

Disputed

WALKER MINING COMPANY

WALKERMINE

PLUMAS COUNTY, CALIFORNIA

April 17, 1941

H. M. HARTMANN, MANAGER

Mr. M. H. Gidel, Assistant Geologist
 Anaconda Copper Mining Company
 Hennessy Building
 Butte, Montana

Dear Mr. Gidel:

Re: Geology of Walker Mine.

I have given considerable thought to the questions you asked in your letter of March 17, 1941, and will give you my interpretation of conditions as I have found them. There is still considerable doubt in my mind, and for this reason I have tried not to form any definite opinions that may later be proved to be entirely wrong.

1. Do we consider the No. 1 Main hanging wall Fissure to be pre-mineral or post-mineral? (We are now almost certain this ties in with the footwall clay of the Piute Orebody.)

The relation between our Main Orebody mineralization and this fissure, has been one of the important geological problems since the opening of the lower levels, and it has not yet been fully determined. Development work along the North Orebody 900 and 1000 Levels, shows that the fissure weaves in and out of the vein, without any apparent displacement of quartz which suggests little, if any, post-mineral movement. From this, we should not consider the Orebody strike faulted, and should not expect a displaced portion on the East side of the fissure lower down. The gradual diminishment in size and grade of the vein with depth, before coming in contact with the fissure also supports this line of thought. We could explain the presence of brecciated quartz along the fissure on the 900 and 1000 Levels, as due to the slight post-mineral adjustments that resulted from the cooling of the granite and the surrounding rocks. This brecciated quartz is found only in places where the vein is right against the fissure. The present clay and breccia zone of the fissure, (including broken vein quartz), would in this case, be the result of the same adjustment. In other words, the pre-mineral fissure zone has been roughly transversed by a post-mineral adjustment. This passed from the fissure zone into the wall rock at points of weakness where the vein flattened and where it changed direction in strike. Thus, our No. 1 hanging wall fault would be a post-mineral adjustment which followed the original channel of the advancing ore fluids, until a change of dip was encountered at the approximate 1000 Level, and a change of strike was encountered North of the 712 Orebody. The fracture took the line of least resistance, which carried it into the hanging wall of the main orebodies and along the footwall of Piute.

There is quartz and mineralization in association with this fissure on the 1200 Level under the Central and North Orebodies, also on the 900 Level at Piute, which suggests bottle necks through which ore fluids passed.

On the other hand, there is evidence in favor of considering the possibilities of ore at lower levels under the present orebodies, but in my estimation, these are not too sound. The fact that we have vein segments on the hanging wall side of the No. 1

Mr. M. H. Gidel, Assistant Geologist
Anaconda Copper Mining Company

Sheet 2.

fissure along the North Orebody 900 and 1000 Levels, suggests a possible fault throw, however 1200 Level developments directly under this area are not very promising. There exists some streaks of footwall mineralization, that may get better at depth, also there is the possibility of favorable conditions having existed along the fissure at lower depths, that have caused ore depositions of a different type than we have developed and mined above. Perhaps some Diamond Drilling to cut the fissure at lower depths should be done from the 1200 Level. I think Mr. Sales and Mr. Lyon have given considerable thought to such a plan.

Since development work along the 900 Level of Piute and especially North of Piute, has indicated a zoning condition that may give us a better grade ore in the Northern regions along our vein zone at greater depth, it is my belief that it is in this country that rests the future of Walker Mine.

2. Is there anything significant about the probable zoning of schist and vein minerals?

There is a marked decrease in the relative amount of pyrrhotite in association with chalcopyrite, progressively North from the granite contact at the South end.

From my observation, there seems to be considerably more garnet progressively North with the exception of the North Piute Orebody, which is considerably different from Piute. At least, the garnet is much more conspicuous in lower Piute, where it occurs as veinlets cutting through the vein quartz as well as a dissemination throughout the schist and the vein. The dissemination of garnet is rather common throughout the Mine, especially in the wall rock where there are zones that are more highly concentrated than usual. I have generally believed that the garnet as well as the magnetite, are your so-called schist minerals, and are residual within the vein. However, the coarse garnet as it occurs in the veinlets of the lower Piute ore, seems to have been introduced during a later surge of mineralization in association with Barite, Magnetite, Chalcopyrite, also some Zeolites and Calcite.

Magnetite is abundant in all orebodies, both in the vein and in the wall rock. Some is coarse and some is fine grained, and local concentrations may be found in any orebody. I imagine a microscopic study would reveal a number of generations of magnetite.

I would not say that the relative amounts of garnet or magnetite has any bearing on the grade of ore.

With the exception of the North Piute Ore, where chalcopyrite is deposited along the structure of chloritic schist, I would say that the deposition of copper minerals is usually accompanied by silicification. It appears that veins were formed by more than one stage of mineralization, starting with the typical glassy quartz vein, containing some sulphides; that was later fractured and enriched by chalcopyrite being deposited along the fractures. It is not uncommon to see lighter colored quartz veinlets of a later stage, cutting through the glassy quartz vein, and these veins as a rule, carry coarse chalcopyrite, chlorite, micas and possibly, other minerals.

Mr. M. H. Gidel, Assistant Geologist
Anaconda Copper Mining Company

Sheet 3.

Primary chalcocite is very rare, and what I have seen, comes from areas that carry bornite. Bornite is quite common and occurs principally as localized disseminations along shoots in the 712, Piute, and North Piute Orebodies. These minerals do not seem to be associated with the extreme silicification that accompanies most of our ore, but is accompanied by a chloritic alterations of the host rock that leaves it distinctly green in color. Very often the bornite occurs intergrown with approximately an equal amount of chalcopyrite, and the combined minerals form small isolated masses disseminated in the vein. Bornite and chalcocite are not associated with the barite, garnet and magnetite, as they occur in lower Piute, although there is some bornite in this country. I think the bornite is earlier than these minerals.

3. Does the strike of our vein conform generally with the banding of the schist?

From my observations, the strike and dip of the Walker Vein to the 712 Orebody, conforms very closely with the banding of the schist, which averages about North 25 degrees West. North of the point where the footwall vein of the 712 Orebody intersects the Main vein; the Piute and North Piute Orebodies are off-set to the East, and their strike changes to practically due North. However, the banding of the schist still remains roughly North 25 degrees West, and carries normal dip, (plus - minus 55 degrees), even though the orebodies flatten to 40 degrees or less.

The hanging wall of the South, Central, and North Orebodies is very often banded with parallel quartz veinlets for a few feet into the massive wall rock, which suggests a direction of shear before mineralizing fluids were introduced. This banded structure is often apparent throughout the full width of the vein, presenting parallel layers of quartz and schist that make up the vein. This is generally referred to as "horses" of waste within the vein. On the other hand, in Piute especially, this parallel banding of quartz and schist angles to the strike of the orebody and usually dips steeper than its footwall. This banding has the normal North 25 degrees West, strike and roughly the normal 60 degrees to the East dip, but the footwall of the orebodies, (Piute and North Piute), are approximately North and South.

These conditions suggest that the original schist was banded with a North 25 degrees West shear, but the ore fluids came in along a later fissure that followed the banding to the 712 Orebody, but cut across it where Piute and North Piute was formed. The quartz banding and schist structure of these two orebodies, are very pronounced and definitely make an angle with the footwall (strike) of the orebodies.

These conditions suggest that the banding of the schist was developed at an earlier date than the vein was deposited.

In conclusion, I might say that it is very possible that a favorable zoning condition exists in conjunction with Walker Mine Ore, and that lower temperature orebodies of better than average grade may be found at intervals along the strike to the North.

Mr. M. H. Gidel, Assistant Geologist
Anaconda Copper Mining Company

Sheet 4.

I trust that these opinions are not too far from right, and that future developments at Walker Mine will disclose something worth while.

Very truly yours,

S. K. Droubay
S. K. Droubay

SKD:DM

cc - Mr. Weed
Mr. Sales
Mr. Lyon
Mr. Perry

23
October 10, 1930

Mr. J. O. Elton, Manager
International Smelting Company
Offices

Subject:

WALKER MINE

Dear Sir:

We have gone over mine development plans at the Walker, and desire to make the following recommendations:

- 1- Complete 706-A shaft to the 1000 level, then continue same to the 1100 level and drift north and south on vein.
- 2- Extend 1017 north on lines as a lateral to the North and 712 ore bodies and crosscut vein at intervals, to be determined as work proceeds.
- 3- Open up 10th level on Piute ore body from Piute winze.
- 4- Continue sinking Piute incline shaft.

We think the above suggested developments are of major importance and should be continued as far as possible without interruption. It might be advisable to continue 706-A shaft to the 1200 level instead of stopping at the 1100.

We feel that it is extremely important to determine, as early as possible, the behavior of these various ore bodies at depth, and particularly in view of the serious consideration now being given to driving a tunnel from the Five Bears property on the Genessee Valley side.

It is very evident that there is not enough ore in sight or indicated to justify the Five Bears tunnel project. The construction of this tunnel will take three years or more, which makes it necessary to start in on a

2- Mr. J. O. Elton

October 10, 1930

Subject: WALKER MINE

program of getting advanced information concerning the downward persistence of the ore bodies, and it will be necessary to develop the veins far in advance of what is needed in the ordinary course of mining.

The detail as to the point of starting and course of the 1017 drift north is a matter for further consideration.

Very truly yours,

RHS:P

Cathy

23

Oct. 15, 1930

Mr. J. O. Elton,
820 Kearns Bldg.,
Salt Lake City, Utah.

Dear Sir:

I have had prepared a set of maps covering the Walker Mine, which I think will make clear to you the geographic relation between the present Walker mine workings and the various deep tunnel sites on the Genessee Valley side of the Walker Mine area.

In this set of maps each sheet indicates a certain level in the mine. The Piute winze has been projected downward and the projected position of the winze shown on the various level sheets. The crosscut distances to possible tunnel sites at the various level elevations are indicated. The contour line shown on each sheet represents the intersection of a horizontal plane drawn through the working level elevation with the surface.

It is readily apparent that the Ward Creek Canyon presents the best point for a tunnel to the Piute workings. The distance from Ward Creek Canyon is not only shorter, but the crosscut from this Canyon will cut through the better formations, that is, formations in which we are most likely

Mr. J. O. Elton---2

Oct. 15, 1930.

to find ore.

It is evident that a crosscut tunnel from the Five Bears property will be a two or three years job. I have already indicated to you in a former letter that the Walker ore reserve is not sufficient to justify the expense of this tunnel. It is very important, therefore, that the developments suggested be carried on as rapidly as possible, in order that we may learn at the earliest possible date whether the Walker ore bodies are promising enough at depth to justify the Five Bears tunnel.

Yours very truly,

RENO H. SALES

RHS:KM
CC: Mr. T. Lyon ✓

315 Kearns Building
Salt Lake City, Utah
September 2, 1940

Mr. R. H. Scales
P. O. Box 4577
Butte, Montana

WALTER WINE
MANAGER

Dear Mr. Scales:

I visited the Walker mine August 25 - 31, accompanied by Bradley, and examined underground and surface geology.

The Walker geological problem may be resolved into two phases, one relating the geology to operating and the other to exploration.

From an operating standpoint, recent developments on the 700 level Flute presents an interesting problem. I mapped these workings and noted a definite localization of better grade values, particularly on the hanging wall and footwall of this body. There is a possibility that selective stoping might be applicable to the Flute area, but before any definite plan can be established, careful channel sampling is essential. Bradley is undertaking a thorough sampling job this week. I have hopes, based on grab sampling, that the mining grade might be raised to 2 - 2.5 per cent copper, leading less tonnage and with attendant profit. The limited shaft capacity at Flute dictates that if a profit is to be realized below the 700 level, a reasonably high mining grade must be maintained.

My observations generally tend to the belief that careful sampling is essential to proper study and solution of the Walker mining problem.

The exploration possibilities at Walker are clouded by the fact that the mine has not made money on most of the ore bodies that have been developed in the past. Therefore, we must evaluate the chance for finding better grade ore. This chance may be resolved into structural and mineralogical elements.

Mineralogically there is definite evidence of a zonal arrangement

Mr. H. H. Nelson

September 3, 1950

with high temperature quartz, pyrrhotite and low grade copper at the south end of the mine close to the granulite. Whether the granulite or some hidden intrusive represents the parent magma, the high temperature locus appears to be at the south end of the property. High grade chalcopyrite in the upper part of the main ore body, bornite in the 712 ore body and better grade chalcopyrite in the Flute area, are facts that confirm this theory. Thus, too, the quartz changes from a glassy to crystalline character at the south end to a granular and finally a vein like character at the north end. The proportion of quartz to sulphides is much greater at the south end of the Walker vein system than at the north end.

Therefore, while the deeper levels near the granulite do not present an attractive mineralogical picture, the north end of the mine may represent a temperature-pressure zone favorable for the segregation of better grade copper.

The Walker fracture zone is remarkably persistent. Generally the schistose country rock is uniformly sheared along the strike of the Walker zone and offers no particularly obvious focal point where a deep seated concentration of sulphides might be anticipated. But there is one exception and that is the area embraced by the 712 - Flute workings. In this section the schist and the fissuring are bent from the general northeast strike to northeast, and the flat east dipping Flute ore body moves increasingly farther to the east with respect to the 712 zone as deeper levels are approached. Is there a chance this zone, which is on the northeasterly prolongation of the 317 fissure, has deep seated structural significance?

Results of recent development are rather encouraging. The better grade ore at the 900 Flute is definitely an improvement in grade over mineralization on the 700 and 800 levels.

3 - Mr. H. H. Sales

September 3, 1910

At the 1200 level, the showing of vein material recently encountered in the main north working is of notable interest. However, this mineralization is typical such "walker" quartz with scattered chalcopyrite and there is no particular improvement in copper content. Further development will be necessary to determine the extent and grade of this mineralization.

Just before leaving the Walker I had an opportunity to examine the last core from Hole 19, being drilled horizontally from the north end of the main workings at the 900 level. At 115 feet the hole encountered abundant chalcopyrite in green schist. From 115' - 120' there is fair chalcopyrite; from 120' - 122.5' the mineralization is less; the last pieces of core to 123 feet show abundant chalcopyrite, and the bottom of the hole is in ore. There is little or no quartz with the sulphide. Druey is sending assays as soon as available.

The showing in Hole 19 may be a significant discovery. It is north of any known ore in the Walker mine. Further drilling will be necessary before the importance of this latest development can be determined.

Sincerely yours,

V. D. Perry
V. D. Perry
P

THP:P

cc: Mr. C. F. Bailey
Mr. J. H. Robbins
Mr. C. H. Reed
Mr. J. C. Nelson
Mr. J. F. Rogers
Mr. Tom Ryan ✓

Signed for Mr. Perry in
his absence

April 25, 1928

Mr. Reno H. Sales
526 Hennessy Building
Butte, Montana

Subject
WALKER MINE

Dear Reno:

I have your letter of April 23rd, regarding the Walker maps.

It is my understanding that Mr. Thayer and Mr. Daly receive 20 scale blueprints from the Walker frequently which show assays and place numbers. So in order to hurry the sketches of the 900 level and Piute ore body I purposely omitted this information. In the future all maps will be complete.

The grade of the ore is calculated by grab sampling the muck pile. In the past I have calculated the average grade of the various ore bodies using this information which I obtained at the mine. The actual stoping of the ore has always resulted in the production of a much lower grade product than the samples have indicated, and I have been severely criticized, consequently I hesitate in making any definite statement regarding the grade of the Walker ore.

For your own information all of the samples taken of the Piute ore body to date average 2.12 per cent copper, but it certainly does not look that good. The piute ore does not look like the ore in the Main and North ore bodies. There is very little vein structure and

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2- Mr. Reno H. Sales

April 25, 1928

very much less quartz present. The schist in the veins and in the walls is nearly black.

There is no footwall fault along the other ore bodies, and as I have stated before, the vein structure is obscure, so that no reliable strikes or dips could be obtained, and I have been unable to make up my mind as to whether the fault and the vein will intersect. The gouge on the fault appears fresh and has every appearance of post mineral gouge.

The crooked workings in the Piute ore body are due to the obscure vein structure.

Very truly yours,

TL/P

Tom Lyon

23
May 25, 1928

Mr. B. B. Thayer,
25 Broadway,
New York.

Dear Mr. Thayer:

Under separate cover I am sending you a set of Walker maps giving the information requested in your letter of May 21st.

Please refer to the map showing Piute ore body. It is our plan to develop this ore body for mining. The program calls for an incline raise to be run in the footwall, starting as indicated in pencil on the map, to connect with the Piute surface tunnel. Intermediate levels will be driven from this incline raise to the ore body. The raise will serve as a safety exit for men, for ventilation, and as a timber passage, to the whole mine. There is lots of good timber on the surface in the vicinity of the Piute surface tunnel. About 30 feet above the 700 level we plan to run a working level connecting it by means of raises at short intervals with the haulage level following the general development plan of the main ore body. Experience has taught us that this is the cheapest way consistent with safety to take out Walker ore. A certain amount of sorting can be done on this level; boulders broken before going into the rock raise, which is large enough to hold ore to fill a whole train.

The diamond drilling campaign is beginning to show results. Hole #16 encountered a quartz vein at 244 feet going through 9 feet of mineralized quartz, then through 18 feet of over 2% copper bearing quartz.

On April 19th, copy of map giving the diamond drill locations was sent you. You will remember that when you were in Butte, you were sent a copy which you were to hand to Mr. Daly. Copy of this was sent to you at New York. Another map showing the position of this hole and the location of the ore, will be sent you within a few days.

It begins to look as though the ore found in #16 hole is a north continuation of the ore body which blew up further south near coordinate 1700. The map which we will forward you shortly will show these general relations.

I expect to visit the mine next week.

June 6, 1928

Mr. Reno H. Sales
526 Hennessy Building
Butte, Montana

Subject:

WALKER MINE

Dear Reno:

I am enclosing a 200 scale map of the Walker showing the 700 level and the workings below.

The Pinite ore body has now been developed for a length of 760 feet with crosscuts into the footwall and hanging wall. Taking the assays of the crosscuts, the vein will average 30 1/2 feet in width and run 1.66 per cent copper. The raise which was started in waste is now up 100 feet and into ore, the latest sample assayed 3 per cent copper. It was intended that this raise would remain in waste from the 700 level to the surface in order not to tie up any ore in shaft pillars. The inclination of the raise is 45 degrees. When the vein flattened and dipped into the raise, the only thing that could be done was to keep the raise going on its projected course as 45 degrees is about the limit that muck will run freely.

The ore found in drill hole number 16 looks good, that is, the vein in which it occurs is quartz and apparently is a definite structure. It is no doubt a continuation of the main shear zone

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2- Mr. Reno H. Sales

June 6, 1928

which apparently blew up farther to the south. The crosscut shown on the map just south of the drill hole is now being continued to crosscut the vein found. After the vein has been picked up in the crosscut, drifts north and south will be extended as rapidly as possible.

The life of the Walker will undoubtedly be extended for several years by finding this ore to the north, providing copper stays above $15\frac{1}{2}$ cents per pound.

Very truly yours,

Tom Lyon

TL/P

Encl.

WALKER MINING COMPANY

WALKERMINE
PLUMAS COUNTY, CALIFORNIA

January 8, 1941

H. M. HARTMANN, MANAGER

Mr. Tom Lyon, Chief Geologist
International Smelting & Refining Co.
818 Kearns Building
Salt Lake City, Utah

Dear Tom:

The accompanying figures are abstracted from the Annual Ore Reserve tabulation of January 1, 1941, as requested by the Accounting Department, to be in your offices by January 10, 1941. These will tie in with the typed tables that will be mailed later.

As the total yearly extraction figures were not available until yesterday, I cannot get the rest of the tables balanced and typed and the accompanying long section maps ready to mail for a couple of days yet.

Although a considerable amount of ore was developed in the 712 and Piute Orebodies, our total Recoverable Ore figure is listed as 545,600 tons less than it was on January 1, 1940. This is due principally to dropping the majority of the Probable and Possible Ore below the 1000 Level of the Main Orebody, from the Recoverable list. Also, a considerable tonnage of Possible Ore was dropped when the footwall vein of 712 proved too low grade to mine, between the 1000 and 700 Levels. Also, more selective mining is being done in the Piute 800 Level stopes, with the result of a lower extraction tonnage, at a higher grade.

I suggest that Recoverable Ore blocked out, plus Recoverable Probable Ore, be used as a reasonably Assured Reserve, to be used by the Accounting Department for Depletion purposes.

Very truly yours,

S. K. Droubay
S. K. Droubay

SKD:DM

cc - Mr. Dugan
Mr. Warburton

WALKER MINING COMPANY
ABSTRACT FROM ANNUAL ORE RESERVES - JAN. 1, 1941

<u>OREBODY</u>	<u>CLASS OF ORE</u>	<u>ESTIMATE OF Jan. 1, 1940</u>	<u>ESTIMATE OF RECOVERABLE ORE Jan. 1, 1941</u>
SOUTH	RECOVERABLE ORE BLOCKED OUT	51,800	57,800
	PROBABLE ORE	87,400	83,800
	POSSIBLE ORE	<u>126,800</u>	<u>98,400</u>
	TOTALS	266,000	160,000
CENTRAL	RECOVERABLE ORE BLOCKED OUT	106,300	71,200
	PROBABLE ORE	18,700	14,700
	POSSIBLE ORE	<u>25,000</u>	<u>None</u>
	TOTALS	148,000	85,900
NORTH	RECOVERABLE ORE BLOCKED OUT	359,500	214,700
	PROBABLE ORE	62,600	4,000
	POSSIBLE ORE	<u>56,600</u>	<u>10,000</u>
	TOTALS	478,500	228,700
710	RECOVERABLE ORE BLOCKED OUT	None	None
	PROBABLE ORE	None	None
	POSSIBLE ORE	<u>26,000</u>	<u>26,000</u>
	TOTALS	26,000	26,000
712	RECOVERABLE ORE BLOCKED OUT	41,200	107,500
	PROBABLE ORE	91,600	58,200
	POSSIBLE ORE	<u>247,900</u>	<u>88,400</u>
	TOTALS	380,500	254,100
PIUTE	RECOVERABLE ORE BLOCKED OUT	447,500	426,300
	PROBABLE ORE	72,400	95,900 + 27,000 = 68,900
	POSSIBLE ORE	<u>50,500</u>	<u>71,000 + 74,000 + 17,000 = 162,000</u>
	TOTALS	570,400	613,200
Totals	ORE BLOCKED OUT	1,006,100	857,500
	PROBABLE ORE	332,600	169,500 196,600
	POSSIBLE ORE	<u>510,600</u>	<u>266,600</u> 313,800
	GRAND TOTALS	1,849,500	1,323,900 1,367,900

NOTE: Reasonable Assured Ore Reserve of Recoverable Ore Blocked Out, plus Recoverable Probable Ore = 1,027,100 Tons. Suggest this figure be used by Accounting Department for Depletion purposes.

Tack:

above change made in conformity with wire received by Tom Lyon.

J. H. 1/10/41

Report Covering Present Conditions At

The Walker Mine

The Walker Mine is located in Plumas County, California, about 70 miles northwest of Reno, Nevada, at an elevation of 6500 feet. The country is heavily wooded, with ample water available for all uses. Heavy snows make the camp difficult of access in winter, otherwise, operating conditions are good.

The mine is equipped with a fairly modern flotation concentrator, capable of handling approximately 1300 tons of ore per day. The concentrates produced are carried over an 3-mile aerial tramway which connects with the railway at Spring Garden, California. During the past summer, the concentrates were trucked to a railway siding near Portola, at some additional cost per ton compared to delivery by the aerial tramway. The concentrates are then shipped to Tooele for treatment at the International smelter.

The mine is operated through a tunnel which delivers the ore into the mill bins. The tunnel level is the 7th level of the mine. This level is connected to surface through the Piute shaft, the Central shaft, and a number of raises and stopes which have broken through to surface. The ore below the 7th level has been developed by underground incline shafts which follow the vein at an angle of about 70° from the horizontal.

The mineralization occurs along a N20°W striking shear zone which has been developed for a length of 8,000 feet. This is not continuous ore, the ore bodies usually being separated by waste areas. Starting from the south, there are five ore bodies, called the South, Central, North, "712", and Piute. The first ore body found, and the one for which the mine was opened, was the Central ore body, which, above the 7th level, averaged 3% to 4% copper and carried considerable gold values. The other ore bodies were of much lower grade averaging around 1.50% copper or less. All of them have gold and silver values. About \$1.35 per ton is being recovered from current production. The lowest precious metal values occur in the Piute ore body, which is the farthest north. Mining costs are comparatively high on account of the hardness of the ore.

Below the 7th level, the ore in general has become narrower and of lower average grade. The one exception is the North Ore body, which has shown a slight increase in grade at the 10th level. There are two main hoisting shafts below the 7th level, with several auxiliary winzes for ventilation and supplies. The shafts are small and of limited hoisting capacity. For this reason, hoisting costs on ore from below the 7th level are high and production low.

Up to comparatively recent years, most of the production has come from reserves above the 7th level, but, as these are now nearly exhausted, increasing proportions of a lower grade ore will have to come from the underground shafts, and at an increased cost. This eventuality was recognized some time ago, and in 1938, with the approval of the local staff, we recommended certain underground development and diamond drilling to determine if there was a possibility

The Walker Mine - 2.

of discovering other large ore bodies of the same grade, or, if there was a possibility of finding higher grade ore. If enough ore could be developed below the 7th level, a suitable hoisting shaft would be installed to lower hoisting costs and provide sufficient capacity to operate the mill. This exploration work was approved, and carried on during the fall of 1938 and in 1939.

In general, the results were disappointing. A surface hole to the north of the Piute ore body showed the vein to continue, but it is doubtful if the mineralization will prove to be as good as in the Piute. This work is now being checked underground by crosscutting on the 900 Piute level, and no final comment can be made until these developments are completed. This should be within the next two months. The balance of the diamond drilling and development was negative except for demonstrating the downward continuation of the "517" ore body located in the footwall of the "712" ore body, and adding some small extensions of present known ore.

The diamond drilling carried on during the past year showed that there was no commercial structure parallel to the Walker vein within the limits of the drilling. If one exists, it must be a great distance from the present workings.

There exists the possibility of ore coming in again below the lowest mine levels. However, this is a very "long" chance as the ore bodies, with a single exception, have gradually dropped in grade with depth, and this certainly does not make this an attractive prospect. At present, a drift on the 1200 level is being advanced under this North ore body, which showed some slight increase in grade on the 10th level as compared with higher levels. The results obtained in this work should determine whether any deeper prospecting by diamond drilling or shaft sinking is justified.

The Walker vein north of the Piute should be explored by surface drilling. There is about two miles of unexplored territory which should be tested by diamond drill holes located at strategic intervals. If commercial ore is indicated in any of the holes, this preliminary work should be followed by closer drilling. Owing to the depth of oxidation in this north area, any ore found will lie below the 7th or tunnel level, and, therefore, be subject to the comparatively higher mining costs incident to hoisting, pumping, etc.

At present, it is costing about 12¢ per pound to produce copper at the Walker Mine, exclusive of depreciation. Operating improvements which can now be foreseen are expected to improve costs, but later they will be offset to a large degree because of higher average costs on ore mined in increasing proportions of ore production from below the tunnel level. Development costs on deeper levels will also be relatively higher, because of water and ventilation problems.

For a limited time, with the diamond drilling program completed, and under a condition of a minimum amount of development work, the 12¢ copper pound cost will be lowered. However, looking forward to a normal operation, with a large proportion of the ore coming from below the tunnel, from ore bodies of such low grade and size as are known to exist, there is small chance of the Walker making an appreciable profit with copper at 12¢ or under.

The Walker Mine - 3.

The gross ore reserve of the Walker as of January 1st, 1940, is estimated at about 4,000,000 tons. Of this, 1,859,000 tons is listed by the Geological Department as probable recoverable ore. The balance is in pillars, or in such a position in the mine that its commercial extraction is not possible. Its average grade is estimated at 1.31% copper, .76 oz silver, and .038 oz gold per ton. The developed recoverable ore on January 1st, 1940, was 1,006,100 tons with a grade of 1.36% copper, .80 oz silver, and .042 oz gold. The total ore which should be recovered from the known ore reserve would probably be somewhere between these two estimates. At a normal rate of production, this gives the property a life of three to four years, provided, no further ore is developed.

The capacity of present shafts below the 7th level is limited. It is, therefore, necessary to produce some ore from above the 7th level to furnish enough tonnage to keep the mill operating. There are probably 400,000 tons of this ore which can be recovered from old pillars left from former mining. This work is now in progress, and these pillars are systematically being recovered. This phase of the operation appears to be successful, and will be continued along with mine operation.

With all of the above in mind, we wish to make the following recommendations:

1st. Continue present stope development and work in "517" ore body.

2nd. Diamond drill the Walker vein north of the Piute workings, beginning with a hole located on the surface 500 feet north of hole #21.

3rd. Continue 1201 drift north to explore the North ore body beneath the better grade portion disclosed on the 10th level.

4th. If and when completed recommendations #2 and #3 do not offer encouragement to the hope that the ore bodies will improve in value at deeper levels or to the north, all development and prospect work other than that incidental to mining should be stopped and the remaining reserve mined as rapidly as possible.

Respectfully submitted,

Charles

Paul H. Sales

New York, N. Y.
June 15, 1940.

October 7, 1940

Mr. C. F. Kelley,
Chairman of the Board,
Anaconda Copper Mining Company,
25 Broadway, New York City.

Dear Mr. Kelley:

I have completed an examination of the Walker Mining Company at Walkerville, California in company with Mr. Sales and the Salt Lake and local officials. This is not submitted as an official report, but written to give you advance information in regard to conditions existing there.

I found the mine in as good operating condition as could be expected. Improvements have been made in working conditions; the tracks and stopes are in good shape. The yam and pillar method of stoping has worked very well giving better ore extraction and better grade ore, but these improvements have not been able to offset the adverse factors.

A larger percentage of ore has had to come from below the 700 or tunnel level. This ore is hoisted through two very inefficient inclined shafts with a maximum capacity of 1000 tons per day. The large stopes in the North Crebody below the 700 level are practically worked out, and this part of the mine will be nearly exhausted within the next six months. Wages were increased 50¢ per day, or \$6,000 to \$7,000 per month from October 1, 1939 to March 4, 1940. In addition a development campaign costing about \$6,000 per month has been carried on; or an additional expense of \$12,000 to \$13,000 had come up since my last report on Walker. After March 4th, 1940, the wage increase was removed, therefore, the increased cost at this time is about \$6,000 per month.

On my visit to the mine last year I thought that it was possible for Walker to clean up its debt to the Anaconda Company but I do not now believe this is possible, except with a price for copper higher than anything we can see in the near future.

Oct. 7, 1940

During the first seven months of 1940 the Walker Company lost \$116,000 or about \$16,500 per month, before depreciation. The loss for August is close to this figure.

There are certain bright spots in the future picture which will be considered. The Walker vein is a strong mineralized fissure with a lateral extension of at least three miles. This has been developed for about 8,000 feet and produced at least two good ore bodies. Our development work has been fairly successful in that we have eliminated a large amount of area as non-commercial and have opened three or four very promising possibilities. In their order of importance these are as follows:

- 1st. The 900 level Piute Orebody south of the Piute shaft.
- 2nd. The 900 level Piute north of the Piute shaft.
- 3rd. The 1200 level below the North Orebody.
- 4th. The 517 fissure vein.

The 900 level to the south of the Piute shaft has opened an orebody over 200 feet long with a maximum horizontal width of 125 feet, and much better values than have been found in the Piute section previously. The drift going south is still in good ore although the vein is much narrower, probably about 80 feet. The last assay from this face was 3.55% Cu and .17 oz. Au. The vein dips at an angle of 30° from the horizontal and the hanging wall branch has a horizontal width of approximately 80 feet, averaging according to cut samples about 2.00% Cu, .85 oz. Ag and .045 oz. Au. The footwall branch is about 40 feet wide and averages 1.75% Cu, .85 oz. Ag and .045 oz. Au. Including the low grade material between the two branches the average assay across the whole width is 1.50% Cu. This orebody has a rake to the south and may well be the top of an important ore shoot. The mineralization is strong and contains considerable bornite.

The 900 level north under a surface drill hole which showed fair mineralization has been cross-cut by a diamond drill hole which showed 16 feet horizontal width of 3.55% Cu. A crosscut was extended to cut this vein at a point approximately 100 feet north of this drill hole. Muck samples from the best point of the vein ran better than 1.50% Cu. Drifting has started north and south along the vein.

The 1200 level north of the central shaft shows ore of unknown width and length, but has the appearance of important mineralization. However, at the time of my visit the drift only averaged 1.00% Cu. A more recent sample showed 1.40% Cu and .025 oz. Au.

Oct. 7, 1940

The 517 fissure is of minor importance as far as future ore is concerned, but should furnish a small tonnage of good grade ore. It has some geologic importance as the ore seems to rake in the direction of the 900 south Piute and may in some way be connected with it. The mineralization is strong and consists of chalcopyrite and bornite.

The balance sheet of current assets and liabilities as of July 31, 1940 shows a debit balance of \$416,000, offset partially by \$154,000 in the supply account and \$197,000 in broken ore inventory in stopes. Certain changes were made in the mining practice during our visit which I am confident will allow the Walker to approximately break even during the next four to six months provided copper remains at 12%.

Considering the financial picture, the ore and geologic possibilities, the limited capacity of the Piute shaft, I believe the following plan to be the correct procedure for the Walker Mine, and if it meets with your approval will recommend it to Mr. Eiton:

1. Continue operations as at present with the changes made at the mine during our visit.
2. As the Piute shaft is up to capacity the good ore showing on the 900 level south should be developed by driving 1017 drift from the 706 shaft about 800 feet to develop this ore. The results desired can be obtained quicker and cheaper in this manner. This level will cut this ore approximately 280 feet below the 900 level measured along the dip of the vein.
3. Continue exploration of the 900 north Piute to determine the character and extent of this mineralization.
4. Continue the exploration of the 1200 level north of the Central shaft.
5. Some incidental diamond drilling to take the place of cross-cutting in order to speed up this work.
6. If this work is successful in finding commercial ore the Walker Mining Company should be reorganized with enough money to pay its existing debts, equip a proper operating shaft and provide operating capital to continue operations. This has been discussed with Mr. J.O. Eiton and I will give you his ideas in regard to future financing on my return to New York.

Mr. Kelley - 4

Oct. 7, 1940

Will you please advise me if these recommendations meet with your approval, sending a copy of your letter to Mr. Elton so that he will be advised as quickly as possible.

Yours very truly,

C. E. Wood.

CW:TH
cc: JH
RSD
PL

WALKER MINING COMPANY

WALKERMINE

PLUMAS COUNTY, CALIFORNIA

February 22, 1941

H. M. HARTMANN, MANAGER

Mr. M. H. Gidel, Assistant Chief Geologist
Anaconda Copper Mining Company
Butte, Montana

Dear Mr. Gidel:

The accompanying sketch of the Walker Mine 900 Level, shows the location of our new North Piute ore, with respect to the rest of the orebodies.

Although the North Orebody ^{no lower grade} has been considerably impoverished in comparison to its upper levels, (they extend considerably further north), by the time it reaches this elevation and the 712 Orebody has practically pinched, the map presents a fair looking pattern. Insomuch as I have not given you a clear picture as to the location of the specimens that were sent in, I will briefly describe each Orebody, as to its physical properties and essential minerals.

SOUTH. The Walker Vein starts at the granite contact, with a northeasterly strike, but gradually turns to a northwesterly strike, before the South Orebody ends. This Orebody has two definite veins, of which the east vein is considerably better in grade than the west vein, except at the extreme south end, where the east vein has pinched and the west vein nears the granite. The granite contact rakes to the north with elevation, and a number of stopes end where the granite cuts over the top. This is especially true, in the upper levels, where numerous granite dikes extend away from the main body.

There are numerous places in this South Orebody country, where the glassy vein material and even the wall rock, reflect the texture of the granite and seems to grade right into it. This characteristic is partly responsible for Ewing (Stanford Masters Thesis) advancing the injection theory, as the source of the Walker Vein. I might add, that Mr. Sales' suggestion that the granite may be the result of a process, rather than the result of a molten mass advancing from a deep seated source, fits very well in my opinion. There could be a combination of both. There have been a number of times when I could see the character of the granite in the schist, shortly before granite was encountered. ✓
granite

This Orebody dips from 65 degrees to 90 degrees to the east. The vein contains considerable pyrrhotite and Ewing's thin sections show the presence of Cubanite (the intermediate mineral between pyrrhotite and chalcopyrite), inter-grown with chalcopyrite. This suggests a formation temperature of at least 400 degrees Centigrade. It appears rather odd, when you see the occurrence of Barite, filling seams in the vein, even at the granite contact. Barite veinlets have been noted in granite, so it may be that it came in as an end product during the cooler stages.

The east vein has pitched against the hanging wall fissure on the lower levels and will die out against the fissure, if it does the same as the Central Orebody.

Mr. M. H. Gidel
Sheet 2.

CENTRAL. This Orebody incorporates both the east and west veins of the South Orebody. It was considerably larger and richer along the upper levels, with a gradual impoverishment with depth. The vein shows up fairly well on the 900 Level, but practically dies out against the hanging wall fissure, by the time it reaches the 1000 Level.

This was the best of the Walker Orebodies. It was a glassy quartz vein, impregnated with chalcopyrite and very similar in appearance to the South Orebody vein. I do not recall seeing pyrrhotite in the few areas I have seen mined, but understand it was present to a certain extent. Also, tourmaline crystals occasionally occur, imbedded in quartz and sometimes in massive chalcopyrite.

NORTH. This Orebody has been the largest from a tonnage standpoint, but was not so rich as Central. There existed many horses of wall rock in the ore and in many places, the vein consisted of somewhat parallel bands of schist and quartz, carrying enough chalcopyrite to be mined. Values were quite irregular, with some narrow zones fairly rich, while others consisted of massive, poor, glassy quartz, that was too low grade to mine in places. It gives the impression, that the infiltration of ore fluids into the shear, or fracture zones, was not complete enough to form a solid, uniform vein, such as the Central Orebody and the silicification ^{herein noted} soaked only into the boarder zones of the larger fragments.

No pyrrhotite to any extent has been noted in the North Orebody. Individual quartz veinlets have the same characteristics, as South and Central ore, but the large amount of residual garnetiferous schist, is much more impressive. The Orebody dips from 55 to 60 degrees.

712. This Orebody is much smaller than the North Orebody, but the heart of it was much higher grade. Advancing ore solutions appear to have been channeled by the pitching arch that is now the hanging wall of the vein, and a higher than average concentration of chalcopyrite was deposited. There is also, a footwall vein in the 712 Orebody, which joins the main vein to the North. The upper levels of the footwall vein are good enough to mine, but is not nearly so rich as the Main Orebody.

A considerable amount of bornite mineralization occurs along a shoot near the junction of the two veins, especially between the 500 and 300 Levels. Most of this occurs as an impregnation in green, chloritic schist, associated with chalcopyrite. Only a poor remnant of the footwall vein extends to the 1000 Level and it is not good enough to mine. No trace of the main vein reaches the 1000 Level.

The 712 quartz seems lighter in color than the rest of the mine and the main vein carries a higher percent of gold and silver. The footwall vein is lower than average in gold and silver. The main vein averages about 45 degrees in dip. The Orebody is not as closely associated with the main fissure as the rest of the orebodies are.

Handwritten note:
Caudex of iron
Sulphide
deposits

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Mr. M. H. Gidel
Sheet 3.

PIUTE. The Piute mineralization in the upper portions, is somewhat similar to the North Orebody vein, in that the ore carries a considerable amount of residual schist. However, the entire Piute Orebody rests on a distinct clay footwall, and the hanging wall is very irregular. The vein flattens from 45 degrees above the 700 level, to 32 degrees at the 900 Level. Alternate bands of ore and waste, that angle slightly to the main footwall and dip about 15 degrees steeper, cause ore values to be rather irregular.

Mineral association in the upper portions of Piute, is about the same as that of the North Orebody, but there is not so much quartz, and there is lots more garnet. The vein might be described as premature, especially in zones where it consists of an aggregate of garnet, magnetite, chlorite, chalcopyrite, biotite, and perhaps other minerals, rather than the glassy vein material which often carries a shadow of the former existence of such minerals.

Where the vein was encountered on the 900 Level, mineral association is in considerably different proportions than usual and altogether new ones are noted. There is an abundance of typical Walker vein quartz, but it seems to have been shattered and an influx of second and possibly, third stage minerals introduced. Veinlets carrying epidote, garnet, barite, magnetite, chalcopyrite, bornite, and in some cases, stilbite and calcite, cut through the formation. In one section, a $7\frac{1}{2}$ x 18 foot raise, was driven through about 50 feet of almost massive garnet. There is very little bornite and what there is, seems to occur near the footwall fissure.

It is from this area that the specimens showing garnet, borite, epidote, stilbite, laumontite, magnetite, and chalcopyrite, were taken and recently sent to you folks at Butte.

NORTH PIUTE. This Orebody consists of a crescent shaped mass, that is essentially a green chloritic schist, impregnated with chalcopyrite. One zone, just beyond the point where surface Diamond Drill Hole No. 21 cuts across the level, contained a considerable amount of Bornite, associated with chalcopyrite in glassy quartz. I sent Mr. Sales a specimen of this. However, just beyond this point, the vein becomes very chloritic, such as the last single specimen I sent to you, and continued so, until it began to pinch to the northeast. Here it became more solid and contains much more quartz, almost the normal amount, and the schist is slightly garnetiferous.

This Orebody is very different from the Main Piute 900 Level ore. No garnet, barite, epidote, or magnetite, has been noted and there is considerably less quartz, than the normal amount. A few cross fissures contained veinlets of sooty chalcocite, but nothing of importance.

Mr. M. H. Gidel
Sheet 4.

The ore does not seem to cut off against any definite fault, although there is a rather weak fissure, that seems to die out into the normal North 25 degrees West, sheeting before the ore completely ends. This appears to dip about 65 degrees to the southeast, but was very irregular as an ore footwall. Mineralization seemed to die out into the schist, rather than follow any particular wall. The schistosity is about parallel to the normal sheeting of North 15 degrees to 20 degrees West, with an easterly dip.

Surface Drill Hole No. 57 just encountered the sub-surface at an elevation of 5990, which shows a decided drop in the last 500 feet from Hole No. 51. It indicates that the 900 Level North heading, would pass into the lava at a point approximately 1500 feet north of the present face. Hole No. 57 will cut the footwall fissure about 200 feet down the dip below the sub-surface.

From a casual glance of the 900 Level plan, one could almost imagine that the Piute and North Piute Orebodies, are thrust faulted lower portions of the Central and North Orebodies.

I trust that this rather hasty explanation will give you a more complete picture of the Walker Vein, and would appreciate any comments you may have.

Very truly yours,

S. K. Droubay
S. K. Droubay

SKD:DM
Encl. 1

September 9th 1941.

Walker

Mr. C. E. Weed,
General Manager of Mines,
Anaconda Copper Mining Company,
Hennessy Building,
Butte, Montana.

Dear Clyde:

This will acknowledge receipt of your two letters of August 21st and August 25th, relative to the Walker mine, together with enclosures.

I telephoned you today that I thought Mr. Elton should call a meeting of the Board of Directors of the Walker Mining Company, and give them the information contained in the reports and estimates prepared by Messrs Dugan and Hartmann, and advise them as to the unpracticability and impossibility of continuing to operate at the estimated lower rate of production and estimated pound cost of approximately 20¢.

I believe that if the Board of Directors of the Walker Mining Company care to take this matter up with the Government, that they should send someone to Washington to discuss the subject.

Frankly, I have grave doubt as to the Government being willing to pay 20¢ or more a pound for such a relatively

Mr. C. E. Weed

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September 9th 1941.

small production.

However, I believe in any event the matter should be placed before the proper officials in the Office of Production Management to the end that they may be informed of the necessity of a shutdown, and given an opportunity to consider the possibility of an arrangement which would enable the Walker Mining Company to continue to produce.

Yours very truly,
Original signed by
J. R. BOSSING

JRE/T

CC-Mr. C. F. Kelley
Mr. R. E. Dwyer
Mr. F. Laist
Mr. J. C. Elton
Mr. Reno Sales ✓