DEPARTMENT OF INTERIOR
BUREAU OF MINES
REGION III
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March 14, 1951

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Answered		

Memorandum

To: Director, Production Expansion Division

From: Copper Commodity Committee

Through: Operating Committee

Subject: IMM-266, Application from Anaconda Copper Mining Company for a purchase agreement on copper to be produced at Yerington, Nevada

The Copper Commodity Committee reviewed this application and recommended a field examination on date of January 10. The report on this examination has been received and reviewed by the Committee.

The Committee regards this as one of the best copper projects because of its large output and the short time required to get it into production. It should be technically feasible to produce about 30,000 tons of copper annually starting in 1953.

The Company asks for a purchase contract at 24½ cents per pound for five years and a Certificate of Necessity to cover the capital investment in mining equipment and in a leaching and precipitation plant, to cost approximately $25,000,000 exclusive of $2,500,000 working capital. Financing arrangements are to be made by a wholly-owned subsidiary corporation to be formed for the purpose, which will negotiate an approved loan from private banks, the Government to guarantee the repayment of this loan. Company proposes to repay the loan out of net proceeds, with provision for retiring any unpaid balance through future royalties in the event of cancellation of the contract.

In event of increased costs of labor and mining supplies, an escalator clause increasing the guaranteed floor price is also requested.

Recommendations:

The Committee recommends, --

(1) That a purchase contract be negotiated, but that in our opinion a lower floor price would still permit the operator to recover his investments. This point has been discussed with Mr. Mc Gann and Mr. Ellis.

(2) That an escalator clause be included in this contract based upon an index including costs of labor and mining supplies.

(3) That assistance be given by the Requirements Division when needed to insure the delivery of materials and necessary equipment and especially with reference to supplies of scrap iron necessary for continuous operation of the leaching plant.

(4) That a Certificate of Necessity be approved for accelerated amortization so that the entire plant may be written off for tax purposes in five (5) years from the date production starts, at least to the extent of 75 percent, the prevailing rate for the domestic copper mining industry. This certificate has not been filed by the Company, and attention of the Company has been called in the course of a telephone call to the New York office, to the desirability of prompt action in this matter.

(5) It is suggested that a purchase agreement may be negotiated that will relieve the Government of the necessity for guaranteeing the private loan.

Applicant's Proposal:

During the years 1941 to 1945 a program of exploration by drilling, supplemented by underground work disclosed an ore body minable by open-pit methods. The upper part of the body, consisting of oxidized ore amounts to 35 million tons assaying 0.97 copper. The lower part, estimated at 15 million tons, consists of sulfide ore assaying 1.13% copper. All these reserves are within the limits of open-pit operation. Total waste removal will amount to 45 million tons.

The applicant's studies indicate that the oxide ore can be leached with dilute sulfuric acid to obtain good copper recovery, but with a high acid consumption. Because of impurities in solution and high costs of an electrolytic plant, it is proposed to recover the copper by precipitation on scrap iron as cement copper.

It is proposed to treat 10,000 tons per day at following costs:

	Per Dry Ton Ore
Mining	$ 0.50
Crushing-bedding	0.11
Tailings disposal	0.10
Leaching (including acid manufacture)	0.50
	$ 1.21

or 7.20¢ per pound of copper

	Per Pound Copper
Iron precipitation	2.52¢
Plant, general expense State taxes ($45,000/mo)	.89
Smelting, freight, refining to market midwest	3.34
New York general expense	.30
	7.05¢

Total estimated cost before depreciation and federal taxes - 14.25¢

Tonnage reserves, leaching feasibility, production costs, capital requirements for mine equipment, plant and construction facilities costs to place the property in operation have been checked by the Government examining team and found acceptable. The fixed capital requirement of $25,000,000 (itemized in application) is considered substantially correct and is therefore recommended by the field team.

It is estimated by the Field Team that production at the rate of about 10,000 tons of ore per day will yield about 27,600 tons of copper per year, starting about 18 months after construction begins, assuming reasonable deliveries of machinery and equipment. The life of the oxide operation will be 10 to 12 years, after which the leaching plant will be worthless for treatment of the remaining, sulphide ore.

Transmitted herewith is the file on this project, including report of the Field Team. The Company proposal is set out in a letter to the Administrator from Mr. Hoover, President of the Anaconda Copper Mining Company, Dated January 11, 1951.

C. H. Johnson
Acting Chairman
Copper Commodity Committee

Attachments

CHJohnson:pf

Approved by:

Chairman, Operating Committee

Member, Bureau of Mines

Member, Geological Survey

Copy to: Executive Officer, DMA Field Team, Region III,
1415 U. S. Appraisers Building, San Francisco 11, Cal.
Executive Secretary
Copper Commodity Committee
Files

February 26, 1951

Memorandum

To: J. K. Richardson, Chairman, DMA, Copper Commodity Committee, Washington, D. C.

From: H. C. Miller, Executive Officer, DMA Field Team, Region III

Subject: Investigations of Yerington Copper Project, Yerington, Nevada; DMA-266

Attached herewith are the following documents relating to a field investigation made on the Yerington copper deposit, in accordance with request from you dated January 12, 1951:

2 copies of a Preliminary Report entitled "Yerington Copper Project, Yerington, Nevada, DMA-266, by W. T. Benson and A. R. Kinkel, Jr.
1 sheet--Vertical Cross-Sections, Yerington Mine.
1 sheet--Vertical Cross-Sections (colored), Yerington Mine.
1 map (Surface Plan), Yerington Mine.
2 sheets of photographs, Yerington Mine

Region III Field Team has reviewed the work of the Field Investigators and concurs with their conclusions.

H. C. MILLER

H. C. Miller
Executive Officer, DMA Field Team, Region III

Attachments 5

Copy to: Ward Smith, Geological Survey

HCMiller:am

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Chrono

February 23, 1951

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

BUREAU OF MINES
JAMES BOYD, DIRECTOR

PRELIMINARY REPORT

YERINGTON COPPER PROJECT
Yerington, Nevada

DMA-266

By W. I. Benson
Mining Engineer

and

A. R. Kinkel, Jr.
Geologist

PRELIMINARY REPORT

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

YERINGTON COPPER PROJECT, YERINGTON, NEVADA. DMA-266
Lyon County, Nev.

Copper

By W. T. Benson[1/]
& A. R. Kinkel, Jr.,[1a/]

SUMMARY

The Yerington Copper project of the Anaconda Copper Mining Co. is situated in Lyon County, Nev., near the floor of Mason Valley about a mile west of Yerington the supply center. Wabuska, the shipping point on the Hazen to Mina branch line of the Southern Pacific Railroad, is 12 miles north.

An exhaustive examination of the property was conducted by the company during the period 1940 through 1943. Results of the investigation were sufficiently conclusive to indicate the deposit could be economically worked under existing conditions.

Rocks exposed in the mine area are quartzite (?) granodiorite, and porphyritic quartz monzonite. The quartzite (?) lies northeast of the mineralized area and outside the pit limits. Much of the mineralized area is covered by valley fill consisting of uncemented sandy gravel.

Porphyritic quartz monzonite intrudes the granodiorite, and in the mine area the younger intrusive is elongated in a N. 60° W. direction. Near surface this intrusive mass flattens southwesterly into

1/ Mining Engineer, Mining Division, Region III, Bureau of Mines
1a/ Geologist, U.S.Geological Survey, San Francisco, Calif.

a wide, mushroom-like extension that contains the ore body.

The ore deposit consists of a zone of oxidized copper minerals about 200 to 400 feet in thickness underlain by a zone of primary sulfide minerals. In the oxide zone the copper minerals occur principally along fractures in the rock, with the main fractures tending to have a parallelism, striking roughly N. 60° W. with the mineralized zone and dipping at moderate angles to the northeast.

The primary copper ore, as seen on mine dumps, consists of pyrite and chalcopyrite in about equal amounts coating fractures and occurring as disseminated grains in the rock. The majority of the chalcopyrite appears to be on seams and fractures rather than disseminated grains, a fact that is of considerable importance in grinding and milling the ore.

Secondary enrichment is apparently not important, as detailed assays of drill holes only locally show evidence of leaching or enrichment.

The deposit is divided into several fairly continuous zones of more or less mineralized rock. The bands of ore and "waste" (less mineralized but not barren rock) dip flatly to the northeast and roughly parallel the flat southwest contact between the porphyritic quartz monzonite and the granodiorite. The bulk of the ore occurs in the porphyritic quartz monzonite.

Rock that is below a cut-off grade of 0.4 percent copper has been classed as "waste" in the ore estimates. This "waste" occurs as large continuous flat-lying bands in the ore and amounts to 31,902,000 tons that may average about 0.298 percent copper. Since

the "waste" contains a low percentage of copper, it constitutes a very large potential reserve of metallic copper and the possibility of recovering the copper from the "waste" should be investigated.

A reserve of approximately 39,000,000 tons is indicated in the oxide portion of the pit which probably averages 0.84 percent copper. Should this material be mined at a rate of 10,000 tons per day, the daily production of copper would amount to 156,730 pounds, or 4,601,900 pounds per month, providing a recovery of 83.9 percent (recover indicated by leaching tests) can be maintained.

Tonnage reserves, leaching feasibility, production costs, capital requirements for mine equipment, plant, and construction facilities costs to place the property in operation have been checked and found acceptable. The capital requirement submitted is substantially correct and is therefore recommended.

INTRODUCTION

The ore reserve estimate, the plant construction cost estimate, and the production cost estimate of the Yerington Copper project, Yerington, Nevada, DMA-266, submitted by offices of the Anaconda Copper Mining Co. have been reviewed and checked by an engineer[2/] of the Bureau of Mines, Reno, Nev., and a geologist[3/] of the U. S. Geological Survey.

In conducting the investigation, ore reserve estimates and methods employed in calculating reserve tonnages, were discussed with Mr. Vincent Perry, Chief Geologist, Anaconda Copper Mining Co.,

2/ Benson, W. T.
3/ Kinkel, A. R. Jr.

Kearns Building, Salt Lake City, Utah, and Alex McDonald of the same office. Summary production cost estimates, together with current capital requirements for mine equipment, plant and construction facilities to place the Yerington property in operation were supplied by the office of D. E. Reed, New York 4, New York.

In addition to checking tonnage reserve and cost estimates, the property at Yerington was visited for the purpose of viewing mine and geological conditions and to obtain samples of material which had been removed from underground openings.

ACKNOWLEDGMENTS

The helpful cooperation of A. F. Millar and J. R. Wilson, Resident Geologist, Anaconda Copper Mining Co., Reno, Nev., in supplying mine maps and necessary data is appreciated.

ORE RESERVE ESTIMATE

At the Salt Lake meeting it was pointed out that the Anaconda engineers had worked up two figures, one of which shows approximately 35,000,000 tons at 0.97 percent copper and another figure for the same oxide body showing about 40,000,000 tons averaging 0.87 percent copper.

The larger but lower grade tonnage is based on a mining concept of adhering to 50-foot benches in the open pit with consequent dilution of ore resulting from a relatively non-selective mining operation. It likewise includes an extreme southeasterly extension of the pit to take in lower grade ore sections developed after the December 1943 estimate of 0.97 percent grade was made. The higher grade, lower tonnage figure, on the other hand, is based on a high

degree of selectivity involving some 25-foot benches and slight contraction in the pit outline. Another reason for the difference in the two estimates is that the higher grade reserve is based on a 0.45 percent cut-off and the lower grade on a 0.40 percent cut-off.

In checking these reserves, the engineer of the Bureau of Mines based his estimates on cross sectional areas which conformed to the pit outline. Results of the three estimates were as follows:

By bench method Anaconda Copper Mining Co.

Class	Tons	%/Cu	Waste Gravel	Waste Bed Rock
Oxide	39,687,700	0.87	12,668,100	
Sulphide	11,173,100	1.13		31,901,900
Total	50,860,800	0.92		

By cross section method Anaconda Copper Mining Co.

Oxide	34,963,500	0.97	12,671,000	
Sulphide	13,869,400	1.13		32,152,500
Total	48,832,900	1.01		

By cross section method conforming to pit outline - U. S. Bureau of Mines.

Oxide	39,105,000	0.94	
Sulphide	11,238,000	1.17	31,902,000
Total	50,343,000	0.99	

The bench method of the Anaconda Copper Mining Co., and the cross section method of the Bureau of Mines, which adheres to the 50-foot bench outline, compare favorably. By comparing the three methods of calculations, the overall tonnage figures and their assay values are close enough in agreement to assume the Anaconda figures as originally submitted are substantially correct and are

acceptable to the examining team.

SAMPLING

A total of 46 samples were taken from segregated surface dumps. Purpose of the sampling was to check the assay value of these dumps and to compare their assay value with the values of the channel cuts and muck pile samples which were taken from underground openings. A comparison of the results follows:

200 - 300 Levels

Working	Footage		%/Cu
201DN	82.0		1.07
201DS	529.0		2.00
205DW	207.0		4.76
266DE	398.0		1.11
Total 200' level	1,216.0	Wt.Av.	2.11
303 x CS	271.0		1.51
308 x CS	32.0		2.27
304DW	189.0		1.32
305DE	435.0		.96
306 x CS	52.0		.83
307 x CN	215.0		1.48
Total 300' level	1,194.0	Wt.Av.	1.26

200 - 300 Raises

303 R Sulfide	79.0		1.95
331 R "	60.0		1.22
313 R "	51.0		.68
336 R "	65.0		1.08
Total Sulfide	255.0	Wt.Av.	1.31

Working	Footage	%/Cu
303 R Oxide	69.0	1.51
202 R "	81.0	1.07
231 R "	84.0	2.06
212 R "	63.0	0.56
207 R "	68.0	0.50
Total Oxide	365.0	Wt.Av.1.18
Total Raises	620.0	1.23

100 Level (Old Workings)

474 feet drifts Av. 1.30

Total Mine Workings

100 Level	474.0	1.30
200 Level	1,216.0	2.11
300 Level	1,194.0	1.26
200 - 300 Raises	620.0	1.23
Total	3,504.0	Wt.Av.1.63

New Workings 200 - 300 Levels 200 - 300 Raises

Total Footage 3,065 Av. Assay 1.65

Dump Samples

A total of 46 samples were taken by the Bureau of Mines of segregated piles of material that came from the new mine workings.

A.C.M.		U.S.B.M.	
Tons	Assay	Tons	Assay
9,558	1.76%	9,558	1.61% Cu

Recapitulation of Sampling Results

Working	Feet	Average Assay
100' Level	474.0	1.30% Cu
200'-300' Levels-Raises	3,065.0	1.65% Cu
Average assay all workings		1.63% Cu
Dumps 9,558 tons U.S.B.M. Samples		1.61% Cu
Dumps 9,558 tons A.C.M. Samples		1.76% Cu

For this comparison the assay values for cut and muck samples from new workings and the dumps were used. From the results obtained it is apparent all methods agree closely. Since they are in such close agreement it is assumed the assay values used by the company and the methods of sampling employed were correct and are therefore acceptable.

GENERAL GEOLOGY

Information on the geology of the Yerington mine was derived in part from published reports on the Yerington district and from a visit to the mine accompanied by Mr. J. Wilson, geologist for Anaconda Copper Co. The surface workings were visited, and numerous segregated dumps from specific locations on the 200- and 300-foot levels were examined. The underground workings were not accessible. Some diamond drill cores were examined. Most of the information on the deposit, however, was derived from geologic and assay maps and detailed drill hole information supplied by Anaconda Copper Co. and from a discussion of the geology with Mr. Wilson. The geologic map accompanying this report was supplied by the Anaconda Copper Co., and the sections accompanying this report were traced from company maps. The writer believes that they accurately show the information now available on the deposit.

The geology of the Yerington copper district was described by Knopf[4] in 1918, and brief descriptions of the district are given

4/ Knopf, Adolph, Geology and ore deposits of the Yerington District, Nevada; U. S. Geol. Survey Prof. Paper 114, 1918.

by other writers[5]. These reports deal mainly with the contact metamorphic copper deposits of the district, and little attention is given to the bodies of rock that contain small quantities of disseminated copper minerals.

The bedrock in the Yerington district is composed of Mesozoic sediments and volcanic rocks that were intruded, probably in early Cretaceous time, by two granitic magmas. The earlier of these is a medium grained basic granodiorite; the later is a porphyritic quartz monzonite. The disseminated copper ore occurs mainly in the porphyritic quartz monzonite. These rocks are overlain unconformably by Tertiary volcanic rocks, but the Tertiary rocks have been eroded from the mine area.

GEOLOGY[6] OF THE MINE AREA

The rocks exposed in the mine area are quartzite (?) granodiorite, and porphyritic quartz monzonite. The quartzite (?) lies northeast of the mineralized area and outside of the pit limits (see geologic map). Much of the mineralized area is covered by valley fill consisting of uncemented sandy gravel.

5/ Carpenter, Jay A., Yerington Copper District, Nevada; Mining and Science Press, 101: 4-9, 1910.
Jennings, E. P., Genesis of the copper deposits of Yerington, Nevada; Eng. and Min. Jour. 83: 1143-1144, 1907.
Jennings, E. P., Canadian Mining Jour. 28 (nsl, No. 12) 365-366, 1907.
Ransom, F. L., The Yerington Copper District, U. S. Geol. Survey Bull. 380, 99-119, 1909.

6/ Kinkel, A. R., geologist, U. S. Geological Survey.

The porphyritic quartz monzonite intrudes the granodiorite, and in the mine area the younger instrusive is elongated in a N. 60° E. direction. The northeast contact of the porphyritic quartz monzonite is steep, but the southwest contact, that appears to be steep in depth, flattens near the surface into a wide, southwesterly, mushroom-like extension that contains the ore body (sections M, O, and S). The granitic rocks are cut by a few narrow silicic and basic dikes.

The porphyritic quartz monzonite is quite variable in appearance. It ranges from a very siliceous light gray rock in which only ghosts of the feldspar phenocrysts can be seen, to a rock with light colored feldspar up to 5 mm. in length set in dark gray groundmass. Some of the quartz monzonite porphyry is extremely siliceous and is cut by many small light gray quartz veins, while some is altered to clay minerals and contains veinlets of clay. Almost all of the ferromagnesian minerals have been altered to chlorite or epidote. The rock is so strongly fractured locally that it is difficult to obtain a fresh surface.

MINERALIZATION

The outcrop of the deposit gives little indication of the mineralization that lies immediately beneath the surface. This is apparently not due to leaching, but to removal by erosion of the softer mineralized part of the rock leaving a surface rubble of angular chips of resistant, siliceous porphyry. Only scattered fragments of chrysocolla give a clue to the presence of an ore zone.

The ore deposit consists of a zone of oxidized copper minerals about 200- to 400-feet in thickness underlain by a zone of primary sulfide minerals. In the oxide zone the copper minerals occur principally along fractures in the rock. The main fractures tend to have a parallelism, striking roughly N. 60° W. with the mineralized zone and dipping at moderate angles to the northeast. Closely spaced zones of fracturing and clay alteration alternate with less fractured and altered zones in the surface cuts, and the bulk of the secondary copper appears to be associated with fracturing. Some disseminated copper minerals can be seen, but these seem to be in part a replacement of the rock by secondary copper minerals.

The primary copper ore, as seen on mine dumps, consists of pyrite and chalcopyrite in about equal amounts coating fractures and occurring as disseminated grains in the rock. The majority of the chalcopyrite appears to be on seams and fractures rather than as disseminated grains, a fact that is of considerable importance in grinding and milling the ore.

Minor chalcocite is present in the sulfide zone. It has been recognized in diamond drill cores near the sulfide-oxide contact, but also has been found in the sulfide zone at a considerable distance below the sulfide-oxide contact. However secondary enrichment is apparently not important, as detailed assays of drill holes only locally show evidence of leaching or enrichment. In most of the drill holes, assays fail to show any marked leaching of the surface or any enrichment at the top of the sulfide zone.

The ore deposit is divided into several fairly continuous zones of more or less mineralized rock. These zones have been separated on the maps and in the ore estimate on the basis of a cut-off grade of 0.4% copper. The bands of ore and "waste" (less mineralized but not barren rock) dip flatly to the northeast and roughly parallel the flat southwest contact between the porphyritic quartz monzonite and the granodiorite. The bulk of the ore occurs in the porphyritic quartz monzonite. The granodiorite was also amenable to ore deposition, however, as zones of sulfide and oxidized copper minerals cross the footwall contact of the porphyritic quartz monzonite in many places (sections G, Q, and S).

The bedrock that is below a cut-off grade of 0.4% copper has been classed as "waste" in the ore estimates. This "waste" occurs as large continuous flat-lying bands in the ore and amounts to 31,902,000 tons (see sections). Even though the "waste" contains a low percentage of copper, it constitutes a very large potential reserve of metallic copper, and the possibility of recovering the copper from the "waste" should be investigated. A rough estimate of the grade of the bands of "waste" in the ore, based on averaging 9,997 feet of drill intercepts in the pit area, shows that the entire 31,902,000 tons contains 0.289% copper. Using the same figure for recovery that the Anaconda Copper Co. used in the ore estimate (16.79 pounds of copper per ton or 83.9%) the "waste" in the pit would contain 154,726,197 pounds of recoverable copper, altho it is not certain that the same recovery could be obtained on very low-grade rock.

This amount of copper is such a large potential reserve, in rock that will have to be broken and removed from the pit in the process of mining, that serious consideration should be given to allowing some form of subsidy price for the recovery of the copper contained in the "waste". There are few places where 150,000,000 pounds of copper would be so readily accessible. In addition, the areas calculated as "waste" (below 0.4% cut-off grade) contain some large, continuous bodies of rock that contain 0.15% copper or less, and it is probable that these could be segregated during mining operations. Elimination of the extremely low-grade parts of the "waste" would lower the tonnage but would raise the grade appreciably.

GROUND WATER

It seems improbable that an excessive flow of ground water will cause serious trouble in a pit operation at Yerington. The deposit is low-lying, and the bottom of the pit will be about 350 feet below the water table, but precipitation is low. Ground water contained in the gravels should not be a serious problem, even though the gravel-bedrock contact is about 50 feet below the present water table in the western part of the pit. Pumping was done in some of the western drill holes in the gravel, and the water table is reported to have been dropped appreciably and uniformly with moderate pumping. Pumping in one hole lowered the water in surrounding holes to about the same level, indicating that although the gravel was quite permeable, no large head of water was present. The water returned to its former level very slowly. The alteration of much of

the rock to clay minerals along seams should make the bedrock impervious to a large, continuous flow of water, although the fractured condition of the bedrock would allow local concentrations of ground water.

PRODUCTION AND PLANT COST ESTIMATES

The following production cost estimates and current capital requirements for mine equipment, plant and construction facilities to place the property in operation, were supplied by C. E. Reed of the New York office of the company.

Estimate A, summarizes the production costs estimated under current labor and material charges, at $0.1425 per lb., copper produced before depreciation and Federal taxes.

Capital expenditures are estimated as follows:

Cement Copper Plant (Estimate B)	$17,260,000
400-ton Acid Plant (Estimate B)	2,560,000
Mine Equipment (Estimate C)	2,016,295
Housing and Townsite (Estimate D)	2,652,100
Stripping Preliminary	511,605
TOTAL CAPITAL EXPENDITURES	$25,000,000

ESTIMATE A

December 1950 Summary Estimate of Production Cost

Grade: 1.00% Cu - 10,000 Tons per Day - Recovery 17.00 Lb. Cu per Ton
Less Smelter Deduction (1.25%) .21
Net Recovery 16.79 Lb. Cu per Ton

Production: 167,900 Lbs. Cu per Day, or 5,000,000 lbs. Cu per month

Cost:

	Per Dry Ton Ore	Per Lb. Cu
Mining	$ 0.50	
Crushing-Bedding	0.11	
Tailings Disposal	0.10	
Leaching (including acid manufacture)	0.50	
	$ 1.21	7.20¢
Iron Precipitation		2.52
Plant General Expense - State Taxes ($45,000 per month)		.89
Smelting, Freight, Refining - to Market Midwest		3.34
New York General Expense		.30
Total Estimated Cost before Depreciation and Federal Taxes		14.25¢

ESTIMATE B

Plant Construction Estimates
(as of December 1950)

CEMENT COPPER PLANT

Primary Crushing Plant	$ 588,000
36" Belt Conveyor No. 1	163,000
Coarse Ore Bins (6000 tons capacity)	297,000
36" Belt Conveyor No. 2	235,000
Secondary Crushing Plant	1,833,000
42" Belt Conveyor No. 3	163,000
Junction House & 42" Belt Conveyor No. 4	66,000
42" Bel Conveyor No. 5 & Tripper	180,000
42" Belt Conveyor No. 7	380,000
Leaching Tanks (Raised & Fully Lined) including Loading & Excav. Bridges & Solution Lines	4,680,000
Cementation Launders	1,110,000
Tailings Disposal	900,000
Miscellaneous Shops & Offices	1,600,000
Water Supply & Storage	405,000
Electric Power Supply & Distribution	700,000
Cement Copper Conditioning	450,000
Transportation, Haulage & Dump Trucks	245,000
Engineering, Supervision & Contingencies	900,000
Workmen's Compensation & Social Security	350,000
Warehouse Handling & Accounting	400,000
Cont.'s O. H. Equip. Rental & Fee	1,615,000
CEMENT COPPER TOTAL	$17,260,000

ACID PLANT

400-ton Sulphuric Acid Plant (Contract)	$ 2,560,000
TOTAL	$19,820,000

New York, New York

January 26, 1951

ESTIMATE C

Mine Equipment

		Delivered
3	5 yd. P & H Shovels 1400 B's	$ 503,400
5,000'	Trail cable for shovels ($2/ft. - 5,000')	12,000
3	42 T Churn Drills (incl. tools & drill cable)	100,000
	Fishing tools & power trail cable (85¢/ft. - 2000')	3,800
1	No. 12 bit dresser, furnaces forging & tempering, etc.	15,500
1	Trail cable vulcanizer and Cable tester	5,000
5	Dozers (3 cats D-8 and 2 Le Tourneau Turnadozers) complete with double drum rear P.T.O. & bulldozers - cable operated. (Plant will also order 1 for tailings).	127,000
1	Carryall scraper (15 to 18 yd. struck)	15,000
1	20 T Truck Crane P & H with extensions & jib	32,000
1	Road Patrol H.D.	13,000
2	Portable Air Compressors (electric drive) 365 or 500 cu.ft./min.	22,000
4	Jackhamers with steel & bits	2,000
2	Wagon Drills " " "	6,000
1	Chevrolet Business Coupe (Mine Supt.)	1,800
4	1/2 T Pick-ups, Chevrolet (Eng., Pit Foreman, Shop, Misc.)	6,400
1	5 yd. Dump Truck GMC (stemming)	9,500
1	GMC - Service truck (field lubricator - power tail gate)	5,000
2	Portable welding units (1 elect. driven - 1 gas)	1,600
1	GMC - Service truck (with winch - bits & casing - PTO)	5,000
2	GMC - Water tank trucks - (water transp. & roads)	10,000

Estimate C (Co[illegible])

15	30 T Dart Trucks - powered 350 or 400 H.P. - twin disc converters - 21 yd. end dump bodies - (place order for delivery 1 year but with reservation as to motor to be used)	660,000
	Drive out Factory to Site	13,500
	Stemming preparation - (screening & storing, etc.)	3,000
	Garage, warehouse, change house, office, buildings incl. in Plant	
	Garage equipment:	
	Wash rack - steam cleaner ($1200) - pipe lines - concrete slab, etc.	3,500
	Tire repairs - minor running repairs only & tire changing equip.	1,000
	Battery charging setup - 6 - 12 V batts. individual controls	2,500
	Lubrication - H.P. and L.P. pumps - hose - connectors - reels - valves, etc.	2,500
	Welding - 400 amp. machine elect. driven & equip.	2,000
	Diesel & gasoline storage and service tanks & station pumps (2 - 30,000 gal. diesel, 1- 30,000 gal. gas)	25,000
	Air compressor - high pressure for operating H.P. lube pumps, inflating large tires, etc.	2,000
	Dynamometer Test Stand	4,600
	Utilitruck	4,500
	12" lathe with attachments) 1/2" Drill Press)	3,000
	Misc.:- Chain blocks, vises, compression gauges, sets hand tools, socket wrenches, torque wrench s, jacks, pullers, come-a-longs, impact air wrenches, hydrometers, voltage testers, spark plug testers & cleaners, timing lights, brake grinders & reliners, electric drills, bench grinders, honing, reboring bar, hydraulic press, micrometers, water softener, misc. tools.	18,000
	1 Wheel & Hub balancer	1,000
	1 Front end Machine (Bear)	4,500
	3 Overhaul Engine Stands	1,200
	Fuel Injector Test Stands	300
	For Fuel Pump Calibration send to outside company	
	Pit Office furniture and supplies including engineering office supplies and equipment such as transits, levels, rods, chains, calculating machines, typewriters, universal drafter, printing machine, etc.	10,000
	Water lines & pumps	20,000
	Power lines - sub station - switch houses - transformers	75,000
	SUBTOTAL	1,753,300
	Contingencies 15%	262,995
	Total Mine Equip	2,016,295

ESTIMATE D

Housing & Townsite

25	1 Bedroom houses)	
25	3 Bedroom houses) @ $8,000	$1,600,000
150	2 Bedroom houses)	
5	(Keymen) Houses @ $11,000	55,000
1	Managers House (furnished)	20,000
1	Guest House (no dining room, no kitchen) O furnished	18,000
12	Single mens quarters (8 to 10 men each) - furnished	144,000
1	Mess Hall - equipped	77,000
	Sewage - water - power	500,000
	SUBTOTAL	$2,411,000
	Contingencies 10%	241,100
	Total	$2,652,100

RECAP:-

Mine equipment	$2,016,295
Townsite	2,652,100
Total estimate	$4,668,395

The above estimates of capital expenditures required are based on current quotations from suppliers and current labor costs, as determined by company engineering studies still in progress. While there may be slight variations in individual cost estimates, the overall capital expenditure figure will probably be altered only slightly from the estimate presently used. These estimates, while still being studied, are sufficiently close for all practical pur-

poses and are therefore accepted.

The summary estimate of production costs are based on current labor charges, and a production of 10,000 tons per day having an average grade of 1.0 percent copper.

From the estimates there are approximately 59,000,000 tons in the oxide portion of the pit which will probably average 0.94 percent copper. Should this material be mined at a rate of 10,000 tons per day the production of copper would be reduced to 156,730 pounds copper per day or 4,601,900 pounds per month providing a recovery of 83.9 percent can be maintained. This would mean a reduction of about 11,170 pounds of copper per day or 398,100 pounds per month. The amount, however, is not sufficient by large to warrant any appreciable change in the production cost estimate as originally planned.

PERCOLATION LEACH TEST

For the purpose of determining the amenability of the ore to acid leaching, the rejects of the 46 samples taken by the Bureau of Mines were submitted to the Hydrometallurgical and Ore Dressing Section, Reno, Nevada for testing.

Each sample was crushed to a minus 3/8 inch in size. A portion of each sample was taken to prepare the composite head from which a charge was cut for the sulphuric acid percolation leach.

The copper minerals present were malachite, azurite, and chrysocolla as stains and seams in an altered siliceous rock. Analyses showed 1.5 percent copper, 0.15 percent sulfide sulphur, and 0.03 percent sulfate sulphur.

The ore was leached for seven days. 81.2 percent of the copper was extracted. The leached residue assayed 0.30 percent copper. Acid consumption was approximately 60 pounds H_2SO_4 per ton of ore.

CONCLUSIONS

From data supplied by the Anaconda Copper Mining Co. on the Yerington Copper Project, it is evident that an exhaustive examination was conducted to determine if the deposit was large enough and of such grade to warrant its being brought into production. Results of the investigation were sufficiently conclusive to indicate that deposit could be economically worked under existing conditions.

Tonnage reserves, leaching feasibility, production costs, capital requirements for mine equipment, plant and construction facilities costs to place the property in operation, have been checked by the Government examining team and found acceptable. The capital requirement submitted is substantially correct and is therefore recommended.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
REGION III
RECEIVED
FEB 26 1951
SAN FRANCISCO, CALIFORNIA

Mining Division
Region III

NEVADA - CALIFORNIA

P. O. Box 1551
Reno, Nevada

February 23, 1951

Refer to		
Answered		

Memorandum

To: Mr. H. C. Miller, Regional Director, Region III

From: Chief, Mining Division, Region III

Subject: Investigations of Yerington Copper Project, Yerington, Nevada, DMA-266

Enclosed, herewith, are five copies of the report by Mr. W. T. Benson, on the Yerington Copper deposit owned by the Anaconda Copper Company. The examination was made by Mr. Benson and Mr. A. R. Kinkel, Jr., of the U. S. Geological Survey. There is only one copy of the survey plan map and one copy of each of the sections, if other copies are needed they will have to be photostatted.

The memorandum to the Executive Officer, DMA Field Team, Region III, dated January 12, 1951, is returned.

A. C. Johnson

A. C. Johnson

Encls.

February 14, 1951

Memorandum

To: A. C. Johnson - Reno, Nevada

From: Regional Director, Region III

Subject: Docket DMA-266, Yerington Copper Project, Yerington, Nevada

Mr. J. K. Richardson, Chairman, Copper Commodity Committee, DMA, Washington, D. C., called me this afternoon, inquiring as to the status of our Yerington and Kennecott Copper investigations.

He told me that Yerington "is very hot" and every effort should be made to rush this investigation to completion.

The Kennecott investigation is not so urgent, as Kennecott is considering withdrawing its application for everything except possible accelerated amortization which the Washington Office can take care of. However, you should continue the Kennecott study but there is no need to crowd it. Yerington, on the other hand, should be given first priority of action.

H. C. MILLER

H. C. Miller
Regional Director, Region III

Copy to: Ward Smith, Geological Survey

HCMiller:am

Files
Chrono

January 26, 1951

Memorandum

To: A. C. Johnson, Bureau of Mines, Reno, Nevada

From: Regional Director, Region III

Subject: Investigations of Yerington Copper Project, Yerington, Nevada, DMA - 266

Attached is an extra Washington copy of subject memorandum, dated January 12, from J. N. Richardson, Chairman, Copper Commodity Committee, DMA. Upon receipt of that memorandum I wrote Mr. Richardson to have the field team of Region III attend to the New York part of the assignment or, as an alternative, have the Anaconda Copper Mining Company send the necessary material to this office. Apparently the latter suggestion is to be carried out in part, as I received the following teletype from Richardson today.

> "Technical data on above project now available at offices of Vincent Perry, Chief Geologist, Anaconda Copper Mining Company, Keyes Building, Salt Lake City, Utah. Suggest your team immediately contact either Perry or Alex McDonald of his office and proceed with investigation as originally outlined. Wood has arranged for your arrival there. Your conclusions urgently needed."

You will note in Richardson's memorandum that the Copper Commodity Committee in Washington wishes us to make a check on the ore reserve estimate, the plant construction cost estimate, and the production cost estimate, as shown in the applicant's application for Government assistance. My feels, as stated in the last two lines of the first page of his memorandum, that our knowledge of local conditions should be brought to bear on the situation when considering the proposed estimated reserves and costs.

Upon receipt of this memorandum, you should send your best copper engineer to Salt Lake City and have him proceed with the investigation. His conclusion should be transmitted to me as soon as possible after conclusion of the investigation.

H. C. MILLER

H. C. Miller
Regional Director, Region III

Attachment

Copy to:
Ward Smith
H. C. Miller:emt
Files
Chrono.

Refer to	Noted	Date
	[illegible]	1-26

Answered 1-26-51 1154A

DEPARTMENT OF THE BUREAU OF RECLAMATION RECEIVED JAN 26 1951 SAN FRANCISCO, CALIFORNIA

1/4-9

241 SF WAF /I-BOM/

WASHINGTON

PBA

H C MILLER, EXECUTIVE OFFICER

1951 JAN 26 AM 9 20

DMA FIELD REG II SF 284178

TELETYPE DIVISION

REFERENCE TO YOUR LETTER OF JANUARY 25 CONCERNING YERINGTON COPPER PROJECT, DMA-266.

" TECHNICAL DATA ON ABOVE PROJE T NOW AVAILABLE AT OFFICES OF VINCENT PERRY, CHIEF GEOLOGIST, ANACONDA COPPER MINING COMPANY, KEARNS BUILDING, SALT LAKE CITY, UTAH. SUGGEST YOUR TEAM IMMEDIATELY CONTACT EITHER PERRY OR ALEX MCDONALD OF HIS OFFICE AND PROCEED WITH INVESTIGATION AS ORIGINALLY OUTLINED. WEED HAS ARRANGED FOR YOUR ARRIVAL THERE. YOUR CONCLUSIONS URGENTLY NEEDED. "

J K RICHARDSON

CJA 1200P

January 23, 1951

Memorandum

Air Mail

To: J. K. Richardson, Chairman, DMA, Copper Commodity Committee, Washington, D. C.

From: H. C. Miller, Executive Officer, DMA Field Team, Region III

Subject: Investigations of Yerington Copper Project, Yerington, Nevada; DMA-266

The DMA Field Team, Region III, composed of the writer as Executive Officer and Ward Smith, of the Geological Survey, acknowledge your subject memorandum dated January 12.

We note that an investigation of the Yerington, Nevada, copper project should be made and should consist of a check on the ore reserve estimate, on the plant construction cost estimate, and the estimated production cost.

As the technical data on the project are assembled in the New York Office of the Anaconda Copper Mining Company, two methods present themselves for making the preliminary investigation. The easier for us is for you to arrange with the Field Team of Region VIII to send a copper expert to New York to check the data in the company's offices, but the more satisfactory might be for you to arrange with the Anaconda Company to send their data to me. The latter method would permit us to utilize our knowledge of local conditions in making our recommendations. A. C. Johnson, Chief, Mining Division, Region III, is familiar with the Yerington district and his knowledge of local conditions may have an invaluable bearing on its consideration.

However, if you are of the opinion, based upon your recent visit to the company's offices, that the study of the collected data should be made in New York and you will arrange with the Field Team in Region VIII to do the work, we will accept its conclusions and check them out here on the basis of our knowledge of local conditions.

Kindly inform me by teletype what procedure you initiate, so I will know what steps we should take out here.

H. C. MILLER

H. C. Miller
Regional Director, Region III

Copy to: Ward Smith,
Geological Survey

HCMiller:am
Files
Chrono

Copy: Regular mail

DEPARTMENT OF THE
BUREAU OF MINES
REGION III
RECEIVED
JAN 19 1951
SAN FRANCISCO, CALIFORNIA

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
WASHINGTON 25, D. C.

Refer to	Noted	Date
Answered		

January 12, 1951

Memorandum

To: Executive Officer, DMA Field Team, Region III, 1415 U. S. Appraisers Building, San Francisco 11, California

Through: Operating Committee

From: Chairman, Copper Commodity Committee

Subject: Investigations of Yerington Copper Project, Yerington, Nevada; DMA-266.

The Anaconda Copper Mining Company has under consideration a large copper project at Yerington, Nevada, for the development of an open pit mine and the construction of a leaching plant to produce approximately 30,000 tons a year in the form of cement copper. Negotiations are under way between the Defense Minerals Administration and the Company to arrive at a purchase agreement that will justify the Company in undertaking the project at this time. The members of this Committee discussed the technical features of the project with Mr. R. S. Newlin, Assistant Vice President of the Company at his office in New York. He told us about its principal features and we spent a little time looking at the plans and sections of the ore body. We could not, however, in the time available, make any kind of a check on the ore reserve estimate, the plant construction cost estimate, or the estimated production cost. It will be necessary to have these things done before DMA can recommend a purchase agreement or a Certificate of Necessity, therefore, it is requested that you review the Company estimates at your earliest convenience.

All of the technical data on the project are assembled in the New York office of the Company; it will be necessary to make the investigation there in greater part. If you wish, the Field Team of Region VIII undoubtedly would be willing to attend to that for you, but as the project would be in your Region we feel that your knowledge of local conditions should be brought to bear on its consideration.

To make arrangements for the study, you should get in touch with Mr. Clyde E. Weed, Vice President in Charge of Mining Operations, Anaconda Copper Mining Company 25 Broadway, New York 4, New York (Telephone Hanover 2-6300).

J. K. Richardson, Chairman
Copper Commodity Committee

For Approval:

S. H. Williston, Acting Chairman
Operating Committee

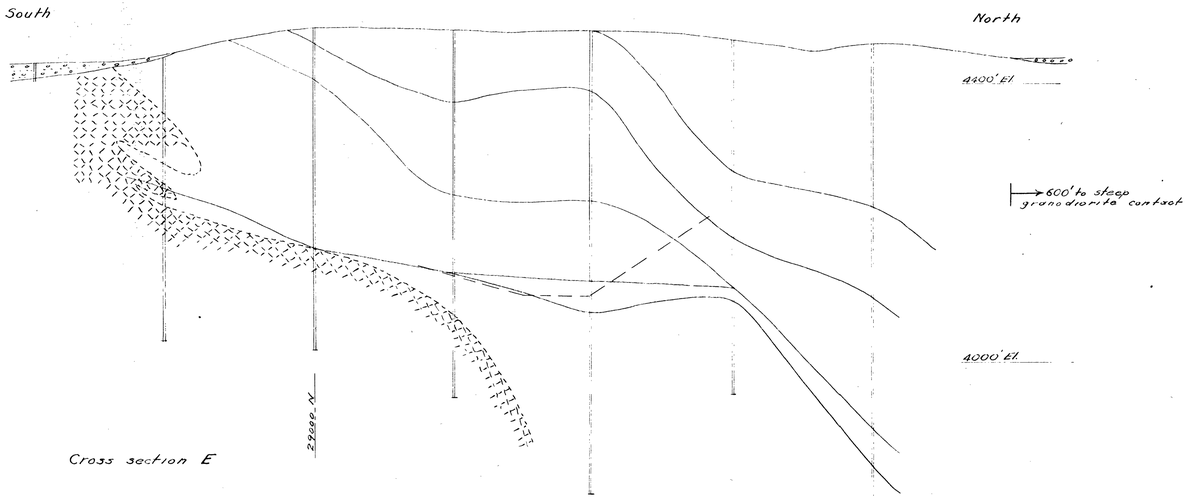
J. H. Hedges

for O. N. Rove

Copy to Mr. Strobel
Copper Commodity Committee
F i l e s

No. 1 Shaft, showing segregated dumps from the 200 and 300 foot levels, Yerington mine, Nevada.

View looking south of proposed pit at Yerington mine, Nevada.



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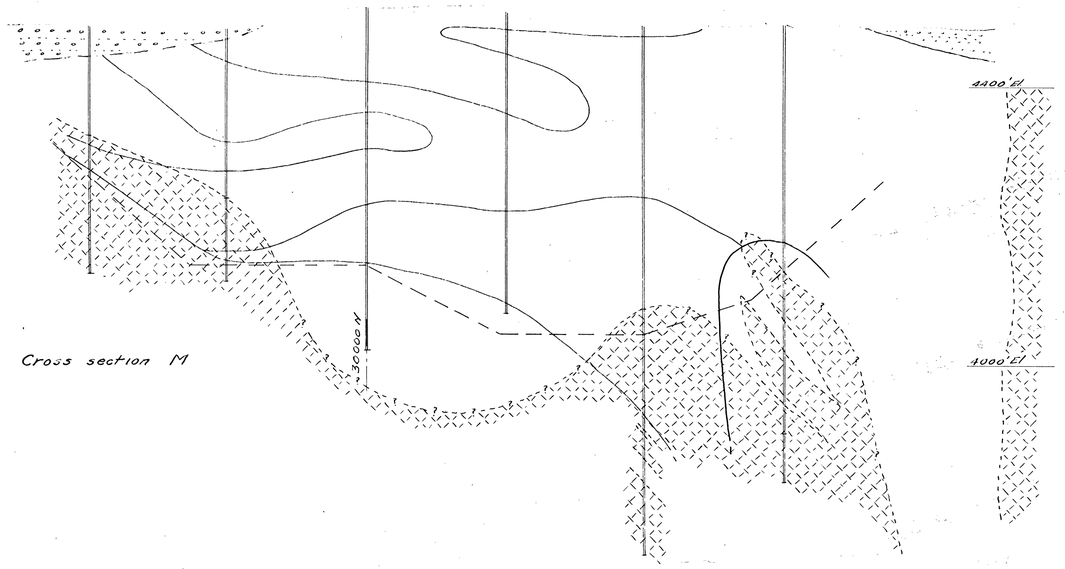

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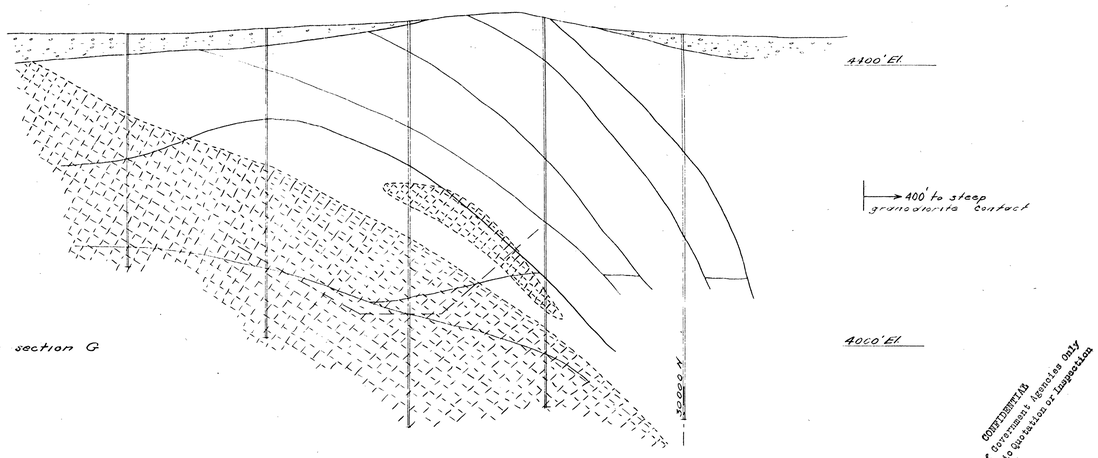

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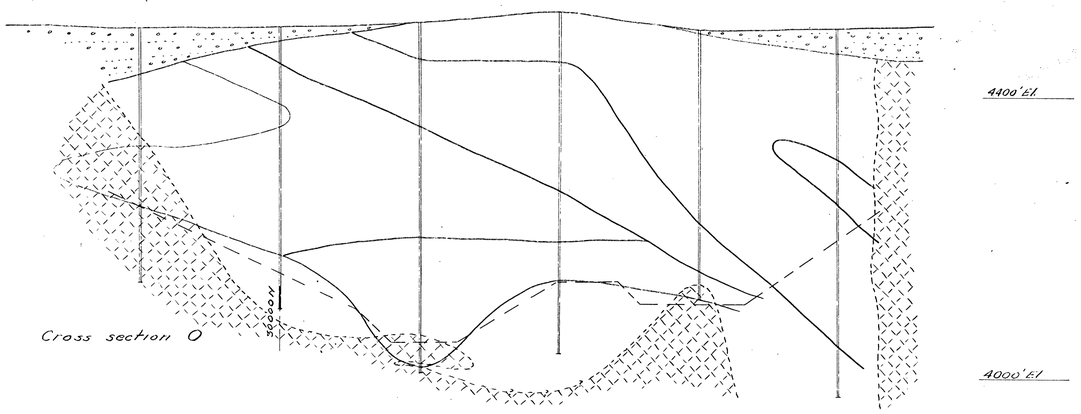

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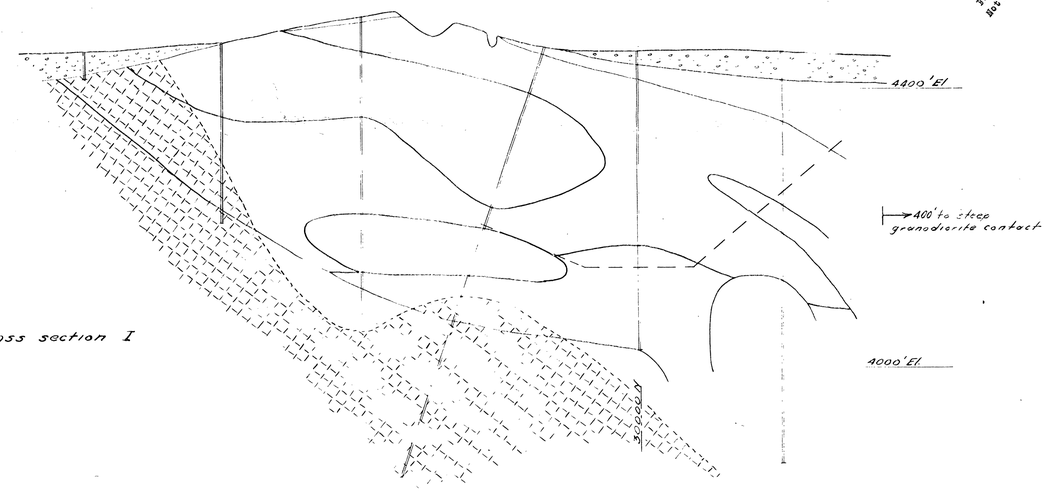

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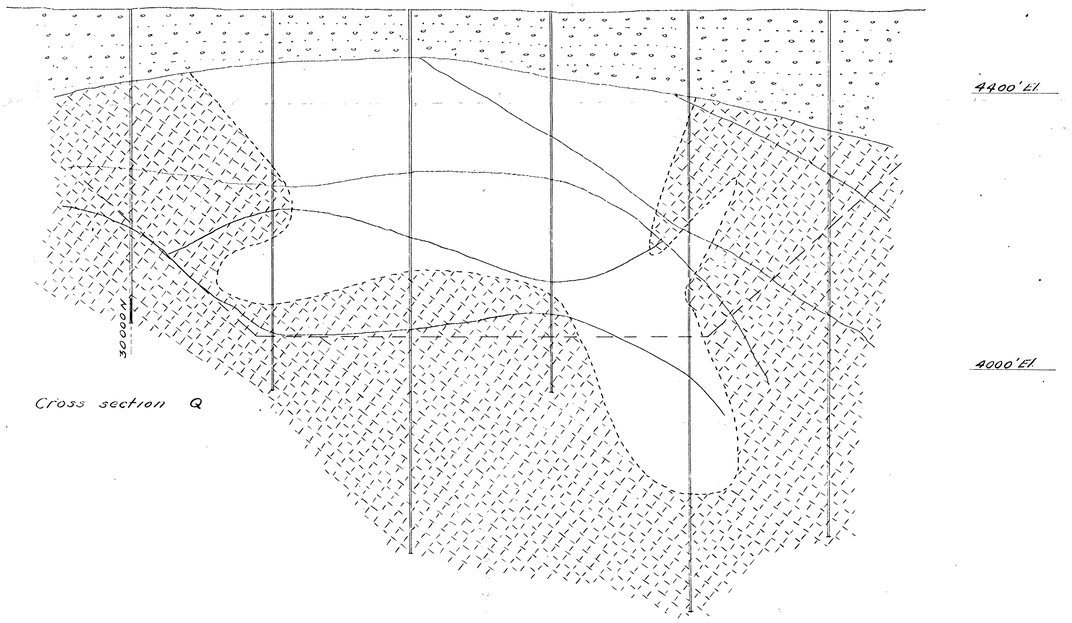

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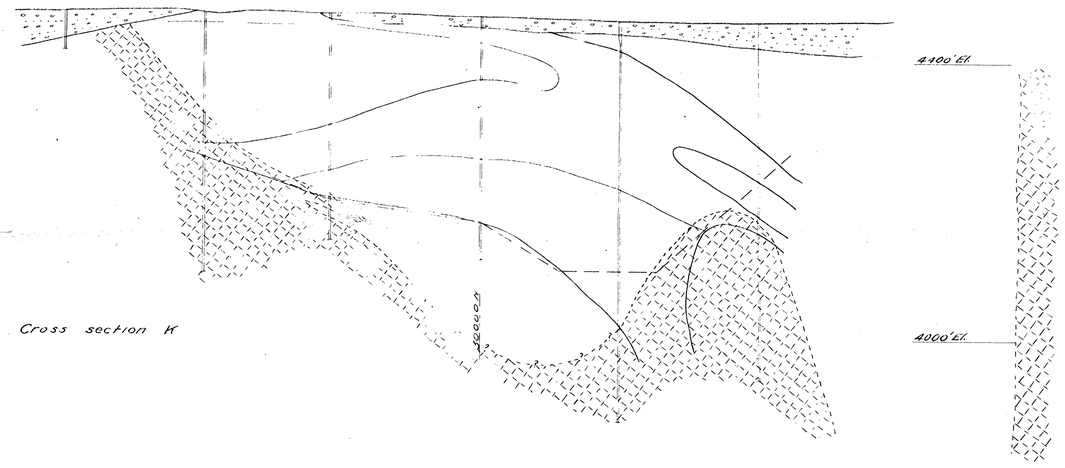

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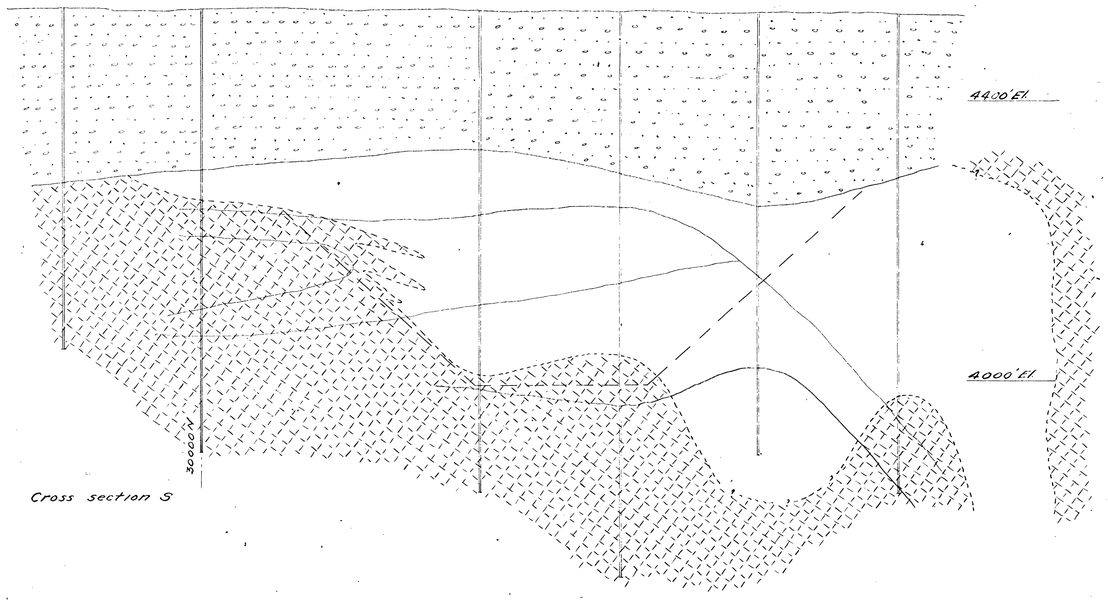

Cross section S

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Explanation

- Sand and gravel
- Quartz monzonite porphyry
- Granodiorite
- Oxidized copper minerals
- Sulfide copper minerals
- Approximate boundary of proposed pit
- Diamond drill and churn drill holes

0' — 500'

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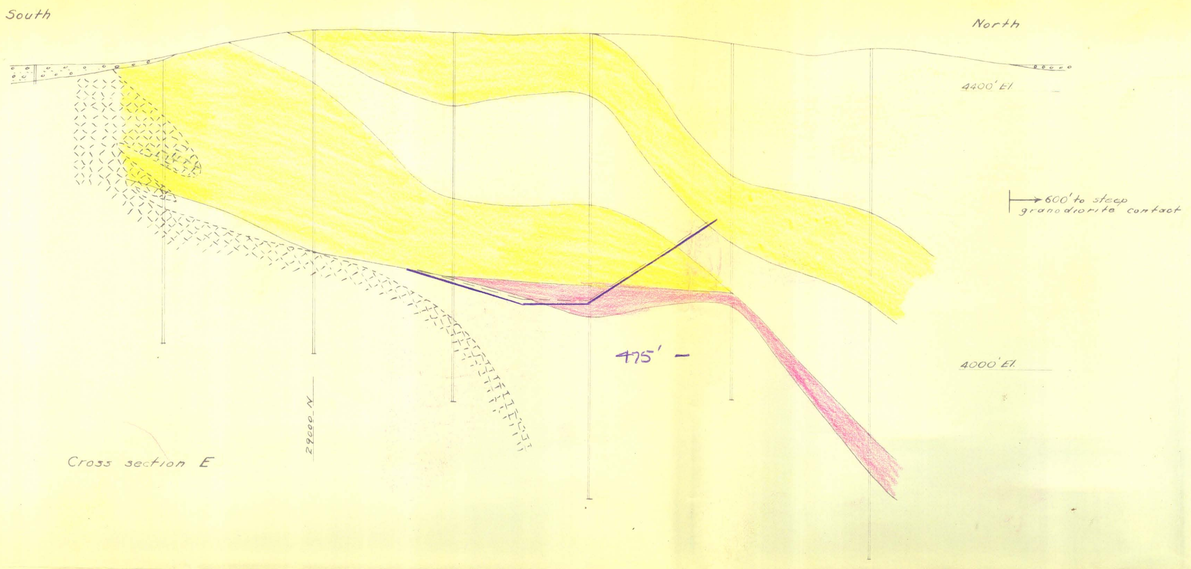
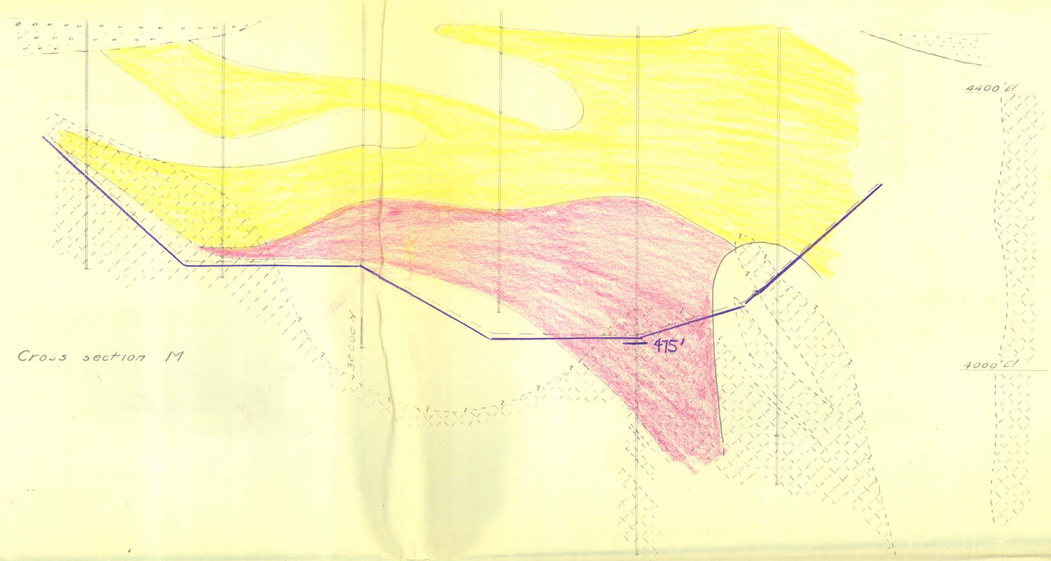
Yerington Mine

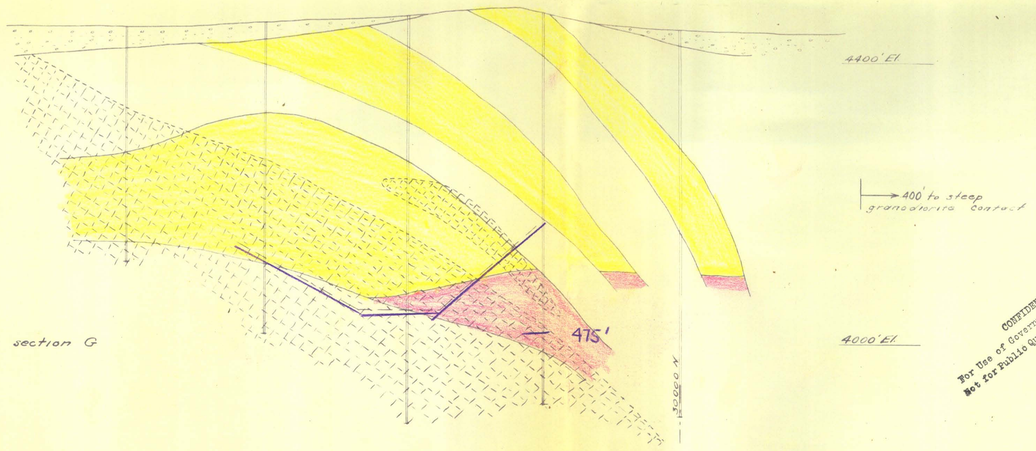
Yerington, Nevada

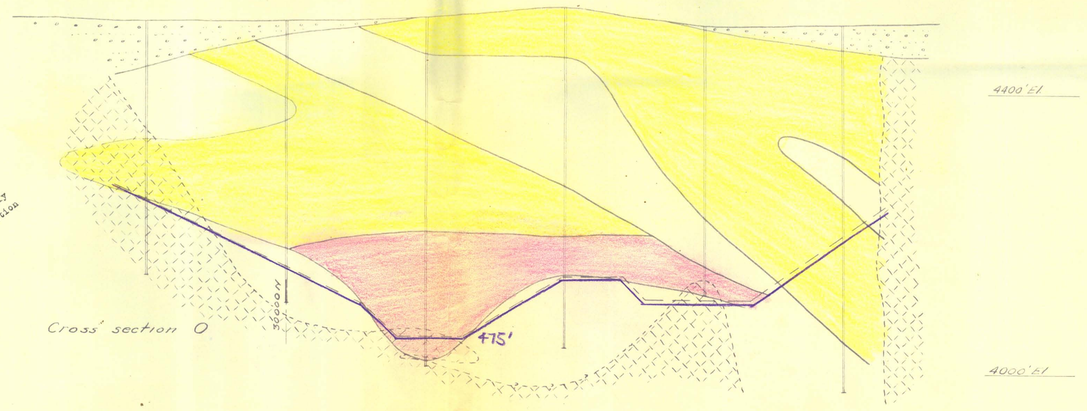
Vertical cross sections
(location shown on geologic plan)

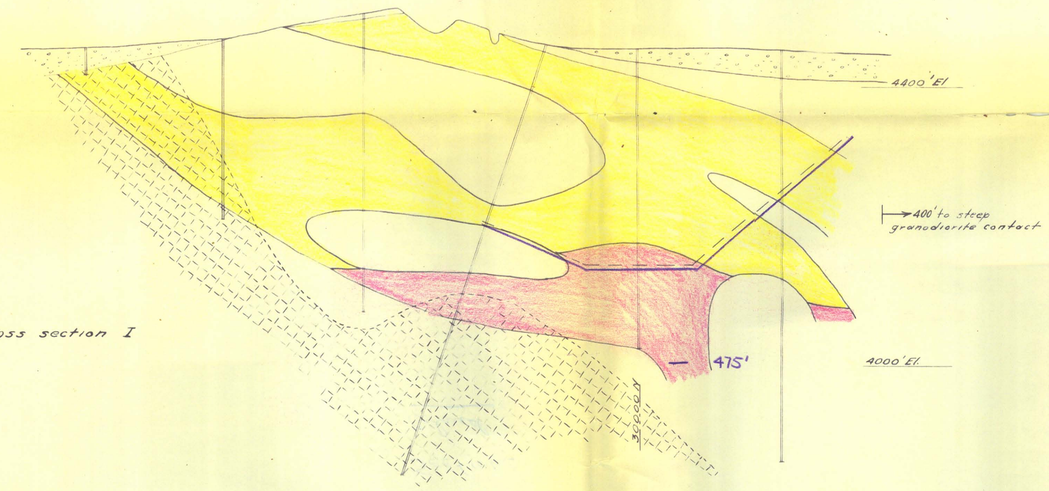
Traced from Anaconda Copper Co maps by A.R. Kinkel Jr., Feb. 16, 1951
Not for public inspection or quotation

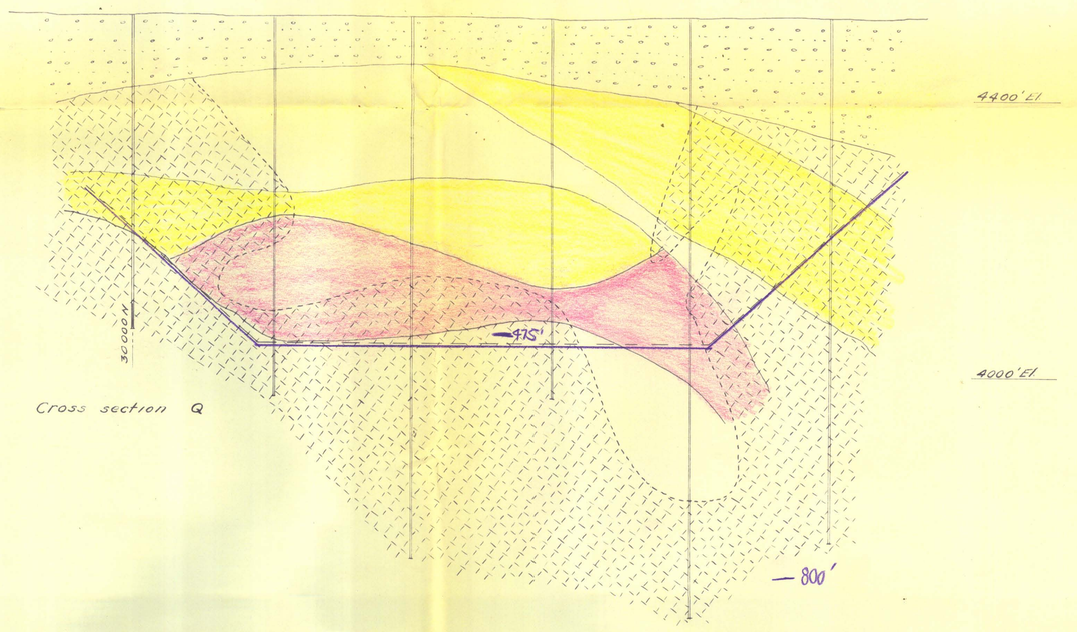


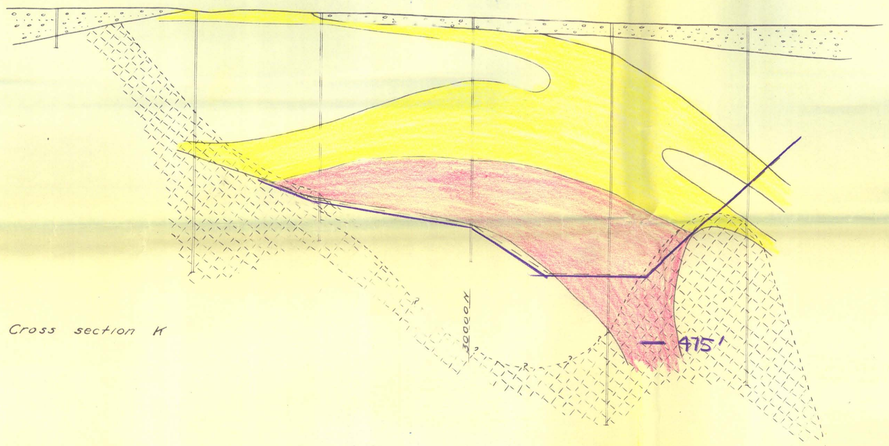


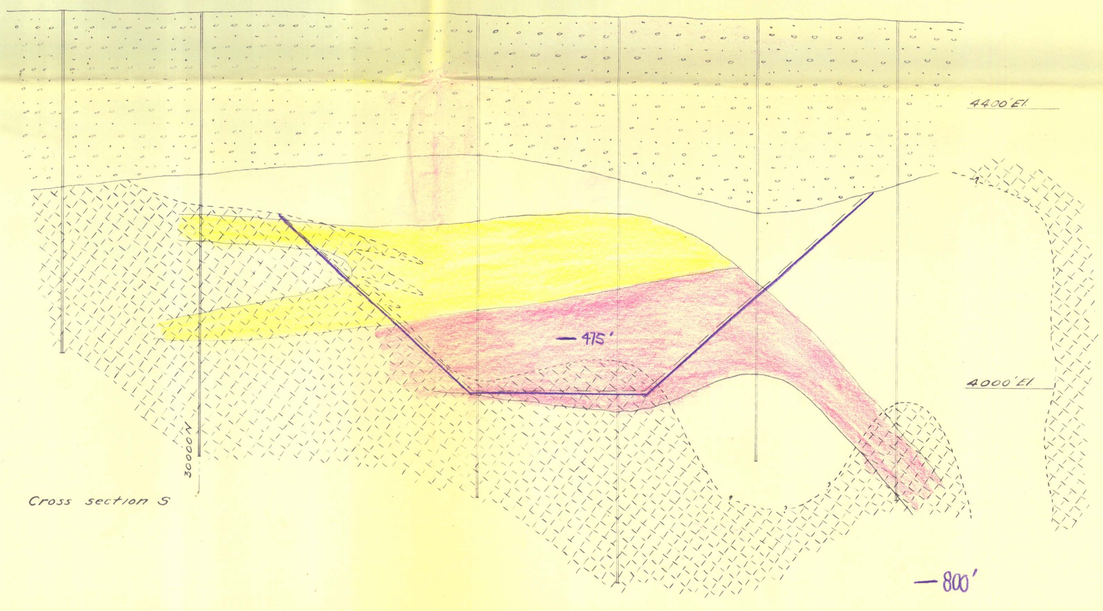












Explanation

- Sand and gravel
- Quartz monzonite porphyry (Blank)
- Granodiorite
- Oxidized copper minerals
- Sulfide copper minerals
- Approximate boundary of proposed pit
- Diamond drill and churn drill holes

0' — 500'

800'

1964 Annual Report:
Pit depth 475' + will be deepened 325' additional to the limit of the known orebody

ARK
5/65

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Yerxington Mine
Yerxington, Nevada

Vertical cross sections
(location shown on geologic plan)

Traced from Anaconda Copper Co maps by A.R. Ainkel Jr., Feb. 16, 1951
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