Surname copy

Murphy

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

JUN 28 1956

Vulcan Silver-Lead Corporation
100 Park Avenue
New York 17, New York

Re: Docket No. DMEA-4203 (Uranium)
Willow Creek Group
Gunnison and Saguache Counties,
Colorado

Gentlemen:

Reference is made to your application for Government aid in an exploration project on the above-named group of claims.

Projects approved by the Defense Minerals Exploration Administration must, in its judgment, show definite promise of yielding materials of acceptable grade in quantities that will significantly improve the mineral supply position for the National Defense Program.

Careful study of all our information indicates to us that the probability of disclosing significant ore reserves on your property is not sufficiently promising to justify Government participation in an exploration program. We regret to advise you that, under these circumstances, your application for exploration assistance is denied. However, this denial is made without prejudice to the property. If future work on your property, or adjacent land, reveals evidence which could materially alter this opinion, we shall be pleased to consider a new application.

Sincerely yours,

G. O. Mittendorf

Administrator

FMMurphy/ai
6-26-56
cc to: Admr.'s Reading File
Operating Committee
Docket
Messrs. JECrawford, R. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA
Code 700
Mr. Murphy
DMEA Field Team, Region III (2)

700
Docket copy
Surname

Summary of Proposed Project

June 19, 1956

Object: Denial of application for exploration aid.

Docket No.: DMEA-4203

Commodity: Uranium

Applicant: Vulcan Silver-Lead Corporation
100 Park Avenue
New York 17, New York

Property: The Willow Creek group consists of 149 claims (31 of which were not included in the application). The group is a combination of the Star, Beta, Elkhorn, Blizzard, Victor and Afterthought groups, as well as the Major and Carta Blanca claims.

The Willow Creek group is situated in secs. 2, 3, 4, 5, and 6, T. 46 N., R. 1 W., and secs. 31, 32, 33, 34, and 35, T. 47 N., R. 1 W., N.M.P.M., Gunnison and Saquache Counties, Colorado

Date of Application: Received March 5, 1956

Referred to Field Team: March 20, 1956

Field Examination made: May 8, 1956

Field Team Report received: June 7, 1956

Amount of Application: $112,425.39

Work Proposed: Diamond drilling to be done in two phases. The 1st phase to consist of six holes, totaling 3,000 feet, and if successful, to be followed by drilling a total of approximately 10,000 feet of additional holes.

Estimate Costs:

| | Phase 1 | Phase 2 |
|---|---|---|
| Drilling, casing, surveying | $20,278.10 | $67,593.75 |
| Supervision | 2,721.88 | 8,084.75 |
| Supplies | 440.00 | 1,505.00 |
| Operating equipment, (rental-depreciation) | 405.03 | 1,150.10 |
| Miscellaneous (includes assaying) | 1,152.19 | 3,741.00 |
| Contingencies | 1,249.86 | 4,103.73 |
| Total Each Phase | $26,247.06 | $86,178.33 |

Total Estimated Cost of Project .....$112,425.39
Government Participation @ 75% .....$ 84,319.04

Excerpts from Field Team report:

Rock units exposed at the Willow Creek group include Precambrian granite, Jurassic Morrison formation, Cretaceous Dakota formation, and Tertiary volcanics. The Morrison consists of the Saltwash member and the overlying Brushy Basin member, estimated to be 40 and 210 feet in thickness, respectively.

The applicant proposed to drill three 450 foot holes to test the purported intersection of the Beta and Willow faults. The field examiners although noting high counts over five rather broad areas (1 to several 1000 feet long and several hundred to a 1000 feet wide) found that the actual fault section showed lower radioactivity. Two samples taken from trenches in the high anomaly areas assayed only .0.32 and .0.79% $U_3O_8$.

The examiners recommend the application be denied without prejudice because:

(1) No uranium mineralization was shown in the Saltwash in the vicinity of the Beta claims.
(2) No uranium minerals can be seen in the Brushy Basin member.
(3) The locations of the faults are not well known.
(4) Geologic evidence is insufficient to justify a program which is more in the nature of prospecting than exploration.

Note: The field examiners investigated the property by plane as well as on the ground. Because of the heavy overburden, presumably the examiners could not precisely define the faults even from the air.

Commodity Members' Comments:

U. S. Geological Survey, N. E. Nelson, June 12, 1956

Mr. Nelson reviewed the field examiners' data, and concludes that inasmuch as adequate exploration targets are not known he concurs in the recommendation to deny the application.

U. S. Bureau of Mines, James Paone, June 21, 1956.

Mr. Paone agrees with the conclusions of the field examiners and concurs in the Field Team's recommendation to deny the application without prejudice.

Rare and Miscellaneous Metals Division, F. M. Murphy, June 25, 1956

According to the field examiners' report although areas of high radioactivity anomalies were noted, specific evidence that the faults controlled the occurrence of uranium was lacking. Moreover, the locations of the faults could not be exactly determined which would make the proposed first phase work of test drilling for intersections of the inferred faults more in the nature of prospecting than exploration.

Conclusion and Recommendation

In view of the lack of a definite target area to explore, this Division concurs in the Field Team's recommendation to deny the subject application.

Ernest Wm. Ellis

Ernest Wm. Ellis, Chief
Rare and Miscellaneous
Metals Division

6/22/56
ai

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

June 21, 1956

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee

From: James Paone, Bureau of Mines Alternate Member
Uranium Commodity Committee

Subject: Report of Examination, DMEA Docket 4203 (Uranium)
Vulcan Silver-Lead Corporation, (Willow Creek Group),
Gunnison and Saguache Counties, Colorado

I have reviewed the report of examination, DMEA Docket 4203 Vulcan Silver-Lead Corporation (Willow Creek Group) Gunnison and Saguache Counties, Colorado, dated June 1 and received in this office June 12, 1956. I have also discussed it with Joseph O. Hosted, Washington representative of the Atomic Energy Commission.

The field examiners recommend that the application for exploration assistance be denied without prejudice, because uranium mineralization is not known to exist in the Salt Wash in the subject area and the proposed program is more of a prospecting than an exploration venture.

We concur in the recommendation that the application for exploration assistance be denied without prejudice.

The report is being forwarded to the Chief, Division of Minerals, in accordance with the routing slip attached thereto.

James Paone
James Paone

RECEIVED
JUN 22 1956

June 21, 1956

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee

From: James Paone, Bureau of Mines Alternate Member
Uranium Commodity Committee

Subject: Report of Examination, DMEA Docket 4203 (Uranium)
Vulcan Silver-Lead Corporation, (Willow Creek Group),
Gunnison and Saguache Counties, Colorado

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We concur in the recommendation that the application for exploration assistance be denied without prejudice.

The report is being forwarded to the Chief, Division of Minerals, in accordance with the routing slip attached thereto.

James Paone

RECEIVED
JUN 22 1956

June 21, 1956

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To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee

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Uranium Commodity Committee

Subject: Report of Examination, DMEA Docket 4203 (Uranium)
Vulcan Silver-Lead Corporation, (Willow Creek Group),
Gunnison and Saguache Counties, Colorado

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The field examiners recommend that the application for exploration assistance be denied without prejudice, because uranium mineralization is not known to exist in the Salt Wash in the subject area and the proposed program is more of a prospecting than an exploration venture.

We concur in the recommendation that the application for exploration assistance be denied without prejudice.

The report is being forwarded to the Chief, Division of Minerals, in accordance with the routing slip attached thereto.

James Paone

RECEIVED
JUN 22 1956

6-13-56

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

RECEIVED
JUN 12 1956

June 12, 1956

Re: DMEA 4203
Vulcan Silver-Lead Corp.
Willow Creek Gp.
Gunnison & Saguache Counties, Colo.
$112,425.39 - Uranium

Memorandum

To: E. W. Ellis, Defense Minerals Exploration Administration

From: N. E. Nelson, U. S. Geological Survey

Subject: Review of Field Team report.

The applicant requested assistance in exploring by drilling, the projected intersections of poorly defined faults with underlying beds of the Morrison formation, particularly the Brushy Basin and Salt Wash members.

The examiners found, by air and ground reconnaissance that the positions of the faults are not too well determined and drilling for their intersections with the so-called favorable beds would be an uncertain procedure. The Brushy Basin and Salt Wash beds while often the host rocks of uranium minerals are not known to be so mineralized in the project area.

Inasmuch as adequate targets are not known, the examiners recommend denial of the application without prejudice, a recommendation with which the Field Team concurs.

I also concur with the recommendation.

N. E. Nelson

N. E. Nelson

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

RECEIVED
JUN 12 1956

June 12, 1956

Re: DMEA 4203
Vulcan Silver-Lead Corp.
Willow Creek Gp.
Gunnison & Saguache Counties, Colo.
112,425.39 - Uranium

Memorandum

To: M. . Ellis, Defense Minerals Exploration Administration

From: N. . Nelson, U. . Geological Survey

Subject: Review of Field Team report.

The applicant requested assistance in exploring by drilling, the projected intersections of poorly defined faults with underlying beds of the Morrison formation, particularly the Brushy Basin and Salt Wash members.

The examiners found, by air and ground reconnaissance that the positions of the faults are not too well determined and drilling for their intersections with the so-called favorable beds would be an uncertain procedure. The Brushy Basin and Salt Wash beds while often the host rocks of uranium minerals are not known to be so mineralized in the project area.

Inasmuch as adequate targets are not known, the examiners recommend denial of the application without prejudice, a recommendation with which the Field Team concurs.

I also concur with the recommendation.

N. E. Nelson

N. . Nelson

NENelson:btr
G 6/12/56

cc: Director's reading file (4212)
Branch reading file (4212)
DMEA (3)
Chron. file
Docket file
J. . Crawford, 3641
J. . Hosted, 3210

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

RECEIVED
JUN 12 1956

June 12, 1956

Re: [illegible] 4212
Pelican Silver-Lead Corp.
Willow Creek Dp.
Gunnison & Saguache Counties, Colo.
-112,425.39 - Uranium

MEMORANDUM

To: [illegible] Ellis, Defense Minerals Exploration Administration

From: [illegible] Nelson, U. S. Geological Survey

Subject: Review of Field Team report.

The applicant requested assistance in exploring by drilling, the projected intersections of poorly defined faults with underlying beds of the Morrison Formation, particularly the Brushy Basin and Salt Wash members.

The examiners found, by air and ground reconnaissance that the positions of the faults are not too well determined and drilling for their intersections with the so-called favorable beds would be an uncertain procedure. The Brushy Basin and Salt Wash beds while often the host rocks of uranium minerals are not known to be so mineralized in the project area.

Inasmuch as adequate targets are not known, the examiners recommend denial of the application without prejudice, a recommendation with which the Field Team concurs.

I also concur with the recommendation.

N. E. Nelson

N. E. Nelson

NENelson:btr
C 6/12/56

cc: Director's reading file (4212)
Branch reading file (4212)
DMA (3)
Chron. file
Docket file
J. K. Crawford, 3641
J. C. Hosted, 3210

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

RECEIVED
JUN 12 1956

June 12, 1956

Re: [illegible] 4[illegible]
Nelson Silver and Gold
Willow Creek Gp.
Gunnison & Saguache Counties, Colo.
$112,425.39 - Uranium

Memorandum

To: [illegible] Willis, Defense Minerals Exploration Administration

From: [illegible] Nelson, U. S. Geological Survey

Subject: Review of field exam report.

The applicant requested assistance in exploring by drilling, the projected intersections of poorly defined faults with underlying beds of the Morrison formation, particularly the Brushy Basin and Salt Wash members.

The examiners found, by air and ground reconnaissance that the positions of the faults are not too well determined and drilling for their intersections with the so-called favorable beds would be an uncertain procedure. The Brushy Basin and Salt Wash beds which often host rocks of uranium minerals are not known to be so mineralized in the project area.

Inasmuch as adequate targets are not known, the examiners recommend denial of the application without prejudice, a recommendation with which the field exam concurs.

I also concur with the recommendation.

R. E. Nelson

R. E. Nelson

N:Nelson:btr
G 6/12/56

cc: Director's reading file (A212)
Branch reading file (A212)
[illegible] (3)
Chron. file
Pocket file
J. [illegible] Crawford, 3641
J. [illegible] Hostet, 3210

6-12-56

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

RECEIVED
JUN - 7 1956

June 5, 1956

224 New Customhouse
Denver 2, Colorado

Memorandum

To: Secretary to the Operating Committee, DMEA

From: Field Team, Region III

Subject: Joint Report of Examination, DMEA Docket 4203 (Uranium), Vulcan Silver-Lead Corporation, (Willow Creek group), Gunnison and Saguache Counties, Colorado

Enclosed are the original and three copies of a joint engineering and geologic report on the subject property.

The field examiners found no uranium mineralization had been shown in the Salt Wash in the vicinity of the Beta claims, and no uranium minerals could be seen in the Brushy Basin member. The locations of the faults are not well known and the evidence at this time is insufficient to justify a true exploration program. They recommend that the application be denied without prejudice. We concur in this recommendation.

DMEA Field Team, Region III

W. M. Traver

By W. M. Traver
Executive Officer

Enclosures

Reviewed by
DMEA OPERATING COMMITTEE
6-11-56
(date)

DMEA
Date Rec'd.

JUN 4 1956

BUREAU OF MINES
Denver, Colorado

Region III

Building 20
Denver Federal Center
Denver 2, Colorado
June 1, 1956

Memorandum

TRANSMITTED

JUN 5 1956

To: Executive Officer, DMEA Field Team, Region III

From: John F. Shaw
E. H. Harshman

Subject: Examination Report, Docket No. DMEA 4203 (Uranium)
Valcan Silver-Lead Corporation, (Willow Creek Group),
Gunnison and Saguache Counties, Colorado

Enclosed are the original and 9 copies of the Joint Engineering and Geologic Report covering docket DMEA 4203.

The Valcan Silver-Lead Corp. applied for DMEA assistance to explore their Willow Creek group of claims in Gunnison and Saguache Counties, Colorado by 13,000 feet of drilling at an estimated cost of $112,425.39.

The property was examined on May 8, 1956 by Frank B. Moore, geologist and Edward W. Buel, mining engineer.

The company proposed to explore the Salt Wash member of the Morrison formation in the vicinity of several poorly defined faults. There is no known uranium mineralization in the Salt Wash in the Willow Creek area and the examining team was unable to identify any uranium minerals along the supposedly favorable fault zones. The program is more in the nature of prospecting than exploration.

It is recommended that the application be denied.

John F. Shaw
Supervising Mining Engineer

for E. H. Harshman
Member Field Team

Reviewed by
DMEA OPERATING COMMITTEE
6-11-56
(date)

cc 9
DMEA 4203
EHHarshman
Chron.

JFS/eh

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

JOINT REPORT OF EXAMINATION BY EXAMINING TEAM
REGION III

DMEA
Date Rec'd.
JUN 4 1956
BUREAU OF MINES
Denver, Colorado
RECEIVED
JUN 4 1956

TRANSMITTED
JUN 5 1956

DMEA 4203

VULCAN SILVER-LEAD CORPORATION

Willow Creek Group

Gunnison and Saguache Counties, Colorado

Uranium

Joint Engineering and Geologic Report

By

Frank B. Moore, Geologist
Geological Survey

Edward W. Buel, Mining Engineer
Bureau of Mines

May 31, 1956

Reviewed by
DMEA OPERATING COMMITTEE
6-11-56
(date)

DMEA 4203

# VULCAN SILVER-LEAD CORPORATION
# WILLOW CREEK GROUP
# GUNNISON AND SAGUACHE COUNTIES, COLORADO

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## ILLUSTRATIONS


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2. Geologic Map of the Beta area, Willow Creek group, Saguache County, Colorado, DMEA 4203 ..... 6

DMEA 4203
Vulcan Silver-Lead Corporation
Willow Creek Group
Gunnison and Saguache Counties, Colorado

RECEIVED
JUN - 7 1956

## SUMMARY

Vulcan Silver-Lead Corporation, 100 Park Avenue, New York, N. Y., has applied for a loan to assist in carrying out a $112,425.39 program, DMEA docket 4203, to drill for uranium at Willow Creek in Saguache and Gunnison counties, Colorado. Drilling would consist of six holes averaging about 500 feet each plus an additional 10,000 feet if results from the six holes warranted such additional drilling. The company proposes to explore the Salt Wash member of the Morrison formation in the vicinity of several poorly defined faults.

The closest known uranium ore body is at the Los Ochos mine about 12 miles to the east.

Because of the lack of any known uranium mineralization in the Salt Wash in the Willow Creek area, the absence of any identifiable uranium minerals along the supposedly favorable fault zones, and the impossibility of locating the faults with present exposures closer than several hundred feet, it is recommended that the application be denied without prejudice.

## INTRODUCTION

The applicant, Vulcan Silver-Lead Corporation, requested DMEA assistance to prospect for uranium on the Willow Creek group. An examination was made of the property from the air and at the property on May 8, 1956. The DMEA examining team was comprised of Frank B. Moore, Geological Survey, and Edward W. Buel, Bureau of Mines. Accompanying the team members were Messrs. James E. Dunn, Arthur Baker III, and R. J. Flynn, respectively, manager, chief geologist,

and field supervisor of the Gunnison Field Office of Vulcan-Silver-Lead Corporation, 100 Park Avenue, New York 17, N. Y.

Conditions permitted an adequate examination of the general area both from the ground and air. The workings were sufficiently exposed for viewing the salient geological features of the cuts.

An aerial reconnaissance did not disclose any further information than could be obtained on the property.

## ACKNOWLEDGMENTS

Geologic mapping covering the area proposed for exploration consists of reconnaissance mapping of the San Juan region of southwestern Colorado by Whitman Cross and Esper S. Larson (U. S. G. S. Bull. 843, 1935) and the mapping done by the company geologist, Arthur Baker, III. Much of the geologic data in this report were taken from the report and maps furnished by Baker in the application for a loan. Baker's report seems to be well prepared though admittedly done on a minimum of information. The company officials were straightforward and apparently made no claims that could not be substantiated. However, their basic assumption of the similarity of Willow Creek to the Los Ochos ore body 12 miles away which leads them to suspect a similar ore body here, is believed to be somewhat over-optimistic.

Richard Hamburger of the Atomic Energy Commission was contacted regarding the property and he concurs with the writers' opinion that there is essentially no evidence to indicate the presence of an ore body.

## LOCATION AND ACCESSIBILITY

The Willow Creek group is at the headwaters of Willow, Corral, and South Beaver Creeks which are a few miles (less than 10) east of Powderhorn and south of Iola, Colorado. The claims are in secs. 2, 3, 4, 5 and 6, T. 46 N., R. 1 W., and secs. 31, 32, 33, 34, and 35, T. 47 N., R. 1 W.,

N.M.P.M., Gunnison and Saguache counties, Colorado (fig. 1).

The property can be reached from Elkhorn, a hamlet alongside U. S. Highway 50 and less than 2 miles east of Iola. From Elkhorn the Willow Creek county road is followed for about 8 miles to the Vulcan mine road that leads along Camp Creek. At the Vulcan mine and townsite a road turns east toward Corral Creek. This road is traveled for about 4 miles before joining several minor roads that pass throughout the Willow Creek group.

## PROPERTY

The Willow Creek group is composed of several groups of claims referred to as the Star, Beta, Elkhorn, Blizzard, Victor, and Afterthought groups, as well as the Major and Carta Blanca claims. These claims total 149 of which 31 were not included in the application (DMEA Docket 4203).

All of the groups are owned by Vulcan Silver-Lead Corporation of 100 Park Avenue, New York 17, N. Y., except for the Star group (9 claims) and the Beta group (4 claims) which are held by the Callahan Zinc-Lead Company, the parent company. Vulcan Silver-Lead Corporation holds a lease agreement with Callahan Zinc-Lead Company on the Beta and Star groups.

Patented surface rights to the claims included under the Willow Creek group are held by L. N. Kmock; Sammons, Sammons, and McGregor; and the Powderhorn Stock Association.

## HISTORY AND PRODUCTION

It is believed that the Willow Creek group was located in 1953, or shortly thereafter, following the discovery of radioactive anomalies in the Willow Creek area. Vulcan Silver-Lead Corporation has conducted geological mapping and reconnaissance, made radiometric and claim surveys, acquired mining claims, and performed superficial prospect trenching and road building.

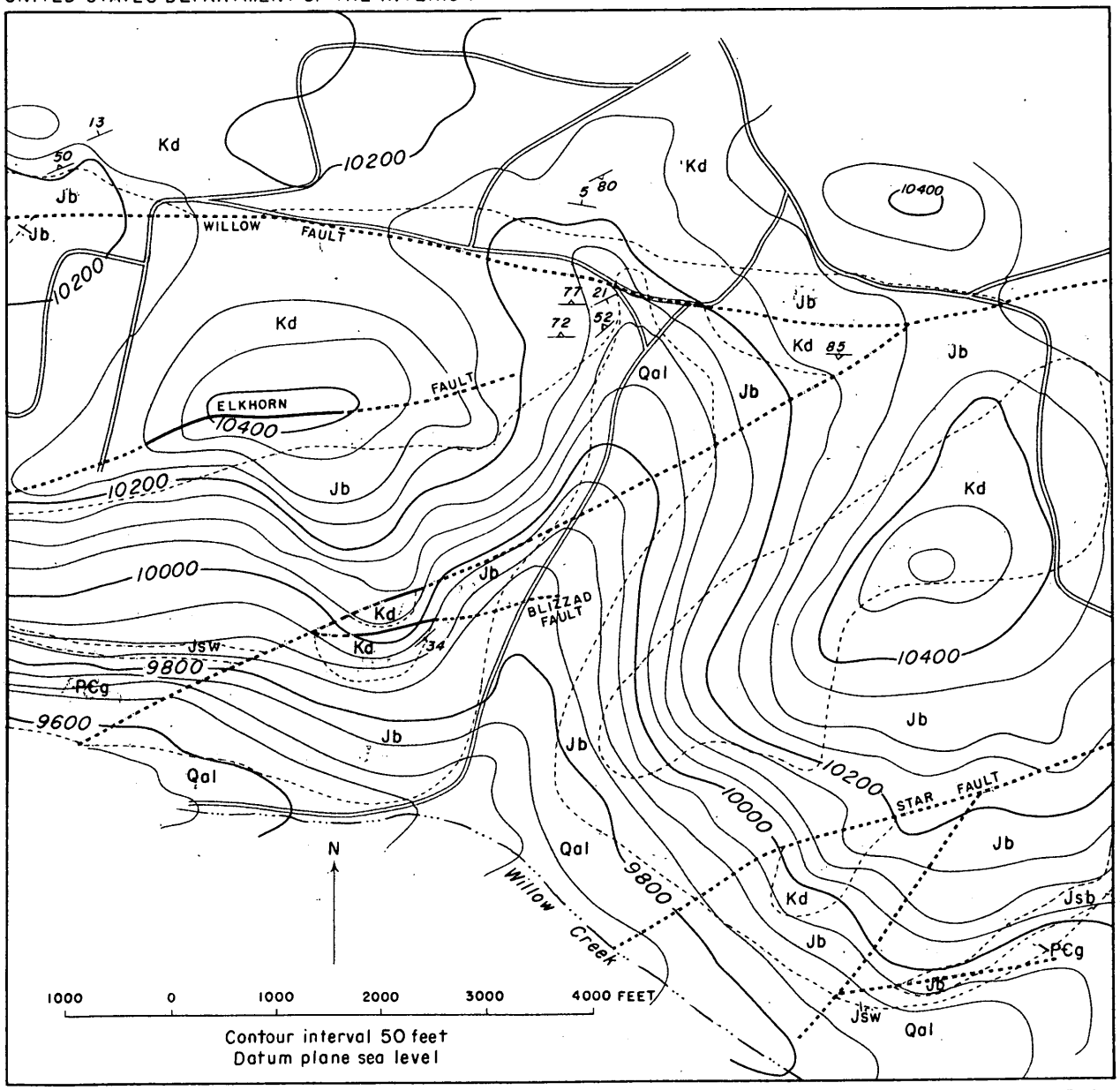


FIGURE 2,—GEOLOGIC MAP OF THE BETA AREA, WILLOW CREEK GROUP, SAGUACHE COUNTY, COLORADO

PREPARED FOR DEFENSE
MINERALS EXPLORATION ADMINISTRATION

## EXPLANATION

Qal — Aluvium

Kd — Dakota formation

Jb — Morrison formation, Brushy Basin member

Jsw — Morrison formation, Salt Wash member

P€g — PRECAMBRIAN Granite

Inferred contact

Fault (Dashed where inferred)

13 — Strike and dip of bedding

52 — Sheeting attitude

After company map by Arthur Baker III, 1955

To date there have been no uranium ore minerals detected on the property; hence, there has been no production.

## SAMPLING AND ORE ESTIMATES

Samples taken by the applicant from bulldozer trenches on the Beta No. 1 claims gave the following:

| Sample No. | Description | %$eU_3O_8$ | % $U_3O_8$ |
|---|---|---|---|
| 30 | Specimen containing green fluorescent chalcedony (plus or minus 10% of the sample is chalcedony) | 0.04 | 0.032 |
| 71 | Specimen containing green fluorescent chalcedony (plus or minus 25% of the sample is chalcedony). | 0.05 | 0.079 |

A grab sample taken of representative material by the DMEA examining team showed an assay return as follows:

| Sample No. | Description | %$U_3O_8$ |
|---|---|---|
| EB-6 | Silicified siltstone with chalcedony | 0.003 |

The present exposures on the Willow Creek group do not display any conspicuous uranium ore minerals, nor evidence of any probable existence of them; hence, the property contains no known ore reserves.

## PRESENT STATUS

The Willow Creek group has been principally developed by several shallow bulldozer trenches in the Beta (claims) area. Some work preparatory to drilling, in the form of roads, drill sites, and a reservoir, has been performed.

The company plans to drill a number of shallow holes less than 100 feet deep to better define the structure of the Beta and Willow fault intersection. This work is expected to begin about May 15, 1956.

## GEOLOGY

Rock units exposed at the Willow Creek group of claims include Precambrian granite, Jurassic Morrison formation, Cretaceous Dakota formation, and Tertiary volcanics. The Morrison consists of a lower Salt Wash member, which rests on the granite, and an upper Brushy Basin member. Tertiary volcanics lie a mile to the east of the area proposed for exploration (Beta area) and, as they have no relationship to the problem other than to help indicate movement along a fault, are not discussed further. Most of the area is covered with overburden and rock exposures are generally poor. The stratigraphic section is given below.

| | Estimated Thickness |
|---|---|
| Cretaceous | |
| Dakota formation<br>Coarse sandstone with conglomerate near the base | 80 feet |
| Jurassic | |
| Morrison formation | |
| Brushy Basin member<br>Red siltstone, probably some shale. No outcrops in the area | 210 feet |
| Salt Wash member<br>Coarse sandstone, no known shale partings; forms but few outcrops | 40 feet |
| Precambrian granite | --- |

The Beta area appears to be on the south flank of a broad, poorly defined anticline; the beds dip about 12° south or southeast although higher dips are reported. Two sets of faults, an east-striking set and a northeast-striking set are reported by the applicant to displace the sedimentary rocks, but this fact could not be checked in the field;because of the heavy overburden, the positions of the faults could not be determined within several hundred feet. The Beta fault, exposed in a trench near the inferred intersection with the Blizzard fault, cannot be found along the

apparent strike in a trench less than 300 feet away. Of the faults, only the Willow, Beta, and Blizzard are important here. The Willow and the Blizzard trend about east and, with the northeast trending Beta fault, form a "Z" pattern (fig. 2).

No uranium minerals have been identified in the Beta area. Anomalous radioactivity of three to four times background occurs in five rather broad areas 1 to several thousand feet long and several hundred to a thousand feet wide, coming from a silicified siltstone in the Brushy Basin member. The anomalous radioactivity of three of the five areas may be related to faults or fault intersections. However, where the Beta fault is exposed in a trench, radioactivity is lower in the fault than in a 30-foot wide sheared zone adjacent to it. A small lens about 6 feet long by 6 inches wide in the sheared zone contains stringers of chalcedony and small masses of limonite which is slightly more radioactive than the silicified siltstone. Two samples, chosen for their chalcedony content, assayed 0.032 percent and 0.079 percent $U_3O_8$.

## APPLICANT'S PROPOSED PROGRAM

The applicant requested exploration assistance for $112,425.39 of which the Government's participation would be 75 percent or $84,319.04. The exploration program was to be completed within 19 months, including suspension of operations during the winter months.

The applicant proposed a diamond drilling program to be performed in two stages. Stage I would consist of six drill holes (Ax) totaling approximately 3,000 feet. Three of those holes would be near the projected intersection at the Blizzard and Beta faults. The locations of the other three holes would be on the purported intersection of the Beta and Willow faults. Stage II called for 10,000 feet of additional diamond drilling contingent upon the results of the drilling performed under Stage I. Location of drilling and planning of the work under Stage II would have been subject

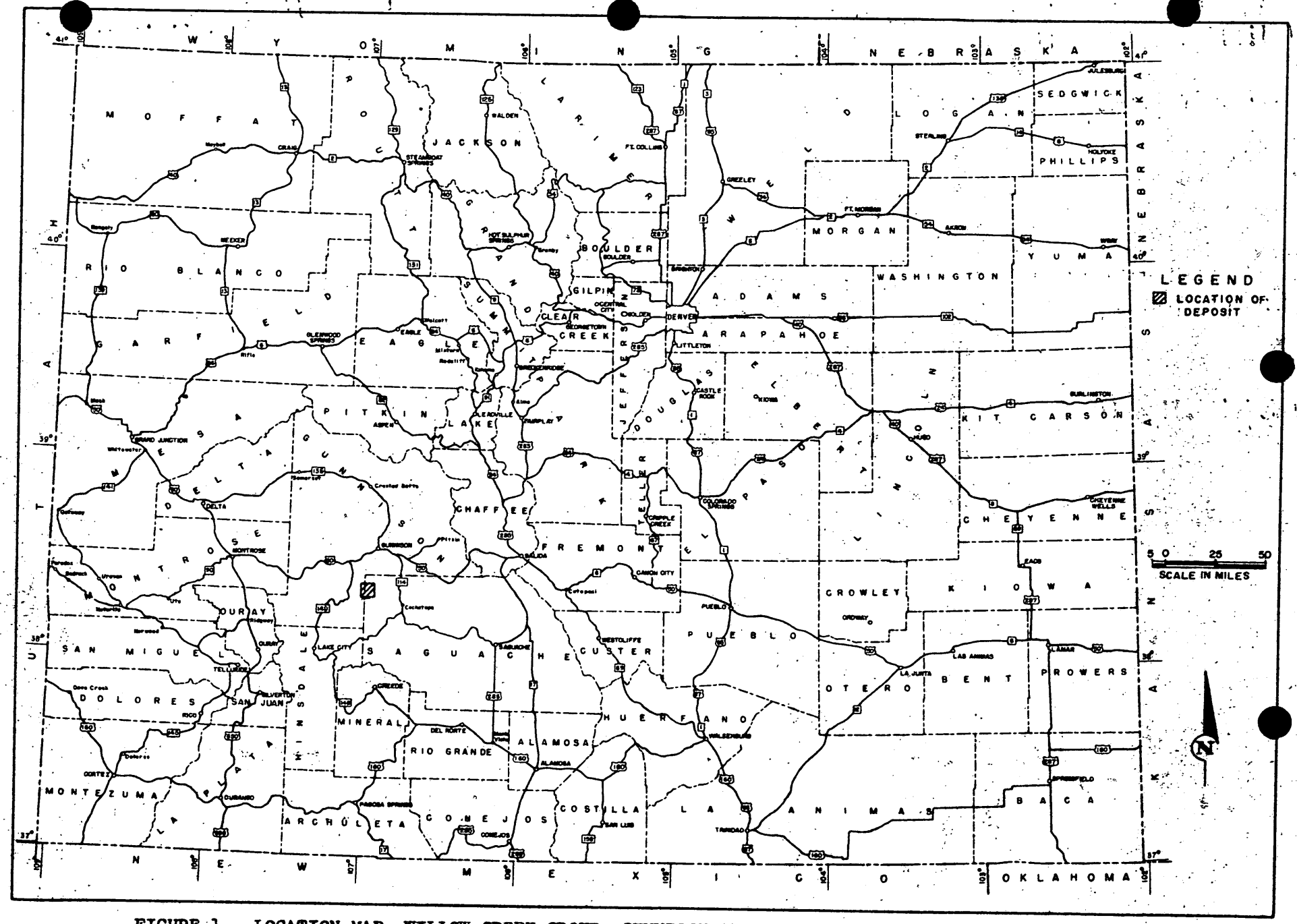


FIGURE 1 - LOCATION MAP, WILLOW CREEK GROUP, GUNNISON AND SAGUACHE COUNTIES, COLO. DMEA 4203

to DMEA approval.

## CONCLUSIONS AND RECOMMENDATIONS

The Vulcan Silver-Lead Corporation proposes to drill three 450-foot holes to test the inferred intersection of the Beta and Blizzard faults and three of similar depth to test the purported intersection of the Beta and Willow faults. Both sets of holes are located to reach the fault intersection in the Salt Wash member of the Morrison formation. As no uranium mineralization has been shown in the Salt Wash in the vicinity of the Beta claims, as no uranium minerals can be seen in the Brushy Basin member, and as the locations of the faults are not well known, the evidence is insufficient to justify a program which is more in the nature of prospecting than exploration.

Because of reasons given above, the examining team recommends that the Vulcan Silver-Lead Corporation's application for a loan to drill for uranium on the Beta group of claims be denied without prejudice.

6-7-56

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

June 5, 1956

224 New Customhouse
Denver 2, Colorado

RECEIVED
JUN - 7 1956

Memorandum

To: Secretary to the Operating Committee, DMEA

From: Field Team, Region III

Subject: Joint Report of Examination, DMEA Docket 4203 (Uranium), Valcan Silver-Lead Corporation, (Willow Creek group), Gunnison and Saguache Counties, Colorado

Enclosed are the original and three copies of a joint engineering and geologic report on the subject property.

The field examiners found no uranium mineralization had been shown in the Salt Wash in the vicinity of the Beta claims, and no uranium minerals could be seen in the Brushy Basin member. The locations of the faults are not well known and the evidence at this time is insufficient to justify a true exploration program. They recommend that the application be denied without prejudice. We concur in this recommendation.

DMEA Field Team, Region III

W. M. Traver

By W. M. Traver
Executive Officer

Enclosures

Reviewed by
DMEA OPERATING COMMITTEE
6-11-56
(date)

DMEA
Date Rec'd.
JUN 4 1956
BUREAU OF MINES
Denver, Colorado

Region III

Building 20
Denver Federal Center
Denver 2, Colorado
June 1, 1956

TRANSMITTED
JUN 5 1956

Memorandum

To: Executive Officer, DMEA Field Team, Region III

From: John F. Shaw
E. H. Hershman

Subject: Examination Report, Docket No. DMEA 4203 (Uranium)
Fulcum Silver-Lead Corporation, (Willow Creek Group),
Gunnison and Saguache Counties, Colorado

Enclosed are the original and 9 copies of the Joint Engineering and Geologic Report covering docket DMEA 4203.

The Fulcum Silver-Lead Corp. applied for DMEA assistance to explore their Willow Creek group of claims in Gunnison and Saguache Counties, Colorado by 13,600 feet of drilling at an estimated cost of $112,425.39.

The property was examined on May 8, 1956 by Frank B. Moore, geologist and Edward W. Buel, mining engineer.

The company proposed to explore the Salt Wash member of the Morrison formation in the vicinity of several poorly defined faults. There is no known uranium mineralization in the Salt Wash in the Willow Creek area and the examining team was unable to identify any uranium minerals along the supposedly favorable fault zones. The program is more in the nature of prospecting than exploration.

It is recommended that the application be denied.

John F. Shaw
Supervising Mining Engineer

for DRMacharen
E. H. Hershman
Member Field Team

Reviewed by
DMEA OPERATING COMMITTEE
6-11-56
(date)

cc 9
DMEA 4203
EHHershman
Chron.
JFS/ch

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

JOINT REPORT OF EXAMINATION BY EXAMINING TEAM
REGION III

DMEA 4202

VULCAN SILVER-LEAD CORPORATION

Willow Creek Group

Gunnison and Saguache Counties, Colorado

TRANSMITTED

JUN 5 1956

Uranium

Joint Engineering and Geologic Report

By


Frank B. Moore, Geologist
Geological Survey

Edward W. Beal, Mining Engineer
Bureau of Mines


May 31, 1956

Reviewed by
DMEA OPERATING COMMITTEE
6-11-56
(date)

DMEA 4203

VULCAN SILVER-LEAD CORPORATION
WILLOW CREEK GROUP
GUNNISON AND SAGUACHE COUNTIES, COLORADO

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DMEA 4203
Vulcan Silver-Lead Corporation
Willow Creek Group
Gunnison and Saguache Counties, Colorado

## SUMMARY

Vulcan Silver-Lead Corporation, 100 Park Avenue, New York, N. Y., has applied for a loan to assist in carrying out a $112,425.39 program, DMEA docket 4203, to drill for uranium at Willow Creek in Saguache and Gunnison counties, Colorado. Drilling would consist of six holes averaging about 500 feet each plus an additional 10,000 feet if results from the six holes warranted such additional drilling. The company proposes to explore the Salt Wash member of the Morrison formation in the vicinity of several poorly defined faults.

The closest known uranium ore body is at the Los Ochos mine about 12 miles to the east.

Because of the lack of any known uranium mineralization in the Salt Wash in the Willow Creek area, the absence of any identifiable uranium minerals along the supposedly favorable fault zones, and the impossibility of locating the faults with present exposures closer than several hundred feet, it is recommended that the application be denied without prejudice.

## INTRODUCTION

The applicant, Vulcan Silver-Lead Corporation, requested DMEA assistance to prospect for uranium on the Willow Creek group. An examination was made of the property from the air and at the property on May 8, 1956. The DMEA examining team was comprised of Frank B. Moore, Geological Survey, and Edward W. Buel, Bureau of Mines. Accompanying the team members were Messrs. James E. Dunn, Arthur Baker III, and R. J. Flynn, respectively, manager, chief geologist,

and field supervisor of the Gunnison Field Office of Vulcan-Silver-Lead Corporation, 100 Park Avenue, New York 17, N. Y.

Conditions permitted an adequate examination of the general area both from the ground and air. The workings were sufficiently exposed for viewing the salient geological features of the cuts.

An aerial reconnaissance did not disclose any further information than could be obtained on the property.

## ACKNOWLEDGMENTS

Geologic mapping covering the area proposed for exploration consists of reconnaissance mapping of the San Juan region of southwestern Colorado by Whitman Cross and Esper S. Larsen (U. S. G. S. Bull. 843, 1935) and the mapping done by the company geologist, Arthur Baker, III. Much of the geologic data in this report were taken from the report and maps furnished by Baker in the application for a lease. Baker's report seems to be well prepared though admittedly done on a minimum of information. The company officials were straightforward and apparently made no claims that could not be substantiated. However, their basic assumption of the similarity of Willow Creek to the Las Cruces ore body 12 miles away which leads them to suspect a similar ore body here, is believed to be somewhat over-optimistic.

Richard Hamburger of the Atomic Energy Commission was contacted regarding the property and he concurs with the writers' opinion that there is essentially no evidence to indicate the presence of an ore body.

## LOCATION AND ACCESSIBILITY

The Willow Creek group is at the headwaters of Willow, Carrel, and South Beaver Creeks which are a few miles (less than 10) east of Powderhorn and south of Lala, Colorado. The claims are in secs. 2, 3, 4, 5 and 6, T. 46 N., R. 1 W., and secs. 31, 32, 33, 34, and 35, T. 47 N., R. 1 W.,

N.M.P.M., Gunnison and Saguache counties, Colorado (fig. 1).

The property can be reached from Elkhorn, a hamlet alongside U. S. Highway 50 and less than 2 miles east of Lola. From Elkhorn the Willow Creek county road is followed for about 8 miles to the Vulcan mine road that leads along Camp Creek. At the Vulcan mine and townsite a road turns east toward Corral Creek. This road is traveled for about 4 miles before joining several minor roads that pass throughout the Willow Creek group.

## PROPERTY

The Willow Creek group is composed of several groups of claims referred to as the Star, Beta, Elkhorn, Blizzard, Victor, and Afterthought groups, as well as the Major and Carta Blanca claims. These claims total 149 of which 31 were not included in the application (DMEA Docket 4303).

All of the groups are owned by Vulcan Silver-Lead Corporation of 100 Park Avenue, New York 17, N. Y., except for the Star group (9 claims) and the Beta group (4 claims) which are held by the Callahan Zinc-Lead Company, the parent company. Vulcan Silver-Lead Corporation holds a lease agreement with Callahan Zinc-Lead Company on the Beta and Star groups.

Patented surface rights to the claims included under the Willow Creek group are held by L. N. Kunek; Summons, Summons, and McGregor; and the Powderhorn Stock Association.

## HISTORY AND PRODUCTION

It is believed that the Willow Creek group was located in 1953, or shortly thereafter, following the discovery of radioactive anomalies in the Willow Creek area. Vulcan Silver-Lead Corporation has conducted geological mapping and reconnaissance, made radiometric and claim surveys, acquired mining claims, and performed superficial prospect trenching and road building.

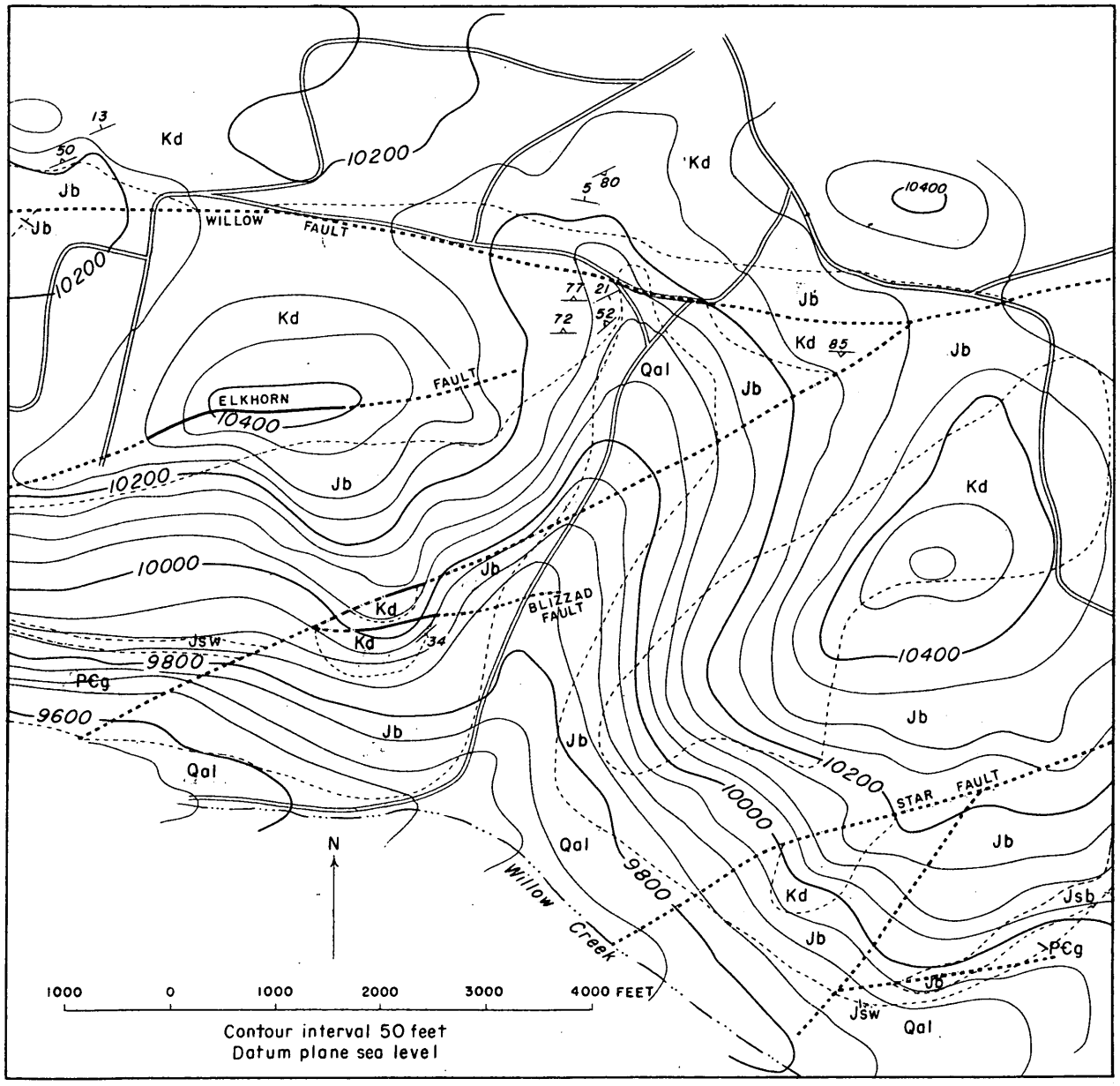


FIGURE 2,—GEOLOGIC MAP OF THE BETA AREA, WILLOW CREEK GROUP, SAGUACHE COUNTY, COLORADO

PREPARED FOR DEFENSE
MINERALS EXPLORATION ADMINISTRATION

## EXPLANATION

**Qal** — Aluvium

**Kd** — Dakota formation

**Jb** — Morrison formation, Brushy Basin member

**Jsw** — Morrison formation, Salt Wash member

**PЄg** — PRECAMBRIAN Granite

Inferred contact

Fault (Dashed where inferred)

13 — Strike and dip of bedding

52 — Sheeting attitude

After company map by Arthur Baker III, 1955

To date there have been no uranium ore minerals detected on the property; hence, there has been no production.

## SAMPLING AND ORE ESTIMATES

Samples taken by the applicant from bulldozer trenches on the Beta No. 1 claims gave the following:

| Sample No. | Description | $\%U_3O_8$ | $\%V_2O_5$ |
|---|---|---|---|
| 30 | Specimen containing green fluorescent chalcedony (plus or minus 10% of the sample is chalcedony) | 0.04 | 0.032 |
| 71 | Specimen containing green fluorescent chalcedony (plus or minus 25% of the sample is chalcedony). | 0.05 | 0.079 |

A grab sample taken of representative material by the DMEA examining team showed an assay return as follows:

| Sample No. | Description | $\%U_3O_8$ |
|---|---|---|
| RB-6 | Silicified siltstone with chalcedony | 0.003 |

The present exposures on the Willow Creek group do not display any conspicuous uranium ore minerals, nor evidence of any probable existence of them; hence, the property contains no known ore reserves.

## PRESENT STATUS

The Willow Creek group has been principally developed by several shallow bulldozer trenches in the Beta (claims) area. Some work preparatory to drilling, in the form of roads, drill sites, and a reservoir, has been performed.

The company plans to drill a number of shallow holes less than 100 feet deep to better define the structure of the Beta and Willow fault intersection. This work is expected to begin about May 15, 1956.

## GEOLOGY

Rock units exposed at the Willow Creek group of claims include Precambrian granite, Jurassic Morrison formation, Cretaceous Dakota formation, and Tertiary volcanics. The Morrison consists of a lower Salt Wash member, which rests on the granite, and an upper Brushy Basin member. Tertiary volcanics lie a mile to the east of the area proposed for exploration (Beta area) and, as they have no relationship to the problem other than to help indicate movement along a fault, are not discussed further. Most of the area is covered with overburden and rock exposures are generally poor. The stratigraphic section is given below.

| | Estimated Thickness |
|---|---|
| Cretaceous | |
| Dakota formation | |
| Coarse sandstone with conglomerate near the base | 80 feet |
| Jurassic | |
| Morrison formation | |
| Brushy Basin member | |
| Red siltstone, probably some shale. No outcrops in the area | 210 feet |
| Salt Wash member | |
| Coarse sandstone, no known shale partings; forms but few outcrops | 40 feet |
| Precambrian granite | —— |

The Beta area appears to be on the south flank of a broad, poorly defined anticline; the beds dip about 12° south or southeast although higher dips are reported. Two sets of faults, an east-striking set and a northeast-striking set are reported by the applicant to displace the sedimentary rocks, but this fact could not be checked in the field; because of the heavy overburden, the positions of the faults could not be determined within several hundred feet. The Beta fault, exposed in a trench near the inferred intersection with the Blizzard fault, cannot be found along the

apparent strike in a trench less than 300 feet away. Of the faults, only the Willow, Beta, and Blizzard are important here. The Willow and the Blizzard trend about east and, with the northeast trending Beta fault, form a "Z" pattern (fig. 2).

No uranium minerals have been identified in the Beta area. Anomalous radioactivity of three to four times background occurs in five rather broad areas 1 to several thousand feet long and several hundred to a thousand feet wide, coming from a silicified siltstone in the Brushy Basin member. The anomalous radioactivity of three of the five areas may be related to faults or fault intersections. However, where the Beta fault is exposed in a trench, radioactivity is lower in the fault than in a 30-foot wide sheared zone adjacent to it. A small lens about 6 feet long by 6 inches wide in the sheared zone contains stringers of chalcedony and small masses of limonite which is slightly more radioactive than the silicified siltstone. Two samples, chosen for their chalcedony content, assayed 0.032 percent and 0.079 percent $U_3O_8$.

## APPLICANT'S PROPOSED PROGRAM

The applicant requested exploration assistance for $112,425.39 of which the Government's participation would be 75 percent or $84,319.04. The exploration program was to be completed within 19 months, including suspension of operations during the winter months.

The applicant proposed a diamond drilling program to be performed in two stages. Stage I would consist of six drill holes (Ax) totaling approximately 3,000 feet. Three of those holes would be near the projected intersection at the Blizzard and Beta faults. The locations of the other three holes would be on the purported intersection of the Beta and Willow faults. Stage II called for 10,000 feet of additional diamond drilling contingent upon the results of the drilling performed under Stage I. Location of drilling and planning of the work under Stage II would have been subject

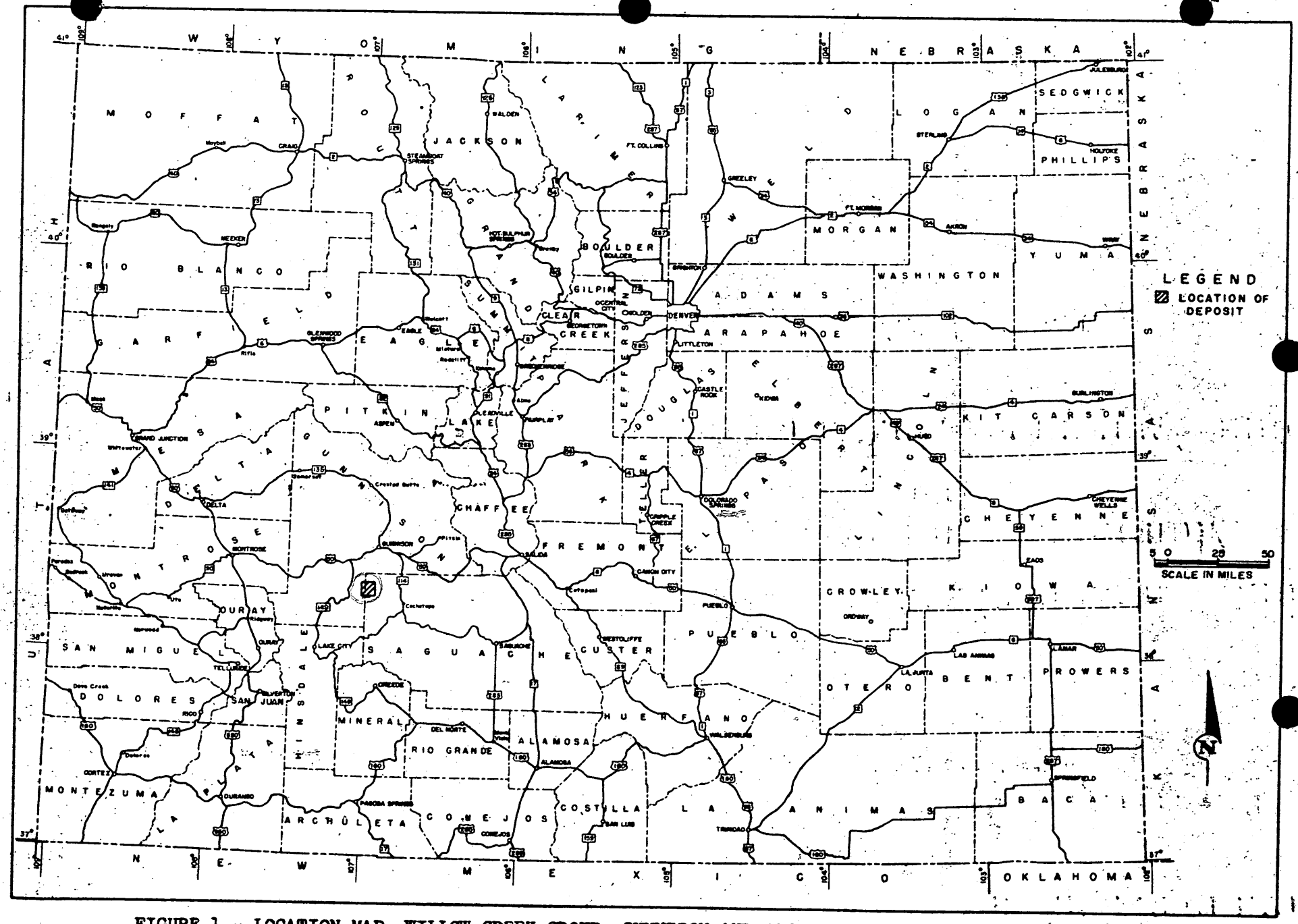


FIGURE 1 - LOCATION MAP, WILLOW CREEK GROUP, GUNNISON AND SAGUACHE COUNTIES, COLO. DMEA 4203

to DMEA approval.

## CONCLUSIONS AND RECOMMENDATIONS

The Vulcan Silver-Lead Corporation proposes to drill three 450-foot holes to test the inferred intersection of the Beta and Blizzard faults and three of similar depth to test the purported intersection of the Beta and Willow faults. Both sets of holes are located to reach the fault intersection in the Salt Wash member of the Morrison formation. As no uranium mineralization has been shown in the Salt Wash in the vicinity of the Beta claims, as no uranium minerals can be seen in the Brushy Basin member, and as the locations of the faults are not well known, the evidence is insufficient to justify a program which is more in the nature of prospecting than exploration.

Because of reasons given above, the examining team recommends that the Vulcan Silver-Lead Corporation's application for a lease to drill for uranium on the Beta group of claims be denied without prejudice.

700

FILE COPY
Surname:

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

MAR 2 0 1956

Mr. W. H. Trever
Executive Officer
DMEA Field Team, Region III
12A New Customhouse Building
Denver 2, Colorado

Re: Docket No. DMEA-4203 (Uranium)
Vulcan Silver-Lead Corporation
Willow Creek Group
Gunnison and Saguache Counties,
Colorado

Dear Mr. Trever:

The captioned application is referred to Region III Field Team for investigation, a field examination, and recommendation. A copy of the application was forwarded to your office on March 8, 1956.

Enclosed are copies of memoranda, dated March 12 and 15, 1956, from N. E. Nelson, USGS, and J. E. Crawford, USBM, respectively.

In the event the Field Team recommends a project to explore the subject group, it should advise the Applicant that we will require six copies of the Owner's Consent to Lien on the Star group and Beta group, executed by the Callahan Zinc-Lead Company.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee (GCS)

Enclosures

APPROVED:

/s/ Robert W. Geehan (RWG)
Member, Bureau of Mines

Thor H. Kiilsgaard (THK)
Member, Geological Survey

FMMurphy/izm 3-16-56
cc to: Docket
Code 700
Mr. Murphy
Admr.'s Reading File
Operating Committee
Messrs. JECrawford, Rm. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA

FCS.

FILE COPY
Surname:
Murphy
Daly
Durham
Selfridge

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

MAR 26 1956

Vulcan Silver-Lead Corporation
100 Park Avenue
New York 17, New York

Re: Docket No. DMEA-4203 (Uranium)
Willow Creek Group
Gunnison and Saguache Counties,
Colorado

Gentlemen:

The application for assistance in exploring the subject group, under the captioned docket number has been reviewed by the Rare and Miscellaneous Metals Division of the Defense Minerals Exploration Administration. It has been referred for a field examination to:

Mr. W. M. Traver
Executive Officer
DMEA Field Team, Region III
224 New Customhouse Building
Denver 2, Colorado

Any assistance you may give the members of the Field Team during the examination will be appreciated.

Sincerely yours,

O. O. Mittendorf

Administrator

FMMurphy/izm 3-16-56
cc to: Docket
Code 700
Mr. Murphy
Admr.'s Reading File
DMEA Field Team, Region III (2)

R.G.S.

3-16-56 [illegible]

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

RECEIVED
MAR 16 1956

March 15, 1956

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee, Room 4445

From: John E. Crawford, Bureau of Mines Member
Uranium Commodity Committee

Subject: Application for assistance, DMEA Docket 4203, Vulcan Silver-Lead Corporation, Willow Creek Group, Saguache County, Colorado

I have reviewed the attached application, Vulcan Silver-Lead Corporation, DMEA Docket 4203, dated March 5 and received in this office March 8. I have also discussed it with Joseph O. Hosted, Washington representative of the Atomic Energy Commission.

The applicant has conducted some geologic mapping, radiometric surveying, and trenching on subject claims, in order to determine the suitability of the property for an elaborate exploration program for uranium. Samples taken on the subject property range from 0.032 to 0.075 percent $U_3O_8$. The proposed two-stage drilling program includes 3,000 feet of core drilling in Stage I and 10,000 feet of additional drilling in Stage II, at a total estimated cost of $112,425.39.

The project as proposed appears to be elaborate and risky, but probably warrants an on-the-ground examination. We recommend that the application be sent to the Field Team and that they consult with D. L. Everhart, Atomic Energy Commission, Denver, Colorado.

John E. Crawford
John E. Crawford

Attachment

3-14-56

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

RECEIVED
MAR 13 1956

March 12, 1956

Re: DMEA 4203
Vulcan Silver-Lead Corp.
Willow Creek Group
Gunnison and Saguache
Counties, Colorado
$112,425.39 - Uranium

Memorandum

To: E. W. Ellis, Defense Minerals Exploration Administration

From: N. E. Nelson, U. S. Geological Survey

Subject: Review of application.

The applicant requests assistance in exploring fault structures which cut Bushy Basin and Salt Wash members of the Morrison Formation. Fault intersections are considered especially favorable locations for uranium mineralization. The application says uranium ore is being mined where similar structural conditions obtain at the Los Ochos mine, 14 miles to the east.

The proposed work consists of:

| | | |
|---|---|---|
| Phase I Preliminary exploration | | |
| Diamond drilling, 6 holes at 500 feet | 3,000 feet | $26,247.06 |
| Phase II | | |
| Diamond drilling 10,000 feet | | 86,178.33 |
| Total | | $112,425.39 |

The claim that a system of faults exists on the large property is well supported by geologic maps and sections. Radiometric grid surveys show anomalous conditions exist and indicate they are roughly peculiar to the fault zones. Seven cuts, made by bulldozing, have exposed bedrock and, as mapped, the rock relationships tend to verify the faulting concept, and from cuts on the Beta No. 1 Lode Claim two samples were obtained which show low grade radioactivity, as:

| No. | Description | Assayer | %eU3O8 | %U3O8 |
|---|---|---|---|---|
| 30 | Specimen containing Green fluorescent Chalcedony (plus or minus 10% of Sample Chalcedony) | C. O. Parker & Co. Denver, Colorado | 0.04 | 0.032 |
| 71 | Specimen containing Green fluorescent Chalcedony (plus or minus 25% of Sample Chalcedony) | Root & Simpson Inc. Denver, Colorado | 0.05 | 0.079 |

That certain conditions are comparable to those at the Los Ochos mine appears to be a reasonable assumption. That uranium ore exists is much less certain, but the drilling outlined should, if done, throw light on that question.

Referral to the Field Team for suitable action is recommended.

N. E. Nelson

N. E. Nelson

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

RECEIVED
MAR 13 1956

March 12, 1956

Re: DMEA 4203
Vulcan Silver-Lead Corp.
Willow Creek Group
Gunnison and Saguache
Counties, Colorado
$112,425.39 - Uranium

Memorandum

To: E. W. Ellis, Defense Minerals Exploration Administration

From: N. E. Nelson, U. S. Geological Survey

Subject: Review of application.

The applicant requests assistance in exploring fault structures which cut Dusky Basin and Wash members of the Morrison Formation. Fault intersections are considered especially favorable locations for uranium mineralization. The application says uranium ore is being mined where similar structural conditions obtain at the Los Ochos mine, 14 miles to the east.

The proposed work consists of:

| | | |
|---|---|---|
| Phase I Preliminary exploration | | |
| Diamond drilling, 6 holes at 500 feet | 3,000 feet | $26,247.06 |
| Phase II | | |
| Diamond drilling 10,000 feet | | 86,178.33 |
| Total | | $ 112,425.39 |

The claim that a system of faults exists on the large property is well supported by geologic maps and sections. Radiometric grid surveys show anomalous conditions exist and indicate they are roughly peculiar to the fault zones. Seven cuts, made by bulldozing, have exposed bedrock and, as mapped, the rock relationships tend to verify the faulting concept, and from cuts on the Beta No. 1 Lode Claim two samples were obtained which show low grade radioactivity, as:

| No. | Description | Assayer | %eU3O8 | %U3O8 |
|---|---|---|---|---|
| 30 | Specimen containing Green fluorescent Chalcedony (plus or minus 10% of Sample Chalcedony) | C. O. Parker & Co. Denver, Colorado | 0.04 | 0.032 |
| 71 | Specimen containing Green fluorescent Chalcedony (plus or minus 25% of Sample Chalcedony) | Root & Simpson Inc. Denver, Colorado | 0.05 | 0.079 |

That certain conditions are comparable to those at the Los Ochos mine appears to be a reasonable assumption. That uranium ore exists is much less certain, but the drilling outlined should, if done, throw light on that question.

Referral to the Field Team for suitable action is recommended.

N. E. Nelson

N. E. Nelson

NENelson:jeh
3/12/56
cc: Director's reading 4212
Branch reading 4212
DMEA (3) ✓
Docket file
J. E. Crawford, 3641 Int.
J. O. Hosted, 3210, GSA

March 8, 1956
Subject: DMEA-4203
Re: Exploration Assistance
Willow Creek Group

Vulcan Silver-Lead Corporation
100 Park Avenue
New York 17, New York

Gentlemen:

The receipt of your application dated (not given) for exploration assistance under the Defense Production Act of 1950, as amended, is hereby acknowledged.

Your application has been assigned Docket Number DMEA-4203 and referred to the Rare & Misc. Mtls. Division.

Kindly identify all future correspondence relating to your application by this docket number.

Sincerely yours,

Robert E. Adams, Chief
Operations Control and
Statistics Division

VULCAN SILVER-LEAD CORPORATION

RECEIVED
MAR - 5 1956

100 PARK AVENUE - NEW YORK 17, N. Y.
TELEPHONE OREGON 9-1300

United States Department of The Interior
Defense Minerals Exploration Administration
Washington 25, D.C.

Gentlemen:

We submit herewith four copies of an application for aid in an exploration project as outlined in D.M.E.A. order #1, amended.

The geological report attached to each copy is made a part of the application and need not be returned to the applicant.

The field season in higher elevations in Colorado is limited to the late spring and summer months. This means that preparations must be made early in the spring to move equipment into the high country as soon as snow conditions permit. In view of these conditions, we would appreciate the handling of this application as expeditiously as possible.

Yours very truly,

VULCAN SILVER-LEAD CORPORATION

R. F. Mahoney

R. F. Mahoney
Vice President

103
ed April 1952)

# UNITED STATES DEPARTMENT OF THE INTERIOR
## DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

RECEIVED
MAR - 5 1956

## APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

*Not to be filled in by applicant*

Docket No. DMEA-4203
Metal or Mineral Uranium
Date Received 3-5-56
Estimated Cost $112,425.39
Participation (Government %) .....

## INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Vulcan Silver-Lead Corporation - Incorporated, State of Idaho
Joseph T. Hall, President --- 100 Park Avenue, New York 17, N. Y.
R. F. Mahoney, Vice-President --- The Flexaust Co., Chestnut St., Amesbury, Mass.
E. A. Salo, Secretary, Treasurer --- 100 Park Avenue, New York 17, N. Y.

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract .....

(*b*) State any mine name by which the property is known.

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise .....

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property.

(*e*) If you own the land, describe any liens or encumbrances on it .....

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice.

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

5. *The exploration project.*—(*a*) State the mineral or minerals for which you wish to explore .....

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc.

(*c*) The work will start within ..... days and be completed within ..... months from the date of an exploration project contract.

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations.

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)?

(*b*) How do you propose to furnish your share of the costs?

☐ Money ☐ Use of equipment owned by you ☐ Other

Explain in detail on acompanying paper.

## CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated ....., 195...

.....
(Applicant)

By R. F. Mahoney

.....

.....

**Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.**

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

Defense Minerals Exploration Administration

Department of the Interior

Washington 25, D. C.

Gentlemen:

We submit herewith an application for aid in an exploration project as outlined in D.MEA order 1 amended.

The information in this letter follows and is supplemental to form M F - 103 which is attached.

1. Vulcan Silver-Lead Corporation - Incorporated, State of Idaho

Field Office - Box 144, Gunnison, Colorado

Home Office - 100 Park Avenue, New York 17, N. Y.
Joseph T. Hall, President --- 100 Park Avenue, N. Y. 17, N. Y.
R. F. Mahoney, Vice President --- The Flexaust Co., Chestnut St. Amesbury, Mass.
A. E. Salo, Secretary, Treasurer --- 100 Park Ave., New York 17, N. Y.

3.(a) The property consists of one hundred eighteen (118) claims in a contiguous group held by location in Gunnison and Saguache Counties, Colorado.

The group is located in sections 31, 32, 33, 34, and 35 T 47, N, R 1 W, N. M. P. M. and in sections 2, 3, 4, 5 and 6 T 46 N, R 1 W, N. M. P. M. Original land surveys were prior to 1900. None of these corners were found on the claim area and presumably are destroyed. All claim surveys are tied to the one quarter ($\frac{1}{4}$) corner between section 31 T 47 N, R 1 W and section 36 T 47 N, R 1$\frac{1}{2}$ W, N. M. P. M. This corner is west of the claim group and is the only corner identified in the general area.

The consolidated claim groups are as follows:

Star Group 9 Claims owned by Callahan Zinc-Lead Company. Held under lease agreement by Vulcan Silver-Lead Corp.

Beta Group 4 Claims owned by Callahan Zinc-Lead Company. Held under lease agreement by Vulcan Silver-Lead Corp.

Elk Horn Group 3 Claims owned by Vulcan Silver-Lead Corp.

Blizzard Group 40 Claims owned by Vulcan Silver-Lead Corp.

Victor Group 57 Claims owned by Vulcan Silver-Lead Corp.

Afterthought Group 3 Claims " " " " " "

Major 1 Claim " " " " " "

Carta Blanca 1 Claim " " " " " "

Claims dropped from original total consisting of 2 Elkhorns and 29 Victors were not considered pertinent to the program, as they cover an unfavorable area with no apparent mineralization.

Copies of lease covering Star and Beta Groups attached. (Exhibit C)

(B) Willow Creek Group
(C) Owner and Lessee (See 3 a )
(D) Copies of Lease attached.
(E) None
(F) Claims listed with book and page numbers of recorded locations are listed and attached to this application. (Exhibit D)

4 (a) Exploration to date has consisted of surface geologic mapping, radiometric grid work and surface cuts with tractor bulldozer. Location and results of this work are shown on maps accompanying geologic report. All work has been done by Vulcan Silver-Lead Corp. during the summer of 1955. This surface work will be accessable for examination by April 5, 1956. There are no mine workings or production facilities.

(b) None

(c) The general geology of the Willow Creek area is identical with that of the uranium producing Los Ochos Mine which lies about 14 miles east of the Willow Creek prospect.

The stratigraphic column at Willow Creek includes three sedimentary rock groups; the Dakota Formation 80' thick, the Brushy Basin member of the Morrison Formation 210' thick and the Salt Wash member of the Morrison Formation 40' thick. These sediments over-lie pre-Cambrian granites.

The area is cut by a major east-west fault that has a nearly vertical attitude and shows a probable 3000' of horizontal displacement. Very little vertical displacement is indicated. Several other faults with a general north-east strike cross the property; these are also vertical and show great horizontal displacement and proportionately minor vertical movement.

Four out of the seven radiometric anomalies are definitely associated with known fault structures. Intersections of faults on the Beta Claim Group and the intersection of the Beta and Willow Fault on the Blizzard Claim group, offer the greatest possibilities of ore occurrence.

In a comparative environment at Los Ochos, concentrations of uranium mineralization have occurred along fault structures in the Morrison Formation with greatest values in the Salt Wash member and in general at fault intersections. Mineralization at Los Ochos is principally pitchblende and is hydrothermal in origin.

Evidence that Willow Creek mineralization is also hydrothermal shows in the silicification of the sediments adjacent to known faults and the fact that the exposures of the Brushy Basin member away from the fault zones are not radioactive.

Specimens taken from shallow surface cuts on Beta Group fault structure, showing small amounts of fluorescent chalcedony assay 0.032% $U_3O_8$ to 0.075% $U_3O_8$. This material was in radiometric balance.

A geologic report with maps and sections, is attached. (Exhibit A)

(d) Gunnison, Colorado is the nearest town of any importance. The property is reached from Gunnison by going west on highway 50 to Iola, Colorado, thence south-east by improved dirt road. Total distance from Gunnison is 30 miles. All points of interest on the property will be accessable either by existing roads or roads to be constructed early in 1956.

Uranium ores from the Gunnison area are presently handled under fringe area agreements with the A. E. C. A mill to handle local uranium ores is planned. A. E. C. approval is expected as soon as enough ore is available to justify its construction.

During early stages of any program the residence and supply point would be Gunnison.

(e) Manpower, materials, supplies and equipment are available for the project. Power would be generated on the property for any type of program undertaken.

Water for exploratory drilling will be retained from spring run-off by construction of a dam across Willow Creek. This would provide sufficient water for any drilling program until sometime in September. This fact necessitates an early start on any exploratory work contemplated.

5 (a) Uranium

(b) The proposed program on Willow Creek would be divided into two phases as follows:

1. Preliminary Exploration

This phase would consist of six drill holes or approximately 3000 ft. of core drilling. Three of these holes would be on the Blizzard Beta Fault intersection on or near section DMEA. A-(Drawing No. GGE 10) indicated on geological plan Drawing GGE 9. Location and attitude of first hole indicated on Drawing GGE 10. The location of the other two holes on this intersection would be made after information from the first hole was evaluated.

Holes to be drilled on the Beta-Willow Fault intersection would be handled in the same manner and as indicated on Drawing No. GGE 11. The first hole would furnish additional information on structure which would allow more intelligent location of following two holes.

Preliminary work before drilling which will be done prior to possible DMEA participation will include reservoir construction, additional road work and probably some shallow drilling of 50' to 60' holes to better define the structure especially that of the Beta-Willow Fault intersection

which has a rather heavy soil cover. Drawings referred to accompany this application as exhibit B.

Phase 2: 10,000 feet of additional drilling contingent on results of the preliminary program under Phase 1. Actual location of drilling and planning on execution of work would be subject to DMEA approval prior to start of this phase of the proposed project.

5 (c) Phase 1 of the program could be completed within four months of contract approval. Actual drilling would take 3 months.

A part of Phase 2 if under taken could be done during the same year providing this work started by Oct. 1st. Completion of the project would be delayed by winter months and it would not be complete until sometime the following year. 18 months after contract date.

(d) Vulcan Silver-Lead Corp. is an owned subsidiary of Callahan Zinc-Lead Co. and retains operating personnel from successful operations of the latter company. The company and personnel therein have carried on profitable operations during the past 40 years in Arizona, Colorado, Idaho, Nevada, New Mexico and Alaska.

General exploration in the uranium field has been underway for two years with intensive study of occurrences in the Gunnison area.

R. F. Mahoney, Vice-President and General Manager, Vulcan Silver-Lead Corp., formerly General Supt., Sunshine Mining Co. is in charge of all mining operations.

J. E. Dunn, Manager in charge of Gunnison area exploration, formerly General Supt. for Callahan Zinc-Lead Co. at Whitepine, Colorado.

Dr. Arthur Baker III, Geologist has had varied experience on base-metals in southwestern U. S. for Coronado Copper and Zinc Co. and Cyprus Mines Corp. His work has been concerned with ore occurrances in the uranium field for the past year. Dr. Baker is in charge of all geological work in the Gunnison area.

## COST ESTIMATE

Phase I

6 (a) Independent Contracts

| | | |
|---|---|---|
| 3000' AX Core Hole @ $4.75 per foot | $14250.00 | |
| 75% of total 2250' casing @ $2.25 per foot. | 5062.50 | |
| Delays for surveying, logging, etc. 5% of total | 965.60 | |
| $6.759 per foot | | $20278.10 |

(b) Payroll (4.5 month period)

| | | |
|---|---|---|
| Chief geologist @ $625.00, mo. 25% of monthly rate. | $703.13 | |
| Jr. geologist @ $450.00 per mo. 75% of monthly rate. | 1518.75 | |
| Misc. general supervision est. for job. | 500.00 | |
| $0.907 per foot | | $2721.88 |

(c) 200 core boxes @ $1.50 $300.00

Gasoline & Oil (transportation) 140.00

$0.147 per foot $440.00

(d) 1 Jeep value $1800.00 @ $30.00 per month. $90.00

Logging equipment value $1000.00 @ $16.67 per month 50.01

Scintillation Equip. value $500. @ $8.34 per month (Rentals calculated on 60 month depreciation basis) 25.02

Tractor dozer est. , 20 hrs. work @ $12.00 per hour. (Rental equipment) 240.00

$0.135 per foot $405.03

(e) None

(f) None

| | | |
|---|---|---|
| (g) Maintenance 1 Jeep, logging equip. and scintillation equip. | $150.00 | |
| Assays (30 est.) @ $6.00 | 180.00 | |
| Accounting | 500.00 | |
| Insurance, Soc. Sec., Comp., etc. 10% payroll | 322.19 | |
| $0.384 per foot | | $1152.19 |
| Total | | $24997.20 |

(h) Contingencies 5%

| | |
|---|---|
| $0.417 per foot | $1249.86 |

Total Cost Phase I

| | |
|---|---|
| $8.749 per foot | $26247.06 |

Phase II

6 (a) Independent Contracts

| | | |
|---|---|---|
| 10,000 ft. AX Core Hole @ $4.75 per foot. | $47500.00 | |
| 75% of total or 7500 ft. casing @ $2.25 per foot. | 16875.00 | |
| Delays for surveying, logging, etc. 5% of total | 3218.75 | |
| $6.759 per foot | | $67593.75 |

(b) Payroll (13 month period)

| | | |
|---|---|---|
| Chief geologist @ $625.00 per mo. 25% of monthly rate | $2031.25 | |
| Jr. geologist @ $450.00 per mo. 75% of monthly rate | 4387.50 | |
| Misc. general supervision est. for job. | 1666.00 | |
| $0.808 per foot | | $8084.75 |

| | | | |
|---|---|---|---|
| (c) | 670 core boxes @ $1.50 | $1005.00 | |
| | Gasoline & Oil (transportation) | 500.00 | |
| | $0.151 per foot | | $1505.00 |
| (d) | 1 Jeep value $1800.00 @ $30.00 per month | $300.00 | |
| | Logging equipment value $1000.00 @ $16.67 per month. | 166.70 | |
| | Scintillation equipment value $500.00 @ $8.34 per month. | 83.40 | |
| | Tractor dozer est., 50 hrs. work @ $12.00 per hour. (Rental equipment) | 600.00 | |
| | $0.115 per foot | | $1150.10 |
| (e) | None | | |
| (f) | None | | |
| (g) | Maintenance 1 Jeep, logging equipment and scintillation equip. | $500.00 | |
| | Assays (100 est.) | 600.00 | |
| | Accounting | 1666.00 | |
| | Insurance, Soc. Sec., Comp., etc. 10% payroll | 975.08 | |
| | $0.374 per foot | | $3741.00 |
| | Total | | $82074.60 |
| (h) | Contingencies 5% | | |
| | $0.410 per foot | | $4103.73 |
| | Total Cost Phase II | | |
| | $8.617 per foot | | $86178.33 |

Total estimated cost of Willow Creek Project --- $112425.39

Copies of bids from 3 drilling companies Exhibit E this application.

Contract drilling costs estimated from MacPherson Drilling Co. bid. Our analysis of the bids indicates that it would be low.

7 (a) Vulcan Silver-Lead Corporation, the applicant, is prepared to furnish 25% of the project cost.

(b) Current monthly costs for the project would be handled through Vulcan Silver-Lead Corporation, Gunnison accounts, with later refund by DMEA of 75% of calculated project cost per foot up to a maximum figure of $6.749 per foot.

Vulcan Silver-Lead Corporation

R. F. Mahoney

R. F. Mahoney
Vice-President

# LIST OF EXHIBITS

Accompanying MF 103

All copies enclosed are a part of application and need not be returned.

Exhibit A : Complete copy of geological report, Willow Creek Group, Arthur Baker III, 1955.

Exhibit B: Maps and Sections

No. GGE 9 Willow Creek Group, Topography and Geology
Proposed DMEA Drilling Area.
Scale : 1" - 1650'

No. GGE 10 Willow Creek Group, Proposed DDH. DMEA - A
Cross-Section.
Scale: 1" - 100'

No. GGE 11 Willow Creek Group, Proposed DDH. DMEA - D
Cross-Section.
Scale: 1" - 100'

No. GGX 1 Willow Creek Group Claim Map showing radiometric
Grid.
Scale: 1" - 1000'

No. GGX 2 Willow Creek Group Drilling Areas
Scale: 1" - 500'

Exhibit C: Copy of lease agreement between Callahan Zinc-Lead Co. and Vulcan Silver-Lead Corp. on Star Group and Beta Group of Claims.

Exhibit D: A list of all claims included in application showing book and page No. of original recording and county of location.

Exhibit E: Copies of drilling proposals submitted by Joy Mfg. Co., MacPherson Drilling Co., and Longyear Drilling Co.

Exhibit F: Copies of Assays -- Beta Group.

GEOLOGICAL REPORT

WILLOW CREEK GROUP (Sections 26-35, T 47 N, R 1 W )

SAGUACHE CO. , COLORADO

AUGUST 25, 1955

ARTHUR BAKER III

INDEX


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DRAWINGS


No. GGC 3 Willow Creek Group, Geology and Topography. Scale: 1" - 1650'

No. GGC 4 Willow Creek Group, Property Ownership and Radiometric Map. Scale: 1" - 1650'

No. GGC 5 Willow Creek Group, Cross Sections A-A', B-B' and Longitudinal Section C-C'

No. GGB 2 Willow Creek Group, Beta Area Geology and Topography. Scale: 1" - 100'

No. GGB 3 Willow Creek Group, Beta Area Radiometric Map. Scale: 1" - 100'

No. GGE 7 Willow Creek Group, Proposed DDH A Cross Section. Scale: 1" - 100'

No. GGE 8 Willow Creek Group, Proposed DDH B Cross Section. Scale: 1" - 100'

## SUMMARY AND CONCLUSIONS

The stratigraphic column in this area includes three sedimentary rock groups: the Dakota formation, 80' thick, the Brushy Basin member of the Morrison formation, 210' thick, and the Salt Wash member of the Morrison formation, 40' thick. These sediments overlie pre-Cambrian granites, and in the eastern part of the area are overlain by Tertiary volcanics. The Dakota and the Salt Wash are predominantly sandstones, somewhat silicified throughout the district. The Brushy Basin, judging from limited exposures, is predominantly siltstone, but in the Beta area at least the uppermost 50' of beds are intensely silicified. In other places, also, some of the uppermost beds are silicified.

The major fault in the area is the Willow Fault, which strikes due East and dips about vertically; this fault has little or no vertical displacement, but has at least 3000' of horizontal displacement, with the north side being moved eastward. One other fault with this attitude is known in the vicinity of the Beta claims. There are several faults striking about N 70° E and dipping vertically; these, also, have large components of horizontal movement, the north sides being moved eastward. At least one large fault strikes N 40° W. All of these faults have had movement since the deposition of the Tertiary volcanics, but the East-striking fault is the youngest.

A radiometric grid survey of the entire claim group shows several areas of anomalously high radioactivity. One of these lies wholly within the volcanic rocks, and is not important, at present. Another lies partly in the volcanics and partly in the pre-Cambrian granite; this one, also, is not important at present. Five other anomalies lie mostly in the upper beds of the Brushy Basin, but some of them lap over into the Dakota. Four of these Brushy Basin anomalies are related to known faults of the N 70° E group.

The Beta anomaly is typical of the radiometric anomalies, except that rock exposures are somewhat better than in the others; for this reason it was chosen for detailed study. The association of the anomalies with faults and the fact that they are generally in the upper part of the Brushy Basin was determined from areal mapping; the detailed work in the Beta area adds the information that the anomalous radioactivity is contained in silicified siltstone, and that the faults contain traces of uranium associated with the oxidized remains of sulfide minerals.

The conclusion I draw from these data is that the anomalies represent concentrations of uranium that was introduced into the silicified siltstone by hydrothermal solutions that entered along the faults -- presumably leakage from deeper mineralization. The persistence of the anomalies into the normally non-radioactive Dakota in places, and the barrenness of the Brushy Basin outside of the anomalies further indicates that the uranium mineralization was introduced by solutions moving along faults. The silicification of the Brushy Basin is not a normal feature

of the Brushy Basin, and I think it probably was caused by an early phase of hydrothermal ~~action.~~ action.

The geology at Willow Creek is almost identical with that at the uranium-producing Thornburg properties, which lie about 12 miles northeast. At Thornburgs', the main structure is an east-west fault (the Los Ochos Fault) with large horizontal displacement, with lesser faults striking N 70° E. The orebodies there occur along the Los Ochos Fault instead of along the N 70° E faults like the anomalies in the Willow Creek area. At least one of the Thornburg orebodies lies at the intersection of the main fault with a N 70° E fault. Silicification of the Brushy Basin is very intense along the Los Ochos Fault in the vicinity of the orebodies, possibly more intense than that in the Beta area on Willow Creek. I understand that surface radioactivity was locally stronger along the Los Ochos Fault than any in the Willow Creek area, and that at one place ore-grade material was found at or close to the surface. However, I understand, also, that much of the surface over the Los Ochos orebodies was essentially non-radioactive.

Thus, at Willow Creek we have an area structurally identical with a nearby known rich uranium mine, and with anomalous concentrations of radioactivity on the surface. The only evident differences between the Willow Creek area and the Thornburg area are in the locations of the anomalies with respect to the structures, and an appreciable difference in the intensity of radioactivity at the surface.

I have recommended four diamond drill holes totalling 1475' of hole to test the Beta anomally because it is the most thoroughly known of the anomalies, and presumably is representative of all of them. Using the Thornburg properties for comparison, if there is any ore beneath the Beta anomaly, there should be at least 20,000 tons. According to hearsay, a conservative estimate of the average grade of the Thornburg ore would be 1% $U_3O_8$; presumably the Willow Creek ore would be similar.

## STRATIGRAPHY

All of the pre-Cambrian rocks exposed in this area are igneous, mostly a uniformly coarse-grained granitic rock. In the western part of the claim group, on the north side of Willow Creek, some finer-grained rocks are exposed in small outcrops.

The Jurassic Salt Wash member of the Morrison formation lies on the pre-Cambrian basement, and is 25' thick at the extreme western end of the area, but somewhat thicker at the east end. 40' has been taken as the average thickness of the member. The only good exposures of the member are west of the claim group, where it is a very hard, probably partly silicified, coarse sandstone; there is no indication of shale partings within the sandstone. In the eastern half of the area, a large part of the surface is underlain by Salt Wash, but outcrops are rare. The boulders found indicate that the Salt Wash here is less silicified than it is farther west.

The Jurassic Brushy Basin member of the Morrison formation overlies the Salt Wash, and at the west end of the property is 210' thick; I have taken this as the average thickness of the member. The only exposures of bedrock Brushy Basin are in bulldozer cuts, of which there are two groups. One group of half a dozen pits lies on Aaberg's ground, just west of our property, and another group of eight pits lies on the Beta group. The pits on Aaberg's ground indicate that the entire thickness of the Brushy Basin in this area is unaltered shale and red or red-green banded siltstone. In the Beta area, pits exposing bedrock are all in the uppermost 50' - 75' of the Brushy Basin, and in this area these beds are intensely silicified to a very hard dense white rock. One of the Beta pits (Pit D) exposes red siltstone, which may lie below the silicified beds or may be an unaltered portion of the same beds. There is no evidence as to the character of the lower half of the Brushy Basin in the Beta area. On the Star claims, one location pit exposes unaltered red and green banded siltstone, but the position of this rock in the Brushy Basin column is unknown. Float material indicates that at least some of the upper beds of the Brushy Basin member are silicified throughout the Willow Creek group of claims.

The Cretaceous Dakota formation, overlying the Brushy Basin, is about 80' thick, and is composed predominantly of coarse sandstone. Near the base is a chert conglomerate that in some exposures is at least 12' thick, but at other places appears to be very thin. The Dakota is everywhere very hard, possibly somewhat silicified.

No exposures of the Cretaceous Mancos formation were found in the field, and it is probable that if there is any Mancos present in the area mapped, it is only in small isolated pockets less than 10' thick. The Mancos formation on the accompanying geologic map (Drawing No. GGC 3) is used to indicate the upper surface of the Dakota formation, to distinguish between areas underlain by the entire thickness of the Dakota as opposed to areas underlain by only part of the formation.

Tertiary volcanics are exposed near the eastern end of the claim group, and east of here they continue for several miles or more. The volcanics in the area mapped belong to the Piedras series, and are mostly flow rocks, though some tuffs may be included.

## STRUCTURE

The sediments in this area are somewhat folded, with dips as steep as 28°, but I have made no attempt to work out the fold pattern because it does not seem important at present. The mapping already done is sufficient to determine the pattern when it seems worth while. I believe, from inspection of the maps, that the fold axes trend northeasterly.

The principal structure in the area is the Willow Fault, which has a general trend of due East, though locally the trend varies as much as 10° north or south of east. The strike is no doubt about the same as the trend, but the dip is indeterminate because there are no exposures of the fault, nor even any places where it can be located within 200' to determine the attitude by the three-point problem. Probably its dip is close to vertical, though it may dip steeply either north or south. This is the most recent fault in the area, offsetting folds and all other faults, and also displacing the volcanics.

The Willow Fault probably has little or no vertical displacement, but has at least 3000' horizontal displacement, the north side being moved eastward. Because of this horizontal displacement and the folding of the sediments, at the west end of the mapped area Dakota on the south side of the fault is apparently dropped against Brushy Basin on the north side, while near the east end of the area pre-Cambrian rocks on the south side are apparently raised into contact with Dakota on the north side. At the east end of the mapped area, the fault splits into two strands, with each strand taking about half of the total horizontal displacement.

Most of the other faults in the area fall into two groups, the most numerous group trending N 60°-70° E, and the less numerous group trending N 20°-40° W. There are also one or more faults trending about due East, possibly close relatives of the Willow Fault, and there is some evidence for one fault trending N 40° E.

The faults of the N 70° E group are older than the Willow Fault, but younger than the N 40° W group and probably younger than the N 40° E fault. The only actual exposure of any of these faults is in a pit on the Beta Fault; this fault is vertical. There is some evidence in the trace of the Elkhorn and Star faults to indicate that they have a steep south dip. Apparent vertical displacement on some of these faults is as much as 100', but the Victor Fault has at least 3000' of horizontal displacement, north side eastward, and it is probable that most of the movement on all of the faults of this group was horizontal.

Of the N 40° W group, only the Beaver Fault can be definitely recognized — by the fact that it drops Tertiary volcanics into position against Morrison sediments. Like the other faults in the area, this one dips about vertically. The apparent vertical displacement on the Beaver Fault is at least 200', the northeast side being dropped, but there is no evidence as to the amount of horizontal displacement. As far as is known, the Beaver is the oldest known fault in the area, but like the others, it is more recent than the Tertiary volcanics. Another fault of this group may lie close to the E 16000 coordinate, but the only evidence for its existence is the apparent thinness of the Brushy Basin in this area; possibly folding or a fault of another system couldcause this.

Of the east-trending faults, except for the Willow Fault, the only important one recognized was the Blizzard Fault in the Beta Area. This fault strikes N 85° E and dips 65° N. It has about 100' apparent vertical displacement, the south side being dropped, but probably this apparent displacement is due to horizontal movement. Two or possibly three minor east-striking faults are suspected in the eastern part of the area, in the pre-Cambrian terrane.

In the area of the Star claim group, the presence of a fault trending N 40° E is suspected from apparent displacement of the Salt Wash member, but no fault is exposed. Possibly folding or a fault of another group has caused the apparent thinning of the Brushy Basin.

## MINERALIZATION

A radiometric grid survey was made of the entire area covered by the Willow Creek claim group, using the corners of the claims for points on the grid. In some small areas, side center monuments were also used. The results of this grid survey are shown on Drawing No. GGC 4, Property Ownership and Radiometric Map. In addition, part of the Beta Area was covered by a radiometric grid using a 200' interval with closer intervals in some parts (see Drawing No. GGB 3, Beta Area Radiometric Map).

For all of the radiometric work in the Willow Creek group, the background used is the lowest reading found in the area, corresponding to 5 cps on the Detectron Nucliometer DR 290, and to 0.0095 mr/hr on the Precision Radiation Instruments Inc. Model [illegible] Scintillator. Only a few of the readings taken were as low as this arbitrary background, and they can probably be considered as anomalously low. This point must be kept in mind in interpreting the radiometric maps, since use of such a low background makes most of the readings appear well above background. Actually, any reading shown on the maps as less than 2 x background is not significantly high, and in general readings up to 2.4 x background do not mean much. Readings above 2.8 x background probably can be considered truly anomalous.

Radioactivity of the Dakota formation for the most part ranges between

background and 2.4 x background, with only two small areas having radioactivity higher than 2.4 x background. These areas of higher radioactivity may be significant, in view of the generally low radioactivity. The Salt Wash member and the alluvium likewise have very low radioactivity in general.

Near the eastern edge of the claim group are two radiometric highs, one of them wholly within the volcanic area, and the other partly in the volcanics and partly in the pre-Cambrian granite. These may be caused in part by variations in the original uranium content of the volcanics, although this explanation hardly accounts for the radioactivity of the granite. Further work will have to be done here if uranium is found anywhere in the area. Near Corner I of the Victor 60 Claim is a small area of relatively very high radioactivity, in an easterly-striking ridge of silicified pre-Cambrian granite. A fractured zone is exposed in an old pit, and thin veinlets of hematite-stained material occupy some of the fractures. This material strongly resembles the thorium-bearing vein fillings found near Powderhorn, a few miles west of here. No uranium minerals are visible. So far I have not been able to collect any material that is radioactive enough to justify an assay for thorium, but I suspect that thorium is the source of the radioactivity. If I am correct, this occurrence has no bearing on the possible presence of uranium in the sediments, since the thorium mineralization is older than the Jurassic sediments (Burbank and Pierson, USGS Circular 236, p. 2). Should uranium be found in the area, this occurrence will require more work, on the chance that I am mistaken in identifying the thorium mineralization.

The most radioactive rock in the area is the Brushy Basin member; about half of the area underlain by this member has radioactivity less than 2 x background, with the other half having radioactivity ranging as high as 4 x background. Five areas in the Brushy Basin, including two areas partly in the Dakota have anomalously high radioactivity greater than 2.8 x background. Two of these anomalies appear to be related to the Beta Fault, and two to the Elkhorn Fault, while the fifth is not close to any known fault. A possible sixth anomaly lies along the Star Fault; readings in this area lie between 2.4 x and 2.8 x background, but their relationship to the fault makes them interesting. The details of only one anomaly, that on the Beta group of claims, have been worked out; this anomaly is covered in the later section on the Beta area.

The relationship between the anomalous areas in the Brushy Basin and the faults indicates a hydrothermal source for the uranium. Radioactivity is notably weak along the Willow Fault, although this is the strongest structure in the area. One explanation for this is the fact that over most of the area the fault is either in unfavorable Dakota formation, or else is covered by a thick layer of Dakota float. Possibly the anomaly near coordinates N 6500, E 12000 is related to the intersection of the Beta and Willow Faults.

All of the anomalies lie in the uppermost beds of the Brushy Basin--in approximately the same beds that are silicified where exposed in the

Beta pits. Evidently these beds are the most efficient collectors of uranium in the stratigraphic column. There is a very slight possibility that these beds were originally deposited with a higher-than-average uranium content, and that the present anomalies are simply areas in which these beds are not covered or are less covered by barren alluvium. I very much doubt that this is the true explanation, however; there is no evidence to indicate that these areas have less alluvium on them than other areas, and the relationship to faults is quite clear.

Bulldozer work on the Beta claims has opened the Beta and Blizzard faults, and exposed slight uranium mineralization in chalcedony in the fault zones. This is described in more detail in the following section.

## BETA AREA

Stratigraphy: See Drawing No. GGB 2, Beta Area Geology and Topography. Except for two small patches of Dakota, the entire Beta area is underlain by rocks of the Brushy Basin member; probably not more than the upper half of the Brushy Basin would be exposed if the soil cover were removed. The Dakota is about 80' thick, predominantly sandstone but with a bed of conglomerate at least 10' thick at or near the bottom. The sandstone is very hard, partly silicified, but no more so than elsewhere in the Willow Creek area.

The only exposures of Brushy Basin bedrock are in the several bulldozer cuts. In Pit D, the rock exposed is a red siltstone similar to the ordinary Brushy Basin as seen in other districts. In all of the other pits, the rock exposed is principally a very hard, dense white to gray silicified material, which I have called silicified siltstone. All of this rock is thoroughly shattered, though in most places with no particular pattern to the fractures, and fracture surfaces are lightly limonite-stained. Some of the rock contains casts of small pyrite crystals; the pyrite was probably formed during silicification, from iron originally contained in the sediments.

In Pit G the rock exposed is partly silicified siltstone interbedded with a soft white clay material that appears to be an alteration product of the silicified siltstone. At one end of this pit is a small exposure of fine-grained limestone, which seems to grade into silicified siltstone; probably some of the material that I have mapped as silicified siltstone is actually silicified limestone, with all trace of its original identity lost. Limestone boulders are numerous in the rubble exposed in Pit H, suggesting that there is at least one limestone bed below the silicified siltstone bed. Much of this limestone is strongly recrystallized and iron-stained, probably because the boulders are mostly derived from the vicinity of the faulting.

There is no evidence as to the character of the lower part of the Brushy Basin or of the Salt Wash in the Beta area.

Structure: The area lies on the flank of a fold, with the bedding striking northeasterly and dipping as steeply as 28° southeast.

Two faults lie close together or intersect in the area: the Beta Fault, with an attitude of N 75° E. vertical, and the Blizzard Fault with an attitude of N 85° E, 65° N. Probably the movement on both faults was largely horizontal, but because of the folding, the apparent vertical displacements are 40' plus on the Beta and 60' plus on the Blizzard, the south side being dropped in each case.

There are also many minor shears, especially close to these two major faults. Most of these strike between due West and N 45° W, and dip 50° to 80° N. None have appreciable displacement, and they are probably simply minor adjustments related to the major faults.

Mineralization: The most radioactive places in the Beta area are in the pits exposing the silicified siltstone; this rock has radioactivity ranging from 3 x to 4.5 x background, with 4 x background the average and most common reading. There is no increase in radioactivity close to the faults. None of the siltstone is recognizably radioactive in hand specimen, nor does any of it contain uranium minerals recognizable either in daylight or ultraviolet light. Of the other rocks exposed, the red siltstone has about 2.4 x background, and the Dakota sandstones have about 1.4 x background.

Drawing No. GGC 4, Beta Area Radiometric Map, shows the results of a radiometric grid survey in the Beta area. The anomalously high (greater than 2.8 x background) radioactive area is an irregular inverted V, within which are several smaller patches with radioactivity above 3.2 x background. The entire Beta area is covered with a soil mantle of variable depth, so there is undoubtedly some distortion of the radiometric pattern caused by movement of radioactive float. It is reasonably certain that the entire anomaly is caused by the radioactivity of the silicified siltstone, both in bedrock and in float. The largest bedrock mass of the siltstone underlies roughly the apex of the V, and two smaller bedrock masses lie under each arm of the V -- segments of the bed dropped by the Beta and Blizzard Faults. Between and around these patches of radioactive bedrock, principally on the down-slope sides, radioactive float covers the barren bedrock, filling in and distorting the V.

Unless there is unrecognized faulting, the silicified siltstone bed continues north of the apex of the V-shaped anomaly, although the anomalous radioactivity does not continue, and similarly, the same bed lies south of the Dakota in the southwestern part of the map, although here the radioactivity is not anomalously high. This suggests that the radioactivity of the siltstone is not persistent throughout the bed -- either because uranium was not introduced into it, or because the bed in these non-radioactive areas was not capable of holding uranium, perhaps because here it is not silicified. There is nothing in the known geology to explain such distribution of either uranium or silicification. Another

possible but unlikely explanation for the lack of radioactivity in these places is that the siltstone is both silicified and uranium-bearing, but is completely covered with a thick mantle of barren material.

The Beta and Blizzard Faults are each well exposed in one pit, both at places where the Dakota lies on one side of the fault and silicified siltstone on the other. In the Beta exposure, the principal movement seems to have taken place along a vertical knife-edge seam, with little disturbance of the Dakota beyond this seam. The silicified siltstone on the other side, however, is thoroughly shattered and somewhat sheared for a distance of 50' from the seam. Aside from the more intense shearing, there is little to distinguish this zone from other parts o f the silicified siltstone except the presence of red clay in the fractures, and this may well have been washed in by ground waters. At one place, near the middle of the shear zone, however, is a small lens -- perhaps six feet long by six inches wide; the ground is torn up by the bulldozer -- of reddish-brown jasper with small masses of porous limonite that probably are the remains of original sulfides. This jasper contains thin films and stringers of chalcedony that fluoresces a bright green; a five-pound sample picked for its chalcedony content was appreciably radioactive, and a chemical assay of this material showed 0.032% $U_3O_8$ (assay by C. O. Parker, Denver). I would estimate that a pure sample of chalcedony would assay about 0.6% $U_3O_8$.

On the Blizzard Fault, the shear zone is at least 60' wide, about half of which width is in Dakota and half in silicified siltstone. The shearing in the silicified siltstone is like that on the Beta Fault; in the hard Dakota sandstone there are some strands of breccia cemented by limonite-stained limy cement, and numerous large blocks of unbroken sandstone. There are at least two lenses of jasper with films of fluorescent radioactive chalcedony.

The chalcedony is the only material in the area that is recognisably radioactive in small masses, and it occurs only in the jasper lenses in the fault zones. This is significant in that it indicates the presence, at one time, of uranium-bearing solutions in the faults. The chalcedony itself is probably a secondary mineral, and the uranium in it no doubt came from an earlier mineral, but the association with the jasper and leached sulfides strongly suggests that the uranium was originally introduced by hydrothermal solutions.

## WATER SUPPLY

The Beta Area, and the Willow Creek group of claims in general, is dry. Willow Creek itself runs during the Spring, but is dry the rest of the year, including now, after a month of rainy weather.

Possible sources of surface water in amounts large enough for diamond drilling are: Vulcan Mine, Beaver Creek, and a beaver dam about two miles down Willow Creek from the Beta.

The Vulcan Mine is 8 miles by road from the Beta group, and five miles of this road would have to be smoothed with a cat to make it passable for a water truck. At least one mile of this would be over ground that is predominantly sandstone boulders and I believe it would be necessary to haul dirt to make a reasonably smooth road surface.

Beaver Creek is nearly 5 miles by jeep trail from the Beta group, and all of this would have to be smoothed with a cat. There is one short ( one-quarter mile) length of rather steep grade, coming out of Beaver Creek. At least two miles of road would be across boulder ground where it would be necessary to haul dirt to make a smooth road surface.

I have not visited the beaver dam on Willow Creek below the Beta, so cannot give any first-hand information on it. I understand from Jim Dunn that it is on patented ground, so we would have to get permission to haul water from it. The bottom of Willow Creek Canyon is mostly boulders, and would be difficult to grade into a road, but a road could probably be cut out of the finer material on the slopes with little difficulty. This is probably the cheapest source of water, if we must haul it.

It is possible that we could get water closer to the Beta group by bulldozing a hole either in the bottom of Willow Creek, or at a wet-weather spring part way up the canyon that runs along the east side of the Beta area. I doubt that we could get much of a hole, however, because this ground is predominantly sandstone and conglomerate boulders up to 5' in diameter. A more effective but more expensive method would be to drill one or more diamond drill holes in this canyon, in hopes of developing a water supply from the Salt Wash sandstone that underlies it. I have laid out a hole (Proposed DDH A) primarily for this purpose, to try to hit the intersection of the Blizzard Fault and the Salt Wash. I think we would stand a very good chance of finding water at this intersection. We would still, however, have to build a road to haul water to do this drilling. The cost of Proposed DDH A would be in the nieghborhood of $500, exclusive of the cost of getting the water to drill it. Assuming a cost of $300 to build a road and haul water for this hole, and assuming that the first hole develops enough water for our purposes, this would make a water cost of 59¢ per foot for the 1350' minimum drilling that I have recommended, exclusive of the cost of pumping and piping the water to the drill sites. An alternative plan would be to haul water for the preliminary prospect drillholes, and develop a water supply if we get encouragement enough for further drilling.

RECOMMENDATIONS

Since all of the anomalies are similar as far as present knowledge goes, a thorough test of one anomaly should give us a fair estimate of the quality of all of them; the Beta anomaly is the logical choice for this, of course, since it is the most thoroughly mapped.

I have laid out Proposed DDH A, a vertical hole 125' long at N 4585, E 2980, primarily to develop a water supply for further drilling. Secondary purposes for this hole, however, are to test the Blizzard Fault for mineralization in this location, and also to determine the stratigraphy of the lower Brushy Basin and the Salt Wash. This latter information would be very useful in interpreting the more important holes testing the Beta anomaly itself.

Proposed DDH B, at N 4570, E 3815, bearing S 11° E, - 80°, 450' long, is intended to test the intersection of the Blizzard Fault with the Salt Wash. I am not satisfied that the dips I have determined for the faults are accurate, but if we get good core recovery we should be able to locate the faults in the hole, and thus determine accurate dips. It is to be hoped, of course, that we will also find ore with this hole, but if we do not, at least two more holes should be drilled on these structures to be certain. I think that about 500' west of Proposed DDH B the Beta and Blizzard Faults intersect at the elevation of the Salt Wash, and if there is such an intersection it is the most favorable place for ore. I have not aimed the first hole for this intersection because I think it will be cheaper to use the first hole to determine the attitude of the faults, although in a less favorable location, and thus be able to spot the intersection accurately. With the intersection located, two holes should be enough to determine whether it is mineralized; these holes would probably be parallel to Proposed DDH B, and like it would be about 450' long. (Two weeks ago I estimated 200' holes would be long enough; this estimate was sadly in error).

The total footage of drill hole necessary to prove the Beta anomaly barren, and the other anomalies barren by inference, would then be 1350', or 1475' if Proposed DDH A is also drilled. All of this should be core drilling, with every effort made to recover as much core as possible, since it is in unknown ground. If any of the holes show mineralization, or possibly if they show only favorable alteration, further drilling would of course be necessary; core might not have to be recovered from all of this second-phase drilling. I can make no estimate of the amount of such drilling that might be necessary.

While the Beta area is being drilled, it would be well to do a limited amount of bulldozer work on some or all of the other anomalies, to attempt to determine whether these anomalies are similar in all respects to the Beta anomaly. If any are significantly different, some diamond drilling may be advisable on the different ones even if no ore is found on the Beta. About one week's bulldozer work on each of three anomalies should be sufficient.

Arthur Baker III

Arthur Baker III

Exhibit "C"

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# L E A S E

THIS LEASE, made and entered into as of this 1st day of October, 1954, by and between CALLAHAN ZINC-LEAD COMPANY, a corporation organized under the laws of the State of Arizona, and duly qualified to transact business in the State of Colorado, party of the first part, hereinafter called the Lessor, and VULCAN SILVER-LEAD CORPORATION, an Idaho corporation, party of the second part, hereinafter called the Lessee, WITNESSETH:

## Article 1. Description of Property.

The Lessor, for and in consideration of the sum of One Dollar ($1.00) to it in hand paid by the Lessee, the receipt whereof is hereby acknowledged, and for and in consideration of the covenants and agreements of the Lessee hereinafter set forth, does hereby lease, let and demise unto the Lessee, its successors and assigns, the following unpatented lode mining claims, situated in Saguache and Gunnison Counties, State of Colorado, to wit:

Star, Star #1, Star #2, Star #3, Star #4, Star #5
Star #6, Star #7, Star #8.

Located in sections 3 and 4, T46N, R1W New Mexico
Principal Meridian and section 34, T47N, R1W N.M.P.M.
All situated and recorded in Saguache County, Colorado.

Beta, Beta #1, Beta #2, Beta #3.

Located in sections 31 and/or 32 T47N, R1W N.M.P.M.
Recorded in both Gunnison and Saguache counties.

## Article 2. Term of Lease.

TO HAVE AND TO HOLD unto the Lessee for the term of thirty (30) years from the 1st day of September, 1954, subject, however, to termination by forfeiture, cancellation or surrender within said term as hereinafter provided.

## Article 3. Possession and Control of Property.

The Lessor hereby gives and grants to the Lessee the right immediately to enter upon and take over the sole and exclusive possession and control of the property and the whole and every part thereof, and during

the effective term of this lease the Lessee shall remain in the sole and exclusive possession and control thereof. The Lessee is also granted the right to investigate, measure, sample, examine, test, develop, work, mine, operate, use, manage and control said property; to erect, construct, use and maintain such buildings, structures, machinery and equipment as may be required by the Lessee for the conduct of its mining and milling operations; and to mine, extract and remove from said property the ores and minerals contained therein and to treat, mill, ship, sell or otherwise dispose of the same and receive the full proceeds therefrom, subject to the terms and conditions hereinafter set forth.

Article 4. Entry, Manner of Work, and Conformity with Laws.

The Lessee agrees to cause all explorations, development and mining work hereunder to be done in a careful and miner-like manner, and to conform in all respects to the Mining Laws and Regulations of the State of Colorado and of the United States of America, as more specifically provided in paragraph B of Article 25 hereof.

Article 5. Work Requirements.

A. The Lessee further agrees (a) to take immediate possession of the property, (b) to proceed promptly with preparations necessary for the exploration thereof, (c) to complete all discovery work thereon and assume all costs incurred or to be incurred subsequent to September 1st, 1954, (d) to perform all assessment work necessary to preserve and maintain possessory title to said claims each year during the currency of this lease, and to file timely proof thereof as required by law, (e) to pay all taxes, or other lawful impositions, levied or imposed upon said property as provided by Article 22, and (f) to diligently explore and develop said property with the end in view of recovering the values therefrom as promptly and expeditiously as possible. Such work shall be prosecuted diligently, subject only to delays due to shortage of labor.

Article 6. Termination of Lease.

The Lessee reserves the right hereby expressly granted by the Lessor

to terminate this lease and surrender the property to the Lessor at any time during the term of this lease, upon ninety days written notice to the Lessor of its intention so to do.

Article 7. Mining Operations.

The Lessee (unless this lease shall be terminated under Article 6) shall proceed with reasonable diligence the exploration and development of the property, placing thereon, within a reasonable time such mining, milling and other equipment, buildings, etc. of the kind, type, character and quality deemed advisable in the Lessee's sole judgment, advancing all money required for that purpose, including working capital, subject, however, to the right of the Lessee to be reimbursed therefor as hereinafter provided in Article 14.

Article 8. Additional Work.

Nothing herein contained shall be construed to prevent the Lessee from conducting any and all such exploratory, development or mining work on the property as may seem advisable to the Lessee in its sole judgment for the benefit of the enterprise, advancing all moneys required in connection therewith; and the Lessee shall be entitled to reimbursement as provided in Article 14 for all capital expenditure in connection therewith, including all expenditures made before the property shall be placed on a profitable operating basis, operating expenditures made thereafter to be deducted in the determination of net profits under Article 15 hereof.

Article 9. Overhead Expenses.

Until such time as the property shall be placed on a profitable operating basis, the Lessee shall be entitled to charge Five Hundred ($500) per month for the general administration of its Wallace and New York offices, that is to say, for management above that of resident superintendent or manager of the property, and such charge shall be considered as an advance for which the Lessee shall be reimbursed as provided in Article 14; and from and after the first day of the month following the commencement of production on a commercial basis such charge shall be increased to the sum of One Thousand Dollars ($1,000) per month, the amount of such increase to be

due and payable, however, only to the extent that there shall be net profits as defined in Article 15 and as determined after deducting the minimum charge of Five Hundred Dollars ($500) per month for general administration.

Article 10. Royalties.

A. Royalty Period.

The Lessee shall pay to the Lessor the royalties prescribed in paragraph B of this Article until such time as the Lessor shall become entitled to share in the profits of operations as provided in Article 14; and royalties allocable to the first quarterly period in which such profits are derived shall be credited against the share of the Lessor in such profits, to the end that the Lessor shall be entitled to receive royalties for that period or its shares of the profits, whichever shall be greater in amount; and the payment of royalties hereunder shall not be resumed unless and until the Lessor shall become entitled thereto as provided in Article 17.

B. Royalties on Ores.

The Lessee shall pay royalties on all ores mined and shipped from said property equal to ten per cent (10%) of the gross receipts received for the product, including all premiums, bonuses or subsidies except where by law or governmental regulation such premiums, bonuses and subsidies, or any part thereof, are excluded from the computation of royalties (but not including haulage or development allowances).

Article 11. Advance Royalties.

Commencing July 1st, 1955, as an advance on account of royalties, payable under Article 10, and to provide for the corporate expense of the Lessor, the Lessee agrees to pay the Lessor the sum of $400.00 per month (a) until such time as Lessee may elect to terminate this lease, as provided in Article 6, or (b) until royalties shall be due and payable hereunder, whichever event shall occur first, provided, however, that if such royalties shall be less than Four Hundred Dollars ($400.00) per month the deficiency, if any, for the applicable quarter shall be advanced by the Lessee against royalties thereafter payable hereunder; and provided further, that all royalties in excess of Twelve Hundred Dollars ($1200.00) per quarter shall

be retained by the Lessee until it shall have been fully reimbursed for royalties advanced hereunder.

Article 12. Gross Receipts.

The term "Gross Receipts" shall be interpreted to mean the total amount received by the Lessee, (i. e. the selling price) for all ore produced and shipped from said property, including premiums, bonuses and subsidies, but not including haulage and development allowances.

Article 13. Development Allowances.

The Lessee covenants and agrees to use any and all development allowances paid pursuant to the Atomic Energy Commission Domestic Uranium Circular No. 5, as amended, which shall be received for ore mined from said leased property exclusively for development work on the property leased hereunder and not for development work on any other property.

Article 14. Application of Profits.

Any and all net profits derived and determined as provided in Article 15 hereof shall be applied, first, to reimburse the Lessee for its advance or expenditures under Articles 5, 7, 8, 9, 17, 22, 23, 25, and 33 hereof (if any, not otherwise deducted in determining net profits) and, second, to establish and maintain working capital in addition to that provided by the Lessee under Article 7, in such reasonable amount as the parties shall from time to time mutually agree upon. Any such profits as may be in excess of the foregoing requirements shall be divided equally between the Lessor and Lessee.

Article 15. Determination of Net Profits.

"Net Profits" shall be determined by deducting total expenses of whatsoever nature in connection with the operation of the property, including royalties under Article 10 from the net proceeds of the crude ores and/or concentrates and other products of the property, but without deduction for depletion or depreciation; and such total expenses shall include also

(a) A charge for general administration of the Lessee's Wallace and New York offices in an amount not less than the minimum and not more than the maximum prescribed by Article 9;

(b) The actual cost of the Lessee's traveling auditor's audit of the accounts about once a year;

(c) The cost of insurance placed and carried by the Lessee under Article 23 or otherwise; and

(d) All taxes, assessments and governmental charges lawfully imposed upon the property or any part thereof, the operations conducted hereunder, or the sale of the product, or in respect to or measured by production, extraction, smelting, refining, sale, transportation, proceeds or value of the product or the metals derived therefrom, other than those for which the Lessee shall be entitled to reimbursement as provided in Article 22, and other than Federal and Colorado income taxes, net profits taxes (except property taxes based on net profits), and taxes of a similar nature, levied by such governmental instrumentality or subdivision thereof, upon the Lessor or the Lessee and which shall be for the account of the party directly responsible therefor.

Article 16. Losses in Operation.

Any loss sustained in the operation of the property during any month shall be a charge upon first net profits thereafter derived.

Article 17. Additional Advances.

If, after the Lessee shall have been reimbursed and working capital shall have been established and maintained, as provided in Article 14, it shall become necessary at any time for the Lessee in its sole judgment to advance additional funds for capital expenditures in excess of those referred to in Article 26, or to continue operations when working capital shall be depleted or exhausted, the amount of such advances shall be repaid to the Lessee out of the first profits thereafter derived with interest thereon at the rate of five per cent (5%) per annum; and if and when the Lessee shall have been so reimbursed with interest and thereafter working capital shall have been established again in the amount prescribed in Article 14, profits shall then be divided equally between the Lessor and the Lessee; provided, however, that if the Lessee shall elect to make advances hereunder to continue operations at a loss to the mine, there shall be paid to the Lessor during such period a royalty of fifty cents (50¢) per ton of crude ore produced from

the property and sold or otherwise disposed of, it being expressly stipulated and agreed that such payments and losses by the Lessee shall constitute an advance or expenditure for which it shall be entitled to reimbursement as hereinabove provided.

Article 18. Maps and Surveys.

The Lessee shall at all times have sufficient surveys and maps made and kept subject to inspection by the Lessor so that the Lessor may be fully informed of the nature and character of the mine workings and operations performed hereunder. The Lessee shall furnish the Lessor from time to time with the monthly operating reports of the superintendent or manager of the property, and, at quarterly periods, if the Lessor so desires, with copies of the logs of all drill holes which have been drilled by the Lessee within the property.

Article 19. Statements of Account.

Ore settlement statements showing royalty due, if any, shall be rendered and the royalty due shall be paid on or before the 25th day of each month on all lots settled for at the mill or smelter or other purchasing agency, during the preceding month; and as soon as conveniently possible after the termination of each quarterly period of each calendar year, the Lessee will render to the Lessor a statement of account in reasonable detail, which quarterly statement shall be accompanied by a payment of the profits or royalties to be accounted for hereunder, if any; and the Lessor shall have sixty (60) days from the date of mailing the said statements within which to examine the same and object thereto in writing if any error is found therein, it being understood and agreed that failing such objection within said period the statement shall be considered as correct.

Article 20. The Records.

The Lessee agrees that it will keep and maintain at the property correct and complete books of account and records showing truthfully and accurately and in all reasonable detail the amount of all metals, minerals or ores mined or recovered and/or milled on the property, the weight and assay value of all products shipped therefrom, the names and addresses of the parties

to whom shipments of product are made, any and all returns received therefrom the gross proceeds thereof, the cost of mining operations and capital expenditures from time to time, and all other particulars necessary and proper for the true and accurate ascertainment of royalties or net profits, and to enable the Lessor to be currently informed and assured as to the correctness of the statements of account to be rendered by the Lessee from time to time as herein provided, its accredited representatives at all reasonable times shall have full and free access to the property and to the plants on the property handling the ores at the sole risk and expense of the Lessor and also the right to inspect and audit all such records and books of account kept by the Lessee at the property relating to any matters in this agreement referred to, and to inspect, check and if deemed advisable or desirable to make copies of any extracts from all reports, records, memoranda, books of account, assay or sampling, smelting, milling or concentrating returns, or other documents, vouchers or memoranda at the property in any way relating to or referring to the matters in this agreement mentioned; provided, however, that such inspection, audit, checking and/or copying shall not unreasonably interfere with the business requirements of the Lessee.

Article 21. Encumbrance.

The Lessor agrees that during the period hereof it will not mortgage, sell or otherwise encumber or dispose of the property subject to this lease without giving the Lessee previous written notice of its intention to do so, and further, that any such encumbrance or disposition of the property or any part thereof shall be made expressly subject to the rights of the Lessee hereunder in such manner as may be approved by counsel for the Lessee.

Article 22. Payment of Taxes.

The Lessee shall pay or if the Lessor shall have paid the Lessee shall reimburse the Lessor for all taxes upon said property falling due during the term of this lease and while the same is in force and effect prorated from and after the date hereof, and shall also pay, when due and before delinquent, all taxes levied or assessed against any and all personal property, machinery and equipment placed upon said property by the Lessee during the term of this

lease. The Lessee shall be liable for and undertakes to pay all sales taxes and other taxes of every kind, character and description levied or imposed during the term of this lease upon the ores, minerals, concentrates or products of ores produced, sold or otherwise disposed of by the Lessee, and all taxes levied against the Lessee as an employer of labor, all such taxes to be promptly paid when due and before delinquent; and the Lessee shall be entitled to reimbursement for all taxes paid hereunder as provided in Article 14 until the property shall be placed on a profitable operating basis when the same shall be deducted in determining net profits as provided in Article 15. However, nothing herein contained shall be construed as obligating the Lessee to pay mine license taxes payable by the Lessor and which shall be for Lessor's sole account.

Article 23. Insurance.

The Lessee, at all times during the term of this lease, shall

(a) keep the leased property and all structures at any time thereon, or at any time being erected thereon, adequately insured against loss or damage by fire, lightning, tornado, cyclone, explosions and/or other risk against which insurance is usually carried by mining companies operating in the same territory, by a reputable insurance company or companies in an amount equal to the full insurable value thereof; any loss in respect of any property so insured to be made payable to the Lessor and Lessee, as their interests may appear, and any proceeds of insurance in excess of the amount necessary for the cost of repairs, restorations and replacements to the property shall be applied as provided in Article 14; it being agreed that if the proceeds of insurance shall be insufficient to provide for the cost of repairs, restorations and replacements, the amount of the deficit shall be charged to operations or advanced by the Lessee if operations shall not have been commenced.

(b) purchase public liability and property damage liability insurance in amounts satisfactory to the Lessor whereby the insurance company will agree to pay on behalf of the Lessee all sums which the Lessee shall become obligated to pay by reason of the liability imposed by law because of bodily injury, including death at any time resulting therefrom, sustained

by any person or persons, or damage to or destruction of property of others caused by accident; and

(c) carry Workmen's Compensation and such other insurance as may be required by the laws and mining regulations of the State of Colorado.

Should the Lessee fail to effect or maintain insurance as provided in this agreement, the Lessor may, but shall not be required to, take out insurance or additional insurance; and the Lessor shall be entitled to receive reimbursement therefor from the Lessee.

The Lessee shall be entitled to reimbursement for all expenses incurred under this Article 23 as provided in Article 14 until the property shall be placed upon a profitable operating basis.

Article 24. Protection from Liens and Damages.

The Lessee shall keep said property and the whole and every part thereof free and clear of liens for labor done or work performed upon said property or materials furnished to it for the development or operation thereof under this lease and while the same is in force and effect, and Lessee will save and keep harmless the Lessor from all costs, loss or damage which may arise by reason of injury to any persons employed by the Lessee in or upon said property or any part thereof, or which may arise by reason of injury to any persons, livestock or damage done to any other property as the result of any work or operations of the Lessee or of its possession and occupancy of the property.

Article 25. Posting Notices and Conformity with Law.

A. The Lessee shall post and keep posted written or printed notices in due form and in compliance with the requirements of the lien laws of the State of Colorado, showing that the property is being worked by the Lessee under lease only and that the Lessor will not be subject to any lien whatever.

B. The Lessee shall observe and promptly comply with all local, county, state and federal laws, statutes, ordinances, rules, regulations, orders and requirements and those of any departments and bureaus of the federal, state and local governments with reference to said property, buildings thereon, and any labor performed thereon, or to any operations thereon; provided, however, that the Lessee shall have the right to contest the validity of any of the

foregoing, taking all such steps as shall be reasonably required to protect the interests of the Lessor; and all expenses incurred or reserves set up in complying therewith shall be capital expenditures (for which the Lessee shall be entitled to reimbursement as provided in Article 14) until the property is placed upon an operating basis and thereafter shall be charged to operations.

Article 26. Replacements.

If at any time during the period of this lease capital expenditures shall be required in the Lessee's sole judgment for the benefit of the operations contemplated herein, in addition to those made before the property shall be placed upon an operating basis, either for increase of mill capacity, substitution or replacement of machinery, or otherwise, the parties hereto agree that any such capital expenditures in an amount not exceeding in the aggregate two hundred fifty thousand dollars ($250,000.00). in any one calendar year shall be deemed expenses in connection with the operation of the property and as such shall be deducted in determining "net profits" as provided in Article 15 hereof.

Article 27. Force Majeure.

If the Lessee shall be delayed at any time during the period of this lease in keeping or performing any agreement on its part to be kept or performed according to the terms and provisions hereof, except the payment of royalties, profits and taxes, by any act or neglect of the Lessor or by strikes, lockouts, fire, unusual delay in transportation, orders of the Government, or any duly constituted instrumentality thereof, unavoidable casualties, or any causes beyond the control of the Lessee, such delay shall not be deemed a breach of this lease or a default on the part of the Lessee constituting a cause for forfeiture; and the Lessee agrees to use reasonable diligence to remove such causes of disability as may occur from time to time. The Lessee shall not be required to mine, mill, or otherwise dispose of the products from said property during periods of financial crises when the metals produced are salable only at abnormally low prices.

It is expressly stipulated and agreed that the Lessee shall promptly notify the Lessor in writing of the commencement or termination of any such

delays or suspensions of performance hereunder, and that the term of this lease shall be extended for a term equal to the period or periods thereof.

Article 28. Forfeiture Clause.

The failure of the Lessee to make or cause to be made any payment herein provided for, or to keep or perform any agreement on its part to be kept and performed according to the terms and provisions of this lease shall, at the election of the Lessor, and upon giving notice thereof to the Lessee, constitute a forfeiture of this lease; provided, however, that in the event of a default on the part of the Lessee, and the election of the Lessor to terminate this lease on account thereof, the Lessor shall give to the Lessee a written notice of its intention to declare a forfeiture of this lease and to terminate the same on account thereof, specifying the particular default or defaults relied upon by it. The Lessee shall have ninety (90) days after receipt of such notice in which to cure such default or defaults, and if such default or defaults are fully cured, there shall be no forfeiture of this lease with respect to such default or defaults. No waiver of and no failure or neglect on the part of the Lessor to give notice of a default or defaults shall effect any subsequent default or impair the Lessor's rights resulting therefrom.

Article 29. Surrender of Property.

Upon termination of this lease either by limitation or at the election of the Lessee as provided in Article 6, or by default as provided in Article 28, the Lessee shall evidence such termination by recordable document, surrender possession of the property and pay all bills or other obligations incurred by it in connection therewith and all royalties or profits due to the Lessor up to date of such termination.

In the event that such termination shall occur before the property is placed upon a profitable operating basis, the Lessee shall have the right to remove from the property the equipment, materials and supplies placed thereon by it, subject, however, to the right of the Lessor to purchase (a) any one or more of the units of removable equipment on the basis of the cost thereof to the Lessee erected or placed on the property, less ten per

cent (10%) per year for depreciation, and (b) all or any part of such materials and supplies on the basis of the delivered cost thereof to the Lessee.

In the event, however, that such termination shall occur after the property shall have been placed upon a profitable operating basis but before the Lessee shall have been fully reimbursed for its expenditures under Articles 5, 7, 8, 9, 17, 22, 23, 25, and 33 hereof, then any cash available in the working capital account shall be applied to so reimburse the Lessee, and the Lessee shall have the further right to remove from the property equipment, materials and supplies of a fair market value not exceeding the amount required for such reimbursement, subject, however, to the right of the Lessor to purchase any of such equipment, materials and supplies at the then fair market value thereof.

If, however, the Lessee shall have been previously so fully reimbursed, or shall be so fully reimbursed through the application of working capital as hereinabove provided, then the amount of any remaining working capital shall be divided equally between the Lessor and the Lessee, and for that purpose the equipment, materials and supplies remaining on the property shall be sold or otherwise disposed of on the basis of the best terms available.

Nothing herein contained shall be construed to permit the removal from the property of mine timbers and mine tracks, ties and pipe lines in place or other permanent improvements on the property the title to which is hereby vested in the Lessor.

Upon termination of this lease either by limitation or at the election of the Lessee as provided in Article 6 or by default as provided in Article 28 the Lessee shall deliver up the property to the Lessor in good order and condition with all mine workings used by the Lessee during the period of ninety (90) days prior to the date of such termination (and not affected by fortuitous event during that period) in condition suitable for continued operations, to the end that the Lessor may operate the property if it so elects; provided, however, that unless the Lessor shall notify the Lessee that it intends to operate the property, the Lessee shall surrender the

property only in such condition as good mining practice requires upon abandonment of operations.

Article 30. Additional Water Rights, etc.

It is expressly stipulated and agreed that any and all water rights and rights of way appurtenant to the property and hereafter acquired shall be vested in the Lessor and become a part of the property covered by this lease.

Article 31. Labor Agreements.

The Lessee further agrees that it will use its best endeavors to avoid the making of any agreement for labor which shall not terminate on or before the termination of this lease, to the end that thereafter the Lessor shall be able to negotiate a new agreement.

Article 32. Notices.

Any notice provided for herein shall be sufficiently given if posted by registered mail addressed to the party entitled to receive the same, as follows:

To Callahan Zinc-Lead Company, Inc.
100 Park Avenue
New York 17, New York.

To Vulcan Silver-Lead Corporation,
100 Park Avenue
New York 17, New York.

except as either party hereto shall otherwise instruct the other party by written notice to be appended to this lease.

Article 33. Costs of Litigation.

All costs of litigation, including counsel fees, incurred by the Lessee, in and about the conduct of its operations shall be deemed an operating expense and deductible in determining net profits as provided in Article 15, and all such costs in defending the Lessee's right to proceed under this lease, unless the Lessee shall be in default hereunder, shall be for the Lessor's account and shall be deducted from that portion of the first net profits which the Lessor shall be thereafter entitled to receive under Article 14, provided, however, that this paragraph shall not apply to any litigation brought by the

Lessee against the Lessor under this agreement unless and until a final judgment shall have been rendered against the Lessor by a court of competent jurisdiction and the time to appeal therefrom has expired.

Notwithstanding the foregoing provisions of this Article 33, before entering upon any litigation involving the title to the property, the Lessor shall have the right to employ counsel to litigate such question, but in the event the Lessor fails to do so the Lessee shall have the right to undertake such litigation as provided for herein.

Article 34. Inurement.

This lease and agreement shall inure to the benefit of and be binding upon the successors and assigns of the parties hereto, and the Lessee may assign this lease only with the written consent of the Lessor first had and obtained, which consent shall not be unreasonably withheld, provided, however, that the Lessee shall have the right to assign this lease without the consent of the Lessor to a corporation all the outstanding capital stock of which shall at the time be owned by the Lessee, but the Lessee shall remain primarily liable for performance hereof by such wholly owned corporation; and provided further, that nothing herein contained shall be construed to require the consent of the Lessor to such participations as the Lessee may elect to grant to any other party or parties presently or from time to time hereafter, but such participation shall not affect the obligations of the Lessee to the Lessor hereunder.

Article 35. Construction.

It is expressly stipulated and agreed that the titled to the respective Articles hereof shall not be deemed a part of this lease and agreement, having been used for convenience only.

IN WITNESS WHEREOF, the Lessor and the Lessee have caused their corporate names to be hereunto subscribed, and their corporate seals to be hereunto affixed and attested by their duly authorized officers, in duplicate counterparts, as of the day and year first above written which shall be the effective date of this lease.

CALLAHAN ZINC-LEAD COMPANY, INC.

By /s/ Joseph T. Hall
President

Attest:

/s/ E. A. Salo
Secretary

VULCAN SILVER-LEAD CORPORATION

By /s/ Joseph T. Hall

Attest:

/s/ E. A. Salo
Secretary

STATE OF NEW YORK )
) SS.:
COUNTY OF NEW YORK)

On this 15th day of December, in the year 1954, before Margaret M.Ackerman, a Notary Public in and for the County and State aforesaid, personally appeared Joseph T. Hall, known to me to be the President of Callahan Zinc-lead Company, Inc., one of the corporations that executed the above instrument and acknowledged to me that such corporation executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed by official seal, the day and year in this certificate first above written.

/s/ Margaret M. Ackerman
Notary Public

Residing at New York
New York City

STATE OF NEW YORK )
) SS.:
COUNTY OF NEW YORK)

On this 15th day of December, in the year 1954, before me Margaret M. Ackerman, a Notary Public in and for the County and State aforesaid, personally appeared Joseph T. Hall, known to me to be the President of Vulcan Silver-Lead Corporation, one of the corporations that executed the above instrument and acknowledged to me that such corporation executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year in this certificate first above written.

/s/ Margaret M. Ackerman
Notary Public

Residing at New York
New York City.

Exhibit E

E. J. Longyear Company

General Offices, Peahay Tower
Minneapolis 2, Minnesota, U. S. A.
Telephone Main 2447. Cable Longco

January 28, 1956

Vulcan Silver-Lead Corporation
Gunnison, Colorado

Attention: Mr. J. E. Dunn, Manager

Gentlemen:

Exploratory Drilling Program
Willow Creek Property -
Vicinity of Gunnison, Colorado

1. Confirming our telephone conversation of January 26th, we are pleased to submit below proposal for your contemplated exploratory drilling program on your Willow Creek property, which is located approximately 28 miles south of Gunnison, Colorado.

2. We understand that the work as now planned will consist of a series of holes varying in inclination from a minus 55° to vertical, and ranging up to a maximum of 500 feet in depth with a minimum aggregate footage of 3,000 feet; and that the drilling is to be mainly through sections of the Dakota, Brushy Basin and Salt Wash formations, and will extend into the underlying pre-Cambrian rocks. We further understand that the water required for the drilling operations is available within a distance of approximately one mile of the drill site; and that you will prepare and maintain all access roads and will level drill sites at no expense to E. J. Longyear Company.

3. For this work we propose to furnish one Longyear truck-mounted, angle type diamond core drill of suitable capacity, together with the necessary accessory equipment required to complete the work as now planned. We further propose to operate the drill on a single shift basis, six days per week.

4. We will carry public liability insurance covering personal injury and property damage, and workman's Compensation insurance, and also, all-risk insurance on the drilling equipment protecting against loss by theft, fire, flood, land-slides and other similar hazards.

We will also assume and pay any and all Old Age Benefit, Unemployment and Social Security taxes and contributions imposed by federal or state authorities.

Certificates showing the coverage referred to will be furnished upon request.

5. Based upon the conditions as outlined above and as specified in your letter of November 28, 1955, to Mr. E. G. Tucker, we are pleased to quote as follows:

a) Overburden drilling in holes varying in inclination from a minus 55° to vertical -

0 to 50 feet in depth .....$6.00 per foot

b) Diamond core drilling in vertical or angle holes as specified above -

0 to 500 feet in depth

AX standard and/or EX wire line, recovering core approximately 1-1/8" in diameter.....$6.00 per foot

BX-size (standard) recovering core approximately 1-5/8" in diameter ..... $6.50 per foot

NX-size (standard) recovering core approximately 2 1/8" in diameter..... $7.25 per foot

e) Reaming and Casing Operation

AX-size hole to receive AX casing.....$2.00 per foot
BX-size hole to receive BX casing.....$2.25 per foot
NX-size hole to receive NX casing.....$2.50 per foot

d) Cementing, waiting for cement to set and drilling out cement.....$11.00 per hour, plus cost of materials used.

e) Delays for your convenience or for which you are responsible.....$9.00 per hour

6. The above-quoted rates for overburden and diamond drilling are based on the understanding that the water required for the operations can be readily secured from a source located approximately one mile from the property. In the event that sufficient supply of water could not be secured from this source, and it became necessary to employ a truck driver on a full time basis and haul the water from a more distant source, it is understood and agreed that we would be reimbursed for all extra labor and direct field expenses resulting from this change in the operational set-up.

7. Drill cores will be turned over to your representative at the drill site in receptacles furnished by you.

8. Statements will be rendered as promptly as possible after the first of each month.

9. We appreciate very much the opportunity to consider this program. If awarded the contract, and providing that field conditions would permit, we would be in a position to commence the work not later than June 1, 1956.

Very truly yours,

E. J. LONGYEAR COMPANY

M. J. Gleason, Manager
Contract Drilling Division

ACCEPTED:

VULCAN SILVER-LEAD CORPORATION

_____

Exhibit E

C O P Y

# A G R E E M E N T

This agreement made and entered into by and between Vulcan Silver-Lead Corporation, of Gunnison, Colorado, hereinafter called First Party, and JEFFERSON DRILLING COMPANY, of Montrose, Colorado, hereinafter called Second Party.

WITNESSETH:

WHEREAS First Party desires to explore its mining property in the Willow Creek area south of Gunnison, Colorado, by drilling thereon, and Second Party is willing to undertake such drilling upon the conditions herein provided.

NOW THEREFORE, in consideration of the promises, agreements and payments hereinafter provided, it is hereby agreed between the parties as follows:

1. The drilling hereunder shall be core drilling from the surface of the ground for Size AX cores. The maximum depth of hole to be drilled shall be five hundred (500) feet, minimum one hundred (100) feet, and the total amount of drilling hereunder shall not be less than three thousand (3,000) feet.

2. Second Party shall commence operations hereunder June 1, 1956, if weather conditions permit, or as soon thereafter as weather conditions may allow.

3. For the performance of said drilling, Second Party will provide one (1) EBS No. 1A screw-feed drill, together with all tools, bits, and supplies necessary to such operations, together with a truck for hauling of water. Sample sacks, core trays, and storage containers shall be furnished by First Party.

4. Second Party will provide a drilling crew of not less than two (2) men, and work will be conducted by working six (6) eight-hour (8-hr.) shifts per week.

5. Water required for drilling shall be provided at its source free of cost by First Party.

6. First Party will provide roads and drilling locations reasonably suitable for the use of the drilling equipment of Second Party, and First Party shall prepare all drilling sites at its expense, including, if necessary, the driving of piles, or furnishing of barges. First Party shall provide a suitable camp site for drilling crew.

7. For such drilling and services to be performed by Second Party, First Party shall pay at the following rates:

Core Drilling: From 0 to 500 feet, $4.75 per foot.

Should Second Party perform any drilling of holes in excess of 500 feet, such drilling shall be at the rate of $4.75 per foot, plus an additional increment of .50(fifty cents) per foot for each additional 100 feet, or fraction thereof above 500 feet.

For setting surface pipe through overburden to rock, $4.30 per foot.

For reaming and installing Size NX casing, $2.75 per foot.

For reaming and installing Size BX casing, $2.50 per foot.

For reaming and installing Size AX casing, $2.25 per foot.

For cementing and drilling out cement, $10.00 per hour, plus cost of cement, or cement substitutes as may be required.

For delay while holes are surveyed with Tro-Pari instrument, $8.00 per hour.

For delays due to logging of hole, or probing of hole, $8.00 per hour.

8. In advance of each drilling operation, First Party shall advise Second Party of the location, depth and angle of hole to be drilled.

9. At the end of each calendar month, Second Party shall render to First Party a statement of charges hereunder for the said month, and First Party shall pay said amount to Second Party by the 10th day of the month following that in which the work was done.

10. Should weather conditions become such that it is not reasonably feasible to continue drilling operations as herein provided, in the opinion of Second Party, Second Party may suspend operations, and during such period of suspended operations, the obligation of both parties hereunder shall be suspended until such operations are resumed.

11. First Party will procure all necessary permits and rights of way for the conducting of such drilling operations and movements to and from the drilling locations, and shall save Second Party harmless from all claims, demands or causes of action arising from alleged trespassing or unlawful entry upon any lands designated by First Party. Evidence of such permission, rights of way, or title shall be exhibited by First Party to Second Party on request.

12. Second Party shall have sole authority and discretion over the supervision of its employees and performance of their work.

13. Second Party shall carry and maintain in full force and effect insurance covering the following risks in the following amounts: 1. Automobile coverage; public liability, One Hundred Thousand Dollars ($100,000.00) each accident, Three Hundred Thousand Dollars ($300,000.00), aggregate; property damage, one Hundred Thousand Dollars ($100,000.00). 2. Workman's Compensation Insurance as required by the laws of the State in which the work shall be done.

14. Second Party shall comply with all applicable laws and regulations, and with the Fair Labor Standards Act of 1938, in connection with the performance of all work hereunder.

15. Should subsurface conditions be such that it is not reasonably possible to complete any hole to the depth requested by First Party, it is understood and agreed that Second Party shall be released from any obligation to complete such hole to such depth, and shall be entitled to payment

according to the amount of hole completed, provided that, before the abandonment of any hole for such reason, First Party and Second Party shall mutually inspect the conditions and agree upon the necessity thereof.

16. Neither party shall be liable for any loss or damage caused by reason of strikes, accidents, Acts of God, or other causes beyond its control.

17. Second Party shall have a reasonable time after operations have terminated under this agreement to remove its equipment, material and supplies from the property of First Party.

18. All amounts due hereunder from First Party to Second Party shall, from date payment is due, draw interest at the rate of six per cent (6%) per annum. Should Second Party be required to employ legal counsel in connection with collection of any amounts due hereunder, or to enforce the performance hereof, First Party agrees to pay to Second Party reasonable attorneys fees incurred in connection therewith.

19. No alteration or amendment of the terms of this agreement shall be binding upon the parties or either of them unless the same shall be made in writing and signed by the parties.

20. Neither party may assign its interest under the terms of this agreement without the approval in writing of the other party.

Executed this_____day of January, 1966

VULCAN SILVER-LEAD CORPORATION

ATTEST:

BY

Secretary — President — First Party

MACPHERSON DRILLING COMPANY,

BY

Second Party

Exhibit E.



COPY

## CORE DRILLING AGREEMENT

1. THIS AGREEMENT, made and entered into this 20th. day of December, 1945 by and between Vulcan Silver-Lead Corporation of Gunnison, Colorado the party of the first part and the Joy Manufacturing Company, of Pittsburgh, Pennsylvania, partyof the second part,

Witnesseth:

2. In consideration of certain payments hereby agreed to be made by the said first party to the said second party, the said second party hereby agrees to drill, sink or prospect with a diamond core drill from surface in or near Willow Creek Property South of Gunnison, Colorado at sites to be selected by the said first party, subject to the conditions hereinafter mentioned. It is further agreed by the said first party that the depth of none of the herein specified drill holes shall exceed a depth of 500 feet, and the total amount as guaranteed must be drilled in not more than twelve holes.

3. The said second party agrees to use for the above described work one Diamond Core drill and men skilled in operating same; to operate the drill, both day and night whenever practicable, and to furnish only such person as the said first party may designate by written order, all core taken out of said prospect holes. Size of core to be approximately NX,BX,AX inches in diameter. The said first party shall provide suitable boxes if it desires to save the core, and if it also desires may have a man at the drill at all times to reserve and take charge of said core. No information whatever regarding the records and results of this drilling is to be given any other party, without the written consent of the said first party.

4. The said first party hereby agrees to pay to said second party the following prices for the herein described drilling.

| | NX Core | BX Core | AX Core |
|---|---|---|---|
| - From surface to a depth of 500' | $7.00/ft. | $6.70/ft. | $6.40/ft. |

5. In accordance with this agreement, the said first party hereby guarantees the said second party a minimum total of 3000 feet of drilling at the prices as herein provided in Clause Four.

The said second party shall have the option of withdrawing from this contract after a total of 3000 feet have been drilled under the terms of this agreement.

In the event the said first party should stop the drilling before the guaranteed footage has been drilled, it agrees to pay the said second party half the price per foot for the undrilled balance, in addition to payment at full price for the footage actually drilled.

6. The party of the second part agrees to haul drilling water a maximum distance of one mile without additional charge.

7. The party of the first part agrees to furnish and maintain satisfactory access roads to each hole site.

C O P Y



9. Should the party of the first part fail to perform its part of the contract of furnishing roads or locate sites, as herein agreed, regardless of cause, or should the party of the first part issue instructions that delay operations for any reason or in any other way interrupt the continuous operation of the said diamond drill, it shall pay the second party the labor expense of drilling crew while idle through such delay , at the rate of $65.00 per shift, consisting of 8 hours, for each shift or part thereof that the operation of the said drill is delayed.

10. The party of the second part agrees to cover its employees with Workmen's Compensation Insurance under the State laws of Colorado and agrees to furnish the first party with insurance certificate as evidence of such coverage. The second party plans to start this work in March 1956, or as soon thereafter as weather permits and in accordance with notification received from the first party. Should inclement weather or snow conditions, after the job is started, prove to be such that the men can not get to the job site, the delay time clause involving a charge at the rate of $65.00 per shift will prevail.

11. The payments for the herein-described work are to be made on the first of each month for all invoices rendered for work done up to the 25th. day of the previous month.

12. The party of the second part hereby agrees to ship the outfit for the herein described work within ------ days from the date of notification of acceptance of this agreement, but the said second party shall not be responsible for delays caused by strikes , railroad accidents or blockades. This proposition is for immediate acceptance, but although accepted does not constitute a contract until approved by an officer of the Joy Manufacturing Company, at the office in Pittsburgh, Pennsylvania, U. S. A., and is subject to change or withdrawal until so approved.

It is expressly agreed that there are no promises, agreements or understandings outside of this contract, and that no agent or salesman has any authority to obligate the Joy Manufacturing Company, by any terms, stipulations or conditions not herein expressed. This contract may be altered only by written consent of both parties hereto.

JOY MANUFACTURING COMPANY

By_____

IN WITNESS WHEREOF, the parties hereto have set their hands and seals.

Accepted by

Approved by JOY MANUFACTURING CO.

_____ By_____

_____ Date_____

Title_____ Title_____

JOY MANUFACTURING COMPANY

EXHIBIT D BMRA MP- 105

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| | Victor No. 8 | 259 | 23 |
| " " | Victor No. 9 | 259 | 25 |
| | Victor No. 10 | 259 | 27 |
| | Victor No. 11 | 259 | 29 |
| " " | Victor No. 12 | 259 | 31 |
| | Victor No. 13 | 259 | 33 |
| | Victor No. 15 | 259 | 35 |
| | Victor No. 16 | 259 | 37 |
| " " | Victor No. 17 | 259 | 39 |
| | Victor No. 18 | 259 | 41 |
| | Victor No. 19 | 259 | 43 |
| | Victor No. 20 | 259 | 45 |
| | Victor No. 21 | 259 | 47 |
| " " | Victor No. 22 | 259 | 49 |
| | Victor No. 23 | 259 | 51 |
| | Victor No. 24 | 259 | 53 |
| | Victor No. 25 | 259 | 55 |
| | Victor No. 26 | 259 | 57 |

| Recorded | Name of Claim | Book | Page |
|---|---|---|---|
| Saguache Co. | Victor No. 27 | 259 | 59 |
| | Victor No. 28 | 259 | 61 |
| | Victor No. 29 | 259 | 63 |
| | Victor No. 30 | 259 | 65 |
| " " | Victor No. 31 | 259 | 67 |
| | Victor No. 32 | 259 | 69 |
| | Victor No. 33 | 259 | 71 |
| | Victor No. 34 | 259 | 73 |
| " " | Victor No. 35 | 259 | 75 |
| | Victor No. 36 | 259 | 77 |
| | Victor No. 37 | 259 | 79 |
| | Victor No. 38 | 259 | 81 |
| " " | Victor No. 39 | 259 | 83 |
| | Victor No. 41 | 259 | 87 |
| | Victor No. 43 | 259 | 91 |
| | Victor No. 47 | 259 | 97 |
| " " | Victor No. 48 | 259 | 101 |
| | Victor No. 53 | 259 | 257 |
| | Victor No. 54 | 259 | 259 |
| " " | Victor No. 55 | 259 | 261 |
| | Victor No. 56 | 259 | 263 |
| | Victor No. 57 | 259 | 265 |
| " " | Victor No. 58 | 259 | 267 |
| | Victor No. 59 | 259 | 269 |
| | Victor No. 60 | 259 | 271 |
| | Victor No. 61 | 259 | 273 |
| | Victor No. 62 | 259 | 275 |
| | Victor No. 77 | 259 | 305 |
| | Victor No. 78 | 259 | 307 |
| | Victor No. 79 | 259 | 309 |
| | Victor No. 80 | 259 | 311 |
| | Victor No. 81 | 259 | 313 |

The following claims located and surveyed late in 1955. Recorded in Saguache County. Indexing information has not been returned to date.

Afterthought No. 1
Afterthought No. 2
Afterthought No. 3
Carta Blanca
Major

DMEA Exhibit F

Assay Results Willow Creek Group -- Beta Dozer Cuts.

| No. | Description | Assayer | %eU3O8 | % U3O8 |
|---|---|---|---|---|
| 30 | Specimen containing Green fluorescent Chalcedony (plus or minus 10% of Sample Chalcedony) | C. O. Parker & Co. Denver, Colorado | 0.04 | 0.032 |
| 71 | Specimen containing Green fluorescent Chalcedony (plus or minus 25% of Sample Chalcedony) | Root & Simpson Inc. Denver, Colorado | 0.05 | 0.079 |

The above samples were taken from bulldozer cuts on the Beta No. 1 Lode Claim in the Willow Creek Group, Saguache County, Colorado.

Assays listed are a true and exact copy of Assay returns from C. O. Parker & Co., Denver, Colorado and Root & Simpson Inc., Denver, Colorado.

Vulcan Silver-Lead Corp.

J. E. Dunn
Manager

JD: fd

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

RECEIVED
MAR - 5 1956

# APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

*Not to be filled in by applicant*

Docket No. DMEA-4203
Metal or Mineral Uranium
Date Received 3-8-56
Estimated Cost $112,425.39
Participation (Government %)

## INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Vulcan Silver-Lead Corporation - Incorporated, State of Idaho
Joseph T. Hall, President --- 100 Park Avenue, New York 17, N.Y.
R. F. Mahoney, Vice-President --- The Flexaust Co., Chestnut St., Amesbury, Mass.
E. A. Salo, Secretary, Treasurer --- 100 Park Ave., New York 17, N. Y.

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract

(*b*) State any mine name by which the property is known.

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property.

(*e*) If you own the land, describe any liens or encumbrances on it

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice.

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

5. *The exploration project.*—(*a*) State the mineral or minerals for which you wish to explore .....

.....

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc.

(*c*) The work will start within ..... days and be completed within ..... months from the date of an exploration project contract.

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations.

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)?

(*b*) How do you propose to furnish your share of the costs?

☐ Money ☐ Use of equipment owned by you ☐ Other

Explain in detail on acompanying paper.

## CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated ....., 195...

.....
(Applicant)

By R. L. Mahney

.....

.....

**Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.**

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

Defense Minerals Exploration Administration

Department of the Interior

Washington 25, D. C.

Gentlemen:

We submit herewith an application for aid in an exploration project as outlined in DMEA order 1 amended.

The information in this letter follows and is supplemental to form M F - 105 which is attached.

1. Vulcan Silver-Lead Corporation - Incorporated, State of Idaho

Field Office - Box 144, Gunnison, Colorado

Home Office - 100 Park Avenue, New York 17, N. Y.
Joseph T. Hall, President --- 100 Park Avenue, N. Y. 17, N. Y.
R. F. Mahoney, Vice President --- The Flexaust Co., Chestnut St. Amesbury, Mass.
A. E. Salo, Secretary, Treasurer --- 100 Park Ave., New York 17, N. Y.

3.(a) The property consists of one hundred eighteen (118) claims in a contiguous group held by location in Gunnison and Saguache Counties, Colorado.

The group is located in sections 31, 32, 33, 34, and 35 T 47 N, R 1 W, N. M. P. M. and in sections 2, 3, 4, 5 and 6 T 46 N, R 1 W, N. M. P. M. Original land surveys were prior to 1900. None of these corners were found on the claim area and presumably are destroyed. All claim surveys are tied to the one quarter (¼) corner between section 31 T 47 N, R 1 W and section 36 T 47 N, R 1½ W, N. M. P. M. This corner is west of the claim group and is the only corner identified in the general area.

The consolidated claim groups are as follows:

Star Group 9 Claims owned by Callahan Zinc-Lead Company. Held under lease agreement by Vulcan Silver-Lead Corp.

Beta Group 4 Claims owned by Callahan Zinc-Lead Company. Held under lease agreement by Vulcan Silver-Lead Corp.

Elk Horn Group 3 Claims owned by Vulcan Silver-Lead Corp.

Blizzard Group 40 Claims owned by Vulcan Silver-Lead Corp.

Victor Group 57 Claims owned by Vulcan Silver-Lead Corp.

Afterthought Group 3 Claims " " " " " "

Major 1 Claim " " " " " "

Carta Blanca 1 Claim " " " " " "

Claims dropped from original total consisting of 2 Elkhorns and 29 Victors were not considered pertinent to the program, as they cover an unfavorable area with no apparent mineralization.

Copies of lease covering Star and Beta Groups attached. (Exhibit C)

(B) Willow Creek Group
(C) Owner and Lessee (See 5 a )
(D) Copies of Lease attached.
(E) None
(F) Claims listed with book and page numbers of recorded locations are listed and attached to this application. (Exhibit D)

4 (a) Exploration to date has consisted of surface geologic mapping, radiometric grid work and surface cuts with tractor bulldozer. Location and results of this work are shown on maps accompanying geologic report. All work has been done by Vulcan Silver-Lead Corp. during the summer of 1955. This surface work will be accessable for examination by April 5, 1956. There are no mine workings or production facilities.

(b) None

(c) The general geology of the Willow Creek area is identical with that of the uranium producing Los Ochos Mine which lies about 14 miles east of the Willow Creek prospect.

The stratigraphic column at Willow Creek includes three sedimentary rock groups; the Dakota Formation 80' thick, the Brushy Basin member of the Morrison Formation 210' thick and the Salt Wash member of the Morrison Formation 40' thick. These sediments over-lie pre-Cambrian granites.

The area is cut by a major east-west fault that has a nearly vertical attitude and shows a probable 3000' of horizontal displacement. Very little vertical displacement is indicated. Several other faults with a general north-east strike cross the property; these are also vertical and show great horizontal displacement and proportionately minor vertical movement.

Four out of the seven radiometric anomalies are definitely associated with known fault structures. Intersections of faults on the Beta Claim Group and the intersection of the Beta and Willow Fault on the Blizzard Claim group, offer the greatest possibilities of ore occurrence.

In a comparative environment at Los Ochos, concentrations of uranium mineralization have occurred along fault structures in the Morrison Formation with greatest values in the Salt Wash member and in general at fault intersections. Mineralization at Los Ochos is principally pitchblende and is hydrothermal in origin.

Evidence that Willow Creek mineralization is also hydrothermal shows in the silicification of the sediments adjacent to known faults and the fact that the exposures of the Brushy Basin member away from the fault zones are not radioactive.

Specimens taken from shallow surface cuts on Beta Group fault structure, showing small amounts of fluorescent chalcedony assay 0.058% $U_3O_8$ to 0.078% $U_3O_8$. This material was in radiometric balance.

A geologic report with maps and sections, is attached. (Exhibit A)

(d) Gunnison, Colorado is the nearest town of any importance. The property is reached from Gunnison by going west on highway 50 to Iola, Colorado, thence south-east by improved dirt road. Total distance from Gunnison is 30 miles. All points of interest on the property will be accessable either by existing roads or roads to be constructed early in 1956.

Uranium ores from the Gunnison area are presently handled under fringe area agreements with the A. E. C. A mill to handle local uranium ores is planned. A. E. C. approval is expected as soon as enough ore is available to justify its construction.

During early stages of any program the residence and supply point would be Gunnison.

(e) Manpower, materials, supplies and equipment are available for the project. Power would be generated on the property for any type of program undertaken.

Water for exploratory drilling will be retained from spring run-off by construction of a dam across Willow Creek. This would provide sufficient water for any drilling program until sometime in September. This fact necessitates an early start on any exploratory work contemplated.

6 (a) Uranium.

(b) The proposed program on Willow Creek would be divided into two phases as follows:

1. <u>Preliminary Exploration</u>

This phase would consist of six drill holes or approximately 3000 ft. of core drilling. Three of these holes would be on the Blizzard Beta Fault intersection on or near section DMEA. A-(Drawing No. GGE 10) indicated on geological plan Drawing GGE 9. Location and attitude of first hole indicated on Drawing GGE 10. The location of the other two holes on this intersection would be made after information from the first hole was evaluated.

Holes to be drilled on the Beta-Willow Fault intersection would be handled in the same manner and as indicated on Drawing No. GGE 11. The first hole would furnish additional information on structure which would allow more intelligent location of following two holes.

Preliminary work before drilling which will be done prior to possible DMEA participation will include reservoir construction, additional road work and probably some shallow drilling of 50' to 60' holes to better define the structure especially that of the Beta-Willow Fault intersection

which has a rather heavy soil cover. Drawings referred to accompany this application as exhibit B.

Phase 2: 10,000 feet of additional drilling contingent on results of the preliminary program under Phase 1. Actual location of drilling and planning on execution of work would be subject to DMEA approval prior to start of this phase of the proposed project.

5 (c) Phase 1 of the program could be completed within four months of contract approval. Actual drilling would take 3 months.

A part of Phase 2 if under taken could be done during the same year providing this work started by Oct. 1st. Completion of the project would be delayed by winter months and it would not be complete until sometime the following year. 18 months after contract date.

(d) Vulcan Silver-Lead Corp. is an owned subsidiary of Callahan Zinc-Lead Co. and retains operating personnel from successful operations of the latter company. The company and personnel therein have carried on profitable operations during the past 40 years in Arizona, Colorado, Idaho, Nevada, New Mexico and Alaska.

General exploration in the uranium field has been underway for two years with intensive study of occurrences in the Gunnison area.

R. F. Mahoney, Vice-President and General Manager, Vulcan Silver-Lead Corp., formerly General Supt., Sunshine Mining Co. is in charge of all mining operations.

J. E. Dunn, Manager in charge of Gunnison area exploration, formerly General Supt. for Callahan Zinc-Lead Co. at Whitepine, Colorado.

Dr. Arthur Baker III, Geologist has had varied experience on base-metals in southwestern U. S. for Coronado Copper and Zinc Co. and Cyprus Mines Corp. His work has been concerned with ore occurrances in the uranium field for the past year. Dr. Baker is in charge of all geological work in the Gunnison area.

## COST ESTIMATE

### Phase I

6 (a) Independent Contracts

| | | |
|---|---|---|
| 3000' AX Core Hole @ $4.75 per foot | $14250.00 | |
| 75% of total 2250' casing @ $2.25 per foot. | 5062.50 | |
| Delays for surveying, logging, etc. 5% of total | 965.60 | |
| $6.759 per foot | | $20278.10 |

(b) Payroll (4.5 month period)

| | | |
|---|---|---|
| Chief geologist @ $625.00, mo. 25% of monthly rate. | $703.13 | |
| Jr. geologist @ $450.00 per mo. 75% of monthly rate. | 1518.75 | |
| Misc. general supervision est. for job. | 500.00 | |
| $0.907 per foot | | $2721.88 |

(c) 200 core boxes @ $1.50 $300.00

Gasoline & Oil (transportation) 140.00

$0.147 per foot $440.00

(d) 1 Jeep value $1800.00 @ $30.00 per month. $90.00

Logging equipment value $1000.00 @ $16.67 per month 50.01

Scintillation Equip. value $500. @ $8.34 per month (Rentals calculated on 60 month depreciation basis) 25.02

Tractor dozer est. , 20 hrs. work @ $12.00 per hour. (Rental equipment) 240.00

$0.135 per foot $405.03

(e) None

(f) None

| | | |
|---|---|---|
| (g) Maintenance 1 Jeep, logging equip. and scintillation equip. | $150.00 | |
| Assays (30 est.) @ $6.00 | 180.00 | |
| Accounting | 500.00 | |
| Insurance, Soc. Sec., Comp., etc. 10% payroll | 522.19 | |
| $0.384 per foot | | $1152.19 |
| Total | | $24997.20 |

(h) Contingencies 5%

| | | |
|---|---|---|
| $0.417 per foot | | $1249.86 |
| Total Cost Phase I | | |
| $8.749 per foot | | $26247.06 |

Phase II

6 (a) Independent Contracts

| | | |
|---|---|---|
| 10,000 ft. AX Core Hole @ $4.75 per foot. | $47500.00 | |
| 75% of total or 7500 ft. casing @ $2.25 per foot. | 16875.00 | |
| Delays for surveying, logging, etc. 5% of total | 3218.75 | |
| $6.759 per foot | | $67593.75 |

(b) Payroll (13 month period)

| | | |
|---|---|---|
| Chief geologist @ $625.00 per mo. 25% of monthly rate | $2031.25 | |
| Jr. geologist @ $450.00 per mo. 75% of monthly rate | 4387.50 | |
| Misc. general supervision est. for job. | 1666.00 | |
| $0.808 per foot | | $8084.75 |

| | | | |
|---|---|---|---|
| (c) | 670 core boxes @ $1.50 | $1005.00 | |
| | Gasoline & Oil (transportation) | 500.00 | |
| | $0.151 per foot | | $1505.00 |
| (d) | 1 Jeep value $1800.00 @ $50.00 per month | $300.00 | |
| | Logging equipment value $1000.00 @ $16.67 per month. | 166.70 | |
| | Scintillation equipment value $500.00 @ $8.34 per month. | 83.40 | |
| | Tractor dozer est., 50 hrs. work @ $12.00 per hour. (Rental equipment) | 600.00 | |
| | $0.115 per foot | | $1150.10 |
| (e) | None | | |
| (f) | None | | |
| (g) | Maintenance 1 Jeep, logging equipment and scintillation equip. | $500.00 | |
| | Assays (100 est.) | 600.00 | |
| | Accounting | 1666.00 | |
| | Insurance, Soc. Sec., Comp., etc. 10% payroll | 975.08 | |
| | $0.374 per foot | | $3741.00 |
| | Total | | $82074.60 |
| (h) | Contingencies 5% | | |
| | $0.410 per foot | | $4103.73 |
| | Total Cost Phase II | | |
| | $8.617 per foot | | $86178.33 |

Total estimated cost of Willow Creek Project --- $112425.59

Copies of bids from 3 drilling companies Exhibit E this application.

Contract drilling costs estimated from MacPherson Drilling Co. bid. Our analysis of the bids indicates that it would be low.

7 (a) Vulcan Silver-Lead Corporation, the applicant, is prepared to furnish 25% of the project cost.

(b) Current monthly costs for the project would be handled through Vulcan Silver-Lead Corporation, Gunnison accounts, with later refund by DMEA of 75% of calculated project cost per foot up to a maximum figure of $8.749 per foot.

Vulcan Silver-Lead Corporation

R. F. Mahoney

R. F. Mahoney
Vice-President

# LIST OF EXHIBITS

Accompanying MF 108

All copies enclosed are a part of application and need not be returned.

Exhibit A : Complete copy of geological report, Willow Creek Group, Arthur Baker III, 1955.

Exhibit B: Maps and Sections

No. GGE 9 Willow Creek Group, Topography and Geology
Proposed DMEA Drilling Area.
Scale : 1" - 1650'

No. GGE 10 Willow Creek Group, Proposed DDH. DMEA - A
Cross-Section.
Scale: 1" - 100'

No. GGE 11 Willow Creek Group, Proposed DDH. DMEA - D
Cross-Section.
Scale: 1" - 100'

No. GGX 1 Willow Creek Group Claim Map showing radiometric Grid.
Scale: 1" - 1000'

No. GGX 2 Willow Creek Group Drilling Areas
Scale: 1" - 500'

Exhibit C: Copy of lease agreement between Callahan Zinc-Lead Co. and Vulcan Silver-Lead Corp. on Star Group and Beta Group of Claims.

Exhibit D: A list of all claims included in application showing book and page No. of original recording and county of location.

Exhibit E: Copies of drilling proposals submitted by Joy Mfg. Co., Mac-Pherson Drilling Co., and Longyear Drilling Co.

Exhibit F: Copies of Assays -- Beta Group.

# GEOLOGICAL REPORT

WILLOW CREEK GROUP (Sections 26-35, T 47 N, R 1 W)

SAGUACHE CO., COLORADO

AUGUST 25, 1955

ARTHUR BAKER III

INDEX


| | |
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| Summary and Conclusions | Page 1 |
| Stratigraphy | 3 |
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| Beta Area | 7 |
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DRAWINGS


No. GGC 3 Willow Creek Group, Geology and Topography. Scale: 1" - 1650'

No. GGC 4 Willow Creek Group, Property Ownership and Radiometric Map. Scale: 1" - 1650'

No. GGC 5 Willow Creek Group, Cross Sections A-A', B-B' and Longitudinal Section C-C'

No. GGB 2 Willow Creek Group, Beta Area Geology and Topography. Scale: 1" - 100'

No. GGB 3 Willow Creek Group, Beta Area Radiometric Map. Scale: 1" - 100'

No. GGE 7 Willow Creek Group, Proposed DDH A Cross Section. Scale: 1" - 100'

No. GGE 8 Willow Creek Group, Proposed DDH B Cross Section. Scale: 1" - 100'

## SUMMARY AND CONCLUSIONS

The stratigraphic column in this area includes three sedimentary rock groups: the Dakota formation, 80' thick, the Brushy Basin member of the Morrison formation, 210' thick, and the Salt Wash member of the Morrison formation, 40' thick. These sediments overlie pre-Cambrian granites, and in the eastern part of the area are overlain by Tertiary volcanics. The Dakota and the Salt Wash are predominantly sandstones, somewhat silicified throughout the district. The Brushy Basin, judging from limited exposures, is predominantly siltstone, but in the Beta area at least the uppermost 50' of beds are intensely silicified. In other places also some of the uppermost beds are silicified.

The major fault in the area is the Willow Fault, which strikes due East and dips about vertically; this fault has little or no vertical displacement, but has at least 3000' of horizontal displacement, with the north side being moved eastward. One other fault with this attitude is known in the vicinity of the Beta claims. There are several faults striking about N 70° E and dipping vertically; these also have large components of horizontal movement, the north sides being moved eastward. At least one large fault strikes N 40° W. All of these faults have had movement since the deposition of the Tertiary volcanics, but the East-striking fault is the youngest.

A radiometric grid survey of the entire claim group shows several areas of anomalously high radioactivity. One of these lies wholly within the volcanic rocks, and is not important at present. Another lies partly in the volcanics and partly in the pre-Cambrian granite; this one also is not important at present. Five other anomalies lie mostly in the upper beds of the Brushy Basin, but some of them lap over into the Dakota. Four of these Brushy Basin anomalies are related to known faults of the N 70° E group.

The Beta anomaly is typical of the radiometric anomalies, except that rock exposures are somewhat better than in the others; for this reason it was chosen for detailed study. The association of the anomalies with faults and the fact that they are generally in the upper part of the Brushy Basin was determined from areal mapping; the detailed work in the Beta area adds the information that the anomalous radioactivity is contained in silicified siltstone, and that the faults contain traces of uranium associated with the oxidized remains of sulfide minerals.

The conclusion I draw from these data is that the anomalies represent concentrations of uranium that was introduced into the silicified siltstone by hydrothermal solutions that entered along the faults -- presumably leakage from deeper mineralization. The persistence of the anomalies into the normally non-radioactive Dakota in places, and the barrenness of the Brushy Basin outside of the anomalies further indicates that the uranium mineralization was introduced by solutions moving along faults. The silicification of the Brushy Basin is not a normal feature

of the Brushy Basin, and I think it probably was caused by an early phase of hydrothermal action.

The geology at Willow Creek is almost identical with that at the uranium-producing Thornburg properties, which lie about 12 miles northeast. At Thornburg's , the main structure is an east-west fault (the Los Ochos Fault) with large horizontal displacement, with lesser faults striking N 70° E. The orebodies there occur along the Los Ochos Fault instead of along the N 70° E faults like the anomalies in the Willow Creek area. At least one of the Thornburg orebodies lies at the intersection of the main fault with a N 70° E. fault. Silicification of the Brushy Basin is very intense along the Los Ochos Fault in the vicinity of the orebodies, possibly more intense than that in the Beta area on Willow Creek. I understand that surface radioactivity was locally stronger along the Los Ochos Fault than any in the Willow Creek area, and that at one place ore-grade material was found at or close to the surface. However, I understand also that much of the surface over the Los Ochos orebodies was essentially non-radioactive.

Thus, at Willow Creek we have an area structurally identical with a nearby known rich uranium mine, and with anomalous concentrations of radioactivity on the surface. The only evident differences between the Willow Creek area and the Thornburg area are in the locations of the anomalies with respect to the structures, and an appreciable difference in the intensity of radioactivity at the surface.

I have recommended four diamond drill holes totalling 1475' of hole to test the Beta anomaly because it is the most thoroughly known of the anomalies, and presumably is representative of all of them. Using the Thornburg properties for comparison, if there is any ore beneath the Beta anomaly, there should be at least 20,000 tons. According to hearsay, a conservative estimate of the average grade of the Thornburg ore would be 1% $U_3O_8$; presumably the Willow Creek ore would be similar.

## STRATIGRAPHY

All of the pre-Cambrian rocks exposed in this area are igneous, mostly a uniformly coarse-grained granitic rock. In the western part of the claim group, on the north side of Willow Creek, some finer-grained rocks are exposed in small outcrops.

The Jurassic Salt Wash member of the Morrison formation lies on the pre-Cambrian basement, and is 25' thick at the extreme western end of the area, but somewhat thicker at the east end. 40' has been taken as the average thickness of the member. The only good exposures of the member are west of the claim group, where it is a very hard, probably partly silicified, coarse sandstone; there is no indication of shale partings within the sandstone. In the eastern half of the area, a large part of the surface is underlain by Salt Wash, but outcrops are rare. The boulders found indicate that the Salt Wash here is less silicified than it is farther west.

The Jurassic Brushy Basin member of the Morrison formation overlies the Salt Wash, and at the west end of the property is 210' thick; I have taken this as the average thickness of the member. The only exposures of bedrock Brushy Basin are in bulldozer cuts, of which there are two groups. One group of half a dozen pits lies on Aaberg's ground, just west of our property, and another group of eight pits lies on the Beta group. The pits on Aaberg's ground indicate that the entire thickness of the Brushy Basin in this area is unaltered shale and red or red-green banded siltstone. In the Beta area, pits exposing bedrock are all in the uppermost 50' - 75' of the Brushy Basin, and in this area these beds are intensely silicified to a very hard dense white rock. One of the Beta pits (Pit D) exposes red siltstone, which may lie below the silicified beds or may be an unaltered portion of the same beds. There is no evidence as to the character of the lower half of the Brushy Basin in the Beta area. On the Star claims, one location pit exposes unaltered red and green banded siltstone, but the position of this rock in the Brushy Basin column is unknown. Float material indicates that at least some of the upper beds of the Brushy Basin member are silicified throughout the Willow Creek group of claims.

The Cretaceous Dakota formation, overlying the Brushy Basin, is about 80' thick, and is composed predominantly of coarse sandstone. Near the base is a chert conglomerate that in some exposures is at least 12' thick, but at other places appears to be very thin. The Dakota is everywhere very hard, possibly somewhat silicified.

No exposures of the Cretaceous Mancos formation were found in the field, and it is probable that if there is any Mancos present in the area mapped, it is only in small isolated pockets less than 10' thick. The Mancos formation on the accompanying geologic map (Drawing No. GGC 3) is used to indicate the upper surface of the Dakota formation, to distinguish between areas underlain by the entire thickness of the Dakota as opposed to areas underlain by only part of the formation.

Tertiary volcanics are exposed near the eastern end of the claim group, and east of here they continue for several miles or more. The volcanics in the area mapped belong to the Piedras series, and are mostly flow rocks, though some tuffs may be included.

## STRUCTURE

The sediments in this area are somewhat folded, with dips as steep as 28°, but I have made no attempt to work out the fold pattern because it does not seem important at present. The mapping already done is sufficient to determine the pattern when it seems worth while. I believe, from inspection of the maps, that the fold axes trend northeasterly.

The principal structure in the area is the Willow Fault, which has a general trend of due East, though locally the trend varies as much as 10° north or south of east. The strike is no doubt about the same as the trend, but the dip is indeterminate because there are no exposures of the fault, nor even any places where it can be located within 200' to determine the attitude by the three-point problem. Probably its dip is close to vertical, though it may dip steeply either north or south. This is the most recent fault in the area, offsetting folds and all other faults, and also displacing the volcanics.

The Willow Fault probably has little or no vertical displacement, but has at least 3000' horizontal displacement, the north side being moved eastward. Because of this horizontal displacement and the folding of the sediments, at the west end of the mapped area Dakota on the south side of the fault is apparently dropped against Brushy Basin on the north side, while near the east end of the area pre-Cambrian rocks on the south side are apparently raised into contact with Dakota on the north side. At the east end of the mapped area, the fault splits into two strands, with each strand taking about half of the total horizontal displacement.

Most of the other faults in the area fall into two groups, the most numerous group trending N 60°-70°E, and the less numerous group trending N 20°-40°W. There are also one or more faults trending about due East, possibly close relatives of the Willow Fault, and there is some evidence for one fault trending N 40°E.

The faults of the N 70°E group are older than the Willow Fault, but younger than the N 40° W group and probably younger than the N 40° E fault. The only actual exposure of any of these faults is in a pit on the Beta Fault; this fault is vertical. There is some evidence in the trace of the Elkhorn and Star faults to indicate that they have a steep south dip. Apparent vertical displacement on some of these faults is as much as 100', but the Victor Fault has at least 3000' of horizontal displacement, north side eastward, and it is probable that most of the movement on all of the faults of this group was horizontal.

Of the N 40° W group, only the Beaver Fault can be definitely recognized -- by the fact that it drops Tertiary volcanics into position against Morrison sediments. Like the other faults in the area, this one dips about vertically. The apparent vertical displacement on the Beaver Fault is at least 200', the northeast side being dropped, but there is no evidence as to the amount of horizontal displacement. As far as is known, the Beaver is the oldest known fault in the area, but like the others, it is more recent than the Tertiary volcanics. Another fault of this group may lie close to the E 16000 coordinate, but the only evidence for its existence is the apparent thinness of the Brushy Basin in this area; possibly folding or a fault of another system could cause this.

Of the east-trending faults, except for the Willow Fault, the only important one recognized was the Blizzard Fault in the Beta Area. This fault strikes N 85° E and dips 65° N. It has about 100' apparent vertical displacement, the south side being dropped, but probably this apparent displacement is due to horizontal movement. Two or possibly three minor east-striking faults are suspected in the eastern part of the area, in the pre-Cambrian terrane.

In the area of the Star claim group, the presence of a fault trending N 40° E is suspected from apparent displacement of the Salt Wash member, but no fault is exposed. Possibly folding or a fault of another group has caused the apparent thinning of the Brushy Basin.

## MINERALIZATION

A radiometric grid survey was made of the entire area covered by the Willow Creek claim group, using the corners of the claims for points on the grid. In some small areas, side center monuments were also used. The results of this grid survey are shown on Drawing No. GGC 4, property Ownership and Radiometric Map. In addition, part of the Beta Area was covered by a radiometric grid using a 200' interval with closer intervals in some parts (see Drawing No. GGB 3, Beta Area Radiometric Map).

For all of the radiometric work in the Willow Creek group, the background used is the lowest reading found in the area, corresponding to 5 cps on the Detectron Nucliometer DR 290, and to 0.0095 mr/hr on the Precision Radiation Instruments Inc. Model 111B Scintillator. Only a few of the readings taken were as low as this arbitrary background, and they can probably be considered as anomalously low. This point must be kept in mind in interpreting the radiometric maps, since use of such a low background makes most of the readings appear well above background. Actually, any reading shown on the maps as less than 2 x background is not significantly high, and in general readings up to 2.4 x background do not mean much. Readings above 2.8 x background probably can be considered truly anomalous.

Radioactivity of the Dakota formation for the most part ranges between

background and 2.4 x background, with only two small areas having radioactivity higher than 2.4 x background. These areas of higher radioactivity may be significant, in view of the generally low radioactivity. The Salt Wash member and the alluvium likewise have very low radioactivity in general.

Near the eastern edge of the claim group are two radiometric highs, one of them wholly within the volcanic area, and the other partly in the volcanics and partly in the pre-Cambrian granite. These may be caused in part by variations in the original uranium content of the volcanics, although this explanation hardly accounts for the radioactivity of the granite. Further work will have to be done here if uranium is found anywhere in the area. Near Corner 1 of the Victor 60 Claim is a small area of relatively very high radioactivity, in an easterly-striking ridge of silicified pre-Cambrian granite. A fractured zone is exposed in an old pit, and thin veinlets of hematite-stained material occupy some of the fractures. This material strongly resembles the thorium-bearing vein fillings found near Powderhorn, a few miles west of here. No uranium minerals are visible. So far I have not been able to collect any material that is radioactive enough to justify an assay for thorium, but I suspect that thorium is the source of the radioactivity. If I am correct, this occurrence has no bearing on the possible presence of uranium in the sediments, since the thorium mineralization is older than the Jurassic sediments (Burbank and Pierson, USGS Circular 236, p. 2). Should uranium be found in the area, this occurrence will require more work, on the chance that I am mistaken in identifying the thorium mineralization.

The most radioactive rock in the area is the Brushy Basin member; about half of the area underlain by this member has radioactivity less than 2 x background, with the other half having radioactivity ranging as high as 4 x background. Five areas in the Brushy Basin, including two areas partly in the Dakota have anomalously high radioactivity greater than 2.8 x background. Two of these anomalies appear to be related to the Beta Fault, and two to the Elkhorn Fault, while the fifth is not close to any known fault. A possible sixth anomaly lies along the Star Fault; readings in this area lie between 2.4 x and 2.8 x background, but their relationship to the fault makes them interesting. The details of only one anomaly, that on the Beta group of claims, have been worked out; this anomaly is covered in the later section on the Beta area.

The relationship between the anomalous areas in the Brushy Basin and the faults indicates a hydrothermal source for the uranium. Radioactivity is notably weak along the Willow Fault, although this is the strongest structure in the area. One explanation for this is the fact that over most of the area the fault is either in unfavorable Dakota formation, or else is covered by a thick layer of Dakota float. Possibly the anomaly near coordinates N 6500 E 12000 is related to the intersection of the Beta and Willow Faults.

All of the anomalies lie in the uppermost beds of the Brushy Basin-in approximately the same beds that are silicified where exposed in the

Beta pits. Evidently these beds are the most efficient collectors of uranium in the stratigraphic column. There is a very slight possibility that these beds were originally deposited with a higher-than-average uranium content, and that the present anomalies are simply areas in which these beds are not covered or are less covered by barren alluvium. I very much doubt that this is the true explanation, however; there is no evidence to indicate that these areas have less alluvium on them than other areas, and the relationship to faults is quite clear.

Bulldozer work on the Beta claims has opened the Beta and Blizzard faults, and exposed slight uranium mineralization in chalcedony in the fault zones. This is described in more detail in the following section.

## BETA AREA

Stratigraphy: See Drawing No. GGB 2, Beta Area Geology and Topography. Except for two small patches of Dakota, the entire Beta area is underlain by rocks of the Brushy Basin member; probably not more than the upper half of the Brushy Basin would be exposed if the soil cover were removed. The Dakota is about 80' thick, predominantly sandstone but with a bed of conglomerate at least 10' thick at or near the bottom. The sandstone is very hard, partly silicified, but no more so than elsewhere in the Willow Creek area.

The only exposures of Brushy Basin bedrock are in the several bulldozer cuts. In Pit D, the rock exposed is a red siltstone similar to the ordinary Brushy Basin as seen in other districts. In all of the other pits, the rock exposed is principally a very hard, dense white to gray silicified material, which I have called silicified siltstone. All of this rock is thoroughly shattered, though in most places with no particular pattern to the fractures, and fracture surfaces are lighly limonite-stained. Some of the rock contains casts of small pyrite crystals; the pyrite was probably formed during silicification, from iron originally contained in the sediments.

In Pit G the rock exposed is partly silicified siltstone interbedded with a soft white clay material that appears to be an alteration product of the silicified siltstone. At one end of this pit is a small exposure of fine-grained limestone, which seems to grade into silicified siltstone; probably some of the material that I have mapped as silicified siltstone is actually silicified limestone, with all trace of its original identity lost. Limestone boulders are numerous in the rubble exposed in Pit H, suggesting that there is at least one limestone bed below the silicified siltstone bed. Much of this limestone is strongly recrystallized and iron-stained, probably because the boulders are mostly derived from the vicinity of the faulting.

There is no evidence as to the character of the lower part of the Brushy Basin or of the Salt Wash in the Beta area.

Structure: The area lies on the flank of a fold, with the bedding striking northeasterly and dipping as steeply as 28° southeast.

Two faults lie close together or intersect in the area: the Beta Fault, with an attitude of N 75° E, vertical, and the Blizzard Fault with an attitude of N 85° E, 65° N. Probably the movement on both faults was largely horizontal, but because of the folding, the apparent vertical displacements are 40' plus on the Beta and 60' plus on the Blizzard, the south side being dropped in each case.

There are also many minor shears, especially close to these two major faults, Most of these strike between due West and N 45° W, and dip 50° to 80° N. None have appreciable displacement, and they are probably simply minor adjustments related to the major faults.

Mineralization: The most radioactive places in the Beta area are in the pits exposing the silicified siltstone; this rock has radioactivity ranging from 3 x to 4.5 x background, with 4 x background the average and most common reading. There is no increase in radioactivity close to the faults. None of the siltstone is recognizably radioactive in hand specimen, nor does any of it contain uranium minerals recognizable either in daylight or ultraviolet light. Of the other rocks exposed, the red siltstone has about 2.4 x background, and the Dakota sandstones have about 1.4 x background.

Drawing No. GGC 4, Beta Area Radiometric Map, shows the results of a radiometric grid survey in the Beta area. The anomalously high (greater than 2.8 x background) radioactive area is an irregular inverted V, within which are several smaller patches with radioactivity above 3.2 x background. The entire Beta area is covered with a soil mantle of variable depth, so there is undoubtedly some distortion of the radiometric pattern caused by movement of radioactive float. It is reasonably certain that the entire anomaly is caused by the radioactivity of the silicified siltstone, both in bedrock and in float. The largest bedrock mass of the siltstone underlies roughly the apex of the V, and two smaller bedrock masses lie under each arm of the V -- segments of the bed dropped by the Beta and Blizzard Faults. Between and around these patches of radioactive bedrock, principally on the down-slope sides, radioactive float covers the barren bedrock, filling in and distorting the V.

Unless there is unrecognized faulting, the silicified siltstone bed continues north of the apex of the V-shaped anomaly, although the anomalous radioactivity does not continue, and similarly, the same bed lies south of the Dakota in the southwestern part of the map, although here the radioactivity is not anomalously high. This suggests that the radioactivity of the siltstone is not persistent throughout the bed -- either because uranium was not introduced into it, or because the bed in these non-radioactive areas was not capable of holding uranium, perhaps because here it is not silicified. There is nothing in the known geology to explain such distribution of either uranium or silicification. Another

possible but unlikely explanation for the lack of radioactivity in these places is that the siltstone is both silicified and uranium-bearing, but is completely covered with a thick mantle of barren material.

The Beta and Blizzard Faults are each well exposed in one pit, both at places where the Dakota lies on one side of the fault and silicified siltstone on the other. In the Beta exposure, the principal movement seems to have taken place along a vertical knife-edge seam, with little disturbance of the Dakota beyond this seam. The silicified siltstone on the other side, however, is thoroughly shattered and somewhat sheared for a distance of 50' from the seam. Aside from the more intense shearing, there is little to distinguish this zone from other parts of the silicified siltstone except the presence of red clay in the fractures, and this may well have been washed in by ground waters. At one place, near the middle of the shear zone, however, is a small lens -- perhaps six feet long by six inches wide; the ground is torn up by the bulldozer -- of reddish-brown jasper with small masses of porous limonite that probably are the remains of original sulfides. This jasper contains thin films and stringers of chalcedony that fluoresces a bright green; a five-pound sample picked for its chalcedony content was appreciably radioactive, and a chemical assay of this material showed 0.032% U308 (assay by C. O. Parker, Denver). I would estimate that a pure sample of chalcedony would assay about 0.6% U308.

On the Blizzard Fault, the shear zone is at least 60' wide, about half of which width is in Dakota and half in silicified siltstone. The shearing in the silicified siltstone is like that on the Beta Fault; in the hard Dakota sandstone there are some strands of breccia cemented by limonite-stained limy cement, and numerous large blocks of unbroken sandstone. There are at least two lenses of jasper with films of fluorescent radioactive chalcedony.

The chalcedony is the only material in the area that is recognizably radioactive in small masses, and it occurs only in the jasper lenses in the fault zones. This is significant in that it indicates the presence, at one time, of uranium-bearing solutions in the faults. The chalcedony itself is probably a secondary mineral, and the uranium in it no doubt came from an earlier mineral, but the association with the jasper and leached sulfides strongly suggests that the uranium was originally introduced by hydrothermal solutions.

## WATER SUPPLY

The Beta Area, and the Willow Creek Group of claims in general, is dry. Willow Creek itself runs during the Spring, but is dry the rest of the year, including now, after a month of rainy weather.

Possible sources of surface water in amounts large enough for diamond drilling are: Vulcan Mine, Beaver Creek, and a beaver dam about two miles down Willow Creek from the Beta.

The Vulcan Mine is 8 miles by road from the Beta group, and five miles of this road would have to be smoothed with a cat to make it passable for a water truck. At least one mile of this would be over ground that is predominantly sandstone boulders and I believe it would be necessary to haul dirt to make a reasonably smooth road surface.

Beaver Creek is nearly 5 miles by jeep trail from the Beta group, and all of this would have to be smoothed with a cat. There is one short (one-quarter mile) length of rather steep grade, coming out of Beaver Creek. At least two miles of road would be across boulder ground where it would be necessary to haul dirt to make a smooth road surface.

I have not visited the beaver dam on Willow Creek below the Beta, so cannot give any first-hand information on it. I understand from Jim Dunn that it is on patented ground, so we would have to get permission to haul water from it. The bottom of Willow Creek Canyon is mostly boulders, and would be difficult to grade into a road, but a road could probably be cut out of the finer material on the slopes with little difficulty. This is probably the cheapest source of water, if we must haul it.

It is possible that we could get water closer to the Beta group by bulldozing a hole either in the bottom of Willow Creek, or at a wet-weather spring part way up the canyon that runs along the east side of the Beta area. I doubt that we could get much of a hole, however, because this ground is predominantly sandstone and conglomerate boulders up to 5' in diameter. A more effective but more expensive method would be to drill one or more diamond drill holes in this canyon, in hopes of developing a water supply from the Salt Wash sandstone that underlies it. I have laid out a hole (Proposed DDH A) primarily for this purpose, to try to hit the intersection of the Blizzard Fault and the Salt Wash. I think we would stand a very good chance of finding water at this intersection. We would still, however, have to build a road to haul water to do this drilling. The cost of Proposed DDH A would be in the neighborhood of $500, exclusive of the cost of getting the water to drill it. Assuming a cost of $300 to build a road and haul water for this hole, and assuming that the first hole develops enough water for our purposes, this would make a water cost of 59¢ per foot for the 1350' minimum drilling that I have recommended, exclusive of the cost of pumping and piping the water to the drill sites. An alternative plan would be to haul water for the preliminary prospect drillholes, and develop a water supply if we get encouragement enough for further drilling.

## RECOMMENDATIONS

Since all of the anomalies are similar as far as present knowledge goes, a thorough test of one anomaly should give us a fair estimate of the quality of all of them; the Beta anomaly is the logical choice for this, of course, since it is the most thoroughly mapped.

I have laid out Proposed DDH A, a vertical hole 125' long at N 4585, E 9980, primarily to develop a water supply for further drilling. Secondary purposes for this hole, however, are to test the Blizzard Fault for mineralization in this location, and also to determine the stratigraphy of the lower Brushy Basin and the Salt Wash. This latter information would be very useful to interpreting the more important holes testing the Beta anomaly itself.

Proposed DDH B, at N 4570, E 8615, bearing S 11° E, - 60°, 450' long, is intended to test the intersection of the Blizzard Fault with the Salt Wash. I am not satisfied that the dips I have determined for the faults are accurate, but if we get good core recovery we should be able to locate the faults in the hole, and thus determine accurate dips. It is to be hoped, of course, that we will also find ore with this hole, but if we do not, at least two more holes should be drilled on these structures to be certain. I think that about 500' west of Proposed DDH B the Beta and Blizzard Faults intersect at the elevation of the Salt Wash, and if there is such an intersection it is the most favorable place for ore. I have not aimed the first hole for this intersection because I think it will be cheaper to use the first hole to determine the attitude of the faults, although in a less favorable location, and thus be able to spot the intersection accurately. With the intersection located, two holes should be enough to determine whether it is mineralized; these holes would probably be parallel to Proposed DDH B, and like it would be about 450' long. (Two weeks ago I estimated 200' holes would be long enough; this estimate was sadly in error).

The total footage of drill hole necessary to prove the Beta anomaly barren, and the other anomalies barren by inference, would then be 1350', or 1475' if Proposed DDH A is also drilled. All of this should be core drilling, with every effort made to recover as much core as possible, since it is in unknown ground. If any of the holes show mineralization, or possibly if they show only favorable alteration, further drilling would of course be necessary; core might not have to be recovered from all of this second-phase drilling. I can make no estimate of the amount of such drilling that might be necessary.

While the Beta area is being drilled, it would be well to do a limited amount of bulldozer work on some or all of the other anomalies, to attempt to determine whether these anomalies are similar in all respects to the Beta anomaly. If any are significantly different, some diamond drilling may be advisable on the different ones even if no ore is found on the Beta. About one week's bulldozer work on each of three anomalies should be sufficient.

Arthur Baker III

Arthur Baker III

Exhibit - C

COPY COPY

# L E A S E

THIS LEASE, made and entered into as of this 1st day of October, 1954, by and between CALLAHAN ZINC-LEAD COMPANY, a corporation organized under the laws of the State of Arizona, and duly qualified to transact business in the State of Colorado, party of the first part, hereinafter called the Lessor, and VULCAN SILVER-LEAD CORPORATION, an Idaho corporation, party of the second part, hereinafter called the Lessee, WITNESSETH:

## Article 1. Description of Property.

The Lessor, for and in consideration of the sum of One Dollar ($1.00) to it in hand paid by the Lessee, the receipt whereof is hereby acknowledged, and for and in consideration of the covenants and agreements of the Lessee hereinafter set forth, does hereby lease, let and demise unto the Lessee, its successors and assigns, the following unpatented lode mining claims, situated in Saguache and Gunnison Counties, State of Colorado, to wit:

Star, Star #1, Star #2, Star #3, Star #4, Star #5
Star #6, Star #7, Star #8.

Located in sections 3 and 4, T46N, R1W New Mexico
Principal Meridian and section 34, T47N, R1W N.M.P.M.
All situated and recorded in Saguache County, Colorado.

Beta, Beta #1, Beta #2, Beta #3.

Located in sections 31 and/or 32 T47N, R1W N.M.P.M.
Recorded in both Gunnison and Saguache counties.

## Article 2. Term of Lease.

TO HAVE AND TO HOLD unto the Lessee for the term of thirty (30) years from the 1st day of September, 1954, subject, however, to termination by forfeiture, cancellation or surrender within said term as hereinafter provided.

## Article 3. Possession and Control of Property.

The Lessor hereby gives and grants to the Lessee the right immediately to enter upon and take over the sole and exclusive possession and control of the property and the whole and every part thereof, and during

the effective term of this lease the Lessee shall remain in the sole and exclusive possession and control thereof. The Lessee is also granted the right to investigate, measure, sample, examine, test, develop, work, mine, operate, use, manage and control said property; to erect, construct, use and maintain such buildings, structures, machinery and equipment as may be required by the Lessee for the conduct of its mining and milling operations; and to mine, extract and remove from said property the ores and minerals contained therein and to treat, mill, ship, sell or otherwise dispose of the same and receive the full proceeds therefrom, subject to the terms and conditions hereinafter set forth.

Article 4. Entry, Manner of Work, and Conformity with Laws.

The Lessee agrees to cause all explorations, development and mining work hereunder to be done in a careful and miner-like manner, and to conform in all respects to the Mining Laws and Regulations of the State of Colorado and of the United States of America, as more specifically provided in paragraph B of Article 25 hereof.

Article 5. Work Requirements.

A. The Lessee further agrees (a) to take immediate possession of the property, (b) to proceed promptly with preparations necessary for the exploration thereof, (c) to complete all discovery work thereon and assume all costs incurred or to be incurred subsequent to September 1st, 1954, (d) to perform all assessment work necessary to preserve and maintain possessory title to said claims each year during the currency of this lease, and to file timely proof thereof as required by law, (e) to pay all taxes, or other lawful impositions, levied or imposed upon said property as provided by Article 22, and (f) to diligently explore and develop said property with the end in view of recovering the values therefrom as promptly and expeditiously as possible. Such work shall be prosecuted diligently, subject only to delays due to shortage of labor.

Article 6. Termination of Lease.

The Lessee reserves the right hereby expressly granted by the Lessor

to terminate this lease and surrender the property to the Lessor at any time during the term of this lease, upon ninety days written notice to the Lessor of its intention so to do.

Article 7. Mining Operations.

The Lessee (unless this lease shall be terminated under Article 6) shall proceed with reasonable diligence the exploration and development of the property, placing thereon, within a reasonable time such mining, milling and other equipment, buildings, etc. of the kind, type, character and quality deemed advisable in the Lessee's sole judgment, advancing all money required for that purpose, including working capital, subject, however, to the right of the Lessee to be reimbursed therefor as hereinafter provided in Article 14.

Article 8. Additional Work.

Nothing herein contained shall be construed to prevent the Lessee from conducting any and all such exploratory, development or mining work on the property as may seem advisable to the Lessee in its sole judgment for the benefit of the enterprise, advancing all moneys required in connection therewith; and the Lessee shall be entitled to reimbursement as provided in Article 14 for all capital expenditure in connection therewith, including all expenditures made before the property shall be placed on a profitable operating basis, operating expenditures made thereafter to be deducted in the determination of net profits under Article 15 hereof.

Article 9. Overhead Expenses.

Until such time as the property shall be placed on a profitable operating basis, the Lessee shall be entitled to charge Five Hundred ($500) per month for the general administration of its Wallace and New York offices, that is to say, for management above that of resident superintendent or manager of the property, and such charge shall be considered as an advance for which the Lessee shall be reimbursed as provided in Article 14; and from and after the first day of the month following the commencement of production on a commercial basis such charge shall be increased to the sum of One Thousand Dollars ($1,000) per month, the amount of such increase to be

due and payable, however, only to the extent that there shall be net profits as defined in Article 15 and as determined after deducting the minimum charge of Five Hundred Dollars ($500) per month for general administration.

Article 10. Royalties.

A. Royalty Period.

The Lessee shall pay to the Lessor the royalties prescribed in paragraph B of this Article until such time as the Lessor shall become entitled to share in the profits of operations as provided in Article 14; and royalties allocable to the first quarterly period in which such profits are derived shall be credited against the share of the Lessor in such profits, to the end that the Lessor shall be entitled to receive royalties for that period or its shares of the profits, whichever shall be greater in amount; and the payment of royalties hereunder shall not be resumed unless and until the Lessor shall become entitled thereto as provided in Article 17.

B. Royalties on Ores.

The Lessee shall pay royalties on all ores mined and shipped from said property equal to ten per cent (10%) of the gross receipts received for the product, including all premiums, bonuses or subsidies except where by law or governmental regulation such premiums, bonuses and subsidies, or any part thereof, are excluded from the computation of royalties (but not including haulage or development allowances).

Article 11. Advance Royalties.

Commencing July 1st, 1955, as an advance on account of royalties, payable under Article 10, and to provide for the corporate expense of the Lessor, the Lessee agrees to pay the Lessor the sum of $400.00 per month (a) until such time as Lessee may elect to terminate this lease, as provided in Article 6, or (b) until royalties shall be due and payable hereunder, whichever event shall occur first, provided, however, that if such royalties shall be less than Four Hundred Dollars ($400.00) per month the deficiency, if any, for the applicable quarter shall be advanced by the Lessee against royalties thereafter payable hereunder; and provided further, that all royalties in excess of Twelve Hundred Dollars ($1200.00) per quarter shall

be retained by the Lessee until it shall have been fully reimbursed for royalties advanced hereunder.

Article 12. Gross Receipts.

The term "Gross Receipts" shall be interpreted to mean the total amount received by the Lessee, (i. e. the selling price) for all ore produced and shipped from said property, including premiums, bonuses and subsidies, but not including haulage and development allowances.

Article 13. Development Allowances.

The Lessee covenants and agrees to use any and all development allowances paid pursuant to the Atomic Energy Commission Domestic Uranium Circular No. 5, as amended, which shall be received for ore mined from said leased property exclusively for development work on the property leased hereunder and not for development work on any other property.

Article 14. Application of Profits.

Any and all net profits derived and determined as provided in Article 15 hereof shall be applied, first, to reimburse the Lessee for its advance or expenditures under Articles 5, 7, 8, 9, 17, 22, 23, 25, and 33 hereof (if any, not otherwise deducted in determining net profits) and, second, to establish and maintain working capital in addition to that provided by the Lessee under Article 7, in such reasonable amount as the parties shall from time to time mutually agree upon. Any such profits as may be in excess of the foregoing requirements shall be divided equally between the Lessor and Lessee.

Article 15. Determination of Net Profits.

"Net Profits" shall be determined by deducting total expenses of whatsoever nature in connection with the operation of the property, including royalties under Article 10 from the net proceeds of the crude ores and/or concentrates and other products of the property, but without deduction for depletion or depreciation; and such total expenses shall include also

(a) A charge for general administration of the Lessee's Wallace and New York offices in an amount not less than the minimum and not more than the maximum prescribed by Article 9;

(b) The actual cost of the Lessee's traveling auditor's audit of the accounts about once a year;

(c) The cost of insurance placed and carried by the Lessee under Article 23 or otherwise; and

(d) All taxes, assessments and governmental charges lawfully imposed upon the property or any part thereof, the operations conducted hereunder, or the sale of the product, or in respect to or measured by production, extraction, smelting, refining, sale, transportation, proceeds or value of the product or the metals derived therefrom, other than those for which the Lessee shall be entitled to reimbursement as provided in Article 22, and other than Federal and Colorado income taxes, net profits taxes (except property taxes based on net profits), and taxes of a similar nature, levied by such governmental instrumentality or subdivision thereof, upon the Lessor or the Lessee and which shall be for the account of the party directly responsible therefor.

Article 16. Losses in Operation.

Any loss sustained in the operation of the property during any month shall be a charge upon first net profits thereafter derived.

Article 17. Additional Advances.

If, after the Lessee shall have been reimbursed and working capital shall have been established and maintained, as provided in Article 14, it shall become necessary at any time for the Lessee in its sole judgment to advance additional funds for capital expenditures in excess of those referred to in Article 26, or to continue operations when working capital shall be depleted or exhausted, the amount of such advances shall be repaid to the Lessee out of the first profits thereafter derived with interest thereon at the rate of five per cent (5%) per annum; and if and when the Lessee shall have been so reimbursed with interest and thereafter working capital shall have been established again in the amount prescribed in Article 14, profits shall then be divided equally between the Lessor and the Lessee; provided, however, that if the Lessee shall elect to make advances hereunder to continue operations at a loss to the mine, there shall be paid to the Lessor during such period a royalty of fifty cents (50¢) per ton of crude ore produced from

the property and sold or otherwise disposed of, it being expressly stipulated and agreed that such payments and losses by the Lessee shall constitute an advance or expenditure for which it shall be entitled to reimbursement as hereinabove provided.

Article 18. Maps and Surveys.

The Lessee shall at all times have sufficient surveys and maps made and kept subject to inspection by the Lessor so that the Lessor may be fully informed of the nature and character of the mine workings and operations performed hereunder. The Lessee shall furnish the Lessor from time to time with the monthly operating reports of the superintendent or manager of the property, and, at quarterly periods, if the Lessor so desires, with copies of the logs of all drill holes which have been drilled by the Lessee within the property.

Article 19. Statements of Account.

Ore settlement statements showing royalty due, if any, shall be rendered and the royalty due shall be paid on or before the 25th day of each month on all lots settled for at the mill or smelter or other purchasing agency, during the preceding month; and as soon as conveniently possible after the termination of each quarterly period of each calendar year, the Lessee will render to the Lessor a statement of account in reasonable detail, which quarterly statement shall be accompanied by a payment of the profits or royalties to be accounted for hereunder, if any; and the Lessor shall have sixty (60) days from the date of mailing the said statements within which to examine the same and object thereto in writing if any error is found therein, it being understood and agreed that failing such objection within said period the statement shall be considered as correct.

Article 20. The Records.

The Lessee agrees that it will keep and maintain at the property correct and complete books of account and records showing truthfully and accurately and in all reasonable detail the amount of all metals, minerals or ores mined or recovered and/or milled on the property, the weight and assay value of all products shipped therefrom, the names and addresses of the parties

to whom shipments of product are made, any and all returns received therefrom the gross proceeds thereof, the cost of mining operations and capital expenditures from time to time, and all other particulars necessary and proper for the true and accurate ascertainment of royalties or net profits, and to enable the Lessor to be currently informed and assured as to the correctness of the statements of account to be rendered by the Lessee from time to time as herein provided, its accredited representatives at all reasonable times shall have full and free access to the property and to the plants on the property handling the ores at the sole risk and expense of the Lessor and also the right to inspect and audit all such records and books of account kept by the Lessee at the property relating to any matters in this agreement referred to, and to inspect, check and if deemed advisable or desirable to make copies of any extracts from all reports, records, memoranda, books of account, assay or sampling, smelting, milling or concentrating returns, or other documents, vouchers or memoranda at the property in any way relating to or referring to the matters in this agreement mentioned; provided, however, that such inspection, audit, checking and/or copying shall not unreasonably interfere with the business requirements of the Lessee.

Article 21. Encumbrance.

The Lessor agrees that during the period hereof it will not mortgage, sell or otherwise encumber or dispose of the property subject to this lease without giving the Lessee previous written notice of its intention to do so, and further, that any such encumbrance or disposition of the property or any part thereof shall be made expressly subject to the rights of the Lessee hereunder in such manner as may be approved by counsel for the Lessee.

Article 22. Payment of Taxes.

The Lessee shall pay or if the Lessor shall have paid the Lessee shall reimburse the Lessor for all taxes upon said property falling due during the term of this lease and while the same is in force and effect prorated from and after the date hereof, and shall also pay, when due and before delinquent, all taxes levied or assessed against any and all personal property, machinery and equipment placed upon said property by the Lessee during the term of this

lease. The Lessee shall be liable for and undertakes to pay all sales taxes and other taxes of every kind, character and description levied or imposed during the term of this lease upon the ores, minerals, concentrates or products of ores produced, sold or otherwise disposed of by the Lessee, and all taxes levied against the Lessee as an employer of labor, all such taxes to be promptly paid when due and before delinquent; and the Lessee shall be entitled to reimbursement for all taxes paid hereunder as provided in Article 14 until the property shall be placed on a profitable operating basis when the same shall be deducted in determining net profits as provided in Article 15. However, nothing herein contained shall be construed as obligating the Lessee to pay mine license taxes payable by the Lessor and which shall be for Lessor's sole account.

Article 23. Insurance.

The Lessee, at all times during the term of this lease, shall

(a) keep the leased property and all structures at any time thereon, or at any time being erected thereon, adequately insured against loss or damage by fire, lightning, tornado, cyclone, explosions and/or other risk against which insurance is usually carried by mining companies operating in the same territory, by a reputable insurance company or companies in an amount equal to the full insurable value thereof; any loss in respect of any property so insured to be made payable to the Lessor and Lessee, as their interests may appear, and any proceeds of insurance in excess of the amount necessary for the cost of repairs, restorations and replacements to the property shall be applied as provided in Article 14; it being agreed that if the proceeds of insurance shall be insufficient to provide for the cost of repairs, restorations and replacements, the amount of the deficit shall be charged to operations or advanced by the Lessee if operations shall not have been commenced.

(b) purchase public liability and property damage liability insurance in amounts satisfactory to the Lessor whereby the insurance company will agree to pay on behalf of the Lessee all sums which the Lessee shall become obligated to pay by reason of the liability imposed by law because of bodily injury, including death at any time resulting therefrom, sustained

by any person or persons, or damage to or destruction of property of others caused by accident; and

(c) carry Workmen's Compensation and such other insurance as may be required by the laws and mining regulations of the State of Colorado.

Should the Lessee fail to effect or maintain insurance as provided in this agreement, the Lessor may, but shall not be required to, take out insurance or additional insurance; and the Lessor shall be entitled to receive reimbursement therefor from the Lessee.

The Lessee shall be entitled to reimbursement for all expenses incurred under this Article 23 as provided in Article 14 until the property shall be placed upon a profitable operating basis.

Article 24. Protection from Liens and Damages.

The Lessee shall keep said property and the whole and every part thereof free and clear of liens for labor done or work performed upon said property or materials furnished to it for the development or operation thereof under this lease and while the same is in force and effect, and Lessee will save and keep harmless the Lessor from all costs, loss or damage which may arise by reason of injury to any persons employed by the Lessee in or upon said property or any part thereof, or which may arise by reason of injury to any persons, livestock or damage done to any other property as the result of any work or operations of the Lessee or of its possession and occupancy of the property.

Article 25. Posting Notices and Conformity with Law.

A. The Lessee shall post and keep posted written or printed notices in due form and in compliance with the requirements of the lien laws of the State of Colorado, showing that the property is being worked by the Lessee under lease only and that the Lessor will not be subject to any lien whatever.

B. The Lessee shall observe and promptly comply with all local, county, state and federal laws, statutes, ordinances, rules, regulations, orders and requirements and those of any departments and bureaus of the federal, state and local governments with reference to said property, buildings thereon, and any labor performed thereon, or to any operations thereon; provided, however, that the Lessee shall have the right to contest the validity of any of the

foregoing, taking all such steps as shall be reasonably required to protect the interests of the Lessor; and all expenses incurred or reserves set up in complying therewith shall be capital expenditures (for which the Lessee shall be entitled to reimbursement as provided in Article 14) until the property is placed upon an operating basis and thereafter shall be charged to operations.

Article 26. Replacements.

If at any time during the period of this lease capital expenditures shall be required in the Lessee's sole judgment for the benefit of the operations contemplated herein, in addition to those made before the property shall be placed upon an operating basis, either for increase of mill capacity, substitution or replacement of machinery, or otherwise, the parties hereto agree that any such capital expenditures in an amount not exceeding in the aggregate two hundred fifty thousand dollars ($250,000.00). in any one calendar year shall be deemed expenses in connection with the operation of the property and as such shall be deducted in determining "net profits" as provided in Article 15 hereof.

Article 27. Force Mejeure.

If the Lessee shall be delayed at any time during the period of this lease in keeping or performing any agreement on its part to be kept or performed according to the terms and provisions hereof, except the payment of royalties, profits and taxes, by any act or neglect of the Lessor or by strikes, lockouts, fire, unusual delay in transportation, orders of the Government, or any duly constituted instrumentality thereof, unavoidable casualties, or any causes beyond the control of the Lessee, such delay shall not be deemed a breach of this lease or a default on the part of the Lessee constituting a cause for forfeiture; and the Lessee agrees to use reasonable diligence to remove such causes of disability as may occur from time to time. The Lessee shall not be required to mine, mill, or otherwise dispose of the products from said property during periods of financial crises when the metals produced are salable only at abnormally low prices.

It is expressly stipulated and agreed that the Lessee shall promptly notify the Lessor in writing of the commencement or termination of any such

delays or suspensions of performance hereunder, and that the term of this lease shall be extended for a term equal to the period or periods thereof.

Article 28. Forfeiture Clause.

The failure of the Lessee to make or cause to be made any payment herein provided for, or to keep or perform any agreement on its part to be kept and performed according to the terms and provisions of this lease shall, at the election of the Lessor, and upon giving notice thereof to the Lessee, constitute a forfeiture of this lease; provided, however, that in the event of a default on the part of the Lessee, and the election of the Lessor to terminate this lease on account thereof, the Lessor shall give to the Lessee a written notice of its intention to declare a forfeiture of this lease and to terminate the same on account thereof, specifying the particular default or defaults relied upon by it. The Lessee shall have ninety (90) days after receipt of such notice in which to cure such default or defaults, and if such default or defaults are fully cured, there shall be no forfeiture of this lease with respect to such default or defaults. No waiver of and no failure or neglect on the part of the Lessor to give notice of a default or defaults shall affect any subsequent default or impair the Lessor's rights resulting therefrom.

Article 29. Surrender of Property.

Upon termination of this lease either by limitation or at the election of the Lessee as provided in Article 6, or by default as provided in Article 28, the Lessee shall evidence such termination by recordable document, surrender possession of the property and pay all bills or other obligations incurred by it in connection therewith and all royalties or profits due to the Lessor up to date of such termination.

In the event that such termination shall occur before the property is placed upon a profitable operating basis, the Lessee shall have the right to remove from the property the equipment, materials and supplies placed thereon by it, subject, however, to the right of the Lessor to purchase (a) any one or more of the units of removable equipment on the basis of the cost thereof to the Lessee erected or placed on the property, less ten per

cent (10%) per year for depreciation, and (b) all or any part of such materials and supplies on the basis of the delivered cost thereof to the Lessee.

In the event, however, that such termination shall occur after the property shall have been placed upon a profitable operating basis but before the Lessee shall have been fully reimbursed for its expenditures under Articles 5, 7, 8, 9, 17, 22, 23, 25, and 33 hereof, then any cash available in the working capital account shall be applied to so reimburse the Lessee, and the Lessee shall have the further right to remove from the property equipment, materials and supplies of a fair market value not exceeding the amount required for such reimbursement, subject, however, to the right of the Lessor to purchase any of such equipment, materials and supplies at the then fair market value thereof.

If, however, the Lessee shall have been previously so fully reimbursed, or shall be so fully reimbursed through the application of working capital as hereinabove provided, then the amount of any remaining working capital shall be divided equally between the Lessor and the Lessee, and for that purpose the equipment, materials and supplies remaining on the property shall be sold or otherwise disposed of on the basis of the best terms available.

Nothing herein contained shall be construed to permit the removal from the property of mine timbers and mine tracks, ties and pipe lines in place or other permanent improvements on the property the title to which is hereby vested in the Lessor.

Upon termination of this lease either by limitation or at the election of the Lessee as provided in Article 6 or by default as provided in Article 28 the Lessee shall deliver up the property to the Lessor in good order and condition with all mine workings used by the Lessee during the period of ninety (90) days prior to the date of such termination (and not affected by fortuitous event during that period) in condition suitable for continued operations, to the end that the Lessor may operate the property if it so elects; provided, however, that unless the Lessor shall notify the Lessee that it intends to operate the property, the Lessee shall surrender the

property only in such condition as good mining practice requires upon abandonment of operations.

Article 30. Additional Water Rights, etc.

It is expressly stipulated and agreed that any and all water rights and rights of way appurtenant to the property and hereafter acquired shall be vested in the Lessor and become a part of the property covered by this lease.

Article 31. Labor Agreements.

The Lessee further agrees that it will use its best endeavors to avoid the making of any agreement for labor which shall not terminate on or before the termination of this lease, to the end that thereafter the Lessor shall be able to negotiate a new agreement.

Article 32. Notices.

Any notice provided for herein shall be sufficiently given if posted by registered mail addressed to the party entitled to receive the same, as follows:

To Callahan Zinc-Lead Company, Inc.
100 Park Avenue
New York 17, New York.

To Vulcan Silver-Lead Corporation,
100 Park Avenue
New York 17, New York.

except as either party hereto shall otherwise instruct the other party by written notice to be appended to this lease.

Article 33. Costs of Litigation.

All costs of litigation, including counsel fees, incurred by the Lessee, in and about the conduct of its operations shall be deemed an operating expense and deductible in determining net profits as provided in Article 15, and all such costs in defending the Lessee's right to proceed under this lease, unless the Lessee shall be in default hereunder, shall be for the Lessor's account and shall be deducted from that portion of the first net profits which the Lessor shall be thereafter entitled to receive under Article 14, provided, however, that this paragraph shall not apply to any litigation brought by the

Lessee against the Lessor under this agreement unless and until a final judgment shall have been rendered against the Lessor by a court of competent jurisdiction and the time to appeal therefrom has expired.

Notwithstanding the foregoing provisions of this Article 33, before entering upon any litigation involving the title to the property, the Lessor shall have the right to employ counsel to litigate such question, but in the event the Lessor fails to do so the Lessee shall have the right to undertake such litigation as provided for herein.

Article 34. Inurement.

This lease and agreement shall inure to the benefit of and be binding upon the successors and assigns of the parties hereto, and the Lessee may assign this lease only with the written consent of the Lessor first had and obtained, which consent shall not be unreasonably withheld, provided, however, that the Lessee shall have the right to assign this lease without the consent of the Lessor to a corporation all the outstanding capital stock of which shall at the time be owned by the Lessee, but the Lessee shall remain primarily liable for performance hereof by such wholly owned corporation; and provided further, that nothing herein contained shall be construed to require the consent of the Lessor to such participations as the Lessee may elect to grant to any other party or parties presently or from time to time hereafter, but such participation shall not affect the obligations of the Lessee to the Lessor hereunder.

Article 35. Construction.

It is expressly stipulated and agreed that the titles to the respective Articles hereof shall not be deemed a part of this lease and agreement, having been used for convenience only.

INWITNESS WHEREOF, the Lessor and the Lessee have caused their corporate names to be hereunto subscribed, and their corporate seals to be hereunto affixed and attested by their duly authorized officers, in duplicate counterparts, as of the day and year first above written which shall be the effective date of this lease.

CALLAHAN ZINC-LEAD COMPANY, INC.

By /s/ Joseph T. Hall
President

Attest:

/s/ E. A. Salo
Secretary

VULCAN SILVER-LEAD CORPORATION

By /s/ Joseph T. Hall

Attest:

/s/ E. A. Salo
Secretary

STATE OF NEW YORK )
) SS.:
COUNTY OF NEW YORK)

On this 15th day of December, in the year 1954, before Margaret M.Ackerman, a Notary Public in and for the County and State aforesaid, personally appeared Joseph T. Hall, known to me to be the President of Callahan Zinc-Lead Company, Inc., one of the corporations that executed the above instrument and acknowledged to me that such corporation executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed by official seal, the day and year in this certificate first above written.

/s/ Margaret M. Ackerman
Notary Public

Residing at New York
New York City

STATE OF NEW YORK )
) SS.:
COUNTY OF NEW YORK)

On this 15th day of December, in the year 1954, before me Margaret M. Ackerman, a Notary Public in and for the County and State aforesaid, personally appeared Joseph T. Hall, known to me to be the President of Vulcan Silver-Lead Corporation, one of the corporations that executed the above instrument and acknowledged to me that such corporation executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year in this certificate first above written.

/s/ Margaret M. Ackerman
Notary Public

Residing at New York
New York City.

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The following claims located and surveyed late in 1955. Recorded in Saguache County. Indexing information has not been returned to date.

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Major

Exhibit E

C O P Y



# A G R E E M E N T

This agreement made and entered into by and between Vulcan Silver-Lead Corporation, of Gunnison, Colorado, hereinafter called First Party, and MCPHERSON DRILLING COMPANY, of Montrose, Colorado, hereinafter called Second Party.

WITNESSETH:

WHEREAS First Party desires to explore its mining property in the Willow Creek area south of Gunnison, Colorado, by drilling thereon, and Second Party is willing to undertake such drilling upon the conditions herein provided.

NOW THEREFORE, in consideration of the promises, agreements and payments hereinafter provided, it is hereby agreed between the parties as follows:

1. The drilling hereunder shall be core drilling from the surface of the ground for Size AX cores. The maximum depth of hole to be drilled shall be five hundred (500) feet, minimum one hundred (100) feet, and the total amount of drilling hereunder shall not be less than three thousand (3,000) feet.

2. Second Party shall commence operations hereunder June 1, 1956, if weather conditions permit, or as soon thereafter as weather conditions may allow.

3. For the performance of said drilling, Second Party will provide one (1) BBS No. 1A screw-feed drill, together with all tools, bits, and supplies necessary to such operations, together with a truck for hauling of water. Sample sacks, core trays, and storage containers shall be furnished by First Party.

4. Second Party will provide a drilling crew of not less than two (2) men, and work will be conducted by working six (6) eight-hour (8-hr.) shifts per week.

C
O
P
Y

5. Water required for drilling shall be provided at its source free of cost by First Party.

6. First Party will provide roads and drilling locations reasonably suitable for the use of the drilling equipment of Second Party, and First Party shall prepare all drilling sites at its expense, including, if necessary, the driving of piles, or furnishing of barges. First Party shall provide a suitable camp site for drilling crew.

7. For such drilling and services to be performed by Second Party, First Party shall pay at the following rates:

Core Drilling: From 0 to 500 feet, $4.75 per foot.

Should Second Party perform any drilling of holes in excess of 500 feet, such drilling shall be at the rate of $4.75 per foot, plus an additional increment of .50(fifty cents) per foot for each additional 100 feet, or fraction thereof above 500 feet.

For setting surface pipe through overburden to rock, $4.30 per foot.

For reaming and installing Size NX casing, $2.75 per foot.

For reaming and installing Size BX casing, $2.50 per foot.

For reaming and installing Size AX casing, $2.25 per foot.

For cementing and drilling out cement, $10.00 per hour, plus cost of cement, or cement substitutes as may be required.

For delay while holes are surveyed with Tru-Pari instrument, $8.00 per hour.

For delays due to logging of hole, or probing of hole, $8.00 per hour.

8. In advance of each drilling operation, First Party shall advise Second Party of the location, depth and angle of hole to be drilled.

9. At the end of each calendar month, Second Party shall render to First Party a statement of charges hereunder for the said month, and First Party shall pay said amount to Second Party by the 10th day of the month following that in which the work was done.

10. Should weather conditions become such that it is not reasonably feasible to continue drilling operations as herein provided, in the opinion of Second Party, Second Party may suspend operations, and during such period of suspended operations, the obligation of both parties hereunder shall be suspended until such operations are resumed.

11. First Party will procure all necessary permits and rights of way for the conducting of such drilling operations and movements to and from the drilling locations, and shall save Second Party harmless from all claims, demands or causes of action arising from alleged trespassing or unlawful entry upon any lands designated by First Party. Evidence of such permission, rights of way, or title shall be exhibited by First Party to Second Party on request.

12. Second Party shall have sole authority and discretion over the supervision of its employees and performance of their work.

13. Second Party shall carry and maintain in full force and effect insurance covering the following risks in the following amounts: 1. Automobile coverage; public liability, One Hundred Thousand Dollars ($100,000.00) each accident, Three Hundred Thousand Dollars ($300,000.00), aggregate; property damage, one Hundred Thousand Dollars ($100,000.00). 2. Workman's Compensation Insurance as required by the laws of the State in which the work shall be done.

14. Second Party shall comply with all applicable laws and regulations, and with the Fair Labor Standards Act of 1938, in connection with the performance of all work hereunder.

15. Should subsurface conditions be such that it is not reasonably possible to complete any hole to the depth requested by First Party, it is understood and agreed that Second Party shall be released from any obligation to complete such hole to such depth, and shall be entitled to payment

according to the amount of hole completed, provided that, before the abandonment of any hole for such reason, First Party and Second Party shall mutually inspect the conditions and agree upon the necessity thereof.

16. Neither party shall be liable for any loss or damage caused by reason of strikes, accidents, Acts of God, or other causes beyond its control.

17. Second Party shall have a reasonable time after operations have terminated under this agreement to remove its equipment, material and supplies from the property of First Party.

18. All amounts due hereunder from First Party to Second Party shall, from date payment is due, draw interest at the rate of six per cent (6%) per annum. Should Second Party be required to employ legal counsel in connection with collection of any amounts due hereunder, or to enforce the performance hereof, First Party agrees to pay to Second Party reasonable attorneys fees incurred in connection therewith.

19. No alteration or amendment of the terms of this agreement shall be binding upon the parties or either of them unless the same shall be made in writing and signed by the parties.

20. Neither party may assign its interest under the terms of this agreement without the approval in writing of the other party.

Executed this_____day of January, 1956

VULCAN SILVER-LEAD CORPORATION

ATTEST:

BY

Secretary President First Party

MACPHERSON DRILLING COMPANY,

BY

Second Party

Exhibit E.

C O P Y



CORE DRILLING AGREEMENT

1. THIS AGREEMENT, made and entered into this 20th. day of December, 1955 by and between Vulcan Silver-Lead Corporation of Gunnison, Colorado the party of the first part and the Joy Manufacturing Company, of Pittsburgh, Pennsylvania, partyof the second part,

Witnesseth:

2. In consideration of certain payments hereby agreed to be made by the said first party to the said second party, the said second party hereby agrees to drill, sink or prospect with a diamond core drill from surface in or near Willow Creek Property South of Gunnison, Colorado at sites to be selected by the said first party, subject to the conditions hereinafter mentioned. It is further agreed by the said first party that the depth of none of the herein specified drill holes shall exceed a depth of 500 feet, and the total amount as guaranteed must be drilled in not more than twelve holes.

3. The said second party agrees to use for the above described work one Diamond Core drill and men skilled in operating same; to operate the drill, both day and night whenever practicable, and to furnish only such person as the said first party may designate by written order, all core taken out of said prospect holes. Size of core to be approximately NX,BX,AX inches in diameter. The said first party shall provide suitable boxes if it desires to save the core, and if it also desires may have a man at the drill at all times to remove and take charge of said core. No information whatever regarding the records and results of this drilling is to be given any other party, without the written consent of the said first party.

4. The said first party hereby agrees to pay to said second party the following prices for the herein described drilling.

| | NX Core | BX Core | AX Core |
|---|---|---|---|
| - From surface to a depth of 500' | $7.00/ft. | $6.70/ft. | $6.40/ft. |

5. In accordance with this agreement, the said first party hereby guarantees the said second party a minimum total of 5000 feet of drilling at the prices as herein provided in Clause Four.

The said second party shall have the option of withdrawing from this contract after a total of 5000 feet have been drilled under the terms of this agreement.

In the event the said first party should stop the drilling before the guaranteed footage has been drilled, it agrees to pay the said second party half the price per foot for the undrilled balance, in addition to payment at full price for the footage actually drilled.

6. The party of the second part agrees to haul drilling water a maximum distance of one mile without additional charge.

7. The party of the first part agrees to furnish and maintain satisfactory access roads to each hole site.

8. Should the party of the first part fail to perform its part of the contract of furnishing roads or locate sites, as herein agreed, regardless of cause, or should the party of the first part issue instructions that delay operations for any reason or in any other way interrupt the continuous operation of the said diamond drill, it shall pay the second party the labor expense of drilling crew while idle through such delay , at the rate of $65.00 per shift, consisting of 8 hours, for each shift or part thereof that the operation of the said drill is delayed.

10. The party of the second part agrees to cover its employees with Workmen's Compensation Insurance under the State Laws of Colorado and agrees to furnish the first party with insurance certificate as evidence of such coverage. The second party plans to start this work in March 1956, or as soon thereafter as weather permits and in accordance with notification received from the first party. Should inclement weather or snow conditions, after the job is started, prove to be such that the men can not get to the job site, the delay time clause involving a charge at the rate of $65.00 per shift will prevail.

11. The payments for the herein-described work are to be made on the first of each month for all invoices rendered for work done up to the 25th. day of the previous month.

12. The party of the second part hereby agrees to ship the outfit for the herein described work within ------ days from the date of notification of acceptance of this agreement, but the said second party shall not be responsible for delays caused by strikes , railroad accidents or blockades. This proposition is for immediate acceptance, but although accepted does not constitute a contract until approved by an officer of the Joy Manufacturing Company, at its office in Pittsburgh, Pennslyvania, U. S. A., and is subject to change or withdrawal until so approved.

It is expressly agreed that there are no promises, agreements or understandings outside of this contract, and that no agent or salesman has any authority to obligate the Joy Manufacturing Company, by any terms, stipulations or conditions not herein expressed. This contract may be altered only by written consent of both parties hereto.

JOY MANUFACTURING COMPANY

By----------

IN WITNESS WHEREOF, the parties hereto have set their hands and seals.

Accepted by

Approved by JOY MANUFACTURING CO.

---------- By----------

---------- Date----------

Title---------- Title----------

JOY MANUFACTURING COMPANY

Exhibit E

E. J. Longyear Company

General Offices, Foshay Tower
Minneapolis 2, Minnesota, U. S. A.
Telephone Main 2447. Cable Longco

January 28, 1956

Vulcan Silver-Lead Corporation
Gunnison, Colorado

Attention: Mr. J. E. Dunn, Manager

Gentlemen:

Exploratory Drilling Program
Willow Creek Property -
Vicinity of Gunnison, Colorado

1. Confirming our telephone conversation of January 26th, we are pleased to submit below proposal for your contemplated exploratory drilling program on your Willow Creek property, which is located approximately 28 miles south of Gunnison, Colorado.

2. We understand that the work as now planned will consist of a series of holes varying in inclination from a minus 55° to vertical, and ranging up to a maximum of 500 feet in depth with a minimum aggregate footage of 3,000 feet; and that the drilling is to be mainly through sections of the Dakota, Brushy Basin and Salt Wash formations, and will extend into the underlying pre-Cambrian rocks. We further understand that the water required for the drilling operations is available within a distance of approximately one mile of the drill site; and that you will prepare and maintain all access roads and will level drill sites at no expense to E. J. Longyear Company.

3. For this work we propose to furnish one Longyear truck-mounted, angle type diamond core drill of suitable capacity, together with the necessary accessory equipment required to complete the work as now planned. We further propose to operate the drill on a single shift basis, six days per week.

4. We will carry public liability insurance covering personal injury and property damage, and workmen's Compensation insurance, and also, all-risk insurance on the drilling equipment protecting against loss by theft, fire, flood, land-slides and other similar hazards.

We will also assume and pay any and all Old Age Benefit, Unemployment and Social Security taxes and contributions imposed by federal or state authorities.

Certificates showing the coverage referred to will be furnished upon request.

5. Based upon the conditions as outlined above and as specified in your letter of November 28, 1955, to Mr. E. G. Tucker, we are pleased to quote as follows:

a) Overburden drilling in holes varying in inclination from a minus 55° to vertical -

0 to 50 feet in depth .....$6.00 per foot

b) Diamond core drilling in vertical or angle holes as specified above -

0 to 500 feet in depth

AX standard and/or BX wire line, recovering core approximately 1-1/8" in diameter.....$6.00 per foot

BX-size (standard) recovering core approximately 1-5/8" in diameter ..... $6.50 per foot

NX-size (standard) recovering core approximately 2 1/8" in diameter..... $7.25 per foot

c) Reaming and Casing Operation

AX-size hole to receive AX casing.....$2.00 per foot
BX-size hole to receive BX casing.....$2.25 per foot
NX-size hole to receive NX casing.....$2.50 per foot

d) Cementing, waiting for cement to set and drilling out cement.....$11.00 per hour, plus cost of materials used.

e) Delays for your convenience or for which you are responsible.....$9.00 per hour

6. The above-quoted rates for overburden and diamond drilling are based on the understanding that the water required for the operations can be readily secured from a source located approximately one mile from the property. In the event that sufficient supply of water could not be secured from this source, and it became necessary to employ a truck driver on a full time basis and haul the water from a more distant source, it is understood and agreed that we would be reimbursed for all extra labor and direct field expenses resulting from this change in the operational set-up.

7. Drill cores will be turned over to your representative at the drill site in receptacles furnished by you.

8. Statements will be rendered as promptly as possible after the first of each month.

9. We appreciate very much the opportunity to consider this program. If awarded the contract, and providing that field conditions would permit, we would be in a position to commence the work not later than June 1, 1956.

Very truly yours,

E. J. LONGYEAR COMPANY

M. J. Gleason, Manager
Contract Drilling Division

ACCEPTED:

VULCAN SILVER-LEAD CORPORATION

_____

DMEA Exhibit F

Assay Results Willow Creek Group -- Beta Dozer Cuts.

| No. | Description | Assayer | %eU308 | % U308 |
|---|---|---|---|---|
| 30 | Specimen containing Green fluorescent Chalcedony (plus or minus 10% of Sample Chalcedony) | C. O. Parker & Co. Denver, Colorado | 0.04 | 0.032 |
| 71 | Specimen containing Green fluorescent Chalcedony (plus or minus 25% of Sample Chalcedony) | Root & Simpson Inc. Denver, Colorado | 0.05 | 0.079 |

The above samples were taken from bulldozer cuts on the Beta No. 1 Lode Claim in the Willow Creek Group, Saguache County, Colorado.

Assays listed are a true and exact copy of Assay returns from C. O. Parker & Co., Denver, Colorado and Root & Simpson Inc., Denver, Colorado.

Vulcan Silver-Lead Corp.

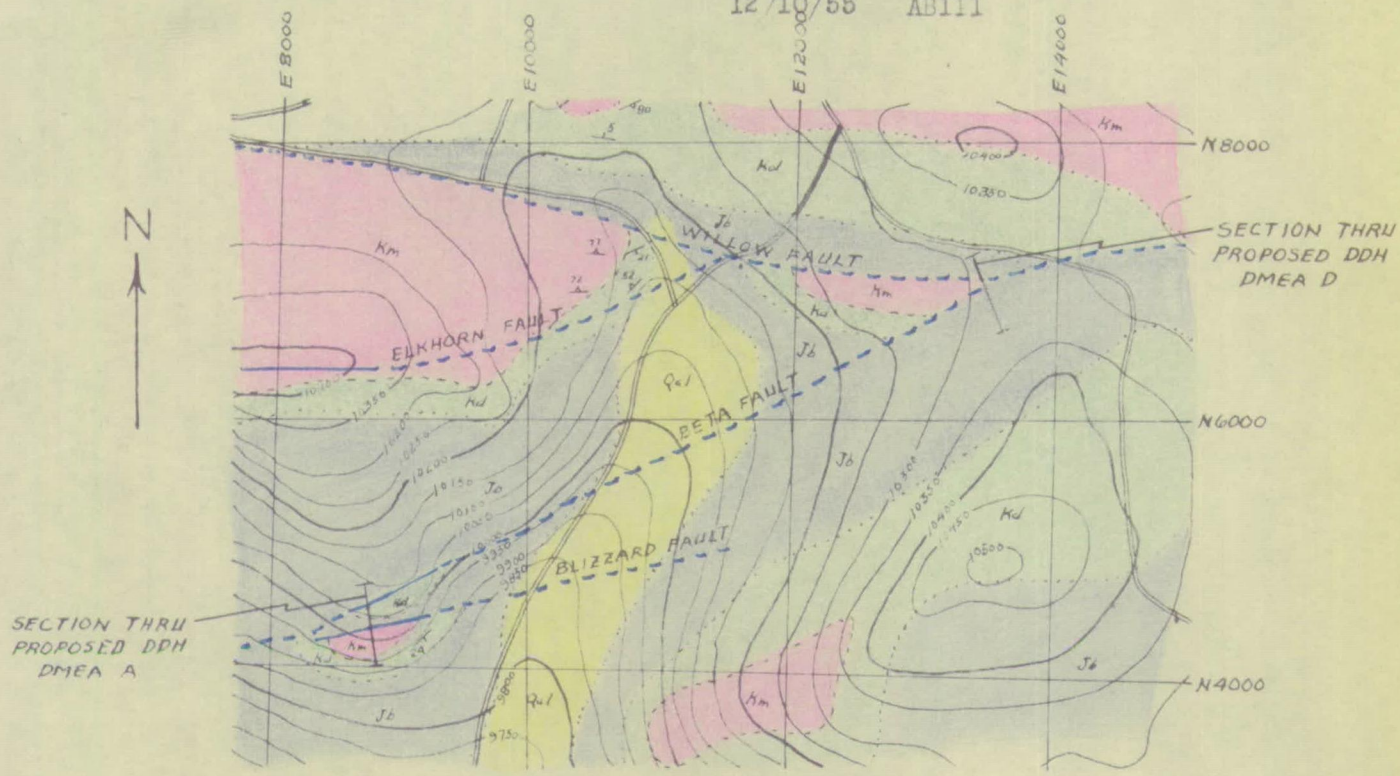
J. E. Dunn
Manager

JD: fd

VULCAN SILVER-LEAD CORP.
Drawing No. GGE 9
Willow Creek Group, Sections 26 - 35,
T 46 N, R 1 W, Saguache Co., Colo.

# EXHIBIT B

Topography and Geology
Proposed DMEA Drilling Area
(Drawings No's. GGE 10 & 11 accompanying)
Scale: 1" - approx. 1650'
12/10/55 ABIII




LEGEND

- Qal — Quaternary alluvium
- Km — Cretaceous Mancos fm. (top of Dakota fm.)
- Kd — Cretaceous Dakota formation
- Jb — Jurassic Brushy Basin formation
- —— - - - Fault; known, inferred

SCALE

1000' 0 1000' 2000' 3000' 4000' 5000'

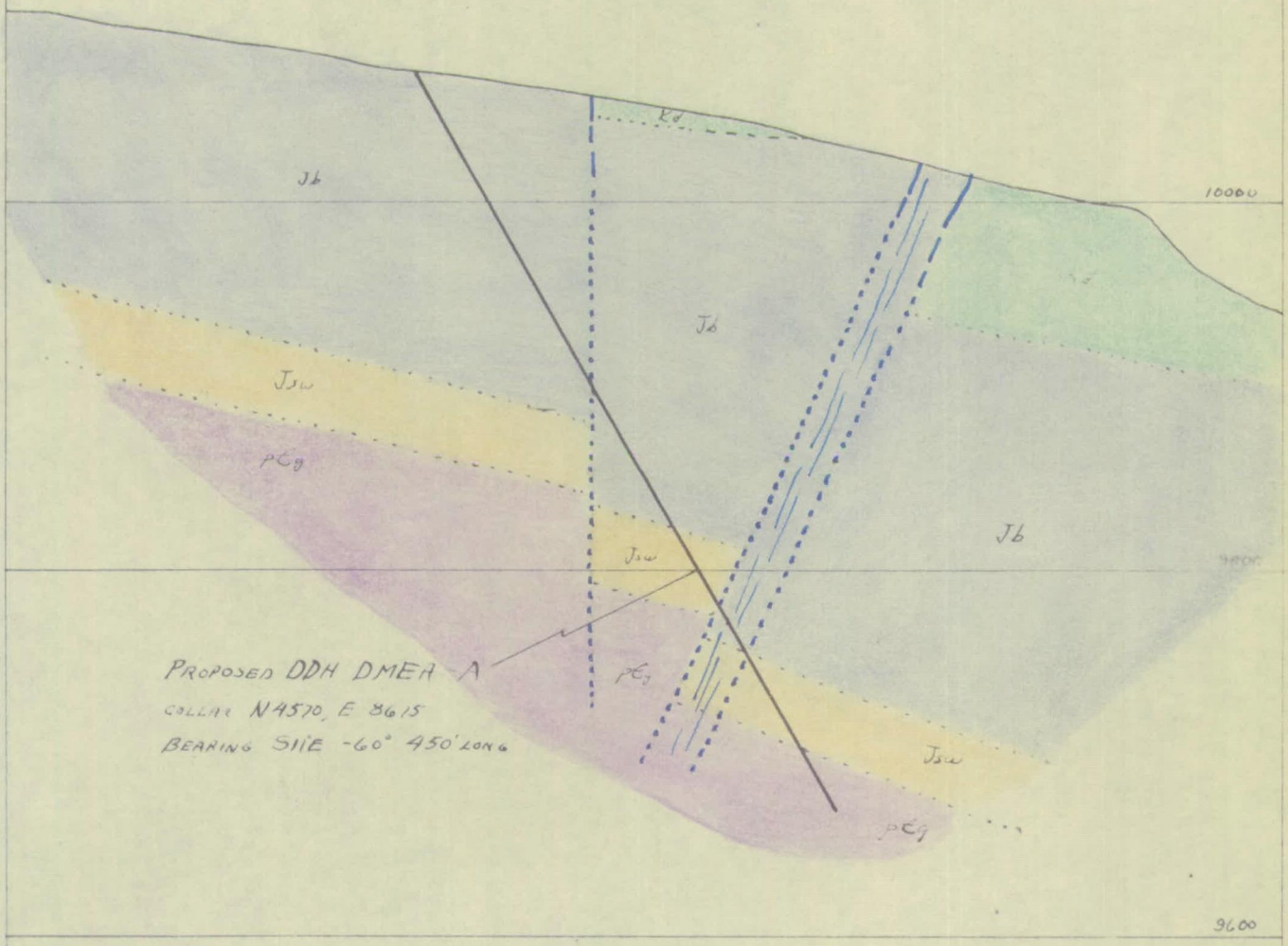
Traced from Drawing No. GGC 3

RECEIVED
MAR - 5 1956

VULCAN SILVER-LEAD CORP.
Drawing No. GGE 10
Willow Creek Group, Sections 26 - 35,
T 45 N, R 1 W, Saguache Co., Colo..

# EXHIBIT B

Proposed DDH DMEA A at N 4620, E 8615
Cross Section
To accompany Drawing No. GGE 9
Scale: 1" - 100' 12/10/55 ABIII

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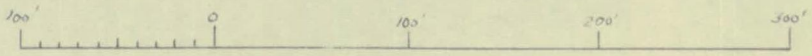



LEGEND

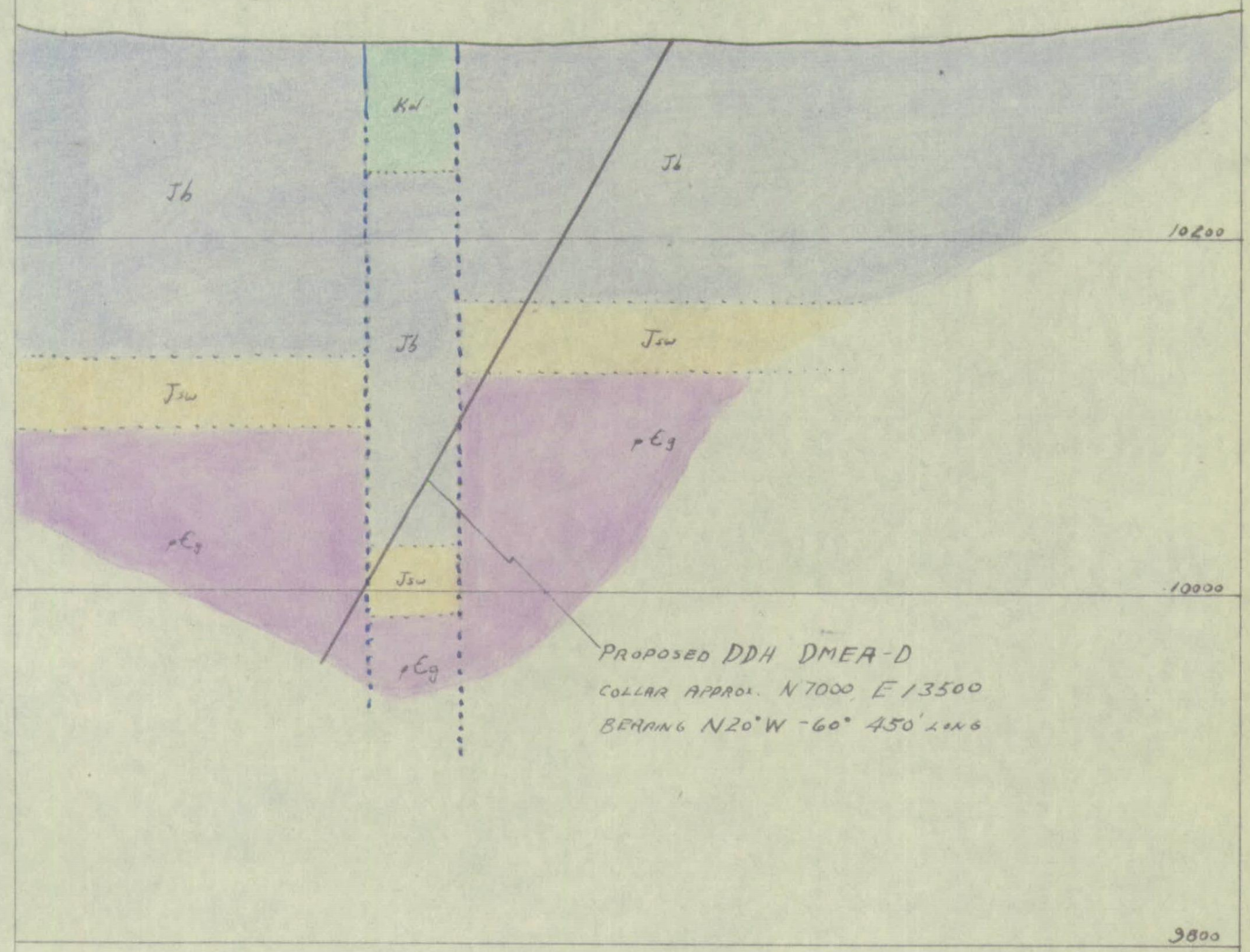
- Kd — Cretacecus Dakota formation
- Jb — Jurassic Morrison formation, Brushy Basin member
- Jsw — Jurassic Morrison formation, Salt Wash member
- pCg — pre-Cambrian granite

RECEIVED
MAR - 5 1956

VULCAN SILVER-LEAD CORP.
Drawing No. GGE 11
Willow Creek Group, Sections 26 - 35,
T 45 N, R 1 W, Saguache Co., Colo.

# EXHIBIT B

Proposed DDH DMEA D at approx. N 7000, E 13500
Cross Section
To accompany Drawing No. GGE 9
Scale: 1" - 100' 12/10/55 ABIII

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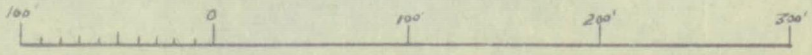



LEGEND

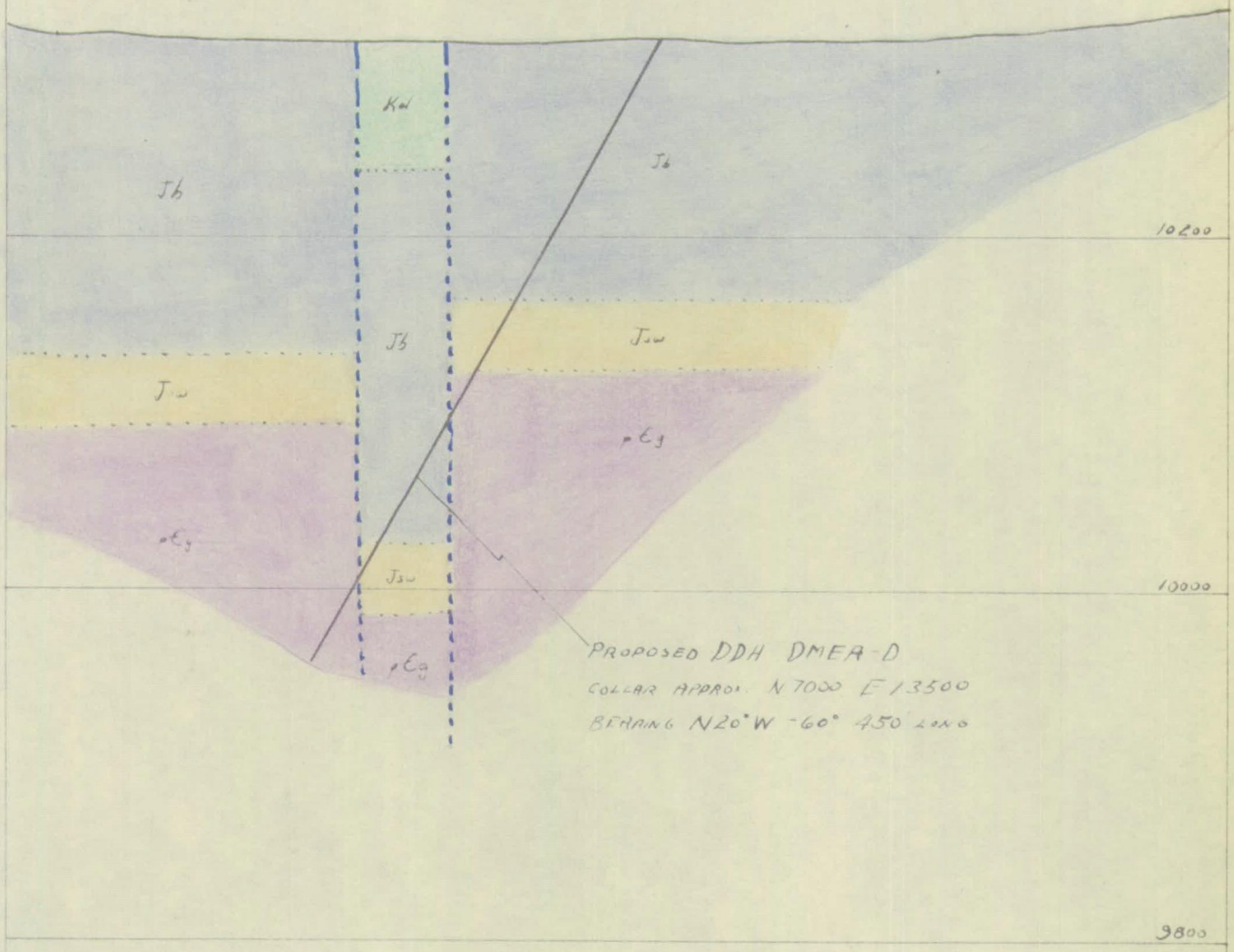
- Kd — Cretaceous Dakota formation
- Jb — Jurassic Morrison formation, Brushy Basin member
- Jsw — Jurassic Morrison formation, Salt Wash member
- pEg — pre-Cambrian granite

RECEIVED
MAR - 5 1956

VULCAN SILVER-LEAD CORP.
Drawing No. GGE 11
Willow Creek Group, Sections 26 - 35,
T 45 N, R 1 W, Saguache Co., Colo.

Proposed DDH DMEA D at approx. N 7000, E 13500
Cross Section
To accompany Drawing No. GGE 9
Scale: 1" - 100' 12/10/55 ABIII

# EXHIBIT B

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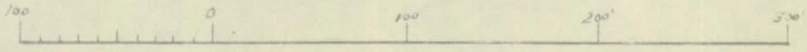



LEGEND

Kd Cretaceous Dakota formation

Jb Jurassic Morrison formation, Brushy Basin member

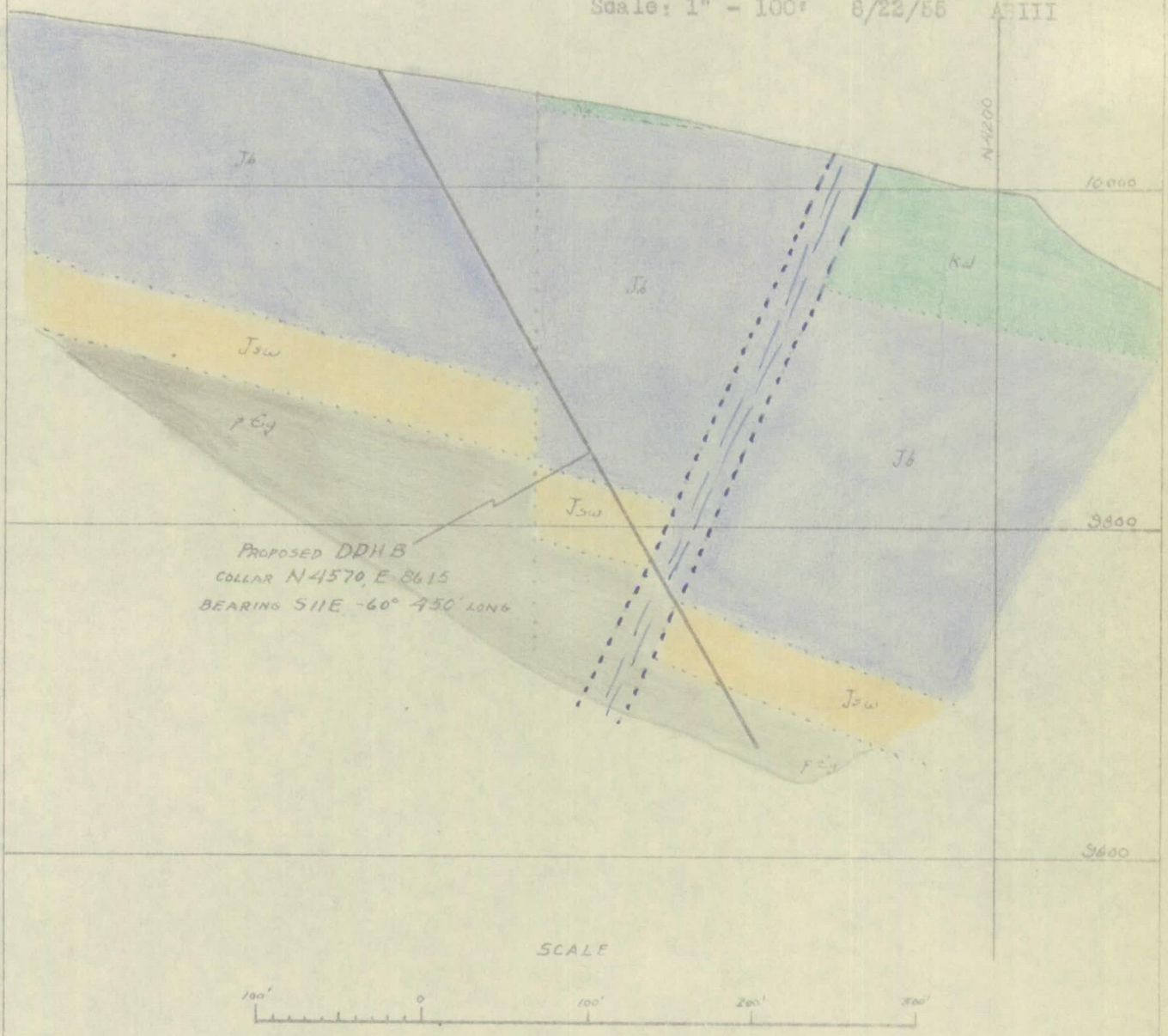
Jsw Jurassic Morrison formation, Salt Wash member

pEg pre-Cambrian granite

RECEIVED
MAR - 5 1956

VULCAN SILVER-LEAD CORP.
Drawing No. GGB 8
Willow Creek Group, Sections 26 - 35,
T 45 N, R 1 W, Saguache Co., Colo.

Proposed DDH B at N 4520, E 8615
Cross Section
To accompany Drawing No. GGB 2
Scale: 1" - 100' 8/22/55 AB III




SCALE




LEGEND

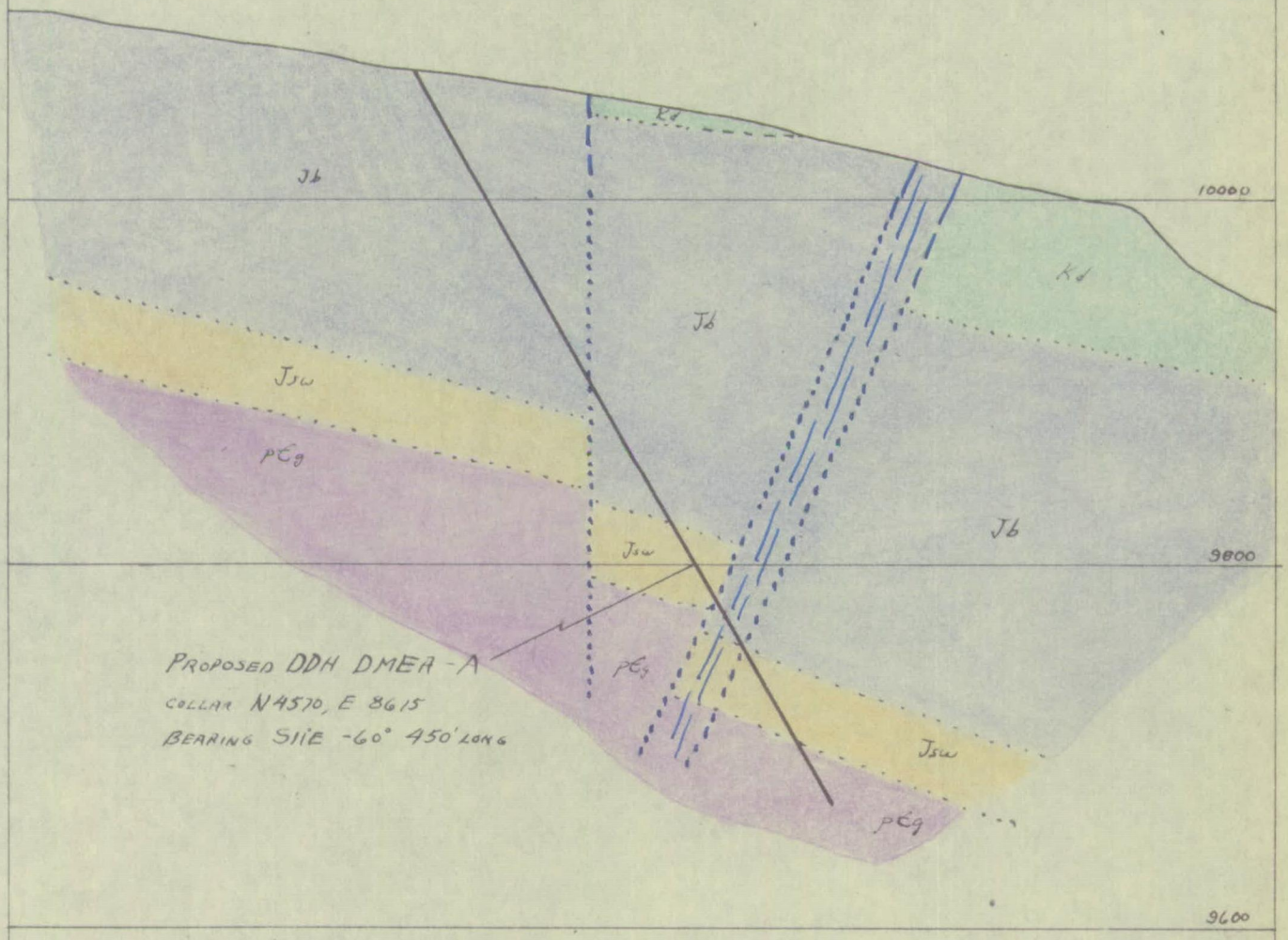
- Kd — Cretaceous Dakota formation
- Jb — Jurassic Morrison formation, Brushy Basin member
- Jsw — Jurassic Morrison formation, Salt Wash member
- pЄg — pre-Cambrian granite

RECEIVED

VULCAN SILVER-LEAD CORP.
Drawing No. GGE 10
Willow Creek Group, Sections 26 - 35,
T 45 N, R 1 W, Saguache Co., Colo..

Proposed DDH DMEA A at N 4620, E 8615
Cross Section
To accompany Drawing No. GGE 9
Scale: 1" - 100' 12/10/55 ABIII

# EXHIBIT B

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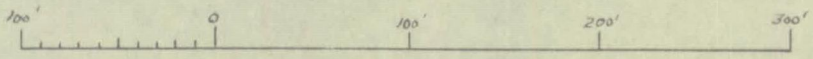


LEGEND

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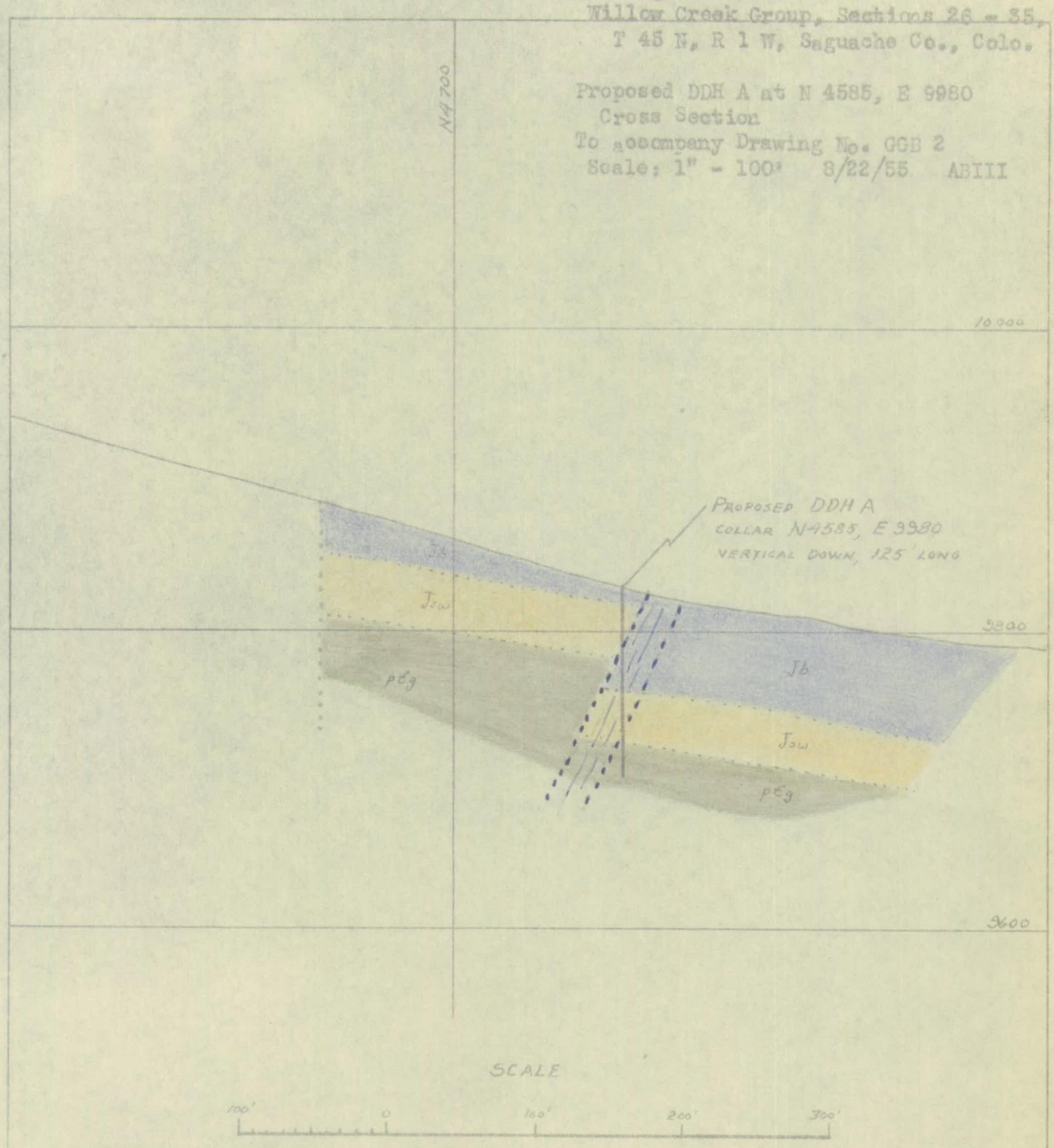
VULCAN SILVER-LEAD CORP.
Drawing No. GGE 7
Willow Creek Group, Sections 26 - 35,
T 45 N, R 1 W, Saguache Co., Colo.

Proposed DDH A at N 4585, E 9980
Cross Section
To accompany Drawing No. GGB 2
Scale: 1" - 100' 8/22/55 ABIII




LEGEND

Kd Cretaceous Dakota formation

Jb Jurassic Morrison formation, Brushy Basin member

Jsw Jurassic Morrison formation, Salt Wash member

pEg pre-Cambrian granite

RECEIVED
MAR - 5 1956

VULCAN SILVER-LEAD CORP.
Drawing No. GGE 9
Willow Creek Group, Sections 26 - 35,
T 46 N, R 1 W, Saguache Co., Colo.

Topography and Geology
Proposed DMEA Drilling Area
(Drawings No's. GGE 10 & 11 accompanying)
Scale: 1" - approx. 1650'
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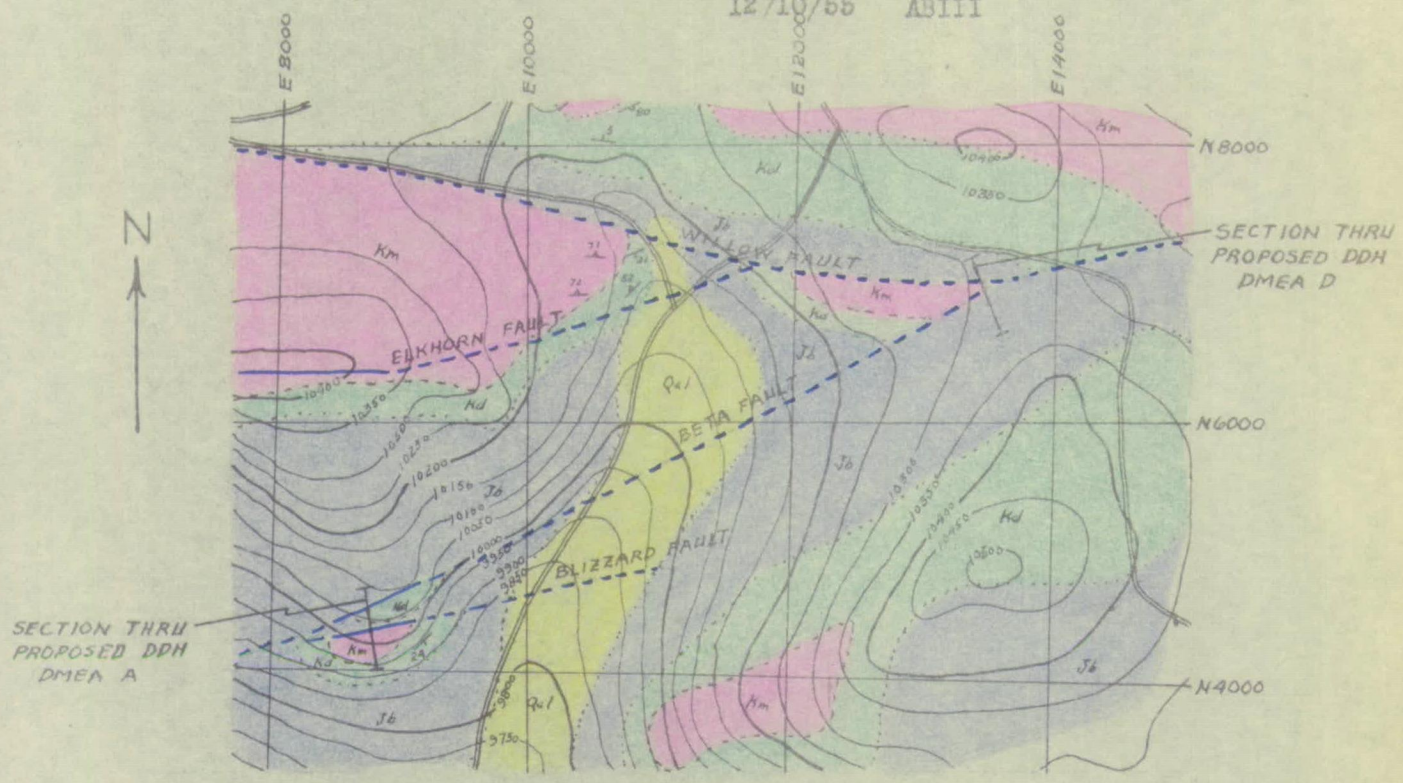
# EXHIBIT B




LEGEND

Qal Quaternary alluvium

Km Cretaceous Mancos fm. (top of Dakota fm.)

Kd Cretaceous Dakota formation

Jb Jurassic Brushy Basin formation

——·—·—Fault; known, inferred

SCALE

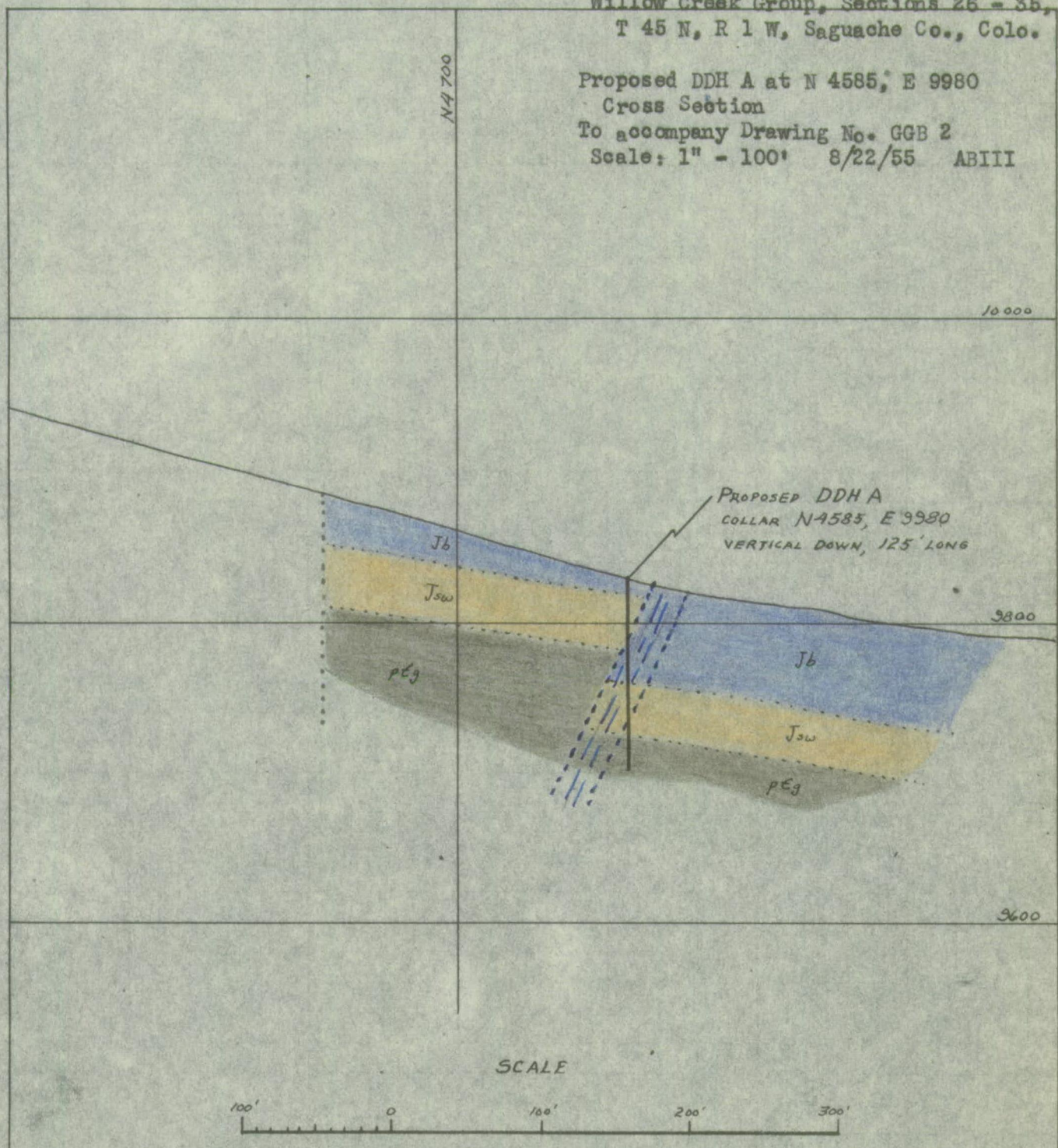
1000' 0 1000' 2000' 3000' 4000' 5000'

Traced from Drawing No. GGC 3

RECEIVED
MAR - 5 1956

VULCAN SILVER-LEAD CORP.
Drawing No. GGE 7
Willow Creek Group, Sections 26 - 35,
T 45 N, R 1 W, Saguache Co., Colo.

Proposed DDH A at N 4585, E 9980
Cross Section
To accompany Drawing No. GGB 2
Scale: 1" - 100' 8/22/55 ABIII




SCALE




LEGEND

Kd Cretaceous Dakota formation

Jb Jurassic Morrison formation, Brushy Basin member

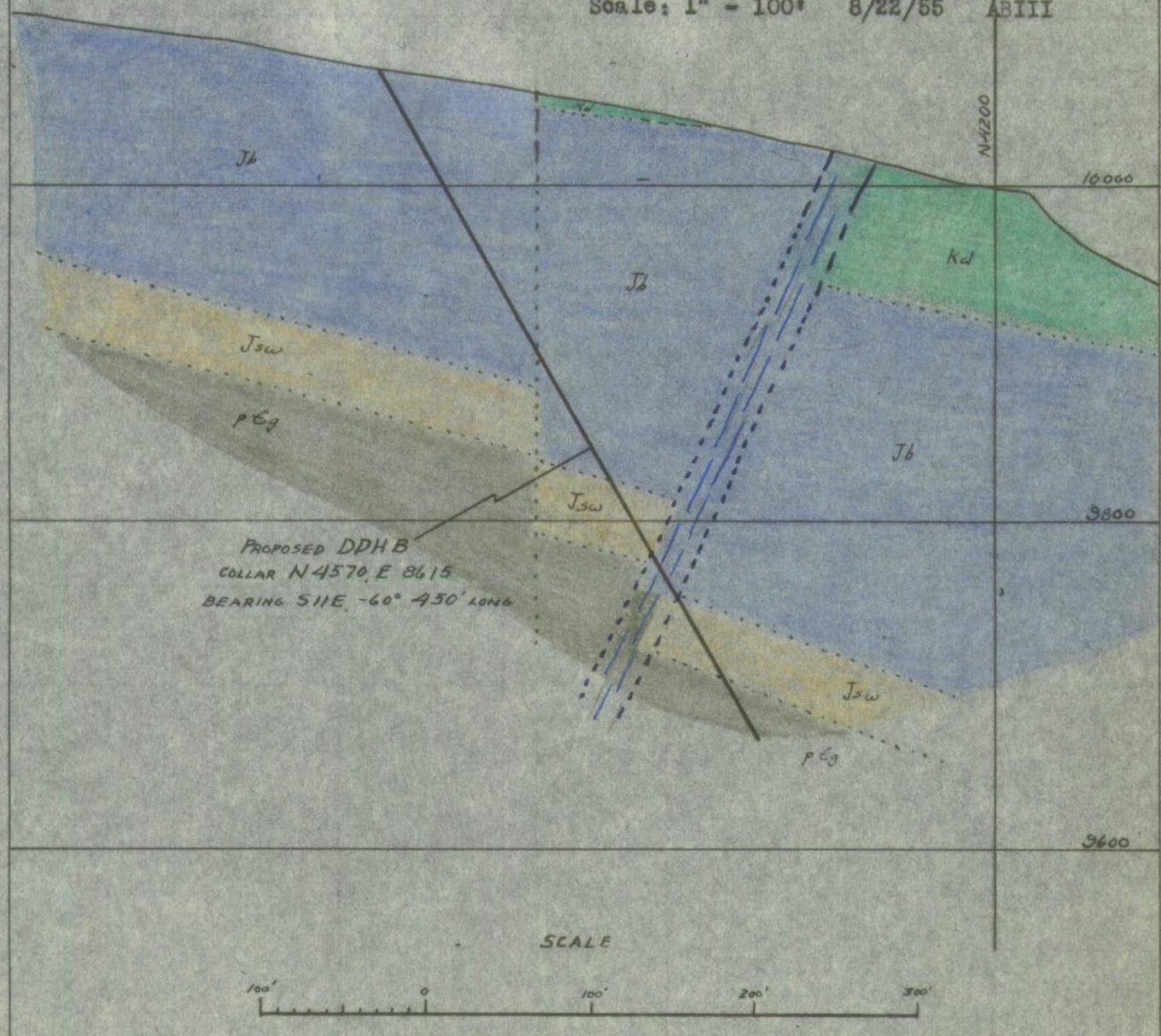
Jsw Jurassic Morrison formation, Salt Wash member

pEg pre-Cambrian granite

RECEIVED
N - 5 1956

VULCAN SILVER-LEAD CORP.
Drawing No. GGE 8
Willow Creek Group, Sections 26 - 35,
T 45 N, R 1 W, Saguache Co., Colo.

Proposed DDH B at N 4520, E 8615
Cross Section
To accompany Drawing No. GGB 2
Scale: 1" - 100' 8/22/55 ABIII




SCALE




LEGEND

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- Jb — Jurassic Morrison formation, Brushy Basin member
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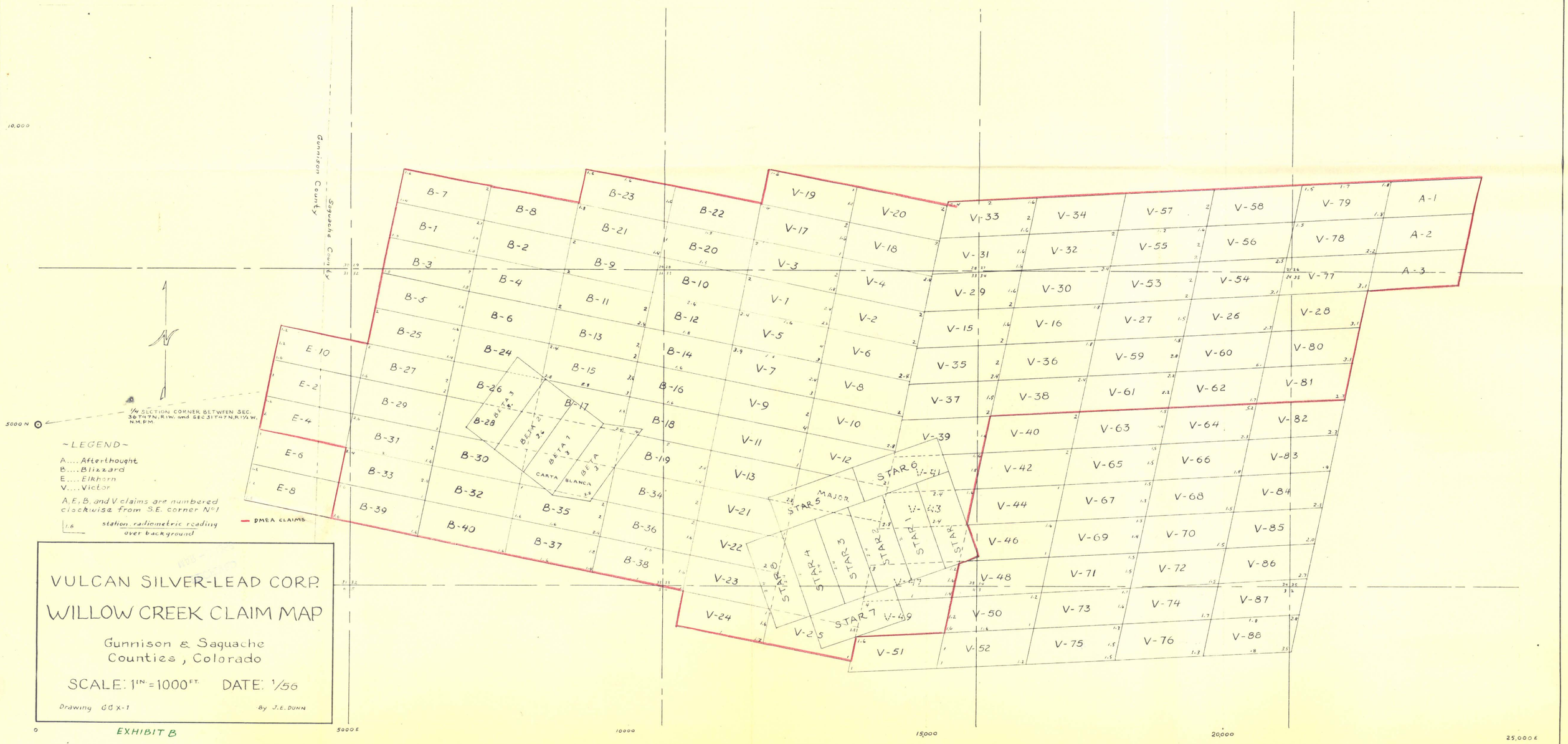
RECEIVED
MAR - 5 1956



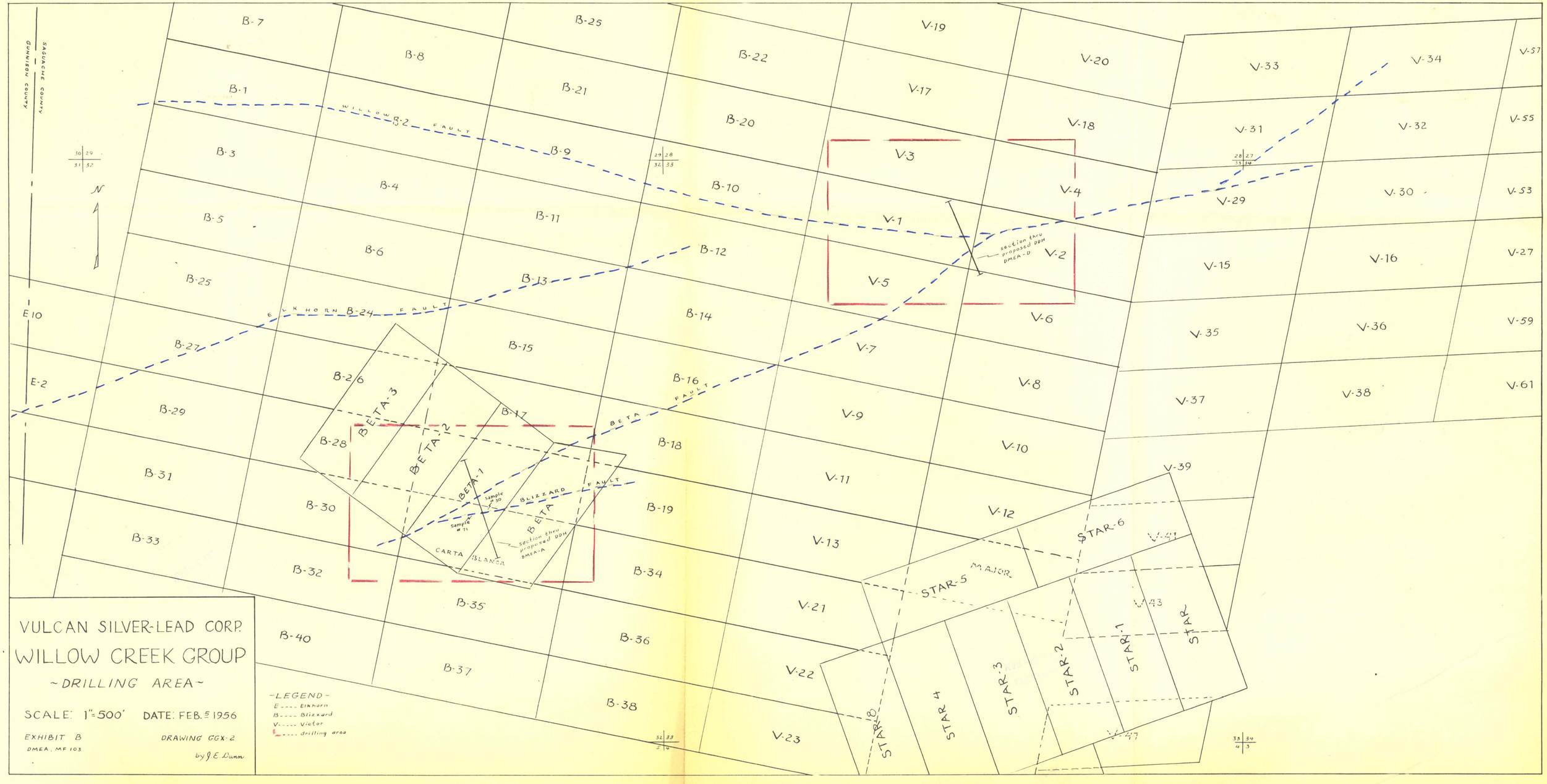

# VULCAN SILVER-LEAD CORP.
# WILLOW CREEK CLAIM MAP

Gunnison & Saguache Counties, Colorado

SCALE: 1 IN = 1000 FT. DATE: 1/56

Drawing GG X-1 By J.E. DUNN

EXHIBIT B


VULCAN SILVER-LEAD CORP.
WILLOW CREEK GROUP
~DRILLING AREA~
SCALE: 1"=500' DATE: FEB. 5 1956
EXHIBIT B
DMEA. MF 103
DRAWING GGX-2
by J. E. Dunn
~LEGEND~
E---- Elkhorn
B---- Blizzard
V---- Victor
---- drilling area
GUNNISON COUNTY
SAGUACHE COUNTY
N
WILLOW CREEK FAULT
ELK HORN FAULT
BETA FAULT
BLIZZARD FAULT
CARTA BLANCA
BETA-1
BETA-2
BETA-3
BETA
Sample #50
Sample #71
section thru proposed DDH DMEA-A
section thru proposed DDH DMEA-D
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STAR-1
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STAR-3
STAR-4
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STAR-6
STAR-7
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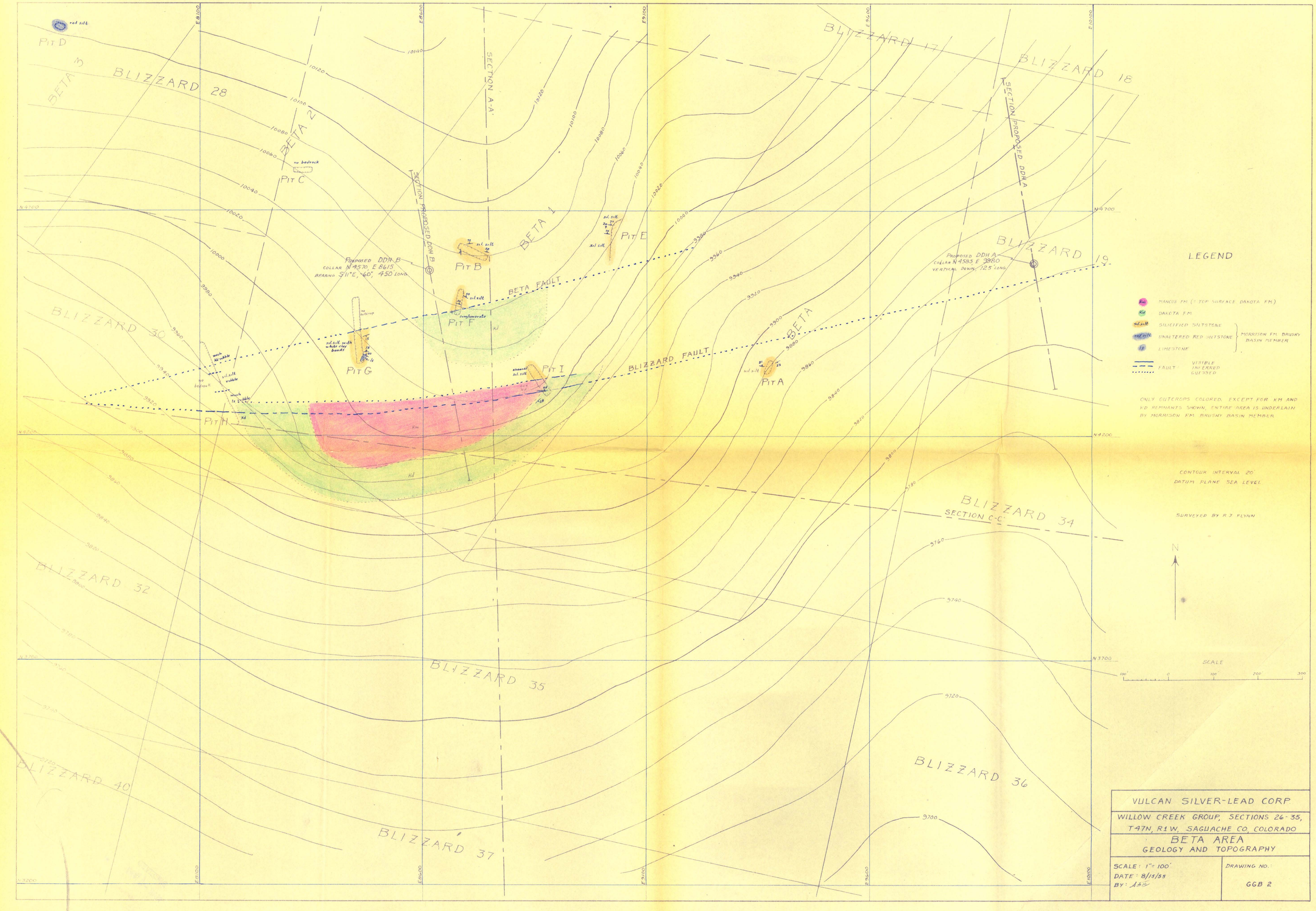
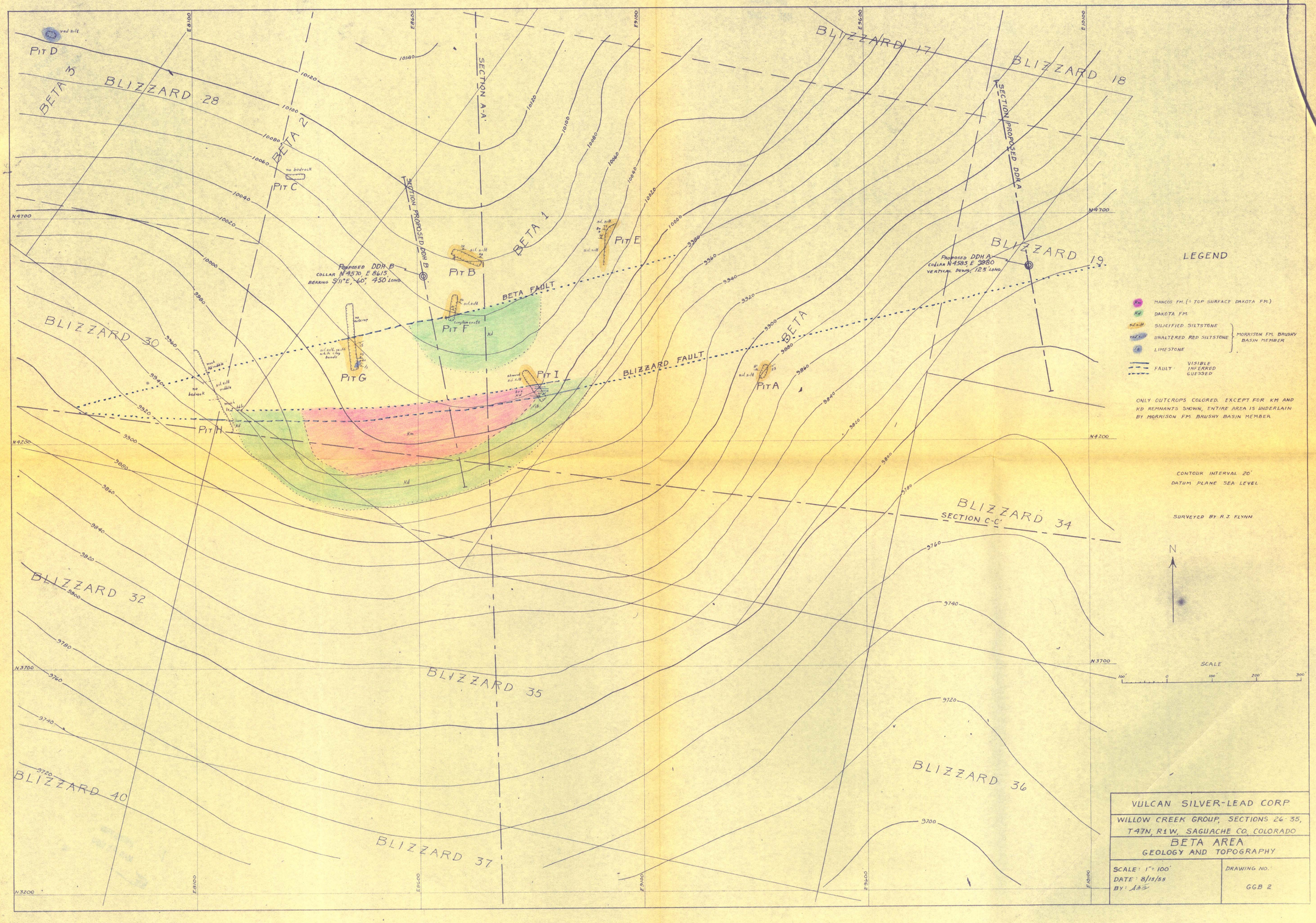
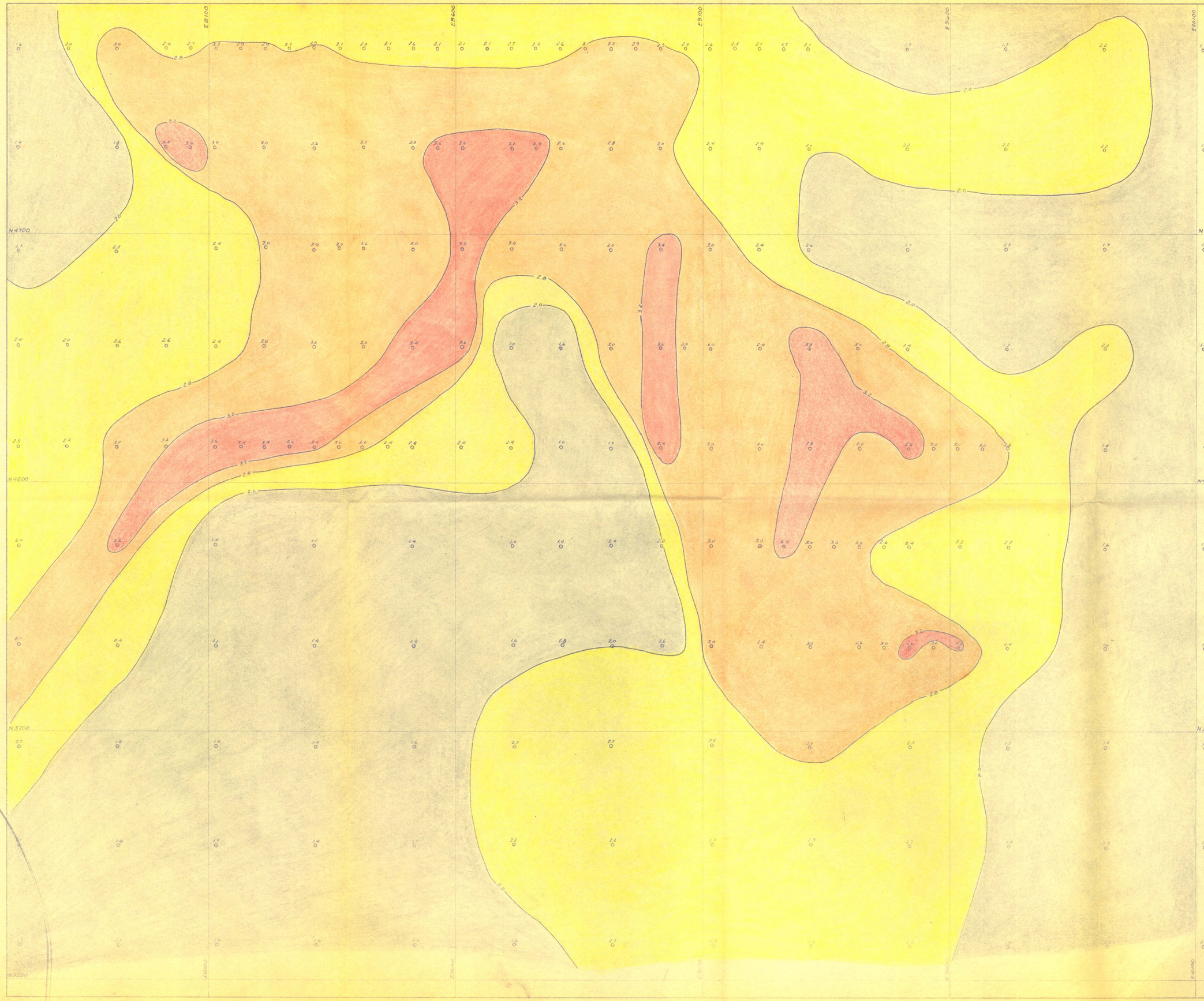
V-61
E-2
E-10


BLIZZARD 28
BLIZZARD 17
BLIZZARD 18
BLIZZARD 19
BLIZZARD 30
BLIZZARD 32
BLIZZARD 34
BLIZZARD 35
BLIZZARD 36
BLIZZARD 37
BLIZZARD 40
BETA 2
BETA 1
BETA
BETA FAULT
BLIZZARD FAULT
SECTION A-A'
SECTION C-C'
SECTION PROPOSED DDH B
SECTION PROPOSED DDH A
PIT A
PIT B
PIT C
PIT D
PIT E
PIT F
PIT G
PIT H
PIT I
red silt
no bedrock
sil. silt
sil. silt with white clay bands
sheared sil. silt
conglomerate
no outcrop
mush Kd rubble
sil. silt rubble
mush Is rubble
Km
Kd
Is
PROPOSED DDH B
COLLAR N 4570, E 8615
BEARING S11°E, -60°, 450' LONG
PROPOSED DDH A
COLLAR N 4583 E 9980
VERTICAL DOWN, 125' LONG
N4700
N4200
N3700
N3200
E8100
E8600
E9100
E9600
E10100
10140
10120
10100
10080
10060
10040
10020
10000
9980
9960
9940
9920
9900
9880
9860
9840
9820
9800
9780
9760
9740
9720
9700
LEGEND
Km MANCOS FM (= TOP SURFACE DAKOTA FM)
Kd DAKOTA FM
sil. silt SILICIFIED SILTSTONE
red silt UNALTERED RED SILTSTONE
Is LIMESTONE
MORRISON FM. BRUSHY BASIN MEMBER
FAULT: VISIBLE INFERRED GUESSED
ONLY OUTCROPS COLORED. EXCEPT FOR KM AND KD REMNANTS SHOWN, ENTIRE AREA IS UNDERLAIN BY MORRISON FM. BRUSHY BASIN MEMBER
CONTOUR INTERVAL 20'
DATUM PLANE SEA LEVEL
SURVEYED BY R.J. FLYNN
N
SCALE
100' 0 100' 200' 300'
VULCAN SILVER-LEAD CORP.
WILLOW CREEK GROUP, SECTIONS 26-35, T47N, R1W, SAGUACHE CO, COLORADO
BETA AREA
GEOLOGY AND TOPOGRAPHY
SCALE: 1" = 100'
DATE: 8/15/55
BY: A.B.
DRAWING NO.
GGB 2


PIT D
red silt
BETA 5
BLIZZARD 28
BETA 2
PIT C
no bedrock
SECTION A-A'
SECTION PROPOSED DDH B
PROPOSED DDH B
COLLAR N4570 E 8615
BEARING S11°E, 60°, 450' LONG
BETA 1
PIT B
PIT E
BETA FAULT
PIT F
conglomerate
PIT G
BLIZZARD 30
PIT H
PIT I
BLIZZARD FAULT
BLIZZARD 17
BLIZZARD 18
SECTION PROPOSED DDH A
PROPOSED DDH A
COLLAR N4585 E 9980
VERTICAL DOWN, 125' LONG
BLIZZARD 19
BETA
PIT A
BLIZZARD 34
SECTION C-C'
BLIZZARD 32
BLIZZARD 35
BLIZZARD 36
BLIZZARD 40
BLIZZARD 37
E8100
E8600
E9100
E9600
E10100
N4700
N4200
N3700
N3200
LEGEND
MANCOS FM. (= TOP SURFACE DAKOTA FM.)
DAKOTA FM.
SILICIFIED SILTSTONE
UNALTERED RED SILTSTONE
MORRISON FM. BRUSHY BASIN MEMBER
LIMESTONE
FAULT: VISIBLE
INFERRED
GUESSED
ONLY OUTCROPS COLORED. EXCEPT FOR KM AND KD REMNANTS SHOWN, ENTIRE AREA IS UNDERLAIN BY MORRISON FM. BRUSHY BASIN MEMBER
CONTOUR INTERVAL 20'
DATUM PLANE SEA LEVEL
SURVEYED BY R.J. FLYNN
N
SCALE
100' 0 100' 200' 300'
VULCAN SILVER-LEAD CORP.
WILLOW CREEK GROUP, SECTIONS 26-35, T47N, R1W, SAGUACHE CO, COLORADO
BETA AREA
GEOLOGY AND TOPOGRAPHY
SCALE: 1" = 100'
DATE: 8/15/55
BY: AJS
DRAWING NO.:
GGB 2




LEGEND

- GREATER THAN 3.2 X BACKGROUND
- 2.8-3.2 X BACKGROUND
- 2.0-2.8 X BACKGROUND
- LESS THAN 2.0 X BACKGROUND

RADIOMETRIC STATION; FIGURE = READING / BACKGROUND

BACKGROUND IS LOWEST READING IN AREA
= 5 CPS ON NUCLIOMETER, 0.0035 MR/HR ON SCINTILLATOR

SURVEYED BY R. J. FLYNN
RADIOMETRY BY B. LONGSTRETH, R. BARRERA

N

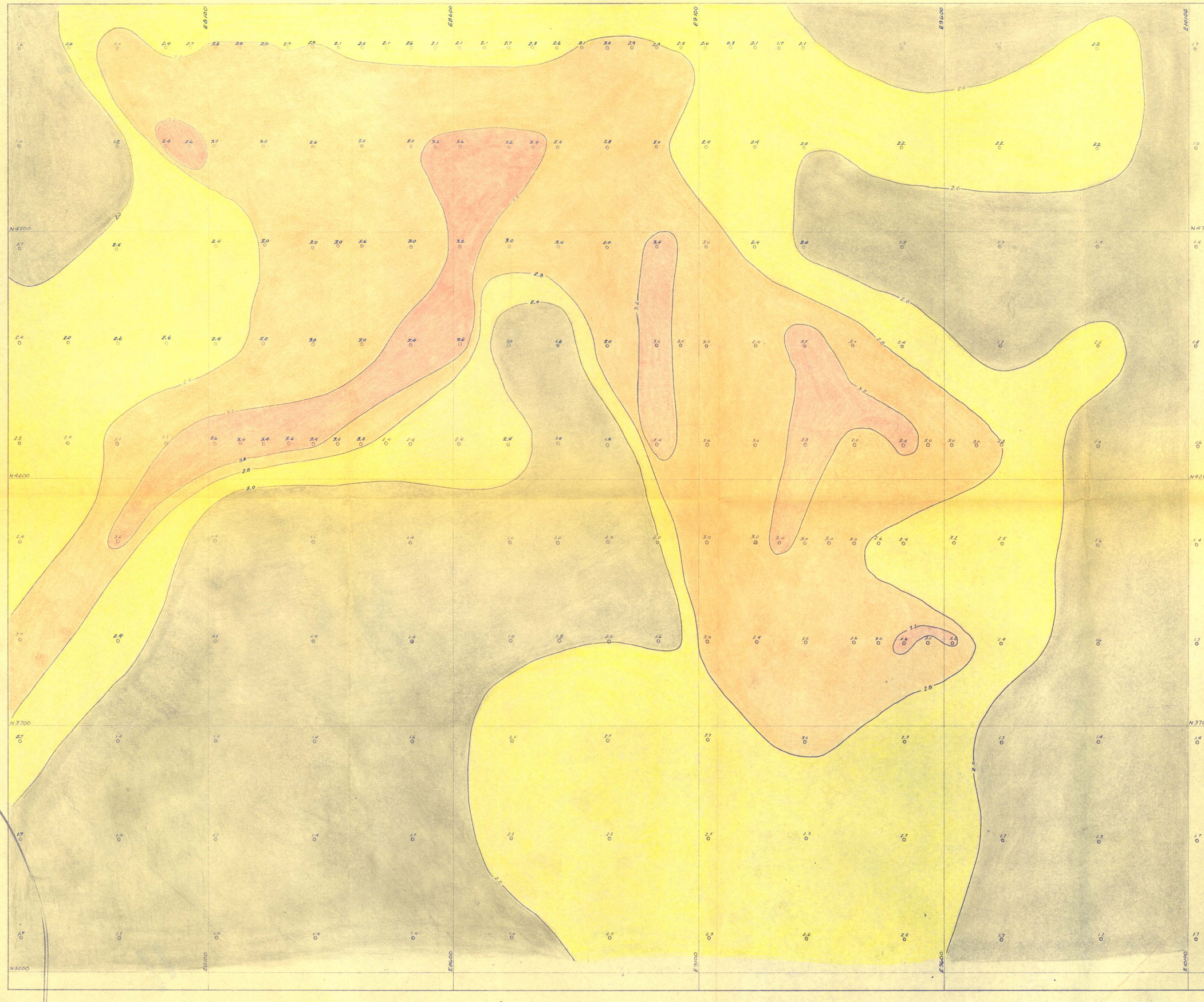
SCALE

OVERLAY FOR DRAWING NO. GCB 2

VULCAN SILVER-LEAD CORP.
WILLOW CREEK GROUP, SECTIONS 26 & 35
T47N, R1W, SAGUACHE CO. COLORADO
BETA AREA
RADIOMETRIC MAP

SCALE: 1" = 100'
DATE: 8/15/55
BY: [illegible]

DRAWING NO.
GCB 3




## LEGEND

- GREATER THAN 3.2 X BACKGROUND
- 2.8-3.2 X BACKGROUND
- 2.0-2.8 X BACKGROUND
- LESS THAN 2.0 X BACKGROUND

RADIOMETRIC STATION; FIGURE = READING / BACKGROUND

BACKGROUND IS LOWEST READING IN AREA
=5 CPS ON NUCLIOMETER, 0.0055 MR/HR ON SCINTILLATOR

SURVEYED BY R. J. FLYNN
RADIOMETRY BY B. LONGSTRETH, R. BARRERA

N

SCALE
100' 0 100' 200' 300'

OVERLAY FOR DRAWING NO. GGB 2

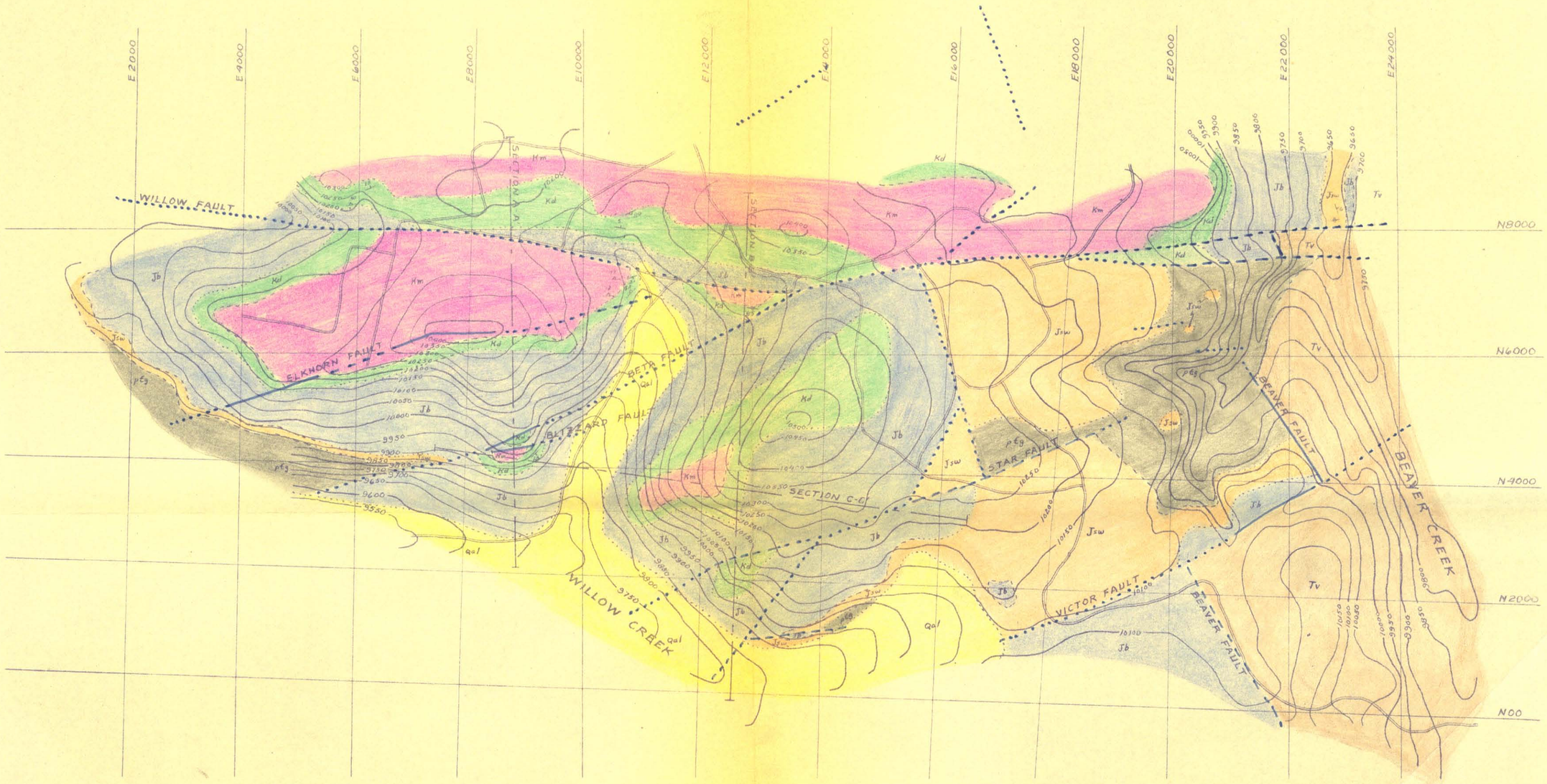
VULCAN SILVER-LEAD CORP.

WILLOW CREEK GROUP, SECTIONS 26-35,
T47N, R1W, SAGUACHE CO, COLORADO

BETA AREA
RADIOMETRIC MAP

SCALE: 1" = 100'
DATE: 8/15/55
BY: [illegible]

DRAWING NO.: GGB 3




## LEGEND

- Qal ALLUVIUM
- Tv TERTIARY VOLCANICS
- Km MANCOS FORMATION (= TOP SURFACE OF DAKOTA)
- Kd DAKOTA FORMATION
- Jb MORRISON FORMATION BRUSHY BASIN MEMBER
- Jsw MORRISON FORMATION SALT WASH MEMBER
- pEg PRE-CAMBRIAN GRANITE

FAULT: KNOWN, INFERRED

21 BEDDING ATTITUDE

78 SHEETING ATTITUDE

CONTOUR INTERVAL 50'. DATUM PLANE SEA LEVEL

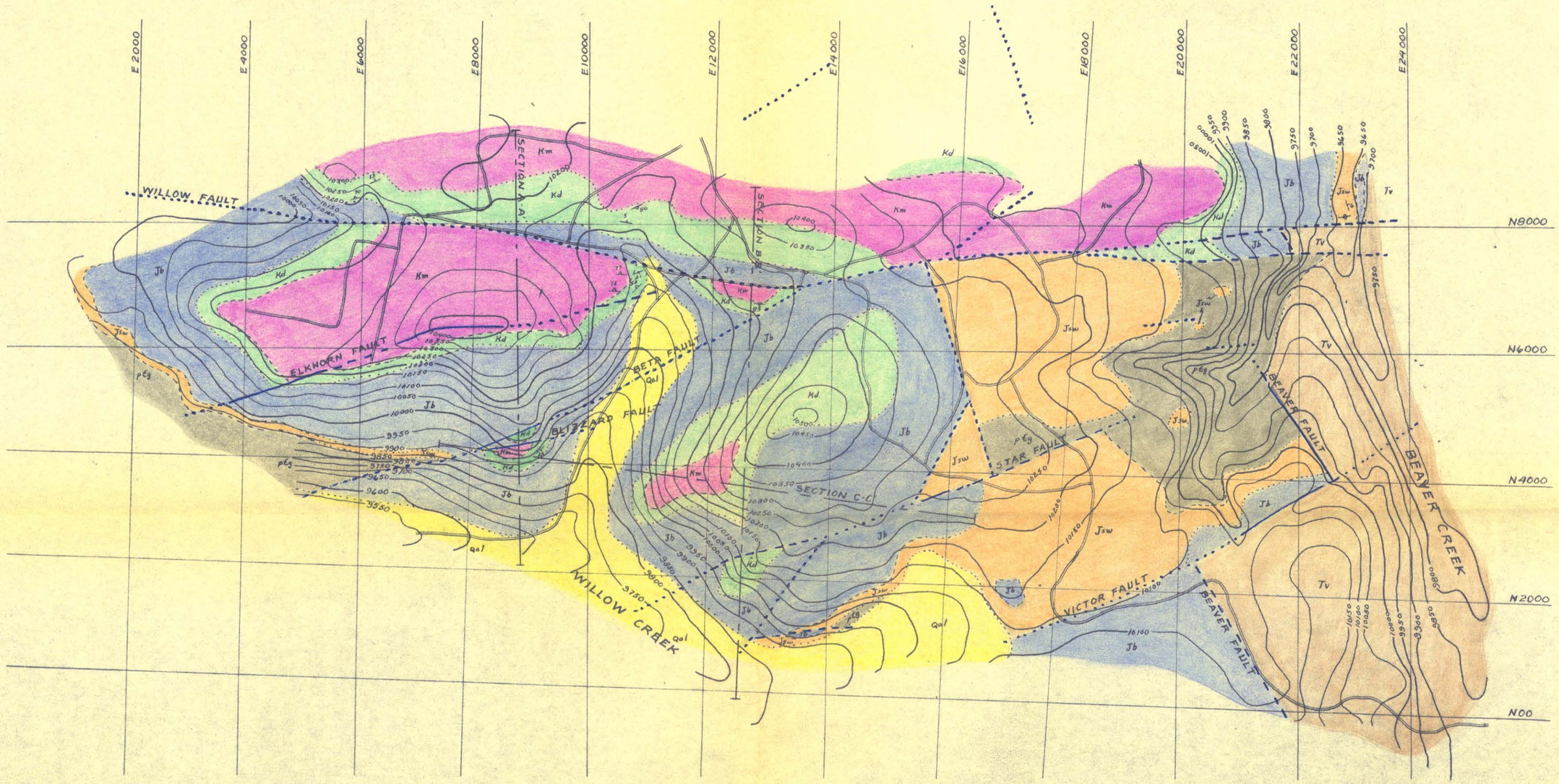
MAPPED ON AND TRACED FROM U.S. FOREST SERVICE AERIAL PHOTOS. ELEVATIONS DETERMINED WITH ALTIMETER. TOPOGRAPHY DRAWN WITH NO HORIZONTAL OR VERTICAL CONTROL.

SCALE

1000' 0 1000' 2000' 3000' 4000' 5000'

N

| | |
|---|---|
| VULCAN SILVER-LEAD CORP. | |
| WILLOW CREEK GROUP, SECTIONS 26-35, T47N, R1W, SAGUACHE CO., COLORADO | |
| GEOLOGY AND TOPOGRAPHY | |
| SCALE: 1" = approx 1650'<br>DATE: 8/13/55<br>BY: ABW | DRAWING NO.:<br>GGC 3 |




## LEGEND

- Qal ALLUVIUM
- Tv TERTIARY VOLCANICS
- Km MANCOS FORMATION (= TOP SURFACE OF DAKOTA)
- Kd DAKOTA FORMATION
- Jb MORRISON FORMATION BRUSHY BASIN MEMBER
- Jsw MORRISON FORMATION SALT WASH MEMBER
- pEg PRE-CAMBRIAN GRANITE

- FAULT: KNOWN, INFERRED
- 21 BEDDING ATTITUDE
- 78 SHEETING ATTITUDE

CONTOUR INTERVAL 50'. DATUM PLANE SEA LEVEL

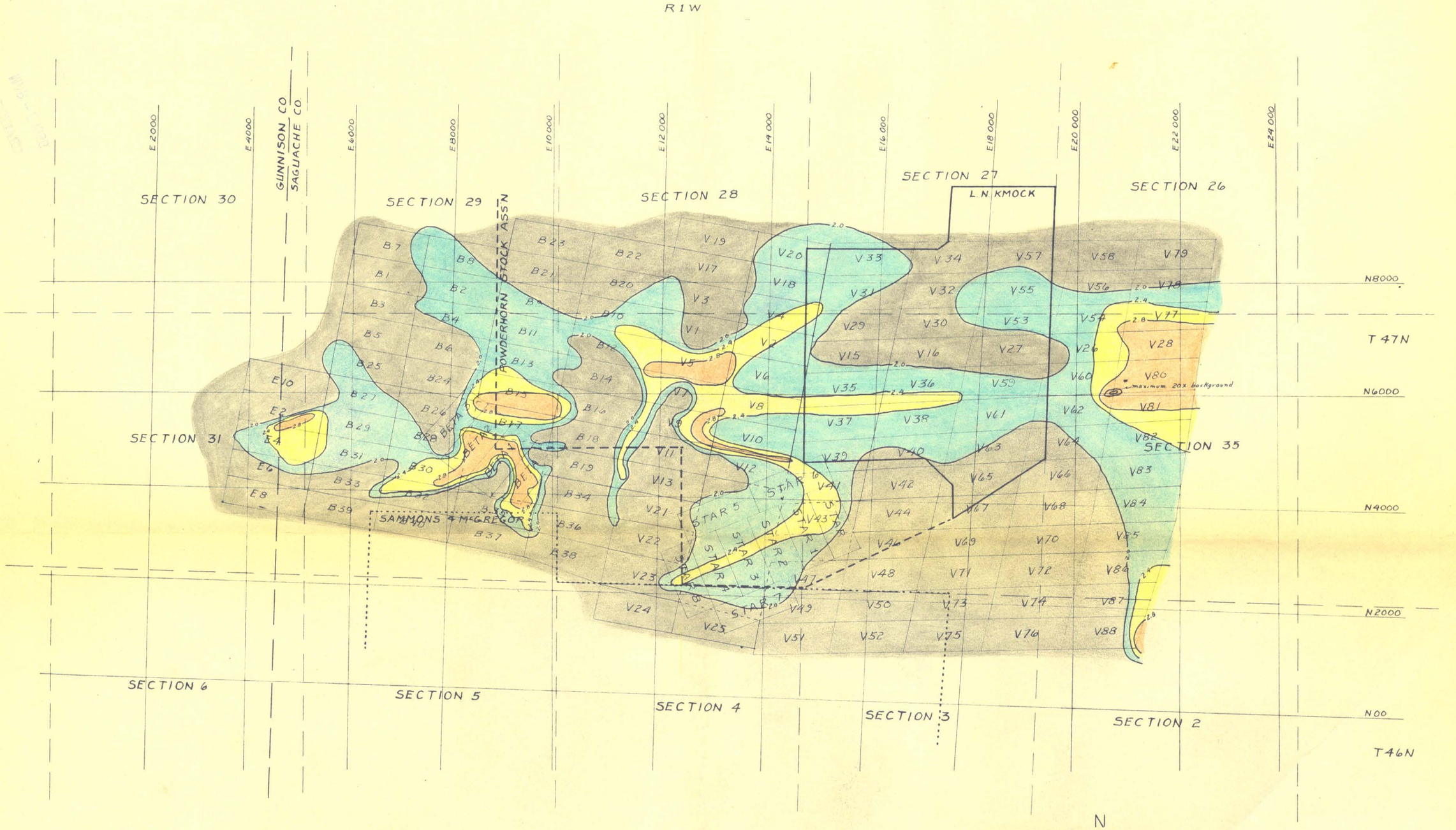
MAPPED ON AND TRACED FROM U.S. FOREST SERVICE AERIAL PHOTOS. ELEVATIONS DETERMINED WITH ALTIMETER. TOPOGRAPHY DRAWN WITH NO HORIZONTAL OR VERTICAL CONTROL.

SCALE

1000' 0 1000' 2000' 3000' 4000' 5000'

N

| VULCAN SILVER-LEAD CORP. | |
|---|---|
| WILLOW CREEK GROUP, SECTIONS 26-35, T47N, R1W, SAGUACHE CO., COLORADO | |
| GEOLOGY AND TOPOGRAPHY | |
| SCALE: 1" = approx 1650'<br>DATE: 8/13/55<br>BY: ABM | DRAWING NO.:<br>GGC 3 |




## RADIOMETRIC LEGEND

- GREATER THAN 2.8 X BACKGROUND
- 2.4 - 2.8 X BACKGROUND
- 2.0 - 2.4 X BACKGROUND
- LESS THAN 2.0 X BACKGROUND

BACKGROUND IS LOWEST READING IN AREA = 5 CPS ON NUCLIOMETER, 0.0035 MR/HR ON SCINTILLATOR

READINGS TAKEN AT ALL CLAIM CORNERS AND LOCATION MONUMENTS AND AT SOME SIDE CENTER MONUMENTS IN CENTER OF MAP. SEE ALSO DETAILED RADIOMETRIC MAP OF BETA AREA

## OWNERSHIP LEGEND

VULCAN CLAIMS: E = ELKHORN, B = BLIZZARD, V = VICTOR

L. N. KMOCK

POWDERHORN STOCK ASS'N

SAMMONS AND SAMMONS & McGREGOR

} PATENTED SURFACE RIGHTS

SECTION LINES (LOCATIONS UNCERTAIN)

ONLY KMOCK PROPERTY LINE MAPPED IN FIELD

ALL LINES DISTORTED SOMEWHAT BY DISTORTION OF AERIAL PHOTOS

GROUND SOUTH OF GROUP STAKED BY UNION GULF OIL CO.; GROUND TO WEST STAKED BY AABERG; SOME OF GROUND TO NORTH STAKED BY G. SETTLE

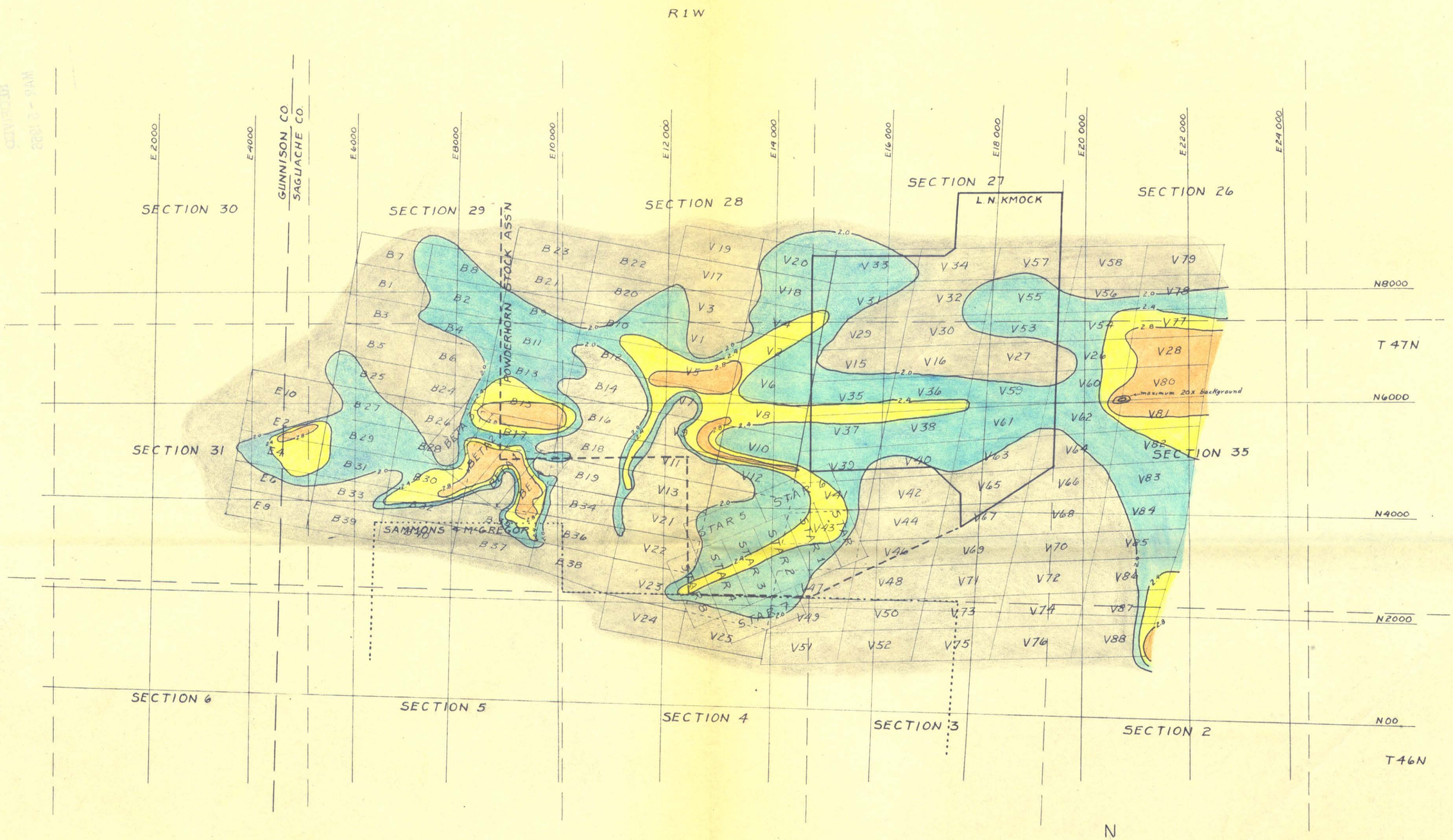
N

SCALE

1000' 0 1000' 2000' 3000' 4000' 5000'

OVERLAY FOR DRAWING NO. GGC3 - GEOLOGY AND TOPOGRAPHY

| | |
|---|---|
| VULCAN SILVER-LEAD CORP. | |
| WILLOW CREEK GROUP, SECTIONS 26-35, T47N, R1W, SAGUACHE CO, COLORADO | |
| PROPERTY OWNERSHIP AND RADIOMETRIC MAP | |
| SCALE: 1" = approx 1650'<br>DATE: 8/15/55<br>BY: ABM | DRAWING NO.<br>GGC 4 |




## RADIOMETRIC LEGEND

- GREATER THAN 2.8 X BACKGROUND
- 2.4 - 2.8 X BACKGROUND
- 2.0 - 2.4 X BACKGROUND
- LESS THAN 2.0 X BACKGROUND

BACKGROUND IS LOWEST READING IN AREA = 5 CPS ON NUCLIOMETER, 0.0035 MR/HR ON SCINTILLATOR

READINGS TAKEN AT ALL CLAIM CORNERS AND LOCATION MONUMENTS AND AT SOME SIDE CENTER MONUMENTS IN CENTER OF MAP. SEE ALSO DETAILED RADIOMETRIC MAP OF BETA AREA

## OWNERSHIP LEGEND

VULCAN CLAIMS: E = ELKHORN, B = BLIZZARD, V = VICTOR

L. N. KMOCK

POWDERHORN STOCK ASS'N

SAMMONS AND SAMMONS + McGREGOR

} PATENTED SURFACE RIGHTS

SECTION LINES (LOCATIONS UNCERTAIN)

ONLY KMOCK PROPERTY LINE MAPPED IN FIELD

ALL LINES DISTORTED SOMEWHAT BY DISTORTION OF AERIAL PHOTOS

GROUND SOUTH OF GROUP STAKED BY UNION GULF OIL CO.; GROUND TO WEST STAKED BY AABERG; SOME OF GROUND TO NORTH STAKED BY G. SETTLE

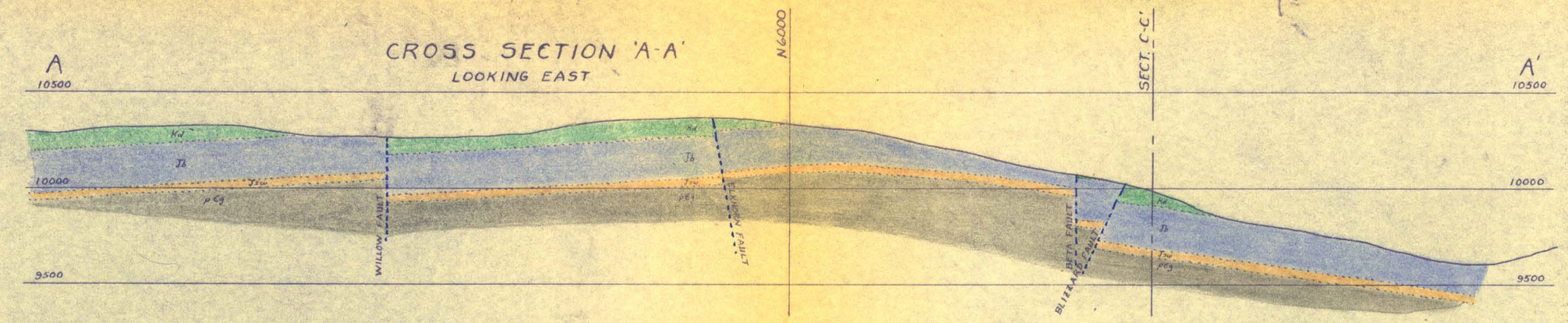
N

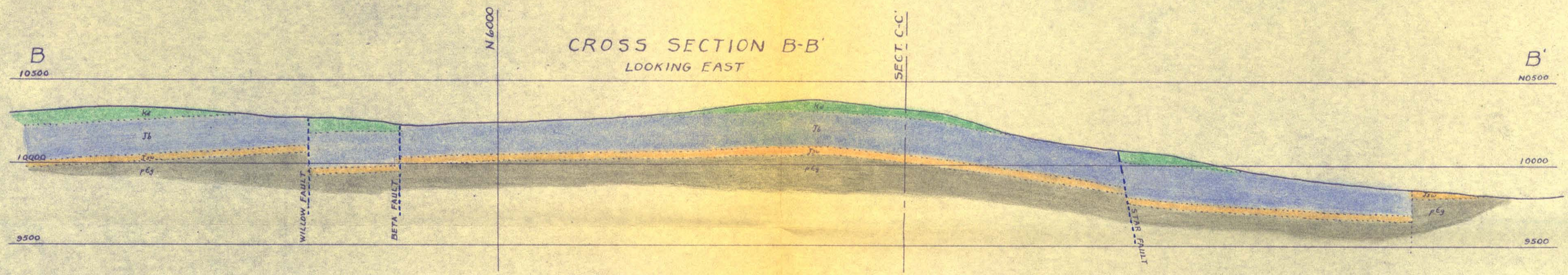
SCALE

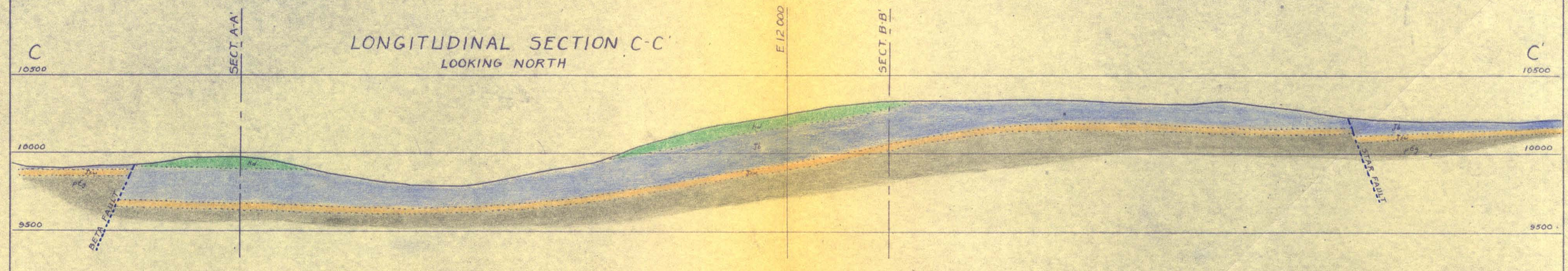
1000' 0 1000' 2000' 3000' 4000' 5000'

OVERLAY FOR DRAWING NO. GGC3 - GEOLOGY AND TOPOGRAPHY

| | |
|---|---|
| VULCAN SILVER-LEAD CORP. | |
| WILLOW CREEK GROUP, SECTIONS 26-35, T47N, R1W, SAGUACHE CO, COLORADO | |
| PROPERTY OWNERSHIP AND RADIOMETRIC MAP | |
| SCALE: 1" = approx 1650'<br>DATE: 8/15/55<br>BY: ABM | DRAWING NO.:<br>GGC 4 |




TO ACCOMPANY DRAWING NO. GGC 3

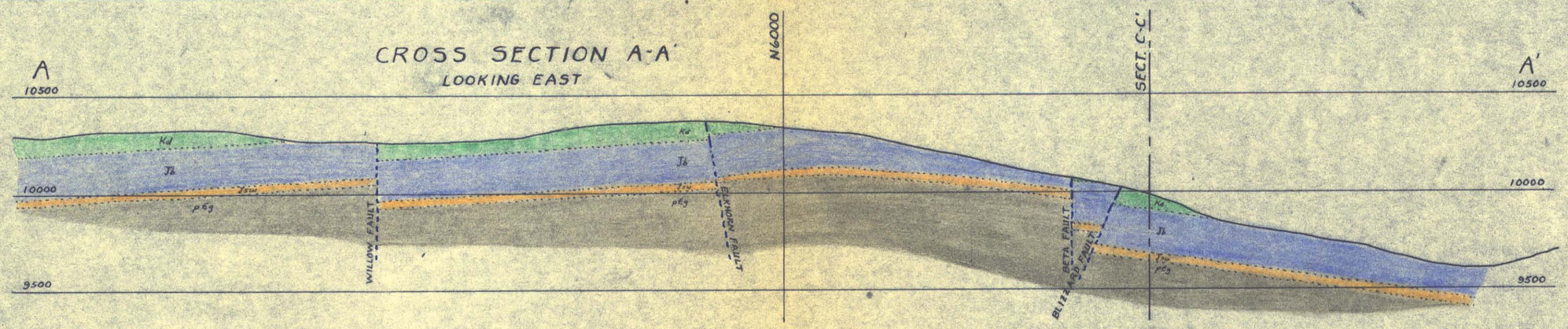
## LEGEND

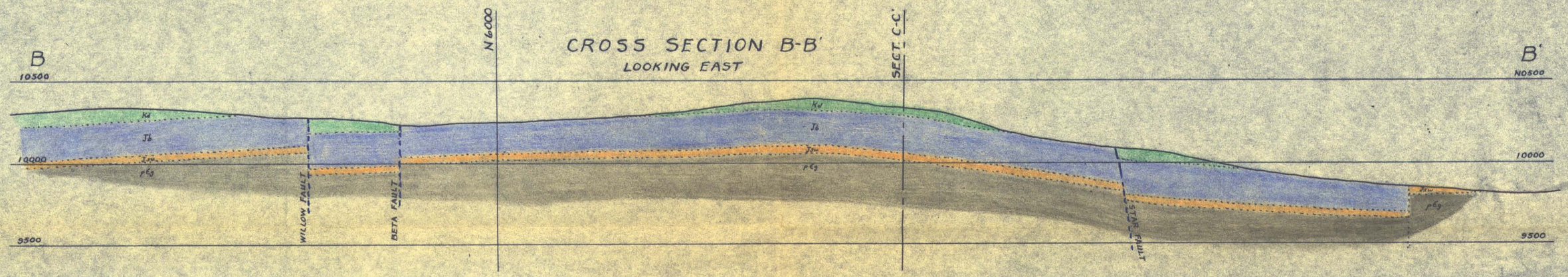
- Kd — DAKOTA FORMATION
- Jb — MORRISON FORMATION, BRUSHY BASIN MEMBER
- Jsw — MORRISON FORMATION, SALT WASH MEMBER
- pEg — PRE-CAMBRIAN GRANITE
- FAULT: KNOWN, INFERRED

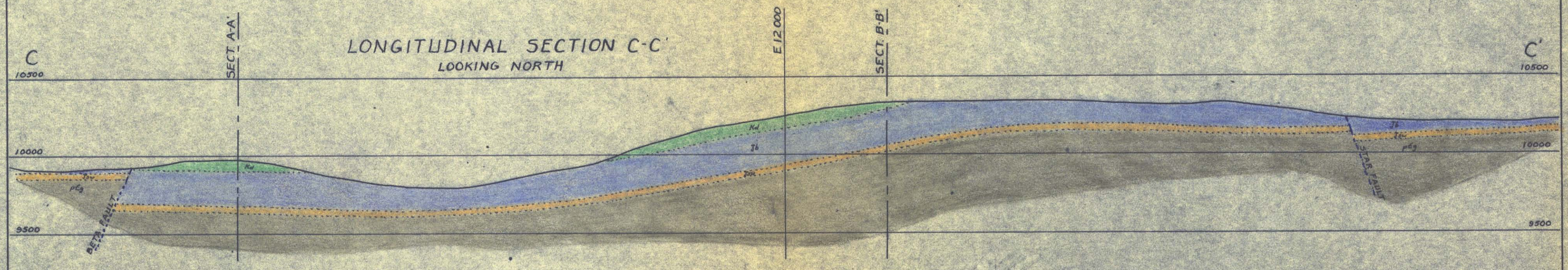
SCALE

500 0 500' 1000' 1500' 2000'

| | |
|---|---|
| VULCAN SILVER-LEAD CORP. | |
| WILLOW CREEK GROUP, SECTIONS 26-35<br>T46N, R1W, SAGUACHE CO, COLORADO | |
| CROSS SECTIONS A-A', B-B'<br>LONGITUDINAL SECTION C-C' | |
| SCALE: 1" = 500'<br>DATE: 8/22/55<br>BY: AMT | DRAWING NO.:<br>GGC 5 |




TO ACCOMPANY DRAWING NO. GGC 3

## LEGEND

- Kd — DAKOTA FORMATION
- Jb — MORRISON FORMATION, BRUSHY BASIN MEMBER
- Jsw — MORRISON FORMATION, SALT WASH MEMBER
- pCg — PRE-CAMBRIAN GRANITE
- FAULT: KNOWN, INFERRED

SCALE

500' 0' 500' 1000' 1500' 2000'

VULCAN SILVER-LEAD CORP.

WILLOW CREEK GROUP, SECTIONS 26-35
T4GN, R1W, SAGUACHE CO., COLORADO

CROSS SECTIONS A-A', B-B'
LONGITUDINAL SECTION C-C'

SCALE: 1" = 500'
DATE: 8/22/55
BY: AMG

DRAWING NO.: GGC 5