returns provided the corporation is granted a lease of $150,000.

The amount of royalty paid the Government is amortization and consequently amortization is not shown as a separate item.

Indicated profit or loss

The estimated smelter returns based on the calculated grade of the ore reserves of the Tennessee-Schuylkill mine based on an average of more than 1,000 mine samples is $17.77 per ton of crude ore. The grade of the production of the various other mines proposed to be worked by the applicant is much the same. It is also believed that costs would not differ greatly. The narrower width of the vein would more than offset any decrease in costs due to more favorable mining conditions.

Returns per ton of ore are $17.77 and costs have been calculated at $25.95 or a loss of $8.18 per ton of ore.

CONCLUSIONS

From 1908 through 1949 the Wallapai district has produced 42,000,000 pounds of lead and 72,000,000 pounds of zinc with appreciable amounts of gold and silver and a little copper. It is doubtful if any appreciable amount of this production was made at a profit. The Goodhue Mining and Smelting Co., a subsidiary of the U. S. Smelting, Refining and Mining Co., operated the Tennessee-Schuylkill mine from 1911 to 1917 and then gave up their lease on the property. Other companies also operated the mine and mill for a few years and shut down. The Golconda mine was operated from 1908 until the latter part of 1917 when the mill burned down and was never rebuilt. Some information has been obtained regarding 100 producers in the district. In the early

days it is probable that some production of gold and silver from the oxidized parts of the veins was profitable but when the sulphide zone was reached profitable operations ceased. Judging from the past history of the Tennessee-Schuylkill, operations as a whole were unprofitable. Net smelter returns from the Calumet amounted to approximately $2,600,000. Whether or not this operation was profitable is unknown. It was not sufficiently profitable to warrant rebuilding the mill in 1917 or since that time. Some small production by lessees might have resulted in small profits mainly because most of the development was already done. The district has always been marginal or sub-marginal and under present conditions cannot be operated at a profit.

The past production of the Summit mine has a grade that is very similar to that of the Tennessee mine. Although it can be operated through a tunnel it is believed that the costs of production will be substantially the same. There is no possibility that profitable operations can be conducted at the Summit or other mines of the applicant under present economic conditions.

RECOMMENDATIONS

Because of high operating costs and present metal prices no substantial tonnage can be produced at a profit. It therefore is recommended that the application for a loan be denied.

APPENDIX

CALCULATION OF [illegible] RESERVES

OF [illegible]

TENNESSEE-SOUTHEASTERN MINE

(See Figure 1)

APPENDIX

It is believed that some day the need for lead and zinc will be sufficiently great to warrant reopening the Tennessee-Pennsylvania mine. The ore reserves have been calculated on the basis of more than 1,000 samples. It is believed that a record of the assay values of these samples will be of great value. They therefore, are made a part of this report and are shown in the appendix.

TENNESSEE KING

SUMMARY OF ORE RESERVES

	Tons	Ounces		Pounds		Average Value Per Ton			
		Gold	Silver	Lead	Zinc	Ounces Gold	Ounces Silver	Pounds Lead	Pounds Zinc
Measured	29,503	2,130	60,160	3,929,300	4,481,296	0.07	2.0	3.3	7.6
Indicated	32,209	3,316	98,400	3,088,226	7,987,424	0.06	1.9	2.9	7.6
Inferred	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Indicated	32,209	3,316	98,400	3,088,226	7,987,424	0.06	1.9	2.9	7.6
Inferred	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

THOMPSON-SCHUYLKILL - INDICATED ORE

Area	Location Level	Location Feet	Shaft	Level	Tons	Assay for Ton Gross Gold	Assay for Ton Gross Silver	Assay for Ton Percent Lead	Assay for Ton Percent Zinc	Total Gross Gold	Total Gross Silver	Pounds Lead	Pounds Zinc
A	700	33 - 210	North	Above Below	6,106	0.11	3.9	3.9	14.2	671.7	23,813	476,268	1,734,104
B	1000	27 - 105	North	Above	3,282	0.02	1.5	2.7	6.0	65.6	4,923	177,288	393,840
D	1000	47 North to 495	South	Below	12,815	0.08	1.5	2.7	6.0	240.9	18,067	690,430	1,445,400
L	1080	910 - 940	North	Above	1,880	0.06	1.7	2.7	12.5	61.2	1,734	55,080	235,000
L	1000	1000 - 1050	North	Above	2,987	0.07	1.9	2.4	13.2	209.1	5,675	143,396	788,568
L	1070	1130 - 1220	North	Above	800	0.09	4.7	10.0	12.4	72.0	3,760	160,800	198,400
K	1100	0 - 60	North	Above	980	0.02	1.5	2.7	6.0	19.6	1,470	52,920	117,600
E	1100	0 - 56	North	Below	636	0.02	1.5	2.7	6.0	12.7	954	34,344	76,320
E	1250	62 - 203	North	Below	1,156	0.03	1.4	1.9	6.7	37.8	1,618	43,988	154,904
E	1250	68 - 195	North	Above	2,570	0.05	1.4	1.9	6.7	128.5	3,598	97,660	344,380
F	1290	610 - 772	North	Below	2,556	0.10	2.0	2.0	14.9	255.6	5,112	102,240	761,668
H	1390	1365 - 1415	North	Above	838	0.10	2.7	6.0	6.6	83.0	2,241	99,600	109,560
H	1390	1427 - 1530	North	Above	1,028	0.10	2.7	6.0	6.6	102.8	2,749	122,160	134,376
J	1390	1672 - 1732	North	Above	1,150	0.11	3.2	4.3	3.7	126.5	3,680	98,900	85,100
I	1390	1140 - 1675	North	Below	8,263	0.15	2.3	4.2	8.4	1,239.5	19,005	694,892	1,388,184
			Total		45,399					3,365.5	98,400	3,008,286	7,987,424
			15 Percent Dilution		6,810								
			Including Dilution		52,209	0.06	1.9	2.9	7.6				

[illegible]-SCHUYLKILL - [illegible] CREEK

Area	Location Lateral	Location Vert.	Side	Level	Tons	Grams per Ton Total Gold	Total Silver	Recov. Gold	Recov. Silver	Total Ounces Gold	Total Ounces Silver	Pounds Gold	Pounds Silver
A	700	33 - 210	North	Above (Bubble)	3,200	0.11	3.9	3.9	14.2	352.0	12,480	24,960	908,800
B	1000	25 - 500	South	Below	6,082	0.08	1.5	2.7	6.0	128.4	9,000	385,188	722,640
C	1000	940 - 965	North	Above	1,044	0.08	1.7	2.4	12.6	88.5	1,775	90,312	263,088
D	1000	975 - 1000	North	Above	940	0.09	1.7	2.3	12.6	81.6	2,598	85,680	236,880
E	1090	1135 - 1235	North	Below	682	0.09	4.7	10.0	12.4	55.1	2,876	138,400	168,776
F	1190	1197 - 1207	North	Below	748	0.05	2.1	3.6	7.2	37.4	1,571	53,896	116,682
G	1250	62 - 288	North	Below	769	0.05	1.4	1.9	6.7	38.2	1,066	38,994	102,242
H	1250	610 - 772	North	Below	1,658	0.10	2.0	2.0	14.9	165.5	3,380	66,200	493,190
I	1250	1080 - 1095	North	Below	1,390	0.05	1.4	2.0	7.3	69.5	1,986	55,600	204,060
J	1250	1372 - 1353	North	Above	1,261	0.07	2.8	6.7	3.7	88.3	3,538	168,974	143,734
K	1250	1348 - 1327	North	Below	1,511	0.07	2.8	4.7	5.7	105.8	4,238	202,434	172,234
L	1250	1685 - 1774	North	Below	1,120	0.12	3.9	4.9	3.8	134.4	4,368	168,760	85,120
M	1350	1365 - 1450	North	Above	637	0.16	2.6	4.7	8.6	102.9	1,656	65,878	109,564
N	1350	1648 - 1698	North	Above	384	0.10	1.8	3.4	3.7	38.4	692	26,112	28,416
O	1350	1088 - 1664	North	Below	4,368	0.15	2.1	4.2	8.4	655.2	10,086	568,512	734,424
			Total		26,695					2,139	60,180	1,929,300	4,182,296
			15 Percent Dilution		[illegible]								
			Unloading Dilution		29,365	0.07	2.0	3.3	9.6				

[illegible]-MONTELLIA – [illegible] ORE

Area	Location Level	Location Feet	Shaft	Level	Tons	Assay per Ton Gold Gold	Assay per Ton Gold Silver	Assay per Ton Lead Lead	Assay per Ton Lead Zinc	Total Ounces Gold Gold	Total Ounces Gold Silver	Pounds Lead Lead	Pounds Lead Zinc
A	700	60 – 225	North	Above	4,790	0.11	3.9	3.9	14.2	526.9	18,681	373,680	1,360,036
B	700	55 – 370	South	Above	18,833	0.05	1.0	2.2	6.1	965.0	18,833	828,652	2,277,626
L	1000	1050 – 1166	North	Above	2,438	0.07	2.4	2.4	12.5	158.7	6,811	136,224	709,500
D	1100	0 – 435	South	Above	8,090	0.02	1.5	2.7	6.0	161.8	12,135	436,860	970,800
D	1250	0 – 390	South	Above	16,000	0.08	1.5	2.7	6.0	320.0	24,000	864,000	1,920,000
H	1250	1365 – 1545	North	Above	2,900	0.07	2.8	6.7	3.7	203.0	8,120	388,600	390,630
I	1350	1165 – 1710	North	Below	24,525	0.15	2.3	4.2	8.4	3,678.8	56,408	2,060,100	4,126,200
K	1600	475 – 555	North	Above	2,928	0.05	1.2	28.2	3.8	58.2	3,480	1,232,922	825,888
			Total		80,884					5,748.4	148,748	6,321,048	11,929,770
			15 Percent Dilution		12,133								
			Including Dilution		93,017	0.06	1.6	3.4	6.4				

TENNESSEE MINE

700 Level (Between Coordinates South 965 to South 1160)

Area "A"

Samples from Assay Plan by Needles Mining & Smelting Co., June 1912.

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Per-cent Lead	Feet times Lead	Per-cent Zinc	Feet times Zinc	
2.0	.44	.88	2.1	4.2	1.5	3.0	6.0	12.0	
4.4	.14	.62	4.6	20.2	3.2	14.1	7.1	31.2	
2.5	.10	.25	2.5	6.3	1.6	4.0	7.8	19.5	
(0.5	.02	.01	2.5	1.3	2.0	1.0	10.4	5.2)	One
(1.3	.02	.03	4.0	5.2	1.3	1.7	4.5	5.9)	Sample
2.5	.10	.25	2.2	5.5	1.6	4.0	7.8	19.5	
1.1	.04	.04	1.4	1.5	Tr	—	12.6	13.9	
1.2	.16	.19	6.5	7.8	10.0	12.0	13.5	16.2	
2.5	.04	.10	0.7	1.8	Tr	—	4.0	10.0	
2.0	.08	.16	0.7	1.4	Tr	—	1.7	3.4	
2.0	.04	.08	0.8	1.6	Tr	—	1.5	3.0	
2.0	.04	.08	1.2	2.4	Tr	—	9.5	19.0	
2.5	.10	.25	2.2	5.5	1.6	4.0	7.8	19.5	
2.5	.08	.20	1.7	4.3	Tr	—	13.1	32.8	
1.2	.08	.10	2.3	2.8	3.2	3.8	14.4	17.3	
1.1	.04	.04	3.6	4.0	2.5	2.8	24.2	26.6	
31.3		3.24		75.8		50.4		255.0	

15 Samples average: 2.1 feet - 0.10 Gold - 2.4 Silver - 1.6 Lead - 8.1 Zinc

Southerly lens - Length sampled - 60 feet.

THREEBOYS - 700 Level - Area "A" (Cont'd)

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Per-cent Lead	Feet times Lead	Per-cent Zinc	Feet times Zinc	
5.1	.16	.82	1.3	6.6	Tr	—	17.0	86.7	
(0.4	.10	.04	2.7	1.1	Tr	—	47.2	18.9)	One
(3.0	Tr	—	Tr	—	Tr	—	4.7	14.1)	Sample
(2.5	.06	.15	2.5	6.3	2.0	5.0	6.5	16.3)	One
(0.4	.08	.03	1.1	0.4	2.5	1.0	45.8	18.3)	Sample
3.0	.14	.42	1.4	4.2	Tr	—	9.8	29.4	
2.1	.02	.04	1.4	2.9	Tr	—	13.2	27.7	
2.1	.04	.08	1.3	2.7	3.0	6.3	12.3	25.8	
5.1	.08	.40	1.3	6.6	Tr	—	12.3	62.7	
4.7	.04	.19	1.3	6.1	Tr	—	9.5	44.7	
6.0	.04	.24	2.9	17.4	1.3	9.0	13.3	79.8	
3.1	.18	.56	2.9	9.0	2.7	8.4	17.8	55.2	
3.6	.08	.29	2.7	9.7	1.2	4.3	18.5	66.6	
6.0	.06	.48	3.5	21.0	1.3	7.8	17.7	106.2	
5.9	.08	.47	3.7	22.5	1.2	7.1	18.1	106.8	
6.0	.12	.72	3.8	22.8	1.5	9.0	15.5	93.0	
6.0	.04	.24	1.9	11.4	1.1	6.6	16.8	100.8	
4.1	.08	.33	5.3	21.1	1.2	4.9	13.0	53.3	
4.5	.08	.36	20.7	93.2	2.8	12.6	16.0	72.0	
(2.0	.06	.12	7.8	15.6	1.5	3.0	28.1	56.2)	One
(2.5	.05	.10	1.3	3.3	Tr	—	4.5	11.3)	Sample
3.7	.08	.30	3.2	11.8	1.8	6.7	20.2	85.8	
4.0	.16	.64	3.8	15.2	2.5	10.0	14.7	58.8	
5.0	.08	.40	1.8	9.0	2.3	11.5	5.5	27.5	
5.5	.16	.88	6.4	35.2	9.2	50.6	22.8	125.3	
(4.3	.16	.69	8.7	37.4	11.4	49.0	19.1	82.1)	One
(2.7	.09	.24	1.1	3.0	Tr	—	0.5	1.4)	Sample
4.0	.20	.80	3.3	13.2	8.4	33.6	19.2	76.8	
5.0	.30	1.50	7.5	37.5	13.2	66.0	23.4	117.0	
(3.0	.24	.72	2.7	8.1	4.1	12.3	16.3	48.9)	One
(2.7	.16	.43	5.8	15.7	14.6	39.4	8.2	22.1)	Sample
(5.3	.16	.85	2.8	14.8	11.7	62.0	15.2	80.6)	One
(2.5	.20	.50	6.2	15.5	5.6	14.0	10.5	26.3)	Sample
4.5	.20	.90	6.8	30.6	12.0	54.0	18.0	81.0	
4.0	.20	.80	2.9	11.6	18.4	73.6	23.4	93.6	
4.5	.10	.45	5.0	22.5	15.3	68.8	20.1	90.5	
[illegible]		16.92		[illegible]		[illegible]		[illegible]	

30 Samples - Average: 4.6 feet - 0.12 Gold : 4.2 Silver : 4.4 Lead : 15.6 Zinc
Northerly Lens - Length sampled - 185 feet

Both South and North Lenses - 45 Samples average: 3.8 feet - 0.11 Gold : 3.9 Silver : 3.9 Lead : 14.2 Zinc

TENNESSEE MINE

900 Level (Between Coordinates South 1150 to South 1525)

Area "F"

Samples from Area, Map by Tennessee-Schuylkill Corp., 1962

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Per-cent Lead	Feet times Lead	Per-cent Zinc	Feet times Zinc
4.5	.02	.09	0.9	4.1	0.8	3.6	4.2	18.9
3.5	.02	.11	0.1	0.6	1.4	7.7	5.5	30.3
7.0	.01	.07	0.6	4.2	0.7	4.9	6.7	46.9
10.0	.02	.20	0.5	5.0	1.3	13.0	6.0	60.0
9.0	.02	.18	1.4	1.3	2.2	19.8	5.5	49.5
5.0	.07	.35	2.8	14.0	5.2	26.0	8.2	41.0
10.0	.05	.50	1.4	14.0	2.4	24.0	8.0	80.0
10.0	.02	.20	0.6	6.0	0.3	3.0	4.7	47.0
10.0	.03	.30	1.2	12.0	2.5	25.0	10.3	103.0
10.3	.04	.42	1.6	16.8	1.7	17.9	10.4	109.2
9.0	.05	.45	1.4	12.6	2.3	20.7	9.6	86.4
9.0	.03	.27	1.1	9.9	1.2	10.8	9.4	84.6
8.5	.02	.17	0.9	7.7	1.8	15.3	6.0	51.0
8.0	.02	.16	0.6	4.8	1.5	12.0	7.3	58.4
7.0	.04	.28	1.5	10.5	1.7	11.9	10.7	74.9
7.0	.03	.21	1.7	11.9	1.0	7.0	17.4	121.8
7.5	.03	.23	1.7	12.7	2.4	18.0	12.5	93.8
8.0	.03	.24	1.2	9.6	1.9	15.2	17.9	143.2
8.0	.02	.16	0.6	4.8	1.5	12.0	7.4	59.2
10.5	.03	.32	0.7	7.4	0.8	8.4	4.0	42.0
10.5	.04	.42	1.6	16.8	2.8	29.4	6.6	69.3
10.0	.02	.20	0.1	1.0	0.6	6.0	3.3	33.0
5.0	.07	.35	2.1	10.5	2.1	10.5	9.0	45.0
5.0	.03	.15	0.8	4.0	0.8	4.0	1.2	6.0
5.5	.02	.11	0.2	1.1	1.7	9.4	1.2	6.6
6.0	.02	.12	0.5	3.0	0.5	3.0	2.2	13.2
6.0	.03	.18	1.4	8.4	1.8	10.8	3.3	19.8
5.0	.02	.10	2.2	11.0	6.6	33.0	6.0	30.0
3.0	.04	.20	3.5	17.0	5.8	29.0	11.0	55.0
6.0	.03	.18	2.0	12.0	5.6	33.6	3.6	21.6
5.5	.01	.06	0.4	2.2	0.5	2.8	4.8	26.4
6.0	.02	.12	0.9	5.4	0.5	3.0	3.2	19.2
6.0	.02	.12	0.2	1.2	Tr	—	2.2	13.2
6.0	.02	.12	0.3	1.8	Tr	—	4.0	24.0
6.0	.02	.12	0.4	2.4	0.5	3.0	3.3	19.8

TOMBSTONE - 900 Level - Area "B" (Cont'd)

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
5.0	.04	.20	0.8	4.5	0.5	2.5	3.5	17.5
7.0	.02	.14	0.8	5.6	2.5	1.5	2.2	15.4
8.5	.06	.51	0.7	6.0	1.6	13.6	2.0	17.0
7.0	.03	.21	0.8	5.6	Tr	—	1.9	13.3
11.0	.07	.77	1.5	16.5	2.2	24.2	8.0	88.0
11.0	.06	.66	1.6	17.6	3.3	36.3	6.1	67.1
10.0	.03	.30	1.5	15.0	2.7	27.0	6.7	67.0
11.0	.07	.77	1.6	17.6	3.2	35.2	3.8	41.8
11.0	.01	.11	0.4	4.4	2.1	23.1	2.4	26.4
9.5	.04	.38	1.5	14.3	3.4	32.3	8.5	80.8
10.0	.06	.60	4.0	40.0	11.7	117.0	10.5	105.0
10.5	.01	.11	1.5	15.8	13.7	143.9	15.1	158.6
12.5	.02	.25	1.5	18.8	4.0	50.0	6.7	83.8
8.0	.02	.16	2.3	18.4	4.8	38.4	11.2	89.6
7.0	.01	.14	0.8	5.6	1.9	13.3	2.6	18.2
7.0	Tr	—	Tr	—	0.6	4.2	1.2	8.4
8.5	Tr	—	Tr	—	0.4	4.20	0.9	7.7
7.0	.01	.07	0.5	3.5	0.4	2.8	5.3	37.1
7.0	.01	.07	0.3	2.1	0.4	2.8	5.2	36.4
9.0	Tr	—	Tr	—	0.2	1.8	4.6	41.4
10.5	.01	.11	0.3	3.2	0.5	5.3	1.7	17.9
7.0	.01	.07	0.4	2.8	0.2	1.4	2.4	16.8
7.0	.01	.07	0.3	2.1	0.6	4.2	3.1	21.7
7.0	.01	.07	0.3	2.1	0.9	6.3	1.3	9.1
6.5	Tr	—	Tr	—	0.8	5.20	1.6	10.4
5.5	.01	.06	0.3	1.7	0.3	1.4	3.9	21.5
4.5	Tr	—	0.2	0.9	0.5	2.3	0.9	4.1
3.5	.02	.07	1.6	5.6	0.5	1.8	5.4	18.9
185.5		13.36		197.2		1,039.80		2,944.1

63 Samples average: 7.7 feet - 0.03 Ounces Gold - 1.0 Ounces Silver - 2.2 percent Lead - 6.1 percent Zinc

Length sampled - 375 feet.

TENNESSEE MINE

1000 Level (Between Coordinates South 160 to South 190)

Area "J"

From Assay Map, Tennessee-Schuylkill Corp., 1940

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
4.9	.06	.29	1.2	5.9	1.5	7.4	4.6	22.5
5.0	.07	.35	1.7	8.5	1.2	6.0	8.6	43.0
8.0	.03	.24	2.8	22.4	3.5	28.0	10.2	81.6
7.5	.08	.60	2.2	16.5	2.6	19.5	12.3	92.3
6.5	.06	.39	2.7	17.6	3.4	22.1	18.3	119.0
7.5	.02	.15	1.4	10.5	2.0	15.0	13.2	99.0
7.0	.04	.28	1.0	7.0	1.4	9.8	22.1	154.7
6.0	.06	.36	1.9	11.4	2.9	17.4	21.1	126.6
6.5	.06	.39	1.9	12.4	3.3	21.5	16.8	109.2
5.0	.05	.25	1.2	6.0	3.7	18.5	12.4	62.0
65.9		3.30		118.2		165.2		909.9

10 Samples average: 6.4 feet - .05 Ounces Gold - 1.8 Ounces Silver - 2.6 Percent Lead - 14.2 Percent Zinc

Length Sampled: 30 Feet

TENNESSEE MINE

90E 6 Winze (Coordinate South 215)

Area "L"
From Assay Map, Tennessee-Schuylkill Corp., 1940

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Per-cent Lead	Feet times Lead	Per-cent Zinc	Feet times Zinc
4.0	.02	.08	Tr	—	Tr	—	1.7	6.8
4.0	.26	1.04	1.1	4.4	0.8	3.2	13.1	52.4
5.0	.04	.20	0.9	4.5	1.7	8.5	17.5	86.5
6.8	.11	.68	2.5	15.5	3.3	20.5	9.0	55.8
4.8	.11	.46	3.0	12.6	3.3	13.9	30.1	126.4
5.0	.12	.60	6.0	30.0	10.5	52.5	25.1	125.5
4.0	.12	.48	2.4	9.6	1.8	7.2	13.5	54.0
4.0	.10	.40	2.7	10.8	4.8	19.8	18.5	74.0
4.5	.03	.14	4.6	20.7	2.1	9.5	20.6	92.7
4.5	.11	.50	0.8	3.6	0.6	2.7	13.9	62.6
5.0	.08	.40	1.1	5.5	1.0	5.0	11.4	57.0
5.0	.08	.40	0.8	4.0	0.5	2.5	8.8	44.0
5.0	.08	.40	0.5	2.5	1.4	7.0	3.4	17.0
4.5	.06	.18	0.8	3.6	3.0	13.5	8.0	36.0
2.5	.16	.56	0.4	1.4	1.0	3.5	9.6	33.6
2.5	.28	.70	1.8	4.5	3.3	8.3	16.5	41.3
3.0	.06	.12	0.8	2.4	Tr	—	8.9	26.7
4.0	.01	.04	Tr	—	Tr	—	0.8	3.2
78.9		7.39		139.6		102.5		798.3

18 Samples average: 4.4 Feet - .09 Ounces Gold - 1.7 Ounces Silver - 2.3 Percent Lead - 12.6 Percent Zinc

Length Sampled: 100 Feet

THUNDER MINE

1000 Level (Between Stoopinates South 225 to South 278)

Area "L"

From Assay Map, Tunnesses-Schuylkill Corp., 1949

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
2.5	.07	.18	1.3	3.3	0.5	1.3	18.0	45.0
3.0	.04	.12	0.9	2.7	0.5	1.5	6.5	19.5
3.0	.06	.18	0.5	1.5	0.5	1.5	4.6	13.8
3.0	.09	.27	0.3	0.9	0.5	1.5	7.6	22.8
2.8	.08	.22	1.2	3.4	0.5	1.4	12.8	35.8
3.6	.05	.18	0.8	2.9	0.5	1.8	7.4	26.6
4.2	.08	.34	3.2	13.4	5.8	23.5	24.5	102.9
4.8	.05	.24	2.0	9.6	3.9	18.7	12.8	61.4
3.8	.09	.34	2.7	10.3	5.6	21.3	13.8	52.4
4.2	.05	.21	2.9	12.2	5.3	22.3	12.4	52.1
4.4	.04	.18	2.1	9.2	4.9	21.6	12.5	55.0
4.6	.08	.37	2.6	12.0	2.5	11.5	12.9	59.3
5.0	.03	.16	0.2	1.0	1.2	6.0	13.3	67.0
49.1		2.99		82.1		136.1		615.8

13 Samples average: 3.8 Feet - 0.06 Ounces Gold - 1.7 Ounces Silver - 2.7 Percent Lead - 12.5 Percent Zinc

Length Sampled: 53 Feet

TENNESSEE MINE

1070 Level -(Coordinates North 30 to South 60)

Area "L"

From Assay Map, Tennessee-Schuylkill Corp., 1960

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
4.5	.08	.36	7.3	32.9	13.1	59.0	16.1	72.5
1.0	.13	.13	6.8	6.8	6.8	6.8	27.4	27.4
2.5	.07	.18	4.5	11.3	11.7	29.3	13.4	33.5
3.0	.08	.24	6.9	20.7	13.9	41.7	14.1	42.3
3.0	.10	.30	7.2	21.6	20.2	60.6	13.8	41.4
2.5	.08	.20	4.0	10.0	8.8	22.0	10.8	27.0
1.0	.12	.12	4.9	4.9	5.8	5.8	19.7	19.7
4.5	.07	.32	3.1	14.0	4.2	18.9	10.0	45.0
3.0	.07	.21	3.1	9.3	3.5	10.5	12.2	36.6
2.5	.13	.32	4.7	11.8	11.6	29.0	12.0	30.0
2.0	.09	.18	1.4	2.8	1.0	2.0	11.1	22.2
3.0	.06	.18	1.3	3.9	1.5	4.5	13.1	39.3
4.0	.08	.32	3.7	14.8	12.8	51.2	7.2	28.8
2.5	.07	.18	2.4	6.0	3.9	9.8	4.9	12.3
4.5	.13	[illegible]	4.5	[illegible]	13.8	[illegible]	14.8	[illegible]
45.5		4.07		213.1		455.8		[illegible]

13 Samples average: 3.0 Feet - 0.09 Ounces Gold - 4.7 Ounces Silver - 10.0 Percent Lead - 12.4 Percent Zinc

Length Sampled: 90 Feet

[illegible]

1170 Level (Coordinates North 20 to South 50)

Vein "L"

From [illegible] Cap, Tennessee-Pennsylvania Corp., 1940

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
4.5	.04	.18	1.6	6.3	1.9	8.1	6.8	30.6
5.0	.06	.20	2.7	3.5	1.1	5.0	9.1	45.5
4.5	.07	.32	2.1	9.5	3.0	13.5	14.0	63.0
4.0	[illegible]	.36	5.9	23.6	14.5	58.4	11.5	46.0
4.5	.07	.32	3.9	20.7	12.3	63.1	12.1	62.1
4.5	.05	.20	2.3	9.2	3.5	14.0	5.7	22.8
4.0	[illegible]	.12	2.3	9.2	3.5	14.0	7.5	30.0
4.5	.08	.36	5.6	25.2	11.2	50.4	13.7	61.7
3.5	.05	.17	3.1	10.8	5.1	17.9	12.9	45.2
3.5	.09	.32	3.6	12.6	4.4	15.4	14.2	49.7
4.5	.02	.09	0.3	1.4	0.5	2.3	2.5	11.3
7.0	[illegible]	.14	0.7	4.9	0.5	3.5	3.1	21.7
3.5	[illegible]	.14	0.1	0.3	0.5	2.0	0.5	[illegible]
7.0	.02	.12	0.7	4.2	0.5	3.0	9.9	59.4
5.5	.03	.20	0.6	3.7	0.8	5.2	1.2	8.8
70.5		3.41		145.6		256.6		552.9

15 Samples averaged: 4.7 Feet - .05 Ounces Gold - 2.1 Ounces Silver - 3.6 Percent Lead - 7.3 Percent Zinc

Length Sampled: 70 Feet

TENNESSEE MINE

1170 Level (Coordinates South 265 to South 305)

Area "E"

From Assay Map, Tennessee-Schuylkill Corp., 1960

Ounces Gold	Ounces Silver	Percent Lead	Percent Zinc
.04	0.6	0.8	7.3
.04	1.9	0.5	5.8
.04	0.7	0.5	3.5
.03	2.7	0.5	8.0
.02	0.2	0.5	6.6
.02	0.6	Tr	3.5
.02	0.5	Tr	2.1
.02	0.2	0.5	1.0
.02	0.4	0.5	2.1
.03	0.3	0.5	0.5
.03	0.4	Tr	0.5
.03	0.2	0.5	0.5
.03	1.0	0.6	[illegible]
.37	9.7	5.4	[illegible]

Arithmetical average of 13 Bar Samples: 0.03 Ounces Gold - 0.7 Ounces Silver - 0.4 Percent Lead - 3.2 Percent Zinc

TENNESSEE MINE

1170 Level (Coordinates South 353 to South 398)

Area "I"

From Assay Map, Tennessee-Pittsburgh Corp., 1960

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
1.5	.04	.06	1.3	2.0	2.1	3.2	6.2	9.3
2.0	.05	.10	1.4	2.8	1.6	3.2	8.3	16.6
2.5	.02	.05	0.5	1.3	0.6	1.5	7.4	18.5
2.5	.02	.05	2.2	5.5	1.8	4.5	9.4	23.5
7.0	.07	.49	2.1	14.7	1.5	10.5	11.6	81.2
4.0	.04	.16	2.4	9.6	2.6	10.4	9.0	36.0
4.0	.04	.16	1.2	4.8	0.7	2.8	7.7	31.0
5.5	.05	.28	2.5	13.8	2.0	7.0	8.1	28.4
1.5	.04	.06	0.5	.8	0.3	.5	2.3	3.5
30.5		1.34		51.3		44.1		247.4

9 Samples average: 3.4 Feet - 0.05 Ounces Gold - 1.7 Ounces Silver - 1.5 Percent Lead - 8.4 Percent Zinc

Length Sampled: 45 Feet

TENNESSEE MINE

1270 Level (Coordinates South 475 to South 520)

Area "E"

From Assay Map, Tennessee-Schuylkill Corp., 1940

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
5.0	.02	.10	4.9	24.5	5.3	26.5	12.0	60.0
4.3	.06	.26	4.0	17.2	3.8	16.3	20.0	86.0
4.8	.06	.29	4.2	20.2	8.2	39.4	17.1	82.1
4.8	.06	.29	2.8	13.4	3.6	17.3	25.4	121.9
8.5	.05	.43	2.1	17.9	3.4	28.9	9.8	83.3
7.5	.06	.45	5.6	42.0	6.5	48.8	16.2	121.5
7.0	.08	.56	8.6	60.2	18.2	127.4	14.9	104.3
7.5	.06	.45	2.0	15.0	8.1	60.8	13.7	102.8
7.0	.06	.42	2.8	19.6	5.4	37.8	8.8	61.6
56.4		3.35		230.0		402.2		803.5

9 Samples average: 6.3 Feet - 0.06 Ounces Gold - 4.0 Ounces Silver - 7.1 Percent Lead - 14.6 Percent Zinc

Length Sampled: 45 Feet

TENNESSEE MINE

1170 Level (Coordinates South 425 to South 465)

Area "H"

From Assay Map, Tennessee-Schuylkill Corp., 1960

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
8.5	.01	.09	0.4	3.4	0.5	4.3	7.6	64.6
5.0	.02	.10	0.2	1.0	Tr	—	Tr	—
6.0	.01	.06	Tr	—	0.5	3.0	Tr	—
6.0	.03	.18	0.4	2.4	0.6	3.6	1.0	6.0
6.7	.05	.34	0.8	5.4	0.5	3.4	4.1	27.5
6.0	.04	.24	0.9	5.4	0.5	3.0	3.2	19.2
7.0	.07	.49	1.2	8.4	1.1	7.7	10.3	72.1
[illegible]	.02	[illegible]	0.7	[illegible]	0.7	[illegible]	6.5	[illegible]
[illegible]		[illegible]		[illegible]		[illegible]		[illegible]

8 Samples average: 6.3 Feet - 0.03 Ounces Gold - 0.6 Ounces Silver - 0.6 Percent Lead - 4.5 Percent Zinc

Length Sampled: 40 Feet

TENNESSEE MINE

1250 Level (Coordinates South 987 to South 1127)

Area "F"

From Assay Map, Tennessee-Schuylkill Corp., 1940

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
1.8	.02	.04	1.2	2.2	Tr	—	6.2	11.2
2.3	.07	.16	1.0	2.2	Tr	—	6.1	14.0
2.0	.03	.06	1.2	2.4	0.7	1.4	6.8	13.6
0.9	.03	.03	0.3	0.3	Tr	—	0.9	0.9
1.9	.03	.06	0.4	0.8	1.7	3.2	2.3	4.4
2.0	.05	.10	0.4	0.8	1.2	2.4	2.3	4.6
2.4	.04	.10	0.4	0.9	0.6	1.4	1.7	4.1
2.5	.05	.13	0.7	1.8	0.7	1.8	12.1	30.3
2.0	.02	.04	0.2	0.4	0.5	1.0	2.1	4.2
2.3	.04	.10	0.8	1.8	0.5	1.2	9.8	22.5
2.7	.06	.16	1.9	5.1	4.5	12.1	[illegible]	54.0
3.0	.05	.15	1.1	3.3	1.6	4.8	2.4	7.2
4.0	.04	.16	1.3	5.2	3.8	15.2	8.5	34.0
3.0	.08	.24	3.0	9.0	6.4	19.2	5.0	15.0
3.4	.10	.35	4.0	14.0	2.0	7.0	7.1	24.9
36.3		1.38		49.3		78.7		222.9

15 Samples average: 2.4 Feet - 0.05 Ounces Gold - 1.4 Ounces Silver - 1.9 Percent Lead - 6.7 Percent Zinc

Length sampled: 140 Feet

TENNESSEE MINE

1250 Level (Coordinates South 635 to South 980)

Area "P"

From Assay Map, Tennessee-Ashby/Hill Corp., 1960

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
3.4	.12	.40	1.7	5.8	2.2	7.5	9.6	32.6
3.4	.35	1.19	1.2	4.1	2.5	8.5	9.1	30.9
5.4	.60	3.2	2.6	14.0	Tr	—	0.6	3.2
5.0	.15	.75	3.1	15.5	3.2	16.0	16.8	84.0
3.8	.12	.40	3.1	15.5	1.6	8.0	20.1	100.5
3.5	.09	.32	2.3	8.1	1.8	6.3	10.7	37.5
6.2	.06	.37	1.5	9.3	0.9	5.6	10.2	63.2
4.8	.07	.34	3.9	18.7	4.8	23.0	18.0	86.4
3.0	.08	.24	2.2	6.6	3.4	10.2	25.4	76.2
4.6	.09	.41	1.4	6.4	3.1	14.3	10.2	46.9
2.1	.08	.17	2.4	5.0	3.0	6.3	23.5	49.4
4.5	.04	.19	4.0	18.0	7.5	33.8	16.1	72.5
7.1	.04	.28	1.6	11.4	1.3	9.2	32.4	230.2
8.0	.06	.48	1.8	14.4	2.6	20.8	23.0	184.0
6.0	.12	.72	3.6	21.6	4.5	27.0	21.1	126.6
4.2	.11	.46	2.9	12.2	2.4	10.1	22.2	93.2
2.7	.07	.19	4.1	11.1	5.0	13.5	18.0	48.5
1.1	.07	.08	1.3	1.4	7.3	8.0	17.5	19.3
4.0	.04	.16	2.8	11.2	1.8	7.2	14.7	58.8
2.3	.12	.28	3.7	8.5	3.3	7.6	16.6	38.2
2.0	.08	.16	2.4	4.8	2.5	5.0	22.5	45.0
2.0	.05	.10	1.3	2.6	5.2	10.4	24.8	49.6
0.9	.06	.05	5.8	5.2	10.2	9.2	13.3	12.0
91.2		11.23		281.1		237.5		1374.9

23 Samples average: 4.0 Feet - 0.12 Ounces Gold - 2.5 Ounces Silver - 2.9 Percent Lead - 17.3 Percent Zinc

Length Sampled: 125 Feet

THERMOSTAT MINE

1250 Level (Coordinates South 415 to South 445)

Area "P"

From Assay Map, Tennessee-Schuylkill Corp., 1940

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
5.0	.16	.80	1.7	8.5	1.4	7.0	14.6	73.0
6.0	.04	.24	1.7	10.2	0.7	4.2	8.9	53.4
6.0	.05	.30	2.1	12.6	0.7	4.2	15.6	93.6
6.5	.04	.26	0.5	3.3	Tr	—	7.7	50.1
7.5	.06	.44	0.3	2.2	Tr	—	7.6	55.5
7.0	.05	.35	1.3	9.1	0.5	3.5	21.6	151.2
7.0	.06	.42	1.0	7.0	0.7	4.9	9.3	65.1
7.5	.07	.53	0.6	4.5	0.6	4.5	7.0	52.5
8.0	.05	.40	1.0	8.0	0.6	4.8	12.7	101.6
60.5		3.34		65.4		33.1		696.0

9 Samples average: 6.7 Feet - 0.06 Ounces Gold - 1.1 Ounces Silver - 0.6 Percent Lead - 11.5 Percent Zinc

Length Sampled: 30 Feet

Average grade of Block "P":
32 Samples average: 6.7 Feet - 0.10 Ounces Gold - 2.0 Ounces Silver - 2.0 Percent Lead - 14.9 Percent Zinc

TENNESSEE MINE

1250 Level (Coordinates South 320 to South 420)

Area "H"

From Assay Map, Tennessee-Schuylkill Corp., 1940

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
6.7	.02	0.13	0.1	.7	0.5	3.3	Tr	—
6.5	.02	0.13	0.8	5.2	0.5	3.3	2.6	16.9
6.0	.01	0.06	0.2	1.2	0.5	3.0	Tr	—
6.3	.05	.32	0.7	4.4	0.5	3.2	4.8	30.2
8.0	.02	.16	0.2	1.6	0.5	4.0	6.5	52.0
8.0	.08	.64	0.3	2.4	0.5	4.0	5.1	40.8
8.0	.08	.32	0.8	6.4	1.6	12.8	6.2	49.6
7.6	.30	2.28	1.9	14.4	1.0	7.6	7.1	54.0
7.0	.19	1.33	1.7	11.9	2.8	19.6	6.5	45.5
8.5	.05	0.43	0.5	4.3	1.4	11.9	3.5	29.8
4.5	.04	0.18	0.8	3.6	1.3	5.9	3.9	17.6
6.0	.07	.42	0.5	3.0	0.5	3.0	9.8	58.8
85.1		6.40		59.1		81.5		395.2

12 Samples average: 6.9 Feet - 0.08 Ounces Gold - 0.7 Ounces Silver
1.0 Percent Lead - 4.8 Percent Zinc

Length Sampled: 100 Feet

TENNESSEE MINE

1220 Raise: Coordinate South 196 (Between 1250 and 1170 Levels)

Area "H"

From Assay Map by Tennessee-Schuylkill Corp., 1939

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
3.0	.03	.09	0.4	1.2	0.5	1.5	7.2	21.6
3.5	.06	.21	1.6	5.6	1.7	6.0	8.9	31.2
3.0	.05	.15	2.3	6.9	4.5	13.0	11.3	33.9
4.0	.04	.16	1.0	4.0	0.7	2.8	8.4	33.6
2.0	.15	.30	1.2	2.4	1.0	2.0	11.5	23.0
3.5	.14	.49	1.6	5.6	0.5	1.8	6.7	23.5
2.5	.22	.55	0.5	1.3	0.5	1.3	3.8	9.5
3.0	.10	.30	9.1	27.3	5.0	15.0	4.2	12.6
3.0	.07	.21	1.3	3.9	0.8	2.4	10.3	30.9
2.5	.05	.13	6.4	16.0	13.5	33.8	13.1	32.8
3.5	.04	.14	1.9	6.7	3.6	12.6	9.0	31.5
3.0	.06	.18	3.0	9.0	6.2	18.6	16.9	50.7
2.5	.05	.13	3.7	9.3	8.2	20.5	9.4	23.5
39.0		3.02		99.2		131.3		358.3

13 Samples average: 3.0 Feet - 0.08 Ounces Gold - 2.50 Ounces Silver - 3.4 Percent Lead - 9.2 Percent Zinc

Length Sampled: 80 Feet

TENNESSEE MINE

1250 Level (Coordinates South 95 to South 180)

Area "R"

From Assay Map, Tennessee-Schuylkill Corp., 1939

Ounces Gold	Ounces Silver	Percent Lead	Percent Zinc
.03	0.6	0.5	5.0
.03	1.4	1.4	7.8
.04	1.0	1.1	4.1
.06	3.8	8.3	9.2
.04	1.1	1.3	2.4
.04	1.2	2.1	8.0
.04	1.1	1.2	6.9
.04	2.0	4.8	8.4
.07	1.2	1.8	15.5
.05	4.1	10.3	13.9
.05	1.2	1.2	7.1
.05	2.0	1.7	7.1
.05	1.4	1.2	8.8
.05	1.0	1.6	13.9
.10	1.8	1.0	13.9
.06	1.2	1.1	12.1
.04	0.6	0.4	6.9
.05	1.0	0.3	5.3
.06	0.7	0.5	4.2
.03	0.3	0.7	2.6
.09	0.6	0.5	1.1
.08	1.1	1.2	4.4
1.13	30.6	41.6	157.0

No sample width given; arithmetical average of 22 samples: 0.05 Ounces Gold - 1.4 Ounces Silver - 2.0 Percent Lead - 7.7 Percent Zinc

Length Sampled: 85 Feet

TENNESSEE MINE

1298 Level (Coordinates South 35 to South 95)

From Assay Map, Tennessee-Schuylkill Corp., 1939

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
4.0	.02	.12	0.1	.4	Tr	—	1.4	5.4
4.5	.03	.20	0.3	2.0	0.3	3.3	4.0	26.0
5.0	.04	.20	0.4	2.0	0.5	2.5	1.5	7.5
4.0	.07	.28	0.7	2.8	1.1	4.4	4.4	17.6
3.0	.08	.24	1.2	3.6	0.8	2.4	8.2	24.6
2.5	.07	.18	0.5	1.3	0.5	1.3	2.0	5.0
2.5	.04	.10	0.6	1.5	1.1	2.8	4.3	10.8
3.5	.05	.18	1.9	6.7	1.1	3.9	4.5	15.8
3.9	.14	.55	1.7	6.6	0.7	2.7	13.8	53.7
5.0	.32	1.60	1.8	9.0	2.1	10.5	18.1	90.5
4.0	.12	.72	7.9	47.4	0.5	3.0	3.8	22.8
5.5	.08	.44	0.6	3.3	0.5	2.8	5.8	31.9
5.0	.11	.55	0.7	3.5	0.5	2.5	2.5	12.5
3.0	.05	.15	0.5	1.5	0.5	1.5	7.2	21.6
3.0	.04	.12	0.7	2.1	1.5	4.5	1.3	3.9
2.5	.08	.20	1.4	3.5	2.2	5.5	10.1	25.3
3.0	.05	.10	1.6	3.2	4.3	8.6	3.4	6.8
66.9		3.93		100.6		62.2		321.7

17 Samples average: 4.1 Feet - 0.09 Ounces Gold - 1.5 Ounces Silver - 0.9 Percent Lead - 5.0 Percent Zinc

Length Sampled: 60 Feet

THORNBURG MINE

1250 Level (Coordinates North 20 to North 80)

From Assay Map, Tennessee-Schuylkill Corp., 1939

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
4.5	.05	.23	3.6	16.2	6.4	29.7	15.5	69.8
4.0	.05	.20	4.0	16.0	9.0	36.0	7.8	31.2
7.0	.08	.56	3.4	23.8	8.0	56.0	9.7	67.9
6.5	.05	.33	3.7	24.1	4.2	27.3	10.8	70.2
6.0	.07	.42	3.6	21.6	6.5	39.0	9.6	57.6
3.5	.02	.11	1.0	3.5	0.8	2.8	5.0	17.5
5.0	.07	.35	2.7	13.5	8.1	40.5	3.4	17.0
3.0	.07	.21	1.0	3.0	0.5	1.5	1.8	5.4
3.5	.03	.11	0.5	1.8	1.1	3.9	1.5	5.3
4.0	.08	.32	1.9	7.6	3.2	12.8	5.8	23.2
3.0	.04	.12	0.6	1.8	0.5	1.5	1.9	5.7
3.0	.06	.18	2.0	6.0	3.6	10.8	9.0	27.0
7.5	.21	1.58	1.0	7.5	0.8	6.0	5.9	44.3
2.5	.30	.75	2.8	7.0	5.0	12.5	3.8	9.5
5.0	.41	2.05	0.7	3.5	0.5	2.5	2.5	12.5
70.0		7.94		136.9		200.4		374.1

Gold

15 Samples average: 4.7 Feet - 0.11 Ounces/- 2.3 Ounces Silver - 4.1 Percent Lead - 6.8 Percent Zinc

Length Sampled: 60 Feet

TERRYVALE MINE

1250 Level (Coordinates North 80 to North 160)

From Assay Map, Tennessee-Schuylkill Corp., 1939

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
5.0	.02	.05	0.4	2.0	0.5	2.5	1.0	5.0
4.0	.02	.08	0.3	1.2	0.5	2.0	0.5	2.0
4.5	.02	.05	0.1	0.5	0.5	2.3	0.5	2.3
5.0	.01	.05	0.1	0.5	Tr	—	0.5	2.3
6.0	.02	.06	0.2	1.2	1.7	10.2	9.4	56.4
7.0	.03	.21	1.1	7.7	Tr	—	5.4	37.8
6.0	.02	.12	0.2	1.2	Tr	—	0.5	3.0
5.0	.03	.15	0.5	2.5	Tr	—	Tr	—
42.5		.77		16.8		17.0		108.8

6 Samples average: 5.3 Feet - 0.02 Ounces Gold - 0.4 Ounces Silver - 0.4 Percent Lead - 2.6 Percent Zinc

Length Sampled: 80 Feet

[illegible] MINE

1290 Level (Coordinates North 160 to North 365)

Area "G"

From Assay Map, Tennessee-Johnny Hill Corp., 1959

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
1.5	.03	.05	0.6	0.9	0.7	1.1	1.6	2.4
1.5	.05	.08	0.5	0.8	Tr	—	1.7	2.6
1.0	.14	.14	1.2	1.2	Tr	—	1.2	1.2
6.0	.04	.24	0.6	3.6	0.5	3.0	4.5	27.0
6.0	.05	.30	1.4	8.4	Tr	—	2.6	15.6
5.0	.04	.20	1.7	8.5	2.4	12.0	1.8	9.0
7.0	.06	.42	1.9	13.3	4.2	29.4	2.0	14.0
6.0	.06	.36	2.5	15.0	7.2	43.2	0.8	4.8
6.0	.07	.42	6.6	39.6	18.3	109.8	2.0	12.0
6.5	.06	.39	3.2	20.8	10.7	69.6	1.2	7.8
8.0	.06	.48	3.7	29.6	10.2	81.6	1.4	11.2
1.5	.11	.17	9.9	14.9	28.7	43.1	13.4	20.1
3.0	.09	.27	3.1	9.3	8.6	25.8	8.1	24.3
1.0	.09	.09	4.2	4.2	11.7	11.7	10.2	10.2
1.0	.08	.08	4.2	4.2	13.7	13.7	6.0	6.0
8.0	.07	.56	6.4	51.2	18.6	148.8	26.7	213.6
2.0	.05	.10	3.0	6.0	8.7	17.4	5.3	10.6
2.0	.05	.10	2.3	4.6	4.0	8.0	8.8	17.6
1.5	.06	.09	2.6	3.9	2.6	3.9	9.2	13.8
1.5	.12	.18	3.5	5.3	4.0	6.0	15.2	22.8
2.0	.13	.26	3.7	7.4	7.9	15.8	10.2	20.4
4.0	.06	.24	1.1	4.4	2.2	8.8	5.9	23.6
5.0	.06	.30	2.2	11.0	2.8	14.0	5.6	28.0
4.0	.06	.24	1.3	5.2	1.1	4.4	4.7	18.8
3.0	.04	.12	1.2	3.6	0.6	1.8	7.0	21.0
2.0	.37	.74	1.5	3.0	0.5	1.0	4.6	9.2
1.0	.32	.16	0.4	2.0	0.5	2.5	0.8	4.0
108.0		6.92		252.9		676.4		576.6

27 Samples average: 3.8 Feet - 0.07 Ounces Gold - 2.3 Ounces Silver - 4.7 Percent Lead - 5.7 Percent Zinc

Length Sampled: 205 Feet

TIMBERSIDE MINE

1290 Level (Coordinates North 365 to North 497)

From Assay Map, Tennessee-Schuylkill Corp., 1960

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
1.5	.20	.30	3.5	5.3	4.9	7.4	14.6	21.9
7.0	.34	2.38	3.7	25.9	4.1	28.9	6.7	46.9
6.0	.25	1.50	1.9	11.4	3.4	20.4	3.8	22.8
6.0	.08	.48	7.2	43.2	18.5	111.0	12.3	73.8
6.0	.07	.42	5.7	34.2	15.9	95.4	4.2	25.2
6.0	.17	1.02	9.6	57.6	22.4	134.4	16.7	100.2
5.0	.16	.80	12.6	63.0	29.6	148.0	7.2	36.0
6.0	.05	.30	3.2	19.2	5.3	31.8	8.2	49.2
6.0	.13	.78	12.7	76.2	32.6	195.6	14.6	87.4
4.0	.04	.16	4.5	18.0	14.7	58.8	5.6	22.4
2.0	.11	.22	5.9	11.8	13.4	26.8	15.4	30.8
3.5	.11	.39	4.2	14.7	5.6	19.6	15.8	55.3
7.0	.07	.49	2.2	15.4	3.7	25.9	7.0	49.0
5.0	.04	.20	2.2	11.0	3.8	19.0	4.5	22.5
6.5	.03	.20	1.5	9.8	3.7	24.1	5.1	33.2
4.0	.04	.16	4.7	18.8	14.9	59.6	3.5	14.0
4.0	.48	2.72	4.3	17.2	3.8	15.2	13.4	61.6
5.0	.91	4.55	6.2	31.0	8.3	41.5	12.0	60.0
3.5	.60	2.10	9.7	33.9	13.4	46.9	7.5	26.3
4.0	.34	1.36	6.3	25.2	7.6	30.4	20.4	81.6
98.0		22.93		542.5		1141.9		721.7

20 Samples average: 4.9 Feet - 0.21 Ounces Gold - 5.5 Ounces Silver - 11.7 Percent Lead - 9.4 Percent Zinc

Length Sampled: 132 Feet

TENNESSEE MINE

1250 Level (Coordinates North 497 to North 607)

Area "J"

From Army Map, Tennessee-Schuylkill Corp., 1960

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
4.0	.05	.20	9.2	36.8	3.8	15.2	2.6	10.4
3.0	.08	.24	33.6	100.8	4.1	12.3	4.5	13.5
3.5	.07	.25	7.7	26.9	8.6	30.1	2.9	10.2
3.5	.03	.11	0.2	0.7	Tr	—	Tr	—
8.0	.05	.40	2.6	20.8	2.6	20.8	1.9	15.2
6.0	.10	.60	10.0	60.0	7.6	45.6	2.6	15.6
5.0	.06	.30	0.8	4.0	1.3	6.5	1.6	8.0
6.0	.06	.36	1.0	6.0	1.1	6.6	2.8	16.8
6.0	.04	.24	1.1	6.6	2.8	16.8	2.6	15.6
5.0	.05	.25	3.4	17.0	1.7	8.5	2.5	12.5
5.0	.07	.35	1.7	8.5	6.0	30.0	1.8	9.0
4.5	.06	.27	1.4	6.3	2.9	13.1	2.6	11.7
5.0	.10	.50	1.7	8.5	5.5	27.5	1.6	8.0
7.0	.09	.63	5.1	35.7	3.5	24.5	4.6	32.2
6.0	.04	.24	0.7	4.2	2.2	13.2	3.1	18.6
6.0	.04	.24	1.2	7.2	4.8	28.8	2.6	15.6
5.0	.36	2.80	2.7	13.5	5.3	26.5	7.5	37.5
7.0	.04	.28	0.5	3.5	1.6	11.2	2.4	16.8
4.0	.10	.40	5.7	22.8	14.0	56.0	6.0	24.0
10.0	.08	.80	4.16	41.6	10.0	100.0	5.0	50.0
9.5	.17	1.62	2.7	25.7	5.0	47.5	7.0	66.5
9.0	.51	4.59	5.2	46.8	9.8	88.2	8.6	77.4
128.0		15.87		303.9		628.9		485.1

22 Samples average: 5.8 Feet - 0.12 Ounces Gold - 3.9 Ounces Silver - 4.9 Percent Lead - 3.8 Percent Zinc

Length Sampled: 110 Feet

TENNESSEE MINE

1250 Level (Coordinates North 607 to North 697)

Area "J"

From Assay Map, Tennessee-Schuylkill Corp., 1960

Width Feet	Ounces Gold	Feet times Ounces Gold	Ounces Silver	Feet times Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
5.5	.01	.06	0.1	0.6	Tr	—	3.0	16.5
3.5	.01	.04	Tr	—	Tr	—	Tr	—
3.5	.01	.04	0.10	0.4	Tr	—	Tr	—
3.5	.02	.06	0.20	0.7	Tr	—	2.4	8.4
1.5	.01	.02	0.11	0.2	Tr	—	3.7	5.6
3.0	.02	.06	0.24	0.7	Tr	—	1.3	3.9
2.0	.03	.06	0.14	0.3	Tr	—	Tr	—
3.0	.02	.06	0.20	0.6	Tr	—	1.2	3.6
2.0	.01	.02	0.10	0.2	Tr	—	Tr	—
1.5	.03	.05	0.30	0.5	1.0	1.5	4.1	6.2
1.5	.02	.03	0.30	0.5	0.8	1.2	3.8	5.7
0.5	.04	.02	1.40	0.7	3.5	1.8	3.2	1.6
1.5	.05	.07	2.90	4.4	5.4	8.1	4.0	6.0
4.0	.02	.08	0.20	0.8	0.5	2.0	Tr	—
3.0	.01	.03	0.20	0.6	Tr	—	1.1	3.3
2.5	.01	.03	0.10	0.3	0.5	1.3	1.0	2.5
2.0	.02	.04	0.20	0.4	0.5	1.0	1.8	3.6
4.0	.01	.04	0.13	0.5	0.5	2.0	1.2	4.8
3.0	.01	.03	0.11	0.3	Tr	—	Tr	—
4.0	.01	.04	0.17	0.7	Tr	—	Tr	—
3.0	.01	.03	0.11	0.3	Tr	—	0.8	2.4
2.0	.01	.02	Tr	—	Tr	—	Tr	—
2.0	.02	.04	0.23	0.5	Tr	—	Tr	—
2.5	.01	.03	0.09	0.2	Tr	—	Tr	—
1.5	.01	.02	0.10	0.2	Tr	—	1.8	2.7
3.0	.04	.12	0.60	1.8	0.7	2.1	0.5	1.5
89.0		1.10		16.4		21.0		78.3

26 Samples average: 2.7 Feet - 0.02 Ounces Gold - 0.2 Ounces Silver - 0.3 Percent Lead - 1.1 Percent Zinc

Length Sampled: 90 Feet

TENNESSEE MINE

1990 Level (Coordinates North 460 to North 510)

Area "J"

From Assay Map, Tennessee-Schuylkill Corp., 1962

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
1.5	0.16	.24	6.0	9.0	17.0	25.5	5.1	7.7
4.0	.22	.88	3.1	12.4	6.2	24.8	5.4	21.6
2.5	.22	.55	6.5	16.3	10.6	26.5	7.2	18.0
3.5	.15	.53	1.7	6.0	4.5	15.8	2.2	7.7
2.0	.02	.04	0.3	0.6	Tr	—	3.0	6.0
2.0	.13	.26	1.4	2.8	0.7	1.4	14.8	29.6
2.0	.04	.08	0.5	1.0	Tr	—	1.8	3.6
2.5	.10	.25	0.9	2.3	0.5	1.3	2.8	7.0
3.0	.02	.06	0.4	1.2	0.5	1.5	1.4	4.2
4.0	.02	.08	0.1	0.4	Tr	—	Tr	—
2.0	.01	.02	0.2	0.4	0.5	1.0	0.5	1.0
29.0		2.99		52.4		99.2		106.1

11 Samples average: 2.6 Feet - 0.10 Ounces Gold - 1.8 Ounces Silver - 3.4 Percent Lead - 3.7 Percent Zinc

Length Sampled: 50 Feet

TENNESSEE MINE

1350 Level (Coordinates North 266 to North 460)

Area "I"

From Assay Map, Tennessee-Schuylkill Corp., 1941

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
1.5	.03	.05	0.2	0.3	Tr	—	2.1	3.2
2.0	.01	.02	0.2	0.4	Tr	—	0.5	1.0
1.5	.45	.68	1.0	1.5	3.5	5.3	1.2	1.8
2.5	.02	.05	0.2	0.5	Tr	—	1.5	3.8
4.0	.03	.12	0.4	1.6	0.6	2.4	1.6	6.4
4.0	.09	.36	1.0	4.0	1.5	6.0	4.1	16.4
3.5	.05	.18	1.7	6.0	3.4	11.9	5.9	20.7
4.5	.12	.54	0.6	2.7	1.0	4.5	5.9	26.6
4.0	.06	.24	1.2	4.8	3.4	13.6	2.7	10.8
1.5	.42	.63	2.6	3.9	7.4	11.1	9.6	14.4
2.0	.13	.26	4.6	9.2	11.6	23.2	5.9	11.8
1.5	.09	.14	2.5	3.8	6.7	10.1	5.9	8.9
2.0	.08	.16	2.6	5.2	5.3	6.6	19.6	39.2
4.5	.12	0.54	0.8	3.6	Tr	—	4.3	19.4
6.0	.20	1.20	1.4	8.4	1.5	9.0	7.6	45.6
5.0	.07	0.35	1.1	5.5	0.6	3.0	10.3	51.5
4.5	.09	0.41	1.6	7.2	0.8	3.6	13.1	59.0
3.3	.04	0.14	0.4	1.4	0.8	2.8	8.0	26.0
4.5	.02	0.09	0.7	3.2	0.8	3.6	4.8	21.6
4.5	.03	0.14	0.8	3.6	1.1	4.9	3.4	15.3
2.0	.03	0.06	0.4	0.8	0.6	1.2	2.9	5.8
4.0	.11	0.44	1.6	6.4	2.3	9.2	10.9	43.6
3.0	.16	0.48	3.4	10.2	7.2	22.6	9.7	29.1
3.0	.09	0.27	1.3	3.9	1.0	3.0	6.6	19.8
3.0	.22	0.66	7.1	21.3	13.7	41.1	20.0	60.0
3.5	.18	.63	3.3	11.6	3.1	10.9	12.5	43.1
3.5	.39	1.37	5.1	17.8	4.5	15.8	28.5	99.7
4.0	.84	3.36	10.1	40.4	18.1	72.4	20.1	80.4
3.0	.74	2.22	6.5	19.5	10.5	31.5	17.4	52.2
2.0	.66	1.32	8.1	16.2	10.5	21.0	23.5	47.0
5.0	.26	1.30	2.5	12.5	4.1	20.5	3.3	16.5
4.5	.39	1.35	4.7	21.2	9.3	41.9	6.5	29.3
4.5	.32	1.44	3.9	17.5	10.4	46.8	8.8	39.6
3.0	.21	.63	4.4	13.2	10.7	32.1	8.3	24.9
2.5	.79	1.98	5.7	14.3	11.6	29.0	5.6	14.0
1.5	.02	0.03	0.5	0.8	2.0	3.0	Tr	—
4.5	.50	2.25	6.5	29.3	15.4	69.3	13.6	61.2

TREMBLEY - 1350 Level - Area "F" (Cont'd)

Width Feet	Ounces Gold	Foot Ounces Gold	Ounces Silver	Foot Ounces Silver	Percent Lead	Foot Times Lead	Percent Zinc	Foot Times Zinc
3.5	.33	2.92	9.1	80.0	19.5	187.3	13.1	72.1
4.0	.49	1.96	10.2	40.8	22.9	91.6	12.9	51.6
2.5	.30	0.75	15.4	38.5	46.2	115.5	11.1	27.8
4.5	.14	.63	6.8	30.6	19.0	85.5	8.5	38.3
4.0	.47	1.88	9.6	38.4	18.8	75.2	13.9	55.6
3.0	.21	.63	13.3	39.9	31.8	95.4	14.6	43.8
3.5	.38	1.76	7.5	41.3	13.0	71.5	17.0	93.5
3.0	.06	.18	7.6	22.8	23.8	71.4	7.5	22.5
3.5	.50	1.75	5.8	20.3	13.3	46.6	10.5	36.8
3.0	.32	.96	4.7	14.1	10.4	31.2	11.0	33.0
3.5	.24	.84	7.5	26.3	20.0	70.0	11.0	38.5
3.0	.12	.36	4.2	12.6	8.2	24.6	15.1	45.3
3.0	.10	.30	2.1	6.3	3.0	9.0	7.6	22.8
3.5	.55	1.93	2.8	9.8	5.6	19.1	8.2	28.7
2.5	.39	.98	8.2	20.5	28.3	70.8	5.9	14.8
2.0	.56	1.12	2.7	5.4	4.4	8.8	5.2	10.4
4.5	.09	.41	1.0	4.5	1.9	8.6	6.3	28.4
3.0	.07	.21	1.9	5.7	1.4	4.2	12.0	36.0
127.0		45.90		761.5		1,[illegible]		1,[illegible]

55 Samples average: 3.4 Feet - 0.36 Ounces Gold - 6.1 Ounces Silver - 8.5 Percent Lead - 9.5 Percent Zinc

Length Sampled: 194 Feet

TENNESSEE MINE

1350 Level (Coordinates North 181 to North 266)

Area "I" and "H"

From Assay Map, Tennessee-Pennsylvania Corp., 1941

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
3.0	.08	.24	2.7	8.1	5.0	15.0	8.5	25.5
1.5	.08	.12	2.4	3.6	1.5	2.3	22.9	34.4
1.0	.11	.11	4.1	4.1	4.7	4.7	21.8	21.8
3.0	.28	.84	3.0	9.0	3.9	11.7	19.3	57.9
5.0	.10	.50	1.4	7.0	3.0	15.0	11.6	58.0
5.5	.40	2.20	3.6	19.8	6.1	33.6	9.5	52.3
5.5	.07	.39	2.5	13.8	2.9	16.0	5.6	30.8
3.5	.05	.18	3.5	12.3	0.9	3.2	2.4	8.4
1.5	.09	.14	0.2	0.3	1.8	2.7	1.2	1.8
2.0	.28	.56	0.5	1.0	0.7	1.4	3.0	6.0
3.0	.05	.15	0.5	1.5	Tr	—	4.5	13.5
4.0	.12	.48	0.6	2.4	1.9	7.6	2.9	11.6
4.0	.07	.28	1.1	4.4	3.1	12.4	2.6	10.4
4.0	.22	.88	1.1	4.4	1.2	4.8	4.5	18.0
3.0	.46	1.38	8.2	24.6	21.7	65.1	13.4	40.2
4.0	.08	.32	5.6	22.4	14.5	58.0	17.5	70.0
53.5		8.77		138.7		253.5		450.6

16 Samples average: 3.3 Feet - 0.16 Ounces Gold - 2.6 Ounces Silver - 4.7 Percent Lead - 8.6 Percent Zinc

Length Sampled 85 Feet: Applies to Block "H" above the level.

TENNESSEE MINE

1390 Level (Coordinates South 100 to North 185)

Area "I"

From Assay Map, Tennessee-Schuylkill Corp., 1961

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
9.0	.01	.09	0.2	1.8	Tr	—	0.5	4.5
4.5	.03	.14	0.2	0.9	Tr	—	0.5	2.3
3.5	.01	.03	0.1	0.5	0.5	2.0	0.5	2.0
3.0	.38	1.09	0.7	3.5	1.0	3.0	1.2	6.0
6.0	.18	1.08	0.4	2.4	0.5	3.0	2.0	12.0
5.0	.04	.20	0.1	0.5	0.5	2.5	0.8	4.0
6.0	.30	1.80	0.8	4.8	2.4	14.4	3.2	19.2
5.5	.46	2.53	1.2	6.6	0.5	2.8	2.7	14.9
5.0	.09	.45	0.7	3.5	0.7	3.5	2.5	12.5
4.5	.07	.32	0.9	4.1	2.0	9.0	4.0	18.0
4.0	.44	1.76	1.6	6.4	1.8	6.8	8.0	32.0
4.5	.16	0.72	1.8	8.1	4.5	20.3	8.3	37.4
4.0	.12	0.48	1.6	6.4	4.0	16.0	9.9	39.6
3.0	.11	0.33	0.3	0.9	1.0	3.0	3.9	11.7
2.5	.16	0.40	0.4	1.0	0.8	2.0	7.4	18.5
1.5	.42	0.63	1.3	2.0	1.0	1.5	6.3	9.8
4.0	.03	.12	0.5	2.0	0.5	2.0	2.5	10.0
6.0	.05	.30	0.9	5.4	0.5	3.0	4.0	24.0
1.5	.20	.30	1.5	2.3	1.0	1.5	10.3	15.5
3.5	.05	.18	1.2	4.2	0.5	1.8	7.5	26.3
4.0	.26	1.04	1.7	6.8	2.5	10.0	6.6	26.4
3.0	.06	.18	0.6	1.8	0.5	1.5	6.6	19.8
3.0	.07	.21	0.2	0.6	1.0	3.0	3.4	10.2
3.0	.09	.27	0.7	2.1	0.5	1.5	2.7	8.1
4.0	.08	0.32	1.0	4.0	1.7	7.6	3.6	13.6
4.0	.05	0.20	0.4	1.6	0.7	2.8	1.0	4.0
4.5	.12	0.54	1.3	5.9	2.7	12.2	2.4	10.8
5.0	.06	.30	2.4	12.0	2.3	11.5	4.4	22.0
3.5	.16	.56	2.1	7.4	2.0	7.0	9.6	33.6
6.0	.12	.72	1.5	9.0	1.8	10.8	11.1	66.6
7.5	.10	.75	2.2	16.5	2.9	17.3	7.3	54.8
8.0	.06	.48	1.4	11.2	2.3	18.4	6.4	51.2
3.0	.08	.24	0.4	1.2	0.8	2.4	8.4	25.2
1.0	.11	.11	1.9	1.9	0.6	0.6	32.8	32.8
3.0	.16	.48	0.8	2.4	1.0	3.0	10.3	30.9
3.5	.10	.35	1.3	4.6	0.5	1.8	23.4	81.9
3.0	.03	.09	0.1	0.3	0.5	1.5	3.7	11.1
6.0	.07	.42	2.5	15.0	1.2	7.2	6.4	38.4

THERMOSE - 1390 Level - Area "I" (Cont'd)

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
6.0	.05	.30	2.0	12.0	2.7	16.2	11.9	71.4
7.0	.06	.42	1.2	8.4	0.5	3.5	14.8	103.6
2.5	.20	.50	2.2	5.5	0.6	1.5	29.1	72.8
2.5	.03	.08	0.3	0.8	0.5	1.3	9.1	22.8
8.0	.04	.40	0.6	4.8	1.0	8.0	7.5	60.0
6.0	.02	.12	0.3	1.8	0.5	3.0	1.3	7.8
6.0	.01	.06	0.1	0.6	Tr	—	3.7	22.2
4.5	.01	.07	0.4	2.6	0.5	3.2	5.5	35.8
8.0	.01	.08	0.2	1.6	Tr	—	0.8	6.4
6.0	.10	.60	0.7	4.2	0.8	4.8	26.0	156.0
2.5	.07	0.18	0.6	1.5	0.5	1.3	17.2	43.0
4.5	.12	0.54	0.9	4.1	0.7	3.2	17.9	80.6
3.0	.08	.24	1.5	4.5	2.3	6.9	9.4	28.2
4.0	.08	.32	2.9	11.6	2.7	10.8	14.6	58.4
4.0	.17	.68	1.5	6.0	1.9	7.6	14.7	58.8
5.5	.07	.39	1.4	7.7	3.2	17.6	12.2	67.1
6.0	.03	.18	3.7	22.2	4.1	24.6	15.0	90.0
7.0	.07	.49	1.5	10.5	0.8	5.6	6.6	46.2
4.0	.02	.08	Tr	—	0.8	3.2	7.4	29.6
4.5	.04	.18	0.7	3.2	0.7	3.2	7.0	31.5
6.0	.06	.36	0.8	4.8	1.6	9.6	5.3	31.8
5.0	.05	.25	0.7	3.5	0.7	3.5	5.1	25.5
2.5	.14	.35	2.3	5.8	2.3	5.8	10.8	27.0
2.0	.15	.30	0.8	1.6	0.6	1.2	9.4	18.8
2.5	.04	.10	0.4	1.0	0.7	1.8	6.5	16.3
3.0	.06	.18	1.0	3.0	1.5	4.5	12.3	36.9
3.5	.07	.25	1.7	6.0	1.9	6.7	15.8	55.3
3.5	.04	.14	0.6	2.1	0.8	2.8	10.1	35.4
3.0	.13	.39	1.3	3.9	1.4	4.2	11.6	34.8
3.5	.03	.11	1.4	4.9	2.7	9.5	13.4	47.9
3.5	.07	.25	2.8	9.8	5.4	18.9	14.3	50.1
[illegible]		[illegible]		[illegible]		[illegible]		[illegible]

69 Samples average: 4.4 Feet - 0.10 Ounces Gold - 1.1 Ounces Silver - 1.4 Percent Lead - 7.8 Percent Zinc

Length Sampled: 283 Feet

TEMBRONIN MINE

Summary 1320 Level (Between Coordinates South 100 to North 440)

Area "I"

Number of Samples	Sum of Widths	Feet Ounces Gold	Feet Ounces Silver	Percent Times Lead	Percent Times Zinc
39	187	40.90	702.5	3,395.8	1,778.5
16	53.5	8.77	138.7	255.5	460.6
40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
115	353.5	[illegible]	[illegible]	[illegible]	[illegible]

140 samples average: 3.9 Feet - 0.15 Ounces Gold - 2.3 Ounces Silver - 4.2 Percent Lead - 8.4 Percent Zinc

Length Sampled 560 Feet. Applies to Block "I" below the level.

TENNESSEE MINE

1350 Level (Coordinates South 100 to South 145)

Area "R"

From Assay Map, Tennessee-Schuylkill Corp., 1942

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
6.0	Tr	—	Tr	—	Tr	—	Tr	—
6.5	.03	.20	0.5	3.3	Tr	—	0.7	4.6
5.0	.06	.30	0.7	3.5	0.7	3.5	7.0	35.0
4.0	.06	.24	0.6	2.4	1.0	4.0	5.5	22.0
5.0	.10	.50	0.4	2.0	0.6	3.0	1.1	5.5
4.5	.05	.23	0.7	3.2	1.1	5.0	3.2	14.4
4.5	.03	.14	0.1	0.5	0.8	3.6	2.0	9.0
4.0	.02	.08	0.4	1.6	0.5	2.0	1.6	6.4
4.0	.03	.12	0.4	1.6	0.5	2.0	3.4	13.6
4.0	.07	.28	0.8	3.2	1.1	4.4	4.6	18.4
47.5		2.09		21.3		27.5		132.5

10 Samples average: 4.8 Feet - 0.04 Ounces Gold - 0.4 Ounces Silver - 0.6 Percent Lead - 2.7 Percent Zinc

Length Sampled: 45 Feet

THERMOPOLIS MINE

1400 Level (Coordinates South 370 to South 570)

Area "B"

From Assay Map, Tennessee-Shenghill Corp., 1958

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet Times Lead	Percent Zinc	Feet Times Zinc
2.0	.03	.06	0.2	0.4	Tr	—	1.8	3.6
2.0	.04	.08	1.4	2.8	2.0	4.0	6.3	12.6
2.0	.06	.12	0.6	1.2	0.5	1.0	4.2	8.4
2.0	.04	.08	0.7	1.4	1.5	3.0	5.9	11.8
3.0	.02	.06	Tr	—	Tr	—	0.5	1.5
2.5	Tr	—	Tr	—	Tr	—	0.5	1.5
2.0	Tr	—	0.2	0.4	Tr	—	1.7	3.4
3.0	.02	.06	0.2	0.6	Tr	—	1.6	4.8
2.0	.04	.08	0.3	0.6	Tr	—	0.6	1.2
2.0	.02	.04	0.1	0.2	Tr	—	1.8	3.6
1.6	.04	.07	0.2	0.4	Tr	—	1.0	1.6
2.8	.02	.06	0.6	1.7	Tr	—	5.8	16.2
2.1	.08	.17	1.2	2.5	1.3	2.7	4.1	8.6
2.7	.06	.16	1.0	2.7	1.7	4.6	1.1	3.0
2.2	.04	.09	Tr	—	Tr	—	0.5	1.1
1.8	.04	.08	Tr	—	Tr	—	0.5	0.9
1.4	.02	.03	0.1	0.1	Tr	—	2.1	2.9
2.1	Tr	—	Tr	—	Tr	—	1.0	2.1
1.9	.02	.04	0.1	0.2	Tr	—	0.8	1.5
2.6	Tr	—	Tr	—	Tr	—	1.2	3.1
2.0	.02	.04	0.2	0.4	Tr	—	0.9	1.8
55.7		1.26		15.6		15.3		98.2

All Samples average: 2.2 Feet - 0.03 Ounces Gold - 0.3 Ounces Silver - 0.3 Percent Lead - 2.1 Percent Zinc

Length Sampled: 200 Feet

TONOPAH MINE

1400 Level (Coordinates South 700 to South 870)

From Assay Map, Hendlee Mining and Smelting Co., 1916

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
2.1	.15	.32	15.0	39.9	18.8	39.5	10.9	22.9
2.1	.09	.19	14.2	29.8	13.3	27.9	19.9	41.8
1.9	.12	0.23	4.1	7.8	3.0	5.7	6.8	12.9
2.2	.10	0.22	5.7	12.5	4.2	9.2	22.9	50.4
1.8	.09	0.16	8.9	16.0	5.2	9.4	35.7	64.3
2.0	.05	0.10	5.4	10.8	3.4	6.8	35.6	71.2
2.8	.06	0.17	6.4	17.9	1.3	3.6	21.3	59.6
4.0	.07	.28	2.8	11.2	7.8	31.2	15.3	61.2
4.8	.07	.34	4.7	22.6	4.9	23.5	16.1	77.3
4.5	.07	.32	7.5	33.8	2.4	10.8	14.9	67.1
3.8	.08	.30	6.7	25.5	14.5	55.1	5.5	20.9
3.8	.08	.30	3.9	14.8	1.3	4.9	21.6	82.1
3.0	.14	.42	6.4	19.2	12.1	36.3	20.6	61.8
38.8		3.35		251.8		263.9		695.5

13 Samples average: 2.9 Feet - 0.09 Ounces Gold - 6.7 Ounces Silver - 6.8 Percent Lead - 17.9 Percent Zinc

Length Sampled: 90 Feet. Mined prior to 1917 by Hendlee Mining and Smelting Co.

TOMBSTONE MINE

1400 Level (Coordinates South 590 to South 640)

From Assay Map, Tombstone-Johnylikill Corp., 1938

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
2.3	.02	.05	Tr	—	Tr	—	7.0	16.1
2.4	.05	.07	.13	0.3	Tr	—	4.7	11.3
2.0	.03	.06	Tr	—	Tr	—	7.6	15.2
2.7	.04	.11	.89	2.4	1.6	4.3	4.6	12.4
3.0	.04	.12	1.0	3.0	2.7	8.1	3.8	11.4
3.7	.02	.07	0.5	1.9	Tr	—	6.9	25.5
4.1	.02	.07	0.6	2.4	0.5	2.0	5.7	23.4
25.1		.57		10.1		14.5		115.1

7 Samples average: 2.9 Feet – 0.03 Ounces Gold – 0.5 Ounces Silver – 0.7 Percent Lead – 5.7 Percent Zinc

Length Sampled: 50 Feet

1400 Level (Coordinates South 672 to South 692)

3.2	.25	.80	12.0	38.4	10.9	34.9	11.4	36.5
4.4	.07	.31	6.3	27.7	7.9	34.8	7.4	32.6
3.7	.04	.15	4.8	17.8	10.4	38.5	14.3	52.9
11.3		1.26		83.9		108.2		122.0

3 Samples average: 3.8 Feet – 0.11 Ounces Gold – 7.4 Ounces Silver – 9.6 Percent Lead – 10.8 Percent Zinc

Length Sampled: 20 Feet

TRESCHER MINE

1600 Level: 112 Feet to 122 Feet South of 1600 Winze

area "C"

From Assay Map, Hendlen Mining and Smelting Co., Sept. 1926

Width Feet	Ounces Gold	Feet Ounces Gold	Ounces Silver	Feet Ounces Silver	Percent Lead	Feet times Lead	Percent Zinc	Feet times Zinc
2.3	.01	.02	2.1	4.8	13.0	30.0	3.3	7.6
2.7	.02	.05	5.6	15.1	16.2	43.7	11.9	32.1
[illegible]	.02	[illegible]	5.8	[illegible]	14.0	[illegible]	13.8	[illegible]
8.3		[illegible]		[illegible]		[illegible]		[illegible]

3 Samples average: 2.8 Feet - 0.02 Ounces Gold - 4.7 Ounces Silver - 14.4 Percent Lead - 10.2 Percent Zinc

Length Sampled: 10 Feet

1600 Level: 60 Feet to 77 Feet South of 1600 Winze

3.2	.02	.06	1.6	5.1	14.5	46.4	0.4	1.3
2.5	.01	.03	0.9	2.3	2.0	5.0	2.3	5.8
[illegible]	.04	[illegible]	1.0	[illegible]	18.5	[illegible]	0.3	[illegible]
8.7		[illegible]		[illegible]		[illegible]		[illegible]

3 Samples average: 2.9 Feet - 0.02 Ounces Gold - 1.2 Ounces Silver - 12.3 Percent Lead - 0.9 Percent Zinc

Length Sampled: 17 Feet

1600 Level: 43 Feet to 79 Feet North of 1600 Winze

2.5	.04	.10	1.8	3.0	18.4	53.5	5.0	12.5
3.0	.03	.09	0.9	2.7	20.2	60.6	2.0	6.0
[illegible]	.02	[illegible]	1.5	[illegible]	19.2	[illegible]	4.5	[illegible]
8.5		[illegible]		10.2		[illegible]		[illegible]

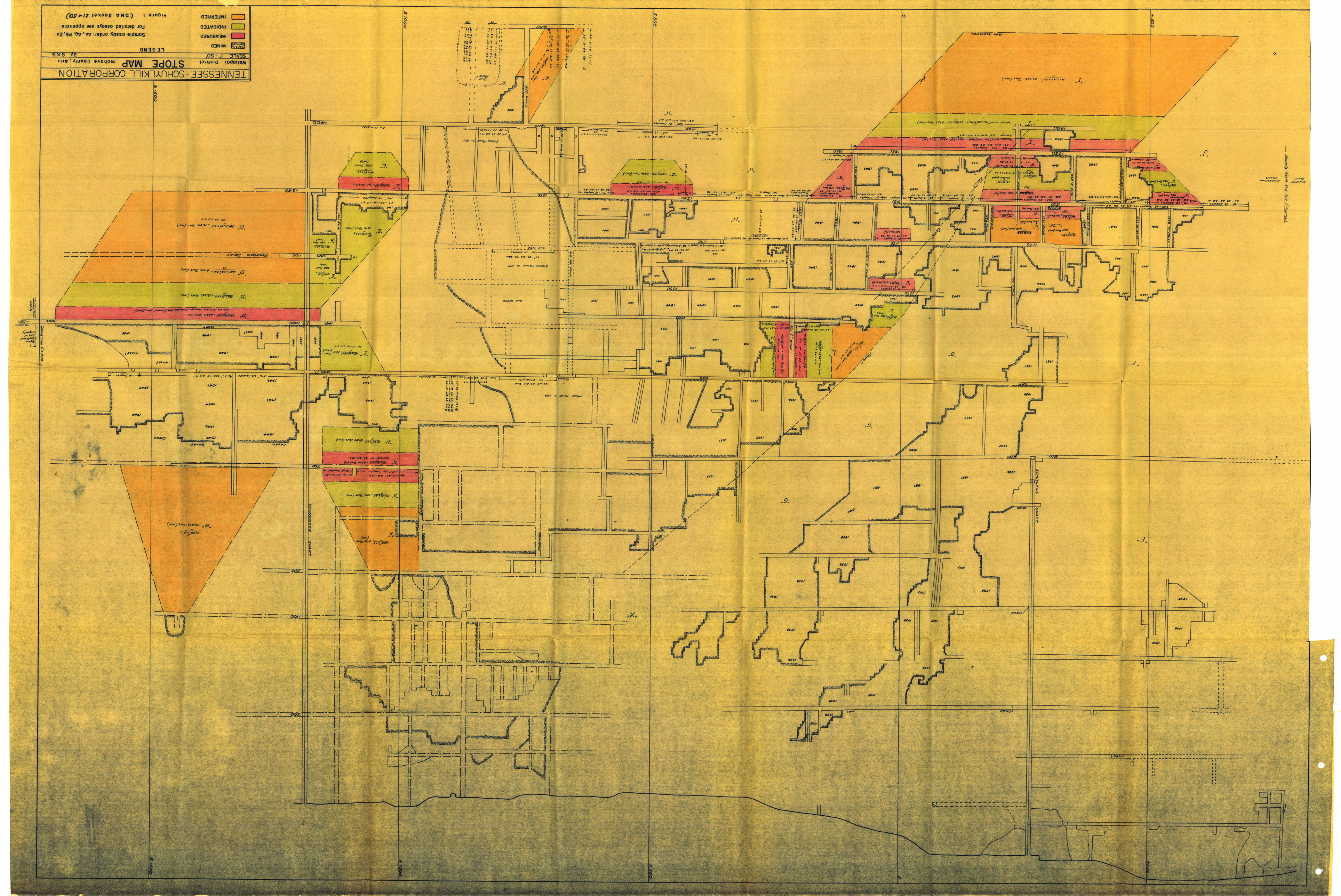
3 Samples average: 2.8 Feet - 0.03 Ounces Gold - 1.2 Ounces Silver - 18.2 Percent Lead - 3.8 Percent Zinc

Length Sampled: 42 Feet

1600 Level: 123 Feet to 126 Feet North of 1600 Winze

3.5	.01	.04	1.1	3.9	7.8	27.3	Tr.	—
[illegible]	.01	[illegible]	0.4	[illegible]	7.6	[illegible]	1.1	[illegible]
7.9		[illegible]		5.7		[illegible]		[illegible]

2 Samples average: 3.9 Feet - 0.01 Ounces Gold - 0.7 Ounces Silver - 7.7 Percent Lead - 0.6 Percent Zinc - Length Sampled 18 Feet


TENNESSEE-SCHUYLKILL CORPORATION
Wallapai District
STOPE MAP
Mohave County, Ariz.
SCALE: 1" = 50'
By: S.K.G.
LEGEND
MINED
MEASURED
INDICATED
INFERRED
Sample assay order: Au, Ag, Pb, Zn
For detailed assays see appendix.
Figure 1 (DMA docket 21-50)
TRAVERSE SHAFT
SCHUYLKILL SHAFT
Stope Floor to 1917
Stope Floor to 1917
Stope Floor to 1917
Old Stope
Pipeline Dept.
Elevator Dam
Shaft Pillar
Shaft Pillar
Shaft Pillar