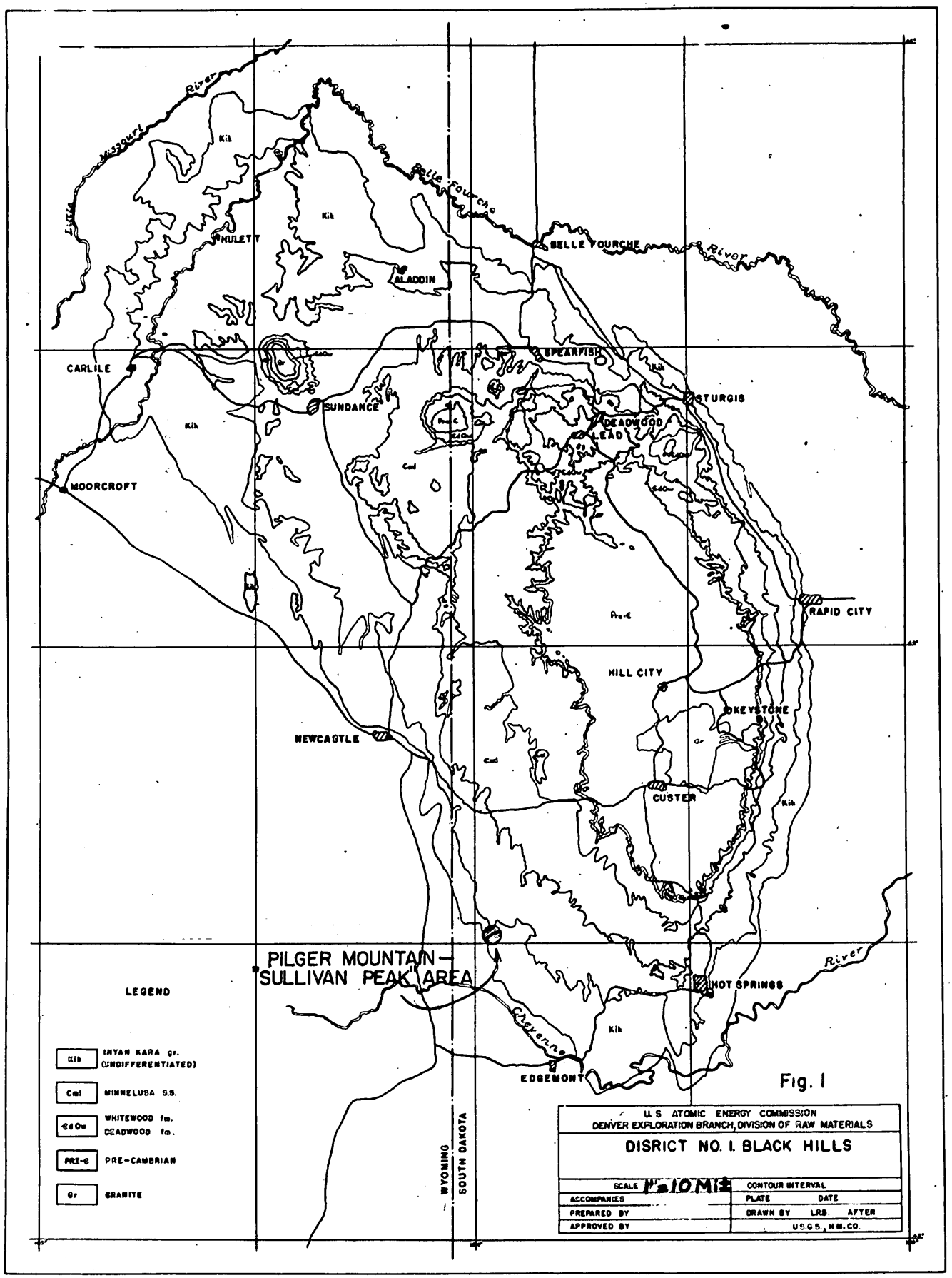
Missouri River
Little
Belle Fourche
Belle Fourche River
Kik
HULETT
ALADDIN
BELLE FOURCHE
CARLILE
SPEARFISH
STURGIS
SUNDANCE
DEADWOOD
LEAD
MOORCROFT
Pre-C
Cml
RAPID CITY
HILL CITY
KEYSTONE
NEWCASTLE
CUSTER
PILGER MOUNTAIN-
SULLIVAN PEAK AREA
HOT SPRINGS
Cheyenne
EDGEMONT
WYOMING
SOUTH DAKOTA
LEGEND
Kik INYAN KARA gr. (UNDIFFERENTIATED)
Cml MINNELUSA SS.
Ꞓdow WHITEWOOD fm. DEADWOOD fm.
PRE-C PRE-CAMBRIAN
Gr GRANITE
Fig. 1
U.S. ATOMIC ENERGY COMMISSION
DENVER EXPLORATION BRANCH, DIVISION OF RAW MATERIALS
DISRICT NO. I. BLACK HILLS
SCALE 1" = 10 MI.
CONTOUR INTERVAL
ACCOMPANIES
PLATE
DATE
PREPARED BY
DRAWN BY LRB. AFTER
APPROVED BY
U.S.G.S., N.M. CO.

RECONNAISSANCE REPORT

on the "Sullivan Peak" - Pilger Mountain Area

South Dakota

by

G. Wendell Smith

Consulting Geologist

Bismarck, North Dakota

INTRODUCTION

Location of Area: The area under discussion is located in extreme Southwestern Custer County, South Dakota, and lies on the Southwest Flank of the Black Hills. (See Figure 1). The specific mineral claims cover parts of Section 12, 13, 14, 24, 25 and 36 of T. 6 S., R. 1 E., and parts of Sections 18, 19, 20, 29 and 30 of T. 6 S., R. 2 E. (See Figure 2).

Purpose of Report: The purpose of this report shall be to present the data gained from a two-day field study of the area under discussion. This is not intended to be an exhaustive study of the area, and is not tendered as such.

Acknowledgements: The writer is greatly indebted to the Messrs. King, O'Neal and Freelund of the South Dakota sub-office of the Atomic Energy Commission for providing maps and general guidance on the area.

GENERAL GEOLOGY

Stratigraphy: The Pilger Mountain - "Sullivan Peak" * Area is underlain by the geologic section typical of the Black Hills Area. The generalized section is shown on Figure 3, which was obtained from the Atomic Energy Commission Office in Hot Springs, South Dakota. No formations younger than the Fall River Sandstone outcrop in the immediate area of the mineral claims to be discussed here, and the oldest formation observed in the immediate area was the Spearfish. No purpose will be served by repeating here the lithologic descriptions shown on Figure 3. The Inyan Kara Group of formations contains all known commercial uranium ore deposits of the Black Hills, with both the Fall River and Lakota Sandstones yielding ore. Figure 1 indicates the Pilger Mountain - "Sullivan Peak" Area is located on the outcrop band of the Inyan Kara Group.

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*The term "Sullivan Peak" as used by the natives and in this report applies to that peak lying in the Southwest Quarter of Section 12, T. 6 S., R. 1 E., and is so used in this report. The U. S. Geological Survey applies the term to that peak lying near the North Quarter corner of Section 28, T. 5 S., R. 1 E.

Structure: The mineral claims herein discussed lie on the Southwest dipping Southwest Flank of the Black Hills Uplift. (See Figure 4). No structural mapping was done during this short reconnaissance, but minor folding was observed and faulting and folding are definitely present in the area immediately adjoining the "Sullivan Peak" Area on the North.

G. WENDELL SMITH
GEORGE E. SUMMERS, JR.
CONSULTING GEOLOGISTS
BISMARCK, N. D.

THE OCCURRENCE OF URANIUM AND VANADIUM IN THE SOUTHERN BLACK HILLS*

Carnotite, the chief mineral in the Black Hills uranium ore, was discovered about three years ago near Edgemont, South Dakota. Since that time, over 1500 claims have been staked in the Southern Black Hills. Uranium ore has been shipped from over fifty locations in the Hills, but tonnages are restricted information and the writer could elicit only that small amount of production data presented later in this report under the discussion of specific mines.

The ore buying station of the Atomic Energy Commission is located at Edgemont (See Figure 1) at the extreme South end of the Hills.

Several radioactive anomalies have been noted in the areas of outcrop of the Inyan Kara Group of formations not only on the South end of the Hills, but also along the Southwest, West and North Flanks.

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*Much of the discussion under this topic is covered by information taken from a published address, "Exploration Phases of the Uranium Program in South Dakota" by John W. King, Chief, Hot Springs, South Dakota Sub-Office, D. E. B., Atomic Energy Commission, delivered before the Colorado Section, A. I. M. E., in Denver, Colorado, May 20, 1954.

According to King*"minor structure appears to be an important feature related to the ore deposits of the Black Hills. It is suggested that the complicated structural pattern, like the complication of sedimentation, may be a significant factor in the localization of uranium ore bodies. ..... It was noted by the U. S. Geological Survey men in the Southern Black Hills last summer that the principal ore deposits follow structural terraces. ..... Although structural control of ore deposition appears to be important, it is to be emphasized that lithology is of prime importance. The deposits are typical sandstone ore bodies in which the uraniferous material (usually carnotite) is deposited as grain coatings and interstitial fillings. Without adequate permeability, access of ore bearing solutions is prohibited and without a chemical environment favorable to precipitation, ore deposits will not occur."

The writer's observations were that carnotite occurs also as coatings along fracture faces and as grain coatings in permeable zones immediately overlain by tight, impermeable, often limonitic sandstone layers. Other occurrences of carnotite are intimately associated with lignite and plant remains.

Exploration procedures for uranium follow the same techniques as in the better established Colorado Plateau producing area. Airborne radiometric surveys, ground scintillometer surveys, wagon drilling, and bulldozer excavating are all employed, and usually in that order. Aerial radiometric anomalies are checked by ground scintillation equipment, and the development is guided by bulldozer excavating and wagon drilling. Most development to date

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*Op. Cit., P. 3.

has been in horizons less than 100 feet below the surface although AEC drilling has shown that good ore may be present as much as 470 feet below the surface.

In summary, Mr. King states*: ".... that over a period of less than three years, the Black Hills Area has progressed from a locality where uranium was not suspected, to a producing area with a bright future. Five separate districts have already produced ore and the near surface deposits have been only scratched. We feel that ore controls are being recognized which will aid greatly in the localization of favorable areas. We have confidence that refinement of the current theories will result in finding more uranium in the Black Hills than we suspect today. Finding it is a job for geologists who have ideas and imagination."

*King, Op. Cit., PP. 6 and 7.

G. WENDELL SMITH
GEORGE E. SUMMERS, JR.
CONSULTING GEOLOGISTS
BISMARCK, N. D.

DISCUSSION OF INDIVIDUAL MINES

LUCKY STRIKE

This claim, shown as No. 1 on Figure 2, is an active mine in which bulldozing has produced an unknown quantity of ore. It is located near the center of the N/2 SE/4 of Section 36, T. 6 S., R. 1 E. The ore occurs in the form of carnotite as grain and fracture coatings in the Fall River Sandstone. No tonnage or data as to quality was available. The Lucky Strike claim lies less than half a mile South of the Del Muerto Claim, one of those belonging to the group under consideration.

FREEZEOUT NO. 4

This mine, lying Southwest of the Del Muerto Claim is operated by John McCloud. Its location is in the NE/4 of the SE/4 of Section 36, T. 6 S., R. 1 E. (No. 2 on Figure 2). Operations were begun this spring and 493 tons of ore averaging .13% U_3O_8 were marketed during May. An unestimated tonnage of apparently good ore is stockpiled on the lease.

COAL CANYON NO. 1

This mine, (No. 3 on Figure 2), located near the center of the E/2 NE/4 of Section 27, T. 7 S., R. 2 E., has two drifts driven into the outcrop of the Lakota Sandstone. The ore is in the form of carnotite coatings around the grains of porous sandstone overlain by an apparently impervious claystone layer which was undoubtedly a controlling factor in the mineralization process. No production data is available in this claim. An extensive detailed wagon drill program is currently in progress, and the general impression gained by visiting the mine is that it is a profitable enterprise and that the wagon drilling is being done to outline precisely the extent of the ore body before a permanent mining plan is effected.

VIRGINIA C

This Claim, No. 4 on Figure 2, is located in the SW/4 SW/4 of Section 26, T. 7 S., R. 2 E., and is here mentioned, although it was not inspected, because production data was obtained. This mine was on production for two months in 1952, and for seven months in 1953. A total of 2600 tons was marketed in those nine months, with the ore averaging 0.29% U_3O_8. The highest percentage was the first ore marketed in 1952, which had .41% U_3O_8.

GOULD

This was the best developed of the mines visited. The ore is carnotite in coatings and seams in very coarse sand to quartz conglomerate within the Lakota Sandstone. A very obvious intraformational unconformity is exposed in the face of the workings and the ore appears richest in the small channel fillings immediately above the unconformity. A considerable amount of carbonized plant remains occur in and near the mineralized zones. Two drifts have been driven into the hillside and extensive wagon drilling has outlined an ore body which Mr. Matt Brown of the Pictograph Mining Company is quoted as estimating at 20,000 tons, running 0.26% U_3O_8.

PILGER MOUNTAIN GROUP

This group of claims is shown on Figure 5. The nearest producing mine is the Lucky Strike, about a quarter of a mile south of the Del Muerto Claim in the NE/4 of Section 36, T. 6 S., R. 1 E.

Del Muerto Claim: This is the one mineral claim which will be discussed individually because it has had some exploration work done on it. The claim is atop a wooded sloping mesa underlain by Fall River Sandstone. Bulldozing has exposed considerable bedrock, and along the east side of the claim Geiger Counter readings of .03 MR/Hr. were obtained along several mineralized fractures, the walls of which exhibited carnotite staining.

An apparently aimless wagon drill program has resulted in several drill holes which were investigated with the counter to only about six feet below the surface which is as deep as the probe of the counter would reach. Readings of 0.15 MR/Hr. were obtained from two core holes. This claim should be investigated by a detailed systematic ground scintillometer survey, followed by extensive drilling. Ore is definitely present here, but the quality and extent should be determined before extensive mining operations are instituted.

The next most interesting claims are Dead Cedar 2 through 8 and Pine 1 through 6. While no Geiger readings were obtained, an extensive limonite coated fracture system with possible faulting was noted on Dead Cedar 4 and on Dead Cedar 8. An estimated 30 feet of Fall River Sandstone outcrops throughout most of these claims and many zones of friable porous sandstone were noted. Since the group of claims listed above is underlain by the Fall River Sandstone and since a fracture system and porosity were noted, these claims should be thoroughly investigated by a ground scintillation program.

The remaining claims shown on Figure 5 are underlain by Fall River Sandstone, and most of them have a thin soil cover so that a ground-scintillometer-wagon drill combination program of exploration is indicated.

G. WENDELL SMITH
GEORGE E. SUMMERS, JR.
CONSULTING GEOLOGISTS
BISMARCK, N. D.

"SULLIVAN PEAK" GROUP OF CLAIMS

The "Sullivan Peak" Group of claims shown in Figure 6 will be more difficult of exploration than the Pilger Mountain Group because of the rough topography. Some bulldozing has been done, but no Geiger readings indicative of uranium mineralization were found on the few exposures examined. A strong joint system in the Fall River Sandstone was observed on "Sullivan Peak" and folding and probably faulting is indicated by outcrops North of "Sullivan Peak". Since minor structural deformation has been proved a factor in ore deposition, this fact coupled with the presence of Inyan Kara Group sediments in outcrops within this group of claims indicates a good potential area for mineralization. A scintillation survey in detail, followed by wagon drilling of anomalous areas is recommended.

G. WENDELL SMITH
GEORGE E. SUMMERS, JR.
CONSULTING GEOLOGISTS
BISMARCK, N. D.

SUMMARY STATEMENT

The Pilger Mountain - "Sullivan Peak" Group of claims are located on the outcrop or are underlain at shallow depths by the Inyan Kara Group of formations which have produced all known commercial uranium ore in the Southern Black Hills. Definite carnotite ore exists on the Del Muerto Claim, its quantity and quality unestimated because of lack of data.

The age and lithology of the rocks present in the area, coupled with observed jointing, fracturing and possible faulting in the area of commercial uranium ore accumulations make these claims very desirable as areas for detailed exploration.

The writer made no detailed examination of the properties, and the maps presented as Figures 6 and 7 were not thoroughly checked in the field, although the few claim corners checked were found to be essentially correct. Figures 6 and 7 are prepared from maps made by a Claim Checker who checked the claims in the field.

Respectfully submitted,

SMITH & SUMMERS

G. Wendell Smith
Consulting Geologist

July 29, 1954

G. WENDELL SMITH
GEORGE E. SUMMERS, JR.
CONSULTING GEOLOGISTS
BISMARCK, N. D.

Returned by Chamberlin

Minutes of Chamberlin

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

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JAN - 7 1955

224 New Customhouse
Denver 2, Colorado

January 5, 1955

Memorandum

To: Secretary to the Operating Committee
Defense Minerals Exploration Administration

From: Executive Officer, DMEA Field Team, Region IV

Subject: Application for DMEA assistance, (Uranium), Del Mundo Uranium and Development Company, Sections 12, 13, 14, 24, 25, and 36, T-6-S, R-1-E, and Sections 18, 19, 30, and 31, T-6-S, R-2-E, Pilger Mountain, Sullivan Peak Area, Custer County, South Dakota

Enclosed are four copies of the subject application and nine extra copies of the claim map as submitted to this office. The application is not acceptable in its present form. It would have been returned to the applicant for corrections and additions if the dollar amount of the application fell within the authority granted to this office. As the application is for $115,404.66, we are forwarding it as received with the recommendation that it be returned to the Del Mundo Uranium and Development Company for the preparation of a revised application. It might be well to discuss the following with the applicant:

(1) We question if Del Mundo Uranium and Development Company has control of the ten sections listed under Question 3 of Form MF-103. Control of mining claims located in these sections is by lease attached to application, and it is believed that this is the only portion of these sections controlled by the applicant company. This question should be clarified on the revised application.

(2) One signed copy of the Power of Attorney granting Helen P. Rothleutner authority to sign for Mary Rothleutner Valentine, Frank Rothleutner, James Rothleutner, Joseph Rothleutner, Katherine Rothleutner, Max Rothleutner, and Clara Rothleutner, must be obtained before a possible contract can be formulated.

(3) The proposals of this application are definitely of a prospecting nature and not within the limits of the Defense Minerals Exploration program. The presence of anomolies as

Copy Returned by
B. of Mines.

detected by Scintillator or Geiger Counter cannot be accepted as the basis for an exploration program, as an anomoly does not necessarily indicate uranium mineralization. Chemical assays would greatly add to the application. It is the applicant's duty to establish a definite target area within his property boundaries and to arrive at a logical program of exploration of the target areas. If this preliminary work were done under the DMEA program it would be in competition with consulting engineers and geologists. The reported production of five tons of 0.31 percent U_3O_8 from the Del Muerto claim does not add to the application as this fact is not established by the applicant.

(4) If a revised application is submitted it should include copies of the claim map on which the location of proposed drill holes are plotted to scale. We must know the location of the applicant's proposed drilling in relation to his property boundaries. The important geologic features of the area such as veins, fault zones, mineralized outcrops and also existing workings and drill holes should also be shown on the map as required under Question 5(b), Form MF-103.

It is suggested that a new set of Forms MF-103 be forwarded to the applicant.

W. H. King

W. H. King

Enclosures

Copy to: C. O. Mittendorf
E. O. Binyon (2)
E. N. Harshman
R. D. Berkenkotter
Sub
Chron

RDB:ld

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

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JAN - 7 1955

Not to be filled in by applicant

Docket No. 3634
Metal or Mineral Uranium
Date Received 1-7-55
Estimated Cost $115,404.66
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 Del Mundo Uranium and Development Company, P. O. Box 361, Bismarck, North Dakota
(b) A South Dakota Corporation
(c) See attached sheet

(*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 Sections 12, 13, 14, 24, 25, and 36 of Township 6 South, Range 1 East, and Sections 18, 19, 30 and 31 of Township 6 South, Range 2 East, all in Custer County, South Dakota. Please refer to map as Exhibit "C" submitted under 5 (b), and lease agreement submitted under 3 (d).

(*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 Lessee by assignment.

(*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. Exhibit "A".

(*e*) If you own the land, describe any liens or encumbrances on it Do not own.

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice Refer to Exhibit "A" for recording data on original location notices, and Exhibit "B" for recording data on amended notices.

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 See attached sheet.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grade See attached sheet.

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

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

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

All necessary labor and materials are readily available in the area.

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

(*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. See attached sheet.

(*c*) The work will start within 30 days and be completed within 18 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. See attached sheet.

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.). See attached sheet.

(*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. See attached sheet.

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

(*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. See attached sheet.

(*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. None.

(*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. None.

(*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. None.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above. None.

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)? Yes.

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

[X] Money [X] Use of equipment owned by you [X] 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 December 21, 1954

Del Monte Uranium Corp.
(Applicant)

By Raymond E. Keys
President

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.

Del Mundo Uranium and Development Company,
P. O. Box 361,
Bismarck, North Dakota

1. (c) President: Raymond E. Hayes, P. O. Box 361, Bismarck, North Dakota.
Vice-President: Norris E. Stolquist, 1807 Avenue E, Bismarck, North Dakota.
Secretary-Treasurer: Keith L. Rising, P. O. Box 1173, Bismarck, North Dakota.

4. (a) Prior to our acquisition of the property, limited exploration work was performed by bulldozer and pneumatic drill. Subsequent to our acquisition of the property, some scintillator work has been done, in addition to the drilling of 10 shallow holes by wagon drill.

(b) Prior to our acquisition of the property, it is reported that approximately five tons of .31 per cent carnotite ore was recovered from the Del Muerto claim. However, no apparent ore reserves were established.

(c) The properties owned by the Company are all located within an area of Inyan Kara outcrops, and the age and lithology of the rocks present in the area, coupled with the observed jointing, fracturing and possible faulting in the area of known commercial uranium accumulations, make the claims of the Company desirable for detailed exploration.

(d) There are currently access roads to practically all the claims, however, in some instances repair work will be necessary. The property is situated approximately 25 miles from the buying station at Edgemont, South Dakota, and approximately 30 miles from both Hot Springs and Custer, South Dakota.

5. (b) It is proposed to drill 590 rotary drill holes on the 59 claims shown in Exhibit "C", at an overall average depth of 150 feet per hole, with none exceeding 250 feet in depth. It is planned that the holes will be drilled at points of scintillator readings and other points to be determined as the program progresses.

(d) Mr. R. E. Hayes, President of the Company, has had direct supervision of core drill equipment in the exploration phase of the oil business and has had managerial experience as land and exploration manager for the Roosevelt Oil and Refining Company of Mt. Pleasant, Michigan, in addition he has had many years experience as an independent mine, quarry and oil operator.

6. UNIT #1--Rotary Drilling (a) through (g)

Drilling	86,000 feet	@ $ .95 per foot	$81,100.00
Supervision	18 months	@$600.00 per month	10,800.00
Coring	2,500 feet	@ $2.25 per foot	5,625.00
Geological Service	156 days	@ $50.00 per day	7,800.00
Engineering Service	50 days	@ $50.00 per day	2,500.00
Engineering Assistant	30 days	@ $10.00 per day	300.00
Clerical Hire	108 days	@ $7.25 per day	783.00
Truck Hire (Company owned)	18 months	@ $30.00 per month (1/60 X $1,800.00)	540.00
Gas	3,500 gal.	@ $ .30 per gal.	1,050.00
Oil	200 gal.	@ $1.60 per gal.	320.00
Tire Chains	2 sets	@ $15.00 per set	30.00

Del Mundo Uranium and Development Company
P. O. Box 361,
Bismarck, North Dakota

6. UNIT #1--Rotary Drilling (a) through (g)--Continued

Grease Truck	40 times @	$1.50 per time	$ 60.00
Repairs for Truck			280.00
Tires for Truck			175.00
Truck Insurance			54.00
Truck Liscense	1½ years @	$30.00 per year	45.00
Radiometric Equipment	1/60 of $780.00 X 18 months		234.00
Batteries for Radiometric Equipment	3 sets @	$25.00 per set	75.00
Maintenance and Repairs on Radiometric Equipment			125.00
Workmans Insurance Compensation	1½ years @	$150.00	225.00
Social Security Tax			243.66
Total			$112,364.66

UNIT #2--Bulldozer Work (a) (Contract)
200 hours @ $12.50 per hour $ 2,400.00

UNIT #3--Chemical Assay (a) (Contract)
120 assays @ $4.50 each $ 540.00

Grand Total $115,404.66

7. (b) Money: The Company will make up in money any deficiency not covered by equipment and labor.
Equipment: See Item 6.
Other: Supervision.

Exhibit A
Del Mundo Uranium Development Co.

LEASE AGREEMENT

This Agreement of Lease made and entered into on this 17th day of June, 1954, by and between Helen P. Rothleutner, individually, Helen P. Rothleutner as Administratrix of the estate of Albert A. Rothleutner, Deceased, and Helen P. Rothleutner as Attorney-in-Fact for Mary Rothleutner Valentine, Frank Rothleutner, James Rothleutner, Joseph Rothleutner, Katherine Rothleutner, Max Rothleutner, and Clara Rothleutner, of Dewey, Custer County, South Dakota, hereinafter referred to as Lessors, and R. E. Hayes, Box 761, Bismarck, North Dakota, hereinafter referred to as Lessee;

WITNESSETH:

WHEREAS, Lessors are the owners of certain mining claims situated in the County of Custer and State of South Dakota, more particularly set forth in Exhibit A, which is attached hereto and made a part of this Lease Agreement by reference for the purpose of describing the mining claims; and

WHEREAS, the Lessee is interested in securing the entire and exclusive right to mine and prepare for market any and all minerals or mineral substances of every kind and character in, upon, beneath, or underlying the above described premises; and

WHEREAS, the Lessors desire to have such minerals and mineral substances mined from said premises as above stated, and the Lessee desires the right and privilege of entering upon said premises and working the same by use of suitable machinery, equipment, fixtures, and buildings for mining purposes which the Lessee may desire to place upon the premises to mine and recover from said premises any and all minerals and mineral substances for the purpose of sale, and the same being acceptable to the Lessors;

NOW, THEREFORE, for values mutually exchanged, receipt and sufficiency of which is hereby acknowledged, and the covenants and agreements to be kept and performed by the Lessee as more particularly stated and set out below, the Lessors have and by these presents do hereby lease, let and demise to the Lessee the exclusive right to enter upon the above described premises for the purpose of removing said minerals and mineral substances, erecting buildings to be used in connection with the operations, installing machinery, sinking shafts, drifting, drilling, or using any or all methods known to the science of mining, processing or otherwise preparing said minerals for market.

1. The Lessee covenants with the Lessors to enter upon the premises within ninety (90) from the date of the execution of this indenture and to commence exploration activities which must necessarily precede the working and mining of the herein described premises so as to take out the greatest amount of ore possible with due regard to safety, development, and preservation of the said premises, and according to standard approved methods and practices for the full recoverable mineral content of the said property, and to market the said minerals as rapidly as practical for the mutual advantage of the parties hereto.

No overburden, mine or mill tailings, or rejected ores or minerals shall be removed from the leased premises nor placed upon any other premises without written consent of the Lessors.

It is expressly agreed that failure to work the said premises for a period of ninety (90) consecutive days unless prevented by sickness, the elements or acts of God, over which the Lessee shall have no control, shall be deemed a breach of this covenant and shall be sufficient cause for the Lessors to terminate this Agreement.

The Lessee agrees upon termination of this Lease that all open shafts shall be fenced for the protection of the stock on the said premises. That all open cuts shall be left in such condition that stock can walk into and out of the said cuts.

The Lessee specially agrees that in the event of termination of this Contract by default on the part of the Lessee, or at the option of the Lessee, that the said Lessee will execute and deliver a release of this agreement to the said Lessors.

2. The term of this Lease shall be for a period of two (2) years, unless earlier terminated by surrender, forfeiture or otherwise, and so long thereafter as the Lessee shall comply with the covenants of this agreement and produce and market minerals from the premises for the mutual benefit of the parties hereto.

3. The royalty hereunder by the Lessee to the Lessors shall be fifteen per cent (15%) of the gross sale price of all ores, minerals and mineral substances mined from the above described premises with the exception that the Lessee shall not pay any royalty on any government allowance for hauling and development insofar as the same shall be related to mining operations on the above described premises. In addition to the above-mentioned fifteen per cent (15%) royalty the Lessee shall pay to the Lessor fifteen per cent (15%) of any bonuses or premiums paid by the government for the production and marketing of any ores recovered from the above described premises. Royalty payments hereunder shall be paid by the Lessee on or before the 15th day of each month for all minerals or mineral substances produced and marketed and for which payment has been received by the Lessee in the preceding month.

The Lessors shall at all times have the right to examine such books, papers and records which shall be kept by the Lessee for the purpose of determining the amount of royalty due under this Lease. Royalties hereunder shall be paid to the Lessors by mailing the royalty payment to the Lessors in care of Helen F. Rathbunnor, Deary, South Dakota.

4. The Lessee shall have the right to terminate or surrender this Lease at any time by giving the Lessors written notice of intention to terminate at least thirty (30) days prior to such termination or surrender and tendering therewith all royalty then due or accrued.

In the event Lessee elects to terminate he shall peaceably surrender the leased premises to the Lessors, leaving the premises in such condition as to be immediately usable insofar as mining operations are concerned; that is to say, all tunnels, shafts, drifts, stopes and every portion of the above described premises shall be left free and clear of any and all debris or any material or materials which would prevent the herein described premises from being placed into immediate operation, except in those instances where the recovery of minerals for the mutual advantage of the parties hereto requires that any tunnel, shaft, drift, or other opening, be modified so as to allow such recovery of minerals contained therein.

The Lessee shall have a period of ninety (90) days after such termination to remove any and all equipment, machinery, buildings or other property of every nature which may belong to the Lessee, provided that no such personal property of the Lessee shall be removed until all payments due and owing shall have been made to the Lessors. Any property remaining on the leased premises after said ninety (90) day period shall then become the property of the Lessors.

5. It is further agreed that time is of the essence of this Agreement, and if the royalty hereby reserved to the Lessors remains unpaid after the specified time, or if the Lessee shall fail to keep any of the covenants herein contained and such failure shall continue for thirty (30) days after written notice from the Lessors specifying such default, then the Lessors may immediately re-enter the described premises and declare this Lease to be terminated; provided that within the aforesaid thirty (30) day notice period the Lessee may commence corrective measures to remove such default.

6. It is further agreed that the Lessors may at any reasonable time enter upon the above described premises to ascertain the condition thereof, the kind, quality and quantity of minerals or mineral substances contained therein or removed therefrom, provided that the same does not unreasonably hinder or interrupt the peaceable operations of the lessee, and provided further, that Lessors shall do so at their own risk.

7. Lessee agrees to perform all needed assessment work on said Claims and to file Affidavits of Proof of Labor within the time provided by law in the name of the Lessors, in the appropriate office or offices.

8. The Lessee shall pay all lawful public taxes levied upon the leased premises or any products thereof or on any improvements placed thereon by the Lessee; provided however, that the Lessee shall not be liable for taxes accruing to the Lessors by reason of any payments or royalties or bonuses paid by the Lessee to the Lessors.

Lessee covenants and agrees that he is responsible for all labor performed, Workman's Compensation and all liability of every sort connected with the mining operations on the

leased premises; that he shall not permit the demised premises or any product thereof to become subject to any liens of laborers, contractors or other persons or firms; and Lessee agrees that the Lessors shall be held harmless for any claims whatsoever or damages connected with the said mining operations;

Lessee further agrees to comply with all applicable State or Federal laws and regulations relative to employment, Workmen's Compensation, Social Security, taxation, mining laws and regulations and Forest Service Regulations arising out of its operations, and to save the Lessors harmless at all times.

9. The right of assignment of all or any part of the demised premises is mutually recognized, provided that the Lessee shall not assign this Lease without first giving written notice to the Lessors of any assignment thereof, and provided that in the event that the Lessors make any assignment of any of their interest herein the same shall not be binding upon the Lessee unless and until such assignment is recorded in the office of the Register of Deeds of Custer County, South Dakota, and a copy thereof furnished to the Lessee at the address of the Lessee hereinabove set forth. Upon the furnishing of such copy the Lessee will recognize any such assignee and make further payments in proportion directly to such assignee.

10. Lessee agrees that in the event any of the above described claims are relinquished, then and in that event, any information relative to the mineral content of said claims obtained by the Lessee by means of core drilling, or otherwise, shall be made available to the Lessors.

11. It is agreed by all parties hereto that this Agreement shall become and be binding upon and inure to the benefit of the parties hereto, their heirs, successors, administrators and/or assigns.

12. It is agreed by the parties hereto that the Lessee shall have the right, for the mutual benefit of the parties hereto, to amend any of the herein described Lode Locations whenever the Lessee shall deem the change to be necessary, and the Lessee shall file such Amended Location in the appropriate office or offices for the benefit of the Lessors.

IN WITNESS WHEREOF the Parties have hereunto affixed their signatures the day and year first above written.

Helen P. Rothleutner
Helen P. Rothleutner

Helen P. Rothleutner
Helen P. Rothleutner, as Administratrix of the estate of Albert A. Rothleutner, Deceased

Helen P. Rothleutner
Helen P. Rothleutner, Attorney-in-Fact for Mary Rothleutner Valentine, Frank Rothleutner, James Rothleutner, Joseph Rothleutner, Katherine Rothleutner, Max Rothleutner and Clara Rothleutner LESSORS

R. E. Hayes
LESSEE

STATE OF SOUTH DAKOTA)
: SS
COUNTY OF CUSTER)

On this 17th day of June, 1954, before me the undersigned, a Notary Public within and for said County and State, personally appeared Helen P. Rothleutner, individually, Helen P. Rothleutner, as Administratrix of the estate of Albert A. Rothleutner, Deceased, and Helen P. Rothleutner as Attorney-in-Fact for Mary Rothleutner Valentine, Frank Rothleutner, James Rothleutner, Joseph Rothleutner, Katherine Rothleutner, Max Rothleutner and Clara Rothleutner, and R. E. Hayes, well-known to me to be the persons who are described in and who executed the within and foregoing instrument and acknowledged to me that they executed the same for the purposes therein contained as their own free and voluntary act.

Walter W. Rudolf
Notary Public

(Seal)

My Commission Expires: Oct. 27, 1957.

EXHIBIT "A"

Descriptions of Lode Mining Claims covered by Lease Agreement to which this exhibit has been attached and made a part of.

Del Muerto Lode Mining Claim, as the same is more particularly described and set forth in the Lode Location Certificate dated the 30th day of June, 1952, and filed for record on the 10th day of July, 1952, at 11:00 o'clock A.M., in Book 17 of Locations, Page 544, in the office of the Register of Deeds of Custer County, South Dakota.

Bingo #1 Lode Mining Claim as the same is more particularly described and set forth in theLode Location Certificate dated the 3rd day of August, 1953, and filed for record on the 4th day of August, 1953, at 3:30 P.M. in Book 18 of Locations on Page 7, in the office of the Register of Deeds of Custer County, South Dakota.

Paula #1 and Paula #2 Lode Mining Claims as the same are more particularly described and set forth in the Lode Location Certificates dated the 20th day of March, 1954, and filed for record on the 29th day of March, 1954, at 8:45 A.M. in Book 18 of Locations on page 90 in the above set forth office.

Lucky Day #1, Lucky Day #2, Lucky Day #4, Lucky Day #5, Lucky Day #6 Lode Mining Claims as the same are more particularly described and set forth in the Lode Location Certificates dated the 22nd day of August, 1953, the 19th day of September, 1953, the 4th day of January, 1954 and the 20th day of March, 1954, and filed for record on the 28th day of August, 1953, the 28th day of September, 1953, the 14th day of January, 1954 and the 29th day of March, 1954, in Book 18 of Locations on page 38, page 47, page 74 and page 91 in the above set forth office.

Crator #1, Crator #2, Crator #3, Crator #4, Crator #5, Crator #6, Crator #7, Crator #8 Lode Mining Claims as the samre are more particularly described and set forth in the Lode Location Certificates dated the 5thday of August, 1953, and filed for record on the 7th day of August, 1953, at 2:35 o'clock P.M., in Book 18 of Locations, Pages 15 to 18, in the above set forth office.

Oak No. 1, Oak #2 Lode Mining Claims, as the same are more particularly described and set forth in the Lode Location Certificates dated August 22, 1953, and filed for record on the 28th day of August, 1953, at 8:15 A.M., in Book 18 of Locations, on Page 37, in the office above set forth.

Pine #1, Pine #2, Pine #3, Pine #4, Pine #5, Pine #6, Pine #7, Pine #8, as the same are more particularly described and set forth in the Lode Location Certificates dated the 12th day of August, 1953, and filed for record on the 20th day of August, 1953, and the 17th day of September, 1953, in Book 18 of Locations, on pages 30 to 33, both inclusive, and page 45, in above set forth office.

Oak #4, Oak #5, Oak #6, Oak #7, Oak #8 Lode Mining Claims, as the same are more particularly described and set forth in the Lode Location Certificates dated the 28th day of October, 1953, and filed for record on the 4th day of November, 1953, at 4:30 P.M., in Book 18 of Locations, Pages 59 to 61 in the above set forth office.

Rock #1, Rock #2, Rock #3, Rock #4, Rock #5 Lode Mining Claims, asthe same are more particularly described and set forth in theLode Location Certificates dated the 10th day of September, 1953, the 19th day of September, 1953, and the 28th day of October, 1953, and filed for record on the 17th day of September, 1953, the 28th day of September, 1953, and the 4th day of November, 1953, in Book 18 of Locations on Page 44, Page 47, and Page 57 in the above set forth office.

Dead Cedar #1, Dead Cedar #2, Dead Cedar #3, Dead Cedar #4, Dead Cedar #5, Dead Cedar #6, Dead Cedar #7, Dead Cedar #8 Lode Mining Claims as the same are more particularly described andset forth in the Lode Location Certificates dated the 3rd day of August, 1953, the 7th day ofAugust, 1953, the 8th day of August, 1953 and the 12th dayof August, 1953, and filed for record on the 4th day of August, 1953, the 10th day of August, 1953, and the 20th day of August, 1953, in Book 18 of Locations on pages 8, pages 22 to 24, both inclusive, and page 34, in the above set forth office.

EXHIBIT "A" (Continued)

Descriptions of Lode Mining Claims covered by Lease Agreement to which this exhibit has been attached and made a part of.

Bingo #2, Bingo #3 Lode Mining Claims as the same are more particularly described and set forth in the Lode Location Certificates dated the 3rd day of August, 1953, and filed for record on the 4th day of August, 1953, at 3:30 P.M. in Book 18 of Locations on pages 8 and 9 in the office of the Register of Deeds of Custer County, South Dakota.

Bob Cat #1, Bob Cat #2, Bob Cat #3, Bob Cat #4, Bob Cat #5, Bob Cat #6, Bob Cat #7 Bob Cat #8 Lode Mining Claims as the same are more particularly described and set forth in the Lode Location Certificates dated the 3rd day of August, 1953, and filed for record on the 4th day of August, 1953, at 3:30 P.M. in Book 18 of Locations on pages 9 to 13 in above set forth office.

Leo #1, Leo #2 Lode Mining Claims as the same are more particularly described and set forth in the Lode Location Certificates dated the 20th day of March, 1954, and filed for record on the 29th day of March, 1954 at 8:45 A.M. in Book 18 of Locations on page 92 in the above set forth office.

Minnesota #1, Minnesota #2 Lode Mining Claims as the same are more particularly described and set forth in the Lode Location Certificates dated the 22nd day of August, 1953 and filed for record on the 28th day of August, 1953 at 8:15 AM in Book 18 of Locations on page 36 in above set forth office.

A - 22737

STATE OF SOUTH DAKOTA, } ss.
COUNTY OF CUSTER,
This instrument of writing was filed for record on the 24 day of August A.D. 1954 at 8:15 o'clock A.M. and duly recorded in Book 18 on page 534

Register of Deeds

Fee #8.00 PD.

RECORDED
INDEXED
COMPARED

COPY

IN COUNTY COURT WITHIN AND FOR THE COUNTY
OF CUSTER AND STATE OF SOUTH DAKOTA

IN THE MATTER OF THE ESTATE OF :
: ORDER
ALBERT A. ROTHLEUTNER, deceased :

Upon reading and considering the Petition of Helen P. Rothleutner, Administratrix of the estate of Albert A. Rothleutner, deceased, and it appearing to the satisfaction of the Court that it would be to the best advantage of the estate for the Administratrix to enter into a mining lease insofar as it affects the Del Muerto Lode Mining Claim as the same is more particularly described in the Lode Location Certificate filed for record on the 10th day of July, 1952 at 11:00 o'clock A. M. in Book 17 of Locations on page 544 in the office of the Register of Deeds in Custer County, South Dakota;

NOW, THEREFORE, IT IS ORDERED, ADJUDGED AND DECREED that the Petitioner, Helen P. Rothleutner, as Administratrix of the estate of Albert A. Rothleutner, deceased, be and is hereby authorized and empowered to execute a mining lease insofar as it affects the above described mining premises; and that no Notice or Hearing is required.

BY THE COURT:

D. Webster Davis
Judge of the County Court

Attest:

Homer V. Morris
Clerk of Courts

(Seal)

STATE OF SOUTH DAKOTA } ss.
CUSTER COUNTY

IN County COURT

do hereby certify that the foregoing instrument

consisting of one (1) sheet

a full, true and correct copy of the original

Order

now on file in my office in the case of Estate of Albert A. Rothleutner, Deceased

and now pending in County court

Witness my hand and seal this 17th day of June 1954

Homer V. Morris
Clerk of Courts, Custer County, South Dakota

By ..... Deputy

June 17 1954
Homer V. Morris

ASSIGNMENT OF MINING LEASE

WHEREAS, On the 17th day of June, 1954, a certain mining lease was entered into by and between Helen P. Rothleutner, individually, Helen P. Rothleutner as Administratrix of the estate of Albert A. Rothleutner, Deceased, and Helen P. Rothleutner as Attorney-in-Fact for Mary Rothleutner Valentine, Frank Rothleutner, James Rothleutner, Joseph Rothleutner, Katherine Rothleutner, Max Rothleutner, and Clara Rothleutner, of Dewey, Custer County, South Dakota, Lessors, and R. E. Hayes, Box 361, Bismarck, North Dakota, Lessee, covering certain mining claims situated in the County of Custer, State of South Dakota, and more particularly described in said lease dated June 17, 1954, and recorded in book 18M, page 534, in the office of the Register of Deeds of Custer County, State of South Dakota.

NOW, THEREFORE, For and in consideration of the sum of one Dollar, (and other good and valuable considerations,) the receipt of which is hereby acknowledged, the undersigned, R. E. Hayes, sells, conveys, transfers, and quit claims all of his right, title, and interest in and to the said lease unto Del Mundo Uranium and Development Company subject to all the terms and conditions of said lease and together with all personal property used thereon or obtained therewith. The same shall be binding upon all of the heirs, executors, and successors.

IN WITNESS WHEREOF, The undersigned has hereunto affixed his signature on this the 11th day of August, 1954.

R. E. Hayes

R. E. Hayes

STATE OF)
: SS
COUNTY OF)

On this 11th day of August, 1954, before me the undersigned, a Notary Public within and for said County and State, personally appeared R. E. Hayes, well-known to me to be the person who is described in and who executed the within and foregoing instrument and acknowledged to me that he executed the same for the purposes therein contained as his own free and voluntary act.

H E Baker

Notary Public

(Seal)

My Commission Expires: Jan 3, 1960.

H. E. BAKER,
Notary Public, BURLEIGH CO., N. DAK.
My Commission expires JAN. 3, 1960.

EXHIBIT "B"

RECORDING DATA ON LOCATION NOTICE AMENDMENTS

CLAIM	NUMBER	DATE	BOOK	PAGE
Bobcat	1	December 14, 1954	18 of Locations	431
Bobcat	2	December 14, 1954	18 of Locations	431
Bobcat	3	December 14, 1954	18 of Locations	432
Bobcat	4	December 14, 1954	18 of Locations	432
Bobcat	5	December 14, 1954	18 of Locations	433
Bobcat	6	December 14, 1954	18 of Locations	433
Bobcat	7	December 14, 1954	18 of Locations	434
Bobcat	8	December 14, 1954	18 of Locations	434
Crator	1	December 14, 1954	18 of Locations	435
Crator	2	December 14, 1954	18 of Locations	435
Crator	3	December 14, 1954	18 of Locations	436
Crator	4	December 14, 1954	18 of Locations	436
Crator	5	December 14, 1954	18 of Locations	437
Crator	6	December 14, 1954	18 of Locations	437
Crator	7	December 14, 1954	18 of Locations	438
Crator	8	December 14, 1954	18 of Locations	438
Bingo	1	December 14, 1954	18 of Locations	429
Bingo	2	December 14, 1954	18 of Locations	430
Bingo	3	December 14, 1954	18 of Locations	430
Lucky Day	2	December 14, 1954	18 of Locations	439
Rock	2	December 14, 1954	18 of Locations	439
Rock	3	December 14, 1954	18 of Locations	440

Exhibit C
Del Mundo Uranium and Development Co.

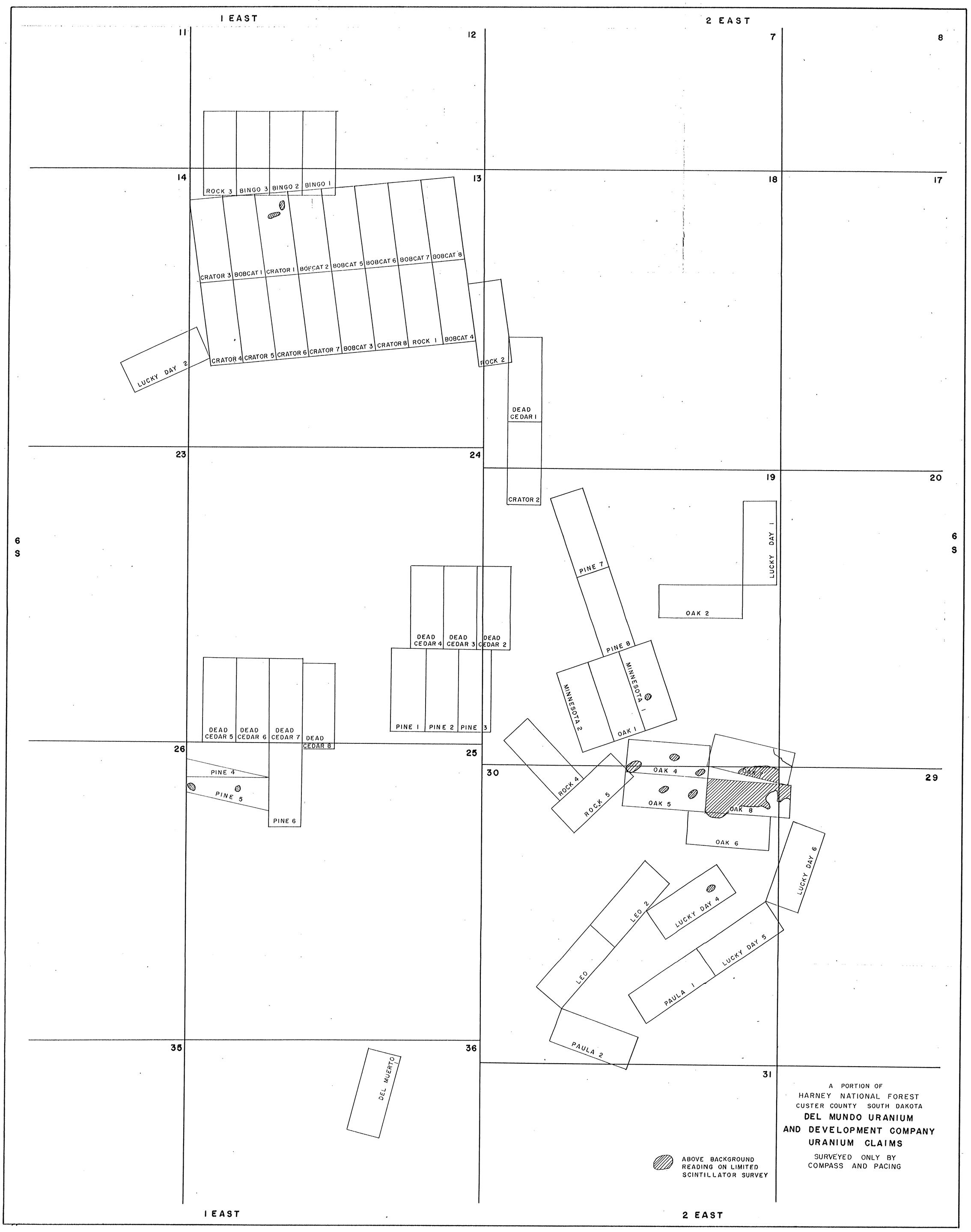
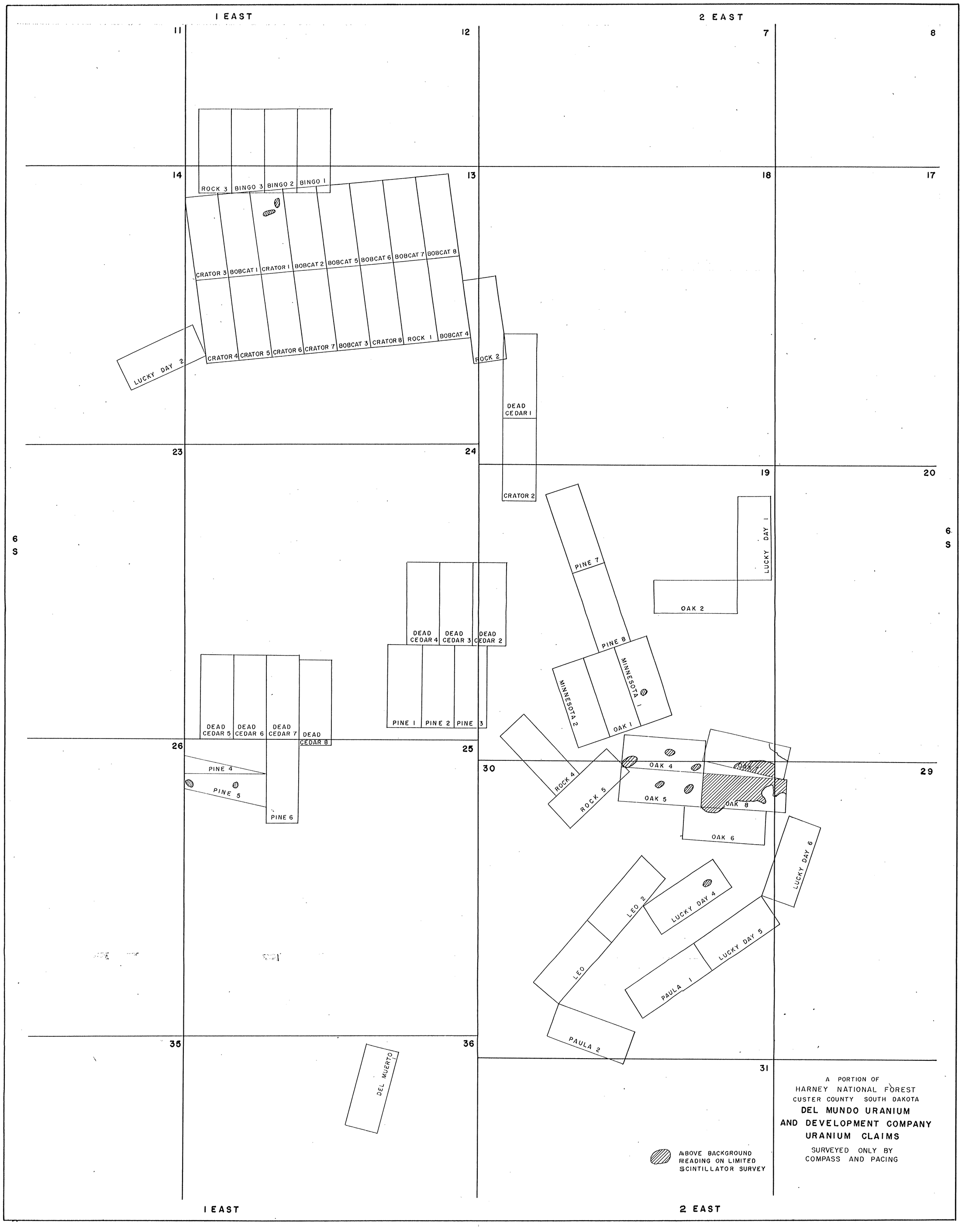


Exhibit C
Del Mundo Uranium and Development Co.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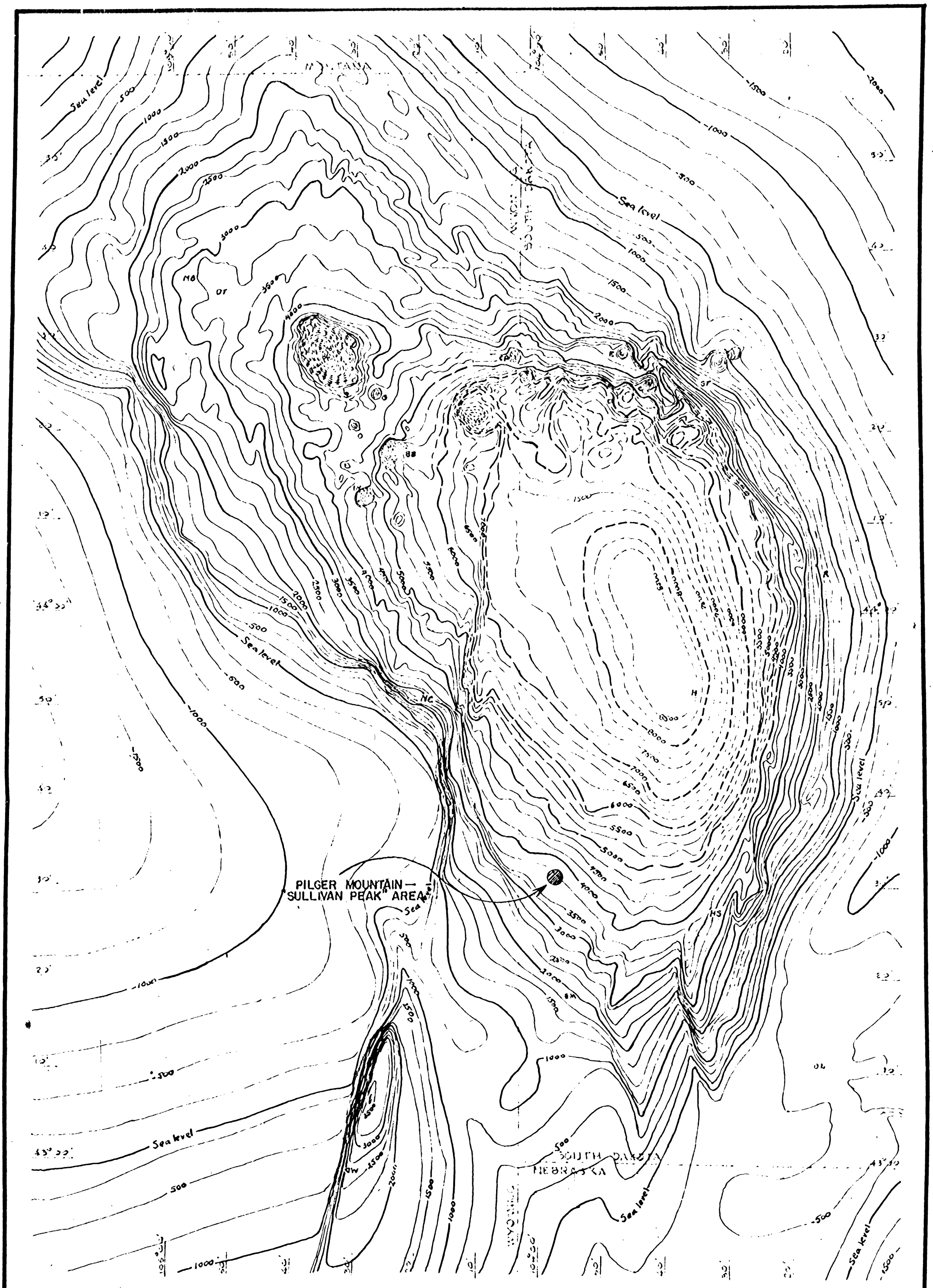
ROCK 3
BINGO 3
BINGO 2
BINGO 1
CRATOR 3
BOBCAT 1
CRATOR 1
BOBCAT 2
BOBCAT 5
BOBCAT 6
BOBCAT 7
BOBCAT 8
CRATOR 4
CRATOR 5
CRATOR 6
CRATOR 7
BOBCAT 3
CRATOR 8
ROCK 1
BOBCAT 4
LUCKY DAY 2
ROCK 2
DEAD CEDAR 1
CRATOR 2
PINE 7
LUCKY DAY 1
OAK 2
DEAD CEDAR 4
DEAD CEDAR 3
DEAD CEDAR 2
PINE 8
MINNESOTA 1
MINNESOTA 2
OAK 1
PINE 1
PINE 2
PINE 3
DEAD CEDAR 5
DEAD CEDAR 6
DEAD CEDAR 7
DEAD CEDAR 8
PINE 4
PINE 5
PINE 6
ROCK 4
ROCK 5
OAK 4
OAK 7
OAK 5
OAK 8
OAK 6
LUCKY DAY 6
LEO 2
LUCKY DAY 4
LEO
LUCKY DAY 5
PAULA 1
PAULA 2
DEL MUERTO
ABOVE BACKGROUND READING ON LIMITED SCINTILLATOR SURVEY
A PORTION OF
HARNEY NATIONAL FOREST
CUSTER COUNTY SOUTH DAKOTA
DEL MUNDO URANIUM
AND DEVELOPMENT COMPANY
URANIUM CLAIMS
SURVEYED ONLY BY
COMPASS AND PACING
1 EAST
2 EAST

		FORMATION	SECTION	Thickness in feet	DESCRIPTION
CENOZOIC	QUATERNARY	Sands and Gravels		0 - 50	Sand, gravel and boulders
	OLIGOCENE	White River Formation		0-1150	Sand, gravel, clay, fuller's earth, sandstone and limestone
	PALEOCENE	(Cannon Ball Marine Formation)		0 - 225	Dark fine grained sandstone and shale. Yellowish to gray sandstone, clayey sandstone, shale and lignite
		Fort Union Formation (Ludlow Lignite Member)		0 - 335	
MESOZOIC	UPPER CRETACEOUS	Hell Creek Formation		425	Somber colored soft brown shale and gray sandstone with lignite lenses in the upper part. Lower half more sandy. Many logline concretions thin lenses of iron carbonate.
		Fox Hills Sandstone		25-200	Grayish white to yellow sandstone
		Pierre Shale		1200 - 2500	Principle horizon of limestone lenses giving tepee buttes. Dark-gray shale containing scattered concretions. Widely scattered limestone lenses, giving small tepee buttes. Black fissile shale with concretions.
		Niobrara Limestone		100-225	Impure chalky limestone and shale.
		(Wall Creek Sands)			Light gray shale with numerous large concretions and sandy layers.
		Carlile Shale		400 - 800	Dark gray shale
		Greenhorn Limestone		25-80	Impure slabby limestone weathers buff.
		(Belle Fourche Shale)		600-850	Dark gray to black clayey shale. Sandy shale Large calcareous concretions, some bentonite, Thin limestone beds.
		Graneros Shale		800 - 1200	
		(Mowry Shale)		(150-250)	Hard light gray sandy shale, fish scales, bentonite.
	?	(Newcastle, muddy, Sandstone)		(20-60)	Reddish to light yellow sandstone.
		(Skull Creek Shale)		(150-300)	Dark gray to black clayey shale, concretions, some sandstone
	LOWER CRETACEOUS (INYAN KARA)	Fall River Sandstone		10-200	Massive sandstone, weathers brown (Ore-bearing)
		Fuson Shale		10-188	Gray to purple shale, thin sandstone.
		Minnewaste Limestone		10-25	Massive gray limestone.
		Lakota Sandstone		25-485	Coarse hard cross bedded sandstone mostly buff to gray. Conglomerate locally coal at base (Ore bearing)
	JURASSIC	Morrison Formation		0-220	Maroon to green shale, thin sandstone
		Unkpapa Sandstone		0-225	Soft, massive, fine grained sandstone.
		Sundance Formation		70-350	Greenish gray shale, small sandstone and limestone lenses, buff sandstone, red sandstone and shale.
		Gypsum Springs Formation		0-45	Gypsum and red shale grading to dolomite
		Nugget? Formation		0-60	Massive cross-bedded, salmon colored sandstone
	TRIASSIC ?	Spearfish Formation		350-700	Red sandy shale, soft red sandstone and siltstone with gypsum layers
					Gypsum locally near base.
PALEOZOIC	PERMIAN	Minnekahta Limestone		30 - 50	Massive gray laminated limestone.
		Opeche Formation		50-150	Red shale and sandstone.
	? PENNSYLVANIAN	Minnelusa Sandstone		300-850	Red cross-bedded sandstone, limestone locally near the top. Interbedded sandstone, limestone and shale Sandstone with interbedded limestone shale at base
	MISSISSIPPIAN	Pahasapa Limestone		300-630	Massive light colored limestone, dolomite in part
		Englewood Limestone		30-60	Pink to buff limestone shale locally at base
	ORDOVICIAN ?	Whitewood Formation ?		0-130	Massive buff limestone, underlain by sandstone, siltstone and gray-green shale.
	UPPER CAMBRIAN	Deadwood Formation		10-500	Massive buff sandstone, greenish glauconitic sandstone, flaggy dolomite and flat pebble limestone conglomerate. Sandstone with conglomerate locally at base
	PRE-CAMBRIAN	Metamorphic and Igneous Rocks			Schist slate and quartzite, arkosic grit intruded by diorite, metamorphosed to amphibolite and by granite and pegmatite.

BLACK HILLS GENERALIZED COLUMNAR SECTION

FIG. 3

From A.E.C., U.S.G.S. and S.D. School of Mines sources.



B, Bear Butte; B B, Black Butte; B L, Bearlodge Range; C, Crook Mountain; C P, Crow Peak; D, Deadwood; D T, Devils Tower; E, Elkhorn Ridge; E.M, Edgemont; G, Green Mountain; H, Harney Peak; H S, Hot Springs; I N, Inyankara Mountain; M B, Little Missouri Buttes; N, Nigger Hill; N C, Newcastle; O L, Oelrichs; O W, Old Woman Creek; R, Rapid; S, Sundance; S T, Sturgis.

Note: Contoured on surface of Minnekahta limestone. Where Minnekahta limestone has been removed by erosion the calculated position of the contours is shown by broken lines.

N

Scale of Miles

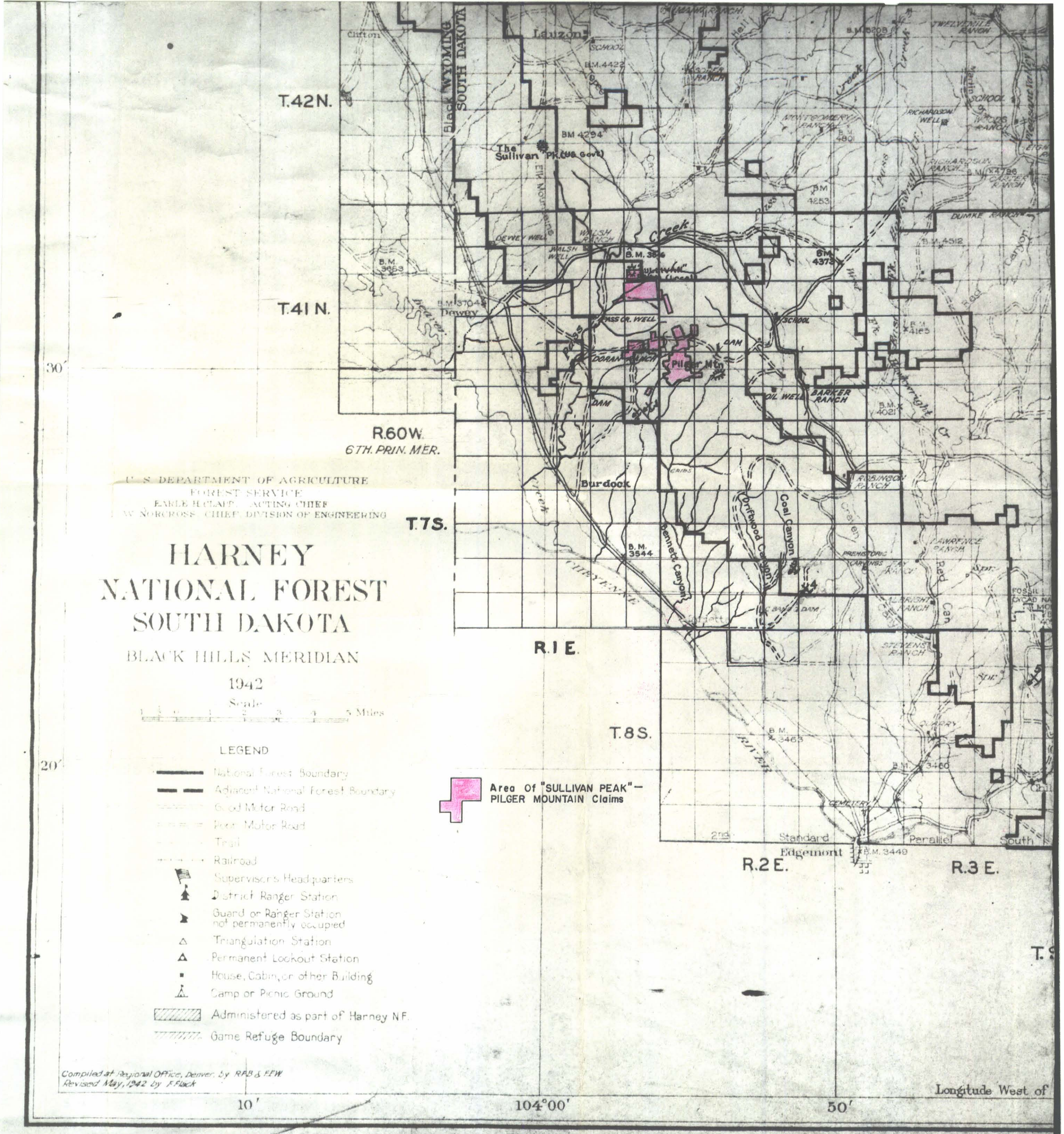
Traced from U.S.G.S. Geologic Atlas, Edgemont folio (No. 108) p. 7, 1904; N. H. Darton and W.S. Tangier Smith

Fig. 4

U. S. ATOMIC ENERGY COMMISSION
DENVER EXPLORATION BRANCH, DIV. OF RAW MATERIALS

STRUCTURE CONTOUR MAP OF BLACK HILLS UPLIFT AREA

SCALE	CONTOUR INTERVAL 250 ft.
ACCOMPANIES	PLATE DATE
PREPARED BY	DRAWN BY W.S. AFTER
APPROVED BY	


U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
EARLE H. CLAPP, ACTING CHIEF
L. W. NORCROSS, CHIEF, DIVISION OF ENGINEERING
HARNEY
NATIONAL FOREST
SOUTH DAKOTA
BLACK HILLS MERIDIAN
1942
Scale
1 ½ 0 1 2 3 4 5 Miles
LEGEND
National Forest Boundary
Adjacent National Forest Boundary
Good Motor Road
Poor Motor Road
Trail
Railroad
Supervisor's Headquarters
District Ranger Station
Guard or Ranger Station not permanently occupied
Triangulation Station
Permanent Lookout Station
House, Cabin, or other Building
Camp or Picnic Ground
Administered as part of Harney N.F.
Game Refuge Boundary
Area Of "SULLIVAN PEAK"— PILGER MOUNTAIN Claims
Compiled at Regional Office, Denver, by RPB & FEW
Revised May, 1942 by F. Flack
T.42N.
T.41N.
T.7S.
T.8S.
R.60W.
6TH. PRIN. MER.
R.1E.
R.2E.
R.3E.
Black WYOMING
SOUTH DAKOTA
Lauzon
Clifton
Dewey
Burdock
Edgemont
The Sullivan Pk. (US Govt)
Pilger Mtn
Elk Mountains
Coal Canyon
Bennett Canyon
Driftwood Canyon
Red Canyon
Standard Parallel South
BARKER RANCH
ROBINSON RANCH
LAWRENCE RANCH
ALBRIGHT RANCH
STEVENS RANCH
DUMKE RANCH
RICHARDSON RANCH
CARTER RANCH
MONTGOMERY RANCH
TWELVEMILE RANCH
WALSH RANCH
DORAN RANCH
PREHISTORIC CARVINGES
FOSSIL CYCAD NAT. MON.
SCHOOL
CEMETERY
QUARRY
DAM
OIL WELL
PASS CR. WELL
DEWEY WELL
WALSH WELL
RICHARDSON WELL
B.M. 4294
B.M. 4422
B.M. 4253
B.M. 4373
B.M. 4512
B.M. 4163
B.M. 4021
B.M. 3544
B.M. 3463
B.M. 3460
B.M. 3449
B.M. 3704
B.M. 3653
B.M. 4801
B.M. 4786
B.M. 6208
30′
20′
10′
104°00′
50′
Longitude West of