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REPORT ON

West End Mine,

Tonopah, Nev.

SPURR & COX, (INC.)
305 BOSTON BUILDING, DENVER, COLO.
165 BROADWAY, NEW YORK, N. Y.
ROOM 401, N. W. COR. CINCO DE MAYO Y
SANTA CLARA, MEXICO CITY, MEX.

REPORT ON

WEST END MINE

TONOPAH, NEVADA

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REPORT ON WEST END MINE, TONOPAH, NEVADA

Tonopah, Nevada, August 6, 1908.

Mr. F. M. Smith,
President, West End Consolidated Mining Co.,
Oakland, California.

Dear Sir:

Following is our report on the West End mine, at Tonopah. This report covers geological conditions and their application.

SUMMARY

In the West End mine are the following rock formations, in descending order: dacite breccia, later andesite, early andesite, West End dacite, and lower andesite. The West End lode is a body of quartz occurring at the upper contact of the West End dacite. The amount of quartz is irregular, but is greatest, so far as developt, in the West End, on the south edge of the developt area. The lode has been traced thru the Tonopah Extension, MacNamara and West End properties, and undoubtedly also passes into the California claim. Its strike is a curving one so that while in the MacNamara it strikes east-and-west and dips north, on the southern edge of the developt area in the West End it strikes west-southwest

and dips southerly. The legal apex of the lode is exposed both in the West End and the MacNamara claims, where the lode is covered by the dacite breccia.

In the Ohio Tonopah mine, all the workings have apparently missed the lode, some being too high, others too low; but it could probably be easily located. The vein in the California claim is probably restricted to the northeast portion.

The probable course of the apex across the California, MacNamara, and West End claims is described in the body of the report, and the legal aspects discussed.

The present West End policy of mining the best ore, sorting it up to shipping grade and neglecting development, is regarded as wrong; and a policy of developing the mine, blocking out and valuing the ore, and making preparations for systematic and extensive mining is recommended.

ROCK FORMATIONS

The following rock formations are exposed in the West End workings. They are all of volcanic origin, and Tertiary age. I begin with the uppermost.

1. Dacite breccia A soft rock composed of volcanic ash and angular fragments of lava, the detritus resulting from a volcanic eruption of explosive nature.

2. Later andesite An andesite of usually purple color. This is a volcanic flow.

3. Early andesite. A volcanic flow somewhat older than the later andesite, and distinguisht from it by certain characteristics.

4. West End dacite. This formation in the West End mine I formerly called Tonopah rhyolite-dacite, but for sufficient reasons that I need not here detail, I have changed the name to the above. There are two main divisions of this rock: the upper division I have called the Ohio phase, and the lower the MacNamara phase. The former is more crystalline, and resembles the early andesite: the latter is a dense green rock, characteristically enclosing angular white fragments.

5. Lower andesite. Beneath the West End dacite, in the West End shaft, comes a fine-grained andesitic rock of a general green color. This is the lowest formation exposed in the mine.

THE WEST END VEIN

Conditions of Formation

At the contact of the West End dacite (which, as the maps and sections show, forms an undulating gently dipping sheet) with the overlying early andesite, a great deal of quartz has been deposited, over a considerable area. The exact contact has been the site of most intense silicification, and from the contact the quartz extends downward into the dacite, irregularly and in greatly differing amounts in different places. Where the amount of quartz thus deposited in

the dacite beneath the contact is great, the overlying andesite also becomes to some extent silicified and contains small veinlets; and this silicification increases with the increase of quartz in the dacite. Always, however, (so far as yet developt) the contact of dacite and andesite limits the main mass of quartz and constitutes the hanging wall of the main lode. This wall is usually clean, characteristic and regular, while the lower limit of quartz is usually irregular and ill-defined. It not infrequently happens that beneath the quartz may come dacite, and still lower another streak of quartz; but the generalization still holds good that the maximum deposition has been at the contact and that from there it extends irregularly downward.

This body of quartz, then, following the contact, forms a flat-dipping undulating lode, with frequent great changes of strike. It is probable that it was formed by ascending hot solutions which ascended along fissures in the brittle dacite, but were dammed back by the softer andesite, and so spread out under the andesite contact and deposited their burden of mineral matter. In some places the quartz at the contact is almost or quite absent, elsewhere (as in the Corkill shaft) it is at least 70 feet thick.

Extent of Lode

This lode extends from the West End thru the MacNamara into the Tonopah Extension. It also undoubtedly extends from the MacNamara into the California claim of the West End Consolidated, tho not yet developt in this claim. Workings fol-

low the lode continuously from the Tonopah Extension thru the MacNamara into the West End.

Strength of Lode in West End

Passing thus southward along the lode, there is a remarkable increase in the amount of quartz, this condition being well shown in section 3 of sheet 3, accompanying. The greatest amount of quartz yet found in the lode is in the West End, along the southern edge of the developt portion of the lode; here the quartz is of extraordinary thickness (at least 70 feet in the Corkill shaft, as above stated) and in it, at several points that have been explored, large bodies of relatively low-grade ore have been encountered, with streaks of high-grade ore of less size. This showing, as exposed all along the southern edge of the developt area, in the West End mine, is by far the most favorable and promising portion of the lode yet developt.

Course of the Lode

The course of the lode in the MacNamara and West End, so far as opened up, is well shown by sheet No. 1, which shows the course of the hanging wall on different levels. As will be seen, there are many undulations, but the most striking thing is a great pitching roll, whose crest trends east and west (along section 2, sheet 3) and inclines to the east at an angle averaging about 17 degrees from the horizontal. Therefore in the lower MacNamara workings the strike is in general east and west, and the dip north at angles averaging

15 to 25 degrees; but further east it curves, and enters the West End side line with a general northwest strike and a northwest dip of 15 to 25 degrees. At the crest of the roll the strike curves suddenly and runs in a west-southwest direction, with a south dip, which seems to be steeper than the dipson other portions of the lode, and is about 35 degrees, so far as yet observed.

Developt Apex of the Lode

The lode does not outcrop. After the time of its formation, it was exposed to considerable erosion (wearing-down of the country) and was then covered up by later volcanic outbursts. The formations representing these later outbursts in the West End mine are the Later andesite and the Fraction dacite breccia; therefore these two rocks, of which the latter is uppermost, constitute the cap-rocks of the lode. Subsequent to the later andesite flow, there was a considerable erosion interval, and much of the andesite was stript entirely off. Thus the later volcanic shower, which formed the Fraction dacite breccia, fell in some places upon the later andesite, in some places upon earlier formations. Either of the cap-rocks may directly overlie the vein at its ancient cropping; and this ancient cropping constitutes in the legal sense an apex to the vein.

The apex has so far been opened up in only two places, one in the MacNamara and one in the West End, and the two places are not far apart. The situation is shown in sheet 1.

So far as developt, this gives no extra-lateral rights

to anybody, except certainly for the MacNamara, in regard to a small strip running into the Tonopah Extension ground.

The probable course of the apex beyond the developt portion will be discusst in a subsequent paragraph.

Post-Mineral Rock-Movement

The lode and the associated rocks have been affected by intense strains, resulting in fissuring, slipping and faulting. This movement was subsequent to the deposition of all the rock formations, even the cap rocks. It has resulted in several small faults, such as the MacNamara fault and the MacNamara No. 2 fault (see sheet No. 1), which each have a vertical component of movement of some 40 feet or thereabout, and a horizontal component (in the case of the MacNamara fault at least) several times as great. It has also resulted in numerous fissures in brittle rocks, like the West End dacite, and in the quartz, and in many planes of slipping in the softer rocks, like the early andesite. The undulating surface of the vein is probably partly due to this movement. Slipping was localized along any weak zone--for instance, at the contact of the quartz lode with the overlying andesite; therefore slips following the hanging wall are very common. Where, at the summit of the roll in the vein, in the West End, the dip flattens or even reverses, the slips keep on at a tangent, separating from the hanging wall, and passing upward into the soft early andesite, where they tend to fork and disappear. It was such slips as these that were followed under the impression that they represented technically the

hanging wall of the lode, and if followed up to the capping could be construed as proving a legal apex to the lode.

THE OHIO TONOPAH MINE

In 1904 I examined the shaft and the bottom level (770-foot level) which then constituted the entire workings of the Ohio Tonopah. Since then considerable work has been done on upper levels, without success. I have been unable to get into these workings, on account of bad air, but the material taken from them was pointed out on the dump to me by Mr. Corkill, superintendent of the West End mine. From this data I have constructed the accompanying geologic section thru the Ohio Tonopah and the MacNamara shafts (sheet 4). The first and second levels of the Ohio were entirely in the Fraction dacite breccia; while the third (called the 400-foot level) passt beneath the capping, and the entire level is in the West End dacite (Ohio phase), and beneath the MacNamara-West End lode. The 770-foot level is entirely in the lower portion of the West End dacite (MacNamara phase).

In the MacNamara workings the lode has been workt and ore stoped nearly to the Ohio line; and there is no doubt that the vein passes into the Ohio (California) ground, as shown on sheet 4, where the section is along the strike of the vein.

As will be seen on this section, the cap rocks pitch downward abruptly from the West End--MacNamara ground toward the west. This is shown not only in the Ohio Tonopah shaft,

but in the Red Rock and Pittsburg Tonopah shafts. In the Ohio Tonopah the capping is about 500 feet deep, while in the Red Rock which lies further west the later andesite probably goes down 700 feet (judged from dump: no accurate information).

This pitching down of the cap rocks causes them to cut off the West End--MacNamara lode obliquely. Therefore, so far as present developments go, the lode in the California claim is probably limited to the northeast corner, or about the portion shown to the northeast of the hypothetical apex line, in the appendix to sheet 1. Within this area, the evidence is in favor of finding ore.

PROBABLE COURSE OF THE APEX

I have reasoned out the probabilities as to the trend of the apex on either side of where it is developt, knowing that even an approximately correct view of the situation in advance may be of use. The probable situation is shown in the appendix to sheet 1. I have purposely left explanations off the map. The solid red line is the developt apex; the dotted red its probable extension. The parallel green lines give the approximate extralateral rights of the West End into the Jim Butler, provided the apex crosses the West End end-line at approximately the point conjectured. (Should the apex swerve so as to cross the south side line of the West End the extralateral rights would be along a strip running east into the Tonopah Mining Company's property, the sides of the strip being bounded by the extended side lines of the

West End). The strip between the orange lines represents the extralateral rights of the MacNamara, to enter Tonopah Extension ground. The strip between the blue lines represents the extralateral rights of the California claim to follow the lode into Tonopah Extension ground, if my assumptions are approximately correct. Concerning the MacNamara Extension fraction I am in some doubt, but think probable it has the right to follow the lode into Tonopah Extension ground, along the strip enclosed by the brown lines. The extralateral rights of the California are interrupted by those of the MacNamara, the latter being the older location, but continue on the other side of the interruption.

The West End and MacNamara claims have no extralateral rights which interfere with one another.

OUTLOOK FOR FUTURE

It appears probable that the lode extends thru the whole southwestern half of the West End claim, where it is entirely undevelopt. Moreover, the indications on the margin of this area are, as already indicated, unusually favorable. This area should be energetically and systematically developt. It will be noted that this portion of the lode will shortly pass into Jim Butler ground: it would therefore be good policy for the West End to avail itself of the diplomatic advantage gained by a knowledge of the situation, to make satisfactory arrangements with the Jim Butler, before beginning its policy of development.

The lode in the Ohio Tonopah is well worth going after. It is barely possible that the lode has been cut by one of the raises, especially raise No. 4, without being recognized. The lode could be opened up most conveniently thru the MacNamara 300-foot level, if that were possible. If not, it can be opened thru the Ohio 400-foot level. I should have to examine this level personally before I could give any more definite directions.

POLICY OF DEVELOPMENT

The present policy of mining in the West End appears to me utterly wrong. So far as I have been able to glean from the scanty data obtainable, we have in this mine at least a reasonable assurance of a large tonnage of ore of moderate and low grade, with streaks of relatively high-grade ore. The policy has been to burrow around and gopher out this high-grade ore, and sorting it up to the required grade for shipping. This method necessitates the handling and re-handling of a large quantity of ore in order to get a ton of shipping material. I gather from the last stockholders report that the proportion of ore stoped to ore shipt must be not far from 15 to 1. This brings up the cost enormously, eliminating the profits; and the time and labor wasted can never be regained. Moreover by this plan the mine is put into a bad shape for systematic profitable working.

In a mine, the natural advantage of a deposit that is so large as to permit the breaking down rapidly of large

quantities of ore is very great, and may easily more than compensate, in the matter of profits, for an average low grade, since it makes cheap mining possible. Added to this great advantage we have in the West End another equally as great, in that ore of this class has been proven susceptible of cheap and easy milling. Under these conditions the proper method of handling the situation is clear. I should recommend entirely discontinuing stoping, and inaugurating an energetic and systematic plan of development work, by which the ore in the mine could be blockt out and its tonnage and value estimated. When enough ore had been blockt out, in this way, so that the carefully calculated profits warranted it, I should recommend arranging for a mill. After that cheap mining on a large scale could be done; and if high-grade ore--(say $60. ore) were encountered in this process, as it probably will be, it would go thru the mill with the rest, and the profits on it would be say $45 a ton, instead of a little or nothing at present. No development work of importance is being done at present.

The best method of development will be to run drifts on different levels, following the hanging wall on its strike; to connect these levels by raises on the dip, also following the hanging wall; and from these levels and raises to test the thickness and values of the vein at frequent intervals, by winzes driven perpendicularly to the dip. For developing the lode on its south dip, in the West End, drifts should follow the hanging wall on the 400, 275, and say the 150-foot levels. From the 150-foot level raises should be put

up along the vein to the apex. At the 400-foot level Corkill shaft, a cross-cut should be driven somewhat east of south to the hanging wall, and then a drift run both ways on the lode. The Corkill shaft should be sunk, and development work along the lines indicated should be carried out on the 5th level.

Respectfully submitted:

Spurr Hoax Inc,
by J. E. Spurr

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REPORT ON THE WEST END MINE

OF THE

WEST END CONSOLIDATED MINES CORPORATION

TONOPAH MINING DISTRICT

ESMERALDA COUNTIES, NEVADA

****

Report by H. D. Budelman,
Tonopah, Nevada.

January ~~20, 1930.~~ 1, 1934

REPORT ON THE WEST END MINE

OF THE

WEST END CONSOLIDATED MINES CORPORATION

TONOPAH MINING DISTRICT

NYE AND ESMERALDA COUNTIES, NEVADA

W. L. 1934

CLAIMS: 18, all patented

The West End Mine includes the following lode mining claims, all patented: West End, California, Rambler, Porcupine Fraction, Montana, Oregon, Moonlight Fraction, Utah, Arizona, Colorado, West Tonopah Fraction, South Fraction, Red Rose, Crocker, Salsberry and Taft. Making a total area of ~~194.588~~ Halifax No. 2 and Protection 214.258 acres.

In addition to the above the West End Consolidated Mines Corporation owns a controlling stock interest in the Tonopah Seventy-Six Consolidated Mining Company, and the West End Extension Mining Company ~~and the Halifax Tonopah Mining Company~~; and a large stock interest in the Monarch Pittsburg Mining Company, all of which companies own claims adjacent to the West End Mine proper. Claims owned by these various companies are as follows, all patented:

Tonopah Seventy-Six Consolidated Mining Company; "76", Seventy-Six Fraction, Sunrise, Wonder, Pactolus and Hart. Making a total area of 47.863 acres.

West End Extension Mining Company; Birds Eye, Birds Eye Extension, Seventy-Nine Fraction, Durham and Bank, Making a total area of 47.365 acres.

Halifax Tonopah Mining Company; Protection, in the western portion of the Tonopah Mining District, and Halifax No. 1, Halifax No. 2, Halifax No. 3 and Halifax No. 4 in the eastern portion of the district. The Protection has an area of 9.670 acres and the Halifax claims have an area of 81.31 acres. Making a total area of 90.980 acres.

Monarch Pittsburg Mining Company; Pittsburg, Hypatia and Monarch. Making a total area of 35.311 acres.

This makes a total area owned or controlled by the West End Consolidated Mines Corporation, in the Tonopah Mining District, of ~~406.107~~ 310.086 acres, of which ~~324.797~~ 240.086 acres is in one group in the central and western portion of the district, and ~~81.310~~ 70 acres is ~~in one group~~ in the eastern portion of the district, all claims being patented.

The attached property map of the Tonopah Mining District shows the position of the respective properties in the district, as well as the position of the groups relative to each other.

LOCATION AND ACCESSIBILITY:

The property is situated in the Tonopah Mining District, Nye and Esmeralda Counties, Nevada, and is ~~265~~ 246 miles south of Reno, Nevada, from which it is reached via the Southern Pacific to Mina and the Tonopah & Goldfield to Tonopah, the railroad station being but a few hundred yards from the property.

Tonopah is one of the largest towns in southern Nevada, with a population of around 3500 at the present time. Elevation above sea level is 6100 feet.

TITLES AND PRESENT OWNERSHIP:

Title to the West End Mine property is vested in the West End Consolidated Mines Corporation, by United States patent issued to the West End Consolidated Mining Company, and subsequent transfer of title by deed to the West End Consolidated Mines Corporation.

Title to the other properties listed above is vested in the respective companies named, by United States patent, and control of the various companies is held by the West End Consolidated Mines Corporation through stock ownership.

HISTORY OF THE RROPERTY AND DISTRICT:

The Tonopah Mining District is so well known throughout the entire world that it is unnecessary to go into much detail regarding it. The following short description can be supplemented

if desired by reading an article, written by the writer of this report, which appeared in the July 5, 1924, issue of the Engineering and Mining Journal-Press.

Tonopah was discovered in April, 1900, by James L. Butler, a typical desert prospector from the town of Belmont, then the County Seat of Nye County. He was en route from Belmont to the new Klondyke District, 10 miles from Tonopah, and during a period of rest for himself and burros he noticed an oxidized quartz outcrop and decided to take a few chunks along for assay. He gave the chunks to an assayer at Klondyke but as the rock was highly oxidized and of an unfamiliar character to the assayer they were discarded and lost and no assay made. On a laterttrip Jim Butler took other samples and these were handed to Tasker L. Oddie of Belmont, now United States Senator from Nevada, and assays made for him showed the rock to carry from fifty to six hundred ounces silver per ton. After some delay Jim Butler returned to his find and located what is now the property of the Tonopah Mining Company of Nevada, from which property probably over $50,000,000 worth of ore has been mined, and which has paid over $16,000,000 in dividends to stockholders.

Leases were granted on a royalty basis, all leases being verbal, and leasers made big money. By the end of 1901 about $4,000,000 worth of ore had been mined. All of this ore had to be hauled to Sodaville by wagon, 60 miles, the nearest railroad station, for shipment to smelters. The large tonnage of rich ore being shipped, which had to run over $100 per ton in order to pay, sonn attracted the attention of the entire mining world to Tonopah and the town grew and flourished, as a typical boom mining camp.

In 1901 the property was sold to the Tonopah Mining Company of Nevada and actual development work started. By this time the country was located for miles aroung and other companies had been organized to prospect for ore. As the entire Tonopah District, with the exception of a small area on Mizpah Hill, on which Jim Butlers original locations were made, is covered by later

and non ore bearing lavas, these outside companies were all more or less regarded as "wildcats", their only virtue being that they were comparatively close to the area which was known to contain ore. However, several companies struck ore bearing formation, and later pay ore, by simply sinking vertical shafts through the capping lavas and the real potential value of the district became appatent. In 1904 the Tonopah & Goldfield Railroad Company completed its broad guage line from Mina to Tonopah, which permitted the profitable shipment of lower grade ores than formerly. In 1906 the Tonopah Mining Company completed its 100 stamp mill at Millers, 14 miles from Tonopah, and real production started. Later mills were constructed by the West End Consolidated, Tonopah Belmont, Montana Tonopah, Tonopah Extension and MacNamara companies. Maximum mill capacity in the district at any one time was about 2200 tons per day.

As is usual in most mining camps, especially true of precious metal ones, Tonopah has had its ups and downs. However, productionuntil the last few years has been fairly consistent, and the total is impressive, over $146,000,000 in silver and gold, with dividends to stockholders in excess of $35,000,000, which places Tonopah among the really great mining districts of the world.

Peak production was reachedin 1912, 1913 and 1914. In 1913 574,542 tons of ore wasmilled which contained 126,444 ounces gold and 11,563,437 ounces silver, with a total value of $9,598,733. That the average grade of ore in Tonopah is high is shown by the fact that these peak years were years of comparatively low silver prices, the average silver quotations during the three years being as follows: 1912, 60.835 cents per ounce; 1913, 59.791 cents per ounce; and in 1914, 54.811,cents per ounce. In November and December 1914, the average price for silver was 49 cents per ounce.

Silver is the most important mineral in the Tonopah ores, and occurs in the consistent ration of 100 ounces silver to 1 ounce of gold, being valued ordinarily at about four fifths of

the total gross value, and gold one fifth.

Total gross production of the Tonopah District to the end of 1929 is estimated to have been 8,168,782 tons of ore, with a metal content of 1,754,580 ounces gold and 165,643,829 ounces silver, valued at $146,403,359.

The West End Mine had its start with the location, on October 27, 1900, of the West End Lode, which was patented in 1902. Various companies were organized to hold and operate portions of the area now included as the West End Mine, and consolidations, purchases, and location of claims covering areas which had been allowed to lapse finally brought the present West End Mine property under one company's control.

The West End Consolidated Mining Company was organized on May 5, 1906, at which time Mr. F. M. (Borax) Smith was elected President of the corporation. He remained in that capacity until September 2, 1926, on which date he severed his connection with the company. Mr. Smith directed the affairs of the company during this 20 year period, and during the early years of its existence was of great service to it. He had supreme confidence in the mine and evidenced this confidence by putting his own money into the enterprise when its future was very uncertain. The mine more than justified this confidence and has made large profits. However, these profits were diverted to other channels and no provision made for the financial future of the company or development in the mine. The mine was gutted of ore in sight in early 1926 and development practically discontinued.

At the time Mr. Smith resigned as President and member of the Board of Directors the company was involved in extensive litigation, was indebted to the United States Government for back income and excess profit taxes and accrued interest more than $500,000, with many smaller obligations, had no ore reserves in the mine whatever, and had no cash with which to proceed with necessary development. In short, it appeared that foreclosure was imminent and the mine would have to be sold to partly pay the company's

creditors. In this condition control of the company's affairs came into the hands of Mr. F. C. Ninnis and Mr. H. D. Budelman, who had been with the company for more than ten years as mill and mine superintendent respectively.

The condition of the mine, with all known ore bodies exhausted, lack of cash for development, the large known obligations of the company and the lawsuits against it, made the situation a critical one. The next year was spent in a successful effort to put the company's affairs in a condition that would justify re-financing, so as to develop portions of the mine which appeared to offer good possibilities for ore.

Stockholders of the West End Consolidated Mining Company were advised, by letter dated May 7, 1929, of the financial condition of the company as of September 2, 1926, and as of May 7, 1929, and informed that during the interim the damage suits against the company had been compromised and removed, and that the government debt of over $500,000 had been compromised for $50,000 and $25,000 paid on account. Total debts of the company were given as $36,000. Stockholders were also informed that a reorganization of the company was necessary and a proposed plan to organize a new 1,000,000 share corporation, to take over all assets and liabilities of the West End Consolidated Mining Company in exchange for 400,000 shares of stock in the new corporation, was outlined, the plan to be considered at the Annual Meeting of Stockholders on May 29, 1929. They were later notified, by letter dated November 12, 1929, that the Adjourned Annual Meeting of Stockholders had been held on November 5, 1929, and the proposed plan adopted. All assets of the West End Consolidated Mining Company, which included the West End Mine, were thereupon deeded to the new corporation, West End Consolidated Mines Corporation.

For obvious reasons very little work was done in the mine during 1927, 1928 and 1929, and production was practically all by leasers. The company is now deriving a small revenue from its leaser operations but such a method of operation has no future

whatever, as leasers do not develop new territory. The future of the mine depends entirely on development of new territory, and there are many places in the mine which justify extensive additional work.

GEOLOGY:

The following short description of rocks in the Tonopah District is offered as a preface to the more detailed description of geological conditions found in the West End Mine.

The rocks of the district are classified as of the tertiary period, are all of volcanic origin, and consist of trachytes, andesites, rhyolites, dacites and breccias. These occur as flows and intrusions, and are often very highly altered and similar in appearance, resulting in complex geological and operating conditions.

The principal rocks, from an ecenomic point of view, as being directly related to the occurrence of ore of commercial value, have been designated as Mizpah trachyte, West End rhyolite and the Extension and Montana brecwias.

The Mizpah trachyte, which is classified as one of the oldest rocks of the district, is a porphyritic rock, usually very much altered and silicified, and there has been some disposition to call it an andesite rather than a trachyte. This rock has so far proved to contain the richest average ore, and by far the largest tonnage. It is the only container of commercial ore in the district which outcrops on the surface, the actual outcrop area on Mizpah Hill, the point of original discovery by Jim Butler, being not over one tenth of one square mile. The rest of this formation is covered by later cap rocks up to several hundred feet in thickness. The body of Mizpah trachyte so far developed has a maximum extent of two miles easterly and westerly, less than one mile northerly and southerly, with a maximum thickness of about 600 feet. The actual termination of the trachyte is in many instances on faults so that future developments may prove a continuation in almost any direction.

In fact, this condition has been found to exist in many cases as faults are solved.

The West End rhyolite is younger than the trachyte and is sometimes intrusive into it. It lies under the trachyte. It is a greenish rock, quite dense and with finely crystalline ground mass, highly silicified, and contains numerous light colored fragments as inclusions up to several feet in diameter. The West End Rhyolite contains important ore bodies, with average grade of ore lower than in trachyte, but it is when it forms one wall of a vein that its importance is most evident. The body of West End rhyolite so far developed is thicker and of more lateral extent than the trachyte, with limits not yet proven.

While the Extension and Montana breccias are considered to be different rocks, their close similarity on various occasions leads to the conclusion that they may, through more detail study, be determined to be very closely related to each other, and possibly different phases of the same formation.

The Extension breccia occurs principally in the western portion of the district, and its limits have not as yet been determined. It is a well defined breccia, quite siliceous, showing quartz phenocrysts, grayish to light brown in color, and contains highly altered fragments of various kinds of rock. Important ore bodies are found in the breccia but the contact with the West End rhyolite is more favorable and one of the largest ore bodies in the district was found on this contact.

The Montana breccia occurs extensively throughout the district, usually in the vicinity of the West End rhyolite, on either the upper or lower contact. It is a decided breccia, quite siliceous, and the included fragments at times almost obliterate the groundmass. It is similar to, and easily confused with other breccias in the district. Some small commercial ore bodies have been found in this breccia but results of developments to date would not indicate that it will ever prove to be an important container of ore. Its volume is likely very much less than that of the Extension breccia, West End rhyolite or Mizpah trachyte.

The other rocks of the district, which includes rhyolites, dacites and breccias, occur as flows and intrusions. Their importance lies in the fact that they cover, underlie or terminate laterally the ore bearing formations and veins, and their occurrence and identity must therefore be studied in order to intelligently prospect for new, or a continuation of known veins.

There are numerous faults throughout the district, many quite large and unsolved as yet. Aside from the fissures in which the veins were formed most of the faults were post mineral and occurred at different intervals during or following periods of volcanic activity. In some cases these faults are mineralized and contain valuable ore. As a rule faults are normal although reverse faults are not uncommon.

Rocks found in the West End Mine are typical of those found in the district as a whole, and the above description will serve to identify the respective formations as they may be referred to in the description of veins or geological conditions as found in this mine.

VEINS:

There are likely over 50 veins in the district which have produced, or are producing profitable ore. Most of them are clearly of the fissure type with both hanging wall and footwall branches. Widths are not uniform, varying from a few inches to over 50 feet of pay ore. In some cases there are well defined walls, in others the walls are imaginary only and represent the dividing line between pay and non pay ore. The veins are fairly continuous on strike and dip until interrupted by faults or later intrusions, and rich stopes have been terminated in this manner, indicating the possibility of rich ore of like grade below or beyond the interruption.

The general strike of the veins is easterly and westerly, although deviation of 45 degrees to the northwest or southwest is not uncommon, especially in the western portion of the district; and the dip may be either to the north or south.

Vein filling consists mainly ofquartz with manganese

almost invariably present as the oxide, carbonate or silicate. Valuable minerals are silver and gold, in the constant ration of 100 to 1 by weight. The silver occurs mainly as sulphides of various kinds with occasionally chlorides, iodides and native silver.

In the West End Mine two main veins have been developed, the West End Vein and the Ohio Vein. Both are flat veins, with a southerly dip, roughly parallel, and from 200 to 400 feet apart vertically. These two veins are large, in places being over 50 feet wide. The maximum width of stopes is 50 feet, and the average width probably over 10 feet. The major portion of the $16,000,000 production of the West End Mine has come from these two veins and their branches.

There are several other veins, aside from the branching and reuniting type customarily found throughout the Tonopah District, which have proven large and profitable producers. These veins are usually branches of the two main veins named above, which diverge from them on their dips and do not reunite. Stopes 8 feet wide are not uncommon and the average width of stope is about 5 feet. Average grade of ore in these veins is higher than in the main veins.

Reference to the attached map showing the western portion of the Tonopah Mining District will assist in understanding the positions of the various veins described below.

The West End Vein, which occurs principally in the West End claim, was first cut in the McQuillan shaft, near the east end line of this claim, at a depth of 400 feet. The vein has a general easterly and westerly strike and a south dip of from 10 to 25 degrees. The north dipping limb, which is locally known as the MacNamara Vein, has a northwest strike and low dip to the northeast, and passes onits dip into the properties of the MacNamara and Tonopah Mining Companies, where it has been extensively developed and proven a large producer of good ore. A side line agreement with the MacNamara company limits the West End Consolidated interest to the north side line of the West End claim. To the south the vein

has been developed and stoped far into Jim Butler ground, the West End Consolidated title to this portion of the vein, through possession of its apex, having been definitely and finally decided in a suit brought by the Jim Butler Company, which suit was carried through the Supreme Court of the United States. To the east the vein was developed and stoped to the east end line of the West End claim, where it passes into the property of the Tonopah Mining Company on its strike. To the west the vein was developed and stoped nearly to the west end line of the West End claim, where it terminated on its strike against cap rock, due to faulting or erosion, and has never been recovered to the west. Along the line of termination, for 500 feet, the vein was wide and good ore.

The West End Vein, starting at its easterly limits in West End Consolidated ground, has a Mizpah trachyte hanging wall and a West End rhyolite footwall, which sometimes changes to the glassy phase of the trachyte. In the vicinity of the West End Shaft it passes into Mizpah trachyte both walls, and continues without change until it terminates on the west. This vein does not reach surface, its nearest approach being about 100 feet, and is covered by later cappings, known as Midway andesite and dacite breccia, against which it apexes.

The West End Vein has been quite fully developed in the area described and has proved very profitable. Its total production will approximate $8,000,000. Future possibilities are to the west and south, but conditions as at present understood do not appear favorable in either direction on the main West End vein.

The Ohio Vein, originally known as the Lower Contact Vein, occurs in the California, Rambler, Porcupine Fraction and West End claims, and is known to extend into the Eureka and Sunset claims of the Jim Butler Company on its dip to the south. No apex rights have been claimed by the West End Consolidated as against the Jim Butler on this vein. It has, generally speaking, a northeast strike and a flat southeast dip, although locally the dip is sometimes so flat that its strike may be atken in any direction. North of the California claim it dips northerly and

forms the Murray Vein of the Tonopah Extension, which was a large producer and contained one of the largest ore bodies ever found in the Tonopah District. North of the West End claim it passes into MacNamara ground, and the MacNamara company stoped a large tonnage of ore from it, although average grade was not so high as in the West End and Tonopah Extension ground.

The Ohio Vein was first developed on the 800 Level from the West End shaft, and was called the Lower Contact Vein, but in this section ~~it contained~~ the limited development work showed only low grade ore and work was discontinued on it in 1912. In 1917 work was resumed from the Ohio shaft, which had been idle for many years, and by the application of geological principles and the driving of 30 feet of crosscut and 30 feet of raise the so called Ohio Vein was found on a contact between West End rhyolite footwall and Mizpah trachyte hanging wall. Within a few months several million dollars worth of ore was in sight in this vein. To date the Ohio Vein, which was later connected by underground workings to the Lower Contact Vein developed nearthe West End shaft, has produced about $6,000,000 in high grade milling ore.

Near the West End shaft the vein has a West End rhyolite hanging wall and a calcite andesite footwall, and in its course to the west it passes through several contacts,at times having West End rhyolite on both walls, West End rhyolite as footwall and Mizpah trachyte as Hanging wall, and finally in the extreme southwest passes into Mizpah trachyte both walls. The best ore was found when both walls are trachyte or when it occurs on the contact of West End rhyolite as footwall and trachyte as hanging wall.

The Ohio Vein does not reach the surface, its nearest approach being in the vicinity of the Ohio shaft where its highest point is approximately 350 feet from surface, the surface being covered by the later Midway andesite and dacite breccia.

As previously stated the Ohio Vein passes into the Tonopah Extension and MacNamara ground to the north, and in the limited exposures to the northeast it is low grade. On the west

it terminates on a roughly north-south line, about 150 feet east of the Ohio shaft, and the direction of this termination swings slightly to the southeast about the center of the Rambler claim. This termination is against dacite breccia on the northern portion and against calcite andesite on the southern portion. This vein was good ore, from 5 to 20 feet wide, and probably averages 10 feet in width along this termination for a distance of 1000 feet. It is believed the termination was due to faulting, which is clearly demonstrated on the southern portion, but the limited developments west of the fault have so far failed to disclose the faulted segment in that direction. This fault has been designated as the Ohio Fault; it has a strike of about north 25 degrees west, and a dip of 30 to 40 degrees easterly, and is believed to have a vertical throw of over 100 feet. On the south the vein, as above stated, passes into Jim Butler ground on the 800 Level. A small amount of development work was done on the vein in Jim Butler ground, working from a flat winze, during a period when a portion of this company's property was under lease to the West End Consolidated. This work is shown on the attached map. The vein in this section was crushed and deformed by formational disturbances in the vicinity of the south side line of the West End and Porcupine Fraction claims, this work and clearly demonstrated a tendency to again become normal where drifted on on the 773 Level. In the southeast face of the drift on this level the vein has a Mizpah trachyte hanging wall and a West End rhyolite footwall, is about 6 feet wide and shows values. At the time this work was done the WestvEnd Consolidated had abundant ore reserves in its own ground, development through the flat winze was costly, and work was stopped with the idea that later on this area would be developed from a lower level. However, the lease was allowed to lapse before lower level work was started and this very promising part of the Ohio Vein remains undeveloped.

Of the subsidiary veins the most important are the Fraction Vein, South Vein, Footwall vein and Hangingwall Vein.

The Fraction Vein is a hanging wall branch from the West End Vein, extensively developed in the easterly half of the West

End claim, with a southeast strike and a dip of 30 to 60 degrees to the southwest. It extends into Jim Butler ground on its strike to the east, in which property it has been extensively developed and stoped, and on its dip to the south. Apex rights have been definitely established on this vein by the West End Consolidated.

The South Vein is a hanging wall branch of the West End Vein, which occurs on the westerly portion of the West End claim, with an easterly strike and dip of 20 to 40 degrees to the south. This vein terminates on the west against the same capping as the West End Vein, and along the line of termination showed some good ore.

The Footwall Vein is a footwall branch from the West End Vein, which ~~occurs~~ has been developed only in the westerly half of the West End claim, with an easterly strike and dip of 50 degrees to the south. This vein terminates on the west against the same capping as the West End Vein, and portions along the line of termination were good ore.

The Hangingwall Vein is a hanging wall branch from the Ohio Vein, and is developed in the central portion of the California and Rambler claims, with an easterly strike and a flat north dip. It terminates to the south and west against the same capping which terminates the Ohio Vein, and along the line of termination showed good ore. This vein was a large producer of uniformly high grade ore.

MINING FACILITIES:

Good water for all purposes is obtained in any quantity desired from the Water Company of Tonopah, which pumps the water from wells at Rye Patch, and then through pipe line to Tonopah, a distance of 14 miles. Price is high but not unreasonable. No water has been encountered in any of the workings in the West End Mine.

Power for all purposes is obtained from the Nevada California Power Company, which services this section of Nevada

from its generating plants on Bishop Creek, California. Prices are high but not unreasonable.

Coal is used for fuel and is obtained from Utah mines. All necessary supplies for mining and milling purposes can be obtained at reasonable cost. Freight rates are high but not excessive.

MINE EQUIPMENT:

Mine equipment consists of first class hoisting and compressor equipment at two shafts, all necessary buildings, tools, trucks, electric storage battery locomotives, fans etc. In fact, mine equipment is complete and operations on any reasonable scale can be started on a moments notice.

DEVELOPMENT:

Development consists of two 2 compartment vertical working shafts, the West End and Ohio shafts, which are 1015 and 1212 feet deep respectively; and one 2 compartment shaft, the McQuillan shaft, which is used for ventilation only, is 600 feet deep vertically, with workings therefrom.

The West End shaft has main levels on the 200, 300, 400, 500, 600, 800, 960 and 1000 levels. The Ohio shaft has main levels on the 300, 400, 500, 800, 1000, and 1100 Levels. Practically all the lateral work has been done on and above the 800 Level, and total footage of development work will exceed 20 miles. The attached map shows the approximate area in which development work has been done, which takes in but a small proportion of the total area of the property.

PRODUCTION, PROFITS, DIVIDENDS:

Production records of the West End Mine are not complete prior to 1910, but as near as can be determined gross production since discovery to the present had a value well over $16,000,000.

Accurate records show production from 1910 to 1929 inclusive to have been 780,826 tons, containing .193 ounces gold

and 18.28 ounces silver per ton, a total gross metal content of 150,309 ounces gold and 14,271,691 ounces silver, a gross value of $18.15 per ton, and a total gross value of $14,169,832.68. Net profit during this period was $6.58 per ton, or a total of over $5,000,000.

Peak years were 1921 and 1922. In 1921 74,674 tons of ore was milled, with average value of $19.55 per ton, and total gross value of $1,460,160.92. In 1922 98,181 tons of ore was milled, with average value of $18.70 per ton, and total gross value of $1,836,303.74. Net profit in 1921 was $633,140.90, and in 1922 was $833,194.32.

For the 17 year period from 1910 to 1926 inclusive, every year a profitable one, 758,185 tons of ore was milled, with a gross value of $14,066,739.17, and net profit for the period was $5,108,817.81, or an average profit per year, for the 17 years, of $300,518.65.

In the early part of 1926, development was discontinued and all known ore stoped out. Production in 1927, 1928 and 1929 was practically all by leasers, working on a royalty basis, and this ore was stoped from around the edges of the old company stopes, and from narrow streaks in various places throughout the old workings. No new development was attempted by leasers and the company was unable to do anything of consequence on its own account due to lack of funds.

During the same 17 year period above referred to cash dividends to stockholders, the first in 1913 and the last in 1923, amounted to $1,967,334.60, or $1.10 per share, while earnings were $5,108,817.81, or $2,85 per share, a difference of $3,141,483.21, or $1.75 per share. Most of this amount was probably advanced to the West End Chemical and West End Opoteca Companies, for which the stockholders of the West End Consolidated Mining Company received as stock dividends 1,788,486 shares of West End Opoteca Mines Company stock, at the rate of one share of West End Opoteca for each share of West End Consolidated held by them; 1,609,636 shares

of West End Chemical Company Preferred stock, at the rate of 9/10 share for each share of West End Consolidated held by them; and 1,967,335 shares of West End Chemical Company Common stock, at the rate of 1 1/10 shares for each share of West End Consolidated held by them.

In summary, the West End Mine made a net profit of $2.85 per share in the 1910 to 1926 period, of which the stockholders received $1.10 in cash dividends. For the remaining $1.75 per share earnings they received as stock dividends, for each share of West End Consolidated held by them, 1 share of West End Opoteca Mines Company stock, 9/10 share West End Chemical Company Preferred stock and 1 1/10 shares West End Chemical Company Common stock. The combined present value of the stock dividends, as indicated by present market value of these shares, as against each share of West End Consolidated, is in the neighborhood of ~~5~~ 10 cents, a shrinkage in value from $1.75 to ~~5~~ 10 cents, and for which the West End Mine is in no way responsible.

METHOD OF MILL TREATMENT:

Milling practise in Tonopah is uniform and metallurgists of the camp have, through long experience and exchange of ideas, pretty well standardized it.

Primary crushing is done in Blake and gyratory crushers, run of mine ore being crushed to 1 1/2 inch. The ore is then delivered to the mill and fed through Challenge feeders to stamp batteries, crushing in cyanide solution to from 3 to 6 mesh. The battery product is classified in Dorr classifiers, the oversize being fed to the tube mills, size 5 by 18 feet, using Danish pebbles, and ground to 75% minus 200 mesh. The overflow passes to Dorr thickeners, then to agitators, where agitation is continued for 60 hoursmat a temperature of 115 degrees Farenheit. Cyanide is usually added at No. 1 agitator. The pulp from the agitators passes to Dorr thickeners, then to a Butters type filter, after which the tails are discharged.

Precipitation is on zinc shavings. The precipitate is

melted in Monarch-Rockwell furnaces, carborundum lined, and the bullion moulded in approximately 2000 ounce bars. The average fineness of the bullion is about 10 gold and 950 silver. The bars are sent to Selbys or the U. S. Mint for refining.

Average extraction is about 92% of the metals, 94$ of the gold and 92% of the silver; and about 93% of the contained values.

The West End Consolidated owns its own mill, of 265 tons daily capacity, but this plant was closed down October 15, 1927, due to lack of sufficient ore to operate efficiently, and the mine ore has since been shipped to the plant of the Tonopah Mining Company, at Millers, 14 miles from Tonopah, which is operated as a custom plant.

DISCUSSION AND CONCLUSIONS:

As has been previously shown the Tonopah Mining District has been in steady production since its discovery in 1900, with gross production valued in excess of $146,000,000 in silver and gold, and has a dividend record of over $35,000,000. This latter amount does not include profits which were spent in outside exploration by the different companies. Actual profit from Tonopah operations probably exceeded $40,000,000, or approximately 35% of the total gross production.

The prosperous life of Tonopah has been longer than that of most precious metal camps, due to a complexity of geological conditions which have made it impossible to accurately block out ore reserves, which would result in temporary increased production, and which led to important new discoveries from time to time. Chief among these conditions are the following:

1. Surface geology gave small evidence ~~gave~~ on which to predicate underground conditions, due to surface covering of later cap lavas except in the small area covered by original discovery.

2. Many rock formations, only a few of which contained ore, which facts had to be learned through underground development.

3. The large number of profitable veins, new ones being added to the list from time to time by discovery.

4. Important faulting, which at times displaces whole blocks of the most favorable formations containing known veins, and at other times simply displacing the veins; the solving of such faults requiring extensive underground work at times, and consuming much time.

The decrease in yearly district production from 1922 to 1929 has been quite pronounced, although for the past four years production has been fairly constant at around $1,500,000 per year. This decrease has been primarily due to a decrease from the Tonopah Mining Company, the Tonopah Belmont and the West End Consolidated properties, which properties, together with the Tonopah Extension, have accounted for probably 90% of the entire district production since discovery.

It is generally regarded as true that the Tonopah Mining Company and the Tonopah Belmont properties have been quite fully developed and that possibilities are limited for the discovery of any extensive new veins or ore bodies in these properties. It naturally follows that as the large known ore bodies are worked out, with no new ones to take their places, more dependence must be plaeed on smaller ones, with a consequent decrease in production. It is of course ~~possible~~ very probable that much more ore will be produced from these properties, and their operations may continue profitable for many years, but it is not probable that there will be any considerable increase in their scale of operations, unless new areas are acquired in the district or developments indicate the presence of ore at deeper horizons.

Conditions in the West End Mine are entirely different. I assume that all known ore in the mine is exhausted, so that there is small hope for any considerable production from the old developed area. The important points of difference are these:

1. The area included in the West End Mine contains promising undeveloped ground.

2. Faults which have displaced veins, with high grade

ore on the termination, have not been solved.

In a district of the character of Tonopah these conditions can pave the way to important discoveries which may result in as large a production in the future as in the past, and might even lead to a revival throughout the entire district.

There are several sections of the West End Mine which justify development, and those listed below are considered the most favorable:

1. The portion of the Ohio Vein which has been described as dipping into Jim Butler ground, (see page 13 of this report), should be developed by a south crosscut on the 960mLevel, starting near the southwest corner of the West End claim, and raises driven to the vein at intervals of 100 feet or less. This work, in addition to developing the downward extension of the Ohio Vein, would crosscut new territory and might open entirely new veins. (In order to do this work it will be necessary to first obtain a long term lease on that portion of the Jim Butler ground, which I believe can be obtained on favorable terms.) A fund of $20,000 should be provided for this work.

2. The faulted segments of the Ohio and Hangingwall Veins, (as described on pages 13 and 14 of this report,) should be prospected for on the 800 Level, and conditions as shown in this work might make it advisable to do additional work on the 960 Level. This is very important work and the faulted segment of the Ohio Vein a prize worth striving for. As stated (on Page 13 of this report) the Ohio Vein showed good ore, which would average 10 feet wide for a distance of 1000 feet along this termination. A fund of $20,000 should be provided for this work.

3. On the 500 Level from the McQuillan shaft an occurrence of low grade quartz in West End rhyolite was disclosed in a short drift about 1908, and no other work has ever been done on it. This has been designated as the 539 Vein and should be further developed. It would cost about $5000 to do this work.

4. The bottom of the Ohio shaft, at 1212 feet depth,

is in rock which has the appearance and chemical characteristics of Mizpah trachyte. No work has been done on it, the deepest level from the shaft being the 1100 Level, which was started to prospect a vein cut ~~out~~ above in the shaft, and which did not to prove to be commercial at that elevation. It was always the intention to return to the shaft bottom and do some work on the 1200 but during the period of rush production there was no opportunity to start this work, and when rush production was over there was no money available for it. This is important work for which a fund of at least $15,000 should be provided.

There are many other minor pieces of development work which might yield results but the above appear to offer the best chances for real important developments.

No mention has been made of any work to be done in the properties of the West End Extension Mining Company, Tonopah Seventy-Six Consolidated Mining Company and ~~the Halifax Tonopah Mining Company~~, mentioned on page 1 of this report, as this work is outside the West End Mine proper and will likely be more costly to complete. Interest in these properties is, ~~however~~, considered to be a very valuable asset of the West End Consolidated Mines Corporation.

In conclusion; I feel that the West End Mine is a valuable one, well worthy of a campaign of development along the lines suggested above, and I recommend the raising of a development fund of $75,000 to carry out this work, (being firmly of the opinion that if any one of the proposed developments is successful the money will be returned many times over.)

F. R. Bradshaw.

Tonopah, Nevada,
January 20, 1930.