DMEA Form 9

UNITED STATES
DEPARTMENT OF THE INTERIOR
Defense Minerals Exploration Administration

OFFICIAL DOCKET FILE E 869 DMEA NO. 3742

Application (Denied
(Withdrawn
(After disposition, delete items not applicable)

Contract (Terminated - not Certified
(Cancelled
(Terminated - Certified
(Royalty Agreement

This is the official contract file containing all official records of the project. The records contained in the files are checked and are arranged in this order:

Left Side

Interim Royalty Audits
(2) Reports of Royalty Review
Certification of Discovery
Certificate of Audit (Final)
Interim Audit(s)
✓ Report of Review
✓ Termination Notice or Agreement
Recision Notice
Assignment of Contract
✓ Contract Amendments (latest on top)
✓ Contract with all exhibits and annexes
✓ Owner's Consent to Lien
Subordination Agreement
✓ Leases and assignments of leases
✓ Application and attachments
(3) Envelope for maps

Right Side

Project summary
Work completed analysis
All other material is filed in chronological order with correspondence including the following reports as checked:

✓ Final Field Team Report (Tab)
✓ Operator's Final Report
(2R) ✓ Interim Reports
(2R) ✓ Operator's monthly reports and all attachments (latest on top)
✓ On-site Exam Report(s) (Tab)
(4) Settlement Sheets

When the volume of records is expected to warrant additional folders, or when convenience of reference warrants separate folders for certain records, they should be set up in this order:

Left Side

Folder No. 2: (In chron. order) Interim Summary Reports by W. O. Engineers

Right Side

Operator's Semi-Annual Report for Certified Project, Field Team Interim Reports, Operator's Monthly Report with transmittal, narrative, maps, and Field Team review.

Folder No. 3: Maps (Use pocket folder or envelope. Fold maps with title block out and show reference to related document or correspondence.)

Folder No. 4: Settlement Sheets

Folder No. 5: Drill Logs

The items that the Applicant requests to be returned are in the map pocket. (See last page of Application) - and [illegible]

9775

DEFENSE MINERALS EXPLORATION ADMINISTRATION
CONTRACT ADMINISTRATION AND AUDIT DIVISION

REPORT OF REVIEW

I have reviewed the Monthly Reports of:

Carolina Tungsten Mining Company
5005 Edgemoor Lane
Bethesda 14, Maryland
and
P. O. Box 1251
Concord, North Carolina

WSM

pertaining to Exploration Project Contract No. Idm-E869, Docket No. DMEA-3742, including Amendment Nos. 1 and 2, for the months of February 1956 to October 1956, inclusive, covering a project for the exploration of tungsten ore on property, known as the Furnis Mine, located in Cabarrus County, North Carolina.

My review included an examination of the Monthly Reports (Forms MF-104) and supporting documents attached thereto, comparison of the costs claimed with the contract and pertinent schedules, verification of work performed by reference to Field Team reports and correspondence, and a determination of the reasonableness and propriety of the costs.

This review was made in lieu of a final audit of the Operator's accounts and records for the following reason:

all of the costs incurred were under a contract provision for payment by the Government on the basis of fixed unit costs of work actually performed.

The review disclosed the following facts in regard to the amount paid or to be paid the contractor:

Total cost as billed by Contractor		$14,067.50
Exceptions:		
By DMEA Finance Officer	$ -0-	
Herewith	-0-	-0-
Total Accepted Cost		$14,067.50

The contract calls for a 75 percent participation of exploration expenses by the United States Government. Therefore, payment to the contractor by the Government in the amount of Ten thousand five hundred sixty-five and 62/100 Dollars

$10,565.62

is considered valid and proper, provided that the Regional Executive Officer, the Administrator, or other competent official has accepted or will accept the project as having otherwise met the terms of the contract.

E. D. Talbert

May 14, 1957

E. D. Talbert, Auditor

Government's copy

Long
Hunter
Hall
Martin
Talbert
Selfridge
Johnson

TERMINATION AGREEMENT

It is agreed this 4th day of September, 1957, between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government," and Carolina Tungsten Mining Company, a partnership, hereinafter called the "Operator," parties to that certain Exploration Project Contract No. Idm-E869,(Docket No. DMEA-3742), dated September 12, 1955, hereinafter called the "Contract," that:

1. Effective November 9, 1956, the Contract and all obligations of the parties thereunder, except as otherwise herein expressly provided, shall be and are hereby terminated.

2. The Government shall contribute only to the fixed unit costs of work performed prior to said effective date. Any work or operations prosecuted or costs incurred by the Operator beginning with said effective date, except as otherwise provided in this termination agreement, shall be for the sole account of the Operator without contribution by the Government.

3. The Operator shall promptly perform all winding-up and settlement actions provided for in the Contract, including the rendering of the final report and final account.

4. All rights of the Government provided for in the Contract with respect to a certification of discovery or development, percentage royalty and liens for its payment, records, audits and recovery of any overpayment, are preserved.

5. The Operator hereby releases and agrees to save the Government harmless from all claims or demands under or arising out of said Contract, except as otherwise provided for in this termination agreement.

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

THE UNITED STATES OF AMERICA

Carolina Tungsten Mining Co.

By Hal Jackson

Title Partner

RECEIVED SEP 25 1957 D.E.A.

By C. J. Mittendorf

Administrator, Defense Minerals Exploration Administration

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DMEA
RECEIVED SEP 25 1957

DATE	INITIALS	CODE

CAROLINA TUNGSTEN MINING COMPANY
DOCKET NO. DMEA 3742
CONTRACT NO. IDM-E769

JUSTIFICATION FOR TERMINATION AGREEMENT

A proposed termination agreement, forwarded to ~~the Field Team~~ on May 6, 1957, for signature by the Operator, if satisfactory to the Field Team and the Operator, contained a "pseudo-certification" clause, inserted because it was considered possible that if there were production from either the Furniss or Phoenix mines (the two areas covered by the contract), such ore, even though not discovered as the result of work done under the contract, might be produced or extracted through DMEA workings.

That proposed termination agreement was returned unsigned by the Operator on May 20, 1957, with a letter stating the Operator's reasons for not signing, chiefly objection to the "pseudo" clause, with the consequent lien on possible future production from the properties.

Comprehensive review of all data available in this office indicates that, although showings on surface gave promise that deposits of tungsten ore might be found by exploration in the quarter-mile interval between the Phoenix and Furniss shafts, neither the small amount of tungsten ore discovered in the 122 feet of new drift driven southwesterly on the 170-foot level of the Furniss mine, nor the tungsten showings disclosed in the 157 feet of new drifting northeasterly on the same level of the Furniss mine, considered with the negative results obtained in drilling the 500-foot diamond drill hole southeasterly from the southwest drift on Furniss 170-foot level, are sufficient to justify any insistance on inclusion of a "pseudo-certification" clause.

In view of the above, and because the probability of mining sufficient tungsten ore from the property during the 10 year royalty repayment period is too small to justify policing a certification, a revised termination agreement with~~the~~out "pseudo" clause has been prepared.

EXPLORATION PROJECT CONTRACT

CAROLINA TUNGSTEN MINING COMPANY, partnership

Docket No. DMEA-3742

AMENDMENT No.2

RECEIVED AUG 23 1956

It is agreed this 15 day of August 1956, between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government," and Carolina Tungsten Mining Company, a partnership, comprised of Paul M Tyler and Hal Lackey, individuals, and Franconia Trading, Inc., hereinafter call the "Operators," parties to that certain Exploration Project Contract Idm-E869, Docket No. DMEA-3742, dated September 22, 1955, hereinafter called the "Contract," be further amended as follows:

1. In Exhibit "A", item 3 is changed to read as follows:

"From the southeasterly side of the southwest drift on the 170-foot level, drill 500 feet southeasterly, in a single hole if possible, approximately horizontal and approximately at right angles to vein or shear zone, to explore shear zone for parallel veins."

All provisions on page 2 of Exhibit "A" are unchanged.

2. Article 3 of the contract is further amended to read..."the Operator.....on or before December 31, 1956 shall complete the work" instead of "on or before August 31, 1956," as provided in Amendment No. 1

This amendment shall not be constructed to increase the estimated total cost of the project, the aggregate total amount which the Government may be required to contribute, nor the agreed unit cost of any item of work.

CAROLINA TUNGSTEN MINING CO.

By: Paul M Tyler
(Partner)

By: Hal Lackey
(Partner)

By: Franconia Trading, Inc., (Partner)

BY: [illegible], President

THE UNITED STATES OF AMERICA

By: Robert A. Lawrence
Executive Officer, DMEA
Field Team, Region V

Docket copy

EXPLORATION PROJECT CONTRACT
CAROLINA TUNGSTEN MINING COMPANY
DOCKET NO. DMEA-3742

AMENDMENT NO. 2

It is agreed this 6th day of July, 1956, between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, and Carolina Tungsten Mining Company, that Exploration Project Contract No. Idm-X869 (Docket No. DMEA-3742), dated September 22, 1955, as amended, is further amended as follows:

Exhibit "A" is deleted and a new Exhibit "A" is substituted as follows:

EXHIBIT "A"

Description of the Work

Fig. 2, Plan map of workings of 170-foot level and surface of Furniss property, indicating proposed drifting and diamond drill holes, is attached hereto and made a part hereof.

1. From present face of northeast drift on the 170-foot level of the Furniss shaft, drift 300 feet northeasterly along the vein or shear zone. The drift shall be sampled in mineralized zones, and samples assayed for tungsten trioxide and gold.

2. From present face of southwest drift on the 170-foot level of the Furniss shaft, drift 200 feet southwesterly along the vein or shear zone. The drift shall be sampled in mineralized zones, and samples assayed for tungsten trioxide and gold.

3. Drill one diamond drill hole from a point in the southwest drift to be selected with the approval of the Government. This hole shall be drilled southeasterly and shall be not more than 1035.7 feet in length.

All diamond drill holes shall be minimum AX size.

All mineralized zones cut by diamond drill shall be sampled by splitting cores and samples assayed for tungsten trioxide and gold.

Sudrity 6/29/56
Sawyer
Holt
Chapman
Talbot
Selfridge

The drifts shall be timbered as necessary and shall be not less than 4 feet by 6½ feet in cross section in the clear.

Estimated Cost of the Work

Fixed Unit Costs

Drift 500 feet @ $37.50/ft.	$18,750.00	
Diamond drill 1035.7 feet @ $7.00/ft.	7,250.00	(rounded)
Sample and analyze for WO_3 and Au, 80 samples @ $5.00/each sample	400.00	
Estimated Total Cost of Project		$26,400.00
Government Participation @ 75%		$19,800.00

* * * * * * * *

This amendment shall not be construed to increase the estimated total cost of the project as amended, the aggregate total amount which the Government shall be required to contribute, nor the fixed unit cost of any item of work.

Executed in sextuplicate the day and year first above written.

THE UNITED STATES OF AMERICA

By C. W. Mitchenor
Administrator, Defense Minerals
Exploration Administration

CAROLINA TUNGSTEN MINING COMPANY

By_____
Paul M. Tyler (Partner)

By_____
Hal Lackey (Partner)

Franconia Trading, Inc. (Partner)

By_____

EXPLORATION PROJECT CONTRACT
CAROLINA TUNGSTEN MINING COMPANY
DOCKET NO. DMEA-3742

AMENDMENT NO. 2

It is agreed this ____ day of _____, 1956, between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, ~~and~~ Carolina Tungsten Mining Company, that Exploration Project Contract No. Idm-E869 (Docket No. DMEA-3742), dated September 22, 1955, as amended, is further amended as follows:

From Exhibit "A", Description of the Work, Item 2, delete: "drift 300 feet southwesterly,"
and substitute:

"drift 200 feet southwesterly."

From Item 3, delete: Diamond drill holes Nos. 1, 2, 3, and 4: and from paragraph 5, delete:

"The total drilling not to exceed 500 feet."
and substitute the following:

Drill one diamond drill hole from a point in the southwest drift to be selected with the approval of the Government. This hole shall be drilled southeasterly and shall be approximately 1036 feet in length.

From Estimated Cost of the Work (Fixed Unit Costs), delete:

Drift 600 feet at $37.50/ft.	$22,500.00	
Diamond drill 500 feet at $7.00/ft.	3,500.00	
Total		$26,000.00

and substitute:

Drift 500 feet at $37.50/ft.	$18,750.00	
Diamond drill 1,035.7 feet at $7.00/ft.	7,250.00	
Total		$26,000.00

This amendment shall not be construed to increase the estimated total cost of the project as amended, the aggregate total amount which the Government shall be required to contribute, nor the agreed unit cost of any item of work.

Executed in sextuplicate the day and year first above written.

THE UNITED STATES OF AMERICA

By _____
Administrator, Defense Minerals
Exploration Administration

CAROLINA TUNGSTEN MINING COMPANY

_____

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MAIL - OFFICE

EXPLORATION PROJECT CONTRACT

CAROLINA TUNGSTEN MINING COMPANY, a partnership

Docket No. DMEA-3742

AMENDMENT No. 1

It is agreed this 16th day of February 1956, between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government," and Carolina Tungsten Mining Company, a partnership, comprised of Paul M. Tyler and Hal Lackey, individuals, and Franconia Trading, Inc., hereinafter called the "Operators," parties to that certain Exploration Project Contract Idm-2869, Docket No. DMEA-3742, dated September 22, 1955, hereinafter called the "Contract," that:

1. ARTICLE 3, be amended to read....."The Operator on or before March 1, 1956 shall commence the work, and on or before August 31, 1956 (unless the Operators obligation to complete the work is terminated - see Article 8) shall complete the work."

This amendment shall not be construed to increase the estimated total cost of the project, the aggregate total amount which the Government may be required to contribute, nor the agreed unit cost of any item of work.

CAROLINA TUNGSTEN MINING CO.

By Paul Tyler
Partner

By Hal Lackey
Partner

By Franconia Trading, Inc. (Partner)

By: [illegible] President

THE UNITED STATES OF AMERICA

BY Robert A. Lawrence
Executive Officer, DMEA Field Team
Region V

~~ision copy~~

Not used
filled by
FE Johnson

AMENDMENT NO. 1
to
EXPLORATION PROJECT CONTRACT Idm-E869
(DOCKET NO. DMEA-3742)
between
UNITED STATES OF AMERICA
and
CAROLINA TUNGSTEN MINING COMPANY

It is agreed this _____ day of _____, 1955, between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, and the Carolina Tungsten Mining Company, that Exploration Project Contract No. Idm-E869 (Docket No. DMEA-3742), dated September 12, 1955, is amended as follows:

A. In Exhibit "A", under the heading Description of the Work, add the following as Items 3 and 4, and change the number of present Item 3 to Item 5:

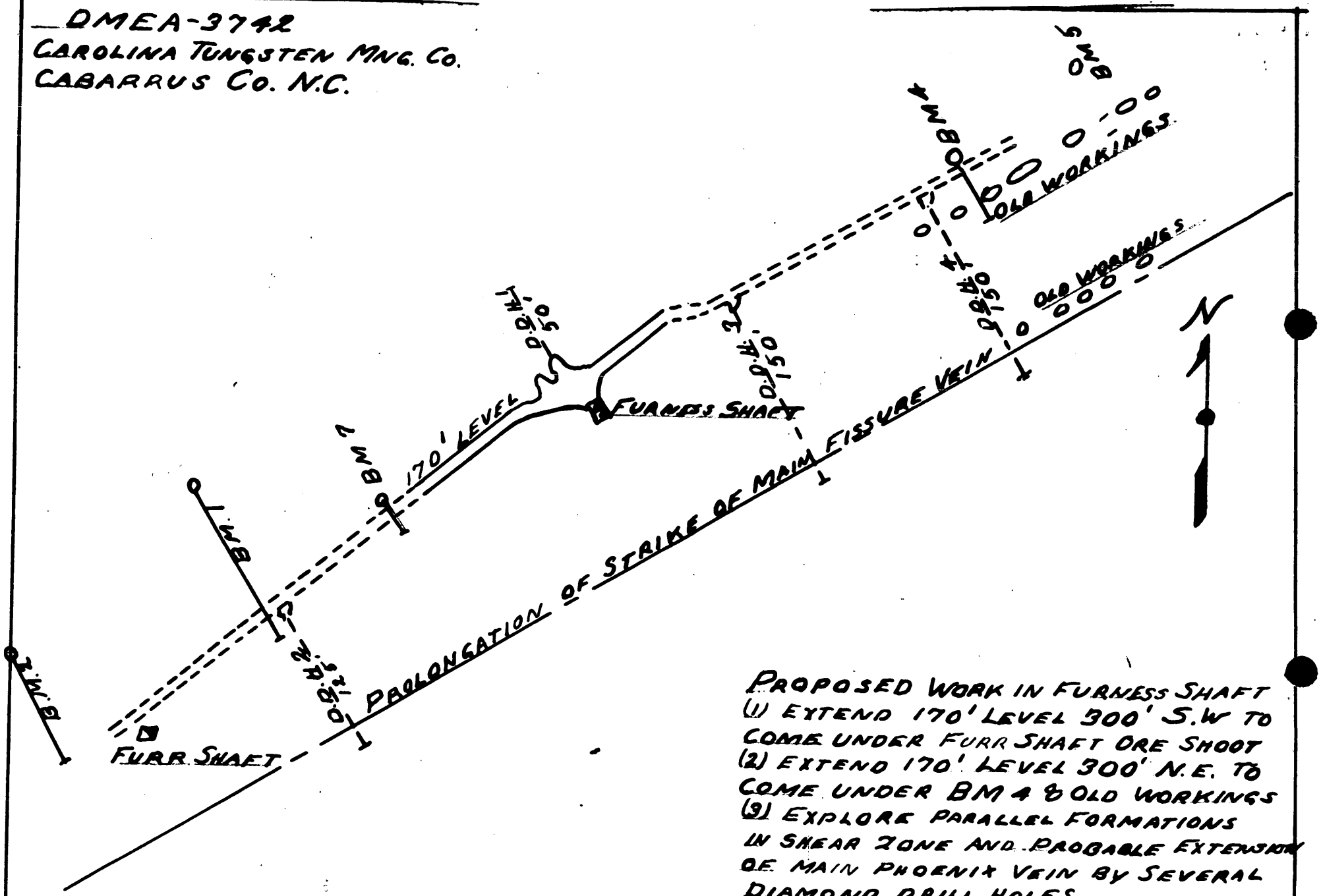
3. The total amount of drifting under items 1 and 2 shall not exceed approximately 546.7 feet, and the Operator with the Government's approval may determine whether the reduction of approximately 53.3 feet shall be under item 1, or under item 2, or under both items 1 and 2.

4. Unwater the Phoenix mine to the six level and take approximately 100 samples from the 6, 5, 4, 3, and 2 levels. Samples shall be taken at 10-foot intervals, and shall be approximately 2 feet long, 1 inch deep, and the width of the vein. The points of sampling shall be approved by the Government. Each sample shall be crushed and split and one portion saved for the Government. Samples shall be sent to a custom assayer and assayed for tungsten trioxide (WO_3) and copper and gold.

B. In Exhibit "A", under the heading Estimated Cost of the Work, Fixed Unit Costs, the following amendments are made:

(1) Delete "Drift 600 feet @ $37.50/ft. $22,500.00"
and substitute
"Drift approximately 546.7 feet @ $37.50/ft. $20,500.00."

DMEA-3742
CAROLINA TUNGSTEN MNG. CO.
CABARRUS CO. N.C.



PROPOSED WORK IN FURNESS SHAFT
(1) EXTEND 170' LEVEL 300' S.W TO COME UNDER FURR SHAFT ORE SHOOT
(2) EXTEND 170' LEVEL 300' N.E. TO COME UNDER BM 4 & OLD WORKINGS
(3) EXPLORE PARALLEL FORMATIONS IN SHEAR ZONE AND PROBABLE EXTENSION OF MAIN PHOENIX VEIN BY SEVERAL DIAMOND DRILL HOLES.

PROPOSED DRIFTS
PROPOSED DIAMOND DRILL HOLES
BUREAU OF MINES D.D. HOLES

SCALE 1" = 100'

FIG. 2

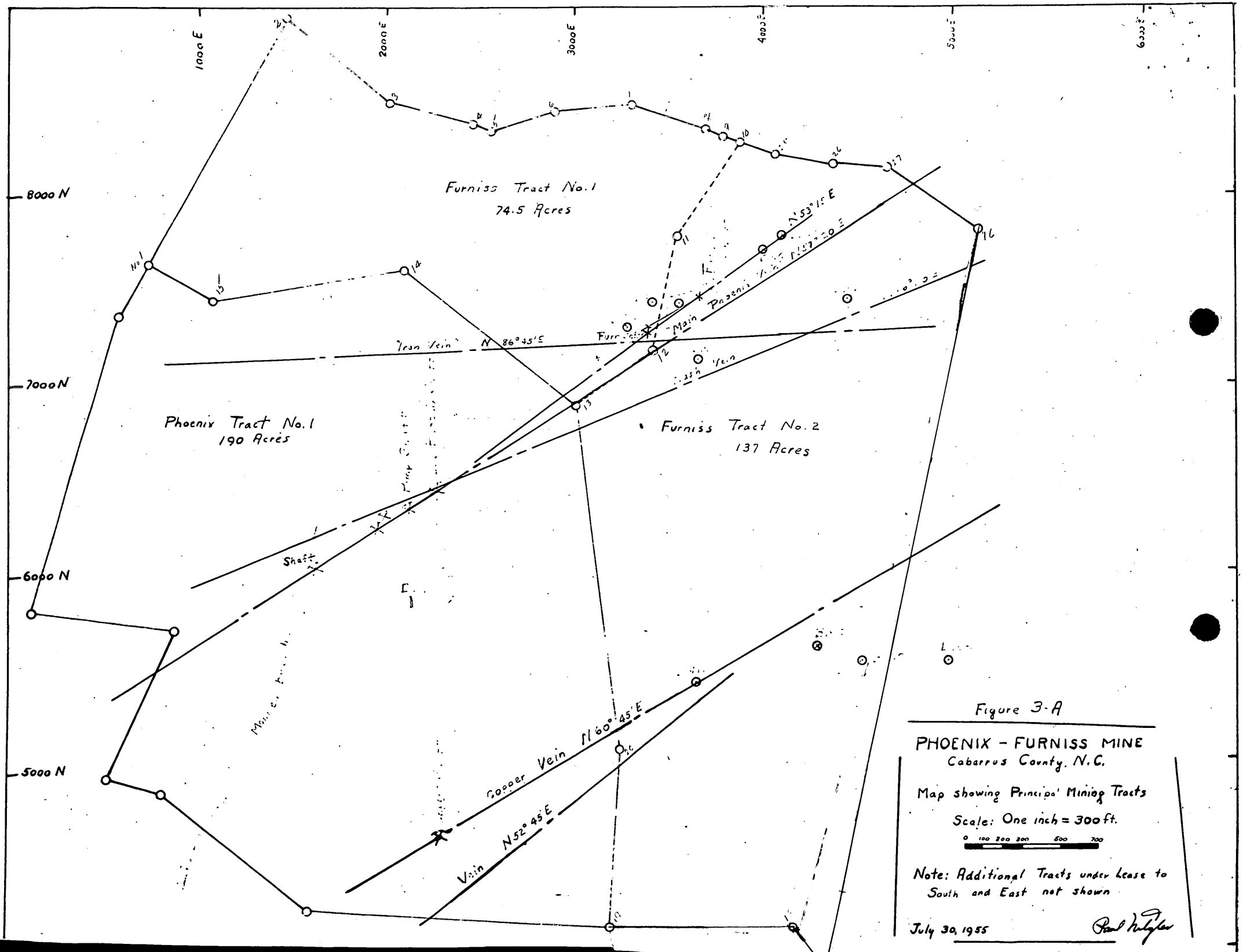


Figure 3-A

PHOENIX - FURNISS MINE
Cabarrus County, N.C.

Map showing Principal Mining Tracts

Scale: One inch = 300 ft.

0 100 200 300 500 700

Note: Additional Tracts under Lease to South and East not shown

July 30, 1955

Paul Kulgler

Docket copy

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NOV - 2 1955

MF-200A
(Revised June 1954)

Docket No. DMEA-3742

Commodity Tungsten

Contract No. Idm-E 869

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
EXPLORATION PROJECT CONTRACT[1]
(Short Form)

It is agreed this SEP 12 1955 day of ....., 195..., between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government," and [2] Carolina Tungsten Mining Company, a partnership, comprised of Paul H. Tyler and Hal Lackey, individuals, and Franconia Trading, Inc., whose mailing address is 5005 Edgemoor Lane Bethesda 14, Maryland, hereinafter called the "Operator," as follows:

ARTICLE 1. *This contract* is entered into under the authority of the Defense Production Act of 1950, as amended. It consists of this form (MF-200A), the attached Exhibit "A," Annex I, and 2 maps, Figures 2 and 3-4.

The Operator shall not transfer or assign this contract or any right thereunder without the written consent of the Government.

ARTICLE 2. *Operator's property rights.*—(a) The land which is the subject of this contract (hereinafter called "the land") is in the State of North Carolina, County of Cabarrus, and is described in Annex I.[3]

(b) The Operator represents and undertakes that:

(1) The Operator is the [4] See Annex I of [5] the mineral rights in the land, in possession and entitled to possession for all of the purposes of this contract, under and by virtue of a [6] See Annex I, [7] recorded in Book -, page -, official records of said County; and

(2) The Operator's right, title, or interest (whether as owner, lessee, or otherwise) is subject only to the following claims, liens, or encumbrances: none.

(c) The Subordination Agreement of the holder of any claim, lien, or encumbrance listed above, and (if the Operator does not hold the legal title) the Consent to Lien of any holder of the legal title of the land (lessor, seller, optionor, etc.), are attached, as follows: Consents to Lien of lessors and sublessors

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] Insert name, and if an organization, its nature (corporation and place of incorporation, partnership with names of partners, etc.).
[3] State on a separate sheet marked "Annex I" the legal description or enough to identify the property, particularly excluding any areas from which the production is not to be subject to the Government's percentage royalty.
[4] Insert "owner," "lessee," "contract purchaser," "locator," etc.
[5] Insert "the entire interest," "the mineral rights," "an undivided one-third," etc.
[6] Insert "deed," "lease," "contract," "location notice," "patent," etc.
[7] If not recorded, so indicate by inserting "un."

(d) The Operator shall preserve and maintain his right, title, and interest in the land and his right to the possession thereof for the purposes of this contract, and shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of this contract. Until the lapse of the time within which the Government may make a certification of discovery or development without any such certification having been made, and after any such certification has been made, the Operator shall neither transfer, convey, nor surrender the land nor any right, title, or interest therein, nor permit nor suffer any claim, lien, or encumbrance thereon, without expressly referring to and providing in the instrument of conveyance, lien, or encumbrance for the preservation of the Government's right to a percentage royalty on production and lien for the payment thereof. If the Government makes no certification of discovery or development within the time limited in Article 7, it shall thereafter have no claim against the land or any production therefrom except for any production referred to in Article 7(b)(1).

ARTICLE 3. *The exploration project.*—The project is a search for indicated or undeveloped deposits of tungsten ore. The work to be performed is described in Exhibit "A." The Operator on or before December 30, 1955 shall commence the work, and on or before June 30, 1956 (unless the Operator's obligation to complete the work is terminated—see Article 8) shall complete the work.

ARTICLE 4. *Performance of the work.*—(a) *Operator's responsibility.*—The work shall be performed with reasonable diligence, efficiently, expertly, in a workmanlike manner, in accordance with good mining standards and State regulations for health and safety and for liability insurance covering employment; and with suitable and adequate equipment, facilities, materials, supplies, and labor, to bring it to completion within the time fixed.

(b) *Government may inspect.*—The Operator shall consult with and inform the Government on all phases of the work as it progresses. The Government may enter at all reasonable times to inspect the work under the contract, and also after a certification of discovery or development to inspect production operations and underground workings. The operator shall provide the Government with all reasonable means of access for such inspections.

ARTICLE 5. *Contribution by the Government.*—A fixed cost for each unit of work to be performed (per foot of drifting, per foot of drilling, per hour of operations, etc.) is hereby agreed upon, and is set forth in Exhibit "A" in connection with the estimated total cost of the project in the sum of $26,400.00 The Government will contribute 75 percent of the fixed unit costs as work is performed, in a total sum not in excess of $19,800.00: *Provided,* That until the Operator has rendered to the Government his final report, and any final auditing required by the Government has been made, and a final settlement of the contract has been made, the Government may withhold from the last voucher or vouchers such sums as it sees fit not in excess of 10 percent of the estimated total cost of the work. The Government will make its contribution on the basis of the monthly vouchers referred to in Article 6(b), but all payments by the Government are provisional only, subject to audit, until the account between the Operator and the Government is finally audited and settled. To the extent that excesses over fixed unit costs or any excess over the estimated total cost may be necessary for the performance of the work, the Operator shall incur and pay such excesses for his own account without contribution by the Government. The Government may make payments directly to independent contractors and suppliers for the account of the Operator rather than to the Operator.

ARTICLE 6. *Reports, accounts, audits.*—(a) *Operator's records.*—The Operator shall keep suitable records and accounts of the units of work performed and of any production in which the Government may have an interest; and shall preserve those with respect to work performed for at least three years after final payment by the Government, and those with respect to production for at least three years after any obligation to pay royalties to the Government has terminated. The Government may inspect and audit said records and accounts at any time, either by itself or by a certified public accountant. The Comptroller General of the United States or his representative, until the expiration of said three-year periods, shall have access to and the right to examine any pertinent books, documents, papers, and records of the Operator. All of the Operator's vouchers and records and accounts relating thereto and the Government's payments thereof remain subject to adjustment until final audit by the Government.

(b) *Progress reports and vouchers.*—The Operator shall provide the Government with five copies of monthly progress reports in three sections as follows: (1) Operator's Monthly Report and Voucher showing a detailed statement of units of work performed during the reporting period; (2) Operator's Unit Cost and Progress Report showing the various types of work performed during the reporting period and the fixed unit costs incurred for each type of work; and (3) a Narrative Report of the work

performed during the reporting period including adequate engineering-geological maps or sketches, drill hole logs and locations, and assay reports on samples taken concurrently with advance in mineralized ground. (Forms for reporting under (1) and (2) above will be provided by the Government.)

(c) *Final report.*—Upon completion of the work or termination of the Government's obligation to contribute to costs, the Operator shall furnish the Government with five copies of a final report (in addition to the final progress report and voucher). This final report shall include a geological and engineering evaluation of the results of the work performed under the contract with an estimate of the ore reserves resulting from such work, complete assay data, adequate geological and engineering maps or sketches, and a summary of the work performed and the unit costs thereof.

(d) *Report of sales.*—The Operator shall provide the Government with suitable accounting and documentary evidence covering all production to which the Government's percentage royalty relates, such as copies of smelter or concentrator settlement sheets, and certified accounts of production and sale or other disposition of production.

(e) *Compliance with requirements.*—If in the opinion of the Government any of the Operator's reports, records, or accounts are insufficient or incomplete, or if the Operator fails to make them, the Government may procure the making or completion of such with suitable attachments as an expense of the work to which the Operator shall contribute. The Government may withhold approval and payment of any vouchers relating to insufficient or incomplete reports, records or accounts.

ARTICLE 7. *Repayment by Operator.*—(a) *Certification.*—If the Government considers that a discovery or development from which production may be made has resulted from the work, the Government, at any time not later than six months after a sufficient final report and final account (see Article 6) has been rendered, may so certify in writing to the Operator. Such certification shall describe broadly or indicate the nature of the discovery or development.

(b) *Royalty on production.*—The Operator, as principal if the Operator is the producer, or as surety if the Operator is not the producer, shall pay to the Government a royalty on all minerals mined or produced from the land, as follows: (1) regardless of any certification of discovery or development, from the date of the contract until the lapse of the time within which the Government may make such certification, or until the total net amount contributed by the Government without interest is fully repaid, whichever occurs first; or (2) if the Government makes a certification of discovery or development, within a period of ten years from the date of the contract, or until the total net amount contributed by the Government without interest is fully repaid, whichever occurs first.

(c) *Basis for computation.*—The Government's royalty shall be a percentage of the gross proceeds (including any bonuses, premiums, allowances, or other benefits) from the production sold, in the form sold (ore, concentrates, metal, or equivalent), at the point of delivery (the f. o. b. point); *except,* that charges of *the buyer* arising in the regular course of business, and shown as deductions on the buyer's settlement sheets, on account of the cost of treatment processes performed by *the buyer,* sampling and assaying to determine the value of the production sold, and freight paid by *the buyer* to a carrier (not the Operator), shall be allowed as deductions in arriving at the "gross proceeds" as that term is used herein. Any costs of treatment processes, sampling or assaying, or transportation, performed or paid by the Operator or by anyone other than the buyer, are not deductible in arriving at the "gross proceeds" as that term is here used. The term "treatment processes," as here used, means those processes (such as milling, concentrating, smelting, refining, or equivalent) applied to the crude ore or other production after it is extracted from the ground, to put it into a commercially marketable form; excluding fabricating or manufacturing.

(d) *Unsold production.*—If any production (ore, concentrates, metal, or equivalent), after the lapse of six months from the date the ore was extracted from the ground, remains neither sold nor used by the Operator in integrated manufacturing or fabricating operations (for instance, if it is stockpiled), the Government, at its option, as long as it so remains, may require the computation and payment of its royalty on the value of such production in the form (ore, concentrates, metal, or equivalent) it is in when the Government elects to require computation and payment. If any production is used by the Operator in integrated manufacturing or fabricating operations before the Government makes its election, the Government's royalty on such production shall be computed on the value thereof in the form in which and at the time when it is so used. "Value" as here used means what is or would be gross income from mining operations for percentage depletion purposes in Federal income tax determination, or the market value, whichever is greater.

(e) *Percentages of royalty.*—The percentages of the Government's royalty shall be as follows:

One and one-half (1½) percent of amounts ("gross proceeds" or "value") not in excess of eight dollars ($8.00) per ton of production in the form in which sold, held, or used, plus one-half (½) percent for each additional full fifty cents ($0.50) by which such amounts exceed eight dollars ($8.00) per ton, but not in excess of five (5) percent of such amounts.

(For instance: the royalty on an amount of five dollars ($5.00) per ton would be one and one-half (1½) percent; on an amount of ten dollars ($10.00) per ton, three and one-half (3½) percent.)

(f) *Time for computation and payment.*—The Government's royalty shall be computed and paid currently upon each lot sold, held, or used in integrated operations, as the case may be, as above provided in this article.

(g) *Lien for payment.*—To secure the payment of its percentage royalty, there is hereby granted to the Government a lien upon the land or the Operator's interest in the land and upon any production of minerals therefrom, until the royalty claim is extinguished by lapse of time or is fully paid.

(h) *Notice to purchasers.*—The Operator shall give notice of the Government's claim for royalty to any purchaser of the production, and shall authorize and direct such purchaser to pay the royalty directly to the Government and to furnish the Government with copies of the settlement sheets. If the records of any production and sales or other disposition of production, whether the production is by the Operator or by others, are not made available to the Government, the amount of the royalty may be estimated by the Administrator, Defense Minerals Exploration Administration, or his successor, and his estimate thereof shall be final and binding upon the Operator.

(i) *No obligation to produce.*—Nothing in this contract is to be construed as imposing any obligation on the Operator or the Operator's successor in interest to engage in any production operations.

(j) *Government not obligated to buy.*—Nothing in this contract shall be construed as imposing any obligation on the Government to purchase any minerals mined or produced from the land.

ARTICLE 8. *Termination of the Government's obligations.*—(a) If in the opinion of the Government operations at any time have failed to achieve anticipated results that indicate the probability of making a worthwhile discovery, and in the opinion of the Government further operations are not justified, the Government may give the Operator written notice thereof, and thereupon the Government shall be free of all obligation to pay on account of units of work not then performed, and the Operator shall be free of all further obligation to prosecute the work other than such as may be necessary and incidental to winding up, reporting, and accounting.

(b) If in the opinion of the Government the Operator is in any manner in default under the terms of the contract, the Government may give the Operator written notice of such default with a specification of reasonable time within which the default must be cured; and if the Operator fails to cure such default as required, thereupon the Government shall be relieved of all obligation to pay on account of units of work not performed when the notice was given, and the Operator shall be free of all obligation to prosecute the work other than such as may be necessary and incidental to winding up, reporting, and accounting. The remedy provided for the Government in this paragraph "(b)" is in addition to any other remedy provided in this contract, and in addition to any other remedy the law may provide for breach of contract.

(c) The giving of any notice by the Government under the provisions of this Article 8 shall not affect the Government's rights as provided for in the contract with respect to a percentage royalty, and such rights shall be fully preserved.

ARTICLE 9. *Notices to be given by the Government* may be delivered to the Operator, or may be sent by registered mail addressed to the Operator at his mailing address stated in this contract. If mailed, notices are deemed to have been delivered five days after the date of mailing.

ARTICLE 10. *Officials not to benefit.*—No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

ARTICLE 11. *Changes and added provisions.*—

Executed in sextuplicate the day and year first above written.

CAROLINA TUNGSTEN MINING COMPANY
(Operator)

By Paul Myers (Partner)

By Steve Lockey (Partner)

By Franconia Trading, Inc. (Partner)

By A B Rothwell President

THE UNITED STATES OF AMERICA

By O P Mitteudorf
Administrator, Defense Minerals
Exploration Administration

Robin Hefflund
"Appd. Sol. Off."
Seymour Talbert

I, Vera L. E. Rothwell, certify that I am the secretary of the corporation named as Operator herein; that A. B. Rothwell who signed this contract on behalf of the Operator, was then President of said corporation; that said contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

Vera L. E. Rothwell
Secretary

[CORPORATE SEAL]

U. S. GOVERNMENT PRINTING OFFICE 16—70618-1

EXPLORATION PROJECT CONTRACT
CAROLINA TUNGSTEN MINING COMPANY
DOCKET NO. DMEA-3742

ANNEX I

The accompanying map (Fig. 3-A), shows location of Furniss and Phoenix mine properties under lease to the applicant by assignments from Russell and Company, Inc.

1. The Furniss property is described by metes and bounds as follows:

Tract #1

BEGINNING at large iron pipe, Mrs. Snyder and Phoenix mine corner and run N. 28 3/4° E., 91 poles, 16 links (1,512.06 ft.), to a large double cedar on east side of Public Road, thence with the Public Road as follows: S. 51½° E., 42 poles, 10 links (699.6 ft.), thence S. 75° E., 28 poles, 3 links (463.98 ft.), thence S. 64½° E., 6 poles (99.0 ft.), thence N. 72½° E., 20 poles, 4 links (332.6 ft.), thence N. 84 3/4° E., 24 poles, 7 links (400.62 ft.), S. 72° E., 24 poles, 7 links (400.62 ft.), thence S. 63½° E., 6 poles, 17 links (110.22 ft.), thence S. 72° E., 6 poles (99.0 ft.), to an iron stake in said Public Road, a new corner; thence three new lines as follows: First S. 31 3/4° W., 36 poles, 9 links (599.94 ft.), to a stake in the farm road, thence S. 11½° W. 37 poles, 22 links (625.02 ft.), to a stake in the road, thence with said farm road S. 53½° W., 28 poles, 16 links (472.56 ft.), to a small hickory, an old corner of the Phoenix mine lands, thence with Phoenix mine lines, N. 54½° W., 71 poles, 6 links (1,175.46 ft.), to a large iron pipe on the east of the branch, thence S. 80½° W., 62 poles to iron pipe (1,023.0 ft.), thence N. 65° W., 23 poles, 9 links (385.44 ft.), to the beginning and containing approximately 74.5 acres.

Tract #2

BEGINNING at an iron stake by small hickory on south side of road (Mrs. W. A. Reiles corner) and runs thence to new line S. 11° W., 250 poles, 8 links (4,130.28 ft.), (a new corner of J. Coggins line), thence N. 34° W., 15 poles, 4 links,

(250.14 ft.), to a pile of stones, thence West 58 poles (957.0 ft.), to a pile of stones; the Phoenix mine corner, thence North 59 poles (973.5 ft.), to a large iron pipe, thence N. 11° W., 111 poles (1,831.5 ft.), to a small hickory, an old corner, thence N. 53½° E., 28 poles, 16 links (472.56 ft.), to a stake in farm road, thence N. 11½° E., 37 poles, 22 links (625.02 ft.), thence N. 31 3/4° E. 36 poles, 9 links (599.54 ft.), to a stake, a new corner of Public Road, thence along said road as follows: S. 72° E. 12 poles, 5 links (201.3 ft.), S. 81° E., 18 poles, 5 links (300.3 ft.), S. 87½° E., 17 poles, 18 links (292.38 ft.), S. 56° E. 35 poles (577.5 ft.) to beginning and containing approximately 137 acres.

The Operator is the Assignee of a Lease-Option Agreement dated January 7, 1955, covering the Furniss property.

2. The Phoenix property is described by metes and bounds as follows:

BEGINNING at a common boundary post of the Furniss Mining property, an old Hickory Tree and running South 9½ degrees East, 1828 feet to an Iron Pipe; thence South 2 degrees West, 993 feet to a White Oak Tree; thence North 88 degrees West, 1614 feet to an Iron Pin; thence North 52 degrees, 45 minutes West, 993 feet to an Iron Pin; thence North 75½ degrees West, 297 feet to a Cedar Post; thence North 23½ degrees East, 842 feet to an Iron Pipe; thence North 83 degrees, 45 minutes West, 769 feet to a Red Oak Tree; thence North 15 degrees East, 1624 feet to an Oak Post, thence North 30½ degrees East 328 feet to an Iron Pipe; thence South 65½ degrees East, 389 feet to an Iron Pipe; thence North 80 degrees East, 1032 feet to an Iron Pipe; thence South 51½ degrees East, 1169 feet to the point of beginning, comprising approximately 188 acres.

The Operator is the Assignee of a sublease dated January 7, 1955, covering the Phoenix property.

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EXPLORATION PROJECT CONTRACT
CAROLINA TUNGSTEN MINING COMPANY
DOCKET NO. DMEA-3742

EXHIBIT "A"

Description of the Work

Fig. 2, Plan map of workings of 170-foot level and surface of Furniss property, indicating proposed drifting and diamond drill holes, is attached hereto and made a part hereof.

1. From present face of northeast drift on the 170-foot level of the Furniss shaft, drift 300 feet northeasterly along the vein or shear zone. The drift shall be sampled in mineralized zones, and samples assayed for tungsten trioxide and gold.

2. From present face of southwest drift on the 170-foot level of the Furniss shaft, drift 300 feet southwesterly along the vein or shear zone. The drift shall be sampled in mineralized zones, and samples assayed for tungsten trioxide and gold.

3. From the approximate locations as indicated on Fig. 2, drill the following diamond drill holes:

D. D. Hole 1. From the northwesterly side of the Furniss shaft station on the 170-foot level, drill a hole northwesterly, approximately at right angles to vein or shear zone, and approximately 50 feet deep, to explore shear zone for parallel veins.

D. D. Hole 2. From the southeasterly side of proposed southeast drift on the 170-foot level of the Furniss shaft, drill a hole southeasterly, approximately at right angles to vein or shear zone, and approximately 125 feet deep, to explore shear zone for parallel veins.

D. D. Holes 3 and 4. From the southeasterly side of proposed northeast drift on the 170-foot level of the Furniss shaft, drill two holes southeasterly, approximately at right angles to vein or shear zone, each to be approximately 150 feet in depth and to

(2) Add the following:

Pump out sin level. Four days @ $125.00/day	$ 500.00
Take and split approximately 100 samples over a period of 8 days @ $8.00/sample 1/	800.00
Assaying 100 samples for tungsten trioxide (WO_3) and copper and gold @ $7.00 each	700.00

1/ This unit cost covers all labor, supervision, engineering, accounting, supplies, and equipment, hoisting and pumping, and any and all other necessary costs of the work.

This amendment shall not be construed to increase the estimated total cost of the project, the aggregate amount which the Government may be required to contribute, nor the agreed unit cost of any item of work.

Executed in sextuplicate the day and year first above written.

THE UNITED STATES OF AMERICA

By _____
Administrator, Defense Minerals Exploration Administration

Dwyer
"Appd. Sol. Off."
Chapman
Martin
Fallert
Selfridge

CAROLINA TUNGSTEN MINING COMPANY

By _____

_____

explore shear zone for parallel veins.

All diamond drill holes shall be minimum AX size and the total drilling not to exceed 500 feet.

All mineralized zones cut by diamond drill shall be sampled by splitting cores and samples assayed for tungsten trioxide and gold.

The drifts shall be timbered as necessary and shall be not less than 4 feet by 6½ feet in cross section in the clear.

Estimated Cost of the Work

Fixed Unit Costs

Drift 600 feet @ $37.50/ft.	$22,500.00	
Diamond drill 500 feet @ $7.00/ft.	3,500.00	
Sample and analyze for WO_3 and Au, 80 samples @ $5.00/each sample	400.00	
Estimated Total Cost of Project		$26,400.00
Government Participation @ 75%		$19,800.00

MF-203
Revised March 24, 1955

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NOV - 2 1955

For Government's Use Only
EXPLORATION PROJECT CONTRACT
Operator Carolina Tungsten Mining Co.
Docket No. DMEA-
Contract No. Idm-E
Contract Date

CONSENT TO LIEN

To the United States of America:

Referring to that certain land in the County of Cabarrus, State of North Carolina, described as follows:1/

See Attachment 1 hereto, made a part hereof.

which is the subject of a proposed exploration project contract, hereinafter called the "contract," with the United States of America, hereinafter called the "Government;" in consideration of the contract and as an inducement to the Government to enter into it, the undersigned hereby--

1. Undertakes and agrees that property in which the Government may acquire an interest or equity under the contract may be dismantled, severed from the land, and removed, as may be provided in the contract; and the Government's interest and equity in such property shall be prior and superior to any adverse right or claim of the undersigned;

2. Grants to the Government a lien upon all of the undersigned's right, title, and interest in the land and upon any production of minerals therefrom to secure the payment to the Government of a percentage royalty on production as may be provided for by the contract;2/ and represents and undertakes that there are no claims, liens, or encumbrances upon the undersigned's right, title, or interest in the land prior to that hereby granted to the Government other than the following:3/

3. Undertakes and agrees neither to commit any act nor assert any claim in conflict with the provisions of this Consent to Lien; and to give advance notice of the Government's rights under this Consent to Lien to any subsequent transferee, mortgagee, encumbrancer, or lessee of any of the undersigned's right, title, or interest in the land; and

1/ Either (a) insert the legal description of the land, or (b) strike out the words "as follows" and insert "in a lease [or contract, deed, or other document] dated _____, and recorded in book _____ page _____ official records of said county." If (b) is used, the book and page of recordation cannot be dispensed with. If the space provided is insufficient, use an Annex, and refer to the Annex in the space.

2/ Mining or production from the land is not required, and in the absence of production there is no obligation to repay the Government.

3/ Write "none" if that is the case. Do not leave lines blank.

4. Consents to all amendments and assignments of the contract without notice thereof, and agrees that this Consent to Lien shall extend and apply thereto.

5. Added provision: _____

_____

_____

_____

_____

_____

_____

_____

Dated this 23 day of August, 195S.

Robert L Nash [Seal]

Ethel A. Nash [Seal]

Archie L. Nash [Seal]

Mary L Nash [Seal]

I, _____ certify that I am the _____ (Secretary, etc.) of the corporation named herein; that _____ who signed this agreement was then _____ (President or Vice-President, etc.) of said corporation; that said agreement was duly signed for and in behalf of said corporation by authority of its governing body, and was within the scope of its corporate powers.

_____

[Corporate Seal]

RECEIVED

ATTACHMENT 1

1. The Furniss property is described by metes and bounds as follows:

Tract #1

BEGINNING at large iron pipe, Mrs. Snyder and Phoenix mine corner and run N. 28 3/4° E., 91 poles, 16 links (1,512.06 ft.), to a large double cedar on east side of Public Road, thence with the Public Road as follows: S. 51½° E., 42 poles, 10 links (699.6 ft.), thence S. 75° E., 28 poles, 3 links (463.98 ft.), thence S. 64½° E., 6 poles (99.0 ft.), thence N. 72½° E., 20 poles, 4 links (332.6 ft.), thence N. 84 3/4° E., 24 poles, 7 links (400.62 ft.), S. 72° E., 24 poles, 7 links (400.62 ft.), thence S. 63½° E., 6 poles, 17 links (110.22 ft.), thence S. 72° E., 6 poles (99.0 ft.), to an iron stake in said Public Road, a new corner; thence three new lines as follows: First S. 31 3/4° W., 36 poles, 9 links (599.94 ft.), to a stake in the farm road, thence S. 11½° W. 37 poles, 22 links (625.02 ft.), to a stake in the road, thence with said farm road S. 53½° W., 28 poles, 16 links (472.56 ft.), to a small hickory, an old corner of the Phoenix mine lands, thence with Phoenix mine lines, N. 54½° W., 71 poles, 6 links (1,175.46 ft.), to a large iron pipe on the east of the branch, thence S. 80½° W., 62 poles to iron pipe (1,023.0 ft.), thence N. 65° W., 23 poles, 9 links (385.44 ft.), to the beginning and containing approximately 74.5 acres.

Tract #2

BEGINNING at an iron stake by small hickory on south side of road (Mrs. W. A. Foiles corner) and runs thence to new line S. 11° W., 250 poles, 8 links (4,130.28 ft.), (a new corner of J. Coggins line), thence W. 34° W., 15 poles, 4 links, (250.14 ft.), to a pile of stones, thence West 58 poles (957.0 ft.), to a pile of stones; the Phoenix mine corner, thence North 59 poles (973.5 ft.), to a large iron pipe, thence N. 11° W., 111 poles (1,831.5 ft.), to a small hickory, an old corner, thence N. 53½° E., 28 poles, 16 links (472.56 ft.), to a stake in farm road, thence N. 11½° E., 37 poles, 22 links (625.02 ft.), thence N. 31 3/4°

E. 36 poles, 9 links (599.54 ft.), to a stake, a new corner of Public Road, thence along said road as follows: S. 72° E. 12 poles, 5 links (201.3 ft.), S. 81° E., 18 poles, 5 links (300.3 ft.), S. 87½° E., 17 poles, 18 links (292.38 ft.), S. 56° E. 35 poles (577.5 ft.) to beginning and containing approximately 137 acres.

2. The Phoenix property is described by metes and bounds as follows:

BEGINNING at a common boundary post of the Furnace Mining property, an old Hickory Tree and running South 9½ degrees East, 1828 feet to an Iron Pipe; thence South 2 degrees West, 953 feet to a White Oak Tree; thence North 88 degrees West, 1614 feet to an Iron Pin; thence North 52 degrees, 45 minutes West, 993 feet to an Iron Pin; thence North 75½ degrees West, 297 feet to a Cedar Post; thence North 23½ degrees East, 842 feet to an Iron Pipe; thence North 83 degrees, 45 minutes West, 769 feet to a Red Oak Tree; thence North 15 degrees East, 1624 feet to an Oak Post, thence North 30½ degrees East 328 feet to an Iron Pipe; thence South 65½ degrees East, 389 feet to an Iron Pipe; thence North 80 degrees East, 1032 feet to an Iron Pipe; thence South 51½ degrees East, 1169 feet to the point of beginning, comprising approximately 188 acres.

MF-203
Revised March 24, 1955

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For Government's Use Only
EXPLORATION PROJECT CONTRACT
Operator Carolina Tungsten Mining Co.
Docket No. DMEA-3742
Contract No. Idm-E
Contract Date

CONSENT TO LIEN

To the United States of America:

Referring to that certain land in the County of Cabarrus, State of North Carolina, described as follows:1/

See Attachment 1 hereto, made a part hereof

which is the subject of a proposed exploration project contract, hereinafter called the "contract," with the United States of America, hereinafter called the "Government;" in consideration of the contract and as an inducement to the Government to enter into it, the undersigned ~~xxxxxxxx~~ surviving Trustee under the will of Charles A. Chapin, deceased, hereby--

1. Undertakes and agrees that property in which the Government may acquire an interest or equity under the contract may be dismantled, severed from the land, and removed, as may be provided in the contract; and the Government's interest and equity in such property shall be prior and superior to any adverse right or claim of the undersigned;

2. Grants to the Government a lien upon all of the undersigned's right, title, and interest in the land and upon any production of minerals therefrom to secure the payment to the Government of a percentage royalty on production as may be provided for by the contract;2/ and represents and undertakes that there are no claims, liens, or encumbrances upon the undersigned's right, title, or interest in the land prior to that hereby granted to the Government other than the following:3/

3. Undertakes and agrees neither to commit any act nor assert any claim in conflict with the provisions of this Consent to Lien; and to give advance notice of the Government's rights under this Consent to Lien to any subsequent transferee, mortgagee, encumbrancer, or lessee of any of the undersigned's right, title, or interest in the land; and

1/ Either (a) insert the legal description of the land, or (b) strike out the words "as follows" and insert "in a lease [or contract, deed, or other document] dated _____, and recorded in book _____ page _____ official records of said county." If (b) is used, the book and page of recordation cannot be dispensed with. If the space provided is insufficient, use an Annex, and refer to the Annex in the space.

2/ Mining or production from the land is not required, and in the absence of production there is no obligation to repay the Government.

3/ Write "none" if that is the case. Do not leave lines blank.

4. Consents to all amendments and assignments of the contract without notice thereof, and agrees that this Consent to Lien shall extend and apply thereto.

5. Added provision: _____

_____

_____

_____

_____

_____

_____

_____

Dated this _____ day of _____, 195__.

Helen Evelyn Chapin Bishop [Seal]
Helen Evelyn Chapin Bishop, Trustee

Ruby Chapin Pitner [Seal]
Ruby Chapin Pitner, Trustee

Lowell H. Chapin [Seal]
Lowell H. Chapin, Trustee

I, _____ certify that I am the _____ _____ (Secretary, etc.) of the corporation named herein; that _____ _____ who signed this agreement was then _____ (President or Vice-President, etc.) of said corporation; that said agreement was duly signed for and in behalf of said corporation by authority of its governing body, and was within the scope of its corporate powers.

_____

[Corporate Seal]

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[illegible]

ATTACHMENT 1

The Phoenix property is described by metes and bounds as follows:

BEGINNING at a common boundary post of the Furniss Mining property, an old Hickory Tree and running South 9½ degrees East, 1828 feet to an Iron Pipe; thence South 2 degrees West, 993 feet to a White Oak tree; thence North 88 degrees West, 1614 feet to an Iron Pin; thence North 52 degrees, 45 minutes West, 993 feet to an Iron Pin; thence North 75½ degrees West, 297 feet to a Cedar Post; thence North 23½ degrees East, 842 feet to an Iron Pipe; thence North 83 degrees, 45 minutes West, 769 feet to a Red Oak Tree; thence North 15 degrees East, 1624 feet to an Oak Post, thence North 30½ degrees East 328 feet to an Iron Pipe; thence South 65½ degrees East, 389 feet to an Iron Pipe; thence North 80 degrees East, 1032 feet to an Iron Pipe; thence South 51½ degrees East, 1169 feet to the point of beginning, comprising approximately 188 acres.

MF-200A
(Revised June 1954)

Docket No. DMEA 3742

Commodity Tungsten

Contract No. Idm-E

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
EXPLORATION PROJECT CONTRACT[1]
(Short Form)

It is agreed this ..... day of ....., 195...., between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government," and [2] Carolina Tungsten Mining Company, Concord, N.C., a Partnership whose partners are: Paul M. Tyler, 5005 Edgemoor Lane, Bethesda 14, Md.; Hal Lackey, 11809 Gorden Road, Silver Spring, Md.; Franconia Trading Inc., 12 Woodside Drive, Milbrook, Greenwich, Conn., whose mailing address is c/o Paul M. Tyler, President, 5005 Edgemoor Lane, Bethesda 14, Md., hereinafter called the "Operator," as follows:

ARTICLE 1. *This contract* is entered into under the authority of the Defense Production Act of 1950, as amended. It consists of this form (MF-200A), the attached Exhibit "A," Annex I, and Map (Figure 3) and Property Map (???)

The Operator shall not transfer or assign this contract or any right thereunder without the written consent of the Government.

ARTICLE 2. *Operator's property rights.*—(a) The land which is the subject of this contract (hereinafter called "the land") is in the State of North Carolina, County of Cabarrus, and is described in Annex I.[3]

(b) The Operator represents and undertakes that:

(1) The Operator is the [4] Sublessee of [5] the mineral rights in the in the land, in possession and entitled to possession for all of the purposes of this contract, under and by virtue of two subleases, [7] unrecorded in Book ....., page ....., official records of said County; and

(2) The Operator's right, title, or interest (whether as owner, lessee, or otherwise) is subject only to the following claims, liens, or encumbrances: none

(c) The Subordination Agreement of the holder of any claim, lien, or encumbrance listed above, and (if the Operator does not hold the legal title) the Consent to Lien of any holder of the legal title of the land (lessor, seller, optionor, etc.), are attached, as follows: (where are the OCL's?)

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] Insert name, and if an organization, its nature (corporation and place of incorporation, partnership with names of partners, etc.).
[3] State on a separate sheet marked "Annex I" the legal description or enough to identify the property, particularly excluding any areas from which the production is not to be subject to the Government's percentage royalty.
[4] Insert "owner," "lessee," "contract purchaser," "locator," etc.
[5] Insert "the entire interest," "the mineral rights," "an undivided one-third," etc.
[6] Insert "deed," "lease," "contract," "location notice," "patent," etc.
[7] If not recorded, so indicate by inserting "un."

16—70618-1

the contract sublessee and purchase optioner of the Furniss mining property
Phoenix mining property and

(d) The Operator shall preserve and maintain his right, title, and interest in the land and his right to the possession thereof for the purposes of this contract, and shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of this contract. Until the lapse of the time within which the Government may make a certification of discovery or development without any such certification having been made, and after any such certification has been made, the Operator shall neither transfer, convey, nor surrender the land nor any right, title, or interest therein, nor permit nor suffer any claim, lien, or encumbrance thereon, without expressly referring to and providing in the instrument of conveyance, lien, or encumbrance for the preservation of the Government's right to a percentage royalty on production and lien for the payment thereof. If the Government makes no certification of discovery or development within the time limited in Article 7, it shall thereafter have no claim against the land or any production therefrom except for any production referred to in Article 7(b)(1).

ARTICLE 3. *The exploration project.*—The project is a search for indicated or undeveloped deposits of ..... The work to be performed is described in Exhibit "A." The Operator on or before ..... shall commence the work, and on or before June 30, 1956 (unless the Operator's obligation to complete the work is terminated—see Article 8) shall complete the work.

ARTICLE 4. *Performance of the work.*—(a) *Operator's responsibility.*—The work shall be performed with reasonable diligence, efficiently, expertly, in a workmanlike manner, in accordance with good mining standards and State regulations for health and safety and for liability insurance covering employment; and with suitable and adequate equipment, facilities, materials, supplies, and labor, to bring it to completion within the time fixed.

(b) *Government may inspect.*—The Operator shall consult with and inform the Government on all phases of the work as it progresses. The Government may enter at all reasonable times to inspect the work under the contract, and also after a certification of discovery or development to inspect production operations and underground workings. The operator shall provide the Government with all reasonable means of access for such inspections.

ARTICLE 5. *Contribution by the Government.*—A fixed cost for each unit of work to be performed (per foot of drifting, per foot of drilling, per hour of operations, etc.) is hereby agreed upon, and is set forth in Exhibit "A" in connection with the estimated total cost of the project in the sum of $..... The Government will contribute ..... percent of the fixed unit costs as work is performed, in a total sum not in excess of $.....: *Provided,* That until the Operator has rendered to the Government his final report, and any final auditing required by the Government has been made, and a final settlement of the contract has been made, the Government may withhold from the last voucher or vouchers such sums as it sees fit not in excess of 10 percent of the estimated total cost of the work. The Government will make its contribution on the basis of the monthly vouchers referred to in Article 6(b), but all payments by the Government are provisional only, subject to audit, until the account between the Operator and the Government is finally audited and settled. To the extent that excesses over fixed unit costs or any excess over the estimated total cost may be necessary for the performance of the work, the Operator shall incur and pay such excesses for his own account without contribution by the Government. The Government may make payments directly to independent contractors and suppliers for the account of the Operator rather than to the Operator.

ARTICLE 6. *Reports, accounts, audits.*—(a) *Operator's records.*—The Operator shall keep suitable records and accounts of the units of work performed and of any production in which the Government may have an interest; and shall preserve those with respect to work performed for at least three years after final payment by the Government, and those with respect to production for at least three years after any obligation to pay royalties to the Government has terminated. The Government may inspect and audit said records and accounts at any time, either by itself or by a certified public accountant. The Comptroller General of the United States or his representative, until the expiration of said three-year periods, shall have access to and the right to examine any pertinent books, documents, papers, and records of the Operator. All of the Operator's vouchers and records and accounts relating thereto and the Government's payments thereof remain subject to adjustment until final audit by the Government.

(b) *Progress reports and vouchers.*—The Operator shall provide the Government with five copies of monthly progress reports in three sections as follows: (1) Operator's Monthly Report and Voucher showing a detailed statement of units of work performed during the reporting period; (2) Operator's Unit Cost and Progress Report showing the various types of work performed during the reporting period and the fixed unit costs incurred for each type of work; and (3) a Narrative Report of the work

performed during the reporting period including adequate engineering-geological maps or sketches, drill hole logs and locations, and assay reports on samples taken concurrently with advance in mineralized ground. (Forms for reporting under (1) and (2) above will be provided by the Government.)

(c) *Final report.*—Upon completion of the work or termination of the Government's obligation to contribute to costs, the Operator shall furnish the Government with five copies of a final report (in addition to the final progress report and voucher). This final report shall include a geological and engineering evaluation of the results of the work performed under the contract with an estimate of the ore reserves resulting from such work, complete assay data, adequate geological and engineering maps or sketches, and a summary of the work performed and the unit costs thereof.

(d) *Report of sales.*—The Operator shall provide the Government with suitable accounting and documentary evidence covering all production to which the Government's percentage royalty relates, such as copies of smelter or concentrator settlement sheets, and certified accounts of production and sale or other disposition of production.

(e) *Compliance with requirements.*—If in the opinion of the Government any of the Operator's reports, records, or accounts are insufficient or incomplete, or if the Operator fails to make them, the Government may procure the making or completion of such with suitable attachments as an expense of the work to which the Operator shall contribute. The Government may withhold approval and payment of any vouchers relating to insufficient or incomplete reports, records or accounts.

ARTICLE 7. *Repayment by Operator.*—(a) *Certification.*—If the Government considers that a discovery or development from which production may be made has resulted from the work, the Government, at any time not later than six months after a sufficient final report and final account (see Article 6) has been rendered, may so certify in writing to the Operator. Such certification shall describe broadly or indicate the nature of the discovery or development.

(b) *Royalty on production.*—The Operator, as principal if the Operator is the producer, or as surety if the Operator is not the producer, shall pay to the Government a royalty on all minerals mined or produced from the land, as follows: (1) regardless of any certification of discovery or development, from the date of the contract until the lapse of the time within which the Government may make such certification, or until the total net amount contributed by the Government without interest is fully repaid, whichever occurs first; or (2) if the Government makes a certification of discovery or development, within a period of ten years from the date of the contract, or until the total net amount contributed by the Government without interest is fully repaid, whichever occurs first.

(c) *Basis for computation.*—The Government's royalty shall be a percentage of the gross proceeds (including any bonuses, premiums, allowances, or other benefits) from the production sold, in the form sold (ore, concentrates, metal, or equivalent), at the point of delivery (the f. o. b. point); *except,* that charges of *the buyer* arising in the regular course of business, and shown as deductions on the buyer's settlement sheets, on account of the cost of treatment processes performed by *the buyer,* sampling and assaying to determine the value of the production sold, and freight paid by *the buyer* to a carrier (not the Operator), shall be allowed as deductions in arriving at the "gross proceeds" as that term is used herein. Any costs of treatment processes, sampling or assaying, or transportation, performed or paid by the Operator or by anyone other than the buyer, are not deductible in arriving at the "gross proceeds" as that term is here used. The term "treatment processes," as here used, means those processes (such as milling, concentrating, smelting, refining, or equivalent) applied to the crude ore or other production after it is extracted from the ground, to put it into a commercially marketable form; excluding fabricating or manufacturing.

(d) *Unsold production.*—If any production (ore, concentrates, metal, or equivalent), after the lapse of six months from the date the ore was extracted from the ground, remains neither sold nor used by the Operator in integrated manufacturing or fabricating operations (for instance, if it is stockpiled), the Government, at its option, as long as it so remains, may require the computation and payment of its royalty on the value of such production in the form (ore, concentrates, metal, or equivalent) it is in when the Government elects to require computation and payment. If any production is used by the Operator in integrated manufacturing or fabricating operations before the Government makes its election, the Government's royalty on such production shall be computed on the value thereof in the form in which and at the time when it is so used. "Value" as here used means what is or would be gross income from mining operations for percentage depletion purposes in Federal income tax determination, or the market value, whichever is greater.

(e) *Percentages of royalty.*—The percentages of the Government's royalty shall be as follows:

One and one-half (1½) percent of amounts ("gross proceeds" or "value") not in excess of eight dollars ($8.00) per ton of production in the form in which sold, held, or used, plus one-half (½) percent for each additional full fifty cents ($0.50) by which such amounts exceed eight dollars ($8.00) per ton, but not in excess of five (5) percent of such amounts.

(For instance: the royalty on an amount of five dollars ($5.00) per ton would be one and one-half (1½) percent; on an amount of ten dollars ($10.00) per ton, three and one-half (3½) percent.)

(f) *Time for computation and payment.*—The Government's royalty shall be computed and paid currently upon each lot sold, held, or used in integrated operations, as the case may be, as above provided in this article.

(g) *Lien for payment.*—To secure the payment of its percentage royalty, there is hereby granted to the Government a lien upon the land or the Operator's interest in the land and upon any production of minerals therefrom, until the royalty claim is extinguished by lapse of time or is fully paid.

(h) *Notice to purchasers.*—The Operator shall give notice of the Government's claim for royalty to any purchaser of the production, and shall authorize and direct such purchaser to pay the royalty directly to the Government and to furnish the Government with copies of the settlement sheets. If the records of any production and sales or other disposition of production, whether the production is by the Operator or by others, are not made available to the Government, the amount of the royalty may be estimated by the Administrator, Defense Minerals Exploration Administration, or his successor, and his estimate thereof shall be final and binding upon the Operator.

(i) *No obligation to produce.*—Nothing in this contract is to be construed as imposing any obligation on the Operator or the Operator's successor in interest to engage in any production operations.

(j) *Government not obligated to buy.*—Nothing in this contract shall be construed as imposing any obligation on the Government to purchase any minerals mined or produced from the land.

ARTICLE 8. *Termination of the Government's obligations.*—(a) If in the opinion of the Government operations at any time have failed to achieve anticipated results that indicate the probability of making a worthwhile discovery, and in the opinion of the Government further operations are not justified, the Government may give the Operator written notice thereof, and thereupon the Government shall be free of all obligation to pay on account of units of work not then performed, and the Operator shall be free of all further obligation to prosecute the work other than such as may be necessary and incidental to winding up, reporting, and accounting.

(b) If in the opinion of the Government the Operator is in any manner in default under the terms of the contract, the Government may give the Operator written notice of such default with a specification of reasonable time within which the default must be cured; and if the Operator fails to cure such default as required, thereupon the Government shall be relieved of all obligation to pay on account of units of work not performed when the notice was given, and the Operator shall be free of all obligation to prosecute the work other than such as may be necessary and incidental to winding up, reporting, and accounting. The remedy provided for the Government in this paragraph "(b)" is in addition to any other remedy provided in this contract, and in addition to any other remedy the law may provide for breach of contract.

(c) The giving of any notice by the Government under the provisions of this Article 8 shall not affect the Government's rights as provided for in the contract with respect to a percentage royalty, and such rights shall be fully preserved.

ARTICLE 9. *Notices to be given by the Government* may be delivered to the Operator, or may be sent by registered mail addressed to the Operator at his mailing address stated in this contract. If mailed, notices are deemed to have been delivered five days after the date of mailing.

ARTICLE 10. *Officials not to benefit.*—No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

ARTICLE 11. *Changes and added provisions.*—

Executed in sextuplicate the day and year first above written.

THE UNITED STATES OF AMERICA

.....
(Operator)

By .....

By .....

.....

I, ..., certify that I am the ..... secretary of the corporation named as Operator herein; that ..... who signed this contract on behalf of the Operator, was then ..... of said corporation; that said contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

.....

[CORPORATE SEAL]

U. S. GOVERNMENT PRINTING OFFICE 16—70618-1

Exploration Project Contract
Carolina Tungsten Mining Company
Docket No. DMEA - 3742

Annex I

The land referred to in Article 2 of the contract is described as follows:

(1) Furniss Mining Property
Beginning etc

(2) Phoenix Mining Property
Beginning etc

The area included within the above parcels is shown on the attached property map.

[redacted] 165 105.6 152 198 39.6 462 112.2 39.6
462 396 105.6 594 594

Link = 7.92 inches

Phoenix line

1 N28¾E 91 Poles × 16½ 1501.5'
16 links × 7.92 in. (66 ft.) / 12 10.56
1512.06

13 - N54½W 71 Ps 6 Ls 1171.5
3.96
1175.46

2 - S51½E 42 Ps × 16½ 693.0
10 Links × 66 6.6
699.6

14 S80½W 62 Ps 1023.0

3. S75E. 28 Poles. 462.0
3 links. 1.98
463.98'

15 N65W 23 Ps 379.5
9 Ls 3.94
385.44

4. S64½E 6 Poles 99.0'

To beginning
74.5 acres.

5 N72½E 20 Poles 330.0
4 Links. 2.64
332.64

6 N84½E 24 P. 396
7 L. 4.62
400.62

8 S63½E 6 Ps 99.0
17 L. 11.22
110.22

7. S72E 24 P 396
7 L. 4.62
400.62

9 S72E 6 Ps 99.0'

10 S31¾W. 36 P. 594.0
9 Ls 3.94
597.94

20805
113
62415
62415
2288.55
2350.965

11 S11¼W. 37 Ps 610.5
22 Ls. 14.52
625.02

12 S53½W. 28 Ps 462.0
16 Ls 10.56
472.56

145 2 828 264 28 16.56

Part 2, FURNISS
MRS. W.A. FOLES CORNER

69 4 118.8
250
16½
4000

16 S 11 W. 250 Ps 4125.0
8 Ls 5.28
4130.28

17 N 34 W 15 Ps 247.5
4 Ls 2.64
250.14

18 WEST 58 Ps P.M.Con 957'

19 NORTH 59 Ps 973.5'

20 N. 11 W 111 Ps 1831.5'

21 N 53½ E 28 Ps 462.0
16 Ls 10.56
472.56

22 N. 11¼ E 37 Ps 610.5
22 Ls 14.52
625.02

23 N 31¾ E 36 Ps 594 26 S 87½ E 17 Ps 280.5
11 9 Ls 5.59 18 Ls 11.88
599.59 292.38

24 S 72 E 12 Ps 198.0
5 Ls 3.30 27 S 56 E 36 Ps 594.0
201.30 to begin

25 S 81 E 18 Ps 297.0
4 5 Ls 3.30
300.30

Docket

ASSIGNMENT

KNOW ALL MEN BY THESE PRESENTS:

That I, Hal Lackey, of 11809 Gorden Rd., Silver Spring, Md., in consideration of the sum of Ten Dollars($10.00) to me in hand paid, receipt whereof is hereby acknowledged, do hereby sell, assign, transfer, and set over to the Carolina Tungston Mining Co., of Concord, North Carolina, a partnership, all my right, title, and interest in and to the attached assignment from Russell and Company, Inc. together with the attachedleases which are incoporated herein and made a part hereof, together with all rights of action accrued or which may hereafter accrue thereunder.

In witness whereof, I hereunto set my hand and seal this sixteenth day of May, 1955.

Hal Lackey (SEAL)

Hal Lackey

Muriel B. Lackey

Witness

KNOW ALL MEN BY THESE PRESENTS:

That Russell and Company, Inc., a corporation organized by virtue of the laws of the State of Delaware, and having its principal office at 1741 DeSales Street, in the City of Washington, D. C., in pursuance of a resolution of the board of directors of said company, passed on the 11th day of March, 1955, in consideration of ten dollars ($10.00), the receipt whereof is hereby acknowledged by these presents does hereby sell, assign transfer, and set over unto Hal Lackey, his heirs and assigns, all that benefit of the attached Agreement, Lease and Option dated January 7, 1955, by and between said company and Robie L. Nash and his wife, Ethel A. Nash and Archie L. Nash and his wife, Mary L. Nash, such said agreement being registered in the Cabarrus County, North Carolina Register of Deeds, Record No. 256, Page 632 on January 18, 1955; and all that benefit of the attached agreement dated January 7, 1955, by and between said company and A. L. Nash and his wife, Mary L. Nash, such agreement being registered in the Cabarrus County, North Carolina Register of Deeds, Record No. 262, Page 2 on January 22, 1955; both of these said agreements are hereby incorporated in and made a part hereof; together with such equipment, tools and machinery as the said company may own which is located on the premises described in the foregoing agreements on this date.

IN WITNESS WHEREOF, said company has caused these presents to be signed in its name, by its president, and

sealed with its corporate seal, attested by its secretary, this 31st day of March 1955.

RUSSELL AND COMPANY, INC.

By W. J. Russell
President

Corporate Seal

ATTEST:
Walter J. Finchum
Secretary

AGREEMENT

CITY OF WASHINGTON,)
DISTRICT OF COLUMBIA.)

This 31st day of March, 1955, personally came before me Anne A. Fuike, a Notary Public in and for the City of Washington, District of Columbia, Walter E. Goodline, who, being by me duly sworn, says that he knows the common seal of Russell and Company, Inc., and is acquainted with W. G. Russell, who is the President of said corporation, and that he, the said Walter E. Goodline, is the Secretary of said corporation and saw the President sign the instrument and saw the said common seal of said corporation affixed to said instrument by said President, and that he, the said Walter E. Goodline, signed his name in attestation of the execution of said instrument in the presence of said President of said corporation.

Witness my hand and Notarial seal, date above written.

Anne A. Fuike
Notary Public

My commission expires June 30, 1957

A G R E E M E N T

THIS AGREEMENT, Made and entered into this the 7th day of January, 1955, by and between A. L. NASH and wife, MARY L. NASH, of the County of Cabarrus and the State of North Carolina, hereinafter called the parties of the first part, and RUSSELL AND COMPANY, INC., (a Delaware Corporation), with office at 1741 DeSale St., Washington, 6, D.C., hereinafter called the party of the second part,

W I T N E S S E T H:

That the parties of the first part are lessees of the mineral rights in certain parcels of real estate described in an Indenture dated the 20th day of December 1951, by and between the parties of the first part and Helen Evelyn Chapin Beshop, Ruby Chapin Pitner, Lowell Meade Chapin and Charles Douglas Chapin, as trustees under the will of Charles A.Chapin, deceased, and registered in record of Deeds No. 237, pages 396-397, office of Register of Deeds, Cabarrus County, N. C.;

That the parties of the first part, for and in consideration of the sum of One Thousand ($1000.00) Dollars, the receipt whereof is hereby acknowledged, and the covenants hereinafter expressed and other good and valuable considerations, have assigned and transferred and by these presents do assign and transfer the aforementioned indenture lease together with all and every right therein to the party of the second part.

The party of the second part agrees to accept and assume all the obligations imposed by the aforementioned indenture lease upon the parties of the first part from and after the 1st day of February 1955, for the duration of this agreement.

The part of the second part further agrees to pay to the parties of the first part six (6) months after the date hereof, the sum of Five Hundred ($500.00) Dollars, and to pay to the parties of the first part twelve (12) months after the date hereof One Thousand ($1000.00) Dollars.

The party of the second part further agrees that beginning one year from the date hereof he will pay annually to the parties of the first part the sum of Twenty-Five Hundred ($2500.00) Dollars in two semi-annual installments. The first of these increased installments shall be due and payable on August 1, 1956.

The parties of the first part, or their duly authorized agent, shall at all reasonable times have the right to enter said premises, and into all parts thereof, inspect same and take samples therefrom and to make assays; and to all these ends the party of the second part shall render all reasonable assistance. The party of the second part agrees to give to the parties of the first part all information which they shall acquire in connection with drilling, mining or other similar information, so that in case the party of the second part shall at any time abandon the venture the parties of the first part may have all of the information acquired by the party of the second part in connection with mining or exploring the property.

The party of the second part reserves the right at any time to cancel this agreement upon sixty (60) days notice and upon such cancellation the aforementioned indenture lease shall revert to the parties of the first part, but all sums which have been paid pursuant to the terms of this agreement are to be considered as liquidated damages for such cancellation.

It is further understood and agreed that all the conditions and covenants herein contained shall extend to and be binding upon the heirs or assigns of both parties.

IN WITNESS WHEREOF, the parties of the first part have hereunto set their hands and seals, and the party of the second part, Russell and Company, Inc., has caused these presents to be signed in its corporate name by its President and its corporate seal to be hereto affixed and attested by its Secretary, all by authority of its board of directors duly given, this the day and year first above written.

A. L. Nash (SEAL)

Mary L. Nash (SEAL)

RUSSELL AND COMPANY, INC.

By [illegible]
President

ATTEST:

Yvonne C. Fisher
Asst. Secretary

NORTH CAROLINA,)
)
ROWAN COUNTY .)

The execution of the foregoing instrument was this the 17 day of January, 1955, acknowledged before the undersigned, Zora N. Strong a Notary Public of Rowan County, by A. L. Nash and wife, Mary L. Nash.

Witness my hand and Notarial seal, date above written.

Zora N. Strong
Notary Public

My commission expires Aug. 9, 1956

CITY OF WASHINGTON,)
)
DISTRICT OF COLUMBIA.)

This 20 day of January, 1955, personally came before me, Anna W. Johnson, a Notary Public in and for the City of Washington, District of Columbia, Yvonne C. Fisher, who, being by me duly sworn, says that She knows the common seal of Russell and Company, Inc., and is acquainted with Hal Lackey, who is the President of said corporation, and that She, the said Yvonne C. Fisher, is Asst. Secretary of said corporation and saw the President sign the instrument and saw the said common seal of said corporation affixed to said instrument by said President, and that she, the said Yvonne C. Fisher signed her name in attestation of the execution of said instrument in the presence of said President of said corporation.

Witness my hand and Notarial seal, date above written.

Anna W. Johnson
Notary Public

My commission expires Dec 15, 1955

NORTH CAROLINA,)
CABARRUS COUNTY.)

The foregoing certificates of Zora N. Strong, a Notary Public of Rowan County Anna W. Johnston a Notary Public of Washington D.C. are adjudged to be in due form and according to law. Therefore let the said instrument, with certificates, be registered.

This the 22 day of January, 1955.

Dorothy R Fagan
Deputy Clerk of Superior Court

NORTH CAROLINA,)
CABARRUS COUNTY.)

Filed in this office for registration on this 22 day of January, 1955, at 11:40 o'clock A M., and duly registered in Book No. 262 of Deeds, page 2.

John R Boger
Register of Deeds

AGREEMENT

THIS AGREEMENT, LEASE AND OPTION, made and entered into this 7th day of January, A. D. 1955, by and between Robie L. Nash and his wife, Ethel A. Nash and Archie L. Nash and his wife, Mary L. Nash, parties of the first part; and Russell and Company, Inc., (a Delaware Corporation), with offices at 1741 DeSales Street, Washington 6, D. C., party of the second part:

WITNESSETH:

That the parties of the first part represent that they are in a position to give good and satisfactory title to the land and mines described in this agreement;

That the parties of the first part, for and in consideration of the sum of One Dollar ($1.00), and the covenants hereinafter expressed and other good and valuable considerations have granted, demised, and let, and by these presents do grant, demise and let unto the party of the second part the exclusive right, privilege and option of leasing and/or purchasing or acquiring all the property known as the Furniss mine property (adjoining the Phoenix mine property and described in a deed to the parties of the first part from the J. E. Latham Company and registered in the office of the Register of Deeds, Cabarrus County, No. 200, page 793 under date of October 7, 1947), including all real estate, water rights, easements, etc., together with all other property and appurtenances, real and personal, now owned or controlled by the parties of the first part in conjunction with the aforesaid Furniss mining property, at the price and upon the terms and conditions, and within the times for payment hereinafter specified.

That the parties of the first part agree to lease the above property to the party of the second part for the term of three years from the date of this agreement, upon the payment as stipulated hereinafter.

The parties of the first part agree to give the party of the second part at any time during this three-year period an option to purchase the entire property free and clear from all liens, encumberances, etc., for the sum of One Hundred Thousand Dollars ($100,000.00) paid in five equal annual payments of Twenty Thousand Dollars ($20,000.00) each. The first of such equal annual payments shall be due and payable on the initial day and date when this option is exercised.

After exercising the option to purchase, interest at the rate of five percent (5%) per annum shall be paid on deferred payments. The party of the second part reserves the right to pay in advance at any time any or all of the various payments due under this option.

In the event the party of the second part does not exercise the aforementioned option to purchase during the term of this lease the lease shall be extended for an additional three years and the parties agree to establish a new option and purchase price not to exceed $100,000.00

In case the party of the second part exercises his option to purchase the property, the royalties as called for in this agreement shall continue until the properties are paid for in full but all such royalties shall apply on the purchase price and be subtracted from the next payment due as called for above.

The party of the second part reserves the right at any time to cancel either the lease or purchase contract upon sixty days' notice, but all sums which have been paid either on lease or purchase price are to be considered as liquidated damages for such cancellation.

SCHEDULE OR ROYALTIES:

The party of the second part agrees to pay royalties upon all ores and concentrates mined and taken from the property and

sold or otherwise disposed of for the profit of the party of the second part at the stipulated rate of ten per cent (10%) of the net smelter or mint returns for all ores, concentrates or bullion, f.o.b. mine shipping point. Such net returns for the purpose of calculating royalties shall include all monies received by the party of the second part for sales of metals or minerals produced from the property without any deductions for cost of mining, concentrating, or chemical treatment.

MINIMUM GUARANTY:

It is further stipulated and agreed that the party of the second part agrees to pay a minimum monthly royalty of not less than One Hundred Dollars ($100.00), such payment to be made on the 15th day of each month beginning January 15, 1955.

CUSTOM MILLING:

The party of the second part shall have the right to use the machinery, water and other facilities and appurtenances of any mill now on or subsequently constructed on the property for the purpose of beneficiating or treating ores from other properties.

FURTHER CONDITIONS:

All royalties provided for under this lease shall be paid on the 15th of the month following the expiration of each quarterly period and shall cover all the ore sold or otherwise disposed of for profit during the preceding three months. The first settlement shall be made on the 15th day of April 1955, and subsequent settlements shall be made quarterly thereafter during the continuance of the lease. While a minimum royalty of One Hundred Dollars ($100.00) per month is to be paid during this lease and purchase agreement, this amount is to apply against the royalty of ten percent (10%) of the net return heretofore provided for and the payments are to be cumulative in their nature. All royalty payments shall be accompanied by a statement showing the amount of ore, mineral or bullion shipped during the period

and its source. The parties of the first part reserve the right to demand access to all shipment records, invoices, and furnace settlement sheets relative to ores, concentrates or bullin shipped from the Furniss property.

The party of the second part undertakes and agrees to pay promptly all bills incurred for labor or material in or about the working, operation, or equipment of said property; and to keep said property free and clear from all liens and lien-claims, and will protect and save harmless the parties of the first part from any and all liens, lien-claims, costs, expenses, and damages which may or might arise by reason of any debt created by or under the party of the second part as lessee; and it is expressly agreed and understood that the party of the second part shall not become in any sense the agent, representative or contractor of the parties of the first part in working or operating the said property.

The party of the second part agrees to maintain liability insurance during the term of the lease to the extent of not less than Fifty Thousand Dollars ($50,000.00) to one person or Two Hundred Thousand Dollars ($200,000.00) to two or more persons arising out of one accident.

The party of the second part at all times after taking possession of said property under the terms hereof, may use therefrom such timber as he may require for mining purposes and shall enjoy all rights and privileges now possessed by the party of the first part in connection with the use of water and all other rights and privileges and easements and including the right to tear down or remodel buildings and other constructions and to use all machinery, tools, and equipment now on the property except only that no timber shall be removed or sold during the period of the lease without the full knowledge and assent of the party of the first part.

The parties of the first part reserve the right to employ certain areas for farming purposes provided, however, that such employment does not in the opinion of the party of the second part interfere in any way with economic mining and/or milling operations.

The parties of the first part, or their duly authorized agent, shall at all reasonable times have the right to enter said premises, and into all parts thereof, inspect same and take samples therefrom and to make assays; and to all these ends the party of the second part shall render all reasonable assistance. The party of the second part agrees to give to the party of the first patt all information which they shall acquire in connection with drilling, mining or other similar information, so that in case the party of the second part shall at any time abandon the venture the parties of the first part may have all of the information acquired by the party of the second part in connection with mining or exploring the property.

The party of the second part agrees that during the period of the lease and option he will pay all local taxes currently assessed on the property, limited, however, to such taxes as may be assessed from the day and date first above mentioned forward.

in case said party of the second part shall fail to comply with any of the terms and conditions of this agreement on his part to be performed, and written notice of such failure to comply is given by the parties of the first part to the party of the second part, then this lease and option hereby granted may, within thirty days, following due notice by the parties of the first part and such violation of this agreement being still in default, be terminated and become void, and all payments theretofore made hereunder, whether of royalty or purchase price, and all improvements theretofore made upon said property shall become and remain the property of the parties of the first part.

It is expressly understood and agreed, however, that machinery, equipment, and tools installed by and belonging to the party of the second part are to remain their property and may be removed by them.

It is further understood and agreed that all conditions and covenants herein contained shall extend to and be binding upon the heirs or assigns of both parties.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals on the day and year first above written.

Rakie L. Nash (Seal)

Ethel A. Nash (Seal)

WITNESS: Archie L. Nash (Seal)

Zora N. Strong. Mary T. Nash (Seal)

Russell and Co. Inc. (Seal)
Jac Locker President

WITNESS: ATTEST: Yvonne C. Fisher (Seal)
Assistant Secretary

Zora N. Strong

NORTH CAROLINA,)
)
ROWAN COUNTY.)

The execution of the foregoing instrument was this the 7th day of January, 1955, acknowledged before the undersigned, Zora N. Strong, a Notary Public of Rowan County, by A. L. Nash and wife, Mary L. Nash, and Robie L. Nash and wife, Ethel A. Nash.

Witness my hand and Notarial seal, date above written.

Zora N. Strong
Notary Public

My commission expires Aug 9, 1956

CITY OF WASHINGTON,)
)
DISTRICT OF COLUMBIA.)

This 13th day of January, 1955, personally came before me, Robert E. Corish a Notary Public in and for the City of Washington, District of Columbia, Yvonne C. Fisher, who, being by me duly sworn, says that she knows the common seal of Russell and Company, Inc., and is acquainted with Hal Lackey, who is the President of said corporation, and that she, the said Yvonne C. Fisher, Asst. is the Secretary of said corporation and saw the President sign the instrument and saw the said common seal of said corporation affixed to said instrument by said President, and that she, the said Yvonne C. Fisher signed his (her) name in attestation of the execution of said instrument in the presence of said President of said corporation.

Witness my hand and Notarial seal, date above written.

Robert E. Corish
Notary Public

My commission expires March 31, 1956

NORTH CAROLINA,)
)
CABARRUS COUNTY.)

The foregoing certificates of Zora N. Strong, a Notary Public of Rowan County, and Robert E. Corish, a Notary Public of the City of Washington, District of Columbia, are adjudged to be in due form and according to law. Therefore let the said instrument, with certificates, be registered.

This the 18 day of January, 1955.

Dorothy R. Faggart
Deputy Clerk of Superior Court

NORTH CAROLINA,)
)
CABARRUS COUNTY.)

Filed in this office for registration on this the ____ day of January, 1955, at _____ o'clock ___M., and duly registered in Book No. ___ of Deeds, page ____ .

_____
Register of Deeds

THIS INDENTURE made this 20th day of December, 1951, by and between HELEN EVELYN CHAPIN BISHOP, RUBY CHAPIN PITNER, LOWELL MEADE CHAPIN and CHARLES DOUGLAS CHAPIN, as trustees under the will of CHARLES A. CHAPIN, deceased, hereinafter called Lessors, and A. L. NASH of the County of Cabarrus and the State of North Carolina, hereinafter called Lessee,

W I T N E S S E T H:

The Lessors, hereinafter named, are the surviving trustees under the will of Charles A. Chapin, deceased, and are now the duly authorized and acting trustees of said trust estate. The real estate hereinafter described is located in Cabarrus County, North Carolina, and was owned by said CHARLES A. CHAPIN at the date of his death in 1913.

In consideration of the sum of TWO HUNDRED AND 00/100 ($200.00) DOLLARS in hand paid by Lessee to Lessors, the receipt whereof is hereby acknowledged, Lessors do hereby lease and demise to Lessee their mineral estate in the following described parcels of real estate, to-wit:

> Lying and being in No. 9 Township, Cabarrus County, North Carolina, adjoining the lands formerly belonging to Ephriam Tucker, Mrs. Martin Boger, G. P. Coggins, Furniss and Gibbs, G. Hilliard Barnhardt, Alfred Smith, and William Maxwell, and others and described as follows:
>
> Two (2) tracts of land, the first containing about one hundred eighty-nine (189) acres and the second containing about one hundred ninety-one (191) acres and being tracts numbers one (1) and (2) described in the deed from the Miami Mining Company, a corporation, to Charles A. Chapin, dated January 27, 1911, and recorded in the Office of the Register of Deeds for Cabarrus County, North Carolina, in Book 75, page 331, specific reference being hereby made to said recorded deed for a full and complete description of said tracts numbers one (1) and two (2) by metes and bounds.

and also such mineral estate as the Lessors have in the following described parcels of real estate, to-wit:

> Two (2) tracts of land being tracts numbers three (3) and four (4) described in the deed hereinabove referred to, specific reference being hereby made to said recorded deed for a full and complete description of said tracts numbers three (3) and four (4) by metes and bounds,

for the purpose of exploring for, developing, working, mining, milling, or otherwise beneficiating, and removing therefrom all the merchantable ores, metals, and minerals which may be found therein and thereon, together with the right and privilege of ingress, egress and regress over and through the said premises

for the purposes hereinabove specified, and of constructing, erecting, installing and maintaining on said premises excavations, openings, ditches, and drains necessary or convenient for the purpose hereinabove specified, and also of constructing, erecting, installing and maintaining on said premises improvements, structures, or facilities necessary or convenient for the purpose hereinabove specified and not in conflict with the separate estate of the owner of the surface of said lands, TO HAVE AND TO HOLD said mineral estate in said lands to the said Lessee, his heirs, legatees and assigns, for and during the term of ten (10) years beginning on the 28th day of December, 1951, and ending on the 27th day of December, 1961, or until this lease shall be terminated in the manner hereinafter provided,but upon the terms and conditions hereinafter set forth.

It is understood and agreed by and between Lessors and Lessee that no covenants or warranties of title, including that of quiet enjoyment, either express or implied, are contained in this indenture, but that Lessors lease and demise to Lessee only such right, title and interest as they now have in and to the above described real estate.

As further consideration for the leasing aforesaid, Lessee covenants and agrees to pay to Lessors as royalties a sum equal to ten (10) per cent of the net smelter, or mint, retruns from the ores, metals, minerals and concentrates removed from the demised property, being ten (10) per cent of the assay value of the metals, minerals and other valuable substances extracted from the property as determined by the smelter, or mint, returns after deduction of smelting charges only. All expenses of any kind whatsoever in connection with the exploring for, developing, working, mining, milling or otherwise beneficiating prior to smelting, removing, and transporting to the smelter the merchantable ores, metals, minerals, and concentrates shall be paid by the Lessee.

The royalties hereunder shall become due and payable on or before the fifteenth days of February, May, August, and November in each year of the term hereby demised. Each such payment shall

include all royalties accruing during the three (3) calender months preceding the month in which said payment is to be made.

Lessee further covenants and agrees to pay to Lessors on the first day of March, 1955, and on the first day of March each year thereafter during the remainder of the term of this lease, the sume of TWO HUNDRED FORTY AND 00/100 ($240.00) DOLLARS. Such annual rental shall be considered a minimum rental and thus Lessee shall be entitled to credit for such payments on royalty payments accruing during the lease year within which such minium rental payment is made. Similarly, Lessee shall be entitled to credit for his TWO HUNDRED AND 00/100 ($200.00) DOLLARS downpayment, hereinabove referred to, on royalty payments accruing prior to the end of the third lease year in December, 1954.

If not then in default under any of the covenants and agreements of this lease to be performed by the Lessee, the Lessee may extend this lease for an additional period of ten (10) years, commencing December 28, 1961, and ending December 27, 1971, provided (1) that royalties or payments averaging ONE HUNDRED AND oo/100 ($100.00) DOLLARS per month shall have been paid by Lessee to Lessors for the period October 1, 1959, to July 31, 1961, and (2) that notice in writing of his election so to extend the lease shall be given by the Lessee to the Lessors on or before September 30, 1961, and not prior to August 15, 1961.

Lessee shall have the right to cancel this agreement or any renewal or extensions thereof at the end of any lease year by giving Lessors ninety (90) days' notice in writing of his intention so to cance; provided lessee is not then in default.

In the event Lessee shall extend the period of this Lease as herein provided, and royalties or payments paid to Lessors in any lease year of such additional period shall aggregate less than ONE THOUSAND ($1,000.00) DOLLARS, Lessors shall have the right to cancel this agreement by giving Lessee on or before the last day of the month following the month in which such lease year terminates thirty (30) days' notice in writing of their intention so to cancel.

Lessee shall have the right at the termination of this

lease by lapse of time or upon cancellation at the election of either party as herein provided to remove from the demised premises all equipment and tools installed by and belonging to the Lessee provided that the Lessee is not then in default in any of the covenants hereby to be performed by the Lessee.

Lessee shall have the right to transfer, sell or assign this agreement.

Lessee agrees to make all necessary arrangements with the present or future owner or owners of the surface rights to permit Lessee's operations to proceed without conflict with said surface rights, and any action necessary to permit Lessee full use of the mineral estate herein conveyed shall be pressed and accomplished by and at the expense of the Lessee. Lessee further agrees at all times to protect the Lessors against any legal action or claims instigated or made by the owner or owners of said surface rights originating from Lessee's exploration or exploitation of the mineral estate.

It is further understood and agreed between the parties hereto that the Lessee shall have the right to mine and work said premises in any practicable and convenient way that will permit of as low cost of operation as is practicably feasible, not, however, interfering with the surface of said premises any more than shall be necessary and convenient to explore for, develop, work, mine, mill or otherwise beneficiate, and remove therefrom all the merchantable ores, metals, and minerals; it being understood and agreed that all such operations and work of mining and beneficiating shall be done and carried on in a good workmanlike and minerlike manner, and in such manner as will not cause unnecessary waste or merchantable ores, metals, and minerals in said premises.

It is further understood and agreed between the parties hereto that the tailings or material eliminated by the concentration or other method of beneficiation of such ores, metals or minerals shall be treated as and deemed to be waste, and may be deposited by the Lessee upon said premised, or elsewhere, in

such places and in such manner as will not conflict with or embarrass the future operations of the mine upon said premises or conflict with the rights of the owners of the surface rights.

Lessee covenants and agrees to pay when and as the same shall become due and payable all lawful taxes and assessments whatsoever, whether general, special, specific, or otherwise, which shall be assessed, levied or payable for, upon, or on account of the premises hereby demised or any part thereof, and upon or on account of any ores or other products of said premises, and upon or on account of any property or improvement that may be on said premised or any part thereof and used for the operation of mining on said premises, and upon or on account of any business or occupation that may be pursued or carried on upon said premises during the term hereof. Lessee agrees to furnish and deliver to Lessors the receipts for all taxes so paid.

It is contemplated by the parties hereto that possibly the first three years of the term of this lease may be used by the Lessee in prospecting, investigating, exploring and making scientific analysis of the ores, metals and minerals which may be found on or in the demised premises in order that the said Lessee may ascertain whether or not said ores, metals and minerals can be profitably mined, and if it is determined that said mining operation can be carried on profitably, in interesting persons, firms or corporations, financially able to carry on the mining operation, in developing, working, mining, milling and otherwise beneficiating, removing and shipping to the smelter, or mint, for sale the merchantible ores, metals or minerals on or in the property hereby demised.

If the Lessee shall not have commenced mining operations prior to the termination of the third year of the term of this Lease, then Lessors, at their option, shall have the right to cancel this agreement by giving Lessee on or before the last day of the month following the month in which such lease year terminates thirty (30) days' notice in writing of their intention so to cancel.

In the event Lessee determines that said mining operation can

be carried on profitably, lessee covenants and agrees that he will, during the demised term, diligently, efficiently, and skillfully prosecute and carry on, or cause to be prosecuted and carried on, the business and operation of exploring for, developing, working, mining, milling or otherwise beneficiating, removing, and shipping to the smelter, or mint, for sale the merchantable ores, metals and minerals which may be found in the property hereby demised. All work and operations on the demised premises shall be so conducted, carried on and completed that the same shall not hinder or render dangerous or unreasonably inconvenient the further excavation of said premises for mineral bearing ores or the continuation of the operation or work of mining thereon. And Lessee agrees to maintain liability insurance during the term of this lease protecting Lessors and Lessee to the extent of not less than FIFTY THOUSAND AND 00/100 ($50,000.00) DOLLARS to one person or TWO HUNDRED THOUSAND AND 00/100 ($200,000.00) DOLLARS to two or more persons arising out of one accident. Lessee shall pay all premiums for such insurance and shall deliver copies of all policies to the Lessors.

It is further understood and agreed between the parties hereto that the Lessors, or their duly authorized agents, may enter upon said premises and into the workings therein at all reasonable and proper times for the purpose of inspection and examination of such premises and the mining operations carried on therein.

The Lessee further covenants and agrees to keep an accurate record of all ores, metals, minerals, concentrates or other valuable substances sold, and to furnish the Lessors copies of all smelter, or mint, records showing the returns from such ores, metals, minerals, concentrates, or other valuable substances.

In the event Lessee shall default in the payment of any rent or royalty due to the Lessors hereunder, or shall fail to pay the taxes herein agreed to be paid by Lessee, or shall default in the payment of any other sum of money required to be paid by Lessee, and such default shall continue for fifteen (15) days after notice in writing thereof by Lessors to Lessee, or in the

event of the default of the Lessee of any of the covenants herein contained to be performed by Lessee, and such default shall continue for thirty (30) days after notice in writing thereof by Lessors to Lessee, or in the event Lessee is adjudicated bankrupt, the Lessors may at their election declare the demised term ended and re-enter the demised premises, including buildings then situated thereon, either with or without process of law, and expel, remove and put out the Lessee and every other person occupying the demised premises.

Any notice, demand, or other instrument to be served upon the parties hereto shall be in writing and shall be deemed to have been duly served if delivered personally or deposited in the United States Mail, enclosed in a registered post-paid envelope, addressed to the parties as follows:

To the Lessors: c/o Albert Wetten & Co.
141 West Jackson Boulevard
Chicago, 4, Illinois

To the Lessee: A. L. Nash
913 South Main Street
Kannapolis, North Carolina

IN WITNESS WHEREOF the parties hereto have hereunto set their hands and seals the day and year first above written.

HELEN EVELYN CHAPIN BISHOP (SEAL)

RUBY CHAPIN PITNER (SEAL)

LOWELL M. CHAPIN (SEAL)
TRustees under the Willof Charles A. Chapin, Deceased

A. L. NASH (SEAL)

STATE OF CALIFORNIA)
) SS
COUNTY OF LOS ANGELES)

I, F. L. Montgomery, a Notary Public in and for said County, in the State aforesaid, DO HEREBY CERTIFY that HELEN EVELYN CHAPIN BISHOP, as Trustee under the Will of CHARLES A. CHAPIN, deceased, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that she signed, sealed and delivered the said instrument as her free and voluntary act as such Trustee for the uses and purposes therein set forth.

GIVEN under my hand and notarial seal, this 2nd day of January, A. D. 1952

F. L. MONTGOMERY (SEAL)
NOTARY PUBLIC
My Commission Expires July 2, 1954

STATE OF CALIFORNIA)
) SS
COUNTY OF LOS ANGELES)

I, F. L. Montgomery, a Notary Public, in and for said County, in the State aforesaid, DO HEREBY CERTIFY that RUBY CHAPIN PITNER, as Trustee under the Will of Charles A. Chapin, deceased, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that she signed, sealed and delivered the said instrument as her free and voluntary act as such Trustee for the uses and purposes therein set forth.

GIVEN under my hand and notarial seal, this 2nd day of January, A. D. 1952.

F. L. MONTGOMERY (SEAL)
NOTARY PUBLIC
My commission Expires July 2, 1954

STATE OF MASSACHUSETTS)
) SS
COUNTY OF MIDDLESEX)

I, Hilda I. Bosworth, a Notary Public in and for said County, in the State aforesaid, DO HEREBY CERTIFY that LOWELL MEADE CHAPIN, as Trustee under the Will of Chalres A. Chapin, deceased, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day and in person acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act as such Trustee for the uses and purposes therein set forth.

GIVEN under my hand and notarial seal, this 29 day of December A. D. 1951.

HILDA I. BOSWORTH (SEAL)
NOTARY PUBLIC
My Commission Expires:

STATE OF NORTH CAROLINA)
COUNTY OF CABARRUS) SS

I, Billie Brantley, a Notary Public in and for said County, in the State aforesaid, DO HEREBY CERTIFY that A. L. Nash, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument as his free and voluntary act for the uses and purposes therein set forth.

GIVEN under my hand and notarial seal, this 21st day of December, A. D. 1951.

BILLIE BRANTLEY (SEAL)
NOTARY PUBLIC
My Commission Expires 9-28-52

STATE OF NORTH CAROLINA) SUPERIOR COURT January 28, 1952
CABARRUS COUNTY)

The foregoing Certificates of F. L. Montgomery, a notary Public of Los Angeles County, California, Hilda I. Bosworth, a Notary Public of Middlesex County, Massachusetts, and Billie Brantley, a notary Public of Cabarrus County, North Carolina, attested by their notarial seal is pledged to be correct. Therefore let the said instrument, with the Certificates be registered.

Dorothy C. Barbee
Deputy Clerk Superior Court

PHENIX MINE

LEASE

TO

A. L. NASH

OFFICE REGISTER OF DEEDS
CABARRUS COUNTY, N. C.

Filed for Registration on the 28 day of Jan. 1952 at 11:50 o'clock A. M. and registered in record of D No. 237 Page 396-397

Myrtle M. Furr
Dep. Register of Deeds

PROCESS METALLURGY
RESEARCH AND DEVELOPMENT

ECONOMIC SURVEYS
WASHINGTON REPRESENTATION

PAUL M. TYLER
REGISTERED PROFESSIONAL
MINING ENGINEER & METALLURGIST
~~WASHINGTON, D.C.~~

RESIDENCE:
5005 EDGEMOOR LA.
BETHESDA 14, MD.

July 30, 1955

Mr. Williams S. Martin, Chief
Iron & Ferro Alloys Division
Defense Minerals Exploration Administration
U. S. Department of the Interior
Washington 25, D. C.

Re: DMEA-3742(tungsten)
Phoenix-Furniss Mines
Cabarrus County, N. C.

Dear Mr. Martin:

Attached hereto are 4 copies of revised descriptions of the Phoenix Mine Tract and two of the Furniss Mine tracts as drawn from the original deeds on file in the Courthouse in Concord, N. C. this week by Mr. Hal Lackey. You will note that this area is substantially larger than that described in respect to the Furniss property in my original application wherein I copied the description from a previous application which was described so as to include only such portions of the property as might be deemed pertinent to proposed mineral explorations.

I have plotted the aforementioned data on a new map which shows the boundary lines of these properties in relation to the various workings and the major strikes of known veins.

Mr. Lackey has not sent me transcripts of the legal decriptions of sundry additional tracts which are included under our leasing and/or option agreements but which lie outside the area of our active interest at present. I have not even inspected these areas since they lie completely beyond the limits of the shear zone that I propose to investigate.

I trust these papers are in order and I regret that we failed to check with the Courthouse records prior to filing our application.

Sincerely yours,

Paul M. Tyler

Carolina Tungsten Mining Company
CONCORD, NORTH CAROLINA

P. O. BOX 866
GRAND CENTRAL STATION
NEW YORK, 17, N. Y.

P. O. BOX 1251
CONCORD, N. C.

July 13, 1955

Mr. Williams S. Martin, Chief
Iron & Ferro Alloys Division
Defense Minerals Exploration Adm.
U. S. Department of the Interior
Washington 25, D. C.

Re: DMEA 3742(Tungsten)
Phoenix-Furniss Mine
Cabarrus County, N. C

Dear Mr. Martin:

In accordance with your suggestions I am submitting the following amendments revising Section 5(b) and Section 6 of our application dated March 30, 1955 for aid in exploration of our Tungsten properties in Cabarus County, North Carolina:

5. The exploration project

(b) Proposed work

It is now proposed in respect to the Furniss property (1) to reopen the Furniss shaft and re-equip same, (2) to re-examine the tungsten showings on the SW end of stope on the 100 foot level with a view to further delineation by deep hole percussion drilling or actual excavations, (3) to attempt to enter and investigate caved workings on NE of shaft at 100 foot level, (4) to continue SW drift on 170-foot level for 300 feet in order to come under the ore shoot reported as found in the Furr shaft in addition to intermediate ore bodies including portion of vein immediately beyond BM 7 intercept and surface indications adjacent to mine road, (5) to extend the NE drift on the 170-foot level, after preliminary investigation to determine location of main Furniss vein, for about 300 feet in order to come under ore shoot encountered in BM 4 and BM 5 and 5a and extensively mined near surface by old workings, and (6) to explore the probable extension of the Main Phoenix Vein and ~~and~~ parallel formations in the shear zone by means of some 600 feet of diamond core drilling(contract) from three suitable stations on the 170-foot level, paying special attention to sludge recovery in addition to core recovery.

Locations of the proposed extensions of the 170-foot level(Items 4 and 5 above) and tentative plans of proposed drill holes (Item 6) are shown on the accompany map, Figure 4-a, which also shows existing workings and indicated extension of the Phoenix vein.

As explained in Section 6 on a later page of this letter, the Company proposes to proceed immediately with Items 1, 2, and 3, as outlined above, but requests partial reimbursement therefor upon completion of the work. No

In respect to the Phoenix property, it is now proposed (7) to complete the unwatering and rehabilitation of the Pump Shaft on Company account, (8) to make a thorough geological examination and an inspection of all accessible workings with ultra-

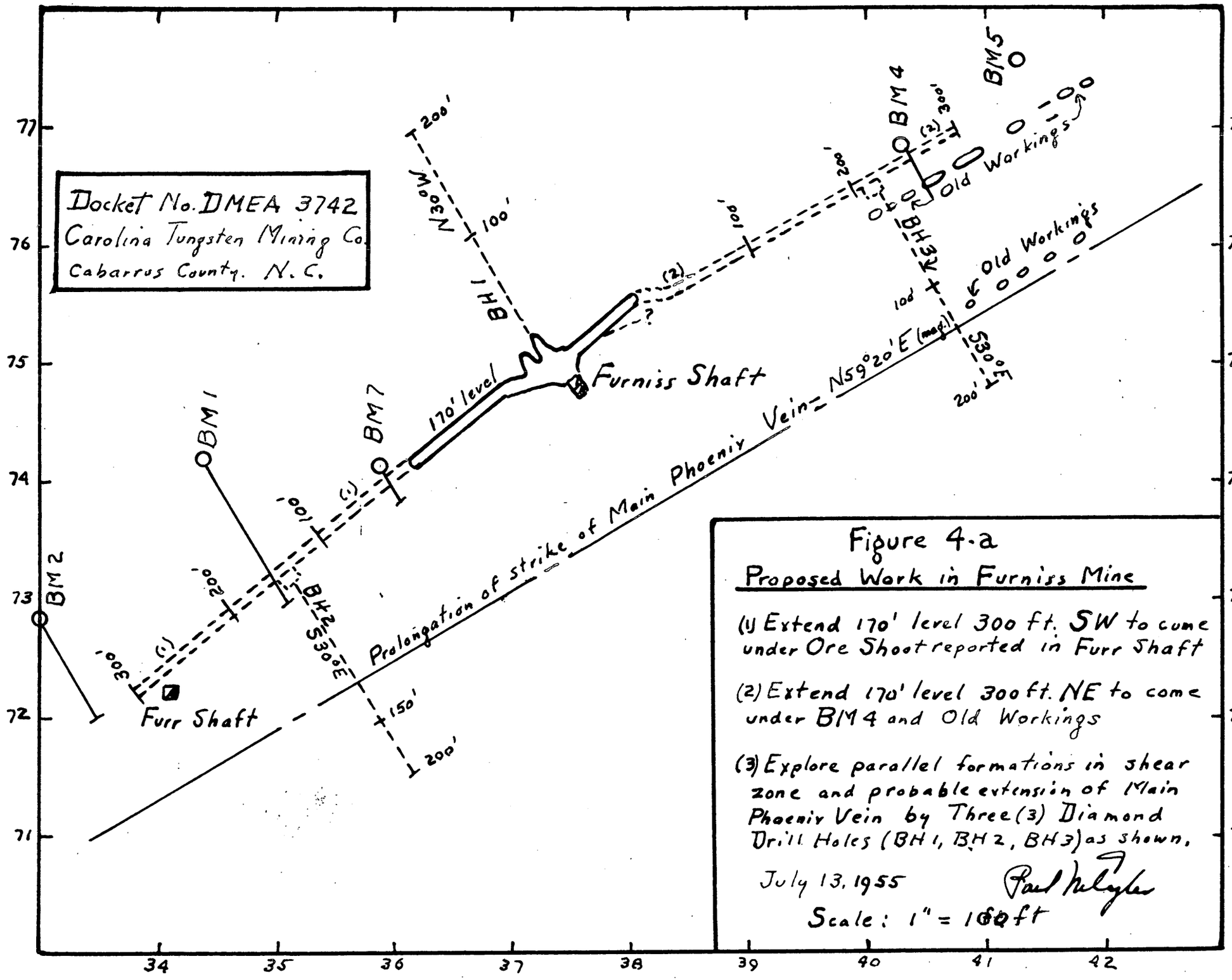


Figure 4-a

Proposed Work in Furniss Mine

(1) Extend 170' level 300 ft. SW to come under Ore Shoot reported in Furr Shaft

(2) Extend 170' level 300 ft. NE to come under BM4 and Old Workings

(3) Explore parallel formations in shear zone and probable extension of Main Phoenix Vein by Three (3) Diamond Drill Holes (BH 1, BH 2, BH 3) as shown.

July 13, 1955 Paul Nelyles

Scale: 1" = 100 ft

violet light, (9) to sample and assay for tungsten(Gold assays, if made, on Company account) selected ore shoots as a means of correlating estimates made on the basis of inspection with the lamp and to afford data for establishing possible geological controls of the tungsten mineralization(which is believed to have preceded the deposition of sulfides and/or gold), and (10) to conduct a limited or Step No. 1, program of deep hole percussion drilling and perhaps diamond core drilling to explore the formation of the shear zone as well as to intersect branching veins which are known to exist and which are believed to be mineralized.

6. Estimate of costs

Total expenditures for the proposed work are now estimated on basis of lump sum or footage allocations, as follows:

FURNISS PROPERTY

(a) Rehabilitation & equipment of shaft(one half of total)		$4,670
(b) Work on 100-foot level		500
(c) Drifting, 5' x 7', on 170-foot level, 600 ft. @ $30 .		18,000
(d) Diamond drilling:	(1) Contract 450 ft. @ $5.50. . .	2,475
	(2) " 150 ft. @ $4.25. . .	637
	(3) Compressed air, stations, etc	1,000
		$27,282

PHOENIX PROPERTY

(a) Geological study(by Field Team, no charge??)	----
(b) Cutting samples in about 6,500 feet of workings . .	$ 1,000
(c) Preparing 100 samples	250
(d) Assaying for WO_3 only(Colorado Assaying Co.) @ $4 .	400
(e) Percussion drilling, 500 feet @ $2	1,000
(f) Diamond drilling, 500 feet @ $6	3,000
	$ 5,650

Grand Total(Step No. 1, $32,932

JUSTIFICATION

Since there is no deep mining within 100 miles of these properties, one or more experienced miners may have to be imported and given subsistence allowance in addition to regular wages. The local greenstone is tough as well as hard and abrasive. I have had no experience in breaking this ground but anticipate difficulty in making four feet of advance per shift and powder costs may be high. Tungsten carbide bits will be used as some ground was reported to be ~~undrillable~~ undrillable when mine was worked in 1905. Actual cost data from mica mines in Spruce Pine or the Hamme tungsten mine in Vance County are not comparable to anticipated costs here where labor and supplies are not quite so readily available and where the rock is much less easily broken than granite or pegmatite.

My breakdown of estimated costs of reopening and equipping the FURNISS Shaft, follows:

Small headframe, guides, bin	$1,000
Timber, 8" x 8", for 5 sets @ $70/ MBM	150
Lagging, 3 MBM @ $65	200
Sump pump, 2 stage, delivered	600
Water column, 3" aluminum(on hand)	--
Hoist and wire rope	1,500
Buildings	1,000
Cage	400
Bucket	250
Rails, 12-lb., 5,000 lbs. @ 10.15 (600 ft. track)	510
Splice bars, 350 @ 69¢	240
Spikes	40
Freight on above	150
Rock drill complete	800
Air pipe, 2", 1,000 ft. @ 45¢	450
Water pipe, 3/4", 1,000 ft. @ 20¢	200
Ore cars, 3 @ $150	450
Ventilation fan and pipe	350
Additional tools	250
Total equipment	$ 8,540
Labor, 5 men @ 3 weeks, plus insurance	800
Grand total	$ 9,320

For drifting, I should aim at four feet advance per shift. On this basis my "guesstimate" of drifting costs breaks down as follows:

	Per shift	Per foot
Miner($1.65/hr.) and helper($1.25)	$23.20	
Muckers & trammers, 2 @ $1.25 per hr.	20.00	
Hoistman @ $1.50	12.00	
Deckman @ $1	8.00	
Supervision	10.00	
Total wages	$73.20	
Insurance @ 9.19%	6.74	
Total labor and insurance	$79.94	$19.98
Dynamite, 40 lbs. @ 20¢	8.00	
Caps and fuse	1.00	
Drill bits and steel	10.00	
Track ties	0.75	
Pipe(included in shaft equipment)	--	
Rails, etc.(included in shaft equipment)	--	
Air compressor, $323 per month	16.00	
Gasoline for compressor and hoist, 40 gals @ 20¢	8.00	
Lights, pumping, etc.	2.00	
Total supplies, etc.	$45.75	11.44
Sampling and Assaying	$ 5.00	1.25
Grand total	$1 30.69	$32.67

Sheet No. 2 (Revised)

3. Applicant' property rights

(a) Legal description of land

(1) Furniss Mining Property

BEGINNING at large iron pipe, Mrs. Snyder & Phoenix Mine corner and run N 28 ¾ E 91 poles 16 links to large double cedar on East side of Public Road, thence with Public Road as follows: S 51 ½ E 42 poles 10 links; thence S 75 E 28 poles 3 links, thenceS 64 ½ E 6 poles, thence N 72½ E 20 poles and 4 links, thence N 84 ¾ E 24 ~~poll~~ poles & 7 links, thence S 72 E 24 poles & 7 links, thence S 63 ½ E 6 poles & 17 links, thence S 72 E 6 poles to an iron stake in said Public Road, a new corner; thence three new lines as follows: First S 31 ¾ W 36 poles & 9 links to a stake in the farm road, thence ~~Sxkk~~ S 11 ¼ W 37 poles & 22 links to a stake in the road, thence with said farm road S 53 ½ W 28 poles & 16 links to a small Hickory, an old corner of the Phoenix Mine lands, thence with Phoenix Mine lines N 54 ½ W 71 poles & 6 links to a large iron pipe on the east of the branch , thence S 80 ½ W 62 poles to iron pipe, thence N 65 W 23 poles & 9 links to the beginning and containing approximately 74.5 acres.

Tract # 2

BEGINNING at an iron stake by small hickory on south side of road(Mrs. W. A. Foiles corner) and runs thence to new line S 11 W 250 poles 8 links to stake(a new corner of J. Coggins line) thence N 34 W 15 poles 4 links to pile of stones, thence W 58 poles to a pile of stones; the Phoenix Mine corner, thence N 59 poles to large iron pipe, thence N 11 W 111 poles to a small Hickory, an old corner, thence N 53 ½ E 28 poles 16 links to a stake in farm road, thence N 11 ¼ E 37 poles 22 links to stake in road, thence N 31 ¾ E 36 poles 9 links to a stake, a new corner of public road, thence along said raod as follows: S 72 E 12 poles & 5 links thence S 81 E 18 poles & 5 links, thence S 87 ½ E 17 poles & 18 links thence S 56 E 35 poles to beginning and containing approximately 137 acres.

(2) Phoenix Mining Property

BEGINNING at a common boundary post of Furniss lands, an Old Hickory Tree, and running S 9 ½ E 1828 feet to an Iron Pipe, ~~x~~ and thence S 2 W 953 feet to a White Oak Tree and thence ~~Nx52x¾xWx993~~ N 88 W 1614 feet to Iron ~~Pipe~~ Pin; thence N 52 ¾ W 993 feet to another Iron Pin, thence N 75 ½ W 297 feet to a Cedar Post; thence N 23 ½ E 842 feet to an Iron Pipe; thence N 83 ¾ W 769 feet to a Red Oak Tree, thence N 15 E 1624 feet to an Oak Post; thence N 30 ¼ E 328 feet to an Iron Pipe, thence S 65 ½ E 389 feet to an Iron Pipe; thence N 80 E 1032 feet to an Iron Pipe and thence S 51 ½ E 1169 feet to the point of beginning and containing approximately 188 acres

(NOTE: Other non-contiguous tracts are included in our lease but are not shown on acconpanying Map, Figure 3-A)

PROCESS METALLURGY
RESEARCH AND DEVELOPMENT

ECONOMIC SURVEYS
WASHINGTON REPRESENTATION

Department of the Interior
Defense Minerals Administration
RECEIVED
MAR 30 1955

PAUL M. TYLER
REGISTERED PROFESSIONAL
MINING ENGINEER & METALLURGIST
WASHINGTON, D. C.

RESIDENCE:
5005 EDGEMOOR LA.
BETHESDA 14, MD.

March 30, 1955

WSM

Mr. Williams S. Martin
Chief, Iron and Ferro-Alloys Division
Defense Minerals Exploration Administration
U.S. Department of the Interior
Washington 25, D. C.

Dear Mr. Martin:

In behalf of the Carolina Tungsten Mining Company, I am submitting in quadruplicate an application for a DMEA loan for exploration of scheelite prospects on the Phoenix-Furniss properties in Cabarrus County, North Carolina.

Reference is made to a previous application by Mr. A. L. Nash in respect to the Furniss property alone. This application was denied without being referred to a field team, presumably because the Bureau of Mines investigations as reported in RI 4724 failed to indicate sufficient geologic probability of making a significant discovery of scheelite.

Since additional information and more vein exposures are now available, I should like to request a field examination and report on the Furniss, as well as on the adjoining Phoenix property which was not included in the Nash application or in the Bureau's investigations in this area.

We have tried to answer completely all questions in our present application and hope that you will find it in order for prompt consideration. Additional supporting documents will be supplied as soon as possible to prove our right of possession of the properties and I can assure you that the "Owner's Consent to Lien" will be obtained in advance of approval as all legal transactions in connection with our agreements should be completed within 2 or 3 weeks.

As indicated in the application, the Carolina Tungsten Mining Company has a lease and option on the Furniss property which is owned by Mr. A. L. Nash and members of his family and a sublease on the mineral rights of the Phoenix property which

are leased to Mr. A. L. Nash and his wife. Mr. Lackey and I, however, negotiated our preliminary agreements with Mr. Nash and began work last January in the name of Russell and Company, Inc. Subsequently, however, the project has been in process of transfer to the newly formed partnership which we are calling the Carolina Tungsten Mining Company. We are currently employing 7 or 8 men pumping out and rehabilitating the Phoenix mine. Although the legal documents have not all been executed yet, I can assure you of our valid right of possession and competence to proceed under any contemplated agreement with the Government.

Although the purpose of a DMEA loan is to make a significant discovery of tungsten in this new district, the probabilities of gold discovery must not be overlooked as it would afford additional security for repayment of the Government's share of exploration costs.

Sincerely yours,

Paul M. Tyler

Paul M. Tyler

If the requested partial reimbursement for rehabilitation of the shaft, estimated as one half of $9,320 or $4,660, should be amortized on the basis of the first 300 feet of drifting, in lieu of a lump sum payment upon completion of the work, the estimated cost of drifting would be increased by $15.53 per foot or a total of $58.20 No

Inasmuch as we are anxious to get this work performed, the Company is willing to make up any small deficit in cost over and above reasonable costs as estimated by DMEA. However, I think the foregoing estimates are reasonable on the basis of local conditions.

I must leave for New England day after tomorrow for at least one week but Mr. Hal Lackey(Telephone JUniper 5-5967) will be available to answer possible questions.

Sincerely yours,

Carolina Tungsten Mining Company

Paul M. Tyler

Paul M. Tyler, President

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAR 30 1955

APPLICATION FOR AID

IN A

TUNGSTEN EXPLORATION PROJECT

IN

CABARRUS COUNTY, NORTH CAROLINA

Carolina Tungsten Mining Company
Concord, N. C.

Mailing Address:

c/o Paul M. Tyler
5005 Edgemoor Lane
Bethesda 14, Md.

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
MAR 30 1955

Not to be filled in by applicant

Docket No. 3742
Metal or Mineral Tungsten
Date Received 4-1-55
Estimated Cost $61,548
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:

Carolina Tungsten Mining Company, Concord, N.C.
Mailing Address: Paul M. Tyler, Pres.
5005 Edgemoor Lane, Bethesda 14, Md.

(*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. Partnership

(*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. See attached papers

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

See attached papers

(*b*) State any mine name by which the property is known. Phoenix Mine, Furniss Mine

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise Sublease on mineral rights on Phoenix; lease & purchase option on Furniss property.

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

(*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. See attached papers

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

(*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 papers

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

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

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

(*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 7 days and be completed within 7 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 papers

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.). None

(*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 papers

(*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)? Yes

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

[X] 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 March 30, 1955

Carolina Tungsten Mining Company
(Applicant)

By Paul Tyler
Paul M. Tyler, Partner

Hal Lackey
Hal Lackey, Partner

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

DEPARTMENT OF THE INTERIOR
Bureau Minerals Administration
RECEIVED
MAR 30 1955

1.(d) Partners of the partnership:

1. Paul M. Tyler
   5005 Edgemoor Lane
   Bethesda 14, Md.

2. Hal Lackey
   11809 Gorden Road
   Silver Spring, Md.

3. Franconia Trading Inc.
   17 Woodside Drive
   Milbrook
   Greenwich, Conn.

3. Applicant's property rights.

(a) Legal description of land.

(1) Furniss Mining Property

BEGINNING, at an iron stake on the South side of the Cold Springs County Road, about 3.3 miles from State Highway 151, and running South 11 degrees West approximately 2025 feet to a creek called Plum Run Branch; thence Westerly along Plum Run Branch about 1600 feet to a large Poplar tree, 20 feet North of the creek bank; thence North 11 degrees West approximately 1550 feet to an iron stake; thence North 60 degrees East approximately 1750 feet to an iron stake on the South side of Cold Springs County Road; thence North 83 degrees East 334 feet to an iron stake; thence South 70 degrees East 650 feet to point of BEGINNING, comprising approximately 90 acres. This tract of land is a portion of Tracts 6 and 5 of the Plat Showing The Wm. P. Furness Lands in Township No. 9 of Cabarrus County, North Carolina, by Walter L. Furr, Civil Engineer, Concord, N.C., dated July 28, 1928, said plat being filed in the records of Cabarrus County, North Carolina.

(2) Phoenix Mining Property

BEGINNING at a common boundary post of the Furness Mining Property, an old Hickory Tree and running South 9-1/2 degrees East 1828 feet to an Iron Pipe; and thence South 2 degrees West 953 feet to a White Oak Tree and thence North 88 degrees West 1614 feet to an Iron Pin; thence North 52 degrees 45'West 993 feet to another Iron Pin; thence North 75 degrees 30'West 297 feet to a Cedar Post; thence North 23 degrees 30'East 842 feet to an Iron Pipe; thence North 83 degrees 45'West 769 feet to a Red Oak Tree; thence North 15 degrees 1624 feet to an Oak Post; thence North 30 degrees 15'East 328 feet to an Iron Pipe; thence North 80 degrees East 1032 feet to an Iron Pipe and thence South 51 degrees 30'East 1169 feet to the point of BEGINNING, comprising approximately 188 acres. This tract of land is a portion of two (2) tracts of land being tracts (1) and (2) described in the deed from Miami Mining Company, a corporation, to Charles A. Chapin dated January 27, 1911 and recorded in the office of the Register of Deeds for Cabarrus County, North Carolina in Book 75, page 331.

THENCE S 65° 30' E 389 FT.

4. Physical Description.

(a) Previous Operations.

A great deal of mining and exploration for gold has been done on these properties and the Bureau of Mines conducted investigations for tungsten on the Furniss property in 1949-50. The latter investigations, most of which were conducted on a parallel vein system, are recorded in RI 4724.

None of the significant workings were accessible when Russell and Company, Inc., began work in February 1955. This Company cleared the debris and opened up the two main shafts on the Phoenix property and the Furniss shaft down to water level and the present applicant is presently engaged in retimbering and pumping out the mine. About one dozen trenches have been bulldozed to expose the vein system at intervals over a total length of one half mile.

The Phoenix mine was being worked long before the Civil War and operations at this property were mentioned in the Engineering and Mining Journal and numerous official state reports indicating a fairly substantial gold production under several managements until the late 1880's.

About 1902, the Miami Mining Company reopened the mines and carried on underground explorations, especially on the 520 and 600 foot levels of the big mine. It also sank the 170-foot shaft on the adjoining Furniss property to intersect one of the veins branching from the main Phoenix vein and the Copper shaft on a roughly parallel vein system 1500 feet to the south. In 1903, Pratt (North Carolina Geol. Survey Econ. Paper No. 8, pages 12-13) reported (1) that this company was conducting extensive development, (2) that the property was opened by 5 shafts, 6 drifts and cross cuts totaling 3932 feet, and (3) that the mine had a 10 stamp mill and 4 Bartlett concentrating tables.

After operating the mill for several months on ore from the Furniss mine, as well as from several levels of the Phoenix mine, the Miami Mining Company abandoned the properties in 1906, probably going bankrupt.

A section of the main Phoenix mine workings and various assay maps, together with weekly reports of underground development and sampling by the Miami Mining Company are available. Professional Paper 213, U.S. Geological Survey, states that the late M. C. Lake, a well known mining engineer, made a report on the Furniss mine in November 1903, but the contents of this report are not known to the present applicant.

Prior to the present applicant's arrival on the properties, the only known excavations of importance since 1906 were in the Furr shaft which was sunk about 1931 on the southwesterly extension of the Furniss vein. A drift on the 60-foot level of this shaft is said to have followed a 3-foot quartz vein with good gold values.

Following the discovery of scheelite on the dumps and ore piles of the Furniss vein by A. L. Nash, Sr., about 1946, a company known as Nash-Moore Mines, Inc., was formed for the purpose of unwatering and sampling the old Furniss shaft. Figure 5 accompanying this application shows a section of this mine with results of the Bureau of Mines sampling as reproduced in RI 4724 by Jack O. Jones and Alexander Peyton. The vein was sampled on both the 100 and 170-foot levels with channel cuts at 30-inch intervals on the 170-foot level where widths of 27 to 32 inches were recorded. The average assay value of these samples was 0.5% WO_3. The Bureau then drilled 8 widely separated shallow diamond drill holes designed to cut the vein at 50-100 foot depths. Tungsten values were found in only two holes, but a vein structure was cut in all but one hole, which may not have been deep enough. The best showings from the Bureau of Mines work on the Phoenix-Furniss vein system were in the northern end, beneath the old workings some 400 feet beyond the Furniss shaft.

No physical exploration has been conducted by the Bureau of Mines on the Phoenix property.

Old maps and records indicate that the main Phoenix shaft was sunk on the vein to an ultimate depth of over 600 feet and that the so-called pump shaft, 175 feet to the southwest, was slightly deeper. As shown on the accompanying section, Figure 1, an ore body at least 300 feet long on the northeastern side of the main shaft was stoped out above the 425-foot level. Another fairly large ore shoot was extracted above the 200-foot level on the southwestern side and smaller stopes were opened on other levels. The main quartz vein, as now exposed at the collars of the two shafts, is about 30 inches wide, but records show it ranged from only a few inches to about 4 feet in the underground workings. A rough calculation indicates that the total rock extracted from these underground workings as shown in Figure 1 approximated 1,250,000 cu. ft. or say 100,000 tons. The 350-foot level, it will be noted, extends 500 feet to the southwest and 400 feet to the northeast of the main Phoenix shaft. Old open cuts and caved shafts indicate some ore was extracted from the Phoenix vein in both directions far beyond the limits of the underground workings.

(b) Production and Reserves.

The Phoenix mine is variously reported to have produced a total of $400,000 to $950,000 worth of gold. Production from the Furniss shaft was undoubtedly included in these totals. Perhaps 1000 tons of ore were extracted from a stope above the 100-foot level of the Furniss shaft and a few thousand additional tons may have been mined from the adjoining open cut on this property. As shown by the recent bulldozer tranches, a considerable production may have been made also from the northeasterly extension of this vein.

Although several small pockets of gold and/or tungsten ore may be inferred from the Bureau of Mines underground sampling in the Furniss shaft, no proven reserves are shown on that property.

If the assay maps and progress reports inherited from the Miami Mining Company are accepted at face value, there are several small ore shoots and perhaps one fairly large ore body already developed and available for extraction in the Phoenix mine, when and if it is unwatered and rehabilitated. These partially indicated reserves appear to be of the order of 10,000 tons of possible mill heads carrying over $10.00 per ton in gold and minor amounts of silver. Additional quantities of material assaying $5 or more per ton have also been opened up.

No mention is made in the old records to the tungsten content of the Phoenix mine ore. It is pertinent to note, however, that almost all surface exposures of the vein system for half a mile show fluorescence when illuminated at night by ultra-violet, that scheelite has been found on all the waste dumps, and that the sand beneath the old concentrating tables assays 0.18% WO_3. The Bureau of Mines reported an assay of 19.6% WO_3 and 0.08% oz. of gold for picked ore from the Phoenix dump. Russell and Company's sampling and assays indicate small (usually less than 0.1% WO_3), but persistent tungsten values in various type-samples from the dump. Although tungsten is widely distributed, both in the andesite and in the quartz, a test run at the State Mineral Dressing Laboratory in Asheville, representing 3000 tons of material from the best corner of the Phoenix dump, showed no promise of profitable treatment.

(c) Geologic Features.

General: The economic geology of the Piedmont Plateau and of the Mountain Region of the various States along the Atlantic seaboard is generally dominated by northeast-southwest zonal trends. In North Carolina, there are six roughly parallel gold-bearing belts and the Phoenix-Furniss veins lie in a series of andesite flows near granitic (quartz-diorite) intrusions close to the western edge of the so-called Central Slate Belt which includes the formerly productive Gold Hill district over the border of Rowan County, 15 miles to the north, the Cid district in Davidson County, and the Virgilina copper district which overlaps the Virginia State line. Smaller gold mines and prospects, some of which are known to carry a little tungsten, are found in the southward extension of this belt. Tungsten minerals have been identified in the ores of the Gold Hill district and more substantial occurrences of scheelite were found at the Cline copper mine about halfway between the Gold Hill district and the Phoenix-Furniss mines (U.S. Bureau of Mines RI 3873).

Figure 2 shows the general geology of the tungsten area in Cabarrus County as mapped by R. S. Houston and submitted with his thesis (see Exhibit A) in partial fulfillment of the requirements for his Master of Science degree in Geological Engineering at the University of North Carolina. Although scheelite has been found on the dumps of various gold mines and prospects along a 30-mile belt, he reported that the best showings appear to be centered in this vicinity in an area not to exceed 2-1/2 miles long and perhaps one-half mile wide. He summarizes his comprehensive review of the pertinent literature as follows:

"Geologic opinion seems to be that the slate series is early Paleozoic and that the associated igneous intrusions are late Paleozoic, formed during or after the Appalachian orogeny. The ore deposits formed

during or after emplacement of the igneous bodies are either late Paleozoic or early Triassic."

Pogue, describing the Cid Mining District (N.C. Geol. and Econ. Surv. Bull. 22, 1910), concluded that the region comprised a series of inclined folds whose axial planes dip steeply to the northwest. The tops of these folds have been eroded, leaving a series of steeply dipping beds striking northeast and dipping northwest. This description fits conditions observed on the Phoenix-Furniss properties.

Phoenix-Furniss Veins: Figure 3 shows the pattern of the Phoenix-Furniss vein system as indicated by available data, including the bulldozer exposures made by Russell and Company, Inc., in February 1955. An old map shows three veins which intersect at or near the old Phoenix shaft. These are fissure veins that all tend to follow the general strike and dip of the enclosing country rock.

The fissure filling is predominantly quartz which forms a fairly continuous tabular body over great distances although occasionally branching or breaking up into relatively small separate lenses. Associated gangue minerals are siderite, calcite, and minor amounts of sericite, hematite and magnetite. Pyrite is the most abundant sulfide mineral, although chalcopyrite is often present. Gold occurs in the native state. It is believed to be younger than the sulfides but closely associated with them. The sulfides form irregular masses in quartz and barite, and thin stringers parallel to the foliation and strike of the veins. Disseminated pyrite and chalcopyrite may also occur in the andesite near the veins.

The scheelite is light orange. It looks a little like feldspar but it is softer. Specimens contain almost theoretical percentages of WO_3 and the molybdenum content is probably negligible or absent. The scheelite occurs as fairly large crystals (up to 2 inches or more) and as irregular and granular masses in quartz and barite. Although commonly associated with the vein quartz, it also occurs in the greenstone. It weathers readily and may be leached out of the outcrop or present only in powdery form.

Barite is white to pink in color and occurs as fine grained masses associated with sulfides and/or scheelite. It also occurs in fairly large masses showing excellent cleavage. Siderite is tan and when unweathered resembles scheelite in appearance, occurring as irregular aggregates in quartz.

The probable order of deposition of the vein filling, as indicated by the data on paragenesis in nearby districts and limited opportunities for local observation, is about as follows: Quartz and siderite were formed before the scheelite. Pyrite, chalcopyrite, gold and barite followed in the order named.

It is believed that scheelite is more abundant where sulfides are absent. However, some ores may contain recoverable values in both gold and scheelite.

Of the three principal veins portrayed on old maps as emanating northeasterly from the Phoenix mine, the middle one is the most

important as indicated by old workings along the strike. The true bearing of this vein is meticulously recorded as N53°15'E and its extension northeast and southwest of the main workings has been confirmed by bulldozer trenches.

The Bureau of Mines explorations in this vein system were confined to the other two veins. The Furniss vein probably corresponds to the trend line N53°15'E as shown on the old maps and plotted in Figure 3 and the N66°30'E trend corresponds to what is now called the Nash vein. Figure 4 shows the relation of the drifts on the lower level of the Furniss shaft and the vein system as herein postulated together with the locations of the Bureau of Mines drill holes.

The Bureau's drilling on the Nash vein showed no tungsten values, but it is questioned whether this evidence is conclusive. Since the actual volume of high specific gravity scheelite crystals in even a fairly rich ore shoot is small, the chances of capturing scheelite in an EX or even an NX core at widely spaced intervals are problematical. There is the further possibility that the softer scheelite might be crushed and washed out in the cuttings, even when a high recovery of core is reported.

Two of the Bureau's drill holes found tungsten values in the Furniss vein and there is a possibility that one or more of the holes that gave negative results may not actually have reached this vein.

Reasons for Wishing to Explore: Since the Phoenix mine appears to be near the center of a scheelite-bearing belt as much as 30 miles long and since the veins and ore shoots in this mine are the longest and most persistent heretofore discovered in this area, the Phoenix-Furniss system should hold the key to the economic significance of the entire area. Where tungsten values are so widely distributed, the chances of discovering economic deposits may depend upon a study of the geological conditions favorable to localized concentrations.

Surface explorations in an area of deep weathering are not likely to prove fruitful. Unless the scheelite is encased in quartz, it weathers and disintegrates about as fast as the country rock. The best showings of scheelite so far found in the United States east of the Rocky Mountains are in the Furniss shaft.

Diamond drilling, although it may afford useful information as to structure, is likely to indicate negative results in exploring low grade deposits of either gold or tungsten, where the economic minerals constitute so small a fraction of the vein filling and especially where the ore shoots are relatively short and spotty.

Although the three major veins that radiate northeasterly from the Phoenix mine are amazingly persistent and almost uniform in strike for at least 2,000 feet, recent trenching has indicated additional branching veins. These veins appear to leave the hanging wall at a slight angle. Most of them seem to fray out within 100 feet and none of them are known to show the persistence of the main veins along strike. However, if one of these veins were encountered in a drill hole, it might be indistinguishable from a main vein. Certain of these minor veins or

branches appear to be mineralized and several of them may be worthy of further investigation.

Since the old workings can probably be made accessible at reasonable expense, the deep development of the Phoenix mine and the 170-foot level of the Furniss shaft afford starting points for intensive underground exploration at relatively low cost.

The Furniss shaft intersected a vein at 85 feet down but it is not certain that this is the principal vein of the Phoenix-Furniss system. Moreover, the map of the workings (Figure 5) indicates considerable distortion and breaking up of the vein near the shaft, especially on the lower level. An engineer, (Mr. Moore), who examined these workings after unwatering them in 1948 states his opinion as follows:

> "In the northeast drift, where we sampled a lens having a length of 25-30 feet, we suspect that the former operators left the main vein and followed for 10 feet a branch stringer, and that the main vein continues in the foot-wall. The reasons for this assumption are two-fold: The end of the lens to the northeast is definitely on the foot-wall and a "boot-leg" on the foot-wall side shows the vein behind the drift wall just ahead of the end of the lens. Furthermore, the lens on the 100-foot level is over 100 feet in length, where ore was extracted by former operators, and it is not likely that the lens has shortened to a mere 25 feet in this depth of 70 feet".

Figure 4 raises the question as to whether the vein (or veins) encountered in the Furniss shaft may not be in the hanging wall of the vein explored by the Bureau of Mines drill holes, BM4, BM5, and BM5-a beneath old workings which appear to have extracted a continuous ore shoot at least 200 feet long beginning about 275 feet beyond the face of the northeast drift in the Furniss shaft. Another series of old workings suggest smaller ore shoots following a parallel vein 75 feet away. Both of these veins are approximately on line with veins which are indicated on the old maps as converging at or near the Phoenix shaft, whereas the prolongation of the bearing of the northeast drift of the Furniss shaft goes further to the north. A quartz outcrop almost due north of BM5 may actually represent such a prolongation. BM4, it should be noted, actually found tungsten and some gold was encountered in BM5. One or more veins outcrop near the county road (not shown) and the existence of other veins or mineralized beds or dikes more or less conformable with the strike of the foliation and bedding of the andesite flows are suspected, although more accurate mapping would have to be done before drawing definite conclusions.

In the area between the Furniss and the Phoenix workings there is evidence of several parallel or branching veins in addition to the three main veins, three of which are known to be mineralized. One ore shoot is reported to have been opened in the Furr shaft (probably on the Furniss vein) and the bulldozer trenches suggest at least one more substantial ore shoot situated about 500 feet further to the southwest on what may prove to be an intermediate vein.

Substantial showings of scheelite-quartz outcrop in the Copper vein system which parallels the Phoenix-Furniss system. The Bureau of Mines explorations in that portion of the Furniss property, however, indicated excessive distortion and possible faulting at this point with no clear evidence of economic possibilities. Scheelite was found on the dump of the Copper shaft which is located on the Phoenix properties and thus beyond the limit of the Bureau's project - but a subsequent drill hole in this vicinity failed to find any economic mineralization.

(d) Accessibility.

The Phoenix-Furniss properties are in the central part of Cabarrus County, North Carolina, about seven miles southeast of Concord and about six miles southwest of Mt. Pleasant.

Concord, the nearest city with a population of about 20,000, is situated on the main line of the Southern Railway. Charlotte, an industrial city of over 100,000, is less than 25 miles away over excellent roads.

The mines are reached from Concord by driving south on State Highway 601 about 3.5 miles to Faggarts Corner (beyond the overpass over the Concord-Raleigh highway Route 49 and a short distance beyond a large school on the left) and thence left on the Miami Church road about 3 miles to the Phoenix-Furniss mine road. The public roads are modern black-top paved gravel type and the clay mine road has been put in good shape for ordinary hauling by the present applicant.

(e) Availability of manpower, materials, etc.

Sufficient labor with proper know-how is available to carry out the planned operations. All necessary materials, supplies and equipment can be secured within the area from the various dealers in mining and industrial equipment.

Electric power is available from the Rural Electrification Administration at the entrance of the mine road about 1/3 of a mile from the Furniss shaft and another rural power line is within similarly easy reach of the Phoenix mine area. However, the amount of power available from these sources is limited, probably not over about 10 KW from either source. The present applicant has installed a 40 KW direct connected gasoline driven electric generator at the Phoenix mine to run the pump. Adequate electric power can be obtained from a more distant source but the estimated cost of connecting lines ($17,500) may favor the use of diesel power on the property.

Ample water supplies for a small year around milling operations are believed to be available in Plum Run Branch. A concrete dam is situated about 500 feet from the site of the old mill near the Phoenix shaft. The difference in elevation is perhaps 50 feet.

5. The exploration project.

(a) See application.

(b) Proposed work.

It is proposed (1) to continue the unwatering and retimbering of the deep shaft so as to inspect the workings in the old Phoenix mine, (2) to reopen the Furniss shaft, (3) to continue the southwest drift of the 170-foot level of the Furniss shaft for 300 feet so as to come under the ore shoot reported as being found in the Furr shaft and for such additional distance as may be necessary to explore this ore shoot, if found, (4) to crosscut to the southeast to a suitable point on the 170-foot level to explore the formations and to seek a possible extension of the main Phoenix vein which it is believed may be encountered within about 100 feet, and (5) to extend the northeast drift on this level about 300 feet to explore the indicated ore shoot encountered in BM4 and BM5.

(1) Rehabilitation of old Phoenix mine.

This work is currently being carried on actively by the applicant and so may be far advanced before a loan can be granted. However, a minimum allotment of $10,000 should be earmarked for completing this work, for sampling and assaying, and for such additional physical explorations as may be indicated.

(2) Rehabilitation of Furniss shaft.

(a) Construction of small frame building, 12'x12'x10', to serve as hoist house and tool room. Also small dynamite storage house (concrete block).

(b) Erection of temporary head frame 30'x4'x4' (oak).

(c) Retimbering about 30 feet below present ground surface to connect with old shaft timbers which are probably in good condition.

(d) REA power-connection and wiring of buildings, shaft and drifts.

(e) Unwatering shaft (about 2 weeks at 100 gpm).

(f) General repairs to shaft timbers, ladderways, and hoisting compartment.

(g) Repairing dams on 100-foot level and establishing pump stations on 100 and 170-foot levels.

(h) Muck out sump at bottom of shaft (10 days ?).

(i) Install water discharge, water feed, and air pipe lines.

(j) Install haulage tracks on 170-foot level and on top.

(k) Install pumps, hoist, cage, cars, compressor, and other equipment.

(3) Drifting and crosscutting.

A total of approximately 550 feet of drifts and 150 feet of crosscut are contemplated from the Furniss shaft.

5. The exploration project.

(d) Operating experience.

Messrs. Lackey and Tyler of the applicant Company were president and vice president respectively of Russell and Company which was engaged for 3 years in producing tungsten concentrates for the GSA stockpile in Spain. Mr. Lackey is a member of the District of Columbia Bar and has considerable legal and administrative experience. Mr. Tyler has been active in mining and allied activities since before graduation from M.I.T. in 1912. As Eastern Regional Engineer of the Bureau of Mines in 1943-4, he was in general charge of the successful exploration of the Hamme tungsten occurrence in Vance County, N.C. Another experienced mining engineer was employed to assist in preliminary work and may be re-employed if needed. Operations are in direct charge of Mr. Gilbert E. Nash, General Manager, who has has considerable local experience in North Carolina mining and who has demonstrated his general competence while opening up the three caved shafts on these properties after they had been abandoned for 50 years. Franconia Trading Company is a private investment corporation headed by Mr. Arthur B. Rothwell and is not otherwise engaged in mining work.

6. Estimate of costs.

Total expenditures for the proposed work are estimated under the following headings:

(a)	Independent contracts - None	
(b)	Labor, supervision, consultants	$26,520
(c)	Operating materials & supplies	9,940
(d)	Operating equipment (rental)	4,854
(e)	Rehabilitation & repairs	1,360
(f)	New buildings, improvements, installations	850
(g)	Miscellaneous	3,155
(h)	Contingencies	14,869
	Grand Total	$61,548

(a) Independent contracts - None

(b) Labor, supervision, consultants.

It is proposed to work two shifts of 8 hours each (44-hour week). Monthly expenditures for labor and other personnel services are estimated as follows:

Local manager and day foreman	$ 500	
Night foreman	350	
Drillers, 2 @ $1.75 per hour	668	
Drill helpers, 2 @ $1.25 per hour	476	
Hoistmen, 2 @ $1.50 per hour	570	
Muckers, 2 @ $1.25 per hour	476	
Deckmen, 2 @ $1.00 per hour	380	
	$3,420	x 6 mos. $20,520

(b) Labor, supervision, consultants (continued)

	$3,420 x 6 mos.	$20,520
Engineering services and bookkeeping @ $1,000 per month		$ 6,000
Grand total for personnel services about		$26,520

(c) Operating materials and supplies.

Gas, oil, grease @ $20/day	$2,500	
Track: 1500' @ 1½ angle-iron	175	
Lumber - 6 MBM @ $70	420	
Electricity for pumps and light . . .	350	
Cage, sheave, hoist rope	350	
Pipe - 2" air line 1,000 ft. @ 35¢ . .	350	
Pipe - ½" water line to drill, 1,000 ft. @ 10¢	100	
Pipe - 2" water discharge, 200 ft. @ 35¢	70	
Pipe fittings	75	
Air & water hoses to drill	220	
Drill rods	300	
Drill bits	1,800	
Lubricator, drill	35	
Lubricator, hoist	50	
Suction hose, footvalve, strainer . .	45	
Dynamite, caps, wire	2,500	
Ventilating fan, tubing	300	
Hand tools	100	
Forge, pipe, bench, etc.	150	
Nails, bolts, etc.	50	
	$9,940	$ 9,940

(d) Operating equipment (monthly rentals).

2 - Station pumps @ $50	$ 100	
Air compressor, 315 cfm	379	
Drifter, Gardner-Denver D89B (or equal)	75	
Sinking pump (returned after one month)	10	
Hand winch, cable, etc.	15	
Gasoline hoist	100	
Ore cars - 3 @ $10	30	
3/4 ton truck	100	
Monthly total	$ 809 x 6 mos.	$ 4,854

(e) Rehabilitation and repairs.

Lumber for shaft repairs	$ 250	
Lumber for temporary head frame - 13 MBM @ $70	910	
Steel for temporary head frame	50	
Concrete for shaft collar	150	
Labor (2 to 3 weeks), included under (a)	---	
	$1,360	$ 1,360

(f) New buildings, improvements, installations.

Electric power connection	$ 500	
Lumber for hoist house, etc.	200	
Concrete for dynamite house	150	
Labor (1 week), included under (a) . .	---	
	$ 850	$ 850

(g) Miscellaneous.

Workmen's Compensation Insurance, 9.19% of $20,520 plus $50	$1,835	
Social Security, 2% of $20,520	410	
Unemployment Insurance, 2% of $20,520 .	410	
Assaying	500	
	$3,155	$3,155

(h) Contingencies.

Reserve for exploration in Phoenix mine	$10,000	
Ten percent to cover unforeseen expenses	4,869	
	$14,869	$14,869

Grand Total $61,548

7. Operators share of cost.

(a) See application

(b) The operators share of costs of project will be met by cash payments.

ILLUSTRATIONS

Fig. 1 - Section through Phoenix Mine (Miami Mining Company).

Fig. 2 - General Geology of the tungsten area in Cabarrus County, N.C. (R. S. Houston).

Fig. 3 - Areal Map of two vein systems on Phoenix-Furniss properties.

Fig. 4 - Northeastern extension of Furniss vein showing underground workings and U.S. Bureau of Mines drill holes.

Fig. 5 - Underground map of Furniss Mine (U.S. Bureau of Mines RI 4724).

In map pocket

EXHIBITS

(To be returned to applicant)

A. U.S. Bureau of Mines R.I. 4724. Investigation of Furniss tungsten deposits, Cabarrus County, N.C., by Jack O. Jones and Alexander L. Peyton.

B. Tungsten deposits in Cabarrus County, N.C. by Robert S. Houston.

(A thesis submitted to the faculty of the State College of Agriculture and Engineering of the University of North Carolina in partial fulfillment of the requirements for the degree of Master of Science in Geological Engineering, Raleigh, N.C., 1950). Two copies.

No photo in copy
sent to DMEA

Plate 1 --- Weathered slates. Photograph taken on North Carolina Highway 200 near Buffalo Creek.

The metamorphosed volcanic flows and tuffs and slates are considered the oldest rocks in the area. Definite age relations between the different volcanic rocks and slates was not established. They are considered to be the same general age.

The igneous intrusives are younger than the volcanic rocks and slates. Definite age relations between the gabbro, diorite, and quartz diorite were not established. They are thought to be phases of the same magma. The granite is definitely the youngest intrusive rock in the area.

Slates and Metamorphosed Volcanic Flows and Tuffs

The slates and volcanic flows and tuffs occur in the eastern half of the area. The southeastern part of the area consists principally of slates. Contacts between the slates and volcanic flows and tuffs are gradational; areas of andesitic tuffs are found within the slates and large bands of felsic flows and tuffs are found within the areas mapped as andesite. The felsic volcanics occur principally in the central part of the area, but here again there is no definite dividing line between slates and felsic volcanics on the east and more mafic volcanics and felsic volcanics on the west.

Slates

The slates occur in the southeastern portion of the area. All contacts between the slates and volcanic flows and tuffs are gradational. Bands or beds of slate occur inside fragmental and flow areas, and lenses-like areas of andesite occur within the main slate division.

Fresh outcrops of slate are found only along creek beds. Weathered outcrops in road cuts show the well defined cleavage, and in a few places the original bedding. In weathered outcrops the slate breaks down into small flat chips which give the weathered outcrop a very characteristic [illegible] (Plate 1).

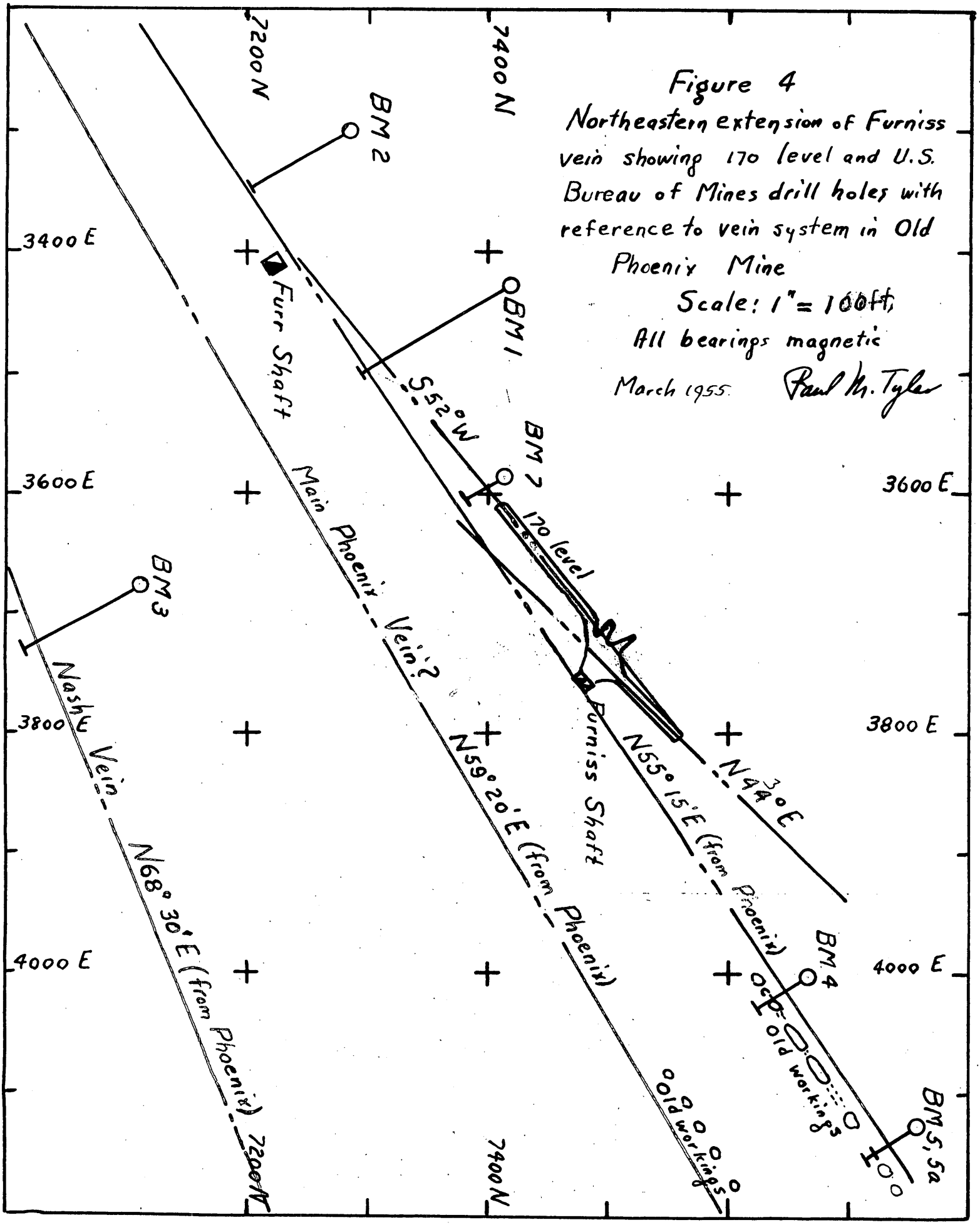


Figure 4
Northeastern extension of Furniss vein showing 170 level and U.S. Bureau of Mines drill holes with reference to vein system in Old Phoenix Mine
Scale: 1" = 100 ft.
All bearings magnetic
March 1955. Paul M. Tyler

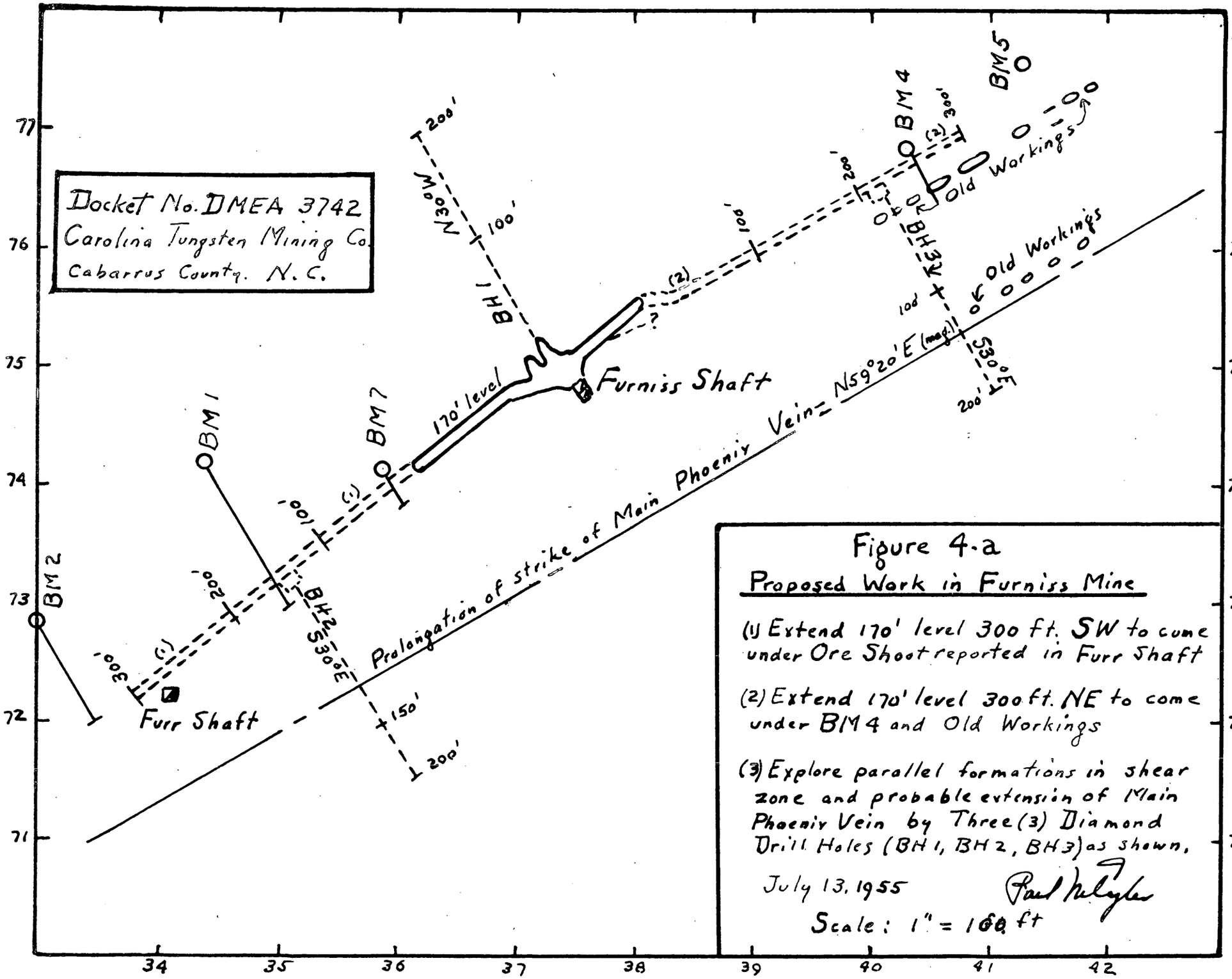


Figure 4-a

Proposed Work in Furniss Mine

(1) Extend 170' level 300 ft. SW to come under Ore Shoot reported in Furr Shaft

(2) Extend 170' level 300 ft. NE to come under BM4 and Old Workings

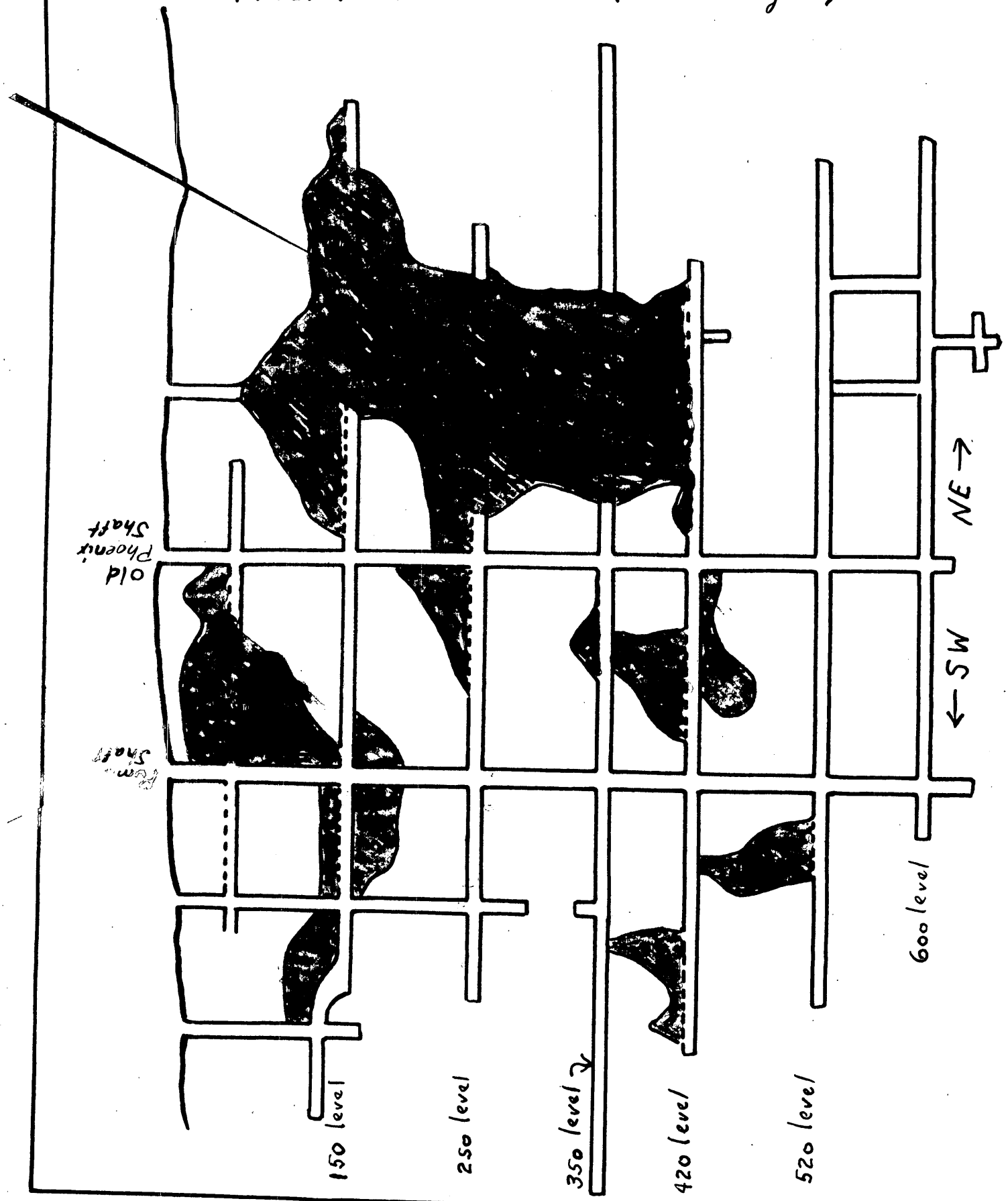
(3) Explore parallel formations in shear zone and probable extension of Main Phoenix Vein by Three (3) Diamond Drill Holes (BH 1, BH 2, BH 3) as shown.

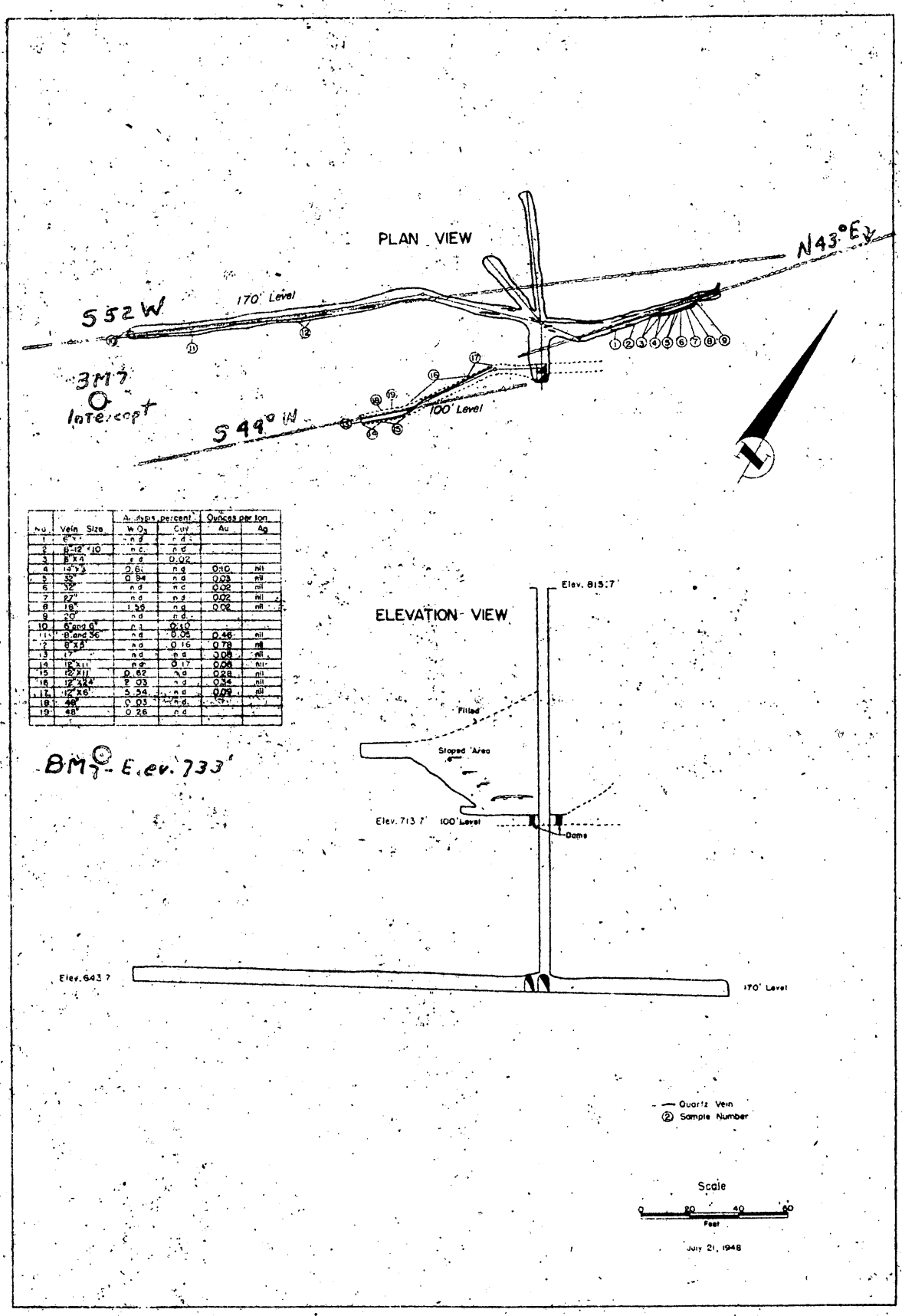
July 13, 1955 Paul Nelson

Scale: 1" = 100 ft

FIGURE 1

PHOENIX MINE SECTION (Miami Mining Co.)





No.	Vein Size	Analysis, percent		Ounces per ton	
		WO_3	Cuy	Au	Ag
1	6"	n d	n d		
2	8-12" 10	n d	n d		
3	8" x 4	n d	0.02		
4	14" x 3	0.61	n d	0.10	nil
5	30"	0.94	n d	0.03	nil
6	30"	n d	n d	0.02	nil
7	27"	n d	n d	0.02	nil
8	18"	1.35	n d	0.02	nil
9	20"	n d	n d		
10	6" and 6"	n d	0.10		
11	8" and 36"	n d	0.05	0.46	nil
12	8" x 5"	n d	0.16	0.78	nil
13	17"	n d	n d	0.08	nil
14	18" x 11	n d	0.17	0.08	nil
15	22" x 11	0.62	n d	0.28	nil
16	12" x 14"	2.03	n d	0.34	nil
17	12" x 6"	3.34	n d	0.09	nil
18	48"	0.03	n d		
19	48"	0.26	n d		

Figure 5. - Underground map of Furniss mine, Cabarrus County, N. C. (from RI 4724) showing approximate location of BM 7 intercept.

Docket 3742

Exhibit "B" to Application - Original returned to Applicant - This copy made for file 10/8/57

Tungsten Deposits in Cabarrus County, North Carolina

by

Robert S. Houston

A thesis submitted to the Faculty of the State College of Agriculture and Engineering of the University of North Carolina in partial fulfillment of the requirements for the degree of Master of Science in Geological Engineering, in the

DEPARTMENT OF GEOLOGY

Raleigh, N. C.
1950

Approved by:

_____
Adviser

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Tungsten Deposits in Cabarrus County, North Carolina

by R. S. Houston

Abstract

The tungsten deposits of Cabarrus County, North Carolina, are located on the western edge of the slate belt of North Carolina. The deposits are lenticular quartz veins which occur in metamorphosed andesitic flows and tuffs near their contact with a large intrusive body of quartz diorite.

The slate belt of North Carolina is a large body of metamorphosed volcanic flows, tuffs, and slates which extends in a northeasterly direction across the central part of the state. Its southern extremity is in Union County and its northern extremity is in Person County. It varies in width from eight to fifty miles with its widest bulge in the center of the state. The slates and volcanic flows and tuffs have been subjected to low rank metamorphism. The beds have undergone folding which varies in intensity in different parts of the slate belt. The bedding observed in Cabarrus County strikes generally northeast parallel to the regional foliation and dips nearly vertically.

In Cabarrus County the slate series consists of early Paleozoic (?) felsic volcanics, andesitic volcanics, and slates. The intrusive bodies which are in contact with the slate belt on its western side are principally quartz diorite and microcline granite and are presumably of late Paleozoic age. The igneous bodies intrude the slate series conformably and are younger than the slate series. With few exceptions the igneous rocks are unmetamorphosed.

The tungsten deposits are confined to the andesitic flows and tuffs which crop out near the quartz diorite intrusives. They are lenticular quartz veins, for the most part less than three feet wide, which are believed to have entered shear zones in the andesitic tuffs. The veins are thought to be mesothermal fissure fillings. All tungsten bearing veins strike in a northeasterly direction and dip steeply westward. One mine (the Phoenix Mine) has been explored to a depth of 602 feet. The mineralization continued to this level, but the width of the vein did not exceed three feet.

The principal ore minerals are scheelite, chalcopyrite, and native gold. They occur in a gangue of quartz, barite, siderite, and calcite. The scheelite is light orange with a hardness of 5. Under ultra-violet light (2540 Angstrom) the scheelite fluoresces a brilliant white.

At the present time (1950) the deposits are considered to be too small and irregular to mine.

Introduction and Acknowledgements

The tungsten deposits of Cabarrus County, North Carolina, are found in lenticular quartz veins which occur in the western edge of the slate belt of North Carolina near the contact of the slate belt with a large northeast trending pluton. All of the deposits described in this report are located in a 25 square mile area 1.3 miles south of Mt. Pleasant, N. C., 3 miles southeast of Concord, N. C., and one mile west of Georgeville, N. C. The area is bordered on the south by Rocky River, the east by Buffalo creek, the west by Cold Water creek, and on the north by the airport road east of Concord, N. C.

The field work was done in the summer of 1949, and later petrographic studies were made at N. C. State College in the fall of 1949 and winter of 1950. The mapping was done on aerial photographs, and brunton and tape surveys were made of some of the most promising prospects.

This investigation was a project of the Division of Mineral Resources of the North Carolina Department of Conservation and Development in cooperation with the Tennessee Valley Authority. It was under the direction of Dr. J. L. Stuckey, State Geologist. Invaluable advice and assistance was given the author by Dr. Stuckey and Dr. J. M. Parker III, professors of geology at North Carolina State College. Thanks are also due to Mr. W. W. Stevens, of the U. S. Soil Conservation Service, who made available aerial photographs which were used as base maps; to Mr. J. I. Moore, Jr., and Mr. A. L. Nash of the Nash-Moore Mining Company for the aid and courtesies which they extended during the investigation; to Mr. V. J. Lynch, of the U. S. Bureau of Mines, who made available information collected by the Bureau during its investigations of the mining properties; to Mr. T. R. Goodicke and Mr. E. E. Jones, who assisted the author in part of the field work; and to numerous citizens of Cabarrus County without whose assistance this report would not have been possible.

Previous Geologic Investigations

Although mining started in Cabarrus County as far back as 1799, no previous detailed geologic work has been done in this area. During the period of greatest mining activity, 1829-1836, little geologic knowledge was available in North Carolina, and since that time the greatest mining activity has been concentrated in the western states and mining in Cabarrus County has been chiefly promotional and spasmodic. Purely academic work has probably been discouraged by the extremely complex nature of the rocks and the ubiq-

nitous overburden. Nevertheless, numerous investigations of mining properties have been made by geologists and mining engineers, and the broader aspects of the geology have been interpreted, beginning with the work of Denison Olmsted in 1824.

Olmsted (1825, p. 23) described the "Great Slate Formation" which he believed to be about 20 miles wide and to "pass quite across the state from north east to south west." He thought the slate belt rocks were "parallel ranges of clay slate in perpendicular slabs." He also included in the slate belt "numerous beds of porphyry, soapstone, serpentine, greenstone, and hone or whetstone slate."

The next important work done in the slate belt was by Ebenezer Emmons, State Geologist. Emmons (1856, pp. 65-69) interpreted the slate belt "as belonging to the oldest known Sediments,...they are Slate and Quartzites mainly, and their Sedimentary Origin is based mainly upon conformable Pebbly Beds. They are found to be related to Rocks which are known in the North, and which there constitute the Taconic System." Emmons found two supposed fossils in the slate belt which he named "Paleostrochis major" and Paleostrochis minor." They were later identified as spherulites by Miller (1899, pp. 59-67).

Kerr (1875, p. 132) clearly outlined the slate belt as "the great central mineral-bearing slate belt, extending quite across the state in a breadth of 20 to 40 miles, composed of silicious slates and clay slates chiefly: the former being often brecciated and conglomerate, the pebbles sometimes a foot and upwards in diameter, frequently chloritic, and often passing into hornstone and chert and occasionally into quartzite." Aside from this "central slate belt," Kerr mapped four other areas of the same rock types in the western part of the state and one area just east of the "central slate belt." He placed these rocks in the Huronian System.

In 1893 G. H. Williams, accompanied by Professor J. A. Holmes, State Geologist, made a reconnaissance study of the rocks between Sanford and Chapel Hill, North Carolina. Williams (1894, pp. 1-31) was the first to recognize the volcanic origin of these rocks. Williams states that he found in this area "an abundance of the most typical ancient lavas, mostly of the acid type."

Hites and Hanna (1896) studied the gold deposits of the state. They recognized the volcanic nature of some of the rocks, and noted a considerable variation in metamorphism of the slates. Slates as typified by outcrops at the railroad station in Monroe, North Carolina, were considered later in age than the slates and schists to the west and north. They suggested the name "Monroe Slates" for these rocks. Hites and Hanna placed both slates and pyroclastic volcanics in the pre-Cambrian.

Francis Baker Laney (1910) studied the Gold Hill Mining District, located approximately 10 miles north of the area discussed in this report. He described an area in which both volcanic sedimentary rocks and igneous intrusive rocks occur. Concerning the slate belt he stated, "The rocks here included under the general term slates make up the entire eastern half of the area, and, while having many local variations, seem clearly to represent a great sedimentary series of shales with which are interbedded volcanic flows, breccias, and tuffs. At and near the western boundary of the formation, that is, at and near the contact with the igneous rocks to the west, the series is closely folded and highly schistose....to the southeast the effects of this intense dynamic metamorphism gradually die out, the schistosity almost wholly disappears, and the rocks present only such structural phenomena as moderately close folds and joints." Laney considered the granite, diorite, and greenstone as intrusives. He describes four distinct types of dikes, in order of age, diorite, granite fine-grained diorite, and diabase.

Lemmy considered the contact between the intrusives and the slate belt a large fault zone.

Pogue (1910) made an excellent map of the Old Mining District in Davidson County, North Carolina. His illustrations and descriptions of the volcanics are probably the best in existence today. Pogue's area did not include large intrusives. Some of his more important conclusions are summarized in the following quotations: "Wide bands of sedimentary, slate-like rock, composed of varying admixtures of volcanic ash and land waste, have the greatest areal extent. Intercalated with these occur strips and lenses of acid and basic volcanic rocks, represented by fine and coarse-grained volcanic ejecta and old lava flows. The acid rocks include fine tuffs, coarse tuffs, and breccias, chiefly of a rhyolitic and dacitic character, together with flows of rhyolite and dacite. The basic series embrace fine tuffs, coarse tuffs, breccias, and flows of an andesitic stamp." Pogue believed the region to be made up of a series of inclined folds, whose axial planes dip steeply to the northwest. The tops of these folds were supposed to have been removed by erosion leaving a series of steeply dipping beds, striking northeast and dipping northwest.

The most important paper concerning the slate belt was a study of the pyrophyllite deposits of North Carolina by J. L. Stuckey. Stuckey (1928) mapped a 75 square mile area in Moore and Chatham Counties. This area is on the eastern edge of the slate belt bordering the Triassic basin of North Carolina. Stuckey considered the rocks "volcanic-sedimentary formations made up of slates and tuffs with which are long interbedded bands of volcanic breccia, flows, and ash." He considered the tuffs the controlling formation, "the other formations, with the exception of the slate occurring as concordant flows or interbedded with them." Stuckey's interpretation of the structure was that of a closely compressed synclinorium.

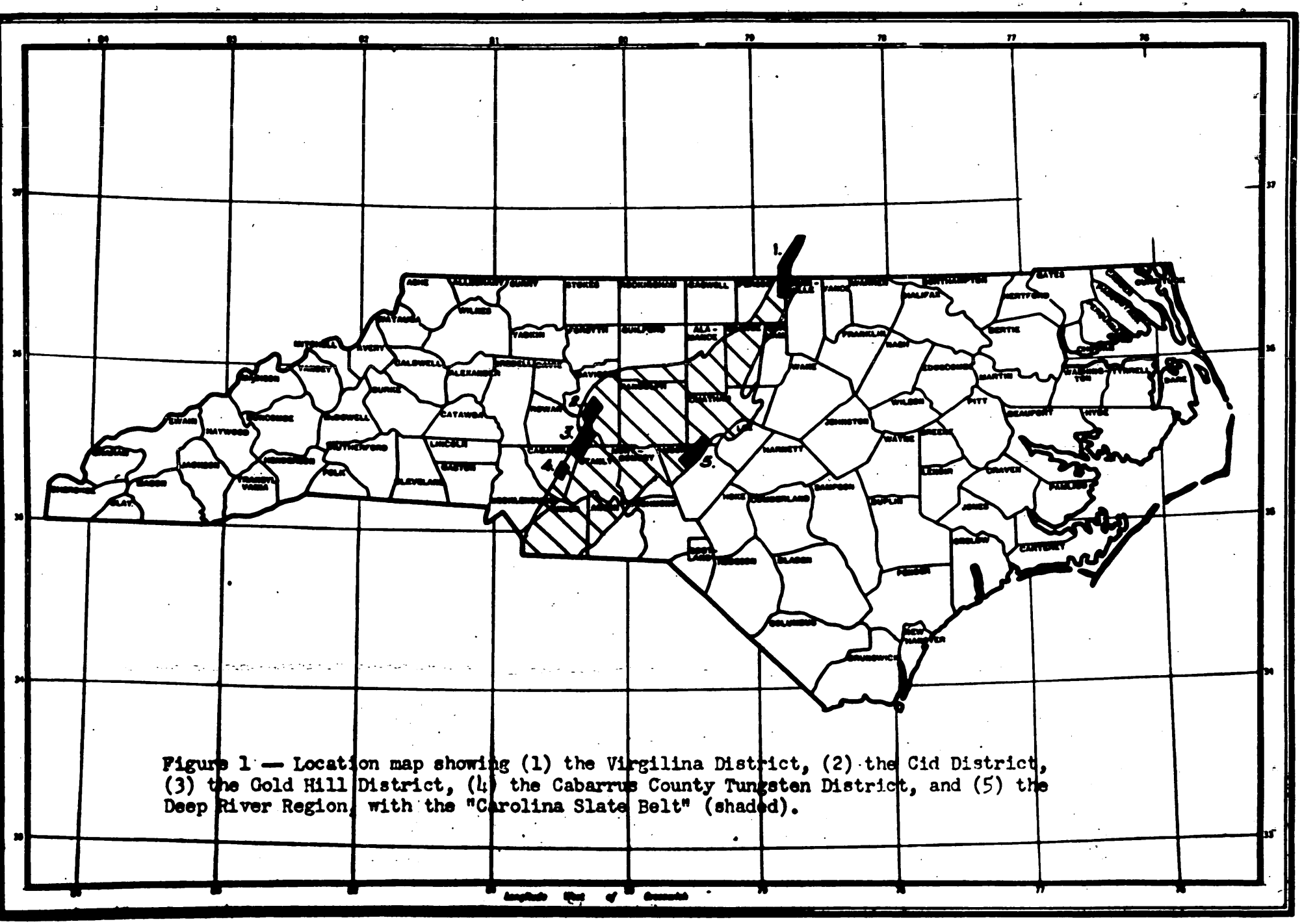

Figure 1 — Location map showing (1) the Virgilina District, (2) the Cid District, (3) the Gold Hill District, (4) the Cabarrus County Tungsten District, and (5) the Deep River Region, with the "Carolina Slate Belt" (shaded).

The latest work done covering the slate belt was a Professional Paper of the U. S. Geological Survey by J. T. Pardee and C. F. Park (1948). This report covers the gold deposits of the southern piedmont, and includes areas in the states of North Carolina, South Carolina, Georgia, Alabama, Virginia, and Tennessee. The emphasis of this report was chiefly on ore deposits, but Park and Pardee (1948, pp. 16) describe the slate belt and mention the fact that beds exposed in Stanly County, North Carolina, contain small cavities whose form shows that they were once occupied by crystals of thenardite, a soluble sodium sulfate of contemporaneous origin. They interpret this to mean that the beds were deposited during a period of arid or semiarid climate.

With the exception of the work by Kesley, Pogue, and Stuckey, all geologic work done on the slate belt of North Carolina has been reconnaissance. No attempt has been made to correlate between the areas mapped by these men because with the exception of the Gold Hill and Old Districts, they are too widely separated. (Fig. 1)

Most writers have considered the slate belt to be Pre-Cambrian. It was shown as Pre-Cambrian in 1932 on the Geologic Map of the United States which was compiled by G. W. Stose for the United States Geological Survey. On the Tectonic Map of the United States published by the American Association of Petroleum Geologists in 1944, the slate belt is shown as Paleozoic (?). It is included in a group of Pre-Cambrian and Paleozoic rocks which extends from Maine southwestward to Alabama. A series of rocks described by Watson and Powell (1911, pp. 13-44) in Virginia, which contained rock types similar to those in the North Carolina slate belt, and which contain early Paleozoic fossils, might be used as evidence to show the North Carolina slate belt

rocks as early Paleozoic also. However, no authentic fossil remains have been discovered in metamorphic rocks in North Carolina to date (1950).

The igneous intrusions bordering the slate belt on the west are thought to be late Paleozoic. The slate belt is regarded by Jonas (1932, pp. 238-243) to be part of the area involved in the folding and formation of the Appalachians during movements in late Paleozoic time. The granite bodies are thought to have been emplaced at that time. Pardee and Park (1948, p. 49) following this trend of thought place the ore deposits of the entire piedmont in late Paleozoic or early Triassic. They state, "Despite their wide distribution, however, the deposits of the Southern Piedmont are within the same geologic province and are of generally similar structure and mineralogy, and it is therefore probable that they were formed at about the same time and by similar causes."

Summarizing, geologic opinion seems to be that the slate series is early Paleozoic and that the associated igneous intrusions are late Paleozoic, formed during the Appalachian orogeny. The ore deposits formed during or after emplacement of the igneous bodies are either late Paleozoic or early Triassic.

Geography

This area is located in the Piedmont Plateau of North Carolina. It is thought to be part of an uplifted maturely dissected peneplain (Fenneman, 1938, p. 270). The elevation ranges from 600 to 700 feet.

The topography is gentle. The surface consists of gently rolling hills with relief generally less than 200 feet. In a distant perspective the surface appears almost flat.

The area is well drained. Most of the streams have dendritic patterns. This is especially marked in the slates. Sandy Creek in the western section

of the area has a trellis pattern which is probably controlled by jointing in the more resistant andesite flows and the igneous rocks. Rocky River runs in an east-west direction across the southern extremity of the area. It is the largest river in this section of the state, and receives all the run-off in this area.

This section of the state is partially wooded and partially cultivated. The wooded areas consist principally of second growth short leaf pine, with deciduous trees growing along creeks.

The rocks differ considerably in resistance to erosion, but in general the area is deeply weathered. Residual mantle extends in many places to a depth of 90 feet and averages approximately 40 feet in depth.

General Geology

Rock Types

General Features

The tungsten deposits of Cabarrus County are located in the western edge of the slate belt. This belt of rocks extends in a northeasterly direction across the entire state. The main body of the slate belt crops out in Union County on the south and extends, northeasterly, to Person County. It varies in width from 8 to 50 miles with its widest bulge in the center of the state.

On the western border of the slate belt is a complex pluton which is composed of microcline granite, quartz diorite, dacite, and gabbro. This pluton underlies about half of the area which is taken up in this report. The other half of the area consists of metamorphosed andesitic flows and tuffs, felsic flows and tuffs, and slates which characterize the slate belt.

The color of the weathered slate is not diagnostic. The slates vary in color from a bright red to a dull gray. Generally the soil is a dull gray color.

The fresh slate is dark blue. Nearer the contacts with the volcanics the color changes to green-gray, enough, perhaps, by an increase in volcanic material.

The chief components of the slate are quartz and sericite. Microscopically it is extremely fine grained, and very little about its nature can be determined under an ordinary polarizing microscope. Magnetite, biotite, quartz, and some secondary sericite and chlorite are found.

Metamorphosed Felsic Volcanics

The felsic tuffs and flows that have been mapped as one unit are the most abundant rocks in this area. They dominate the southcentral part of the area and gradually pinch out toward the northeast. They occur as inclusions in diorite and are interbedded with andesite flows and tuffs on the west and with slates and andesite tuffs on the east.

Tuffs and flows are so intimately interbedded in narrow bands, and good outcrops are so few that it was not possible to separate the two on the map. The beds of tuff vary in width, but generally occur as elongated bands striking northeast. It was not possible to trace individual bands of tuff any great distances within the volcanic area, but one inclusion, about 50 feet wide, in quartz diorite was traced for almost a mile in a northeasterly direction. The felsic volcanics are all light colored, but they vary considerably in texture. They vary from dense chloritic phases to tuffaceous phases in which large crystals of quartz and feldspar are visible. The fragmental or flow nature of the rocks is best observed in weathered outcrops. The soil derived from them is light colored, almost white near the contact with the andesite.

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Plate 2 --- Felsic tuffs showing elongated fragments. Photograph taken on Rocky Creek just north of the point of entrance into Rocky River.

The felsic volcanics have been metamorphosed to a greater or less degree depending on their lithology. The tuffaceous phases are badly sheared. In excellent exposures in Rocky Creek, [illegible] yards north of the point of entrance into Rocky River, outcrops of felsic tuffs interbedded with andesite can be seen in which every fragment is aligned parallel to the regional foliation. The fragments are elongated, strike northeast, and dip nearly vertical. (Plate 2)

Felsic Tuffs

In fresh specimens some phases of the felsic tuff look very much like a porphyry. Euhedral crystals of feldspar and quartz can be seen megascopically. The tuffs contain fragments of rhyolite and quartz feldspar porphyries. Therefore, when the fragment outlines are not visible as is the case in some fresh specimens, the tuff looks more like a porphyry. Other phases of the felsic tuffs show their fragmental nature clearly. (Plate 2) These contain angular irregular fragments cemented by aphanitic ground mass. The felsic tuffs are generally grey to white.

Microscopically the felsic tuffs consist of irregular grains composed primarily of crystallites of oligoclase or orthoclase or both, irregular grains of fine grained quartz, grains in which the ground mass is too fine for positive identification, and [illegible] cryptocrystalline ground mass and [illegible] large euhedral crystals of feldspar and quartz. The fragment outlines [illegible] show clear under the microscope. Observing the thin sections [illegible] in a good light quite often proves to be a better method of finding fragment outlines. In one thin section examined the fragments were outlined by veins of fine grained [illegible]

[illegible] of the darkener cemented [illegible] to be composed of the different [illegible]. Each of the certain [illegible] cryptocrystalline ground mass

with large euhedral crystals of feldspar completely altered to epidote and equally large hornblende crystals altered to chlorite. The ground mass or matrix of the tuffs consists chiefly of quartz, magnetite, sericite, chlorite, biotite, and orthoclase. Sphene and garnet occur sparingly. Some of the magnetite is altered to hematite and feldspar to epidote. Pyrite, however, is the principal secondary mineral. Quartz is by far the most abundant mineral in the matrix making up about 50 to 70 per cent of the whole. Much of the quartz is interstitial, however, some of fine quartz have the shape of feldspar crystals, much of the quartz occurs in veinlets interlacing throughout the ground mass, and some of the finest quartz have the shapes of feldspar crystallites.

Rhyolite Flows

The rhyolite flows occur interbedded with the felsic tuffs, sediments, and as inclusions in the diorite. They can be distinguished from the tuffs by their lack of pisolitic and fragmental. Foliation can be just discernable under in the field, but the foliation of the flows was not observed as an angle to the regional foliation; so it is not possible to say the foliation is primary.

Megascopically the rhyolite flows are indistinguishable from ground mass. They are highly siliceous, and quite difficult to break in fresh exposure. In hand specimen they are light colored, usually white to dark gray. Under the microscope the cryptocrystalline ground mass has a felsitic texture, a definite alignment of grains in the flow direction is shown by slender dark lines pointing in the direction. A few phenocrysts of feldspar and quartz are entirely altered to epidote. These phenocrysts sometimes

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Plate 3 --- Typical "cocked hat" outcrops of andesitic breccia.

are found, but the greater part of the ground mass is composed of quartz, sericite, and possibly orthoclase. Epidote, actinolite, sphene, and magnetite are rare constituents.

Metamorphosed Andesitic Flows and Tuffs

Andesite crops out in the western half of the area, and in long narrow lenses in the slates in the southeastern section. Andesite is interbedded with felsic volcanics and is intruded conformably by quartz diorite and granite.

It does not crop out on ridges or in fields in place, but andesite float is very abundant. In one restricted area of andesite breccia in the east central part of the district there are typical "cocked hat" outcrops very much like those described by Pogue (1910, p. 14). The outcrops are narrow elongated slabs that trend parallel to the foliation. Some of the slabs are nearly 5 feet high, and at a distance the group of outcrops looks very much like a graveyard. (Plate 3)

The andesite weathers to a deep brownish red soil. The great quantity of float rock and the characteristic color of the soil makes the andesite more easily traced than other rock types.

The andesite has been metamorphosed to such an extent that most of its original nature is lost. The major portion of the andesite is probably tuffaceous. The one small area of breccia previously described is best identified in the field. There large fragments can be seen, but under the microscope the breccia consists chiefly of epidote and secondary quartz. The western area of andesite may contain as much flow rock as tuff, but here again alteration to epidote has obscured the original texture.

Megascopically the andesite is fine grained. In some hand specimens angular fragments can be seen, and in some phenocrysts are found, but, in

general, the andesite is too fine grained to be distinguished as a tuff, flow, or porphyry in the field. It is dark colored, black to green, depending on how much of the rock has been altered to epidote.

In hand specimen the andesite thought to be a tuff, contains many subhedral areas that look much like fragments. Under the microscope these areas are composed entirely of fine grains of epidote. The matrix also contains much epidote and sericite, but plagioclase feldspar, hornblende, quartz, magnetite, and pyrite can be identified. Much of the quartz is believed to have been introduced. The quartz occurs as irregular veinlets, as needle-like crystals in feldspar, and in a few instances completely replacing subhedral crystals which were probably originally feldspar. The replacing quartz is fine grained and much of it is circular. It looks much like small droplets of water. Although most of the feldspar grains have been altered to epidote some of the crystallites are either andesine or oligoclase high in calcium.

Much of the andesite which apparently contains no fragments is composed chiefly of hornblende, plagioclase, pyrite, and quartz. All of these minerals have been altered --- the hornblende and plagioclase to epidote and sericite, and much of the pyrite to limonite. Some of these rocks contain so much epidote that they might be better named epidosite.

Some of the andesite is probably porporitic. The phenocrysts have been completely altered to epidote but their subhedral outline suggests that they may have been originally phenocrysts of feldspar rather than fragments. This porphyritic variety grades into normal andesite.

Metamorphism of the Volcanic Rocks

The volcanic flows and tuffs and slates have been subjected to low rank dynamic metamorphism. The slates are clearly foliated, and the frag-

ments in the felsic and mafic tuffs show a definite alignment parallel to the local foliation. The andesitic and rhyolitic flows have withstood the forces causing metamorphism better, but both of these types are slightly foliated, and in many cases altered to epidote and sericite.

Nearer the igneous bodies the alteration to epidote of the felsic and mafic flows and tuffs appears more pronounced. This is thought to be the result of contact metamorphism.

The slates and volcanic flows and tuffs are considered to be the same general age. Each type is interbedded with the others and all are metamorphosed as a unit. The group is older than the igneous intrusions; in every exposure of contacts between the igneous rocks and the slates and volcanics the igneous rocks clearly cut the latter group.

It is evident that the slates and volcanics are, at least, as old as late Paleozoic, and that at some time during their history they have been subjected to low rank regional metamorphism. The greater alteration to epidote near the igneous intrusions shows that the group has also undergone some local contact metamorphism.

This regional metamorphism may have occurred in early Paleozoic time possibly at the end of the Ordovician period, and the contact metamorphism during the Appalachian Orogeny at the time of emplacement of the igneous bodies.

Igneous Intrusives

Igneous intrusive rocks make up the greater portion of the western half of the area. They consist principally of two rock types, microcline granite and quartz diorite. Smaller bodies of gabbro and dacite are present and numerous basalt, aplite, and diabase dikes occur within the igneous bodies and the adjacent volcanics.

Contacts show that the unmetamorphosed igneous rocks are younger than the volcanics and slates. Locally stringers from the igneous bodies may cut across the foliation of the volcanics, but generally contacts between the larger igneous bodies and the volcanics are conformable to the foliation of the volcanics and the bedding planes, where they can be found. The contacts are gradational. As the contacts between the igneous rocks and the volcanics are approached inclusions of volcanics become more and more numerous until the area consists principally of volcanics with sills of igneous rocks, and aplite and basalt dikes.

With the exception of the dike rocks the granite is the youngest intrusive rock. The relationships between the gabbro, dacite, and quartz diorite are not clear, but the first two are thought to be phases of the quartz diorite body. The dike rocks in order of decreasing age are basalt, aplite, and diabase.

Quartz Diorite

Quartz diorite is second in importance to the felsic volcanics in areal exposure. It occurs as a large wedge shaped mass in the northeastern portion, and in two smaller masses in the western and central portions of the area.

The best outcrops occur along creek beds. It is the least resistant of the igneous rocks with the exception of the gabbro. The diorite is younger than the volcanics and older than the granite. The quartz diorite intrudes the volcanics conformably. Along the contacts with the volcanics it occurs in narrow conformable bands which become wider and wider nearer the main body of the diorite. It contains numerous inclusions of both felsic and mafic volcanics particularly along the contacts. These bands

Plate 4 --- Granite and quartz diorite contact (granite light colored). Photograph taken on North Carolina Highway 151 on east side of Cold Water Creek.

of volcanics within the quartz diorite body appear very much like dikes, but weathered exposures along road cuts show the quartz diorite interfingering in the bands of volcanics, and the volcanics sometimes show foliation which the quartz diorite does not have.

The granite sends stringers into the diorite and cuts it in all directions. Many of the granite stringers have connecting shoots, and quite often a large mass of granite will have an inclusion of diorite. (Plate 4)

The fresh rock is dark blue caused by a small amount of blue quartz. Quartz, plagioclase, biotite, and hornblende can be recognized in the hand specimen. Initial weathering of the fresh rock makes a very white surface with dark crystals of hornblende in bold contrast. The color of the soil varies from brown to light grey.

Under the microscope, the diorite has a medium-grained phaneritic texture. The primary minerals present are andesine, microcline, hornblende, tremolite, and quartz with accessory biotite, magnetite, and apatite. Many of the andesine grains have been completely altered to epidote and sericite, and some of the magnetite has changed to leucoxene. Grains of sericite replacing the microcline are arranged perpendicular to each other suggesting replacement along cleavage planes. A few of the hornblende crystals are altered to chlorite. The quartz is fresh in appearance, and its relations to some of the other crystals suggest that it may be secondary, but there is no conclusive evidence of this. Andesine makes up about 50 per cent of the rock and has the composition of $Ab_{60}An_{40}$. Quartz ranges from 10 to 20 per cent, and hornblende 10 to 15 per cent. Microcline makes up about 10 per cent of the rock with the other minerals occurring in minor amounts generally less than 5 per cent.

Dacite

The dacite outcrops in the northeastern section of the area as a lenses like mass. It intrudes slates on the east and grades into quartz diorite on the west. In the center of the dacite body is an inclusion of andesite.

The outcrops of dacite are found principally in creek beds. It resists weathering poorly. The soil color is grey to brown, and does not differ notably from the quartz diorite.

In hand specimen plagioclase, quartz and biotite can be identified. It is fine grained almost aphanitic, and has a light orange color. It is not foliated.

Microscopically the dacite is a fine grained phaneritic rock. It contains approximately 60% andesine and 30% quartz, with minor amounts of biotite and magnetite. Many of the andesine crystals have been altered to epidote and sericite. Both of these secondary minerals occur in the same feldspar.

Gabbro

Gabbro outcrops in a limited exposure in the west central part of the area. It is observed intruding andesite conformably on one of the tributaries of Hanby Creek, but the relation between the gabbro and diorite is not clear. It may be gradational into the diorite.

Fresh specimens of the gabbro are dark colored and very coarse grained. Hornblende and plagioclase can be identified. The gabbro is the least resistant igneous rock to weathering. It is best exposed in creek beds, but small amounts are found as float in fields. The soil derived from the gabbro is dark brown and can not readily be separated from the diorite.

Microscopically the gabbro is equigranular with grains above 5 mm in diameter. It is composed principally of labradorite and hornblende with minor amounts of ilmenite, titanite and biotite. Some of the labradorite is zoned and much of it is altered to epidote and zoisite. Crystal outlines of the hornblende suggest that it may have been derived from original augite. Hornblende occurs in both large and small crystals. In the larger hornblende crystals there are euhedral crystallites of labradorite. A few grains of quartz occur that may have been introduced.

Granite

The granite is the second igneous rock in importance in areal extent. It outcrops in the northwestern portion of the area in a large irregular mass and occurs as sills in the southwestern section. It interfingers into the volcanics conformably and contacts the diorite very irregularly. (Plate 4) With the exception of the diabase dikes it is the youngest rock in the area.

The best exposures of the granite are found in the southwestern portion of the area on the western fork of Hanby Creek just north of the intersection of N.C. 151 and N.C. 200. There it is exposed as large rounded masses which represent the best exposures of any rock in the area.

The granite is not foliated, but one sample taken from an exposure near the source of Hanby Creek, when examined in thin section showed a most remarkable fracturing of the individual grains. Every mineral in the specimen was badly strained. Undoubtly there was some movement in this area after the granite was emplaced, but there is not evidence in the field to indicate what it may have been.

In hand specimen the granite is light colored (white to pink) and equigranular. Quartz, microcline, and biotite can be identified megascopically.

On weathering the outcrops spalled off into spherical boulders. The soil derived from the granite is light colored to bright red.

Microscopically the granite is a medium grained phaneritic rock. It contains quartz, microcline, oligoclase, biotite, muscovite, and sericite. The microcline crystals are euhedral and slightly larger than the quartz and oligoclase. Sericite replaces the microcline, and crystallites of oligoclase are also found inside the microcline. Microcline makes up about 60% of the rock with quartz and oligoclase in about equal proportions of the remainder of the rock.

Dikes

Basalt

Fine grained dikes of basalt are found throughout the areas of quartz diorite. They were not observed cutting the granite in this area. Laney (1910, pp. 56-57) however, has stated that they do cut granite in the Gold Hill District just north of Mt. Pleasant. The dikes look very much like the andesite in the field, in fact, inclusions of andesite in the diorite and granite were mistaken for basalt dikes in weathered outcrops until stringers of diorite and granite were observed in the andesite inclusions. Exposures in creeks show the dikes cutting the diorite clearly. The dikes are aphanitic near the contacts with the diorite. Near the center of the dikes they become coarser and some euhedral crystals of feldspar can be seen.

These dikes were also found in the andesite. Although it was extremely difficult to distinguish the dikes from the fresher andesite --- and it is not possible to determine how much of the outcrop consists of dikes --- some of the dikes cut the felsic tuff and here they could be clearly dis-

tinguished. Since the felsic tuff is interbedded with the andesite the dikes are thought to cut the andesite also.

Microscopically the basalt contains about 40% labradorite and 40% hornblende, with minor amounts of pyrite and biotite. Some of the labradorite is altered to epidote.

Aplite

Aplite dikes were found cutting granite, diorite, and volcanics. They were aphanitic and light colored. The color varies from white to light red. These dikes were quite distinctive and could not be confused with any of the rock types with the possible exception of the rhyolite flows, which, in most cases showed lineation or planar flow structure.

Diabase

In this area the diabase dikes were not numerous. One large dike was found in the diorite and some smaller ones in granite and the volcanics. The diabase dikes cut the volcanics and igneous rocks in all directions. Their age relations are not established here, but Lanny (1910, p. 90) mentions one dike in the Gold Hill mine, north of this area, that cuts across a quartz vein. This apparently proves that the dikes are the youngest rock type in the area.

The diabase dikes were dark colored with fine laths of plagioclase visible in hand specimen. One of the dikes could be traced for a short distance by float in the shape of spheres. These rounded boulders are called "nigger heads" locally, but this term is not restricted to diabase. Any rounded dark rock received this title.

The diabase dikes are thought to be Triassic. They are believed to correspond to the dikes found in great quantities in the Triassic belt of North Carolina.

Structure

The detailed structure of the whole slate belt has not been worked out. Very little is known about most of the central portion of the series. Stuckey (1928) interpreted a section of the slate belt bordering the Triassic in Chatham and Moore Counties as a tightly compressed synclinorium. Lamey (1910) thought than both the Gold Hill District and the Virgilina District were closely compressed synclinoriums. Pogue (1910) believed the Cid District in Davidson County to be made up of a series of inclined folds, whose axial planes dip steeply to the northwest.

In Cabarrus County a satisfactory interpretation of the structure is not possible because of the limited extent of each volcanic bed and the scarcity of outcrops. Where contacts between beds were observed, the contacts were nearly always parallel to the local foliation. The two seem to diverge at a few places especially in the slates, but these exposures were too widely separated to make an interpretation of the structure possible. Where observations could be made of the dip of the beds and foliation planes, both dipped steeply westward. Their strike varies from N30E to N60E, but the dip was for the most part between 80 to 85 degrees west or northwest. This could be interpreted to mean that the volcanics have been intricately folded and overturned toward the southeast, or this area may represent the eastern limb of an anticlinorium or the western limb of a synclinorium.

Faulting

Very little evidence of faulting was found in the area. Several low angle thrust faults were noted which displaced the quartz veins. The faults dipped towards the east at angles less than 15 degrees. The veins were not displaced over a foot in most cases.

Rocks which contained slickensides and striations were found on some of the mine dumps, particularly those in the northern portion of the quartz diorite intrusion. This suggests that there may have been some movement connected with this mineralization.

Jointing

Joints occur in all rocks except the diabase dikes, which are thought to have entered in many cases along joint planes (Lemay, 1910, p. 90). There are five major joint sets (figure 2). The two most prominent sets strike N60W and N30W. These are numerous, individually long, and evenly spaced from 6 to 12 inches apart. The other three joint sets striking generally northeast are not so well developed or continuous. They are, however, closely spaced about 6 inches apart.

The rhyolite flows have the best developed joints, and the felsic tuffs the most poorly developed. The igneous rocks all have well developed joints in many directions. Where the rocks are much foliated as is the case in the andesitic and felsic tuffs, the northeastern sets are parallel to the foliation and difficult to see.

The quartz veins are cut by both northwest and northeast joints sets. The veins in the quartz diorite in the northeastern part of the area stand at an angle of approximately 70 degrees to the regional foliation. The strike of these veins is approximately parallel to the northwest joint sets. This may indicate that these veins entered joint plane. If this is true there has been more than one period of jointing in this area.

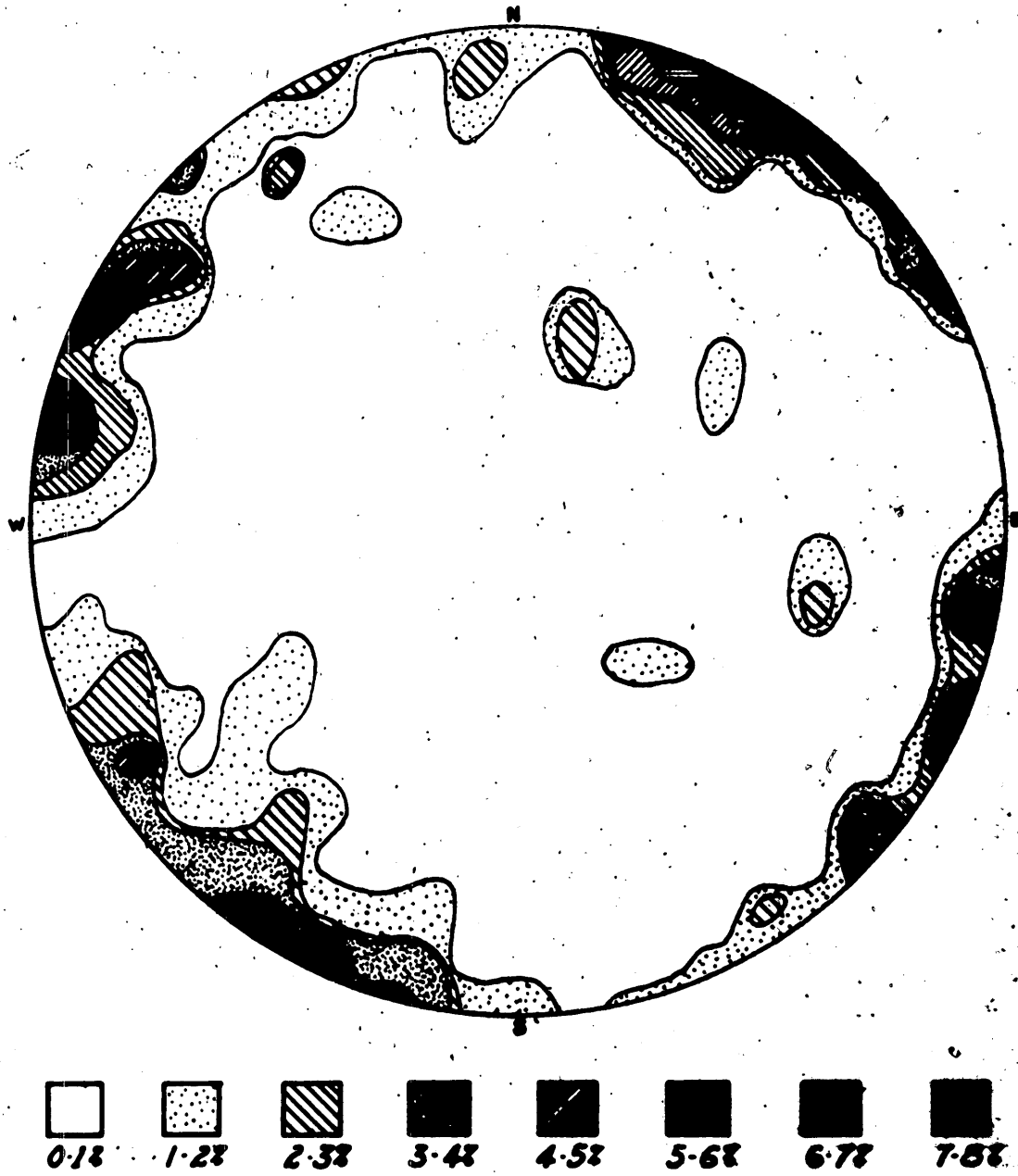

Fig. 2 Contoured Diagram of the perpendiculars of 144 joints in Cabarrus County Tungsten Area based on equal area projection point diagram, plotted on upper hemisphere. To plot the joints, a line is drawn from the center of the circle at right angles to the strike of the joints and in the direction of dip. Using a scale based on equal area projection the dip is plotted outward from the center of the circle.

Ore Deposits

The tungsten deposits occur in lenticular quartz veins containing scheelite, metallic sulphides, barite, and carbonates. The veins are fissure fillings in metamorphosed andesitic tuffs and flows near the contact of these metamorphosed volcanic rocks with a large intrusive body of quartz diorite. The principal veins containing scheelite occur in a belt 2.5 miles long and 1/2 mile wide. The strike of the veins corresponds, generally, to the foliation and bedding of the volcanics. The veins all dip steeply towards the northwest.

Mineralogy

The minerals found in the veins include principally pyrite, bornite, chalcopyrite, barite, and scheelite. Quartz is the chief gangue mineral and is associated with siderite, calcite, and minor amounts of hematite, sericite, calcite, and magnetite. Fine specks of native gold can be seen in some specimens.

The scheelite is light orange, with a white streak, and a hardness of 5. It occurs as large crystals up to 2 inches in diameter, and in irregular granular masses in quartz and barite. Where scheelite occurs the sulphides are usually absent. Analyses made for J. I. Moore, Jr., show that the scheelite is close to the theoretical composition. Some specimens contained as much as 79% WO_3, and in the specimens tested, only traces of molybdenum were found. The scheelite flourescces a brilliant white under short-wave ultra-violet light (2540 Angstrom). At night on dumps of the Copper Mine and the Charles Dry Property the scheelite display under ultra-violet light is striking. The recent discoveries by Mr. A. L. Nash were made by using a "Mineralight." Later prospecting on the Charles Dry Property disclosed

scheelite specks in the soil and led to the discoveries of soil-covered scheelite veins.

The barite occurs in fine grained equigranular masses associated with sulphides and scheelite. Fine specks of scheelite are sometimes found in masses of barite that contain sulphides. Large crystals of barite are not uncommon; generally, however, where it is associated with sulphides and scheelite, the barite is fine grained. The barite is white to pink. In larger masses with megascopic crystals the cleavage is excellent.

Pyrite is the most abundant sulphide mineral. It occurs in varying amounts at all mines. Chalcopyrite is also common, particularly at the Copper Mine. Native gold occurs in most of the mines. According to Lacey (1910, pp. 92-95) the gold is closely associated with pyrite and chalcopyrite, is younger than the sulphides, and always occurs in the native state.

The sulphides occur as irregular masses in quartz and barite, and as thin stringers parallel to the foliation and strike of the veins. Minor amounts of pyrite and chalcopyrite occur in the country rock adjacent to most of the exposed veins.

Siderite and calcite are found particularly on the Phoenix and Furnice dumps. The siderite is tan and occurs as irregular aggregates in quartz. In general appearance it is much like the scheelite. Its lighter weight and rusty appearance on weathered outcrops serve to differentiate the two.

Oxidation and Leaching

Oxidation and leaching has occurred to some extent. Scheelite in the upper 3 or 4 feet of the veins is decomposed to a powdery form. Scheelite in quartz discovered on the dump of the Furnice Mine has been almost completely removed, but excellent tetragonal-pyramidal outlines remain which

indicate the presence of the mineral when all other indication is absent. Pyrite has been removed on the surface, leaving voids. Chalcopyrite observed on dumps has been altered to limonite, malachite, and cuprite.

Supergene Enrichment

No supergene enrichment was observed. According to Gannett (1919, pp. 68-78) tungsten minerals are dissolved easily and tungsten compounds in solution easily hydrolyze and form insoluble compounds. This would prevent downward migration of tungsten, which would mean that there are no extensive supergene zones of tungsten minerals.

Alteration of Wall Rock

On the Dry Property where it was possible to observe the wall rock in contact with the veins, little alteration of the andesite has occurred. The quartz in contact with andesite sometimes has a thin coating of sericite, but extensive alteration is absent.

Paragenesis

The first deposited vein minerals were quartz and siderite. These two minerals are closely related. In some specimens siderite seems to be replacing the quartz and in others the reverse is true. It is thought that these two minerals were deposited at about the same time. Barite is the last mineral deposited in all cases. Fine grained barite completely encloses both sulphides and scheelite. Where it is associated with quartz and other gangue minerals it clearly replaces them. Lenney (1940, pp. 92-95) has shown that in the Gold Hill District pyrite and chalcopyrite precede the gold. Satisfactory specimens were not found to determine their age here. A probable order

of occurrence for these minerals studied would be as follows:

Quartz

Siderite

Scheelite

Pyrite

Chalcopyrite

Gold

Barite

Not determined: bornite, hematite, chlorite, sericite, magnetite, and calcite. Supergene minerals: cuprite, malachite, limonite, powdery scheelite, and MnO_2 stains.

Veins

The quartz veins are not confined to any particular part of the area. They occur in every rock type and are younger than the rocks they are associated with in all cases. Most of the veins observed are narrow lenticular bodies varying in width from a few inches to three feet. Much larger veins, some as wide as twenty-five feet, are found in the eastern part of the area, but unfortunately these larger veins are barren.

The tungsten bearing quartz veins are found near the contact with the quartz diorite; but, generally, where the greater concentrations of tungsten occur, the host rock is andesite. Most of these mine dumps contain andesite principally, though the surrounding areas are quartz diorite. The most important tungsten veins are in the large area of andesite just east of the quartz diorite body. Here no quartz diorite is present on the dumps, which consist principally of andesite flows and tuffs.

Most of the veins strike northeast and dip steeply westward. Their strike varies from N20E to N7aE, conformable to the foliation. In the northeastern part of the area which is underlain principally by quartz diorite the veins diverge from the general northeasterly trend and strike from N10W to N50W. These veins stand at an angle of approximately 70 degrees to the regional foliation. They are, however, approximately parallel to the major joint set which strikes northwest.

Some of the lenticular tungsten bearing veins are as wide as four feet, but most of them are between two and three feet in width. These lenticular veins widen and pinch along the strike, one pod or lense following another. The Phoenix and Furnise Mines are probably on the same strike, and the Phoenix Copper Mine and Dry Properties probably represent the same "lead." If this is true, these veins are continuous for at least 3/4 of a mile.

The veins contain numerous vugs or open spaces near their centers. These vugs contain excellent crystals of quartz. In some veins, siderite and quartz crystals are grown together in open spaces. The veins also contain angular fragments of wall rock which are not orientated with the wall rock or each other.

The veins are jointed both parallel to their strike and perpendicular to it. They are also thrust faulted at low angles. Some of the faults observed had displacements over a foot.

Ore Shoots

Very little has been determined about the nature of the ore shoots in this area. The main ore shoot in the Phoenix Mine was reportedly 300 feet long, and it was said to pitch northeast (Hitze, 1897, p. 62). J. I. Moore states that the observations he made on the Furnise Mine at the time that it was unwatered indicate that the wider portions of the vein are not as

Origin of the Veins

Smooth even contacts of the veins with wall rock, comb structure, vugs, and absence of evidence of replacement support the viewpoint that the tungsten bearing veins are fissure fillings. Any discussion of fissure veins involves first the origin of the fissures along which the veins entered.

All tungsten bearing veins strike close of N60E conformable to the local foliation. These veins are dilation or lenticular veins which pinch (become narrow) and swell (become wider) both in the vertical and horizontal dimensions. According to Bateman (1942, pp.130-131) this type vein is caused by the bulging or dilation of schistose rocks due to pressure transmitted by the mineralizing solutions. Many of the mine dumps in Sabarras County contain rocks that show considerable evidence of shearing, slickensides, unusually good foliation, and smooth surfaces coated with chlorite. It is not known whether this shearing occurred before or after emplacement of the veins. The veins are jointed and faulted to some minor extent, but, in general, they are not severely sheared. It seems more reasonable to conclude that if shearing did occur in these rocks, it occurred prior to the emplacement of the veins. The veins, therefore, may have entered shear zones formed at some time after the metamorphism of the rocks or they may have been formed by bulging or dilation of schistose rocks due to pressure transmitted by mineralizing solutions.

The tungsten bearing veins occur in andesitic flows and tuffs which have been conformably intruded by quartz diorite. Veins associated with granite, and those which occur in rock types other than andesite have not been found to contain tungsten. There is a possibility that the nature of the wall rock may have influenced deposition of the scheelite. Ross (1936) believes that the tungsten mineralization at the Silver Dyke mine

in Nevada was controlled by the wall rock. Here tungsten occurs in a vein system 600 feet wide and 6 miles in length. The vein system cuts three principal rock types: volcanic breccias, flows, tuff and associated sedimentary strata, an intrusive diorite, and later volcanics. The chief precipitation of scheelite has occurred in the vicinity of the diorite. Kerr believes that the diorite has probably furnished calcium which may have combined with tungstic acid of the vein forming solutions to produce scheelite. He points out that the diorite is the most calcareous rock immediately associated with the ore deposits. This theory might also apply to the Cuberres County deposits. Here the andesite flows and tuffs are the most calcareous rocks associated with the deposits, and no tungsten mineralization is known outside of these rocks.

The deposits contain both high and low temperature minerals. Specular hematite and magnetite, found in the veins, are considered by Lindgren (1933, p. 637) to be high temperature minerals. Barite which is also prominent in most of the deposits is thought to be a low temperature mineral. Other minerals in the veins are characteristic of the mesothermal deposits. The barite is considered the last mineral deposited, and may be indicative of a later stage of mineralization. In all probability the veins are mesothermal with some later additions of low temperature minerals.

The mineralizing solutions are believed to have come from deep lying portions of the igneous magma which formed the intrusives that border the slate belt on its western side.

Continuation of the Veins to Depth

In the past much emphasis has been placed on the theory that the veins in the slate belt and other parts of the Piedmont of the Southeastern states

are "grass roots" deposits; that is, they were thought to be the lower level remains of veins, the greater part of which had been eroded away. The epithermal, mesothermal, and part of the hypothermal portion of the veins were believed to have been removed, leaving shallow veins containing high temperature minerals. The rich accumulations of free gold found near the surface of many veins were thought to be accumulations from much larger veins which had been eroded away. The high temperature minerals, topaz, garnet, tourmaline, muscovite, and cyanite found in some of the veins were cited as evidence that all veins were close to the source of the mineralizing solutions. The close association with pegmatites (Lanny (1910, p. 98) states that in the Gold Hill district barren portions of a few veins in the slate belt strongly resemble pegmatites) in some cases was also used as evidence that the veins would not continue to depth. The vast exposures of granite in the Piedmont was thought to mean that most of the productive zone had been eroded away. These facts built up quite a formidable case against the ore deposits of the Southeast. Despite the fact that many competent geologists, for example, Lanny, Graton, Stuckey, and more recently Furnes and Park, have cited evidence to disprove this theory, there is still a tendency among some geologists and mining engineers to consider the deposits in the slate belt and other areas in the Piedmont uneconomic deposits because they do not continue to depth. The tungsten deposits in Vance County were looked upon with considerable suspicion, and had it not been for the recent war (1941-1945) these deposits might not have been developed.

In actuality the "grass roots" theory is not borne out by the facts. In Cabarrus County the Phoenix Mine has been operated to a depth of 608 feet, with the most important mineralization at the 600 feet level. In Rowan County the Gold Hill Mine was operated to a depth of 800 feet. The Vance County deposits, at this time (1950), have reached a depth of 500 feet, and still show no sign of diminishing in value.

No photo in copy sent to DMEA

Plate 5 --- Old Chileen Mill located on Pumice Mine Property.

The idea that the Piedmont contains vast uninterrupted granite bodies has also been disproved in areas in which the surface has been mapped in some detail. The work of Mundorff (1948, p. 7) in the Greensboro area of North Carolina and the recent investigation of the area near the Vance County tungsten deposits[1] have shown the granite bodies to be much smaller than had been previously supposed.

In conclusion it can be said that the mineral deposits in the slate belt and other areas in the Southern Piedmont can not be classified as one general type of deposit. There are probably hypothermal, mesothermal, and even epithermal deposits in these areas. Rather than make broad generalizations covering the entire area, each deposit should be considered separately.

History of Mining

Mining in Cabarrus County followed the first important gold discovery in the United States. Gold was discovered on the John Reed Plantation in 1799. John Reed's young son found a nugget weighing three and one-half pounds in the bed of Meadow Creek on the Reed Plantation. This nugget was used as a door stop until 1802 when Reed sold it to a jeweler in Fayetteville, North Carolina, for $3.50. Reed later realized the true value of the gold and mining began in earnest on the Reed Plantation. The mining methods consisted chiefly of surface washings and shallow placer operations. The Reed property yielded close to one million dollars before operations ceased.

After the Reed strike gold mining became widespread in North Carolina. Mining methods improved with the use of the pan-rocker, Long Tom, and sluice box. Vein mining started in 1835 at the Barringer Mine in Stanly County, North Carolina. Milling at first was done by hand methods using mortars

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[1] Personal communication from J. M. Parker III.

and pans, but later the Chilean Mill was introduced and finally the stamp-mill. A Chilean Mill in excellent condition is located on the Franklin Mine property in Cabarrus County. (Plate 5)

Although the major emphasis was on gold production, other metals have been produced. In Cabarrus County copper has been extracted as a by-product from many mines, and silver from the Allen-Parr Mine.

Tungsten was not reported until 1889 when occurrences of scheelite were described by Genth (1889, pp. 254-255) in the Bangle and Cullen Mines in Cabarrus County. Pratt (1916, p. 91) states, "Scheelite has been found at the following mines in Cabarrus County: at the Flume Mine, where it occurs in yellowish crystals; at the Cooky Mine, where yellowish crystalline masses of considerable size were found; and at the Cullen Mine, where it has been observed in rounded granular patches of a grayish-yellow color. Wolframite has also been found associated with the scheelite at all these mines, but from what information can be obtained, the scheelite predominates."[1]

The recent discovery of scheelite on the dump of the Franklin Mine in Cabarrus County was made by Mr. A. L. Hash of Kannapolis, North Carolina, in the spring of 1948. The United States Bureau of Mines investigated the property in the fall of 1948, drilling a total of 1,082 feet with a diamond drill. Later Mr. Hash and Mr. J. I. Moore formed a corporation, the Hash-Moore Mines, Inc., and continued investigations of the Franklin Mine and adjacent properties. This led to further investigation by the Bureau of Mines in the winter of 1949-50.

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[1] It is interesting to note that Pratt (1916, p. 92), in North Carolina Geological Survey Economic Paper No. 4, stated that wolframite had been reported on the Chock farm, near Henderson, Vance County. This deposit received no attention until its rediscovery in 1942 by the Hamme brothers of Oxford, North Carolina. It has since become one of the most important tungsten producers in the United States.

Mines and Prospects

With the exception of the Furnace Mine belonging to the Nash-Shore Mining Company, none of the mines of this district have been open since 1936. The Furnace Mine was unwatered in the summer of 1948, and examined by Mr. J. L. Moore, Jr., and members of the United States Bureau of Mines. Unfortunately the mine was not open at the time this survey was being made.

The major part of the information contained in this report was gathered by study of recent bulldozer cuts made by the Bureau of Mines on the Roy Property and by study of old mine dumps.

Most of the mines and prospects examined in this area have not been worked for at least one hundred years. In a few, the quartz vein is exposed, but in most of them it could not be located. The strike of the pits was considered to be the strike of the vein where it was not exposed.

All mines and prospects are located on the mine map (Fig. 3, in pocket), which also includes minerals noted, dip, and width of the veins.

Since so very little information was available on most of the mines and prospects, only the more important and better exposed will be described in detail.

The Phoenix Mine

The Phoenix Mine is located five and three-fourths miles SSE of the Courthouse at Concord, North Carolina, five miles SSW of the Mallister School in Mt. Pleasant, North Carolina, and three and one-fourth miles NNW of Georgeville, North Carolina.

Emerson (1896, pp. 177-178) does not state when the mine was first opened, but at the time of his investigation the mine had been worked to a depth of 180 feet. He states that at the 140 foot level a white quartz and sulphate of barytes took the place of the brown ore.

According to Kerr (1887, pp. 284-285) the Phoenix Mine was being operated in 1886 by Adolph Theis, and at that time the works had reached 350 feet. He stated that in the upper levels the vein had a comby structure, and in the lower it was stringy and scattered. In the lower levels the vein ranged from three to four feet in width with an ore seam approximately two feet wide. Gold and chalcopyrite were said to be the chief ore minerals with a gangue of quartz and barite. Theis used a chlorination method to process the ores with considerable success. Operations by Theis ceased at the Phoenix in 1889.

According to Hites (1897, pp. 61-62) the vein strikes N70E, dips 80 degrees northwest, and varies in thickness from twelve to thirty-six inches. The principal ore shoot was 300 feet long, pitching northeast. This shoot had been worked by Theis to a depth of 485 feet, but had not been drifted from.

In 1903 Pratt (1903, pp. 12-13) reported that the Miami Mining Company had been carrying on extensive development work at the Phoenix Mine up to January 1904. The property was opened by means of five shafts, six drifts, and cross cuts amounting to 3,932 feet. The deepest shaft was the Old Phoenix, which was sunk to a depth of 604 feet. The mine was equipped with a ten stamp mill and Bartlett concentrating tables. The tailings were cyanided. The company reportedly sustained a considerable loss.

The Phoenix Mine was probably most profitably worked by its first owners who were able to process free gold and by A. Theis, who made good recoveries by use of his chlorination process. The shoot worked by Theis yielded 0.2 ounces of gold and one ounce of silver per ton. This ore was extracted at a cost of $8 per ton. ?

Weighted analyses made by Mr. J. I. Moore, Jr., from daily records kept on the Phoenix from the 250 feet level to the 602 feet level show that

the vein averaged 14.6 inches in width, and carried values in gold of $27.67 per ton. The highest values of $35 per ton were obtained at the 602 foot level. Analyses made from the tailings dump of the Phoenix contained about .35% tungsten.

At the present time all of the shafts of the Phoenix Mine are caved at least at the surface. The buildings have been removed and the dumps will soon be utilized by the North Carolina State Highway Department for road material.

The vein is not visible in any of the caved shafts or prospect pits. Vein material on the dumps of the shafts and prospect pits shows the presence of the vein at particular workings, and from the alignment of these shafts and pits it appears that the strike of the vein is approximately N15E. Seven hundred and twenty-five feet southeast of the main Phoenix shaft is a two inch vein exposed in a series of prospect pits which strikes approximately east-west. If the strike of this vein is prolonged to intersect the Phoenix vein, the point of intersection would be 325 feet NE of the main Phoenix shaft. At this point a shaft has been sunk, which according to Mr. J. I. Moore, Jr., was known as the Junction Shaft. The dump does not show much vein material, and it is not known whether or not this proved to be an intersection of the two veins. The dumps indicate that the shaft was probably not sunk over fifty or sixty feet; so it is assumed that if there was an intersection of veins here it was not an enlargement.

The dumps of the Phoenix Mine and adjacent prospect pits consist principally of andesite tuff and a very fine grained variety of andesite which was probably originally a flow. Very little of the ore can be found. Pyrite and chalcopyrite are found in small quantities associated with quartz, barite, siderite, and calcite. Some azurite has been found on the dumps

by the use of the "Mineralight." It is surprising that no mention has ever been made of scheelite occurring in the mine, especially in view of its long and, at times, successful operation.

The Copper Mine

The "copper vein" is located approximately one-fourth mile south of the Phoenix Mine. It is not known when the first work was done in this mine, but Pratt (1901, p. 12) states that the Miami Milling Company sunk a shaft 150 feet deep and drifted 234 feet on the vein. The vein was reportedly two feet wide.

At the present time the property consists of a series of prospect pits striking N60E with one caved shaft on the northwest side. The dump is principally andesite.

More vein material was found at this mine than any other in the district. It consists of scheelite, barite, quartz, and minor amounts of chalcopyrite, bornite, and pyrite.

Just south of the Copper Mine is another series of prospect pits. The vein exposed here strikes N60E, parallel to the copper vein. It is less than a foot wide, and contains only small amounts of pyrite. No shaft was sunk here, and from the volume of rock on the dumps, it appears that the pits were not excavated over ten feet.

The Furnace Mine

The Furnace Mine is located one-fourth mile northeast of the Phoenix.

Pratt (1903, pp. 12-13) mentions the Furnace Mine in his progress report of 1903. He states that the Miami Mining Company sunk a 170 foot shaft on the Furnace vein with 140 feet of drifts on the 100 foot level and 234 feet of drifts on the 170 foot level.

No other published information is available on the Furnise Mine. It is thought that no work has been done on this property since 1906 when the Miami Milling Company ceased operations.

Mr. A. L. Nash of Kannapolis, North Carolina, discovered scheelite on the dump of the Furnise Mine in 1948. Mr. Nash and Mr. J. I. Moore, Jr., of Henderson, North Carolina, then formed the Nash-Moore Mines, Inc. The Furnise shaft was unwatered, and the property was brought to the attention of the United States Bureau of Mines. Mr. M. E. Kline and Mr. H. C. Dech, Bureau officials of the Raleigh, North Carolina, division investigated the property. This investigation was continued by the Bureau by drilling seven diamond drill holes, five along the outcrop of the Furnise vein, and two near two smaller veins just south of the Furnise. These holes were drilled to intersect the vein at the 170 feet level. The drill hole logs indicate that the cores consisted chiefly of andesite flows and tuffs with a few bands of siliceous material which may have been rhyolite or silicified andesite. In drill hole No. 7, 250 feet southwest of the Furnise shaft, a four foot quartz vein was encountered which carried .03 per cent WO_3 and .2 ounces Ag. In drill hole No. 4, 460 feet northeast of the Furnise shaft, a 1.3 foot vein of quartz was encountered which contained .26 per cent WO_3 and .4 ounces Ag. In all other drill holes, quartz veins were not encountered above .6 inches wide, and no WO_3 was found. These results were disappointing, and the Bureau ceased operations at the Furnise in September 1948.

Samples taken from the 100 foot level of the Furnise Mine where the vein averaged two feet wide analyzed as high as 5.54 per cent WO_3, and contained approximately .2 ounces Ag. The best values were found along a two foot vein which was continuous for forty feet. At the end of the workings the vein widened to four feet, but the values in tungsten decreased to .26 per cent and no gold was found. At the 170 foot level the vein had been

drifted on for 240 feet. Little tungsten or gold was found at this level since most of the ore had been removed. (Fig. 4, in pocket)

The Furnice vein strikes N60E and dips 80 degrees northwest. Prospects pits expose small veins less than one foot wide intermittently in a southwesterly direction to the Phoenix Mine. Although the main vein at the Furnice Mine strikes N60E and the main vein at the Phoenix Mine strikes N62E, it is possible that these are local variations, and that both mines are on the same "lead." The vein is small and intermittent along this strike between the two mines, but at the Furr Mine located approximately midway between the two mines, the vein is reportedly 3.5 feet wide. The vein probably averages less than a foot in width along this strike. Five hundred and sixty feet northeast of the Furnice Mine prospect pits and drill holes 4 and 5 show the presence of a small vein approximately one foot wide.

Four hundred feet southeast of the Furnice Mine is another series of prospect pits which expose a vein with a strike parallel to the Furnice vein. At its widest point this vein is two feet wide. Analyses show poor values of tungsten.

The dumps of the Furnice Mine and surrounding properties all contain andesitic flows and tuff. The wall rock associated with the quartz vein itself is badly sheared. Most of the dump rock is an extremely fine grained andesite, parts of which may have been silicified.

Minerals on the dump include scheelite, chalcopyrite, bornite, pyrite, barite, siderite, calcite, and gold.

The Furr Mine

The Furr Mine is located 600 feet southeast of the Furnice Mine. It is in line with the shafts of the Phoenix Mine on the southeast and the Furnice Mine on the northeast. According to A. L. Koch, this shaft was

No photo in copy sent to DMEA

Plate 6 — Diamond drilling by the United States Bureau of Mines on the Charles Dry Property.

sunk to a depth of approximately seventy feet. The ore contains chalcopyrite and pyrite with fine particles of free gold which can be seen with a hand lense. The vein is reportedly 3.6 feet wide.

The Charles Dry Property

The Charles Dry Property is located three-eighths of a mile southeast of the Furnise Mine.

This property consists of a series of shallow prospect pits striking N60E parallel to the main Furnise vein, and extending in a southwesterly direction to the Copper Mine on the Phoenix property. On the northeastern end of the deposit near the Charles Dry homesite the vein changes direction and strikes N60W.

The most extensive work was done just west of the Charles Dry homesite. Here a series of prospect pits strike N60W and a shaft has been sunk on the northeast side. This may be the Orchard Mine. Emmons (1856, p. 178) stated that the Orchard Mine was located one-fourth mile east of the Phoenix Mine, that it carried chalcopyrite, and that it was not rich enough to work.

An investigation in early 1949 by Nash and Moore using a "Mineralight" disclosed numerous specks of scheelite in the soil just north of the Charles Dry homesite and east of the old Orchard Mine. Crosscuts were made and a new vein was discovered which strikes N60W parallel to the Orchard prospect pits. This vein is approximately two feet wide and contains numerous large crystals of scheelite in quartz.

In the fall of 1949 the Bureau of Mines investigated the Dry Property. Twenty-two bulldozer cuts were made perpendicular to the strike of the veins, and four diamond drill holes were put down.

No photo in copy sent to DMEA.

Plate 7 --- Three and one-half foot quartz vein exposed at southwestern border of the Charles Dry Property. Note the lenticular nature of the vein.

These bulldozer cuts exposed the vein striking N60E, intermittently, for a distance of 400 feet and the vein striking N60W, continuously, for a distance of 140 feet.

These exposures clearly show the lenticular nature of the veins. In one exposure near a small tributary of Flume Run Branch on the vein striking N60E, the vein is 3.5 feet wide. Bulldozer cuts show the vein gradually pinching out towards the southwest, and at a distance of less than 100 feet, it pinches out entirely. (Plate 7) In a northeasterly direction it becomes much smaller, and just north of the Orchard Mine it is again lost.

There are four veins exposed just north of the Dry homestite which strike approximately N60W. These veins, with the exception of the original vein discovered by Nash and Moore, are less than one foot wide. The large vein is continuous for 140 feet along its strike. It averages two feet in width. This vein contains unusually large crystals of scheelite found in pockets along its strike. Minor amounts of gold, chalcopyrite, pyrite, bornite, and specular hematite also occur in this vein. Drill hole No. 10 of the Bureau of Mines was drilled beneath this vein and was designed to intersect the vein at the 170 foot level. No mineralization was encountered. This is most unexpected in view of the strong continuity of the vein on the surface.

The large vein is cut by numerous low angle thrust faults. These are minor displacements generally less than a foot. The faults dip approximately 15 degrees southeast. The southwestern end of this vein has been cut off abruptly. Although the area around the fault was uncovered for ten feet in all directions, the faulted end was not found. Such evidence may indicate that there was considerable movement in this case. It may also explain the failure of the diamond drill holes to encounter mineralization below the veins if a similar thrust fault of considerable displacement has occurred at depth. Drill hole No. 10 was continued for sixty-five feet beyond the

The prospect pits indicate that the vein strikes N30W which is at an angle of approximately 70 degrees to the regional foliation. This mine is located in quartz diorite which is not foliated.

At the present time the shafts are caved and the vein is not visible. The dumps consist principally of quartz diorite.

Future of the District

The facts indicate that mining in this area at the present time (1950) would be unwarranted. The lenticular nature of the veins both in the horizontal and vertical dimensions, the narrow width of the veins, and the fact that the richer ore shoots occur in the narrower parts of the veins is discouraging.

The fact should not be overlooked, however, that these veins occur in an area of deep residual weathering, and that because of this the exact nature of the veins has not been determined. The diamond drill holes put down by the United States Bureau of Mines have shown the lenticular nature of the veins and their general thinness. It is quite possible though that this particular set of drill holes has shown the narrow parts of the veins, and that another set drilled in the area might encounter wider segments of the veins and present an entirely different picture. It is therefore possible that further exploration in this area, particularly in times when economic conditions favor the production of tungsten, might prove profitable.

Suggestions for Exploration

Further exploration for tungsten deposits in this area should be carried on in the outcrops of andesitic tuffs and flows near the quartz

diorite bodies or other igneous intrusives. No tungsten mineralization has been found in rock types other than the andesitic tuffs and flows. The tungsten bearing solutions are believed to have originated in the quartz diorite and/or the granite intrusives, and, in general, tungsten mineralization is not to be expected far from intrusive bodies.

Prospecting for scheelite should be done principally at night by examining quartz veins with a "Mineralight." Scheelite is difficult to identify in daylight, particularly where it is associated with siderite. At night, however, the two minerals are easily distinguished under ultraviolet light. The scheelite fluoresces a brilliant white and the siderite does not react.

In North Carolina the most favorable localities to search for the mineral would be along the western edge of the slate belt near the intrusive bodies, near Rockingham, North Carolina, where a small cupola intrudes the slates, and in the northeastern part of the slate belt where two tongue-like intrusive bodies contact the slates.

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Rcth 11/8/55

DME 4-3742

L O G

Underground Diamond Drill Hole No. 1

Furniss Mine

Cabarrus County, North Carolina

Began - 8/23/56, finished - 10/5/56

Collar - 245', S58.5°W from Furniss Shaft

Collar Elevation - Approximately 650'

Direction - S25°E, Horizontal

BX size core, 0 - 10', AX size core, 10 - 500'

Average core recovery, 80% (69 intervals)

0-500' -- Repetitious interstratified sequence of fine grained to megascopically felsitic, dark chloritic green to gray-black porphyritic flow (?) material (reportedly andesite), and slightly phyllitic fine grain to lapilli tuff.

Rare intervals of quartz vein material 3/4 to 6 inches thick, totaling 8 3/4 inches of core. Considerable intermittent post vein alteration superimposed on the above rock types.

Thin milky quartz fracture veins, rare pyrite-chalcopyrite mineralization. No visible scheelite in core.

(3/4" at 128', rare fine disseminated pyrite)
(6", 360-360.5', no mineralization, probably Nash Vein)
(1", with interstitial carbonate at 410', rare chalcopyrite)
(1" at 450.6', no mineralization)

Porphyritic felsite to felsite porphyry, feldspar phenocrysts 1 mm to 1 cm in length, irregular to rounded angular to perfect rectangular lathe shape in section. Separate intervals 1 inch to 19 feet in thickness, may represent individual flows or in some cases suggestive of poorly sorted lapilli tuff with the shape of the feldspar-quartz lapilli suggestive of a clastic origin.

Individual intervals are as follows:

(36-37') (41.5-48') (63.5-65') (69-72') (76-77.5) (86-89')
(99-100') (122-123') (125-126') (147-148') (165-166') (245.5-246.5')
(270-296) (303-305') (311-315') (322') (344-337') (361.5-380.5')
(390') (405-406') (436-449') (462.5-463.5') (464.5-466')
(471-471.5') (473.5') (475-479') (480.6-481') (486')
(490.6-493')

Intervals of fine grain poorly stratified tuff and poorly sized lapilli tuff. Lapilli oriented roughly parallel to tuffaceous bedding (65-75° to axis of core). Occasional unconformable relationships between layers were noted. Commonly associated with the tuff are phenocrysts or lapilli of angular to rounded, opalescent blue quartz 1 to 8 mm. in diameter. Some blue quartz is found in what was megascopically logged as felsite porphyry.

Individual intervals are as follows:
(138.5-142') (145-146') (151') (166-167') (170-220')
(342') (411-416') (419-421') (427) (497-500')

Thin post vein carbonate-epidote filled fractures with considerable adjacent wall alteration. Fractures orineted 0-45° to axis of the core. Minor disseminated pyrite in epidote and in adjacent wall rock. Epidote partially replaces feldspar phenocrysts in porphyritic material. Altered wall rock color leached reddish brown, to buff to white, softened, and with a marked increase in solubility.

Epidote veinlet zones at (33-35') (37') (39.5-40.5')

(42') (43') (90.5-93.5) (102') (108-109') (112') (120') (128.5')
(417-422.5')

Carbonate (ankerite?) veinlets at (88-90' parallel to core)

(249-250' ≠ jasper) (320' ≠ jasper) (1" at 338') (1/8" at 349.5')

Fine grain siliceous alteration (relative age unknown) usually light gray in color, contains extremely fine grain crystalline aggregates of amphibole and occasionally very fine foliated micaceous material.

Individual intervals at -- (18.5') (20-21') (48-60.5')

(72-74') (77-80') (222-234') (337.5') (338-361.5')

(381-381.5') (382') (392-393') (469.5-471') (490')

The two alteration types occasionally occur superimposed upon each other.

MME Form 7
(2/63)

OFFICIAL FILE COPY

Date	Surname	Code
2/18/69		110
		220

FEB 19 1969

Mr. J. Harold Nash
302 North Ridge Avenue
Kannapolis, North Carolina 28081

Re: DMEA-3742 (Tungsten)
Carolina Tungsten Mining Co.
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract Idm-E869

Dear Mr. Nash:

Thank you for your letter of February 13, 1969, enclosing your check in the amount of $3.00 to cover the cost of duplicating and mailing certain information on the subject contract.

In compliance with your request, copies of the following papers are enclosed:

Operator's Final Report

Log of Diamond Drill Hole No. 1

Map of Furniss Mine showing work completed under the subject contract.

Sincerely yours,

FRANK E. JOHNSON (gla)

Frank E. Johnson
Chief, Office of
Minerals Exploration

Enclosures

cc: Director's Reading File
Economic Geology File
OME docket
OME Reading File

FEJohnson/gla 2-18-69

Kannapolis City Schools

W. J. BULLOCK, SUPERINTENDENT

KANNAPOLIS, NORTH CAROLINA 28081

COPY
O. M. E.
RECEIVED
FEB 17 1969
INITIALS CODE
~~130~~
110

February 13, 1969

Mr. Frank E. Johnson
Chief, Office of Minerals Exploration
U. S. Department of Interior
Geological Survey
Washington, D. C. 20242

Re: DMEA-3742 (Tungsten)
Carolina Tungsten Mining Co.
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract Idm-E869

Dear Mr. Johnson:

Enclosed is my check for $3.00, payable to the U. S. Geological Survey. Please send copy of report requested.

Sincerely,

J. Harold Nash

J. Harold Nash
302 North Ridge Avenue
Kannapolis, N. C. 28081

JHN:bb

Enclosure

OFFICE OF MINERALS EXPLORATION
U.S. GEOLOGICAL SURVEY

FROM:

Budget and Finance **Office of Minerals Exploration**

- ABSTRACT OF REMITTANCES -

Date	Amount	Bank, City and State	Name of Remitter	Docket & Contract Numbers	Purpose
2/13/69	$3.00	Cabarrus Bk. & Trust Co. Kannapolis, N. C.	J. Harold Nash	DMEA 3742 E-869	Duplicating

REMARKS: (List smelter or mill lot numbers covered by royalties)

2/17/69
Date Prepared

C. Curtis
Person Preparing Abstract

Date Received

Person Receiving Remittance

OFFICIAL FILE COPY

Date	Surname	Code
2/6/69		110
		220
		110

FEB 6 1969

Mr. H. Harold Nash
302 North Ridge Avenue
Kannapolis, North Carolina 28081

Re: DMEA-3742 (Tungsten)
Carolina Tungsten Mining Company
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract Idm-E869

Dear Mr. Nash:

This is in reply to your letter of January 31, 1969, advising that you are still the owner of the property under the subject contract and requesting information on the property.

The Government has not prepared any reports on the property for publication. The Operator, however, forwarded a Final Report on the work completed under the contract, a copy of which with map and log of the 500-foot drill hole can be made available to you upon payment of the cost of duplicating and mailing. If you desire this information, please forward your check or Money Order to this office in the amount of $3.00, payable to the U. S. Geological Survey.

Sincerely yours,

FRANK E. JOHNSON (gla)

Frank E. Johnson
Chief, Office of
Minerals Exploration

cc: Director's Reading File
Economic Geology File
OME docket
OME Reading File

FEJohnson/gla 2-6-69

January 31, 1969

OFFICIAL COPY
O. M. E.
RECEIVED
FEB 3 1969

INITIALS	CODE
	110

90
OME

file under

U. S. Geological Survey

Washington, D. C.

Re: Docket No. DMEA-3742
Contract No. IDM-E-869
(Tungsten)

Gentlemen:

From 1954-1957, we had a property known as the Furniss Mine leased to the Carolina Tungsten Mining Company. This firm had a DMEA contract referred to above. We still own this property and would like to know if any formal reports by the government were compiled concerning this property which we may obtain for our information. We are particularly interested in obtaining a log of the 500 ft. underground core drill hole which was done as a part of the DMEA contract.

We would be appreciative of any data which you may be able to furnish us regarding this property.

Sincerely,

J. Harold Nash

J. Harold Nash
302 North Ridge Avenue
Kannapolis, North Carolina
28081

JHN:bb

C o p y
mg 1/23/58

OFFICIAL FILE COPY
DMEA
RECEIVED JAN 26 1958
DATE
1/27 C 220
1/27 800
WSM 400

January 23, 1958

Mr. Owen Kingman
Chief Geologist
Tennessee Copper Company
Ducktown, Tennessee

Dear Mr. Kingman:

We are not permitted to release to the public, or even to the Operator, the Government reports and maps prepared in connection with a DMEA project.

However, the Operator is at liberty to give any information he has on the results of the work, based on his own or his staff's observations. The Operator in the case of the Phoenix-Furniss mine was Carolina Tungsten Mining Company, c/o Mr. Paul Tyler, 5005 Edgemoor Lane, Bethesda 14, Maryland, and I suggest that you write him for any information which may be available.

Very truly yours,

Robert A. Laurence
Executive Officer
DMEA Field Team, Region V

RAL/mg
cc - Operating Committee (2)
Mr. Thor H. Kiilsgaard
Mr. V. J. Lynch
Files

TENNESSEE COPPER COMPANY

DIVISION

TENNESSEE CORPORATION

NEW YORK OFFICE -- 61 BROADWAY

COPPERHILL, TENN.

OFFICIAL FILE COPY
DMEA
LOGGED JAN 29 1958
DATE | INITIAL | NOTE

Mine Office,
Ducktown, Tenn.
Jan. 17, 1958.

Mr. R.A. Lawrence, Regional Geologist.,

Post Office Building,

Knoxville, Tennessee.

Dear Bob:

We have secured an option on the Phoenix prospect, Cabarrus County, North Carolina and intend to explore for possible extension of the known vein.

We understand some work has been done on this prospect under the auspices of the D.M.E.A.. If the results of this work are, or can be made available to the public, we would like very much to make use of them.

Sincerely,

Owen

Owen Kingman,
Chief Geologist.

OK;k

RECEIVED
JAN 20 1958
U. S. Geological Survey
Geologic Division
Knoxville, Tenn.

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
10-4	Holt	400
10-4	Martin	400
10-9	Chamber	800
10/10	Selfridge	2120
10/11	Johnson	110
"	Attendry	100
10/11	B	220
		400

Received 10-9
Duplicating machine overworked

OCT 11 1957

Carolina Tungsten Mining Company
5005 Edgemoor Lane
Bethesda 14, Maryland

Re: Docket No. DMEA 3742 - Tungsten
Phoenix and Furniss mines
Cabarrus County, North Carolina
Contract No. Idm-2869

Gentlemen:

This is with reference to the subject exploration contract between you and the Government.

It is not our intention to issue a certification of discovery or development which would create a lien against the subject property. We are, therefore, closing our books and records with respect to this project. Your attention is called, however, to the provisions of the contract which require the operator to keep and preserve certain records for the period indicated.

We regret that the exploration work performed did not result in a discovery or development. Your participation in the exploration program, however, is sincerely appreciated.

As requested in your application the following exhibits, which were attached to the application, are returned herewith:

1. Report of Investigations 4724, Bureau of Mines. Investigation of Furniss Tungsten Deposits in Cabarrus County, North Carolina. 1 printed copy.

2. Tungsten Deposits in Cabarrus County, North Carolina, by Robert S. Houston. A thesis submitted to the College of Agriculture and Engineering of the University of North Carolina, 1950. 1 bound typed copy.

Sincerely yours,

C. O. Mittendorf (for)

Administrator

SPHOLT:foc 10-4-57
cc to: Code 400
800
Admr. R. File
~~Supervx&Comm~~
FT. REG. V

Enclosures

R. W. Holliday, USBM
T. H. Kiilsgaard, USGS

8623

OFFICIAL FILE COPY

Date	Surname	Code
9-30	Holt	400
9-30	Martin	400
9/30	[illegible]	130
	Johnson	110
"	Matthews	100
10/1	B	220
		400

SEP 30 1957

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furniss mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

In your letter of September 23, 1957, returning two signed copies of the termination agreement to the above-cited contract, you noted that the justification was attached.

It is not our practice to send out for the Operator's inspection our justification for the action taken. Such justifications are intended strictly for inter-office use. In this case, by inadvertence, the justification remained with the copies of the agreement sent to you for signature by the Operator.

In the future, it will be appreciated if you will make sure to remove, before presentation to the Operator, any such justification that inadvertently might reach you attached to a contract, amendment, termination or other document.

Sincerely yours,

George C. Selfridge
(Agnes)
Chairman, Operating Committee

APPROVED:

Frank D. Lamb
(Agnes)
Member, Bureau of Mines

E. P. Williams
(Agnes)
Member, Geological Survey

SPHOLT:foc 9-30-57
cc to: Docket
Code 400
Admr. R. File
Oper. Comm.
FT. REG. V
Messrs. R. W. Holliday, USBM
T. H. Kiilsgaard, USGS

8623

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 13 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

WASHINGTON 25, D.C.

OFFICIAL FILE COPY DMEA RECEIVED SEP 25 1957		
DATE	INITIALS	CODE
9/26	B	220
9/26	WSM	400

September 23, 1957

Memorandum

To: Operating Committee, DMEA - Washington

From: Executive Officer, DMEA - Region V - Knoxville

Subject: Termination Agreement-Idm-E869, DMEA-3742
Carolina Tungsten Mining Co.

Transmitted are two signed copies of the subject termination agreement with justification attached.

The usual distribution of the other copies has been made.

zm.

Robert A. Laurence

Robert A. Laurence

IN REPLY REFER TO:

FILE COPY
DMEA
SEP 10 1957

DATE	INITIALS	CODE
9/10	G	220
	WSM	400

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

September 9, 1957
Re: DMEA 3742 Idm-E869
Carolina Tungsten Mining Co.
Furniss & Phoenix Mines
Cabarrus County, North Carolina
Tungsten

~~Memorandum~~

To: W. S. Martin, Defense Minerals Exploration Administration

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

Subject: Review of Field Team Final Report.

The contract, awarded September 12, 1955, authorized the expenditure of $26,400.00 on 450 feet of diamond drilling and 600 feet of drifting on a reputed tungsten-bearing gold vein on the 170 level of the oldtime Furniss mine.

The Furniss and nearby Phoenix mines, on the same ore structure, have been the sites of considerable investigative work by the U. S. Bureau of Mines and several independent operators since the mines ceased operations as gold mines in the late 1800's. Scheelite was noted in the dumps of the Phoenix mine in 1943 and tungsten minerals have been found in adjoining and nearby mines and prospects.

Following rehabilitation of the Furniss shaft, 122 feet of drifting was done on a thin continuous vein to the southwest of the Furniss shaft and 157 feet to the northeast, part of which was in vein matter. Additional work was done by the operator. Diamond drilling amounted to 500 feet (450 feet under contract) in one cross-cutting hole, drilled southeasterly from a crosscut in the southwest drift on the Furniss 170 level. Only low gold, silver, tungsten, and copper values were met with in the drifting. The contract work cost $14,087.50.

The long drill hole cut what is taken to be the Nash vein which shows as 6 inches of quartz, 360 feet in the footwall of the Furniss-Phoenix vein.

Work, especially sampling, by the operator in the Phoenix mine showed fairly strong continuity of low grade scheelite-sulfide mineralization along 235 feet of the 350-foot level, 210 feet of the 420-foot level, and 625 feet of the 520-foot level.

As no ore was found by the DMEA assisted work, the geologist examiner and Field Team recommend that no certification be made. I concur with the recommendation. In the opinion of the examiner, ... "The lack of success on the immediate contract is not believed to have decreased the potential of the area, but to point up the need for a broader geologic base on which to conduct an exploration program. This has been one of the few occasions in the past 50 years where major underground exposures of fresh rock have been available for extended study and sampling."

N. E. Nelson

N. E. Nelson

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
8-29	Holt	400
8-29	Martin	400
9-3	Chambers	800
9/4	[illegible]	130
"	Johnson	110
"	Whitendale	100
9/5	[illegible]	220
		400

SEP 5 1957

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furniss mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

In accordance with the recommendation of the Field Team of March 18 and August 19, 1957, and in consideration of Mr. Tyler's letter of May 21, 1957, and a subsequent conference with Mr. Tyler, enclosed are the original and four copies of a proposed termination agreement to the above-referenced contract, signed by the Administrator for the Government. Two extra copies are enclosed for the use of the Field Team.

If the terms and conditions of this proposed termination agreement are satisfactory to you and the Operator, all five copies should be signed by the Operator and the usual distribution made.

If any part of the proposed termination agreement does not have your approval or that of the Operator and cannot be altered within your delegated authority, the original and all copies are to be returned to this office, together with the proposed changes for consideration.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee

APPROVED:

A. D. McMahon (sig)
Member, Bureau of Mines

Thor H. Kiilsgaard (sig)
Member, Geological Survey

SPHOLT:foc 8-29-57
cc to: Docket
Code 400
Admr. R. File
Oper. Comm.
FT. REG. V
Messrs. R. W. Holliday, USBM
T. H. Kiilsgaard, USGS

Enclosures

8623

OFFICIAL FILE COPY
DMEA
RECEIVED AUG 30 1957

DATE	INITIALS	CODE
8/30	C	220
8/30	WSM	400
Memorandum		

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

Date August 30, 1957

DMEA Docket No. 3742
DMEA Contract No. Idm-E 869
Commodity Tungsten
Name of applicant Carolina Tungsten Mining Co.
Name of property Furniss & Phoenix Mines
Location of property Cabarrus County, N. C.
Estimated cost of project

To: W. S. Martin, Chief, Iron and Ferroalloys Division-DMEA
Through: Acting Chief, Branch of Ferrous Metals and Ferroalloys HR

From: R. W. Holliday, Commodity Specialist, Branch of Ferrous Metals and Ferroalloys

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

1. Date of subject document: 8-15-57 2. Date received by reviewer: 8-26-57

3. Prior reports on this property known to reviewer: Yes [ ] No [X]

4. Prior reports on nearby properties known to reviewer: Yes [ ] No [X]

5. Information available on past production: Yes [ ] No [X]

6. Other pertinent factors known to reviewer: Yes [ ] No [X]

7. Explain items marked yes above:

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

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

10. Remarks: (Use back of page if necessary)
I agree with the Field Team that no certification should be issued.

R W Holliday
R. W. Holliday

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 1 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

OFFICIAL FILE COPY
DMEA
RECEIVED AUG 19 1957

DATE		
8/20	G	220
8/21	JB	130
"	JEJ	110
		130 JB
		220
26	Com	100
28	WSM	400

AUG 19 1957

Memorandum

Reviewed by
DMEA OPERATING COMMITTEE
8-23-57
(date)

To: Operating Committee, DMEA - Washington

From: DMEA Field Team, Region V - Knoxville, Tennessee

Subject: Final Report, DMEA-3742, Idm-E869(tungsten)
Carolina Tungsten Mining Co.
Furniss & Phoenix Mines, Cabarrus County, N.C.

Enclosed are the original and two copies of the subject report.

The work done under this contract demonstrated rather clearly that there is almost no possibility of a significant tonnage of gold-tungsten ore on this property. The lack of any parallel veins, as shown by the drill hole was the final blow to any remaining hope of discovery.

We agree that certification should not be issued. There is also no justification for pseudo-certification, and we recommend that the termination agreement be rewritten, eliminating the pseudo-certification clause.

For your information, there is attached one copy of a letter from the assistant State Geologist to the Operator.

Robert A. Laurence
Robert A. Laurence,
Executive Officer, DMEA
Region V

V. J. Lynch
V. J. Lynch, Member
Bureau of Mines

30 December 1955

Paul M. Tyler
5005 Edgemoor La.
Bethesda, Maryland

Dear Mr. Tyler

I have just returned from the Phoenix mine where Mr. Bergman from Bob Lawerence's office and I spent the past two days making an inspection of the underground workings. Since water will soon cover the lower levels we thought it advisable to get as much information as time allowed. Several things were noted. Some are of academic interest only, others may have a bearing of your plans for future exploration. At any rate I thought I would pass along our observations and speculations to you for what they might be worth.

It is quite obvious that the Phoenix vein occupies a zone of fracture which is persistent both along strike and down dip. The wall rock is highly jointed and many of the tension fractures indicate the possibility of a southwestward plunge of the major structure. This is substantiated somewhat by a pronounced set of slickenside surfaces within and along the vein which dip at from 40° to 60° toward the southwest. These surfaces are found in all levels of the mine. The strike of the main fracture zone is relatively constant although there are local variations and offsets. There are indications that there has been more than one period of movement and mineralization.

While the vein is very strong in some places it is difficult to follow in others. A few minor structures and more especially an apparent overlapping of quartz bodies promote the possibility of an echelon arrangement within the vein system. Northeast of the Phoenix shaft most of the vein exposed consists of a single unit although there is an occasional second mineralized zone paralleling the main unit. Toward the southwest and especially southwest of the Pump shaft, the rocks appear to have been more highly fractured, and although the main unit is still quite persistent in most instances, two or more parallel zones are common. In this part of the mine a considerable amount of wall rock has been incorporated in the vein structure. Mineralized veinlets filling cross fractures occur at many places. At no place could major cross veins be detected as is indicated on the surface maps. Tension fractures cutting across the trend of the vein are often filled with vein material, but these are not expected to be persistent.

The vein proper is from three feet to less than 2 inches in width and probably averages from 12 to 15 inches. Locally the mineralization is erratic but for the mine as a whole it is quite persistent. Most of the mineralization is concentrated in cracks and fractures along the outer limits of the vein, although some of the minerals are disseminated throughout. The wall rock is mineralized locally but in most cases is barren. It is not possible to determine whether or not the ore "shoots" make definite patterns.

Of course your problem is largely one of finding sufficient ore reserves to justify the erection of a mill, and much of the above information is of little direct aid to you. However the persistence of the Phoenix vein regardless of its width is of major importance since it and the somewhat parallel Copper vein to the south increase the possibilities of other parallel structures between the two. It appears to me that the economic future of the area may well depend upon the presence of such structures. I cannot see any reason to expect the tungsten mineralization to increase appreciably along strike of the Phoenix vein, but of course it is possible. Since you are to explore the Furniss shaft you will be in a position to determine whether or not it does. The several apparent cross veins exposed at the surface might in some cases represent cross-fracture fillings between two major planes of movement. If this is true they would not be expected to be very persistent along strike. In your horizontal drilling at the Furniss I am hoping that you will encounter additional veins paralleling in general the Phoenix vein. If you are successful I suggest that you consider drilling a few horizontal holes in the Phoenix mine, both northeast and southwest of the Pump shaft.

I have no idea as to DMEA's reaction to such an effort, but I cannot help but believe that your program would not be rounded out without an attempt at exploration in this direction. I also would not recommend such work if results of your present sampling program are not favorable. It should take some time before the water rises to any great height in the Phoenix mine, and occasional pumping with your present equipment would keep the water below the 320 level. In the meanwhile you could carry out your horizontal drilling at the Furniss as rapidly as pratical, and the results of the sampling will be ~~known~~. back from the assayer before you have to make any decisions

The above ramblings are merely in the form of ideas and suggestions from a "belabored State Employee" and I trust you will take them as such. If I can be of any service in the future I shall be glad aid where possible.

Best regards

Sam D. Broadhurst

UNITED STATES

DEPARTMENT OF THE INTERIOR

DEFENSE MINERALS EXPLORATION ADMINISTRATION

FIELD TEAM FINAL REPORT, REGION V

OFFICIAL FILE COPY
DMEA
RECEIVED 1957

DATE		CODE
		130
		220

On

DMEA-3742, Idm-E869, FURNISS MINE (Tungsten)
Cabarrus County, North Carolina

It's Final Report

By

S. C. Bergman, Geologist
U. S. Geological Survey

August 15, 1957

Reviewed by
DMEA OPERATING COMMITTEE
8-23-57
(date)

FINAL REPORT

DMEA-3742, FURNISS MINE
Contract Idm-E869 (Tungsten)
Cabbrus County, North Carolina

Operator: Carolina Tungsten Mining Company, a partnership composed of
Paul M. Tyler and Hal Lackey, individuals, and
The Franconia Trading Company, Inc.
5005 Edgemoor Lane, Bethesda 14, Maryland

SUMMARY

A total of 279 feet of drift was completed under the contract, following the strike of thin vein structures exposed in the existing headings on the 170-foot level of the Furniss Mine. Continuous vein structure was followed for 122 feet to the southwest, but the average vein thickness (10 inches) and grade (0.074 % WO_3) of vein samples is poor in regard to mining potential. The conditions found in this vein segment are believed to be representative of the Furniss vein as a whole. The contract work to the northeast followed a thin (1-4 inch thick) vein with little visible mineralization for a distance of about 80 feet before losing it in a complex crosscutting post-vein fault system. Although the drift was extended a total of 157 feet to the northeast, only thin fragments of the vein structure were subsequently found.

A 500-foot horizontal diamond drill hole oriented in a S. 25° E. direction was completed from a point 247 feet southwest of the shaft station. Only a few inches of quartz vein material was intercepted with no tungsten mineralization indicated. The results of the drilling indicate that locally, the development of vein structures is poor and that the possibility of mining-width structures occurring in the existant environment is practically nil.

Under the contract, a total of 25 samples were cut and assayed for tungsten, gold, silver, and copper. Some additional sampling and assaying was done at the Operator's own expense, mostly for mill investigations.

A total of 93 feet of drift and crosscut was driven at the Operator's own expense. About 40 feet of strike length drift was driven on the 100-foot level, and 53 feet of crosscut driven on the 170-foot level. Most of this work is shown on the report map. The contract was terminated short of completion, after the results of the drilling and drifting indicated that an adequate evaluation of the vein potential had been made. As a result of this work, no certification of discovery can be recommended. A small continuous block of sub-economic tungsten, gold, silver, copper, barite mineralization can be outlined in the Phoenix Mine, but not as a result of DMEA participation.

INTRODUCTION

Location and Access

The Furniss shaft is 4.0 airline miles S. 67° E. of the intersection of U. S. Highway 601 and State Highway 49, which is immediately southeast of Concord, Cabarrus County, North Carolina. The site can be reached by following a good paved secondary road 2.9 miles east from Faggert's Crossroads at U. S. Highway 601, thence south on a dirt farm road about one-fourth mile to the mine. The Phoenix shafts which appear to be on the same vein system, are located 1845 feet S. 54° W. of the Furniss shaft. Both shafts can be reached by car in almost any weather.

Previous Exploration and Development

The Phoenix-Furniss vein system was worked for its gold content an unknown number of years prior to 1856, at which time, the Phoenix Mine had been developed to a depth of 140 feet. During this period, development at the Furniss consisted of trenching along the vein outcrop to recover free gold from the partly disintergrated zone of oxidation, to depths of not more than 20 feet. Operations were sustained at the Phoenix Mine by Adolph Thies and others until the late 1880's.

The Miami Mining Company reopened and operated the Phoenix Mine from 1900 to 1906, during which time, the Furniss shaft was sunk and levels driven. Gold ore from the Furniss Mine and development on the 520- and 600-foot levels of the Phoenix sustained the company mill until its shutdown in 1906. Total production from this vein system up to this time has been estimated to be roughly $400,000 or more in gold.

In the 1930's, during a period of renewed interest in gold mining, the Furr shaft was sunk on the Furniss vein, to a depth of 70 feet and from which, an unknown amount of drift was driven. It is located 445 feet southwest of the present Furniss shaft.

At least two exploration or development efforts have taken place on the Copper vein, which is a fracture occurrence similar and roughly parallel to the Phoenix-Furniss system. The Copper shaft is 1825 feet due south of the Phoenix shaft, and is reportedly 150 feet deep with a total of 234 feet of drift driven from the shaft. Another shaft is located 2290 feet northeast of the Copper shaft and about 2170 feet southeast of the Furniss shaft. Nothing is known of the depth or extent of these later workings, except that a Bureau of Mines drill hole intercepted 4 feet of old workings at a depth of 150 feet below the surface and 25 feet west of the shaft.

The occurrence of scheelite in the area was first reported by Genth in Mecklenburg County in 1859, and subsequently in the Phoenix dumps by N. D. Raman and E. A. Brown of the U. S. Geological Survey in March of 1943, during southeastern tungsten investigations, by W. A. Beck in examination of the nearby Cline mine in April 1946, and by D. W. Lemmon of the U. S. Geological Survey in May of 1948. The list of underground quartz-vein developments in Cabarrus County from which scheelite and in a few cases cuproscheelite and wolframite have been reported, include: The Whitney, Cline (Cruze), Dixie Queen, Phoenix-Furniss, Copper, Bangle, Cosby, Cullen, Flowe, California, and Junction. In 1946, a partnership composed of Mr. A. L. Nash and J. I. Moore conducted exploration by means of trenching in the vicinity of the Furniss and Nash veins. The partner-

ship also unwatered and gained access to two levels of the Furniss mine. This led to investigations by the U. S. Bureau of Mines, who sampled the Furniss drifts for gold, silver, copper, and WO_3, and drilled eight angle diamond drill holes in the vicinity of the Furniss and Nash veins, totaling 1,022 feet of drilling. Four additional angle diamond drill holes totaling 764.5 feet were drilled at the Copper vein. In addition to the drilling, 2884 linear feet of trench was bulldozed, and an additional 271 linear feet of trench dug by hand. This work was done between August 11, 1948 and April 10, 1950. The results of this exploration were published in Bureau of Mines' Report of Investigations 4724 by J. O. Jones and A. L. Peyton.

An application for assistance in rehabilitation and exploration of the Furniss underground (Docket No. DMEA-2663) was submitted in March of 1952 by The Nash Mining Company, Inc. This application was subsequently denied. Russell and Company, a partnership composed of Messrs. Paul Tyler and Hal Lackey, began renewed exploration efforts at the Phoenix and Furniss mines in January of 1955. The collars of the main Phoenix shaft as well as the nearby Pump shaft were cleared of debris and dewatering of the Phoenix mine began. The collar of the Furniss shaft was also cleared and rehabilitation work started. The interests of Russell & Company were transferred to the Carolina Tungsten Mining Company and an application for exploration assistance submitted to Defense Minerals Exploration Administration in January of 1955. An examination of DMEA-3742 was conducted on May 10, 1955, at which time, the Furniss mine was not accessible and entry could be gained only to the 150-foot level

of the Phoenix mine. Based on the available information, a staged exploration program was proposed at the Furniss mine consisting of shaft rehabilitation, 300 feet of exploration drift followed by three 150-foot horizontal crosscutting diamond drill holes. An additional 300 feet of drift and/or crosscut was suggested as Stage II, dependent on the results of Stage I drifting and drilling. Fifty vein and/or core samples were recommended for each work stage as needed. An exploration contract was set up as of September 12, 1955. It provided for 600 feet of drifting from the 170-foot level of the Furniss mine, to extend the existing headings 300 feet each way along the vein structure. In addition to the drifting, three 150-foot horizontal, crosscutting diamond drill holes, and 80 sample analyses were provided for as needed.

Summary of Work Completed

Although the contract was set up on September 12, 1955, actual drifting did not begin until February 12, 1956 due to unforeseen difficulties in gaining access and rehabilitation of the Furniss shaft and drifts.

On October 26, 1955, a team consisting of W. A. Beck and A. L. Peyton of the Bureau of Mines and S. C. Bergman of the Geological Survey, as well as all partners in The Carolina Tungsten Mining Company, examined the then accessible levels of the Phoenix mine down below the 520-foot level, to see whether extensive sampling of the mine would be justified. Fairly strong continuity of scheelite-sulfide mineralization was established along 235 feet of the 350-foot level, 210 feet of the 420-foot level, and 625 feet of the 520-foot level. Two bulk samples,

10 feet long and 30 inches wide (minimum mining width) were taken at widely separated points on the 520-foot level and at locations which all parties agreed were representative as to megascopic grade and vein thickness. The samples were analyzed by the Bureau of Mines, Southern Experiment Station at Tuscaloosa, Alabama. The samples which included more barren wall rock than vein material assayed 0.17 % and 0.18 % WO_3, 0.42 % and 0.21 % Cu, 0.04 and 0.06 oz gold/ton respectively. A grab sample of what was considered to be representative vein material assayed 0.47% WO_3, 1.06% Cu, and 0.28 oz. gold/ton. Although a small continuous body of well mineralized vein material can be defined, nowhere in the mine does the vein structure reach minimum mining thickness, and in the opinion of the examiners should be considered sub-economic.

Upon learning that the pumps were being pulled from the mine, a second examination was made on December 27-28, 1955, in order to record as much of the mappable geology as possible before it was again lost. Mr. Sam Broadhurst, Assistant State Geologist, accompanied the author during this examination. His comments on the geology of the mine as well as the results of the hurried mapping accompany this report.

On or about February 6, 1956, the Operator started the contract drifting on the 170-foot level in the northeast heading at a point 74 feet northeast of the station at the shaft crosscut (see map). About the same time, a crosscut was driven 15 feet into the footwall from a point 58 feet northeast of the shaft station, and the Operator was slabbing the walls and taking up floor in the existing southwest drift to provide suitable access for the new contract drifting. All this preliminary

work was at the Operator's own expense. Contract drifting did not start in the southwest heading until early May 1956.

Total contract drift driven in the northeast heading is 157 feet, broken down roughly in the following increments; 72 feet N. 46° E., 24 feet N. 77° E., 19 feet S. 79° E., and 42 feet N. 55° E. At the Operator's own expense, an additional 6 feet of crosscut was driven southeast from a point 189 feet northeast of the shaft station, and 13 additional feet of crosscut from the 15-foot crosscut noted above.

A total of 122 feet of contract drift was driven on thin, continuous vein, in a roughly S. 55° W. direction from a point 170 feet southwest of the shaft station. At a point 247 feet southwest of the shaft station a 19-foot crosscut was driven southwest into the footwall for a drill station. An amendment dated August 15, 1956, allowed the consolidation of all contract drilling into a single horizontal hole not to exceed 500 feet in length.[1] The hole was collared in a S. 25° E. direction with an elevation of +1°. Drilling started on or about August 23, 1956, and was completed shortly before the last inspection of October 5, 1956. All drilling was done with AX size equipment and was contracted by the Pennsylvania Drilling Company. The Operator had a 30-foot horizontal hole drilled in the hangingwall from a point opposite the position and direction of the contract hole, as well as one 25-foot long into the footwall from the crosscut at the 189 foot point northeast. Both short holes were at the Operator's expense and did not cut any vein structure or mineralization.

[1] For log see pages 27 and 28.

About 40 feet of drifting and some raising was done by the Operator at his own expense, to the southwest on the 100-foot level under a pre-existing stope in locally rich scheelite-bearing vein material.

The Operator has reported 9 channel samples taken of the vein in the southwest contract drift at intervals of 0 feet (3 samples), 15 feet, 35 feet, 55 feet, 100 feet, 112 feet, and 120 feet from the starting point. Only one sample was taken in the northeast contract area since not much in the way of vein is present (see map). Ten muck and dump samples were reported, both from the northeast and southwest contract areas as well as composite samples. The samples were assayed by the Colorado Assaying Company with one channel sample split and double-checked by the Bruce Williams Laboratories. All assays fell within rather close limits. Channel samples out of the southwest drift averaged 0.074 % WO_3, 0.075 oz.gold/ton, 0.196 oz. silver/ton and no reported copper for a vein averaging 9.5 inches in thickness. Muck and dump samples averaged 0.055% WO_3, 0.058 oz. gold/ton, 0.733 oz. silver/ton and no reported copper. The one channel sample out of the northeast drift assayed no tungsten, 0.08 oz. gold/ton, 1.05 oz. silver/ton and 0.20% copper.

The project was unofficially terminated and work ceased on or about October 5, 1956, when a review of the results of the drifting and drilling completed, indicated that further exploration work at the Furniss mine would not be justified. Termination was held in abeyance for a considerable period of time while the Operator considered the

possibility of requesting an amendment to convert some of the remaining funds into long hole crosscut drilling from the underground levels of the Phoenix mine. Termination papers were finally drawn as a result of the Operator's inability to participate further in the project, the effective date being November 26, 1956. To date, the Operator has not signed the termination papers.

GEOLOGY

General Geologic Setting

The Phoenix-Furniss veins occur as a fracture system in a series of steeply dipping northeast-southwest trending, volcanic tuffs, lapilli tuff, and pyroclastic breccias which is considered to be of early Paleozoic age. The area is near the northwest boundary of the so-called Slate Belt, "Monroe Slates", or in Virginia, the "Virgilina Greenstone", and is one of four general, metamorphic, gold-bearing belts of the southeastern Piedmont, described by Pardee and Park in U. S. Geological Professional Paper 213, 1948 (pp. 10-16). The particular belt extends from southern Virginia to east-central Georgia and is generally bounded on the southeast by a crystalline complex and overlying Triassic and Coastal Plain sediments and on the northwest by an intrusive complex of granites and quartz diorites of variable composition, and textures, reflecting a somewhat extended and complex intrusive history.

A remarkable number of copper-gold quartz vein prospects and mines are localized along or near the poorly defined northwest boundary of the so-called Slate Belt in North Carolina, occurring mostly in the volcanics and extending for a distance of almost 90 miles southwest of

High Point, North Carolina, through Randolph, Davidson, Rowan, Cabarrus, Mecklenburg, and Union Counties almost to the South Carolina State line. The area has gone through an extended depositional history, subsequent isoclinal folding and imbricate faulting, extensive and complex intrusion, at least two recognizable stages of quartz or quartz-sulfide mineralization, and subsequent but related extensive hydrothermal alteration and faulting of the country rock. The area has been peneplaned, moderately dissected, and residually weathered locally to depths of 16 to 63 feet.

Local Rock Types

Bedded Volcanics

In the Phoenix-Furniss mine area, the rocks are locally metamorphosed and hydrothermally altered, but are generally of low metamorphic rank. There is practically no noticeable secondary foliation, lineation, or slaty cleavage developed except near the margins of the vein structures or along strong fault zones. The rocks are tightly folded and imbricately faulted in the bedding plane, producing a rather uniform strike and dip for such a complexly disturbed area. The strike of indicated bedding varies from N.47° to 64° E. while the dips vary from 60 to 80° NW.

Results of underground mapping and crosscut underground drilling indicate a sequence of thin- to thick-bedded, fine grained, dark chloritic green to gray-black tuff and minor lapilli tuff (roughly 13%). The tuffs show rare to occasional crossbedding, graded bedding, and disconformable beds. Characteristic of the tuffs is the poor size sorting of the individual grains. The tuffs appear to consist predominately of a now altered aggregate of feldspar, quartz, amphibole chlorite and minor oxides.

Approximately 20% of the drill core consists of interstratified intervals, 1 inch to 19 feet in thickness, which contain subangular to lath-shaped feldspar (plagioclase) crystals 1 mm to 1 cm. in length, in a tuffaceous fine-grained matrix as described above. Megascopically, these intervals look like porphyritic flow material, but as seen under a binocular microscope the poor shape sorting of the feldspars, the clastic nature of the matrix, and the lack of any definitive flow structures suggests a pyroclastic origin. Commonly associated with the coarser tuffaceous material are intervals containing minor subangular to subrounded grains of opalescent blue quartz 1 to 8 mm in diameter. Although on an areal basis, flow material has been described or reported, it is believed that the immediate area is underlain by rocks of pyroclastic origin, deposited for the most part subaerially, rather than in water as has been generally suggested in other reports. Only very minor layers cut by the drill core show any evidence of shallow water reworking.

Alteration phenomena of a variety of types and periods have been superimposed on the above described rock type, either in thin zones along the vein structures or in thin to massive zones across the structures. Without reference or access to unweathered material, and with the superposition of deep residual weathering, recognition of the original rock is extremely difficult, if not sometimes impossible at the surface. Some of the alteration types not only soften the original rock, but greatly increase its solubility, thus greatly decreasing its resistance to weathering. A number of different rock types have been mapped in the area by various investigators which the author feels may be only

alteration phases of the original tuffaceous sediments. About $1\frac{1}{2}$ miles northwest of the Furniss mine is a fairly large artifical exposure of coarse, poorly sorted pyroclastic tuff and breccia about 25 feet thick, bedded between fine grained tuffs megascopically identical to the sequence in the Furniss mine area. Individual breccia fragments range from less than 1 mm to more than one foot in diameter. This particular pyroclastic unit is cut by a number of granite dikes and contains considerable sulfide mineralization (contact metamorphic). The unit is generally radioactive and isolated specimens contain as much as 0.1% eU.

Intrusives

Contrary to reports by the Operator and other investigators, no intrusive material could be defined in the mine area, expect for a number of thin aphanitic diabase (?) sills and/or dikes of reported late Triassic age. Identification of this rock is mostly from extrapolation of identifications from nearby areas in the Slate Belt where the dikes are commonly found cutting both the Slate Belt and Triassic sediments. A six inch thick dike was mapped at the southwest end of the 350-foot level in the Phoenix mine, adjacent and parallel to the vein, in a post-vein shear zone. This was the only dike mapped in place, but dike material was found on the dumps at both the Phoenix and Furniss mines.

Reported granite dikes, exposed by recent bulldozing in the area between the Phoenix and Furniss mines, are believed to be weathered secondary alteration phases of the tuff now reduced by weathering to a homogeneous, white clayey material. In a number of surface exposures, the material grades into massive epidote, thence into normal tuffaceous

material, and does not have the characteristic rubbly texture (residual interstitial quartz) of known granitic exposures in the area.

A geologic map of the area by R. S. Houston, submitted as part of a Master's thesis (University of North Carolina, 1949) shows extensive areas of quartz diorite and gabbro in the area immediately north and northwest of the mine area. Traverses along the road cuts supposedly crossing this intrusive area could not define anything except typical weathered and altered tuffaceous sediments common to the mine area.

About one and one-half miles northwest of the mine area are exposures of a medium grained calc-alkalic biotite granite in the form of multiple northwest-southeast trending dikes, 5 to 25 or more feet thick. The granite is more or less equigranular, contains about 20% interstitial quartz, and has a comparatively high Na:K feldspar ratio. Noticeable accessary minerals include about 3% biotite and minor amphibole. Epidote is a fairly common alteration mineral.

Geologic Structure

The area has been subjected to a long complex and repetitious deformational history starting in the Ordovician (?), reaching a climax in late Paleozoic time, and extending intermittently through the Triassic period.

In the Phoenix-Furniss area, the tuffaceous sediments have undergone tight isoclinal folding and imbricate faulting long before the development of Appalachian stresses. Faulting, probably contemporaneous with early Appalachian stresses, has resulted in the local mineralized

host structures. Pardee and Park (1948) point out that Appalachian stresses, from the east and/or southeast tended to be relieved by rotation of the crustal blocks producing shear zones trending northeast-southwest and tension fractures trending in a westerly direction. This is essentially the condition found in the Phoenix-Furniss area and at a number of other prospects in the immediate area. The stresses which produced these structures was accompanied by either contemporaneous or sequentially related igneous activity, which provided the mineralizing physico-chemical environment reflected by the present quartz-barite-sulfide veins.

The vein structures are of a variety of types, dependent on the local competence of the country rock. The main structures are bedding plane tear faults, striking N. 47-64° E. and dipping 60-80° NW Local minor undulations and rotation by minor post-vein crossfaulting has resulted in local deviations from these orientations. In the mine area, are numerous tension fractures oriented east-west and dipping 60-70° to the north, tapering outward from the vein margins from a few inches to 30 feet or more into the country rock. Almost all of these secondary fractures are located on the hangingwall or northwest margin of the vein structure. Occasional fracture blocks of country rock occur within the veins, whose shape and orientation indicate that they have been developed by the same couple that developed the tension fractures. Occasional isolated quartz-filled tension fractures outcrop intermediate between known northeast-trending veins. Common to much of the vein structure is a sheeted fracture system, consisting of many closely

spaced parallel vein-filled fractures (1/16th-$\frac{1}{2}$ inch thick) parallel to the vein structure which are predominantly elongate lenses extending from a few inches to several feet outward from the vein margins. Again, these structures are developed predominantly on the hangingwall of the vein and are especially well developed in the southwest drift of the Furniss mine. Some mineralization has been noted in most all of these sheeted zones and they appear to carry the bulk of the total values in thin zones near or at the main vein margins.

Joint fractures of a wide variety of orientations are arrayed across the vein structures. The surfaces generally are slickensided, but show no indications of displacement. Directions of movements indicated on adjacent joint surfaces are commonly anomalous to each other. This condition suggests that most of the joints were developed as a result of relief from strong compressive stresses at some period post-dating the development of the vein structures. One set of slickensides found parallel and adjacent to the vein margins is consistant in orientation throughout the Phoenix-Furniss mine and outcrop area. Its straie have an indicated plunge of from 40 to 60° southwest which is normal to the plane of the marginal tension fracturing. This suggests that they may be related to the original fault structure. The combination of effects indicates that the hangingwall of any one vein structure has been displaced to the northeast relative to the footwall with an indicated plunge along the direction of movement of from 40 to 60° southwest. The veins themselves are essentially tabular and have good strike continuity where the tension and sheeted fractures are well

developed. This appears to be indicative of a more brittle (and economically desirable) condition of fracture. Portions of the veins are elongate lenses either overlapping en echelon essentially in the same plane, or discrete en echelon structures, suggesting short increments of differential movement over a thick sequence of bedded material. A measurement of overlapping structures in the Furniss mine, suggests a general shortening of any given strike interval of roughly 30% by fault displacement. This estimate of displacement should hold approximately true for the fault structure in general.

A series of north-northwest trending high angle, strike-slip faults has been mapped in both the Phoenix and Furniss mines. These structures cut and displace the main vein structures and appear to localize most of the secondary hydrothermal mineralization and alteration. In adjacent areas similar fault series reportedly localize Triassic diabase dikes. The presence of mineralization and alteration which is considered to be subsequent but related to the main epoch of mineralization suggests that these faults may be related to stresses occurring late in the main period of mineralization. Displacements along any one fault are in relatively small increments of a few inches to several feet, generally to the northwest along the northeast side of any one fault. Where these faults are in sequence and in various orientations, as in the northeast drift of the Furniss mine, the included blocks appear to have been rotated to some extent, resulting in an anomalous displacement of the vein structure. Although displacements are small, the high frequence of such structures indicated by the underground mapping makes

the strike projection of any single vein structure rather doubtful. The alignment of structures over distances of 1,000 feet or more is likely to be coincidence. A series of strong intersecting rotational faults of a later age than those described above has been mapped at the shaft station on the 170-foot level of the Furniss mine. These relatively open fissures are draining considerable quantities of water into the drift. The blocks of ground included between faults have been rotated from 45 to 80° apparently clockwise out of their normal position.

A map submitted by the Operator, as part of the application, has an interpretation of vein structure based on long projections of isolated vein outcrop plotted to the nearest minute of angle, which results in the acute convergence of continuous vein material, interpolated and extrapolated over distances of as much as one-fourth to one-half mile. A careful plotting of vein outcrop coupled with the mine mapping, indicates a subparallel, en echelon arrangement of the vein with no evidence of vein convergence, except as represented by the marginal tensional fracturing. Individual segments of vein outcrop show as much as 18° variation in strike, and almost as much variation can be mapped locally in the mine drifts.

Mineralization

Vein mineralization is probably contemporaneous with and a resultant of late Paleozoic igneous activity, which is related to Appalachian tectonics. The veins represent a mineralogical sequence which appears to have begun by the introduction of barite, carbonates of

the ankerite series, probably strontianite, and minor quartz, dilating and partially absorbing the thinly sheeted margins of the fault zones. Accompanying the above material in fine crystal stringers is pyrite, chalcopyrite, scheelite, reported galena, and minor other primary sulfides, as well as gold and silver. The sulfides and scheelite have crystalized in or along the margins of the thin sheeted country rock or relics of it. The gold and silver are mineralogically bound in the sulfides as indicated by the high proportion of the gross values recoverable only by chlorination. Thies, in the 1880's reported 90 to 95% of the gold being recovered by chlorination, of which about 43% was bound in the sulfides.

Later in the sequence of events, was the massive introduction of relatively barren quartz which was deposited in the main fractures commonly forming a relatively distinct core with thin mineralized margins ($\frac{1}{2}$-6 inches thick), composed of the previously introduced barite-ankerite-sulfide material described above. The massive quartz varies in thickness from mere stringers to lens-like bodies with thicknesses up to 4 feet thick. Occasionally, instead of being more or less symmetrically zoned, the quartz is interlayered with the sheeted wall rock. It is probable that the introduction of the quartz remobilized part of the already crystalized ore and gangue material, with the result that relatively minor, discontinuous areas within the massive quartz contain coarsely crystalline dolomite, barite, pyrite, chalcopyrite, scheelite, specularite, siderite, and free gold and silver, in decreasing order of abundance. These minerals occur more or less randomly dis-

seminated either singly or in aggregates in the quartz. Although these areas contain the most impressive ore and gangue minerals, they have little mining potential, because of a limited and discontinuous nature as well as a seemingly erratic distribution without any known structural identity.

The thin barite-ankerite-sulfide zones usually carry good ore-grade material and exhibit the only longitudinal continuity in the Phoenix-Furniss area, but nowhere in the area are these zones known to reach minable thickness. Only locally, where supplemented by values in the massive quartz, is a combination of mining grade and thickness attained. The barite-ankerite-sulfide zones do not seem to be as well developed in the Furniss mine as in the Phoenix mine. This is reflected by the much lower vein assays from the Furniss mine as well as comparative megascopic and ultraviolet lamp traverses of the veins by the examiners in both mines.

The scheelite in the barite-ankerite-sulfide zones is so finely granular and light colored as to be megascopically indistinguishable from the matrix, except with short wave ultraviolet light. The fluorescence of this occurrence is a brilliant white. In the massive quartz, the scheelite is a coarsely crystalline aggregate with individual crystals up to two inches across and with a variation in color from a pale orange (10 YR 8/2) in the fresh exposure to a light brown (5 YR 5/6) on the outcrop. The fluorescence of this material varies from a brilliant white to a distinct light pinkish color, and in the weathered scheelite, the fluorescence is distinctly dulled.

The significance of this difference was not explained by two spectrographic analysis of scheelite of contrasting colors of fluorescence. Both specimens were free of molybdenium and comparative in every respect including 0.5% strontium in each specimen. The presence of this much strontium in megascopically clean specimens of scheelite, is the basis for the belief that considerable strontium is associated with the barite, probably in the form of strontianite. The only other mineral fluorescence noted was isolated patches of an unexplained weak light green color in coarsely crystalline specimens of barite, which also had a short residual luminescence of the same color.

Sulfide mineralization of uncertain genetic relationship is found uniformly disseminated in the country rock near the vein margin and in discontinuous zones from a few inches to as much as 10 feet thick. These zones have been cut principally in the footwall crosscuts of the Furniss mine, both in megascopically unaltered rock and in thoroughly altered material of post-vein origin, Where secondary carbonate-epidote alteration was cut in the drilling, associated sulfides are fairly common. The secondary (?) sulfides range from less than 1% of volume of the country rock to a maximum of about 3% and appear to consist primarily of pyrite with minor chalcopyrite. There appears to be very little in the way of gold or silver values and no tungsten. Scheelite appears to be completely confined to the primary vein material.

In the early days of gold mining activity, the vein outcrop of the Phoenix-Furniss system was thoroughly trenched to depths of not more than 20 feet to recover free gold from the zone of weathering, where the sulfides had been completely oxidized and the vein partly disintegrated.

Although this zone has been largely removed, secondary minerals resulting from the deep weathering are still in evidence to some extent. Minerals reported or observed include; limonite, red hematite, azurite, malachite, chrysocolla, and chalcocite.

Alteration Phenomena

Rock alteration in the Phoenix-Furniss mine area is of both dynamic and hydrothermal origin and represents periods of activity contemporaneous with and postdating the ore mineralization.

The primary alteration effect subsequent to the induration and deformation of the tuffs is a general chloritization of the somewhat basic rock type which has imparted a dark gray-green to blue-green color to the rock. It is probably a result of decomposition of the original amphibole and/or pyroxene, but by what agent is not known. A local alteration contemporaneous with the vein mineralization, has thoroughly altered the margins of the vein from a fraction of an inch to more than a foot outward, grading into normal country rock. The rock has been bleached to a light yellow-gray (5y 7/2). Most original textures and structures have been obliterated and it is now a microscopically fine grained aggregate of clay minerals, and minor quartz, carbonate, and chlorite.

Superimposed discontinuously along the vein structure and along minor fractures and contemporaneous with the late stages of vein mineralization is a finely recrystalline silicification. This has produced a hard dense rock with a fine saccharoidal texture, which still retains to some degree the original textures and structures. Normally

the rock is a dark gray to black, but occasionally thin seams are a light gray with fine disseminated crystalline aggregates of what appears to be amphibole which may be a reconstitution of original constituents.

A strong alteration phase has been superimposed across the vein structure mainly along the north-northwest trending post-vein faulting, secondarily along the vein structure and in random (?) fracture veinlets. The alteration has produced several effects which include carbonate veinlets occupying the north-northwest shears with accompanying color and compositional alteration of the wall rock, thin fracture veinlets to broad bands of massive epidote and minor coarse amphibole as much as 10 feet thick with or without accompanying wall rock alteration. This phase is accompanied by disseminated barren sulfide mineralization in the wall rock. The wall alteration accompanying the carbonate (ankerite) veining has reduced the rock to a soft light buff aggregate of clay minerals and carbonate. The epidotization has generally altered the feldspar lapilli from a slight color leach to complete replacement by epidote while it has reduced areas of the country rock to a hard flinty buff to reddish rock with most of the original textures completely destroyed. Most of the massive epidote forms dike-like bodies which trend in a north-northwest direction replacing large quantities of country rock and completely obliterating any trace of the original fractures. The epidote grades into normal country rock through the above described alteration but it also occurs in sharply defined veins and veinlets with no trace of wall alteration. The post-vein occurrence of this alteration is clearly shown by veinlets

of carbonate and epidote which cut the main vein structure and along fractures which have displaced the main vein structure.

All deformation and alteration previously described, has not produced any foliated rocks of any consequence in the Phoenix-Furniss area, in spite of almost universal referral in the literature to schistose country rock. Only a slight phyllitic texture has developed near the vein structure in the Phoenix mine. The only micaceous development noted was in the Phoenix mine, in one case along a one to two inch thick shear zone on the margin of the previously described diabase dike. A true, fine-grained biotite-sericite schist has locally developed probably as a result of the shearing stresses. At several places in the altered zone adjacent to the vein structure are small areas rich in fine grained sericite and not particularly well foliated, developed as a result of hydrothermal soaking. No micaceous development of any kind was noted at the Furniss mine. Although the over-all metamorphic grade is low, it is distinctly higher at the Phoenix than at the Furniss mine. This may have a direct relationship to the difference in grade of mineralization which is distinctly higher at the Phoenix mine.

CONCLUSIONS AND RECOMMENDATIONS

A lengthy final report has been written on this contract because of what is considered to be a good potential mineralized area where very little detailed study of the environment has been made and geologic map coverage is poor. The lack of success on the immediate contract is not believed to have decreased the potential of the area, but to point up

the need for a broader geologic base on which to conduct an exploration program. This has been one of the few occasions in the past 50 years where major underground exposures of fresh rock have been available for extended study and sampling.

The results of exploration at the Furniss mine have been almost completely negative except for the basic geologic information gained. The crosscut drilling indicates a low frequency distribution of fractures of the right age, which reflects a moderate intensity of fracturing. The drifting and mapping clearly indicate a weak structural development and the sampling, a deficiency of ore mineralization. The results of mapping and sampling in the Phoenix mine indicate a substantially better environment, better fracture development, slightly higher indicated metamorphic grade, and substantially higher grade mineralization. Even though more favorable in every respect, the Phoenix mine material is still considered by the author to be sub-economic under today's conditions.

The work completed at the Furniss nine cannot be considered certifiable, because a completely negative evaluation of the economic potential could be made even though only part of the work had been completed. From mapping and sampling in the Phoenix mine, a small block of sub-economic gold, copper, tungsten, and possibly barite mineralization can be outlined to the southwest of the old gold stopes. Although the Phoenix is included in the contract area, what mineralization is present was certainly not outlined through DMEA efforts, and is considered by the author to be non-certifiable.

EXPENDITURES

(a)	Total Approved	$26,400.00
(b)	Total Cost of Project	14,087.50
(c)	Government's Share of Cost	10,565.62
(d)	Government's Share Unexpended	9,234.38
(e)	Value of Production	None
(f)	Royalty Paid Todate	None

August 15, 1957

Sheldon C.Bergman, Geologist
U. S. Geological Survey

BIBLIOGRAPHY

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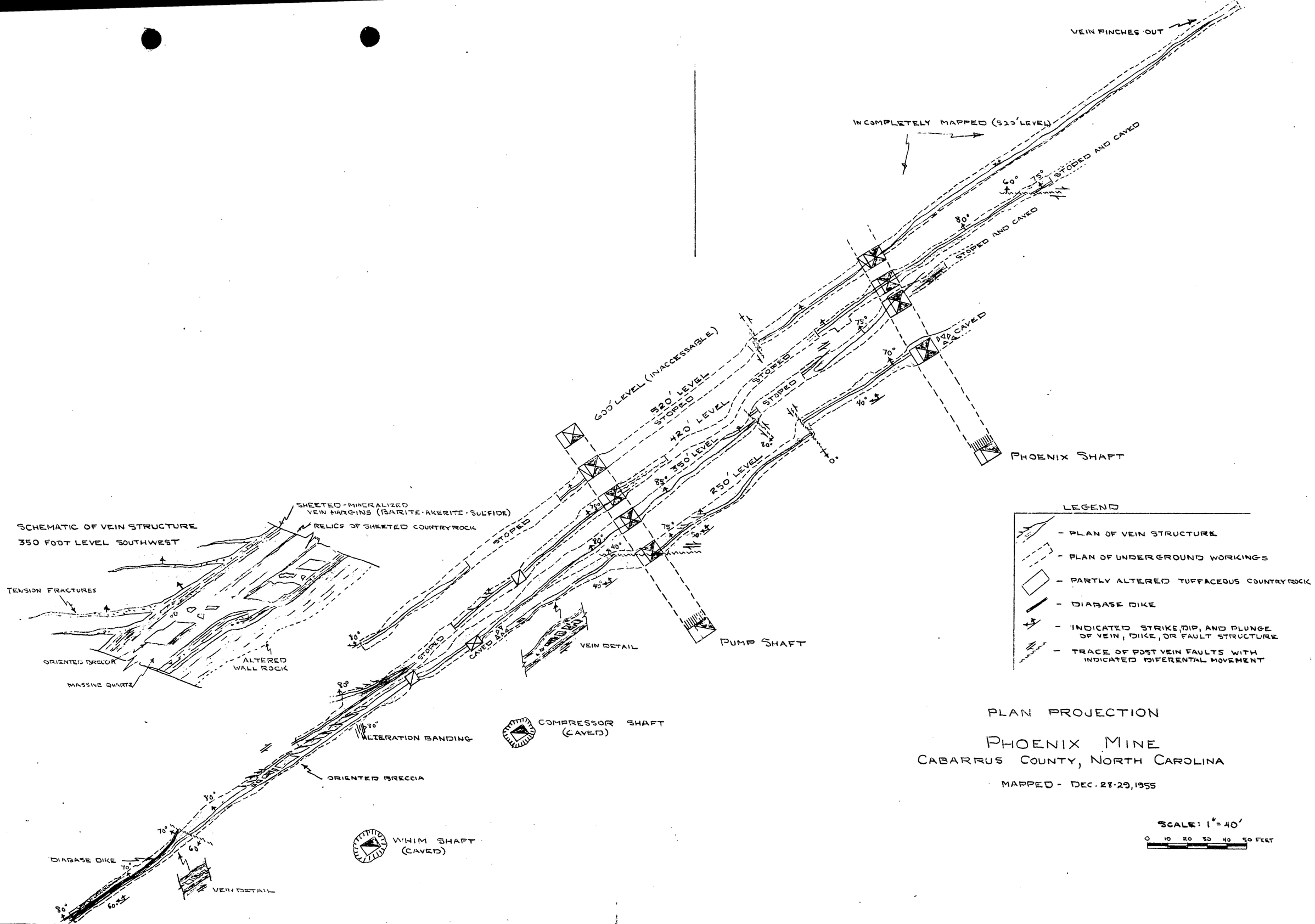
*Not seen by author.



PLAN PROJECTION

PHOENIX MINE

CABARRUS COUNTY, NORTH CAROLINA

MAPPED - DEC. 28-29, 1955

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
8-15	Holt	400
8-15	Martin	400
		140

August 15, 1957

MEMORANDUM

To: Associate Solicitor, Division of Mineral Resources

From: Division of Iron and Ferro-Alloys, DMEA

Subject: Preparation of Termination Agreement
Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Attached is a rough draft of a proposed Termination Agreement for the above-captioned contract for your use in preparing it in final form.

W. S. MARTIN

W. S. Martin, Director
Division of Iron and Ferro-Alloys

Attachment

8623

TERMINATION AGREEMENT

It is agreed this _____day of _____, 1957, between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government" and Carolina Tungsten Mining Company, a partnership, hereinafter called the "Operator", parties to that certain Exploration Project Contract No. Idm-E869, Docket No. DMEA 3742, dated September 12, 1955, hereinafter called the "Contract", that:

1. Effective November 9, 1956, the Contract and all obligations of the parties thereunder, except as otherwise herein expressly provided, shall be and are hereby terminated.

2. The Government shall contribute only to the fixed unit costs of work performed prior to said effective date. Any work or operations prosecuted or costs incurred by the Operator beginning with said effective date, except as otherwise provided in this termination agreement, shall be for the sole account of the Operator without contribution by the Government.

3. The Operator shall promptly perform all winding up and settlement actions provided for in the contract, including the rendering of the final report and final account.

4. The Operator hereby releases and agrees to save the Government harmless from all claims or demands under or arising out of said Contract, except as otherwise provided for in this termination agreement.

5. All rights of the Government provided for in the Contract with respect to certification of discovery or development, percentage royalty and liens for its payment, records, audits and recovery of any overpayment, are preserved.

IN WITNESS WHEREOF, these parties have executed this agreement as

of the day and year first above written.

THE UNITED STATES OF AMERICA

By_____
Administrator, Defense Minerals
Exploration Administration

CAROLINA TUNGSTEN MINING COMPANY

By_____

TITLE_____

CAROLINA TUNGSTEN MINING COMPANY
DOCKET NO. DMEA 3742
Contract No. Idm-E869

JUSTIFICATION FOR TERMINATION AGREEMENT

A proposed termination agreement, forwarded to the Field Team on May 6, 1957, for signature by the Operator, if satisfactory to the Field Team and the Operator, was returned unsigned with a letter dated May 20, 1957, stating the Operator's reasons for not signing, chiefly objection to the "pseudo-certification" clause, with the consequent Government lien on possible future production from the property.

Comprehensive review of all data available in this office indicates that, although showings on surface gave promise that deposits of tungsten ore might be found by exploration in the quarter mile interval between the Phoenix and Furniss shafts, neither the small amount of tungsten ore discovered in the 122 feet of new drift driven southwesterly on the 170-foot level of the Furniss mine, nor the tungsten showings disclosed in the 157 feet of new drifting northeasterly from the same shaft are sufficient to justify any insistance on inclusion of a "pseudo-certification" clause.

In view of the Operator's refusal to sign an agreement containing such a clause and because the probability of mining sufficient tungsten ore from the property during the 10 year royalty repayment period is too small to justify policing a certification, a revised termination agreement without the "pseudo" clause has been prepared.

Fold.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 1313 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

OFFICIAL FILE COPY
DMEA
RECEIVED MAY 23 1957

DATE	INITIALS	CODE
5/23	C	220
		130
5/23	WSM	400

, May 21, 1957

Memorandum

To: Operating Committee, DMEA - Washington

From: DMEA Field Team, Region V - Knoxville, Tennessee

Subject: Termination Agreement - DMEA-3742, Idm-E869-Tungsten Carolina Tungsten Mining Co. Furniss Mine, Cabarrus County, N. C.

Enclosed is the original and two copies of a letter from Mr. Paul M. Tyler, and the original and seven copies of the termination agreement for the subject contract returned unsigned. Mr. Tyler's objection to the Termination Agreement is clearly stated in his letter.

V. J. Lynch

V. J. Lynch, Acting
Executive Officer, DMEA
Region V

Helmuth Wedow, Jr.

Helmuth Wedow, Jr.
Geologist, U. S. Geological Survey

Government's Copy

Long
Dempsey
"Appd. Sol. Off."
Holt
Martin
Champeny
Selfridge
Johnson

TERMINATION AGREEMENT

It is agreed this 6th day of May, 1957, between the United States of America, acting through the Department of the Interior, Defense Minerals Exploration Administration, hereinafter called the "Government" and Carolina Tungsten Mining Company, a partnership, hereinafter called the "Operator," parties to that certain Exploration Project Contract No. Idm-E869, Docket No. DMEA-3742, dated September 12, 1955, hereinafter called the "Contract," that:

not used

1. Effective NOV 9 1956, the Contract and all obligations of the parties thereunder, except as otherwise herein expressly provided, shall be and are hereby terminated.

2. The Government shall contribute only to the fixed unit costs of work performed prior to said effective date. Any work or operations prosecuted or costs incurred by the Operator beginning with said effective date, except as otherwise provided in this termination agreement, shall be for the sole account of the Operator without contribution by the Government.

3. The Operator shall promptly perform all winding up and settlement actions provided for in the Contract, including the rendering of the final report and final account. All rights of the Government under the Contract with respect to records, audits, and all rights with respect to recovery of overpayment are preserved.

4. The Operator, as principal if the Operator is the producer or as surety if the Operator is not the producer, shall pay to the Government the royalty on production provided for in the Contract, in the same manner and amount, for the same period, and subject to the same conditions as if a certification of discovery or development had been made, such certification being hereby waived.

5. The Operator hereby releases and agrees to save the Government harmless from all claims or demands under or arising out of said Contract, except as otherwise provided in this termination agreement.

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

THE UNITED STATES OF AMERICA

By O. Mitchendorf
Administrator, Defense Minerals Exploration Administration

CAROLINA TUNGSTEN MINING COMPANY

By _____

Title _____

PROCESS METALLURGY
EXAMINATIONS

PAUL M. TYLER
REGISTERED PROFESSIONAL
MINING ENGINEER & METALLURGIST
WASHINGTON 14, D. C.

RESIDENCE:
5005 EDGEMOOR LA.
BETHESDA 14, MD.

OFFICIAL FILE COPY
DMEA ECONOMIC SURVEYS
WASHINGTON REPRESENTATION
RECEIVED MAY 23 1957

DATE	INITIALS	CODE

May 20, 1957

Mr. Robert A. Laurence
Executive Officer
DMEA, Region V.
Post Office Building
Knoxville 2, Tennessee

Re: DMEA-3742-Tungsten
Idm - E869
Furniss-Phoenix Mine
Cabarrus Co., N. C.

Dear Bob:

I am returning the enclosed original and 5 copies of the proposed termination agreement in respect to the contract with Carolina Tungsten Mining Company--unsigned.

Please forgive my delay in attending to this matter but I have been out of town and it was not until this evening that I was able to contact my partner, Hal Lackey.

Mr. Lackey agrees with me that item 4 of the proposed termination agreement is not in harmony with our original contract. Inasmuch as no economic orebody was found or indicated by the work performed under the contract, there should be no liens of any sort against the property or properties and neither the owners or ourselves should be held accountable to pay royalty in even that some luckier operator should find ore and get into production. This is an unfair proposal which was not foreseen at the time the contract was signed. It might even be comstrued to apply to possible commercial production from the Phoenix Mine as the Government insisted that we obtain the Owners' Consent on that property even though no contract work was perfommed except on the Furniss property.

I shall be glad to sign a new agreement identical with this draft after elinination of Item 4.

Sincerely yours,

Paul M. Tyler

On behalf of Carolina Tungsten Mining Co

RECEIVED
MAY 21 1957
U. [illegible]
[illegible]

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
5/14	Talbert	800
5/14	C	220
5/15	WSM	400

MAY 14 1957

Mr. Robert A. Laurence
Executive Officer
DMEA Field Team, Region V
Room 14, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA-3742 (Tungsten)
Carolina Tungsten Mining Company
Furnise Mine
Cabarrus County, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

Enclosed are the original and two copies of a Report of Review prepared in accordance with the request contained in your memorandum of May 9, 1957.

If you concur with the facts stated in this report, normal distribution should be made. Otherwise, all copies should be returned to this Division.

Sincerely yours,

(Signed) E. D. Talbert

E. D. Talbert, Acting Chief
Contract Administration
and Audit Division

Enclosure

EDTalbert/wb
May 14, 1957

Copy to: Docket
Admr. Reading File
Mrs. Helen R. Miller
Mr. Chambers

8623

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
5-3-	Holt	400
5-3	Martin	400
5-6	Chambers	800
5/6	Selfridge	130
"	Johnson	~~110~~
"	Rutledge	~~180~~
		~~110~~
		~~100~~
5/1	C	220

400

MAY - 6 1957

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Postoffice Building
Knoxville 2, Tennessee

Re: Docket No. DMEA 3742 - ~~Tungsten~~
Carolina Tungsten Mining Company
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

The Field Team's recommendation of March 18, 1957, on the subject project has been reviewed and the details have been discussed with Mr. Paul Tyler. Enclosed are the original and five copies of a proposed termination agreement to the above referenced contract, signed by the Administrator for the Government. Two extra copies are enclosed for the use of the Field Team.

If the terms and conditions of this proposed termination agreement are satisfactory to you and the Operator, all six copies should be signed by the Operator and the usual distribution made.

If any part of the proposed termination agreement does not have your approval or that of the Operator and cannot be altered within your delegated authority, the original and all copies are to be returned to this office, together with the proposed changes for consideration.

Under Item 1 of the proposed termination agreement the effective date has been left blank. A suitable date, agreeable to you and the Operator, should be inserted when the agreement is signed by the Operator.

Sincerely yours,

George C. Selfridge (By ...)
Chairman, Operating Committee

APPROVED:

Frank D. Lamb (By ...)
Member, Bureau of Mines

N. E. Nelson (By ...)
Member, Geological Survey

SPHolt:am 5-3-57
cc to: Docket
Code 400
Admr. Read. File
Oper. Comm.
FT REG V
Messrs. R. W. Holliday, USBM
T. H. Kiilsgaard, USGS

Enclosure

8623

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
4-23	Holt	400
4-23	Martin	400
		130
		110
		100

April 23, 1957

MEMORANDUM

To: Administrator, DMEA

From: Iron and Ferro-Alloys Division, DMEA

Subject: General Summary of Contract and Results Obtained
Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Operator: Carolina Tungsten Mining Company, a partnership comprising Paul M. Tyler and Hal Lackey, individuals, and Franconia Trading Company, Incorporated. Address, 5005 Edgemoor Lane, Bethesda 14, Maryland.

Operator's Property Rights:

The Operator controls, by assignment of a Lease-Option Agreement by the lessee, Russell and Company, 1741 DeSale Street, Washington 6, D. C., the mineral rights on two tracts of land, known as the Furniss mine, containing 74.5 and 137. acres, total 211.5 acres, located in Cabarrus County, North Carolina, owned by Robie L. Nash, his wife Ethel A. Nash, and Archie L. Nash, and his wife Mary L. Nash, address, 913 South Main Street, Kannopolis, North Carolina; also, by assignment of lease by the sub-lessee, Russell and Company, address above, the mineral rights on one tract of land, known as the Phoenix mine, containing approximately 188 acres, located in Cabarrus County, North Carolina, owned by Helen Evelyn Chapin Bishop, Ruby Chapin Pitner, and Lowell M. Chapin, Trustees of the Estate of Charles A. Chapin, address, c/o Albert Wetten and Company, 141 West Jackson Boulevard, Chicago 4, Illinois, and leased to A. L. Nash, 913 South Main Street, Kannopolis, North Carolina.

Contract: (a) Executed September 12, 1955 (Short Form, MF-200A).

(b) Work to be commenced on or before December 30, 1955, and to be completed on or before June 30, 1956.

8623

Contract: (c) Work authorized:

Fixed Unit Costs

Drift 600 feet @ $37.50/ft.	$22,500.00	
Diamond drill, 4 holes, aggregate total length 500 feet, @ $7.00/ft.	3,500.00	
Assay 80 samples for WO_3 and Au, @ $5.00/spl.	400.00	
Estimated Total Cost of the Contract		$26,400.00
Government Participation @ 75 percent		$19,800.00

Amendment No. 1, executed Feburary 16, 1956, extended the date of commencement of the work from December 30, 1955, to March 1, 1956, and the date of completion of the work from June 30, 1956, to August 31, 1956.

Amendment No. 2, executed August 15, 1956, changed the work authorized to permit all the diamond drilling authorized to be done in one hole, extending southeasterly from the southwest drift on the Furniss 170 level. The amendment also further extended the time for completion of the work from August 31, 1956, to December 31, 1956.

(d) Work completed:

Fixed Unit Costs

Drifting, 279 feet @ $37.50/ft.	$10,462.50*	
Diamond drilling, 500 feet @ $7.00/ft.	3,500.00*	
Assaying, 25 samples for WO_3 and Au, @ $5.00/spl.	125.00*	
Estimated Total Cost of the Project		$14,087.50*
Government Participation @ 75 percent		$10,565.62*

* Subject to final audit.

Work under the contract was started February 7, 1956, and was stopped, short of completion, in October 1956.

Audits: The Final audit, or review in lieu thereof, has not yet been received. It is expected to be completed within a short time.

Reports: The Operator's Final Report, dated November 1, 1956, was received by the Field Team on or before November 9, 1956, and in this office on November 13, 1956. The Final Report of the Field Team is in preparation.

Past Production:

The Furniss mine was operated intermittently until 1906 as a gold mine. Total production is not known, but it is estimated

from the examination of underground workings that not more than 1,000 tons of ore were extracted. There is no report that any tungsten was recovered. It is reported that the Phoenix mine was being worked long before the Civil War, and that there was a fairly substantial production of gold under several managements until the late 1880's. Records of tonnage and grade of gold ore mined are not available.

Present Production:

During the course of operations under the contract, about 200 tons of material, averaging 0.05 ounces Au, 0.81 ounces Ag, 0.024 percent WO_3 and 1.26 percent $BaSO_4$, were mined and stock-piled from the Furniss mine. There has been no recent production from the Phoenix mine.

Certification: Certification of discovery or development is not recommended by this Division, but please see comments below.

Comments: The project consisted of work on the Furniss mine tract of land to explore for tungsten, which occurs as scheelite in quartz veins in greenstone and andesite. Although the lands of the Phoenix mine tract are included in the contract, no work in the Phoenix was provided under the contract, and no work was done on that property.

Work done under the contract did not result in the discovery of presently minable reserves of tungsten ore. However, because of the favorable, though not commercial, showing of mineralization in the southwest drift of the Furniss 170-foot level, the fact that the objective of this drift was not reached, and the fact that no exploration was done on the Phoenix mine property, this Division recommends that the contract be terminated by a mutual termination agreement embodying a "pseudo certification" clause to protect the rights of the Government.

W. S. Martin

W. S. Martin, Chief
Iron and Ferro-Alloys Division

SPHolt:am
cc to: Docket
Code 400
Admr. Read. File
Oper. Comm.

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
4-23	Holt	400
4-23	Martin	400
		140
		140

April 23, 1957

MEMORANDUM

To: Associate Solicitor, Division of Mineral Resources

From: Iron and Ferro-Alloys Division, DMEA

Subject: Preparation of Termination Agreement
Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Transmitted herewith is a rough draft of a proposed Termination Agreement for the above captioned contract for your use in preparing it in final form.

W. S. Martin

W. S. Martin, Chief
Iron and Ferro-Alloys Division

Attachment

SPHolt:am
cc to: Docket
Code 400

RECEIVED
APR 24 1957
ASSOC. SOLICITOR
MINERAL RESOURCES

8623

Mr. Martin -

W30

1 - Hold until March 31st.

2 - Call Paul Tyler. Called - S.P.H.

3 - Probably terminate.

FEJohnson

Letter not sent
S.P.H.

OFFICIAL FILE COPY

Date	Surname	Code
3/25	Holt	400
3/25	Martin	400
		130
		110
		100
		220

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Postoffice Building
Knoxville 2, Tennessee

Re: Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furnies Mines
Cabarrus Counties, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

This will acknowledge receipt of your reply of March 18, 1957, to our request of March 14 for your Final Report and recommendations on certification of the subject contract.

As you will recall, when this contract was being prepared estimates differed as to probability that the project work would result in the discovery of significant tonnage of tungsten ore. Consequently, we would prefer not to terminate the contract until the Operator has had every reasonable opportunity to satisfy himself that more work would not be advisable.

However, we do not want to postpone termination indefinitely, and would appreciate your prompt advice as soon as Mr. Tyler notifies you whether or not he wishes to request further work under the contract.

Sincerely yours,

Chairman, Operating Committee

APPROVED:

SPHolt:am 3-25-57
cc to: Docket
Code 400
Admr. Read. File
Oper. Comm.
FT REG V
Messrs. R. W. Holliday, USBM
T. H. Kiilsgaard, USGS

Member, Bureau of Mines

Member, Geological Survey

8623

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

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Postoffice Building
Knoxville 2, Tennessee

Re: Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furniss Mines
Cabarrus Counties, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

This will acknowledge receipt of your reply of March 18, 1957, to our request of March 14 for your Final Report and recommendations on certification of the subject contract.

As you will recall, when this contract was being prepared estimates differed as to probability that the project work would result in the discovery of significant tonnage of tungsten ore. Consequently, we would prefer not to terminate the contract until the Operator has had every reasonable opportunity to satisfy himself that more work would not be advisable.

However, we do not want to postpone termination indefinitely, and would appreciate your prompt advice as soon as Mr. Tyler notifies you whether or not he wishes to request further work under the contract.

Sincerely yours,

Chairman, Operating Committee

APPROVED:

Member, Bureau of Mines

Member, Geological Survey

2

Gross Value, @ $55.00 per unit of WO_3
35.00 " oz. of Au

= .87 x $55.00 $47.85 WO_3

+ .11 x 35.00 $3.85 Au

Total gross value per ton of dilute ore = $41.70

Total Value = 427 tons, @ $41.70/ton = $17,805.90

Total royalty to be expected from this @ 5% = $890.29

Docket 3742

N.S.B.M. R.I. 4724, Fig. 4

Spl. No.	Length	WO_3 % Assay	L x A
15	11'	0.62	6.82
16	24'	2.03	48.72
17	6'	5.54	33.24
	41	2.17	88.78

~~Weighted~~ Average

Width 1.0 Length 41'

Height, average - 5-0' to assumed ground line

$41 \times 5.0 \times 1 / 12 = 171$ tons

If 2.5' stoping width is assumed, tonnage will be $2.5 \times 171 = 427$ tons and grade will be

$$\frac{2.1}{2.5} = 0.87\% \ WO_3$$

Gold Assay

No.	Length	Au, oz.	L x A
15	11	0.28	3.08
16	24	0.34	8.16
17	6	0.09	0.54
	41	0.273	11.78

If 2.5 stoping width be assumed as above, the gold assay will be 0.11 oz. Au

55036
13884
41,452

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 1025 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

MAR 20 1957

DATE	INITIALS	CODE
3/20	C	220
		225

March 18, 1957

Memorandum

To: Operating Committee, DMEA - Washington

From: DMEA Field Team, Region V - Knoxville, Tenn.

Subject: DMEA-3742, Idm-E869-Tungsten. Carolina Tungsten Co. Phoenix and Furniss Mines, Cabarrus County, N.C.

Reference is made to your letter of March 14, 1957.

We have been delaying preparation of a final report until some definite word was received from Mr. Tyler about his plans for a revised program for additional work.

In a letter which we received last week, Mr. Tyler states "The appropriate reply to your letter of March 6th is probably we are washed up in our efforts to resume work on the Phoenix property, and that consequently our DMEA contract should be terminated." He goes on to request that we delay a decision until March 31, as he is seeking financial aid from another party. We see no reason for such a delay, as he has no definite program for work at the Phoenix mine, and the work at the Furniss mine clearly indicates that no more work should be done there.

Therefore, we request permission to terminate by mutual consent, effective November 9,1956. Certification will not be recommended. The field examiners have completed the geologic map for the final report, and we will forward the report as soon as it is completed.

Robert A. Laurence

Robert A. Laurence, Executive Officer
DMEA Field Team, Region V

V. J. Lynch

V. J. Lynch, Member
Bureau of Mines

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 1, POST OFFICE BLDG.
KNOXVILLE 2, TENNESSEE

MAR 20 1957

DATE	INITIALS	CODE

March 18,1957

Mr. Paul M. Tyler
5005 Edgemoore Lane
Bethesda 14, Maryland

Re: DMEA-3742, Idm-E869-tungsten
Carolina Tungsten Mining Co.
Phoenix-Furniss Mines
Cabarrus County, N.C.

Dear Paul,

Based upon the contents of your letter of March 9, we have decided to recommend termination of the Furniss-Phoenix project. Accordingly, we have written to the Washington office, requesting permission to terminate the contract, effective November 9, 1956. There does not appear to be any sound reason for continuing work under the contract, even though the full amount of the contract has not been spent.

If additional work in the area turns up sufficient evidence at the Phoenix or any of the other mines or prospects in the vicinity to justify further exploration, a new application may be submitted.

I share your regrets that the project was not the success we hoped for. It was a pleasure to be associated with you on this job.

Sincerely yours,

Robert A. Laurence
Executive Officer, DMEA
Region V -

RAL/zm
Opr. Com-3
Lynch
Files

A Form 7
12-56)

OFFICIAL FILE COPY

Date	Surname	Code
3/12	Holt	400
3/12	Martin	400
3/13	Selfridge	130
"	Johnson	110
"	Whitenbeck	100
3/14	C	220

225

MAR 14 1957

Mr. Robert A. Laurence, Executive Officer
DMRA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMRA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

This will acknowledge receipt of copies of your letter of March 6, 1957, asking Mr. Paul M. Tyler about his plans for termination of the subject contract.

The Operator's Final Report for the same project was forwarded by your office on November 9, 1956, but we have not yet received the Final Report of the Field Team.

Your prompt advice will be appreciated as to when the Field Team's report may be expected, also your recommendation regarding certification.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee (JHB)

APPROVED:

P. F. Yopes (JHB)
Member, Bureau of Mines

Thor H. Kiilsgaard (JHB)
Member, Geological Survey

SPHOLT:foc 3/12/57
cc to: Docket
Code 400
Admr. Read. File
Oper. Comm.
FT. REG. V
Messrs. R. W. Holliday, USBM
T. H. Kiilsgaard, USGS

8623

Operating Com.

ORIGINAL FILE COPY
DMEA

RECEIVED
MAR 8 1957

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UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.
KNOXVILLE 2, TENNESSEE

March 6, 1957

Mr. Paul M. Tyler
5004 Edgemoor Lane
Bethesda 14, Maryland

Re: DMEA-3742, Idm-1869-Tungsten
Carolina Tungsten Mining Co.
Furniss & Phoenix Mines
Cabarrus County, N.C.

Dear Paul:

We have been holding further action on this contract in abeyance, as requested in your letter of December 8, 1956. However, three months have passed and we have not received your proposal for work at the Phoenix mine.

I have recently been told, although I have not verified it, that Carolina Tungsten Mining Company has surrendered its lease on the Phoenix mine. If this is true, then there is no reason for further delay in preparing a termination agreement for the exploration contract.

If you still have a proposal for additional work, please let me have it as soon as possible so that we may give it full consideration.

Sincerely yours,

Robert A. Laurence
Executive Officer, DMEA
Region V

RAL/sm
cc
Lynch
Opr. Com
Shirley
Files

CWS

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D.C.
ROOM 8 FDCC BLDG
KNOXVILLE 2, TENN.

RECEIVED DEC 14 1956 D.M.E.A.

December 12, 1956

Memorandum

To: Operating Committee, DMEA, Washington, D. C.

From: Field Team, DMEA, Region V, Knoxville, Tennessee

Subject: DMEA-3742, Idm-E869 (Tungsten)
Carolina Tungsten Mining Co.
Furniss-Phoenix Mines, Cabarrus County, North Carolina

On December 8, Mr. Paul M. Tyler wrote as follows:

"I have delayed thanking you for your letter of November 16th in the hope that meanwhile I might develop a definite proposal for further work on our Phoenix property. However, we are having financial troubles and I frankly don't know when or if we shall be in a position to resume operations. We have some encouragement but nothing at all definite. For almost two months we have merely kept our foreman, Pete Nash, on the payroll, but no further work has been done.

"Would it be possible to postpone termination of our Contract, which you kindly agreed to recess, for say three months more? The last amendment calls for completion of all work by December 31, 1956 and I realize that you would rather not have too many idle contracts, but as long as there is a chance of our getting going again I should like to have an opportunity to present a new proposal."

We suggest postponing termination of the contract until Mr. Tyler makes a definite decision concerning a proposal for additional work. At present, it seems doubtful that a workable proposal will be submitted, but we might as well give him the benefit of the doubt.

Robert A. Laurence

Robert A. Laurence
Executive Officer

V. J. Lynch

V. J. Lynch, Member
Bureau of Mines

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D.C.
ROOM 1 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

RECEIVED DEC 14 1956

December 12, 1956

Mr. Paul M. Tyler
5005 Edgemoor Lane
Bethesda 14, Maryland

Re: DMEA-3742, Idm-8869 (Tungsten)
Carolina Tungsten Mining Co.
Furniss-Phoenix Mines
Cabarrus County, North Carolina

Dear Paul:

As requested in your letter of December 8, we will take no definite action on termination of the Furniss contract for the time being. Unless washington office objects, we will hold it in abeyance for awhile, until you reach a definite decision concerning a proposal for additional work to be done at the Phoenix.

Thanks for sending the two thin sections. I will return them after we have studied them. Mr. Bergman is in the field now, and I know he will want to see them.

Sincerely yours,

Robert A. Laurence
Executive Officer
DMEA Field Team, Region V

RAL/mg
cc - Operating Committee (3)
Mr. V. J. Lynch
Mr. L. E. Shirley
File

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 1 POST OFFICE BLDG.
KNOXVILLE 2, TENNESSEE

WASHINGTON 25, D. C.

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

November 9, 1956

Memorandum

To: Operating Committee, DMEA - Washington

From: DMEA Field Team, Region V - Knoxville, Tenn.

Subject: Operator's Final Report, DMEA-3742, Idm-E869 (Tungsten) Carolina Tungsten Mining Co., Furniss Mine, Cabarrus County, N.C.

Enclosed are the original and 3 copies of the Operator's final report.

Please note that, in the last paragraph, the Operator asks for a recess, so that he may present a proposal for an amendment. We will submit our comments on that proposal when it is received; therefore, we are not requesting permission to terminate at this time.

Robert A. Laurence
Robert A. Laurence
EXECUTIVE OFFICER
DMEA REGION V

V. J. Lynch
V. J. LYNCH
MEMBER, BUREAU OF MINES

OP'S FINAL REPORT

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

FINAL REPORT

Geological and Engineering Evaluation of

Explorations in the FURNISS MINE

Cabarrus County, N. C.

Docket No. DMEA - 3742

Contract No. Idm - E 869(Tungsten)

Respectfully submitted,

Carolina Tungsten Mining Company

By Paul M. Tyler
Paul M. Tyler, Partner

November 1, 1956

Final Report -- November 1, 1956: DMEA 3742 Idm- E 869

Carolina Tungsten Mining Company, P. O. Box 1251, Concord, N. C.

After expending approximately $40,000 of which over $14,000 represents work performed under the Contract, all underground explorations in the Furniss Mine have been terminated with negative results.

In the opinion of the Operator, further investigation of the Phoenix-Furniss vein system can be conducted more profitably in the vicinity of the Phoenix Mine where geological conditions seem more favorable and where substantial ore bodies have already been found. Work done in the mine and on the surface on this vein system and on other veins on the Furniss property tends to prove that the ore shoots are smaller in this direction than they are in the same veins on the Phoenix property and no richer in tungsten. Our sampling, moreover, indicates that gold and copper values in the northeasterly extensions of the same veins are much lower than they are in and near the Phoenix Mine. Moreover, it is reasonable to suppose that if gold values persisted in this direction, they would have been extracted at the same time as those of the Phoenix Mine. In view of the extensive prospecting in this area over a period of almost a century our best chance for developing a mine is to take advantage of modern metallurgy and byproducts that were not known to the old timers. For these reasons it is thought that enough drifting has been done on thin veins to explore the strike extensions in this area notwithstanding the fact that neither of the original targets was reached. There is no certainty that the enrichment anticipated at either of these points is more important than that found in other minor ore shoots which have proved to be too small or too low grade to constitute an ore body.

Geological Observations

The vein or veins explored in the Furniss Mine are persistent down dip and along strike. The quartz component may be accompanied for hundreds of feet horizontally by one or more bands of finely disseminated scheelite, usually along with barite and/or carbonates. Upon microscopic examination, unfortunately, the scheelite often appears merely as a coating on quartz or other light-colored mineral. Because of this dissemination in fine grains the apparent amount of scheelite present in the vein or in a muck pile is greatly exaggerated when viewed with a Mineralight A few specimens of calcite and perhaps some of the barite found in the Furniss Mine tend to fluoresce but their fluorescence should not be confused with that of the scheelite. Such confusion as we have encountered seems to be due to the fact that many of the bands that look like solid scheelite actually are composed in large part of other minerals. Clean scheelite crystals contain almost the theoretical percentage of tungsten and are spectographically free of molybdenum. Strontium is present but probably tends to be dispersed in the barite rather than in the scheelite. No other tungsten minerals have been identified.

The country rock in the Furniss Mine, as elsewhere on the Phoenix -Furniss properties, is greenstone--probably an altered andesite of slightly varying composition. In places it has been altered almost entirely to epidote accompanied by ferromagnesian mineral(pyroxene?) but generally it still contains some feldspar (plagioclase) and a little quartz. More or less carbonate and/or barite occur as coatings or small masses and occasional veinlets along joints and fissures not only in the vicinity of the veins but apparently at random.

As intercepted by the 500-foot horizontal drill hole as well

as in numerous other exposures, the greenstone exhibits many variations in texture and in degree of epidotization in addition to having been invaded by silica and carbonates and possibly by iron-bearing solutions besides those depositing sulphides. Occasional bands with porphyritic structure are noted. In the vicinity of a vein the country rock may be much lighter in color, especially along joints or tension fractures, apprently due to leaching, yet an unusually dark phase, often heavily charged with sulphides, seems to be characteristic of the footwall of several veins.

Petrographic study might show at least two ages of quartz and barite and perhaps also of pyrite. Gold is believed to be mostly free but intimately disseminated in the sulfides, especially in the pyrite. However, the gold content of pyrite varies over a wide range, even in the vein, and the pyrite in the country rock is often devoid of precious metal content or copper. Specular hematite seems to be irregularly distributed along with pyrite.

A large mass of dolomite was found near the crosscut from the shaft and may have developed in the fault zone. I suspect that much of the silicification and additions of carbonates and barite both in and away from the veins occurred subsequent to the formation of the mineralized quartz veins.

The structure in this northeastern extension ofthe vein system as found on the Furniss property generally seems to be somewhat more open and consequently more favorable for the deposition of larger ore bodies than the tighter structure found in the Phoenix Mine. This more open structure, however, seems to have developed mainly after the supply of valuable elements was exhausted and there is more post-mineral faulting. These observations apply not only to the Phoenix-Furniss vein system as observed in the Furniss Mine but likewise to the Copper-Tucker and intermediate veins,

including the Nash vein.

Inasmuch as a fairly large intrusive mass lies only about 300 yards northwest of the Furniss shaft, it might be surmised that this location should be more favorable for tungsten because that element is commonly associated with granitic intrusions. This mass is designated as being quartz diorite on the geologic map by R. S. Houston. The nearest portion of this mass to the Phoenix shaft is fully 600 yards to the west and the distance to a disconnected mass described as "granite" is nearly one mile. However, no evidences of granite have been observed on the Furniss properties whereas I have found fairly fresh granite on the dumps of workings situated on the southwestern extension of the Furniss vein. Dr. Clarence S. Ross of the U. S. Geological Survey was kind enough to have thin section made of a fragment of this rock which is composed of well-crystallized plagioclase feldspar, severely crushed quartz, and a black mineral which he surmised might be pyroxene. The texture of this rock is medium coarse and granitic and the mineral composition differs markedly from the various phases of the greenstone. Outcrops of what I believe represent weathered granite dikes may be observed just north of the Phoenix shaft and also to the northwest and east. Although we have no real information as to the attitude of the intrusive masses or their relation(if any) to the deposition of tungsten and other valuable elements additional information on this subject might be useful.

279' SW
-1/5/76

General Discussion of Explorations

A total of 279 feet of drifting and 500 feet of diamond core drilling was performed under the terms of the Contract as amended. This work was all done on the 170 foot level of the mine and before it could begin, the Contractor had to erect a headframe and necessary buildings, open the caved collar of the shaft, and unwater

and retimber the shaft. Access to the level was accomplished in late January 1956 but then a large amount of mucking, widening of drifts, straightening, and taking up bottom had to be done before track could be laid and compressed air and ventilation pipe installed. Actual work under the Contract began in the northeast heading on or about February 7th but almost two months elapsed before the southwest heading was prepared to go ahead.

In addition to the work performed under the Contract and the preliminary work necessary thereto, the Contractor drove two crosscuts in the northeast level and paid for a 25 foot drill hole On the southwest level drift we not only provided a 16 foot station to accomodate the diamond drill but we also drilled at our own expense a 30 foot hole in the hanging wall directly opposite the 500 foot horizontal hole which was aimed S 25 E. On the 100 level we advanced the drift by about 40 feet and stoped out 200 tons or more of low grade tungsten ore.

The scheelite content of the vein in the Southwest drift on the 170 improved markedly as shown by the lamp. At one time, as shown in our monthly reports, the vein was over four feet wide with fair-sized lumps of scheelite in the quartz component and numerous parallel bands or stringers which also carried scheelite and pyrite Inasmuch as these showings encouraged the belief that we had opened up a substantial ore body, most of the muck for a period of two months was saved for "ore". However, it takes about three weeks to obtain the results of assays and as reported in Table 1 the assays of current samples were all disappointing. A final sampling of several hundred tons of material on the dump which had been classed as "ore" indicated an average content of only 0.05 oz/T gold, 0.81 oz/T silver, 0.024% WO_3 , and 1.26% Ba SO_4.

Table 1. - Assays of Samples from Furniss Mine

Description	Gold oz/T	Silver oz/T	Copper %	WO_3 %	$BaSO_4$ %
Channel samples, 170 SW-					
0 ft. from start'g point 8-in. quartz	0.04	0.02	n. d.	0.04	n. d.
15 ft. from start, 20" qtz.	.02	.02	n. d.	.01	n. d.
35 ft. " " 8" qtz.	.10	.59	n. d.	.05	n. d.
55 ft. " " 8" qtz.	.28	.06	n. d.	.02	n. d.
100 ft. " " 58" vein, 7" qtz	.02	.08	n. d.	.04	0.94
112 ft. " " 38" vein, 8" qtz	.02	.11	n. d.	.03	n. d.
# Same sample-check assay #	.03	.10	n. d.	.04	n. d.
120 ft. from start, 10$ vein	.06	.04	n. d.	.03	4.53
Original heading, 170 SW 10"	.04	.62	0.06	.07	n. d.
Muck samples, 170 SW --					
Minus ½", 5/10/56	.04	.86	.03	.27	n. d.
General muck, 6/6/56	.02	1.18	n. d.	.02	n. d.
" " 6/12/56	.16	.32	n. d.	.03	n. d.
Minus ½", 6/14/56	.10	.48	n. d.	.08	n. d.
General muck, 7/6/56	.041	.76	n. d.	.056	n. d.
"Ore Dump", 10/11/56					
Plus ½"(73.4% of smple)	.04	.86	n. d.	.015	1.06
Minus ½"(26.6% " "	.08	.67	n. d.	.050B	1.80
Composite(calculated)	.05	.81	n. d.	.024	1.26
170SW, 8" quartz, 6/25/56	.14	.32	n. d.	.41	n. d.
Composite muck, 170 NE and SW(both head'gs)5/10/56					
Minus ½"	.04	.68	n. d.	.02	n. d.
Plus ½" minus 2"	.04	.84	n. d.	.01	n. d.
170 NE, shear zone muck, 6/6/56	.02	.68	n. d.	n. d.	n. d.
170 NE, New Vein, 15 ft. wide	.08	1.05	0.20	n. d.	n. d.

#Check sample assayed by Colorado Assaying Co. All other assays by Bruce Williams Labs.

As channel samples cut from the back(roof) of this drift further disproved the discovery of a commercial ore body and as even the appearance of the vein worsened during the last 50 feet, the Southwest drift was stopped at only about half way to the reported ore shoot in the Furr Shaft and 178 feet short of the 300 feet contemplated in the Contract.

The Northeast drift on the 170 level never even gave the appearance of developing ore and even the small ore shoot indicated in the sample report of the Bureau of Mines RI4724 was found to be merely a few scattered small pockets yielding a total of less than 2,500 pounds of ore with an estimated content of less than one percent WO_3.

A new and more or less parallel vein carrying little or no visible tungsten was found by the Operator in the first crosscut which was driven in the footwall of the ore shoot indicated by the Bureau of Mines sampling. The quartz component of this vein varied from 8 to 12 inches in width and was situated 9 feet from the original vein. Masses of chalcopyrite up to several inches across were contained in the quartz and the country rock on both sides was heavily charged with sulphides. A channel sample over a width of 15 feet assayed 0.08 oz/T gold, 1.05 oz/T silver, and 0.20% copper

The thin vein exposed in the original heading was followed for about 75 feet where it disappeared in a fault zone. Beyond the fault zone, but about 30 feet to the east of the lost vein, a vein was finally found after the Operator had been directed to discontinue any further work in this drift. It is not known whether this vein corresponds to the stringer that was followed in the drift or whether it is a contimuation of the "new vein" discovered in the crosscut. A 25-foot drill hole which the Operator had put in

footwall(east) proved nothing. Without doubt, this vein is the one encountered in BM 4 and so leads to the original target. Nevertheless it is so narrow and lacking in visible values that the Operator concurs in the judgment that prospects are poor of finding an intermediate ore shootwithin the next 100 feet. Although there is evidence of an ore shoot at the original target point, there is no assurance that it would prove any larger or richer than the meager findings already observed.

The 500 foot horizontal drill hole, which was authorized in an amendment to the contract and which was expected to yield useful geologic information and to test the existence at depth of the several veins that had been indicated on the surface, afforded more disappointment. The Operator suspected the continuation of the main Phoenix vein which according to old maps lined up with the old workings east of the vein explored in BM 4 and BM 5 and 5 A. As indicated on the accompanying map, traces of such a vein had been found at intervals as a result of our bull dozing work on the surface. Although the continuity of this vein had not been completely established, our measurements indicated that it should be looked for somewhere between 60 and 100 feet along thedrill hole, depending upon the dip. At 90 to 95 feet, the drill core showed marked alteration and the core recovery was only 65%. While there is thus a possibility that this does mark the extension of the main Phoenix vein this observation has no practical significance as the vein is too weak and lacks any suggestion of metal values.

What is believed to be the Nash vein was penetrated at around 360 feet but the core showed no signs of tungsten or pyrite.

At 410 feet, the core contains a quartz veinlet accompanied by occasional specks of pyrite at 422 feet. This raises a question ~~as to whether it may not be~~

as to whether it may not be the final fraying out of the strong vein indicated in the southwest corner of the accompanying map. Hitherto, I had assumed that this was merely a continuation of the Nash vein and this opinion was apparently held by the Miami Mining Company whose map shows this vein continuing all the way to the Phoenix Mine .

In event that we agree that notwithstanding the difference in strike these two veins are merely broken parts of the Nash vein, we may then assume that the drill hole lies close to a sharp flexure or fault. This theory may be supported by the fact that the drill core, especially in the first 200 feet, was badly broken and by the further fact that heavy flow of water was encountered. Except in a fracture zone, both the Furniss and the Phoenix mines are remarkably dry. My calculations indicate that the inflow of water in the latter mine, despite its extensive workings, averages much less than 10 gallons a minute. The water raining down the Furniss shaft from the fault zone there adds up to 25 to 50 gpm according to the season and the long drill hole resulted in almost doubling this flow.

Whereas all work under the Contract has been terminated, the Contractor has requested a recess in lieu of cancellation of the agreement. We hope soon to present a proposal for work to be done in or near the Phoenix shaft . If an amendment is approved for such additional work, a supplemental Final Report will be submitted after completion of the work.

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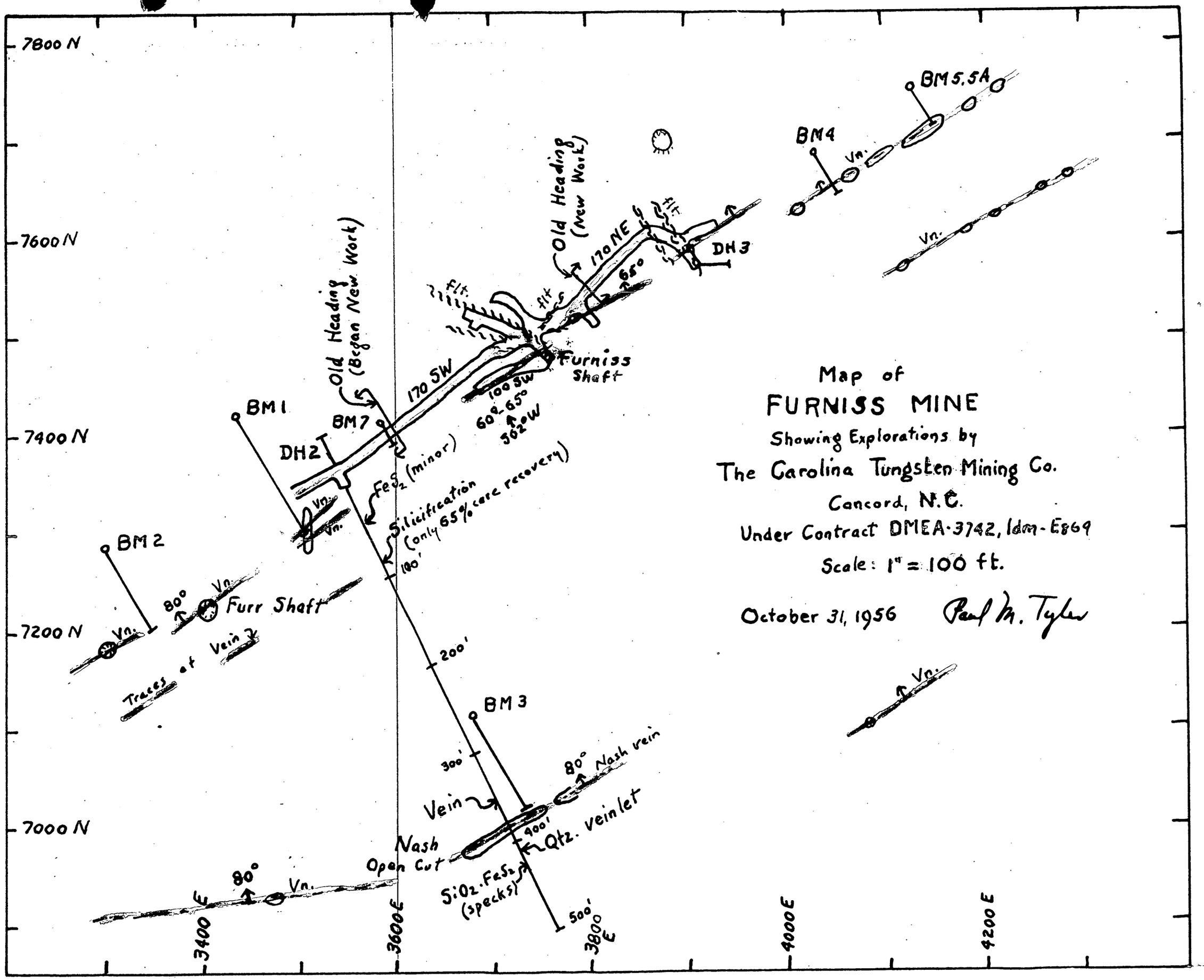
Gr.


7800 N
7600 N
7400 N
7200 N
7000 N
3400 E
3600 E
3800 E
4000 E
4200 E
BM 5.5A
BM 4
Vn.
Old Heading (New Work)
170 NE
65°
DH 3
Old Heading (Began New Work)
170 SW
Furniss Shaft
100 SW
60°-65°
S 62° W
BM 1
BM 7
DH 2
FeS2 (minor)
Silicification (only 65% core recovery)
100'
BM 2
80°
Furr Shaft
Traces of Vein
200'
BM 3
300'
80°
Nash vein
Vein
400'
Qtz. veinlet
Nash Open Cut
SiO2. FeS2 (specks)
500'
Map of
FURNISS MINE
Showing Explorations by
The Carolina Tungsten Mining Co.
Concord, N.C.
Under Contract DMEA-3742, Idm-E869
Scale: 1" = 100 ft.
October 31, 1956
Paul M. Tyler

RECEIVED
OCT 29 1956

October 26, 1956

Mr. Jay L. Chambers, Chief
Contract Administration and Audit Division
DMEA
Washington 25, D. C.

Re: DMEA-3742, Idm-E869(Tungsten)
Carolina Tungsten Mining Co.
Furniss & Phoenix Mines
Cabarrus County, N.C.

Dear Mr. Chambers:

Upon receipt of your letter of October 23, we are approving the September voucher and forwarding it to the Finance Office for payment of $1,933.13

We have received a letter from Paul M. Tyler, stating that his October voucher will claim the costs of assaying samples, and will be accompanied by his final geologic and engineering report. Because the costs of assaying will approximate $200, we decided not to withhold that amount from the September voucher.

We will advise you further, when we receive the October voucher.

Sincerely yours,

Robert A. Laurence
Executive Officer, DMEA
Field Team, Region V

RAL/zm
cc:
Opr. Com.-2
Finance Office
Lynch
Files

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 1025 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

RECEIVED
OCT 29 1956

October 26, 1956

Mr. Paul M. Tyler
Carolina Tungsten Mining Co.
5004 Edgemoor Lane
Bethesda 14, Maryland

Re: DMEA-3742, Idm-E869(Tungsten)
Furniss & Phoenix Mines
Cabarrus County, N. C.

Dear Paul:

Your September voucher is being forwarded for payment of $1,933.13. This figure is derived as follows:

Disallowance,	55 ft. drilling @ $7.00	$385.00
Allowance,	3 ft. drifting @ $37.50	112.50
	Net disallowance.....	273.50

Amount claimed on your voucher	$2,850.00
Disallowance, as shown above	273.50
Approved total	$2,577.50
75% of approved total	1,933.13
Approved for payment.....	1,933.13

The above figures have been approved by an audit review by our Washington staff.

Although you actually did 279 feet of drifting under the contract, you claimed only 276 feet. That accounts for the additional three feet, as shown above.

Please correct the totals on your records, so that the next one will show the following "totals previously reported:"

Drilling	$ 3500.00
Drifting	10462.50
Total	13962.50

Sincerely yours,

Robert A. Laurence
EXECUTIVE OFFICER
DMEA REGION V

RAL/am.
cc:
Opr. Com.-2
Finance Office
Lynch
Chambers
Files

Talbert

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

OCT 23 1956

Mr. Robert A. Lawrence
Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA-3742 (Tungsten)
Carolina Tungsten Mining Co.
Phoenix and Paradise Mines
Cabarrus County, North Carolina
Contract No. DMe-E869

Dear Mr. Lawrence:

By memorandum dated October 17, 1956, you forwarded to the DMEA Operating Committee the enclosed copy of the referenced Operator's September, 1956, MF-104 and attachments with the request for a review and audit prior to your approval for payment.

An audit review of this project has disclosed that the total costs of $14,295.00 claimed by the Operator are subject to adjustments of (1) a disallowance of $365.00 for 55 feet of diamond drilling in excess of the contractual maximum and (2) an additional allowance of $112.50 for 3 feet of drifting performed but not claimed by the Operator. Therefore, the total acceptable costs amount to $13,962.50 with $10,472.87 being the Government's proper 75 percent participation.

Inasmuch as the Operator heretofore has been paid an aggregate of $6,538.74, there remains a balance of $1,933.13 payable on the September, 1956, MF-104. In approving this voucher for payment it is suggested, however, that a minimum of $200.00 be withheld to assure the rendition by the Operator of the final report required by Art. 6 (e) of the contract.

The issuance of a Report of Review in lieu of a final audit is being withheld pending determination that the September, 1956, MF-104 is in fact the final voucher and that the contract will not be amended to authorize additional work.

Sincerely yours,

(Signed) J. L. Chambers

Jay L. Chambers, Chief
Contract Administration
and Audit Division

Enclosure

Copy to: Docket
Admr. Reading File
Mr. Chambers
Helen Miller
Mr. Martin
Mr. Talbert

EDTalbert/wb
October 22, 1956

R.C.S.

Nickel

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 23 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

RECEIVED
OCT 19 1956

October 17, 1956

Mr. Paul M. Tyler
Carolina Tungsten Mining Co
5005 Edgemoor Lane
Bethesda, Maryland

Re: DMEA-3742, Idm-E869
(Tungsten)
Furniss & Phoenix Mines
Cabarrus County, N.C.

Dear Paul:

Your September voucher has been received, and as this may be the final voucher, we have sent it to the Washington office for audit before we can approve payment. It is possible that Mr. Chambers, or others of our Contract Administration and Audit Division will contact you directly, if they encounter any problems.

It is regrettable that more favorable results did not show up in the core drilling; the results combined with the drifting certainly indicate that no further work is justified at the Furniss. Referring to the fourth paragraph of the last page of your narrative, I do not agree that the main targets were not reached. I have always thought that cross-cutting exploration is the main objective; drifting on thin veins is too expensive and by doing 276 feet of drifting we have more than adequately explored the strike extensions of the main Furniss vein.

We will be glad to consider your suggestion that some work be done at the Phoenix before the contract is considered complete. Please submit your proposal for that work, and if it is approved, an amendment will be prepared to authorize the additional work.

We are unable to authorize the excess of 55 feet of core drilling, as the contract provided only 500 feet. After the long hole failed to intersect any veins, additional drilling at the Furniss is hard to justify.

You did not include costs of any assays on your voucher, although your narrative indicates that 19 samples were assayed. Is this to be reported on a subsequent voucher?

I would suggest that you submit your final engineering and geologic report on the work at the Furniss mine (article 6c of the contract) now, in order to avoid delay in approval of your September voucher. If an amendment is approved to authorize work at the Phoenix, a supplementary final report may be submitted after completion of that work.

Sincerely yours,

Robert A. Laurence,
Executive Officer, DMEA
Field Team, Region V

RAL/xm
cc
Opr. Gen.-1
Chambers
Lynch
Shirley
Files

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D.C.
ROOM 1030 FED. BLDG.
KNOXVILLE 2, TENN.

RECEIVED
OCT 19 1956

October 17, 1956

Memorandum

To: Operating Committee, DMEA - Washington

From: Executive Officer, DMEA - Region V - Knoxville, Tenn.

Subject: DMEA-3742, Idm-E869(tungsten) Carolina Tungsten Mining Co. Furniss & Phoenix Mines, Cabarrus County, North Carolina

Enclosed is one copy of the September, and possibly final voucher on the subject exploration contract. We are submitting it for review and audit, before approving for payment. As this is a short-form, unit cost contract, there are no invoices or other documentation. The Operator's records can probably be consulted at the office of Mr. Paul M. Tyler, 5005 Edgemoor Lane, Bethesda 14, Maryland.

Our records indicate that 279 feet of drifting has been done, although the Operator claimed 276 feet. He has not claimed anything for assays, although the contract authorized them. We do not recommend approval of the 55 feet of excessive core-drill footage which is claimed.

Drifting has been suspended, in keeping with instructions from this office. Results to date indicate that further drifting cannot be justified. However, as the Operator indicates that he will request an amendment providing for work at the nearby Phoenix mine, we are withholding a recommendation for termination until that proposal is received and studied. The work to date will not support a recommendation for certification.

We have not yet received a final report on the Furniss exploration, although the Operator has submitted good monthly narrative reports. It is my understanding that the pumps have been removed, so that no additional information will be available, and I have suggested that the Operator submit his report on the Furniss work now.

Upon receipt of the audit and review, we will then forward this voucher to the Finance Office.

Robert A. Laurence

Robert A. Laurence

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

September 10, 1956

Memorandum

To: Catherine Curtin, Statistics and Control Division

From: Hazel Berry, Operating Committee

E57

Subject: Amendment to Contract

Attached is the following docket copy of an amendment to a contract which has been reviewed and approved by the commodity division and the Contract Administration and Audit Division.

No clearance by Legal appears necessary.

Carolina Tungsten Mining Co., DMEA-3742, Idm-E869, Amendment No. 2.

Attachment-1

400

DOCKET
Surname:
Chapman
Martin
Selfridge
H Johnson

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA-3742, Tungsten
Carolina Tungsten Mining Co.
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract No. Idm-2869

Dear Mr. Laurence:

Reference is made to Amendment No. 2 to the subject contract, prepared by the Field Team, Region V, and executed August 15, 1956, before you had received Operating Committee Memorandum No. 32 of August 24.

The cited memorandum advised that all amendments extending the time for completion of contracts for more than three months should have an extension of one year for royalty payments.

If you should write another amendment to said contract, please include an appropriate extension of time for royalty payments. We shall do the same if another amendment thereto is prepared here.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee

APPROVED:

Frank D. Lamb

Member, Bureau of Mines

Thor H. Kiilsgaard

Member, Geological Survey

cc: Docket
Code 400
Adm. Read. File
Oper. Committee
Thor Kiilsgaard, USGS
H. W. Holliday, USBM
FT, Reg. V

TLChapman/WSMartin/ls
9/7/56

RGS

Remote

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D.C.
ROOM 15 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

August 27, 1956

Memorandum

To: Operating Committee, DMEA, Washington, D. C.

From: Field Team, DMEA, Region V, Knoxville, Tennessee

Subject: DMEA-3742, Idm-E 869 (Tungsten)
Carolina Tungsten Mining Company
Furniss and Phoenix Mines, Cabarrus County, North Carolina

Enclosed are the original and two copies of Amendment No. 2 to the subject contract. The usual distribution of the other copies has been made.

This amendment was necessary in order to consolidate all the cross-cut drilling into a single hole, in order to thoroughly explore possible parallel veins to the southeast. The additional time was needed, as the Operator had difficulty in sub-contracting the diamond drilling, and drilling did not get started until late in August.

Robert A. Laurence
Robert A. Laurence
Executive Officer

Wm. A. Beck
Wm. A. Beck for V. J. Lynch
Member, Bureau of Mines

RECEIVED
AUG 30 1956

Enclosures 3

cw

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.
ROOM 101 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

August 15, 1956

Memorandum

To: Operating Committee, DMEA, Washington 25, D. C.

From: Field Team, DMEA, Region V, Knoxville, Tennessee

Subject: Docket No. DMEA-3742, Contract Idm-E869 (Tungsten)
Carolina Tungsten Mining Company
Furniss and Phoenix mines, Cabarrus County, North Carolina

Mr. Paul Tyler, of Carolina Mining Company, phoned this week to tell us that Pennsylvania Drilling Company had agreed to drill a 500-foot horizontal diamond drill hole at the Furniss mine for $7.00 per foot. It is our understanding that an amendment to consolidate the 500 feet provided in item 3 of exhibit "A" into a single hole is within the Field Team's delegated authority; accordingly we gave Mr. Tyler authorization to begin the drilling from near the southwest heading of the 170-foot level, and to drill to the southeast. We are preparing Amendment No. 2 to provide for this and to extend the date for completion to December 31, 1956.

The Operator is now cross-cutting in the northeast end, at his own expense, in an effort to pick up the vein. If he relocates the vein, and it looks sufficiently promising, we will authorize resumption of drifting to the northeast, but we cannot agree with Mr. Tyler's plan of driving a straight drift in country rock to reach and intersect the vein in Bureau of Mines drill hole No. 4, 350 feet northeast of the shaft.

Please correct an error in the July 26 interim report. The fourth sentence should read, "From 84 to 109 feet the drift has been driven due east and from 109 to 144 feet the drift has been driven N. 60° E."

Robert A. Laurence
Robert A. Laurence
Executive Officer

V. J. Lynch
V. J. Lynch
Member, Bureau of Mines

RECEIVED
AUG 17 1956

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 1 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

RECEIVED
AUG - 1 1956

July 31, 1956

Memorandum

To: Operating Committee, DMEA - Washington

From: DMEA Field Team, Region V - Knoxville, Tennessee

Subject: DMEA-3742, Idm-E869 (Tungsten) Carolina Tungsten Mining Co., Furniss Mine, Cabarrus County, N. C.

Enclosed are all eight copies of the proposed amendment No. 2 returned by the Operator unsigned, and 4 copies of the Operator's letter of explanation.

We are not in favor of a long hole (1000 ft.) at the higher cost, though we do think a long cross-cutting hole is desirable. The Operator's proposal to drill as far as possible beyond the 150 feet provided in the contract is acceptable to us and could be handled without an amendment, if the total footage is 500 feet or less. We favor a single hole to the southeast, from a point in the southwest drift on the 170-foot level. Decision as to any further drilling would depend on results of this hole. We do not favor drilling any holes to the northwest, as all available surface and underground information suggests that parallel or en echelon veins, if such are present, are most likely to lie to the southeast. The "Nash vein," approximately 480 feet southeast of the Furniss shaft, is the best target.

Copies of our reply to the Operator are attached.

Robert A. Laurence
Robert A. Laurence
Executive Officer, DMEA
Field Team, Region V

V. J. Lynch
V. J. Lynch, Member
Bureau of Mines

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON, D.C.
ROOM 1087 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

RECEIVED
AUG - 1 1956

July 31, 1956

Mr. Paul M. Tyler
5005 Edgemoor Lane
Bethesda 14, Maryland

Re: DMEA-3742, Idm-E869 (tungsten)
Carolina Tungsten Mining Co.
Furniss Mine, Cabarrus County,
North Carolina

Dear Mr. Tyler:

I have returned the unsigned amendments to our Washington office, along with your letter explaining the reasons for not signing them.

As we are not going to drill the single long hole, the proposal to drill one (possibly two) holes is in accordance with the contract, and I would suggest that the first should begin near the Southwest end of the 170-foot level of the Furniss and extend, if possible, to the "Nash" vein. The decision to drill a second hole would be dependent upon results of the first hole. None of our group here thinks that a hole to the northwest is justified, and we would prefer to see all the drilling money used in the block of ground lying southeast of the Furniss vein.

Our Field Examiners report that the northeast drift has been in country rock for some distance after crossing the zone of cross fractures. Further drifting in that area is inadvisable, and so no work should be done in that direction. Drifting to the southwest should continue, as the vein zone appears to be widening in that direction.

At present, I do not see a basis for drilling in the vicinity of the Phoenix mine, as we have too little knowledge of the geologic relations. If, however, you want to submit a proposal for such drilling and can demonstrate its feasibility, we will be glad to give it due consideration.

Sincerely yours,

RAL/zm
cc:
Lynch
Opr. Com-k
Shirley
Files

Robert A. Laurence
Executive Officer, DMEA
Field Team, Region V

PROCESS METALLURGY
RESEARCH AND DEVELOPMENT

ECONOMIC SURVEYS
WASHINGTON REPRESENTATION

PAUL M. TYLER
REGISTERED PROFESSIONAL
MINING ENGINEER & METALLURGIST
WASHINGTON, D. C.

RECEIVED
AUG - 1 1956

RESIDENCE:
5005 EDGEMOOR LA.
BETHESDA 14, MD.

July 20, 1956

Mr. Robert A. Laurence
Executive Officer, DMEA
Region V, Room 13
Post Office Building
Knoxville 2, Tennessee

DMEA-3742, Idm-E869(tungsten)
Carolina Tungsten Mining Co
Furniss Mine, Cabarrus Co. NC

Dear Bob:

I am regretfully returning unsigned the enclosed original and 4 copies of the proposed Amendment No. 2 to our DMEA contract.

On the basis of the fixed unit costs in this proposal, the total allowance for a single diamond drill hole is $7,250 of which the Government share at 75% would amount to a maximum of about $5,000. Since making my application for amending the contract, I have sought bids for doing the work and the only firm offer I have received indicates a total cost of approximately $10,000. In other words, our share of the cost would probably exceed $5,000 and in my opinion we could spend this sum more effectively elsewhere. We have already spent so much more than I anticipated in respect to our contract work that I feel we simply cannot afford to go into the hole so much on this single item.

After considerable correspondence I have received a firm quotation from Sprague & Henwood, as follows:

For drilling one or more holes, approximately horizontal to a maximum depth of 1,000 feet

For drilling depth	0' to 250'	---	$6.00 per lin. ft
from "	250' to 500'	---	$6.50 per lin.ft.
from "	500' to 750'	---	$7.25 per lin.ft.
from "	750' to 1000'	--	$8.25 per lin. ft

RECEIVED
JUL 23 1956
U. S. Geologic Division
Knoxville, Tenn.

Although we might be able and willing to pay these contract prices for the drilling, and possibly also accept the risk of hourly guaranties and additional expenses in event the hole should encounter broken or cavey ground(which I should not anticipate), the real obstacle is the fact that the drilling contractor would require a minimum of 450 cubic feet of air per minute under 90 psi whereas our compressor can furnish only 315 cfm of which we should also want to operate our own rock drill at the heading. I feel sure that it would cost us at least $2,000 to rent and operate another air compressor for the duration of the core drilling.

The extra cost, of course, is due to the fact that only a heavy drill can be employed for so deep a hole. A very small drill would suffice for a 150-ft. hole but the larger drill calls for more air, a larger drill station, and substantial moving expense as it would have to be dissassembled in order to go down our shaft, the

larger compartment of which measures only about 45 x 47 inches.

I have discussed this situation with Tom Chapman of the DMEA Washington Office and he indicated that there was not much chance of negotiating a new amendment which would cover the estimated cost of a 1,000 ft. drill hole such as we had proposed. However, he believes that a compromise arrangement might be worked out between you and Messrs. Bergman and Peyton on the one hand and ourselves whereby we might drill say two holes of the longest depth obtainable with a light diamond drill. My partners and I would be agreeable to modifying the original plan for drilling three short holes to the Southeast and a single short hole to the Northwest and in lieu thereof drilling one hole in each direction starting from approximately the present location of the Southwest heading on the 170 ft. level of the Furniss Mine. Each hole should be at least 150 ft. long and as much longer as proves feasible with the light drill which will operate on our available air supply. If this work were done on the basis of the $7.00 per foot estimated cost mentioned in the original contract, Mr. Chapman feels that it could be performed under the terms of the contract inasmuch as the Field Office has authority to modify the location and direction of exploratory work in accordance with new information and developments under a contract. Apparently the main limitations to such field authority relate to the total expenditures authorized for the specified type of work at the specified unit cost. However, you are the best judge of how far you should go in making changes.

Hal Lackey and I hoped to meet Mr. Bergman in Concord on July 5th but he was unable to come so we have not discussed the most recent developments. I am especially hopeful that he will be able to complete his general mapping of the property. Although I am greatly encouraged by the showing in our Southwest Drift at the Furniss I am leaning more and more to the opinion that our best chances are in and near the Phoenix Mine, particularly to the Southwest and thence southeasterly all the way to the Copper Shaft vein system. If the Government concurs in this opinion, we might want to recess our drifting in the Furniss and employ the unexpended funds for several exploratory diamond drill holes from the surface in order to check structure and possible shheelite-bearing veins in the southern part of the Phoenix Mine property. This, of course, is merely a tentative suggestion which I should like to submit for consideration by Mr. Bergman as I have a lot of respect for his perception of geologic field relationships and his good judgment.

I am truly sorry to have initiated the proposal for the amendment that we cannot afford to go through with and trust to have better luck in the future.

Sincerely yours,

Paul M. Tyler

Paul M. Tyler, Partner
Carolina Tungsten Mining Company

Reference is made to Amendment No. 2 to the subject contract, prepared by the Field Team, Region V, and executed August 15, 1956, before you had received Operating Committee Memorandum No. 32 of August 24.

The cited memorandum advised that all amendments extending the time for completion of contracts for more than three months should have an extension of one year for royalty payments.

If you should write another amendment to said contract, please include an appropriate extension of time for royalty payments. ~~and~~ We shall ~~plan to consider~~ do the same ~~sort of proviso~~ if another amendment thereto is prepared here.

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

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA-3742, Tungsten
Carolina Tungsten Mining Co.
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

Reference is made to Amendment No. 2 to the subject contract, prepared by the Field Team, Region V, and executed August 15, 1956.

The amendment is acceptable, but please note that no extension of time for royalty payments has been written into this amendment although all amendments that extend the time over three months should have an extension of one year for royalty payments, as set forth in Operating Committee Memorandum No. 32, dated August 24, 1956.

If you should write another amendment to said contract, please include an appropriate extension of time for royalty payments, and we shall plan to consider the same sort of proviso if another amendment thereto is prepared here.

Sincerely yours,

Chairman, Operating Committee

APPROVED:

Member, Bureau of Mines

Member, Geological Survey

Remote

DOCKET
SURNAME
Holt
Chapman
Talbot
Selfridge

400

JUL 9 - 1956

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA 3712 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furniss Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

Enclosed are the original and five copies of a proposed Amendment No. 2, to the above referenced contract, signed by the Administrator by the Government. Two extra copies are enclosed for the use of the Field Team.

If the terms and conditions of this proposed amendment are satisfactory to you and the Operator, all six copies should be signed by the Operator and the usual distribution made.

If any part of the proposed amendment does not have your approval or that of the Operator and cannot be altered within your delegated authority, the original and all copies are to be returned to this office, together with the proposed changes for consideration.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee (GCS)

APPROVED:

/s/ Robert W. Geehan (RWG)

Member, Bureau of Mines

Thor H. Kiilsgaard (THK)

Member, Geological Survey

Enclosures

TLChapman/foc 7/3/56
cc to: Docket
Code 400
Admr. Read. File
Oper. Comm.
FT. REG. V
R. W. Holliday, USBM
T. H. Kiilsgaard, USGS

400 Docket
Chapman
Martin

June 25, 1956

MEMORANDUM

To: Associate Solicitor,
Division of Mineral Resources

From: Iron and Ferro-Alloys Division, DMEA

Subject: Preparation of Amendment No. 2
Docket No. DMEA-3742, Tungsten
Carolina Tungsten Mining Company
Furniss and Phoenix Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Transmitted herewith is a rough draft of a proposed Amendment No. 2 to the above-captioned contract for your use in preparing the final draft.

W. S. Martin, Chief
Iron and Ferro-Alloys Division

Attachment

cc: Docket
Code 400

TLChapman/ls

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.
ROOM 13 POST OFFICE BLDG
KNOXVILLE 2, TENN.

RECEIVED
JUN 14 1956

June 12, 1956

Memorandum

To: Operating Committee, DMEA, Washington, D. C.

From: Field Team, DMEA, Region V, Knoxville, Tennessee

Subject: DMEA-3742, Idm E-869 (Tungsten)
Carolina Tungsten Mining Corp.
Phoenix and Furniss Mines, Cabarrus County, N. C.

Reference is made to Mr. Martin's teletype of May 31, and Mr. Laurence's phone call to Mr. Martin on June 11. Reply to the teletype was delayed until Mr. Bergman and Mr. Peyton returned from an inspection of the project on June 8.

We are in agreement with the Operator's request to consolidate the drilling into a single cross-cut hole from the southwest drift; we do not think a horizontal hole more than 1000 feet long is practical and we favor using some of the money provided for drifting for the additional 500 feet instead of providing additional money as requested by the Operator. Therefore, we recommend preparation of an amendment changing item 3 of exhibit A to provide a single horizontal drill hole to the southeast from a point in the southwest drift, 170-foot level, which is acceptable to the Government, not to exceed 1000 feet in length; core size to be AX or larger.

Item 2 of exhibit "A" should be changed to reduce drifting by the appropriate amount needed to provide funds for drilling. It is suggested the wording "not to exceed .... feet" be used here.

Estimated Costs should be changed to provide not to exceed 1000 feet of drilling at $7.00 per foot; total $7,000.00, and reduce footage of drifting accordingly. It is recommended that the $7.00 unit cost include cost of contract drilling, moving drill to and from site, driving of crosscut to provide a drill set up, core boxes, sample bags and all services incidental to drilling. It is our understanding that that is the basis of the $7 price in the present contract.

INTERIM REPORT

DMEA-3742, Idm-E869, FURNISS MINE (Tungsten)

RECEIVED
JUN 18 1956

Operator: Carolina Tungsten Mining Co., c/o Paul M. Tyler,
5005 Edgemoor Lane, Bethesda, Maryland

Location: Seven miles southeast of Concord, Cabarrus County, N. C.

There has been an advance of 18 feet in the northeast heading of the 170-foot level since the last inspection and totals 111 feet in that direction. The drift is in a wide sequence of north-south trending fracture zone and the vein has been temporarily lost. Drifting will continue through the fracture zone and then try to pick up the vein on the other side. Displacements along these fractures seem to be of small magnitude. Contract drifting to the southwest totals 41 feet, an advance of 13 feet since the last inspection. The drift has followed a continuous, 6 - 12 inch quartz-barite vein with small but persistent showings of sheelite and sulfide. The Operator was advised to continue drifting in both directions.

Progress is satisfactory.

Inspected: June 7, 1956

A. L. Peyton
A. L. Peyton, Mining Engineer
U. S. Bureau of Mines

S. C. Bergman
S. C. Bergman, Geologist
U. S. Geological Survey

XXXXXXXXXXXXXXXXXXXXXXX

Interior Department
Defense Minerals Exploration
Administration
14X1401 (01) Revolving Fund,
Interior (Allocated Working
Fund to the Office of the Secretary)

DOCKET
SURNAME
Chapman
Martin
Kilsgaard
Holliday
Chambers
Baker

T E L E T Y P E

MAY 31 1956

Mr. Robert A. Lawrence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Mr. Tyler of Carolina Tungsten Mining Company, Docket No. DMEA 3742, visited this office and requested consolidation of four diamond drill holes into one. If you approve suggested change please advise Operator that he may proceed and send us a draft from which we will prepare an appropriate amendment.

W. S. Martin
ACTING Chairman, Operating Committee (245)

TL.Chapman/Bee
5-29-56
cc to: Docket
Code 1403
Admy. Read. File
Operating Comm.
FT. REG. V
Robert W. Holliday, USBM
T. H. Kilsgaard, USGS

R.C.S.

PROCESS METALLURGY
RESEARCH AND DEVELOPMENT

ECONOMIC SURVEYS
WASHINGTON REPRESENTATION

PAUL M. TYLER
REGISTERED PROFESSIONAL
MINING ENGINEER & METALLURGIST
WASHINGTON, D. C.

RESIDENCE:
5005 EDGEMOOR LA.
BETHESDA 14, MD.

Docket

Copy retained in 400

Recd 5/28/56

May 28, 1956

Mr. W. S. Martin, Chief
Iron & Ferro-Alloys Division
Defense Minerals Exploration Administration
U.S. Dept. of Interior
Washington 25, D. C.

Re: DMEA-3742(Tungsten)
Phoenix-Furniss Mines
Cabarrus County, N.C.

WSM

Dear Mr. Martin:

In accordance with information obtained subsequent to signing our original contract for exploration of our scheelite prospects in North Carolina, I should like now to make application for an amendment to the contract so as to assure more far-reaching investigation of the wide shear zone between the two known main systems with the hope of locating additional veins or other tungsten-bearing deposits.

It is now proposed, in lieu of the four horizontal diamond drill holes contemplated in the original contract, to drill a single long hole aimed approximately S 30° E from a station to be cut in the Southwest drift of the 170 level of the Furniss Mine. In addition to intersecting the probable extensions of the main Phoenix vein(about 140 feet) and of the Nash vein(about 400 feet), the proposed hole should encounter other veins whose existence is suspected.

A further purpose of drilling across the formation would be to study the tension fractures which apparently antedate the deposition of tungsten and which may have had a significant influence upon the development of suitable repositories for economic mineralization. Our observations underground show that these fractures are often mineralized where they cross the "main veins" and they seem to favor the development of wider ore shoots. This condition was noted especially on the 350 level of the Phoenix Mine. Although it is not anticipated that these fractures will develop into important ore bodies per se, the possibility of a southwestward plunge of the major structure and the tendency for an echelon arrangement of ore bodies within the vein system may be indicated. Our buldozing has uncovered numerous veinlets that strike and dip in different directions and it now appears that the mineralization may be more diffused than one might suppose on the basis of previous mining operations which were confined to the main veins. Some of the geological controls that have been established in the Hamme Mine may be extrapolated into this territory.

Copy retained 400

Now that we have studied underground exposures over a distance of 1,000 feet along strike in the old Phoenix Mine and for 350 feet on the 170 level of the Furniss Mine, I am still of the opinion that the proposed extensions of the drifts on the Furniss

vein should be accomplished. Inasmuch as we have already proved a moderate tonnage of ore in the Phoenix Mine one or two small new ore shoots might suffice to justify building a mill. However, I am not hopeful that investigation of targets on the Phoenix-Furniss vein extensions will be likely to find ore bodies substantially larger than those previously worked in the Phoenix Mine, the largest of which averaged scarcely 24 inches in width and 300 feet long. No such limitation exists in respect to possible parallel veins or mineralized areas in the shear zone.

Whereas the contract now calls for four relatively short drill holes, it is believed that the most urgent need at present is for more knowledge of the structure between the two vein systems which have been opened up at various points. The horizontal distance between the two vein systems is approximately 1,500 feet and this entire distance should be explored. Apart from a few stringers and loose float there is no surface indication of underlying quartz veins across most of the intervening space but the overburden is heavy and there is a reasonable chance that scheelite mineralization may occur in only slightly silicified country rock or in barite which tends to disappear in weathering and erosion along such slopes as there are between the two vein systems that yield good outcrops. However, it may be noted that only meagre traces of the vein are found on the surface overlying the principal ore shoot at the Phoenix Mine, although on this vein there are numerous old workings along strike to indicate that there may have been outcrops or other surface indications elsewhere.

The present contract calls for a total of only 500 feet of AX core drilling at an estimated cost of $7 a foot or $3,500 for this work. It is requested that this sum be made available toward one long hole and that additional allotments be made to permit continuing the hole for the full 1,500 feet. Assuming that the unit price of this drilling should be the same, this calls for an additional allotment of $7,000, thereby increasing the total authorization under our contract from $26,400 to $33,400 of which the Government share would be $25,050.00.

In contrast to the proposed expenditures under the contract, the applicant has already spent approximately $80,000 of which almost $20,000 are directly chargeable to rehabilitating the Furniss Mine preparatory to starting work under the contract.

The proposal as outlined in this letter has been discussed with Messrs Bergman and Peyton of the Knoxville field team who have previously on many occasions expressed their interest in emphasizing exploration perpendicular to the strike of the known veins.

Respectfully submitted,

Carolina Tungsten Mining Company

Paul Tyler

By Paul M. Tyler, Partner

Justification of these recommendations is as follows, based on reports from Mr. Bergman and Mr. Peyton:

A wide zone (at least 2400 feet) of parallel to sub-parallel fractures exists here which can best be explored by horizontal crosscut drilling from underground stations beneath the zone of weathering. Angle drilling from the surface will not test these structures satisfactorily. The explored portions of the Phoenix and Furniss veins are thin and will hardly make mineable tonnage and grade. Potential ore grade material has been found and strong horizontal and vertical continuity established in the Phoenix mine. Surface indications and inference from observed fracture systems undergrounds suggests presence of parallel or echelon veins which might provide sufficient tonnage to make a mineable ore body.

If the crosscut drilling does not pick up structures of mineable width, the drifting should probably be stopped and the project terminated at that time.

Previous to the contract work, the Operator unwatered and reconditioned the old Phoenix mine below the 520 ft level. The field examiners visited the property on October 26, 1955 and returned on December 26-27, to map the accessible portions of the Phoenix mine before it was again flooded. Strong horizontal and vertical continuity of scheelite-sulfide mineralization was established for over 500 feet horizontally and vertically.

Access was gained to the old Furniss workings some 1960 ft to the northeast, about the middle of January 1956. Regular contract drifting was started in the northeast heading on the 170 ft level, February 7, 1956, and total in that direction, 111 feet. A strong northsouth trending fracture zone was intercepted at the 82-foot point and vein has been temporarily lost. The present plan is to drive through the fracture zone and pick up an en echelon segment of vein cut in a crosscut 58 ft from the shaft station. The southwest heading on the 170 ft level has been driven 41 ft on a continuous mineralized 9 - 12 inch vein.

In addition to the contract work, the Operator has driven at his own expense 28 ft of crosscut to the southeast at a point 58 ft northeast of the 170 ft level shaft station, and 23 ft of drifting on the 100 ft level to the southwest.

Robert A. Laurence

Robert A. Laurence
Executive Officer

V. J. Lynch

V. J. Lynch
Member, Bureau of Mines

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROWAN POST OFFICE BLDG.
KNOXVILLE 2, TENN.

RECEIVED
MAR - 9 1956

March 7, 1956

Memorandum

To: Operating Committee, DMEA - Washington

From: Executive Officer, DMEA - Region V

Subject: Amendment No.1 - DMEA-3742, Idm-E869. Phoenix-Furniss Mine
Cabarrus County, N. C. Tungsten

Transmitted are three signed copies of the subject amendment.

The usual distribution of the other copies has been made by this office.

Robert A. Laurence
Robert A. Laurence

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.
ROOM POST OFFICE BLDG.
KNOXVILLE 2, TENN.

RECEIVED
FEB 20 1956

February 16, 1956

Memorandum

To: Operating Committee, DMEA - Washington

From: DMEA Field Team, Region V - Knoxville, Tennessee

Subject: DMEA-3742, Idm-E869 (tungsten) Carolina Tungsten Mining Co.
Furniss-Phoenix Mines, Cararrus County, North Carolina

Enclosed are 3 copies of a letter from Paul M. Tyler, describing progress of work at the Furniss Mine. We will prepare an amendment extending the date for beginning of work under the contract, as it was not possible for Mr. Tyler to get started by December 31, 1955, the date set in the contract.

Robert A. Laurence
Robert A. Laurence
EXECUTIVE OFFICER
DMEA REGION V

V. J. Lynch
V. J. Lynch, Member
Bureau of Mines

PROCESS METALLURGY
RESEARCH AND DEVELOPMENT
RECEIVED
FEB 14

ECONOMIC SURVEYS
WASHINGTON REPRESENTATION

PAUL M. TYLER
REGISTERED PROFESSIONAL
MINING ENGINEER & METALLURGIST
~~WASHINGTON, D.C.~~

RECEIVED
FEB 20 1956

RESIDENCE:
5008 EDGEMOOR LA.
BETHESDA 14, MD.

February 11, 1956

Mr. Robert A. Laurence
Executive Officer
DMEA, Region V
Post Office Building
Knoxville 2, Tennessee

Re: DMEA-3742(tungsten)
Phoenix-Furniss Mine
Cabarrus County, N. C.

Dear Bob:

I have postponed writing you in regard to a firm date for commencing work under our exploration contract until now because I just did not know when we could lick our numerous problems. We are by no means in the clear as yet, but technically, I believe, we have at long last started work. I shall appreciate it, therefore if you will prepare the necessary papers and forward them to me as soon as convenient. My guess of February 15th as a suitable date, as mentioned in my letter of January 7, would be about right.

As indicated in my previous letter, we had some trouble and delay in the shaft below the 100-level but we entered the 170-level crosscut about three weeks ago. Our subsequent troubles were due to the fact that the workings are tortuous and narrow so that we have had to knock off corners and dig up bottom before laying track or even getting in with air and water lines. I personally spent two days with 6 men trying to lay the turns into the two drifts and ended up by improvising a turntable. There is so much water raining down at the intersection that I did not deem it wise to employ a turnsheet for twisting the cars. I still don't know what to do about the Southwest drift where the last 120 feet are not only crooked but extremely narrow. The drift is broken out only to the walls of the vein which is about 36 inches wide and dipping 60°. We were barely able to run a wheelbarrow in for cleaning out the muck and before we can run a car in we shall have to drill and shoot as much as 100 tons off the footwall side. We also ought to take up bottom as the average grade is close to 7%.

The two crosscuts or drifts extending westward from the inter section of the level and the crosscut to the shaft are both filled with muck--at least 250 tons of material that is almost as hard as concrete after being under water for perhaps 75 years. We were planning to use one of these crosscuts as a station for a drill hole to explore the hanging wall country.

We have laid track in the northeast drift but my inspection of the ground intensified my feeling that this drift does not follow the main vein so I decided to take a look into the footwall before extending the heading much further. Yesterday, Friday, when I left Concord, we had drilled and blasted a round in the new crosscut-to-be and in the heading. We had shot both of these faces twice and still failed to break to the bottoms of the holes.

Evidently we shall have to do some experimenting before we learn how to break this ground. An engineer from the explosives company should arrive next week(we expected him earlier) and he may show us some tricks. Some of the trouble so far was my fault. I hoped t to use 40% ammonia dynamite in order to minimize fumes and because I think it is less dangerous to handle. It won't work in this hard ground. Our "miner" also got mixed up on the delayed electric blasting caps and shot the cut holes too late. It also takes him too long to collar a hole and I am not enthusiastic about the pattern of his favorite round. However, we ought to get on top of this problem within a few days.

I am worried about costs. I expected that our contract price of $37.50 would serve to reimburse us in part for our heavy expense in rehabilitating and equiping the shaft but I doubt if it will allow us to break even on a straight footage basis. With our manager and three other men on top, out overhead is excessive for a one drill operation and my present guess on explosives and bits is about $10 a foot higher than I anticipated. Moreover, my figures are predicated upon breaking at least 4.5 feet per round and we have to prove whether even this is feasible.

The detailed geology in the Furniss calls for study. The crosscut from the shaft on the 170 follows a fault zone that I take to be subsequent to the tungsten mineralization although the drift that follows this fault beyond the level drifts shows a narrow quartz veinlet on the wall of the fault which runs roughly east and west (my compass showed N70W) The vein from the Southwest drift seems to tend to follow the usual N 60 E trend of the major vein system (actually N 55 E plus) but the Northeast drift may have encountered an entirely different vein and in the present heading it seems to be swinging even further away from the normal strike. The country rock in the southwest drift is about the same as in the Phoenix although there is more carbonate in the vein. The greenstone in the northeast drift is much lighter and in the footwall is full of calcite along the joints and perhaps in the form of sizable lenses. In shooting bottom we removed about a ton of material consisting mostly of calcite and dolomite. There seems to be more siderite in the vein quartz here than in the Phoenix. It may be pertinent to note that the BuMines drill holes encountered more carbonates in the northern extension of the Nash vein, including a 6-ft. body of dolomite in BM 6.

I am not quite satisfied with our assays on the Phoenix and am having about 12 of them checked by other labs. We obtained one assay of 8.98% WO_3 but generally the samples ran lower in tungsten and higher in gold than I anticipated. We have some ore there but not enough in sight to justify a mill. We ought to do some more vigorous prospecting. But more about this later.

RECEIVED
FEB 14 1958

Sincerely yours,

Paul

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 400 POST OFFICE BLDG.
WASHINGTON 25, D.C.
KNOXVILLE 2, TENN.

400

RECEIVED
JAN 9 1956

January 5, 1956

WSM

Mr. Paul Tyler
5005 Edgemoor Lane
Bethesda, Maryland

Re: DMEA-3742, Idm-8869 (tungsten)
Phoenix-Furniss Mine
Cabarrus County, N. C.

Dear Paul:

Sheldon Bergman and Sam Broadhurst visited the Phoenix mine during the last week of December, and Bergman tells me you have pulled the pumps from the Phoenix shaft. Therefore, I assume that you will soon be ready to begin work under the exploration contract at the Furniss shaft.

Please let me know approximately when you expect to begin at the Furniss. We will then prepare an amendment extending the time for beginning and completion, as I told you in a phone conversation about a month ago, and will forward it for you signature.

Sincerely yours,

Robert A. Laurence
Executive Officer, DMEA
Region V

RAL/mm

Operating Committee

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 1 POST OFFICE BLDG.
WASHINGTON 25, D.C.
KNOXVILLE 2, TENN.

January 5, 1956

Memorandum

To: Operating Committee - DMEA - Washington

From: DMEA Field Team, Region V - Knoxville, Tennessee

Subject: DMEA-3742, Idm-E869 (tungsten) Carolina Tungsten Mining Co. Phoenix-Furniss Mine, Cabarrus County, N. C.

Work at this project has not been started by the date specified in the contract, December 30, 1955. However, this was by verbal agreement between the Operator and the Field Team.

Reason for the delay was that pumping and hoisting equipment was being used at the Phoenix shaft, and in order to thoroughly examine the possibilities of the Phoenix, that mine was kept unwatered until late in December.

To avoid the excessive cost of providing duplicate equipment at the Furniss, we agreed to let the Operator start at a later date, when the hoist and pumps are no longer needed at the Phoenix. We expect that this will be in January or early February. As soon as we get definite word from the Operator, we will draft an amendment extending the beginning and completion dates of this contract.

Robert A. Laurence
Robert A. Laurence
Executive Officer -DMEA
Region V

V. J. Lynch
V. J. Lynch, Member
Bureau of Mines

RECEIVED
JAN 9

DOCKET
Surname:
Chapman
Martin
Kiilsgaard
Holliday
Talbot
Selfridge

400

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Co.
Furniss & Phoenix Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Dear Mr. Laurence:

Enclosed are the original and five copies of a proposed Amendment No. 1 to the above-referenced contract, signed by the Administrator for the Government. Two extra copies are enclosed for use of the Field Team.

If the terms and conditions of this proposed amendment are satisfactory to you and the Operator, all six copies should be signed by the Operator and the usual distribution made.

If any part of the proposed amendment does not have your approval or that of the Operator and cannot be altered within your delegated authority, the original and all copies are to be returned to this office, together with the proposed changes for consideration.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee (HB)

Enclosures

APPROVED:

/s/ Robert W. Geoffard (HB)
Member, Bureau of Mines

Thor H. Kiilsgaard (HB)
Member, Geological Survey

cc: Docket
Code 400
Oper. Comm.
Adm. Read. File
T. Kiilsgaard, USGS
R. Holliday, USBM
FT, Reg. V

TLChapman/ls
12/1/55

Filed by
T.G.S.

DOCKET
Surname
Chapman
Martin
Holliday

400

November 29, 1955

MEMORANDUM

To: Associate Solicitor, Div. of Mineral Resources

From: Chief, Iron and Ferro-Alloys Division, DMEA

Subject: Preparation of Amendment No. 1
Docket No. DMEA 3742, Tungsten
Carolina Tungsten Mining Co.
Furniss and Phoenix Mines
Cabarrus County, North Carolina
Contract No. Idm-E869

Transmitted herewith is a rough draft of an Amendment No. 1 to the above-captioned contract for your use in preparing the final draft.

W. S. Martin, Chief
Iron and Ferro-Alloys Division

Attachment

cc: Docket
Code 400

LScott

Samples in the Phoenix a little disappointing

600 Still not unwatered

520 lamps fairly consistent

Sw heading 520 30" 0.17 % WO3 $1.40 Av.

.42 Cu

Sang $15.82

NE 30" 0.18

Scheelite from vein 0.47 .28 oz Av

900' @ 6' intervals 150 samples $2500

16.66

Sw drifting @ the Furnace $11,000 that JT never liked

Put our engineer there few days notice

would go along with 10 ft interval

5 —	250
10-15 —	350
10	420
10-15	520
	600

Sample 6 lens 25 samples [illegible]

" 5 " 25 "

" 4 " 15

" 3 " 20

" 2 " 15

100

Actual [illegible]

4 men underground

1 [illegible] man here

Foreman

" 60 day

100 samples 2.000 actual cost

DOCKET
Surname:
Martin
Mottesley

NOV - 9 1955

Mr. Paul M. Tyler
5005 Edgemoor Lane
Bethesda 14, Maryland

Re: Docket No. DMEA 3742-Tungsten
Carolina Tungsten Mining Co.
Phoenix and Furniss Mines
Cabarrus County, N. C.
Contract No. Idm-E869

Dear Mr. Tyler:

In compliance with your request when submitting application for exploration assistance at the subject properties, we are returning herewith one copy each of the following exhibits which accompanied your application:

Exhibit A, Bureau of Mines Report of Investigations 4724, Investigation of Furniss Tungsten Deposits, Cabarrus County, N. C., by Jack O. Jones and Alexander L. Peyton

Exhibit B, Tungsten Deposits in Cabarrus County, North Carolina, by Robert S. Houston.

For reference purposes we are retaining one copy of Exhibit B in our files until completion of the exploration work authorized under the above-captioned contract.

Sincerely yours,

SIGNED

W. S. Martin, Chief
Iron and Ferro-Alloys Division

Enclosures

cc: Docket
Adm. Read. File
Code 400
FT, Reg. 5
T. Kiilsgaard, USGS
R. Holliday, USBM

LScott 11/8/55

R.C.S.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM POST OFFICE BLDG.
WASHINGTON 25, D. C.
KNOXVILLE 2, TENN.

RECEIVED
NOV - 3 1955

October 31, 1955

Memorandum

To: Operating Committee, DMEA - Washington

From: DMEA Field Team, Region V, Knoxville

Subject: Signed Contract - DMEA-3742, Idm-E869 (tungsten)
Carolina Tungsten Mining Co. Bethesda, Md. Furniss and Phoenix Mines, Cabarrus County, N. C.

Enclosed are three copies of the subject contract. The usual distribution of the other copies has been made.

We still object to the present form of the contract, as explained in our memorandum of September 26. We did not think it fair to the Operator to delay further because of this, since there is general agreement that the northeastward drifting at the Furniss should be the initial work of the project.

However, we shall shortly propose an amendment which will eliminate the southwest drifting at the Furniss and substitute cross-cutting and/or drifting and/or raising, to follow diamond drilling.

A possible amendment to provide for work at the Phoenix is being considered, but a definite decision is awaiting results of preliminary sampling last week by the field examiners.

Robert A. Laurence

Robert A. Laurence
EXECUTIVE OFFICER
DMEA REGION V

V. J. Lynch

V. J. Lynch, Member
Bureau of Mines

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

10/19/55

Paul Tyler called up to say he now has the OCL we asked for and he will give it to the FT, when their men come to see his project on Tuesday (Oct 25), and sign the contract then. As soon as we hear from Laurence we should write to Alexander. WSM

Re DMEA
3742

Told Laurence when he called 10/21/55 that we would give favorable consideration to any amendment that increased the amount of sampling. That contract should be executed in its present form and should not be delayed in order to make changes, but that no one should think the present form was anywhere near perfect. We need more information

Friday, October 21, 1955

Mr. Laurence phoned Mr. Martin from Knoxville today at 11:30 a.m.; stated Tyler had given him the OCL; had dewatered the Phoenix property and was ready to go ahead; however, FT questioned certain aspects of contract and asked Mr. Martin's advice on same. Mr. Martin explained our willingness to amendments pertaining to certain part of the work where FT being on the land was in better position to appraise the situation than had we been in preparing the contract here in D. C. Mr. Laurence will go ahead and submit the contract to Tyler for signature.

about the U.G. workings and the showings there. Told him our purpose was to find out one way or the other whether the property had merit. He thinks we should substitute sampling for the present drilling, and perhaps do some other drilling after driving the exploration headings.

Alexander 9M Visi, N.C.

Hugh Quincy Alexander

Phoned personally July 1, 1955 and wants to be told what we do about this

Docket

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 25 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

RECEIVED
SEP 23 1955

WASHINGTON OFFICE

September 26, 1955

Copy [illegible]

Memorandum

WSM

To: Operating Committee, DMEA - Washington

From: DMEA Field Team, Region V - Knoxville, Tennessee

Subject: DMEA-3742 (Tungsten) Carolina Tungsten Mining Co.
Bethesda, Md. Furniss and Phoenix Mines, Cabarrus,County, N. C.

Reference is made to your letter of September 12 and the proposed contract, which were not received until September 20. We have discussed the proposed contract with Mr. Beck and Mr. Teague, who wrote the examination report.

Apparently, several changes in the recommendations were discussed with Mr. Paul Tyler, and were satisfactory to him. However, in the absence of recommendations supporting these changes, we are not inclined to agree with them. We have received copies of Mr. Martin's comments in his memorandum of August 4, but have not received the usual reviews by the commodity specialists of the Survey and the Bureau. We would be interested in their comments, especially if these contributed to the proposed changes.

1. All work recommended in the field examination report, and all work approved in the proposed contract, is to be on the Furniss Property and none is closer than 500 feet to a property line. Why, then, is it necessary to include the Phoenix Property and to obtain Consent to Lien for it? Why not provide later, if desired, for work at the Phoenix in an amendment or a new, separate contract?

2. The field examiners proposed drifting 300 feet on the 170-foot level at the Furniss. Following this, three holes to be drilled from the 170-foot level and an additional 300 feet of drifting and/or crosscutting and/or raising, contingent upon results of the drilling. We do not see the justification for driving the second 300 feet of drift before the holes are drilled. Not only does this explore different ground than was recommended, but it fails to provide for any follow-up of the drilling if it is favorable. We doubt that adequate samples can be obtained by drilling, and would prefer to see provisions made for sampling from underground workings.

3. As tungsten will, at best, be only a by-product, values of other metals may well be the deciding factor in this deposit. We think some provision should be made for copper assays when visual examination of the samples indicates it is warranted.

4. Evidently Mr. Tyler agreed to erect a headframe and unwater and rehabilitate the shaft at the Company's expense in order to avoid delays. Isn't this a legitimate expense of exploration and if so, should not it have been included in the contract? This may be an academic question, for he may have most of this work done before a contract is executed.

Robert A. Laurence

Robert A. Laurence
EXECUTIVE OFFICER
DMEA REGION V

V. J. Lynch

V. J. Lynch, Member
U. S. Bureau of Mines

Docket

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.
ROOM 13 POST OFFICE BLDG.
September 20, 1955 NN.

RECEIVED
SEP 2 1955

Copy retained 400

WSM

Mr. Paul M. Tyler
Carolina Tungsten Mining Co.
5005 Edgemoor Lane
Bethesda 14, Maryland

Re: DMEA-3742 (tungsten)
Furniss & Phoenix Mines
Cabarrus County, N. C.

Dear Paul:

I have your letter of September 13, and the copy of Mr. Lackey's letter to the agent of the Trustees for the Phoenix property. We have been advised by the Washington office that, if you are unable to obtain a Consent to Lien from the trustees, a performance bond, a third party guaranty, or a waiver of any third party security will be considered as alternatives.

The contract, as proposed by our Washington office, provides for drifting at a fixed unit-cost of $37.50 per foot, but does not provide anything for erecting a headframe, or for unwatering and rehabilitating the shaft. I assume that these items were discussed in your conference with our Washington staff and that they are satisfactory to you, otherwise you would not have begun work on the headframe and rehabilitation at your own expense.

We will be glad to hear of further progress, and will plan to have the field examiners visit the mine at some later date.

Sincerely yours,

Robert A. Laurence

RAL/am
cc:
Lynch
Shirley
Opr. Com.
Files

George C. Selfridge

RECEIVED

SEP 20 1955

WSM
9/20/55

NORRIS W 29 NORRIS 299
WA 340
GEORGE C SELFRIDGE CHZIRMAN OPERZTING COMMITTEE DMEA

RE MY MEMO SEPTEMBER 19 FURNISS CONTRACT DMEA 3742 RECEIVED TODAY

ROBERT A LAURENCE

Norris, Texas.

SEP 20 12 38 PM '55
BUREAU OF MINES
MAIL ROOM
WASHINGTON, D. C.

Pocket

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
ROOM 2[illegible] POST OFFICE BLDG.
KNOXVILLE 2, TENN.

WASHINGTON 25, D.C.

September 19, 1955

RECEIVED
SEP 2[illegible] 1955

Copy retained 400

Memorandum

To: Operating Committee, DMEA - Washington

From: DMEA Field Team, Region V - Knoxville, Tennessee

Subject: DMEA-3742, (tungsten) Carolina Tungsten Mining Co., Bethesda, Md. Furniss Mine, Cabarrus County, N. C.

We note, in Operating Committee Minutes No. 565, September 9, 1955, that a proposed contract for the Furniss and Phoenix Mines was mailed to us. We have not received either the letter or the contract. On September 15, we received a letter from Paul Tyler stating that he had considerable doubt that the owners of the Phoenix property will sign a Consent to Lien, but that he was requesting it anyway.

If the contract which was mailed on September 9 cannot be located, please send us another copy, so that we may comment on it. However, we do not see why it is necessary at this time to obtain the Owner's Consent to Lien on the Phoenix, as the Field Team report recommends work at the Furniss Mine only. If it is later decided to do work at the Phoenix, that could be provided in an Amendment or a new contract.

Robert A. Laurence

Robert A. Laurence
EXECUTIVE OFFICER
DMEA REGION V

Wm. A. Beck

Wm. A. Beck, for V. J. Lynch
Member, Bureau of Mines

COPY

September 13, 1955

Mr. Robert A. Laurence
Executive Officer, DMEA
Region V, Room 13
Post Office Building
Knoxville 2, Tennessee

Re: DMEA-3742(tungsten)
Phoenix-Furnixx Mine
Cabarrus Vounty, N. C.

WBM

Dear Bob:

In compliance with instructions from the Washington Office we have initiated a request for execution of Owners Consent To Lien in respect to the Phoenix Mine property. Copy of Mr. Lackey's letter to the agent of the Trustees is enclosed for your files.

There is considerable doubt in my mind whether the owners of this property will agree to sign and, in any event, a good deal of time must elapse before the papers can be circulated to Hawaii, California, and Massachusetts where the respective owners reside. Meanwhile, I hope some arrangement can be made for completing the contract for the work which, as now proposed, is confined to the Furniss Mine property for which we have obtained all necessary signatures from the four owners.

Owing to heavy rains and failure to receive timber on time, we almost lost the Furniss shaft again, but now it is re-timbered and the collar is in place. Work on the headframe began this week. I do not anticipate much trouble in completing the unwatering but there may be some nasty mucking at the bottom and, of couse, there is the job of buying and installing the hoist, track, air lines, etc. I have not yet been able to find a suitable hoist and am having some trouble in having small ore cars built to ride in a 47 x 48 inch shaft compartment. I delayed some of these major expenditures because the contract price as negotiated in the contract might be interpreted as including some reimbursement for the cost of rehabilitating and equiping the shaft. In such case, I felt that the price might be reduced if the preliminary work had been completed before the contract was finalized

We are leaving tomorrow for the mine and I shall write you after my return in regard to an estimated date for a visit from the field team. However, it will probably be mid-October before we can establish suitable reference markers from which to measure progress in the drifts. We have also suffered delays in unwatering the Phoenix below the 420 level. We may have to get another pump. The upper levels are encouraging and I am looking forward to obtaining the good advice of the field team as to how best to go about sampling and ~~xxx~~ planning additional exploration.

Sincerely yours,

Paul M. Tyler

COPY

September [illegible], 195[illegible]

S. A. Bailey & Co.
[illegible] Boulevard
Chicago [illegible], Ill.

Dear Sirs:

In order to accelerate our efforts to find economic ore deposits on the old [illegible] property [illegible] [illegible] for Government financial assistance in the form of a loan from the Defense Minerals Exploration Administration.

[illegible] form of this [illegible] to make [illegible] Government [illegible] that [illegible] the work covered by the contract [illegible] result in discovery of [illegible]. If the explorations at financial [illegible] prove successful, the Government certifies the discovery [illegible] the loan shall [illegible] be repaid, [illegible] interest, in the form of [illegible] royalty [illegible] from [illegible] commercial production. [illegible] no [illegible] is made to the Government [illegible] from the property within a 10-year period. After [illegible] years, the Government can [illegible] no claim for further royalty [illegible] the property by [illegible] of the loan.

[illegible] of negotiation, the Government [illegible] contracts which [illegible] 2, [illegible] for [illegible] the Phoenix-[illegible] mineralized zone. [illegible] we have [illegible] on these [illegible] locations [illegible] is small. However, it [illegible] some [illegible] about to [illegible] possibility [illegible] may be made available [illegible] the Government [illegible] additional [illegible].

Before [illegible] contract can be [illegible], the Government [illegible] obtain [illegible] Owners' Consent to Lien covering [illegible]. We have obtained [illegible] Government [illegible] but we are also required to obtain [illegible] mineral rights on the [illegible] property.

[illegible] (6 copies) have [illegible] enclosed [illegible] letter. [illegible] [illegible] policies of the Government [illegible] [illegible]. Your attention is directed to [illegible] at the bottom of the first page of Form DMEA [illegible] which specifically states "Mining or production from [illegible] not required, and [illegible] absence of [illegible] is no obligation to [illegible] the Government." In other words, the only obligation of the owner is in case our company and/or Mr. [illegible] should abandon the property after certification of a discovery, and subsequent [illegible] during the [illegible] years would [illegible] to

assume the 5% royalty on any commercial production within the specified period.

In the interest of the owners of the property, I am asking you to circulate these forms by airmail and have them signed by as many of the trustees or their authorized representatives as may be necessary to validate the tentative agreement.

I am also requested to ask you to inform me promptly as to how much time it should take before the necessary signatures can be obtained and returned to me for transmittal to the Government.

Very truly yours,

CAROLINA TUNGSTEN MINING CO.

Hal Lackey, Partner

RECEIPT FOR CERTIFIED MAIL—15¢

No. 801635

SENT TO

G. R. Bailey & Co.

STREET AND NO.

141 Boulevard

CITY AND STATE

Chicago, Ill.

If you want a return receipt, check which ☐ *7¢ shows to whom and when delivered* ☐ *31¢ shows to whom, when, and address where delivered*

POSTMARK OR DATE

SILVER SPRING, MD. WOODSIDE STA. 1955 SEP 1

POD Form 3800
Apr. 1955

Frances,

Litha said extra cy of Contract loaned to Mr Tyler to use in getting Consent to Lien from ~~Cap~~ Chapin Estates.

JB

DOCKET
Surname:
Martin
Rutty
Selfridge

400

SEP 12 1955

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville, Tennessee

Re: Docket No. DMEA 3742, Tungsten
Carolina Tungsten Mining Co.
Furniss and Phoenix Mines
Cabarrus County, North Carolina

Dear Mr. Laurence:

Enclosed are the original and five copies of a proposed contract for an exploration program by the above-referenced applicant, signed by the Administrator for the Government, together with Exhibit "A" (2 pages), Annex I (2 pages), and 2 maps.

If any part of the proposed contract does not have your approval or that of the applicant and cannot be altered within your delegated authority, the original and all copies are to be returned to this office, together with the proposed changes for consideration.

The Owner's Consent to Lien provided by Robert and Ethel Nash and Archie and Mary Nash for the Furniss land is attached to the contract.

In a conference here, Mr. Tyler was advised that we require Owner's Consent to Lien from the trustees of the Chapin Estate as to the Phoenix tract. He felt that it would be difficult and time-consuming to obtain the necessary signatures. If he demonstrates that such consent is unobtainable, we could then consider the alternatives of a surety company's performance bond or a third party guaranty such as we have accepted in other cases, or a waiver of any third party security as to the Phoenix property. Mr. Tyler has been provided MF-203 forms prepared here.

Under Article 3, the starting date has been left blank and is to be filled in when the contract is signed by the Operator.

Sincerely yours,

George C. Selfridge
Chairman, Operating Committee (2/3)

Enclosures

APPROVED:

P. F. Yopes (2/3)
Member, Bureau of Mines

/s/ N. E. Nelson (2/3)
Member, Geological Survey

R.C.B.

TLChapman/ls
9/8/55

cc: Adm. Read. File
Thor Kilsgaard, USGS
Robt. Holliday, USBM

cc: Docket
FT, Reg. V
Oper. Comm.
Code 400

400

DOCKET
Surname:
Holt
Chapman
Holiday
Talbut
Selfridge

Not used

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville, Tennessee

Re: Docket No. DMEA 3742, Tungsten
Carolina Tungsten Mining Co.
Furniss and Phoenix Mines
Cabarrus County, North Carolina

Dear Mr. Laurence:

Enclosed are the original and five copies of a proposed contract for an exploration program by the above-referenced applicant, signed by the Administrator for the Government, together with Exhibit "A" (2 pages), Annex I (2 pages), and 2 maps.

If any part of the proposed contract does not have your approval or that of the applicant and cannot be altered within your delegated authority, the original and all copies are to be returned to this office, together with the proposed changes for consideration.

Under Article 3, the starting date has been left blank and is to be filled in when the contract is signed by the operator.

Please File in M&F Docket

Sincerely yours,

Chairman, Operating Committee

Enclosures

APPROVED:

Member, Bureau of Mines

Member, Geological Survey

cc: Docket
FT, Reg. V
Oper. Comm.
Code 400
Adm. Read. File
Thor Kiilsgaard, USGS
Robt. Holliday, USBM

TLChapman/ls
8/24/55

MF-203
Revised March 24, 1955

For Government's Use Only
EXPLORATION PROJECT CONTRACT
Operator Carolina Tungsten Mining Co.
Docket No. DMEA- 3742
Contract No. Idm-E
Contract Date

CONSENT TO LIEN

To the United States of America:

Referring to that certain land in the County of Cabarrus, State of North Carolina, described as follows:1/

See Attachment 1 hereto, made a part hereof.

which is the subject of a proposed exploration project contract, hereinafter called the "contract," with the United States of America, hereinafter called the "Government;" in consideration of the contract and as an inducement to the Government to enter into it, the undersigned hereby—

1. Undertakes and agrees that property in which the Government may acquire an interest or equity under the contract may be dismantled, severed from the land, and removed, as may be provided in the contract; and the Government's interest and equity in such property shall be prior and superior to any adverse right or claim of the undersigned;

2. Grants to the Government a lien upon all of the undersigned's right, title, and interest in the land and upon any production of minerals therefrom to secure the payment to the Government of a percentage royalty on production as may be provided for by the contract;2/ and represents and undertakes that there are no claims, liens, or encumbrances upon the undersigned's right, title, or interest in the land prior to that hereby granted to the Government other than the following:3/

3. Undertakes and agrees neither to commit any act nor assert any claim in conflict with the provisions of this Consent to Lien; and to give advance notice of the Government's rights under this Consent to Lien to any subsequent transferee, mortgagee, encumbrancer, or lessee of any of the undersigned's right, title, or interest in the land; and

1/ Either (a) insert the legal description of the land, or (b) strike out the words "as follows" and insert "in a lease [or contract, deed, or other document] dated _____, and recorded in book _____ page _____ official records of said county." If (b) is used, the book and page of recordation cannot be dispensed with. If the space provided is insufficient, use an Annex, and refer to the Annex in the space.

2/ Mining or production from the land is not required, and in the absence of production there is no obligation to repay the Government.

3/ Write "none" if that is the case. Do not leave lines blank.

4. Consents to all amendments and assignments of the contract without notice thereof, and agrees that this Consent to Lien shall extend and apply thereto.

5. Added provision: _____

_____

_____

_____

_____

_____

_____

_____

Dated this _____ day of _____, 195__.

_____ [Seal] _____ [Seal]
Robert L. Nash Mary L. Nash

_____ [Seal]
Ethel A. Nash

_____ [Seal]
Archie L. Nash

I, _____ certify that I am the _____ _____ (Secretary, etc.) of the corporation named herein; that _____ _____ who signed this agreement was then _____ (President or Vice-President, etc.) of said corporation; that said agreement was duly signed for and in behalf of said corporation by authority of its governing body, and was within the scope of its corporate powers.

_____
[Corporate Seal]

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

August 29, 1955

Memorandum

To: Chief, Branch of Ferrous Metals and Ferroalloys

From: Commodity Industry Analyst

Subject: DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Furniss and Phoenix Mines, Cabarrus County, North Carolina
Transmittal of Exploration Contract

Subject contract calls for 600 feet of drifting at $37.50, 500 feet of diamond drilling at $7.00 and analysis of 80 samples at $5.00 for a total of $26,400 with 75 percent Government participation.

In view of the geology, the past history, and the present effort being made by the operation, I concur in the decision to negotiate the subject contract.

Robert W. Holliday

Robert W. Holliday

Copy to Div. of Minerals (Mr. Geehan)
Ferrous Metals
Mr. Holliday
Files

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SOLICITOR
WASHINGTON 25, D. C.

Rubin
Nelson

AUG 16 1955

Memorandum

To: The Administrator, DMEA
Attention: Mr. W. S. Martin

From: Acting Assistant Solicitor, Defense Minerals

Subject: Docket No. DMEA-3742, Carolina Tungsten Mining Company (Tungsten)

As requested in Mr. Martin's undated memorandum, we have prepared a contract covering the subject project.

Prior to execution of the contract we require that copies of the assignment to the applicant of the Lease-Option Agreement covering the Furniss Property, and of the assignment of the sublease to applicant of the Phoenix property be submitted. In this regard, the docket contains a copy of an instrument executed by Hal Lackey, purporting to assign his rights in "the attached assignment from Russell and Company, Inc., together with the attached leases which are incorporated herein," however, assuming that the leases referred to in this instrument are the leases contained in the docket, there is no copy of the assignment from Russell and Company in the docket.

Consents to Lien are required of Robert and Ethel Nash, and Archie and Mary Nash for the Furniss land; and Consents to Lien are required of Archie and Mary Nash, and the Trustees of the Chapin Estate for the Phoenix land.

J. L. Hofflund

J. L. Hofflund
Acting Assistant Solicitor
Defense Minerals

Attachments

P. S. The maps referred to in the contract should be attached prior to execution.

HCRubin/emd
Copy to: DMEA Docket
Solicitor's Docket
W. S. Martin (2)
J. L. Hofflund
H. C. Rubin
chron.

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

August 4, 1955

CONTAINS INFORMATION FOR
U. S. GOVERNMENT USE ONLY

MEMORANDUM

To: Administrator

From: Iron and Ferro-Alloys Division

Subject: Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Furniss and Phoenix Mines
Cabarrus County, North Carolina

The following considerations, which did not apply in the case of our recommendation of a denial of DMEA Docket No. 2663, Nash Mining Company, Inc., affect our recommendation of a contract for the subject application.

1. We now note that the "Confidential Section" of R.I. 4724 concludes as follows:

"Trenching uncovered considerable fluorescent vein material; however, the analyses of bulk samples indicated the tungsten content was very low and in most cases not detectable with routine methods of analysis.

Core drilling on the extensions of the Copper, Nash and Furniss veins indicated they are not continuous and do not extend to depth.

The underground examination and sampling of the Furniss mine showed considerable tungsten and a fairly persistant vein. The main veins of the Phoenix, California and Junction shafts extend to depth and in the Phoenix the vein has been developed to the 650-foot level. These dumps all show scheelite.

It is recommended that the Bureau map the area between these properties, which is about a mile in length, to better correlate the main vein structures. This should be followed by additional drilling and trenching to determine if the area merits further work."

2. Apparently we now have a more efficient and experienced Operator.

3. Instead of a project with a high proportion of rehabilitation work, we find that the Operator has completed, or will complete, all the necessary rehabilitation for its own account.

4. The "target" is larger. The work already completed suggests that tungsten occurs not only in the quartz veins, but also in the wall rocks, and therefore the Operator believes that the shearing may have resulted in deposits of minable grade over fair mining widths.

W S Martin

W. S. Martin, Chief
Iron and Ferro-Alloys Division

400 DOCKET
SURNAME
Chapman
Martin

8/3/55

MEMORANDUM

To: Acting Assistant Solicitor, DMEA

From: Iron and Ferro-Alloys Division, DMEA

Subject: Preparation of proposed contract
Docket No. DMEA 374a2 - Tungsten
Carolina Tungsten Mining Company
Furniss and Phoenix Mines
Cabarrus County, North Carolina

Transmitted herewith is a rough draft of a proposed contract for your use in preparing the final draft.

The applicant and lessors will see the contract in final form before executing Owner's Consent to Lien.

Please return draft for our files.

W. S. Martin, Chief
Iron and Ferro-Alloys Division

Attachment

TLChapman:foc
8-3-55
cc to: Docket
Code 400

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

COLLEGE PARK, MARYLAND

July 12, 1955

Memorandum

To: Mr. Robert Holliday, Room 3511, Washington Office
ATTN: Mr. W. S. Martin

From: Administrative Assistant, Eastern Experiment Station

Subject: R. I. on Cabarrus Co., N.C.

As per your telephone request of July 11, 1955, the following report is enclosed:

80:1355 R. I. "Investigation of Furniss Tungsten Deposits, Cabarrus Co., North Carolina" (Confidential Section included) By Jones and Peyton

Please receipt the carbon copy of this memorandum and return to this office.

F. R. Kantner PAC
F. R. Kantner

PACooper/pac

cc: Regional Director, Region V
Calvin Pierson, WO
Technical Records Unit
Chief, Minerals Div., WO
Mr. Kantner
1. Mr. Ambrose 2. C.P. Files

Docket.

IN REPLY REFER TO:

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

RECEIVED
JUN 23 1955

Copy retained 300

June 22, 1955

Memorandum

To: W. S. Martin, Defense Minerals Exploration Administration

From: T. H. Kiilsgaard, U. S. Geological Survey

Subject: Review of Field Team report, DMEA Docket 3742, Carolina Tungsten Company, Cabarrus County, N. C.

The applicant has secured control of two old gold mines, the Phoenix and Furniss, which have been more or less inactive since the turn of the century. In 1946 scheelite was discovered on the dumps of these mines, the better showing being at the Furniss. On the basis of this discovery, the U. S. Bureau of Mines conducted two exploration projects on the properties in 1948 and 1949-50 (see R.I. 4724). Twelve holes were diamond drilled, six of them exploring the Furniss vein near or under old Furniss workings. There was also 3,155 linear feet of trenches bulldozed and numerous samples collected for assaying. At that time the Furniss mine was unwatered and the 100 and 170 levels mapped and sampled.

Work by the Bureau of Mines revealed the best scheelite occurrences were on the 100 level of the Furniss mine, where 41 feet of vein averaged 1-foot in width and 2.1 percent WO_3. On the 170 level no scheelite was found southwest of the shaft, but a 15-foot length of vein northeast of the shaft contained sparse scheelite. In addition, two of the diamond drill holes on the Furniss vein showed tungsten. Hole 4, between 55.3 and 57.7 feet, contained 2.4 feet of core averaging .25 percent WO_3, and Hole 7, between 99.1 and 103.2 feet contained 4.1 feet of core averaging 0.03 percent WO_3. No reserves are shown in the Bureau's R.I., although Lemmon (memo to Selfridge, Sept. 18, 1952) tentatively infers 3000 units of WO_3 to the 170 level in the Furniss and Furr mines.

The applicant proposes the following exploration:

1) Rehabilitate the Phoenix shaft and examine old Phoenix workings.
2) Rehabilitate Furniss shaft.
3) Drift southwest on Furniss 170 level 300 feet.
4) Crosscut southeast on Furniss 170 level 100 feet.
5) Drift northeast on Furniss 170 level 300 feet.

Field examiners, following a one day examination during which they inspected outcrops and the 150 level of the Phoenix mine, decided there was enough scheelite on the property to create interest, but they wavered on whether there was enough to warrant exploration. Finally, they concluded that exploration could be justified at the Furniss mine but not at the Phoenix unless rehabilitation at that mine by the applicant gave more encouraging results. They recommended the following work:

1) Rehabilitate the Furniss shaft -- a project reported by the applicant to already be in progress.
2) 300 feet of drift and/or raise from the Furniss 170 level.
3) If above results are successful, explore the Furniss footwall by 3 150-foot diamond drill holes.
4) If mineralization is found in any of the holes, drive 300 feet of crosscut and drifts to check mineralization.

The applicant reports that he is currently rehabilitating both the Phoenix and Furniss mines, his interest in these mines being primarily because of the gold content. Information on the gold reserves is sketchy. Houston, (attached Master's thesis) reports the Phoenix vein between the 250 and 602 levels to average 14.6 inches in thickness and to contain $22.67 of gold per ton. It is extremely doubtful if such a vein could be mined as ore under present economic conditions. There is even less information on the Furniss mine although the applicant hopes the gold content of the vein, augmented by the scheelite, will make it economically possible to mine.

From the descriptions I have read, the applicant's property is comparable in many respects to countless quartz veins in the west, which have been mined for gold but have been found to contain minor amounts of scheelite. Scheelite in such gold-quartz veins is a common gangue mineral but only in extremely rare instances is it present in sufficient quantity to be called ore. For the most part, the scheelite is not recoverable in a gold mill even as a byproduct.

Additional exploration at the Furniss mine does not appear to be justified. The vein to be explored is narrow, averaging less than 2 feet in thickness, and scheelite occurrences are sporadic both on strike and dip. The irregularity of size and grade of the vein has been conclusively determined by extensive surface dozing, diamond drilling, and underground workings. Further, there is nothing to suggest the vein will improve in thickness or in grade either on strike or in depth.

As I appraise the merits of the property there is only one factor that weighs in favor of a contract. That is the possibility of stimulating development in that part of the country by continued

exploration. Owing to the deep overburden little is known on the distribution of mineralized deposits in that region and there is the possibility that many are being bypassed. Exploration on those now known would be helpful in looking for additional deposits.

On the comparison of the applicant's property with similar quartz-scheelite veins I have seen and with other properties explored by DMEA contracts, I recommend denial of the application. The probability of making a worth while discovery at the mine appears to be too remote to warrant expenditure of public funds. In view of the unusual location and the possibility of obtaining additional information from this comparatively interested area, however, I would not object to a contract if one was approved by DMEA.

T. H. Kiilsgaard

T. H. Kiilsgaard

Docket

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

June 13, 1955

Copy retained 400

Memorandum

To: W. S. Martin, Chief, Iron and Ferro Alloys Division, DMEA

From: R. W. Holliday, Branch of Ferrous Metals and Ferroalloys

WSM

Subject: Review of application - DMEA 3742
Carolina Tungsten Company
Phoenix and Furniss Mines
Cabarrus County, N. C.

This is a property which will eventually require examination and additional exploration. The present time, when part of the work has already been done, would be a good time to complete the work.

Byproduct production of tungsten should be encouraged as one means of maintaining a necessary domestic industry in the face of the uncertain economics of tungsten mining.

I agree with the examiners recommendation that the application should be approved.

R W Holliday
R. W. Holliday

Docket

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.
ROOM 13 POST OFFICE BLDG.
KNOXVILLE 2, TENN.

RECEIVED
JUN - 8 1955

June 6, 1955

Memorandum

To: Operating Committee, DMEA, Washington 25, D. C.

From: Field Team, DMEA, Region V

Subject: Field Examination Report, DMEA-3742 (Tungsten)
Carolina Tungsten Company
Phoenix and Furniss Mines, Cabarrus County, N. C.

W Say

Sam Kiilsgaard
Phoned Nelson 6
" K&N 6/2

ON-SITE REPORT

Enclosed are four copies of the subject field examination report. Also, returned herewith is a copy of exhibit "B" which is marked "Please return to Paul M. Tyler," which should be returned to him after the review of this application has been completed.

Mr. Tyler has written to four diamond drilling contractors for estimates. The following replies have been received:

Sprague and Henwood
"For drilling AX holes from underground locations, 3 or more holes with a minimum total of 450 linear feet, $5.50 per foot.
"For any additional drilling over the minimum, $4.25 per foot."

Pennsylvania Drilling Co.
"a lump sum charge of $300 to get on and off the job, plus a charge of $4.50 per linear foot drilled."

Joy Manufacturing Co.
$4.85 per foot.

McCall Brothers
Not in a position to bid on an underground job.

Reviewed by
DMEA OPERATING COMMITTEE
6-10-55
(date)

This proposal appears to be a borderline case. We are in agreement with the examiners' opinion that tungsten occurrences at the Furniss warrant additional exploration at this time, but that no assistance should be authorized for the Phoenix now. This is one of those cases where the strategic mineral will, at best, be a by-product and the economic value of the mine depends upon the gold content. But if a workable gold deposit does exist, then it may well become a tungsten producer of some importance.

UNITED STATES
DEPARTMENT OF THE INTERIOR

RECEIVED
JUN - 8 1955

DEFENSE MINERALS EXPLORATION ADMINISTRATION

EXAMINATION REPORT BY FIELD TEAM, REGION V

On

DMEA-3742, Phoenix and Furniss Mines (Tungsten)
Cabarrus County, N. C.

By

K. H. Teague, Geologist
U. S. Geological Survey

and

Wm. A. Beck, Mining Engineer
U. S. Bureau of Mines

May 10, 1955

Reviewed by
DMEA OPERATING COMMITTEE
6-10-55
(date)

FIELD EXAMINATION REPORT
ON THE

PHOENIX AND FURNISS MINES - DMEA-3742 (Tungsten)

Applicant: Carolina Tungsten Mining Company
c/o Paul M. Tyler
5005 Edgemoor Lane
Bethesda 14, Maryland

A firm opinion as to the merits of these deposits as a source of tungsten is difficult to form. Both mines contain tungsten mineralization as indicated from a study of dump material. However, scheelite--the only tungsten mineral known to occur--is considerably more abundant in the Furniss mine. At present the Furniss mine is inaccessible. The Phoenix mine was examined on the 150-foot level, but insufficient tungsten mineralization is present to warrant taking samples. Recent trenches cut by the applicant have added little to the information available on the deposits as almost all trenching has been in soil.

The examiners are of the opinion that these properties have some merit for exploration assistance. Sufficient mineralization is present to create interest; however, adequate data are not available to either condemn or approve the deposit. The examiners believe that this application affords an excellent opportunity to determine whether or not a commercial deposit of scheelite is present on these properties. Therefore, we recommend that exploration assistance be granted.

The deposits were examined on May 10, 1955. The following individuals were present at the time of the examination and represented the applicants: Paul M. Tyler, Hal Lackey, Arthur B. Rothwell, and G. E. Nash. Present also were A. L. Peyton, U. S. Bureau of Mines and Sam D. Broadhurst, Assistant State Geologist of North Carolina. The entire day was spent on the examination.

The Phoenix-Furniss properties are in the central part of Cabarrus County, North Carolina, about seven miles southeast of Concord and about six miles southwest of Mount Pleasant. The mines are reached over good all-weather roads.

The applicant's property rights are described in the application. They control adequate area for the proposed work.

These deposits are located in an area of low relief which is rather well covered by small second growth timber. In the area surrounding both the Furniss and Phoenix mines, vegetation has been cleared. At the Phoenix mine two new buildings have been sonstructed. One is a 10' x 15' generator house located near the collar of the Old Pump shaft which is being reconditioned. The other building is a combination office and toolhouse with dimensions of 12' x 20'. The generator supplies power for an electric pump being used in dewatering the mine and for lights. At the Furniss shaft

there is a 15' x 20' building which has been used for storage. All buildings are in good repair.

Existing underground and surface workings are adequately described in the application, except the recent trenches. These trenches are cross-cutting, each about 100 feet long and 4 feet deep. Six trenches have been cut between the Furniss and Phoenix deposits and two northeast of the Furniss. They offer no new data. All available maps are given in the application.

The applicant has recently removed the slumped material from the collar of three shafts--Old Pump shaft and old Phoenix shaft on the Phoenix deposit and the Furniss shaft. They are currently dewatering the Phoenix mine and at the date of the examination had the water down to the 155-foot level and the Old Pump shaft reconditioned and ladders installed to the 150-foot level.

Little new information can be added to that given in the application on the geology of the area. Only a brief summary and certain general views which may differ from those expressed in the application will be given.

Tungsten mineralization occurs at this place in association with thin quartz veins which are conformable to the foliation of the andesite tuff and fine grained andesite wall rock. There is a difference of opinion as to the various vein systems. The examiners are of the opinion that the Phoenix and Furniss mines are in the same zone and are probably in the same vein. The veins do not strike in a straight line as indicated on Figure 3 of the application. They range in strike from about N. 20° E. to N. 74° E. In the Phoenix-Furniss area, the average strike is about N. 60° E. and the dip 80° NW. The quartz vein pinches and swells, ranging froma few inches to about four feet in thickness. It is reported that the vein branches at several places in the Phoenix mine. In the only level available for inspection (150-foot level) two branches of the vein are present. Each is about 12 inches thick and they are separated by three feet of wall rock. Both the quartz vein and the wall rock show effects of shearing. Striations which were observed on the 150-foot level plunge at a low angle to the southwest. Previous observers have suggested that ore shoots rake to the northeast. The examiners have no opinion on this subject.

The 150-foot level of the Phoenix mine was examined in part with a "short wave" mineralight. Some scheelite mineralization is present, but not enough to justify sampling. There is no clear cut opinion as to whether or not gold and tungsten values are together. Some investigators believe that they are together; others disagree.

Little information is available as to reserves of the tungsten ore. D. L. Lemmon (1952) has suggested that 3,000 units may be present between the Furr shaft and a point 780 feet to the northeast to the 170-foot level. Certainly the known reserves are small.

From the information currently available, it appears that the area northeast and southwest of the Furniss shaft offers the best possibility for the discovery of a worthwhile tungsten deposit. Information available on the Phoenix is less encouraging. The scheelite mineralization in the dump may be misleading as most of the vein material was milled for its gold content, thus leaving little scheelite in the dump. Furthermore, little

opportunity has been had to inspect the vein in place. However, with the data available it appears that the Phoenix mine shows little promise as a source of tungsten.

Mention should be made of other values that occur in these deposits--namely gold. Between the 250-foot and 602-foot level in the Phoenix mine the vein is reported to average 14.6 inches in thickness and contain $22.67 of gold per ton @ $35/oz. (Houston, 1950, page 43). Other analysis from the Furr and Furniss openings are not available.

Summarizing--the following points should be mentioned. A quartz vein has been mined for gold at various places along its strike over a length in excess of one quarter mile. The vein pinches and swells, ranging in thickness up to about 4 feet, with an average thickness of probably less than two feet. In the thicker portions of the vein both gold and tungsten are reported to be absent, The richest known portion of the vein is in the vicinity of the Furniss shaft and the richest ore so far analyzed represented a selected sample which contained 11.9 percent of WO_3. Known reserves are small, as indicated by the U. S. Bureau of Mines work during 1948-50. At that time the Furniss shaft was unwatered and retimbered where necessary and two levels sampled. Also, seven diamond drill holes were drilled on the vein. Only one hole encountered tungsten mineralization.

From the above, it is apparent that the possibilities for the discovery of a worthwhile tungsten deposit in this area are not too good. Also, it should be mentioned that the applicants are mainly interested in recovering the gold values. Certainly if the deposit can be made to pay, the gold values will be the principal source of revenue.

In general the following plan of exploration is recommended:

Phoenix Mine--The applicants are currently unwatering and rehabilitating one of the shafts at this mine, having at the time of the examination spent approximately $15,000 on the work. They plan to continue this work and have requested $10,000 assistance from DMEA so that the mine can be adequately sampled. Unless far superior grade ore is uncovered than that now showing, assistance is not warranted. We are of the opinion that assistance should be withheld at this time. If as unwatering progresses, commercial tungsten is uncovered, possibility of DMEA assistance should be considered.

Furniss Mine.--The possibility of making a worthwhile discovery at this mine is better than the Phoenix. We recommend that a headframe be constructed, shaft timbered where necessary, workings unwatered, and accumulated muck removed from the shaft. As conditions warrant, 300 feet of drift and/or raise from the 170-foot level are recommended.

If results from the above are successful, the footwall should be explored for possible parallel ore zones. To do this three 150-foot drill holes from the 170-foot level are recommended. If mineralization is encountered in any of the holes, not more than 300 feet of crosscut and drifts are recommended to check the mineralization.

In zones of mineralization adequate samples should be taken and analyzed for their gold and tungsten content.

Estimated costs of the proposed exploration are as follows:

Stage I

Construct Headframe		
1 carpenter 10 days @ $1.50/hr.	$120.00	
3 laborers 10 " @ $1.00/hr.	240.00	
Hardware - sheave, bearings, bolts, washers, nails, etc.	150.00	
Lumber - 7000 board feet @ $70.00/M	490.00	
		$1,000.00
Construct 12'x12'x10' hoist and toolhouse		
1 carpenter 2 days @ $1.50/hr.	24.00	
1 laborer 2 " @ $1.00/hr.	16.00	
Lumber - 2000 board feet @ $70.00/M	140.00	
Nails, tar paper, windows, etc.	70.00	
		250.00
Rehabilitate 170 feet shaft and install partitioned ladder way. One Month		
1 - Supervisor 1 month @ $500.00/Mo.	500.00	
1 - Hoistman 20 days @ $1.50/Hr.	240.00	
3 - Laborers 20 " @ $1.00/hr.	480.00	
Lumber - 4000 board feet at $70.00/M	280.00	
2 - Electric pumps @ $50.00/Mo. rental	100.00	
Gasoline hoist @ $50.00/Mo. rental	50.00	
Hand tools and miscellaneous supplies	350.00	
		2,000.00
Drive 300 feet of 5' x 8' drift and/or/ raises or/crosscuts (120 shifts)		
Labor		
1 - Supervisor @ $500.00/Mo.	2,500.00	
1 - Driller @ $1.50/hr.	1,440.00	
1 - Hoistman @ $1.25/hr.	1,200.00	
2 - Laborers @ $1.00/hr.	1,920.00	
Equipment (rental)		
Compressor, drill and jackleg @ $250.00/Mo.	1,250.00	
Hoist @ $50.00/Mo.	250.00	
Pump @ $50.00/mo.	250.00	

Supplies			
Gasoline and oil	450.00		
Explosives	600.00		
Drill steel	200.00		
Hand tools	90.00		
Miscellaneous	100.00		
Insurance and Social Security	1,000.00		
		$11,250.00	
Analysis of 50 samples @ $5.00 each		250.00	
Estimated total cost of Stage I			$14,750.00
Stage II			
Diamond drill 3 - 150' AX holes @ $7.00/ft.*		$ 3,150.00	
*(Includes all costs, air, water, set-up, etc.)			
Drive 300 feet of 5' x 7' drift and or/raises or crosscut (120 shifts) @ $37.50/ft.		11,250.00	
Analysis of 50 samples @ $5.00 each		250.00	
Estimated total cost of Stage II			14650.00
ESTIMATED TOTAL COST OF PROJECT			$29,400.00

REFERENCES CITED

Houston, Robert S., 1950. Tungsten deposits in Cabarrus County, N. C. Unpublished M.S. thesis, North Carolina State College, submitted as exhibit "B" with DMEA-3742 application.

Lemmon, D. M., 1952. Memorandum, dated Sept. 18, 1952, to George Selfridge, reviewing DMEA-2663 application.

May 10, 1955

K. H. Teague, Geologist
U. S. Geological Survey

and

Wm. A. Beck, Mining Engineer
U. S. Bureau of Mines

g

DOCKET
SURNAME

400 Rutledge
Martin
Selfridge
J. H. Hedges

APR 15 1955

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furnies mines
Cabarrus County, North Carolina

Dear Mr. Laurence:

Enclosed are copies of the indentures by which Russell and Company, Inc., control the property referred to in the above referenced application for exploration assistance. Transfer of interest in these properties from Russell and Company, Inc., to the Carolina Tungsten Mining Company is in process.

A list of the documents enclosed follows:

1. Lease and Option Agreement on the Furnies property between Robie L. Nash and his wife, Ethel A. Nash and Archie L. Nash and his wife, Mary L. Nash, parties of the first part; and Russell and Company, Inc., party of the second part. Agreement dated January 7, 1955.

2. Lease dated December 20, 1951, on mineral rights of the Phoenix property between Helen Evelyn Chapin Bishop, Ruby Chapin Pitner, Lowell Meade Chapin and Charles Douglas Chapin, as trustees under the will of Charles A. Chapin, deceased, hereinafter called Lessors, and A. L. Nash, hereinafter called Lessee.

3. Sublease dated January 7, 1955, on mineral rights of the Phoenix property between A. L. Nash and wife, Mary L. Nash, parties of the first part, and Russell and Company Inc., party of the second part.

FARutledge:foc 4-14-55
cc to: Docket
Code 400
Adm. Read. File
cc to: Mr. Holliday, USBM
Mr. Kiilsgaard, USGS

APPROVED:
Operating Comm.
FT. REG. V

Sincerely yours,

George C. Selfridge
CHAIRMAN, Operating Committee (HB)

J. H. Hedges (HB)
Member, Bureau of Mines

Thor H. Kiilsgaard (HB)
Member, Geological Survey

R.C.M.

SUH
400
Chapman
Martin
Holliday
Selfridge
Elmer
Kiilsgaard

APR 11 1955

Mr. Robert A. Laurence, Executive Officer
DMEA Field Team, Region V
Room 13, Post Office Building
Knoxville 2, Tennessee

Re: Docket No. DMEA 3742 - Tungsten
Carolina Tungsten Mining Company
Phoenix and Furnace Mines
Cabarrus County, North Carolina

Dear Mr. Laurence:

The above docketed application for exploration assistance is being referred to your office for a field examination.

Two copies of a relevant memorandum dated April 6, 1955, by E. L. Newcomb, Geological Survey, are enclosed for your information.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee (JHB)

Enclosure

TLChapman:fec
4-11-55
cc to: Docket
Code 400
Adm. Reading File
Operating Comm.
FT. Reg. V
Messrs. Holliday, USBM
Kiilsgaard, USGS

APPROVED:

J. H. Hedges (JHB)
Member, Bureau of Mines

Thor H. Kiilsgaard (JHB)
Member, Geological Survey

R.A.L.

400

DOCKET
Surname:
Chapman
Martin
Holliday
Kiilsgaard
Hedges
Johnson

APR 11 1955

Mr. Paul M. Tyler
Carolina Tungsten Mining Company
5005 Edgemoor Lane
Bethesda 14, Maryland

Re: Docket No. DMEA 3742 - Tungsten
Phoenix and Furniss Mines
Cabarrus County, North Carolina

Dear Mr. Tyler:

The above-docketed application for exploration assistance for tungsten ores has been reviewed by the Iron and Ferro-Alloys Division of the Defense Minerals Exploration Administration and referred to Mr. Robert A. Laurence, Executive Officer, Region V, Room 13, Post Office Building, Knoxville 2, Tennessee, for a field examination.

Any assistance that you can give the members of the Field Team will be appreciated.

Sincerely yours,

C. O. Mittendorf

Administrator

cc: Docket
FT, Reg. V
Code 400
Adm. Read. File
Oper. Comm.
Robt. Holliday, USBM
Thor Kiilsgaard, USGS

TLChapman/ls 4/11/55

IN REPLY REFER TO:

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

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

April 6, 1955

Re: DMEA-3742
Carolina Tungsten Mining Co.
(Phoenix & Furniss Mines)
Cabarrus Co., N.C.
$61,548 - Tungsten

Memorandum

To: W. S. Martin, Defense Minerals Exploration Administration

From: E. L. Newcomb, U. S. Geological Survey

Subject: Review of application

The applicant has proposed to unwater and rehabilitate the Phoenix mine, reopen the Furniss shaft, drift 300 feet southwesterly on the Furniss 170-level, crosscut 100 feet from 170-level to explore for an extension of the Phoenix vein and drift 300 feet northeasterly on the 170-level to explore for a possible ore shoot indicated in holes BM4 and BM 5.

The work of reopening the Phoenix and Furniss mines is currently being done by the operators. It would be highly desirable to have the old workings accessible for DMEA examination. However, a limited amount of participation by DMEA in the Phoenix mine rehabilitation work may be justified. Inasmuch as the Bureau of Mines has examined and sampled the Furniss mine in recent years I do not believe DMEA should participate in the reopening of the Furniss mine.

In August, 1952, The Nash Mining Co., Inc., applied for DMEA exploration assistance (DMEA-2663) on the Furniss mine. The application was denied on September 25, 1952. Although the Bureau of Mines and Survey commodity reviewers recommended the work be denied, their recommendations for denial were based, at least in part, on the valid conclusion that the cost of the proposal was high when compared to the value of the exploration objectives. However, D. Lemmon stated under Conclusion: in his memorandum of September 18, 1952, "- - - my convictions are not too firm and I would not oppose a less costly program to delineate the ore shoot at the Furniss mine, perhaps involving 100 to 200 feet of drift northeast on the 170-level and a 50 foot raise from the center of any ore discovered." It seems only fair to call attention to this statement especially inasmuch as a field examination was not made at the Furniss property.

The operator has recently completed about a dozen trenches across the Furniss-Phoenix vein system. An examination of these new exposures should be carried out by the Field Team.

A rather complete description of the Phoenix mine is included in D. Lemmon's memorandum of May 11, 1948, which is a part of DMEA-2663 docket file. Although it is based on an examination of surface exposures which existed in 1948, it refers to information in earlier reports which describe the underground workings.

The Phoenix-Furniss area contains sufficient evidence of tungsten mineralization to warrant further DMEA consideration of a possible exploration project. I recommend the application be referred to the Field Team for an examination and a report with their recommendations. The earlier docket file, and the reports attached to DMEA-3742 should accompany the application.

E. L. Newcomb

E. L. Newcomb

April 1, 1955
Subject: DMEA 3742
Re: Exploration Assistance
Phoenix Mine, Furniss
Mine

Carolina Tungsten Mining Company
C/o Mr. Paul M. Tyler, Pres.
5005 Edgemoor Lane
Bethesda 14, Maryland

Gentlemen:

The receipt of your application dated March 30, 1955 for exploration assistance under the Defense Production Act of 1950, as amended, is hereby acknowledged.

Your application has been assigned Docket Number DMEA 3742 and referred to the Iron and Ferro-Alloys Division.

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

Sincerely yours,

Robert E. Adams, Chief
Operations Control and
Statistics Division

only 2 copies of the book attachments (Exhibits A + B) were submitted.

M -500

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

REFERENCE SLIP

DATE 9/20

REFERRED TO:

1. 400
2.
3.
4.

FOR:

..... Action	..... Recommendation
..... Approval	..... Record of .....
..... Comment	..... Referring to .....
..... Conference	..... Reply for signature of .....
..... Consideration	..... Rewriting
..... Filing	..... Signature
..... Instructions	..... Suggestions
..... Investigation	..... Your information
..... Initials	
..... Mailing	
..... Previous correspondence	

REMARKS:

The memo. referred to in teletype has not been rec'd in this office. c

Check (X) before the items needing attention.

ROBERT L. [illegible] want results for G.P.

9/28/55 Initials of sender.

Mr. M.

GPO 16—63815-1

~~L.S.~~ ~~Kee the~~

~~Pls bring~~

~~this back~~

~~when the memo~~

~~turns up~~

P.S. There was a "congressional" on this — was it taken care of?

No! by letter **No** didn't you phone Hon Hugh Alexander and offload work?

FURNISS MINE

CABARRUS COUNTY, NORTH CAROLINA

DMEA-3742 (W, Cu, Au,)

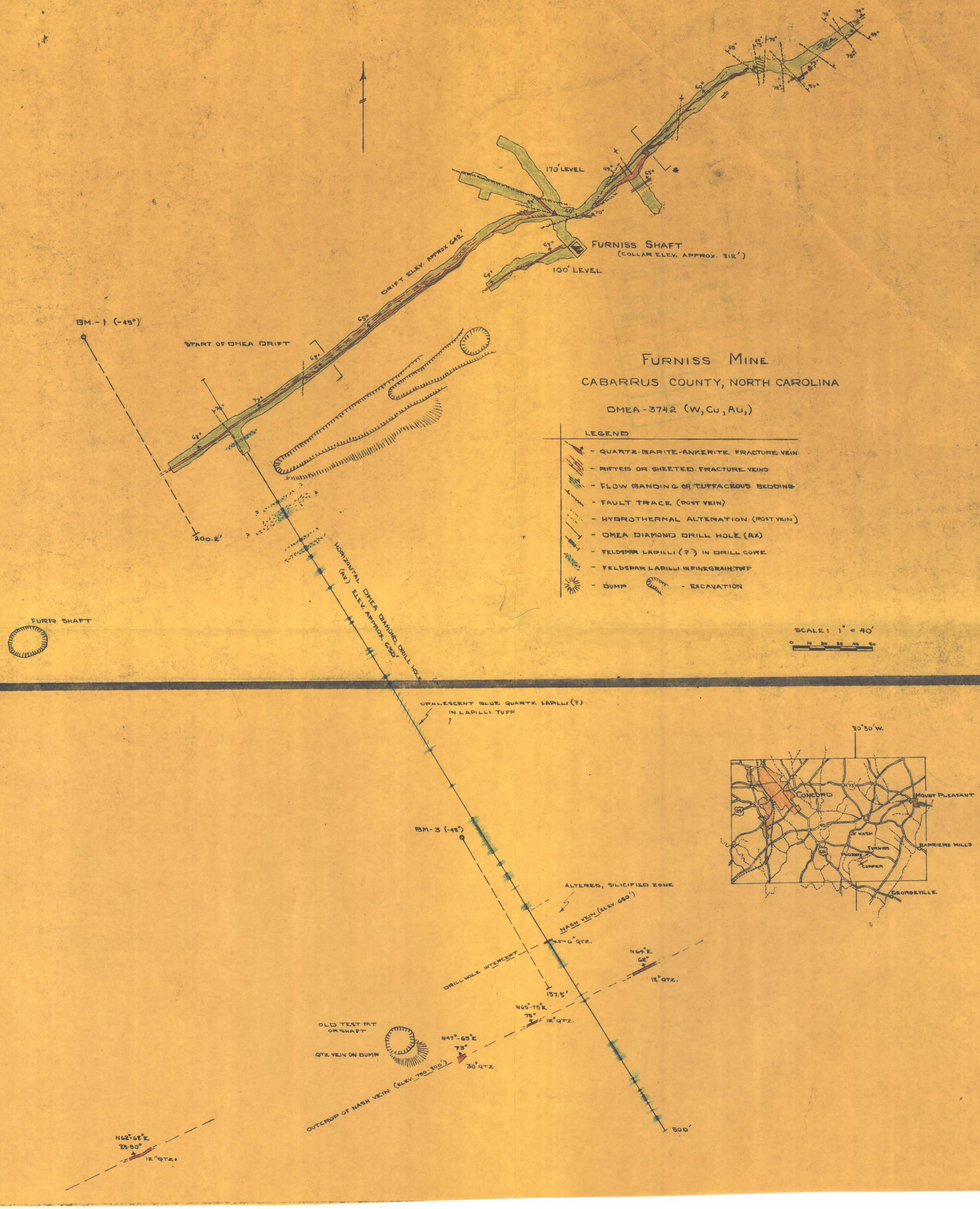


Figure 3

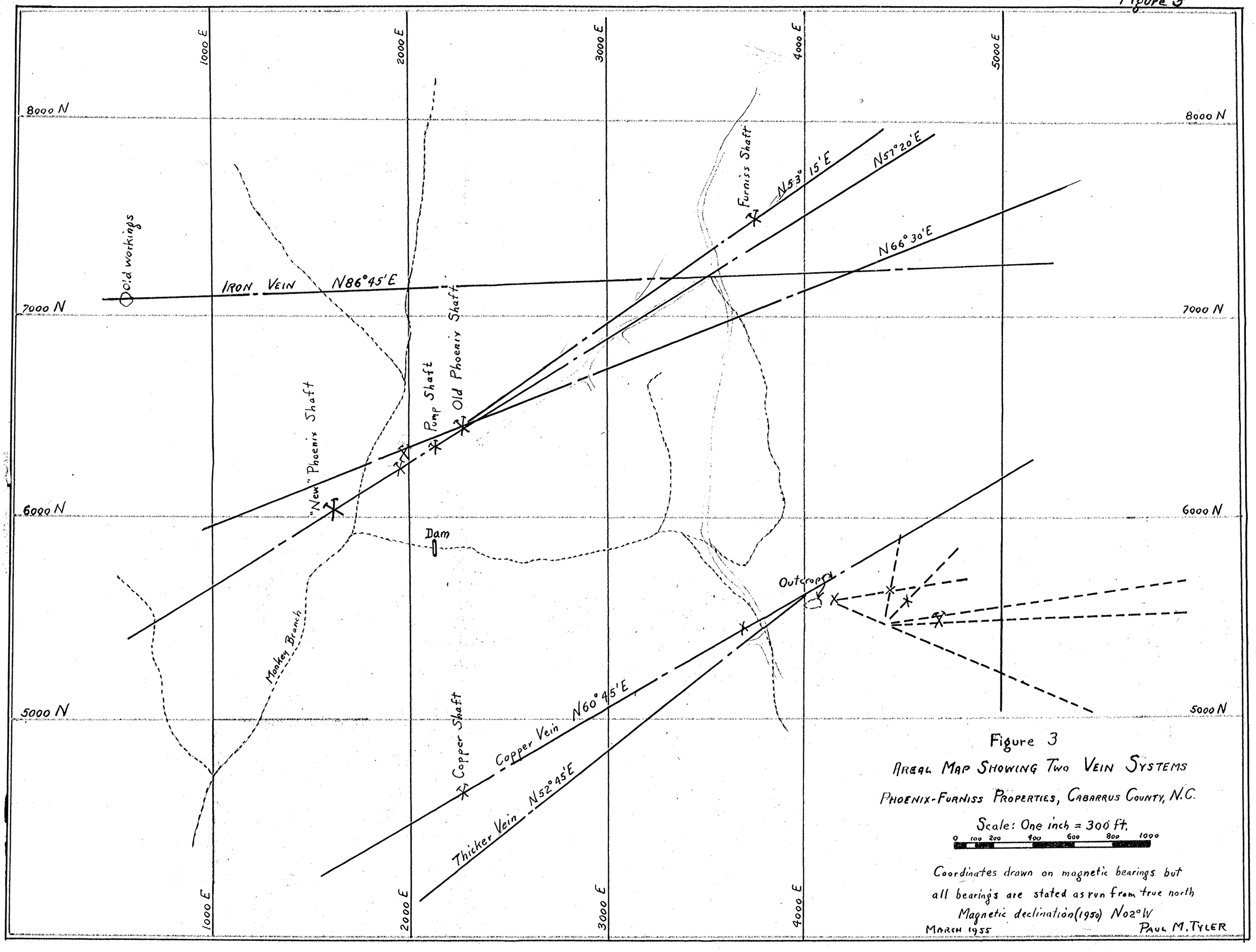


Figure 3

AREAL MAP SHOWING TWO VEIN SYSTEMS

PHOENIX-FURNISS PROPERTIES, CABARRUS COUNTY, N.C.

Scale: One inch = 300 ft.

0 100 200 400 600 800 1000

Coordinates drawn on magnetic bearings but all bearings are stated as run from true north

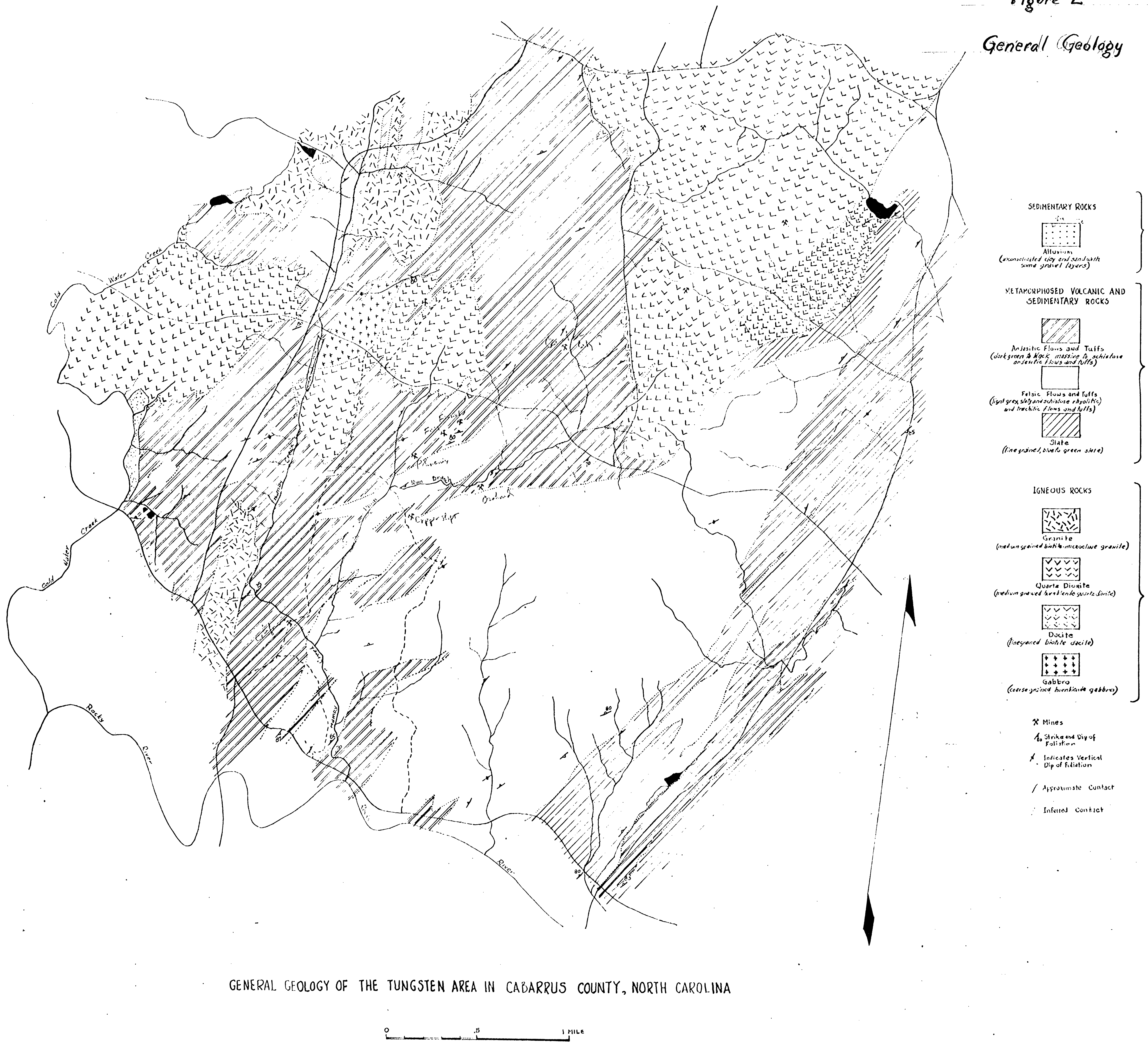
Magnetic declination (1950) N02°W

MARCH 1955

PAUL M. TYLER

Figure 2

General Geology



GENERAL GEOLOGY OF THE TUNGSTEN AREA IN CABARRUS COUNTY, NORTH CAROLINA

Geology by R. S. Houston

1949

FIGURE 2

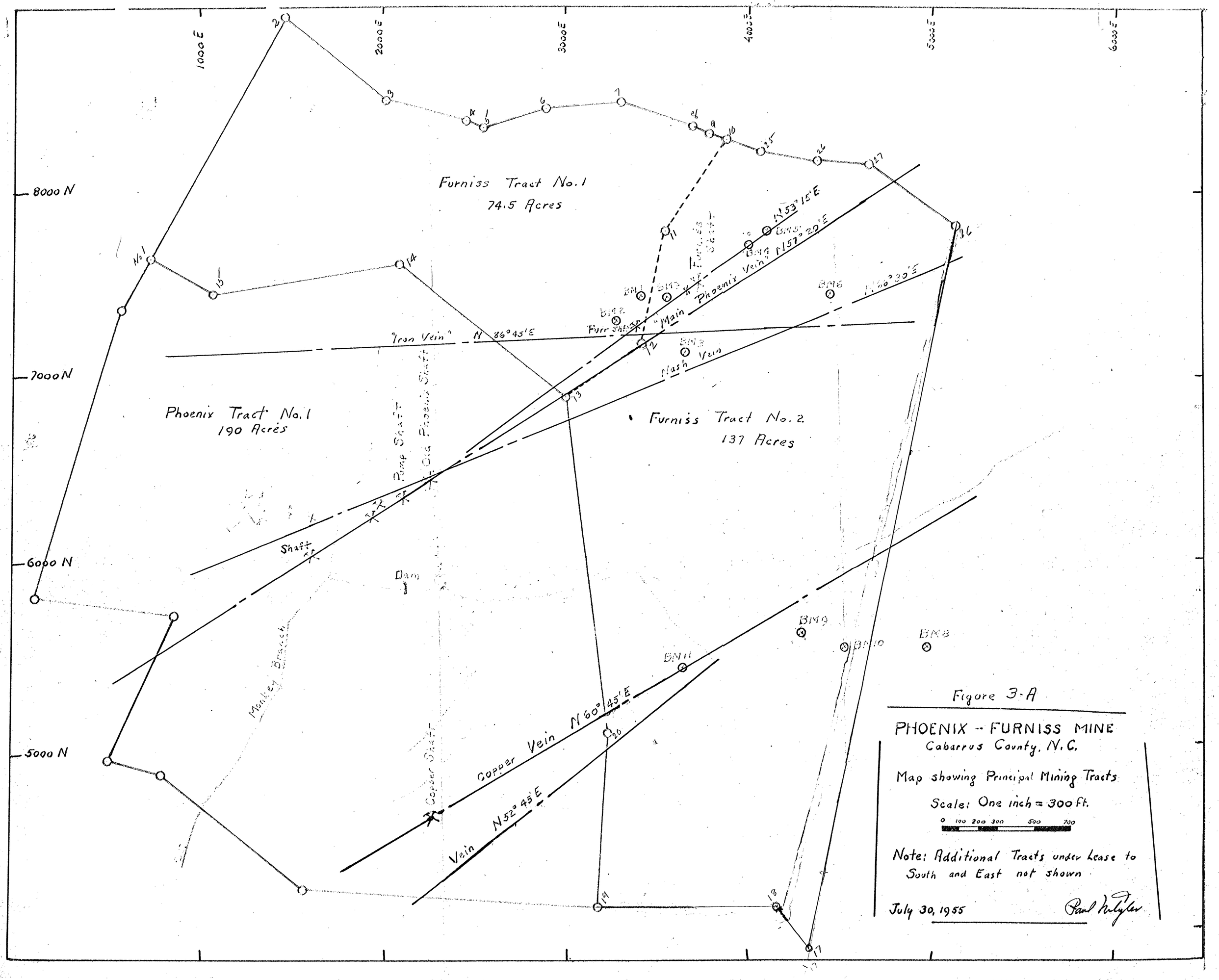


Figure 3-A

PHOENIX -- FURNISS MINE
Cabarrus County, N.C.

Map showing Principal Mining Tracts

Scale: One inch = 300 ft.

0 100 200 300 500 700

Note: Additional Tracts under lease to South and East not shown

July 30, 1955

Paul Kulyler