RESUBMITTED 8-1-72 (Washington D.C.)

DME - 6890

SPOTTED HORSE MINE

exploration program

VIKING EXPLORATION INC.

153282

When no longer needed, kindly return report to:
Viking Exploration, Inc.
820 Denver Center Building
1776 Lincoln Street
Denver, Colorado 80203

U.S. GEOLOGICAL SURVEY
OFFICE OF MINERALS EXPLORATION

OME-6880 (GOLD)

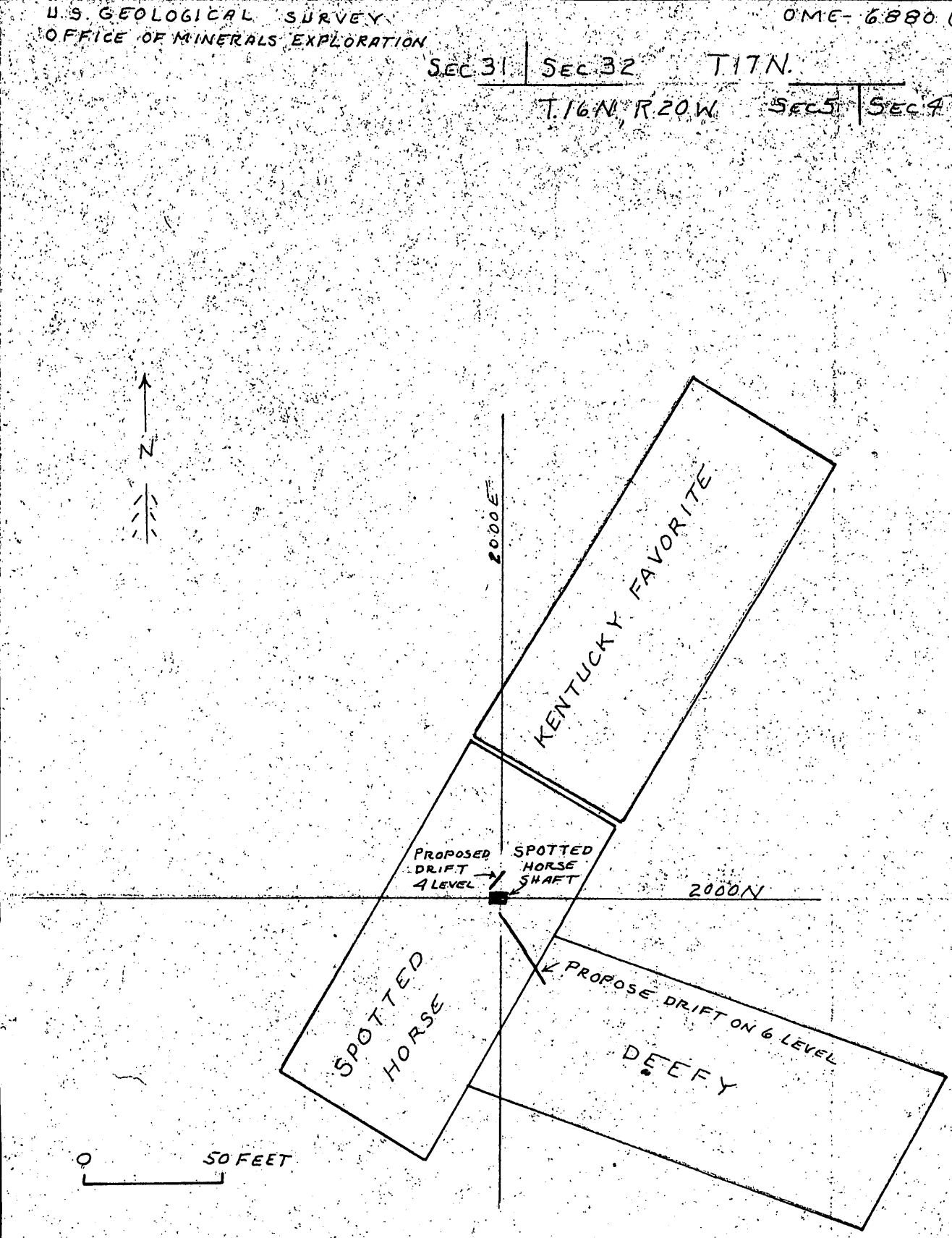
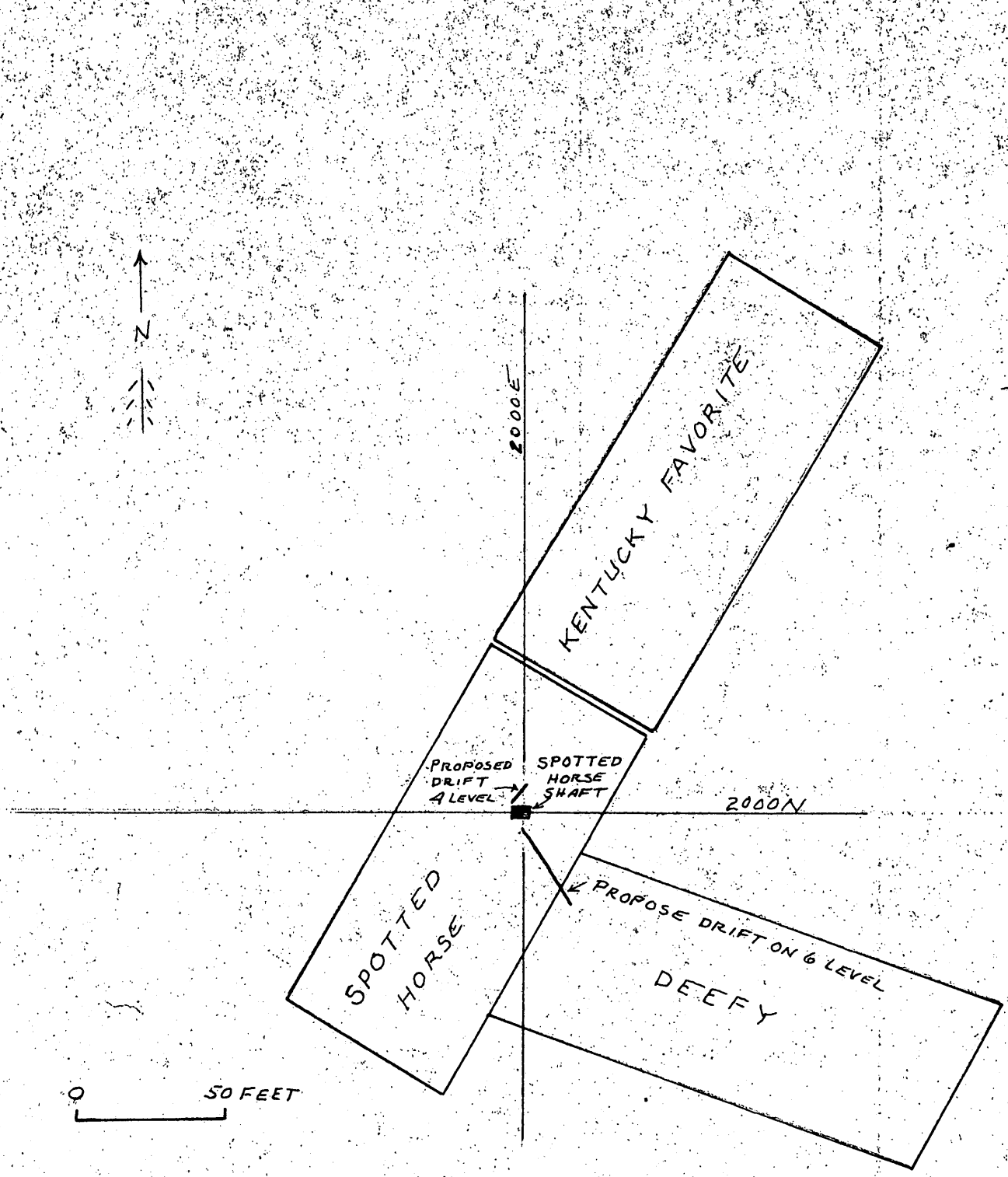


FIGURE 1- PROPERTY MAP- SPOTTED HORSE MINE
FERGUS COUNTY, MONTANA

U.S. GEOLOGICAL SURVEY
OFFICE OF MINERALS EXPLORATION

OME-6,880 (GOLD)



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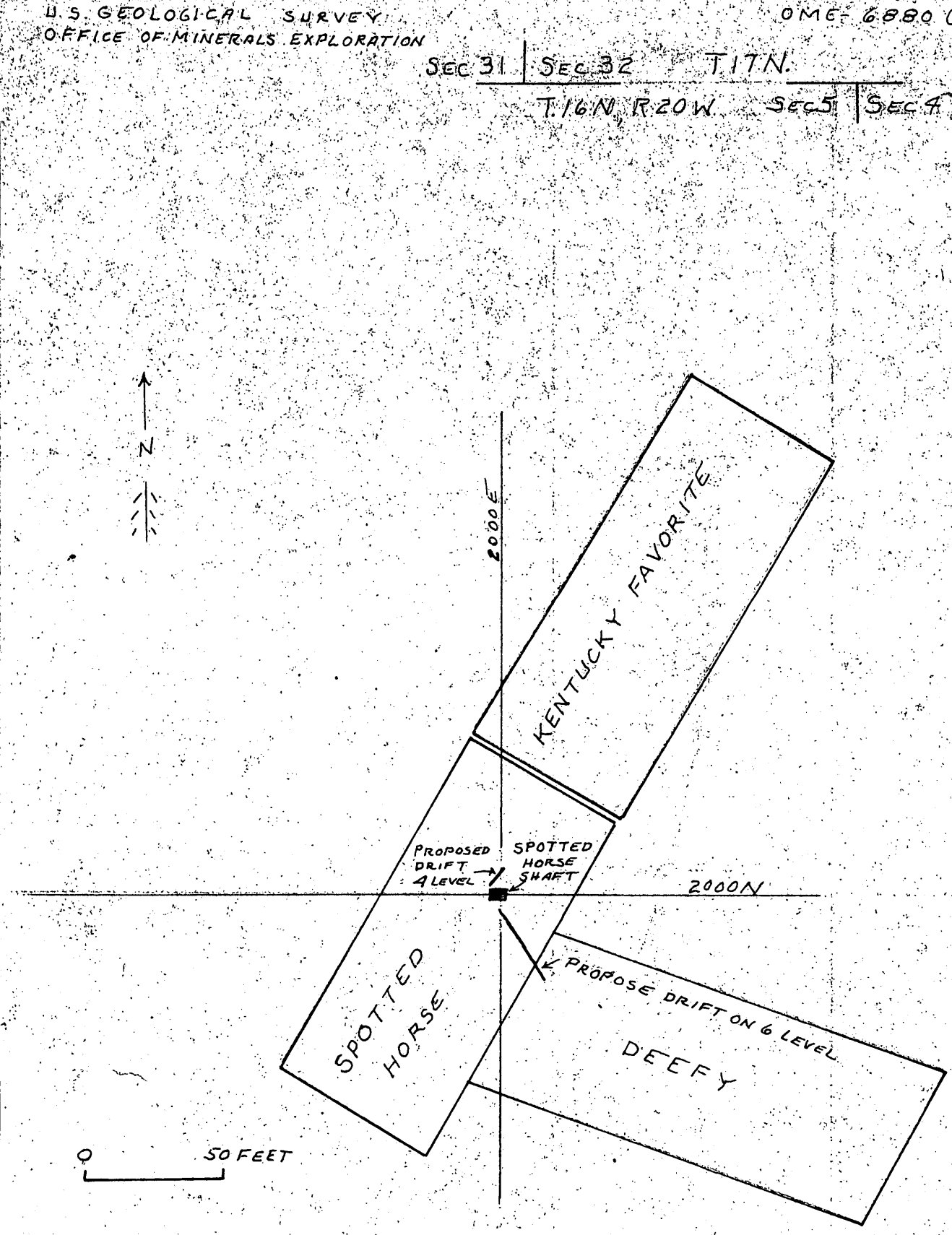

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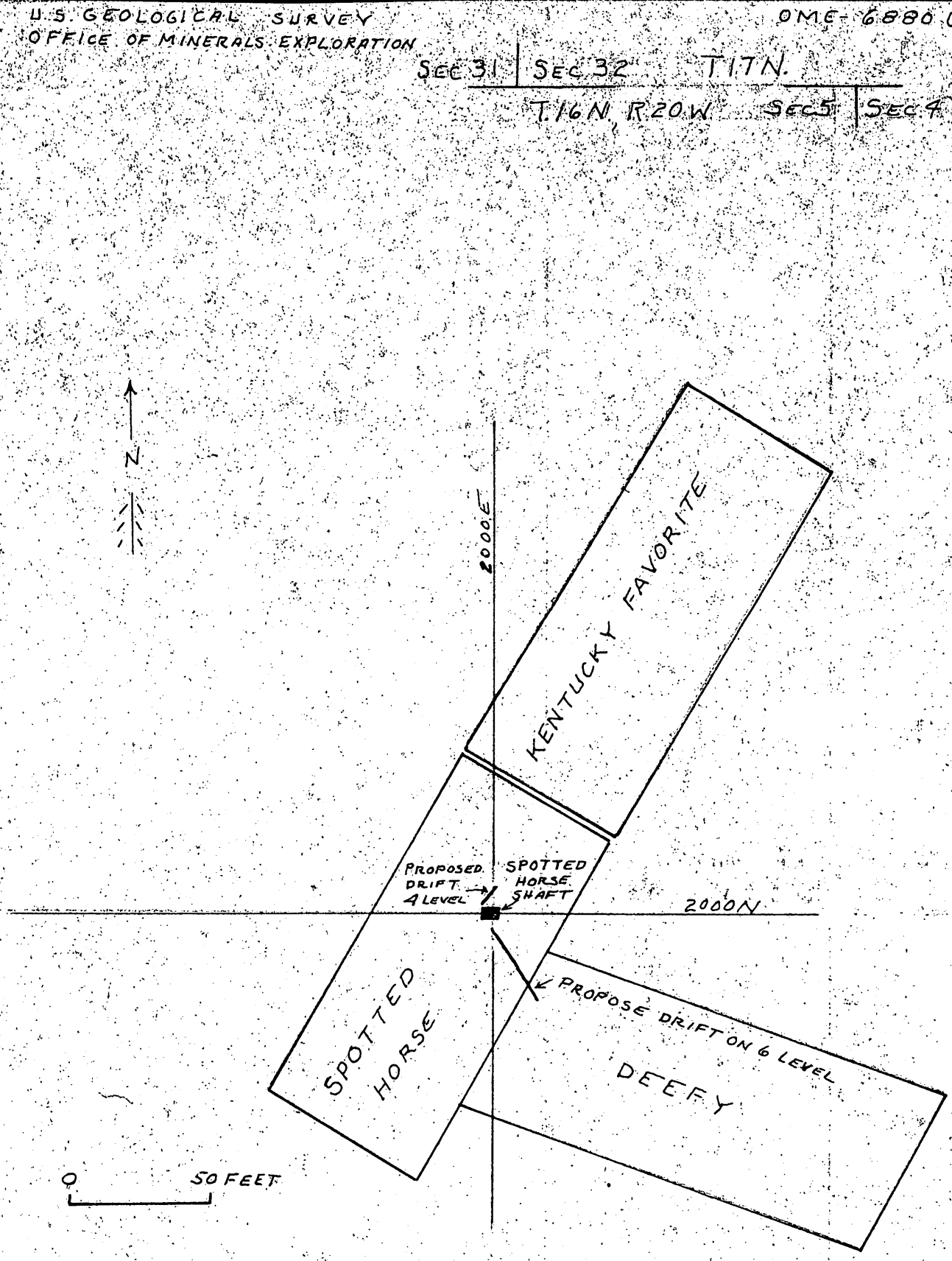

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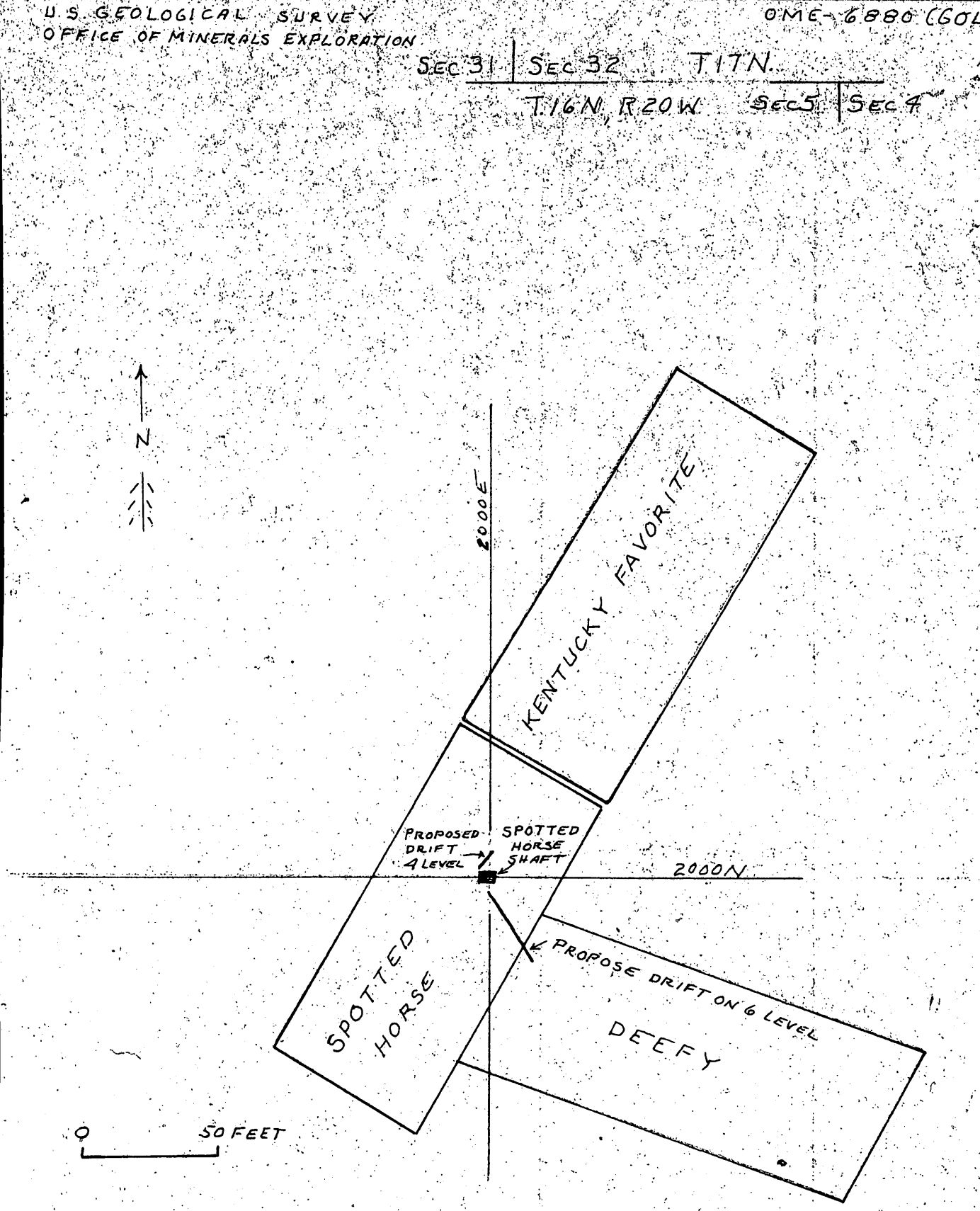

FIGURE 1- PROPERTY MAP- SPOTTED HORSE MINE
FERGUS COUNTY, MONTANA

EXPLORATION PROGRAM

SPOTTED HORSE MINE

LARRY C. HOFFMAN
MINING PROJECTS ENGINEER
VIKING EXPLORATION, INC.

April, 1972

VIKING EXPLORATION INC.

ADDENDA

At the suggestion of Mr. William Hasler, of the Denver O.M.E. office, the following expansions are to be noted in regard to the following pages.

Item 1 (b) The actual work on the property will be done in the name of Blue Range Mining Company, under which name Mr. Hoffman operated the property since 1968. This ficticious name is now part and parcel of Viking Exploration and may be regarded as its operating division. (See sub-lease and lien subordination agreements attached). The purpose of this arrangement is to take advantage of credit and good will already established by Mr. Hoffman.

Item 1 (c) Viking's mining exploration budget for 1972-73 is $35,000, of which the major portion is scheduled for Spotted Horse exploration. This money will be diverted from Viking's operating revenues as they are received. Should expenditures at the mine exceed revenues temporarily, the difference would be filled by a small group of investors who have a limited amount of capital for emergencies.

Item 5 (c) Work will begin within 90 days of the execution of the contract unless signing occurs in mid winter after the mine has not been operated for some time. In that case work will commence on or before the following August 15. The reason being that the road would not be possible to re-open once allowed to drift closed.

VIKING EXPLORATION INC.

SPOTTED HORSE MINE EXPLORATION PROGRAM

Supplement to fulfill specifications of MME form 40 for OME loan application.

1. (a) Attached letters of application for loan of $93,356, for Spotted Horse exploration, to 1st National Bank and Central Bank & Trust, both of Denver. Resulting refusals also attached.

   (b) Viking Exploration, Inc. is an independent minerals exploration firm, with no parent, affiliated or controlling companies.

   (c) Viking's share of exploration expenses will be furnished from exploration fund and private investors.

2. (a) The area to be explored is covered by two patented mining claims, held under lease (copy attached). There are no liens or other encumbrances against the property.

   (b) The exploration targets lie under the Spotted Horse and Kentucky Favorite patented lode mining claims (patent surveys attached), as described on pages 3 & 4, as well as Map D, of the main report. The unpatented claims will not be explored under this program, but may be included in the government lien if the OME so desires.
   Part of the unpatented land SE of the Spotted Horse claim was formerly part of the Ella & Clara May claims (Robertson, 1949, IC 7544).

   (c) As patented claims are held by estate trustees, no lien subordination is available (see attached letter of refusal).
   Viking can supply a performance bond, if necessary.

3. (a) As described in report. Pp. 8-13, 68-69 Maps. Compressed air is piped from the compressor at the portal through a 2" line to the shaft, and by 3" shaft column to the 7th level. 2" pipe connects the shaft, through the 7th level & the winze, to the 8th level.

Shaft equipped with 3" pump colmn from sump to 1st level.

25-30 lb. rail on surface and in adit to the shaft. Old rail on 1st, 2nd and 3rd levels is 8 lb./yd.

On lower levels is 12 to 16 lb. rail.

Compressor, storage and shop facilities are located in a 20' x 36' frame building at the portal. Assay office is located in a 12' x 36' frame building.

(b) As described in report, pp. 11-13, recent work was conducted by Larry C. Hoffman, d/b/a Blue Range Mining Co., who will be in charge of the proposed exploration work. Viking Exploration, Inc. acquired sub-lease from Mr. Hoffman early in 1972.

(c) As itemized in report, with published information attached. (Pp. 11, 71-74)

(d) At the present time there are no known ore reserves.

(e) As described in report.

(f) With the exception of the 5th level, no sampling has been done in the areas of proposed exploration due to lack of exposure. Assays along the basic contact-fault structures away from the ore shoots are of no significance.

The basis for expecting to find ore is discussed in the main report. (p. 14-35)

(g) All available data attached, in duplicate. Return requested.

4. (a) Viking's representative for all examinations and correspondence will be Larry C. Hoffman, Viking Exploration, Inc., 820 Denver Center Building, Denver, Colorado, 80203. Tel. (303) 825-2209.

At the location, Mr. Hoffman may be contacted at the B & B Motel, 390 E. Main St., Lewistown, Montana, 59457. Tel. (406) 538-5497. Mr. Hoffman will be in Lewistown only at the appointed inspection time.

The property may be reached following the maps (A & B) in the report. From Lewistown, north on Highway 119 for about 11 miles, then east on the Maiden road marked by a historical monument. Proceed about 1 mile past end of pavement on radar base road. Turn off radar base road at Maiden Canyon Resource Conservation Area sign and follow that road to the old cement dam. Mine yard is to immediate right.

The property is accessible from about May 1, to Dec. 15. All mine workings relevent to the proposed exploration are open for inspection. The main shaft is traversed by ladders.

(b) The nearest rail depot is at Brooks, about 12 miles from the mine, served by the Milwaukee road. Small supplies, light mining tools, and machine shop facilities are available in Lewistown. Heavy mining equipment is available in Billings, Helena and Butte, respectively 130, 200 and 260 miles distant by highway.

Smelters are located at East Helena and Anaconda, 200 and 280 miles from the mine. Both will accept Spotted Horse ore.

Pure water is available at the mine, at the rate of 100 gpm. Single phase 220-110 volt electric power (REA) is wired into the mine, and a 3 phase line (Montana Power) is located at the Lewistown Radar Station, 3 miles distant. All roads are excellent and maintained to the mine yard.

Timber is locally available at reasonable cost.

5. (a) As described in report. All drifting to be 5' x 7' in cross-section, no timbering or other problems anticipated. The 5th level raises will be 5' x 5' in cross-section, pps. 28-40, Maps.

(b) All access roads have been constructed.

(c) Work will begin on rehabilitation work in May, 1972, and exploration work would begin upon completion of the repair work and execution of the exploration contract.

All drifting and raising will progress at the average rate of 4 ft. per day, over the entire project, barring unforeseen difficulties. Progress will be slow in the initial phases (first 2½ months) while miners are being trained.

6. Corporate Background

The general background of Viking Exploration has been in the field of oil and gas exploration. With the exception of some legal aspects and the actual type of exploration, the type of work done strongly parallels mineral exploration.

Viking has completed 27 exploration programs from inception to completion. This has included preparing the geologic information and engineering data, assembling crews and equipment, coordinating all aspects, and all associated overhead and support work. As most of this work has been done in association with other companies and individual investors, close budgeting and careful engineering have been a necessity. All projects have been completed within reasonable time-cost projections.

The background of the principals involved is outlined in the following resumes.

MR. CHARLES ALBERT EINARSEN

Mr. Charles A. (Chuck) Einarsen is President of Viking Exploration, Inc. He obtained the Degree of Petroleum Engineering from the Colorado School of Mines in 1947 and is a Registered Professional Engineer.

Immediately after graduation, Mr. Einarsen went to work for Amoco, formerly Stanolind Oil & Gas Company, as a Junior Petroleum Engineer in Wink, Texas. In 1949 he became District Mud Engineer at Midland, Texas and in 1950 he became Division Staff Petroleum Engineer in Fort Worth, Texas, In 1952 he was promoted to Research Engineer in the Well Completion Section of Tulsa, Oklahoma. While in the Fort Worth division office, which kept 45 to 50 rigs busy, he was responsible for the supervision of drilling mud programs throughout the Permian Basin, the preparation of various field development programs, budget, and was liaison engineer between the research laboratories and the district and field offices for field testing new materials and techniques associated with drilling mud, cementing, stimulation and well completion.

Mr. Einarsen left Stanolind to join Cherokee Laboratories, Inc. as a stock holder and Area Manager for West Texas and New Mexico. He served in that capacity for four years, setting up 44 stock points and warehouses for the distribution of various drilling mud and cement additives. While with Cherokee, he addressed numerous engineering and geological societies and conventions across the U.S.A. on drilling practices, mud control and cementing techniques. He also authored several papers on lost circulation control and cementing.

In 1957 Mr. Einarsen joined Petroleum Research Corporation as a stockholder and Division Engineer. He later became Manager of the Engineering Services Division. PRC is an internationally known consulting firm specializing in hydrodynamic research, development, and exploration. He traveled widely throughout the United States and Canada, working with regional and specific hydrodynamic problems of various clients. He also co-authored a number of hydrodynamic research, development, and application reports and lectured widely before numerous company groups and several geological and engineering groups throughout the United States. From 1957 to 1964, Mr. Einarsen took a number of business management courses at the University of Colorado.

From 1963 to 1964 he was Director of Marketing of C.S. Card Iron Works, Denver, Colorado. From 1964 to 1968 Mr. Einarsen

became a hydrodynamic consultant and consulting petroleum engineer. His services included the hydrodynamic evaluation of areas and geologic prospects, preparation of regional and semi-regional hydrodynamic maps, recommendation of acreage for acquisition, preparation of oil and gas well drilling wells, completion of wells, evaluation of oil and gas reserves, and property management.

During the same period, Mr. Einarsen, in addition to the above consulting work, put together a number of geological prospects which have been drilled in Wyoming, Montana, and Colorado. His work has led to the discovery of the Cinder Buttes Field in the San Juan Basin, which is a multiple pay gas field, producing from three horizons with a total estimated reserve of 380 billion cubic feet of gas. One of his prospects was the extension of the Lamb Field in the Big Horn Basin of Wyoming.

In 1968 Mr. Einarsen became Vice President of and a stockholder in Tensleep Petroleum Corporation, a position from which he resigned to form Viking Exploration, Inc.

Mr. Einarsen and Mr. Theodore D. Sheldon have worked together in the past very successfully. A well drilled on a combination of Mr. Sheldon's geology and Mr. Einarsen's hydrodynamic studies resulted in the discovery of the Homestead Field in the Big Horn Basin which now has nine producing Tensleep wells.

On March 17, 1969, Mr. Einarsen and Mr. Sheldon formed Viking Exploration, Inc., by pooling all of their oil and gas assets, including oil and gas leases, overriding royalties, geological and engineering reports, maps, files, plays, etc. In 1969 Viking negotiated for and won a 29,000,000-acre concession in Queensland, Australia and has since sold this concession to U.S. Natural Resources, retaining an overriding royalty under the entire block. U.S. Natural Resources is currently performing seismic work on the concession and has developed a number of prospects which they will soon be attempting to get drilled.

The geographic areas in which Mr. Einarsen has carried out professional geologic and engineering work are: West Texas and New Mexico, Mid-Continent Area, Gulf Coast Area, Rocky Mountains, Canada, and Australia.

He was an active member of the Toastmasters Club in Fort Worth, Tulsa, and Midland from 1952 to 1956. He has served in various capacities in the Methodist Church, including teaching, Sunday School Superintendent, Board of Stewards and Chairman of the Visitation and Evangelism Commission. Mr. Einarsen is married and has five children.

Charles Albert Einarsen

Mr. Einarsen is a member of the Independent Petroleum Association of America, Rocky Mountain Oil and Gas Association, American Association of Petroleum Geologists, American Institute of Mining, Metallurgical and Petroleum Engineers, and is a member of the American Association of Petroleum Landmen. He has been a member of various American Petroleum Institute and Society of Petroleum Engineers committees. Mr. Einarsen has been listed in the Who's Who In The West and is a member of the Denver Petroleum Club

MR. THEODORE D. SHELDON

Mr. Theodore D. (Ted) Sheldon is presently Vice President and Exploration Manager of Viking Exploration, Inc. Mr. Sheldon is a Petroleum Geologist; he obtained a B.S. Degree in Geology from the California Institute of Technology in 1953.

From July 1951 until graduation from college he worked as a geological assistant for Seaboard Oil Co. After graduation, he became geologist for Seaboard on a full time basis. From 1954 until 1956 he served in the U.S. Army as an instructor at the anti-aircraft and guided missle school at Fort Bliss, Texas, and in 1956 returned to work for Seaboard until Seaboard merged with Texaco in 1958, at which time Mr. Sheldon became an independent. While with Seaboard he worked both in California and the Rocky Mountain area, primarily concentrating on research projects.

As an Independent Consulting Geologist, from May 1958 to March 1969, Ted Sheldon has worked in California, and throughout the entire Rocky Mountain area. During this period he was retained by Signal Drilling & Exploration, Inc. in the capacity of consulting geologist. During this time Signal maintained a very successful exploration record and discovered significant petroleum reserves in Sheridan County, Montana, and in Divide County, North Dakota, in which he was directly involved.

Mr. Sheldon has handled the geological supervision of more than 130 drilling wells in northeastern Montana and northwest North Dakota as well as doing occasional well-site supervision in the other states in the Rocky Mountain Region. He has conducted geologic evaluations for such companies as Calvert Exploration Company, Polumbus Corporation, Delta Drilling Company, McCulloch Oil Corporation of California, Pauley Petroleum, Inc., and Petro Search, Inc, Kilroy Company of Texas, National Co-operative Refinery Association and Four Corners Pipe Line Company.

From March 1969 to the present time, Mr. Sheldon has been employed by Viking Exploration, Inc. in the capacity of Exploration Manager.

He is a member of the American Association of Petroleum Geologists, the Geological Society of America, the American Institute of Professional Geologists, and the American Institute of Mining and Metallurgical and Petroleum Engineers as well as various local geological societies. He is presently listed in Who's Who in the West.

LARRY C. HOFFMAN

Mining Projects Engineer, Viking Exploration

B.S. Mining Engineering, Montana School of Mines 1969.

Worked in all phases of mining, as employee of numerous small mines since childhood. Since 1963 has owned and operated several small mines d/b/a Blue Range Mining Co., Lewistown, MT. Has worked on Spotted Horse property since June, 1968, and is intimately familiar with the property, and its problems. Experienced as engineer, contract miner, surveyor, mechanic, assayer, and machinist, as result of small mine experience.

Resume

Summers, 1953-1961, helper around small mine owned by family friends. Cleaning ditches to contract miner, assisted mining engineer, assayer, mill operator, mechanic-machinist, and others. Led three-man drifting team 1960-61.

Summers and nights, 1962-63, operated quarry and crusher plant for aggregate, P & D Enterprises, Lewistown, MT. Designed and executed all drilling and blasting operations, re-built equipment, operated loaders, trucks, crushers, etc. Supervised 1 to 4 men.

1963-1971, part time and full time. Operated several small mines in Central Montana area, including Spotted Horse. Involved re-opening, equipping, surveying & mapping, and exploration work. Also worked at following jobs to finance college and prospects.

December 1964-April 1966-part time as contract miner at Leonard Mine, Anaconda Company, Butte, MT.

Summer 1965-Contract miner, Machinery Center, Inc., Cobalt, Idaho.

December 1967-March 1968 - Contract surveyor, Cominco American, Garrison, MT.

May-June 1968 - Contract surveyor, Calmont Mines, Inc., Helena, MT.

May-June 1969 - Contract surveyor, International Nuclear Corp., Denver, Colo.

May-June 1970 - Contract surveyor, Cyprus Mines Corp., Spokane, Wash.

EDWARD WIEGLENDA

Mine Foremen (probable)

Intimately associated with mines & mining since 1937. Extremely intelligent, self taught, practical mining man. Expert miner, assayer, mechanic, and foreman. Vast experience initiating and operating small mines, exploration programs, and miner training programs.

Resume:

1937-1939 - Worked with uncle, George H. Wieglenda on numerous prospects and mines in the Spotted Horse area, mostly in the Maginnis mine adjoining the Spotted Horse to the southwest.

1939-1942 - Assayer, mill hand, heavy equipment operator, North Moccasin Mines Syndicate, Lewistown, MT.

1942-1945 - Airforce aircraft mechanic and flight engineer.

1946-1947 - Mining leases and construction work.

1948-1951 - Mechanic, Harlem, MT.

1951-1956 - Mine operator, Gold Bug mine, Landusky, MT., supervised all work.

1956-1961 - Superintendant of mines and mills for Northern Milling Co. at Zortman & Townsend, MT., trained full minine and milling crews from farm hands.

1962 - Construction work-Kaiser Engineers

1963 - Mechanic, Denton, MT.

1964-1966 - Maint. foreman for mill & power plant, Continental Explorations, Tucson, Arizona.

1967-1968 - Little Rockies Mining Co., Ltd, mine foreman, Landusky, MT.

1969-1971 - Niseka Mining Co., Ltd., mine foreman, Landusky, MT.

Both Mr. Wieglenda and Mr. Hoffman have followed the ups and downs of small mines and are very much aware of the problems and hazards involved, as well as innumerable time and money saving methods.

7. (a) There will be no independent contracts during this exploration program. Once miners are trained, drifting and raising may be placed on a "contract" basis, with the miners paid a bonus for extra footage broken.

(b) No outside consultants will be used. All services are available. An itemized salary-expense sheet has been prepared and is part of the cost breakdown of this project. (Appendix III of report).

(c) See Appendix IV of report.

(d) See Appendix IV of report.

(e) All initial rehabilitation and repairs will be completed before exploration contract is executed.

(f) None.

(g) No repairs necessary other than above. Miscellaneous costs are included in Appendix IV.

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SUMMARY AND CONCLUSION

The Spotted Horse mine has produced nearly 200,000 ounces of gold, from 1884 to 1917. Records show it was always a good producer when properly managed, but often suffered in the hands of poor operators. After 1917 it was occasionally worked by lessors until 1935 when all entrances became inaccessible.

The present work was begun in 1968, and consisted of re-opening the old workings, mapping and sampling. Nearly 2½ miles of horizontal workings were examined, as well as numerous stopes and raises. Although little ore was found left in the old workings, it became apparent that there were several potential ore zones.

All of the veins that produced in the past still have strong potential in their downward projections. Very little effort was expended by past operators to explore the structures downdip. In addition, there are several areas of the mine that seem to offer the proper geologic conditions for ore emplacement, but have never been examined.

The mine has a unique combination of conditions that make production especially attractive. These include high ore grade, no water, ventilation, timbering, or ecological problems, the veins are adapted to low-cost mining methods, and the future of the gold market is considered excellent.

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If present indications are substantiated, the mine should have a life of more than 10 years, producing over $1,000,000 per year.

PROPERTY DESCRIPTION

The Spotted Horse mine is located in Section 5, T-16-N, R-20-E, Montana Meridian, in the Warm Springs mining district of the Judith Mountains, about 22 miles northeast of Lewistown, Fergus County, Montana. The mine is served by paved roads for the first 18 miles from Lewistown, and by improved and maintained gravel roads to the mine.

The Judith Mountains are a low rolling mountain range, one of the last easterly uplifts of the Rocky Mountain group in Montana (Map A & B). They rise to an elevation of 6400 feet or about 2500 feet above the plains to the east. The uplift is centered on a series of laccoliths and stocks curving in a northeasterly direction. The Gold Hill stock is near the center of the mountains and is the locus of the major mines of the Warm Springs District.

Gold Hill is a porphyritic body roughly a mile in diameter. To the south, east, and northeast the porphyry contacts the Carboniferous, Silurian, and Devonian limestones, and it is in faulted areas on the contact zones that the orebodies are found. (Map C).

The Spotted Horse mine is located in a brecciated zone on the east side of Gold Hill. The Cumberland group of claims adjoin to the north, and the Maginnis mine lies a short distance to the southwest. Although the mine workings do not connect, all three

mines are quite similar geologically. Their cumulative production is near 350,000 ounces of gold.

The property is comprised of two patented mining claims, the Kentucky Favorite to the north and the Spotted Horse to the south. They are designated as Lots 3314 and 42, respectively by the Surveyor General of Montana, and hold patent numbers 3314 and 2361. In addition, the Blue Range Mining Co. has located four unpatented lode mining claims to the west of the patented ground, and two unpatented mill sites to the east of the patented claims. The patented land is held by lease and covers about 36 acres. The unpatented mining claims hold approximately 60 acres, and the millsites 5 acres each. (Map D).

ECONOMIC GEOLOGY

The ore deposits of the Gold Hill area are of the epithermal type. This is the class of ore deposition within 3,000 feet of the surface, at fairly low temperatures and pressures. The epithermal classification includes most of the world's richest "bonanza" type ore deposits. Most of these have been mined 1,000 to 3,000 feet deep. Some of the more familiar mining districts and their operated depth are as follows:

Colorado	Cripple Creek	Gold-Silver	3,000'
Nevada	Comstock Lode	Gold-Silver	3,000'
	Goldfield	Gold-Silver	2,400'
	Tonopah	Gold-Silver	1,500'
Utah	Mercur	Gold-Silver	1,500'
	Park City	(Silver-Gold	
		(Lead-Zinc	2,400'

Mexico	Fresnillo	(Silver-Gold (Lead-Zinc	3,000'
	Pachuca-Real del Monte	Silver-Gold	3,000'

The mineralization of the Gold Hill mines is localized in breccia zones at or near the contact of the limestones with the porphyries. The brecciation results from multiple faulting of the area, in five basic stages.

The apparent basis of the mineral localization is the northeast trending ancestral faulting. The original movement was laterally, as indicated by the regular strike of the zones through various mediums. These ancestral faults were re-activated during Laramide times by the igneous activity. In the Judith Mountains, the first Laramide activity appears to have been east-west normal faulting, notably through Warm Springs Canyon, with the north side displaced downward. This was followed by radial faulting and bedding slips around the domal igneous uplifts. Fourth stage movement occurred along the northeast ancestral zones as normal faulting, followed by northwest trending faults. These generally dip north and have some right lateral offset.

All stages of faulting probably created movement along the ancestral structures, creating a variety of breccias. Through alteration, some were made impermeable to ore solutions, while others remained as porous solution channels. The majority of the ore deposits occur along the northeast fault zones, with some in the northwest structures. The Glory Hole and Bonanza East struc-

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tures fall into the latter class. Where the two faults intersect, the large Bonanza Breccia orebody occurred.

One of the large northeast structures has been plotted on the level maps in a generalized form, to emphasize the alignment of the orebodies. It is felt that this trend will provide a strong basis for future exploration.

This area has been highly altered, especially near the surface, making paragenetic relationships difficult to establish. Microscopic, x-ray and electron micro-probe methods show that free gold is present as well as the telluride minerals. This indicates the possibility of two stages of ore emplacement, and helps explain the occurrence of both free gold and un-oxidized tellurides on all horizons.

The precious minerals identified are native gold, calavarite, sylvanite, krennerite and petzite. They occur in breccia matrices, usually in intimate association with fine-grained purple fluorite, and roscoelite, a vanadium mica. Forrest and McLernan (1971) established the general paragenetic relationship as follows: Quartz and sulfide minerals appeared, followed by a second phase of quartz, fluorite, roscoelite, and possible celestite. Final disposition included the telluride minerals, and possibly native gold. If the native gold occurred as a separate stage it is likely to have been deposited after the tellurides.

The ores are composed of all three breccia types, porphyry,

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porphyry-limestone, and limestone. The veins are generally concentrically banded along the dip with three or more breccia bands that vary greatly within the walls, as well as in relation to each other. On the upper levels, especially in the Bonanza area, the ore is found as "boulders", within wide zones of soft fault gouge. As depth increases, the veins become more distinct and narrow. After the third or fourth level, they remain nearly constant or even widen somewhat. The grade of ore declines from the surface to this horizon and then increases slowly to the lowest depth worked.

The ores mined in the past have varied considerably in grade and gold-silver ratio. Ore assaying over 2,000 ounces of gold per ton has been mined in quantity and large specimens containing over 75% gold have been found. The production records indicate an overall relationship of about two ounces of silver per ounce of gold. The extremes range from assays of 2,370 oz. Au/ton and 5.6 oz. Ag/ton to 0.41 oz. Au/ton and 3,726 oz. Ag/ton. The very high silver values were obtained from narrow fissures below the Bonanza stope, apparently supergene enrichment. No commercial supergene enrichment zones have been found, but may exist below the water table.

Base metals are present in very minor amounts throughout the mine, and seem to increase with depth. It seems unlikely that they would ever increase to the point of being considered ore.

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HISTORY:

The outcrop of the Discovery vein of the Spotted Horse was discovered in 1881, one of the first mineral locations in the Judith Mountains. Little work was done on the property until 1884 when it was acquired by P. W. McAdow. A crude arrastre mill was set up and outcrop ore was processed yielding nearly three ounces of gold per ton, and leaving twice that amount in the tailings. At this time it was common practice to mill the ore to obtain payroll money, and then ship the tailings to a smelter. The mine was run in this manner until 1887 when a new mill was built. In August, the shaft was 225 feet deep and the orebody was ten feet wide. Free milling ore assaying over five ounces of gold per ton was being milled and telluride ores running 40-80 oz. Au/ton were being shipped to Newark, New Jersey in ten ton lots. McAdow stated that he was producing $1,000 per day at a cost of $125. By 1889 the mine was running its own mill and the mill at the Maginnis at full capacity. Early in the year McAdow sold the mine to the Hauser & Holter Co. of Helena. When they were unable to make the mine pay, Mr. McAdow took it over again, and soon had it on a paying basis. As the Hauser & Holter people had given the mine a bad name, McAdow had a 290 pound gold bar cast, worth over $120,000 today, and displayed it in Helena.

By November 200 men were employed at the mine, with a payroll of $23,000 per month. The mine was producing over 5,000 ounces of

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gold per month from the two mills, and a new mill at the mine was under construction. An additional 1500 ounces of gold per month were realized from shipping ore. In 1890 the new mill was started and 40 stamps were dropping on Spotted Horse ore. The first 40-day run of the new mill produced 250 pounds of gold bullion, valued at $111,000 at present prices. In 1891 a body of ore was opened 35 feet wide, assaying nearly 20 oz. Au/ton. In 1893 a rich pocket 10 feet wide, 25 feet long, and 15 feet deep yielded 1500 ounces of gold. In the same area, another pocket, even smaller, produced 1750 ounces.

Spotted Horse gold formed the base of the Montana statue at the 1893 World Exposition. McAdow also cast and displayed two statuettes of his own.

In 1894 McAdow sold the mine due to ill health and retired to Florida. Without his careful management, the mine ceased to be a steady producer. It was promoted on its reputation by unscrupulous owners, extravagantly robbed by the miners, and whatever profits remained seldom went farther than the mine manager. From 1895-1902, the mine was sold at least eight times, often at forced sales by the sheriff. In 1902 the mill was destroyed by fire, and the mine had become so poorly maintained that it was closed for eight years.

In 1910 the Spotted Horse was purchased by James Breen of Spokane. Breen had the mine cleaned out, re-timbered, and

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sampled, but devoted most of his efforts to the Cumberland. The Spotted Horse was leased to Coolidge, Bryant, and Associates in 1912. No new development work was done, but the old workings were re-examined and 2500 tons of high grade ore, averaging 4.74 oz. Au/ton were shipped by the end of 1915. This production was totally from the reworking of old stopes. At this time, a mill was built and selective mining methods were abandoned and milling grade ore was mined. Only a small tonnage of ore was high-graded and shipped. The mill was improperly designed and would not recover the gold from the ore. According to USBM records for 1916, 14,400 tons of ore yielded 4,013 ounces of gold. Of this total 82.75 tons was high-graded and shipped to Anaconda, producing 647.75 ounces of gold. Approximately 12,000 tons of old mill tailings were also re-treated, but were found to be nearly barren from three previous treatments. The ore actually run from the mine was all over 1 ounce of gold per ton.

After the failure of the mill, operations at the mine became very sporadic. The new Cat Creek oil field became more attractive to investors, inflation set in after World War I and the mine and equipment fell into disrepair. In 1926 the main shaft caved in after scavengers mined under a fault zone too close to the shaft. Some lessee work continued until 1935 when all the mine entrances became completely caved.

The Kentucky Favorite was developed at the same time as the

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Spotted Horse, but was largely overshadowed by the richness of its neighbor. A shaft, vertical and then inclined, was sunk 250 feet along the vein. An almost continuous stope ran off this shaft 60 to 100 feet to the southwest and a few feet to the northeast. This vein, though narrow, was quite high grade. Eventually, a long drift from the second level of the Spotted Horse was driven to the Kentucky Favorite shaft and a second parallel vein worked.

However, water problems prevented any serious work below the Spotted Horse second level, although high grade ore is reported in the bottom of the shaft. The old workings are presently inaccessible or nearly so.

The total production of the two properties is uncertain. Records were often not kept, were destroyed by unscrupulous managers, or simply lost during inactive periods. The production has been estimated at between 170,000 and 300,000 ounces of gold. From all available sources, including reliable reports as to the amount of bullion and ore stolen, an estimate of nearly 200,000 ounces has been made by the author. The production records from 1902 to the present indicate the grade of ore obtained from scraping old stopes. (See Appendix II). The total tonnage mined from the stopes is about 85,000 tons. The dumps are estimated to contain 40,000 tons of waste material.

The present operations began in June of 1968. At that time,

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less than 500 feet of workings were open to inspection, almost none in the ore zones. All of the main mine was inaccessible and the shaft was locally reputed to be flooded.

Work was undertaken on the basis of many conversations with Mr. Frank Bryant, who operated the mine with great success from 1912 to 1915. A great deal of research was also done from other sources and on the property itself. From the compiled information it was decided to try and re-open the mine.

The old haulage adit was located under a cinder dump and re-opened to the main shaft, which was badly caved down to the level and debris filled below. The material above was supported, the shaft cleaned out and each level was then cleaned up sufficiently to give access for examination. Mapping was done with Brunton compass and tape, using backsighting and rotation to minimize magnetic deviation. The geology was mapped by the author, Mr. Robert Miller of Magma Copper Corporation, Henry McLernan and Richard Forrest of the Montana Bureau of Mines and Geology, and Mr. Don Adair, a consulting geologist. Samples were taken of all promising veins and assayed for gold and silver. An experimental geochemical analysis was done on the underground workings but failed to establish any definite trends.

The mine was found to have been quite thoroughly stripped by lessees and clandestine high-graders. Isolated small tonnages of ore were located, but not enough to justify production or pay

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for further development. The downward extensions of all veins were buried under the accumulated muck from the open stopes above. The 8th level was not examined as the timber in the winze has rotted out. The majority of the 7th level was inaccessible due to water accumulation, eight feet deep at the shaft (see cross-section). Surface water has also built up in the winze to the eighth level.

As a whole, the mine is in excellent condition, the only major caving being near the surface in mined out areas. The zones having new ore potential are all in good condition. The major items of rehabilitation are the main shaft internal hoist installation, and the winze repair. The pipe and track in the balance of the mine need only minor repair work.

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VEINS:

There are eight ore shoots in the Spotted Horse - Kentucky Favorite workings that have had major production. In addition, there are several small veins that may have significance. Of the major structures, many are inter-related and sometimes not distinct from each other. Each deposit will be described as completely as possible. The major veins are the Discovery, Bonanza, Lime Crack, Mud Stope, South Cut, Glory Hole, Kentucky Favorite, and Kentucky Favorite West veins. The minor veins are the Smith Cut, Bryant, Coolidge, Parsons #1, North Bend and Corkscrew Raise

DISCOVERY VEIN (Maps 0 - 7)

This is the major structure of the mine, having been continuously stoped nearly 700 feet down its 75-80° dip. It averages over five feet in width and 100 feet in length. The ore is found as a cemented breccia generally occurring along the contact of the limestone and porphyry. Beginning on the sixth level, the vein trends into the porphyry breccia and is over 50% in the porphyry on Seven. The opposite drawing is a composite section of several exposures of the vein on the Second, Fourth, Sixth and Seventh levels. The bands vary considerably in width and grade, as does the vein as a whole. The central and footwall bands are generally very high grade, over 10 ounces per ton. The hanging wall band varies from 0.3 to 1.3 ounces per ton, and the intermediate bands may range from trace gold content to 3 ounces per ton.

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Ore specimens show a finely broken mass of mixed porphyry-limestone fragments, re-cemented in close association with fluorite and roscoelite. Silica has replaced the majority of the calcite. Rusty gold and gold tellurides may be seen with the naked eye. The average grade of the ore was probably over 2 ounces per ton, and about 36,000 tons were mined.

The ore and wall rocks are competent and need no support other than an occasional pillar. The barren spots in the structure generally provide ample pillars. The shape and attitude of the vein make it easily mineable.

BONANZA (Maps 1 - 7)

The Bonanza ore shoot is a more complex structure than any other in the mine. Between the surface and the first level it occupies a large breccia zone nearly 60 feet wide. Below this, it separates into East, West and Middle zones. The West structure may continue into the Lime Crack between the first and second levels, as they are very close. The Middle and East zones join below the first level and continue along the contact of the limestone and syenite porphyry dike. Between the second and fourth levels, the stope averages 15 feet wide and 50 feet long.

Just above the fourth level, the ore suddenly goes into the limestone as a sill deposit, and then continues downward as a breccia pipe to the seventh level, the last horizon worked. The pipe is 40 feet in diameter on the fifth level, and 20 feet in

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diameter on six. The stope is still inaccessible on the seventh level.

As might be expected with the changes in environment, the ore character also undergoes several changes. In the upper breccia zone, the ore was found as massive "boulders" within the fault clay, and as selectively replaced fragments of the breccia. This area was noted for massive telluride deposits, and pure sylvanite and calavarite were found in masses running to several pounds. Down to the fourth level, the "boulders" decreased and the replaced fragments became the major ore. Within the sill, the fractured limestone cracks were filled with sylvanite. Finally, in the lower breccia pipe, the ore was more or less evenly distributed through the breccia. All of the ores show the close association of gold with fluorite and roscoelite.

The ore grade varied tremendously, up to 3,000 ounces per ton, however, a general average would probably be about three ounces per ton for the roughly 20,000 tons mined.

LIME CRACK (Maps 2 - 7)

The Lime Crack originates below the first level where it is a northeasterly continuation of the Discovery structure. As mentioned, the West Bonanza may also progress downward to the Lime Crack. Above the 2nd level, the vein has a thin porphyry breccia wall to the west and a lime wall to the east. The stope reaches its maximum width of about 20 feet on the second level. Shortly

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below, both walls become limestone and remain so, while the vein narrows to about four feet and remains fairly constant. The maximum vein length is below the third level, where it reaches 110 feet. It then shortens to the sixth level where it is only 18 feet, and stoping ends. Work apparently resumes on the same structure on the seventh level, but little information is available. The dip of the whole vein is nearly vertical.

The deposit was mined prior to 1900, and then Coolidge, Bryant, and Associates slabbed ore off one wall, averaging over 4 oz. Au/ton. The ore specimens show a limestone breccia, re-cemented with silica, and containing much visible gold. Interestingly, no fluorite or roscoelite is evident in the ore. The stope indicates about 8,000 tons were removed, probably averaging around five ounces of gold per ton.

MUD STOPE (Maps 4 - 7)

The Mud Stope begins just below the fourth level, where muddy limestones apparently formed a cap to mineralizing solutions. The vein probably is connected to the Lime Crack between the fourth and fifth levels, or at least is on the same break in the limestones. The stope is much larger than the Lime Crack, averaging 10 to 12 feet wide and probably 80 feet long. Presumably the ore was lower grade, perhaps only an ounce or so per ton. The tonnage mined was around 8,000 tons. No work has been done on the structure below the sixth level in spite of the apparent strength of the shoot above.

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SOUTH CUT VEIN (Maps 0 - 2)

The vein is a surface outcrop structure just south of the main shaft collar. It was apparently mined on the first level, but not below, although the long hook-like drift on the second level was probably an attempt to find the vein again. Weed and Pirsson (1897) state that high grade ore was found in the area, but little else is known. Several small, narrow veins branch off to the southwest of the cut, including the Bryant, and probably the Smith Cut veinlets. The ore appears to have been a porphyry-limestone breccia with abundant fluorite and fair silver values, in addition to the gold. Samples of stringers off the main cut ran 1.0 to 3.77 oz. Au/ton and 17 to 47 oz. Ag/ton.

The map in Weed & Pirssons report indicates that this structure may be an extension of the Bonanza East ore shoot, and may also connect to the Glory Hole shoot. As the dip and plunge of the vein are unknown, a downward projection is impossible to make. From the scant information available, an estimated 3,500 tons of material averaging two ounces of gold per ton was mined.

GLORY HOLE (Maps 0 - 3)

The Glory Hole is a pit southeast of the main shaft collar, located along the contact of the syenite porphyry dike and the limestones to the southwest. Weed & Pirsson mention high grade ore removed from the zone, and Coolidge, et al, mined and sorted the ore from a chute on the second level.

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The pit is 120 feet long and 60 feet wide, but much of this probably is due to caving. On the third level the stope is only three feet wide and twenty feet long. No work was done below the third level. The pit caving has completely filled all underground workings, so little additional data is available. A small stope begins on the second level, in the porphyry breccia, that is related, perhaps as an en echelon structure.

The ore was probably similar to the Bonanza upper level ore, but the overall quantity mined, about 3,500 tons, was almost certainly much lower grade, perhaps less than one ounce per ton. The high grade core of this deposit probably ran three to four ounces per ton.

KENTUCKY FAVORITE (Maps 0 - 2)

The main Kentucky Favorite vein runs southwest from the Kentucky Favorite shaft. It is in a breccia between limestone walls and has been stoped four feet wide and about sixty feet long. The original vein was probably less than two feet wide since there is a great deal of back fill in the stope. The vein has been mined out from the surface to the Spotted Horse second level. It is a wet structure, flowing 50-70 gallons per minute, the only major waterflow in the mine.

The ore was very high grade, much of it running 100 ounces per ton or more. Some samples of black fractured limestone with no fluorite or roscoelite, but sylvanite fissure fillings were in

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the possession of Mr. Frank Bryant. The ore tonnage removed was almost certainly less than 1,500 tons, but probably over six ounces per ton. Mr. Bryant, a most reputable engineer, stated that the vein at the bottom of the Kentucky Favorite shaft was 16 inches wide, assaying over eight ounces per ton. A narrow streak of sylvanite 35 feet from the bottom assayed 600 ounces of gold per ton.

The shaft and vein are completely caved, and flooded below the Spotted Horse second level.

The West vein of the Kentucky Favorite is about 50 to 60 feet west of the shaft and apparently similar to the main vein. It is filled with a shaley mud and completely inaccessible.

MINOR VEINS

SMITH CUT (Map 0)

The Smith Cut is a trench that crosses the Discovery ridge about 100 feet east of the Discovery open pit. According to Mr. George Smith of Gilt Edge, the last operator, the vein was a calcite stringer with fluorite. The ore occurred as pods and lenses of coarse-grained silicified limestone, with gold specks in fluorite. Loose material of this type in the trench assays 1 to 3.5 oz.Au and 3 to 35 oz. Ag/ton. Smith shipped 12,980 pounds of ore that returned 1.91 ounces gold and 2.4 ounces silver per ton. The veinlet, as shown on the surface map, is offset to the west at the north end of the cut, and trenching indicates it proceeds into the Smith

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Cut.

The drifting 80 feet below the outcrop develops several small veinlets of similar nature, but apparently never quite reached the downward extension of the vein.

BRYANT VEIN (Map 0)

This narrow lead also runs southwest from the South Cut, and is very similar to the Smith Cut ore. Some work was done on the vein in 1971 and it was found to be very erratic in shape and grade. A bulk sample of 1,420 pounds assayed 0.965 ounces of gold and 0.6 ounces of silver per ton. Channel samples varied from 0.92 to 2.35 oz. Au/ton.

A cave occurs next to the vein to the west and both are apparently on a faulted contact between dolomite and limestone. Some of the soft cave material assays up to 1.0 ounces silver per ton.

COOLIDGE VEIN (Maps 0 & 1)

In 1917, while jacking up the southwest corner of the mill ore bin, a small vein was discovered and opened up about 30 feet to the southwest. Two lots of ore were shipped, 1,680 pounds assaying 45.15 ounces gold and 171.0 ounces silver, and a more select lot of 57 pounds running 66.97 ounces of gold and 1,176.5 ounces of silver. No ore samples are available for description.

A raise was run from adit, apparently under the vein, but is caved near the surface. No further exploration work has been done.

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PARSONS VEIN (Maps 0 & 1)

Just south of the Coolidge vein is a small cavelike structure that was apparently stoped, as timber and tool marks are in evidence. The opening continues down into the fault zone separating the carboniferous and Cambrian limestones in the adit. According to Ed Wieglenda of Lewistown, his uncle and a Mr. Parsons mined a small quantity of ore during the 1930's. The author obtained a sample of sand from a crack in the stope floor that contained balls of native gold 1 to 2 mm. in diameter. No old records or assays are available. The area is very muddy and broken due to faulting, making it difficult to explore.

NO. 1 VEIN (Map 1)

About halfway between the shaft and the "T" of the adit is a raise-stope following a narrow breccia dike. From its size, considerably larger than a normal raise, it may be assumed that ore was mined, but no other information is available. Another smaller working was raised at the adit "T" also apparently on a small stringer.

NORTH BEND VEIN (Map 1)

Weed and Pirssons' map of the mine indicates that spotty ore was found in the fault zone at the northeastern extremity of the first level. Tool marks and timbering indicate some mining was done, but no significant assay values could be found by the present

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operators.

The lack of ore samples from these areas make interpretation difficult, but there is a possibility that the values occurred as "drag" ore, moved from its original location by faulting. Since direction and magnitude of the faults are unknown, no positive theories may be advanced as to the source.

CORKSCREW VEIN (Map 3)

On the third level, a corkscrew raise was run about 45 feet up on a narrow ore stringer. Samples from the top show no significant assays, but erratic values occur in the seam below. This may be an isolated stringer, "drag" ore, or the very end of a major ore body. Eventually, exploration should be done in the area.

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INTERNAL HOIST INSTALLATION

1" = 5'

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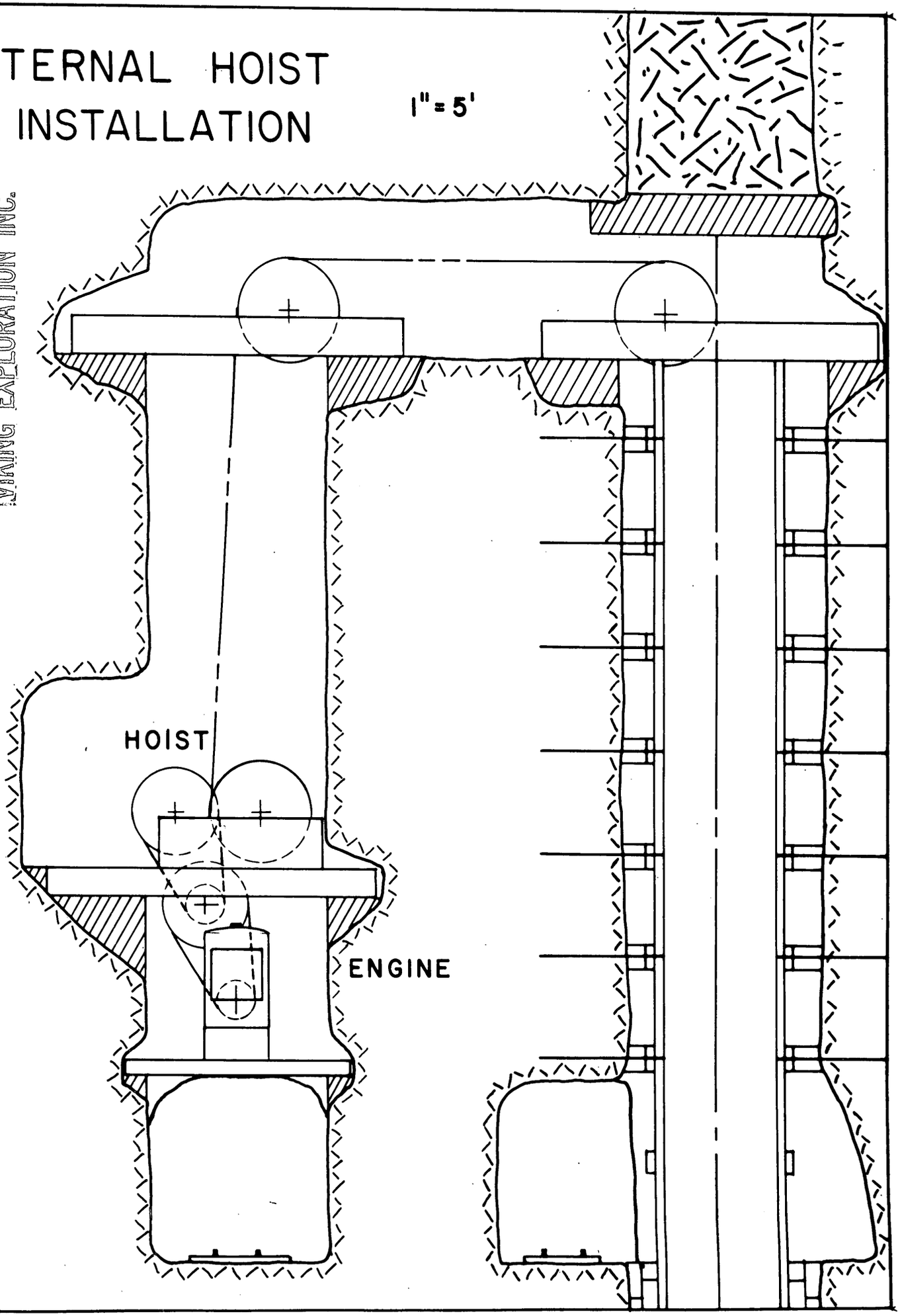

EXPLORATION TARGETS:

In the course of the present work, several areas have been noticed that would seem to offer excellent possibilities for new ore. Some are potentially very large, while others might only be small pockets. The smaller targets with a lower probability of success would be best explored after the mine is in production. Only the best possibilities should be examined in the initial exploration program, since it is the larger deposits that will decide the future of the property.

Each major target will be examined and discussed level by level. The maps are indexed and fold out for convenient referral. The overall cost and time required for each target will be listed in the discussion, with itemized breakdowns compiled in Appendix I.

The targets selected will depend upon the amount of financing available. The suggested exploration plans may be expanded, confined, or re-organized to best fit the objectives of the investor.

"0" LEVEL

The area south of the South Cut is highly fractured, with numerous veinlets, notably the Smith & Bryant structures. The area should eventually be explored under the Smith Cut and with a cross cut to the northwest past the Bryant vein. This would explore the northeasterly fracture pattern for mineable veins. The veins would probably be narrow and irregular, but might be worth mining if the values were high enough. This area might also be

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examined on the lower levels for favorable bedding mineralization or a conducive change in dip or strike. Strength is given to these possibilities by the fact that the Lime Crack and Mud Stope structures are strong and well mineralized on the lower levels.

Work on this area might be done during slack time in other work. The uncertain nature of the known veins near the surface in this area make it a poor primary exploration target. As a long term possibility, however, it remains attractive.

The whole block of ground south of the main shaft including the Bonanza, Glory Hole, South Cut and Discovery veins may have enough low grade values and veinlets to form the basis of a small open pit down to the first level. Again, this is a long-term possibility.

FIRST LEVEL

By far the largest area to be explored is the block of ground lying between the Spotted Horse workings and the Kentucky Favorite-Breccia Shaft area. This zone is highly brecciated on the surface and several hundred feet of contact run through it. Located between two known ore zones and on the productive structure, (see First Level map), this target is potentially one of the best in the mine. Although a drift runs between the Spotted Horse and Kentucky Favorite shafts on the second level, it lies far to the east of any potential ore zones. Like many of the workings in the

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mine, it was driven by "feel" rather than any geologic evidence, or even surveying. The target area, then, is unexplored on any level of the mine.

The first level lends itself to an exploration program because no hoisting of waste or supplies is necessary. Exploratory drifting and cross-cutting would be more adviseable than diamond drilling in this area, due to the brecciated nature of the zone, and the many voids therein. Core costs would be high, recovery low, and if ore were found, the drifting would still remain to be done. The cost of initial drifting would be somewhat higher than core drilling but the results much more desirable, and the area would be ready for production upon completion of the exploratory work. This same reasoning holds true for most of the exploration work in the mine, especially since the present workings are close to all targets.

It is proposed to explore the area with a drift from near the shaft station, convenient to the waste disposal raise, proceeding northeast, more or less along the contact for about 700 feet. This would include cross-cuts necessary to explore promising dikes, faults, etc.

Barring major unforeseen difficulties such as caving ground or heavy water flow, the total cost of exploring this area would be $33,538 and would take 7½ months time.

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SECOND LEVEL

Just southwest of the main shaft, there is a potential orebody at the southerly junction between the east dike and the main porphyry mass, which includes a point of limestone that should be a very favorable ore deposition zone. It is located at the intersection of the northeast and northwest fault systems, both of which were mineralized less than 100 feet away. The zone is untested to the fifth level where it merges with the Bonanza breccia zone.

FOURTH LEVEL OME

The same point of brecciated limestone may be explored from the fourth level with an 80' cross-cut. If a full exploration program is instituted, the higher cost of work on this level would be justified by the higher tonnage available for overhand stoping, if ore were found.

The work would probably be postponed under a restricted exploration program until justified by work on the second and fifth levels.

After the shaft and level station have been put in order, the work would take less than 4 weeks and cost $5,303.

FIFTH LEVEL

The old Bonanza Pipe stope, accessible from the fifth level, has several places that show encouraging assays. Exploration from

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ASSAYS - 5TH LEVEL BONANZA PIPE STOPE
(See 5th level detail map for location)

No.	Au	Ag
5017	0.86	1.74
5018	0.08	0.08
5019	0.70	5.94
5020	0.95	2.73
5021	23.71	27.50
5021 ck	2.71	8.34
5021 ck	0.95	2.77
5022	0.15	0.55
5023	1.15	0.95
5024	0.65	1.10
5025	3.72	3.15
5025ck	2.68	3.00
5026	Tr	Tr
5027	1.05	1.86
5028	0.65	0.75
5029	0.33	0.45
5030	0.47	0.57
5031	0.25	0.30
5032	0.88	1.05
5033	0.15	0.35
501	23.54	28.70
502	0.52	0.70
503	0.52	1.15
504	Tr.	0.90
505	0.56	0.40
506	Tr.	Tr.
507	0.88	1.10
508	0.86	1.10
509(501 ck.)	1.92	4.60
510	0.34	0.60

Note: In no case were assays consistent enough to constitute delineation of ore reserves.

All samples were chip samples perpendicular to the strike and/or dip of the vein. All surfaces cleaned prior to sampling. 2 to 5 lb. samples taken, then split down for 1/2 A.T. assays. Samples 5017, 5021, 5025 and 509 were channel samples 1" deep x 2" x 2' long.

this stope may lead to commercial tonnages of ore, eliminating much of the risk of blind prospecting. Some very rich, though erratic samples have been taken from the stope walls and back.

A cost estimate for this type of work is very difficult to arrive at. The structures may continue for many feet or pinch off immediately. From general experience with this type of mine, a time allotment of about a month for two men should be made. Two raises 20 feet high should be run as shown on the detail map. In addition, two short eye drifts are proposed, one proceeding about N 80° W from assay 501, the other running about N 45° E from Assay 5017 (not shown on detail map due to crowding). The total collaring cost would be $1,250, and the cost of raising 40 feet would be about $2,170. The eye drifts would only involve about 10 feet each or around $1,080, bringing the total expenditure to $4,500. The actual footages involved may be shifted according to the results encountered, but the overall budget will remain the same.

SIXTH LEVEL OME

As mentioned in the discussion of the veins, the Bonanza stope suddenly leaves the porphyry-limestone contact above the fourth level, and proceeds into a breccia pipe.

This sudden change is not characteristic of the Spotted Horse oreshoots, but vein branching is a common occurrence. It is to be suspected, then, that there is a good possibility of the contact

being mineralized below the fourth level.

There is also the possibility that the Glory Hole vein, pinched below the third level, may open up again below.

These possibilities could be examined with a drift along the contact on the sixth level. About 60 feet of drift has already been run in this direction and need only be continued.

Three hundred feed of drifting along the contact should expose any mineralized zones. From the size and grade of the orebodies above, this area has good potential.

The cost of the work would be $18,743 and it would take about 13 weeks to complete.

SEVENTH LEVEL

Once the seventh level has been recovered, as described in the Rehabilitation discussion, work could proceed toward the downward extension of the Mud Stope vein. A drift begun just north of the projection should fully develop the structure within 150 feet. This would cost $9,541 and take about 1½ months. From the size and shape of the Mud Stope on the sixth level, it is reasonable to assume the vein was quite strong and probably continues downward. Further exploration could eventually be done from the eighth and ninth levels.

JOB SCHEDULING

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JOB SCHEDULING

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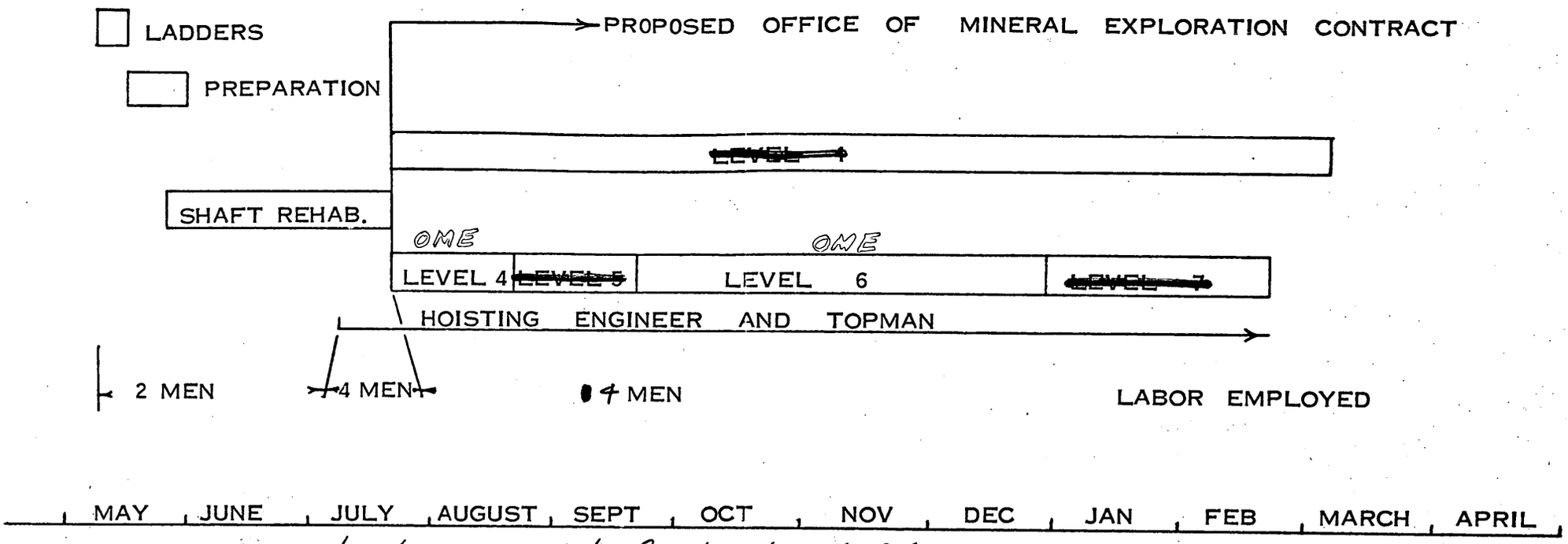

17 weeks time required for Levels 4 & 6

ACTUAL JOB SCHEDULING MAY VARY ACCORDING TO CONDITIONS

EXPLORATION PROGRAM:

A specific exploration program is difficult to set out when the amount of capital and the requirements of the investors are as yet unknown. Naturally, it would be best to have the financing available to explore all possibilities. Since this amount of money is not likely to be available from the outset, both a medium and a minimum program will be outlined.

To find a single vein or oreshoot would not be a satisfactory basis for operation of the mine. Fluctuations in the size and grade of a single deposit can ruin even a well managed mine. The objective is to develop as many veins as possible on several horizons to balance productivity. This is why it is essential, even with a limited exploration program, to install the hoist in the main shaft and explore several levels.

The smaller and more speculative possibilities may be examined once production is established. If no ore is found in the major zones examined, it is unlikely that these areas would provide enough ore to make up the deficit.

The exploration time schedule would again depend on the cash flow available and the investors requirements. A larger number of miners working on several projects concurrently would mean higher utilization of facilities, service and supervision time, and overhead, resulting in a lower cost per unit of work. On the other hand, benefits may result from spreading the work into two

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fiscal years.

Time estimates and the related labor costs are dependent on the quality and learning ability of the worker. All miners would be trained on the job resulting in workers familiar with the mine conditions and without poor practices brought from other mines. The training period will be about 2 months, during which time productivity will naturally be lower.

As with any project of any size, there are always unforeseen delays and costs. This is the basis of the contingency budget. All of the estimates, including the contingency, have been based on previous experience and careful cost analysis.

PROGRAM I

~~1. Full development of the first level contact between the Spotted Horse shaft and the Kentucky Favorite with necessary cross-cuts to explore promising structures.~~

2. Rehabilitation of necessary facilities and workings to the shaft sump. (NOT part of OME contract)

3. An 80-foot cross-cut on the fourth level to the limestone point.

~~4. Follow ore structures on the fifth level from the Bonanza pipe stope.~~

5. Drift along East Dike contact for 300 feet to explore Bonanza and Glory Hole vein extensions on the sixth level.

~~6. On the seventh level, drift 150 feet into the Mud Stope projection area.~~

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The total cost of this program would be $50,289.30 including rehabilitation work. The total of an OME contract would be $38,077.10, of which we would like to obtain the full 75% OME participation, or $28,577.83.

PRODUCTION:

The Spotted Horse has an unusual combination of factors favorable to production:

1. The walls and veins are firm, requiring no timbering of mined areas.
2. The size, shape and attitude of the veins make them very adaptable to several modern high-production mining methods.
3. The ore is quite high grade and easily treated with modern technology. Gold is always a salable commodity to various markets.
4. The mine has no water problem, having natural drainage on all levels, and yet sufficient water flow to supply mining needs.
5. All levels are naturally ventilated winter and summer, eliminating nearly all artificial ventilation needs. The large volume of air within the mine is more than ample supply during the few days of dead air during the seasonal air flow change. Only small fans would be necessary for blind headings.
6. Only minor work is needed to comply with the U.S. Bureau of Mines secondary escapeway requirements. The mine more than meets all other standards.
7. The mine may be operated easily all year around as the

temperature within the workings remains nearly constant.

8. The property is located on excellent roads, only 10 miles from a railhead.

9. The mine is located 190 miles from the East Helena Smelter, and 260 miles from the Anaconda Smelter, both of which accept custom ore. Both pay for gold based on the free market price.

10. The ore is a silicified limestone, highly desirable at the smelters as flux, for which a discount is given on smelting costs.

11. Commercial 3-phase power is available less than 3 miles from the mine.

12. The mine is ecologically desirable as no new surface workings will be opened, and all waste products may be dumped underground. All production facilities will also be located underground. The only waste exhausted would be blasting fumes, high in available nitrates, benefiting surrounding vegetation.

13. The area has been primarily agriculturally based and suffers from high seasonal fluctuation. A stable mineral based industry would be welcomed.

It is roughly estimated that for every ton of shipping grade

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ore, eleven tons of mill ore will be mined. This means a mill on the property will be an eventual necessity, and should be constructed as soon as possible after enough ore has been blocked out to justify construction. The mill capacity should be between 30 to 100 tons per day, depending on the amount of ore available.

The old Lime Crack stope, between the third and fifth levels would provide an ideal location for an underground mill. This would eliminate some hoisting and tramming cost, all winter operating problems, building maintenance and environmental conflict.

Much of the equipment has already been located and purchased by the Blue Range Mining Co. While the exact type of mill would have to be determined by extensive metallurgical tests, the cost would be approximately $100,000.

If 50 tons per day were milled, at an average grade of one ounce of recoverable gold per ton, the gross return would be $2,400 per day. An additional 4 tons would be shipping grade ore at 5 oz. Au/ton, bringing in $960 per day.

Mining costs would depend on the depth, shape, size, grade and nature of the orebody, as well as the mining method. From past experience with similar mines, the costs should not exceed $20 per ton. Milling costs would probably be less than $10 per ton. For the shipping grade ore, transportation and smelting costs would be $27 per ton.

Using these figures, $3,360 would be produced each day, at a

cost of $1,768. This would mean a net profit of $1,592 per day before taxes, etc.,leaving a good margin for lower ore grade and/or higher costs. At this rate, the costs of exploration, development and mill construction would be paid for out of profits in less than a year, once full production is established.

The mine and mill would provide employment for about 15 men on a full year-round basis. The life of the mine would probably be about 10 years. If part of the profits are diverted to an exploration fund to develop the adjoining properties, the life span could be extended to 40 years, or more.

VIKING EXPLORATION INC.

APPENDIX I

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Present Operating Equipment	70

VIKING EXPLORATION INC.

DRIFTING COSTS

5' X 7' Heading, average of 4 feet advance/day, no timber, straight work, less than 500' haulage.

LEVEL 1

Engineering & Supervision	$17.26
Labor @ $34.81/man/day ($28/day = 24.3% labor costs)	17.41
Compressor, fuel, oil, maintenance	2.54
Drill, oil, maintenance, hose	1.49
Mucking machine, oil, maintenance, hose	1.92
Cars and track maintenance	.86
Bit and steel consumption	2.91
Explosives, dynamite, caps, fuse	8.90
Pipe and fittings	.83
Rail, hardware, ties	1.99
Total Cost/Foot	$56.11

LEVELS 2-7 - Hoisting Costs/Day

Hoisting engineer and topman	$69.62
Hoist Fuel, oil, maintenance	19.92
Car transfer time differential	7.14
Shaft maintenance	2.40
	$99.08

1 Heading served = $99.08/heading = $24.77/foot hoisting cost

Total Cost/Foot	$78.88

TIMBERED HEADINGS - Timber @ 13¢/bd.ft.

3 - 7'x 10"x 10" Posts	$22.88
14 - 5'x 3"x 12" Lagging	27.30
6 - 5' x 4"x 12" Lagging	15.60
2 - 5'x 6" x 6" Girts	3.90
Blocks and wedges	2.40
Labor/5' set	34.81
	$106.89
Additional cost/ft. Levels 1-7	$ 21.38

VIKING EXPLORATION INC.

COLLARING COSTS

1ST LEVEL DRIFT

Labor, 2 men, 4 days	$278.48
Switch, rail, & acc.	23.70
	$302.18

4TH LEVEL DRIFT

Labor, 2 men, 4½ days		$313.29
Rail & acc.	OME	48.49
Shaft service		152.61
		$514.39

6TH LEVEL DRIFT

Labor, 2 men, 5 days		$348.10
Rail & acc.		152.48
Machinery operation	OME	25.00
Explosives		47.30
Miscellaneous supplies		15.00
Shaft service		197.43
		$785.31

7TH LEVEL DRIFT

Labor, 2 men, 4 days	$278.48
Switch, track & acc.	43.73
Shaft service	73.27
Cutout round	167.37
	$562.85

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EQUIPMENT - PROGRAM I
(To be Purchased)

3 mine lamps, new, with charger	$170.00
1 Set (2'- 4' - 6') 7/8 x 4¼ hex drill steel, new	58.00
3 Timken 1-3/8 x 11° T.C. bits, new	15.00
Pulverizer motor (2 H.P.), new	100.00
Fire Extinguishers 3 - 10 lb. CO_2, new	210.00
	$553.00

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OVERHEAD COSTS

Geologist	$1200.00
Office and Bookkeeping	900.00
Travel, Viking (Eng. & Geol.)	530.00
Per diem, Viking @ $15.00/day	1350.00
Electric Service	130.00
Telephone	340.00
Mileage	800.00
TOTAL	$4250.00

VIKING EXPLORATION INC.

SUMMARY

Level 4	Collaring Cost	$ 514.39
	80' drift @ $78.88/ft.	6,310.40
Level 6	Collaring Cost	785.31
	300' drift @ $78.88/ft.	23,664.00
New Equipment		553.00
Overhead		4,250.00
Total		$38,077.10
75% OME Participation		$28,557.83

PRESENT OPERATING EQUIPMENT

Air Equipment

Ingersoll-Rand type 40 model 25 air compressor with UD-9 International Diesel engine	1800.00
Gardner-Denver FL-48 airleg rock drill	350.00
AF-79 longhole drifter with 75' coupled drill steel	450.00
Cleveland LH-45 sinker	250.00
Sullivan #6 Diamond drill with 150' EX rod	500.00
2 - I-R R-58 stopers	150.00
I-R X-71 drifter	300.00
2 G-D HEE air slushers with cable and buckets	1300.00
Eimco 12B mucking machine	3500.00
Thor 65# paving breaker	100.00
I-R MT-3 tie tamper	100.00
Chicago Pneumatic clay spade	75.00
Chicago Pneumatic wood boring drill	75.00
Sullivan E-111 tugger hoist with 300' cable	750.00
3 Anaconda timber hoists	300.00
C-P sump pump with extra motor	100.00
C-P 6 sludge pump	50.00
2000' 2" air pipe	600.00
100' 1" air hose	100.00
50' 3/4" air hose	20.00
50' 1/2" air hose	20.00

Assay Office Complete — 2500.00

Denver Fire Clay #14 furnace with Diesel burner
Braun UA pulverizer
DFC chipmunk jaw crusher
Ainsworth VG gold balance
Ainsworth pulp balance
Crucibles, glassware, fluxes, utensils, etc.

Mine cars, 18 guage

5 - 1½ ton side dump	300.00
6 - 1 ton rotary end dump	300.00
1 - 2 ton rotary end dump	50.00
1 - 3/4 ton rotary end dump	50.00
1 - Anaconda timber car	40.00
5 tons 16-25 lb. rail, with accessories	750.00

VIKING EXPLORATION INC

Miscellaneous Equipment

Askania 6E theodolite	850.00
Mine Safety Appliance - 4 lamp type S charging panel	150.00
Mine Safety Appliance - rescue stretcher, complete	75.00
1200' 8-10" ventilation fan bag	240.00
200 rock bolts, 4'X 6'X 8'	500.00
100 h.p. 44 X 24 single drum shaft hoist, less engine and cable	800.00
Shop-built crawler snow plow	750.00

Milling Equipment

10' diameter X 7'X 5' Cylindro-conical steel ore bin	
10' " X 10'X 5' Cylindro-conical steel ore bin	
Universal 6 X 12 jaw crusher	
Humphreys 12 X 12 rolls crusher	
Denver 3'X 4' ball mill	
Denver 6 cell #18 flotation machine	N.A.
2 - 6'X 6' steel water tanks (open)	
1 - 10'X 20' steel water tanks (closed)	
Misc. 1" to 2" sand and water pumps	
Misc. electric motors	

Supplies, spare parts, fittings, lubricants, misc. pipe, wire, hose, small equipment and tools.	1000.00

All equipment in good to excellent condition with only minor maintenance required.

VIKING EXPLORATION INC

APPENDIX II

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VIKING EXPLORATION INC.

SMELTER RETURNS

DATE	WET LBS.	OZ. AG	OZ. AU
Nov. 1909	8860	8.5	7.69
	37760	2.9	2.71
Feb. 1912	58130	5.6	2.71
Apr. 1912	83650	2.2	5.04
May 1912	64630	1.8	3.43
June 1912	63990	4.4	3.52
July 1912	66170	8.8	3.03
	65190	7.8	3.40
Aug. 1912	34600	6.3	2.51
	28890	3.4	9.48
	65390	5.3	3.68
Sept.1912	65380	3.0	3.17
	66740	2.6	2.88
Oct. 1912	67260	5.8	2.80
	63800	2.6	2.59
Nov. 1912	69600	3.2	2.66
	69410	4.8	3.19
Dec. 1912	68720	3.8	3.19
	65520	5.4	4.27
	57350	3.8	3.66
Jan.1913	67620	2.7	3.67
	63370	2.6	5.79
Feb.1913	65550	4.2	9.23
	26060	2.0	1.85
Mar.1913	97610	4.2	6.21
	63590	4.7	4.09
Apr.1913	62580	4.3	9.42
May 1913	64420	5.6	7.46
June 1913	62460	5.8	4.85
	64230	4.0	4.02
July 1913	64340	1.7	3.68
Aug. 1913	66230	1.6	6.09
Sept.1913	65200	2.9	6.74
	68300	2.3	3.52
Oct. 1913	65180	6.7	2.01
	64500	4.9	2.26
Nov. 1913	64110	3.7	3.46
Dec. 1913	68330	2.3	4.29
	67550	2.6	2.76
Misc.1913	**64760	2.9	4.82
Jan. 1914	68020	2.5	3.03
	65720	2.7	4.13
	70010	2.1	6.52
	* 66620	2.3	6.10

VIKING EXPLORATION INC.

DATE	WET LBS.	OZ. AG	OZ. AU
Feb. 1914	64830	2.3	6.29
	68270	1.6	5.80
	68590	1.0	3.28
	* 194	101.1	50.00
Mar.1914	67460	1.6	3.36
	69140	2.7	7.84
	69430	1.7	6.26
Apr. 1914	65100	1.0	4.90
	2644	5.6	38.24
	70980	1.0	5.59
	71600	1.3	5.50
	944	28.6	70.64
May 1914	69880	1.1	5.71
	70240	2.1	9.93
June 1914	70560	2.3	5.92
	64800	2.1	6.52
	67850	1.0	5.02
July 1914	67720	1.3	3.77
	64490	1.4	3.60
	67240	2.4	4.78
Aug. 1914	12310	9.0	9.64
	48070	1.5	2.40
Sept.1914	10330	12.7	11.94
	52000	2.1	2.98
	62380	3.8	5.05
Oct. 1914	63750	5.6	5.64
Nov. 1914	66600	2.0	2.04
	3780	13.0	16.84
	60980	2.5	2.36
Dec. 1914	60970	4.7	4.48
	57890	2.8	1.72
Jan. 1915	58960	6.8	3.84
	62670	3.0	5.80
Feb. 1915	63700	2.8	4.00
	58150	2.5	6.80
	4320	6.5	32.16
Mar. 1915	64580	2.5	5.98
	2080	5.3	19.56
Apr. 1915	62560	1.6	3.66
	59800	1.9	2.44
May 1915	61770	0.9	2.92
	49500	0.8	2.10
	49950	1.5	2.80

VIKING EXPLORATION INC.

DATE	WET LBS.	OZ. AG	OZ.AU
Mar. 1916	46660	9.3	8.20
	1280	16.7	23.82
May 1916	38820	11.1	5.67
July 1916	39300	16.2	4.42
Sept.1916	41140	30.6	6.33
Mar. 1917	1680	171.0	45.15
	57	1176.5	66.97
May 1918	32580	1.8	3.44
June 1919	57800	2.8	6.24
	12840	1.3	2.68
July 1919	60000	2.5	3.27
	63760	3.8	2.68
Jan. 1920	44500	3.1	2.89
Sept.1925	65620	0.8	3.49
Oct. 1925	62540	0.7	3.80
Dec. 1925	60720	1.4	5.68
Mar. 1926	32600	8.1	2.70
	10340	1.4	1.95
Aug. 1926	39840	6.6	4.36
	16890	7.8	2.92
July 1932	12980	2.4	1.91
	73760	2.5	0.65
Sept.1932	55760	0.6	0.36
Dec. 1933	6600	0.6	2.13
	28280	3.1	1.40
Aug. 1935	29680	2.2	6.30
Total	5,966,749		4.44 av.

* East Helena Smelter
**Pittsmont Smelter

VIKING EXPLORATION INC.

U.S. BUREAU OF MINES PRODUCTION RECORDS

Ore Milled

Direct Shipping Ore		As Previously Itemized	
		Yield	
Year	Tonnage	Oz. Au	Oz. Ag
1902	1,032*	1,373	328
1916	14,417**	3,365	4,961
1934	219	84	59

*Some of this ore was shipped, but amount is unknown.

**Includes some 12,000 tons of old mill tailings.

Note: No records are available prior to 1902. Approximate production 1884 - 1902 estimated to be over 183,000 ounces of gold.

VIKING EXPLORATION INC.

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VIKING EXPLORATION INC.

APPENDIX III

7. (b) Supervision

Mining Engineer	$850/month
Foreman	$850/month
Geologist	$1650/month

Mining Engineer and Foreman to be employed full time for the duration of the project. Geologist to act as consultant for a total of ~~30~~ 15 days during project.

Labor

All laborers to be paid at $28/day employed as outlined on the job scheduling sheet opposite page 40. Time and one-half to be paid for overtime work.

Appendix IV
(OME)

7. (c)	Electric power (single phase) av. (REA)	$ 0.0265/kw-hr
	Fuel - Gasoline, bulk, incl. taxes	$ 0.318/gal
	Diesel, #2 bulk, incl. taxes	$ 0.167/gal
	Water	nil
	Drilling - Drill steel 2'	$12.85
	4'	$18.90
	6'	$22.70
	8'	$29.60
	Tungsten Carbide bits	$ 4.95 ea
	water needles	$ 6.80 ea
	air hose, 1", wire countered	$ [illegible].98/ft
	water hose, ½", plain	$ 0.31/ft
	oil, drill	$ 1.74/gal
	compressor	$ 1.76/gal
	engine	$ 2.01/gal
	Blasting	
	Dynamite	$39.75/cwt
	fuse	$ 0.019/ft
	caps	$ 4.50/c
	loading sticks	$ 2.30 ea
	igniting cord	$ 0.031/ft
	Loading	
	Mucker cables	$ 7.80 ea
	Chain links	$ 0.90 ea
	shovel (#2 round point)	$ 5.70 ea
	pick	$ 6.20 ea
	Service	
	wire (electric 3 cond.)	$ 0.21/ft
	track spikes	$31.50/cwt
	bolts	$49.60/cwt
	plates	$ 0.60/pr
	ties	$ 0.11/bd ft
	rail	$ 0.91/ft
	2" pipe, steel, used	$ 0.30/ft
	3/4" pipe, plastic, new	$ 0.06/ft
	3/4" plastic pipe coupler	$ 0.13
	clamp	$ 0.21
	2" coupler	$ 0.87
	union	$ 2.31
	"T"	$ 1.19
	elbow 45°	$ 1.15
	90°	$ 1.17

Misc.

Safety Hard Hat (MSA)	$ 5.90 ea.
Safety Boots (Penney's)	13.00 ea.
Safety belt (MSA)	16.70 ea.
Safety Glasses (Plano)	4.70 pr.
Maintenance - welding rod	$ 0.24/lb.
oxygen	8.60/tank av.
acetylene	10.00/tank av.
grinding wheels (carb)8"x 1"	7.20 ea.
(sil.carb)8"x 1"	13.80 ea.
Assaying - sample bags	$ 5.80/C
bone ash (100 lbs.)	72.50
Litharge (100 lbs.)	55.00
Soda Ash (100 lbs.)(4 bags)	5.76
Silica	0.11/lb.
Flour	0.10/lb.
Crucibles (20 g)	29.83/96
inquarts	9.20/C
Fire extinguisher, 5 lb. CO_2	$30.00
2½" fire hose	2.00/ft.
Motor oil (deterg.)	2.00/gal.
Nails	0.18/lb.
Most bolts and nuts	0.35/lb.
Lumber	0.13/bd.ft.
Structural steel	0.18/lb.av.
Mine lamp, Type S used	12.50 ea.
Wheat new	40.00 ea.

7. (d) Drilling - FL48 G-D.airleg rock drill (used) $ 350.00
chuck assembly 73.00
Mucking 12B Eimco mucker 2500.00

Misc. - ~~radiant heater~~ ~~$ 60.00 ea.~~
~~assay furnace~~ ~~500.00~~
pulverizer motor 100.00
~~Diesel electric set, 75 kw~~ ~~2500.00~~
fire extinguisher, 10 lb. CO_2 60.00 ea.

7. (e) None

(f) None

(g) Analytical work
200 Au - Ag assays @ $1.43/sample $ 286.00
Accounting & Bookkeeping 800.00

7. (g) Cont'd)

Workmen's Compensation & Liability Ins.	16.0% of wages
Unemployment Insurance	3.1%
Social Security	5.2%
Total	24.3%

VIKING EXPLORATION INC.

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LEGEND OF MAP SYMBOLS

MINE WORKINGS

SHAFT OR WINZE —

RAISE, UP — DOWN —

ADIT —

CAVED AND INACCESSIBLE WORKING — (surface)

WORKING BACKFILLED —

WATER FILLED —

RAISES GO TO NEXT LEVEL UNLESS OTHERWISE SPECIFIED

GEOLOGY

LIMESTONE —

CAMBRIAN —

BLACK SHALE —

PORPHYRY - SYENITE —

RHYOLITE —

BRECCIA — MASSIVE LIMESTONE —

MIXED ROCK —

PORPHYRY —

CONTACT —

FAULT —

BED OR STRUCTURE DIP — 20

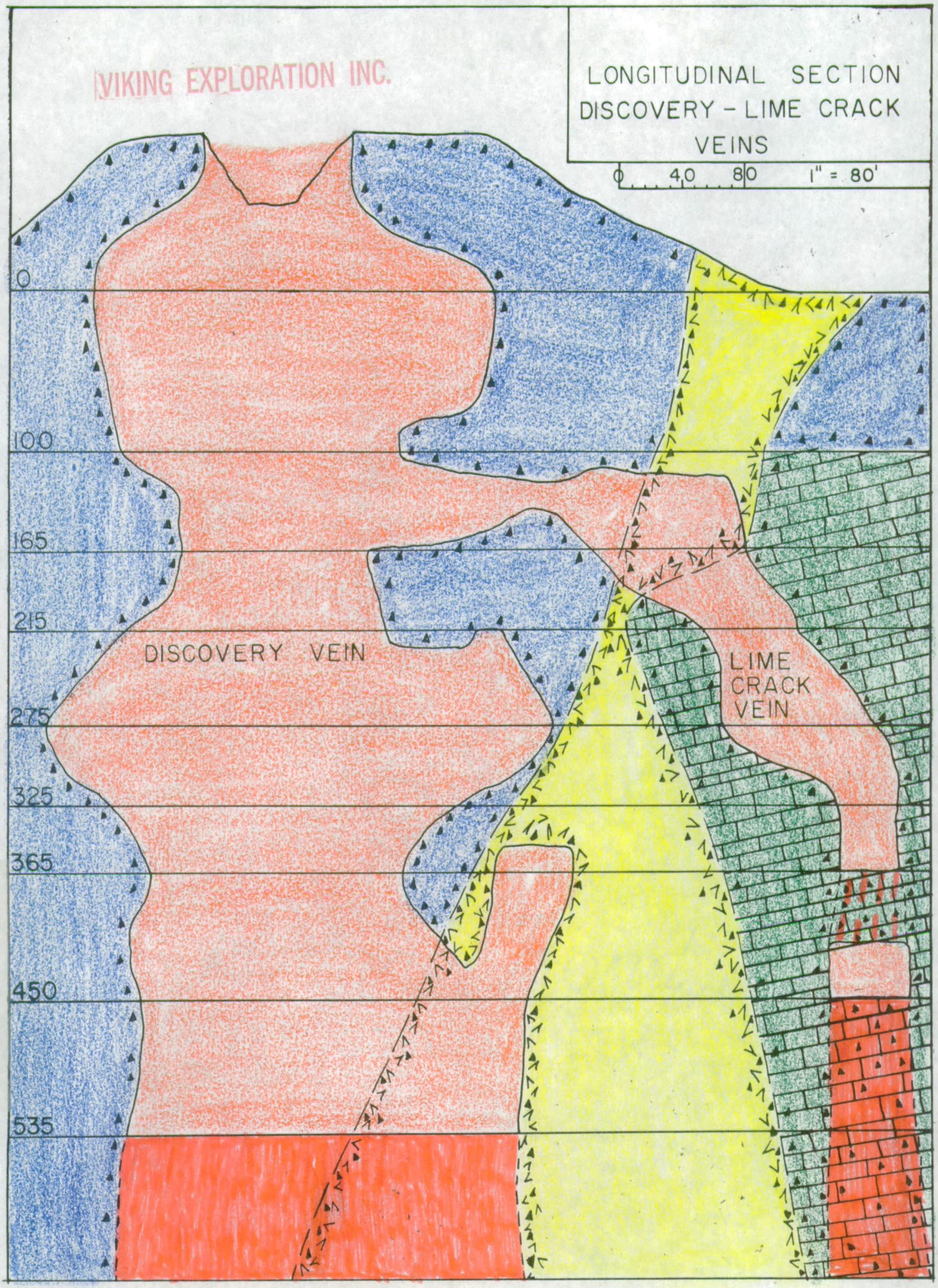
MINED ORE —

PROJECTED VEIN —

VIKING EXPLORATION INC.

LONG. SEC. DISC, LIME CR. VN

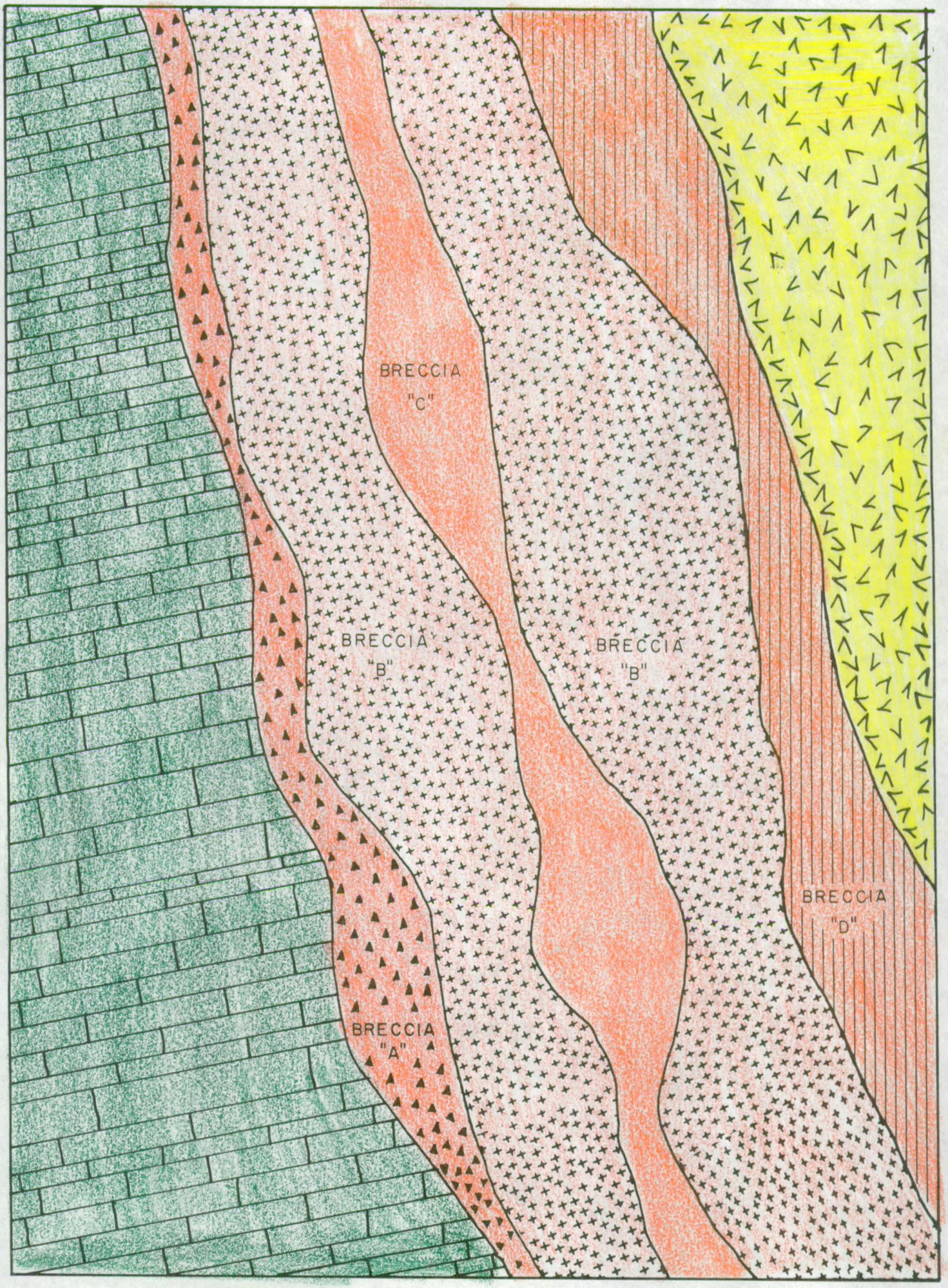
VIKING EXPLORATION INC.


VIKING EXPLORATION INC.
LONGITUDINAL SECTION
DISCOVERY - LIME CRACK
VEINS
0 40 80 1" = 80'
0
100
165
215
275
325
365
450
535
DISCOVERY VEIN
LIME
CRACK
VEIN

Disc. Vn. X-Section

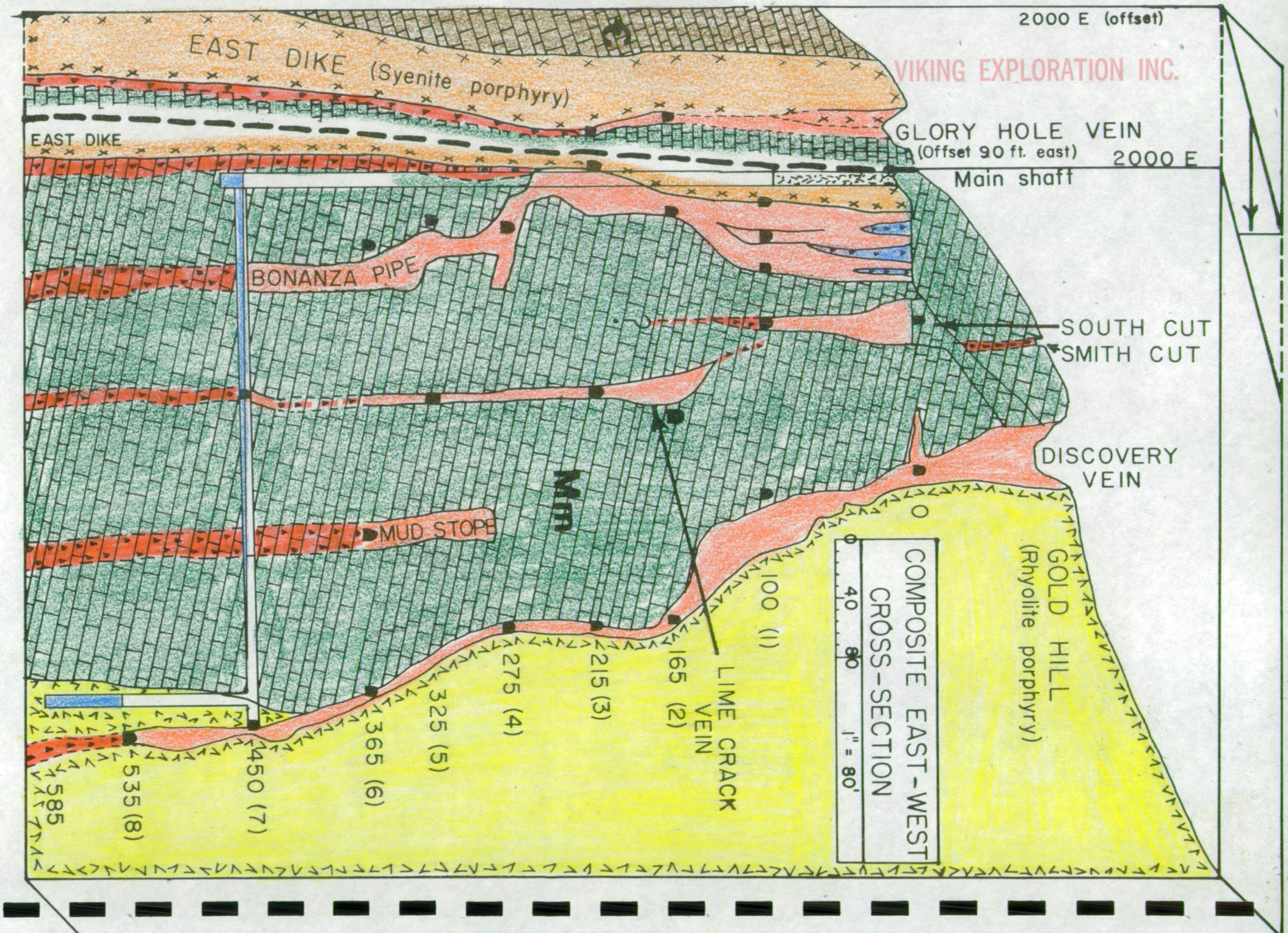
VIKING EXPLORATION INC.

VIKING EXPLORATION INC.



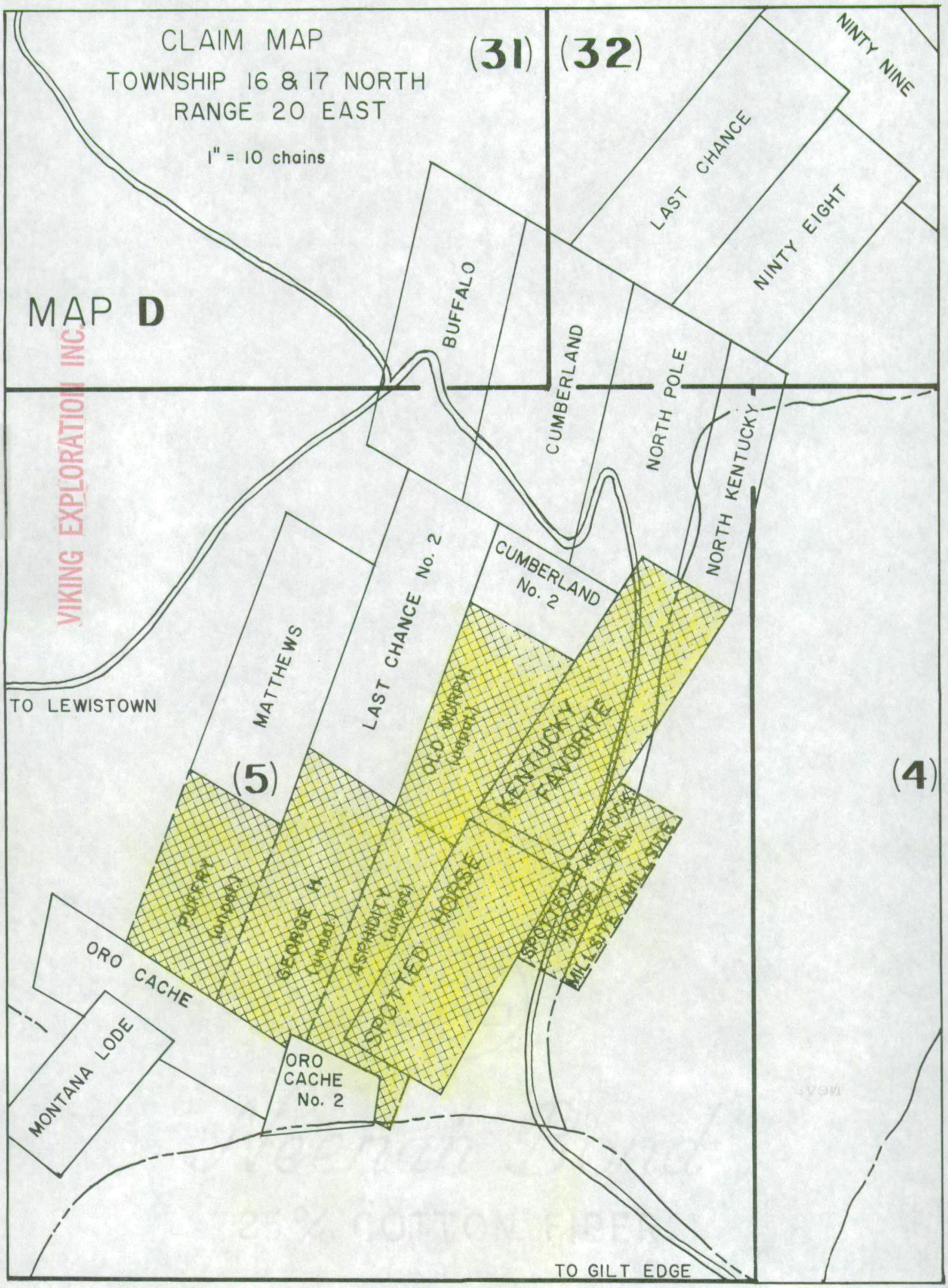
MINE X-SECTION

VIKING EXPLORATION INC.


2000 E (offset)
VIKING EXPLORATION INC.
EAST DIKE (Syenite porphyry)
EAST DIKE
GLORY HOLE VEIN
(Offset 90 ft. east)
2000 E
Main shaft
BONANZA PIPE
SOUTH CUT
SMITH CUT
DISCOVERY VEIN
MUD STOPE
MUD
GOLD HILL
(Rhyolite porphyry)
COMPOSITE EAST-WEST CROSS-SECTION
0
40
80
1" = 80'
LIME CRACK VEIN
100 (1)
165 (2)
215 (3)
275 (4)
325 (5)
365 (6)
450 (7)
535 (8)
585

CLAIM MAP

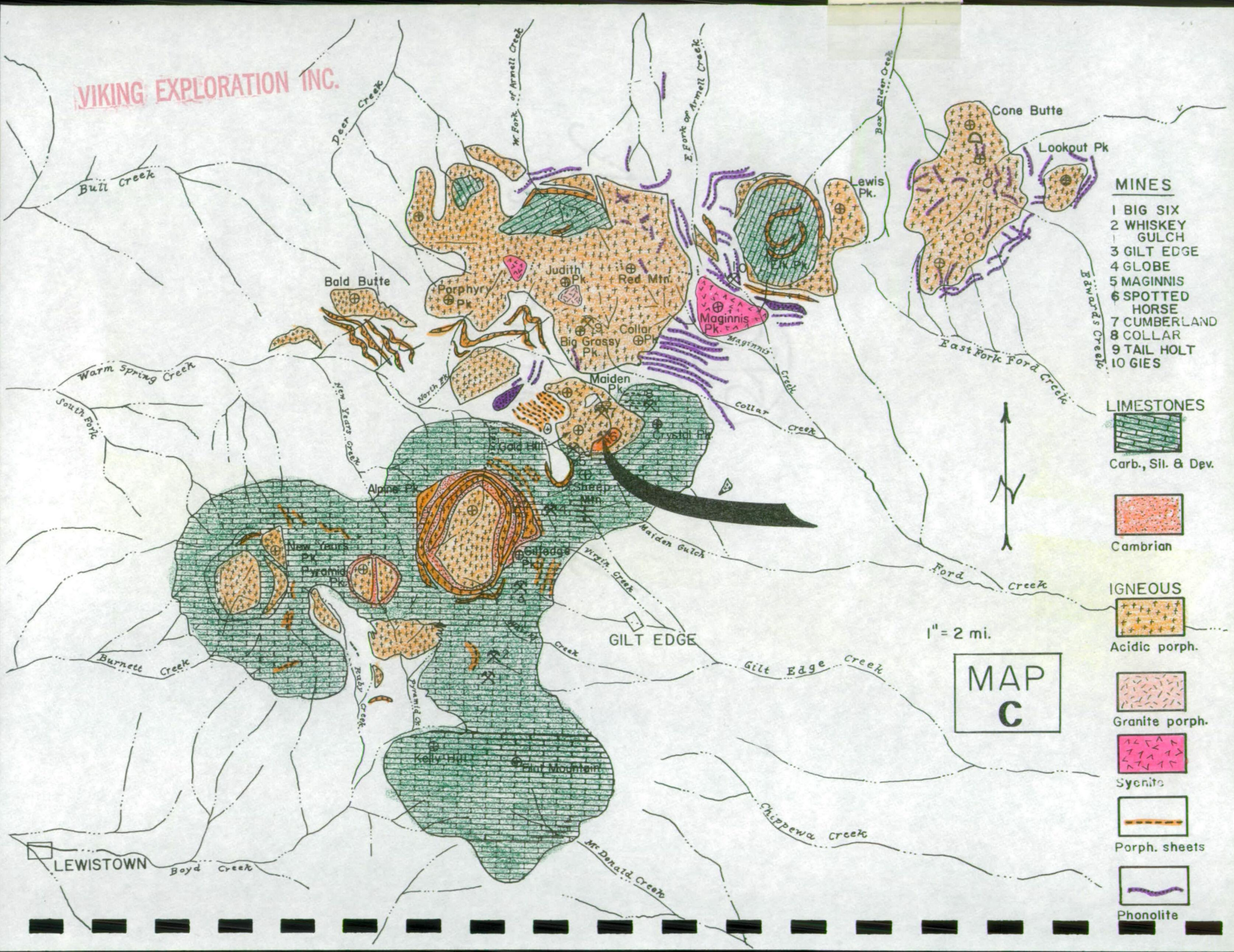
VIKING EXPLORATION INC.


CLAIM MAP
TOWNSHIP 16 & 17 NORTH
RANGE 20 EAST
1" = 10 chains
(31)
(32)
MAP D
VIKING EXPLORATION INC.
NINTY NINE
LAST CHANCE
NINTY EIGHT
BUFFALO
CUMBERLAND
NORTH POLE
NORTH KENTUCKY
CUMBERLAND No. 2
LAST CHANCE No. 2
MATTHEWS
TO LEWISTOWN
(5)
(4)
O.O. MURPHY (Lapsed)
KENTUCKY FAVORITE
DUFFY (Lapsed)
GEORGE H. (Lapsed)
ASPHODITY (Lapsed)
SPOTTED HORSE
SPOTTED HORSE FRACTION
MILLSITE (MILLSITE)
ORO CACHE
MONTANA LODE
ORO CACHE No. 2
TO GILT EDGE

GEOLOGIC MAP

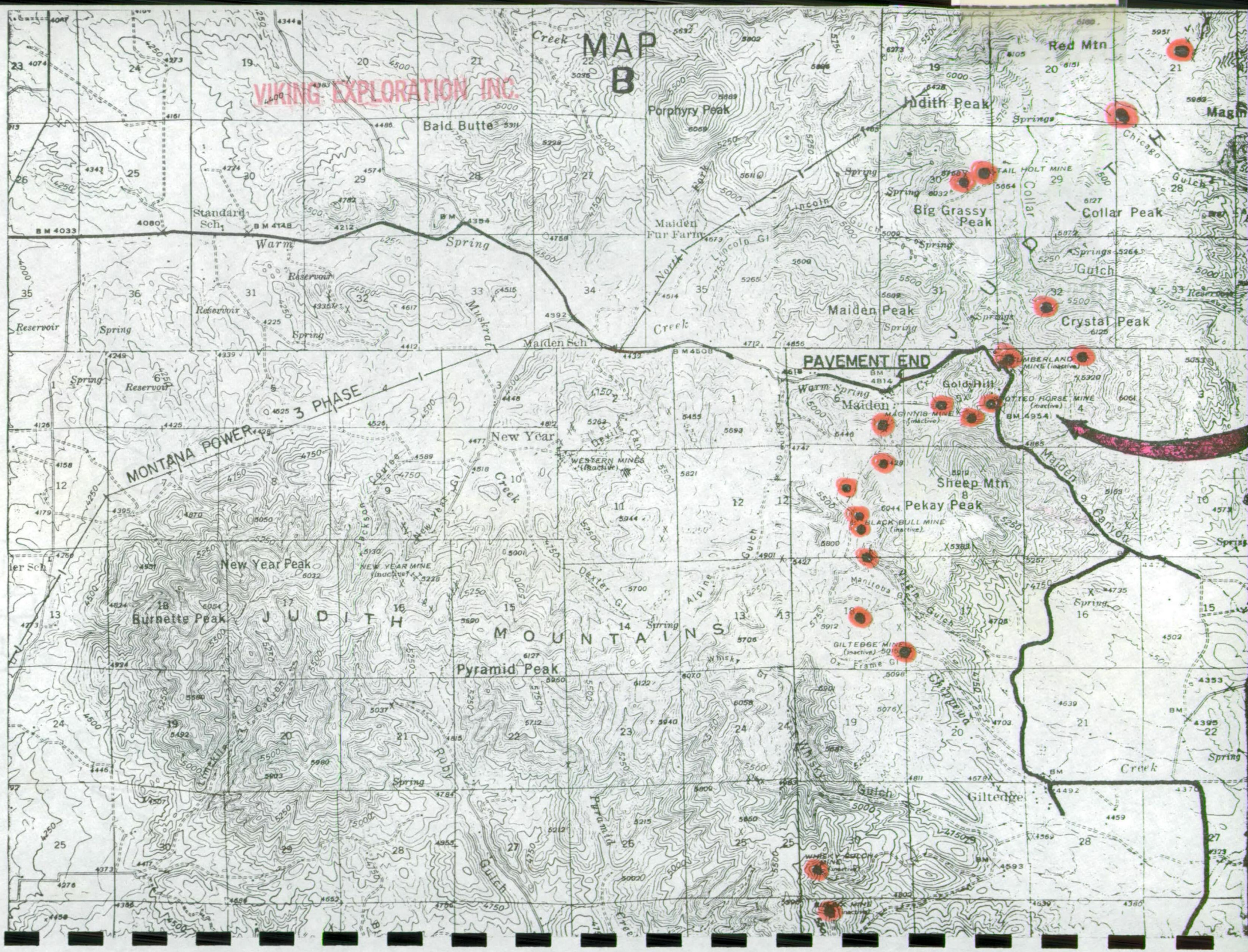
VIKING EXPLORATION INC.

VIKING EXPLORATION INC.



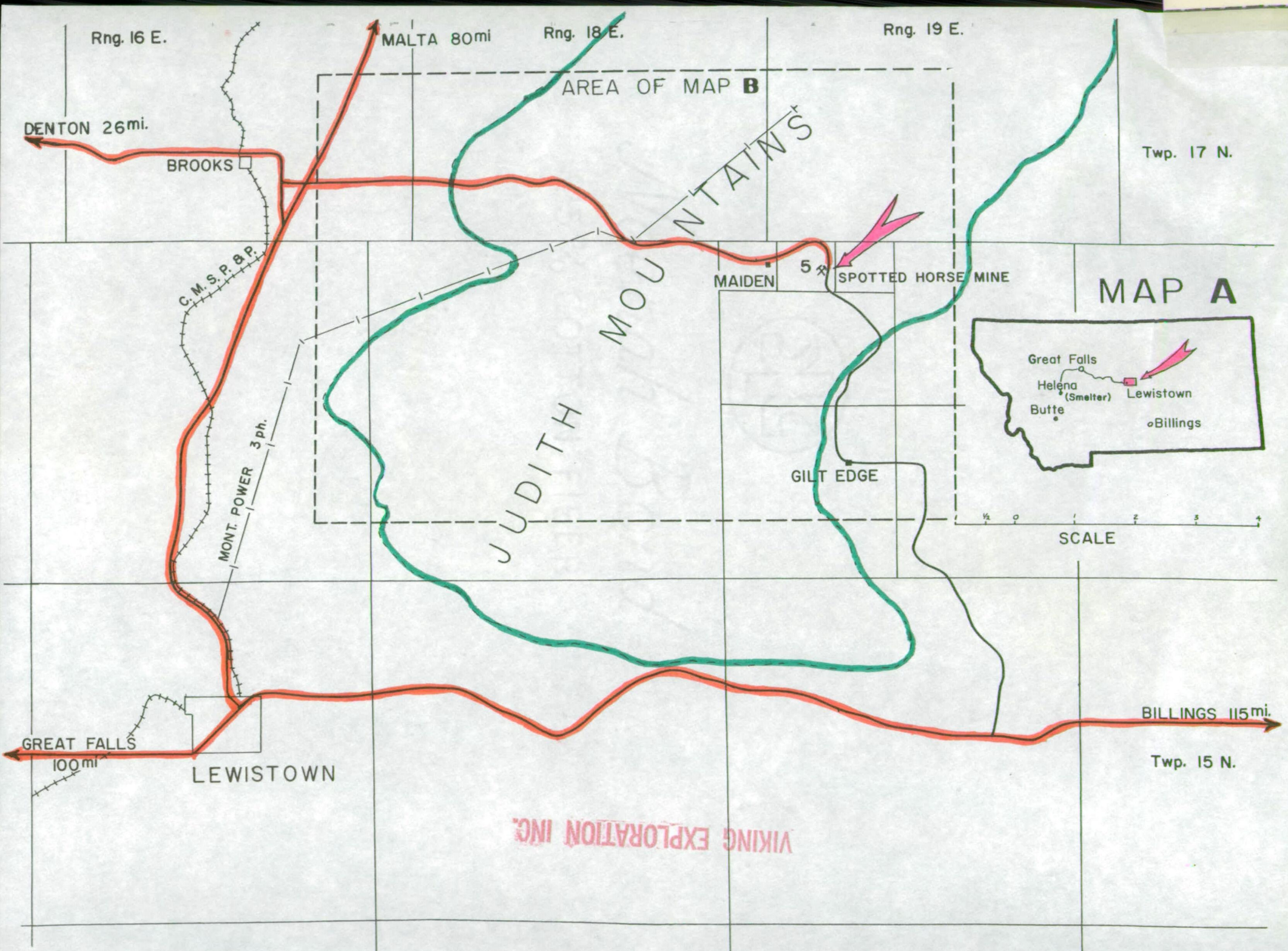
TOPOGRAPHIC MAP

VIKING EXPLORATION INC.


MAP B
VIKING EXPLORATION INC.
Porphyry Peak
Bald Butte
Judith Peak
Red Mtn
Big Grassy Peak
Collar Peak
Crystal Peak
Maiden Peak
Maiden Fur Farm
Standard Sch
Warm Spring
Reservoir
Muskrat Creek
Maiden Sch
PAVEMENT END
Gold Hill
Maiden
New Year
WESTERN MINES (inactive)
Sheep Mtn
Pekay Peak
BLACK BULL MINE (inactive)
Manitoba
GILTEDGE MINE (inactive)
Giltedge
New Year Peak
NEW YEAR MINE (inactive)
Burnette Peak
JUDITH MOUNTAINS
Pyramid Peak
Ruby Gulch
Maiden Canyon
Chicago Gulch
Collar Gulch
MONTANA POWER 3 PHASE
BM 4033
BM 4748
BM 4354
BM 4508
BM 4954
BM 4814
BM 4593

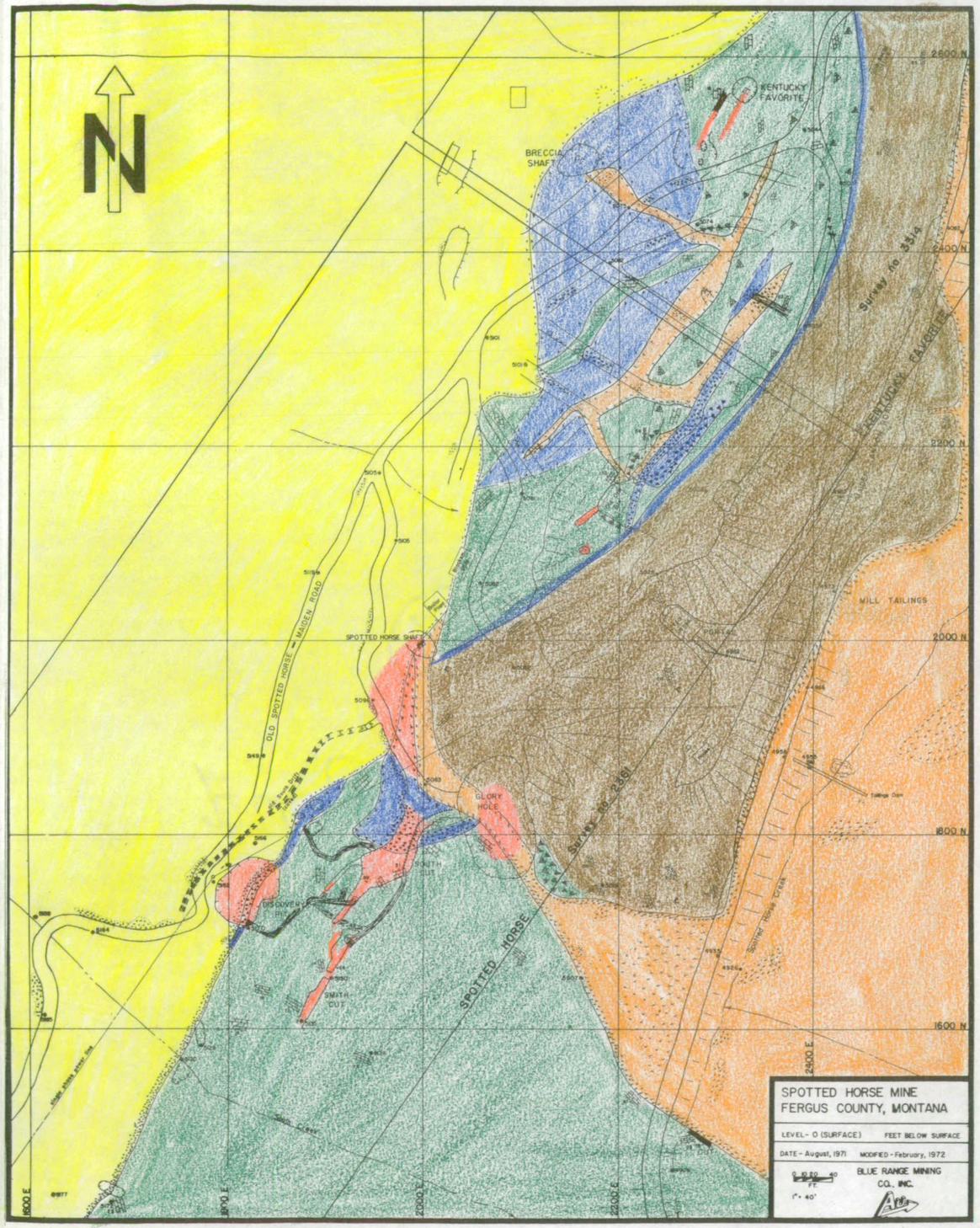
LOCATION MAP

VIKING EXPLORATION INC.



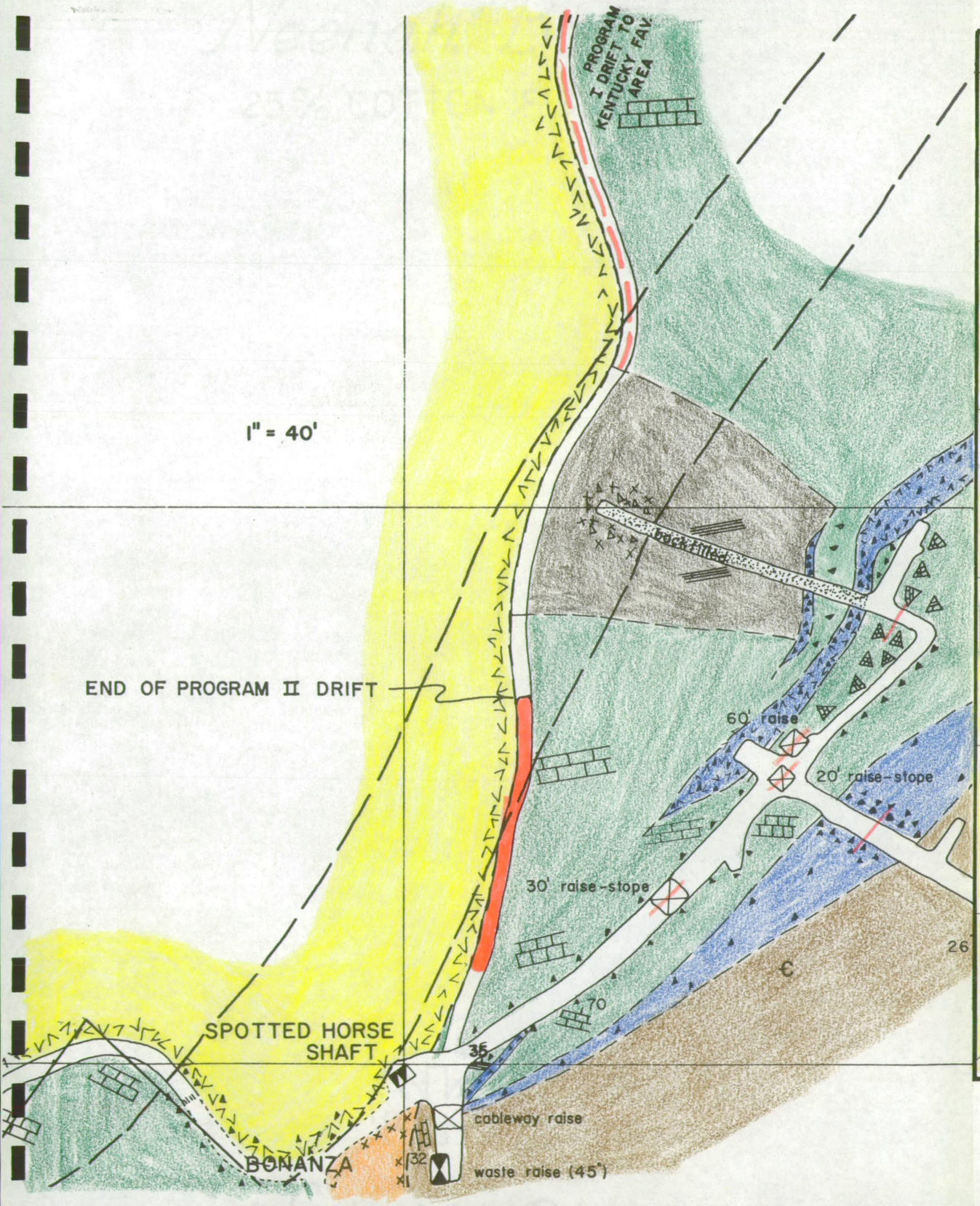
VIKING EXPLORATION INC.

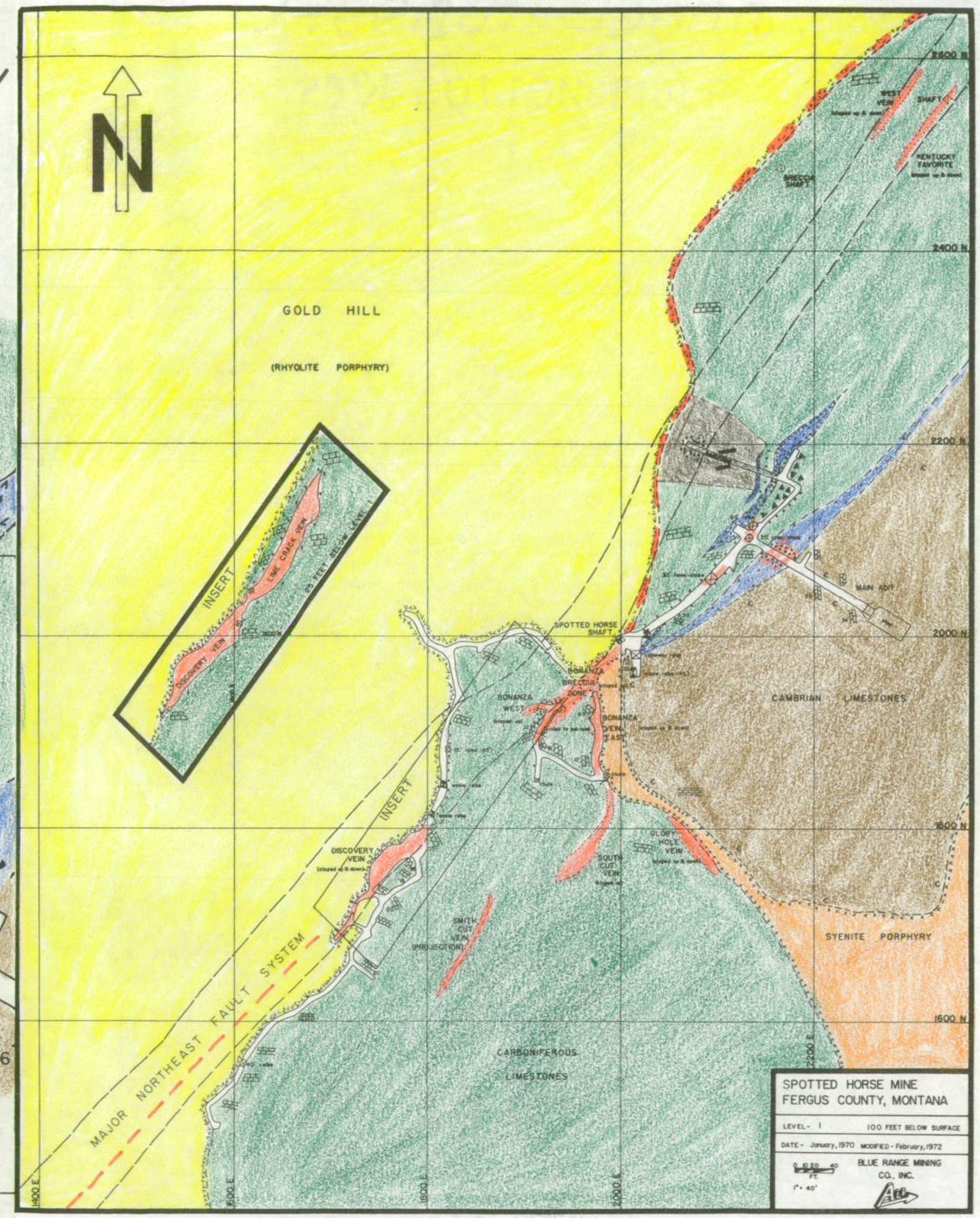
The true relationship of the various levels, workings and structures is much more clear when viewed three-dimensionally. A mine model has been constructed and may be viewed at the offices of Viking Exploration, 820 Denver Center Building, Denver, Colorado. High grade ore specimens are also available for inspection.



Neenah Bond
25% COTTON FIBER

VIKING EXPLORATION INC.


1" = 40'
PROGRAM I DRIFT TO KENTUCKY FAV AREA
END OF PROGRAM II DRIFT
backfill
60' raise
20' raise-stope
30' raise-stope
26
70
35
SPOTTED HORSE SHAFT
cableway raise
BONANZA
32
waste raise (45°)


N
GOLD HILL
(RHYOLITE PORPHYRY)
INSERT
LIME CRACK VEIN
DISCOVERY VEIN
125 FEET BELOW LEVEL
2600 N
2400 N
2200 N
2000 N
1800 N
1600 N
WEST VEIN
SHAFT
KENTUCKY FAVORITE
BRECCIA SHAFT
MAIN ADIT
SPOTTED HORSE SHAFT
BONANZA BRECCIA ZONE
BONANZA WEST
BONANZA VEIN EAST
CAMBRIAN LIMESTONES
GLORY HOLE VEIN
SOUTH CUT VEIN
DISCOVERY VEIN
SMITH CUT VEIN (PROJECTION)
SYENITE PORPHYRY
MAJOR NORTHEAST FAULT SYSTEM
CARBONIFEROUS LIMESTONES
1400 E
1600 E
1800 E
2000 E
2200 E
SPOTTED HORSE MINE
FERGUS COUNTY, MONTANA
LEVEL - I
100 FEET BELOW SURFACE
DATE - January, 1970 MODIFIED - February, 1972
BLUE RANGE MINING CO., INC.

VIKING EXPLORATION INC.

PROGRAM II DRIFT

SPOTTED HORSE SHAFT

pump station

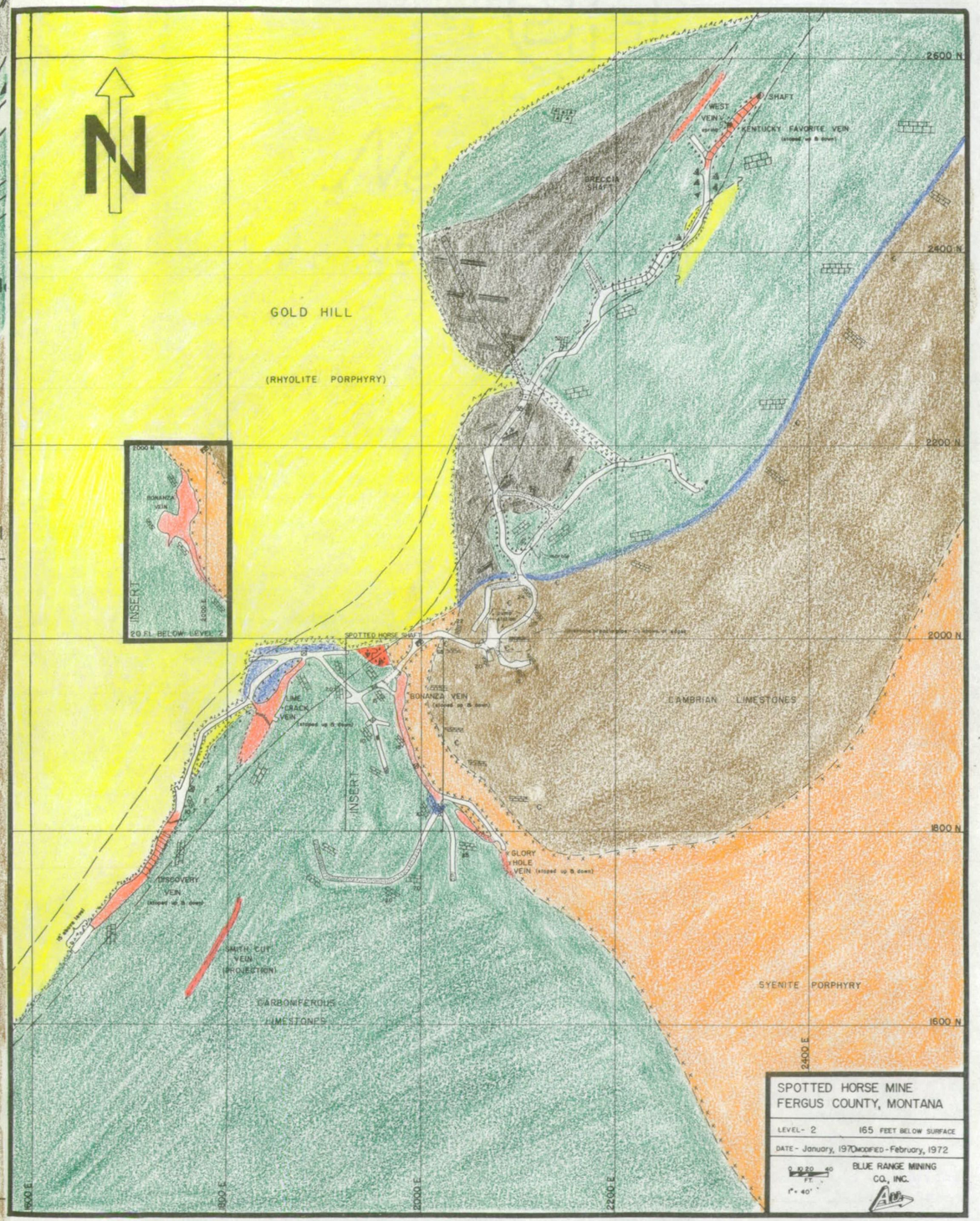
LIME CRACK VEIN (stoped up & down)

BONANZA VEIN (stoped up & down)

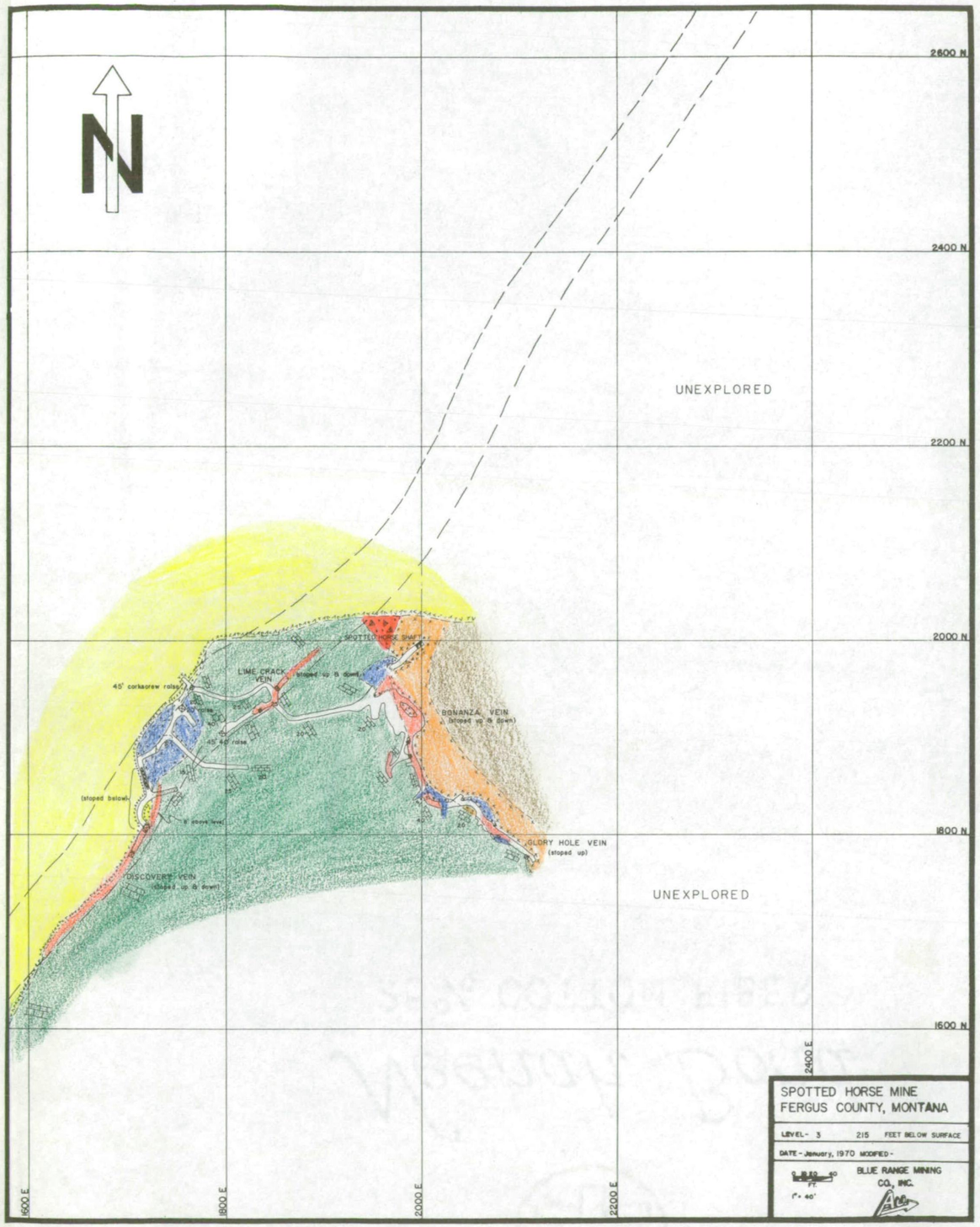
1" = 40'

INSERT

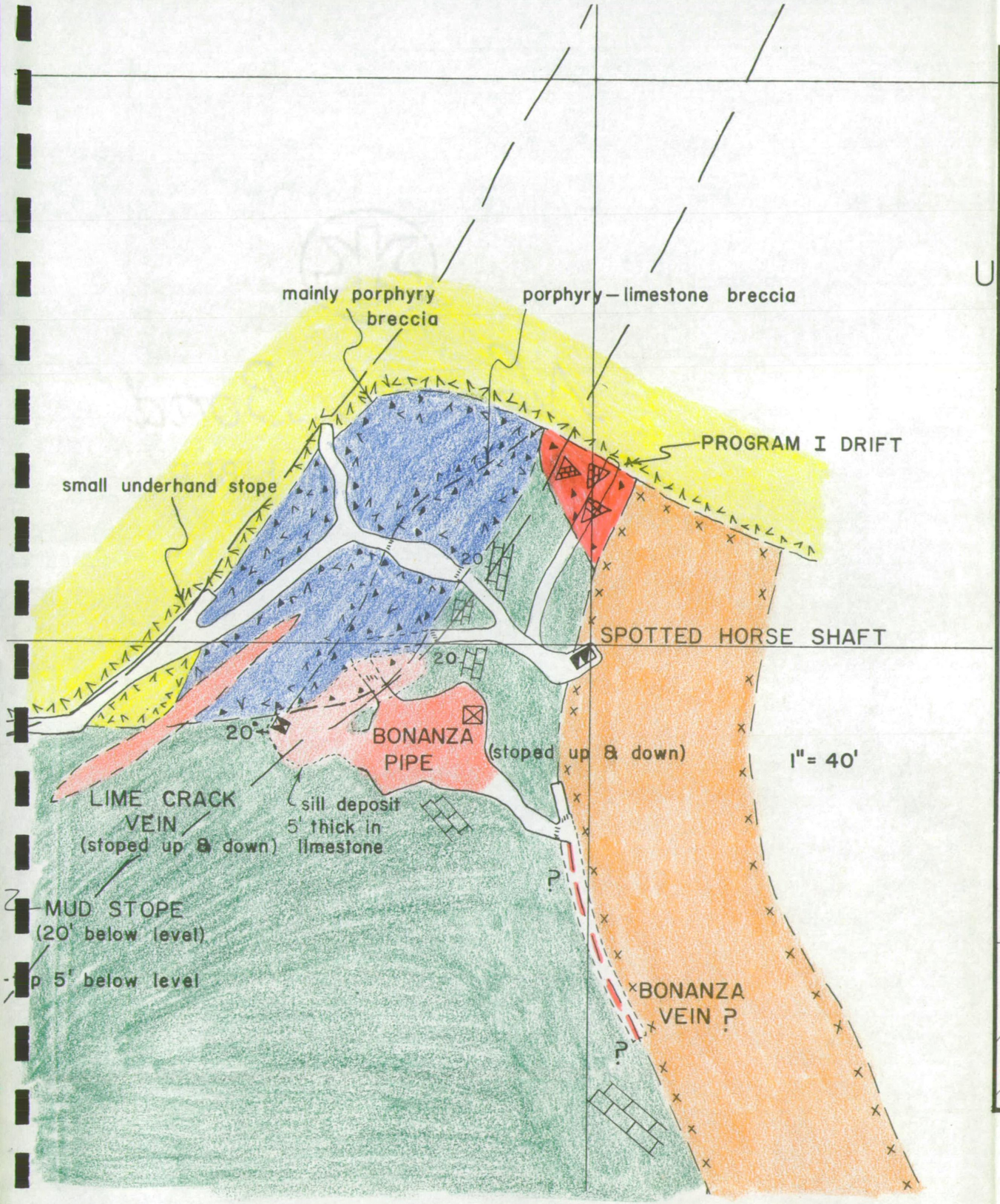
GLORY HOLE

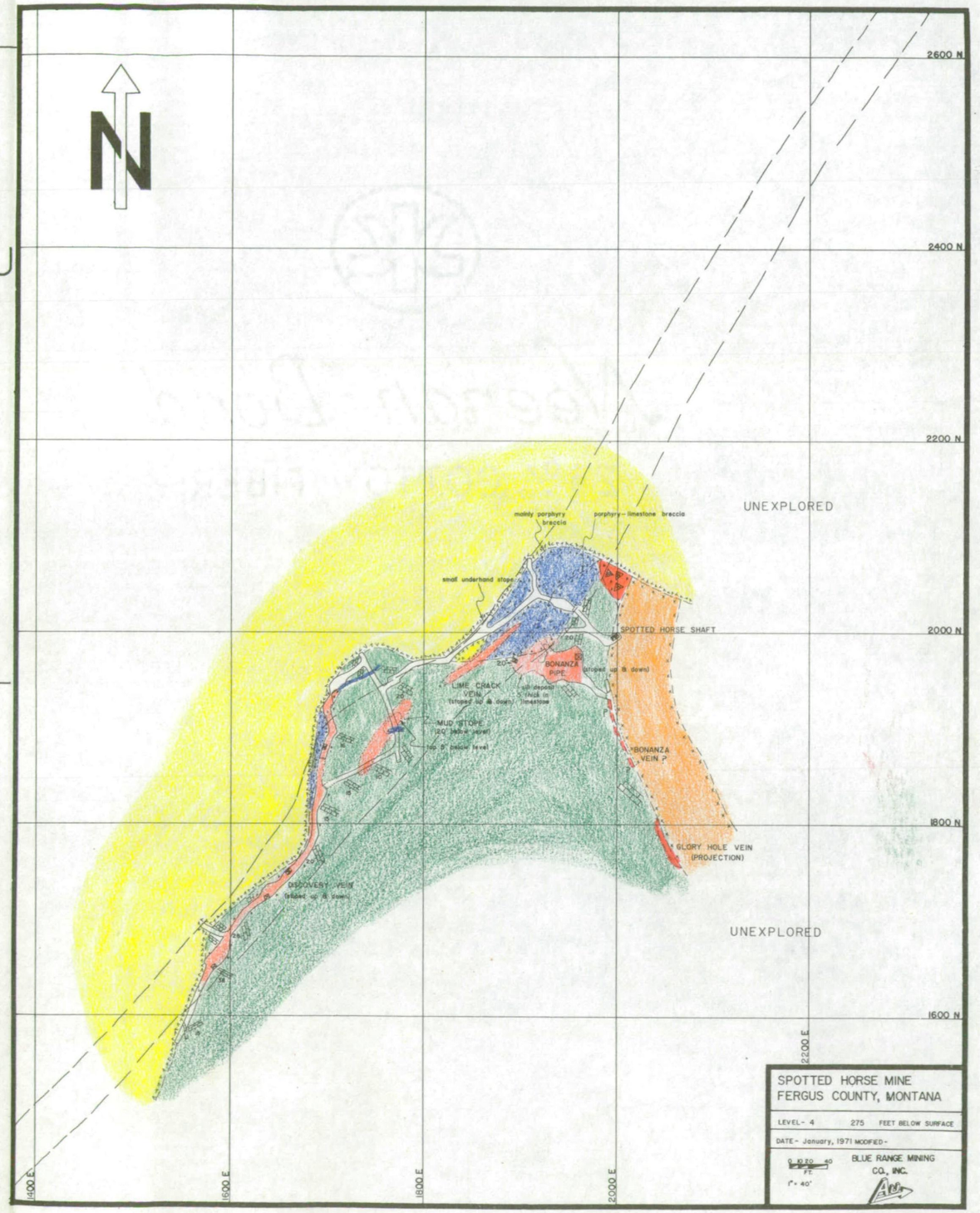


VIKING EXPLORATION INC.


N
2600 N
2400 N
2200 N
2000 N
1800 N
1600 N
1600 E
1800 E
2000 E
2200 E
2400 E
UNEXPLORED
UNEXPLORED
SPOTTED HORSE SHAFT
LIME CRACK VEIN
(stoped up & down)
45° corkscrew raise
BONANZA VEIN
(stoped up & down)
45° 40' raise
(stoped below)
GLORY HOLE VEIN
(stoped up)
DISCOVERY VEIN
(stoped up & down)
SPOTTED HORSE MINE
FERGUS COUNTY, MONTANA
LEVEL- 3
215 FEET BELOW SURFACE
DATE - January, 1970 MODIFIED -
1" = 40'
BLUE RANGE MINING CO., INC.

VIKING EXPLORATION INC.

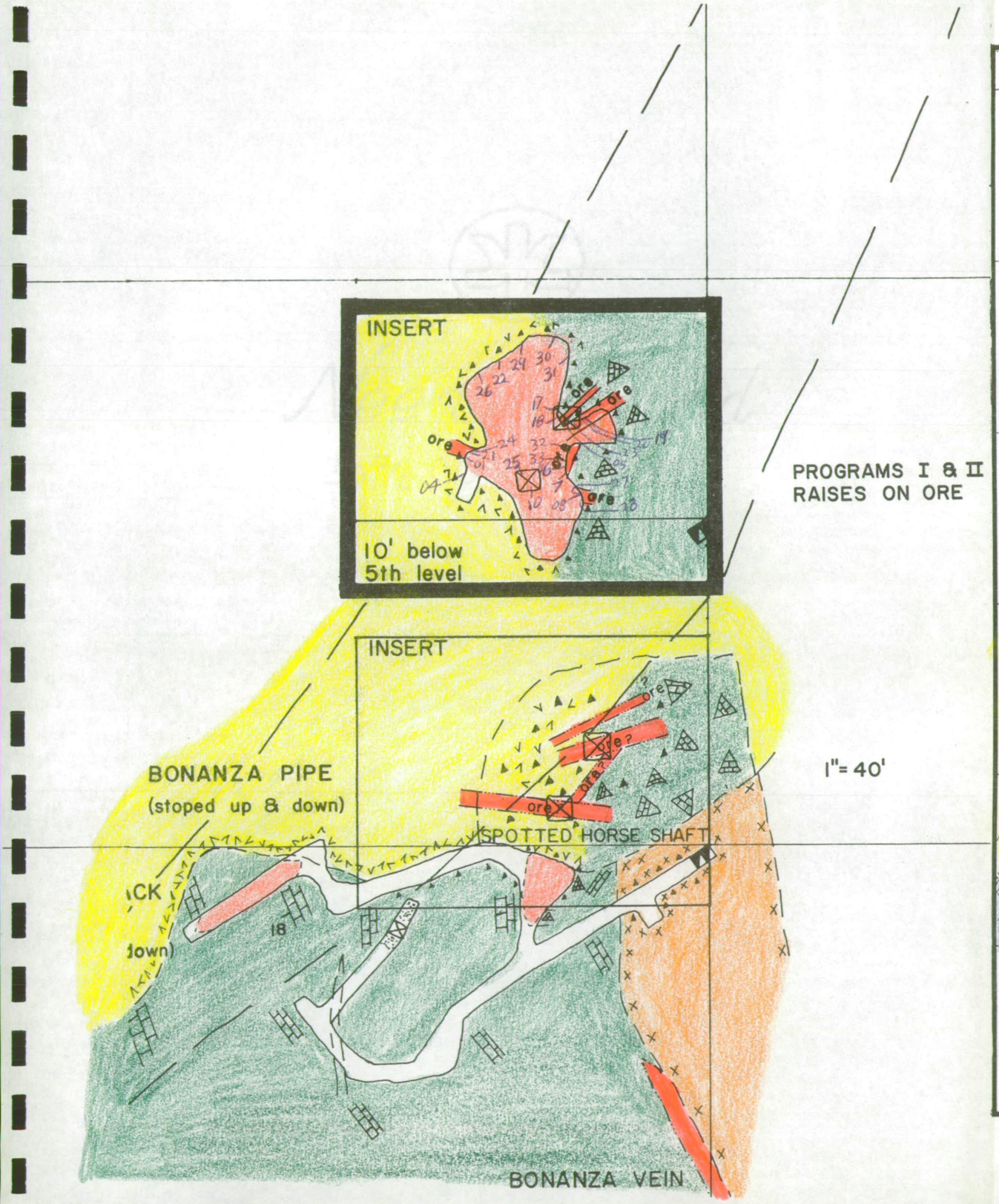

mainly porphyry breccia
porphyry—limestone breccia
PROGRAM I DRIFT
small underhand stope
20
20
20
SPOTTED HORSE SHAFT
BONANZA PIPE
(stoped up & down)
1"= 40'
LIME CRACK VEIN
(stoped up & down)
sill deposit 5' thick in limestone
MUD STOPE
(20' below level)
p 5' below level
?
?
BONANZA VEIN ?

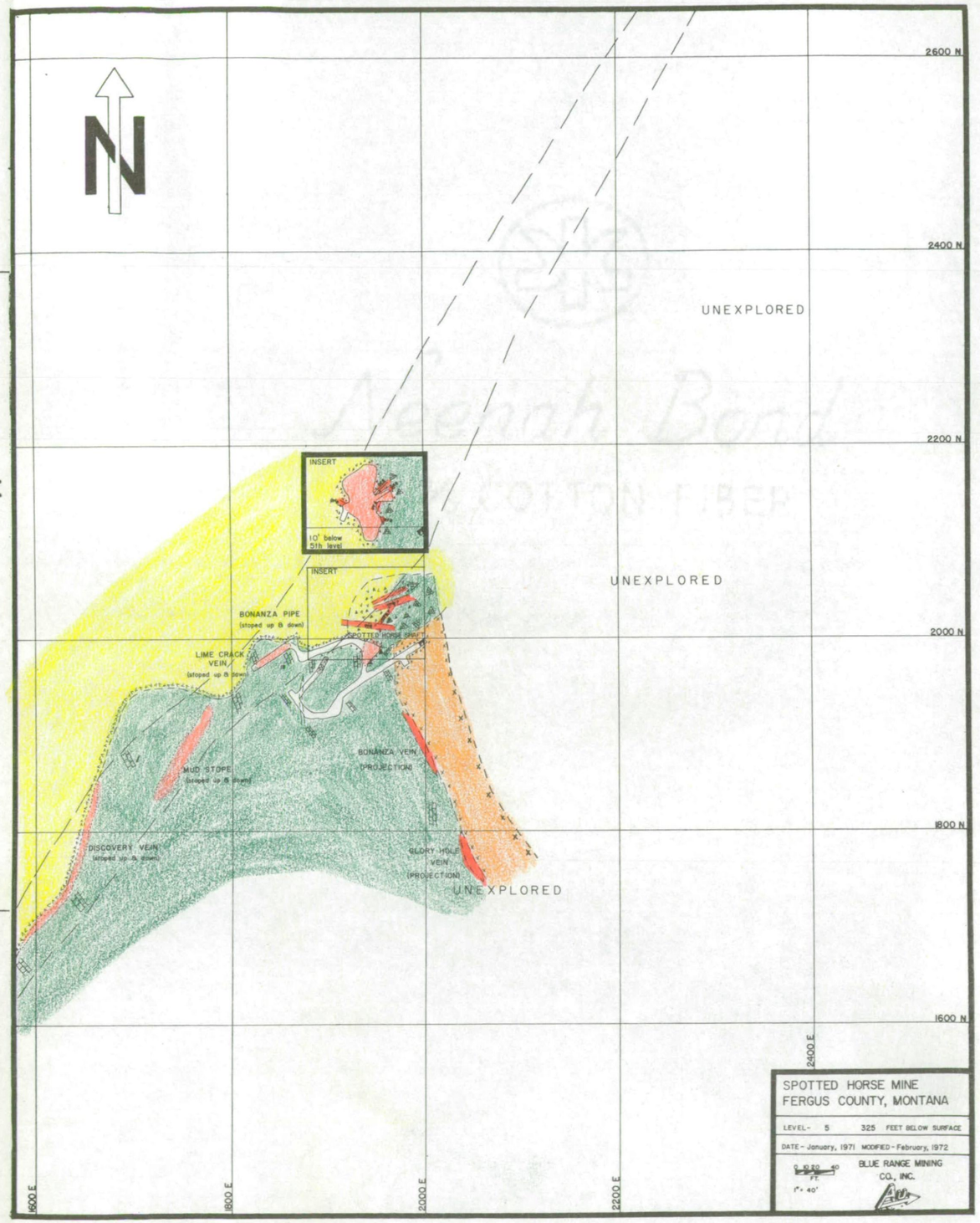

N
2600 N
2400 N
2200 N
2000 N
1800 N
1600 N
1400 E
1600 E
1800 E
2000 E
2200 E
UNEXPLORED
mainly porphyry breccia
porphyry—limestone breccia
small underhand stope
SPOTTED HORSE SHAFT
BONANZA PIPE
(stoped up & down)
LIME CRACK VEIN
(stoped up & down)
sill deposit 5' thick in limestone
MUD STOPE
(20' below level)
up 5' below level
BONANZA VEIN ?
GLORY HOLE VEIN
(PROJECTION)
DISCOVERY VEIN
(stoped up & down)
UNEXPLORED
SPOTTED HORSE MINE
FERGUS COUNTY, MONTANA
LEVEL- 4
275 FEET BELOW SURFACE
DATE- January, 1971 MODIFIED-
0 10 20 40
FT
1"= 40'
BLUE RANGE MINING CO., INC.

Neenah Bond

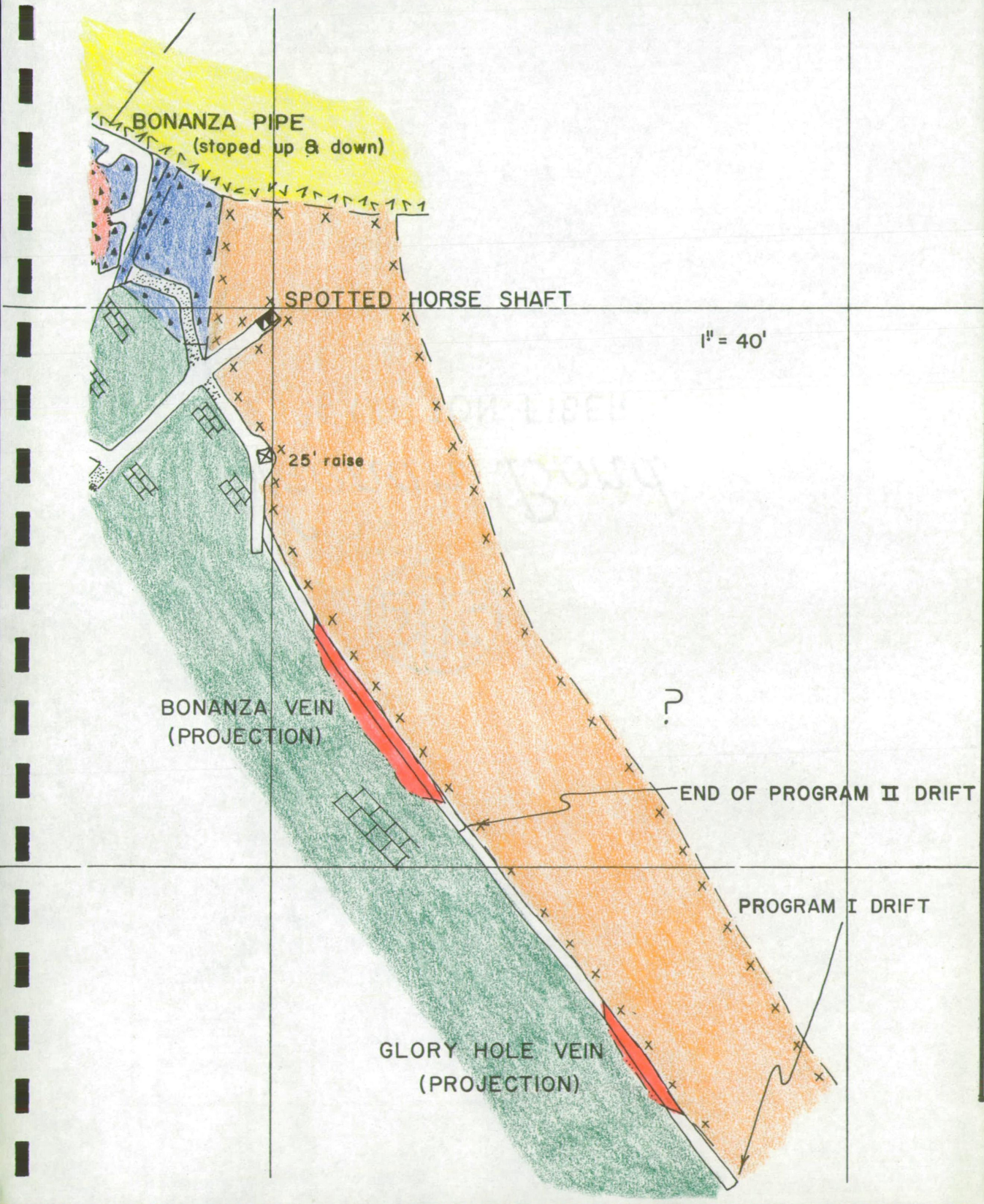
25% COTTON FIBER

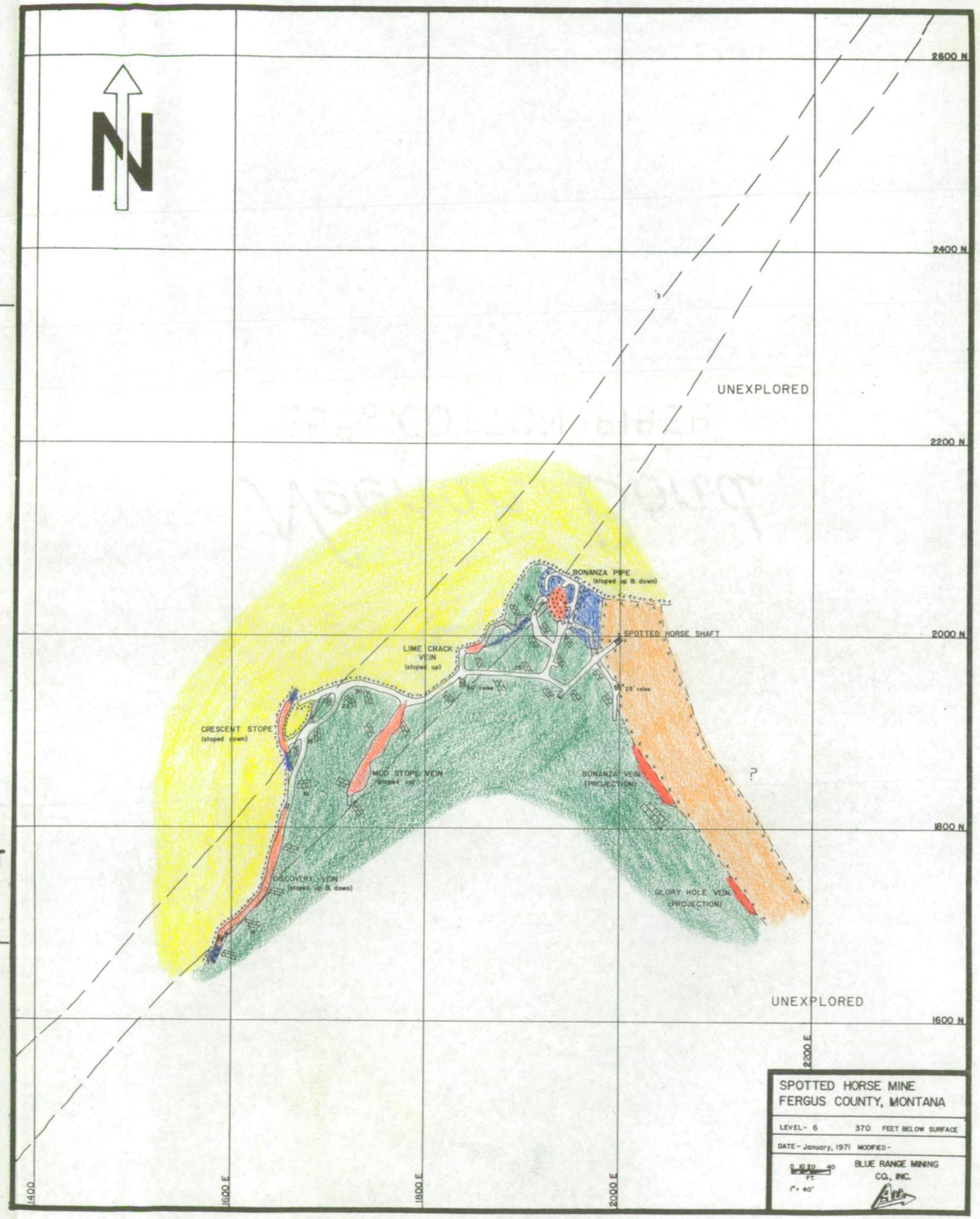
VIKING EXPLORATION INC.


INSERT
10' below
5th level
INSERT
BONANZA PIPE
(stoped up & down)
SPOTTED HORSE SHAFT
BONANZA VEIN
ore
PROGRAMS I & II
RAISES ON ORE
1"= 40'

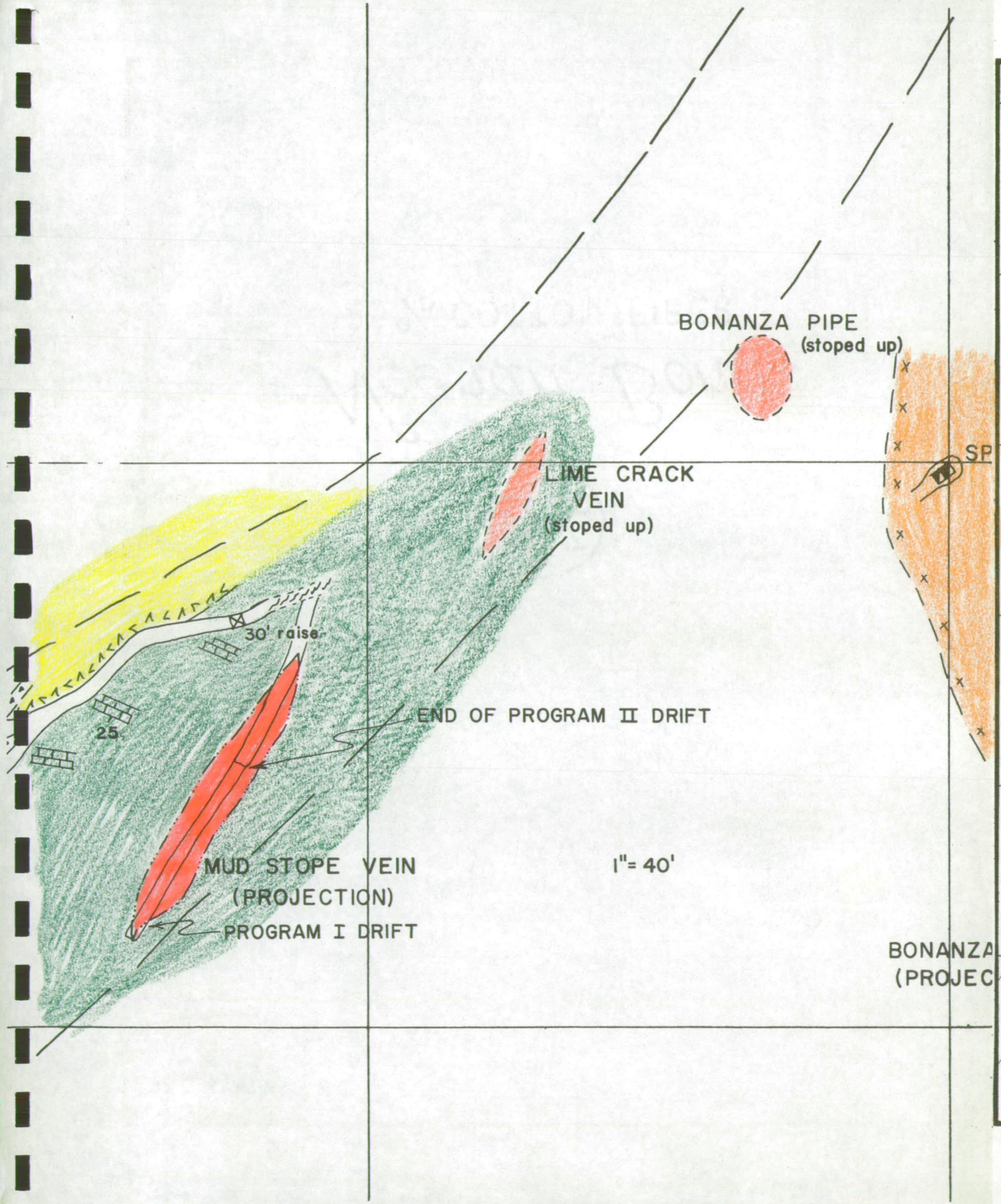

N
2600 N
2400 N
2200 N
2000 N
1800 N
1600 N
1600 E
1800 E
2000 E
2200 E
2400 E
UNEXPLORED
UNEXPLORED
UNEXPLORED
INSERT
10' below
5th level
INSERT
BONANZA PIPE
(stoped up & down)
SPOTTED HORSE SHAFT
LIME CRACK
VEIN
(stoped up & down)
MUD STOPE
(stoped up & down)
BONANZA VEIN
(PROJECTION)
DISCOVERY VEIN
(stoped up & down)
GLORY HOLE
VEIN
(PROJECTION)
SPOTTED HORSE MINE
FERGUS COUNTY, MONTANA
LEVEL- 5 325 FEET BELOW SURFACE
DATE- January, 1971 MODIFIED - February, 1972
1"= 40'
BLUE RANGE MINING
CO., INC.

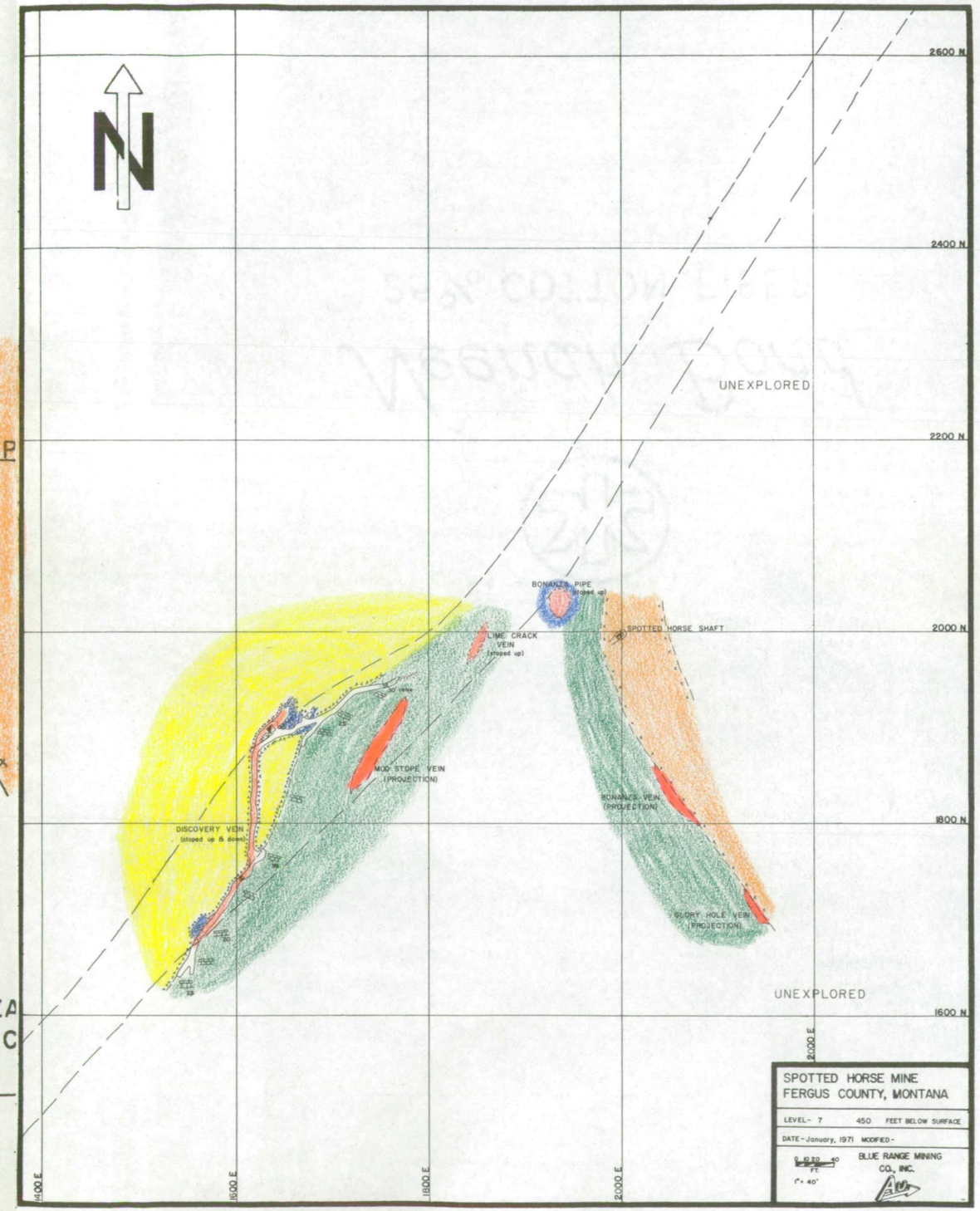
VIKING EXPLORATION INC.


BONANZA PIPE
(stoped up & down)
SPOTTED HORSE SHAFT
1" = 40'
25' raise
BONANZA VEIN
(PROJECTION)
?
END OF PROGRAM II DRIFT
PROGRAM I DRIFT
GLORY HOLE VEIN
(PROJECTION)


N
2600 N
2400 N
2200 N
2000 N
1800 N
1600 N
1400
1600 E
1800 E
2000 E
2200 E
UNEXPLORED
UNEXPLORED
BONANZA PIPE
(stoped up & down)
SPOTTED HORSE SHAFT
LIME CRACK VEIN
(stoped up)
CRESCENT STOPE
(stoped down)
MUD STOPE VEIN
(stoped up)
BONANZA VEIN
(PROJECTION)
?
DISCOVERY VEIN
(stoped up & down)
GLORY HOLE VEIN
(PROJECTION)
SPOTTED HORSE MINE
FERGUS COUNTY, MONTANA
LEVEL- 6
370 FEET BELOW SURFACE
DATE - January, 1971 MODIFIED -
0 10 20 40
FT
1" = 40'
BLUE RANGE MINING
CO., INC.

VIKING EXPLORATION INC.


BONANZA PIPE
(stoped up)
LIME CRACK
VEIN
(stoped up)
SP
30' raise
END OF PROGRAM II DRIFT
25
MUD STOPE VEIN
(PROJECTION)
PROGRAM I DRIFT
1" = 40'
BONANZA
(PROJEC


N
2600 N
2400 N
2200 N
2000 N
1800 N
1600 N
1400 E
1600 E
1800 E
2000 E
2100 E
UNEXPLORED
BONANZA PIPE
(stoped up)
SPOTTED HORSE SHAFT
LIME CRACK
VEIN
(stoped up)
30' raise
MUD STOPE VEIN
(PROJECTION)
BONANZA VEIN
(PROJECTION)
DISCOVERY VEIN
(stoped up & down)
GLORY HOLE VEIN
(PROJECTION)
UNEXPLORED
SPOTTED HORSE MINE
FERGUS COUNTY, MONTANA
LEVEL - 7 450 FEET BELOW SURFACE
DATE - January, 1971 MODIFIED -
0 10 20 40
FT
1" = 40'
BLUE RANGE MINING
CO., INC.

VIKING EXPLORATION INC.