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

224 New Customhouse
Denver 2, Colorado

August 27, 1954.

Memorandum

To: Secretary to the Operating Committee, DMEA

From: Executive Officer, DMEA Field Team, Region IV

Subject: Docket No. DMEA-3152 (Uranium), Hanosh Mines, Inc., McKinley County, New Mexico.

Enclosed are four copies of the report of field examination on the subject application and two copies of Form 3b.

This docket has been closed by this office effective August 16, 1954 because the applicant has not provided an approved Assignment of Lease.

W. H. King

Enclosures

RDB:cwm

cc: Docket
Administrator, DMEA
WMTraver
Arnold Brokaw
AHKoschmann
Chron.

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Mining Division
Region IV

March 3, 1954.

Memorandum

To: Field Team, Region IV

From: Chief, Mining Division, Region IV

Subject: Report of Examination - DMEA Docket 3152 (Uranium), Hanosh Mines, Inc., McKinley County, New Mexico.

Enclosed are eleven copies of the engineering report of examination on the subject docket.

The applicant requested $26,460.69 to drill the property on a scale which appears to be too ambitious to the examining engineer.

The examining engineer recommends a drilling program to be divided into three stages, the work to consist of 342 holes averaging 40.5 feet in depth at an estimated total cost of $13,851.00.

We concur in this recommendation.

W. H. King

W. H. King

Enclosures

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

Memorandum

February 19, 1954

To : W. H. King, Chief, Mining Division, Region IV

From : Chief, Mining Methods Br., Mining Div., Region IV

Subject : Engineering Report on Docket DMEA-X152, Hanosh Mines, Inc., Uranium Property, McKinley County, N. Mex.

Enclosed are original and 9 copies of a revised report by Lloyd L. Farnham of the Bureau of Mines on the above property. The other copy will be forwarded to you by R. P. Fischer of the Geological Survey's Grand Junction office. J. D. Strobell of the Geological Survey has read and approved this report by Farnham.

The DMEA field examiners recommend that Hanosh Mines, Inc. be granted exploration assistance to drill its property north of Grants, N. Mex. I concur with this recommendation.

Walter R. Storms

Walter R. Storms

CC W. H. King (10)
R. P. Fischer
DMEA-X152
DF

WRStorms:frj

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Defense Minerals Exploration Administration
Denver Federal Center
Denver 2, Colorado

February 23, 1954

Memorandum

To: DMEA Field Team, Region IV

From: A. H. Koschmann

Subject: DMEA Docket 3152, Hanosh Mines, Inc., McKinley County, New Mexico

Enclosed are 11 copies of a geologic report by J. D. Strobell, Jr., of the U. S. Geological Survey covering the above docket.

The recommended plan of exploration has been revised to agree with that suggested by Lloyd Farnham of the Bureau of Mines office in Tucson, as requested by the Field Team in December.

A. H. Koschmann

A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures (11)

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

C
O
P
Y

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey
P. O. Box 360
Grand Junction, Colo.

February 24, 1954.

Memorandum

To: W. H. King, DMEA Field Team, Region IV

From: R. P. Fischer, Colorado Plateau District

Subject: DMEA 3152, Hanosh Mines, Inc., Uranium Property, McKinley County, New Mexico.

Forwarded herewith is carbon copy of Farnham's report, DMEA 3152, Hanosh Mines, Inc., Uranium Property, McKinley County, New Mexico, as requested by Storms in his memorandum of February 17.

/s/ R. P. Fischer
District Supervisor

Enclosure

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

P. O. Box 360
Grand Junction, Colo.

February 19, 1954

Memorandum

To: A. H. Koschmann, Field Team, Region IV

From: R. P. Fischer, Supervisor, Colorado Plateau District

RPF

Subject: DMEA 3152, Hanosh Mines, Inc., McKinley County, New Mexico

Transmitted herewith are 11 copies of Strobell's revised report on the above application. The recommended plan of exploration has been revised to agree with that suggested by Lloyd Farnham of the Bureau of Mines office in Tucson, as requested by the Field Team in December.

Enclosures 11
JDS/mlr

cc: A. H. Koschmann (1 extra)
W. H. King
W. R. Storms

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P. O. BOX 360
GRAND JUNCTION, COLORADO

October 9, 1953

Memorandum

To: A. H. Koschmann, DMEA Field Team, Region IV

From: R. P. Fischer, Acting Supervisor
Colorado Plateau District

Subject: DMEA 3152, Hanosh Mines, Inc., McKinley County, New Mexico

Transmitted herewith are eleven copies of a geologic report on the ground leased by the Hanosh Mines, Inc., McKinley County, N. Mex. The company applied for assistance in exploring for uranium; they propose to do 30,410 feet of drilling and related work at an estimated cost of $26,460.69.

The attached report is prepared by J. D. Strobell, Jr., and is based on a joint field examination on September 15 with Lloyd Farnham, USBM, and Irving Rapaport, representing the applicants. The examining team also conferred with P. E. Melancon, AEC geologist, who is in general agreement with the conclusions and recommendations offered in the report.

Strobell concludes that exploration in the area has a good chance of finding 6,000 to 9,000 tons of ore, and thus is favorable for exploration. On this basis, he recommends an exploration contract, pointing out at the same time, however, that the value of the ore expected probably will not be sufficient to repay through royalty payments the entire cost to the government. A program of ~~15,000~~ feet of drilling, smaller than that proposed by the applicant, is suggested. 13,851

I concur with these conclusions and the suggested plan of exploration.

R. P. Fischer

R. P. Fischer
Acting District Supervisor

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

Enclosures 11

RPF/mlr

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In August 1953, Hanosh Mines, Inc. applied to the Defense Minerals Exploration Administration, under the Defense Production Act of 1950, as amended, for an exploration loan amounting to $26,460.69. The application was docketed as DMEA-3152. The funds requested were to be used in the exploratory drilling of a uranium prospect situated in the Grants district of northwestern New Mexico. The property was examined[1/] on September 15, 1953.

Extensive exploration has been under way in the Grants region since 1950 when the presence of uranium first was detected. The deposits occur as sporadic, irregular, blanket-type replacements in the Todilto limestone and also in some of the overlying formations. The Todilto in the Grants area is a persistent gently dipping (4°) bed about 20 feet in thickness which owing to its relative resistance to erosion, usually caps many of the lower benches and mesas along the valley floors.

The project property covers an unexplored area of about 43 acres that is underlain by this ore-bearing limestone. Except in the immediate vicinity of the outcrop the favorable bed is usually completely covered with varying amounts of soil and younger sediments, which increase progressively in thickness down the dip of the limestone. This mantle of overburden not only covers the area proposed for exploration but prevails generally throughout the district. Structural controls or other ore-guides usually are lacking so that closely spaced

1/ Farnham, L. L., Mining Engineer, Bureau of Mines; Strobell, J. D., Geologist, Geological Survey

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

blind drilling has been, and still is the only practical means of discovering ore in the district. Exploratory drilling of this nature has found important, but sporadic ore bodies occupying an irregular belt that extends for about 3 miles to the southeast and for some 4 miles west of the subject property.

The applicant proposed to explore the 43-acre tract by 30,410 feet of rotary drilling in 706 holes, spaced from 100 to 25 feet apart. This work was estimated to cost $26,460.69. As this amount of drilling appeared excessive for the purpose of exploration, an alternative program was recommended which involved 13,850 feet of drilling in 342 holes at an estimated cost of $14,500.

The area proposed for exploration is favorably situated in respect to a productive trend and for that reason it appears to be worthy of exploration. Therefore, it is recommended that a loan amounting to not more than $14,500 be approved.

UNITED STATES DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMEA 3152, Hanosh Mines, Inc.,

Section 22, T. 13 N., R. 10 W., Grants District,

McKinley County, New Mexico

Uranium

Geologic report

J. D. Strobell, Jr., Geologist
U. S. Geological Survey

October 9, 1953

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

HANOSH MINES, INC.,
McKINLEY COUNTY, NEW MEXICO

INTRODUCTION AND SUMMARY

Application has been made by Hanosh Mines, Inc., for government assistance (DMEA 3152) in exploring for uranium in the Todilto limestone of the Grants District, McKinley County, N. Mex. The applicant proposes 30,410 feet of drilling, at an estimated cost of $26,460.69, to explore about 45 acres in the NE ¼, sec. 22, T. 13 N., R. 10 W. The property was examined on September 15, by Lloyd Farnham of the U. S. Bureau of Mines, Tucson, Ariz., and J. D. Strobell, Jr., of the U. S. Geological Survey, Grand Junction, Colo. The examiners were accompanied by the applicant's representative, Mr. Irving Rapaport, and conferred also with Mr. P. E. Melancon, District Geologist of the U. S. Atomic Energy Commission, Grants, N. Mex.

The property lies on allotted Indian lands. Prospecting and mining rights are leased to the applicant with the approval and under the general supervision of the Bureau of Indian Affairs, U. S. Department of the Interior. Royalties stipulated by that Bureau range from 10 to 20 percent of the mine value of the ore (excluding allowances for development and transportation) and include in addition 10 percent of any bonuses paid by the U. S. Atomic Energy Commission.

A somewhat curtailed program (about 50 percent reduction) to explore this property with government assistance is recommended. The applicant's proposal is considered to carry the exploration too far into the development phase not appropriately a part of DMEA exploration. A maximum of ~~15,000~~ 13,851 feet of drilling in primary and offset holes is recommended. It is also suggested that in addition to the radiometric logging of these holes proposed by the applicant, collection of cuttings from the limestone be required until such time as the reliability of radiometric logging is definitely established in the district.

GEOLOGY

In the Grants district, uranium deposits occur in the Todilto limestone and Morrison sandstone beds of Jurassic age, and in the overlying Cretaceous rocks. The Hanosh lease in sec. 22 covers an area underlain by the Todilto limestone. The Todilto caps cliffs of the underlying Entrada sandstone and forms a broad bench where the overlying Summerville formation has been removed by erosion. It dips very gently northeastward across the property and is covered by a veneer of dune sand and alluvium up to about 50 feet thick, which may also locally conceal remnants of the Summerville formation. Except along the rim at the top of the Entrada cliff, the limestone is completely covered on the Hanosh property. Near the northern edge of the property increasing amounts of the silty sandstone of the Summerville formation are likely to be present. The limestone is about 20 feet thick on the average, and the applicant states that the overburden on the property averages only 18 feet in thickness.

ORE DEPOSITS

In the Grants district, uraniferous minerals locally coat bedding planes and joint surfaces of the limestone, are disseminated in blebs and crystals, and are associated with coarsely crystalline carbonates in veinlets. Among the important ore minerals are tyuyamunite, carnotite, uranophane, and uraninite. These minerals are locally present in sufficient amounts to form ore bodies of irregular plan and thickness without sharply defined limits. Controls of their localization are not well understood. The ore bodies occur at all positions between the top and bottom of the limestone. There is evidence of their localization along the axial portion of minor folds, but not all such folds are mineralized. This produces elongated ore bodies, as does localization on dominant joints. The ore bodies range in size from small tabular masses covering a few square feet to large bodies several hundred feet across. The thickness ranges from 1 foot or less up to about 14 feet. Most of the ore bodies are small elongated masses containing less than 2 or 3 thousand tons. The average grade of the ore shipped ranges from .20 to about .25 percent U_3O_8, and rarely up to .35 percent U_3O_8.

The applicant has developed no ore on this property. There are two showings of uranium mineralization on the rim exposures, and one near the northwest corner of the section that is in a limestone lens near the base of the Summerville formation. The nearest known ore is that discovered in the southern part of sec.23 by the Santa Fe Railroad and in the northern part of sec. 26 by the applicant. Several ore bodies have been found farther southeast in secs. 25, 30, and 31.

In these several sections, the known ore bodies are estimated to contain from 25 to more than 10,000 tons of ore apiece. The average ore body contains on the order of 3,000 tons. The size and distribution of these known deposits might be considered representative of the deposits expected in the area to be explored. The known ore bodies total about 40 in number, and were found by exploration of a combined area about 1.25 square miles in extent. It therefore seems possible that exploration of the applicant's 45 acres (.07 square mile) might discover 2 or 3 deposits that might contain as much as 6,000 to 9,000 tons of ore.

The value of this ore (before initial production bonus and haulage allowance), assuming an average grade between .20 and .25 percent U_3O_8, would range from $16.00 to $20.75 per ton. The value of the anticipated discoveries would therefore expectably be between $96,000 and $186,750.

The known ore bodies range in size from less than 25 feet in diameter up to 100x800 feet. Their small size and irregular shape make them difficult targets for exploration, but where they lie at shallow depths many small ore bodies can and will be mined at a profit. Closely spaced drilling therefore seems justifiable in shallow ground such as the area under consideration.

PROPOSED EXPLORATION

The exploration proposed by the applicant consists of a maximum of 30,410 feet of rotary drilling estimated to cost $26,460.69. It is proposed to do the drilling in three stages: (1) An initial grid of 207 holes (8,919 feet) spaced 100 feet apart to test the whole area; (2) a secondary grid of 286 holes (12,306 feet) consisting of 8 off-set holes spaced 50 feet apart around one initial hole in five; and (3) a tertiary grid of 213 holes (9,186 feet) consisting of 8 off-set holes spaced 25 feet apart around one secondary hole in ten. Radiometric logging would be used to determine which of the initial and secondary holes should be offset. Samples would be collected only from the holes drilled on 25-foot centers, and these samples would be tested radiometrically to determine the grade of the rock cut in drilling. Chemical assays would be made of a few of the samples to check the radiometric determinations.

The field examiners believe the area is favorable for finding uranium deposits, but that the applicant proposed more drilling than is needed for exploration. The following modified program is suggested:

Stage 1: The entire area should be tested with an initial pattern of holes spaced 200 feet apart, beginning 100 feet south of the north boundary line and 100 feet west of the east boundary line. This stage will require 48 holes, averaging 40.5 feet deep for a total of 1944 feet. Although this initial test would find only unusually large deposits, it will test for the presence of the ore-bearing limestone and may by chance find some small deposits. It does not in itself constitute an adequate test of the property because of the small size and narrow elongate shape of the typical deposits.

Stage 2: The second phase of the exploration should, therefore, provide sufficient footage to complete a 100-foot grid pattern, no holes to be drilled within 100 feet of the north and east property lines. Experience has shown that holes drilled on this pattern will indicate the presence of most deposits of average size, and would be accepted as a fair test of the property in the event of completely negative results. This stage will require 123 holes. Assuming they also average 40.5 feet in depth, they would total 4981.5 feet of drilling.

Stage 3: According to P. E. Melancon, AEC geologist, experience in the district indicates that one hole in six drilled on 100-foot centers will cut rock having enough radioactivity to justify off-setting. On this basis 28.5 of the holes drilled in Stages 1 and 2 might require additional holes to test the adjacent ground. Allowing 6 offset holes for each of these 28.5 holes, 171 holes should be provided for in Stage 3. These holes should be spaced 50 feet apart, and may be drilled 50 feet from the property lines. The suggested allowable maximum footage for Stage 3 is 6925.5.

It is further suggested that Stage 1 and Stage 2 holes be completed and their relative favorability be determined before the Stage 3 offset holes are drilled. In this way, the whole area can be appraised and the most favorable parts can be selected for further testing by offset drilling.

This program, totalling 13,851 feet of drilling, presents allowable maximum footages. By beginning with 200-foot spacing in Stage 1, it is possible that some parts of the area can be eliminated from further consideration, thus saving a few holes in stage 2. It is also possible that all of the allowable footage in Stage 3 might not be needed to test whatever favorable indications are obtained in Stages 1 and 2. On the other hand, in the event of many favorable showings, it is desirable to allow the use of unexpended Stage 2 footage in Stage 3. In this way, within the allowable maximum under the contract, some flexibility is obtained even though the program is organized in stages.

No drilling on 25-foot centers, as proposed by the applicant, is suggested, as it is believed that drilling on 100-foot centers with some 50-foot offsets will find most average sized deposits or at least suggest their proximity. Closer spaced drilling, however, probably would be required to obtain a reasonably accurate appraisal of the tonnage and grade of deposits and certainly would be required to develop them for mining. It is believed that the applicant should be willing to do at his own expense the work he considers necessary to develop ore for mining if the greater risks of exploration have already been taken in the DMEA project.

The applicant has proposed to take no samples from the holes drilled on 100- and 50-foot centers, but rather to rely upon radiometric determinations by in-hole logging equipment to select the holes to be offset. Although the AEC field personnel have recommended this practice, and it has been accepted by the DMEA examining team for use on projects already studied, a more critical analysis of the logging method shows that it has not been thoroughly tested and proved. Furthermore, the AEC does not have the capacity to do the radiometric logging on this project whereas they have promised to do it on other DMEA projects, and the applicant proposes instead to use unproved logging equipment. The examining team therefore recommends that, in addition to the proposed radiometric hole logging, samples of the drill cuttings representing 2-foot intervals throughout the Todilto limestone be taken from all drill holes. This sampling will of course increase the cost of the project, but it seems necessary for the present in order to ensure obtaining adequate guidance for the drilling and to establish the reliability of the logging equipment.

Experience in the Grants district has shown that the uranium ore in the limestone is essentially in radioactive equilibrium and that radiometric determinations with laboratory scalers or even with simple portable counters can be used, if the instruments are properly calibrated and checked, to determine the grade of samples. The applicant proposes to use radiometric determinations for assaying samples; 20 chemical assays of samples selected at random are also proposed as checks. The proposed plan of radiometric assaying with 20 chemical assays for checking is considered sound and should be acceptable to DMEA. All drill holes, however, should be sampled as suggested above.

CONCLUSIONS AND RECOMMENDATIONS

Exploration of the Hanosh property in sec. 22, T. 13 N., R. 10 W., McKinley County, N. Mex., by rotary drilling appears to have a favorable chance of finding as much as 6,000 to 9,000 tons of ore containing 0.20 to 0.25 percent U_3O_8. At the present price schedule, this ore will have a value of $96,000 to $186,750, which is probably not sufficient to repay completely the government's share of the cost of exploration. On the basis that the ground offers the chance of finding a significant amount of ore, however, it is recommended that the government enter into a contract for a maximum of ~~15,000~~ 13,851 feet of drilling to cover a primary ~~100~~ 200-foot grid, a secondary 100-foot grid, and about ~~140~~ 171 off-set holes at 50-foot spacing. It is desirable to use in-hole radiometric logging as proposed by the applicant, but cuttings should be collected through the limestone in all holes and selected samples checked by radiometric assay in order to establish the reliability of the technique. A few chemical assays should be provided to check the grade of possible discoveries.

DMEA-3152, HANOSH MINES, INC., URANIUM PROPERTY
McKINLEY COUNTY, NEW MEXICO

Engineering Report

By L. L. Farnham, Mining Engineer
U. S. Bureau of Mines

February 1954

Reviewed by
DMEA OPERATING COMMITTEE
9-3-54
(date)

DMEA-3152, MANOSH MINES, INC., URANIUM PROPERTY
McKINLEY COUNTY, NEW MEXICO

CONTENTS

Engineering report — Page

Introduction — 1
Acknowledgment — 1
Location and physical features — 1
History and production — 2
Ownership and extent — 2
Description of the deposits — 3
Proposed exploration — 5
Sampling — 11
Estimated cost of project — 11
Proposed financing — 13
Conclusions and recommendations — 14

ILLUSTRATIONS

Figure — Following page

1 Location map — 1
2 Outcrop of Todilto limestone — 2
3 Topographic and structural contour map — 3

INTRODUCTION

Late in August 1953, Hanosh Mines, Inc., applied to the Defense Minerals Exploration Administration under the Defense Production Act of 1950, as amended, for an exploration loan amounting to $26,460.69. The application was docketed as DMEA-3152. The funds requested were to be used in search of uranium deposits by means of 30,410 feet of rotary drilling.

The property was visited by the DMEA examiners[1/] on September 15, 1953. The initial engineering report, submitted in October 1953, has been revised in this report in accordance with recent policy decisions.

ACKNOWLEDGMENTS

Acknowledgments are made to Paul E. Melancon, formerly of the Atomic Energy Commission, and to Irving Rapaport for their assistance during the examination.

LOCATION AND PHYSICAL FEATURES

The property is situated about 19 miles north of the town of Grants in the NE¼ of Sec. 22, T. 13 N., R. 10 W., McKinley County, N. Mex. It can be reached by traveling west of Grants on U. S. Highway 66 for 3.2 miles, thence northward on State Highway 53 for 10.8 miles to a side road branching westward. The site of the proposed project is reached by proceeding about 4 miles in a northwesterly direction on this branch road (figure 1). The subject property is 22 miles from the uranium processing plant of the Anaconda Copper Mining Co. near Bluewater.

1/ Strobell, J. D., Geologist, Geological Survey;
Farnham, L. L., Mining Engineer, Bureau of Mines.

The area proposed for exploration is situated on a relatively flat, gently-sloping alluvium-covered bench or mesa. Altitudes above sea level range from a high of 7,120 feet at the southeast corner of the tract to a low of 7,050 feet at the northeast corner.

HISTORY AND PRODUCTION

The first mining activity in the Grants district began in 1950, following the initial discovery of uranium near Haystack Butte (figure 2). These deposits, situated about 4 miles west of the subject property, have proven to be the largest found to date in the district. Large scale production from this area is awaiting the completion of the Anaconda plant near Bluewater. The applicant's property, valuable only for grazing prior to the discovery of uranium in the region, has not been explored. Drilling on contiguous tracts, southeast of that held by the applicant, has disclosed important deposits. Four properties in this area were in production at the time of the examination.

OWNERSHIP AND EXTENT

The applicant reportedly holds a lease on the NE¼ of Sec. 22, T. 13 N., R. 10 W., McKinley County, N. Mex. This property is an Indian allotment and as such is under the jurisdiction of the Bureau of Indian Affairs of the Department of the Interior. A copy of the applicant's lease is not available. It is the writer's understanding that the royalty payments stipulated in the lease are based on a sliding scale starting at 10 percent for ore with a mill value of $20 a ton and increasing one percent for each $10 in added value. Under the lease, royalty is payable on all bonuses, premiums and other allowances received by the shipper.

The area proposed for exploration covers about 43 acres situated in the extreme northeast corner of Sec. 22. The land in Secs. 15 and 23, which immediately adjoins the subject property on the north and east, is either owned or controlled by the Atchison, Topeka & Santa Fe Railway Co. (figure 3). The applicant company is producing ore from another lease covering a portion of Sec. 26, T. 13 N., R. 10 W.

DESCRIPTION OF THE DEPOSITS

Uranium mineralization in the area under consideration occurs in the Todilto limestone. This formation is a persistent gently-dipping bed averaging about 20 feet in thickness. The tract proposed for exploration is underlain by this limestone. Its irregular outcrop marks the western and southern boundaries of the project area (fig. 3). Erosion has completely removed the Todilto limestone from all of Sec. 22 with the exception of the extreme northeastern corner which constitutes the area proposed for exploration. Except in the immediate vicinity of the outcrop the favorable bed is usually completely concealed by varying thicknesses of overburden. This is not only true of the tract under consideration but prevails generally throughout the district. Although shearings of uranium mineralization are not uncommon along the outcrop of the Todilto it appears that very few of the district's more important ore bodies have been found exposed in this manner. Closely spaced blind drilling has been the chief means of finding and outlining the present ore reserves of the district.

Exploratory drilling on properties southeast of the subject tract has indicated over 100,000 tons of ore in an irregular belt about 3 miles long that roughly parallels the outcrop of the favorable limestone bed (figure 2). This drilling has been confined to those areas near the outcrop where the limestone was overlain with the least overburden, thus permitting open pit mining. It is reported that drilling has indicated about 30,000 tons of ore on Sec. 23 which adjoins the subject property on the east. None of the details of this work were available. Still farther southeast in Sec. 25, about 300 acres bordering the limestone outcrop was drilled on an initial 100-foot grid. This work found 17 separate ore bodies totaling about 61,000 tons, having an estimated average grade of 0.19 percent U_3O_8. These individual ore bodies were scattered at random and varied greatly in shape, thickness and grade. Some of the smaller ones were of the order of 25 feet long and 25 feet wide. The largest covered an area of about 29,000 square feet. The ore, occupying various horizons in the limestone, ranged from 2 to 14 feet in thickness. In the 300 acres drilled, there were large areas covering 40 or more acres in which no ore bodies were found. In the SW¼ of Sec. 30, T. 13 N., R. 9 W., closely spaced drilling of a 60 acre tract indicated 3 ore bodies totaling about 8,800 tons, having an average grade of approximately 0.25 percent U_3O_8.

Thus in the 360 acres for which the results of former drilling are available, it appears that somewhat less than 200 tons of ore was found per acre. However, within that 360 acres there were tracts of the size of the subject property that contained much more than 200 tons of ore per acre and also there were areas of equivalent size (43 acres) that contained no ore at all.

The principal uranium mineral found in the Todilto limestone is tyuyamunite.

PROPOSED EXPLORATION

The applicant's proposals are quoted as follows:

"It is proposed that an initial 100-foot grid of 207 holes, averaging 43.08 feet in depth, be completed first. The disposition of holes on 50 and 25 foot centers shall be determined by the results obtained by the initial grid. Approximately 20 percent of the holes drilled in the central portion of the Grants District have shown gamma ray counts about three times that of the background count of the hole. Applying this ratio 285.66 offset holes on 50 foot centers are anticipated. Ten percent of the holes on 50 feet centers contained 0.05% U_3O_8 or better. On this basis, 213.25 holes on 25 feet centers are anticipated. Several of the mine owners in this district prefer to continue their search for ore on 10 feet centers. It is our opinion that the large additional expense is not warranted by the small pods of uranium found in this manner."

A summary of the applicant's proposal with costs is given below:

Phase	No. Holes	Avg. Depth	Total Feet	Cost/ft.	Total Cost
Initial grid (100 ft.)	207	43.08*	8,919.00	$0.50	4,459.00
Secondary grid (50 ft.)	285.66	43.08	12,305.43	0.50	6,152.715
Tertiary grid (25 ft.)	213.25	43.08			
(a) Limestone Cuttings required		20.00	4,265.00	1.00	4,265.00
(b) Overburden		23.08	4,921.81	0.50	2,460.905
Totals	705.91	43.08	30,410.24		$17,337.62

Radiometric logging and the preparation of a permanent geologic record of every hole: 30,410.24' @ $0.15 - 4,561.36

Supervision, accounting, correspondence, surveying, collection of cuttings, 30 chemical assays of cuttings, radiometric assays of cuttings, geologic mapping and ore reserve calculations:-

30,410.25' @ $0.15 - 4,561.536

Total maximum cost of exploration program - $26,460.69

*Average hole is composed of:
18.08 feet of overburden (alluvium, siltstone and shale)
20.0 feet of limestone (ore horizon)
5.0 feet of sandstone (underlying Entrada sandstone)

The applicant estimated that 207 holes would be required for the initial 100-foot grid. This estimate evidently was based on holes drilled directly on the northern and eastern property line boundaries.

The Field Team believes, in cases such as this where the adjoining property has different ownership and cannot be subordinated, that the initial holes should not be drilled closer than 200 feet from the adjoining ground. If this is adopted in this instance it will reduce the size of the area to be explored by nearly 14 acres, or from 43 to

about 29 acres. As the smaller the tract the less likely it is to contain the average proportion of ore bodies, it is suggested in this case that the initial drilling be started 100 feet from the north and east boundaries of the adjoining property. On this basis the writer recommends the following alternative program:

Stage 1 would consist of drilling the tract with holes spaced 200 feet apart, starting the grid 100 feet south of the north property line and a like distance west of the east side of the tract. This pattern would require 48 holes (figure 3). Holes spaced 200 feet apart would fail to explore an area approaching 40,000 square feet within each 200-foot square. An ore body covering but 10,000 square feet may contain as much as 6,000 tons of ore which is nearly twice the size of the average ore body found by the drilling of 300 acres in sec. 25 (figure 2). Consequently negative results at the end of stage 1 would not necessarily warrant the termination of this project.

Stage 2: Because of the favorable mining conditions prevailing on this property and the relatively small size of the targets, it appears advisable to allow sufficient additional footage under stage 2 so that each initial hole of Stage 1 may be offset on a 100-foot grid pattern (figure 3). Stage 2 would then require an additional 123 holes, none to be drilled closer than 100 feet from the boundary lines of the property.

Stage 3: After the completion of stages 1 and 2, the entire tract will have been drilled on a 100-foot grid pattern. According to Paul Melancon, former Chief of the Atomic Energy Commission's office in Grants, prior drilling experience in the district has indicated that about one sixth of the holes drilled on a 100-foot grid pattern can be expected to warrant offsetting. On this basis, if all the 171 holes of stages 1 and 2 were drilled, about 28.5 of this number could be expected to warrant offset holes, spaced 50 feet apart. Assuming that each of these 28.5 holes will require an average of 6 offsets, then stage 3 would consist of 171 holes drilled on a 50-foot offset pattern in the favorable areas indicated by former holes. This estimated amount of drilling constitutes the allowable maximum. For instance, if only 10 of the holes drilled in stages 1 and 2 were considered worthy of offsetting, then stage 3 would consist of but 60 holes. In case stages 1 and 2 found no holes that would justify offsets, then of course, the project would be terminated. None of stage 3 holes should be drilled closer than 50 feet from the property lines. Any unexpended footage in stage 2 should be transferred to stage 3 upon approval of the Field Team.

Once started, rotary drilling will proceed very rapidly, perhaps as many as 6 holes being completed daily. Just what constitutes a hole worthy of offsetting may in some cases be a difficult problem. Complications with the drilling contractor will arise if his equipment is idle while awaiting decisions. The highly important sampling procedure may be faulty and questions may arise as to the true depth of some of the

holes that have partially caved. To obviate some of the foreseeable difficulties it might be advisable to have a DMEA representative on the job during a large part of the time that the project is under way. Such an arrangement would seem more advisable if 2 DMEA projects were operating in the district at the same time.

The alternative program recommended by the writer is summarized as follows:

Stage 1 -	48 holes on a 200-foot grid;
Stage 2 -	123 holes on a 100-foot offset pattern;
Stage 3 -	171 holes on a 50-foot offset pattern.
Total	342 holes

From figure 3, the distance between the surface and the base of the Todilto limestone was found to average about 37.5 feet. Allowing an additional 3 feet of drilling below the bottom of the limestone to permit probing, the average depth of the holes would be about 40.5 feet. Thus 342 holes would require 13,851 feet of drilling. This amount of exploration would appear adequate for the purpose of disclosing whether or not the property contained worthwhile ore bodies.

If the host limestone underlying the area proposed for exploration averages 20 feet in thickness, then the average depth of overburden would be about 18 feet. For ore found below that amount of overburden, stripping and open-pit mining would be feasible. Under these favorable conditions the mining cost including stripping, as judged from similar operations, would probably not cost more than $8 a ton. If ore averaging 0.20 percent U_3O_8 was found on the property, it would have the following value per ton, f.o.b. mine:

Base price (4 lbs. @ $3.50) ————————	$14.00
Premium (excess over 4 lbs. @ $0.75) ———	None
Development allowance (4 lbs @ $0.50) ———	2.00
Hauling allowance (22 miles @ $0.06) ———	1.32
Total value	$17.32

A bonus amounting to an additional $14.00 a ton would apply on the initial 10,000 pounds of U_3O_8, or in this case on the first 2,500 tons of 0.20 percent ore produced. Thus the average value of the initial 2,500 tons would be $31.32. If a total of 9,000 tons of 0.20 percent ore was found on the property it would have an average value of $21.20. On ore of this value the royalties, consisting of 11 percent to the lessor and 5 percent to the Government, would amount to $3.39 a ton. With operating costs of $8, the resulting profit would be nearly $10 a ton. Hence small ore bodies, under thin overburden, though they contained but a few hundred tons would be profitable and no doubt mined, thus constituting a source of uranium.

It is recognized that an ore body containing but a few hundred tons cannot be considered significant, yet the combined output of all the numerous smaller deposits in the district would be substantial. However, the search for these small average grade deposits by closely spaced drilling is justified only in areas of such shallow overburden as to permit open-pit mining. An experienced operator in the district expressed the opinion that a deposit of average size and grade becomes marginal when covered by more than 35 feet of overburden.

SAMPLING

All the holes drilled under the project should be logged radiometrically and samples collected from the ore-bearing bed as well. An accurate log and the sample results of each hole should be made and recorded by the applicant. In this case the limestone would be sampled in 342 holes by catching the cuttings at each 2-foot interval. If the limestone averaged 20 feet in thickness, 10 samples would be taken from each hole. These samples should be split over a Jones riffle and a representative portion sacked, labeled, and preserved for future checking. The other portion of the sample could be scanned with a calibrated Geiger Counter and those that appeared to be of near ore-grade or better should be assayed.

The applicant proposed assaying all of these samples radiometrically with 20 of the number checked by chemical analyses. It has been shown that the results obtained by radiometric assaying of the limestone ores in the district check very closely with the results obtained by chemical methods. Consequently in this case radiometric assaying of the samples with 20 chemical checks should be satisfactory for the purpose of the proposed exploration.

ESTIMATED COSTS OF THE PROJECT

The applicant proposed that the Four Corners Exploration Co. of Grants be given an independent contract covering all phases of the contemplated exploration. The costs of this complete service as submitted by the above contractor are summarized as follows:

Drilling:

1st 100 feet or any part thereof - $0.50 a foot
2nd 100 feet or any part thereof - 1.00 a foot
Blowing hole clean and catching cuttings every 2 feet - $0.50 a foot extra over regular prices.
Radiometric logging and preparation of a permanent geologic record of every hole: - $0.15 a foot. Supervision, accounting, correspondence, surveying, collection of samples, 20 chemical assays of cuttings, radiometric assay cuttings, geologic mapping and ore reserve calculations: - $0.15 a foot.

These prices appear reasonable and so far as the drilling is concerned, they are competitive with other contracts in the district.

The average depth of the proposed holes was calculated from the Atomic Energy Commission's topographic map of the area, and structural contours which were based on the presumption that the average dip of the limestone was about 10 feet vertically in 140 feet horizontally (figure 3). From these data the depth of the proposed holes was found to average 37.5 feet. An additional 3 feet of drilling below the base of limestone is desirable in order to afford space for any caving that might occur before the hole could be probed with the radiometric logging device. The applicant desired an extra 5 feet of drilling for this purpose but in the case of such relatively shallow holes it would seem that 3 feet would be sufficient. Thus by allowing 3 feet of extra drilling below the base of the limestone the average depth of the holes would be about 40.5 feet.

Based on the foregoing bid of the Four Corners Exploration Co. the estimated cost of the alternative program would be as follows:

Stage	Grid Pattern	Number of Holes	Depth, Feet	Total Feet	Price per Foot	Cost
1	200 feet	48	40.5	1,944	$0.50	$972.00
2	100 feet	123	40.5	4,981.5	0.50	2,490.75
3	50 feet	171	40.5	6,925.5	0.50	3,462.75
	Totals	342		$13,851.0		$6,925.50

Sampling: 342 holes over 20 ft. thickness = 6,840 ft. @ $0.50	3,420.00
Radiometric logging - 13,851. ft. @ $0.15	2,077.65
All other costs - 13,851 ft. @ $0.15	2,077.65
Total	$14,500.80
Average cost per foot	$1.05

Working continuously 26 days a month with an average footage of 250 feet per day the drilling could be completed in slightly over 2 months.

PROPOSED FINANCING

The project as estimated by the writer would cost $14,500 of which the applicant would furnish 10 percent, or $1,450 and the Government would provide $13,050.

The ore produced from neighboring properties has averaged about $22 a ton. With ore of this value and a 5 percent royalty the subject property would have to produce about 11,860 tons of ore in order to repay the Government loan. Judged by the information available, the tonnage indicated by the drilling on neighboring properties has averaged about 200 tons of ore per acre. On that basis the 43 acres in question could be expected to yield 8,600 tons of ore. However, because of the unpredictable erratic distribution of the deposits, the subject property could contain more than 8,600 tons, and likewise could contain much less.

CONCLUSIONS AND RECOMMENDATIONS

The productive limestone throughout the area is for the most part completely covered with alluvium or younger sediments so that the only means available for judging the merits of an unexplored tract is its location to known trends and/or its proximity to known ore bodies. The subject property lies within the projected trend of an irregular belt of the Todilto limestone in which ore has been found on neighboring properties and for that reason it is considered worthy of exploration.

The ore-bearing bed underlying the area proposed for exploration is covered with such a thin matte of overburden that any ore found could be mined cheaply in open pits. This would permit the production of uranium from smaller and lower-grade ore bodies than would be economically feasible where a large amount of stripping or underground mining was necessary. Consequently in areas of shallow overburden, such as the tract in question, there is justification for closely spaced drilling in order to discover as many as possible of the smaller, yet profitable ore bodies.

The applicant proposed to award the drilling contract to the Four Corners Exploration Co. This company is a newly formed organization owned jointly by F. O. Manel and Irving Rapaport, both of Grants, N. Mex.

Rapport is a graduate geologist with about 4 years experience in uranium exploration. He was employed about 3 years of that time by the Atomic Energy Commission as project supervisor in Utah and New Mexico. For the past year he has been managing the exploration and mining operations of the Hanosh Mines, Inc. F. O. Manel, the other partner, has been exploiting a uranium property in the Grants district for the past year and a half with considerable success. The equipment belonging to the Four Corners Exploration consisted of a Failing 1500 mobile rotary drilling rig with auxilliary air compressor and Duclone sampler. A truck mounted radiometric hole logging unit had been ordered and delivery was expected late in October 1953. Whether or not it is available at this time is not known.

As there appears to be a reasonable chance of finding ore on the subject property it is recommended that a loan amounting to $14,500 be approved. A short form contract is suggested specifying a maximum of 13,850 feet of drilling at a price of $1.05 a foot.

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

224 New Customhouse
Denver 2, Colorado

August 27, 1954.

Memorandum

To: Secretary to the Operating Committee, DMEA

From: Executive Officer, DMEA Field Team, Region IV

Subject: Docket No. DMEA-3152 (Uranium), Hanosh Mines, Inc., McKinley County, New Mexico.

Enclosed are four copies of the report of field examination on the subject application and two copies of Form 3b.

This docket has been closed by this office effective August 16, 1954 because the applicant has not provided an approved Assignment of Lease.

W. H. King

Enclosures

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Mining Division
Region IV

March 3, 1954.

Memorandum

To: Field Team, Region IV

From: Chief, Mining Division, Region IV

Subject: Report of Examination - DMEA Docket 3152 (Uranium), Hanosh Mines, Inc., McKinley County, New Mexico.

Enclosed are eleven copies of the engineering report of examination on the subject docket.

The applicant requested $26,460.69 to drill the property on a scale which appears to be too ambitious to the examining engineer.

The examining engineer recommends a drilling program to be divided into three stages, the work to consist of 342 holes averaging 40.5 feet in depth at an estimated total cost of $13,851.00.

We concur in this recommendation.

W H King

W. H. King

Enclosures

February 19, 1954

Memorandum

To : W. H. King, Chief, Mining Division, Region IV

From : Chief, Mining Methods Br., Mining Div., Region IV

Subject : Engineering Report on Docket DMEA-3152, Hanosh Mines, Inc., Uranium Property, McKinley County, N. Mex.

Enclosed are original and 9 copies of a revised report by Lloyd L. Farnham of the Bureau of Mines on the above property. The other copy will be forwarded to you by R. P. Fischer of the Geological Survey's Grand Junction office. J. D. Strobell of the Geological Survey has read and approved this report by Farnham.

The DMEA field examiners recommend that Hanosh Mines, Inc. be granted exploration assistance to drill its property north of Grants, N. Mex. I concur with this recommendation.

Walter R. Storms

Walter R. Storms

Cc: W. H. King (10)
R. P. Fischer
DMEA-3152
DF

WRStorms:frj

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Defense Minerals Exploration Administration
Denver Federal Center
Denver 2, Colorado

February 23, 1954

Memorandum

To: DMEA Field Team, Region IV

From: A. H. Koschmann

Subject: DMEA Docket 3152, Hanosh Mines, Inc., McKinley County, New Mexico

Enclosed are 11 copies of a geologic report by J. D. Strobell, Jr., of the U. S. Geological Survey covering the above docket.

The recommended plan of exploration has been revised to agree with that suggested by Lloyd Farnham of the Bureau of Mines office in Tucson, as requested by the Field Team in December.

A. H. Koschmann

A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures (11)

C
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P
Y

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey
P. O. Box 360
Grand Junction, Colo.

February 24, 1954.

Memorandum

To: W. H. King, DMEA Field Team, Region IV

From: R. P. Fischer, Colorado Plateau District

Subject: DMEA 3152, Hanosh Mines, Inc., Uranium Property, McKinley County, New Mexico.

Forwarded herewith is carbon copy of Farnham's report, DMEA 3152, Hanosh Mines, Inc., Uranium Property, McKinley County, New Mexico, as requested by Storms in his memorandum of February 17.

/s/ R. P. Fischer
District Supervisor

Enclosure

C
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P
Y

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

February 19, 1954.

MEMORANDUM

TO: A. H. Koschmann, Field Team, Region IV

From: R. P. Fischer, Supervisor,
Colorado Plateau District

Subject: DMEA 3152, Hanosh Mines, Inc., McKinley County, New Mexico

Transmitted herewith are 11 copies of Strobell's revised report on the above application. The recommended plan of exploration has been revised to agree with that suggested by Lloyd Farnham of the Bureau of Mines office in Tucson, as requested by the Field Team in December.

Enclosures 11

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P. O. BOX 360
GRAND JUNCTION, COLORADO

October 9, 1953

Memorandum

To: A. H. Koschmann, DMEA Field Team, Region IV

From: R. P. Fischer, Acting Supervisor
Colorado Plateau District

Subject: DMEA 3152, Hanosh Mines, Inc., McKinley County, New Mexico

Transmitted herewith are eleven copies of a geologic report on the ground leased by the Hanosh Mines, Inc., McKinley County, N. Mex. The company applied for assistance in exploring for uranium; they propose to do 30,410 feet of drilling and related work at an estimated cost of $26,460.69.

The attached report is prepared by J. D. Strobell, Jr., and is based on a joint field examination on September 15 with Lloyd Farnham, USBM, and Irving Rapaport, representing the applicants. The examining team also conferred with P. E. Melancon, AEC geologist, who is in general agreement with the conclusions and recommendations offered in the report.

Strobell concludes that exploration in the area has a good chance of finding 6,000 to 9,000 tons of ore, and thus is favorable for exploration. On this basis, he recommends an exploration contract, pointing out at the same time, however, that the value of the ore expected probably will not be sufficient to repay through royalty payments the entire cost to the government. A program of ~~15,000~~ feet of drilling, smaller than that proposed by the applicant, is suggested. 13,851

I concur with these conclusions and the suggested plan of exploration.

R. P. Fischer

R. P. Fischer
Acting District Supervisor

Enclosures 11

RPF/mlr

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In August 1953, Hanosh Mines, Inc. applied to the Defense Minerals Exploration Administration, under the Defense Production Act of 1950, as amended, for an exploration loan amounting to $26,460.69. The application was docketed as DMEA-3152. The funds requested were to be used in the exploratory drilling of a uranium prospect situated in the Grants district of northwestern New Mexico. The property was examined[1] on September 15, 1953.

Extensive exploration has been under way in the Grants region since 1950 when the presence of uranium first was detected. The deposits occur as sporadic, irregular, blanket-type replacements in the Todilto limestone and also in some of the overlying formations. The Todilto in the Grants area is a persistent gently dipping (4°) bed about 20 feet in thickness which owing to its relative resistance to erosion, usually caps many of the lower benches and mesas along the valley floors.

The project property covers an unexplored area of about 43 acres that is underlain by this ore-bearing limestone. Except in the immediate vicinity of the outcrop the favorable bed is usually completely covered with varying amounts of soil and younger sediments, which increase progressively in thickness down the dip of the limestone. This mantle of overburden not only covers the area proposed for exploration but prevails generally throughout the district. Structural controls or other ore-guides usually are lacking so that closely spaced

1/ Farnham, L. L., Mining Engineer, Bureau of Mines; Strobell, J. D., Geologist, Geological Survey

blind drilling has been, and still is the only practical means of discovering ore in the district. Exploratory drilling of this nature has found important, but sporadic ore bodies occupying an irregular belt that extends for about 3 miles to the southeast and for some 4 miles west of the subject property.

The applicant proposed to explore the 43-acre tract by 30,410 feet of rotary drilling in 706 holes, spaced from 100 to 25 feet apart. This work was estimated to cost $26,460.69. As this amount of drilling appeared excessive for the purpose of exploration, an alternative program was recommended which involved 13,850 feet of drilling in 342 holes at an estimated cost of $14,500.

The area proposed for exploration is favorably situated in respect to a productive trend and for that reason it appears to be worthy of exploration. Therefore, it is recommended that a loan amounting to not more than $14,500 be approved.

UNITED STATES DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMEA 3152, Hanosh Mines, Inc.,

Section 22, T. 13 N., R. 10 W., Grants District,

McKinley County, New Mexico

Uranium

Geologic report

J. D. Strobell, Jr., Geologist
U. S. Geological Survey

October 9, 1953

HANOSH MINES, INC.,
McKINLEY COUNTY, NEW MEXICO

INTRODUCTION AND SUMMARY

Application has been made by Hanosh Mines, Inc., for government assistance (DMEA 3152) in exploring for uranium in the Todilto limestone of the Grants District, McKinley County, N. Mex. The applicant proposes 30,410 feet of drilling, at an estimated cost of $26,460.69, to explore about 45 acres in the NE ¼, sec. 22, T. 13 N., R. 10 W. The property was examined on September 15, by Lloyd Farnham of the U. S. Bureau of Mines, Tucson, Ariz., and J. D. Strobell, Jr., of the U. S. Geological Survey, Grand Junction, Colo. The examiners were accompanied by the applicant's representative, Mr. Irving Rapaport, and conferred also with Mr. P. E. Melancon, District Geologist of the U. S. Atomic Energy Commission, Grants, N. Mex.

The property lies on allotted Indian lands. Prospecting and mining rights are leased to the applicant with the approval and under the general supervision of the Bureau of Indian Affairs, U. S. Department of the Interior. Royalties stipulated by that Bureau range from 10 to 20 percent of the mine value of the ore (excluding allowances for development and transportation) and include in addition 10 percent of any bonuses paid by the U. S. Atomic Energy Commission.

A somewhat curtailed program (about 50 percent reduction) to explore this property with government assistance is recommended. The applicant's proposal is considered to carry the exploration too far into the development phase not appropriately a part of DMEA exploration. A maximum of ~~15,000~~ 13,851 feet of drilling in primary and offset holes is recommended. It is also suggested that in addition to the radiometric logging of these holes proposed by the applicant, collection of cuttings from the limestone be required until such time as the reliability of radiometric logging is definitely established in the district.

GEOLOGY

In the Grants district, uranium deposits occur in the Todilto limestone and Morrison sandstone beds of Jurassic age, and in the overlying Cretaceous rocks. The Hanosh lease in sec. 22 covers an area underlain by the Todilto limestone. The Todilto caps cliffs of the underlying Entrada sandstone and forms a broad bench where the overlying Summerville formation has been removed by erosion. It dips very gently northeastward across the property and is covered by a veneer of dune sand and alluvium up to about 50 feet thick, which may also locally conceal remnants of the Summerville formation. Except along the rim at the top of the Entrada cliff, the limestone is completely covered on the Hanosh property. Near the northern edge of the property increasing amounts of the silty sandstone of the Summerville formation are likely to be present. The limestone is about 20 feet thick on the average, and the applicant states that the overburden on the property averages only 18 feet in thickness.

ORE DEPOSITS

In the Grants district, uraniferous minerals locally coat bedding planes and joint surfaces of the limestone, are disseminated in blebs and crystals, and are associated with coarsely crystalline carbonates in veinlets. Among the important ore minerals are tyuyamunite, carnotite, uranophane, and uraninite. These minerals are locally present in sufficient amounts to form ore bodies of irregular plan and thickness without sharply defined limits. Controls of their localization are not well understood. The ore bodies occur at all positions between the top and bottom of the limestone. There is evidence of their localization along the axial portion of minor folds, but not all such folds are mineralized. This produces elongated ore bodies, as does localization on dominant joints. The ore bodies range in size from small tabular masses covering a few square feet to large bodies several hundred feet across. The thickness ranges from 1 foot or less up to about 14 feet. Most of the ore bodies are small elongated masses containing less than 2 or 3 thousand tons. The average grade of the ore shipped ranges from .20 to about .25 percent U_3O_8, and rarely up to .35 percent U_3O_8.

The applicant has developed no ore on this property. There are two showings of uranium mineralization on the rim exposures, and one near the northwest corner of the section that is in a limestone lens near the base of the Summerville formation. The nearest known ore is that discovered in the southern part of sec.23 by the Santa Fe Railroad and in the northern part of sec. 26 by the applicant. Several ore bodies have been found farther southeast in secs. 25, 30, and 31.

In these several sections, the known ore bodies are estimated to contain from 25 to more than 10,000 tons of ore apiece. The average ore body contains on the order of 3,000 tons. The size and distribution of these known deposits might be considered representative of the deposits expected in the area to be explored. The known ore bodies total about 40 in number, and were found by exploration of a combined area about 1.25 square miles in extent. It therefore seems possible that exploration of the applicant's 45 acres (.07 square mile) might discover 2 or 3 deposits that might contain as much as 6,000 to 9,000 tons of ore.

The value of this ore (before initial production bonus and haulage allowance), assuming an average grade between .20 and .25 percent U_3O_8, would range from $16.00 to $20.75 per ton. The value of the anticipated discoveries would therefore expectably be between $96,000 and $186,750.

The known ore bodies range in size from less than 25 feet in diameter up to 100x800 feet. Their small size and irregular shape make them difficult targets for exploration, but where they lie at shallow depths many small ore bodies can and will be mined at a profit. Closely spaced drilling therefore seems justifiable in shallow ground such as the area under consideration.

PROPOSED EXPLORATION

The exploration proposed by the applicant consists of a maximum of 30,410 feet of rotary drilling estimated to cost $26,460.69. It is proposed to do the drilling in three stages: (1) An initial grid of 207 holes (8,919 feet) spaced 100 feet apart to test the whole area; (2) a secondary grid of 286 holes (12,306 feet) consisting of 8 off-set holes spaced 50 feet apart around one initial hole in five; and (3) a tertiary grid of 213 holes (9,186 feet) consisting of 8 off-set holes spaced 25 feet apart around one secondary hole in ten. Radiometric logging would be used to determine which of the initial and secondary holes should be offset. Samples would be collected only from the holes drilled on 25-foot centers, and these samples would be tested radiometrically to determine the grade of the rock cut in drilling. Chemical assays would be made of a few of the samples to check the radiometric determinations.

The field examiners believe the area is favorable for finding uranium deposits, but that the applicant proposed more drilling than is needed for exploration. The following modified program is suggested:

Stage 1: The entire area should be tested with an initial pattern of holes spaced 200 feet apart, beginning 100 feet south of the north boundary line and 100 feet west of the east boundary line. This stage will require 48 holes, averaging 40.5 feet deep for a total of 1944 feet. Although this initial test would find only unusually large deposits, it will test for the presence of the ore-bearing limestone and may by chance find some small deposits. It does not in itself constitute an adequate test of the property because of the small size and narrow elongate shape of the typical deposits.

Stage 2: The second phase of the exploration should, therefore, provide sufficient footage to complete a 100-foot grid pattern, no holes to be drilled within 100 feet of the north and east property lines. Experience has shown that holes drilled on this pattern will indicate the presence of most deposits of average size, and would be accepted as a fair test of the property in the event of completely negative results. This stage will require 123 holes. Assuming they also average 40.5 feet in depth, they would total 4981.5 feet of drilling.

Stage 3: According to P. E. Melancon, AEC geologist, experience in the district indicates that one hole in six drilled on 100-foot centers will cut rock having enough radioactivity to justify off-setting. On this basis 28.5 of the holes drilled in Stages 1 and 2 might require additional holes to test the adjacent ground. Allowing 6 offset holes for each of these 28.5 holes, 171 holes should be provided for in Stage 3. These holes should be spaced 50 feet apart, and may be drilled 50 feet from the property lines. The suggested allowable maximum footage for Stage 3 is 6925.5.

It is further suggested that Stage 1 and Stage 2 holes be completed and their relative favorability be determined before the Stage 3 offset holes are drilled. In this way, the whole area can be appraised and the most favorable parts can be selected for further testing by offset drilling.

This program, totalling 13,851 feet of drilling, presents allowable maximum footages. By beginning with 200-foot spacing in Stage 1, it is possible that some parts of the area can be eliminated from further consideration, thus saving a few holes in stage 2. It is also possible that all of the allowable footage in Stage 3 might not be needed to test whatever favorable indications are obtained in Stages 1 and 2. On the other hand, in the event of many favorable showings, it is desirable to allow the use of unexpended Stage 2 footage in Stage 3. In this way, within the allowable maximum under the contract, some flexibility is obtained even though the program is organized in stages.

No drilling on 25-foot centers, as proposed by the applicant, is suggested, as it is believed that drilling on 100-foot centers with some 50-foot offsets will find most average sized deposits or at least suggest their proximity. Closer spaced drilling, however, probably would be required to obtain a reasonably accurate appraisal of the tonnage and grade of deposits and certainly would be required to develop them for mining. It is believed that the applicant should be willing to do at his own expense the work he considers necessary to develop ore for mining if the greater risks of exploration have already been taken in the DMEA project.

The applicant has proposed to take no samples from the holes drilled on 100- and 50-foot centers, but rather to rely upon radiometric determinations by in-hole logging equipment to select the holes to be offset. Although the AEC field personnel have recommended this practice, and it has been accepted by the DMEA examining team for use on projects already studied, a more critical analysis of the logging method shows that it has not been thoroughly tested and proved. Furthermore, the AEC does not have the capacity to do the radiometric logging on this project whereas they have promised to do it on other DMEA projects, and the applicant proposes instead to use unproved logging equipment. The examining team therefore recommends that, in addition to the proposed radiometric hole logging, samples of the drill cuttings representing 2-foot intervals throughout the Todilto limestone be taken from all drill holes. This sampling will of course increase the cost of the project, but it seems necessary for the present in order to ensure obtaining adequate guidance for the drilling and to establish the reliability of the logging equipment.

Experience in the Grants district has shown that the uranium ore in the limestone is essentially in radioactive equilibrium and that radiometric determinations with laboratory scalers or even with simple portable counters can be used, if the instruments are properly calibrated and checked, to determine the grade of samples. The applicant proposes to use radiometric determinations for assaying samples; 20 chemical assays of samples selected at random are also proposed as checks. The proposed plan of radiometric assaying with 20 chemical assays for checking is considered sound and should be acceptable to DMEA. All drill holes, however, should be sampled as suggested above.

CONCLUSIONS AND RECOMMENDATIONS

Exploration of the Hanosh property in sec. 22, T. 13 N., R. 10 W., McKinley County, N. Mex., by rotary drilling appears to have a favorable chance of finding as much as 6,000 to 9,000 tons of ore containing 0.20 to 0.25 percent U_3O_8. At the present price schedule, this ore will have a value of $96,000 to $186,750, which is probably not sufficient to repay completely the government's share of the cost of exploration. On the basis that the ground offers the chance of finding a significant amount of ore, however, it is recommended that the government enter into a contract for a maximum of ~~15,000~~ 13,851 feet of drilling to cover a primary ~~100~~ 200-foot grid, a secondary 100-foot grid, and about ~~140~~ 171 off-set holes at 50-foot spacing. It is desirable to use in-hole radiometric logging as proposed by the applicant, but cuttings should be collected through the limestone in all holes and selected samples checked by radiometric assay in order to establish the reliability of the technique. A few chemical assays should be provided to check the grade of possible discoveries.

DMEA-3152, HANOSH MINES, INC., URANIUM PROPERTY
McKINLEY COUNTY, NEW MEXICO

Engineering Report

By L. L. Farnham, Mining Engineer
U. S. Bureau of Mines

February 1954

DMEA-3152, HANOSH MINES, INC., URANIUM PROPERTY
McKINLEY COUNTY, NEW MEXICO

CONTENTS

Engineering report	Page
Introduction	1
Acknowledgment	1
Location and physical features	1
History and production	2
Ownership and extent	2
Description of the deposits	3
Proposed exploration	5
Sampling	11
Estimated cost of project	11
Proposed financing	13
Conclusions and recommendations	14

ILLUSTRATIONS

Figure		Following page
1	Location map	1
2	Outcrop of Todilto limestone	2
3	Topographic and structural contour map	3

INTRODUCTION

Late in August 1953, Hanosh Mines, Inc., applied to the Defense Minerals Exploration Administration under the Defense Production Act of 1950, as amended, for an exploration loan amounting to $26,460.69. The application was docketed as DMEA-3152. The funds requested were to be used in search of uranium deposits by means of 30,410 feet of rotary drilling.

The property was visited by the DMEA examiners[1/] on September 15, 1953. The initial engineering report, submitted in October 1953, has been revised in this report in accordance with recent policy decisions.

ACKNOWLEDGMENTS

Acknowledgments are made to Paul E. Melancon, formerly of the Atomic Energy Commission, and to Irving Rapaport for their assistance during the examination.

LOCATION AND PHYSICAL FEATURES

The property is situated about 19 miles north of the town of Grants in the NE¼ of Sec. 22, T. 13 N., R. 10 W., McKinley County, N. Mex. It can be reached by traveling west of Grants on U. S. Highway 66 for 3.2 miles, thence northward on State Highway 53 for 10.8 miles to a side road branching westward. The site of the proposed project is reached by proceeding about 4 miles in a northwesterly direction on this branch road (figure 1). The subject property is 22 miles from the uranium processing plant of the Anaconda Copper Mining Co. near Bluewater.

1/ Strobell, J. D., Geologist, Geological Survey;
Farnham, L. L., Mining Engineer, Bureau of Mines.

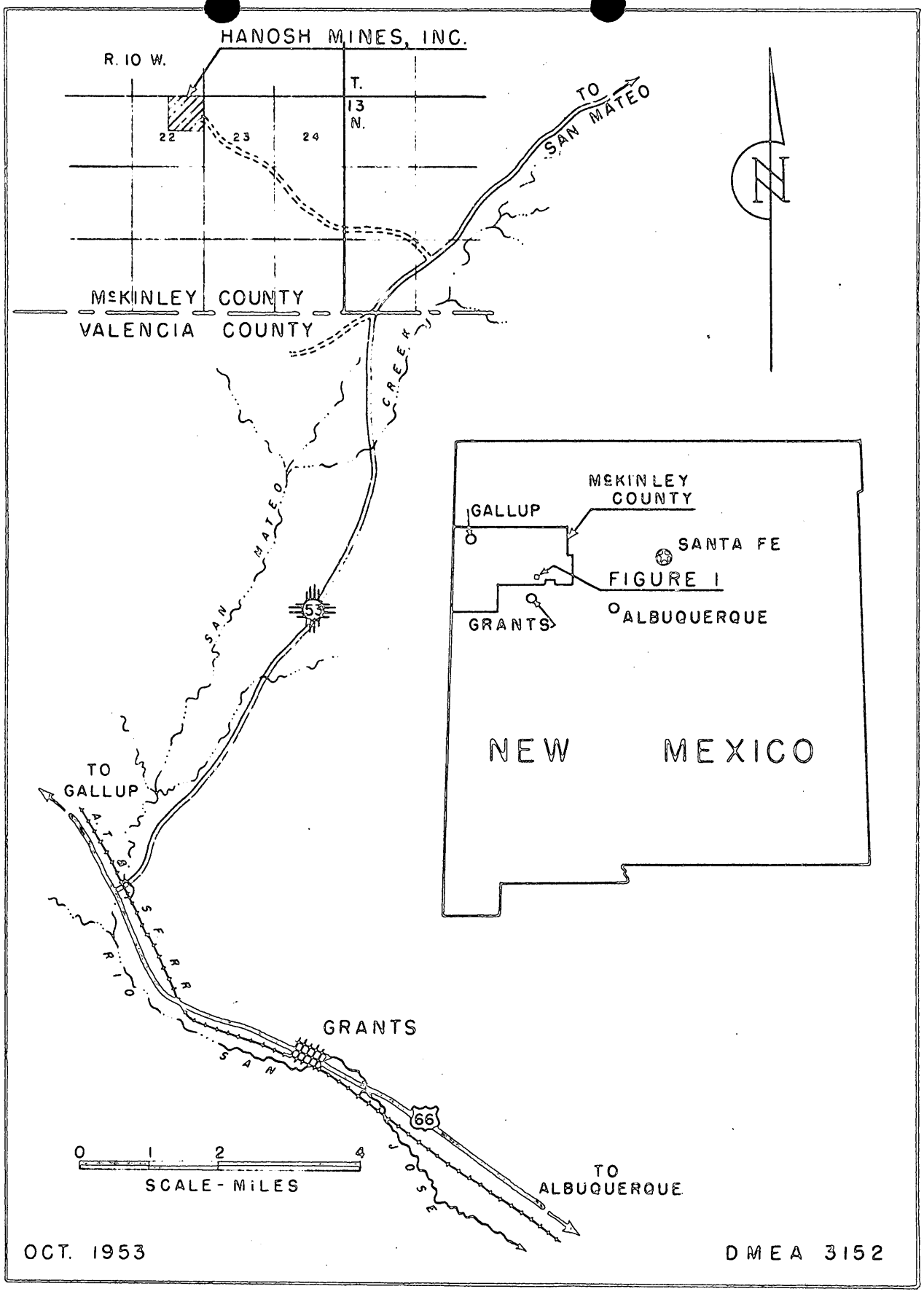

FIGURE 1, - LOCATION MAP - HANOSH MINES, INC.
McKINLEY COUNTY, NEW MEXICO

The area proposed for exploration is situated on a relatively flat, gently-sloping alluvium-covered bench or mesa. Altitudes above sea level range from a high of 7,120 feet at the southeast corner of the tract to a low of 7,050 feet at the northeast corner.

HISTORY AND PRODUCTION

The first mining activity in the Grants district began in 1950, following the initial discovery of uranium near Haystack Butte (figure 2). These depositx, situated about 4 miles west of the subject property, have proven to be the largest found to date in the district. Large scale production from this area is awaiting the completion of the Anaconda plant near Bluewater. The applicant's property, valuable only for grazing prior to the discovery of uranium in the region, has not been explored. Drilling on continguous tracts, southeast of that held by the applicant, has disclosed important deposits. Four properties in this area were in production at the time of the examination.

OWNERSHIP AND EXTENT

The applicant, reportedly holds a lease on the NE$\frac{1}{4}$ of Sec. 22, T. 13 N., R. 10 W., McKinley County, N. Mex. This property is an Indian allotment and as such is under the jurisdiction of the Bureau of Indian Affairs of the Department of the Interior. A copy of the applicant's lease is not available. It is the writer's understanding that the royalty payments stipulated in the lease are based on a sliding scale starting at 10 percent for ore with a mill value of $20 a ton and increasing one percent for each $10 in added value. Under the lease, royalty is payable on all bonuses, premiums and other allowances received by the shipper.

Exploratory drilling on properties southeast of the subject tract has indicated over 100,000 tons of ore in an irregular belt about 3 miles long that roughly parallels the outcrop of the favorable limestone bed (figure 2). This drilling has been confined to those areas near the outcrop where the limestone was overlain with the least overburden, thus permitting open pit mining. It is reported that drilling has indicated about 30,000 tons of ore on Sec. 23 which adjoins the subject property on the east. None of the details of this work were available. Still farther southeast in Sec. 25, about 300 acres bordering the limestone outcrop, was drilled on an initial 100-foot grid. This work found 17 separate ore bodies totaling about 61,000 tons, having an estimated average grade of 0.19 percent U_3O_8. These individual ore bodies were scattered at random and varied greatly in shape, thickness and grade. Some of the smaller ones were of the order of 25 feet long and 25 feet wide. The largest covered an area of about 20,000 square feet. The ore, occupying various horizons in the limestone, ranged from 2 to 14 feet in thickness. In the 300 acres drilled, there were large areas covering 40 or more acres in which no ore bodies were found. In the SW$\frac{1}{4}$ of Sec. 30, T. 13 N., R. 9 W., closely spaced drilling of a 60 acre tract indicated 3 ore bodies totaling about 9,000 tons, having an average grade of approximately 0.25 percent U_3O_8.

Thus in the 360 acres for which the results of former drilling are available, it appears that somewhat less than 200 tons of ore was found per acre. However, within that 360 acres there were tracts of the size of the subject property that contained much more than 200 tons of ore per acre and also there were areas of equivalent size (43 acres) that contained no ore at all.

The principal uranium mineral found in the Todilto limestone is tyuyamunite.

PROPOSED EXPLORATION

The applicant's proposals are quoted as follows:

"It is proposed that an initial 100-foot grid of 207 holes, averaging 43.08 feet in depth, be completed first. The disposition of holes on 50 and 25 foot centers shall be determined by the results obtained by the initial grid. Approximately 20 percent of the holes drilled in the central portion of the Grants District have shown gamma ray counts about three times that of the background count of the hole. Applying this ratio 285.66 offset holes on 50 foot centers are anticipated. Ten percent of the holes on 50 foot centers contained 0.05% U_3O_8 or better. On this basis, 213.25 holes on 25 foot centers are anticipated. Several of the mine owners in this district prefer to continue their search for ore on 10 foot centers. It is our opinion that the large additional expense is not warranted by the small pods of uranium found in this manner."

A summary of the applicant's proposal with costs is given below:

Phase	No. Holes	Avg. Depth	Total Feet	Cost/ft.	Total Cost
Initial grid (100 ft.)	207	43.08*	8,919.00	$0.50	4,459.00
Secondary grid (50 ft.)	285.66	43.08	12,305.43	0.50	6,152.715
Tertiary grid (25 ft.)	213.25	43.08			
(a) Limestone Cuttings required		20.00	4,265.00	1.00	4,265.00
(b) Overburden		23.08	4,921.81	0.50	2,460.905
Totals	705,91	43.08	30,410.24		$17,337.62

Radiometric logging and the preparation of a permanent geologic record of every hole: 30,410.24' @ $0.15 - 4,561.36

Supervision, accounting, correspondence, surveying, collection of cuttings, 20 chemical assays of cuttings, radiometric assays of cuttings, geologic mapping and ore reserve calculations:-

30,410.25' @ $0.15 - 4,561.536

Total maximum cost of exploration program - $26,460.69

*Average hole is composed of:
18.08 feet of overburden (alluvium, siltstone and shale)
20.0 feet of limestone (ore horizon)
5.0 feet of sandstone (underlying Entrada sandstone)

The applicant estimated that 207 holes would be required for the initial 100-foot grid. This estimate evidently was based on holes drilled directly on the northern and eastern property line boundaries.

The Field Team believes, in cases such as this where the adjoining property has different ownership and cannot be subordinated, that the initial holes should not be drilled closer than 200 feet from the adjoining ground. If this is adopted in this instance it will reduce the size of the area to be explored by nearly 14 acres, or from 43 to

about 29 acres. As the smaller the tract the less likely it is to contain the average proportion of ore bodies, it is suggested in this case that the initial drilling be started 100 feet from the north and east boundaries of the adjoining property. On this basis the writer recommends the following alternative program:

Stage 1 would consist of drilling the tract with holes spaced 200 feet apart, starting the grid 100 feet south of the north property line and a like distance west of the east side of the tract. This pattern would require 48 holes (figure 3). Holes spaced 200 feet apart would fail to explore an area approaching 40,000 square feet within each 200-foot square. An ore body covering but 10,000 square feet may contain as much as 6,000 tons of ore which is nearly twice the size of the average ore body found by the drilling of 300 acres in sec. 25 (figure 2). Consequently negative results at the end of stage 1 would not necessarily warrant the termination of this project.

Stage 2: Because of the favorable mining conditions prevailing on this property and the relatively small size of the targets, it appears advisable to allow sufficient additional footage under stage 2 so that each initial hole of Stage 1 may be offset on a 100-foot grid pattern (figure 3). Stage 2 would then require an additional 123 holes, none to be drilled closer than 100 feet from the boundary lines of the property.

Stage 3: After the completion of stages 1 and 2, the entire tract will have been drilled on a 100-foot grid pattern. According to Paul Melancon, former Chief of the Atomic Energy Commission's office in Grants, prior drilling experience in the district has indicated that about one sixth of the holes drilled on a 100-foot grid pattern can be expected to warrant offsetting. On this basis, if all the 171 holes of stages 1 and 2 were drilled, about 28.5 of this number could be expected to warrant offset holes, spaced 50 feet apart. Assuming that each of these 28.5 holes will require an average of 6 offsets, then stage 3 would consist of 171 holes drilled on a 50-foot offset pattern in the favorable areas indicated by former holes. This estimated amount of drilling constitutes the allowable maximum. For instance, if only 10 of the holes drilled in stages 1 and 2 were considered worthy of offsetting, then stage 3 would consist of but 60 holes. In case stages 1 and 2 found no holes that would justify offsets, then of course, the project would be terminated. None of stage 3 holes should be drilled closer than 50 feet from the property lines. Any unexpended footage in stage 2 should be transferred to stage 3 upon approval of the Field Team.

Once started, rotary drilling will ppoceed very rapidly, perhaps as many as 6 holes being completed daily. Just what constitutes a hole worthy of offsetting may in some cases be a difficult problem. Complications with the drilling contractor will arise if his equipment is idle while awaiting decisions. The highly important sampling procedure may be faulty and questions may arise as to the true depth of some of the

holes that have partially caved. To obviate some of the foreseeable difficulties it might be advisable to have a DMEA representative on the job during a large part of the time that the project is under way. Such an arrangement would seem more advisable if 2 DMEA projects were operating in the district at the same time.

The alternative program recommended by the writer is summarized as follows:

Stage 1 -	48 holes on a 200-foot grid;
Stage 2 -	123 holes on a 100-foot offset pattern;
Stage 3 -	171 holes on a 50-foot offset pattern.
Total	342 holes

From figure 3, the distance between the surface and the base of the Todilto limestone was found to average about 37.5 feet. Allowing an additional 3 feet of drilling below the bottom of the limestone to permit probing, the average depth of the holes would be about 40.5 feet. Thus 342 holes would require 13,851 feet of drilling. This amount of exploration would appear adequate for the purpose of disclosing whether or not the property contained worthwhile ore bodies.

If the host limestone underlying the area proposed for exploration averages 20 feet in thickness, then the average depth of overburden would be about 18 feet. For ore found below that amount of overburden, stripping and open-pit mining would be feasible. Under these favorable conditions the mining cost including stripping, as judged from similar operations, would probably not cost more than $8 a ton. If ore averaging 0.20 percent U_3O_8 was found on the property, it would have the following value per ton, f.o.b. mine:

Base price (4 lbs. @ $3.50) ----------	$14.00
Premium (excess over 4 lbs. @ $0.75) ------	None
Development allowance (4 lbs @ $0.50) -----	2.00
Hauling allowance (22 miles @ $0.06) ------	1.32
Total value	$17.32

A bonus amounting to an additional $14.00 a ton would apply on the initial 10,000 pounds of U_3O_8, or in this case on the first 2,500 tons of 0.20 percent ore produced. Thus the average value of the initial 2,500 tons would be $31.32. If a total of 9,000 tons of 0.20 percent ore was found on the property it would have an average value of $21.20. On ore of this value the royalties, consisting of 11 percent to the lessor and 5 percent to the Government, would amount to $3.39 a ton. With operating costs of $8, the resulting profit would be nearly $10 a ton. Hence small ore bodies, under thin overburden, though they contained but a few hundred tons would be profitable and no doubt mined, thus constituting a source of uranium.

It is recognized that an ore body containing but a few hundred tons cannot be considered significant, yet the combined output of all the numerous smaller deposits in the district would be substantial. However, the search for these small average grade deposits by closely spaced drilling is justified only in areas of such shallow overburden as to permit open-pit mining. An experienced operator in the district expressed the opinion that a deposit of average size and grade becomes marginal when covered by more than 35 feet of overburden.

SAMPLING

All the holes drilled under the project should be logged radiometrically and samples collected from the ore-bearing bed as well. An accurate log and the sample results of each hole should be made and recorded by the applicant. In this case the limestone would be sampled in 342 holes by catching the cuttings at each 2-foot interval. If the limestone averaged 20 feet in thickness, 10 samples would be taken from each hole. These samples should be split over a Jones riffle and a representative portion sacked, labeled, and preserved for future checking. The other portion of the sample could be scanned with a calibrated Geiger Counter and those that appeared to be of near ore-grade or better should be assayed.

The applicant proposed assaying all of these samples radiometrically with 20 of the number checked by chemical analyses. It has been shown that the results obtained by radiometric assaying of the limestone ores in the district check very closely with the results obtained by chemical methods. Consequently in this case radiometric assaying of the samples with 20 chemical checks should be satisfactory for the purpose of the proposed exploration.

ESTIMATED COSTS OF THE PROJECT

The applicant proposed that the Four Corners Exploration Co. of Grants be given an independent contract covering all phases of the contemplated exploration. The costs of this complete service as submitted by the above contractor are summarized as follows:

Drilling:

1st 100 feet or any part thereof - $0.50 a foot
2nd 100 feet or any part thereof - 1.00 a foot
Blowing hole clean and catching cuttings every 2 feet - $0.50 a foot extra over regular prices.
Radiometric logging and preparation of a permanent geologic record of every hole: - $0.15 a foot. Supervision, accounting, correspondence, surveying, collection of samples, 20 chemical assays of cuttings, radiometric assay cuttings, geologic mapping and ore reserve calculations: - $0.15 a foot.

These prices appear reasonable and so far as the drilling is concerned, they are competitive with other contracts in the district.

The average depth of the proposed holes was calculated from the Atomic Energy Commission's topographic map of the area, and structural contours which were based on the presumption that the average dip of the limestone was about 10 feet vertically in 140 feet horizontally (figure 3). From these data the depth of the proposed holes was found to average 37.5 feet. An additional 3 feet of drilling below the base of limestone is desirable in order to afford space for any caving that might occur before the hole could be probed with the radiometric logging device. The applicant desired an extra 5 feet of drilling for this purpose but in the case of such relatively shallow holes it would seem that 3 feet would be sufficient. Thus by allowing 3 feet of extra drilling below the base of the limestone the average depth of the holes would be about 40.5 feet.

Based on the foregoing bid of the Four Corners Exploration Co. the estimated cost of the alternative program would be as follows:

Stage	Grid Pattern	Number of Holes	Depth, Feet	Total Feet	Price per Foot	Cost
1	200 feet	48	40.5	1,944	$0.50	$972.00
2	100 feet	123	40.5	4,981.5	0.50	2,490.75
3	50 feet	171	40.5	6,925.5	0.50	3,462.75
	Totals	342		$13,851.0		$6,925.50

Sampling: 342 holes over 20 ft. thickness = 6,840 ft.	@ $0.50	3,420.00
Radiometric logging - 13,851. ft. @ $0.15		2,077.65
All other costs - 13,851 ft. @ $0.15		2,077.65
Total		$14,500.80
Average cost per foot		$1.05

Working continuously 26 days a month with an average footage of 250 feet per day the drilling could be completed in slightly over 2 months.

PROPOSED FINANCING

The project as estimated by the writer would cost $14,500 of which the applicant would furnish 10 percent, or $1,450 and the Government would provide $13,050.

The ore produced from neighboring properties has averaged about $22 a ton. With ore of this value and a 5 pencent royalty the subject property would have to produce about 11,860 tons of ore in order to repay the Government loan. Judged by the information available, the tonnage indicated by the drilling on neighboring properties has averaged about 200 tons of ore per acre. On that basis the 43 acres in question could be expected to yield 8,600 tons of ore. However, because of the unpredictable erratic distribution of the deposits, the subject property could contain more than 8,600 tons, and likewise could contain much less.

CONCLUSIONS AND RECOMMENDATIONS

The productive limestone throughout the area is for the most part completely covered with alluvium or younger sediments so that the only means available for judging the merits of an unexplored tract is its location to known trends and/or its proximity to known ore bodies. The subject property lies within the projected trend of an irregular belt of the Todilto limestone in which ore has been found on neighboring properties and for that reason it is considered worthy of exploration.

The ore-bearing bed underlying the area proposed for exploration is covered with such a thin matte of overburden that any ore found could be mined cheaply in open pits. This would permit the production of uranium from smaller and lower-grade ore bodies than would be economically feasible where a large amount of stripping or underground mining was necessary. Consequently in areas of shallow overburden, such as the tract in question, there is justification for closely spaced drilling in order to discover as many as possible of the smaller, yet profitable ore bodies.

The applicant proposed to award the drilling contract to the Four Corners Exploration Co. This company is a newly formed organization owned jointly by F. O. Manol and Irving Rapaport, both of Grants, N. Mex.

Rapport is a graduate geologist with about 4 years experience in uranium exploration. He was employed about 3 years of that time by the Atomic Energy Commission as project supervisor in Utah and New Mexico. For the past year he has been managing the exploration and mining operations of the Hanosh Mines, Inc. F. O. Manol, the other partner, has been exploiting a uranium property in the Grants district for the past year and a half with considerable success. The equipment belonging to the Four Corners Exploration consisted of a Failing 1500 mobile rotary drilling rig with auxilliary air compressor and Duclone sampler. A truck mounted radiometric hole logging unit had been ordered and delivery was expedted late in October 1953. Whether or not it is available at this time is not known.

As there appears to be a reasonable chance of finding ore on the subject property it is recommended that a loan amounting to $14,500 be approved. A short form contract is suggested specifying a maximum of 13,850 feet of drilling at a price of $1.05 a foot.

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

224 New Customhouse
Denver 2, Colorado

August 16, 1954

Memorandum

To: Secretary to the Operating Committee, DMEA

From: Executive Officer, DMEA Field Team, Region IV

Subject: Docket No. DMEA 3152-Hanosh Mines, Inc., McKinley County New Mexico

Reference is made to our letter to the applicant dated July 16, 1954 in which we gave them thirty days to submit approved Assignment of Lease.

We have not heard from the applicant. Therefore, this docket has been closed.

W. H. King

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

224 New Customhouse
Denver 2, Colorado

August 16, 1954

Memorandum

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W. H. King

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

224 New Customhouse
Denver 2, Colorado

July 16, 1954.

Mr. George Hanosh, President
Hanosh Mines, Inc.
P. O. Box 338
Grants, New Mexico

Re: Docket No. DMEA-3152

Dear Mr. Hanosh:

We have had no reply to our letter to you dated April 20, 1954 in which we requested the approved assignment of the lease or a photostat of the approved assignment of the lease from D. F. Mollica and George S. Hanosh to Hanosh Mines, Inc.

If we do not receive the approved assignment of the lease within 30 days we will presume that you are no longer interested in the exploration and we will close this docket.

Very truly yours,

W H King

W. H. King
Executive Officer
DMEA Field Team, Region IV

HMC:cwm

cc: Docket
Administrator, DMEA
WMTraver
AHKoschmann
WPWilliams
Chron.

Defense Minerals Administration
RECEIVED
JUL 7 - 1954

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

224 New Customhouse
Denver 2, Colorado

July 1, 1954

Mr. George S. Hanosh, President
Hanosh Mines, Inc.
P. O. Box 338
Grants, New Mexico

Re: DMEA Docket 3152 (Uranium),
Hanosh Mines, Inc., McKinley
County, New Mexico

Dear Mr. Hanosh:

Reference is made to our letter of April 20, 1954, a copy of which is enclosed.

To date, we have not heard from you in regard to the requested assignment of lease.

If we do not hear from you concerning this matter by August 9, 1954, we will consider that you are no longer interested in the Defense Minerals Exploration program and will close your application.

Very truly yours,

W. H. King
Executive Officer
DMEA Field Team
Region IV

Enclosure

RDB:es
cc: Docket 3152
Administrator DMEA
Williams
Traver
Koschmann
Chron.

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

224 New Customhouse
Denver 2, Colorado

April 20, 1954.

Mr. George S. Hanosh, President
Hanosh Mines, Inc.
P. O. Box 338
Grants, New Mexico

Re: Docket No. DMEA-3152

Dear Mr. Hanosh:

This replies to your letter of April 16, 1954 informing us that D. F. Mollica and George Hanosh are the sole owners of Hanosh Mines, Incorporated.

The mining lease on allotted Indian lands, which is the subject of your Defense Minerals Exploration Administration application, was issued to two individuals, George S. Hanosh and D. F. Mollica. The DMEA application for exploration assistance was made in the name of Hanosh Mines, Inc., a New Mexico corporation.

If the exploration project contract is to be awarded to Hanosh Mines, Inc., George S. Hanosh and D. F. Mollica must assign the lease made to them, as individuals, to Hanosh Mines, Inc.

Please refer to paragraph 3(g) of your mining lease which specifies - "Not to assign this lease or any interest therein by an operating agreement or otherwise, nor to sublet any portion of the leased premises before restrictions are removed, except with the approval of the Secretary of the Interior."

Before we can process the contract we must have the approved assignment of the lease or a photostat of the approved assignment of the lease from D. F. Mollica and George S. Hanosh to Hanosh Mines, Inc.

Very truly yours,

John F. Shaw

John F. Shaw
For W. H. King
Executive Officer
DMEA Field Team, Region IV

HMC:cwm

cc: Docket
Administrator, DMEA
WMTraver
AHKoschmann
RPFischer
Chron.
HMConnors

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

224 New Customhouse
Denver 2, Colorado

March 19, 1954

Mr. George Hanosh, President
Hanosh Mines, Inc.
P.O. Box 338
Grants, New Mexico

Re: Docket DMEA 3152

Dear Mr. Hanosh:

The mining lease on the NE¼ Sec. 22, T. 13 N., R. 10 W., was issued to George Hanosh and D.F. Mollica as individuals. The DMEA application was made in the name of Hanosh Mines, Inc., a New Mexico corporation.

Paragraph 3(g) of the lease specifies "Not to assign this lease or any interest therein by an operating agreement or otherwise, nor to sublet any portion of the leased premises before restrictions are removed, except with the approval of the Secretary of the Interior."

If the Exploration Project Contract is to be awarded to Hanosh Mines, Inc. as operator please furnish this office with the approved assignment of the lease from George Hanosh and D.F. Mollica to Hanosh Mines, Inc.

When we receive the approved assignment of the lease or a photostat of the approved assignment of the lease we will continue to process the contract.

Very truly yours,

W. H. KING

W. H. King
Executive Officer, DMEA
Field Team, Region IV

HMC:jp
cc Subject
Chron
COMittendorf
WMTraver
RPFischer
AHKoschmann
HMConnors

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

224 New Customhouse
Denver 2, Colorado

March 3, 1954.

Memorandum

To: Administrator, Defense Minerals Exploration Administration
Attention: 200

From: Field Team, Region IV

Subject: Report of Examination - DMEA Docket 3152 (Uranium), Hanosh Mines, Inc., McKinley County, New Mexico.

Exploration assistance in the amount of $13,851.00 has been approved and a contract will be prepared by this office.

Four copies of the report of examination will be forwarded you when the contract is executed.

The original and one copy of Form 3b are attached.

W. H. King

W. H. King

A. H. Koschmann

A. H. Koschmann

Enclosures

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

224 New Customhouse
Denver 2, Colorado

March 3, 1954.

Memorandum

To: Administrator, Defense Minerals Exploration Administration
Attention: 200

From: Field Team, Region IV

Subject: Report of Examination - DMEA Docket 3152 (Uranium), Hanosh Mines, Inc., McKinley County, New Mexico.

Exploration assistance in the amount of $13,851.00 has been approved and a contract will be prepared by this office.

Four copies of the report of examination will be forwarded you when the contract is executed.

The original and one copy of Form 3b are attached.

W. H. King
W. H. King

A. H. Koschmann
A. H. Koschmann

Enclosures

DMEA Form 3b
(Revised)

DEFENSE MINERALS EXPLORATION ADMINISTRATION

CONTROLLED DOCUMENT
Revised Abstract

DMEA Docket No. 3152

Name of Applicant Hanosh Mines, Inc.

Change:	From		To		
	III 1	[ ]	III 1	[x]	2-26-52
	III 2	[ ]	III 2	[ ]	
	III 3	[ ]	III 3	[ ]	
	III 4	[x]	III 4	[ ]	
	III 5	[ ]	III 5	[ ]	
			III 6	[ ]	
			III 7	[ ]	

Add:

II 7 $ 26,460.69

II 8 $ 13,851.00

II 8a % _____

II 9 $ _____

Remarks:

Initials of person preparing sheet H.M.C.

Date sheet prepared 2-26-52

33978

DMEA Form 3b
(Revised)

DEFENSE MINERALS EXPLORATION ADMINISTRATION

CONTROLLED DOCUMENT
Revised Abstract

DMEA Docket No. 3152

Name of Applicant Hanosh Mines, Inc.

Change:	From		To	
	III 1	☐	III 1	☒ 2-26-52
	III 2	☐	III 2	☐
	III 3	☐	III 3	☐
	III 4	☒	III 4	☐
	III 5	☐	III 5	☐
			III 6	☐
			III 7	☐

Add:

II 7 $ 26,460.69

II 8 $ 13,851.00

II 8a % _____

II 9 $ _____

Remarks:

Initials of person preparing sheet H.M.C.

Date sheet prepared 2-26-52

33978

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

224 New Customhouse
Denver 2, Colorado

February 26, 1954.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAR 1 - 1954

Hanosh Mines, Inc.
Box 447
Grants, New Mexico

Re: Docket No. DMEA-3152

Gentlemen:

In preparing a contract for exploration work on your property it will be necessary for us to know in which state Hanosh Mines is incorporated. We will also require a signed copy of your lease or a photostat of a signed copy of the lease.

When this information is received by this office, we will be pleased to continue to process the contract.

Very truly yours,

W. H. King
Executive Officer
DMEA Field Team, Region IV

HMC:cwm

cc: Docket
Administrator, DMEA
WRStorms
AHKoschmann
Chron.
HMConnors

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

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

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

Not to be filled in by applicant

Docket No. DMEA-3152
Metal or Mineral
Date Received 8/31/53
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: Kenosh Mines, Incorporated. Box 447, Grants, New Mexico.

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

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

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

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

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract Northeast 1/4, Section 28, Township 13 North, Range 10 West, McKinley County, New Mexico.

(*b*) State any mine name by which the property is known. none

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise The property is an Indian allotment held under lease by Kenosh Mines, Inc.

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

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

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

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

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

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

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

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

5. *The exploration project.*—(*a*) State the [illegible]eral or minerals for which you wish to expl[illegible]radium

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

(*c*) The work will start within 30 days and be completed within 3 months from the date of an exploration project contract.

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

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

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

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

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

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

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

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

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

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

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

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

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

/ ☐ Money ☐ Use of equipment owned by you ☐ Other

Explain in detail on acompanying paper.

CERTIFICATION

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

Dated August 3, 195--

Hanosh & Mollica
(Applicant)

By George S. Hanosh

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 New Mexico

c) President --- George S. Hanosh, Box 447, Grants, N.M.
Treasurer --- Annabelle Hanosh, Box 447, Grants, N.M.
Secretary --- D. F. Mollica, Gallup, N.M.

4. a) This property, in McKinley County, New Mexico, may be reached in the following manner: 1) Travel three miles west on U.S. #66 from the town of Grants; 2) Turn north on U.S. #53 (the San Mateo Road) and go eleven miles along the valley floor. This road then ascends a gently sloping portion of the Entrada Sandstone scarp for approximately a mile and descends upon the broad Todilto Limestone bench: 3) Turn northwest at a well constructed cattle-guardand follow the most prominent graded road past numerous open pit and underground uranium operations for approximately four miles.

It has taken the Indian Service approximately two years to sign this lease. Therefore, only geologic mapping and sampling and no physical development has been completed.

b) No production.

c) Geologic Reasons for Wishing to Explore the N.E. ¼ of Sect. 22.

1) Favorable Location

Virtually all of the large mines and blocked out ore bodies of the Grants District are situated between Haystack Butte and Grants Mesa, a distance of about 13 miles. (fig. 1) The extension of this apparent mineral belt for fourty miles to the northwest, contains scattered prospects. No major deposits have been developed in this direction. Southeast of Grants Mesa, for approximately fourty miles, numerous uranium showings have also been discovered. With the exception of the Jackpile Mine of Anaconda, no appreciable tonnage has been developed. The property for which application is asked is situated in the central portion of the main productive area. It lies squarely across the apparent mineral belt. The only adjacent property which has been explored, Santa Fe's Section23, contains about 30,000 tons of uranium ore.

2) Ease of Exploration

The two major ore horizons in this district are the Todilto limestone and the Morrison formation. The Morrison formation is assuming greater economic importance, but the bulk of developed ore lies within the Todilto limestone.

One of the major reasons for the rapid development of the Grants District is the ease with which the Todilto limestone may be explored. The limestone is the most resistant rock in the Jurassic section and forms a gently dipping bench (4°) under shallow cover for as much as a half mile back from the Entrada sandstone rim. This feature is well demonstrated by the fact that the deepest hole proposed on this property, 1700 feet back from the rim, has but 49 feet overburden to penetrate. The 43 feet average depth of hole consists of 18 feet of overburden, 20 feet of limestone, and 5 feet of underlying sandstone. More of the ore horizon is examined per dollar of exploration than any other area of carnotite-type deposits.

3) High-grade ore

The uranium minerals of the blanket-type ore deposits initially mined in Todilto limestone, on or close to the rim, consisted of carnotite, tyuyamunite, and uranophane, with limonite, hematite, and coarsely-crystalline calcite. At depth, away from the rim, the above oxide-type minerals are in lesser amount and larger amounts of pitchblende, fluorite, barite, and pyrite are discernable. Two showings of carnotite are present along the rim of Section22 and an ore-grade prospect is situated in an arroyo near the north line of this section. (fig. 2)

d) Section 22 is 22 miles by road from the Anaconda Copper Mining Co. mill at Bluewater, New Mexico. Fifteen miles of improved and maintained road lead from the property to the main line of the Santa Fe Railway and U.S. #66. It is 7 miles on U.S. #66 to the mill from this point. The town of Grants is 13 miles from this property.

e) An abundant supply of cheap labor is available in this area. The Navajo Indians are excellent for mucking and hand sorting. The shut-down of the fluorite mines in this area has provided a surplus of skilled miners. Powder, hardware, timber, and truck parts are available at Grants. Inexpensive fuel can be obtained at the Prewitt oil refinery close to the mill site. Almost all mining machinery firms maintain dealerships at Albuquerque, 80 miles east of Grants over U.S. #66. A water well is present on Section 22.

5. b) Figure 2 illustrates the desired work. It is proposed that an initial 100 foot grid of 207 holes, averaging 45.08 feet in depth, be completed first. The disposition of holes on 50 and 25 foot centers shall be determined by the results obtained by the initial grid. Approximately 20% of the holes drilled in the central portion of the Grants District have shown gamma ray counts about three times that of the background count of the hole. Applying this ratio, (see fig. 3), 285.66 offset holes on 50 foot centers are anticipated. Ten percent of the holes on 50 foot centers contained .05% U_3O_8 or better. On this basis, 213.25 holes on 25 foot centers are anticipated. Several of the mine owners in this district prefer to continue their search for ore on 10 foot centers. It is our opinion that the large additional expense is not warranted by the small pods of uranium found in this manner. (For summary of proposed drilling see Table 1.)

It is proposed that reliance be placed on radiometric logging for holes on 100 and 50 foot centers. (see sheet on the value of radiometric logging.) ~~The A.E.C. has a logging truck in this area and has volunteered to perform the service without charge~~. The cuttings from the 20 feet of limestone in holes on 25 foot centers shall be collected at two foot intervals and the portions of these cuttings which show abnormal radioactivity shall be radiometrically assayed. To definitely check the uranium values obtained by probing and radiometric assaying, twenty random chemical assays shall be run on cuttings.

d) It is proposed that the Four Corners Exploration Company, of Grants, New Mexico, undertake all drilling, geologic work, surveying, accounting, and supervision involved in this program. Mr Irving Rapaport, co-owner of the Four Corners Exploration Co. and the proposed supervisor of this program has had the following experience.

Chronologically:

Miner - Evergreen Mining Company, Colorado, Minn.	3 months
" - Climax Molybdenum Co., Climax, Colo.	9 "
" - Golden Cycle Corp., Cripple Creek, Colo.	1 "
" - Sunshine Mining Co., Wallace, Idaho	3 "
Bachelors in Geologic Engineering, U. of Minnesota	1949
Geologist A.E.C. Exploration Projects	
Calamity Mesa, Colo.	9 "
Project Supervisor A.E.C. Exploration Projects	
Marysvale, Utah	9 "
Grants, New Mexico	15 "
Manager, Manoch Mines, Inc.	15 "
Consultant Geologist	Total of
Chilean Nitrate Corporation	110 days at
J.H. Whitney Enterprises	$100.00 per
Spencer Chemical Co.	day

6. a) It is proposed that all drilling to done by a Failing 1,500 rotary rig at the rate of $.50 per foot by the Four Corners Exploration Company. The approximate cost of previous exploration cost in this area is:

Type	Company	Cost
Core drilling	Anaconda	$2.15 per foot
Wagon drilling	Santa Fe R.R.	$.90 " "
" "	Anaconda	$.90 " "
" "	Manoch Mines, Inc.	$.95 " "
" "	Manol and partners	$1.05 " "

The A.E.C. has let a contract to the low bidder for rotary drilling in this area at $.575 per foot. The previous low unit cost for A.E.C. exploratory drilling was the wagon drilling contract at Temple Mountain, Utah, at $.98 per foot.

For that minor proportion of the drilling where sample is desired a cost of $1.60 per foot is bid.

An additional cost of $.15 per foot has been added to cover the cost of geologic work, radiometric assays of the cuttings, 20 check chemical assays, surveying, accounting, correspondence, and supervision. (For tabulation of drilling, see Table 1).

The A.E.C. has stated that its radiometric logging truck is to be used primarily for its own drilling, and may not be available for private exploration. A truck-mounted radiometric logging unit, somewhat inferior to that employed by the A.E.C. is to be bought for use on this program. An additional $.15 per foot is proposed for this service.

b), c), d), e), f), g), and h).

The individual items of expense are not listed as a per unit basis is being employed in this bid.

The equipment to be used on this job includes:

Item	Approximate Cost New
1 Failing rotary drilling rig (1,500' rated capacity)	$27,000.00
1 Ingersol Rand Gyroflow Compressor (315 c.f.m.)	3,200.00
1 S.D. Duclono sampler	500.00
1 Chevrolet truck for compressor (1½ ton)	3,200.00
2 Pickup trucks (½ ton)	3,300.00
1 Truck-mounted radiometric logging unit	3,500.00
Total	$45,700.00

7. a) Henosh Mines, Inc. is fully prepared to furnish its share of the cost of the proposed project in accordance with the regulations on Government participation.

b) Henosh Mines, Inc. share of the expense of exploration will be provided in money.

Table 1

SUMMARY OF DRILLING

SECTION 22, T 13 S, R 10 W.

Phase	No. Holes	Avr. Depth	Total Feet	Cent/Ft.	Total Cost
Initial Grid (100')	207	43.030	8,910	$.50	$4,459.00
Secondary Grid (50')**	285.66	43.03	12,305.43	$.50	$6,152.715
Tertiary Grid (25')***	213.25	43.03			
a) Limestone Cuttings required		20.00	4,265.00	$1.00	$4,265.00
b) Overburden		23.03	4,921.51	$.50	$2,460.755
Totals	705.91	43.03	30,410.24	$.570	$17,337.680

Radiometric logging and the preparation of a permanent geologic record of every hole ---------- 30,410.24' @ $.15/Ft-$4,561.536

Supervision, core bins, correspondence, surveying, collection of cuttings, twenty chemical assays of cuttings, radiometric assays of cuttings, geologic reports, and ore reserve calculations. 30,410.24' @ $.15/Ft-$4,561.536

Total minimum cost of exploration program $26,460.752

* Average hole is composed of:
18.03 feet of overburden (alluvium, siltstone, and chalk)
20.00 " " limestone (ore horizon)
5.00 " " sandstone (underlying Entrada sandstone)

** The ratio developed in figure 2, assuming 20% of holes on the initial grid to be mineralized, was applied to yield a total of 285.66 holes on the secondary grid.

*** The ratio developed in figure 3, assuming 10% of holes on the secondary grid to yield ore mineralization, was applied to obtain the figure of 213.25 holes on the tertiary grid.

[illegible]
[illegible] 101
[illegible]

__[illegible]__

1) An exact, a natural, and permanent record of the intensity of each radiation of every inch of the [illegible] is produced.

2) The extreme sensitivity of this method presents two major advantages.

a) Each trace may be differentiated by their relative inherent radioactivity. Specifically, [illegible] to distinguish [illegible] from the [illegible] natural radiation [illegible]. [illegible] at a cost of approximately [illegible] per foot. The [illegible] and [illegible] at a cost of approximately [illegible] per foot.

b) A large [illegible] of trace [illegible] can be [illegible]. The [illegible] may consist of but a few [illegible] of [illegible] along a [illegible] plane. This [illegible] [illegible] when the [illegible] is [illegible]. [illegible] traces are not discernible when diluted by more than 25 inches of [illegible].

3) The exact thickness of [illegible] is defined.

4) The [illegible] operator is able to decide where he will [illegible] immediately.

5) The overall cost of completion is reduced.

a) The volume of [illegible] by the [illegible] is reduced.

b) [illegible] the [illegible] of the [illegible] of [illegible].

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

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID
PAYMENT OF POSTAGE, $300
(PMGC)

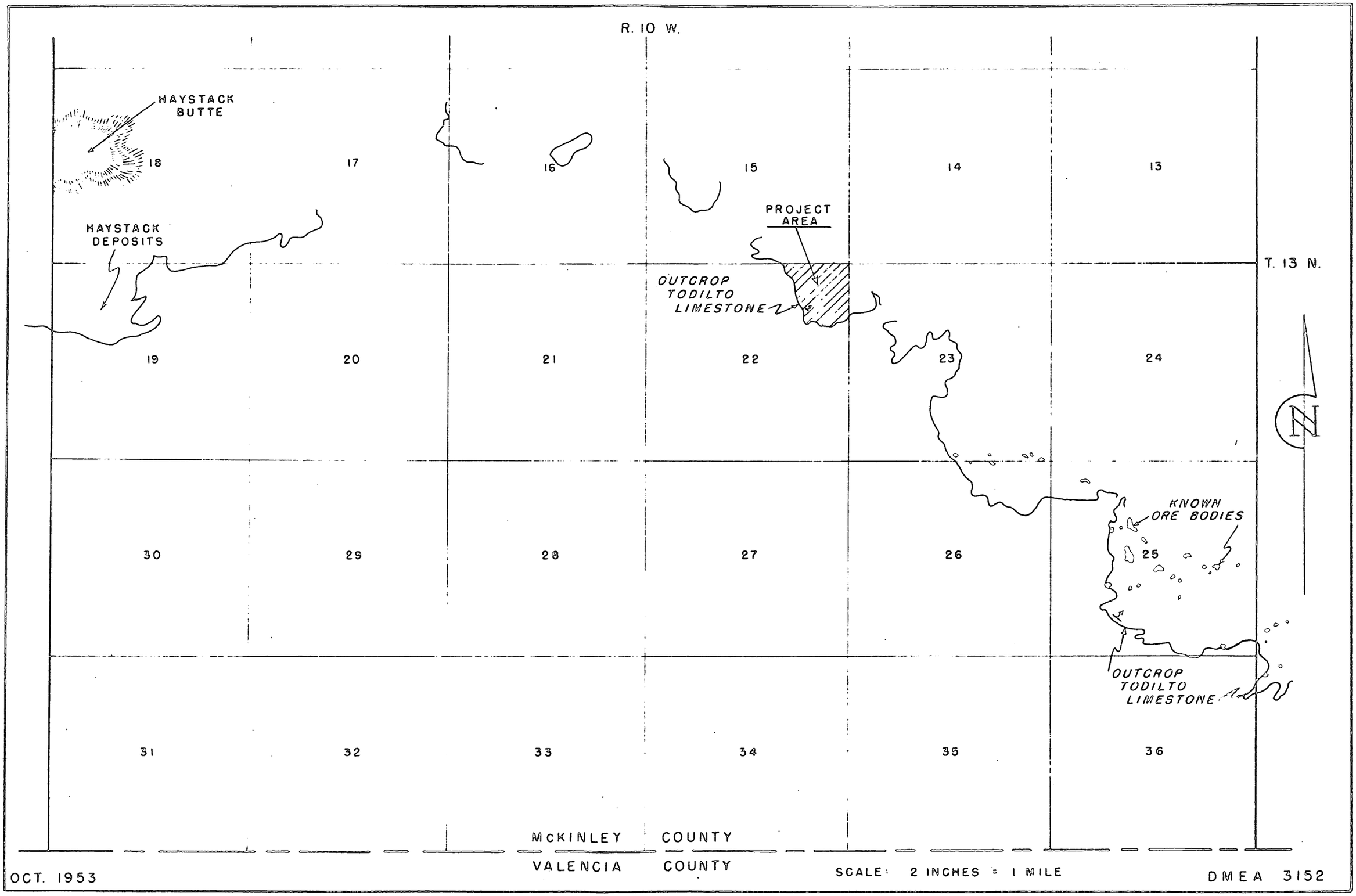


FIGURE 2. - OUTCROPS OF TODILTO LIMESTONE
(SHOWING SOME OF THE KNOWN ORE BODIES)

HANOSH MINES, INC. McKINLEY COUNTY, NEW MEXICO

The area proposed for exploration covers about 43 acres situated in the extreme northeast corner of Sec. 22. The land in Secs. 15 and 23, which immediately adjoins the subject property on the north and east, is either owned or controlled by the Atchison, Topeka & Santa Fe Railway Co. (figure 3). The applicant company is producing ore from another lease covering a portion of Sec. 26, T. 13 N., R. 10 W.

DESCRIPTION OF THE DEPOSITS

Uranium mineralization in the area under consideration occurs in the Todilto limestone. This formation is a persistent gently-dipping bed averaging about 20 feet in thickness. The tract proposed for exploration is underlain by this limestone. Its irregular outcrop marks the western and southern boundaries of the project area (fig. 3). Erosion has completely removed the Todilto limestone from all of Sec. 22 with the exception of the extreme northeastern corner which constitutes the area proposed for exploration. Except in the immediate vicinity of the outcrop the favorable bed is usually completely concealed by varying thicknesses of overburden. This is not only true of the tract under consideration but prevails generally throughout the district. Although showings of uranium mineralization are not uncommon along the outcrop of the Todilto it appears that very few of the district's more important ore bodies have been found exposed in this manner. Closely spaced blind drilling has been the chief means of finding and outlining the present ore reserves of the district.

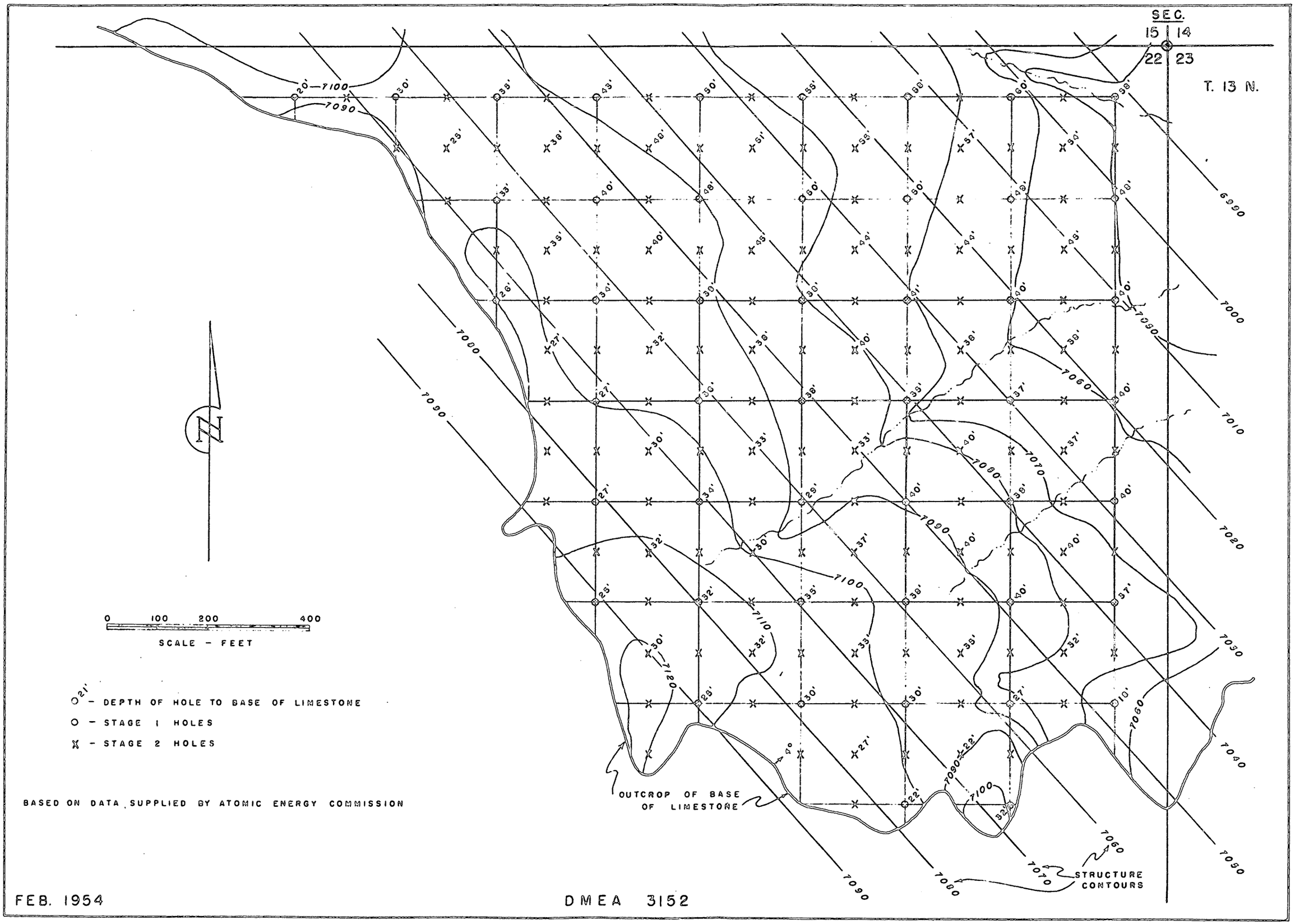


FIGURE 3. - TOPOGRAPHIC AND STRUCTURAL CONTOUR MAP

HANOSH MINES, INC. (SHOWING STAGE 1 AND 2 OF PROPOSED DRILLING) McKINLEY COUNTY, NEW MEXICO

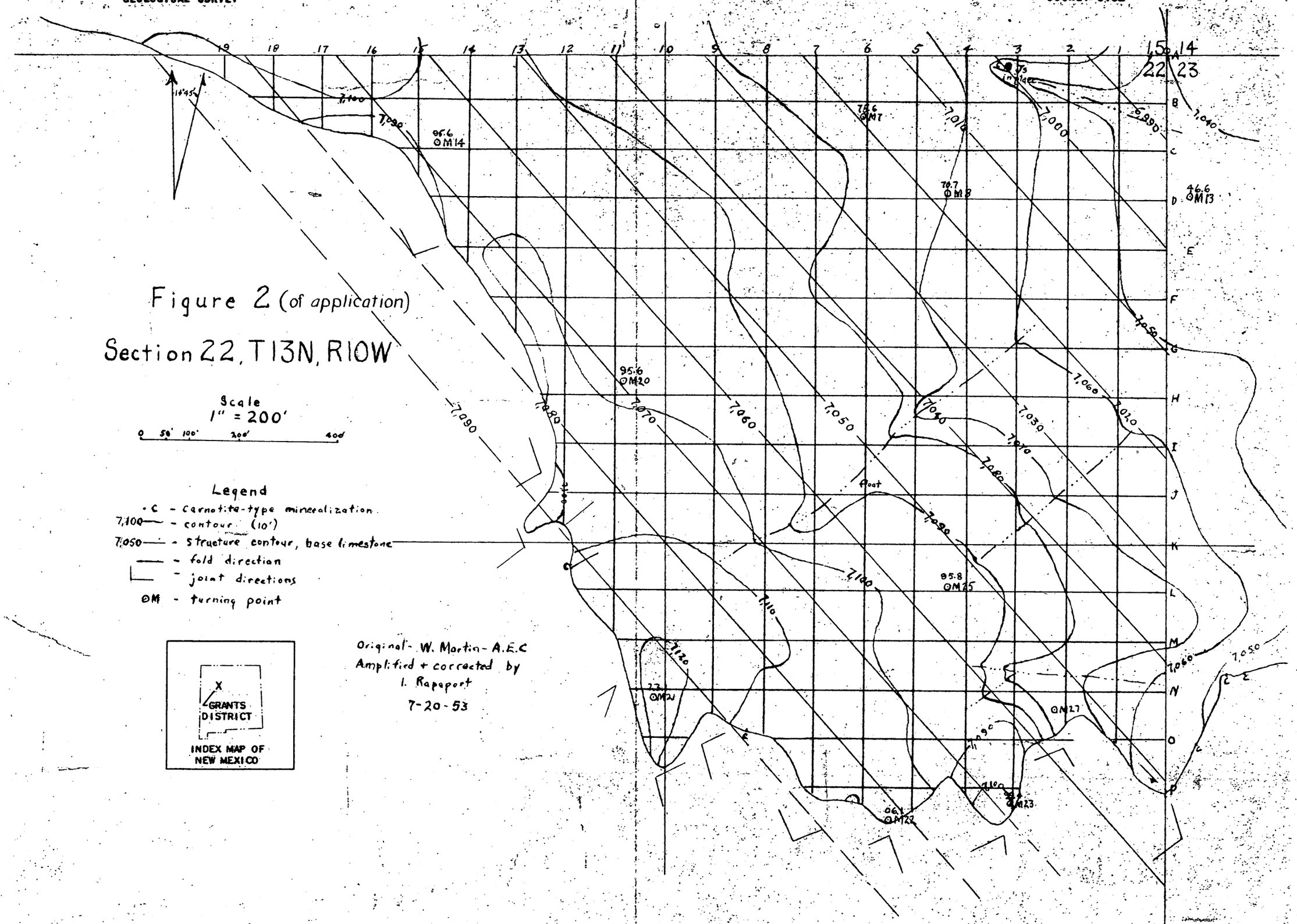


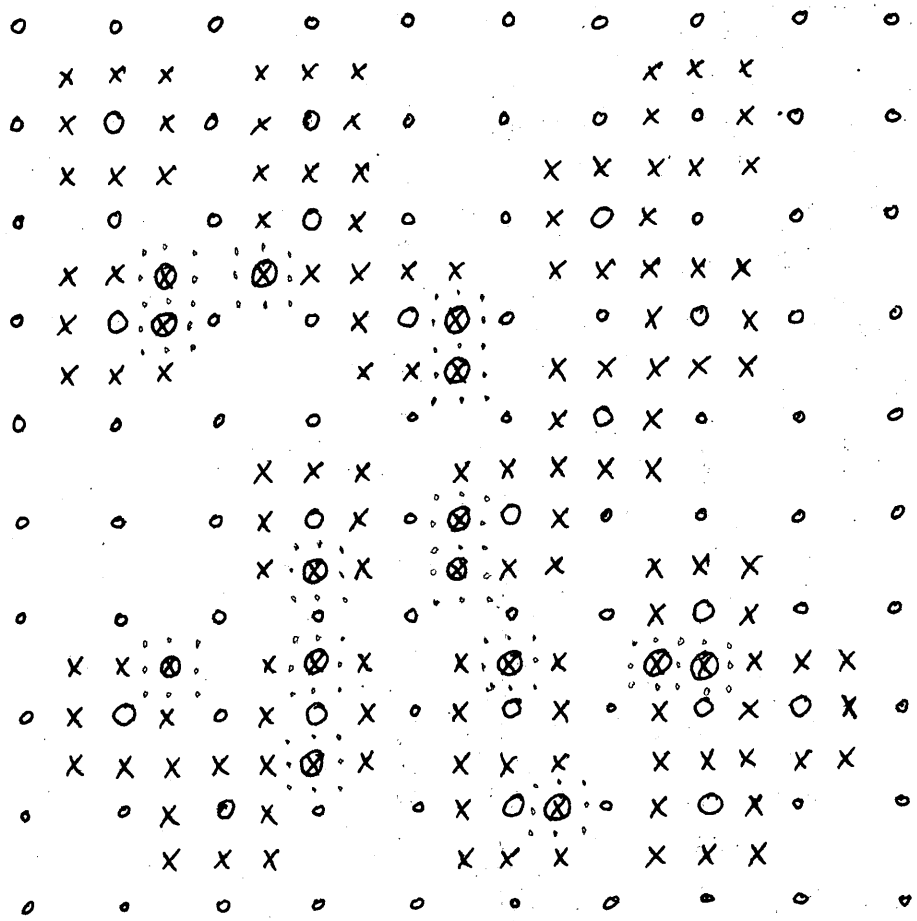
Figure 1. INITIAL DRILLING PATTERN, SUGGESTED BY APPLICANT, KANOSH MINES INC., GRANTS DISTRICT, McKINLEY COUNTY, NEW MEXICO

Figure 3

1) ○ 100 holes initial (100%) grid
○ 20% (20) " mineralized (3X overgrown)
2) X 138 " secondary (50%) grid regularized
⊗ 10% (10) " mineralized (overgrown or grade) (1500 ft - 0.5% 0.5%)
3) 103 " tertiary (20%) grid regularized

L. Rapoport
8-6-73

Figure 3



D MCG-3152

1) O 100 holes initial (100') grid
   O 20% (20) " mineralized (3X background)
2) X 138 " secondary (50') grid required
   ⊗ 10% (13.8) " mineralized (approaching ore grade) (1,500 c/s = .04% U_3O_8)
3) · 103 " tertiary (25') grid required

I. Rapaport
8-6-53

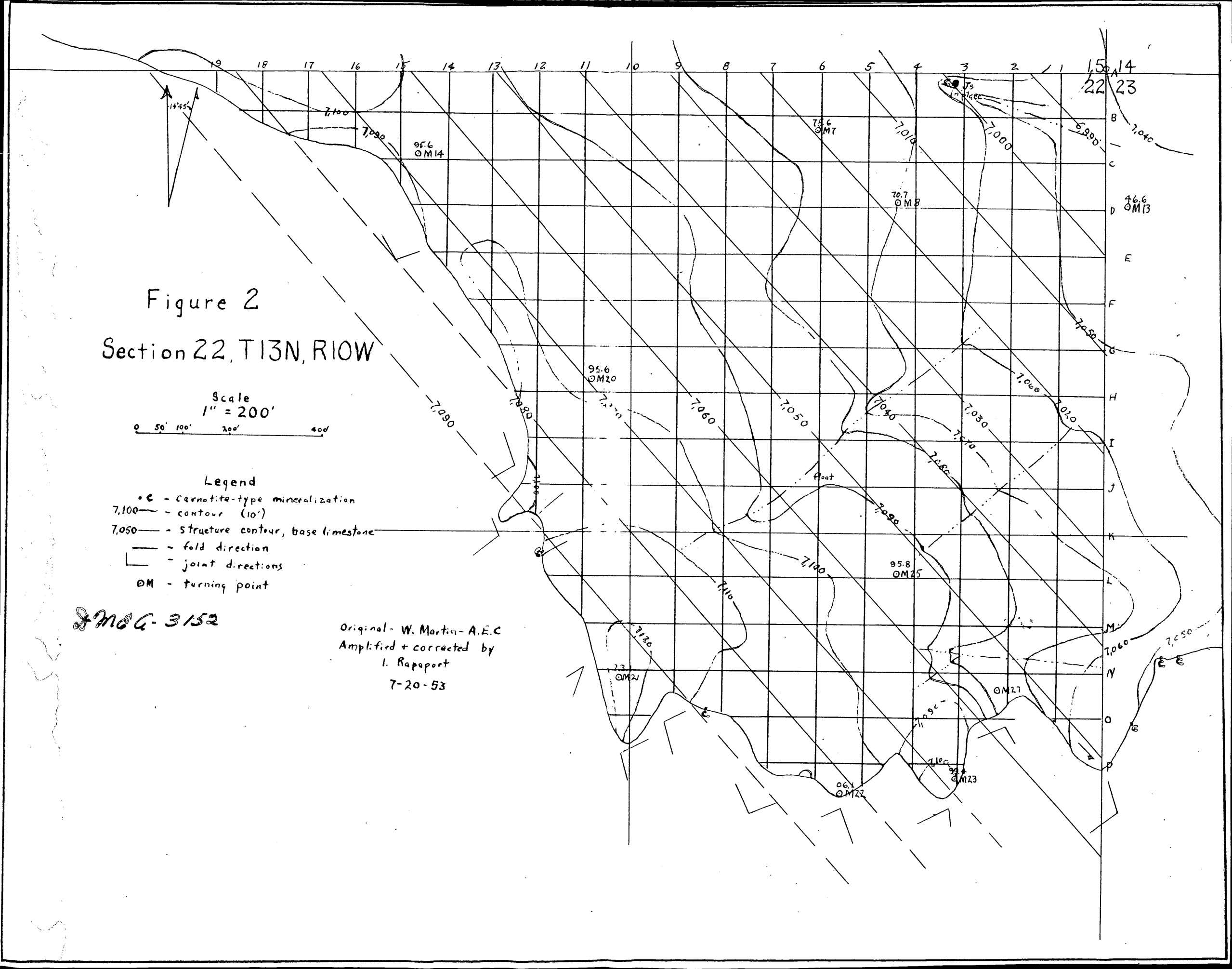


Figure 2
Section 22, T13N, R10W
Scale
1" = 200'
0 50' 100' 200' 400'
Legend
• C - Carnotite-type mineralization
7,100 - contour (10')
7,050 - structure contour, base limestone
- fold direction
- joint directions
OM - turning point
AMEG-3152
Original - W. Martin - A.E.C
Amplified + corrected by
I. Rapaport
7-20-53
95.6 OM14
95.6 OM20
79.6 OM7
70.7 OM8
46.6 OM13
95.8 OM25
OM27
OM23
OM22
OM21
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7,070
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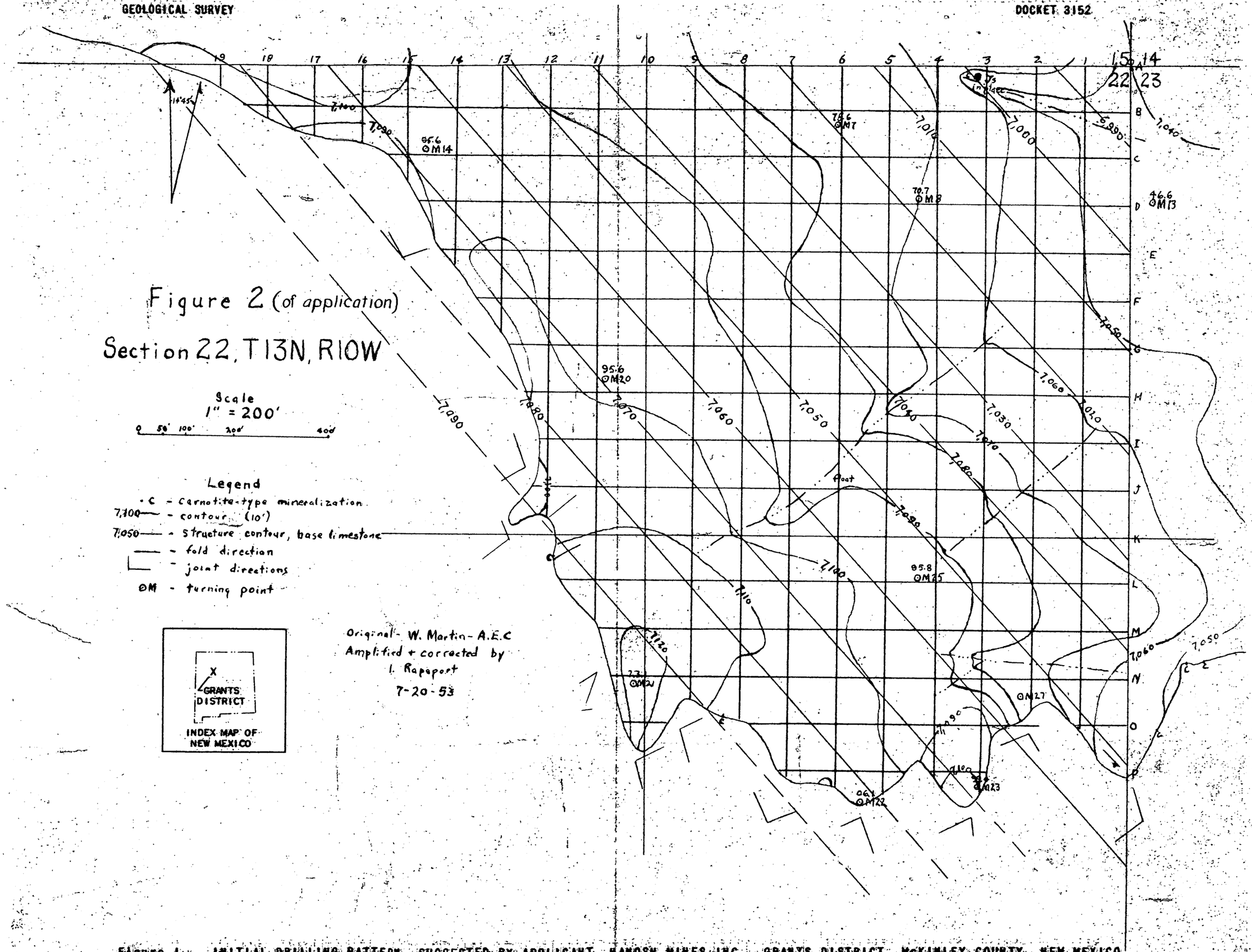
Figure 2 (of application)
Section 22, T13N, R10W
Scale
1" = 200'
0 50' 100' 200' 400'
Legend
• C - Carnotite-type mineralization
7,100 - contour (10')
7,050 - structure contour, base limestone
- fold direction
- joint directions
OM - turning point
Original - W. Martin - A.E.C
Amplified + corrected by
I. Rapoport
7-20-53
X
GRANTS DISTRICT
INDEX MAP OF NEW MEXICO
95.6 OM14
95.6 OM20
78.6 OM7
70.7 OM8
46.6 OM13
95.8 OM25
OM27
OM23
OM22
Root
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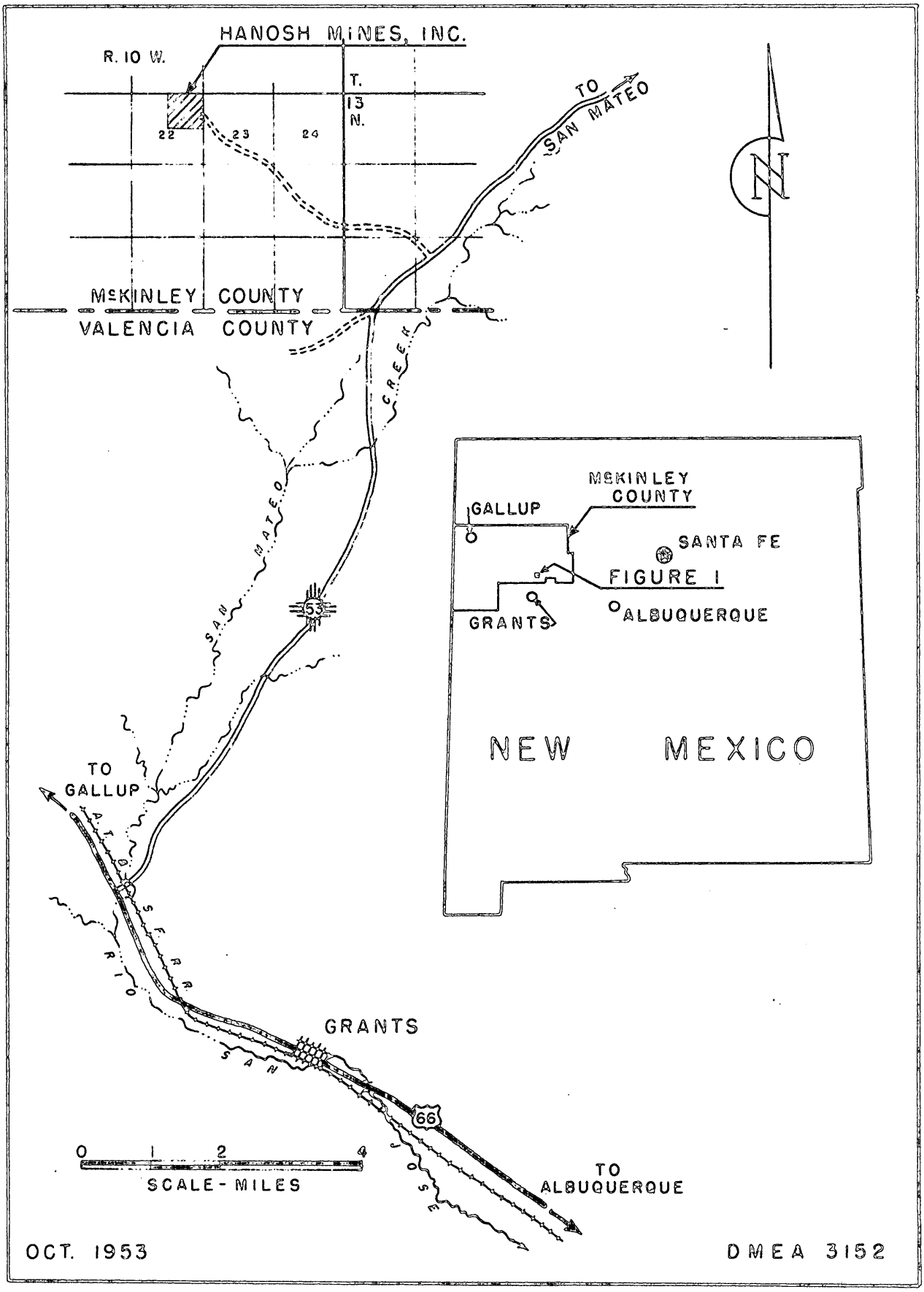

FIGURE 1, - LOCATION MAP - HANOSH MINES, INC.
McKINLEY COUNTY, NEW MEXICO

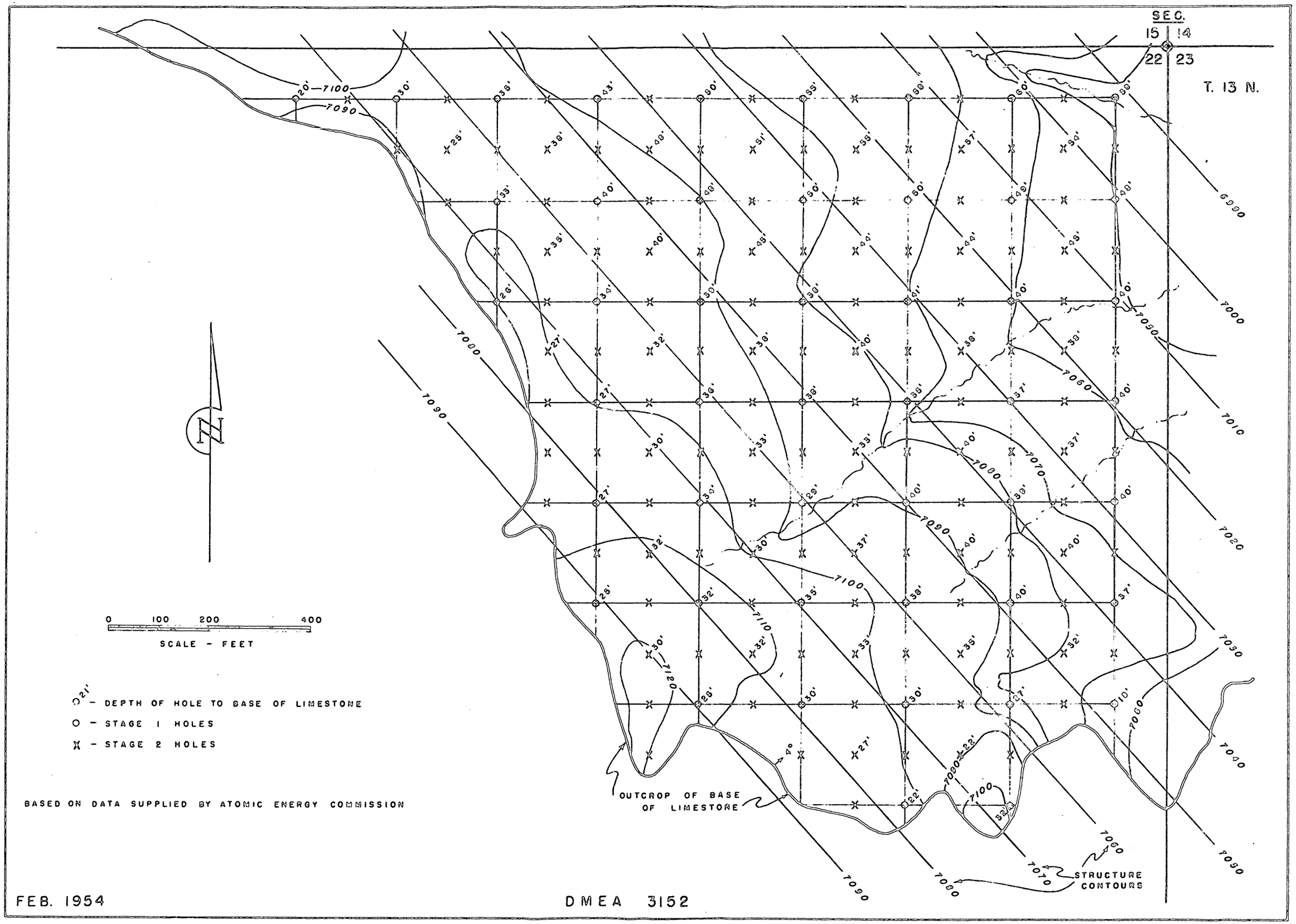

FIGURE 3. - TOPOGRAPHIC AND STRUCTURAL CONTOUR MAP

HANOSH MINES, INC. (SHOWING STAGE 1 AND 2 OF PROPOSED DRILLING) McKINLEY COUNTY, NEW MEXICO

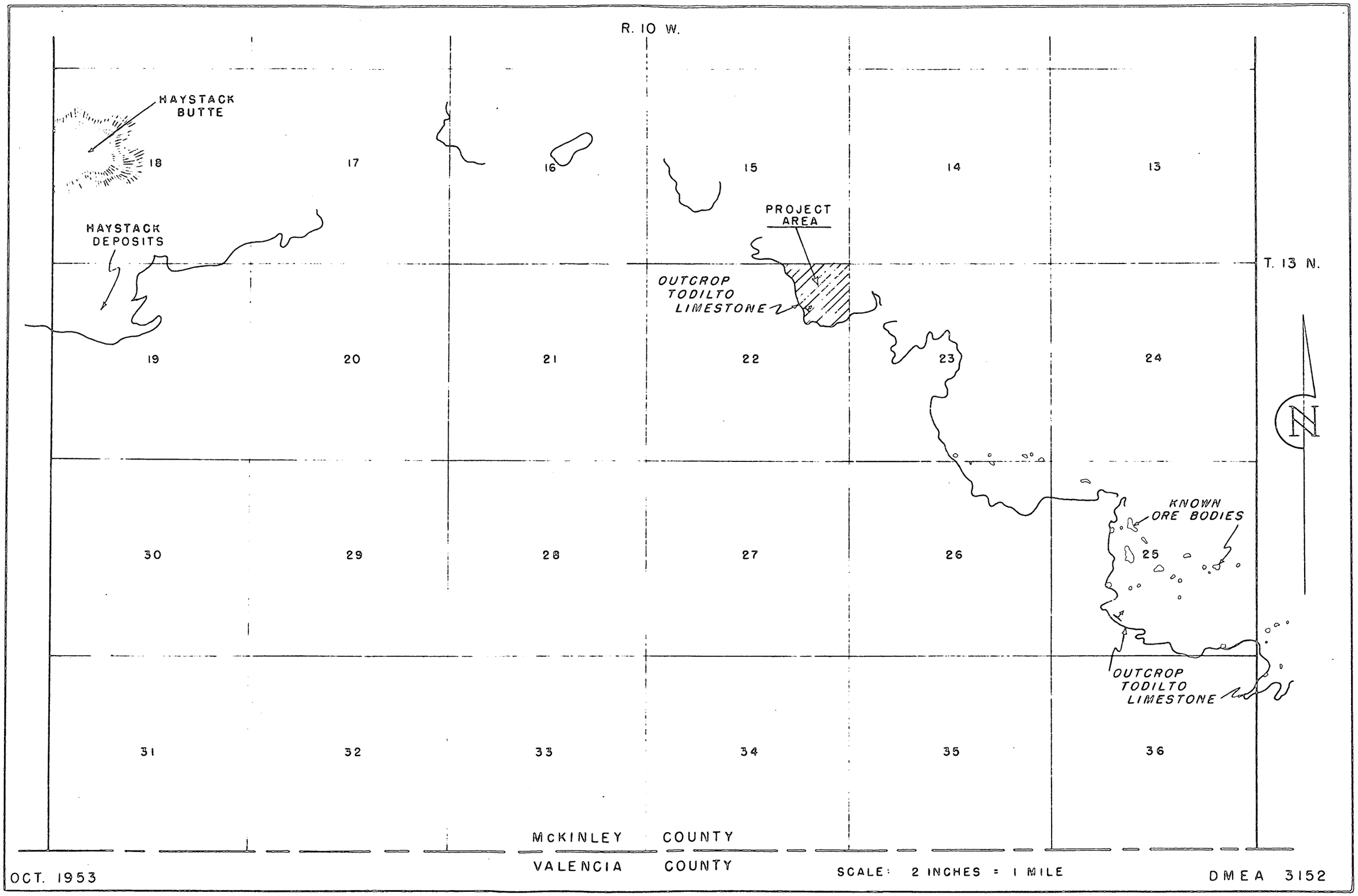

FIGURE 2. - OUTCROPS OF TODILTO LIMESTONE
(SHOWING SOME OF THE KNOWN ORE BODIES)

HANOSH MINES, INC. McKINLEY COUNTY, NEW MEXICO