

John Smith

GEOLOGICAL REPORT
ON THE PROPERTIES OF THE
Tonopah Western Consolidated Mining Company
and
Greenwater Copper Mining & Smelting Company
ESMERALDA COUNTY, NEAR TONOPAH, NEVADA
By
WILBUR H. GRANT

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1918

MARK G. BRADSHAW
TONOPAH, NEVADA

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

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GEOLOGICAL REPORT
on the Properties of the
TONOPAH WESTERN CONSOLIDATED MINING COMPANY
and
GREENWATER COPPER MINING & SMELTING COMPANY
Esmeralda County, near Tonopah, Nevada
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INTRODUCTION

At the request of Mr. Oscar Rohn of the former company, and Mr. Oscar A. Daube and Superintendent John McGee of the latter Company, I visited the above properties during September and October for the purpose of making a geological survey of them.

The Tonopah Western Consolidated Mining Company is a holding company which includes the following subsidiary companies and their holdings:

Tonopah Comstock Mining Company

Golden Gate Consolidated Mining Company

Table Mountain Group of Claims

Silver Queen Group of Claims

The Greenwater Copper Mining & Smelting Company is also a holding company which has as subsidiaries:

Great Western Consolidated Mining Company

Tonopah Bonanza Mining Company
Including the Desert King Mining Company

Tonopah Ruby Mining Company

Sixteen days were spent at the properties. A detailed geological survey was made of all available workings on the

properties above mentioned. In addition to this, an inspection of all the surface was made, and reconnaissance trips were made to the adjacent mines, including the West Tonopah Mine, Monarch Pittsburg, the Ohio workings of the West End Consolidated, and the Tonopah Extension.

Over 100 rock specimens were collected, a chemical analysis was made of a typical specimen of the single ore-bearing formation found in the Great Western workings, a personal microscopic study was made of thin sections of 66 of these rocks, and Professor A. F. Rogers of Stanford University is now making a detailed study of each of these thin sections and will report shortly.

The data obtained and the conclusion drawn from the above sources are incorporated herewith.

WORKINGS

The only work on any of the properties of the Tonopah Western Consolidated Mining Company other than superficial surface diggings, is the Golden Gate Shaft, which is said to be 650 feet deep. The workings on the holdings of the Greenwater Copper Mining & Smelting Company consist, in addition to superficial surface workings, of two shafts with drifts and crosscuts therefrom, listed as follows:

Great Western Property:

<u>Name Working</u>	<u>Depth below Collar</u>	<u>Length</u>	
		<u>Total</u>	<u>Accessible</u>
Shaft		1150 ft.	1133 feet
850 Foot Level	857 feet	220 ft.	220 feet
1140 Foot Level	1133.2 feet	600 ft.	575 feet
Total		1970 feet	1928 feet

Bonanza Mine:

<u>Name Working</u>	<u>Depth below Collar</u>	<u>Length</u>	
		<u>Total</u>	<u>Accessible</u>
Shaft		1650 feet	935 feet
600 Foot Level	573.5 feet	100 feet	50 feet
700 Foot Level	684.0 feet	30 feet	30 feet
850 Foot Level	843.4 feet	15 feet	15 feet
1630 Foot Level	1630.0 feet	<u>513 feet</u>	<u> </u>
Total		2308 feet	1030 feet

The workings of the adjacent West Tonopah Mine are as follows:

West Tonopah Mine:

<u>Name Working</u>	<u>Depth below Collar</u>	<u>Length</u>	
		<u>Total</u>	<u>Accessible</u>
Shaft		1100 feet	1010 feet
500 Foot Level	528 feet	430 feet	430 feet
700 Foot Level	720 feet	780 feet	780 feet
800 Foot Level	822 feet	390 feet	380 feet
950 Foot Level	945 feet	2325 feet	940 feet
1100 Foot Level	?	<u>?</u>	<u>?</u>
Total		5025 feet	3540 feet

The Golden Gate Shaft has been in disuse for several years, so it was considered unsafe by Mr. McGee to attempt to go down it.

Most of the workings of the Great Western Mine were available. The south crosscut from the shaft on the 1133 Foot Level had been bulkheaded on account of having encountered a strong flow of water. The north crosscut of this level was open, but very wet from a strong flow of water. The 850 Foot Level was used as a reservoir, but it was possible to get into all of the

workings on this level.

The Bonanza Mine has very few lateral workings. The skip in the shaft could not be lowered below a point about 860 feet below the collar, on account of swelling timbers. The lower levels are under water and the upper levels were not much more than stations.

It was only from these very few workings that geological data were available.

MINE WATER

There was water in the bottom of the Golden Gate Shaft, but, as it was impossible to go down it, the exact elevation was not determined.

The normal ground water level of the Great Western Shaft is about 65 feet below the 850 Foot Level. By extending the workings below this point and laterally from the shaft, the flow increases rapidly as each vein, fault, and fissure is encountered.

In sinking the Tonopah Bonanza Shaft no water was encountered above the present bottom of the shaft, 1650 feet below the collar, with the exception of a small amount of surface water which was caught at the 600 Foot Level. The last drill hole driven in the bottom of the shaft encountered a very strong flow of water which had to be blocked. This accounted for the discontinuance of the shaft sinking. The work was discontinued in July of this year. The present water level was estimated at about 1400 feet, and was continuing to rise slowly. It is not known what the permanent ground water level will be. In the West Tonopah Mine the conditions were quite similar to that

at the Great Western Mine adjacent to it. The ground water level is slightly below the 945 Foot Level, which is a little higher than the ground water level in the Great Western workings. It is very evident that there is an underground connection between these two shafts, as pumping in one shaft lowers the water in the other.

There is very little water in the workings in the central portion of the Tonopah Camp, some mines being without any at all, but the water increases in the mines towards the west and increases rapidly with depth. Mr. McGee informs me that the Great Western Mine was making about 1000 gallons per minute when the West Tonopah Mine was not pumping and all workings were open. By bulkheading some of the worst fissures the amount of water to handle was reduced.

The mines in this portion of the camp depended on electrical power to run their pumps. This power was intermittent, due to interruption during electric storms, so that it was found necessary to construct an auxiliary power plant at Tonopah to furnish immediate power when the main lines went out. The flow of water was so great and the margin of safety between the pumping capacity and the flow was so slight, that the mines were frequently bothered by having their pumps flooded.

The pumping capacity at either the West Tonopah or Great Western Mines was less than 1000 gallons per minute. This would barely hold the flow. Therefore it is quite evident, if this portion of the camp is developed on an economical scale, the ground water is a very important geological occurrence to consider in outlining the work. It is necessary to provide

pumping capacity for at least twice the present flow with provisions for an increase in this capacity should development prove that this is desirable.

GENERAL GEOLOGY

The general geology of the Tonopah District is exceedingly complicated. The central portion of the camp lies between two series of volcanic necks. Those to the northeast are represented by Mount Ararat, Mount Oddie and Golden Mountain. Those to the southwest by Brougher Mountain, Brock Mountain, Butler Mountain, and Siebert Mountain, which represent the main series of the volcanic activity of the immediate vicinity. There are no sedimentary formations in the district. The rocks consist entirely of explosive, effusive, and intrusive volcanic rocks. Mr. J. E. Spurr (Economic Geology, Volume 10, Number 8, Page 713, December, 1915) gives a synopsis of the geological history as follows:

"At Tonopah the oldest rock is a trachyte flow highly altered to quartz, sericite, and adularia. The lower part of this flow is a fine flow-banded glassy trachyte. The main body of the trachyte contains the oldest and by far the most important group of mineral veins; the glassy trachyte appears practically barren.

"Stresses subsequent to the trachyte extrusion produced horizontal fissuring near the zone of transition between the main body of trachyte and its glassy lower portion; and along here an andesite (Sandgrass andesite) intrusion penetrated. After renewed fissuring along the same zone, a glassy trachy-alaskitic

intrusion (Montana breccia), very full of inclusions, took place, usually following along immediately above the andesite. Subsequent movement reopened this line of weakness, and a second trachy-alaskitic intrusion came in -- the West End rhyolite sheet -- which penetrated along a fissure usually lying immediately above the Montana breccia. At a subsequent epoch came an eruption of andesite (Midway andesite) as a surface flow; at a still later epoch there was a series of rhyolitic and alaskitic surface flows and intrusions, of which the most important in the mine workings is a great intrusive mass called the Tonopah rhyolite.

"The principal veins were formed after the trachyte eruption and before the Sandgrass andesite-Montana breccia-West End Rhyolite intrusions. They are quartz veins carrying silver and gold. A second set of veins was formed after the West End rhyolite intrusion and before the Midway andesite eruption. This second set is divided into four successive groups--A, large typically barren quartz veins; B, tungsten-bearing veins; C, mixed quartz and adularia veins, typically barren; D, productive veins like those of the first set following the trachyte. A third set of veins was formed after the Tonopah rhyolite intrusion. They are quartz veins carrying occasional lead, zinc and copper sulphides.

"All these veins formed at shallow depths, and the different types are held to represent various stages of temperature. The First Period veins represent the normal shallow-seated type, and followed the trachyte eruption; the Second Period B veins probably represent an abnormally intense shortly-sustained temperature, following the trachy-alaskitic intrusion;

the Second Period D veins a subsequent briefly-sustained stage of temperature more normal to shallow depths, the Third Period a relatively high but briefly-sustained temperature following the alaskitic (Tonopah rhyolite) intrusion. No important vein-formation followed the andesite eruption.

"The history of faulting is long and complex; important movements have taken place at every stage of the geologic history. These movements accompanied and were due to the volcanic disturbances."

The above data in tabulated form is as follows:

Rhyolite-dacite Flow (Latest)
(Fourth Period = Chalcedony)

Brougner Dacite

Oddie Rhyolite

Basalt

Siebert Tuffs

(Third Period = Colorless, usually translucent quartz)
(occasionally sulphides in considerable amounts at or
(near contacts in Tonopah Rhyolite. Sulphides are
(galena, sphalerite, pyrite and chalcopyrite, little
(silver values, when sulphides are absent the quartz
(has decided amethystine or rose color.)

Tonopah Rhyolite Breccia

Fraction Dacite Breccia

Heller Dacite

Midway Andesite

(Second period = A = Frosty lustered quartz, frequent)
(barite (nearly barren)
(B = Honeycombed quartz, gypsum, hübnerite, (barren)
(C = Quartz, adularia (barren)
(D = Banded or crustified gray quartz; pinkish
(manganese bearing carbonates carries silver sul-
(phides like first period. Rich but narrow veins
(and sweetens A Quartz of Second Period.)

West End Rhyolite -

Montana Breccia - Ext. Breccia

Mospeh Trachyte

Sandgrass Andesite

(First Period - Main productive Quartz Veins.)
 (Primary minerals - white quartz, adularia, carbon-)
 (ates of lime, magnesium and manganese; stephanite,)
 (polybasite, argentite, silver selenide, galena,)
 (pyrite, chalcopyrite, etc.)

Mizpah Trachyte**Glassy Trachyte****Hornblende Andesite****Granite****SURFACE GEOLOGY**

The surface of the property under examination consists almost entirely of wash and Siebert Tuffs. At the ^{south} eastern corner of the property, especially on Ruby Group, there is exposed a small amount of fraction dacite breccia. Just to the north of the Great Western Shaft there is a fault block which is capped by an outlier of Brougner dacite. Near the Golden Gate Shaft is an area of vesicular rhyolite flow breccia. Practically all the rest of the large area is covered by Siebert tuffs and in turn by variable amounts of wash. On account of the fact that all of these rocks are of late age and all post mineral, no attempt was made to construct a surface geological map of the property.

GREAT WESTERN MINE

As will be seen by Map No. 3, the geological log of the shaft is as follows:

<u>From</u>	<u>To</u>	<u>Thickness</u>	<u>Name of Formation</u>
Collar	32 feet	32 feet	Dump material and wash.
32 feet	258 feet	226 feet	Siebert Tuffs.
258 feet	750 feet	492 feet	Fraction Dacite Breccia.
750 feet	1067 feet	317 feet	Midway Andesite, Including 850 Level.
1067 feet	1150 feet	83+ feet	Western Latite.

Rocks

As will be seen from Mr. Spurr's classification above, there are no rocks later than the West End rhyolite, which carries veins of commercial value. Therefore all rocks above a depth of 1067 feet in the Great Western Shaft afford no possibilities of containing veins of value. Hence these are called cap rocks. The rocks shown above this point are more or less typical of the rocks in the central portion of the camp, which have been described abundantly in published literature, so that these rocks will not be re-described here.

The rock throughout most of the 1133 Foot Level does not correspond exactly to any of the rocks described in the central portion of the camp, so this formation has been given a most thorough study. A chemical analysis was made of specimen #27, and a thorough microscopic study made of the thin sections of 12 specimens representing different phases of the formation which were taken from the 1133 Foot Level.

This rock is light greenish gray in color, and more than half of the exposed portion shows a pronounced flow banding, the bands being light gray and light brown in color alternately. This flow structure strikes on an average of N 80 W, and dips 50° to north. The flat contact between this formation and the Midway andesite immediately above, shows the andesite is unconformable with this formation. There are numerous slips and faults which fault the contact, while there are others which apparently do not extend into the andesite. There is intense alteration of the formation which is not true of the above cap rocks. This alteration consists of variable quantities of

silicification with keolinization. The texture of the rock is distinctly porphyritic, but the phenocrysts have been so altered that they are recognizable with great difficulty. There were no quartz phenocrysts whatsoever. There were abundant* feldspar phenocrysts, but these are not recognizable as such in the hand specimen, although their casts are recognizable. The original biotite phenocrysts are still recognizable, but these are considerably altered to chlorite. Secondary calcite and quartz and minute quartz veinlets are common. On account of the almost complete obliteration of the original characteristics of the rock, it was necessary to resort to chemical and petrographical means for determining its classification. The type specimen was analyzed by Booth, Garrett & Blair, of Philadelphia. They gave the following analysis of this rock:

Silica-----	68.00 %
Alumina-----	17.41 "
Ferric Oxide-----	3.40 "
Ferrous Oxide-----	0.49 "
Lime-----	1.12 "
Magnesia-----	0.76 "
Soda-----	0.082"
Potash-----	4.051"
Titanic Acid-----	0.42 "

This analysis corresponds quite closely to Mr. Spurr's average analysis of his so-called Mizpah Trachyte with two exceptions. The lime is slightly high and the soda slightly low for his average analysis, but these do not vary as much from his average as some of his definitely determined rocks of this class. Titanic

acid was not reported in any of the published analyses of the trachyte, but occurs in an appreciable amount in this rock, indicating the presence of titanite.

The microscopic study of the thin sections of this rock shows very plainly the megascopic conclusion that the rock has been intensely altered. Both the groundmass and the phenocrysts are almost completely replaced, with the exception of biotite and a few other accessory primary minerals. There are few unreplaced fragments of the original minerals which give a clue to its original classification, but even these fragments are determined with great difficulty and the determinations are not incontrovertible. The whole rock, as it is, is composed almost exclusively of secondary products and introduced substances. The primary minerals appear to be phenocrysts of biotite and plagioclase with some apatite and other accessory minerals. The biotite and whatever other few ferro-magnesian minerals there might have been, have altered to chlorite, epidote and kaolin. The feldspars have altered to quartz and kaolin. There are so few secondary ferro-magnesian minerals in the rock that it is evident that the primary minerals of this class were very few. The ground mass is almost completely a microcrystalline mass of secondary quartz and kaolin. In addition to the above, there is considerable sericite and some muscovite. These two minerals probably account for most of the potash content of the rock. These data require a classification of this rock as biotite andesite, but the small quantity or complete absence of original ferro-magnesian minerals shows that the rock tended to a more acid variety.

On account of the pronounced flow structure and other general characteristics which differ from the Mizpah Trachyte of the central portion of the Tonopah Camp, while its chemical and microscopic characteristics correspond, there are still sufficient doubts about the identity of the two formations which justify me in refraining from classifying them as identically the same rock. It might ^{possible} be/after an opportunity has been had to compare the types in more detail, to identify these as the same, but in any event this rock will remain a different phase from that found in the central portion. In view of the fact that this rock has no resemblance to a trachytic texture and has the chemical and mineralogical characteristics of a transition rock between the trachyte and the andesite, I have classified it as a latite.

The age of this rock is of much more commercial importance than its exact name. The data bearing on this is very incomplete in the 1133 Foot Level of the Great Western Mine. It is definitely older than the Midway andesite, as the andesite, both in the Great Western Shaft and the north crosscut of the 1133 Foot Level, includes fragments of the latite, and slightly intrudes at its contacts. The latite shows greater age by its greater alteration and faulting. The relative age of the West End rhyolite has not been determined. Specimens of the West End rhyolite were found on the West Tonopah dump, and Mr. McCee reports that he has seen it in portions of those workings which were not accessible to me at the time of my visit. When the West Tonopah workings are all unwatered and the bad air has been removed, it is possible that the relation between

the latite and West End rhyolite can be determined. As the latite is older than the Midway andesite it is old enough to carry the highly productive second period "D" mineralization above described, and may or may not be old enough to carry the first period quartz veins. Therefore this latite is a formation sufficiently old to carry veins of commercial mineralization.

Mineralization

My study indicates that there was mineralization after each intrusive mentioned in the above list. So far as found, however, there are only four periods of mineralization which occur in considerable quantity, and only two of these carry appreciable metallic minerals of commercial value. These have been described briefly above.

The first period represents the large high grade veins which have produced the majority of the values of the Tonopah Camp. They are found only in the Mizpah Trachyte which, with its glassy phase, is the only formation found in place in the district that is older than this first period of mineralization. Fragments of still ^{older} order rocks are found in the trachyte, such as hornblende andesite, granite and limestone, but these rocks do not occur as a formation, so far as development work has gone.

The second period of mineralization occurred after the West End rhyolite intrusion. Therefore this mineralization can occur in the West End rhyolite, Montana breccia, Extension breccia, Sandgrass andesite, Mizpah trachyte, and glassy trachyte. It characteristically occurs, however, essentially in the West End rhyolite and Montana and Extension breccias. The second period is represented by four distinct stages of

mineralization as previously described. The first stage occurs in tremendous quantities forming veins and silicified country rock of many tens of feet in thickness. The "B" and "C" stages occur in relatively small quantity. The "D" stage carries practically all the values of this second period, and most frequently occurs as the deposition in re-openings of the veins of the "A" stage of the second period. This fact has caused this "A" stage of the second period to be considered productive mineralization.

It is a commonly observed fact, although not necessarily true in every case, that the first period of mineralization usually occurs as rather steep veins, while the common occurrence of the second period of mineralization is as flat veins varying from 50° to horizontal. The third and fourth periods, recognized as such, are not found in the West Tonopah, Great Western, or Bonanza workings, nor at surface within the area under examination. The fourth period, however, is abundantly represented a short distance to the east of the Ruby Group, where large quantities of chalcidonic quartz are found on the east side hill.

Veins

In the Midway andesite, especially on the 850 Foot Level, numerous weak quartz veins are found, and at the station there is a three foot zone of silicified andesite. This mineralization is not sufficiently exposed to correlate with the mineralization above classified for the central portion of the camp, but it is known to carry no values and never can be expected to. It is later than the productive types of mineralization.

On the 1133 Foot Level in the latite, there is one strong vein with several weaker stringers. These are definitely

classified as the second period of mineralization of the "A" and "D" stages. These are shown on Map No. 3. The main vein strikes N 80 W, parallel to the flow structure, and dips 26° to the north, this flat dip being characteristic to the second period mineralization. This main vein is essentially a silicified latite zone in two parts, the upper and larger part is five feet thick, and separated from the one to two foot lower part by an unsilicified latite band. The degree of silicification varies between wide limits, from nearly unsilicified latite to solid white quartz. This solid quartz occurs in only small quantity. The color is prevailing dark gray. There is imperfect replacement of the original latite fragments, leaving many cavities which are frequently incrustated by barite and fine pyrite. Barite will be remembered as the characteristic mineral of the second period "A" stage of mineralization. The quartz of this vein is of the typical frosty variety. At a point half-way in from the north crosscut in the west drift, there was a spot of sulphides in this silicified zone which ran about \$50.00 per ton in gold and silver, which shows that this vein can be "sweetened" by the second period "D" stage of mineralization, and that the vein is well worth additional development.

The easterly end of this vein has been cut off by faults as represented on the map. Although there is recent movement along the fault planes, these faults appear to have been essentially pre-mineral faults, which have caused the mineralization to pinch down at the time of deposition. This indicates that the vein will be discontinuous and hard to follow, as is found to be the case in the West Tonopah workings at a similar

horizon. It is significant, however, that this mineralization is of the productive type, and it is to be expected that the development work will show up varying degrees of silicification by barren quartz, which is locally "sweetened" by metallic minerals of commercial value.

The characteristics of the vein, so far as exposed, indicates that the mineralization is either far from its origin, or that the quantity of quartz was not great at this particular point. Development work alone can prove whether or not there are other and stronger veins in this portion of the district and what the productive characteristics of the veins will be.

BONANZA MINE

The geological log of the Bonanza Shaft is as follows:

<u>From</u>	<u>To</u>	<u>Thickness</u>	<u>Name of Formation</u>
Collar	25 feet	25 feet	Dump and wash.
25 feet	452 feet	427 feet	Siebert Tuffs.
452 feet	816 feet	364 feet	Fraction Dacite Breccia.
816 feet	1650 feet	834 feet	Midway Andesite.
1650 feet			Western Latite

exposed
These/rocks are all cap rocks and cannot carry any veins of commercial importance. The lower portion of the andesite, as developed near the bottom of the shaft and represented by the material on the dump, is quite fresh. This shows that there is relatively little faulting, leaching, or ascending mineralization in this area.

The drill hole at the bottom of the shaft encountered a very different character of material. The drillings were decidedly white in color, showing that a leached fault in the

andesite had been encountered or that the drill hole had entered a new formation, possibly the latite. As that portion of the workings is now under water, it was necessary to take Mr. McGee's data in regard to the nature of the rock encountered in this drill hole.

There is a pronounced lack of mineralization of any sort in any of the workings of the Bonanza Mine. As all the rocks are cap rocks, no important mineralization could have been found therein.

It is quite definitely proved that if this property ever develops any commercial veins, they will be at least 600 feet lower than those in the Great Western Mine, and at the west end of the Bonanza property they will be at most 3200 feet in elevation, or 2400 feet below the surface.

This property, however, is on the main trend of the Tonopah mineralized belt. Therefore it is a property of vague potentialities, but on account of its position, has possibilities which might be developed at a profit at some future time. It should not be developed at present, however, on account of the depth of the favorable formation, and therefore increased costs, until after the more promising portion of the consolidated properties has been developed.

TONOPAH WESTERN MINE

As has been stated above, there is no work on the Tonopah Western Mine of importance other than the Golden Gate Shaft, which is down 650 feet. This is all in cap rocks, consisting mostly of some of the later rhyolite breccias.

At the east end of the Tonopah Western property the favorable formation I estimate to be at the probable elevation of

4600 feet, or 1180 feet below surface. At the southwest corner the favorable formation will be at an elevation of 3900 feet, or 1745 feet below surface. At the northwestern corner the favorable formations will be at about the elevation of 3430 feet, or 2180 feet below the surface.

There is no development on this property in the favorable formation. Therefore there is no data to prove whether or not there are any veins apexing in the Tonopah Western Consolidated Mining Company's ground. Development of this area will be pioneer work, which can be done cheapest by developing the east end of the property by sinking the Great Western Shaft 500 feet deeper and crosscutting 2700 feet northerly.

WEST TONOPAH MINE

At the time of my visit the management of this property was unwatering the shaft to the 1100 Foot Level. The skip was very busy so that it was impossible to study the geology in the shaft. On the 945 Foot Level the north crosscut was used as a sump, so was inaccessible. The south crosscut to the vein was open, but at the vein bad air was encountered, so that none of the vein workings could be studied. Therefore only a small portion of the 945 Foot Level and the upper levels were accessible. Consequently I made only a hurried inspection of these workings. Since my visit the water was lowered to the 1100 Foot Level and crosscutting southerly towards the known vein was started, but such a large flow of water was encountered that this crosscut had to be abandoned. When sufficient pumping facilities have been installed, it will be valuable information for the

consolidated group under examination, to completely map the West Tonopah workings.

Numerous small veins were encountered in the upper workings, but all these carried very little values. It is reported that the vein ⁸¹⁰ 720 feet south of the shaft on the 945 Foot Level would not carry continuous mineralization. There was a strong fissure in which lenses of quartz occur, and in some of these lenses good values were found. Some of this mineralization was found on the dump. A sample of this was assayed, which ran .1 ounce gold, 1.1 ounce silver, or a value of \$3.10 with silver at \$1.00 an ounce. It is reported that later development by a winze on this vein has encountered mineralization running over \$30.00 per ton. The results obtained by developing this vein will have an important bearing on the possibilities of the Great Western vein.

ORE POSSIBILITIES

From the above data and attached maps it is evident that the West Tonopah and Great Western Shafts have already reached the favorable formations in which productive veins can be found, but these shafts have reached only the top of the favorable formations. The Great Western Shaft has penetrated it for only 65 feet. As above stated, I was unable to determine how deep the favorable formation has been developed in the West Tonopah Mine, but probably an equivalent amount. This work has exposed strong quartz veins with spotted value at or near their apexes. I have concluded that the main veins in these two workings are the same.

It is considered in this district that the main vein of these two mines is the same as that found in the Monarch

Pittsburg Mine to the east, and the Monarch Pittsburg vein is further considered to be an extension of the Murray Vein of the Tonopah Extension property. They have similar strikes and a flat northerly dip and carry similar mineralization, so it is possible that the general impression is true. If development proves that these exposures are all one and the same vein, this vein has a remarkable continuity for the Tonopah District. It cannot be expected that commercial mineralization or even quartz will be continuous throughout this fissure, but if the fissure continues for that distance it will be encouraging for the future of this Western District.

The Merger Vein of the Tonopah Extension trends towards the consolidated group under examination, but no development work has been done on the Merger Vein within 6000 feet of the property. This intervening area will need to be developed before any definite conclusions regarding its extension can be made. This vein has a westerly strike and a northerly dip similar to that of the ^{Murray?} Merger Vein.

These facts combined with the intense alteration of the favorable formation found in the West Tonopah and Great Western workings, are the principal data encouraging development work of this western area.

The unfavorable features of this district are that the faulting is less intense although present in this portion of the district. It is one to two miles from the volcanic necks, and therefore regions of volcanic activity, and the relative weakness of replacement of country rock by silicified solutions so far as developed.

CONCLUSIONS

My conclusion is that, although the geology of this portion of the Tonopah District, so far as developed, indicate that veins will not be such big producers ^{those of} as the central portion of the Tonopah Camp, the veins are of sufficient strength and contain enough high grade spots and silicified barren material to warrant the development of this area.

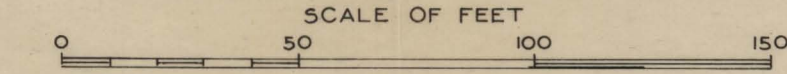
Respectfully submitted,

Wilbur H. Grant

San Francisco,

October, 1918.

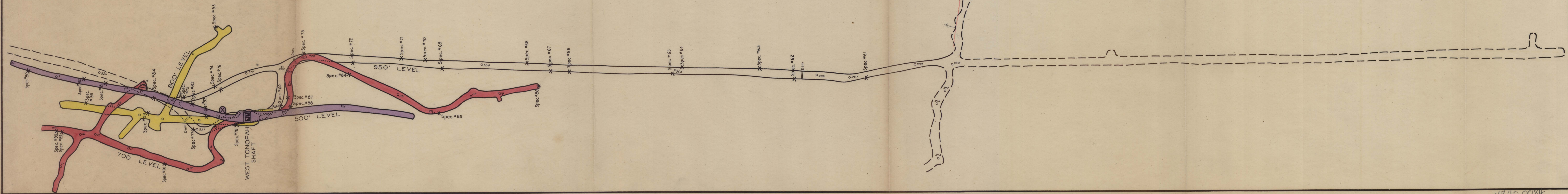
TONOPAH WESTERN CONSOLIDATED MINING CO.
 ESMERALDA CO. NEAR TONOPAH, NYE CO., NEVADA
COMPOSITE PLAN
WEST TONOPAH WORKINGS
 TO ACCOMPANY REPORT BY WILBUR H. GRANT, OCT. 1918



LEGEND

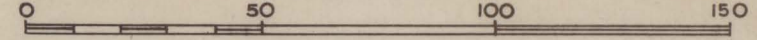
Workings below Plan	
Inaccessible Workings	
Rock Specimens	Spec. #27 x

MARK G. BRADSHAW



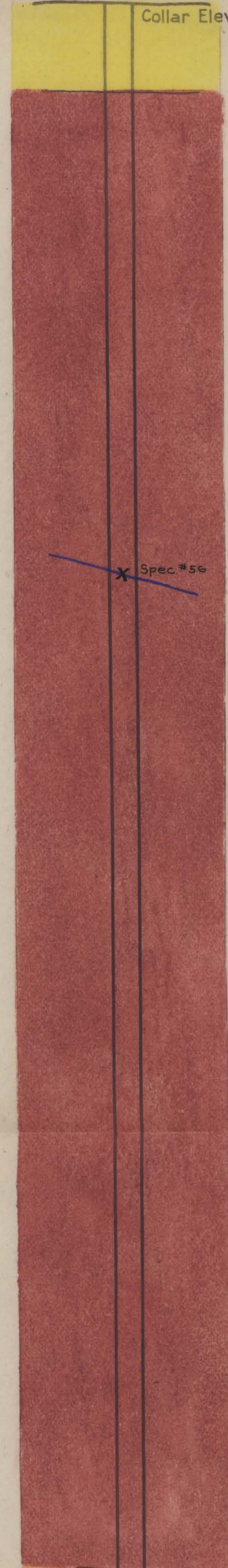
TONOPAH WESTERN CONSOLIDATED MINING CO.
ESMERALDA CO. NEAR TONOPAH, NYE CO., NEVADA
GEOLOGICAL SECTION
BONANZA SHAFT

LOOKING S. 84° W.
TO ACCOMPANY REPORT BY WILBUR H. GRANT OCT. 1916
SCALE OF FEET



LEGEND

- Wash and Dump Material.....
- Siebert Tuff.....
- Tonopah Rhyolite Breccia.....
- Midway Andesite.....
- Faults and Fissures.....
- Rock Specimens.....
- Inaccessible Workings.....
- Workings back of Section.....



573.5'-600' LEVEL

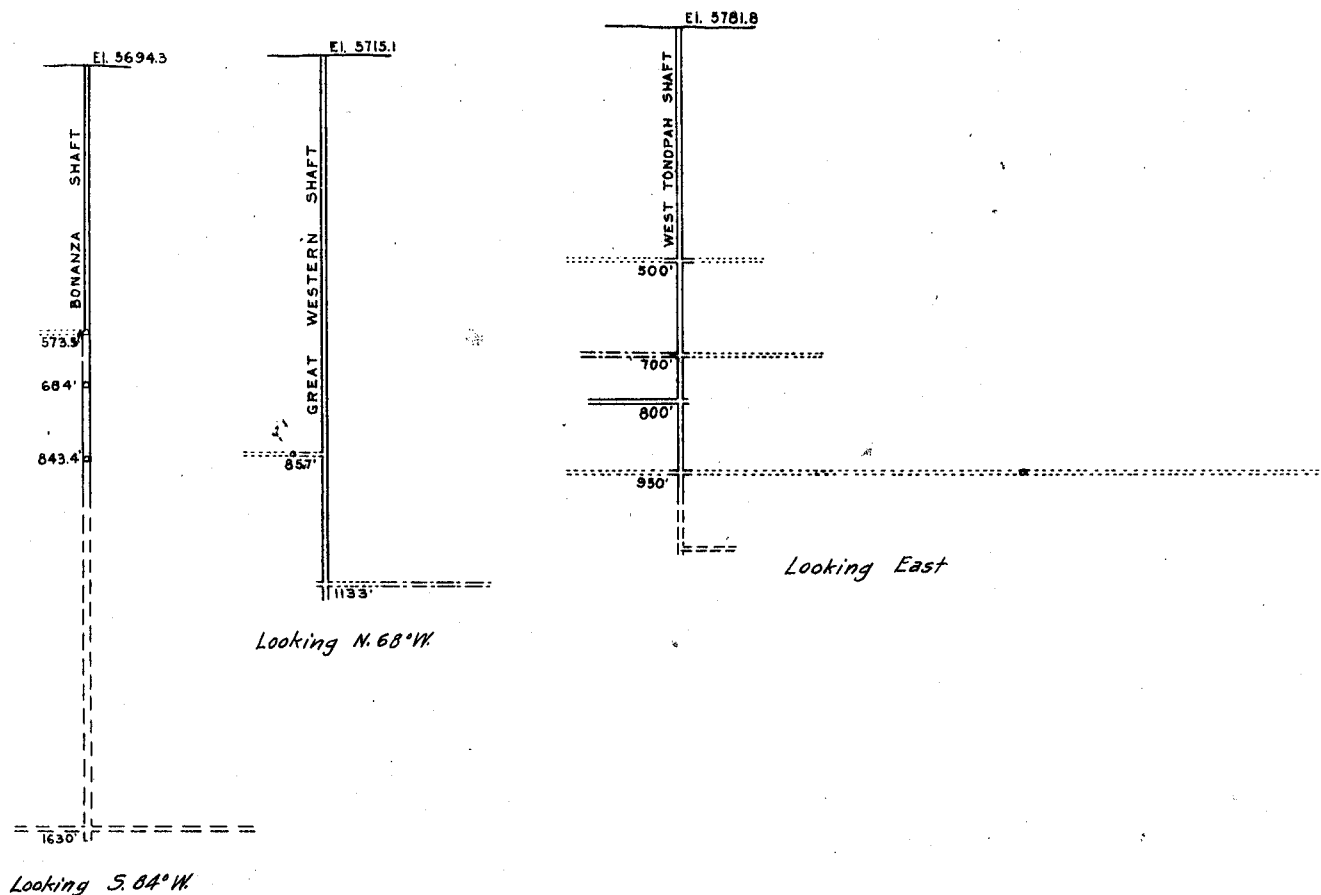
684'-700' LEVEL
XCUT 30' EASTERLY

X Spec. #58

843.4'-850' LEVEL
XCUT 15' EASTERLY

X Spec. #57

1630' LEVEL



TONOPAH WESTERN CONSOLIDATED MINING CO.
ESMERALDA CO. NEAR TONOPAH, NYE CO., NEVADA

SHAFT SECTIONS

SHOWING SEA-LEVEL ELEVATIONS OF COLLARS
 AND DEPTH OF DEVELOPMENT WORK

TO ACCOMPANY REPORT BY WILBUR H. GRANT, OCT. 1918

SCALE OF FEET



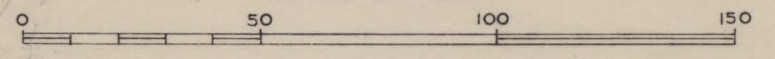
Workings in front of Section ————
 " back of Section
 Inaccessible Workings ————

MARK G. BRADSHAW

TONOPAH WESTERN CONSOLIDATED MINING CO.
ESMERALDA CO. NEAR TONOPAH, NYE CO., NEVADA
GEOLOGICAL SECTION AND PLANS
GREAT WESTERN CONSOLIDATED WORKINGS

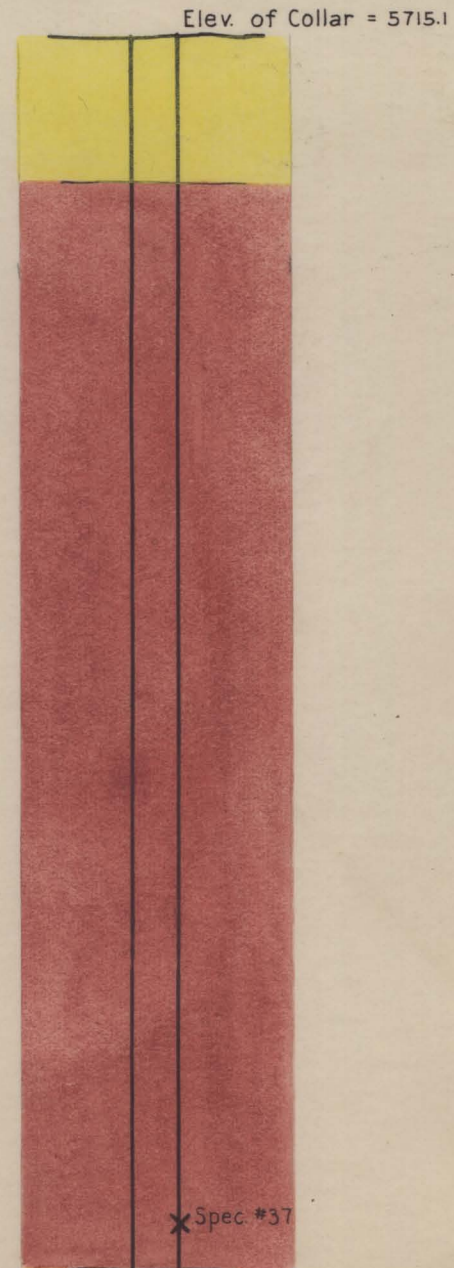
TO ACCOMPANY REPORT BY WILBUR H. GRANT OCT. 1918.

SCALE OF FEET

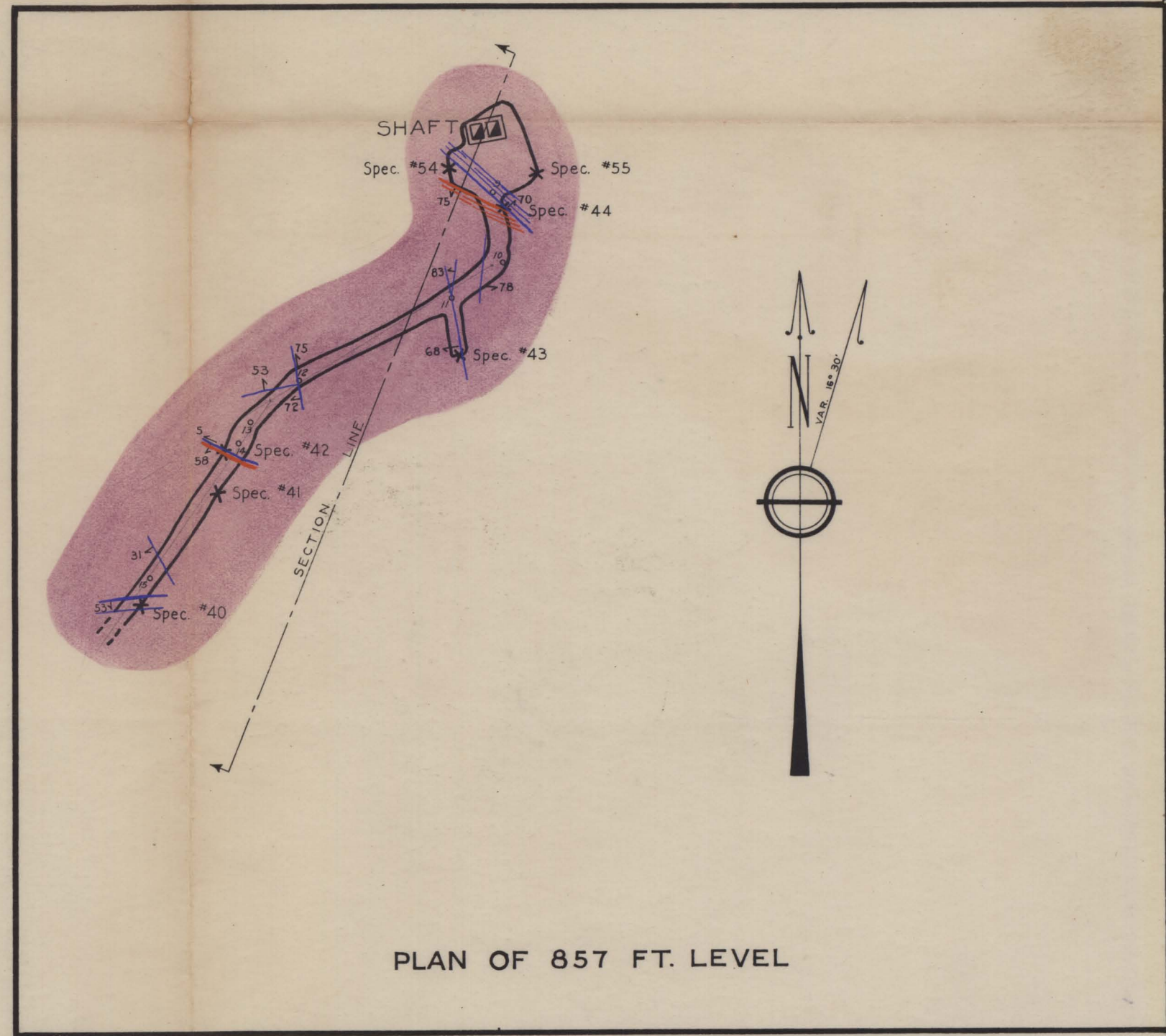


LEGEND

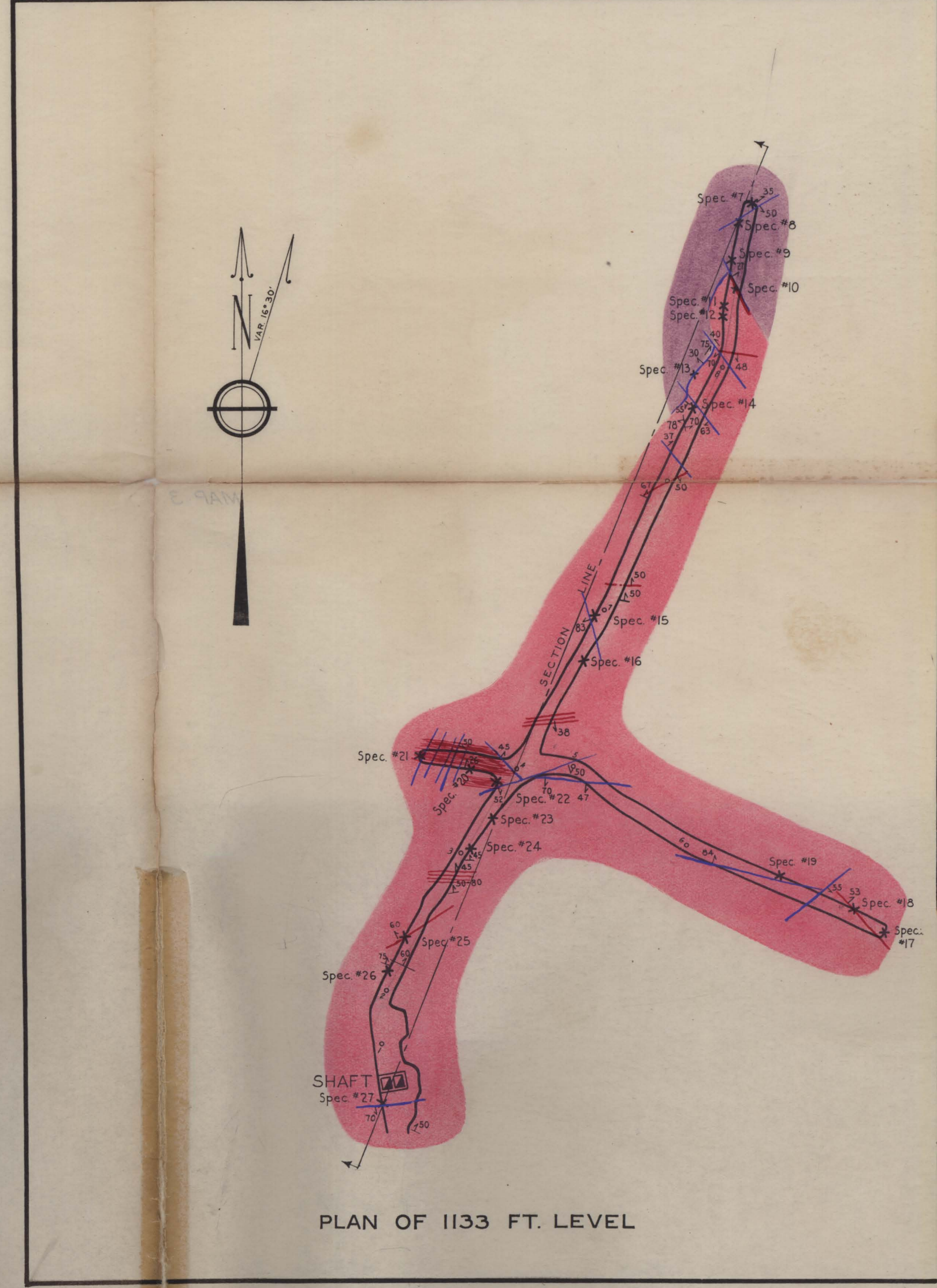
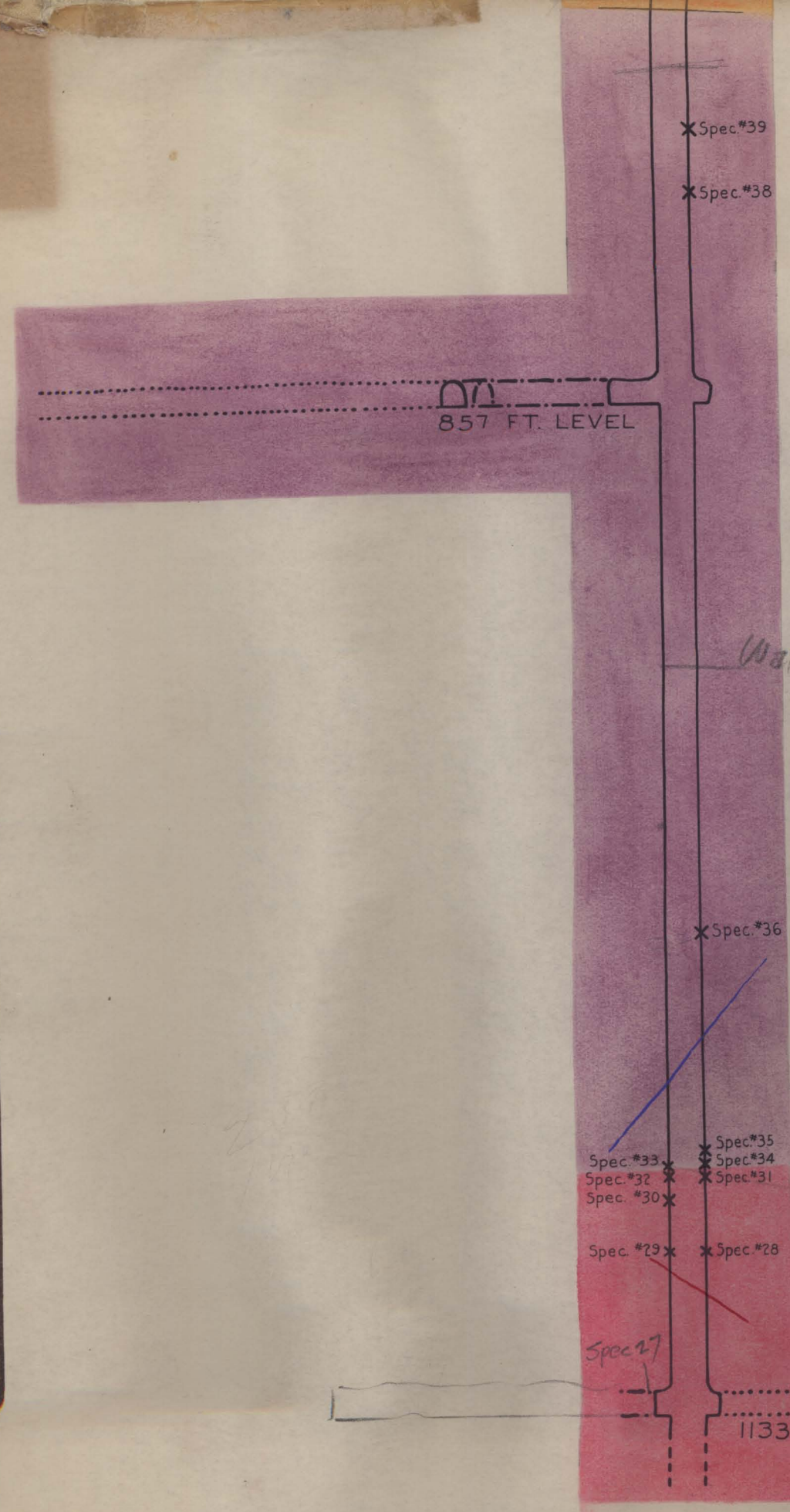
Wash and Dump Material.....	
Siebert Tuff.....	
Tonopah Rhyolite Breccia.....	
Midway Andesite.....	
Western Latite.....	
Faults and Fissures.....	
Unproductive Mineralization.....	
Productive ".....	
Rock Specimen.....	
Workings in front of Section.....	
" back of " ".....	



Spec. #53 X



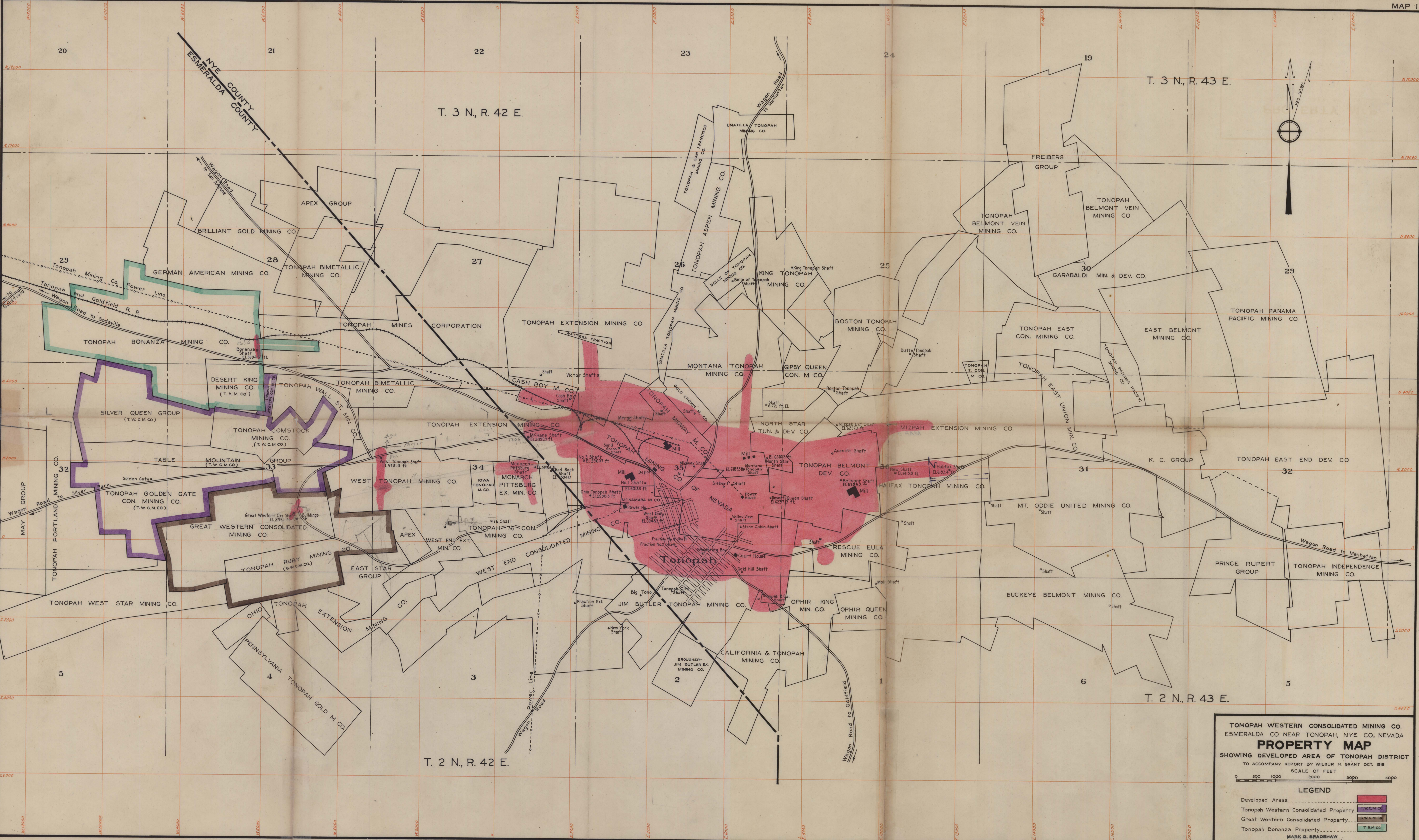
PLAN OF 857 FT. LEVEL



PLAN OF 1133 FT. LEVEL

SECTION OF SHAFT
LOOKING N. 68° W.

4840 0084



TONOPAH WESTERN CONSOLIDATED MINING CO.
ESMERALDA CO. NEAR TONOPAH, NYE CO. NEVADA

PROPERTY MAP

SHOWING DEVELOPED AREA OF TONOPAH DISTRICT
TO ACCOMPANY REPORT BY WILBUR H. GRANT OCT. 1918

SCALE OF FEET
0 500 1000 2000 3000 4000

LEGEND

- Developed Areas.....
- Tonopah Western Consolidated Property.....
- Great Western Consolidated Property.....
- Tonopah Bonanza Property.....

MARK G. BRADSHAW