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September 11, 1972

Management Committee,
Kam-Kotia-Burkam Joint Venture,

Gentlemen:

INTERIM REPORT NO. 72-3
RE EXPLORATION - DEVELOPMENT PROGRAM

General

The following summaries relate to my August 21-25, 1972 visit to the operation - this, fortunately more-or-less coinciding with visits by Messrs. Walkey and Buller. This joint attendance of a majority of the management and geological personnel directly concerned with the project resulted in several lively and informative discussions of the various geological and operational aspects of current and proposed exploration. Some of the opinions advanced and decisions reached, which are admittedly only tentative, or subject to change as the program develops, are included with this report.

In this report I have attempted an interpretation of the mine geology - submitted with the hope that it will explain some current theories concerning ore controls, and the underlying reasoning on which some of the current recommendations are based. Hopefully, it will also promote critical discussions of this particular geological approach to the exploration problem.

Summary - Personal Field & Office Work

Aug. 21: Review exploration with Mr. Hogg - particularly the results of diamond drilling from 4690 W Lateral and of advance in 4625 #2 x-cut; discuss geological aspects of mapping and core-logging with Messrs. Redshaw and Olson; commence up-dating personal set of 20-scale mine maps.

Aug. 22: Inspect current exploration headings and drill cores with Messrs. Hogg, Redshaw, and Olson, and discuss geological details. Discuss mine geology and exploration with Mr. Buller.

Aug. 23: Inspect 4690 and 4855 W. Lat. drill cores with Mr. Buller and check-log d.d.h. K-125. Make detailed inspection of 4625 #2 x-cut with Messrs. Buller, Hogg, Redshaw, and Olson. Participate in office discussions re layouts for initial drill-exploration from 4625 #2 x-c; continue additions and revisions to 20- and 100-scale maps, with attendant discussions.

Continued.....

Aug. 24: With Mr. Buller on check-logging d.d. holes K-124, -133, -135, with particular attention to significant changes in lithology and/or core-to-bedding angles (re indirect evidence of intersection of lode elements).

Participate, with Messrs. Walkey, Buller, and Hogg, in detailed discussions on mine geology, possible ore controls, and proposed exploration of the lode within and beyond the general mine locality.

Continue 20/100 scale revisions and additions with supplementary drill-hole plotting.

Aug. 25: With Messrs. Hogg and Buller re detailing exploration layouts and schedules.

Investigate, with Messrs. Redshaw and Olson, feasibility of exploring Jennie Ridge-Evening Basin lode interval via long-hole core drilling from a surface site in the easterly part of the basin.

Sept. 1: Study E.B. Mayo 1951 report, with local additions of relevant detail to 100-scale plan.

Sept. 7: Up-date 20-scale x-secs via plots of original log and check-log data; transfer 20-scale geological and advance detail to 100-scale plan.

Sept. 8: Continue Sept. 7 detail.

Sept. 10 - 11: Complete above; plot lode contours, incl. revisions on 20- and 100-scale plans.

Include marked points on ore contacts in order to keep ahead of G.W. re's Bell 29 derived concepts.

Current Geological Interpretations & Concepts

At present, the mine "footwall section" is much better exposed and understood than the corresponding "hangingwall section". As a result, there has been a general tendency to base geological assessments of ore potential rather too exclusively on apparent footwall-to-lode relationships, and thus overlook possibly more, or equally significant hangingwall-to-lode relationships.

ore contacts

(a) Footwall Section: Rocks in the footwall of the mine lode are principally argillites, quartzites, and gradational varieties of these. A pervasive alteration, which produces massive siliceous, to banded siliceous-silicate assemblages is most evident in rocks relatively near to the lode, but particularly so in the vicinity of the larger granitic-to-dioritic ('porphyry') bodies. Most of the footwall section, excepting that part of it which is penetrated by the easterly 600 feet of 4755 E. Lateral, comprises medium to thickly bedded or layered brittle argillites and quartzites.

and porphyry

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In E-W vertical section bedding, going downward through the section, rolls from easterly to westerly dips at about the 5050' ('Queen Bess' fold axis) horizon. Between the 5050' and 4800'(?) horizons the general section appears to dip flatly westward. Below the 4800' horizon bedding dips are predominantly westward, but with frequent pronounced ('west-panel drag') reversals to easterly dips to, and through the 4625' horizon. Below this, the bedding section is essentially west-dipping to about the 4000' ('Payne' fold) horizon - with local exceptions occuring within regions of the Payne axis which are confused by multiple overturning, flat-slicing, or are locally distorted by massive intrusions of porphyry or diorite.

The most distinctive and influential element of the footwall section is the steeply dipping (or plunging) section of porphyry and quartzite penetrated by, but lying largely to the east of the (N-S vertical plane through) 4625 crosscut. This comprises the 'central footwall buttress' over which a temporary but significant southerly deflection of the lode-strike occurs.

(b) Hangingwall Section: The writer suspects that, ~~beyond~~ at some distance above the 'productive' and 'potentially productive' intervals or areas of the lode, the general pattern of (displaced) hangingwall bedding structures is roughly similar to those occurring within the footwall section. However, within the productive, or substantially mineralized area of the mine lode evidence provided by a number of widely separated openings suggests a condition of general conformity of lode and hangingwall bedding attitudes. In regard to this situation the 'lode' is defined as the (average 10'-40' wide) zone of intense shearing and fracturing within which the bulk of the ore, 'ore-grade' mineralization, and typical gangue minerals occur - usually over only a part of the section.

In earlier reports and during recent discussions, the specific configuration of hangingwall bedding structure has been termed a 'lode panel'. At this time it appears advisable to redesignate it as a 'transverse panel' (see Mayo, 1951, pps. 18, 25, 29). Such panels have been noted at various widely separated (strike and dip) intervals of the general Standard-Mammoth-Carnation lode system, and they do not appear to be localized to specific rock types, or to specific elements of the Slocan Fold. On the other hand, they show a general (apparent?) tendency to relate to lode elements and/or intervals with general E-W strikes and dips less than 40 degrees. Their general field relationships also indicate that they formed prior to the general period of lode development. However, it is ~~locally~~ obvious that some 'conformable' assemblages of beds relate to lode displacements. The lode may 'split' within transverse panels; however, bedded shears may be due to either lode splits or to inter-bed displacements relating to the development of the transverse panel itself.

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P. Billingsley attributed the occurrence of transverse panels to a sharp southward down-warping of the axial planes of overturns (where beds are approx. horizontal) (Mayo, P.29). However, this explanation would not appear to fit all such occurrences.

Evidence provided by the relatively few workings which penetrate beds over the lode, some drill cores, and, indirectly, the character and structural configuration of the lode itself within the mine locality suggest that the mine transverse panel apexes at about the 4900' horizon and co-exists with the lode between 10,300 E and 11,500 E (ref. 4690' horizon). Its strength in 4690 #2 x-c indicates that it will, at least locally, extend down-dip for a few hundred feet below the 4690' horizon. However, as transverse panel development, porphyry intrusion, lode-arching, and silicification appear to comprise inter-related phenomena, it is quite possible that other transverse panels have developed where combinations of these attendant features are present. On this basis, it is fairly possible that a transverse panel has developed over, and up-dip of the large porphyry body intersected by the Silmonac 5-W (3996) Lateral - and, possibly over other such bodies to the east of this.

(c) Ore Controls: The productive part of the 'mine lode,' as indicated by the present extent of the workings, situates within the interval where it deflects (strike and dip) over the 4625 porphyry-quartzite footwall buttress - resulting in a broad, somewhat crenulated, flatly south-plunging nose. The principal ore bodies occur on the flanks and apex of this nose.

The shape and/or orientation of minor fold and fracture structures within a lode provide a statistical basis on which to determine relative footwall-hangingwall displacements. The majority of those observed within the mine lode indicate that, relative to the footwall section, the hangingwall moved almost horizontally along the strike of the lode, but generally towards the east, with only a minor component of dip-wise displacement.

The position of the easterly group of orebodies, situating on the 'lee side' of the arch or nose, is in accord with one of main Kelowna Ex. criteria relating to optimum ore situations; however, the other conditions, necessary for the development of "open-space" conditions, are only very locally present. Also, on the basis of usual Kelowna criteria, the west (main) orebody should not situate on this 'tight' interval of the bend. In view of the existing structural relationships, it seems fairly apparent that a relatively unique system of structures provides the necessary 'open-space' conditions within the lode. Evidence gathered to date indicates that these comprise zones of crumpling and fracturing — pitching and striking across, or quite obliquely to the

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line of lode displacement, but with plunges locally influenced by structural-litholigical variations within the footwall buttress.

It appears unlikely that significant crumpling would occur within the lode if it were bounded on both walls by strong or at least relatively competent (east-dipping or west-dipping) beds. On the other hand, the indicated situation, presumeably one in which it is underlain by a firm (inflexible) buttress and overlain by a conformable panel comprising rocks of varied thickness and competence, is one which would appear to be favourable to the development of such crumple-fracture zones. The success of the current 'hangingwall' exploration is at least partly contingent on the possibility that the above conditions and structures, as well as open-space conditions relating to dip-rolls, will persist for, or re-occur at significant distances below the 4690 and 4625 horizons.

Observations - Current Exploration

1. 4690 West Lateral: West of Sec. 10,300 E the lode weakens, and perhaps strands out to an extent which makes it difficult to identify in the drill core. The results from drilling yet to be done at Sec. 9725 E may, or may not indicate some change of lode strength or attitude. With reference to the latter possibility, it would be adviseable to extend hole K-124 to about 200'.

2. 4855 West Lateral: The situation here is similar to that relating to the 4690 W Lateral.

Recommendations - Continuing Exploration

These are as agreed upon at the Aug. 24, 1972 meeting and as listed in Mr. Hogg's subsequent memorandum, but with minor revisions as noted in Mr. Buller's letter of September 5, 1972; hence, they need not be repeated here. However, in reference to Item 6, it is doubtful that a suitable drilling site exists. The construction of an access road to the foot of the 'Jennie' ridge is feasible. However, construction and maintenance of an access road and drilling bench beyond this point could be difficult, in that bedrock within this area could be overlain by at least 50[illegible] feet of coarse, unstable talus. Also, should the foregoing prove to be quite feasible, there is still considerable doubt that the local east-dipping assemblage of hard and soft rocks would not deflect the contemplated 1400'-1500' drill hole beyond controllable limits.

Respectfully submitted,

W. M. Sharp.

W. M. Sharp, P. Eng.

Kam-Kotia *mines limited*

25 Adelaide Street West, Suite 416, Toronto 1, Canada
Telephone 362-4581

March 20, 1973.

Mr. W. M. Sharp, P.Eng.,
171 W. Esplanade,
North Vancouver, B. C.

Dear Bill:

I have your letter of March 15, 1973 and enclosure of sketches to show a possible scale of exploration drilling on a systematic basis. At this moment, whether I agree with the proposed spacing or not is not important, and, I think the coverage is perhaps too broad, at least for certain areas. I don't agree with driving 170 ft. of x-cuts to get sections at 150 ft. centres and I note you propose the x-cuts at 300 ft. centres. What is important, however, is that we have a plan and eliminate or reduce random, spur of the moment type of exploratory drilling.

Your suggestion on drilling procedures are good. Notes a, b, c, f and h can be implemented quickly. Sludge sampling is difficult, expensive, and can be erratic, and your suggestions merit consideration.

I note your comments on geological staff and we will discuss this with you at our next meeting.

I am sending a copy of your letter and the sketches to Bill Hogg so he can study your suggestions and be in a position to make comments.

I now plan to go to New Denver, March 27, and will fly out to Vancouver March 26 in the morning. I want to leave Vancouver on the 2:00 p.m. flight on Friday, March 30 so I should have the best part of three days at New Denver and I hope you can arrange to be at the mine at the same time.

Yours very truly,

KAM-KOTIA MINES LIMITED,

G. W. Walkey,
Vice-President and General Manager.

GWW/rk

March 2, 1973.

Mr. W. Sharp, P. Eng.,
171 W. Esplanade,
North Vancouver, B. C.

Dear Bill:

Re: Kam-Kotia-Burkam Joint Venture.

I refer to our conversation on the telephone last week in Vancouver. As I told you, recent drill holes from the 4,625 E. lateral, drilled between co-ordinate 11,400 E. and co-ordinate 11,500 E. have given very encouraging results and, we are developing in this area now by means of a x-cut to the S.E. from 4,625 lateral, boxholing, and, ultimately laterals and dip raises in the lode. We are also developing an indicated pod of ore at co-ordinate 11,000 E., by a stub x-cut at 4,625 #2 x-cut, and a raise.

We also are extending the 4,625 H.W. lateral to 11,800 E. co-ordinate and this should be completed late in March.

We have given Bill Hogg instructions to do everything possible to maintain mill operations at the current level, even though material may have to be milled that will not provide an overall profit. Basically, we have instructed Bill to mine and mill material that has enough net value to cover direct costs of mining and milling and make a contribution to exploration and overhead costs. Obviously this policy could not continue indefinitely and, generally, the highest grade material available should always be milled first.

I have given Bill Hogg data on how to quickly and simply assess the net value of ore at various grades and I enclose a copy of these notes. Metal prices, particularly silver, have fluctuated widely and quickly in recent times, and, even lead prices are constantly changing these days. I am also enclosing a copy of a recent letter to Bill Hogg which provides answers to the above and shows the minimum grades we can mine and mill currently, and make a contribution to costs, as long as we are committed to an all out program of exploration. I must ask you to treat the enclosures as confidential, but, if you are going to make the maximum possible contribution to our efforts, I feel you must know how we are thinking. Our primary target continues to be to

make the maximum possible profit from exploiting the property and we should never forget this fact. There are a great many aspects of the operation that concern me, but, ~~there is~~ three in particular stand-out about which we can take some positive action. These three items concern geology and diamond drilling.

Diamond drill core drilling remains as the most economic and efficient method of locating and defining ore pods or lenses along the lode or lodes, even though it is an imperfect tool and may give misleading results. Those of us who have worked on the problem of finding ore in the Slocan lodes know how difficult it is to locate, and define, ore lenses due to the extremely erratic nature of the quality and extent of the economic mineralization. The chances of locating ore lenses would appear to be related to the density of the drill hole sampling, when drilling or testing a mineralized and potential panel of the lode. The density of drill coverage in this case will be completely different to the pattern required in drilling to locate the lode and mineralized panels. At this time, we have two mineralized panels, one east of 4,625 No. 1 x-cut, and south from the 4,625 E. lateral, with the down dip extension and strike extension to the east still not defined. We are in reasonably good shape to drill test this panel, on a density basis over an area of about 500,000 sq. ft. on the plane of the lode, and can easily extend this area by more development. Basic drill exploration is best done on a firm pattern, once strike and dip is known. Detail drilling to define and expand a good drill intersection may require variations in the pattern and, will require very high density drilling to sample and define tonnage potential. This means, of course, a high exploration and development cost, but, a less expensive program that does not test and define, is far more expensive overall, and, may be unsuccessful, which would make it more expensive.

I believe this is a matter that requires much study and, I would like you to treat it this way and give it a lot of consideration.

The second matter is the actual drilling procedure, and the interpretation and use of the results. We all know that core recovery of the lode material is difficult and tends to be poor. In fact, in many cases, it is possible that only ~~bottoms~~ bottoms are recovered.

This is obviously a very important matter, as we depend almost entirely on core results to find the ore zones.

One possibility would be to recover sludges, as soon as there is reason to think the hole is close to the lode. This could be done but the technique and procedure would be critical.

I think we can do a better job of recording core

recovery and assessing the actual amount of grinding and this should be done. This means more accurate logging and recording of results from drilling. I don't think that Redshaw fully understands this problems, although I know he is aware of the problem and records what the drillers show by the blocks. You can help on this matter too, by educating and training Redshaw. — will take some time during next visit.

The third factor is Redshaw himself and the amount and quality of geological staff that we require to carry out the programs as I see them. I would appreciate your comments on this matter.

Assuming we continue to mine and mill, grade control and stope geology is almost a full time job for one man, if done properly. Supervising, controlling, logging, recording and maintenance of maps and records seem to me to be a full time job as well. In any event, I would like your thoughts on these matters, and you should discuss them with Bill Hogg on your next visit. I hope to go out to New Denver later this month, but, I can't set a date as yet.

Earlier I pointed out we have two mineralized panels that require exploration, and I covered the east panel. The west panel, i.e. west of 4,625 No. 1 x-cut, and south of 4,690 W. lateral, obviously has potential and continues down dip below the 4,625 level. This panel has potential, in mineralized and requires more work. However, I believe we should concentrate our efforts on the east panel at this time. You could give this zone some thought as well.

Yours very truly,

KAM-KOTIA BURKAM JOINT VENTURE,

G. W. Walkey.

GWW/rk
Encls.

Division of Geological Dept Functions;

1- Stope geologist; record + control, incl. direction of X-ray drilling as it relates to production; Keep up stope records @ office.

2. Sr. Geologist - gen. eval of work (1)
Exploration for new ore, both in mine + region as office work incl mapping, old layouts, core logging + rel. office work

Surveyor + office technician provide necessary detail for above as well as provide production rel. data

Copies to Bill Hogg

To: Bill Hogg March 1, 1973.

From: G. W. Walkey

Subject: As noted. mineable grades - method of calc.

1. Further to my memo of February 8, and my visit to New Denver on February 20 & 21, I want to restate and confirm the items we discussed last week.

2. I refer you to my memo on net mine value for silver, lead and zinc content of ore, dated December 20, 1972. In this study, the prices used were as follows: - silver - $1.95/ounce, zinc 18.0 cents /lb. and Pb. 14.667 cents /lb.

Current prices are as follows: - silver - $2.40/ounce, zince 19.5 cents, lead 15.78 cents /lb. (N.Y.M.E. spot price).

Using these prices, the net value to the mine for silver is $1.89 per ounce, for lead, $1.76 per 1.0% or 8.8 cents per lb. and, for zinc per 1.0% - $1.47 or 7.35 cents per lb.

The exact net value for any metal price can be calculated by the formula used in my December 20, 1972 memo. Currently, material grading 10 ounces silver 5% Pb. and 5.0% Zn. would have a net value of 18.90 + 5 x 1.76 + 5 x 1.47 equals $35.05 /ton. January's production costs were $34.67 /ton (including exploration and overhead) so this grade would allow a break even. on a total cost basis.

However, at this time, when we are short of ore for the mill and, we are committed to maintaining the operation and continuing exploration, and, again using January's cost figures, any material that will have a net value in excess of actual mining, milling and haulage expense, e.g. about $18.24 /ton, should be reducing. mined, if available, as it would make a contribution to the exploration and overhead costs. The mill heads required would be 5 ounces silver (5 x 1.89 = 9.45) plus 4% Pb. (4 x 1.76 = $7.04) plus 3% Zn. (3 x 1.47 = 4.41) = $20.90, or any combination of heads that will net plus $18.24, say a cut off grade of $25.00. This approx. should provide a reasonable margin of safety. However, metal = gross op. prices must be watched and values adjusted as metal prices change. cost

3. It is agreed that the 4,625 H.W. lateral (e) will be continued to co-ordinate E. 11,800, but, no further at this time. The 4,625 H.W. lateral's only function is as a base for exploration of the lode below the 4,625 adit level. Our objective is to indicate sufficient ore reserves, with reasonable assurance, to warrant carrying out the necessary development work to provide access for mining and extractions. If this can be done, continuing and further exploration can be carried out much cheaper from the new access workings.

It is probably premature to start planning development for below the 4,625 level. However, there are only so many possible methods, and, it may be useful to list them now for possible study.

Ore below the 4,625 level can be developed by access provided as follows: - 1) by sinking an internal shaft. 2) by a new adit from surface at a lower elevation. 3) by one or more decline headings from the 4,625 level. 4) by a raise from the Silmonac 3,990 level. All these methods would be expensive, and the correct method will require much study, and, perhaps more exploration to increase potential ore reserves. This could result in extending the 4,625 H.W. lateral, to allow for testing more of the lode before making a development decision. In any event, cross sectional exploration drilling from the H.W. lateral should be completed as soon as possible, and, diamond drilling should proceed at the maximum rate possible, as allowed by plant and personnel. Any extension of the 4,625 E. H.W. lateral may be best carried out on a different strike, to the east of co-ordinate 11,800 E. but, any decision will depend on future results and information.

Diamond Drilling - Diamond drill coring to test, locate and sample the lode is obviously an imperfect and somewhat unreliable tool, primarily due to the problem with core recovery. However, it is still the most feasible method, other than actual development work in the lode which is impossible for broad exploration. Diamond drilling must be used to locate and generally define minable pods or zones of ore and this may require extremely close spaced holes. Every drill hole intersection that gives ore grades must be checked by additional drilling, and, if confirmed, should be developed if the economics are reasonable. Judgement will be important and we must be prepared to take some risks.

With the above in mind, we should make every effort to improve the drilling technique , in regard to coring in the lode. Perhaps an improvement in logging and recording of core data, in the lode is possible. We should even consider collecting sludge for sampling, particularly when in the lode. I discussed this problem with Bill Sharp in Vancouver, and asked him to spend time on the problem with you on his next visit. I know you are aware of the problem and perhaps, collectively we can develop improved technique.

Future production - As I wrote in my Feb. 8 memo and told you in my Feb. 20 visit, it is important to try and maintain continuity of production and retain present work force. I fully understand the present situation with regard to available milling material and our immediate prospects for developing good grade mill feed. However, in view of the current metal prices, there may be material available that can be mined and contribute to the cost of exploration and overhead.

Currently, you are developing two zones, 1) by a short x-cut and raise off the 4,625 No. 2 x-cut, at about 11,000 E. co-ordinate. Two narrow good grade bands are indicated by several drill holes and this area should provide some production. 2) By means of a x-cut and raise, a zone indicated by holes K168 & 170 plus additional holes. To expedite development to provide quick production, access to the lode is placed well above the x-cut back and holes K129, 171 and 167 show that the ore should continue down dip to at least 4,640 elevation, and this will require extending the x-cut to the south east.

Studying the whole area and all the drill holes, the lode is certainly mineralized from at least 11,600 E. to west of 11,300 E. although actual ore zones may by lensy and somewhat erratic. While our immediate objective is to get production, from this zone, you must be prepared to test this whole area and have a development plan. The zone can be tested by short drill holes from the 4,625 E. lateral, and, it may be necessary to drive a second lateral close to where the lode cuts through the 4,625 level. '4625' horizon

I know you got disappointing results from the lateral driven to the east off 4,625 west lateral, along the lode. However, the lode to the west, i.e. west of 10,600 E. co-ordinate and below the 4,690 panels, still has potential and requires more exploration. Present drill results are inconclusive and erratic, but, do show good values, both above the 4,625 level and down dip. This area is still a prime testing area, and requires more exploration although the east blocks have priority at this time.

Generally, we must be prepared to take risks, and expect some disappointments. The actual ore pods are difficult to locate and define. However, as long as we can finance continuing exploration and development by production, the operators are agreeable to continuing with the program, and, we are well placed to explore a major segment of what appears to be a favourable panel of the lode.

GWW/rk

G. W. Walkey.