DMEA Form 1

DEFENSE MINERALS EXPLORATION ADMINISTRATION
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DMEA Docket No. 4446

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

DEC 27 1956

Mr. K. D. Kaasch, Vice President
Cullen Minerals Corporation
610 Rood Avenue
Grand Junction, Colorado

Re: Docket No. DMEA-4446 (Uranium)
Elizabeth Group
Mesa County, Colorado

Dear Mr. Kaasch:

Your application for aid in an exploration project and other information available to us in Washington concerning the above-named property have been reviewed.

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, although noting several small uranium deposits on your property, indicates to us that the probability of disclosing significant ore reserves is not sufficiently promising to justify Government participation. We regret to advise you that, under these circumstances, your application for exploration assistance is denied.

We wish to thank you for your interest in the Defense Minerals Exploration Program and for bringing your property to our attention.

Sincerely yours,

G. O. Mittendorf (f w)

Administrator

MChing/izm 12-21-56
cc to: Docket
Code 700
Mr. Ching
Admr.'s Reading File
Operating Committee
DMEA Field Team, Reg. III (2)
Messrs. JECrawford, Rm. 3643
THKiilsgaard, Rm. 5224
Posted

R.C.H.

Docket

700

Chiang
Ellis

December 21, 1956

Summary of Proposed Project

Object: Denial of application for an exploration project.

Docket No.: DMEA-4446

Commodity: Uranium

Applicant: Cullen Minerals Corporation
610 Rood Avenue
Grand Junction, Colorado

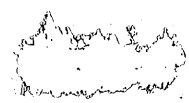
Property: Elizabeth Group, consisting of 9 full-size and 12 fractional lode mining claims as follows: Elizabeth 1-8, south half of Elizabeth 9, Elizabeth 10, 13-16, Elizabeth 17 (where not in conflict with Elizabeth 18), Elizabeth 19-24, located in sec. #28, 29, 32, and 33, T. 50 N. R. 17 W., and in sec. 4, T. 49 N., R. 17 W., N.M.P.M., Blue Mesa County, Colorado. The property is owned by Federal Uranium Corporation and leased to Terminal Exploration Company. Cullen secured possessory rights through an Agreement with Terminal.

Date of Application: August 27, 1956

Amount of Application: $53,980.23

Work Proposed: Explore the Salt Wash by drilling the first of a three phase program as follows:

1,020 ft. core drilling in 5 holes through total Salt Wash @ $2.10/ft.
6,450 ft. plug bit drilling in 29 holes through total Salt Wash @ $1.35/ft.
19,740 ft. plug bit drilling in 141 holes through Rim No. 3 @ $1.35/ft.



Estimated Costs:		
	Above drilling costs	$37,498.50
	30 hrs. standby time @ $12/hr.	360.00
	250 hrs. bulldozer work @ $12/hr.	3,000.00
	Supervisor and technical services	4,250.00
	Miscellaneous	1,830.83
	Contingencies	7,040.90
	Total	$53,980.23
	Government participation @ 75%.	$40,485.17

Field Team Report: November 21, 1956, Harry F. Robertson, USBM & Donald P. Elston, USGS:

A sandstone lens, 40 to 50 feet thick in places, and lying 40 to 50 feet below the basal conglomerate sandstone of the Brushy Basin member, is the main ore bearing sandstone on the property,

which is mostly within the Uravan mineral belt on Blue Mesa. Altered mudstone in association with the ore-bearing sandstone is not as abundant in this area as it is in most uranium-vanadium producing areas of southwestern Colorado. The absence of extensive alteration suggests that solutions were weak and thus might be expected to form only low-grade small deposits.

The deposits found on the property are small, thin, irregularly shaped bodies which, in general, follow the bedding in sandstone. There is a lack of continuity of mineralized layers. Individual ore bodies commonly are less than 50 feet long and range from 1 foot to 15 feet in width. Thickness ranges from a few inches to 4 feet, but as much as 8 feet has been reported.

The USGS has drilled 284 holes in the Blue Mesa area. The company has drilled possibly 1,000 shallow non-core holes on and immediately adjacent to the subject claims, many of them as offsets 15 to 25 feet apart. The majority of the deposits found are on land excluded from the subject application. Two workings on the Elizabeth No. 1 claim, an open cut and a tunnel operation, failed to develop any measurable reserves. There are many prospects and open cuts on and near the subject claims. Mineralized rock of less than ore grade can be found in or adjacent to many of the workings but no significant ore bodies have been developed from such showings.

There are several mineralized outcrops of sandstone lenses lying stratigraphically below the main ore-bearing sandstone. These are not of ore-grade and there is no reason to suspect that ore bodies will be found at depth in equivalent lenses. The USGS was unsuccessful in offsetting mineralized material in sandstone lenses below the ore-bearing sandstone.

A total of 1,443 tons of ore averaging 0.27% U_3O_8 and 1.85% V_2O_5 have been produced from all the Elizabeth claims, but it appears that most of this tonnage came from Elizabeth 18 and the north half of Elizabeth 9, which are excluded from the subject application.

On July 1, 1956, the AEC estimated total reserves on all the claims as 3,581 tons of 0.16% U_3O_8 and 1.55% V_2O_5 ore. There may be 2,000 tons of potential ore in small, scattered, locally clustered ore bodies on the subject claims but the chances of finding significant deposits are not good. Recommends denial of the application.

Commodity Group Comments:

USBM, John E. Crawford, December 13, 1956:

Reviewed the Report of Examination with the AEC representative. Agrees with the Field Team that the application should be denied.

USGS, W. P. Williams, December 18, 1956:

Past Government and private drilling, and the small production, all indicate that ore deposits on Blue Mesa are small and scattered. Regionally the property is located in a transition zone between favorable and unfavorable ground where large deposits are not expected to exist. A large part of the property is classed as unfavorable by USGS standards. This is illustrated on Figure 2 accompanying the Report of Examination. The prospect of finding significant ore reserves does not seem good. Agrees with the Field Team's recommendation for denial.

Rare and Miscellaneous Metals Division, Michael Ching, December 21, 1956:

Extensive work has been done on the subject and adjacent claims. The potential size of ore bodies has been established as small. While an exploration project might discover one or more small deposits, they would probably not be of sufficient size to justify the project.

Conclusions and Recommendations:

Extensive work done to date in the Blue Mesa area has demonstrated that the potential size and number of ore bodies that might be found on the subject property are too limited to justify a DMEA project. It is recommended that the application be denied.

Ernest Wm. Ellis

Ernest Wm. Ellis, Chief
Rare and Miscellaneous
Metals Division

12/21/56

Mr. M:

Mr. McKenzie, Cullen Minerals Corp., Grand Junction, wants to be called re DMEA-4446.

Op. 91 ~~Exn~~ Chapel 2-9222

Denial letter not yet surnamed.

fw

Mr. McKenzie phoned from G.J. this P.M. I told him denial was in the offing. He was shocked! Said F.T. did not do in accurate. Said he shipped $10,000 last month & has drilled ahead of drift & picked up good ore. He speaks as though he will reopen case. M

IN REPLY REFER TO:

12-19-56

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

December 18, 1956

Memorandum

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

From: W. P. Williams, U. S. Geological Survey

Subject: Review of field examination report, DMEA 4446, Cullen Minerals Corp., Elizabeth claims, Mesa County, Colorado, (uranium).

Past Government drilling, private drilling, and small production all indicate that ore deposits on Blue Mesa are small and scattered. The examining team further point out that lack of extensive alteration in the Salt Wash member is indicative of small ore deposits. Regionally the property is located in a transition zone between favorable and unfavorable ground where large deposits are not expected to exist.

A large part of the applicant's property is classed as unfavorable by U.S.G.S. standards. This is illustrated on figure 2 accompanying the examining team's report. The examiners report that possibly as many as a thousand drill holes, many on very close centers, have been drilled on and near the property. The holes plus two mine openings failed to find appreciable ore reserves.

The examining team offers a modified proposed drilling project in the event DMEA wishes to provide the applicant with a contract. The prospect of finding significant ore reserves does not seem good, however; and for the reasons outlined above I am in agreement with the Field Team's recommendation for denial of the application.

W. P. Williams

W. P. Williams

12-13-56

RECEIVED DEC 13 1956 D.M.E.A.

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

Date December 13, 1956

DMEA Docket No. 4446
DMEA Contract No.
Commodity Uranium
Name of applicant Cullen Minerals Corp.
Name of property Elizabeth Group of Claims
Location of property Mesa County, Colorado
Estimated cost of project $58,980.23

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee

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

Subject: Review of Field Team Report
(Application, Field Team Report, etc.)

1. Date of subject document: 11/30/56. 2. Date received by reviewer: 12/11/56.

3. Prior reports on this property known to reviewer: Yes ☐ No ☐

4. Prior reports on nearby properties known to reviewer: Yes ☐ No ☐

5. Information available on past production: Yes ☐ No ☐

6. Other pertinent factors known to reviewer: Yes ☐ No ☐

7. Explain items marked yes above:

8. Factors needing special consideration:
   a. Location ☐
   b. Ownership ☐
   c. Evidence of mineralization ☐
   d. Geology ☐
   e. Proposed exploration method ☐
   f. Alternate exploration method ☐
   g. Costs ☐
   h. _____ ☐

9. Action advised:
   a. Obtain information from applicant ☐
   b. Refer to Field Team ☐
   c. Denial [x]
   d. Agree with Field Team [x]
      1. Consult with Mr. _____ at _____ AEC office.
   e. Disagree with Field Team ☐
   f. Suggest alternate plan ☐
   g. Request another examination ☐
   h. Approval ☐

10. Remarks: (Use back of page if necessary) Mr. J. O. Hosted, Washington representative of the Atomic Energy Commission, assisted in the review.

12/2/56

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

224 New Customhouse
Denver 2, Colorado

November 30, 1956

RECEIVED DEC 3 1956 D.M.E.A.

Memorandum

To: Secretary to the Operating Committee

From: DMEA Field Team, Region III

Subject: Joint Report of Examination Docket DMEA 4[illegible] (Uranium)
Cullen Minerals Corporation (Elizabeth Group of Claims)
Mesa County, Colorado

Enclosed are the original and three copies of a joint engineering and geologic Report of Examination, covering the subject application by H. F. Robertson, Mining Engineer, USBM, and Donald P. Elston, Geologist, USGS, and transmittal thereof to the Executive Officer by J. William Hasler, USGS, through John F. Shaw, Supervising Mining Engineer, and E. N. Harshman, member Region III Field Team.

The Cullen Minerals Corporation proposes to explore for uranium ore in the upper Salt Wash member of the Morrison formation and in the underlying Summerville formation by a program of core and noncore drilling estimated to cost $58,980.23.

The examiners conclude and we concur that the proposed exploration program will not lead to the discovery of significant deposits of uranium ore.

The examiners have outlined a modest alternate program of exploration which might lead to the discovery of a few small, shallow ore bodies in the upper Salt Wash sandstone. We would not be adverse to this limited program; but in view of the Applicant's dissatisfaction with the program proposed by the examiners, and the expected small size of any ore bodies that might be found, we recommend that this application be denied.

In the event that Washington decides to prepare a contract, extra copies of the map included will be furnished upon request.

DMEA Field Team, Region III

for J W Townsend

Enclosures

Reviewed by
DMEA OPERATING COMMITTEE
12-7-56
(date)

By W. M. Traver
Executive Officer

FT REPORT

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P. O. Box 360
Grand Junction, Colorado

MINERAL DEPOSITS
DMEA
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NOV 14 1956

TRANSMITTED
NOV 30 1956

DMEA
DEPARTMENT OF THE INTERIOR
NOV 29 1956
REGION III
DENVER, COLORADO

November 1, 1956

GEOLOGICAL SURVEY
DENVER, COLORADO

RECEIVED
1956
D.M.E.A.

Memorandum

To: Executive Officer, DMEA Field Team, Region III

Through: E. N. Harshman
John F. Shaw

From: J. William Hasler

Subject: Transmittal of report of examination
DMEA docket No. 4446 (Uranium), Cullen Minerals Corporation,
(Elizabeth group of claims), Mesa County, Colorado

The Cullen Minerals Corporation, 610 Rood Avenue, Grand Junction, Colorado, applied for Government assistance to explore the Elizabeth group of claims on Blue Mesa, Mesa County, Colorado. The application was referred to the examining team, consisting of D. P. Elston and H. F. Robertson, who examined the property on September 5, 1956.

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DEC 3 1956
D.M.E.A.

The Elizabeth group of claims are in an area that has been explored by the U. S. Geological Survey and, although some production has been made from parts of these claims, the property is in an area that is considered more or less unfavorable for the occurrence of significant ore bodies.

The applicant proposes to explore the upper part of the Salt Wash member of the Morrison formation of Jurassic age as well as testing the lower part of the Salt Wash member on into the underlying Summerville and Entrada formations. The USGS drilling has adequately tested the upper, or "ore bearing" portion of the Salt Wash sandstone and the drilling also has shown that the lower portion of the Salt Wash is generally unfavorable for ore.

The ore bodies on Blue Mesa are small and are spotty in their distribution, as well as varying widely in grade. In view of the fact that much of the drilling proposed by the applicant is shallow drilling and the fact there may be as much as 2,000 tons of ore discovered on the subject group of claims, an alternate program is suggested in this report. The alternate program will test the more favorable portion of the Salt Wash member, and it is the opinion of the examining team that the deposits of little significance are likely to be found by drilling the deeper portion of the member. The applicant feels that the deeper portion of his program is not being duly considered, but because of adequate information obtained from the prior drilling and geologic mapping, the examining team feels that drilling for deposits in the lower part is not likely to discover any ore bodies of significant size and grade.

Reviewed by
DMEA OPERATING COMMITTEE
12-7-56
(date)

DMEA 4446 11/13/56

It is proposed that the application be denied unless the Field Team deems it advisable to approve the limited program herein outlined.

Enclosed is a rough draft of a joint engineering and geologic report and the required number of figures and illustrations for inclusion in the joint report, as well as costs for the proposed program. The applicant states that he would go along with any program that might be proposed.

The AEC was consulted relative to the appraisal of the property and the results of Survey drilling was extensively used in the examining team's appraisal of the property. I concur with the conclusions and recommendations of the examining team that the application be denied.

J. William Hasler

J. William Hasler,
Geologist

JWH/mlr

Enclosures

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DMEA
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NOV 29 1956
U. S.
GEOLOGICAL SURVEY
DENVER, COLORADO

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION
REGION III

TRANSMITTED
NOV 30 1956

DMEA 4446

CULLEN MINERALS CORPORATION

Elizabeth Group

Mesa County, Colorado

RECEIVED
DEC 3 1956
D.M.E.A.

Uranium

JOINT ENGINEERING AND GEOLOGIC REPORT

Harry F. Robertson, Mining Engineer
Bureau of Mines

Donald P. Elston, Geologist
Geological Survey

November 21, 1956

Reviewed by
DMEA OPERATING COMMITTEE
12-7-56
(date)

DMEA 4446
CULLEN MINERALS CORPORATION
Elizabeth Group
Mesa County, Colorado

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ILLUSTRATIONS

Figure

1. Location Map, Cullen Minerals Corporation, Elizabeth Claims, Blue Mesa, Mesa County, Colorado.

2. Map of Elizabeth Claims showing Government drill holes and proposed Stage I DMEA drill holes, Cullen Minerals Corporation, Blue Mesa, Mesa County, Colorado.

in envelope pocket w/ 12-3-56 received stamp

DMEA 4446
CULLEN MINERALS CORPORATION
ELIZABETH GROUP
MESA COUNTY, COLORADO

RECEIVED DEC 3 1956 D.M.E.A.

INTRODUCTION AND SUMMARY

Cullen Minerals Corporation, 610 Rood Avenue, Office No. 6, Grand Junction, Colorado applied on August 27, 1956, for Government assistance to explore for uranium on the Elizabeth group of claims on Blue Mesa, Mesa County, Colorado.

A program of noncore and core drilling requiring 27,200 feet of drilling in 165 holes and costing $53,980.23 has been proposed by the applicant.

A field examination was made on September 5, 1956, by a DMEA examining team accompanied by Messrs. K. D. Kaasch and L. Peterson representing the applicant.

The Elizabeth claims are located on the east and northeast sides of Blue Mesa, Mesa County, Colorado. The claims are mostly within the Uravan mineral belt (fig. 2).1/

Uranium-vanadium minerals are scattered in several of the sandstone lenses of the Salt Wash member of the Morrison formation of Jurassic age, but almost all of the production has come from the upper part of the member. A sandstone lens, which in places is 40 to 50 feet thick, and lies about 40 to 50 feet beneath the basal conglomeratic sandstone of the Brushy Basin member of the Morrison formation, is the main "ore-bearing sandstone" on Blue Mesa. There are numerous prospects and several mines in the lens in the area. None have ore bodies of significant size as compared to other parts of the Uravan mineral belt. Ore bodies are seldom over 50 feet in the longest dimension; many are narrow, 10 to 15 feet in width. Commonly the ore layers are 1 to 3 feet thick, but drill holes reportedly have penetrated as much as 8 feet of ore-grade material. In several places the clustering of ore bodies into small deposits has made underground mining feasible. The grade of individual ore deposits, ore bodies, and locally parts of ore bodies

1/ Fischer, R. P. and Hilpert, L. S., Geology of the Uravan Mineral Belt, U. S. Geological Survey Bull. 988-A, 1952.

is highly variable. The grade in bodies of mineralized material ranges from about 0.07 percent U_3O_8 to about 0.70 percent U_3O_8. The weighted average grade of the ore reserves discovered by U. S. Geological Survey drilling on Blue Mesa is about 0.19 percent U_3O_8 and 1.5 percent V_2O_5 2/ and is certainly not comparable to the higher grade deposits on Outlaw Mesa to the north.

The presence of "altered" gray-green and green mudstone intercalated with the sandstone at the base and top of the sandstone, plus the presence of radioactive carbon in the sandstone, appear to be the best guides for ore on Blue Mesa. Evaluation of U. S. Geological Survey drill-hole data and examination of outcrop and of mine workings show that altered mudstones are restricted almost exclusively to local areas which contain or are near ore minerals in the sandstone. There is commonly no green mudstone at the base of sandstone at distances greater than 50 feet laterally from ore bodies. In addition, green mudstone intercalated with the sandstone is also commonly sparse away from ore bodies, and much of the sandstone has a reddish cast. The lack of extensive alteration suggests that mineral-bearing solutions were weak, and thus might be expected to form only small low-grade deposits.

The results of Geological Survey drilling 4/ as interpreted on the basis of geologic guides to carnotite deposits 5/ are that Blue

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2/Finch, W. I., Carnotite Resources of part of Blue Mesa, Mesa County, Colorado; TEIR 154, February 1952.

4/ Op. Cit. p. 16

5/ Weir, D. B., Geologic Guides to Prospecting for Carnotite Deposits on Colorado Plateau, U. S. Geol. Sur. Bull. 988-B, 1952.

Mesa does not contain as much favorable ground as Outlaw Mesa, and favorable ground on Blue Mesa is less favorable than similar ground on Outlaw Mesa. Furthermore, the Blue Mesa area appears to be in a transitional zone and the more favorable ground probably was present east of Blue Mesa before erosion; the western limit of the Uravan mineral belt was found to be nearer the northeastern edge of Blue Mesa than was anticipated.

Because of the generally small size of ore bodies found on the claims to date, their variability in grade and their spotty distribution, it is recommended that DMEA assistance for exploration on the subject claims be denied. However, since drilling depths are mostly shallow and there is a chance of finding some small ore bodies, a more limited drilling program is presented in this report for the Field Team's consideration, if approval of a project is considered advisable. The revised drilling program is designed to test, by non-core drilling only, the ore-bearing sandstone in unexplored ground on the claims. The program is set up in two stages; the first stage is on moderate-spaced 150-300 foot centers, and the second stage is on 50-foot centers offsetting holes which penetrate strongly mineralized or favorable ground.

ACKNOWLEDGEMENTS

The applicant furnished a well-documented brochure with a geologic report by H. W. C. Prommel, and a cost estimate accompanied by bids from three independent drilling contractors.

Results of exploration drilling by the U. S. Geological Survey during 1950 and 1951 were used in the evaluation of the subject

property. Ore reserve and production figures were obtained from both the Geological Survey and the Atomic Energy Commission.

LOCATION, TOPOGRAPHY, AND PHYSICAL FEATURES

The Elizabeth group of claims included in the proposed DMEA project are located in Secs. 28, 29, 32, and 33, T. 50 N., R. 17W., and in Sec. 4, T. 49 N., R. 17W., NMPM, Blue Mesa, Mesa County, Colorado. The property is about 13 miles southeast of Gateway, Colorado, and is accessible over a network of unimproved truck trails that connect with Colorado Highway 141. The route most frequently used is to travel southeast on U. S. Highway 50 for nine miles to its junction with Colorado Highway 141; thence 15 miles southwest to Taylor's ranch; thence southerly on the Forest Service Road, which traverses the Uncompahgre Plateau, for a distance of 34 miles to Outlaw Mesa; thence 7 miles southeasterly on a very rough, rocky road to the subject property.

The topography of Blue Mesa is the usual flat-top mesa-land bordered by steep slopes and canyons drained by intermittent streams. Altitudes in the Blue Mesa area range from 5,600 to 6,400 feet. The area is covered with a sparse to thick growth of juniper, pinon pine, and sage brush. Small perennial streams, Blue Creek on the West and Mesa Creek on the east, flow along two sides of the area.

HISTORY, PRODUCTION, AND RESERVES

The Blue Mesa area has shown sporadic mining activity since about 1940. Most of the early production was obtained from 1940 to 1943, and in 1949. Mining was resumed in 1951, when an increase in the price of uranium allowed profitable mining of deposits that were previously uneconomical.

Atomic Energy Commission records show that since the AEC buying program was initiated in late 1948, 1,443 tons of ore having an average grade of about 0.27 percent U_3O_8 and 1.86 percent V_2O_5, have been produced from the Elizabeth claims as of July 1, 1956 (Table I). AEC reserves on these claims, as of the same date, are 3,581 short tons of ore having an average grade of 0.16 percent U_3O_8 and 1.55 percent V_2O_5. Most of the ore has been produced since 1951.

In 1952, the Geological Survey estimated that about 3,000 tons of low-grade ore was discovered on the subject claims by Government drilling. The difference (about 2,000 tons) between the original Geological Survey estimate, the production, and the reserves presently estimated by the AEC is the result of additional ore having been discovered and developed by private drilling. The examining team estimates a potential ore reserve, in addition to the known ore, of about 2,000 tons. This ore will probably occur in small, scattered, and locally clustered bodies in the claim area.

OWNERSHIP AND EXTENT

The Elizabeth claim group, as shown on the applicant's map and included in the proposed DMEA project, consists of 9 full-size (600 feet by 1500 feet) mining claims and 12 fractional mining claims. Recording data on the claims included in the proposed project are given in Table II.

The Jody claim Nos. 4, 5, 6, and 7 are not included since essentially the same area is covered by the Elizabeth claims Nos. 3, 4, 5, 6, 7, and 8. Elizabeth No. 12 is not included as it apparently was

TABLE I

Production from Blue Mesa, as of July 1, 1956 plus AEC Resources

PROPERTY	Produced	% U_3O_8	% V_2O_5	RESERVES TONS	RESERVES % U_3O_8	RESERVES % V_2O_5
Elizabeth Claims 7-10 incl.	495	0.17	1.70	2,946	0.17	1.45
Elizabeth Claim #18	815	0.34	1.91	635	0.14	2.03
Elizabeth #1	133	0.18	2.11	---	---	---
Total & Weighed Av. Grade	1,443	0.27	1.85	3,581	0.16	1.55
Big 7 Claim (West of Elizabeth Group)	826	0.64	3.09	929	0.60	2.40
Jody Lode (East of Elizabeth Group)	484	0.25	2.15	438	0.35	1.67
Black Streak (Hunt Oil)	1,427	0.33	1.67	1,478	0.22	1.77
Jim Fraction	138	0.21	1.15	144	0.23	0.89
Total & Weighed Av. Grade	2,875	0.39	2.13	2,989	0.35	0.87
TOTALS	4,318	0.34	2.04	6,570	0.24	1.124

TABLE II - Elizabeth claims included in Proposed Project.

DMEA 4446 (Uranium) Cullen Minerals Corporation (Elizabeth Group)

Blue Mesa, Mesa County, Colorado

CLAIM NAME	LOCATION DATE	BOOK	PAGE
Elizabeth 1	4/14/39	291	493
Elizabeth 2	4/14/39	291	493
Elizabeth 3	4/14/39	291	494
Elizabeth 4	4/14/39	291	494
Elizabeth 5	4/14/39	291	495
Elizabeth 6	4/14/39	291	495
Elizabeth 7	5/17/39	291	496
Eliaabeth 8	5/17/39	291	496
Elizabeth 9 (South half)	4/14/39	291	497
Elizabeth 10	4/14/39	291	497
Elizabeth 13	5/17/39	291	498
Elizabeth 14	4/14/39	291	499
Elizabeth 15	4/14/39	291	499
Elizabeth 16	4/14/39	291	500
Elizabeth 17 (where not in conflict with Elizabeth 18)	4/14/39	291	500
Elizabeth 19	4/14/39	291	501
Elizabeth 20	4/14/39	291	502
Elizabeth 21	5/19/39	291	502
Elizabeth 22	3/1/56	678	35
Elizabeth 23	7/28/55	655	308
Elizabeth 24 (Millsite)	5/19/39	291	503

eliminated by the boundary settlement along the east side of the claim group.

The Elizabeth Nos. 3, 4, 5, 6 are not specifically named in any documents furnished with the brochure with the exception of the letter from Federal Uranium Corporation to Terminal Exploration Company. This letter points out that Elizabeth Nos. 3, 4, 5, and 6 cover essentially the same ground as Jody Nos. 4, 5, 6, and 7. Elizabeth Nos. 3, 4, 5, and 6 were located in April 1939, and are prior to the Jody Nos. 4, 5, 6, and 7 which were located in April 1950. For this reason, the Elizabeth claims are considered as the senior claims by the lessor, Federal Uranium Corporation, and the lessee, Terminal Exploration Company. Apparently, then, the applicant's interest in the Elizabeth Nos. 3, 4, 5, and 6 is valid and the Elizabeth claims, rather than the Jody claims, are included in the proposed DMEA project.

Elizabeth No.18 is not included in the proposed DMEA project as the applicant is at the present time operating a small mine recovering company-developed reserves.

The Elizabeth claims were originally located in April 1939 by Wade Collier, A. L. Crist, and R. V. Ivie. Utida Uranium Company, Inc. procured the claims from the original owners. This company merged with Federal Uranium Corporation, thus transferring ownership of the Elizabeth group of claims to the surviving company. Federal Uranium Corporation then leased the claim group to Terminal Exploration Company and held a 15 percent royalty on the gross amount received from the sale of ores produced, less development or haulage allowances but including initial production bonuses. Terminal Exploration Company

and Cullen Minerals Corporation have signed a contract wherein each company holds a one-half interest in the mining lease. Cullen Minerals Corporation is obligated to actively perform the mining or exploration work on the claim group.

An inspection of the various leases, contracts, and agreements furnished by the applicant appears to establish the fact that Cullen Minerals Corporation has a valid interest in the Elizabeth group of claims. The subject claim group covers an area of about 300 acres on the east and northeast side of Blue Mesa.

PRESENT STATUS

Exploration and Development

Between August 1950 and July 1951, the U. S. Geological Survey drilled 284 holes in the Blue Mesa area. Information from about 80 of these holes has been used in evaluation of the subject property. Most of the holes were drilled in the favorable areas found by initial wide-spaced drilling.

Company drilling on and immediately adjacent to the subject claims has been confined mostly to development noncore air drilling near mineralized outcrops and ore bodies discovered by the Geological Survey. There may be as many as 1,000 of these holes; many of them are concentrated in the northern part of the area. The lack of continuity of individual ore and mineralized layers, and their variability in length, width, and thickness is best shown by the many offset holes which have been drilled on centers which are 15 to 25 feet apart, and, in places, 7½ feet apart. Such "exploration" and development drilling can be economically feasible only when the ore is at very shallow depths.

The majority of the workings are on the portions of the property excluded from the application. Two mines are presently being operated on the claim group, and neither of these are within the boundaries of the proposed DMEA project. Two workings, not operating at the present time, are located on the Elizabeth No. 1 claim. One is a strip operation which was opened by removing about six feet of overburden and the other is a tunnel operation. The latter consists of about 100 feet of drifting. Neither of the workings have developed any measurable reserves and have accounted for very little production.

MINING EQUIPMENT AND OTHER FACILITIES

Most of the mining equipment on the property is owned by contractors doing business with the applicant. Cullen Minerals Corporation has established a camp on the Elizabeth Millsite which would serve as housing for any project personnel. The camp is on the north bank of Mesa Creek which is a small perennial stream, furnishing water for domestic purposes as well as for drilling. Power needs would be met by the use of portable equipment.

GEOLOGY

The geology of Blue Mesa has been discussed by W. I. Finch 6/ and, in part, is abstracted in the following paragraphs.

Sedimentary rocks of Mesozoic age are exposed on Blue Mesa. These rocks consist of the Lower Cretaceous Burro Canyon formation underlain by the Upper Jurassic Morrison formation. Only the Morrison formation crops out on the Elizabeth claims. The Morrison formation consists of two members, the Brushy Basin member above and the Salt Wash member

6/ Finch, W. I., Carnotite resources of part of Blue Mesa, Mesa County, Colorado, TEIR 154, December 1951

below. The former consists mostly of mudstone with some sandstone and conglomerate beds; the latter consists of sandstone lenses interbedded with mudstone. A geologic section measured about 1½ miles west of the claims by C. N. Holmes, U. S. Geological Survey, in September 1948, gives the following thicknesses: Burro Canyon formation, 30 feet; Brushy Basin member, 305 feet; Salt Wash member, 333 feet; Summerville formation, 112 feet.

The Blue Mesa area is bounded on the east by a steep monoclinal fold. The dip of the rocks in the Blue Mesa area ranges from about 50° SW along the east flank to 3½° SW over most of the area.

The known carnotite deposits are in a number of sandstone lenses in the upper part of the Salt Wash member. These lenses, called the "ore-bearing sandstone", range in thickness from a knife-edge to 80 feet and have an average thickness of about 40 feet.

The ore-bearing sandstone is generally cross-bedded or massive. It is dominantly medium-to medium-fine-grained, though in places it is fine-grained. Where classed as favorable for ore it is mainly light- to pale-brown and speckled with spots of limonite. Locally, in wet ground in and near ore body No. 2, south of the Utida shaft, the sandstone is light gray and contains scattered sulfides. Outside of the favorable areas surrounding most of the ore deposits the sandstone is vari-colored and contains many thin to medium beds of light to dark reddish-brown sandstone intercalated with pale brown sandstone. This color difference is due to the red color of interstitial mudstone and perhaps also to fine coatings of hematite on the sand grains. In places the entire sandstone is light to dark reddish-brown.

The sandstone contains some mudstone which occurs as thin to thick lenses, and as irregular lenses of mudstone-pebble conglomerate. They are found most commonly at the base of the sandstone lenses. Fossil plant remains are abundant in the sandstone both in the vicinity of and away from ore deposits.

The mudstones that are above and below the ore-bearing sandstone, as well as the mudstone pebbles and lenses within the sandstone are dominantly red. Field relations suggest that this was their original color, as near ore deposits some of the interstitial mudstone and lenses within the ore-bearing sandstone, as well as some of the mudstone below the ore-bearing sandstone, are altered to gray. Altered mudstone near deposits, however, is not as abundant on Blue Mesa as it is in most places which produce uranium-vanadium ore in southwestern Colorado. The absence of extensive alteration suggests that solutions ware weak and thus might be expected to form only low-grade, small deposits. In vari-colored sandstone, beds showing altered mudstone appear to be coarser grained and more permeable than beds showing no alteration effects.

ORE DEPOSITS

The ore consists mainly of sandstone impregnated with uranium-vanadium-bearing minerals, but, in places, some of the fossil plant remains are richly mineralized. The mudstone pebbles within the ore have a high vanadium content, and locally the ore minerals are solely in mudstone. The deposits consist of small, thin, irregularly shaped bodies, which, in general, follow the bedding in sandstone. The lack of continuity of mineralized layers and the habit of individual ore deposits, which are small and consist of a cluster of small ore bodies, is apparently the

result of sedimentary structural control of the ore solutions by many small, high angle cross-cutting cross-beds.

Carnotite is the principal uranium-bearing mineral. The principal vanadium-bearing mineral is finely divided and micaceous and is generally referred to as "roscoelite." Where the ore minerals are locally unoxidized or little oxidized the ore minerals are probably uraninite, montroseite and vanadium clays (including "roscoelite").

Carbonaceous material, consisting of fossil tree trunks, branches, leaves and finely divided particles, as well as seams of coaly material as much as 1 inch thick, is common throughout the area. Unlike carbonaceous material on nearby Outlaw Mesa, the carbonaceous material on Blue Mesa generally is not radioactive except in and near ore deposits.

Individual ore bodies commonly are less than 50 feet long and range from about 1 foot to 15 feet in width. Thickness ranges from a feather edge to 3-4 feet but several holes drilled by the applicant in their Number 2 ore body reportedly cut thicknesses of about 8 feet of ore-grade material. The geological member of the examining team had the opportunity to talk to the leasors of the applicant's No. 3 ore body and to observe the mining results around a hole which penetrated a reported 7 to 8 feet of ore. The estimate presumably was based on radiometric probing. The upper part of the "ore zone" consisted of an abruptly pinching wedge of ore about 1 foot thick underlain by about 5 to 6 feet of barren rock which in turn was underlain by a circular, log-like "roll" of ore-grade material about 1 foot in diameter and 15 to 20 feet long. There was no ore and very little mineralized rock at a distance of less than one foot to one side of the drill hole. Clusters of ore bodies form

ore deposits which may have dimensions of about 100 by 200 feet. Some of the deposits appear to have a northeastward trend, but many appear to have no systematic orientation.

There are many prospects and open cuts on and near the subject claims. Mineralized rock, apparently of less-than-ore grade can be found in, or in dumps adjacent to, many of the workings. None of the mineralized outcrops have developed significant ore bodies as has occurred in other parts of the Uravan mineral belt.

There are several mineralized outcrops in sandstone lenses which are stratigraphically beneath the ore-bearing sandstone. These lenses are thinner and generally are more red than the ore-bearing sandstone. Surface outcrops of ore minerals in these lenses have hardly been economic, and there is no reason to suspect that ore bodies will be found at depth in these or equivalent lenses. The ore minerals in these lenses are in layers and rolls that are small and commonly thin. The U. S. Geological Survey has been unsuccessful in offsetting mineralized material in sandstone lenses beneath the ore-bearing sandstone.

PROPOSED EXPLORATION

The applicant proposed a program of 1,020 feet of core and 26,190 feet of noncore drilling which is estimated to cost $53,980.23. Of the proposed Stage I holes, the first five drilled are to be cored through the Salt Wash member of the Morrison formation and the Summerville formation, and are to be bottomed in the Entrada sandstone. These would be followed by 29 noncore holes which would also bottom in the Entrada sandstone. The final phase of wide-spaced drilling would consist of 131 noncore holes which would test only the ore-bearing sandstone or, in the

south end of the claims, a stratigraphically lower sandsone lens where the ore-bearing sandstone has been removed by erosion.

The following revised program is being submitted for the Field Team's consideration. The applicant has been consulted and is not too pleased, but would go along with the program if a contract were prepared. He feels that their main objectives of testing the lower Salt Wash sandstone is not duly being considered. The revised program designates that drilling is to be confined to the upper sandstone lenses of the Salt Wash member. All drilling is to be noncore as Geological Survey core-drill holes appear to be adequate for purposes of obtaining stratigraphic control. Many of the Survey drill holes were drilled to depths of 30 to 50 feet and more below the base of the ore-bearing sandstone. The applicant should make full use of these data. Any of the DMEA drill holes can be judiciously bottomed after having penetrated from one to 10 feet of red mudstone beneath the ore-bearing sandstone. The bottoming depths should be determined by correlation of the sandstone lenses, carried on during drilling. The shallow drill holes, 65 feet and less, in nonwater-bearing areas should be drilled by a wagon drill or other relatively inexpensive method. These holes are on the Elizabeth 1-8, 13, and parts of Elizabeth 17 and 19 claims. The remaining holes probably will have to be drilled by rotary noncore methods.

Two stages of drilling are proposed. The hole pattern for Stage I (fig. 2) is similar to that submitted by the applicant but with fewer holes in the area classed as unfavorable on the basis of Geological Survey drill hole data.

Stage II drilling is to consist of offset holes around holes which have penetrated ore, strongly mineralized rock and/or sandstone

classed as favorable for ore on the basis of green mudstone, a brown or gray color of the sandstone and radioactive carbon. No hole is to be closer than 50 feet to any previously drilled hole. The location of all Stage II holes is to be approved by DMEA prior to their being drilled, and the usual requirements with regard to sample collecting and radiometric probing should be stipulated in the contract.

ESTIMATED COST OF REVISED PROPOSAL

STAGE I

Estimated time for completion----------1 month

Basis - 2 drill-rigs---------1 shift per day per rig

25 days per month----------200 feet per day per rig

1. Independent Contracts

Bulldozing for roads and drillsites		
(150 hours at $12.00 per hour)	$1,800.00	
Wagon drilling 98 holes 5,390 feet	4,042.50	
(at $0.75 per foot)		
Rotary non-core drilling 37 holes 2,275 feet (at $1.25 per foot)	2,843.75	
Total Independent Contracts		$8,686.25

2. Labor, supervision, and technical services

1 geologist-supervisor, full-time		
(1 month at $600.00 per mo.)	600.00	
1 surveying crew		
(3 days at $100.00 per day)	300.00	
Total labor, supervision, and technical services		$900.00

3. Operating materials and supplies

Gasoline, oil, and repairs on pickup for supervisor-geologist (1 month at $50.00 per mo.)	$50.00	
Sample Bags, drill log forms, surveying and office supplies (1 month at $50.00 per mo.)	50.00	
Total operating supplies		$100.00

4. Operating Equipment

Rental	None	
Purchase	None	
Depreciation		
1 pickup valued at	$1,800.00	
1 counter and probe valued at	800.00	
	$2,600.00	
Depreciation on 60 month basis		
$\frac{2,600}{60}$ = $43.33 per month	$43.33	
Total Operating Equipment		$43.33

5. and 6. No initial rehabilitation, repairs, new buildings or equipment.

7. Miscellaneous

Accounting, 1 month at $50.00 per mo.	$50.00	
Sampling and analyses, 100 samples analyzed for U_3O_8 and V_2O_5 at $5.00 each	500.00	
Compensation insurance, payroll taxes, etc. on geologist-supervisor's salary at 6 percent of $600.00	36.00	
Total Miscellaneous		$586.00
Total cost of Stage I		$10,315.58

STAGE II

Stage II costs are estimated on the basis that about the same proportion of wagon drilling to rotary noncore drilling will be necessary. The estimated total footage is 5,000 feet. The estimated time for completion of Stage II is one month, and includes enough time for evaluation of the results obtained from previous drilling.

Estimated time for completion----------1 month

Basis--2 drill rigs---------1 shift per day per rig

25 days per month---------200 feet per day per rig

1. Independent Contracts

Bulldozing for roads and drillsites (100 hours at $12.00 per hour)	$1,200.00	
Wagon drilling, 3,300 feet (at $0.75 per foot)	2,475.00	
Rotary noncore drilling, 1,700 feet (at $1.25 per foot)	2,125.00	
Total independent contracts		$5,800.00

The remaining categories of estimated cost will be the same as those of Stage I.

2.	Total labor, supervision, and technical services	$900.00
3.	Total Operating materials and supplies	100.00
4.	Total Operating equipment	43.33
5. and 6.		None
7.	Total miscellaneous	586.00
	Total estimated cost of Stage II	$7,429.33
	Total estimated cost of project	$17,744.91

BREAKDOWN OF COSTS

Item	STAGE I	STAGE II
Independent Contracts		
Bulldozing	$1,800.00	$1,200.00
Wagon-drilling	4,042.50	2,475.00
Rotary non-core drilling	2,843.75	2,125.00
Labor and Supervision	900.00	900.00
Operating Materials and Supplies	100.00	100.00
Operating Equipment	43.33	43.33
Misc. (less assaying)	86.00	86.00
Total (Less assaying)	$9,815.58	$6,929.33
Total drilling	7,665 feet	5,000 feet
Cost per foot	1.28	1.39
Average cost per foot (for contract use)	$1.32	
Chemical assays at $5.00 each	500.00	500.00
Cost (incidental allowance)	1,129.33	1,129.33
(Less independent contracts and chemical analyses)		
Cost per foot (incidental allowance)	0.15	0.23
Average cost per foot (incidental allowance) (for contract use)	$0.18 (.1783)	

SUMMARY OF COSTS FOR CONTRACT USE

It is suggested that the unit cost type of contract be used for this project. The computed unit cost to cover all categories, with the exception of chemical analyses, is $1.32 per foot of drilling performed. The overall (rounded) cost of the project would be $16,718.00 plus $1,000 for 200 chemical assays, or $17,718.00. Government participation would be 75 percent of $13,288.50.

A tabulation of this type is shown below

	UNIT		STAGE I		STAGE II		TOTAL	
Item	Units	Cost	Units	Cost	Units	Cost	Units	Cost
Chemical Analyses	each	$5.00	100	$500.00	100	$500.00	200	$1,000.0
All Other	foot	1.32	7,665	10,118.00	5,000	6,600.00	12665	16,718.0
Contract Total				$10,618.00		$7,100.00		$17,718.00

As an alternate, the independent contract costs can be listed at actual bid price and the remaining estimated costs can be computed on a unit-cost basis as shown below. The total project cost would then be $17,892.60 and Government participation at 75 percent would amount to $13,419.45.

The price of $1.25 per foot for rotary non-core drilling, as bid by Leon Whetley, Drilling Contractor, was used in the calculations. A price of $0.75 per foot for wagon drilling, although not formally bid, is the normal price for that specific type of work and is used as a basis for the calculations.

A summary of the estimated cost of the alternate program is shown below:

Item	UNIT UNITS	UNIT COST	STAGE I UNITS	STAGE I COST	STAGE II UNITS	STAGE II COST	TOTAL UNITS	TOTAL COSTS
Bulldozer work	hour	$12.00	150	$1,800.00	100	$1,200.00	250	$3,000.00
Wagon drilling	foot	0.75	5,390	4,042.50	3,300	2,475.00	8690	$6,517.50
Rotary non-core drilling	foot	1.25	2,275	2,843.75	1,700	2,125.00	3975	$4,968.75
Chemical Analyses	each	5.00	100	500.00	100	500.00	200	$1,000.00
Incidental Allowance	foot	0.19	7,665	1,456.35	5,000	950.00	12665	$2,406.35
CONTRACT TOTAL				$10,642.60		$7,250.00		$17,892.60

In the event that a wagon drill can satisfactorily drill the deeper ground presently allotted to rotary non-core methods, provision should be made to transfer footage from the more expensive rotary noncore category to the cheaper wagon-drill category.

CONCLUSIONS AND RECOMMENDATIONS

The chances of finding significant bodies of ore on the subject claims are not good, However, there may be about 2,000 tons of potential ore in small scattered, and locally clustered, ore bodies in the more favorable areas of the claims. In much of the area, the depths to an ore layer will be 50 feet or less.

The examining team recommends denial of the application for DMEA assistance for exploration, but because there is a possibility of finding some small yet economic ore bodies, a relatively inexpensive drilling program for exploring the claims is submitted for the Field Team's consideration.

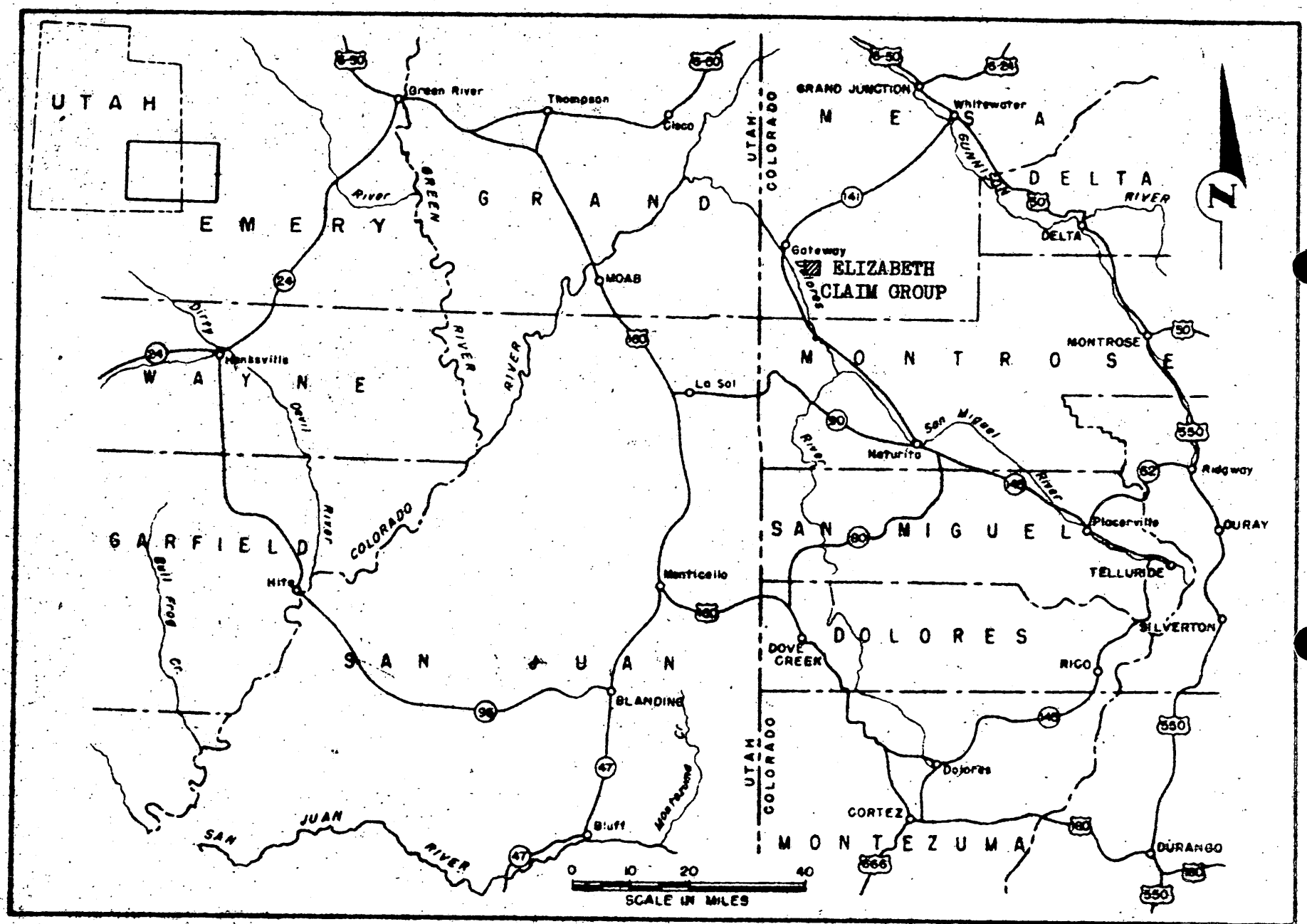

FIGURE 1 - LOCATION MAP, CULLEN MINERALS CORPORATION, ELIZABETH CLAIMS, BLUE MESA, MESA COUNTY, COLO.

DMEA 4446

OCT 9 1956

RECEIVED
OCT 9 1956

October 3, 1956

Memorandum

To: W. M. Traver, Executive Officer, DMEA Field Team, Reg. III

From: Superintendent, Denver Experiment Station, Reg. III

Subject: Docket DMEA 4446 (Uranium), Cullen Minerals Corporation (Elizabeth Group) Mesa County, Colorado

The application for Cullen Minerals Corporation, Docket DMEA 4446, in the amount of $53,980.20 was received in this office on October 3, 1956.

A field examination will be made and suitable report prepared by an engineer from the Denver or Grand Junction office.

W. H. KING

W. H. King

cc: W. M. Traver (2)
E. N. Harshman
J. W. Hasler
M. H. Salsbury
J. F. Shaw
Sec. Op. Com. (2)

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

RECEIVED
OCT - 1956

224 New Customhouse
Denver 2, Colorado

October 2, 1956

Memorandum

To: Messrs. W. H. King (2) (w/brochure) and J. W. Hasler

From: DMEA Field Team, Region III

Subject: Docket DMEA 4446 (Uranium) Cullen Minerals Corporation (Elizabeth Group) Mesa County, Colorado

Enclosed is the subject application in the amount of $53,980.20. A field examination and suitable report are requested.

Your attention is directed to the attached copy of a letter from the Chairman of the Operating Committee, dated September-27, 1956, and the memoranda of review of the application by W. P. Williams and James Paone.

Please return the brochure with the report of examination.

DMEA Field Team, Region III

W. M. TRAVER

W. M. Traver
Executive Officer

Enclosures

HMC:ytl
cc: Sec. Op. Comm.
Harshman
Docket 4446
Chron.

urname copy

700

Ching
Lamb
Kilpatrick
Selbedge
Gilmson

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

SEP 27 1956

Mr. K. D. Kaasch, Vice President
Cullen Minerals Corporation
610 Rood Avenue
Grand Junction, Colorado

Re: Docket No. DMEA-4446 (Uranium)
Elizabeth Group
Mesa County, Colorado

Dear Mr. Kaasch:

The application for assistance in exploring your property, 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 to:

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

The Regional Office will contact you in regard to your project if additional information is required.

Sincerely yours,

C. O. Mittendorf

Administrator

MChing/gla
9-25-56
cc to: Admr.'s Reading File
Docket
Code 700
Mr. Ching
DMEA Field Team, Region III (2)

R.C.K.

Surname copy

700

Ching
F. Kuzuda
Sellridge
Kelman
Underdeck

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

Mr. W. M. Traver
Executive Officer
DMEA Field Team, Region III
22h New Customhouse Building
Denver 2, Colorado

Re: Docket No. DMEA-1446 (Uranium)
Cullen Minerals Corporation
Elizabeth Group
Mesa County, Colorado

Dear Mr. Traver:

The subject application is being referred to you for investigation, a field examination if warranted, and recommendations. Two copies of the application were retained for the use of the Field Team.

Copies of memoranda, dated September 13 and 18, 1956, by W. P. Williams, USGS, and James Paone, USBM, respectively, relating to the application, are enclosed for your information.

Your attention is called to part of the proposed work which is purely of a prospecting nature seeking favorable geological information and part of which is for the purpose of blocking out ore, both of which are not acceptable for DMEA assistance. Also, based upon the results of the great amount of work done in this area, particularly on Applicant's property, the chances of finding ore deposits of sufficient size and grade to justify the amount of expenditures required to find them, are not favorable. However, from your knowledge of the area, possibly you can recommend a smaller project for finding ore in the more favorable locations and at the most favorable horizons.

In the event a contract appears likely, Consents to Lien and Subordination Agreements should be requested of Federal Uranium Corporation and Terminal Exploration Company.

Please note that the application lists 26 claims and fractions under 3(a), omitting Elizabeth No. 12, but including Elizabeth No. 18. Under 3(f), only 22 claims and fractions are listed. Elizabeth No. 12 is included, Elizabeth No. 18 is omitted, and Jody Nos. 4, 5, 6, and 7 are omitted. The Second Amendment to Mining Lease includes 22 of the claims and fractions listed under 3(a), but omits Elizabeth Nos. 3, 4, 5, and 6. The claim map accompanying the application shows 22 claims but

A.C.R.

does not show the Jody Nos. 4, 5, 6, and 7 claims. A letter, dated August 7, 1956, from Federal Uranium Corporation to Terminal Exploration Company points out that Elisabeth Nos. 3, 4, 5, and 6 claims cover essentially the same ground as Jody Nos. 4, 5, 6, and 7 claims. If a contract appears likely, it is suggested that the field examiners check any discrepancies with the Applicant and make up a reliable claim list, with book and page numbers, for incorporation into the proposed contract.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee (GCS)

Enclosures

APPROVED:

Frank D. Lamb (FDL)

Member, Bureau of Mines

Thor H. Kiilsgaard (THK)

Member, Geological Survey

MChing/gla
9-25-56

cc to: Admr.'s Reading File
Operating Committee
Docket
Messrs. JECrawford, 3643
THKiilsgaard, 5224
JOHosted, 3210, GSA
Code 700
Mr. Ching

9/20/56 gla

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

RECEIVED SEP 19 1956

RECEIVED SEP 19 1956

Date 9/18/56

DMEA Docket No. 4446
DMEA Contract No.
Commodity Uranium
Name of applicant Cullen Minerals Corporation
Name of property Elizabeth Group
Location of property Mesa County, Colorado
Estimated cost of project $53,980.20

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee

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

Subject: Review of Application
(Application, Field Team Report, etc.)

1. Date of subject document: 8/27/56. 2. Date received by reviewer: 9/13/56.

3. Prior reports on this property known to reviewer: Yes ☐, No ☒.

4. Prior reports on nearby properties known to reviewer: Yes ☐, No ☒.

5. Information available on past production: Yes ☐, No ☒.

6. Other pertinent factors known to reviewer: Yes ☐, No ☒.

7. Explain items marked yes above:

8. Factors needing special consideration:
   a. Location ☐
   b. Ownership ☐
   c. Evidence of mineralization ☐
   d. Geology ☐
   e. Proposed exploration method ☐
   f. Alternate exploration method ☐
   g. Costs ☐
   h. _____ ☐

9. Action advised:
   a. Obtain information from applicant ☐
   b. Refer to Field Team ☐
   c. Denial ☐
   d. Agree with Field Team ☒ memo 9/7/56
   e. Disagree with Field Team ☐
   f. Suggest alternate plan ☐
   g. Request another examination ☐
   h. Approval ☐
   i. Consult with Mr. _____ at _____ AEC office.

10. Remarks: (Use back of page if necessary)
Recommend field examination. Mr. Joseph O. Hosted, Washington representative of the Atomic Energy Commission, assisted in the review.

9/17/56 gla

IN REPLY REFER TO:

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

RECEIVED
SEP 14 1956

September 13, 1956

Memorandum

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

From: W. P. Williams, U. S. Geological Survey

Subject: Review of application, DMEA 4446, Cullen Minerals Corporation, Elizabeth claims, Blue Mesa, Mesa County, Colorado.

The applicant proposes to explore for uranium ore deposits on Blue Mesa by means of an extensive drilling project. The work would consist of a total of 27,210 feet of core and plug-bit drilling.

As pointed out by Grand Junction personnel, the Government has done a large amount of drilling on Blue Mesa. The U. S. Geological Survey drilled 52 holes on the subject property. Small tonnages of ore have been shipped from the property by the applicant and others.

The ore deposits on Blue Mesa have so far proven to be of small size - a few hundred tons each. In view of the fair amount of drilling already on the property and the characteristics of the ore deposits it does not seem that a large and costly exploration project is warranted at this time. Perhaps a limited, revised program could be justified.

I recommend that the application be referred to the Field Team for further review and report.

W. P. Williams

W. P. Williams

9/12/56 gla.

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

RECEIVED
SEP 12 1956

September 7, 1956

224 New Customhouse
Denver 2, Colorado

Memorandum

To: Secretary to the Operating Committee, DMEA

From: Field Team, Region III

Subject: Docket DMEA 4446 (Uranium) Cullen Minerals Corporation, (Elizabeth group) Mesa County, Colorado

Enclosed are the original and three copies of a review of the subject application by the Grand Junction Office, DMEA.

They recommend that a field examination be made on this property. We concur in this recommendation.

DMEA Field Team, Region III

W. M. Traver

By W. M. Traver
Executive Officer

Enclosures

DMEA-4446

Hmc

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P. O. Box 360
Grand Junction, Colorado

IN REPLY REFER TO:
MINERAL DEPOSITS
DMEA

DMEA
DEPARTMENT OF THE INTERIOR
SEP 6 1956
REGION III
DENVER, COLORADO

RECEIVED
SEP 12 1956

RECEIVED
SEP 5 1956
U. S.
GEOLOGICAL SURVEY
DENVER, COLORADO

September 4, 1956

Memorandum

To: Executive Officer, DMEA Field Team, Region III

Through: E. N. Harshman Buck for ENH

From: J. William Hasler

Subject: Advisability for field examination on application for DMEA aid (Uranium), Cullen Minerals Corporation (Elizabeth group) Mesa County, Colorado.

The Cullen Minerals Corporation has applied to the Defense Minerals Exploration for aid to explore the Elizabeth group of claims on Blue Mesa, Mesa County, Colorado. The estimated cost of the program is $53,980.20.

The U. S. Geological Survey completed 284 diamond drill holes totaling 31,374 feet on Blue Mesa between 1948-1951. As a result of this drilling, nine ore deposits were discovered and a total indicated and inferred reserves of approximately 5,000 tons of ore averaging 0.19 percent U_3O_8 and 1.5 percent V_2O_5. Production from the Elizabeth group of claims as of July 1, 1956, amounted to 1,443 tons with an average grade of 0.26 percent U_3O_8 and at present the Atomic Energy Commission is carrying a reserve figure of approximately 4,000 tons of ore that will average 0.16 percent U_3O_8 for this group of claims. Total production to date from Blue Mesa is 4,318 tons of uranium ore that will average 0.25 percent U_3O_8 and the present reserve figure for the area is about 6,500 tons.

The ore deposits on Blue Mesa are found in the upper sandstone beds of the Salt Wash member of the Morrison formation of Jurassic age. The ore bodies average from 50 to 150 tons in size and may contain as much as 400 tons. According to the present figures, the applicant appears to be spending almost as much money as is now available from known ore reserves.

From this data it is concluded that an examination should be made and that a limited exploration program may be warranted. This project is similar to the American Leduc property on Calamity Mesa (DMEA docket 4041, contract Idm-E 969). It is, therefore, recommended that an examination be made.

The applicant's material will be retained in this office pending further instructions from Washington.

Frank M. Byers, Jr.
For J. William Hasler,
Geologist

JWH/mlr

August 31, 1956

Cullen Minerals Corp.
610 Rood Avenue
Grand Junction, Colorado

Subject: DMEA-4446
Re: Exploration Assistance
Elizabehh Group

Gentlemen

The receipt of your application dated August 27, 1956 for exploration assistance under the Defense Production Act of 1950, as amended, is hereby acknowledged.

Your application has been assigned Docket Number DMEA-4446 and referred to the Rare & Misc, Metals Division.

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

Sincerely yours,

Allen S. Dakan
~~XXXXXXXXXXXXXXXX~~ Chief
Operations Control and
Statistics Division

August 31, 1956

Memorandum

To: Executive Officer, DMEA Field Team, Region III

From: Chief, Operation's Control and Statistics Division

Subject: Assignment of Docket Number

There is listed below the assigned docket number to an application recently received from Region III.

DMEA
-444 Cullen Minerals Corp.
Elizabeth Group

Robert E. Adams
Chief, Operation's Control
and Statistics Division

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

August 29, 1956

224 New Customhouse
Denver 2, Colorado

Memorandum

To: Secretary to the Operating Committee, DMEA

From: Field Team, Region III

Subject: Application for DMEA Aid (Uranium) Cullen Minerals Corporation (Elizabeth group) Mesa County, Colorado

Enclosed are two copies of the subject application in the amount of $53,980.23.

It is noted on page 5 of the application that reference is made twice to "Plate No. 4". No Plate No. 4 accompanied the application.

It is also noted that the Applicant requests a three-phase program, the third phase of which would consist of blocking out ore encountered in phase 1 and phase 2.

One copy of the application is being forwarded the Grand Junction Office, DMEA, for their review and recommendations concerning the advisability of a field examination. One copy of the application is being retained in our file.

DMEA Field Team, Region III

By W. M. Traver
Executive Officer

Enclosures

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

August 29, 1956

224 New Customhouse
Denver 2, Colorado

Memorandum

To: J. W. Hasler

From: Field Team, Region III

Subject: Application for DMEA Aid (Uranium) Cullen Minerals Corporation (Elizabeth group) Mesa County, Colorado

Enclosed is the subject application in the amount of $53,980.23.

Please discuss this application with the Bureau of Mines representative in the Grand Junction office and the AEC and forward this office nine copies of your recommendations concerning the advisability of making a field examination.

DMEA Field Team, Region III

W. M. TRAVER,
By W. M. Traver
Executive Officer

Enclosures

HMC:ab

cc: Sec. Op. Comm. (2)
Harshman
Shaw (2)
Docket
Chron.

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

August 29, 1956

224 New Customhouse
Denver 2, Colorado

Mr. K. D. Kaasch, Vice-President
Cullen Minerals Corporation
610 Rood Avenue
Grand Junction, Colorado

Re: Application for DMEA Aid (Uranium)
(Elizabeth Group) Mesa County, Colorado

Dear Mr. Kaasch:

This will acknowledge receipt of your letter dated August 27, 1956 transmitting four copies of your DMEA application on the Elizabeth group of claims on Blue Mesa.

Your application is being forwarded to the Washington Office, DMEA, for further processing, and they will advise you if additional information is required.

Very truly yours,

W. M. TRAVER,

W. M. Traver
Executive Officer, DMEA
Field Team, Region III

HMC:ab

cc: Sec. Op. Comm. (2)
Harshman
Shaw (2)
Hasler
Docket
Chron.

APPLICATION FOR AID IN AN EXPLORATION PROJECT ON THE ELIZABETH GROUP OF CLAIMS, GATEWAY MINING DISTRICT, MESA COUNTY, COLORADO, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950 AS AMENDED

CULLEN MINERALS CORPORATION
610 ROOD AVENUE, ROOM 6,
GRAND JUNCTION, COLORADO.

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

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

Date Rec'd.
AUG 28 1956
BUREAU OF MINES
Denver, Colorado

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. .....
Metal or Mineral .....
Date Received .....
Estimated Cost .....
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: Cullen Minerals Corporation
610 Rood Avenue
Office No. 6
Grand Junction, Colorado

(*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. typed on separate page

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

(*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 typed on separate page

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

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise The property is owned by Federal Uranium Corp. and leased to Terminal Exploration Co. with whom Cullen Minerals Corp. has an operating contract.

(*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. See Exhibit 1 & 2

(*e*) If you own the land, describe any liens or encumbrances on it None

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

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. separate page

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

(*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. See Prommel Report (Exhibit #3)

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points. See Prommel Report (Exhibit #3)

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

See Prommel Report (Exhibit #3)

16—66551-1

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

(*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. separate page

(*c*) The work will start within 30 days and be completed within 12 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. on separate page

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. All of No. 6 on Page 8

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)? Yes

(*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 27 Aug, 1956

Cullen Minerals Corp
(Applicant)

By K. D. Kaech

Vice-Pres

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

1. (b) Incorporated in the State of Delaware.

(c) President - Lucien Hugh Cullen, 617 Shell Building, Houston, Texas

Vice-President - K. D. Kaasch, 610 Rood Avenue, Grand Junction, Colorado

Sec-Treasurer - T. N. Tucker, National Bank of Commerce Bldg., San Antonio 5, Texas

3. (a) The Elizabeth Claims as hereafter listed:

Elizabeth #1 ✓ Elizabeth #23 ✓

Elizabeth #2 ✓ Elizabeth #24 ✓

Elizabeth #21 ✓

Located in Section 4, T 49 N, R 17 W, Mesa County, Colorado

Elizabeth #3 ✓ Jody #4 ✓

Elizabeth #4 ✓ Jody #5 ✓

Elizabeth #8 Jody #6 ✓

The portions of Jody #7 ✓

Elizabeth #5 ✓

Elizabeth #6 ✓

Elizabeth #7 ✓

Elizabeth #8 ✓ not covered by Jody 4, 5, 6, & 7

The above claims are covered in lease between Terminal Exploration Company and Federal Uranium Corporation (See Plate 1 of Prommel Report).

The above listed claims and fractions are located principally in Section 33, T 50 N, R 17 W, NMPM, Mesa County, Colorado.

South 1/2 of Elizabeth #9 ✓

Located principally in Section 32, T 50 N, R 17 W, Mesa County, Colorado

3. (a) Continued

Elizabeth #10 ✓ Elizabeth #15 ✓

Elizabeth #14 ✓ Elizabeth #16 ✓

valid portions of

Elizabeth #13 ✓

Elizabeth #20 ✓ that are included in the lease from Federal Uranium Corporation to Terminal Exploration Company (See Plate 1).

Elizabeth #17 ✓ which is not covered by

Elizabeth #18 ✓

Elizabeth #22 ✓

(26)

These claims are located in Section 32, T 50 N, R 17 W, NMPM, Mesa County, Colorado

Elizabeth #19 ✓

Located in Sections 28, 29, 32, 33, T 50 N, R 17 W, NMPM, Mesa County, Colorado

(f) The following are the names of claims with book and page as recorded in the Mesa County Recorder's office, Mesa County, Colorado.

Claim	Location Date	Book	Page	
Elizabeth #1 ✓	4/14/39	291	493	
Elizabeth #2 ✓	4/14/39	291	493	
Elizabeth #3 ✓	4/14/39	291	494	
Elizabeth #4 ✓	4/14/39	291	494	
Elizabeth #5 ✓	4/14/39	291	495	except portions overlapped by Jody #8, #9, in Section 33
Elizabeth #6 ✓	4/14/39	291	495	except portions overlapped by Jody #8, #9, in Section 33
Elizabeth #7 ✓	5/17/39	291	496	except portion over by Jody #8 & #9 in Section 33
Elizabeth #8 ✓	5/17/39	291	496	

3. (f) Continued

Claim	Location Date	Book	Page	
Elizabeth #9	4/14/39	291	497	
Elizabeth #10	4/14/39	291	497	
Elizabeth #12	4/14/39	291	498	except portions overlapped by Jody #9 - 12 in Section 33
Elizabeth #13	5/17/39	291	498	except portions overlapped by Jody #9 - 12 in Section 33
Elizabeth #14	4/14/39	291	499	
Elizabeth #15	4/14/39	291	499	
Elizabeth #16	4/14/39	291	500	
Elizabeth #17	4/14/39	291	500	
Elizabeth #19	4/14/39	291	501	except portions overlapped by Jody #14 in Section 28
Elizabeth #20	4/14/39	291	502	except portions overlapped by Jody #12, #13 in Section 33
Elizabeth #21	5/19/39	291	502	
Elizabeth #22	3/1/56	678	35	
Elizabeth #23	7/28/55	655	308	
Elizabeth #24	Mill site ?			

22

4. (a) The majority of the workings are on the portions of the property excluded from this application. There are six operations presently working on the property. Only two of these are on areas included in this application, these are both on Elizabeth #1.

One is a strip operation which has been opened up by removing about six feet of overburden, and the other is a tunnel operation. These workings consist of about 100 feet of drifting in from the rim. Both operations are being operated for the applicant under a contract.

All mining operations are accessible by two-wheeled drive automobile, either by coming up Mesa Creek from the Gateway-Uravan road or by coming over Outlaw Mesa and across Blue Creek.

(b) There is no record of ore shipments made from the property during the period 1939 to 1954. From the number of shallow surface workings along the rims on the property, it is evident that considerable ore must have been shipped during that time when only the vanadium content of the ore was being paid for.

During 1954 the Utida Mining Company shipped 100.95 Tons of ore averaging 0.177% U_3O_8 and 1.849% V_2O_5.

During 1955 there were no shipments.

4. (b) Continued

Cullen started shipping ore February, 1956 and has shipped the following:

Month	Dry Pounds	% U_3O_8	% V_2O_5
February	239,861	0.483	1.722
March	110,293	0.569	2.280
April	90,245	0.273	1.679
May	278,769	0.375	1.894
June	436,677	0.310	1.914
TOTAL	1,155,845		
ORE GRADE		0.383	1.88

5. (b) The proposed drilling program is the first of a three phase program. Phase One of this program is to test the ground for favorability, ? Phase Two is to deliniate favorable areas and Phase Three is to determine ? whether or not sufficient ore reserves are present to justify mining.

only Exp. & plant

There have been 52 holes drilled on the area under consideration by the U.S.G.S. Some of these holes will eliminate some areas as unfavorable. The favorable and semi-favorable holes were a guide in spotting other holes in unexplored areas (See Plate #4). There are also some areas which show favorability on the rims. All these factors have been considered in spotting the holes for this drilling program.

There are large areas of unexplored ground which must be drilled for ? stratigraphic information and favorability (Areas in white on Plate 4).

Our drilling program would start with five widely spaced holes which

5. (b) Continued

would core the complete Salt Wash section. These holes would give us a picture of the section from one end of the property to the other. This would be approximately 1,020 feet of core drilling.

The next step on the Phase One program would be to drill twenty-nine (29) plug bit rotary holes, or about two holes per claim, through the complete Salt Wash section. The results of this drilling would be correlated with the core drilling and a complete picture of the total section could be laid out and studied. This step will consist of 6,450 feet of plug bit drilling.

The third step of Phase One will be to drill one hundred forty one (141) holes through the big rim which Prommel calls Rim No. 3 (See Map 3). This step will consist of 19,740 feet of rotary plug bit drilling.

The logs of all holes can then be studied and a favorability map of the whole property can be prepared. This is the end of Phase One.

After the favorability map and cross-sections have been prepared, Phase Two could start. This Phase consists of closer spaced drilling in the favorable zones, and is dependent on Phase One.

Phase Three would consist of blocking out ore encountered in Phase One and Phase Two and would be dependent on Phases One and Two.

(d) The mining division of Cullen Minerals Corporation consists of K. D. Kaasch and Larry Peterson.

Mr. Kaasch will be in charge, and Mr. Peterson will be helping supervise the work.

5. (d) Continued

Mr. Kaasch has had ten years experience in the mining business. He has worked for U. P. Coal Company in Rock Springs, Wyoming as a miner. He has worked for the Climax Molybdenum Company as an engineer. He has worked for The Bear Creek Mining Company as a geologist and also as a geologist for Climax Uranium Company. With the Climax Uranium Company, he spent two years supervising drilling projects of a nature similar to that covered by this application.

Mr. Peterson has had a number of years experience with U. S. V., Climax Uranium Company, and numerous other mining companies not associated with the uranium business.

6.

ESTIMATE OF COSTS

(a)	Drilling (See bids)		
	1020 feet Core @ $2.10/ft.	$ 2,142.00	
	26,190 feet Plug bit drilling @ $1.35/ft.	35,356.50	
	Stand by time 30 hrs. @ $12/hr.	360.00	
	Total Drilling		$ 37,858.50
	Dozer work for drill sites & roads 250 hrs. @ $12/hr.		3,000.00
(b)	One Engineer & Geologist @ $750/mo. for 4 months	3,000.00	
	One Geologist @ $1250/mo. for one month	1,250.00	
	Total		4,250.00
(c)	Transportation and meals	750.00	
	Core boxes	130.00	
	Total		880.00
(d)	Geiger Counter, probe, and reel @ $50/mo. rental		200.00
(e)	All Camp buildings are in good shape		
(f)	No new buildings are necessary		
(g)	Analytical work	300.00	
	Accounting	200.00	
	Payroll taxes	170.00	
	Liability Insurance	47.33	
	Workmen Compensation	33.50	
	Total		750.83
	GRAND TOTAL		$ 46,939.33
(h)	Contingencies 15%		7,040.90
			$ 53,980.23

HOWARD BINKLEY
DRILLING CONTRACTOR
ROTARY WET OR DRY CORE
WAGON

605 Grand Mesa Avenue
Grand Junction, Colo.
July 31, 1956

COPY

BID

on
ELIZABETH GROUP 1 -- 18

BLUE MESA CLAIMS, GATEWAY MINING DISTRICT
MESA COUNTY, COLO.

To: Terminal Exploration Company
ATTENTION: Doug Kaasch

Equipment to be used Full Combination Rotary 1000 Porta Drill
4 1/4 inch Hole

PLUGGING PRICE	$1.35
CORING PRICE	2.10
WET OR DRY	

AVERAGE HOLE DEPTH 150 to 160 feet

STANDBY TIME $12.00 per day

TOTAL CORING 1,000 feet

TOTAL PLUGGING 20,000 feet

ALL ROADS AND DRILL SITES TO BE FURNISHED BY TERMINAL EXPLORATION CO.

(S) Howard Binkley

CUTTING
WATER
AIR

LEON WHATLEY DRILLING CONTRACTOR .....
115 East Alcove Drive
Telephone 05-J4

Grand Junction
Colorado

COPY

DRILLING BID

August 2, 1956

TO: Cullen Minerals Corporation
610 Rood Avenue
Grand Junction, Colorado

Prospect: Blue Mesa, Uravan District, Colorado

Footage: 26,190 feet Plug Bit, 1020 Core

PLUG BIT:

0 to 200 feet	.....	$1.25 per ft.
200 to 400 feet	.....	1.40 per ft.
400 to 600 feet	.....	1.60 per ft.

CORE: (NX 2 1/8")

0 to 200 feet	.....	$3.50 per ft.
200 to 400 feet	.....	4.00 per ft.
400 to 500 feet	.....	5.00 per ft.

EQUIPMENT: Mayhews and Frank's 1000's air or water

Probing and Recording equipment can be furnished at no extra charge.

Sincerely yours,

(S) Leon Whatley

COLORADO DRILLING AND DEVELOPMENT CO.
602 North 15th
Grand Junction, Colorado

July 31, 1956

Drilling bid on Terminal Exploration Lease on the Elizabeth and Jody Claims located on Blue Mesa in Mesa County, Colorado

Prospect or block drill a minimum of 20,000 feet air blast plug or core as follows:

0 to 200 ft. air blast	$1.25 per ft.
200 to 300 ft. air blast	1.50 per ft.
300 to 400 ft. air blast	1.75 per ft.
400 to 500 ft. air blast	2.15 per ft.

In the event it becomes necessary to drill with water, an additional seventy-five cents (75¢) per foot will be added to the above prices.

Core drilling at $4.00 per ft. of core cut.
Core holes to be marked in advance as drill colars must be used to hold holes straight.

All prices as stated plus one-half (½) bit cost.

Loss circulation time after the first two (2) hours at the rate of $20.00 per hour and material.

Stand-by time after the first (1st) one hour (1) at the rate of $20.00 per hour.

Move-in and move-out time $300.00. To be absorbed by the drilling company in the event the total footage drilled on this contract exceeds 20,000 feet.

All roads and locations to be built by the Terminal Exploration Co.

Terms of this contract will be payment each two weeks for total footage drilled. Final payment ten (10) days after completion.

COLORADO DRILLING AND DEVELOPMENT CO.

(S) By R. A. Moedel

COPY

GEOLOGICAL REPORT
on the
ELIZABETH GROUP OF MINING CLAIMS

BLUE MESA, GATEWAY MINING DISTRICT
MESA COUNTY, COLORADO

by
H. W. C. PROMMEL

EXHIBIT NO. 3

H. W. C. PROMMEL
CONSULTING GEOLOGIST AND MINING ENGINEER
731 SOUTH DOWNING STREET
DENVER 9, COLORADO

GEOLOGICAL REPORT ON THE ELIZABETH GROUP OF MINING CLAIMS

BLUE MESA, GATEWAY MINING DISTRICT MESA COUNTY, COLORADO

BY
H. W. C. PROMMEL
AUGUST 1955

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

The Elizabeth group of mining claims are situated in sections 23, 29, 32 and 33, T-50-N, R-17-W, and sections 4 and 5, T-49N, R-17-W, N.M.P.M. on Blue Mesa, Mesa County, Colorado. These claims are approximately 20 miles north of Uravan and 80 miles south of Grand Junction by state highway 141. The claims were first examined by me in a reconnaissance way during February, 1955, when two days were spent on the property. This was followed by considerable plane table work and geological studies from May 8, to June 7. The present report is based on subject matters of two preliminary reports, field data assembled from May 8 to June 7, Atomic Energy Commission and U.S.G.S. data on 81 test holes drilled by the U.S.G.S., about 100 wagon drill holes drilled by Utida Mining Company during 1954, and other accumulated information.

All of this data bearing on the future development of this property is set forth on the following pages of this report, and Maps No. 1, 2 and 3 which are attached hereto. Not all of the property has as yet been covered by plane table surveys and detailed geological studies.

The Elizabeth group of mining claims consists of 12 full-sized claims, 7 fractional claims and 1 millsite. Two additional fractional claims covering some intervening ground have since been located and recorded by Terminal Exploration Company. The property is held under lease by Terminal Exploration Company from Utida Mining Company. A camp has been established along the west bank of Mesa Creek on the Elizabeth millsite claim where potable water is available throughout the year for domestic and drilling purposes.

With exception of the southern part of Elizabeth No. 21 and Elizabeth millsite, the entire group of claims are underlain by the entire Salt Wash series

of the Morrison formation of Jurassic age which contains all the known uranium and vanadium deposits of this area. The western part of the claims is covered by the lowest part of the "Brushy Basin" shale member overlying the Salt Wash series.

Drilling depths to explore four possible ore horizons vary from less than 50 feet to about 250 feet. These ore horizons are situated in the upper part of the "Big Rim" sandstone; in the lower part of the same sandstone and in the shale immediately underlying it; at the base of rim No. 5 sandstones and in the lowest part of the Salt Wash series below rim No. 6. All are described in greater detail in the body of this report:

"Big Rim," rim No. 3, sandstone can be drilled with wagon drills or diamond core drills. For deeper drilling, below 100 feet, rotary drilling is advisable.

During 1954, Utida Mining Company shipped 100.95 tons of ore encountered while drifting southward from the Utida shaft to wagon drill hole No. 35. This ore contained an average of .177% U_3O_8 and 1,849% V_2O_5. The five shipments of ore returned $2,449.19.

Reviewing the evidence set forth on the following pages of this report, I have arrived at the following conclusions:

CONCLUSIONS

The property is well within the mineral producing trend on the Colorado Plateau extending from Gateway southeastward and southward to Uravan and onward to Slickrock and Dove Creek through Mesa, Montrose, San Miguel and Dolores Counties.

Fossil logs encountered on the property show a northeasterly orientation similar to those on adjoining properties and a probable northeasterly to easterly trend of local ore bodies at right angles to the regional trend.

The Salt Wash member of the Morrison formation consists of thick sandstones grey to white in color, with greyish-green interbedded clays and mudstones - conditions favorable for ore deposition. Five topographic "rim" expressions are present on the property, with small amounts of the overlying Morrison shale present, making shallow prospecting by drilling possible at most places.

Ore and ore indications have been found at four different elevations or horizons within the Salt Wash sandstone member of the Morrison formation. Ore has been mined from three of these horizons; namely, the upper part of rim No. 3; the lower part of rim No. 3 and the shale immediately below it; the bottom of rim No. 5. Ore is indicated in the sandstone in the lower part of the

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Salt Wash member below rim No. 6. These horizons are discussed in greater detail in the body of this report.

A short distance to the south of the Utida shaft in the vicinity of hole No. 35 a body of ore has been partially blocked out by drilling. This ore varies in thickness from one foot to 10 feet with values ranging from .1% to .90% U_3O_8. This is the best ore body so far encountered on the Elizabeth group of claims.

Mining costs within this general region average about 10 to 12 dollars per ton of ore produced. This may vary somewhat depending on the size and thickness of ore bodies encountered.

A number of areas for prospect as well as close pattern drilling of possible ore deposits in the "Big Rim," rim No. 3, and some at the base of Rim No. 5 suggest themselves on the Elizabeth group of claims. More or less in order of their importance, they are situated on the following claims.

out	1.	Elizabeth No. 9 --	Area to east-northeast of wagon drill hole No. 35 and adjoining holes.
out	2.	Elizabeth No. 9 --	Area to east and northeast of mine workings south of Utida shaft.
out	3.	Elizabeth No. 9 --	Area to east and northeast of mine workings north of Utida shaft.
out	4.	Elizabeth No. 18 --	Area southeast of road on Elizabeth No. 17 - 18 overlap. Gridding and pattern drilling first holes 50 feet deep, later holes probably shallower.
	5.	Elizabeth No. 17 --	Area east of Ace Turner mine in vicinity of G.S. holes 182, 185, 187.
	6.	Elizabeth No. 7 --	Area north, south, east and west of G.S. hole 235 described in detail in the body of this report.
out	7.	Elizabeth No. 9 --	Area to east, west, north and south of G.S. hole 182. These holes should be drilled to depth of 100 to 125 feet in order to test ore horizons of rim No. 3 and rim No. 5.
out	8.	Elizabeth No. 9 --	Area around wagon drill holes 90 and 91, Drill to depth of 100 and 125 feet to test ore horizons of rim No. 3 and rim No. 5.

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9. Elizabeth No. 10 -- Area northeast of hole 134, G.S. 205.

10. Elizabeth No. 10 -- Area in southwest corner of claim in vicinity of Prommel stations 122, 123, 124, G.S. holes 282, 209 and 258 respectively.

11. Elizabeth No. 10 -- Area in close proximity of G.S. holes 93, 175, 130 and 131, toward wagon drill hole 106.

12. Elizabeth No. 10 -- Areas in vicinities of G.S. holes 248, 55, and 249 along east side of claims.

13. Elizabeth No. 2 -- Offset drilling to rim No. 6 horizon in southeast corner of claim to test lowest possible producing horizon and Benchmark, rim No. 5, horizon exposed in prospect working on Elizabeth 21.

14. Elizabeth No. 21 -- Areas north of prospect tunnels to test Benchmark, rim No. 5 horizon and rim No. 6 horizon but location of holes must await further mapping and geologic field work.

15. Elizabeth No. 21 -- Area along county road, on north side through Elizabeth 21 and Elizabeth millsite to test rim No. 6 horizon. Depth of holes - 75 feet to 100 feet approximately.

16. Elizabeth No. 16 -- Area northeast of hole G.S. 242 in southeastern part of claim.

17. Elizabeth No. 5 -- Area around G.S. hole 162. G.S. holes 218, 162 and 219 were not drilled deep enough to test either rim No. 5 or rim No. 6 horizons.

18. Elizabeth Nos. 14, 15 Area southeast and northwest of G.S. holes 96 and 64 at northern end of claims.

19. Elizabeth No. 20 -- Area around G.S. hole 85.

All of these localities as well as of regions not yet covered by detailed geological field work are discussed in greater detail in the body of this report.

The property is easily accessable by a county road, with side roads and drilling roads to many parts of the property. A camp has been established

on the bank of Mesa Creek, a perennial stream, which furnishes water for domestic as well as drilling purposes the year around. The nearest ore processing plant is only 20 miles distant at Uravan.

Based on the evidence above set forth as well as on the following pages and maps of this report, I believe that the Elizabeth group of claims offers very good opportunities for exploration and development by test drilling of a number of possible ore bodies at four different horizons within the Salt Wash sandstone series of the Morrison formation.

One of these ore bodies, at wagon drill hole No. 35, has already been partially drilled out.

There is no reason why other ore bodies similar to that of the Ace Turner mine situated in the re-entrant angle between Elizabeth No. 17 and 18 claims, or larger, might not be present at a number of localities on the Elizabeth group of claims.

During Utida Mining Company operations of the property in 1954, work was done without proper engineering guidance; wagon drill holes were put down without geological studies and proper planning, and no record or logs of such holes are available. Since Terminal Exploration acquired the lease on the property, exploration work in the Utida shaft was stopped due to the incomplete depth of the shaft for reaching the ore deposit at wagon drill hole No. 35. Since that time, six holes have been drilled by Terminal Exploration Company with a small diamond drill in the vicinity of hole No. 35.

RECOMMENDATIONS

Ten additional wagon drill holes were just completed on August 14 in this same vicinity. Nine of these encountered good ore of commercial width and value, but the details on these holes are not yet available.

The property is now ready for well planned, properly executed drilling campaigns at nineteen places quoted above. Unless Terminal Exploration Company expects to do the exploratory drilling itself, the work should be done by experienced drilling contractors with the proper type of equipment, and this work should continue uninterruptedly.

It must be emphasized that close spacing of holes adjacent to holes which show even weak mineralization only, is essential on the Blue Mesa in order not to miss possible ore channels.

19 prospective drilling sites have already been quoted, and others will no doubt suggest themselves as further mapping and geological work on the property is carried on.

I recommend that pattern drilling of the ore body at wagon drill hole No. 35 and its immediate vicinity be continued without letup so that the size of this ore body may be determined, and the advisability of driving an incline shaft to this ore body may be considered. Drilling at other locations should be started as soon as possible while weather and road conditions are favorable.

Geological work to guide exploration and development work will be essential in the future. Much of the area has not as yet been mapped, but the ground work has been laid for proper correlation of data of all test wells drilled during the past and in the future.

My report is herewith respectfully submitted.

Harald W. C. Prommel
Consulting Geologist and Mining Engineer
Denver, Colorado

Denver, Colorado
August 16, 1966

H. W. C. PROMMEL
CONSULTING GEOLOGIST AND MINING ENGINEER
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GEOLOGICAL REPORT ON THE ELIZABETH GROUP OF MINING CLAIMS

BLUE MESA, GATEWAY MINING DISTRICT MESA COUNTY, COLORADO

BY
H. W. C. PROMMEL
AUGUST 1955

INTRODUCTION

The Elizabeth Group of mining claims situated on Blue Mesa, Mesa County, Colorado, was first examined by me in a reconnaissance way during February, 1955. Only two days were spent on the property. Much of the ground was covered with snow, and the reconnaissance suggested that more detailed work should be done later on in the year. I, therefore, returned to the claims on May 8, 1955, and did considerable plane table and geological work until June 7. From my field data, Atomic Energy Commission and U.S. Geological Survey data on 81 test holes drilled by the U.S. Geological Survey during 1951, about 100 wagon drill holes drilled by Utida Mining Company during 1954, and other information, I have since compiled maps No. 1, No. 2 and No. 3 which are attached to this report and on which I have set forth all available information obtained to date bearing on the future development of the property.

Not all of the property has to date been detailed by plane table survey work in order to determine the variations in thickness and attitude of the Salt

Wash sandstone series of Morrison age which outcrop along the edges of and which underlie the claims.

LOCATION

The Elizabeth Group of mining claims are situated in sections 28, 29, 32 and 33, T-50-N, R-17-W, and sections 4 and 5, T-49-N, R-17-W, N.M.P.M., approximately 20 miles north of Uravan, and 80 miles south of Grand Junction by state highway No. 141, thence 10 miles northerly along a county road following Mesa Creek upstream to the camp site on the claims. From here, the county road continues northward along and through the claims, connecting with Outlaw Mesa and finally joining highway No. 141 in Unaweep Canyon, some 30 miles south of Grand Junction. While the county road is unimproved but passable throughout the year, travel on it is at times interrupted during and after heavy rains and snows when the roadbed becomes soft and cut up.

The Elizabeth group of mining claims consists of 12 fullsized claims, 7 fractional claims and one millsite. They were located on the 14th day of April, 1939, and duly recorded at the Mesa county court house in Grand Junction, Colorado. The claims were tied to section and quarter section corners established in the field by U. S. Bureau of Land Management surveys. The names of the claims, as well as bearings and distances from section or quarter section corners to the nearest claim corners are shown on the following table:

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CLAIM TIES

Elizabeth	#1	From	SW	cor.	Sec.	33	S 85 Degr.	39 Min. E	1111'	To Cor. #2
"	#2	"	"	"	"	"	S 85 Degr.	39 Min. E	1111'	To Cor. #1
"	#3	"	"	"	"	"	S 85 Degr.	39 Min. E	1111'	To Cor. #3
"	#4	"	"	"	"	"	S 85 Degr.	39 Min. E.	1111'	To Cor. #4
"	#8	"	"	"	"	"	S 28 Degr.	16 Min W	180'	To Cor. #3
"	#9	"	"	"	"	"	S 28 Degr.	16 Min. W	180'	To Cor. #4
Elizabeth Millsite		24? From	E¼	cor.	Sec.	5	N 63 Degr.	53 Min. E	1250'	To Cor. #3
Elizabeth	#21	"	"	"	"	"	N 72 Degr.	50 Min. E	356'	To Cor. #3
Elizabeth	#5	From	E¼	cor.	Sec.	32	N 76 Degr.	59 Min. E	954'	To Cor. #2
"	#6	"	"	"	"	"	N 55 Degr.	16 Min. E	409'	To Cor. #2
"	#7	"	"	"	"	"	N 55 Degr.	16 Min. E	409'	To Cor. #1
"	#10	"	"	"	"	"	N 79 Degr.	13 Min. W	875'	To Cor. #2
"	#13	"	"	"	"	"	N 55 Degr.	16 Min. E	409'	To Cor. #4
"	#14	"	"	"	"	"	N 79 Degr.	13 Min. W	875'	To Cor. #3
"	#15	"	"	"	"	"	N 79 Degr.	13 Min. W	875'	To Cor. #4
"	#16	"	"	"	"	"	N 79 Degr.	13 Min. W	875'	To Cor. #1
Elizabeth	#17	From	NE	cor.	Sec.	32	S 43 Degr.	40 Min. W	1365'	To Cor. #4
"	#18 ?	"	"	"	"	"	S 61 Degr.	06 Min. W	1365'	To Cor. #1
"	#19	"	"	"	"	"	N 61 Degr.	06 Min. W	880'	To Cor. #2
"	#20	"	"	"	"	"	S 43 Degr.	40 Min. W	1365'	To Cor. #3

12
22
23

Two additional fractional claims covering the triangle between Elizabeth No. 19 and Elizabeth No. 20 claims and the area between Elizabeth No. 21, Elizabeth Millsite and Elizabeth Nos. 1 and 2 (See Map No. 1), have since been located and recorded by Terminal Exploration Company. All claim corners are properly marked by 4" x 4" posts 4 ft. high.

IMPROVEMENTS ON PROPERTY

The camp for the property is situated on the Elizabeth millsite and consists of a one-story bunkhouse large enough to accommodate eight persons, with storage space underneath the roof. There is a kitchen and messhouse, one dugout cellar for produce storage, one 12 x 24 feet two-room office building and a 12 x 14 feet tent on a wooden frame with a wooden floor. The camp is on the north bank of Mesa Creek which is a perennial stream, furnishing water for domestic purposes as well as for drilling purposes. This is a great advantage as water does not have to be hauled for miles for drilling purposes.

Surface improvements at the Utida shaft consist of one gallows frame made of welded tubular pipe with steel plate dump chute and small ore bin. The shaft house contains an open hoist room in front and a shop room in back of the hoist room. There is a storage room above the shop room. A powder magazine (See Map No. 2) is located near the shaft.

The underground workings at the Utida shaft get air circulation through two churn drill holes at stations No. 4 and 5 which connect with the workings. The workings are making a small amount of water, sufficient to furnish water for drilling purposes. The water accumulates in the sump of the shaft overnight

and is pumped out in about five minutes in the morning. Some of this mine water is stored in a tank from which a pipe extends down through one of the drill holes into the workings so that water for drilling purposes is available under pressure.

The county road which follows the eastern border of the property and goes across its north and south ends, as well as many secondary drill roads extending from it, furnish easy access to most parts of the property.

GENERAL GEOLOGICAL FEATURES

Blue Mesa lies within the Gateway-Uravan mineral belt along which many uranium deposits of various sizes have been found and are being extensively worked at this time. Production has been obtained from properties adjoining the Elizabeth Group on the southeast, east, north, northwest and west, and the claims themselves have produced uranium and vanadium ore during the past. There are a large number of shallow tunnel workings and open cuts on various parts of the property. Some of these have been surveyed and are shown on Maps 1 and 2 attached hereto, while others remain to be tied into the survey and studied. Past production has been derived from several horizons in the "Big Rim" or rim No. 3 sandstone member of the Salt Wash series of the Morrison formation of Jurassic age. The Salt Wash series contains all of the known uranium and vanadium deposits in this area.

The Morrison formation as a whole consists of two easily distinguished parts. The lower and upper parts of the formation are 297 and 410 feet thick respectively. The lower part is composed of lenticular beds of brown to grey, medium-grained cross bedded sandstones alternating with and replacing red to

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grey and green colored clay shale and mudstone, representing flood plain deposits. This zone of wide-spread, bench forming sandstone beds giving rise to rim topographic features makes up the lower part of the Morrison formation exposed on and near the property; it is known as the "Salt Wash" member of the Morrison formation. Ore showings are present at four different horizons within this sandstone series on the property.

In the western part of the claims only the lower part of the upper member of the Morrison formation, known as the "Brushy Basin" shale member, is present at the surface, so that drilling depths on any part of the property are not excessive.

Along Beaver Creek, some 12 miles west of the Calamity Group of claims, the "Salt Wash series is 220 feet thick. At the Calamity Group of claims some 4-1/2 miles in airline northwest of Blue Mesa, it is 260 feet thick. Along the southeastern slope of the Blue Mesa in Section 4, T-49-N, R-17-W, the Salt Wash series is approximately 297 feet thick, and the underlying Summerville measures 61 feet. The last-mentioned section is described in greater detail later on in this report.

Structurally, the property lies on the eastern flank of a broad northwest trending syncline into which the rocks dip at low angles from the Uncompahgre Plateau uplift to the northeast and from the Sinbad Valley anticline and the La Sal Mountains to the southwest. On the claims the strike of formations is N 35 degrees to N 40 degrees W while the dip varies from 4 degrees to 5 degrees to the southwest.

During 1951, the United States Geological Survey

PAST DEVELOPMENT AND TEST DRILL HOLES

carried on an extensive drilling program on the Elizabeth claims as well as in the surrounding region during which 81 test holes were core drilled on various parts of the property. The records of these holes are available and have been studied by me; 51 of these test holes were located and tied into my survey. During 1954, Utida Mining Company drilled about 100 wagon drill holes on various parts of the property. 64 of these were located and tied into my survey, as were 5 churn drill and rotary holes drilled by other parties and 6 small core holes drilled by Terminal Exploration Company during July, 1955. 10 additional wagon drill holes have since been drilled by Terminal Exploration Company. Unfortunately, the logs of wagon drill holes put down by Utida Mining Company were not available. However, all of such holes still open during May, 1955 were probed and results recorded. All of the above test holes except some of the wagon drill holes are shown on Map No. 1 attached to this report: a great number of them are shown on Map No. 2 which is a detailed survey of a part of Elizabeth No. 9 and No. 10 claims.

PLAIN TABLE SURVEY WORK

The plane table survey work shown on Maps 1 and 2 was tied to section corners shown on U.S. Bureau of Land Management Maps and marked in the field. The northern work was tied to the joint corner of Sec. 28, 29, 32 and 33, T-50-N, R-17-W, while starting elevation was obtained from U.S.G.S. bench marked "Dark," a short distance to the southwest of the above joint corner. The work on the southern end of the claims was tied to the joint southwest corner of Sec. 33 and the southeast corner of Sec. 32, and elevations were tied to a U.S.G.S. benchmark located

south of the road on the Elizabeth Millsite claim. (See Map No. 1) Altogether, 271 stations were established and their elevations determined. They are distributed as follows:

5	churn drill or rotary test holes
64	wagon drill test holes
51	U.S.G.S. test holes (core holes)
71	stations for geological cross sections
80	traverse stations and stations on old shallow surface workings
271	---- Total

Attached to this report is a table giving the number of each station, type of station, and its elevation above sea level. Map No. 1, shows that considerable areas covered by the claims have not as yet been covered by detailed plane table surveys.

GEOLOGIC SECTIONS

During the field work, a section of the formations underlying a part of the area was surveyed along Mesa Creek where they outcrop, from the top of Rim No. 3 downward to the Entrada sandstone. The principal sandstone rims were outwalked and mapped from the "Big Rim" or Rim No. 3 downward to the top of the Entrada sandstone. From this work, graphic sections were drawn which are shown on Map No. 3 attached to this report. The sections obtained by this study are set forth on the following page.

SECTION OF SALT WASH SANDSTONE SERIES AND SUMMERVILLE FORMATION EXPOSED

ALONG MESA CREEK IN THE NW$\frac{1}{4}$ OF SECTION 4 T-49-N, R-17-W

Approx. Top of Big Rim, Rim No.3.

sandstone	14 ore hor. at base
sandstone	34

Bottom of Big Rim

shale	22

Top of Rim No. 4

sandstone	15
shale	10

Top of Bench Mark Rim, Rim No. 5

sandstone	16
shale	36

Upper Rim of Double Rim, Rim No. 6.

sandstone	13

Lower Rim of Double Rim, Rim No. 6

sandstone	20

Bottom of Double Rim **Total 180 ft.**

Approx. Top of Big Rim, Rim No. 3.

sandstone	24
sandstone	25

Bottom of Big Rim

shale	16

Top of Rim No. 4

sandstone	25
shale	6

Top of Bench Mark Rim, Rim.No. 5.

sandstone	14
shale	15
sandstone	14
shale	10

Upper Rim of Double Rim, Rim No. 6

sandstone	16

Lower Rim of Double Rim, Rim No. 6

sandstone	20

Bottom of Double Rim **Total 155 ft.**

Variegated shale, red and green	40
Sandstone, base covered)	
Green shale)	30
Sandstone, base covered)	
Green and red shale)	46
Thin sandstones and shale	25

Ore horizon at 170 to 178 ft. in rotary hole on Elizabeth #1 claim, Prommel sta. 95.
Transition zone. Upper $\frac{1}{2}$ Salt Wash series; Lower $\frac{1}{2}$ Summerville formation predominantly dark brown and red

Top Concretion Horizon

Hard, flinty, Cu stained concretions	1
Red, sandy shale	12
Total	154 ft.

Top Entrada Sandstone

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The total distance from the approximate top of the Big Rim, or Rim No. 3, to the top of the Entrada sandstone is therefor 334 ft. to 339 ft. in this part of the region.

The distance from the approximate top of Rim No. 3 to the ore showing in the rotary hole on Elizabeth No. 2, Prommel Sta. 95, is about 220 ft., plus or minus. At the elevation of the road southwest of camp on Elizabeth #21 claim this ore horizon should lie at a depth of around 78 ft., based on contours as shown on Calamity Mesa topographic sheet, and the top of the Entrada sandstone should be 114 ft. below that.

The top of the Summerville, where shown above, is arbitrary, for there is no distinct dividing line, the zone being transitionary. Thickness of the Summerville varies anywhere from 0 ft. to 120 ft. on the Colorado Plateau.

The Section as given above does not include rims Nos. 1 and 2 which lie between Rim No. 3 and the base of the overlying "Brushy Basin" shale member. Rim No. 1 consists of a lenticular conglomeratic sandstone member which is present at some places and absent at others. This member may lie within the basal part of the Brushy Basin shale and its exact relation to the underlying section has not as yet been determined.

Rim No. 2 outcrops over a large part of the Elizabeth claims; it is prominent immediately south and north of the Utida shaft on Elizabeth No. 9 and No. 10 claims. Part of the outcrop line of this rim is shown on Map No. 2. No ore has so far been found in, or immediately below this rim. The distance between the top of Rim No. 2 and Rim No. 3 is approximately 50 feet.

As will be seen from a study of Map No. 3, four possible ore horizons

underlie the Elizabeth claims. They are, from the top of Rim No. 3 downward, a horizon from zero to 14 feet below the top of Rim No. 3. This is exposed by a number of shallow workings extending through the southern parts of Elizabeth No. 3 and No. 4 claims and the northern and central parts of Elizabeth No. 1 and Elizabeth No. 2 claims. These workings have not as yet been surveyed or studied in detail, but one of them is shown on the cross section A-A' on Map No. 3 at Station 216, in the upper left hand corner of the Section.

ORE HORIZONS

The second ore horizon occurs in grey sandstone and shale partings in the lower 34 feet of Rim No. 3 sandstone and in the upper part of the shale member immediately underlying this sandstone. All of the ore so far encountered in workings and test holes on Elizabeth No. 9 and 10 claims occurs at this general horizon. The distance from the top of Rim No. 3 to the ore occurrences varies in different test holes and in the workings, due to the presence of channels which are difficult to interpret. A small body of high-grade ore in the shale immediately underlying Rim No. 3 was found at the mouth of a shallow-prospect working in the southernmost part of Elizabeth No. 9 claim, about 150 feet southwest of the northeast corner of Section 5, Township 49-N, Range 47-W, at survey station No. 99.

A third possible ore horizon is indicated by the presence of several prospect holes near the south line of Elizabeth #21 claim. High-grade uranium ore, possibly a fossil tree, was encountered here in one of these tunnels in the early days. The sandstone in a part of this working shows impregnations of carnotite as well as extensive bluish-green stains on fracture planes in the

sandstone. A chemical analysis made on a representative sample of this sandstone assayed .38% U_3O_8. The assayer's certificate is shown on the following page. This showing of ore occurs at the base of the "Benchmark" Rim or Rim No. 5 as indicated on Map No. 3. Plane table work has not as yet been extended to this area, but Rim No. 5 which is shown on Map No. 1 at Station No. 214, immediately above the north line of the Elizabeth Millsite Claim, extends across Elizabeth No. 21 Claim and thence northward along a gully into the general region to the west of Elizabeth No. 2 Claim.

A fourth possible ore horizon is said to have been encountered in a rotary drill hole marked Station No. 95 on Map No. 1, in the southeast corner of Elizabeth No. 2 claim. This hole was drilled during 1954 by Utida Mining Company to a total depth of 266.3 feet and ore probing .10% U_3O_8 and higher is said to have been encountered at a depth of 170 to 178 feet. Two other holes were started in this same vicinity, but difficulties were encountered in both holes and they were never finished. As Hole No. 95 is now caved, the presence of this ore could not be verified by additional probing. This ore horizon as shown on Map No. 3, occurs approximately 40 feet below the base of the "Double Rim" or Rim No. 6, in the basal part of the Salt Wash series, similar to ore occurrences in the Bull Canyon region of the Colorado Plateau. If the top of the Summerville formation is assumed to lie about 62 feet above the top of the Entrada Formation (this is an arbitrary point as the top of the Summerville and the base of the Salt Wash series lie within a transitionary zone) this fourth horizon would lie about 53 feet above the base of the Salt Wash Series. The section along Mesa Creek shows still another sandstone below this ore horizon, at a distance of 30 feet

DATE 7/11/55

MINERALS ASSAY LABORATORY

549 NOLAND AVENUE GRAND JUNCTION, COLORADO

PHONE 1441

L#1932

NAME Terminal Exploration Co. ADDRESS Box #431 City

Lab#	SAMPLE 7/9/55	PERCENT URANIUM	PERCENT VANADIUM	PERCENT LIME AS. CACO3	PERCENT TUNGSTEN OXIDE	PERCENT MOLY AS. MO			
#3160		0.38	1.09						
	REPRESENTATIVE SAMPLE OF ORE TAKEN FROM OLD ADIT ABOVE ROAD ON LOWER END OF ELIZABETH #21 BLUE MESA								

Total Charges $ $5.00

RE Dia 11 14

below its top. The thicknesses of these two lowest sandstones in the Salt Wash series could not be accurately determined as their lower edges are covered by wash along the hillside.

INDIVIDUAL CLAIMS AND RECOMMENDATIONS

Beginning at the north end of the Elizabeth Group of claims, I shall endeavor to give a brief description of the present development on these claims, as well as recommendations regarding future test drilling and development.

ELIZABETH NO. 18

This claim lies at the very northwest corner of the Elizabeth Group, its western half being situated just north of the Ace Turner mine where a good ore body was developed in the workings during the past years. A lease on some 17 acres in this vicinity was obtained by Ace Turner from the Atomic Energy Commission. Although good ore from 6 inches to 3 feet wide shows in some of the faces, the property is shut down for reasons unknown to me, and it is rumored that the lease has been cancelled. As an ore body so close to the Elizabeth claims naturally has a bearing on future development on these claims, I made a compass survey of the underground workings as well as of surface features of this mine. (See Map No. 1).

The largest ore body in the Turner mine was found in its southeastern part. The ore widens from 6 inches in the northwest to about 2 to 3 feet to the southeast, and the ore pitches to the southeast. Some water is standing in this part of the workings but not enough to prevent inspection of faces.

A number of shallow tunnels and open cuts extend in an east-west direction through the central part of Elizabeth No. 18 claim. At their eastern

extremity, these workings swing to the southeast. During 1954, Utida Mining Company removed the overburden from a couple of tracts of ground in order to test the continuity of ore encountered in the tunnels and open cuts above described and did some jack-hammer drilling at these places. A part of the ground was also cleared of timber preparatory to removal of overburden.

An attempt was made by Messrs. Merle McKenzie and Ray Jones of Terminal Exploration Company to run a scintillometer survey over the clearing just north of station 158. Readings were taken on a grid with stations 20 feet apart. Background reading was high and readings were so nearly alike that the results of this survey are inconclusive.

Immediately south of survey station No. 194, high-grade ore in the form of a fossil log was removed from the very surface of the ground. Considerable vanadium ore shows in the open cut at stations Nos. 199 and 198, and high geiger-counter readings above .3% U_3O_8 can be obtained at station No. 199. Throughout the length of the shallow workings, pieces of carnotite ore are scattered over the dumps and pieces of vanadium and uranium ore encountered, during bulldozing operations have been collected in piles on the cleared ground.

The ore in the Ace Turner mine occurs in the upper part of a sandstone rim which may correspond to the "Big Rim", rim No. 3, outcropping on Elizabeth No. 1 claim. It may correspond to the ore horizon marked at survey station No. 216 on Elizabeth No. 1 claim: however, exact correlation with the section to the south is as yet uncertain as the sandstone rims have not been traced and tied in by survey between the work done on the northern end of the claims and that done in the central and southern part of the claims. The sequence

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of beds in the Salt Wash section may change somewhat from south to north, and a section from the Entrada sandstone upward through the Salt Wash series, north of Elizabeth 17, 18 and 19 claims, where they outcrop along Blue Creek Canyon should be studied and mapped, and compared with the section already studied and mapped along Mesa Creek in the NW1/4, Section 4, Township 49-N, Range 17-W as given in this report.

Generally speaking, the strike of the formations at the Ace Turner mine and on Elizabeth No. 18 claim appears to be northeast - southwest, and the dip is to the northwest. This is unconformable to the general northwest-southeast strike and southwesterly dip of the formations elsewhere on the claims. At present, it appears that the ore horizon in the Turner mine is approximately the same as that encountered in the open cut workings and shallow tunnels on Elizabeth No. 18 claim, and that any additional ore will be found close to the surface on this claim. However, in further test drilling, it would be advisable to drill holes through this sandstone series until a decided red shale bed is encountered below them. I would suggest that the first holes be drilled to depths not less than 50 feet, or until the thickness of this sandstone series has been definitely determined. For the present, additional test hole drilling is advised just southwest of station No. 199, between it and the road, as well as to the northeast of station No. 199, thence in a southeasterly direction across the two tracts from which overburden has been removed.

A light bluish shale is present above the ore-bearing sandstone at the Turner mine. This can be traced in a northeasterly direction toward the large clearing at stations No. 188 to 193 where it is especially prominent in the

southeastern end of the clearing. Semi-favorable formation conditions were found in G.S. core holes Nos. 133 and 134 at survey station Nos. 182 and 187 respectively on Elizabeth No. 17 claim, 105 and 185 feet south of the south line of Elizabeth No. 18 claim, and weak showings were probed in G.S. holes No. 76 survey station No. 185, 90 feet to the south of the south line of Elizabeth No. 18 claim. I have been unable to obtain information to date on wagon-wheel drill holes at stations No. 181, 183 and 184 near the south line of Elizabeth No. 18 claim. (See Map No. 1) These conditions certainly warrant an extensive drilling program at the places above indicated, from the west line of Elizabeth No. 17 claim in an easterly direction. It is somewhat difficult to advise as to how many holes should be drilled and how closely these holes should be spaced. This absolutely depends on what is encountered in the holes as they are being drilled, probed and sampled. I would suggest at first a distance of not over 25 feet between holes, to be followed by closer spacing if showings of ore have been encountered in some of these holes. It is entirely possible that several thousand feet of drilling may be required in order to block out additional ore bodies in the Ace Turner mine ore horizon on Elizabeth No. 18 claim.

ELIZABETH NO. 19 This claim is situated to the east of Elizabeth No. 18 claim at the northeast extremity of the Elizabeth group. Shallow surface workings were found in the northeastern part of this claim. While at a higher elevation, this ore horizon may correspond to that of the Ace Turner mine and open cut workings on the Elizabeth No. 18 claim. As on Elizabeth No. 18, additional field work will be necessary to determine this definitely. A sandstone rim heads on this claim near the joint corners of sections Nos. 28, 29, 32 and 33, and extends

in a westerly direction across the southern part of Elizabeth No. 19 and the central part of Elizabeth No. 17 claim. This rim also continues in a southwesterly direction across Elizabeth No. 20 claim, but this rim has so far not been mapped, and no elevations for correlation purposes have so far been obtained. One G.S. hole, G.S. 77, has been drilled on the line between Elizabeth 18 and 19 claims. This hole shows unfavorable formation, but a single hole does not in any way condemn this region nor the region to the northwest of it for future drilling.

ELIZABETH NO. 17 As the north end of Elizabeth No. 17 claim overlaps on Elizabeth No. 18 claim, conditions on the north half of Elizabeth No. 17 were described under Elizabeth No. 18.

No survey work has so far been done on the south half of Elizabeth No. 17 claim. Two holes drilled by the G.S., G.S. 98 and G.S. 91, show semi-favorable and unfavorable formations. Drilling is not deemed advisable at present on the south half of Elizabeth No. 17 until more studies of this region are made.

ELIZABETH NO. 20 No survey work has so far been done by me on Elizabeth No. 20 claim. Three G.S. holes were drilled on this claim -- all of which show unfavorable formation on the logs; however, G.S. 85, in the southeast part of the claim, probed by the Atomic Energy Commission, shows very weak radiation at a depth of 41 to 42 feet in this hole, and eventually it may be advisable to drill some additional prospect holes in the southeastern part of this claim.

ELIZABETH NOS. 13, 14 and 15 No survey work has as yet been done by

me on these claims, and only five widely scattered G.S. survey holes were drilled on them. G.S. 88 on Elizabeth No. 13 shows unfavorable formations. G.S. 64 on Elizabeth No. 14 shows favorable formation. Three holes on Elizabeth No. 15, G.S. 96, G.S. 63 and G.S. 62 show semi-favorable, unfavorable and unfavorable formations respectively. Additional holes should later on be drilled a short distance to the north of G.S. holes 96 and 64 on Elizabeth Nos. 14 and 15 as well as a short distance to the south of these holes in order to determine whether a northeasterly trend of ore may be present in this general vicinity. Additional drilling in other parts of these three claims must await further survey work and geological study.

ELIZABETH NOS. 5 and 6 No survey work has so far been done nor detailed studies made of these claims. Two G.S. holes, G.S. 219 and G.S. 162 were drilled on Elizabeth No. 5 and G.S. hole 218 was drilled just across the south line of Elizabeth No. 5 on Elizabeth No. 3. G.S. 219 shows unfavorable formations, G.S. 218 shows semi-favorable formations, while G.S. 162 shows favorable ore bearing sandstone 43-1/2 feet thick with abundant carbon and green mudstone and limonite. This hole also shows very weak readings by Atomic Energy Commission probings. None of the above three holes were drilled deep enough to test ore horizons below rims No. 5 and No. 6, as shown on Section A-A', Map No. 3, attached to this report. I consider the showings in G.S. hole 162 sufficient to do further prospect drilling through rim No. 3 on down through rims Nos. 5 and 6 in this general vicinity.

No holes have been drilled on Elizabeth No. 6, but there are a considerable number of shallow surface workings on this claim which have so far not

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been surveyed but which justify further investigation, especially as they lie to the east of favorable conditions encountered on Elizabeth Nos. 7 and 10 described below.

ELIZABETH NOS. 3, 4 and 8 No detailed survey work or geological studies have so far been made on these claims. Only five G.S. test holes have been drilled at widely separated places. (See Map No. 1) Of these, G.S. 218 on Elizabeth No. 3 and G.S. 163 on Elizabeth No. 4 show semi-favorable formations on the logs. Holes G.S. 167 and 169 on Elizabeth No. 8 show unfavorable formations as does G.S. hole 237. Nevertheless, this last hole is on the southern fringe of a very favorable area on Elizabeth No. 7 which will be discussed below:

ELIZABETH NOS. 1 and 2 A small amount of survey work has been done on Elizabeth #1 in connection with the measuring of geological sections to the east of it along Mesa Creek. A considerable number of shallow surface workings in the upper part of rim No. 3 trend in one or more northeasterly directions across Elizabeth Nos. 1 and 2 claims, but time so far has been insufficient to map the workings and study them in detail. One of these workings is shown at survey station 216 in the southeastern part of Elizabeth No. 1 where a tunnel has been driven and some ore seems to have been mined. Only one G.S. hole, G.S. 86, has been drilled on these two claims. This hole is located in the southwestern part of Elizabeth No. 1 and shows semi-favorable formations on the G.S. log. The ore-bearing sandstone is 38 feet thick, showing favorable color and abundant green and grey mudstone and carbon. At a depth of 11 to 11.5 feet, Atomic Energy Commission records show "very weak" probings. Some 20 wagon drill

holes were drilled on these claims to the north of shallow surface workings, but logs on these holes are unavailable, and attempts to probe them have not as yet been made by Terminal Exploration Company. This region unquestionably warrants further detailed survey work and geologic study.

In the southeast corner of Elizabeth No. 2, Utida Mining Company drilled a rotary hole in 1954 at station 95 to a total depth of 266.3 feet which, according to their field superintendent, Mr. Robert Chastain, proved .10% U_3O_8 and higher at a depth from 170 to 178 feet. This showing has already been discussed under ore horizons on a previous page of this report. Additional drilling in this vicinity to outline a possible producing zone at this lower horizon in the "Salt Wash" series as well as to test possibilities shown on Elizabeth No. 21 claim below the Bench Mark rim, rim No. 5 and already discussed under "ore horizons," certainly seems warranted. Neither of two offset holes to hole 95 reached the lower horizon and no logs of these three holes are available.

ELIZABETH NO. 21 No test holes of any kind have been drilled on this claim as yet, and no surveys or geological studies have been made except those mentioned under "ore horizons" which described the showing of some high-grade ore in a short prospect tunnel at the southern line of the claim, shown on Map No. 1. In the southernpart of this claim, along the county road, it is possible to drill some shallow wells to the deep ore horizon encountered in test hole 95 on Elizabeth No. 2 claim. These would have to be drilled to a depth of 75 - 100 feet. to test this horizon. The Benchmark rim extends across Elizabeth No. 21, and before some additional survey work is done, it is difficult to determine depths to which test holes should be drilled and where they should be drilled in order to test the

high-grade ore showing below rim No. 5. As a starter, some holes should be drilled to the northeast of the prospect markings.

ELIZABETH MILLSITE No work of any kind has been done on the millsite, and no test holes have been drilled. The outcrop of rim No. 5 strikes across the northwest corner of the millsite while rim No. 6 lies buried underneath the northwest part of the claim. Again, some shallow drilling to the ore horizon encountered in hole No. 95 on Elizabeth No. 22 claim is possible here. The depths of such holes would be approximately 50 - 80 feet. A hole approximately 175 - 200 feet deep should reach the top of the Entrada sandstone at this general locality, and would explore the lowest part of the Salt Wash sandstone and shale series.

ELIZABETH NO. 16 No detailed survey work or geological studies have as yet been made on Elizabeth No. 16. Rim No. 2 forms extensive outcrop lines across this section. Four G.S. test holes have been drilled at widely-separated places on this claim. G.S. holes 59 and 241, the two western most holes drilled, show unfavorable formation, while G.S. holes 242 and 19, about 175 feet to the northeast and 175 feet to the southeast of G.S. holes 241 show semi-favorable formations G.S. hole 242 shows a chemical test of 0.1% V_2O_5 at a depth of 42.7 to 43.7 feet on the G.S. log. This hole also shows a very weak AEC probe reading at a depth of 35.7 to 36.1 feet. Some additional drilling may be warranted to the northeast of G.S. hole 242.

ELIZABETH NOS. 7, 9 and 10 CLAIMS The south half of Elizabeth No. 7, Elizabeth No. 10 and the northern 2/3 of Elizabeth No. 9 exhibit the most extensive test hole drilling performed by the U.S.G.S. as well as by Utida Mining

Company. 26 G.S. holes and 6 wagon drill holes were drilled on Elizabeth No. 10. 19 G.S. holes, more than 55 wagon drill holes and 2 churn drill holes were drilled on Elizabeth No. 9. Seven G.S. holes were drilled on the southern half of Elizabeth No. 7.

Three G.S. holes, Nos. 55, 93 and 94 were drilled on Elizabeth No. 10 during October and December of 1950. A narrow streak of high-grade ore showing chemical analysis of .55% U_3O_8 was encountered in hole 93 at a depth of 34.2 to 34.5 feet; this evidently lead to a further drilling campaign by the G.S. from April to June, 1951, during which 23 additional holes, spaced about 50 feet apart, were drilled in this general area. A shaft, now caved, was started at G.S. hole 93, and another shaft, now open was sunk to a depth of 17 feet at G.S. hole 265, Prommel stations 118 and 105 respectively. All of these holes were surveyed by me, the logs were studied, and 31 graphic logs were prepared by me of G.S. and wagon drill holes in order to carefully study the depth at which ore was encountered as well as to get some idea of the thickness of the ore in the different holes. The results are set forth on Map No. 2 attached to this report.

The southern part of Elizabeth No. 10 claim on Map No. 2 shows every hole drilled in this region as well as a number of surface elevations obtained on the top of the "Big Rim", rim No. 3, sandstone where it forms a dip slope on the surface over a considerable part of this area. In the vicinity of the test holes, the top of rim No. 3 is covered by overburden but is reported on the logs, so that structure contours on the top of the "Big Rim" could be drawn for this area.

While the structure contours show the structural attitude of these beds,

minor flexures in them may be due to differential deposition along the top of the "Big Rim" sandstone, and these in turn may, with additional field work in adjoining regions, point to the presence of certain channels near and at the top of rim No. 3.

Of the many holes drilled, the following are of special interest: Holes No. G.S. 258, 209 and 282 near the southeast corner of Elizabeth No. 10. (See Map No. 2) The Atomic Energy Commission probe record of Hole No. 258 shows the following:

Feet		
50.1 to 50.6	--	"Very weak"
52.5 to 53.6	--	"Weak"
53.6 to 58.1	--	"Very weak"

The G.S. log shows semi-favorable ore bearing sandstone 62.8 feet thick with favorable to semi-favorable color and the presence of carbon.

The G.S. log of hole 209 shows depth probed from 34.5 to 35.4 feet as "strong." Chemical analysis of samples from 34.3 feet to 35.50 feet are recorded as follows:

Base Feet	Thick Feet	U_3O_8 %	V_2O_5 %	$CaCO_3$ %
34.30				
34.70	.40	*e0.004	0.20	-
35.20	.50	0.031	1.58	0.10
35.30	.10	0.34	2.23	0.20
35.50	.20	e0.015	0.54	0.10

*Assays marked "e" are from lab gamma-ray readings

Atomic Energy Commission probing of hole G.S. 282 from 48 to 48-1/2 feet shows "very weak." The G.S. log shows semi-favorable conditions, ore bearing sandstone 70.6 feet thick, grey-green mudstone, sandstone mostly of

favorable color. While the mineralization is narrow in this vicinity, these three holes are 50 feet from each other, and some thicker ore might very well be present between them, or in their immediate vicinity. Any additional holes within this region should be drilled to a depth of about 70 feet unless considerable red shale below sandstone is encountered in them at a lesser depth.

From a study of Map No. 2, it is seen that some ore has been encountered in the holes situated in the central part of the drilled area; such as: G.S. 93, 265, 178, 175, 257, 205, 264, and wagon drill holes, stations 106 and 111. All of these ore occurrences which prove anywhere from less than .1% to .50% U_3O_8 are less than one foot in width and are somewhat irregularly distributed as to depth, with the exception of holes G.S. 178 and G.S. 205, survey stations 130 and 134 respectively. These two holes record from one foot to 1-1/2 feet of ore, the 1-1/2 feet being present in hole G.S. 205 at a depth of 32.5 to 34 feet and probing 0.18 and 0.20 U_3O_8, with amounts of .074 shown on G.S. log at depths of 44 to 45 feet. This is the best showing of all the holes drilled in this vicinity. Hole G.S. 263 which shows favorable formation only, is 45 feet north of G.S. hole 205 and G.S. hole 269, also showing favorable formation, is 50 feet east of hole 205. No drilling has been done between G.S. holes 263 and 269 which are 65 feet apart. It is entirely possible that a channel extends from hole 205 in a northeasterly direction between G.S. holes 263 and 269, and close drilling to the northeast of G.S. hole 205 is fully justified. The ore channels so far explored and drilled on the Blue Mesa appear to be narrow and long. They are in places not over 5 feet wide but have been found to extend 1500 feet in length. It must, therefore, be emphasized that close spacing of holes adjacent

to holes which show even weak mineralization only, is essential on the Blue Mesa in order not to miss possible ore channels.

Within the same area, more holes might also be drilled near G.S. holes 93, 175, 130 and 131, all of which are 50 feet from each other. A possible channel may be present here extending in a northeasterly direction towards wagon drill hole 106.

G.S., holes 248, 55 and 249 extend in a north direction about 100 feet west of the east side line of Elizabeth No. 10 claim. They show favorable formation and weak radiation by probing. These holes again point to a possible northeasterly trend of channels in this part of Elizabeth No. 10 claim.

The 7 holes drilled in the southern 1/3 of Elizabeth No. 7 claim lie in a northeasterly direction from the cluster of holes drilled in the south 1/3 of Elizabeth No. 10 claim. 6 of these holes show favorable formation while one, G.S. 236 near the southwest corner of Elizabeth No. 7 shows semi-favorable formation. G.S. holes 211 and 214 show less than .1% U_3O_8 present. On G.S. hole 235, the Atomic Energy Commission gives the following probing results:

Depth logged (ft.) From	To	Footage From	To	Percent *eU_3O_8
0.0	51.8	17.1	20.9	Very weak
		20.9	22.7	Strong
		22.7	23.4	Weak
		23.4	24.0	Strong
		24.0	25.0	Weak
		25.0	25.3	Strong
		45.7	47.1	Very weak

*Assays marked "e" are from lab gamma - ray readings

The G.S. log gives the following chemical assays:

To	Feet	U_3O_8	V_2O_5	$CaCO_5$
21.6'				
22.0	0.4	.068	0.39	3.9
23.5	1.5	.21	1.46	1.2
24.3	0.8	.043	0.38	10.8
24.9	0.6	.074	0.74	10.3
26.5	1.6	-	0.67	4.2

This hole, therefore, shows 1-1/2 feet of ore with a chemical analysis of .21% U_3O_8 with lower values above and below this horizon for a total thickness of 2.9 feet. The lower 2/3 of Elizabeth No. 7 claim is one of the best prospective regions within the Elizabeth group of claims. Again, holes should be drilled to about 70 feet unless red shale of considerable thickness is encountered below the sandstone which extends from the surface downward.

Map No. 2 shows the underground workings driven from the Utida shaft. This shaft evidently was sunk on the showing obtained in G.S. holes 274, 268, 267, 247, 273, 275 and 272. I believe the shaft was sunk before Utida Mining Company acquired the property and leases operated in the workings extending in a northwesterly direction from the shaft. Evidently, some ore was shipped from these workings.

Upon acquiring the property, Utida drilled 55 wagon drill holes around and to the south of the Utida shaft as shown on Map No. 2. The logs of none of these wagon drill holes are available but those which were still open were probed during May, 1955 by Mr. Merle McKenzie and myself. The results obtained are shown by respective symbols on Map No. 2 which are explained on the legend on the map. Most of the holes drilled around the Utida shaft workings and to the

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east of them show narrow streaks of ore and indicate the presence of several northeasterly trending channels. One of these may be present some 20 feet northwest of the shaft. Ore also was encountered right at the shaft. Another channel is suggested along wagon drill holes 31, 15 and 10. An extensive drilling campaign, therefore suggests itself to the northeast of the Utida shaft workings. In order to test the ore horizon encountered in some of the holes, additional holes should be drilled to a depth not exceeding 70 feet.

During the Utida drilling program, a hole was drilled at station 35 about 212 feet southeast of the Utida shaft. This hole was probed by me in February, 1955 and registered .50% U_3O_8 at a depth of 68 to 80 feet. This hole had been probed earlier by Utida Company and others, and a number of additional holes were drilled in close proximity, such as wagon drill holes 40, 41, 42, 43, 44, 45, 46 and 47. These holes are said to have encountered ore at approximately the same horizon as that in hole No. 35. Most of these holes are caved now and could not be probed.

The drift extending south from the Utida shaft was to be continued to this hole in order to start mining operations. When Terminal Exploration Company took over the property, it was found that the shaft was not deep enough to reach this ore and it was decided to drill some additional holes and outline the ore body in greater detail.

A small diamond core drill was obtained and holes T1 to T6 were drilled. All but one of these encountered ore ranging in thickness from 2 to 9-1/2 feet at depths ranging from 48-1/2 to 66-1/2 feet, somewhat more shallow than the ore encountered in wagon drill hole 35. The difference in elevation of the ore

body may be due to a roll in the channel.

The ore encountered in the near vicinity of wagon drill hole 35 is the best in width as well as in value so far encountered on the Elizabeth group of claims, widths ranging from 1/2 foot to 9-1/2 feet and values from less than .1% to .90% U_3O_8. There is no reason why every effort should not be made to block out this promising ore body by closely spaced drill holes. A width of 40 feet and possibly 60 feet has been established by the holes already drilled, and this channel should extend in a northeasterly-southwesterly direction for a considerable distance. As soon as additional holes are drilled to delineate the ore body, its tonnage can be calculated, before work is undertaken on the proposed incline shown on Map No. 2, which shall be driven in order to mine out this ore.

Graphic logs, as far as possible, were drawn for 24 of the test holes in the Utida shaft vicinity. These graphic logs have three uses:

1. The structural attitude of the top of rim No. 3 can be determined. This throws some light on the regional structure as well as on irregularities at the top of rim No. 3 due to differential deposition.
2. The stratigraphic sequence of beds as it changes from hole to hole can be studied.
3. The depth of ore with respect to the bottom of the Utida shaft can be determined from the graphic logs.

It might be suggested to develop the ore body in the vicinity of drill hole 35 through the Utida shaft working by deepening the shaft and taking up the bottom in the drift south from the shaft. However, the area around the shaft is comparatibely level, and there is little dump space. For this reason, the incline shown

on Map No. 2 has been proposed, to be driven after sufficient ore has been developed. This incline would consist of 75 feet of open cut and 275 feet underground incline in order to reach hole No. 35 location. The inclination would be approximately 8% or a drop of 8 feet per hundred so that the incline would be below the base of the ore body at wagon drill hole 35.

As shown on Map No. 2, a number of wagon drill holes were drilled south of the Utida shaft workings. Logs of these holes were not available, but those which were open in May, 1955 were probed. Except holes 90 and 91, none gave any reactions. Holes No. 90 and 91 gave showings as follows:

Hole 90			Hole 91		
74 feet	-	.02% U_3O_8	66 feet	-	.05% U_3O_8
74.5 "	-	.12% "	67 "	-	.05% "
75 "	-	.14% "	68 "	-	.08% "
			59 "	-	.06% "
Total depth 75 ft.			Total Depth 74 ft.		

Holes 90 and 91 are 22 feet apart and they evidently were not drilled quite deep enough. Additional prospect drilling to the northeast as well as to the southwest is warranted at this place.

Some 340 to 380 feet southeasterly from wagon drill hole 35, a number of holes were drilled by the U.S.G.S. They are shown on Maps No. 1 and 2. These G.S. holes, No. 15, 179 to 182 and 215 to 217 are shown on maps No. 1 and 2. They were drilled to a depth of 125 to 150 feet and encountered mineralization in both No. 3 rim ore horizon and the "Bench Mark", No. 5 ore horizon, described under "ore horizons" in this report. Best value and width were encountered in G.S. hole 182 in which a chemical analysis of one foot of ore at a depth of 99 to 100 feet gives .24% U_3O_8 and 1.21% V_2O_5 and 1-1/2% $CaCO_3$ on the G.S. log.

Hole No. 180 was probed during June, 1955 by Mr. Merle McKenzie of Terminal Exploration Company with the following results:

39' - .08% U_3O_8	95' - .06% U_3O_8	98' - .08% U_3O_8
40' - .06% "	96' - .04% "	99' - .06% "
94' - .04% "	97' - .06% "	100' - .04% "

While, with the exception perhaps of G.S. hole 182, none of this mineralization is commercial, it nevertheless proves the existence of two ore horizons in this general vicinity, the upper one or rim No. 3 horizon of between 25 and 50 feet depth and the rim No. 5 horizon described earlier in this report, at a depth of around 100 feet.

With exception of discussion of G.S. holes 179 to 182 on Elizabeth No. 9 claim, above discussions of conditions on individual claims have concerned themselves principally with drilling and development of ore deposits in the "Big Rim," rim No. 3. The depth of holes to be drilled for exploratory purposes of deeper horizons depends on the location of such holes. In most parts of the area, exploratory holes would start a short distance above, or on the "Big Rim," rim No. 3, and a hole 220 to 250 feet deep would test all possible ore horizons.

DRILLING TO DEEPER ORE HORIZONS

At the section measured in the northwest quarter of section 4, the distance between the base of rim no. 3 and the base of rim No. 5 is about 60 feet, and the distance between this point and the approximate ore horizon below the "Double Rim," ore rim No. 6, is about 120 feet. However, these distances may vary somewhat from place to place, and close logs should be kept of all holes drilled, so that they can be correlated with logs of holes already drilled and with sections eventually to be surveyed and measured at the north end of the property. The

drilling of test holes to the "Benchmark" rim and Double Rim ore horizons has already been discussed under Elizabeth No. 2, 5 and 6 claims. The lowest horizon at which ore is said to have been encountered at station No. 95 rotary hole in the southeast corner of Elizabeth No. 2 should at first be tested near this same locality by a hole drilled not over 15 to 20 feet away from the discovery hole. There is at present no guide to determine where other holes should be drilled to the two lower ore horizons, further than drilling one or two exploratory test holes along the county road where it traverses Elizabeth No. 3 claim, which is about one thousand feet to the west of where the basal part of the "Salt Wash" series was measured at section B-B'. For additional deep holes, the grid system used by the U.S.G.S. could be followed, namely, drilling such wells at first 500 to 1000 feet apart in a general northeast - southwest and northwest - southeast direction over the property, and later drilling additional holes between those already drilled and near those which have encountered mineralization.

In order to test the "Big Rim," rim No. 3, horizon, wagon drills or core drills can be used to advantage. For testing below 100 feet, it is recommended that rotary drills, capable of coring when necessary, be used.

DRILLING METHODS

There are various types of wagon drills and rotary drills in use on the Colorado Plateau, and inquiries on these are being made by Mr. Merle McKenzie of Terminal Exploration Company. I believe that holes can be dry-drilled in most places. The small amount of water present in the vicinity of the Utida shaft may be due to surface seepage or to synclinal or channel conditions in the "Big Rim" sandstone at this locality, which led to the formation of an underground seepage

or water course.

ORE SHIPMENTS

There does not appear to be any record of early ore shipments made from the property during the period 1939 to 1954. From the number of shallow surface workings along the rims on the property, it is evident that considerable ore must have been shipped during that time and prior to it, when only the vanadium content of the ore was being paid for.

During 1954, when Utida Mining Company was drifting southward from the Utida shaft toward drill hole No. 35, pockets of ore were encountered which yielded 100.95 tons of ore averaging $24.26 per ton for uranium and vanadium content. Shipment contents varied from .14% to .23% U_3O_8 and 1.42% to 2.42% V_2O_5. The average for the 100.95 tons being .177% U_3O_8 and 1.849% V_2O_5, the five shipments of ore returning a total of $2,449.19.

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

A summary, conclusions and recommendations in which conditions on the property, ore horizons, drilling depths, etc. are briefly discussed preceeds the body of this report. In view of the evidence set forth above and on the maps accompanying this report, I am convinced that the Elizabeth group of claims offer very good possibilities for the development of a number of uranium ore deposits in the Salt Wash member of the Morrison formation of Jurassic age.

Respectfully submitted,

Harald W. C. Prommel

Harald W. C. Prommel
Consulting Geologist and Mining Engineer
Denver, Colorado

Denver, Colorado
August 16, 1955

PROMMEL SURVEY STATIONS AND ELEVATIONS

LEGEND FOR "TYPE OF STATION"

G.S.B.M.	United States Geological Survey Bench Mark
G.S. 225	" " " " Core Drill Hole & Number
R. D.	Rotary Drill Hole
Ch. D.	Churn Drill Hole
W. D.	Wagon Drill Hole
—	Traverse and Geology Stations
Workings	Open Cuts and Mine Workings
Geol. Sec.	Geologic Sections
*	Off Property

All Prommel Survey Stations are marked in the field with a 1/4 inch by 1-1/4 inch stake 8 to 10 inches long, the survey station number, marked on each stake with black lumber crayon, preceded by the letter "P", as P-155.

Sta. No.	Type of Station	Elevation	Sta. No.	Type of Station	Elevation
1	G.S. 245	6124.5	51	W. D.?	6131.6
2	—	6139.2	52	" " "	6128.9
3	Shaft	6132.6	53	G.S. 274	6130.3
4	Ch. D.	6132.1	54	—	6142.5
5	Ch. D.	6134.9	55	—	6146.4
6	W. D.	6134.2	56	G.S. 246	6135.8
7	" "	6136.7	57	—	6114.5
8	" "	6135.2	58	*G.S. 280	6114.8
9	" "	6137.0	59	*G.S. 243	6108.6
10	" "	6136.7	60	*G.S. 279	6107.0
11	" "	6134.5	61	*G.S. 284	6106.4
12	" "	6132.8	62	*G.S. 277	6109.1
13	" "	6127.6	63	W. D.	6114.9
14	" "	6134.3	64	" "	6114.0
15	" "	6132.8	65	" "	6113.1
16	" "	6130.9	66	—	6111.9
17	G.S. 272	6131.7	67	W. D.	6151.4
18	" " 275	6130.3	68	" "	6150.4
19	W. D.	6132.3	69	" "	6142.7
20	" "	6132.3	70	—	6137.4
21	" "	6132.3	71	—	6137.4
22	" "	6131.6	72	W. D.	6135.1
23	" "	6131.9	73	—	6109.5
24	" "	6130.6	74	—	6065.9
25	" "	6132.1	75	W. D.	6080.3
26	" "	6132.4	76	W. D.	6080.9
27	" "	6132.2	77	—	6116.7
28	" "	6133.2	78	G.S. 181	6123.0
29	" "	6133.6	79	G.S. 15	6127.6
30	—	6128.8	80	—	6125.6
31	W. D.	6133.0	81	—	6105.7
32	" "	6132.9	82	W. D.	6089.6
33	" "	6133.7	83	Incline	6078.8
34	—	6135.3	84	"	6099.9
35	W. D.	6131.0	85	G.S. 253	6074.6
36	—	6152.1	86	W. D.	6080.8
37	W. D.	6131.7	87	" "	6080.4
38	" "	6131.8	88	" "	6079.6
39	" "	6130.8	89	" "	6078.2
40	" "	6131.2	90	" "	6078.4
41	" "	6130.6	91	" "	6077.1
42	" "	6133.2	92	G.S. B.M.	5957.0
43	" "	6134.2	93	—	6013.0
44	" "	6135.6	94	R. D.	6002.0
45	" "	6134.9	95	" "	6001.5
46	" "	6134.5	96	—	5977.0
47	" "	6132.8	97	—	5949.8
48	" "	6137.3	98	—	5944.4
49	" "	6138.1	99	Working	6029.1
50	—	6121.7	100	—	6086.6

Sta. No.	Type of Station	Elevation	Sta. No.	Type of Station	Elevation
101	—	6090.3	151	—	6407.5
102	Sec. Corner	6081.3	152	Working	6424.2
103	" "	6083.2	153	"	6423.7
104	—	6148.7	154	"	6418.2
105	G.S. 265	6148.9	155	"	6405.6
106	W. D.	6149.6	156	"	6412.2
107	G.S. 264	6150.1	157	—	6351.8
108	W. D.	6151.3	158	G.S. 11	6338.7
109	" "	6153.4	159	—	6315.0
110	G.S. 263	6156.3	160	Working	6334.3
111	W. D.	6151.4	161	—	6273.9
112	" "	6150.3	162	G.S.B.M. "Dk"	6479.0
113	" "	6149.4	163	*G.S. 225	6272.7
114	G.S. 262	6147.2	164	*G.S. 160	6279.8
115	G.S. 269	6155.4	165	—	6264.4
116	G.S. 208	6143.7	166	Working	6258.6
117	G.S. 175	6143.1	167	Working	6279.3
118	G.S. 93	6144.4	168	Working	6281.0
119	—	6153.7	169	Working	6272.5
120	G.S. 256	6139.9	170	*G.S. 135	6266.0
121	—	6134.6	171	Working	6284.8
122	G.S. 282	6134.7	172	—	6285.6
123	G.S. 209	6136.8	173	*G.S. 172	6280.8
124	G.S. 258	6136.0	174	W. D.	6279.4
125	—	6122.9	175	—	6279.9
126	G.S. 259	6131.3	176	*G.S. 173	6283.9
127	G.S. 177	6136.0	177	—	6298.5
128	G.S. 176	6142.1	178	—	6298.9
129	G.S. 210	6154.0	179	*G.S. 174	6278.9
130	G.S. 178	6147.2	180	—	6317.5
131	G.S. 257	6146.0	181	W. D.	6317.2
132	G.S. 255	6142.0	182	G.S. 133	6311.6
133	G.S. 207	6145.4	183	W. D.?	6323.9
134	G.S. 205	6152.1	184	W. D.	6321.7
135	G.S. 251	6159.5	185	G.S. 76	6316.8
136	—	6163.2	186	—	6363.0
137	—	6162.2	187	G.S. 164	6314.9
138	—	6158.1	188	—	6338.1
139	—	6153.2	189	—	6342.1
140	—	6147.4	190	—	6339.0
141	—	6155.9	191	—	6333.3
142	G.S. 248	6162.6	192	—	6323.3
143	G.S. 55	6174.1	193	—	6329.5
144	G.S. 249	6183.8	194	—	6328.7
145	R. D.	6177.8	195	—	6326.2
146	—	6184.9	196	—	6319.2
147	Sec. Corner	6422.5	197	—	6323.0
148	—	6417.3	198	Working	6321.4
149	—	6419.6	199	Working	6319.4
150	Working	6421.7	200	Working	6318.7

Sta. No.	Type of Station	Elevation
201	Working	6317.4
202	Working	6318.9
203	Working	6316.3
204	Working	6305.0
205	Working	6312.3
206	Working	6309.4
207	Working	6300.0
208	Working	6285.2
209	Working	6247.9
210	Working	6290.0
211	Working	6264.2
212	Working	6280.1
213	Geol. Sec.	5968.2
214	" "	5963.5
215	" "	6043.5
216	" "	6080.0
217	" "	6095.5
218	" "	6091.5
219	" "	6164.5
220	" "	6109.4
221	" "	6031.5
222	" "	6015.9
223	" "	6006.0
224	" "	5989.7
225	" "	5954.3
226	" "	5943.9
227	" "	5927.8
228	" "	5963.0
229	" "	5992.8
230	" "	5986.3
231	" "	5996.0
232	" "	6007.5
233	" "	6014.2
234	" "	6039.5
235	" "	6046.4
236	" "	6072.0
237	" "	6091.4
238	" "	6116.0
239	" "	6137.5
240	" "	5963.0
241	" "	6059.4
242	" "	6030.9
243	" "	6056.7
244	" "	6083.9
245	" "	6120.7
246	" "	6102.1
247	" "	6097.7
248	" "	6072.7
249	" "	6103.7
250	" "	6130.2

Sta. No.	Type of Station	Elevation
251	Geol. Sec.	6136.2
252	" "	6133.8
253	" "	6028.5
254	" "	6049.3
255	" "	6039.6
256	" "	6032.9
257	" "	6044.7
258	" "	6087.6
259	" "	6065.5
260	" "	6074.6
261	" "	6162.6
262	" "	6155.6
263	" "	6289.6
264	" "	6154.6
265	" "	6148.8
266	" "	6177.1
267	" "	6104.0
268	" "	6086.9
269	" "	6062.3
270	" "	6052.7
271	" "	6107.1

PROMMEL, Harald W. C. Res. 731 So. Downing St., Denver, Colo., Born Feb. 21, 1887.
REGISTERED GEOLOGIST AND MINING ENGINEER, STATE OF COLORADO

SUMMARY EXPERIENCE RECORD

1902-1904. South America, Employed on railroad, Guayaquil to Quito, Ecuador. With South American Development Co. at gold mines near Zaruma, Ecuador, as timekeeper, hoisting engineer, machine man and powder man.

1904-1908. Day laborer and miner, Cripple Creek District, Colorado, U. S. A. Student, International Correspondence Schools, Metal Mining and Spanish.

1908-1913. Mexico, States of Guerrero, Morelos, Hidalgo, Oaxaca, Zacatecas, Sonora. Mine sampler, shift boss, mine foreman, mine superintendent, assayer, mine examinations, clerical work, interpreter Spanish-English-German. 1913, Mt. Hope Iron Mines, New Jersey, timber foreman; student in mining engineering, Columbia University, New York, N.Y.

1913-1914. Mine examinations, Colorado, California, Idaho, Mexico. Student, Denver University, Denver, Colorado, term 1914-1915.

1915-1916. South America: Peru, Bolivia, Chile. Examinations and reports on tin mines and copper deposits.

1916-1917. Student, Colorado School of Mines, Golden, Colorado, term 1916-1917. Mine examination, zinc and copper, Kelly, New Mexico; Sandon District, British Columbia; interpreter and assistant to C. A. Fisher, Consulting Geologist, Denver, Colorado, on reconnaissance investigation of oil possibilities of Cuba.

1917-1922. Associate Geologist and Mining Engineer with Fisher & Lowrie, Consulting Geologists, Denver, Colorado. Geological and mining investigations, oil fields, coal and metal mines in Wyoming, Colorado, Utah, Kansas, Nevada, Montana, Texas, Tennessee, Kentucky, South Dakota, Oklahoma, Arizona, Louisiana, Nebraska, Illinois. Internal Revenue Agent, U.S.A., collecting oil and gas data and natural gas samples Rocky Mountain Region, for U. S. Internal Revenue Bureau.

1923-1930. Independent Consulting Geologist and Mining Engineer, Denver, Colorado. Investigations in Wyoming, South Dakota, New Mexico, Texas, Oklahoma, Kansas, Colorado, Nebraska, Montana, Utah. South America, Brazil. Investigation of oil possibilities of Brazil.

1930-1932. Russia and Siberia. Chief Consulting Geologist for Tavetnetsloto, non-ferrous metal mining trust of the U.S.S.R. Examinations of lead, copper and zinc mines and prospects. Organization of geological and prospecting departments.

1932-1934. Geological and mine examinations, lode and placer mines, in Colorado. President and General Manager, Prommel Mining Company. Gold placer operations on South Boulder Creek, Gilpin County, Colorado. Report on Theory of origin of helium rich natural gases, their occurrence, distribution, drilling for same and development of fields. Report written for Soyuzgas Trust, U.S.S.R. Article on Oil and Gas Development in Utah, 1934, for A. I. M. M. E.

1935-____. Organizing Keystone drill test work, Pantolus placer, Colorado. Lode mine geological investigation Nevada. Investigation of tungsten mine, California, and gold silver mine, Panamint Range, California. Detailed sampling, value and yardage estimation and report on gold-scheelite desert placer deposit, Randsburg-Atolia District, California. Placer sampling and report Bighorn County, Wyoming.

(over to page 2)

1936-1942. Investigations and reports, reconnaissance and detail, sampling by various methods, structural and areal geologic and topographic mapping; lode mines and placer deposits; gold, silver, lead, zinc, copper, tungsten, fluorspar, oil and gas; in Colorado, New Mexico, Nevada, and in Sinaloa and Sonora, Mexico.

1942-1947. Project Engineer, U.S. Bureau of Mines, sampling and reporting on lead-zinc dumps, Leadville District, Colorado. Placer and lode mine investigations in Colorado, Sonora, Mexico, South Dakota; sampling and report on Bentonite, Wyoming. Sampling and reports on placer deposits in New Mexico and Virginia; fluorspar, phosphate, gold, silver, copper, lead investigations in Colorado and reports on same. Investigation of sand and gravel deposits in Western Colorado (Ute Indian lands).

1948-1955. Investigations and reports on Natural gas, fire clay, fluorspar, silver, lead zinc, tungsten, gold, sulphur, uranium, vanadium, manganese in Colorado, Montana, Idaho and Wyoming. Investigation of lode gold placer gold deposits in British Guiana, South America.

LANGUAGES. Speak, read and write ENGLISH, SPANISH, GERMAN. Some knowledge of FRENCH, PORTUGUESE AND RUSSIAN.

MAPPING, ETC. Plane Table, topography, structural and areal geology. Keep books, operate typewriter, Monroe calculator.

ENGINEERING SOCIETIES	American Institute of Mining and Metallurgical Engineers*-	1912
	American Association of Petroleum Geologists	1921
	Rocky Mountain Association of Geologists *-	1922
	North Texas Geological Society	1925
	Colorado Scientific Society *-	1929
	Colorado Mining Association and Denver Mining Club *-	1930
	Colorado School of Mines Alumni Association *-	
	*- Active 1955	

TECHNICAL ARTICLES PUBLISHED	Bulletin of the American Assoc. of Petroleum Geologists, Tulsa, Okla.	
	Inland Oil Index, Casper, Wyoming	
	Mining Review, Salt Lake City, Utah	
	Trans. American Inst. of Mining and Metallurgical Engineers, New York	
	Oil and Gas Journal, Tulsa, Oklahoma	
	Mining Congress Journal, Washington, D.C.	1940, 1945
	Colorado Mining Association Yearbooks, Denver, Colo.	1939, '41, '42, '43, '44
	Engineering and Mining Journal, New York	1941, 1942
	U.S. Bureau of Mines, Washington, D.C. (Inf. Circ. 6960)	1937
	Mines Magazine, Colorado School of Mines	1942, '45, '46, '49, '50

REFERENCES 1948

Mining Engineering and Geology

Robert S. Palmer, Secretary, Colo. State Mining Fund,
204 State Office Building, Denver, Colorado.

O. R. Whitaker, E. M.
932 Equitable Building, Denver, Colorado.

A. J. Martin, Supervising Engineer, Field Offices, U.S. Bureau of Mines,
Denver Federal Center, Denver, Colorado (Statistical)

Oil and Gas Geology

Hon. E. D. Millikin, Senator from Colorado
Senate Office Building, Washington, D. C.

C. E. Dobbin, Conservation Branch, U.S. Geological Survey
Denver Federal Center, Denver, Colorado

LEASES AND CONTRACTS

EXHIBIT 1 - OPERATING CONTRACT by and between TERMINAL EXPLORATION COMPANY and CULLEN MINERALS CORPORATION.

- AMENDMENT and MODIFICATION of above CONTRACT.

EXHIBIT 2 - AMENDED MINING LEASE by and between FEDERAL URANIUM CORPORATION and TERMINAL EXPLORATION COMPANY.

SECOND AMENDED MINING LEASE.

LETTER OF INTENT from FEDERAL URANIUM CORPORATION to TERMINAL EXPLORATION COMPANY.

State of Colorado)
County of Mesa)ss:

Recorded at 4:00 o'clock P.M. Aug 3 1956
Reception No. 624736
Annie M. Dunaton
Annie M. Dunaton
Recorder

BOOK 691 PAGE 379

AMENDMENT AND MODIFICATION OF AGREEMENT

THIS AMENDMENT AND MODIFICATION OF AGREEMENT, made and entered into as of the 24th day of April, 1956, by and between TERMINAL EXPLORATION COMPANY, a Nevada corporation, hereinafter called "Terminal", and CULLEN MINERALS CORPORATION, a Delaware corporation, hereinafter called "Cullen":

WITNESSETH:

WHEREAS, on the 22nd day of December, 1955, Terminal and Cullen entered into an Agreement, hereinafter referred to as the Terminal-Cullen Agreement, relating to the Elizabeth and Jody claims located in the ~~Mesa Creek~~ GATEWAY Mining District of Mesa County, Colorado; and

WHEREAS, at the time of the Terminal-Cullen Agreement, Terminal was the owner of a mining lease covering an eight-ninths (8/9) interest in the mining claims described therein; and

WHEREAS, since the date of the Terminal-Cullen Agreement the mining lease owned by Terminal has been amended to cover and include all, rather than an eight-ninths (8/9), interest in the mining claims described therein and certain additional mining claims; and

WHEREAS, Paragraph VII of the Terminal-Cullen Agreement provides that the net profit interest of Terminal shall be increased from a 7/18 interest to a 9/18 interest in the event that the additional 1/9 interest above referred to is acquired by Terminal; and

WHEREAS the parties hereto desire to modify and amend the Terminal-Cullen Agreement in the particulars hereinafter set forth;

NOW, THEREFORE, for and in consideration of the mutual covenants contained herein and the benefits to be derived by each of the parties hereto by the execution hereof, and for the purpose of including said additional interest and mining claims within the terms of the Terminal-Cullen Agreement and complying with the terms of the Terminal-Cullen Agreement, it

is hereby agreed as follows:

1. The first paragraph of the Terminal-Cullen Agreement is hereby deleted and there is substituted in its stead the following:

For and in consideration of the performance by Cullen of the covenants and agreements hereinafter expressed, Terminal does hereby sell, grant, bargain and assign unto Cullen all its right, title and interest in and to that certain Amended Mining Lease dated October 18, 1956, and that certain Second Amendment to Mining Lease, dated April 24, 1956, entered into by and between Federal Uranium Company, a corporation, as lessor, and Terminal, as lessee, covering the full interest in the following described unpatented mining claims located in the ~~Moore-Creek~~ GATEWAY Mining District of Mesa County, Colorado, the Location Certificates of which are recorded under the book and page numbers set forth opposite the names of such claims, in the records of the County Clerk and Recorder of said county, to-wit:

NAME OF CLAIM	RECORDED IN Book	Page
Elizabeth No. 1	291	493
Elizabeth No. 2	291	493
Elizabeth No. 9	291	497
Elizabeth No. 10	291	497
Elizabeth No. 14	291	499
Elizabeth No. 15	291	499
Elizabeth No. 16	291	500
Elizabeth No. 17	291	500
Elizabeth No. 18	291	501
Elizabeth No. 21	291	502
Jody No. 4	525	411
Jody No. 5	525	412
Jody No. 6	525	413
Jody No. 7	525	414
Elizabeth Fraction No. 22	655	307
Elizabeth No. 23	655	308
Elizabeth Millsite		
Dick No. 1	673	365
"S" Claim	673	250
Beth No. 2	673	248

and

All that part of Elizabeth Claims Nos. 7, 8, 13, 19 and 20, lying in Sections 29 and 32, Township 50 North, Range 17 West, New Mexico Principal Meridian,

together with all improvements and appurtenances thereon and personal property used in connection therewith.

2. Paragraph VII is hereby deleted in its entirety. The first sentence of Paragraph III is hereby deleted in its entirety and there is substituted in place thereof the following sentence:

Terminal hereby excepts and reserves unto itself, its successors and assigns, a one-half (1/2) interest in the net profits accruing as a result of ores, minerals and metals produced, saved and marketed from the leases assigned hereunder, said net profits to be calculated monthly and to be paid by Cullen to Terminal monthly on or before twenty days following the close of each calendar month.

3. Other than as specifically amended herein, the Terminal-Cullen Agreement shall remain in full force and effect as to all the provisions contained therein.

EXECUTED as of the day and year first above written.

Attest:

J. M. Muellen
Secretary

TERMINAL EXPLORATION COMPANY

By E. J. Jones
President

Attest:

CULLEN MINERALS CORPORATION

By R. J. Kaul
Vice President

STATE OF California)
) SS.
COUNTY OF Los Angeles)

The foregoing instrument was acknowledged before me this 24th day of April, 1956, by E. J. Jones as President of Terminal Exploration Company.

Witness my hand and official seal.

My commission expires My Commission Expires July 30, 1958

Notary Public

STATE OF Colorado)
) SS
COUNTY OF Mesa)

The foregoing instrument was acknowledged before me this 3rd day of August, 1956, by R. J. Kaul as Vice President of Cullen Minerals Corporation.

Witness my hand and official seal.

My commission expires August 4, 1956

Notary Public

C O N T R A C T

THIS CONTRACT, made and entered into this day by and between TERMINAL EXPLORATION COMPANY, a Nevada corporation, herein called "Terminal", and CULLEN MINERALS CORPORATION, a Delaware corporation, herein called "Cullen",

W I T N E S S E T H:

For and in consideration of the performance by Cullen of the covenants and agreements hereinafter expressed, Terminal does hereby sell, grant, bargain and assign unto Cullen all its right, title and interest in and to that certain Amended Mining Lease entered into on the 18th day of October, 1955, by and between Federal Uranium Company, a corporation, as lessor, and Terminal, as lessee (hereinafter referred to as the Federal Lease), covering an undivided eight-ninths (8/9) interest in the following described unpatented mining claims (hereinafter referred to as said leased premises), located in the Gateway Mining District of Mesa County, Colorado, the Location Certificates of which are recorded under the book and page numbers set forth opposite the names of such claims, in the records of the County Clerk and Recorder of said county, to-wit:

NAME OF CLAIM	RECORDED IN BOOK	PAGE
Elizabeth No. 1	291	483
Elizabeth No. 2	291	493
Elizabeth No. 9	291	497
Elizabeth No. 10	291	497
Elizabeth No. 14	291	499
Elizabeth No. 15	291	499
Elizabeth No. 16	291	500
Elizabeth No. 17	291	500
Elizabeth No. 18	291	501
Elizabeth No. 21	291	502

and

Jody No. 4	525	411
Jody No. 5	525	412
Jody No. 6	525	413
Jody No. 7	525	414

and

All that part of Elizabeth Claims Nos. 7, 8, 13, 19 and 20, lying in Sections 29 and 32, Township 50 North, Range 17 West, New Mexico Principal Meridian,

Exhibit 1

LHC
JAM

together with all improvements and appurtenances thereon and used in connection therewith.

I

Terminal represents and warrants that it is the true and lawful owner of the Federal Lease, free of encumbrances, a true and correct copy of said lease marked Exhibit "A" being hereto attached and referred to for a particular and full description of all things therein contained. Terminal does not warrant, either expressly or by implication, the title to the mining claims covered by said lease or the nature and extent of the interest in said claims which are covered by said lease.

II

In consideration of the foregoing assignment, Cullen contracts and agrees to enter upon said leased premises within fifteen (15) days after the execution and delivery to it of this contract and to assume at its own cost and expense (except as hereinafter provided) the responsibility and liability for the performance of the Federal Lease in accordance with the terms thereof, and in addition, Cullen will establish in the United States Bank of Grand Junction, Colorado, concurrently with the execution of this contract, a cash fund of Twenty-five Thousand Dollars ($25,000.00) to be expended, and it will expend the same, on said leased premises for exploration, development and mining.

III

Cullen shall have exclusive charge, control and supervision of all operations of every kind to be conducted on said leased premises for the exploration for and development, production, treating, handling, transporting and marketing of minerals and ores, as well as the payment of rentals, royalties, taxes and other charges which may arise or become due, it being agreed, however, that Cullen shall operate said leased premises in a good and workmanlike manner in accordance with all applicable laws, rules and regulations of governmental agencies.

Exhibit 1

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IV

(a) The net profits, if any, accruing from Cullen's operation of said leased premises shall be allocated in the following manner:

To Cullen:	9/18
To Terminal:	7/18
To the unleased interest:	2/18

Terminal hereby excepts and reserves unto itself, its successors and assigns a net profit interest in said amount shown above, as the same may be increased in accordance with Paragraph VIII hereof. Said interest shall be in effect during the existence of the Federal Lease and any extension, renewal or new lease taken in lieu thereof. Losses, if any, resulting from Cullen's operation shall not be chargeable to Terminal except out of net profit as herein computed.

(b) Net profits shall be calculated monthly and shall be paid by Cullen to Terminal monthly on or before twenty days following the close of each calendar month. Net profits shall be determined in accordance with good accounting practice. It is specifically provided that in determining net profits (1) overriding royalties or other encumbrances or interests created subsequent to the date hereof shall be disregarded, (2) no charge shall be made for any indirect or administrative expenses, such as over-head, bookkeeping, interest and the like; PROVIDED, HOWEVER, in the event that a geologist or mining engineer is employed on the premises a charge for such supervisory expense may be made not to exceed Fifty Dollars ($50.00) per day, (3) depreciation shall be computed on the straight line method, (4) all exploration costs shall be expensed, (5) all development costs shall be recovered through cost depletion for settlement between the parties hereto, but this provision shall not bind the parties to cost depletion for tax purposes, (6) no taxes based upon net income shall be considered an expense, (7) no expenditures attributable to the cash fund referred to in Paragraph II shall be taken into consideration in computing net profits, (8) proceeds derived

Exhibit 1

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AUG 31 1956

from the sale of all ores, materials and minerals produced from the mining claims described above shall be considered as income, including any portion thereof which may be allocable to the one-ninth interest not covered by the Federal Lease, (9) all bonuses, premiums and allowances paid by any Governmental agency in connection with the purchase of all ores, materials and minerals mined from said leased premises shall be considered income, including those allocable to the one-ninth interest not covered by the Federal Lease, (10) no expenditure attributable to a grant or loan made by any Governmental agency repayable solely out of production shall be deductible nor shall such expenditure increase the basis of property except that upon repayment of such grant or loan, the expenditures shall be allowed as deductions or increase basis of property as if made at the time of repayment, (11) a net loss, if any, occurring in any calendar month shall be carried forward and charged against the net profits of succeeding calendar months.

(c) Upon termination of operations on the premises, Cullen and Terminal shall attempt to agree on the salvage value of the equipment and materials which can readily be removed from the premises. If such agreement cannot be reached, such material and equipment shall be sold. In the event that the salvage of such material or equipment, whether determined by agreement or by sale, exceeds the cost of such material and equipment on the books of Cullen, then Terminal shall receive a share in the profits attributable to such excess, less any expenses of sale, in an amount equal to the percentage of its net profit interest as determined by Paragraphs IV and VIII hereof.

(d) No assignment may be made to any contractor of an interest in production from said leased premises, or profits hereunder, but Cullen may operate the property through contract drillers or miners, paying them on a flat rate per foot for drilling, a flat rate per ton for mining, or a flat rate per pound of metal

Exhibit 1

LHC
L.M.M.

recovered, such rates to be those that are usual, customary and reasonable, and such contract costs shall be a proper cost in computing net profits.

V

Cullen shall keep accurate records and accounts of its operation of said leased premises, including an accurate record of its expenditure of the $25,000.00 provided for in Paragraph II hereof. Terminal and its accredited representatives shall have the right at all reasonable times to examine the books and accounts, of Cullen maintained incident thereto. Terminal and its representatives, at their own risk, shall also have the right to go upon the leased premises from time to time for the purpose of examining the progress, extent and nature of the work performed hereunder by Cullen, and shall have the right to enter into the mines of said leased premises, take samples and perform geological examinations. Terminal and its representatives shall also have access to all geological and engineering data and reports made or acquired by Cullen with respect to said properties. Irrespective of whether or not there are net profits accruing to Terminal's interest, Cullen shall, on or before the 20th day following the close of each calendar month, furnish Terminal with a profit and loss statement and balance sheet reflecting operations on said leased premises during the preceding month, said balance sheet and profit and loss statement to be prepared in accordance with good accounting practice. Such statement shall be supported by copies of the ore settlement sheets or other receipts or statements given by any ore purchaser or any governmental agency with respect to the payment for ore sold from said mining property or the payment of any allowance, bonus, premium

Exhibit 1

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or other sum made with respect to the operation of said property. Upon request, such statements shall be supported by copies of all invoices, work orders or other applicable papers or records. Cullen monthly shall furnish to Terminal a copy of the report sent to Federal pursuant to Paragraph 16 of the Federal Lease.

VI

At any time when there is no accrued obligation hereunder or under the Federal Lease, and after the expenditure of the initial $25,000 as provided in Paragraph II hereof, Cullen shall have the right, at its election, to withdraw from this project and to cancel and terminate this contract, it being provided, however that prior to termination Cullen (a) shall have settled or paid all outstanding accounts, debts, demands and claims incurred in its operations hereunder and (b) if in default with respect to the Federal Lease, shall have corrected such default. If Cullen should so elect to terminate this contract, it shall notify Terminal in writing thereof of its desire and within a reasonable time thereafter, Terminal shall notify Cullen whether or not it elects to reacquire the Federal Lease from Cullen. If Terminal elects not to reacquire said lease, then Cullen shall terminate mining operations on said leased premises in accordance with applicable mining law and the charges of such termination shall be considered a proper item of expense in determining net profits as provided in Paragraph IV hereof. If Terminal elects to reacquire the Federal Lease, it shall notify Cullen in writing thereof and Cullen shall promptly execute such instruments as may be necessary or convenient to convey to Terminal all the interest in the Federal Lease which is acquired by Cullen hereby, free and clear of all encumbrances other than those, if any, which existed on the date of this contract. In the event of reassignment, the said leased premises shall be redelivered to Terminal in condition for continued mining, without removal of necessary ore pillars, together with all improvements and appurtenances thereon, including, but not by way of limitation, rail, air lines and wiring.

Exhibit 1

SHC
J.M.M.

VII

Cullen shall furnish promptly to Terminal copies of any notices or correspondence with Federal Uranium Company relating to said leased premises. In the event Federal Uranium Company gives any notice under Paragraph 13 of the Federal Lease and Cullen fails to correct the specified default within twenty (20) days, then in addition to any other remedy of Terminal hereunder, Terminal may terminate this contract and re-enter said leased premises for the purpose of correcting said default. In such event, Cullen shall surrender to Terminal immediate possession of said leased premises for such purpose.

VIII

With respect to the outstanding undivided one-ninth (1/9) unleased mineral interest in said lands, Cullen shall have the right to comply with the provisions of Article 23, Chapter 92, Colorado Revised Statutes, 1953, insofar as may be consistent with the provisions of the Federal Lease. If, at any time, however, while this contract is in force, subject to the provisions of the Federal Lease, Terminal should acquire in its own name a mining lease on said outstanding undivided one-ninth (1/9) interest, it will promptly assign the same to Cullen and Cullen will assume the obligations of the lessee thereunder to the extent only of obligations imposed upon the lessee in the Federal Lease, and if the lease to said undivided one-ninth (1/9) interest imposes greater burdens upon the lessee, Cullen will not be obligated to perform such greater burdens. Upon the assignment of such lease to Cullen, or if such undivided one-ninth interest becomes subject to the terms of the Federal Lease in accordance with Paragraph 24 thereof, the fractional interest of Terminal in the net profits of said mining operation as hereinabove defined, will be increased to nine eighteenths (9/18). If Cullen, either directly or indirectly, should acquire a lease covering said interest or the right to operate the same, then similarly the net profit interest of Terminal shall be increased from seven eighteenths (7/18) to nine eighteenths (9/18) in operations upon the leased premises.

Exhibit 1

LHe
L.M.M.

IX

Cullen shall keep said mining property free and clear from any lien or encumbrance resulting from Cullen's operations thereof. Cullen shall indemnify and hold Terminal harmless from any and all losses, claims, and demands resulting from Cullen's operations hereunder.

X

Cullen shall not assign or sublease its interest, or any part thereof, received hereunder or enter into any contracts by which third persons or companies may obtain an interest in production from the leased premises by mining, exploration or development work without first obtaining the written consent of Terminal; it being provided, however, that Cullen may assign said interest to a subsidiary corporation in which it is owner of a majority of the stock or to a successor corporation through merger, consolidation, or reorganization, or sale of all of its assets. In the event of assignment to such a subsidiary corporation Cullen shall remain liable for the performance hereof.

XI

It is understood that Terminal has paid $15,000 advance royalty pursuant to Paragraph 9 of the Federal Lease. Cullen agrees to pay Terminal fifteen per cent (15%) royalty otherwise payable to Lessor under paragraphs 5 and 6 of the Federal Lease, until said sum of $15,000 has been re-paid to Terminal.

XII

(a) Should Terminal actually have a valid lease on less than the full undivided eight-ninths (8/9) interest assigned hereby, and Cullen thereby become legally liable to make payments of net profits under the statutes of Colorado to unleased mineral interests (other than to the undivided one-ninth (1/9) not covered by the Federal Lease or by this assignment), such payments shall be deducted from the net profits of each party hereto in proportion to their respective interests therein.

Exhibit 1

JHC
J.M.M.

(b) All sums necessarily expended by Cullen in defending the title to the leasehold hereby assigned shall be chargeable as a cost in computing net profits.

XIII

It is hereby agreed that in case any disagreement or difference shall arise at any time hereafter between the parties hereto, or any person claiming under them, in relation to this contract, either as to the construction or operation thereof or the respective rights and liabilities thereunder, such disagreement or difference shall be submitted to the arbitration of three persons, one to be appointed by each party to this agreement, and the third to be appointed by the senior United States District Judge for the District of Colorado. None of such persons shall be financially interested in the affairs of either party hereto and shall be persons with mining or legal experience. And if either party shall refuse or neglect to appoint an arbitrator within five (5) days after the other party shall have appointed an arbitrator and served written notice thereof upon the other party requiring him to appoint an arbitrator, then the arbitrator so first appointed shall have power to proceed to arbitrate and determine the matters of disagreement or difference as if he were an arbitrator appointed by both parties hereto for that purpose, and his award in writing shall be final, provided such award shall be made within ten (10) days after such refusal or neglect of the other party to appoint an arbitrator. In case there are three arbitrators selected as above mentioned, an award in writing signed by any two of them shall be final.

XIV

In its operations hereunder Cullen will comply with applicable workmen's compensation laws, maintain in usual and customary amounts public liability, automobile, employer's liability and property insurance on major items of equipment and permanent improvements, premiums for all of which shall be a proper charge in computing net profits.

Exhibit 1

JHC
JAM

XV

This contract shall be effective on the date of delivery of this contract which is executed in duplicate originals by the proper officers of each party, all theretofore duly authorized by resolutions by the respective Board of Directors of the parties. It shall be binding upon and shall inure to the benefit of the respective successors and assigns of the parties hereto. The conditions and provisions hereof shall be covenants running with the land and leasehold estate assigned hereby.

DATED this 2 day of _____, 1955.

TERMINAL EXPLORATION COMPANY

By: E. N. Jones
President

ATTEST:
J. M. Mueller
Secretary

CULLEN MINERALS CORPORATION

By: Lucien Hugh Cullen
President

ATTEST:
Asst. Secretary

STATE OF California
COUNTY OF Los Angeles } SS.

The foregoing instrument was acknowledged before me this 2nd day of December, 1955, by E. N. Jones as President of TERMINAL EXPLORATION COMPANY.

Witness my hand and official seal.

My commission expires July 30 1958.

Marjorie H. Lugsen
Notary Public

STATE OF _____
COUNTY OF _____ } SS.

The foregoing instrument was acknowledged before me this _____ day of November, 1955, by Lucien Hugh Cullen, as President of CULLEN MINERALS CORPORATION.

Witness my hand and official seal.

My commission expires _____.

_____
Notary Public

Exhibit 1

JWC
J.M.M.

FEDERAL URANIUM CORPORATION

248 SOUTH MAIN STREET / SALT LAKE CITY, UTAH

TELEPHONE EMpire 3-5777

RECEIVED
AUG 31 1956

August 7, 1956

RICHARD W. LOTTRIDGE, *Assistant to the President*

Mr. Merle McKenzie
Terminal Exploration Company
P. O. Box 431
Grand Junction, Colorado

Dear Merle:

During our visit in your office on August 2nd, you told me that the A.E.C. certificate for the initial bonus on the Elizabeth Group of Claims shows only the name, "Elizabeth," and that the name, "Jody" does not appear. Your lease does not show the Elizabeths 3, 4, 5 and 6, but does cover the Jodys 4, 5, 6 and 7. We recognize that the Elizabeths 3, 4, 5 and 6 cover essentially the same ground as the Jodys above mentioned.

Please be assured that it is the intent of the lease that you be entitled to mine ore and to receive your portion of the initial bonus on the land covered by the Elizabeths 3, 4, 5 and 6.

Our Legal Department has been advised that the property description in the lease and assessment work papers described the land as being in T. 59 N., rather than in 50 N. The necessary corrections will be made.

Yours truly,

Richard W. Lottridge
Assistant to the President

RWL/bb

cc: Ralph W. Neyman
C. Allen Elggren

Exhibit 2

SECOND AMENDMENT TO MINING LEASE

THIS SECOND AMENDMENT TO MINING LEASE, made this 24th day of April, 1956, by and between FEDERAL URANIUM CORPORATION, a Nevada corporation, authorized to do business in Colorado, hereinafter referred to as "Lessor", and TERMINAL EXPLORATION COMPANY, a Nevada corporation, hereinafter referred to as "Lessee",

WITNESSETH:

WHEREAS, on March 31, 1955, Utida Uranium Co., Inc., as Lessor, to whose interest Federal Uranium Corporation has succeeded by way of a merger, and Terminal Exploration Company, as Lessee, did heretofore make and enter into a mining lease covering certain mining claims, which mining lease was amended on the 13th day of October, 1955; and

WHEREAS, there have been certain additional claims contiguous with the claims which were the subject of the mining lease, acquired by Federal Uranium Corporation since the last amendment, and the parties hereto specifically desire to make the said claims subject to said mining lease, as amended; and

WHEREAS, the Lessor has acquired through purchase, the outstanding undivided one-ninth (1/9) interest in the claims which are described in said lease.

NOW, THEREFORE, in consideration of the premises and mutual covenants and agreements hereinafter contained and the royalties to be paid by Lessee to Lessor, as provided in the Amended Mining Lease of October 13, 1955, the parties hereto agree as follows:

1. That Paragraph 2 of the Amended Mining Lease dated October 13, 1955 shall be amended to read as follows:

"Lessor represents to its best knowledge and belief that it is the owner, by way of location and mining deeds, of the following described unpatented lode mining claims, located in Mesa Creek Mining District of Mesa County, Colorado, the location certificates of which are located under the book and page numbers set forth opposite the names of such claims in the records of the County Clerk and Recorder of said county, to-wit:

Name of Claim	Recorded in Book	Page
Elizabeth No. 1	291	493
Elizabeth No. 2	291	493
Elizabeth No. 9	291	497
Elizabeth No. 10	291	497
Elizabeth No. 14	291	499
Elizabeth No. 15	291	499
Elizabeth No. 16	291	500
Elizabeth No. 17	291	500
Elizabeth No. 18	291	501

Exhibit 2

Name of Claim	Recorded in Book	Page
Elizabeth No. 21	291	502
Jody No. 4	525	411
Jody No. 5	525	412
Jody No. 6	525	413
Jody No. 7	525	414
Elizabeth Fraction No. 22	655	307
Elizabeth No. 23	655	308
Elizabeth Millsite		
Dick No. 1	673	365
"S" Claim	673	250
Beth No. 2	673	248

and

All that part of Elizabeth Claims Nos. 7, 8, 13, 19 and 20, lying in Sections 29 and 32, Township 59 North, Range 17 West, New Mexico Principal Meridian, all in Mesa County, Colorado.

2. That Amended Mining Lease dated October 13, 1955 and recorded on December 2, 1955 in Book 669, Page 305 in the Recorders Office of Mesa County, Colorado, is and shall in all other respects remain in full force and effect.

3. That this Amendment to Mining Lease shall be binding upon and shall enure to the benefit of the parties hereto and their respective successors.

IN WITNESS WHEREOF, the parties hereto have executed this Second Amendment to Mining Lease as of the day and year first above written.

FEDERAL URANIUM CORPORATION,
A Nevada Corporation, Lessor

ATTEST:

Secretary

By: W D Nebeker Jr
President

TERMINAL EXPLORATION COMPANY,
A Nevada Corporation, Lessee

ATTEST:

Secretary

By: _____
President

STATE OF UTAH)
)ss:
COUNTY OF SALT LAKE)

On the 24th day of April, 1956, before me personally came W. D. NEBEKER, JR., to me known, who being by me duly sworn, did depose and say that he resides in Salt Lake City, Utah; that he is President of FEDERAL URANIUM CORPORATION, the corporation described in and which executed the foregoing Second Amendment to Mining Lease; that he knows the seal of said Corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of

RECEIVED
AUG 31 1955

Directors of said Corporation, and that he signed his name thereto by like order.

Lee M. Zenker
Notary Public
Residing at: LEE M. ZENKER
SALT LAKE CITY, UTAH

My Commission Expires:

APRIL 12, 1959

STATE OF CALIFORNIA)
)ss:
COUNTY OF)

On the day of April, 1956, before me personally came , to me known, who being by me duly sworn, did depose and say that he resides at ; that he is President of TERMINAL EXPLORATION COMPANY, the corporation described in and which executed the foregoing Second Amendment to Mining Lease; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said Corporation, and that he signed his name thereto by like order.

Notary Public
Residing at:

My Commission Expires:

Recorded at 2:36 o'clock P. M., Dec 2, 1955
Reception No. 654315 Annie M. Dunston, Recorder

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AUG 31 1955

AMENDED MINING LEASE

THIS AMENDED MINING LEASE made this 18th day of October, 1955, by and between FEDERAL URANIUM CORPORATION, a Nevada corporation empowered to do business in Colorado, hereinafter designated as "Lessor" and TERMINAL EXPLORATION COMPANY, a Nevada corporation, hereinafter designated as "Lessee":

P R O V I D E S:

THAT WHEREAS on March 31, 1955, Utida Uranium Co., Inc. an Idaho corporation, as Lessor, and Terminal Exploration Company, as Lessee, did heretofore make and enter into a Mining Lease covering the hereinafter described mining claims and mining properties, which said Mining Lease was recorded on May 19, 1955, in Book 644 at Page 545, in the office of the County Recorder of Mesa County, State of Colorado;

AND WHEREAS, subsequently the said Lessor's interest of Utida Uranium Co., Inc., an Idaho corporation, in said Mining Lease was duly acquired by Federal Uranium Corporation, a Nevada corporation, and the Federal Uranium Corporation, a Nevada corporation, is presently the owner of the Lessor's interest therein and of the mining claims and mining properties subject to the interests and estate of Terminal Exploration Company, a Nevada corporation, as Lessee thereof;

AND WHEREAS, Federal Uranium Corporation, a Nevada corporation, as successor Lessor and owner of such mining claims and properties and Terminal Exploration Company, a Nevada corporation, as Lessee mutually desire to amend and change such prior Mining Lease, and for purposes of convenience desire all changes and other covenants incorporated into this one single instrument designated as "Amended Mining Lease", and for this reason and purpose do make, execute and deliver this "Amended Mining Lease";

NOW, THEREFORE, for and in consideration of the mutual covenants and agreements hereinafter contained and the payments to be made by Lessee to Lessor, as provided herein, the parties agree as follows:

1. This Amended Mining Lease when duly executed and delivered by Lessor and Lessee shall supersede the Mining Lease above referred to and duly recorded on May 19, 1955, in Book 644, at Page 545, in the office of the County Recorder of Mesa County, State of Colorado. Both parties acknowledge full performance by the other of the terms and provisions of said other Mining Lease.

2. Lessor represents to its best knowledge and belief that it is the owner of an undivided eight-ninths (8/9ths) interest in the following described unpatented mining claims located in the Mesa Creek Mining District of Mesa County, Colorado, the Location certificates of which are recorded under the book and page numbers set forth opposite the names of such claims of the records of the County Clerk and Recorder of said county, to-wit:

Name of Claim	Recorded in Book	Page
Elizabeth No. 1	291	493
Elizabeth No. 2	291	493
Elizabeth No. 9	291	497
Elizabeth No. 10	291	497
Elizabeth No. 14	291	499
Elizabeth No. 15	291	499
Elizabeth No. 16	291	500
Elizabeth No. 17	291	500
Elizabeth No. 18	291	501
Elizabeth No. 21	291	502

and,

Exhibit 2

Name of Claim	Recorded in Book	Page
Jody No. 4	525	411
Jody No. 5	525	412
Jody No. 6	525	413
Jody No. 7	525	414

and,

All that part of Elizabeth Claims Nos. 7, 8, 13, 19 and 20, lying in Sections 29 and 32, Township 59 North, Range 17 West, New Mexico Principal Meridian, all in Mesa County, Colorado,

together with all improvements and appurtenances thereon.

3. Lessor does hereby lease, demise and let unto Lessee the unpatented mining claims hereinabove described for the purpose of exploring and prospecting for and developing, mining and selling ore, materials, and minerals of all kinds, and with the right to remove, ship, treat, sell and dispose of the same and retain the proceeds therefrom for Lessee's own use upon payment to the Lessor of the royalties hereinafter set forth.

4. The term of this Lease shall be from the date hereof to July 1, 1965, unless sooner forfeited or terminated in the manner provided herein.

5. Lessee shall pay to Lessor as a royalty an amount equal to fifteen percent (15%), subject to reduction as provided in paragraph 6 hereof, of the gross amount of the returns received by Lessee from the sale of all ores, minerals, concentrates, and metals produced and sold from the mining claims leased hereby, such royalty to be computed on the following basis:

(a) Should the Atomic Energy Commission or other successor government agency discontinue its present ore purchase program during the term of this Lease or any extension thereof, and if any ores or minerals mined hereunder are concentrated or treated at a mill or smelter not owned by the Lessee, then royalties shall be computed upon the amount of the gross sale price of such concentrates, less a proportionate part of the smelter and mill charges and penalties paid with reference thereto.

(b) If ores or minerals are sold to the United States of America (or any Department of or Commission thereof) or to any other purchaser in crude form and prior to milling or concentration, royalties shall be computed on the gross amount of such sale; it being provided, however, that the term "sale" (1) shall not be construed to include development or haulage allowances and (2) shall be construed to include discovery bonuses paid by the Atomic Energy Commission.

(c) Lessee may also deduct a proportionate part of any taxes which may be assessed against said Lessor's royalty interest or the interest in production from which the same is paid if paid by Lessee. All payments of the royalty herein provided shall be paid by the smelter, custom mill, or other mineral-purchasing agency directly to the Lessor at the time of settlement for each lot purchased, if such method of payment is customarily allowed by such mineral purchaser, unless there exists a credit balance in favor of Lessee by reason of the payment of advance royalties as provided in Paragraph~~s~~ ~~10 and 11~~ hereof. In no event shall the Lessee be required to pay royalties hereunder until Lessee has received the proceeds from the sale of ores, minerals, or concentrates upon which said royalty is to be computed.

6. Royalties which may be paid hereunder shall be paid in the proportion that the interest owned by Lessor (i.e., an undivided 8/9ths interest) in the leased premises bears to the entire and undivided mineral estate therein.

7. Lessee may install, maintain, replace and remove, during the term of this Lease, and any extension or renewal thereof, any and all mining machinery, equipment and tools which it may desire for use on or in connection with its operations hereunder on the leased premises. Upon termination of this Lease by lapse of time, default, or otherwise, Lessee shall have a period of sixty (60) days following such termination during which it may remove, at its own expense, any and all machinery, equipment, tools, and supplies placed by it on the leased premises.

8. Lessee shall have the use of buildings and mining equipment which is appurtenant to the mine shaft, ore dump, winch house, and other buildings, if any, now on the leased premises.

9. Upon delivery of the mining lease referred to in the first premise hereof, Lessee paid to the Lessor therein the sum of Fifteen Thousand Dollars ($15,000.00) as an advance royalty and in the event of production and sale of ore from the leased premises, Lessee shall not be obliged to pay to Lessor herein any royalties thereon until the amount of royalties accruing hereunder on the basis of computation as herein provided, shall equal the sum of Fifteen Thousand Dollars ($15,000.00).

10. Lessee agrees to perform or cause to be performed on the average during the six months' period commencing sixty (60) days from the date hereof not less than sixty (60) eight-hour man shifts during each calendar month; not less than one hundred twenty (120) eight-hour man shifts during each calendar month on the average during the six months' period following; and not less than one hundred eighty (180) eight-hour man shifts in each calendar month on the average thereafter during the remainder of the term of this Lease. Coring, drilling, road building, geological services, and engineering services shall apply on the work shift requirements, and where payments therefor are in excess of daily miner's wages per eight-hour shift, the same shall be spread and credited in satisfaction of shift requirements on the basis of the use of the unit of miner's wages per eight-hour shift.

11. The Lessee agrees to enter in and upon the leased premises and to explore and develop the same in a good and workmanlike manner and in a manner necessary for economical mining and to produce the greatest amount of marketable ore feasible, with due regard to the development and preservation of the mine and premises as a workable mining unit and economical operation.

12. Lessor or its duly authorized representative shall have the right at all reasonable times and at its own risk to enter into and upon said premises and workings thereon for the purpose of examining and inspecting the same and ascertaining whether the terms and conditions hereof are being carried out and performed by Lessee, and Lessor or its duly authorized representative shall at all reasonable times have access to records of production and such other records as will show compliance of Lessee with the provisions of this Lease.

13. If Lessee shall fail to perform any term or condition on its part to be performed, Lessor may give Lessee written notice specifying such failure, and the Lessee shall have thirty (30) days thereafter to remedy such default. Upon failure or refusal by the Lessee within such thirty-day period to remedy such default, then all Lessee's rights hereunder except the right to remove machinery and equipment as provided hereinabove, shall terminate.

14. It is expressly agreed that Lessee, at any time hereafter, upon thirty (30) days' written notice, may terminate this agreement and be freed from any and every obligation and liability hereunder or in any manner arising out of any

term, covenant or condition hereof, excepting only the obligation of Lessee to pay royalty on all ores, minerals, concentrates and metals actually produced and sold on the terms as provided herein. Such termination may be effected by Lessee by mailing a written notice to Lessor stating the intention of Lessee to discontinue performance hereunder and to surrender this Lease and all rights as Lessee hereunder.

15. The Lessor shall file the annual work affidavits required by law to be filed on said claims within the time and in the manner required by law, but Lessee for this purpose shall make available to Lessor on or before May 1st of each year such of Lessee's records of expenditures that may be useful in the preparation of said affidavits. In the event Lessor fails or refuses to file said affidavits, the Lessee may prepare and file the same upon the basis of the work performed by it.

16. Lessee shall furnish to Lessor, on or before the 20th day of each succeeding month, records of the previous month's operation showing among other things, (a) the number of work shifts conducted during the preceding month; (b) the number of ore shipments and the tonnage thereof made during the preceding month; (c) representative assay reports made during the preceding month upon the faces then being worked; and (d) reports and the results of additional exploratory drilling.

17. The waiver of any breach or default shall not constitute a waiver of any succeeding breach or default by the Lessee.

18. The Lessee may only assign this lease upon obtaining the written consent of the Lessor; provided, however, that Lessee may have the right to sublease portions of the claims which are the subject of the terms of this lease provided that Lessee shall continue to be fully responsible and liable for performance of this lease in accordance with the terms hereof.

19. The Lessee agrees to operate the leased premises without risk or liability to the Lessor; and Lessee shall hold Lessor harmless and free and clear of any and all liability of every kind and character arising out of said operations and to indemnify and save harmless Lessor from and against any and all claims and demands whatsoever arising out of such operations.

20. Should the United States of America or its duly authorized buyers suspend the purchase of uranium, thorium, or any other fissionable material produced from said claims, for a period of time, and there is no other market where ores can be sold at a reasonable profit, this Lease shall not expire during said period of suspended buying and shall not be subject to cancellation by the Lessor during such period, and Lessee's obligations under Paragraph 10 and other similar and allied provisions of this Lease shall be suspended during such period or periods of time. Failure or refusal to perform any of the covenants or conditions hereof on the part of the Lessee shall not be ground for cancellation or termination or forfeiture hereof if such breach or failure to perform is caused, or compliance is prevented, by severe winter weather, explosion, unusual mining casualty, fire, flood, civil or military authority, insurrection, riots, strikes, acts of God, or any other circumstance or condition beyond the control of the Lessee, whether or not the same is herein enumerated while any such condition shall continue to exist, and the time covered by the pendency of any of the above contingencies shall not be counted against the Lessee as affecting the term of this Lease.

21. Lessee shall comply with the requirements of the applicable Workmen's Compensation or Employer's Liability Laws of the State of Colorado and shall indemnify and save harmless Lessor from all labor liens, mechanics' liens and materialmen's liens and other liens or charges upon the leased premises and upon any machinery and equipment, if any, rented or loaned by Lessor to Lessee.

22. All notices and reports to be given hereunder may be given by mailing the same by registered mail, postage prepaid, as follows:

LESSOR: Federal Uranium Corporation
David-Keith Building
Salt Lake City, Utah

LESSEE:

23. Lessor declares that in accordance with its best knowledge and belief the leased premises are subject to no prior possessory or contractual rights and that it is the owner of the leased premises under the existing laws of the United States and State of Colorado, subject to no outstanding encumbrances, liens, clouds, title defects other than as enumerated herein. Lessee shall have the right at any time to pay for Lessor any mortgage, taxes or other liens on the above described lands, in the event of default of payment by Lessor and be subrogated to the rights of the holder thereof, and Lessor hereby agrees that any such payments made by the Lessee for the Lessor may be deducted from any amounts of money which may become due to the Lessor under the terms of this Lease.

24. In the event that Lessor hereafter acquires any additional interest in the mining claims hereby leased, then such interest shall automatically become subject to the terms of this mining lease. In the event that Lessee acquires the undivided 1/9 interest which is not presently owned by Lessor, or any portion thereof, then Lessee shall offer to convey said interest to the Lessor upon the same terms and conditions as acquired by Lessee upon the payment by Lessor to Lessee of all sums of money expended by Lessee in the acquisition thereof.

25. Lessee agrees to pay or cause to be paid all taxes which may accrue on the leased premises during the continuance of this agreement, including its proportion of taxes measured on production, and all taxes levied and assessed on improvements placed upon the leased premises by the Lessee during the continuance of this agreement. Lessee shall not be responsible for the payment of any taxes which may have accrued on the leased premises prior to the date hereof, whether or not said taxes may actually have been assessed prior thereto.

26. This agreement shall be binding upon and shall inure to the benefit of the parties hereto and their respective successors and assigns. Time is of the essence hereof, in each and every one of the particulars of performance hereunder.

IN WITNESS WHEREOF, the parties hereto have executed this Lease as of the day and year first above written.

LESSOR:

FEDERAL URANIUM CORPORATION,
a Nevada corporation

By W D Nebeker Jr

ATTEST:

LESSEE:

TERMINAL EXPLORATION COMPANY,
a Nevada corporation

By G N Jones
President

ATTEST:

M Mueller
Secy.

Exhibit 2

STATE OF Utah)
) ss
COUNTY OF Salt Lake)

The foregoing instrument was acknowledged before me this 18th day of October, 1955 by W. D. NEBEKER, JR. as PRESIDENT of Federal Uranium Corporation.

WITNESS my hand and official seal.

Margaret M. Stewart
NOTARY PUBLIC

Residing at Salt Lake City, Utah

My Commission Expires:
July 18, 1959

STATE OF CALIFORNIA)
) SS
COUNTY OF LOS ANGELES)

The foregoing instrument was acknowledged before me this 21 day of October, 1955 by E. A. Jones as President of Terminal Exploration Company.

WITNESS my hand and official seal.

Marjorie H. Jupson
NOTARY PUBLIC

Residing at Los Angeles Calif

My Commission Expires:
My Commission Expires July 30, 1958

MAPS

MAP NO. 1 - Map of Elizabeth Group of Claims, Gateway Mining District, Mesa County, Colorado.

Plane Table Survey and Compilation by H. W. C. Prommel.

Superimposed upon Map are: Proposed Core and Drill Holes, and Areas of Favorability, Semi-Favorability and Unfavorability.

o - Core Holes Surface to Entrada

o - Plug Bit Holes to Entrada

⊙ - Plug Bit Holes through 3rd Rim

- Favorable Areas

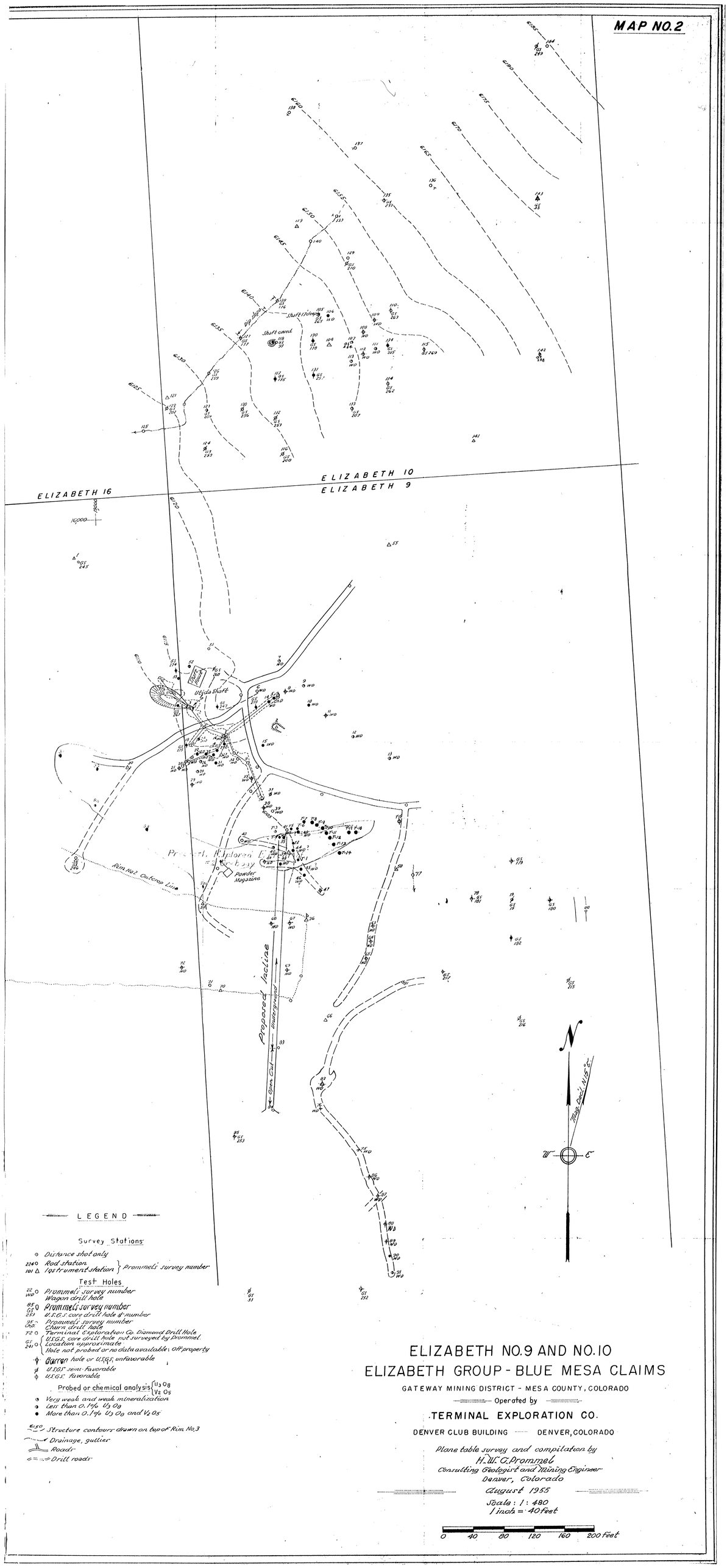
- Semi-Favorable Areas

- Unfavorable Areas

MAP NO. 2 - Large Scale Map of Portions of Elizabeth No. 9 and Elizabeth No. 10.

MAP NO. 3 - Cross Sections A - A' and B - B'.

MAP NO. 2



ELIZABETH NO. 9 AND NO. 10
ELIZABETH GROUP - BLUE MESA CLAIMS

GATEWAY MINING DISTRICT - MESA COUNTY, COLORADO

Operated by

TERMINAL EXPLORATION CO.

DENVER CLUB BUILDING — DENVER, COLORADO

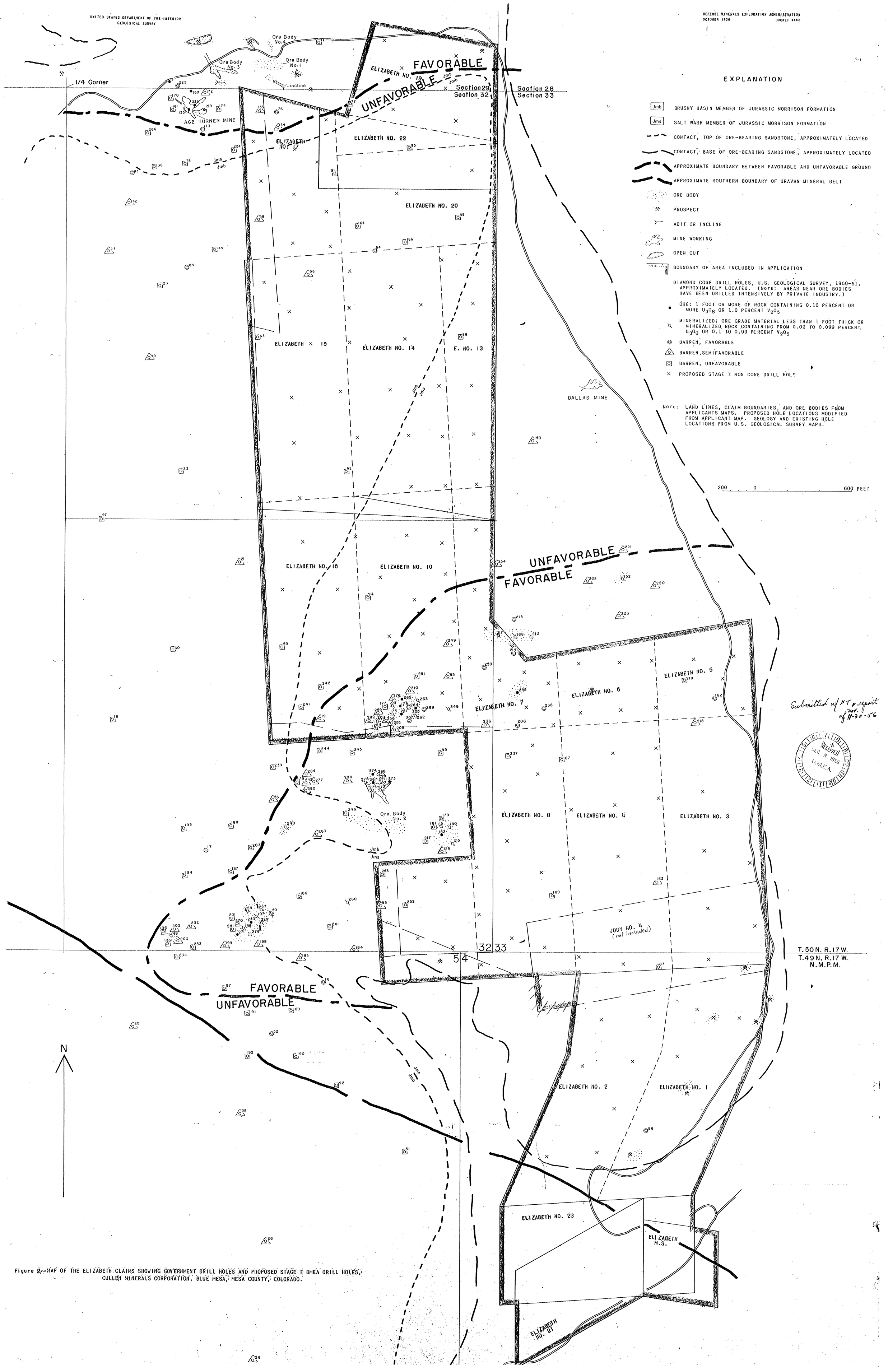
Plane table survey and compilation by
H. W. G. Prommel
Consulting Geologist and Mining Engineer
Denver, Colorado

August 1955

Scale: 1 : 480
1 inch = 40 feet

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DEFENSE MINERALS EXPLORATION ADMINISTRATION
OCTOBER 1956 DOCKET 4446

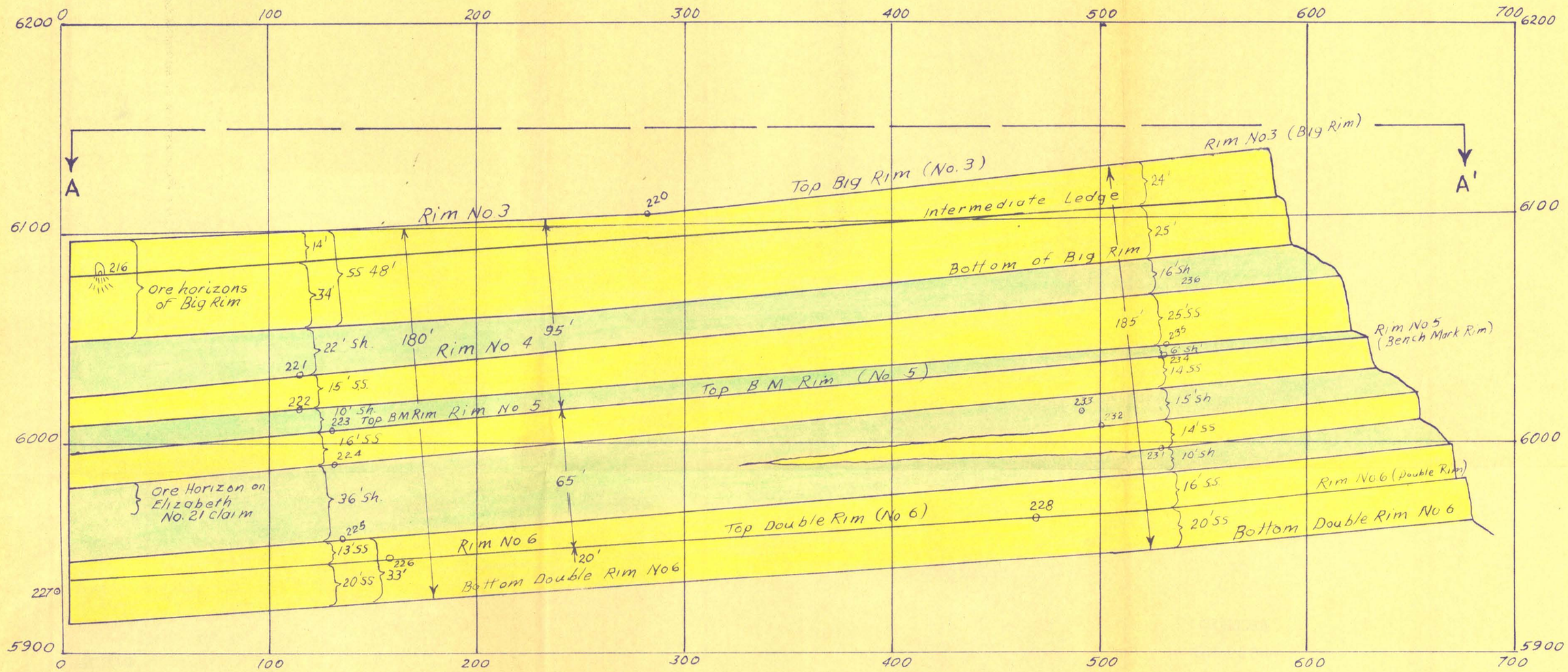


Submitted w/ FT report of Nov. 30-56

RECEIVED DEC 3 1956 D.M.E.A.

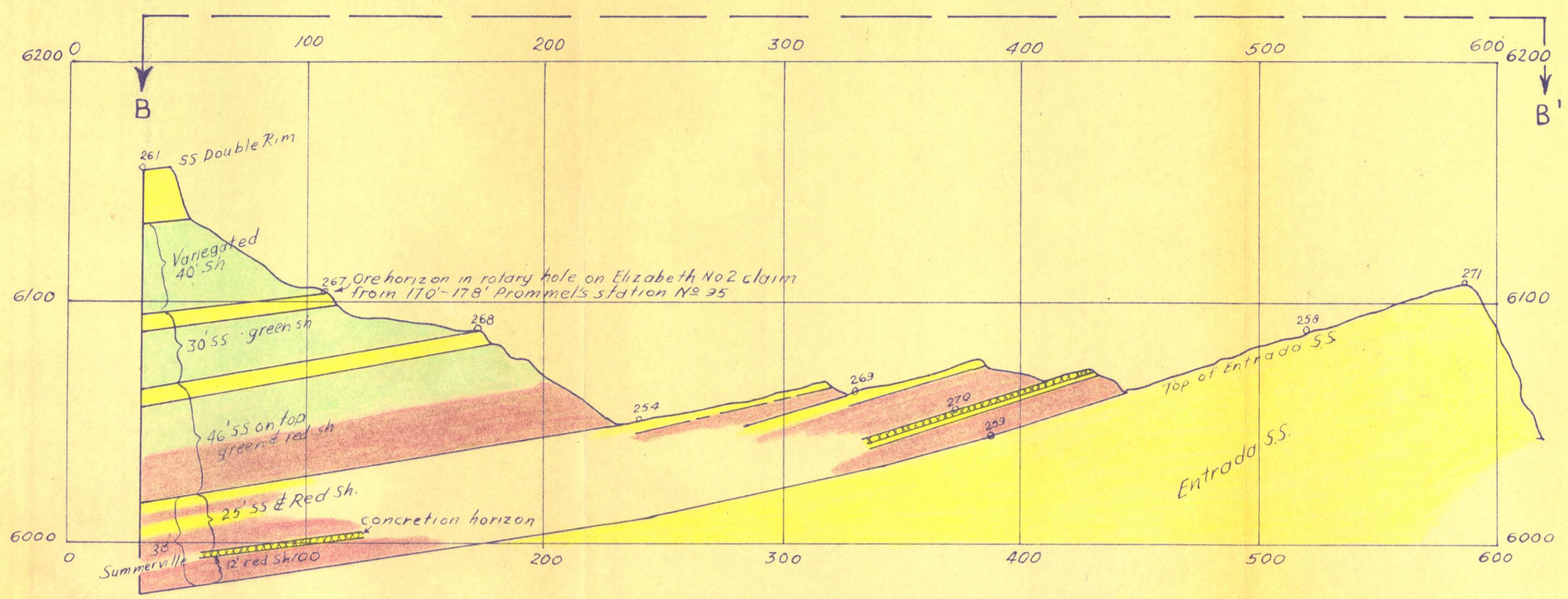
Figure 2r-MAP OF THE ELIZABETH CLAIMS SHOWING GOVERNMENT DRILL HOLES AND PROPOSED STAGE I DMEA DRILL HOLES, CULLEN MINERALS CORPORATION, BLUE MESA, MESA COUNTY, COLORADO.

MAP NO.3



SECTION A-A'

Horizontal & Vertical Scale 1" = 40'



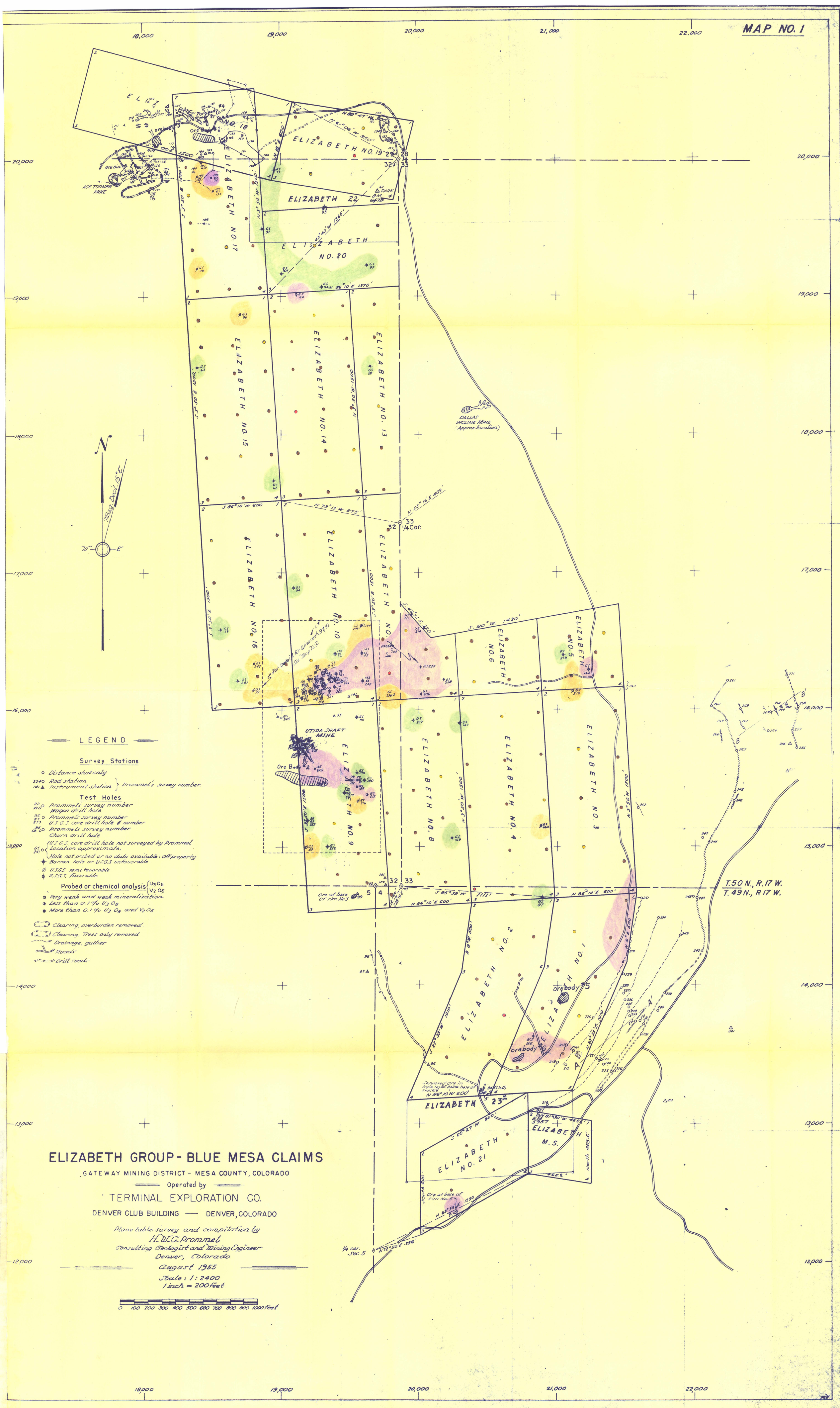
SECTION B-B'

Horizontal & Vertical Scale 1" = 40'

Legend

SS Sandstone
Sh. Shale (Green or Red as indicated)

Compiled & plotted by H.W.C. Prommel
August, 1955


MAP NO. 1
ELIZABETH NO. 19
ELIZABETH 22
ELIZABETH NO. 17
ELIZABETH NO. 20
ELIZABETH NO. 15
ELIZABETH NO. 14
ELIZABETH NO. 13
ELIZABETH NO. 16
ELIZABETH NO. 10
ELIZABETH NO. 7
ELIZABETH NO. 6
ELIZABETH NO. 5
ELIZABETH NO. 9
ELIZABETH NO. 8
ELIZABETH NO. 4
ELIZABETH NO. 3
ELIZABETH NO. 2
ELIZABETH NO. 1
ELIZABETH 23
ELIZABETH NO. 21
ELIZABETH M.S.
ACE TURNER MINE
DALLAS INCLINE MINE (Approx. location)
UTIDA SHAFT MINE
Ore Body #1
Ore Body #2
orebody #5
orebody #6
Mag. Decl. 15° E
T.50 N., R.17 W.
T.49 N., R.17 W.
LEGEND
Survey Stations
Distance shot only
Rod station
Instrument station
Prommel's survey number
Test Holes
Prommel's survey number
Wagon drill hole
Prommel's survey number
U.S.G.S. core drill hole & number
Prommel's survey number
Churn drill hole
U.S.G.S. core drill hole not surveyed by Prommel
Location approximate.
Hole not probed or no data available: Off property
Barren hole or U.S.G.S. unfavorable
U.S.G.S. semi-favorable
U.S.G.S. favorable
Probed or chemical analysis
Very weak and weak mineralization
Less than 0.1% U3O8
More than 0.1% U3O8 and V2O5
Clearing, overburden removed.
Clearing. Trees only removed
Drainage, gullies
Roads
Drill roads
ELIZABETH GROUP - BLUE MESA CLAIMS
GATEWAY MINING DISTRICT - MESA COUNTY, COLORADO
Operated by
TERMINAL EXPLORATION CO.
DENVER CLUB BUILDING — DENVER, COLORADO
Plane table survey and compilation by
H. W. G. Prommel
Consulting Geologist and Mining Engineer
Denver, Colorado
August 1955
Scale: 1:2400
1 inch = 200 feet
0 100 200 300 400 500 600 700 800 900 1000 feet